

# **DA7511 Occurrence Investigation**

## **Executive Summary**

On April 13, 2017, Daily Air scheduled passenger flight DA7511, a DHC-6-400 airplane, registration number B-55571, departed from Tatung airport to Lanyu airport at 1610 Taipei local time with 2 flight crew members, 1 maintenance personnel and 16 passengers, totally 19 persons on board. About 1632, the aircraft veered off runway 13 and hit the fence of the airport during landing roll at Lanyu airport. The aircraft sustained substantial damage. All persons on board were safe.

According to the Republic of China (ROC) Aviation Occurrence Investigation Act and the content of Annex 13 to the Convention on International Civil Aviation, the Aviation Safety Council (ASC) an independent aviation occurrence investigation agency, was responsible for conducting the investigation. The investigation team also included members from Transportation Safety Board of Canada (TSB), Viking Air aircraft company, Pratt & Whitney Canada (P&WC), Civil Aeronautical Administration (CAA) and Daily Air.

The draft “Final Report” of the occurrence investigation was completed in November 2017. In accordance with the procedure, it was reviewed at ASC's 63rd Council Meeting on 21st November, 2017 and sent to relevant organizations and authorities for comments. After comments were collected and integrated, the Final Report was reviewed and approved by ASC's 66th Council Meeting on 27 February 2018. The Final Report was published on 28 March 2018.

There are a total of 19 findings from the Final Report and 12 safety recommendations issued to the related organizations.

## **I. Findings as the result of this investigation**

### **Findings related to probable causes**

1. The occurrence aircraft performed the final approach in left crosswind and landed with its nose yawing to the left. It was probably affected by the clockwise horizontal wind shear on the runway and pilot's operation, the aircraft began drifting to the left after touching down.
2. As the aircraft was drifting to the left, the Captain had used right rudder to correct the deviation, and also pulled the power levers into the reverse range. According to the recorded engine data of torque and (reverse) power of both engines, it revealed that the Captain inadvertently pulled back the left power lever while he was intending to apply the right-turning differential power to assist him in correcting the left drift. It resulted in increasing the left reverse power and intensified the aircraft's left drifting tendency.
3. Though the Captain attempted to get the directional control of aircraft by increasing the right rudder input and the right wheel brake pressure, however he still kept increasing the reverse power of left engine to the maximum, not knowing that he was taking the wrong side. Consequently, the aircraft veered off the runway, hit the fence and caused aircraft substantial damage.

### **Findings related to risk**

#### **Flight Operations**

1. The occurrence Captain and Daily Air's DHC-6-400 flight crew were still in the initial stage of accumulating flying experience of the type aircraft. Their experience and familiarity of applying differential power for directional control during landing were still very limited,

and that their opinions about timing and willingness on those were also diverse.

2. With regard to the issue of applying differential power during landing, Daily Air did not provide detailed guidance on using differential power during landing to flight crew, or specifically instruct and assure them the technique and timing of using it during transition training. Nor did Daily Air request flight crew to study and discuss this issue in relevant technical meetings.

### **Airlines Safety Management**

3. Although both of the Daily Air's Safety Management Committee and Flight Operations Safety Action Group followed the requirements of the Safety Management Manual to convene meetings regularly, they still failed to effectively review the internal and external flight operations related safety data. This resulted that very limited hazards were identified. In addition, some of the action items concluded by the above meetings were not followed up. The overall operations of the safety management system did not reach to effective level.
4. The Daily Air principal instructor of safety management system (SMS) did not receive the formal SMS training which was required in the Daily Air's safety management manual.
5. The Daily Air's Flight Operations Department not only failed to follow up some of the findings of the internal evaluation program (IEP), but also failed to conduct a trend analysis of IEP. The planning of flight operations observation was inadequate. The overall effectiveness of the IEP was compromised.
6. Although there are requirements to conduct flight risk assessment on each route every six months, assessment of flight crew members, crew

training and fleet management on a quarterly basis, the Daily Air's Flight Operations Department failed to implement part of the assessments.

7. According to the organizational structure and functions of Flight Operations Department, fleet management unit is accountable for both functions of pilots "training" and "standardization" which may be difficult to achieve the objective of impartiality and objectivity on the test/check of pilots

### **Civil Aeronautics Administration**

8. The Civil Aeronautics Administration (CAA) conducted a routine check on the flight operations of Daily Air's internal evaluation program (IEP) prior to the accident, but several deficiencies were still found in this occurrence investigation. These deficiencies should have been found by reviewing the IEP scheme and relevant rules/procedures with related forms/records and meetings minutes. This indicated that the methods, frequency and/or focuses of inspecting IEP performed by the CAA should be enhanced.
9. As for the previous occurrence investigation, Aviation Safety Council issued a Safety Recommendation (ASC-ASR-15-12-008) in 2015 to Civil Aeronautics Administration (CAA) on the improvement of the safety on the runway strips. However the CAA incorporated these improvement measures into a long-term runway reconstruction plan, resulted in a longer completion period and did not eliminate or mitigate the existing risk in a timely manner.
10. The fire truck of Lanyu Airport encountered the problem of engine starting and flameout on the way to the occurrence site. The situation may delay the airport emergency response and rescue time.

## **Other findings**

1. The flight crew were certificated and qualified in accordance with the Civil Aeronautics Administration and company requirements. No evidence indicated any preexisting medical conditions that might have adversely affected the flight crew's performance during the occurrence flight.
2. In the final approach and landing phase of the occurrence aircraft, moderate wind shear and approximately moderate turbulence were encountered, but the left crosswind and the tail wind encountered did not exceed the limits of the aircraft.
3. The weight and balance of the occurrence aircraft were within limits. The airworthiness and maintenance of occurrence aircraft were in compliance with company standards and current civil aviation regulations. There were no aircraft system or engine malfunctions that would have prevented normal operation of the aircraft. No discrepancies were found of the examination of engine control and brake system post the occurrence.
4. There were two events related to aircraft drifting off to the left with both power levers not matched of the occurrence aircraft during landing roll. After the maintenance actions were taken on March 24 2017, the discrepancies were rectified and similar event did not occur again before this occurrence. These two previous mentioned events were not related to the occurrence.
5. The Transport Canada approved procedure of Crosswind landings for the DHC-6-400, states that directional control should be maintained with rudder only unless it becomes absolutely necessary to use nose wheel steering, while the manufacturer provides information regarding

*Directional control during landing* informs that asymmetric thrust may be used to control the tendency to weathercock in crosswinds. However, the pre-condition of using asymmetric thrust for directional control during landing is “as the aircraft slows down”.

6. The Daily Air did not have capability to download and readout flight data recorder (FDR), therefore she could not implement the requirements of Advisory Circuit, AC 120-021A (Airworthiness and Operational Approval of Digital Flight Data Recorder Systems), to verify the quality of FDR recorded data.

## **II, Safety recommendation**

### **To Daily Air**

1. Evaluate the necessity and timing of applying differential power for directional control during landing, establish corresponding policies as well as technical guidance accordingly, and reinforce the training and checks of pilots for landing operations, in order to improve their techniques and responding capability. (ASC-ASR-18-03-010)
2. Review and enhance safety management system including the organizational operations and coordination, operational process, and proper trainings to assure the relevant personnel completing the required trainings, familiarizing his/her safety responsibilities and accountabilities, understanding the safety management process and procedures and implementing those accurately. (ASC-ASR-18-03-011)
3. Review and enhance the internal evaluation program (IEP) of Flight Operations Division, flight risk assessment, and the planning/implementation of flight operations safety evaluation. It

should be made sure that relevant personnel who indeed understand and implement their responsibilities for above activities as required. (ASC-ASR-18-03-012)

4. Evaluate either adjusting the organizational structure and functions of Flight Operations Department, or enhance procedure controls on flight training and check to achieve the objective of impartiality and objectivity on the test/check of pilots. (ASC-ASR-18-03-013)
5. Evaluate the setup of flight data recorder (FDR) data download/readout capability to fulfill the program of ‘Airworthiness and Operational Approval of Digital Flight Data Recorder Systems’, so as to maintain the accuracy and integrity of the FDR system, and ensure the FDR data useful for safety events and/or occurrence investigation. (ASC-ASR-18-03-014)

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

1. Supervise Daily Air to timely complete the evaluation of the necessity and timing of applying differential power for directional control during landing, establish corresponding policies as well as technical guidance accordingly, and reinforce the training and checks of pilots for landing operations, in order to improve their technique and coping capability. (ASC-ASR-18-03-015)
2. Positively assist and oversight the implementation of Daily Air’s safety management system (SMS) to assure that her SMS instructors complete required training, Safety Management Committee and Safety Action groups operate effectively. (ASC-ASR-18-03-016)

3. Review and enhance the routine inspections of the Daily Air internal evaluation program (IEP), including inspection frequency, methods, and/or focuses, to assure that Daily Air indeed implements her IEP as required. (ASC-ASR-18-03-017)
4. Supervise the Daily Air to timely complete either the adjustment of organizational structure/ functions of Flight Operations Department, or enhance procedure controls on pilots training and check to achieve the objective of impartiality and objectivity in the test/check of pilots. (ASC-ASR-18-03-018)
5. Supervise Daily Air to evaluate the setup of flight data recorder (FDR) data download/readout capability to fulfill the program of 'Airworthiness and Operational Approval of Digital Flight Data Recorder Systems', so as to maintain the accuracy and integrity of the FDR system, and ensure the FDR data useful for safety events and/or occurrence investigation. (ASC-ASR-18-03-019)
6. Enhance the airport hazard risk assessment and control mechanisms, and assess the priority of airport runway improvement projects such as giving priority to the hazards caused by non-fragile objects and open ditches on runway strips so as to enhance runway safety in a timely manner. (ASC-ASR-18-03-020)
7. Enhance the maintenance of airport fire truck and the training of fire fighter including quick troubleshooting of fire truck to ensure that an emergency can be timely responded and fire hazard can be reduced in case of emergency with fire. (ASC-ASR-18-03-021)