

Follow-up to recommendation: Takeoff with erroneous takeoff data, Embraer 195-E2

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1. About the report

On 12 September 2021 a commercial aircraft at Berlin Brandenburg Airport in Germany took off 443 metres before the end of the runway. By taking off so close to the end of the runway, the mandatory safety margins were exceeded. The late takeoff was a result of using incorrect takeoff data, also referred to as erroneous takeoff data.

Incidents related to erroneous takeoff data occur frequently across all aircraft types and operators, because the process of determining and entering takeoff parameters is inherently prone to human errors due to the amount of data selections, entries and transfers. These incidents could have catastrophic results. Runway safety-related accidents, including runway excursions, incursions, tail strikes, and collisions with obstacles, are known consequences of erroneous data entries. The persistence of this type of occurrence is a long standing and complex problem. In the longer term, aircraft software and systems are expected to provide hard barriers against erroneous data entry. However, technical solutions will take some time to be developed and implemented in standard procedures.¹ It is therefore important that operators learn as much as possible both retroactively - from occurrences - and proactively with the aim of reducing the number of these incidents. In our report we formulated three lessons to stimulate operators to learn more.

Aircraft software and systems that provide hard barriers against erroneous data entry need to become available as soon as possible. Therefore, in 2020 the Dutch Safety Board recommended EASA to develop requirements for onboard systems. EASA is working on a new rule making task (RMT) regarding takeoff performance parameters and position errors for large aircraft. We believe the aviation industry should not wait for regulation and develop technical solutions to prevent the use of erroneous takeoff data as soon as possible to speed up the availability of technical and software onboard systems. Both Airbus and Boeing have already developed technical systems for takeoff surveillance and monitoring that have been certified by EASA. Embraer, the manufacturer of the aircraft involved in this incident, did not, and therefore we formulated a recommendation for Embraer to develop onboard systems that provide hard barriers against erroneous data entry.

¹ EASA, Safety Information Bulletin 2016-02R1, *Use of Erroneous Parameters at Take-off*, 2021

2. Response to the recommendation

Recommendation

To Embraer

To start the development of an independent onboard system that detects gross input errors in the process of takeoff performance calculations and/or alerts the flight crew of abnormal low accelerations for the actual aeroplane configuration as well as insufficient runway length available.

Response

The *Brazilian Civil Aviation Authority* (ANAC) responded via the *Aeronautical Accident Investigation and Prevention Center* (CENIPA) on 8 March 2024.² We received an update on this reaction from ANAC, again via CENIPA, on 15 July 2024. Both reactions can be found in full on our website.

In its response ANAC states that, at present, all practical mitigations are being adopted by Embraer, including an improvement to the performance application tool by July 2024, which will feature a pictorial representation of the intersection for which the performance calculations have been made. ANAC further states that the development of an independent onboard system that detects gross input errors is dependent on progress in new regulation and on the development of technical solutions. With regard to new regulation, ANAC points to the recent discussion between EASA and the industry, which is expected to result in a Notice of Proposed Amendment (NPA) on independent monitoring system related to aircraft position and performance.

3. Assessment of follow-up

To reduce occurrences of erroneous takeoff data, Embraer has initiated improvements to the performance application tool. These proactive improvements to the performance application tool, led the Dutch Safety Board to decide that a recommendation on this topic was excessive.

Although improvements of the performance application tool may contribute to preventing erroneous takeoff data, these improvements are not hard barriers against such incidents. Onboard aircraft software and systems are expected to provide such hard barriers. According to the response on our recommendation, Embraer so far did not start the development of such software and systems, since it considers there needs to be progress on the development of new regulation first.

² CENIPA states that the recommendation was sent to ANAC 'in order to comply with the Brazilian process'. ANAC has processed the reaction on the recommendation together with Embraer. CENIPA sent us the response of ANAC.

We believe aircraft manufacturers should not wait for new regulations to start the development of systems that can benefit safety. Given that other major manufacturers of commercial aircraft, like Airbus and Boeing, have already started developing onboard aircraft software and systems, we strongly believe Embraer, as one of the major manufacturers of commercial aircraft, should also start with this. We understand that Embraer has been involved in the rule making process for a long time and that they work together with the industry and EASA on requirements for onboard systems. Nevertheless, we urge Embraer once more to start the development of onboard systems that provide hard barriers against erroneous data entry as soon as possible, despite the current lack of regulation.

Classification of follow-up

When assessing the follow-up to recommendations from aviation reports, the Dutch Safety Board uses the classification and assessment criteria developed by the *European Network of Civil Aviation Safety Authorities* (ENCASIA) (see Appendix 1).

We classify the follow-up on the recommendation as not adequate.

Recommendation to	(Core of) Recommendation	Follow-up
Embraer	To start the development of an independent onboard system that detects gross input errors in the process of takeoff performance calculations and/or alerts the flight crew of abnormal low accelerations for the actual aeroplane configuration as well as insufficient runway length available.	Not adequate

Appendix 1. Assessment criteria for aviation

In assessing responses to recommendations made to the aviation sector, the Safety Board uses the guideline issued by ENCASIA on the EU Regulation on the Investigation and Prevention of Accidents and Incidents in Civil Aviation (Regulation (EU) No 996/2010). ENCASIA is the European Network of Civil Aviation Safety Investigation Authorities. The classifications and associated assessment criteria are as follows:

Category	Guidance
Adequate	<p>The response clearly shows that the safety issue identified by the recommendation has been addressed.</p> <p>The response shows that there is a high probability the action will be taken in the future to address the safety issue or intent.</p> <p>The response may not meet the intent of the recommendation as written but does address the underlying safety issue or has been superseded by other evidence/action.</p>
Partially adequate	<p>The response goes some way to addressing the intent of the recommendation or safety issue in that some action is taking place, but there is:</p> <ul style="list-style-type: none"> • a likelihood the action may not take place, or • little or no likelihood of any further action by the addressee.
Not adequate	<p>The recommendation response did not address the intent or safety issue, or the recommendation was rejected by the addressee and is not likely to be acted upon by them.</p>
Awaiting response	<p>Awaiting the first response from the addressee.</p>
Superseded	<p>The safety recommendation has been superseded.</p>

The recommendations, associated reactions and classifications are included in the European Safety Recommendations Information System (SRIS) database, publicly available via <https://sris.aviationreporting.eu/safety-recommendations>.