



Boletim Especial de Aeronavegabilidade (*Special Airworthiness Bulletin*)

ATA: 71 - PowerPlant

BEA Nº 2020-02

Subject: Operation in weather conditions with high concentration of ice crystals **Date:** April 13th, 2020

Introduction:

This Special Airworthiness Bulletin (BEA) is intended to alert owners and operators of Yaborã Industria Aeronautica S.A. airplanes, models ERJ170-100, ERJ170-200, ERJ190-100 and ERJ190-200, regarding the possibility of in-flight thrust loss when operating in weather conditions with high concentration of ice crystals.

This bulletin is informative, and the recommendations are not mandatory. Until this time, there is no airworthiness concern that would warrant an Airworthiness Directive (AD) according to Regulamento Brasileiro de Aviação Civil (RBAC) nº 39.

Manufacturer: Yaborã Industria Aeronautica S.A.

Affected Aeronautic Product: ERJ170-100, ERJ170-200, ERJ190-100 and ERJ190-200.

Background:

In the aviation industry, “icing conditions” is a well-known and documented phenomenon. It occurs with the presence of liquid water droplets in temperatures lower than freezing point. Such environment conditions can cause ice to adhere to the cold airframe. However, there is another phenomenon known as “ice crystal icing”, which is less common and harder to detect using radar returns.

The conditions which have shown high concentration of ice crystals are found almost exclusively in the vicinity of deep convective clouds. And thus, the potential to cause substantial effects in airplane airframe and systems is higher in such conditions.

Large convective formations have the capacity to lift high concentrations of moisture to high altitudes. When this moisture reaches low ambient temperature, it freezes into ice crystals.

A result of this phenomenon is that the ice crystals, although in large concentration around the deep convective storm, are small in size. The onboard weather radar provides good awareness for rain, hail, and snow. When flying into ice crystals (even in high concentration), the radar only provides little or no reflectivity due to their size.

Several in-flight events, from different airplane models and manufacturers, are associated with ice crystal phenomenon that has been identified as a serious potential environmental threat to turbine engines. Ice crystals melt when impinging on warm surfaces of the engine. The referred surfaces become wet and then cool to 0°C due to the impingement of additional ice crystals. As a result, ice begins to accumulate in some interior engine components and may cause loss of thrust.

Recommendations:

To avoid operation in weather conditions with high concentration of ice crystals, owners and operators are recommended to adopt the procedure included in *Embraer Flight Operation Letter FOL N°: 170-006/18, Revision 01, “Ice Crystal Icing”, dated July 03, 2019* as Standard Operating Procedure (SOP):

ICE CRYSTALS ICING**Thundercloud Detected CIRCUMNAVIGATE PF**

Circumnavigate the detected thundercloud or area by 25 miles or more when traffic conditions permit.

To anticipate areas of higher ice crystal concentration, observe wind direction.

When circumnavigating a thunderstorm, use radar tilt function and also evaluate radar returns below the airplane. Areas directly above red returns might also contain high concentration of ice crystals. Therefore, avoid flying over such formations.

If suspected ice crystal icing affects the airplane and the engine performance consider descending to a lower altitude, which shows to be a successful recovering action.

CAUTION: REDUCING ALTITUDE MAY POSITION THE AIRPLANE CLOSER TO CONVECTIVE ACTIVITY. AFTER RESTORING AIRPLANE AND ENGINE PERFORMANCE, THE FLIGHT CREW MUST AVOID STORM CONDITIONS FOR REMAINING OF THE FLIGHT.

Reference documents:

1. *Embraer Flight Operation Letter FOL N°: 170-006/18, Revision 01, “Ice Crystal Icing”, dated July 03, 2019*

For further information contact

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