APPENDIX G—EMBRAER ICING GUIDANCE/PROCEDURES

EMBRAER
EMB120 Brasilia
OPERATIONAL BULLETIN

O.B. Nº: 120 - 002 / 96
DATE : Apr 12, 96

I - DOCUMENT EFFECTIVITY: ALL EMB 120 A/C

This bulletin is issued by EMBRAER as the need arises to quickly transmit technical and operational information. It is distributed to EMB-120 BRASILIA operators and to any personnel who need early advice of this information.
The matter published in this bulletin may not be approved by Airworthiness Authorities at the time of issuing. In the event of conflict with the approved publication (AFM, WB, MMEL, or CDL) the approved information shall prevail.

II - SUBJECT: OPERATION IN ICING CONDITIONS

III - REASON:

To provice information and recommendations regarding the aircraft operation in icing conditions.

IV - BACKGROUND INFORMATION:

In October 1994, a transport category aircraft was involved in an accident which resulted from an in-flight loss of control and a subsequent dive until the aircraft crashed into the ground. Although the investigation has not yet made a finding of the probable cause of the accident, the in-flight loss of control of the aircraft is suspected to have been caused by ice accretion on the upper surface of the wing aft of the protected area which resulted in airflow separation and abnormal aileron force necessary to maintain coordinated flight. It was noted that weather at the time of the accident involved atmospheric conditions outside the icing envelope specified in Appendix C of part 25 of the Federal Aviation Regulations (14 CFR part 25) used for certification of the aircraft. Such atmospheric conditions, involving freezing rain and freezing drizzle, are referred to as supercooled large droplets (SLD) and are also described as severe icing. SLD condition is not addressed in the appendix C and the FAA has not required that aircraft demonstrate the capability of safely flying in those icing conditions.

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Since the potentially unsafe condition of flying in severe icing conditions outside of the envelope for which the aircraft is certified is not limited to the type of aircraft that was involved in the accident, EMBRAER was required to conduct a series of tests to evaluate the roll control characteristics of the EMB-120 while flying in SLD conditions.

During these tests, the EMB-120 was operated in a spray of supercooled water droplets generated by an icing tanker simulating the typical SLD environment. The results of the tests allowed for the determination of aircraft specific visual cues which can be used by flight crews to identify when the aircraft is operating in icing conditions for which the aircraft has not been certified. In addition, these tests allowed for the defi[illegible] realistic representation of the ice shapes, in terms of thickness, width and pattern on the wing, that could occur in flight. These ice shapes were then reproduced artificially and extensive tests were flown in dry air to assess the handling qualities of the aircraft.

Results of these tests, as well as the related procedures during operation in freezing rain/freezing drizzle are included herein. EMBRAER highly recommends that this document be distributed to all personnel involved with flight operations within operators' organizational structure.

a degradation of the flight qualities.

- Aircraft operation in SLD conditions with autopilot engaged was found to be adequate under the conditions tested.
- Operational recommendation when flying in SLD conditions:
- Minimum icing speed is 160 kt, which must be increased if buffet appears.
- Use of the autopilot HDG and ½ ϕ modes while flying in icing conditions.
- Increased airspeed on final approach: V_{REF} + 5 kt plus Δ gust.

All tests conducted in relation to the SLD conditions were not targeted at certifying the aircraft to fly under these conditions. The EMB-120 is still not approved for flight in freezing rain and freezing drizzle. Upon recognizing SLD conditions in flight, per visual cues as stated in "SLD CONDITIONS VISUAL CUES", the crew must take immediate action to leave the SLD condition as soon as possible.

Monitoring Ice Formation

Monitoring of ice starts on ground. Contamination on ground may be caused by falling snow (wet or dry), slush or frost. Frost or ice can form following a cold soaked period at altitude or overnight at the ramp. If it rains on a cold-soaked wing, clear ice, difficult to detect, can form. Frost often occurs on wing lower surface as a result of humidity which condenses and freezes on the wing surfaces where fuel is at 0 degrees C or colder. Some conditions, such as freezing rain, freezing fog or high humidity can cause a kind of frost or ice that is also difficult to detect. While on ground, the rule is obvious: never takeoff with snow or ice adhering to any part of the aircraft.

The only way to ensure that wings, control surfaces and propellers are free from ice is through close visual inspection prior to takeoff. At intermediate stops, an external walk around is necessary because of the possibility of ice reforming after landing.

In addition to a visual inspection, touching the ice accretion may provide additional cues regarding ice thickness and roughness. Do not touch the surfaces with bare hands, as the skin may stick to a freezing surface.

Ice should be prevented and avoided. Before taking off, every pilot should analyze the weather situation contained in weather briefings from a flight service station or an authorized aviation meteorological source. Also pay special attention to pilots reports (PIREPS) of ice (or no ice) along the intended route of flight.

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In flight, ice monitoring starts when the outside air temperature is near freezing. Closely monitor the temperature indicator so that, when moisture is present, a look at the windshield, windshield wipers, engine air inlets, spinner, and wing leading edge will tell you if ice is starting to accumulate. During climb and descent, watch the temperature indicator for any temperature inversion. Listening to the SIGMETS may also help in determining if ice conditions exists outside of the aircraft.

When ice starts to build up, check the type and build-up rate to determine the severity of the ice encountered. If it is rough and milky, it is rime ice. If it is clear and horn-shaped, it is the glaze ice. If the ice build-up is slow, you may be flying in a stratus cloud, and its horizontal extent may cause a large ice accumulation. Another clue comes from the size of the water droplets (that you can see at night by turning on the landing lights) – small droplets, usually found in stratus cloud, tend to form rime ice. At night, turn on wing inspection lights to assist in defining rate and type of ice accumulation.

Another tool that can be used to alert the crew to the presence of ice is through performance changes. Airspeed decreases as a result of the increased drag. The pitch angle may be higher than normal to maintain a given altitude.

After the condition of ice is evaluated, develop a plan based on the facts. Do not hesitate to leave the icing conditions if necessary. Make the air traffic controller aware of the current situation and that you may be requesting altitude changes or expeditious handling due to icing conditions.

Heavy or severe ice is defined as that situation where the rate of ice accumulation is such that the deicing or anti-icing equipment fails to reduce or control the hazard. Continuously monitor the leading edge de-icers on the wing, observing the remaining ice between two consecutive cycles. It is characteristic of pneumatic deicing system that all the ice accretion cannot be eliminated because of the continuos accretion between the cycles.

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Operation in Icing Conditions

The procedures for operation in *NORMAL* icing conditions are specified in the approved AFM. The aircraft has demonstrated that flight in icing requires no special procedures beyond those already contained in the manual. Such procedures are re-stated and reinforced in this document to provide pilots with a clear understanding of the procedures and recommendations.

During the icing test series, the aircraft demonstrated nominal control response even when flying in SLD conditions. As such, the procedures to be used under those conditions do not differ significantly from that of the normal icing. The procedures are presented here in a checklist format as a memory aid.

All procedures and speeds presented herein must be applied as long as ice is adhering to the aircraft. After the aircraft is free of ice, normal operation should be resumed.

Flight in Normal Icing Conditions

External Safety Inspection

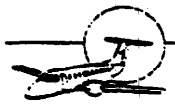
Operating regulations (FAR 91.209) clearly state that no pilot may takeoff an aircraft that is contaminated by frost, snow or ice. Regarding the air carriers (FAR 121.629), the regulations are very specific about whether and how aircraft can operate in icing conditions.

The ground check should follow the EXTERNAL SAFETY INSPECTION contained in the approved AFM, with special emphasis on the surfaces that may collect ice: wing and leading edge, horizontal stabilizer upper and lower surfaces and leading edge, rudder and vertical stabilizer, fuselage, Pitot/AOA/TAT probes, static ports; antennas, all intakes and outlets, landing gear and wheel well, and engine.

When the aircraft is contaminated, application of deicing or anti-icing fluid, or both, may be required. While deicing removes the contamination, anti-icing prevents the accumulation for certain period of time.

Tests were performed to assure no performance or handling degradation due to fluid application. Approved deice/anti-ice fluids for the EMB-120 are stated in Operational Bulletin 120-004/93.

Ensure that the aircraft is clean before takeoff, by checking that critical areas have been properly deiced and anti-iced. If any ice or snow has accumulated, do not assume it will blow off during takeoff roll. Try to minimize the time between fluid application and the start of takeoff roll. Charted holdover times for de-ice and anti-ice products should be viewed conservatively. Holdover times can be significantly reduced due to many factors influencing fluid effectiveness. If contamination is building up, or the holdover time expires, do a pre-takeoff contamination check and if necessary go back for one another fluid application.



After Engine Starting/Takeoff

If ice is forecast, ice protection systems must be tested according to the procedures prescribed in the approved AFM. After testing is concluded, leave the protection systems on if the takeoff will be performed in icing conditions. Never leave the ground in known or forecast icing conditions with any ice protection system inoperative.

Takeoff procedures and speeds contained in the approved AFM remain unchanged.

To avoid the risk of engine malfunction during takeoff run due to ingestion of contaminants, turn engine ignition on prior to setting takeoff power. Takeoff should be performed using the static takeoff technique: apply takeoff power before releasing brakes. Check that engine limits are not exceeded.

Climb/Cruise

Monitor ice continuously during climb/cruise. At the first sign of ice formation, turn all ice protection systems on.

Manual climb (autopilot off) is initiated at a speed not less than 160 KIAS, at a constant pitch angle and climb power setting. When reaching 160 KIAS, pitch should be reduced in order to maintain that speed.

To climb with autopilot on, trim the aircraft with climb power and at least 170 KIAS. Then engage autopilot and select IAS mode to maintain the minimum required speed. Avoid the use of pitch hold for climb.

CLIMB mode, mainly on those MOD 67G autopilots with 155 KIAS climb speed, is not recommended. Instead, use IAS mode at 170 KIAS. With AP engaged, use HDG and ½ Ø bank mode.

Continuously monitor airspeed and autopilot operation. Be alert for mistrimmed condition that may be masked by the autopilot. Periodically disengage the autopilot and check trims – keep the aircraft trimmed all the time.

With autopilot on or off, increase airspeed if buffet onsets.

Upon attaining the desired flight altitude, accelerate with climb power until the aircraft reaches the desired cruise speed. Then set cruise power.

During climb/cruise, maintain NH above 80% for proper operation of the ice protection systems. Also observe the NP established by performance requirements during climb, which may be either 100 or 90%. Propeller vibration may occur due to ice accumulation on the blades. Cycling the propeller RPM may aid in shedding ice from the blades.

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Descent/Holding/Landing

Descent in icing conditions is normally accomplished by selecting DSC mode on the FD control panel. Airspeed is not a problem as it will be close to VMO. HDG mode and ½ Ø are still recommended. Keep the aircraft trimmed all the time.

Observe the holding procedures contained in the approved AFM. Flaps up, minimum NP is 85 %. Minimum airspeed is 160 KIAS, which must be increased if aerodynamic buffeting occurs.

Apply a minimum 5 kt increase plus Δ gust to the approach and landing speeds to compensate for the ice effect. In addition, refer to the landing performance charts and apply the gradient/weight increments as required.

Should a failure occur in any deice or anti-ice equipment, the appropriated procedures can be found in the ABNORMAL PROCEDURES SECTION of the Airplane Flight Manual. Refer to these procedures and apply the necessary corrections to speeds and use the correct flap setting for landing.

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Flight in SLD Conditions

Prior to departure, a thorough study of the weather condition is required. If weather reports or forecasts indicate the possibility of freezing rain or drizzle along the route of flight, serious consideration should be given to alternate routing to avoid the forecast areas and altitudes should be chosen to avoid the temperature ranges conducive to SLD conditions. Formulate contingency plans ahead of time in the event you should inadvertently encounter SLD conditions.

Tests with simulated ice shapes following the icing tanker flights has demonstrated the satisfactory handling characteristics of the EMB-120 aircraft under freezing rain and freezing drizzle conditions. Airplane handling was demonstrated to be adequate for safe operation. Aileron control forces are somewhat increased, but still are well within the normal certification limited values. Autopilot operation in SLD conditions was found to be adequate for safe operation of the aircraft.

Nevertheless, the EMB-120 is NOT certificated for continued flight into SLD conditions. Visual cues to recognize SLD conditions are stated under the "SLD CONDITION VISUAL CUES" heading.

While flying in icing conditions, continuously monitor the wing boots for ridge development aft of the last inflatable rib. If ridges are developing, confirm the condition by checking for ice formation on the spinner in the blade root area. If SLD conditions are confirmed, you are operating outside the certified aircraft envelope and must depart icing conditions immediately.

Should the aircraft inadvertently encounter SLD conditions, the following procedures apply:

- Gear.....UP
- Flaps.....UP
  In icing conditions, use of flaps is restricted to takeoff, approach and landing only. When the flaps have been extended for approach and landing, they may not be retracted unless the upper surface of the wing aft of the protected area is clear of ice, or unless flap retraction is essential for go-around.
- Airspeed.....160 KIAS MINIMUM.
  If buffet onset occurs, increase airspeed until buffet subsides.
- Autopilot .....AS REQUIRED.
  With AP engaged, use HDG and ½ Ø. Disengage autopilot if you suspect or observe abnormal operation. When disengaging autopilot, hold control column firmly to prevent roll excursion resulting from an out-of-trim condition that may have been masked by the autopilot. Retrim the aircraft if necessary.
- Leave and avoid SLD conditions.
- Avoid excessive and abrupt roll maneuvering which can lead to wing tip stall.

Landing after or during SLD conditions:

- Gear.....DOWN
- Flaps.....45 or 25°
- Landing Speed.....$V_{REF45\ or\ 25}$+5 kt plus Δ gust
- Touchdown with normal flare technique, delaying power reduction until just before touchdown.

EMB120 Brasília

AIRPLANE FLIGHT MANUAL

CTA APPROVED AIRPLANE FLIGHT MANUAL
(AFM-120/794)

LOG OF REVISIONS

REVISION NUMBER AND DATE	REVISED PAGES	DESCRIPTION OF REVISION	CTA APPROVAL	
			DATE	SIGNATURE
43 Apr 23, 1996	2-13 and 4-39	Improve Operation in Icing Conditions Information.	23 APR, 96	
44 Oct 14, 1996	4-3	Delete electrical emergency switching daily check.	14 OCT, 96	
45 Oct 14, 1996	3-15, 3-49, 3-50, 3-50A, 3-56 and 3-56A	Update Abnormal Landing Gear Extension procedure.	14 OCT, 96	
46 Oct 14, 1996	S-i, S11-iii to S11-14	Include Supplement 11 – Ferry Flight with Landing Gear Down.	14 OCT, 96	
47 Oct 14, 1996	3-8, 3-8A, 3-56, 3-69, 4-9 and 4-19 5-8 Appendix 1 A1-iii and 6-1	Include, update and improve emergency, abnormal and normal procedures. Update performance information. Update CDL items.	14 OCT, 96	
48 Oct 14, 1996	2-13, 2-14, 4-39 and 4-40	Update flight in icing conditions (SLD) information.	14 OCT, 96	
49 Jan 06, 1997	3-45, 3-46, 3-49, 3-50, 3-50A and 3-50B	Update flaps abnormal procedures.	6 JAN/97	

CTA APPROVED
APRIL 23, 1996
REV. 49 – JANUARY 06, 1997

OPERATION IN ICING CONDITIONS

When flying into known or forecast icing conditions, proceed:

IGNITION Switches ..... ON

Ice Protection System ..... TURN ON AS REQUIRED

The ice protection system should be turned on as follows:

- AOA, TAT and SLIP: before flying into known icing conditions.
- Propeller: before flying into known icing conditions or at the first sign of ice formation.
- Engine air inlet and windshield: at the first sign of ice formation.
- Wing and tail leading edges: when ice accumulation is 1/4" to 1/2 ".

Holding configuration:

Landing Gear Lever ..... UP

Flap Selector Lever ..... UP

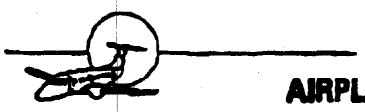
Airspeed ..... 160 KIAS MINIMUM

Np ..... 85% MINIMUM

To eliminate propeller vibrations, increase Np as required.

NOTE: For approach procedures in known or forecast icing conditions, increase the airspeed by 5 up to 10 KIAS until the short final.

– OPERATION IN ICING CONDITIONS CHECKLIST COMPLETED –



OPERATION IN ICING CONDITIONS

When flying into known or forecast icing conditions, proceed:

IGNITION Switches ..... ON

Ice Protection System ..... TURN ON AS REQUIRED

The ice protection system should be turned on as follows:

- AOA, TAT and SLIP: before flying into known icing conditions.
- Propeller: before flying into known icing conditions or at the first sign of ice formation.
- Wing and tail leading edges, engine air inlet and windshield: at the first sign of ice formation.

Holding configuration:

Landing Gear Lever ..... UP

Flap Selector Lever ..... UP

Airspeed ..... 180 KIAS MINIMUM

Np ..... 85% MINIMUM

To eliminate propeller vibrations, increase Np as required.

NOTE: For approach procedures in known or forecast icing conditions, increase the airspeed by 5 up to 10 KIAS until the short final.

– OPERATION IN ICING CONDITIONS CHECKLIST COMPLETED –

FLIGHT CREW

- Required Flight Crew ..... Pilot and Copilot

KINDS OF OPERATION

The airplane is certificated in the transport category (passengers and cargo), in the following conditions, both day and night, when the appropriate equipment and instruments required by the airworthiness and operating regulations are approved, installed and in an operable condition:

- Visual (VFR);
- Instrument (IFR);
- Icing Conditions.
  In icing conditions, use of flaps is restricted to takeoff, approach, and landing only. When the flaps have been extended for approach or landing, they may not be retracted unless the upper surface of the wing aft of the protected area is clear of ice, or unless flap retraction is essential for go-around.

MANEUVERING FLIGHT LOAD FACTORS LIMIT

- − 1 g to + 2.80 g with flaps retracted.
- 0 g to 2.00 g with flaps extended.

NAVIGATION AND COMMUNICATION EQUIPMENT

- Do not operate weather radar during refueling near fuel spills or people.
- The airplane must not be moved until all heading and attitude information is valid on both pilot and copilot ADIs.
- Approach must be made with EFIS in angular mode only. (For airplanes equipped with Collins EFIS-86B).
- While transmitting in HF, hydraulic fluid quantity indicator, battery temperature monitor and RMI information is not valid.
- The non-precision approaches using NDB course on the EFIS are not permitted. (For airplanes equipped with Bendix EFS-10A).
- The Fast/Slow indication is not valid for flaps 15° and 25°. (For airplanes equipped with Stall Warning Computer PN's C-61806-1 and C-61806-1 MOD. A).
- When the TCAS system is operational, the TCAS operator's manual must be on board or the material from the manual must be incorporated in the flight crew operating manual.

EMB-120 Flight Crew Awareness Seminar; Aircraft Icing
Tuesday November 15th, 1995
14

	Name (please print)	Title	Company	Phone	Fax
	Ken Mayfield	CHECK AIRMAN	FL GULF AIRLINES	904-741-9800	904-741-9801
1	William Dudley	Sr Check Pilot	ASA	404 766 1400 308	404-209-0162
2	Dan Ence	Dir of Flt Stds	Skywest	801-639-3735	801-634-3705
3	Robert Melcher	Asst. Chief Inspector	Comair	407-825-3580	407-851-1570
4	WAYNE A. WOLKE	PROGRAM MANAGER	Comair	606-767-2458	606-767-2476
5	RICK ST. ONGE	DIR OF OPS	Comair	606-767-2459	606-767-2452
6	LANGHORNE BOND		EAC	202 363-2111	202-966-4166
7	MANUEL MONTEIRO	MGR. TECH. LIAIS	EAC	305-359-3700	305-359-8173
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EMBRAER AIRCRAFT CORPORATION

November 20, 1995

TO: All EMB-120 Operators, FAA, NTSB, RAA, Embraer

From: Mark Lowell , Instructor Supervisor

Re: Meeting Minutes; EMB-120 Flight Crew Awareness Seminar; Aircraft Icing

The attached document contains the meeting minutes form the EMB-120 Flight Crew Awareness Seminar; Aircraft Icing that was held on November 15, 1995.

A draft of the meeting minutes was circulated and reviewed by the participants. All comments and amendments were included and the final document is attached.

Though no formal schedule was determined, the committee tentatively agreed to a future meeting to review the test results from the tanker and subsequent aircraft test data. The future meeting would further amend this document to include the results of the tests.

Mark W. Lowell
Embraer Aircraft Corporation

276 Southwest 34th Street, Fort Lauderdale, Florida 33315
Telephone: (305) 359-3700 • Telex: 80-3562 • Fax: 359-3700

TO: All EMB-120 Operators, FAA, NTSB, RAA, Embraer

From: Mark Lowell , Instructor Supervisor

RE: Meeting Minutes; EMB-120 Flight Crew Awareness Seminar; Aircraft Icing

During the November 7th Washington D.C. operators meeting, it was recommended that EMB-120 operators meet with Embraer to discuss aircraft icing issues specific to the aircraft. As a result, a Flight Crew Awareness Seminar was convened at 9:30 AM on Tuesday November 15th in Ft. Lauderdale, Florida.

The attendees were as follows:

Ken Mayfield, Mesa Airgroup
William Dudley, Atlantic Southeast Airlines
Dan Ence, Skywest Airlines
Robert Melcher, Comair Airlines
Wayne Wolke, Comair Airlines
Rick St. Onge, Comair Airlines
Chuck Bundesen, Miami Flight Service
Langhorn Bond, Embraer
Manuel Monteiro, Embraer
Mark Lowell, Embraer

Representatives from Great Lakes Aviation and Continental Express were unable to attend due to schedule conflicts but will be kept fully informed of meeting issues and recommendations.

The purpose of the seminar was

To discuss operation of the EMB-120 in icing conditions.

To generate recommendations for a flight crew awareness program to be implemented by EMB-120 operators

To recommend changes or additions to aircraft publications regarding operations in icing conditions

To identify any specific test points to be incorporated in the icing tanker tests to be conducted in the near future

In preparation for the seminar, the following list of discussion topics was distributed to the EMB-120 operators. This same list of topics was used during the seminar as an outline to structure the discussions.

Aircraft Characteristics:

- Aircraft flight characteristics in icing
- Ice recognition and monitoring
- Aircraft buffet characteristics in icing conditions / recognition of impending stall
- Autopilot characteristics in icing conditions
- Stall warning system characteristics
- Discussion of known icing incidents

Aircraft Procedures:

- Autopilot modes of operation/procedures
- Holding in icing conditions
- Operation of deice/anti-ice systems
- Deicing systems failures and tests
- Approach and landing in icing conditions with and without deice system failures
- Deice system maintenance

FAA / ATC Topics:

- Identification of icing conditions in weather reports and forecasts
- New FAA weather report formats
- Operations criteria based on known icing conditions
- Ground deicing and dispatch procedures in icing conditions
- Escape procedures for severe icing encounters
- ATÇ information and cooperation regarding icing conditions

During the initial portions of the seminar, Embraer brought the members up to date on the testing conducted with the artificial ice shapes and the current plans for inflight tanker tests

Discussions took place regarding all aspects of the listed topics. In addition, the MIA FSS specialist explained the types of reports and forcasts that would contain freezing rain or drizzle and explained the new weather reporting system to be implimented in July of next year

As a result of these discussions, the following conclusions and recommendations were agree to by the committee.

Conclusions and Recommendations:

With regard to aircraft characteristics, the operators indicated that their in-service experience has revealed no specific or unique problems associated with the operation of the EMB-120 in icing conditions. The aircraft has operated world wide for ten years with no reported icing related incidents attributed to the airframe when the aircraft was operated in accordance with the procedures contained in the approved aircraft flight manual.

Relative to the upcoming tanker tests, the committee recommends that the tests include identification of unique large droplet signatures in the form of visual cues to the crew that are readily visible from the cockpit. These signatures should be filmed or photographed for inclusion in training documents. If possible, also determine the best visual cues available to the crew to identify the first formation of any ice on the aircraft such as wiper blades.

Reference the Configuration Deviation List 57-20-1 Vortex Generators. The committee recommends that the flight test group consider the effects of missing vortex generators relative to ice shapes ahead of the ailerons and determine if testing in this area is warranted.

Reference the wing inspection lights MMEL item 33-47-1 first item, the committee recommends that the first item be amended as follows. Change the repair interval from category C to category B. Change the number required for dispatch from 0 to 1. Insert the word "One" before the word "May" in the accompanying text.

Reference the "icing incidents" cited by the FAA at the November 7th meeting, the committee recognized and discussed elements in these events. Some of these contained an apparent "lack of proper monitoring of ice formation", "probable failure to properly operate the leading edge deicing systems", "probable failure to recognize reduced stall margins with ice on the aircraft", "improper use of autopilot modes", "failure to maintain speed in a turn with the autopilot engaged".

The committee concluded that these elements constituted crew awareness and procedural issues As such the committee recommends that Embraer produce a document in the form of an Operations Bulletin that addresses operation of the EMB-120 in icing conditions. This document would form the basis for operator crew awareness programs and would be distributed through current communication channels in place within each operators organizational structure

The Operations Bulletin would contain information pertaining to:

- Identification of various ice types and unique signatures applicable to the EMB-120 (data from the tanker tests to be included)
- decreased stall margins with ice on the aircraft
- specific temperature ranges and conditions conducive to ice formation
- recommendations for autopilot mode usage
- recommended speeds for all phases of flight in icing conditions
- recommendations for proper monitoring of ice formation
- recommendations for proper operation and testing of the deice systems
- stall warning system operation relative to operations in ice

In light of the fact that the FAA seems predisposed to place restrictions on flight operations in areas of SLD (Super cooled Large Droplets), the committee recommends that the FAA publish clear and unequivocal guidance as to what constitutes SLD conditions, freezing rain, and freezing drizzle, how these conditions can be clearly identified and distinguished by flight crews in flight and on the ground, and how SLD conditions will be identified in hourly reports, terminal and area forecasts, sigmets and other reports.

The committee also recommends that dispatch criteria for such conditions be clearly defined without ignoring that the aircraft currently meets all certification requirements for flight in icing conditions. Specifically, what criteria will the flight crews use to recognize that conditions exceed the current certification limits. In addition, the FAA should also publish clear and concise information detailing atmospheric conditions conducive to SLD formation such as temperature ranges and layer thickness and recommended procedures to leave SLD conditions based on this information.

In discussions of ice recognition at night, the committee agreed that recognition of clear ice conditions was the most difficult. The committee recommended that Embraer investigate low cost visual aids possibly in the form of high contrast markings that would aid in the identification clear ice and gauge the thickness of ice formation.

Discussions took place relative to the adequacy of the ice related information, procedures, and tests contained in the aircraft flight manual. While the committee agreed the information in its current form is adequate, the committee recommends that a statement reading "Caution: Avoid prolonged operation in areas of freezing rain or drizzle." be added to page 4-39 of the flight manual. In addition, the committee recommended that notes regarding airspeed increases in icing conditions be added to the applicable abnormal procedures sections related to abnormal flap conditions for landing.

Discussion took place regarding the revision 39 amendment to the "Daily Checks" section of the flight manual which specifies 80% Nh for the functional check of the deice systems. This engine speed range is likely to impinge on the propeller speed range that causes the highest blade stress environment in quartering tailwind conditions. In addition, propeller thrust produced in the 80% Nh range could be potentially hazardous if this test is conducted on slippery surfaces such as ice or hard packed snow. The committee recommends that Embraer review the amended procedure in light of the aforementioned.

Discussion took place regarding the need for unusual attitude recovery training to be part of the operators simulator programs. Some operators have already implemented such plans. Unknown to the committee at the time was the September 20th Operations Bulletin, OB 120-002/95 entitled "UNUSUAL FLIGHT ATTITUDE - RECOGNITION AND RECOVERY". This document should be helpful in operator development of unusual attitude recovery simulator programs.

Agreed to by the committee,

EMB-120 Flight Crew Awareness Seminar; Aircraft Icing
Ft. Lauderdale, Florida
November 14, 1995