


SAFETY INFORMATION AND ADVISORY NOTICE (SIAN)		 Transport Malta Civil Aviation Directorate Safety and Compliance Unit Transport Malta Centre Triq Pantar Lija LJA 2021 Malta aviationsafety.tm@transport.gov.mt
SIAN Number: 01/24	Issue Date: 22/08/2024	
Subject: Possible Flight Safety Issue: Loss of Pitch Control and Trim - EMBRAER 550-500/600		

1.0 INTRODUCTION

- 1.1 The Civil Aviation Directorate (CAD) has recently been informed about three occurrences in which the pilots perceived the loss of pitch control after take-off.
- 1.2 After a thorough review of the Flight Data Recorder (FDR) and Onboard Maintenance System (OMS) by the affected operator, several key areas have been identified that require additional education and understanding of the flight control systems. This includes new considerations of the appropriate pilot actions required for events of a similar failure.
- 1.3 During two departures, the pilots were not able to retract the gear on the first attempt. On the second attempt, the gear retracted - but the pilots also noted several CAS messages:
 - Engine 1 Idle Lock Fail,
 - Engine 2 Idle Lock Fail,
 - Ground Spoiler Fail,
 - Engine 1 & 2 Reverser Fail,
 - Brake Control Fault.

The autopilot and autothrottles were inoperative as well.

- 1.4 In both cases, the pilot's perception was that they were unable to control the pitch rate. After reviewing the FDR information, it was determined that the aircraft had reverted to ground mode following the gear retraction. The result was that the automatic trimming of the stabilizer was no longer enabled. Therefore, as the aircraft accelerated after take-off, the stabilizer remained in the take-off position. This position caused the aircraft to pitch up and climb because the pilots attempt to overcome the climb with only the elevators was ineffective.
- 1.5 In the first event, the pilots decided to slow the aircraft and manually controlled the trim. This remedied the climb rate and the aircraft returned to the departure airport.
- 1.6 In the second event, the pilots started to diagnose the issue. Because the left seat pilot was not able to control the climb rate, the pilots elected to check the effectiveness of the right seat stick. The pilot in the right seat was able to arrest the climb. What was unknown to the pilots was that at the same time the pilot in the right seat was trying to determine if he had control,

the aircraft switched back to flight mode. This re-enabled the automatic stabilizer trim system and the stabilizer began moving to correct the climb as directed by the pilot. The aircraft landed safely back at the departure airport.

- 1.7 In the third event the pilots were also unable to control the pitch rate after departure. This was due to the one Flight Control Computers (FCC's) failing, followed by the second FCC failing - possibly due to an AHRS disagreement. As a result, the aircraft switched to 'Direct Mode'. The CAS Message "FLTCTRL N-MODE FAIL" and Master Caution illuminated. Because the airplane switched to 'Direct Mode', automatic trimming of the stabilizer was no longer enabled. Therefore, as in the first two occurrences, this caused the aircraft to pitch up and climb because the pilots attempt to overcome the climb with the elevators was ineffective.
- 1.8 The pilot's reaction to this event was to try with one sidestick, then the other, and then an intentional dual input to try and overcome the pitching up. They diagnosed a flight control misbehaviour and pushed the 'Direct Mode button' with intention of selecting 'Direct Mode'. But, unknown to the pilots, the airplane was already in 'Direct Mode'. By pressing the 'Direct Mode button', they reset the FCC's and the plane returned to 'Normal mode'. Therefore, while the pilots thought they had selected 'Direct Mode', they had returned the aircraft to the normal mode and all control surfaces were operating normally.

2.0 APPLICABILITY

- 2.1 This Notice is to be disseminated to all personnel, and people who have interests relating to the safe conduct when operating EMBRAER 550-500/600 aircraft.

Aerodromes:	Not primarily affected.
Air Traffic:	Not primarily affected.
Airspace:	Not primarily affected.
Airworthiness:	All organisations managing EMBRAER 550-500/600 aircraft.
Flight Operations:	All operators operating EMBRAER 550-500/600 aircraft.
Licensed/Unlicensed Personnel:	Not primarily affected.

3.0 RECOMMENDATIONS AND INSTRUCTIONS

- 3.1 Based on the events mentioned in section 1.0, the following lessons have been identified by the operator, and are being shared for awareness on the matter:
 - *The knowledge base for correcting these situations can be improved. The current simulator training scenario for a flight control misbehaviour generally does not incorporate a pitch control issue, particularly during take-off and high thrust settings.*

- *If an issue with pitch control is encountered, there is a need to consider the trim control of the aircraft as a priority. Hence,*
 - a. *If the sidesticks are not responding to pitch input, first try to manually trim the airplane with the trim switch on the pedestal as an applied memory item. Going to 'Direct Mode' alone may not correct the situation because the stabilizer position can only be controlled by the manual pitch trim switch.*
 - b. *Next, follow the appropriate checklist to return the aircraft to normal mode.*
NOTE: This is not yet aligned with the QRH but work is progressing with Embraer on this issue.

- *If the landing gear does not retract on the first attempt due to the lock-out function, or the gear fails to retract, it is advised to return the landing gear switch to the 'down position' and not attempt a second gear retraction. Leave the gear down and land at a suitable airfield. Based on the information available, an attempt to recycle again may lead to the pitch up trim issues as a result of entering 'Ground Mode' again. The only exception to this guidance is if you have lost power in an engine and obstacles can be avoided by retracting the gear.*

3.2 The root causes for all the three occurrences above are **still under investigation** by the operator. The operator is working closely with Embraer to understand the causes of these events.

4.0 FURTHER INFORMATION

- 4.1 The CAD will remain vigilant on the development of these events. This SIAN will be updated as necessary to reflect any additional outcome from the current investigation and/or new safety information related to this matter.
- 4.2 Operators are encouraged to raise awareness among their crew members and monitor for any possible similar events.
- 4.3 Operators and organisations are encouraged to monitor appropriate sources for any relevant safety publications that may be published by the OEM and/or aviation regional bodies and assess accordingly.

5.0 CANCELLATION

- 5.1 This SIAN will remain in force until further notice.

Safety and Compliance Unit