

AE7931 Occurrence Investigation

Executive Summary

On May 2, 2019, an ATR 72-212A aircraft of Mandarin Airlines, scheduled passenger flight number AE7931, nationality and registration number B-16851, took off at 14:32 from Kaohsiung International Airport to Hualien Airport with 2 flight crew, 2 cabin crew, 1 maintenance personnel, and 48 passengers, total 53 people on board. The aircraft suffered a cabin pressure loss during the descent. After being handled by the flight crew, the aircraft landed at Hualien Airport at 1528 without any damage or injuries.

The maintenance personnel checked the aircraft after it landed at Hualien Airport, and found that the ground connection check valve might have not been fully closed due to a broken spring of the check valve before the aircraft took off from Kaohsiung International Airport. Prior to this occurrence, Mandarin Airlines did not incorporate the aircraft manufacturer issued technical progress status of the check valve into its maintenance assessment notice. Neither did the Airlines take into account the service letter referring to the renovation and improvement of the check valve issued by the aircraft manufacturer and replace the new check valve with improved design. Moreover, relevant work orders did not instruct maintenance personnel to mandatorily check and confirm that the ground connection check valve should be in a fully closed position after the aircraft receiving an external air supply from a ground air-conditioning cart.

After the aircraft took off, climbed, and reached the cruise phase, the air intake of the engine was sufficient to maintain the cabin altitude of the aircraft. However, the thrust lever was retarded to idle when the aircraft

was descending, which resulted in cabin altitude exceeding the threshold from the reduced air-conditioning air supply. The cabin altitude alert was triggered by the excessive cabin altitude, and the flight crew donned their oxygen masks and declared an emergency to air traffic control.

This occurrence investigation was based on comprehensive factual data and analysis results, a total of six findings were obtained with no safety recommendations as follows.

I. Findings from investigation

Findings related to probable causes

Before the aircraft took off from Kaohsiung International Airport, the ground connection check valve might have been malfunctioned and could not be maintained in the fully closed position that caused the connection of the pressurized cabin and atmospheric environment. While the aircraft descending from cruising altitude, the cabin pressurization system was affected by flight altitude, reduced air intake of the air-conditioning system, and unclosed check valve, failed to provide an appropriate cabin pressure. Consequently, the excessive cabin altitude triggered the cabin altitude warning.

Findings related to risks

1. Before the occurrence, Mandarin Airlines did not assess the service letter on renovation and improvement of the check valve issued by the aircraft manufacturer on February, 2018 (RIL-2018-03) and replace the new check valve with improved design.
2. Before the occurrence, there were no instructions on Mandarin Airlines work orders for preflight, transit, and daily checks that

the ground connection check valve should be checked and confirmed in a fully closed position after the aircraft receiving an external air supply from a ground air-conditioning cart.

3. When the occurrence aircraft cruised at flight level 130, the air inside the cabin leaked from the unclosed check valve causing the cabin altitude increased gradually from 2,000 ft to 8,000 ft. If the flight crew had checked the exact cabin altitude value during the cruising phase, they could have found that the cabin altitude had exceeded the normal range.

Other findings

1. The flight crew of the occurrence flight held valid Certification of Aviation Personnel and Waiver on Medical Exam issued by the Civil Aeronautics Administration. All crew members met the flight qualifications of both the Civil Aeronautics Administration and Mandarin Airlines. No abnormal findings in training and test records related to the occurrence were found. Moreover, no evidence suggested alcohol as a factor influencing the performance of the flight crew.
2. The airworthiness directive (AD) and maintenance of the occurrence aircraft complied with regulations of the Civil Aeronautics Administration and Mandarin Airlines. The malfunction of the ground connection check valve was the only factor contributing to this occurrence. Other aircraft systems and engines were functioning normally.

II. Transportation Safety Recommendations

Safety Recommendations

N/A

Safety recommendations that have been implemented

Mandarin Airlines Co., Ltd.

1. A comparison table demonstrating the reference cabin altitude for different flight levels and corresponding measures have been added to Sections 1.2.14 CLIMB-CRUISE and 2.5.5 EMERGENCY DESCENT of the ATR 72-600 Flight Crew Operating Manual to facilitate the early detection of abnormal cabin pressure by the flight crew and handle the situation promptly on time.
2. This occurrence has been made as a briefing, including the 10,000 ft check and cabin altitude comparison instructions, and featured it in the aviation monthly newsletter for the entire flight crew understanding and learning to make correct judgments in response to similar situations in the future.
3. The ATR 72-212A aircraft pre-flight, transit, and daily check work orders have been revised to regulate that whenever an ATR 72-212A receives an external air supply from a ground air-conditioning cart, the maintenance personnel should confirm the position of the ground connection check valve after the air conditioning cart was removed.
4. The occurrence aircraft (B-16851) and four other aircraft of the same type (B-16852–B-16856) have had their ground connection check valves replaced with new ones to avoid situations where the check valve is failed in open.
5. The ground connection check valve has been included as an A check item in the ATR 72-600 Aircraft Maintenance Program.
6. Detailed operation procedures for TPS and other maintenance notices

to be evaluated by engineers have been added to the “Maintenance Manual, AD, and Maintenance Notice Operation Procedures” section in Quality Procedure QP-MP-03 which incorporating TPS into the maintenance notices that requiring official evaluation by engineers. All TPS evaluations were completed on August 30, 2019, and the newly issued TPS will be downloaded from the ATR website every month for evaluation.