

## **Executive Summary**

On June 28, 2011, UNI Air flight B7 642, a scheduled revenue service passenger flight, Dash-8-300, with aircraft registration number B-15231, took off from Makong Airport for Tainan Airport. There were 2 flight crew members, 2 cabin crew members and 43 passengers, total 47 people on board.

The aircraft was scheduled to land at the runway 18L of Tainan Airport, however it landed at the undesignated runway 18R. The aircraft had no damage and all people on board were safe.

The Aviation Safety Council (ASC), is an independent agency responsible for civil aviation, public aircraft and ultra-light vehicle occurrences investigation. According to the Republic of China Aviation Occurrence Investigation Act and referencing to the related content of Annex 13 to the Convention of International Civil Aviation Organization (ICAO), the ASC launched an occurrence investigation by law. The organization or agency being invited to join the investigation team also included: Civil Aeronautics Administration (CAA), Uni Air and Air Force Command Headquarter, Ministry of National Defense. The Final Report was reviewed and approved by the ASC's 2nd Council Meeting on July 17, 2012.

There are a total of 30 findings from the Final Report, and 16 safety recommendations issued to the related organizations.

### **Findings Related to Probable Causes**

1. When the captain had the runway in sight, the aircraft has passed over the visual descent point and was approaching the miss approach point. Meanwhile the captain had to maneuver to land at the touchdown zone due to the aircraft at a higher altitude than normal, and because of the heavy rain, failing to wear glasses and not switching on wipers, the captain's mind was set to the landing operation and did not receive the information about aiming to the wrong runway provided by the controller and the first officer.
2. When realizing that they were aiming the wrong runway, the first officer (F/O) reminded the captain the aircraft was off course to the right side. While the captain did not respond to the F/O, the F/O did not remind the captain again and did not determine to call out for go-around, which led to the captain not being alerted the runway he was trying to land was wrong and the aircraft as a result of landed at the unassigned runway 18R.
3. The captain and the first officer both understood that there were 2 parallel runways 18L and 18R at Tainan Airport, however on the day of the occurrence they were not sufficiently alerted to the situation. When visualizing one runway, pilots immediately thought it as the runway 18L assigned by the controller without a proper verification.
4. During approach there was medium rainfall near the airport area and there existed different levels of clouds scattered at the altitude below 1,000 ft. and cumulonimbus at the south east side of the airport near the runway

18L, which influenced the pilots to locate the runway 18L assigned by the controller during the visual approach phase.

5. When the pilot had the visual contact with the runway, the aircraft had approached or entered into the blind zone of the approach lights of runway 18L, which might make the approach lights difficult to be located by the pilots. If the weather condition was good, the pilots should have had an opportunity to locate the runway 18L with the approach lights on if they have had sufficient situation awareness.
6. The VOR/DME approach is non-precision approach, which is less accurate. At the final approach phase after the pilot disengaged auto-pilot the aircraft was positioning at the west side of the extended centerline of runway 18R, which was closer to the aircraft instead of the runway 18L assigned by the ATC, once the pilot had the visual contact with the runway which led to the aircraft to aim at the runway 18R then.

### **Findings Related to Risk**

1. When the pilot saw the runway, the aircraft was at a higher altitude. In order to have the aircraft landing at the runway touchdown zone, the throttles were set to idle and the aircraft headed downwards, so that a steeper glide path angle could be achieved. This maneuver caused the air speed was lower than the approach speed temporarily, the maximum descend rate was over 1,000 ft/min and the average descend rate about 775 ft/min, which was more than the normal descend rate of 500 ft/min. The average glide path angle of the aircraft was 6.02° which was also steeper than the normal glide slope angle of 3°.
2. Uni Air's existing procedures related to the non-precision approach define that when the aircraft approaches to the visual descent point without pilot's visual contact with the runway, the aircraft may remain above the minimum descent altitude to proceed approach to the miss approach point. However when the miss approach point is located far behind the visual descent point together with the delay of the pilot's visual contact with the runway, it might cause the pilot to maneuver considerably to land and to have the descend rate and the approach speed exceeding the company's stable approach standard, which exists a contradiction between the training manual and the Flight Operation Manual (FOM).
3. When the aircraft was approaching Si-Gang VOR radio station, Pilot Flying (PF) was performed by the first officer. The captain as Pilot Monitoring (PM) without asking PF's approval, decided to assist the PF to adjust the course from 125 to 120 degree.
4. As the Flight Operation Manual did not prescribe the take-over timing, the two pilots did not determine the time to transfer duties though both pilots had decided to have the captain as Pilot Flying during landing. The captain took over when the aircraft was 1.5 nautical miles from the runway 18R threshold.
5. When captain was on duty as Pilot Monitoring, he disengaged the auto-pilot without using the standard call-out or any other ways to take over

and did not call out 'auto-pilot disengage' to disengage the auto-pilot by himself.

6. The first officer as Pilot Monitoring during the final approach phase did not perform the standard call-out procedure as per manual.
7. When the ATC controller reminded that '642, the runway you are aiming is wrong', the captain, then already as Pilot Flying, took the initiative to respond with the microphone 'runway in sight'. However according to the procedures, the radio communication shall be the responsibility of Pilot Monitoring performed by the first officer.
8. There existed a condition of power distance between the two pilots. It may not be excluded that this factor affected the performance during the occurrence.
9. Bearing the pressure of the captain not following the procedures to disengage the auto-pilot and to take over the command and that the aircraft approached during heavy rain, the first officer could not keep calm and had the symptoms of pressure, such as nervousness and failing to handle the sudden events, which made him unable to fulfill effectively the duty as a Pilot Monitoring during visual descent at the approach phase.
10. For the captain, he should have worn glasses to rectify his far sighted vision for both eyes and the near sighted vision for the left eye but failed to follow the requirement to wear glasses according to the limitation stated in his medical certificate.

### **Other Findings**

1. There were no anomalies having been found in the flight crew recurrent training and check records, but there were procedures following and the CRM issues having been found in this occurrence like the standard callout, control transfer, situation awareness etc. It shows that some deficiencies of the flight operation have not been found during the process of the recurrent training and check.
2. The ATC controller received the reply from the flight crew after reminding that they were aiming the wrong runway, and confirmed that the situation wouldn't result in runway incursion. The handling of the ATC controller didn't violate the associated procedures.
3. The CVR is only capable of recording 30 minutes of cockpit voice. Upon landing the flight crew already knew they were on the wrong runway; however, they did not shut the power of CVR after engine shut-down check, according to "Aircraft Flight Operation Regulations" Article 111 and UNI FOM Article 10.3.5. CVR remained on power for another 26 minutes, therefore voice recording associated with the occurrence was not preserved.
4. The ICAO and FAA believe that the risk of the step down approach is higher than the CDFFA. The CDFFA technique could relieve the pilot workload and decrease the chance of making error, it could also increase

the situational awareness of pilots.

5. The regulatory agency of international state did publish the advisory circular and demand the operators to adopt the CDFA technique based on the suggestion from ICAO and FAA, but CAA in Taiwan did not publish related circular to the operators.
6. Based on the paragraph 7.10.6, FOM, the pilots could select either the step down approach or the CDFA, but the POI did not challenge it.
7. The CDFA procedures have not been built in the local non-precision approach chart based on the suggestion from ICAO and FAA.
8. The pilots did not fully understand the definition of the aviation occurrence as well as the related CVR power off procedures, even there is a procedure to deal with the flight recorders when safety event occurred which has been set by the UNI Air.
9. The UNI Air transition training program did cover the runway 18L Tainan airport VOR approach, but did not cover the runway confirmation during landing in critical weather condition. The recurrent training program did not cover the closely-spaced parallel runway operation.
10. The official notification for opening of AWOS to the relevant navy and air force units issued by Air Force Weather Wing was 15 days after the opening. It caused the Tainan tower to leave AWOS display device unused eight days after, as well as relevant information was failed to be updated timely on AIP.
11. The error of flight guidance using the VOR RWY18L instrument approach in Tainan airport may be higher than the 354 meters separation between two runways, the risk of aiming wrong runway exists.
12. Tainan airport restricts simultaneous parallel runway operation due to lack of enough separation between their centre lines. This restriction complies with the safety requirements of 「Civil Aerodrome design and Operation Guidance」 and 「Air Traffic Management Procedures」.
13. The airport CCTV indicated that the runway edge lights of runway 18L was on but runway 18R was off during the occurrence.
14. Based on the interview record of Tower controllers, the runway edge lights, approach lighting systems with its sequence flash light, visual approach slope indicator systems of runway 18L were turned on. The runway edge lights and visual approach slope indicator systems of runway 18R were turned off.

## **Safety Recommendations**

### **To Uni Air**

1. Reinforce to request Dash-8 pilots to follow FOM's standard operation procedures, for example, the transfer of the command and the regulations to the approach visual reference. Reinforce crew resources management

training in flight crew communication, attention allocation and stress management.

2. Review and consider to revise relevant contents of the Dash-8 flight crew training manual to meet the FOM's requirement of the stable approach, to add timing of the command transfer.
3. Review and consider to revise relevant contents when the F/O encounters landing limitation in the FOM and the operation skill of the VOR approach at the runway 18L at Tainan Airport, to have a training plan of the Dash-8 simulator training to identify the runway during the non-precision approach at parallel runways and to emphasize reminders related to identifying landing runways.
4. Request pilots to perform flight duties following the requirement from the limitation prescribed in the medical certificate accordingly.
5. Revise the operating skill related to the non-precision approach in the FOM to request each aircraft type to employ the operating skill of continuous descend final approach when non-precision approach is performed, and reinforce to request flight crew to follow the procedures of the stable approach to improve flight safety.
6. With the compulsory reporting of flight safety related events prescribed in the 'Regulations for Aircraft Flight Safety-related Events', supervise flight crew to follow the 'Aircraft Flight Operation Regulations' Article 111 and the FOM regulations that flight crew shall deactivate the CVR immediately after suspecting any occurrence of the flight safety related events.
7. To enhance daily self-audit concerning flight operation.

#### **To Civil Aeronautics Administration**

1. Evaluate cautiously the possibilities to set up navigation facilities such as additional instrument landing systems or localizer stations to assist aiming runway with better accuracy and promulgate appropriate instrument approach procedures.
2. Issue additional warning notifications for NDB and VOR instrument approach charts at Tainan Airport to raise the alert of identifying runways to remind pilots to pay attention.
3. Supervise Uni Air to request Dash-8 pilots to follow FOM standard operation procedures, for example, the transfer of the command and the regulations to the approach visual reference. Reinforce crew resources management training of flight crew communication, attention allocation and stress management.
4. Supervise Uni Air to review and consider to revise the FOM's content related to the stable approach to meet the actual requirement of the Dash-8 aircraft type, to add timing of the command transfer when the F/O encounters landing limitation.
5. Supervise Uni Air to review and consider to add the operation skill related

to the non-precision approach procedures, the simulator training to identify the landing runway at parallel runways and verifying reminders of the landing runways.

6. Supervise Uni Air to implement the CVR deactivation procedures after the occurrence of flight safety related events.
7. Supervise Uni Air to implement flight crew members evaluation mechanism.
8. Refer to ICAO to promote continuous descend final approach, to reinforce trainings of the flight operation inspectors and relevant staff and to revise relevant manuals, procedures and the approach charts.

#### **To Air Force Command Headquarters**

1. Supervise Air Force Meteorological Wing to establish reporting operation procedures concerning any significant alternations to the installation, the cancelation and the booking of the weather equipment and the revision of the weather information to ensure that all relevant units and departments promptly receive the notifications.