

# CHINA AIRLINES, B737-800, B-18612, FLIGHT CI 112 EMERGENCY DESCENT AND IN FLIGHT TURN BACK DUE TO CABIN LOSS OF PRESSURIZATION DURING CLIMB

## Executive Summary

On July 22<sup>nd</sup> 2010 China Airlines Corp. (CAL) B737-800 national registration B-18612 flight CI 112 took off from Taiwan Taoyuan International Airport (Taoyuan Airport) at 17:09 hours Taipei time for Hiroshima International Airport, Japan (Hiroshima Airport) with 2 flight crew members, 5 cabin crew members and 89 passengers on board.

According to the pilot interviews and Flight Data Recorder (FDR), CM1 informed CM2 of no pressurization at the left hand side at 17:12:45 hours at the altitude of 31,000ft. Flight crew checked cockpit pressure vertical speed indication rising 900ft/minute, when the aircraft was passing the altitude of 33,000ft, at around 8,000ft flight crew checked cabin altitude. FDR showed that there was a Master Caution at 17:27:13 hours at the altitude of 35,300ft. When cabin altitude was rising close to 10,000ft, CM2 requested ATC for permission to descend to 32,000ft and informed ATC that the aircraft had cabin pressurization issue. After noting that cabin altitude and the climb rate kept rising, flight crew requested ATC for permission to descend to 10,000ft and to return back. During descent, the aircraft was passing altitude of 36,200ft at 17:29:07 hours and cockpit had warning sound; flight crew performed emergency descent procedures. During descent flight crew found the of oxygen masks already dropped down; at 17:34:29 hours at the altitude of 18,130ft, CM2 called out 'MAYDAY' and set the transponder at 7700 and requested to descend to 8,000ft, after clearance and instructions from ATC the aircraft had air turn back to Taoyuan Airport and landed at 18:11 hours Taipei time, without any damage or injury.

## Findings Related to Probable Causes

1. At the time of the aircraft dispatch, Flight Maintenance Log Book had recorded the defect of Engine no. 1 (left engine) bleed air system with low pressure. The system had malfunction during climb, though maintenance personnel had performed checks and regarded it as normal. Due to the left bleed air system failure, the left air conditioning pack could not provide sufficient cabin pressure; while a flexible duct ruptured at the air cycle machine outlet of the right air conditioning pack, the right pack could not provide sufficient cabin pressurization compressed air. both packs failed to provide cabin pressure, which led the aircraft lose pressurization during climb.
2. The malfunction of Engine no. 1 bleed-air system was caused by a broken kiss seal from the pre-cooler control valve, which failed to control the pre-cooler to supply cool air, and therefore, the bleed-air system without sufficient cool air auto shut off due to temperature over limit.
3. The rupture of the flexible duct at the outlet of the right air cycle machine might be caused by chaffing of the duct on metal rings under the normal operation of the air conditioning pack.

## Findings Related to Risks

1. Flight crew were alert to the situation, but did not observe the abnormal cabin pressure at the early stage to react promptly.

2. The aircraft had Master Caution warning illuminated at 17:27:13 hours. According to CVR and FDR records the aircraft has been climbing at a climb rate of 840ft/min for 90 seconds (till 1728:44 hours), then started to descend after ATC gave clearance.
3. CAL maintenance failed to find out and trouble-shooting the defect of the aircraft bleed air system during transit check.
4. ATC controller did not hear the emergency situation announced by the flight crew and did not notify the coordinator (Control Supervisor) after the situation was known.
5. When oxygen masks dropped, some cabin crew members did not follow the procedure to remain seated and took action to protect themselves or failed to use Portable Oxygen Bottle (POB); which raised the risk in lack of oxygen themselves.

### Other Findings

1. Flight crew's flight license and certificate were compliance with the existing civil aviation regulations.
2. No evidence showed that flight crew was affected by alcohol or medication during the flight.
3. Cabin crew fail to collect cabin situation and report to flight crew, and cabin crew did not fill in cabin defects into cabin log books.
4. The procedure to notify ATC did not include the 'EMERGENCY DESCENT' MEMORY ITEM.
5. The workload of the controller might have been over loaded owing to lack of assistance.
6. Though aware of the issue of lack of manpower on duty, Area Control Center failed to control manpower by assigning appropriate deputies.
7. At the time of the occurrence, the number of off-duty personnel at Area Control Center was more than on person as defined in regulations. The controller supervisor could have adjusted the shifts to fill vacancy.
8. The existing 'ATC Operation General Guideline' of the Air Navigation and Weather Services did not include the procedure to handle the insufficient manpower for ATC controllers.
9. 'North Sector Control Center Operation Manual' did not state clearly the responsibilities between Deputy Supervisor's duty dispatch and Controller Supervisor's on-duty dispatch.
10. After knowing the emergency situation of the aircraft, North Sector's Radar Controller did not confirm if Controller Supervisor has received the information, thus the controller supervisor unaware accordingly.
11. When North Sector was under high workload, the Controller Supervisor and Acting Coordinator left coordinator duty, and did not make manpower adjustment nor assign deputy neither.

12. The overall performance was affected by the human factor of having poor communication, though all of ATC members understood procedures and regulations,; ATC should improve trainings on crew resource management and team work.

## FLIGHT SAFETY RECOMMENDATIONS

### To Civil Aeronautics Administration, Ministry of Transportation and Communications

1. Supervise China Airlines flight crew to proceed immediately with necessary procedures when there is an abnormal situation during flight. (ASC-ASR-11-04-001)
2. Supervise China Airlines to study 'EMERGENCY DESCENT' MEMORY ITEM and add the procedure of notifying ATC. (ASC-ASR-11-04-002)
3. Supervise China Airlines to consult the aircraft manufacturer Service Letter 737-SL-21-045 and to use the built-in cabin pressure controller inspection function, evaluate the setting of the monitoring mechanism of the cabin pressure performance trend for B737-800 aircraft type. (ASC-ASR-11-04-003)
4. Supervise China Airlines to reinforce maintenance personnel's using Trouble Shooting Manuals and capability of trouble-shooting. (ASC-ASR-11-04-004)
5. Review 'Taipei Area Control Center North Sector controller operation procedure' and the personnel's workload to adjust the time sectors and manpower distribution. (ASC-ASR-11-04-005)
6. Establish the handling principles to temporary lack of manpower on duty in 'ATC Operation General Guideline' for management personnel to follow. (ASC-ASR-11-04-006)
7. Review 'North Sector Control Center Operation Manual' to clear the responsibilities and obligations between Deputy Supervisor's duty dispatch and Controller Supervisor's on-duty personnel dispatch. (ASC-ASR-11-04-007)
8. Implement Area Control Center's control to the manpower for shifts and the distribution of the on-duty manpower. (ASC-ASR-11-04-008)
9. Review ATC personnel training courses to reinforce ATC personnel trainings on human factor and crew resource management to improve team work. (ASC-ASR-11-04-009)
10. Supervise China Airlines cabin crew to follow cabin loss of depressurization procedures to perform emergency procedures and have self-protection. (ASC-ASR-11-04-010)

### To China Airlines

1. Request flight crew to proceed with all immediately necessary procedures when there is an abnormal situation during flight. (ASC-ASR-11-04-011)
2. Study 'EMERGENCY DESCENT' MEMORY ITEM of the aircraft type to add the procedure of notifying ATC. (ASC-ASR-11-04-012)

3. Consult the aircraft manufacturer Service Letter 737-SL-21-045 and to using the built-in cabin-pressure controller inspection function, evaluate the setting of the monitoring mechanism of the cabin pressure performance trend for B737-800 aircraft type. (ASC-ASR-11-04-013)
4. Improve aircraft maintenance personnel the expertise of aircraft bleed air system and capability of trouble-shooting. (ASC-ASR-11-04-014)
5. Request cabin crew to follow cabin depressurization procedures when cabin was depressurized to proceed with emergency procedures and have self-protection. (ASC-ASR-11-04-015)