China Airlines Flight CI 641 Occurrence Investigation Report

Executive Summary

On October 2, 2008, China Airlines flight CI 641, a B747-400 aircraft, B-18202 performed a scheduled passenger flight from Taoyuan International Airport via Hong Kong International Airport to Bangkok International Airport with 2 pilots, 16 cabin crew members and 147 passengers, in total 165 people on board.

The aircraft took off from Hong Kong at 12:03 Taipei time for Bangkok with a cruise altitude of 40,000ft and good weather condition along the way. When the aircraft was ready to descend at 13:45:20, ATC in Thailand gave the clearance to CAROS heading of 240 degrees to use CAROS 1B approach procedure to approach. The interview record showed that at that time there was an independent cumulonimbus cloud (CB) with a diameter of less than 10 nautical miles at left hand side of the aircraft ahead; radar display showed red, yellow and green echoes and the top of the CB was over 40,000ft. The flight crew discussed and believed that the aircraft might successfully avoid that area with the course at that time and would not be affected by CB. The captain (CM-1) then left cockpit for the rest room.

At 13:55:53, ATC in Thailand requested the aircraft to turn left for heading 210 due to separation reason. By then the CM-1 was not yet back to the cockpit. The co-pilot (CM-2) evaluated that the distance to CB was more than 20 nautical miles and by judging visibility and the radar display the aircraft might pass the left side of the CB after the change of course; therefore he accepted ATC's instruction and started to turn for heading 210. Then CM-1 was back to the cockpit and saw a CB at 20 nautical miles ahead and the aircraft was heading toward this CB, so he asked CM-2 the reason for change of course. CM-2 replied that ATC instructed for heading 210. CM-1 promptly made an analysis, considering aircraft speed and altitude, and found that the radius of the turn would be enormous, even passing by CB's left side, the aircraft would be quite close to CB. Then he instructed CM-2 to request for change of course to heading 190, at the same time disengaged auto pilot to manual mode and used bigger slope to turn.

The interview record and flight data recorder (FDR) showed that the airflow had been stable during the turn. When the heading was at 190 degree, the

auto pilot was engaged again. Then there were no more echoes on radar display, with CB at the right hand side of the aircraft. After continuing the flight for 1 minute, at 13:58:16 the aircraft encountered turbulence with a variation of the vertical acceleration between -0.866g and 1.663g. This turbulence continued for 7 seconds, and then the vertical acceleration was back to a more stable condition.

After being notified by cabin crew of some injuries due to the turbulence, flight crew contacted with Bangkok ATC at 14:08:57 to report the turbulence encountered and that some people were injured on board and requested for ambulance and doctors to stand by.

The aircraft landed at Bangkok International Airport at 14:23. The injured were sent to local hospitals in Bangkok and the aircraft was ferried from Bangkok to Taoyuan International Airport after relevant inspections.

Findings Related to Probable Causes

1. When passing area covered by CB, the aircraft did not keep a safe distance to CB; which led the aircraft encounter the severe turbulence occurrence.

Findings Related to Risk

1. The reason why some passengers and cabin crew members were injured might be due to seat belts not fastened during turbulence (cabin crew seat belt included).

2. The reasons why the passengers did not fasten seats belt might be:
   (1) Passengers did not do as per 'Fasten Seat Belt' (FSB) warning, did not follow the request from the broadcast, or unbuckled the seat belt after cabin crew's inspection.
   (2) Cabin crew might not have found out that some passengers did not fasten seat belts during cabin security check, the cabin security check area might have been overlapped among cabin crew members or might not have been fully covered, or it was not easy to identify if seat belts were fastened because passengers were covered with blankets or taking a rest.

3. The airline's relevant manuals did not define the procedures for pilots to inform cabin crew of moderate or higher scales of turbulence being released, did not set up the way to make the statistics of the injured and the level of injury, and did not define how to handle and evacuate numerous injured people.

4. There was no cabin crew at passenger door 4R during landing, which might consist a risk that nobody would open the emergency exit after landing if it is necessary under emergency situation.

Other Findings

1. Cabin crew were not notified by flight crew of 2 beeping sound of FSB warning before the occurrence, so for the cabin crew it was classified as a turbulence without warning.

2. Purser did not make a use of cabin communication system to give cabin crew systematic duty distribution of cabin emergency response operation and did not use cabin communication system or broadcasting to inform all cabin crew members that the turbulence has been stabilized, and then to give them the instruction to perform cabin inspection.

3. Cabin crew did not take the responsible area as the basis to do the statistics of the injuries, the purser did not give any clear instruction neither to cabin crew as how to do the calculation of the injured; which led the purser having difficulty to get promptly correct statistics of the injured.

4. Some cabin crew members were not familiar with the usage of sterile gloves or not aware of the existence of sterile gloves in the medical kit. Some cabin crew members did not wear gloves when handling blankets, pillows and cushions covered with blood and did not collect blood-stained items according to procedures; which showed that some cabin crew members were lacking of recognition of the risk that pathogen of any blood-borne disease might be hazardous to personal safety.

FLIGHT SAFETY RECOMMENDATIONS

To China Airlines Corp.

1. Reinforce and promote pilot training on how to avoid CB to ensure flight safety, so that pilots may have good judgment and planning to avoid a known potential turbulence area during the flight. (ASC-ASR-10-10-006)

2. Implement and promote that passengers and cabin crew members remain seated or have seat belt fastened when there is a turbulence warning, to include reinforcement of seat-belt inspection, timing to check passengers' seat belts, prevention and handling procedures in operation manuals. Evaluate the feasibility to add turbulence hazards, statistics, information of real cases into educating passenger safety concept, safety instruction card, broadcasting of fasten seat belts, in-flight entertainment system, or any medium to remind passengers beforehand. (ASC-ASR-10-10-007)

3. Review and implement operation manuals concerning turbulence prevention and the standard operation procedures of handling, to include how to release the moderate and higher scales of turbulence, the statistics of possible injuries after turbulence, announcement and update, the handling when the majority of cabin crew members are disabled, and the handling of numerous injured people and the principles of the evacuation. (ASC-ASR-10-10-008)

4. Reinforce cabin crew's concept about occupational safety and hazards, to include to fasten seat belts while seated, to confirm first the safety of work during turbulence, the risk in pathogen of blood-borne diseases, how and when to use sterile gloves, handling of passengers under bleeding condition, handling of blood-stained items in the cabin. (ASC-ASR-10-10-009)

5. Reinforce purser's ability of commanding with emergency response, integrating, priority setting, and using resources during occurrences without warning or under urgent situations. (ASC-ASR-10-10-010)

6. Review flight safety recommendations in the investigation reports published by ASC concerning turbulence prevention and handling of flight safety and CAA AC No.: 120-037 Prevent Damage Caused by Turbulence, AC No.: 121-001 Remind Passengers of Safety and Reminder Card, AC No: 120-32B Safety Management System, AC No.: 120-036 Coordination and Communications between Flight Crew and Cabin Crew, AC No.: 120-034

Status of Principles and Implementation in 'Flight Operations' and 'Cabin Safety' Human Factor Development, to reduce the occurrences of injuries caused by turbulence. (ASC-ASR-10-10-011)

To Civil Aeronautics Administration, Ministry of Transportation and Communications

1. Consult the content of this investigation report to review each aircraft operator if the turbulence prevention and handling procedures are appropriate. (ASC-ASR-10-10-012)

2. Evaluate to provide passengers with safety education or to add the turbulence hazards into any mediums that may remind them of safety to reinforce self-awareness to fasten seat belt. (ASC-ASR-10-10-013)

RECOMMENDATION FOLLOW-UPS

Response from China Airlines

1. Since November 01st 2009 CAL have requested flight instructor pilots to teach trainees relevant airborne equipments during Initial Operating Experience (IOE) and to give oral tests to trainees who have to meet the standard required. Flight Operations have set up a 26-hour course of Aviation Meteorology in Airline Pilot Qualification training and had a special report on 'Weather Radar Operation' in the flight safety meeting on Dec 10th 2009, to remind flight crew of operating correctly weather radar when encountering different weather conditions in flight to avoid weather hazards environment like CB. This special report was archived at Flight Operations Website for flight crew's reference to enhance the effect.

2. With the latest weather forecast SOC provide flight crew with the most updated weather information of the aircraft's estimated arrival time, which includes the weather at the destination airports and alternative airports. SOC also provide information of weather hazards through ACARS along the flight control area for flight crew to utilize and for their reference.

3. Since November 2009 CAL have added the announcement, 'Due to China Airlines' safety policy, please ensure to fasten your seat belt while seated to

remain safe', on the CAL Website, In-flight Magazine, and on board broadcast, to reinforce the promotion that passengers on board should fasten seat belt while seated. Since March 2009 In-flight-Service department have implemented cabin crew training materials to provide cabin crew with conversation technique to request passengers to fasten seat belt and tips for verification. In Cabin Crew Operations Manual CH 2.10, the chapter related to seat belt regulations, was revised to add the timing and technique to carry out.

4. CAL Flight Operations have revised Flight Operations Manual (FOM) Rev20 to give examples to describe how to coordinate among crew members, and In-flight-Service department have published Cabin Crew Operation Manual (CCOM) Rev 03 to revise the content of CH 2.11 Turbulence Prevention and Handling, 5.4.2.2 after confirming airflow status with flight crew, the purser broadcast 'Cabin Crew Released' to inform cabin crew members. At CH 2.11 Turbulence Prevention and Handling, 5.3.3.2 carry out safety inspection when passing through turbulence, according to the safety & security check route of each aircraft type to carry out security inspection to cabin and responsible area.

5. CAL In-flight-Service department have revised CCOM Rev03 chapter 3.2, disabled crew-member handling, to explain the procedures to dispatch deputies and reorganization of the responsibilities when crew members are disabled; in CH 3.3 emergency medical care, it is defined for the principles to evacuate the injured for emergency medical care and that cabin crew make the initial categorization of the injured according to the levels of injuries; and after the calculation of the injured, the purser or the deputy of the disabled cabin crew are requested to report the status to the captain, so that after landing the medical personnel can proceed medical checks to the injured accordingly and send them to hospitals.

6. CAL In-flight-Service have revised CCOM Rev02 in April 2009 to add CH 4 abnormal flight check cards to provide the check list under emergency abnormal situations and in the annual purser meeting of the year, which had trainings concerning commanding with emergency response, integrating, priority setting, using resources during occurrences without warning or urgent situations.

7. In order to reduce the occurrences with injuries caused by turbulence, CAL Flight Operations have reinforced and improved the crew procedures which were one of the occurrence causes. In 2009 Flight Operations and In-flight-Service have consulted CAA AC No.120-037 Prevent Damage Caused by Turbulence, AC No.: 120-036 Coordination and Communications between Flight Crew and Cabin Crew, AC No.120-034 Status of Principles and Implementation in 'Flight Operations' and 'Cabin Safety' Human Factor Development, to develop JCRM courses; which is to proceed studies and promotion for turbulence prevention, including films to explain how to pass turbulence information and how to prevent through crew briefing and to introduce the existing equipments that can detect turbulence, emphasizing that they cannot detect all. Only it can reduce accidents by establishing a clear communication channel and following the procedures.

8. Besides of crew improvement, some implementation has been done before the prevention measures, by promoting 'ensure to fasten seat belt while seated' to passengers. In 2008 the broadcast of 'promoting cabin safety policy' was added to Passenger Announcement Handbook to remind passengers to ensure to fasten their seat belts while seated to reduce the number of injuries.