

SMS Case Study - 4 February 2015 [ATR72-600](#)

SMS Case Study - 4 February 2015, an [ATR72-600](#) (B-22816) being operated by TransAsia Airways on a scheduled domestic passenger flight from Taipei Songshan to Kinmen as GE235



The Investigation formally documented a series of 9 **Findings related to Probable Causes** as follows:

Powerplant

- An intermittent signal discontinuity between the right hand engine Auto Feather Unit (AFU) and its associated torque sensor may have led to the automatic take-off power control system (ATPCS) not being continuously armed during the take-off roll and being activated during the initial climb which resulted in a complete ATPCS sequence including the auto feathering of the right hand engine
- The available evidence indicated that the intermittent discontinuity between the torque sensor and the right hand engine AFU was probably caused by compromised soldering joints inside the Unit.

Flight Operations

- The flight crew did not reject the take off when the ATPCS 'ARM' indication did not light during the initial stages of the take off roll.
- TransAsia did not have a clearly documented company policy with associated Instructions, Procedures and Notices to Crew for ATR72-600 operations which communicated the requirement to reject the take-off if the ATPCS did not arm.
- Following the uncommanded auto feather of the right hand engine, the flight crew failed to perform the documented failure identification procedure before taking any action. That resulted in the Pilot Flying's confusion regarding the identification and nature of the loss of engine power and he reduced power on the operative left hand engine.
- The flight crew's non-compliance with TransAsia Airways ATR72-600 Abnormal and Emergency Procedures for an [engine flame out](#) at take-off resulted in the Pilot Flying reducing power on and then shutting down the wrong engine.
- The loss of engine power during the initial climb and inappropriate flight control inputs by the Pilot Flying generated a series of stall warnings, including activation of the stick pusher. The crew did not respond to the stall warnings in a timely and effective manner.
- The loss of power from both engines was not detected and corrected by the crew in time to restart an engine. The aircraft stalled during the attempted restart at an altitude from which the aircraft could not recover from loss of control.
- Flight crew coordination, communication, and [threat and error management \(TEM\)](#) were less than effective and compromised the safety of the flight. Both operating crew members failed to obtain relevant data from each other regarding the status of both engines at different points in the occurrence sequence. The

Pilot Flying did not appropriately respond to or integrate input from the Pilot Monitoring.

It further documented a series of 10 **Findings Related to Risk** as follows:

Powerplant

- The engine manufacturer attempted to control intermittent continuity failures of the AFU by introducing a recommended Inspection Service Bulletin (ISB) at 12,000 flight hours to address ageing issues. Recorded AFU failures at 1624 flight hours and 1206 flight hours show that causes of intermittent continuity failures of the AFU were not only related to ageing but also to other previously undiscovered issues and that the ISB implemented by the engine manufacturer to address this issue before the occurrence was not sufficiently effective. The engine manufacturer has issued a modification addressing the specific finding of this Investigation. This new modification is currently implemented in all new production engines, and another Service Bulletin is available for retrofit.

Flight Operations

- The Pilot Flying's decision to disconnect the Autopilot shortly after the first Master Warning increased his subsequent workload and reduced his capacity to assess and cope with the emergency situation.
- The omission of the required Pre Take-off Briefing meant that the crew were not as mentally prepared as they could have been for the propulsion system malfunction they encountered after take-off.

Airline Safety Management

- TransAsia Airways did not follow its own procedures when selecting and training the Pilot Flying for command upgrade. Its Quality Assurance processes had not detected that the command selection upgrade process had been compromised.
- TransAsia Airways did not use widely available [crew resource management](#) (CRM) guidelines to develop, implement, reinforce and assess the effectiveness of their flight crew CRM training programme.
- While the TransAsia Airways ATR72-600 differences training program was consistent with the EASA ATR72 Operational Evaluation Board (OEB) report and compliant from a Civil Aeronautics Administration (CAA) regulatory perspective, it may not have been sufficient to ensure that their flight crews were competent to

operate the ATR72-600 under all normal procedures and a set of abnormal conditions.

- The ATR72-600 differences training records for the accident aircraft flight crew showed that Captain 'A' probably needed more training on the single engine flame out at take-off procedure. That meant that if the differences training records were stored, adequately maintained and evaluated by appropriate TransAsia Airways Flight Operations and/or Quality Assurance personnel, there would have been yet another opportunity to review Captain A's ability to handle engine out emergencies.
- Captain A's performance during the occurrence was consistent with the performance weaknesses noted during his training, including his continued difficulties in handling emergency and/or abnormal situations, including engine flame out at take-off and single engine operations. However, TransAsia Airways did not effectively address the evident and imminent flight safety risk that Captain A represented.

Regulatory Oversight

- The Civil Aeronautics Administration (CAA) oversight of flight crew training, including crew resource management (CRM) training, is in need of improvement.
- The systemic nature of TransAsia Airways' flight crew non-compliance with standard operating procedures identified in previous investigations, including the [fatal accident to a Company ATR72](#) less than seven months previously, remained unaddressed at the time of the accident investigated here. Although the CAA had conducted a special audit after this previous accident, which identified the standard operating procedures compliance issue, they did not ensure that the Operator responded to previously identified systemic safety issues in a timely manner to minimise potential future risk.

A total of 16 **Safety Recommendations** were made as a result of the Investigation as follows:

- that **TransAsia Airways** document a clear company policy with associated instructions, procedures, training, and notices to crew members for ATR72-600 operations communicating the requirement to reject a take-off in the event that the automatic take off power control system (ATPCS) is not armed as required. **[16-06-001]**

- that **TransAsia Airways** conduct a thorough review of the airline's flight crew training programmes, including recurrent training, crew resource management (CRM) training, upgrade training, differences training, and devise systematic measures to ensure that:
 - Standardised flight crew check and training are conducted;
 - All flight crews comply with standard operating procedures;
 - All flight crews are proficient in handling abnormal and emergency procedures, including engine flame out at take-off;
 - The airlines use widely available guidelines to develop, implement, reinforce, and assess the effectiveness of their flight crew resource management (CRM) training programme, particularly the practical application of those skills in handling emergencies;
 - Command upgrade process and training comply with the airline's procedures and that competent candidates are selected;
 - ATR72-600 differences training and subsequent line training are sufficient to ensure that flight crews are competent to operate the ATR72-600 under all normal and abnormal conditions; and
 - All flight crew training records during the employment period are retained in compliance with the aircraft flight operation regulations; **[16-06-002]**
- that **TransAsia Airways** improve the airline's internal quality assurance oversight and audit processes to ensure that recurring safety, training, and administrative problems are identified and rectified in a timely manner. **[16-06-003]**
- that **TransAsia Airways** implement and document an effective and formal pilot performance review programme to identify and manage pilots whose performance is marginal. **[16-06-004]**
- that **TransAsia Airways** evaluate the safety culture of the airline to develop an understanding of the reasons for the airline's unacceptable safety performance, especially the recurring non-compliance with procedures. **[16-06-005]**
- that the **Civil Aeronautics Administration** review airline safety oversight measures to ensure that safety deficiencies are identified and addressed in an effective and timely manner. **[16-06-006]**

- that the **Civil Aeronautics Administration** implement a highly robust regulatory oversight process to ensure that airline safety improvements, in response to investigations, audits, or inspections, are implemented in a timely and effective manner. [16-06-007]
- that the **Civil Aeronautics Administration** conduct a detailed review of the regulatory oversight of TransAsia Airways to identify and ensure that the known operational safety deficiencies, including crew non-compliance with procedures, non-standard training practices and unsatisfactory safety management, were addressed effectively. [16-06-008]
- that the **Civil Aeronautics Administration** provide inspectors with detailed guidance on how to evaluate the effectiveness of operator non technical training programmes such as crew resource management (CRM) and threat and error management (TEM) training programmes. [16-06-009]
- that **UTC Aerospace System Company** work with the manufacturers of engine and aircraft to assess the current operating parameters and aircraft risks associated with the PW127 series engine auto feather unit (AFU) to minimise or prevent occurrences that could result in uncommanded auto feather. [16-06-010]
- that **Pratt & Whitney Canada** work with manufacturers of the auto feather unit and airframe to assess the current operating parameters and aircraft risks associated with the PW127 series engine auto feather unit (AFU) to minimise or prevent occurrences that could result in uncommanded auto feather. [16-06-011]
- that **Avions de Transport Régional (ATR)** work with manufacturers of the auto feather unit and engine to assess the current operating parameters and aircraft risks associated with the PW127 series engine auto feather unit (AFU) to minimise or prevent occurrences that could result in uncommanded auto feather. [16-06-012]
- that **Avions de Transport Régional (ATR)** publish in the flight crew operating manual (FCOM) an operational procedure related to rejected take-off and expanded information regarding conditions leading to rejected take off. [16-06-013]
- that the **European Aviation Safety Agency** require a review at industry level of manufacturer's functional or display logic of the flight director so that it disappears or presents appropriate orders when a stall protection is automatically triggered. [16-06-014]

- that the **European Aviation Safety Agency** study the content and the duration of the minimum requirement regarding a differences training programme between a conventional avionics cockpit and an advanced suite including enhanced automated modes for aircraft having the same type rating. **[16-06-015]**
- that the **European Aviation Safety Agency** require a review of manufacturer's airplane flight manual (AFM) to ensure that a rejected take-off procedure is also applicable to both engines operating. **[16-06-016]**

This Case study is used to support the following Sofema Aviation Services (SAS) www.sassofia.com training course – see <https://sassofia.com/course/sms-hazard-identification-risk-assessment-1-day/>

For comments & questions please email team@sassofia.com