

# DA7012 Occurrence Investigation

## Executive Summary

### I. Narrative

On April 23<sup>th</sup>, 2018, Daily Air scheduled passenger flight DA7012, a DHC-6-400 airplane, registration number B-55573, departed from Qimei airport to Kaohsiung Int. airport at 1658 Taipei local time with 2 flight crew members, and 15 passengers, total 17 people on board. The captain was the pilot-in-command (PIC), who seated on the left seat as the pilot flying (PF), and the first officer seated on the right seat as the pilot monitoring (PM).

The occurrence aircraft maintained 4,000 feet for cruising and flew southeast bound after take-off, the flight joined SIGANG ONE KILO ARR (SN1K), then the crew made a visual approach to runway 09 of Kaohsiung Int. airport (RCKH) which was cleared by Kaohsiung approach at 1715. The Kaohsiung Control instructed runway 09 in use, wind condition 180/12 knots, and cleared the flight to land.

The landing reference speed ( $V_{REF}$ ) of the occurrence aircraft was 75 knots, flap 20 degrees, and the approach speed ( $V_{APP}$ ) was 80 knots. At 1720 the flight crew performed final checklist, the item of “nose wheel steering” was read out by PM, PF replied “centered and locked”. When the aircraft descended through 200 feet agl, the PM called out “right 17 (crosswind) tail 2 (tailwind)” to inform the captain wind condition from the navigation display (ND).

According to flight data recorder data and results of site-survey, the

occurrence aircraft landed at 1,360 feet from runway 09 threshold at 1722:10. The tire marks were found in front of the aiming point, with right landing gear touched ground first before the right-wing tilted up slightly. The tire marks were left starting from 1,675 feet from the threshold, 5 feet to the right-side of runway centerline. The tire marks started to drift to right about 5 degrees w.r.t. the centerline while the occurrence aircraft passed through taxiway Bravo during deceleration, but it drifted to left when it reached around 2,100 feet from the threshold afterwards.

The occurrence aircraft veered off from the left-hand side of runway 09 with 35 degrees drift angle, and crossed the runway edge at approximately 2,500 feet from the runway threshold, and finally it stopped on the grass area at 2,630 feet from the runway threshold, 180 feet away from the runway edge, the heading toward 276 degrees, which was opposite to its landing direction. There was no injury and the right landing gear was deflated due to tire departed from the barrel.

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, Civil Aeronautical Administration (CAA) and Daily Air.

Pursuant to the Aviation Occurrence Investigation Act of Republic of China (ROC) and refer to the Annex 13 of the Convention on International Civil Aviation,

the Aviation Safety Council (ASC) an independent aviation occurrence investigation agency, is responsible for conducting the investigation. The investigation groups included Civil Aeronautical Administration (CAA) and EVA Airways. The investigation report of this occurrence was drafted in December 2018. In accordance with the processes, it was reviewed at ASC's 74th Council Meeting on 25th December, 2018 and distributed to the relevant organizations and authorities to request for comments. After collected and integrated the comments, the final investigation report was reviewed and approved by ASC's 77th Council Meeting on 26th March 2019. This report concluded with 17 findings and 7 safety recommendations comprehensively to the related organizations as the items below.

## **II. Definition of investigation findings**

The ASC presents the findings derived from the factual information gathered during the investigation and the analysis of the occurrence. The findings are presented in three categories: **findings related to probable causes**, **findings related to risk**, and **other findings**.

The **findings related to probable causes** identify elements that have been shown to have operated in the occurrence, or almost certainly operated in the occurrence. These findings are associated with unsafe acts, unsafe conditions, or safety deficiencies associated with safety significant events that played a major role in the circumstances leading to the occurrence.

The **findings related to risk** identify elements of risk that have the potential to degrade aviation safety. Some of the findings in this category identify unsafe

acts, unsafe conditions, and safety deficiencies including organizational and systemic risks, that made this occurrence more likely; however, they cannot be clearly shown to have operated in the occurrence alone. Furthermore, some of the findings in this category identify risks that are unlikely to be related to the occurrence but, nonetheless, were safety deficiencies that may warrant future safety actions.

**Other findings** identify elements that have the potential to enhance aviation safety, resolve a controversial issue, or clarify an ambiguity point which remains to be resolved. Some of these findings are of general interests that are often included in the ICAO format accident reports for informational, safety awareness, education, and improvement purposes.

### **III. Findings as the result of DA7012 investigation**

There are a total of 17 findings from the final report and 7 safety recommendations issued to the related organizations.

#### **3.1 Finding related to probable causes**

1. The occurrence aircraft landed in a right crosswind. After touchdown, the pilot flying (PF) attempted to correct the lateral deviation but misused the nose wheel steering lever which caused the aircraft veered-off the runway from its left hand side with a 35 degrees drift angle. The aircraft turned 180 degrees left and stopped on the grass area.

### **3.2 Findings related to risk**

1. At the time of the occurrence, the DHC-6-400 level D flight simulator was not yet available in the aviation industry. The Daily Air could only carry out pilot training and check in a real aircraft. However, it is not only impossible to simulate various scenarios and weather conditions in a real aircraft, but also contained higher risks, thus restricted the effectiveness of pilot training and check.
2. Daily Air did not specify standard call-outs in relevant manuals for pilot monitoring (PM) to remind lateral deviation during landing roll. Thus the flight crew acted on their own style and it weakened the effectiveness and accuracy of the communication.
3. Daily Air did not specify the timing or speed limit in relevant manuals for the use of "nose wheel steering". It may result in divergence of views and actions toward this issue and adverse effect on standardization in the DHC-6-400 fleet.
4. Daily Air did not have a clear policy regarding the usage of asymmetric thrust to assist directional control during landing roll. There were divergences in opinions between management, instructor pilots, check airmen and flight crew in the DHC-6-400 fleet.
5. The captain of this occurrence had already carried out all flying tasks, including take-off and landing operations manually for 8 legs, and his flight duty period had exceeded 10 hours. The captain's decayed physical and mental conditions due to his accumulated workload could weaken his alertness and

ability to perform tasks safely.

6. Although flight crew schedules of Daily Air was in compliance with the CAA regulations, a bio-mathematical model analysis of pilot fatigue showed that the eastern Taiwan routes with 12 legs a day may exist a high risk of fatigue, the Taiwan eastern routes with 10 legs a day may exist a moderate-to-high risk of fatigue; the western Taiwan routes with 8 legs a day may exist a moderate risk of fatigue.
7. Shortage of pilots in Daily Air DHC-6-400 fleet has existed at least for a year before the occurrence happened, especially in the case of a shortage of captains, which may result in high risk of fatigue on the pilot flight schedule.
8. The cockpit of DHC-6-400 aircraft owned by Daily Air was not equipped with effective air-conditioning, which may result in unpleasant mental situation or fatigue of flight crew members due to potentially heat stress environment.
9. Daily Air failed to completely integrate its internal evaluation programs of its flight operations division in the safety management manual. The internal evaluation program was scattered over its flight operations manual and the safety management manual, which is harmful to the implementation and review of internal evaluation programs.
10. According to the safety management manual of Daily Air, flight crew recurrent flight check was included in the internal evaluation programs. However, the flight check is an essential requirement to maintain pilot qualification, which should not be classified as internal evaluation programs.

### **3.3 Other findings**

1. The flight crew were certificated and qualified in accordance with the Civil Aeronautics Administration regulations and company requirements. No evidence indicated any preexisting medical conditions or alcohol that might have adversely affected the flight crews' performance during the occurrence flight.
2. The pilot flying completed the transition as well as upgrade training and check on DHC-6-400 type one month before the occurrence. He has accumulated 204 hours and 8 minutes on DHC-6-400. No anomaly related to this occurrence, such as "direction control during landing roll" or "usage of nose wheel steering" was found in his training records.
3. At the time of the occurrence, surface winds of runway 09 in Kaohsiung airport were blowing from the right with the velocity of 10 knots to 19 knots. The weather condition was within the limits of DHC-6-400 fleet.
4. All available evidences indicated that the nose wheel of the occurrence aircraft should be in the center position before landing. The possibility of veered-off due to nose wheel steering malfunction was ruled out.
5. The nose steering system and hydraulic system were normal during the landing roll period.
6. The output torque difference between two engines was about 1%, and gas generator speed of the left engine (Ng) was 1% lower than the criteria at the idle from the maintenance manual during performing post-occurrence engine

examination, were not considered as influences in aircraft controlling or might have resulted in a significantly directional change.

#### **IV. Safety Recommendations**

##### To Daily Air

1. Integrate relevant flight manuals of the DHC-6-400 fleet to contain standard call-outs for lateral deviation during landing roll, specific timing and speed limitation for the usage of nose wheel steering ... etc, so that the flight crew operation and training can be standardized and the flight safety can be promoted. (ASC-ASR-19-04-001)
2. Expedite the process of training program on DHC-6-400 level D simulator to strengthen the flight crew training and check for crosswind landing. (ASC-ASR-19-04-002)
3. Review and improve the shortage of the DHC-6-400 flight crew and the cockpit environment. And identify high fatigue risks from the pilot flight schedule patterns to revise schedule rules or strengthen the fatigue management mechanisms to mitigate pilot fatigue. (ASC-ASR-19-04-003)
4. Refer to the advisory circular F120-59A “Air Carrier Internal Evaluation Programs” issued by Taiwan CAA. Review, strengthen, and integrate the internal evaluation programs for each units at Daily Air. (ASC-ASR-19-04-004)



To Civil Aeronautics Administration, Ministry of Transportation and  
Communications

1. Supervise Daily Air on integrating relevant flight manuals of the DHC-6-400 fleet to standardize flight crew operation and training, request the compliance with procedures, so as to improve the flight safety. (ASC-ASR-19-04-005)
2. Supervise Daily Air on expediting the process of training program on DHC-6-400 level D simulator to strengthen the flight crew training and check for crosswind landing. (ASC-ASR-19-04-006)
3. Supervise and assist Daily Air improving its flight crew cockpit environment, workload and fatigue managements, flight crew manpower management and internal evaluation programs. (ASC-ASR-19-04-007)