## Attachment 10

To Operations Group Factual Report

# DCA12IA141

Bombardier AFM – Operation in Icing Conditions

#### 4.7 OPERATION IN ICING CONDITIONS

#### NOTE

#### **ICING CONDITIONS:**

Icing conditions exist when the SAT on the ground and for take-off is 10°C or below, or SAT in flight is 5°C or below, and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet, or ice crystals).

Icing conditions also exist when the SAT on the ground and for take—off is 10°C or below when operating on ramps, taxiways or runways where surface snow, ice, standing water, or slush may be ingested by the engines or freeze on engines, nacelles or engine sensor probes.

#### WARNING

Flight in freezing rain, freezing drizzle or mixed icing conditions (supercooled liquid water and ice crystals) may result in ice build-up on protected surfaces, exceeding the capability of the ice protection system or may result in ice forming aft of the protected surfaces. This ice may not be shed using the ice protection systems and may seriously degrade the performance and controllability of the airplane.

Severe icing conditions may be encountered during flight in visible rain with SAT below  $0^{\circ}$  C ambient temperature and specifically with droplets that splash or splatter on impact.

Severe icing may be identified by unusually extensive ice accreted on the airframe in areas not normally observed to collect ice, the accretion of ice on the propeller spinner aft of the spinner nose toward the propeller blades or ice accreted on the side windows of the flight compartment aft of the leading edge.

#### 4.7.1 ICE PROTECTION CHECKS.

#### AIRFRAME

- 1. DEICE PRESS indicator Check  $18 \pm 3$  psi on each dial.
- 2. VALVE HEAT switch VALVE HEAT.
- 3. AIRFRAME AUTO selector FAST. During one complete cycle (60 seconds) execute the following checks:
  - a. Check the WING advisory lights illuminate and go out sequentially in pairs, commencing with the outboard pair and ending with the inboard pair, followed by the inboard TAIL then the outboard TAIL.

#### NOTE

On airplanes incorporating Mod 8/0824 the sequence of the WING 3rd and 4th advisory lights on the left side is reversed.

- b. Check that the DEICE PRESS indicator needles fluctuate in phase with the indicator lights.
- c. Check visually that the engine air intake boots inflate with the third lights in wing boot sequence.
- d. Check that the cycle recommences after 24 seconds dwell period then turn selector to OFF.
- 4. AIRFRAME MANUAL selector Rotate through wing and tail positions and observe WING and TAIL advisory lights illuminate as selected.

#### 5. VALVE HEAT switch – OFF.

#### PROPELLER

- 1. PROP TMR selector PROP TMR 1, ABOVE –10°C.
- 2. POWER levers Advance to achieve not less than 900 Np (1000 Np on pre–Mod 8/0202 airplanes).

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3. PROP TEST switch – Hold at TEST. Check PROPS advisory lights illuminate individually for approximately 10 seconds and go out in sequence through one cycle.

#### CAUTION

During ground test do not hold PROP TEST switch at TEST for more than one cycle without a 60–second dwell time between cycles.

- 4. PROP TMR selector PROP TMR 2, BELOW –10°C. Check PROPS advisory lights illuminate individually for approximately 20 seconds and go out in sequence through one cycle.
- 5. PROP TEST switch Release.
- 6. PROP TMR selector OFF.
- 7. POWER levers FLT IDLE.

#### ELEVATOR HORNS

- 1. ELEV HORN switch Hold at TEST. Check that L ELEV HORN HEAT and R ELEV HORN HEAT caution lights illuminate and go out after 2 seconds (pre–Mod 8/0385 aircraft, ELEV HORN HEAT caution light illuminates and goes out after 2 seconds).
- 2. ELEV HORN switch Release.

ENGINE INTAKE BYPASS DOORS

- 1. ENGINE INTAKE BYPASS DOOR switches Press. Check CLOSED advisory lights go out and after 35 to 40 seconds OPEN/HTR advisory lights illuminate.
- 2. ENGINE INTAKE BYPASS DOOR switches Press. Check CLOSED advisory lights illuminate.

#### NOTE

The HTR advisory light may not illuminate if SAT is greater than 15°C (pre-Mod 8/0928, 10°C).

#### 4.7.2 ICE PROTECTION PROCEDURES

- 4.7.2.1 BEFORE ENTERING ICING CONDITIONS OR WHEN ICE IS DETECTED.
  - 1. ENGINE INTAKE BYPASS DOOR switches Press. Check OPEN/HTR advisory lights illuminate.
  - 2. IGNITION 1 and IGNITION 2 switches MANUAL (MS 8Q100813 AUTO).
  - 3. ELEV HORN switch HEAT.
  - 4. VALVE HEAT switch VALVE HEAT.
  - 5. PROP TMR selector Select 1 or 2. Select ABOVE –10°C OR BELOW –10°C as appropriate. Observe PROPS advisory lights illuminate individually and go out in sequence.

#### NOTE

- The effectiveness of the propeller deicing system can be improved and propeller vibration reduced by operation of the propellers up to 1200 Np.
- 2. On pre–Mod 8/0202 airplanes propeller rpm should be maintained above 1000 Np during propeller deicing operation.
- 3. On pre–Mod 8/0312 airplanes the SYNCHROPHASE switch must be selected to OFF when propeller deicing system is operating.
- 6. WINDSHIELD HEAT:
  - a. WINDSHIELD HEAT selector WARMUP (minimum 30 seconds).
  - b. WINDSHIELD HEAT selector NORM.

If ice forms on forward edge of pilot's side window:

7. PLT WDO/HT switch - ON.

8. DEICE PRESS indicator – Check 18 + 3 psi on each dial.

#### NOTE

- 1. On pre-Mod 8/0783 airplanes incorporating Mod 8/0347, if pressure on DEICE PRESS indicator is observed to stabilize at a value below 15 PSI; pressure may be restored by selecting one BLEED switch to OFF for three to five seconds.
- 2. For performance penalty see Table 5-13-1.
- 4.7.2.2 CLIMB, CRUISE and DESCENT in ICING CONDITIONS.

On initial detection of ice:

1. AIRFRAME AUTO selector – FAST or SLOW, depending on the rate of ice accumulation. Check WING and TAIL advisory lights illuminate sequentially in pairs.

#### NOTE

Monitor ice accumulation between boot cycles (use wing inspection lights as required) to confirm that the selected AIRFRAME AUTO rate [FAST or SLOW] is appropriate.

#### CAUTION

An accumulation of ice on the airplane may change the stall characteristics, stall speed, or warning margin provided by the stall warning system.

- 2. Monitor WING and TAIL deicer boot advisory lights for normal operation.
- 3. Minimum airspeed:
  - a. Climb Final Take-off Climb Speed (figure 5-2-5) + 15 kt.
  - b. Descend 1.3 V<sub>S</sub> (figure 5–1–2) flap  $0^{\circ}$  + 15 kt.

When clear of icing conditions:

4. Continue to cycle the boots on FAST until all ice is removed from visible leading edges.

When all ice is removed from visible leading edges:

- 5. AIRFRAME AUTO selector OFF.
- 4.7.2.3 HOLDING, APPROACH AND LANDING IN ICING CONDITIONS.

#### NOTE

When holding in icing conditions flap must be at 0°.

On initial detection of ice:

- 1. Airspeed Minimum holding, 1.3 V<sub>S</sub> (figure 5–1–2) flap  $0^{\circ}$  + 15 kt (pre–Mod 8/0379 airplanes, hold at not less than 150 kt IAS).
  - Approach and Go-around Speed (figure 5-8-1) flap  $5^{\circ}$  + 15 kt.
  - Approach and Go-around Speed (figure 5-8-2) flap  $15^{\circ}$  + 10 kt.
  - Landing V<sub>REF</sub> (figure 5–8–1) flap  $15^{\circ}$  + 10 kt.
  - Landing V<sub>REF</sub> (figure 5–8–2) flap  $35^{\circ}$  + 5 kt.

AIRFRAME AUTO selector – FAST.

#### NOTE

On pre-mod 8/1375 airplanes, to ensure adequate de-ice pressure at low power settings, the BLEED switches must be selected to BLEED 1 and BLEED 2 until clear of icing conditions or commencement of go-around.

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#### NOTE

For performance penalty see Table 5-13-2.

#### CAUTION

An accumulation of ice on the airplane may change the stall characteristics, stall speed, or warning margin provided by the stall warning system.

4.7.2.4 HOLDING, APPROACH AND LANDING AFTER FLIGHT IN ICING CONDITIONS AND WITH SUSPECTED ICE ACCUMULATION ON UNPROTECTED SURFACES. (ICE PROTECTION SYSTEM "OFF").

Before commencing the hold or approach or at any time airspeed is  $1.4 V_S$  (figure 5-1-2) or less:

1. Continue to cycle the boots on FAST until all ice is removed from visible leading edges.

When all ice is removed from the visible leading edges:

- 2. AIRFRAME AUTO selector OFF.
- 3. Airspeed Minimum holding, 1.3 Vs (figure 5-1-2) flap 0°.
  - Approach and Go-around Speed (figure 5-8-1) flap  $5^{\circ}$  + 5 kt.
  - Approach and Go-around Speed (figure 5-8-2) flap  $15^{\circ}$ .
  - Landing VREF (figure 5-8-1) flap 15°.
  - Landing VREF (figure 5-8-2) flap 35°.

#### NOTE

For performance penalty see Table 5-13-3.

#### 4.7.3 FLIGHT IN SEVERE ICING.

1. Autopilot – Disconnect immediately.

#### CAUTION

Be prepared for a possible roll force requirement by firmly holding the control wheel prior to disconnecting the autopilot.

- 2. Condition levers MAX.
- 3. POWER levers Adjust as required to maximum continuous power (figure 5-1-9).
- 4. Minimum airspeed 150 kt IAS.
- 5. Exit severe icing conditions by changing altitude and/or course as required.

#### CAUTION

Avoid aggressive maneuvering.

When clear of severe icing conditions:

#### NOTE

It can be assumed that the airplane is no longer affected by the severe ice encounter when the ice accumulated on the flight compartment side window is removed.

- 6. POWER levers and conditions levers Adjust as required.
- 7. Airspeed As required.
- 8. Autopilot As required.
- 9. Refer to paragraph 4.7.2.3 or 4.7.2.4 as appropriate, for holding, approach and landing.