



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

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Attachment 7 – Southwest Airlines Aircraft Operations Manual (Excerpts)

OPERATIONAL FACTORS

DCA19CA151

Note: 8 The left recirculation fan operates unless both PACK switches are in HIGH and the right recirculation fan operates even if both PACK switches are in HIGH.

When ready for takeoff:

R PACK Switch	AUTO
ISOLATION VALVE Switch	AUTO
L PACK Switch	AUTO
APU BLEED Switch	OFF
ENG BLEED Switches	ON

15.2.3 Taxi Considerations

Revised: 07/11/2019

When operating the brakes in high ambient temperatures, the main landing gear fuse plugs may melt and deflate the main landing gear tires. Brake cooling procedures should be used when operating on runways and taxiways exposed to high temperatures. Excessive brake use should be avoided. Use of intermittent braking allows the brakes to cool between applications; do not ride the brakes. Allow the aircraft to accelerate, brake to a slow taxi speed, then release the brakes completely.

15.3 Precipitation and Convective Activity

Revised: 07/21/2016

This section contains information regarding precipitation and convective activity.

15.3.1 Severe Precipitation—Engine Operation

Revised: 07/11/2019

If extremely heavy precipitation is inadvertently encountered:

- Maintain the required turbulent air penetration airspeed.
- Engine Start Switches—CONT.
- Do not make thrust changes unless excessive airspeed variations occur.
- If thrust changes are necessary, move the thrust levers very slowly.
- Rapid thrust lever movements during flight in extremely heavy precipitation may cause engine stall and damage.
- Avoid changing thrust lever direction until engines have stabilized at a selected setting.

15.4 Turbulence

Revised: 01/15/2018

Notify the Flight Attendants when approaching areas of turbulence. Refer to FOM 15.3 Turbulence.

In any turbulence, accomplish the following:

- Ensure that the FASTEN SEAT BELT sign is illuminated. If possible, advise Passengers and Flight Attendants of any turbulent conditions prior to encountering them.
- Although use of the autopilot is considered desirable in most turbulence conditions, its use is at the Captain's discretion. During flight, Boeing recommends in light to moderate turbulence, the autopilot and/or autothrottle may remain engaged unless performance is objectionable.

In severe turbulence, accomplish the following:

- Autothrottle—Disengage
- Thrust—Set (see considerations below)
- Autopilot (if engaged)—CWS Mode (do not use Altitude Hold)
- Engine Start Switches—FLT
- Yaw Damper—Ensure ON

The following considerations apply to flights in severe turbulence:

- Set thrust as needed for the phase of flight and target airspeed. Change thrust setting only if needed to modify an unacceptable airspeed trend. The FMC CRZ page displays N_1 target values for level flight in turbulence.
- Severe turbulence causes large and often rapid variations in indicated airspeed. Do not chase the airspeed.
- The best airspeed and flight configuration to use in severe turbulence is that which affords ample protection from stall and high speed buffet and also provides structural integrity. Adjust the airspeed to the recommended turbulence penetration speed. Target air speed should be approximately 280 KIAS or 0.76 MACH, whichever is lower, or 250 kt below 15,000 ft.
- If the autopilot is engaged, use CWS (pitch and roll) mode only, adjusting attitude and heading by manual autopilot controls. If sustained trimming occurs, disengage the autopilot.
- If not using the autopilot, trim the aircraft for the appropriate penetration speed, and do not change the trimmed stabilizer position. Control the aircraft pitch attitude with the elevator using the attitude indicator as the primary reference instrument.
- In extreme up/down drafts, large attitude changes may occur. Do not make sudden or large control inputs. Corrective actions should be smooth and deliberate. Altitude variations are probable in severe turbulence and should be allowed to occur if terrain clearance is adequate. Control the aircraft's attitude first, then make corrections for airspeed, altitude, and heading.
- Avoid any maneuver that might result in a stall or upset by maintaining a constant heading, without overcontrolling. It is impossible to maintain a constant altitude in extremely turbulent conditions; therefore, it is important to maintain altitude with light to moderate pitch control inputs to avoid overcontrolling or overstressing the aircraft's structure.
- Avoid high speeds and steep turns as these impose greater structural loads on the aircraft during turbulence.

- The yaw damper greatly reduces the structural loads imposed on the aircraft.
- Flight through turbulence or hail may cause inlet airflow distortion. This distortion, along with engine icing, angle of attack changes, and high altitude engine surge margins can result in engine surge and flameout. Activate the FLT ignition as soon as severe turbulence is encountered or anticipated.
- Flap extension in an area of known turbulence should be delayed as long as possible because the aircraft can withstand higher gust loads with the flaps and gear retracted. Divert to another airfield if severe turbulence persists in an area.

15.5 Windshear

Revised: 07/21/2016

Windshear is a change of wind speed and/or direction over a short distance along the flight path. In severe cases, the loss of airspeed and/or change in the vertical flight path can exceed aircraft performance capability.

Windshear encounters near the ground are the most threatening because there is very little time or altitude to respond to and recover from an encounter. As little as five seconds may be available to react to a degrading vertical flight path.

Flight Deck Crew actions for windshear are categorized into three areas: avoidance, precaution, and recognition and recovery.

Refer to the *QRH* for windshear recovery profiles and further information.

15.5.1 Avoidance

Revised: 07/21/2016

When convective or other adverse weather is present, be aware of the clues that indicate the presence of windshear along the intended flight path. Windshear may be indicated by:

- Thunderstorm activity
- Virga (rain that evaporates before reaching the ground)
- Pilot reports
- Low level windshear alerting system (LLWAS) warnings
- Microburst alerting system warnings

Stay clear of thunderstorm cells, heavy precipitation, and areas of known windshear. If the presence of windshear is confirmed, delay takeoff or do not continue an approach. Windshear conditions often dissipate within 10 to 20 minutes.

The Predictive Windshear System (PWS) provides windshear alerts, cautions, and warnings when windshear conditions are detected below 1,200 ft along and ahead of the aircraft flight path. Follow PWS procedures located in the *QRH*.