

Extra NG,
G-MIIL

Upper Heyford,
Bicester, Oxfordshire

02 April 2022

Accident

Investigation Synopsis

Whilst the aircraft was in straight and level flight at 184 KIAS, the canopy broke up without warning. The pilot, the only occupant of the aircraft, sustained serious injuries and was unable to continue flying the aircraft. He was wearing a parachute and bailed out, the aircraft entering a descent and colliding with an unoccupied block of flats.

The investigation identified a lack of appropriate bonding between the inner and outer canopy frame around the front of the canopy. This caused localised and increased stresses within the transparency which under flight loads promoted fatigue crack development. When these cracks reached a critical length, catastrophic failure resulted.

One Safety Action has been taken by the aircraft manufacturer and two Safety Recommendations are made regarding the design and installation of the canopy.

Safety Recommendation 2024-004

Justification

The canopy fitted to G-MIIL broke up whilst operating within the aircraft's certified flight envelope due to fatigue cracking of the acrylic transparency. The cracking was initiated by differential forces acting on the canopy frame, induced by inadequate bonding between the inner and outer frame. This, in turn, caused localised stresses being imparted into the transparency, presenting conditions which promoted fatigue crack development. This resulted in a catastrophic failure of the canopy when cracks reached a critical length.

Therefore, the following safety recommendation was made:

Safety Recommendation 2024-004

It is recommended that the European Union Aviation Safety Agency (EASA) ensure the canopies fitted to all Extra NG aircraft are manufactured to meet the required certification standards and can withstand expected aerodynamic and flight loads.

Date Safety Recommendation made: 16 February 2024

LATEST RESPONSE

Response received: 26 April 2024

The European Union Aviation Safety Agency (EASA), together with the aircraft manufacturer, has reviewed the design data of the EXTRA NG canopy. The manufacturing process, used to bond the inner and outer canopy frames with each other, and the canopy glass with the previously bonded canopy frame, is unchanged compared to the earlier Type Design EA 300 for which no similar in-service occurrence was recorded. Additionally, the Type Certificate Holder (TCH) has conducted a computational fluid dynamics (CFD) analysis under conservative assumptions which has shown that the canopy assembly meets the required certification standards.

Nevertheless, EASA is evaluating, with the aircraft manufacturer, the need to perform on a voluntary basis, a one-time Non Destructive Test (NDT) to verify the correct bonding of the in service canopy frames as precautionary measure.

EASA is also considering the scenario presented by Bundesstelle für Flugunfalluntersuchung (BFU) on the role that the change in the locking mechanism of the canopy of the Extra NG compared to the previous models might have had in the accident.

Safety Recommendation Status **Open**

AAIB Assessment **Partially Adequate**

Action Status **Planned Action Ongoing Update Due 01 May 2025**

Feedback rationale

The AAIB acknowledges the EASA response and the suggested testing of the canopy. The AAIB will await the results of the proposed actions with an update due by May 2025. (EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

N/A

Safety Recommendation 2024-005

Justification

SB-NG-2-22 was introduced by the manufacturer to address inadequate bonding of areas of the cockpit canopy during the manufacture of early production Extra NG aircraft. The investigation was unable to establish the effectiveness of the SB due to the unknown adhesive ability of the foam used, the existing state of surfaces it contacts and the extent to which it penetrates voids due to existing epoxy bond bead lines and exposed peel ply surfaces. In addition, as the foam adhesive is only applied at the front of the canopy, the SB does not rectify the anomalies found in the quality of the inner and outer canopy frame bonding on both sides of the canopy or its hinge pin brackets.

Therefore, the following safety recommendation was made:

Safety Recommendation 2024-005

It is recommended that the European Union Aviation Safety Agency (EASA) assess the effectiveness of SB-NG-2-22 in rectifying inadequate bonding

Date Safety Recommendation made: 16 February 2024

LATEST RESPONSE

Response received: 28 November 2024

The European Union Aviation Safety Agency (EASA) considers the conclusion received on 28/06/2024 (AAIB-28120) concerning the scope of the SB-NG-2-22 is correct. Notwithstanding the above, EASA's view is that Extra NG aircraft canopies comply with the applicable certification requirements even without the incorporation of the aforementioned SB. As precautionary measure, the manufacturer is willing to recommend a one-off inspection of canopy frames as per Aircraft Maintenance Manual 20-10-06 on aeroplanes in service. Furthermore, not overlooking the possibility that the canopy was not correctly latched, the manufacturer is offering an improvement on the latching system together with a proactive replacement of the outer canopy frame, or even replacing with a new canopy as an alternative. Together, EASA finds that these improvements fully satisfy the intent of this safety recommendation.

EASA Status: Closed – Partial Agreement

Safety Recommendation Status Closed

AAIB Assessment Partially Adequate

Action Status Planned Action Completed

Feedback rationale

EASA's response to the adequacy of SB-NG-2-22 does not address the direct concerns of the AAIB in ensuring that the injected foam bond will spread across all the surfaces within the frame void or that the composite surfaces themselves will be prepared to ensure adequate bonding.

In addition, EASA remains of the opinion that all Extra NG aircraft canopies comply with the applicable certification requirements, even without the incorporation of the aforementioned SB.

This certification requirement includes drawings, material selection and the assembly process, with the manufacturer needing to demonstrate that component testing conforms, in his case, to CS 23.

However, achievement of certification requirements relies on components being consistently manufactured exactly to the drawings. The canopy fitted to G-MIIL was not.

As a precautionary measure, EASA states the manufacturer is willing to recommend a one-off inspection of canopy frames as per Aircraft Maintenance Manual 20-10-06 on aeroplanes already in service. Furthermore, the manufacturer is offering an improvement on the latching system with a proactive replacement of the outer canopy frame, or entire canopy.

The AAIB concluded that the accident was not a result of improper latching of the canopy. The AAIB, however, accepts EASA's position that these improvements by the manufacturer, once completed, should ensure the airworthiness of the canopy and, as such, the response to the recommendation is deemed Partially Adequate and the recommendation closed. (EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

Response received: 26 April 2024

The European Union Aviation Safety Agency (EASA) highlights that Service Bulletin (SB) SB-NG-2-22 was issued as a precautionary measure following the subject accident. The intent of the SB was not to rectify an assumed inadequate bonding. EASA finds that the actions prescribed in the SB would be effective in improving the bonding by fitting the canopy glass more homogeneously to the canopy frame.

EASA Status: Closed – Disagreement

AAIB Assessment – Not Adequate Open