

UNI AIR MD-90 NATIONAL REGISTRATION B-17917 FLIGHT BR 806 VEERED OFF RUNWAY WHEN LANDING AT TAOYUAN AIRPORT

Executive Summary

On May 12, 2011, UNI Airways Corporation (UNI AIR) an MD-90 national registration B-17817, wet leased from EVA Airways Corporation (EVA AIR), had a passenger flight BR 806 from Macau Airport for Taoyuan International Airport (Taoyuan Airport) with 2 flight crew members, 5 cabin crew members and 127 passengers on board. The aircraft landed at 20:36 hours at Taoyuan Airport Runway 06. During rolling out the right main gear veered off the runway at 3,340ft from Runway 06 threshold, then back to the runway at 5,100ft. After aircraft taxied via Taxiway S6 and arrived at the parking bay, the inspection found that the aircraft had minor damage, but no one on board was injured.

According to records from on-site investigation, personnel interviews, Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR), the flight status is as the following:

Before take-off the flight crew was acknowledged of good visibility, heavy rain, cloud ceiling at 2,500ft at the destination with thunder storms along the flight. The aircraft took off at 19:17 hours with the captain seated at the left seat in the cockpit acting as Pilot Monitoring (PM) and the first officer at the right seat acting as Pilot Flying (PF). As the aircraft was reaching cruise altitude 31,000ft at 19:38 hours, the flight crew received information from Automatic Terminal Information Service (ATIS) broadcasted by Taoyuan Airport during flight that the wind direction was 040 degree at Taoyuan Airport with wind speed of 16 knots/hour and visibility of 3,500m, which met the standard for the first officer to perform landing. During approach briefing the captain decided to have the first officer acting as Pilot Flying.

The aircraft started to descend at 20:09 hours. When it passed an altitude of 20,000ft at 20:21 hours around the region of Miaoli, the weather radar on board indicated cumulonimbus cloud ahead; and lightning as well were within visibility, so the flight crew asked ATC for clearance to deviate eastbound to avoid thunder storms. At 30 nautical miles from the airport, the aircraft was approaching by ATC Radar Vectors. Flight crew stated that there were thunder storms during approach. According to CVR, the aircraft extended landing gears at 20:32:25 hours and started to proceed with pre-landing checks. At 20:33:04 hours at an aircraft altitude of 2,700ft, ATC gave the landing clearance and informed of wind direction of 030 degree, wind speed of 10 knots/hour and visibility of 3,500m at Runway 06. According to CVR records the flight crew has reported during pre-landing checks at 20:33:30: "... spoiler brake armed uh medium flaps slat".(Quotation). The captain and first officer were discussing about the weather outside, which was a thunder storm at 20:33:39 hours, with an aircraft altitude of 2,248ft at that time. When ATC issued thunder storm warning at 20:34:41 hours, the aircraft was at an altitude of 1,452ft.

When the aircraft was passing 500ft at 20:35:52 hours, the flight crew cross-checked and confirmed "stable". The captain called out: "Approach light insight"(Quotation) and the first officer asked the captain to activate wipers at 20:36:06 hours. At 20:36:39 hours the aircraft was landing with left and right main gears and nose gear at the same time at air speed of 144 knots/hour. At 20:36:41 hours the left and right thrust reversers were activated. The left main gear mode was transferred from "GND" to "AIR" at the 3rd and 4th seconds after main gears landed; while the right main gear mode was transferred from "GND" to "AIR" at the 6th and 7th seconds; at 20:36:46 hours the aircraft was located at 3,340ft from Runway 06 threshold and the flight track was veered off out of the right hand side of Runway 06; at 20:36:49 hours CVR recorded abnormal rolling noise; at

20:37:56 hours the aircraft was back to Runway 06 at 5,100ft from Runway 06 threshold. FDR showed that the left and right spoilers were not extended during the time of 20:36:39 and 20:41:55 hours.

According to the interview records, the captain stated that it turned to heavy rain just before landing and there was water accumulated on the runway before touchdown. After landing thrust reverser was immediately activated and the aircraft veered towards right hand side. Though the captain used left rudder to correct the heading, the aircraft kept veering off toward the right hand side; but the heading was corrected soon afterwards. After the aircraft left the runway, the flight crew found that taxiing was ok and no abnormal indication for tires. Then the aircraft taxied off the runway via Taxiway S6, back to parking bay C10. During taxiing the flight crew reported to ATC: "Braking action poor" (Quotation) and later requested ground personnel to check exterior of the aircraft.

The ground inspection found the landing gear flap deformed and scratches on main wheels number 1, 2, 3 and 4, some damages on Engine no. 2 exterior surface and inlet guide vanes and damages of 4 landing lights at the right hand side of Runway 06.

Findings Related to Probable Causes

1. It existed leftside crosswind at a speed of 10 knots/hour and 20 knots/hour during the period between flying at the altitude of 500ft and landing; the flight crew were not acknowledged of dramatic change of wind speed before landing; the ground spoilers were not promptly extended after landing, which failed to minimize the wing lift to reduce the impact of the ground wind to the aircraft's lean to the right; when the left crosswind increased to maximum 18 knots/hour after landing, the wing lift was increased at the left wing due to the increase of crosswind and PF did not use promptly lever to windward to overcome the left wing lift phenomenon, so the aircraft had a lean to the right; when encountering weathercock effect during crosswind landing, the flight crew did not decrease the thrust reverser in order to slow down and reduce the lateral pitch, which aggravated the aircraft's lean to the right and eventually made the aircraft out of control to veer off the runway.

Findings Related to Risks

1. At the time when the flight crew informed ATC that the approach preparation was done, the model, altitude, air speed and distance to the airport did not meet the airlines' requirement of "cross-check performance" and "descent plan".
2. The flight crew failed to notice that the aircraft's altitude was higher than normal descent plan with higher speed and failed to go through identification and discussion before performing relevant operations.
3. When Taipei Approach Taoyuan South controller gave approach clearance to BR-806, the altitude information intercepted by the aircraft from ILS was 1,000ft higher than Glide Slope without any distance related information, which increased the risk for pilots to perform approach.
4. The weather information the flight crew had before descent and the weather information provided by ATC before landing met the landing standard for the first officer to perform landing; however the weather changed afterwards and the change of crosswind before landing was over the limit of the landing standard; the flight crew were not acknowledged the most current weather information before landing.

5. Taipei Approach Taoyuan South controller did not follow "Air Traffic Management Procedures" to ensure that pilots receive the most current ATIS.
6. Due to broadcasting thunder storm warning, visibility and providing thunder storm information requested by other aircraft, ATC Airport controller failed to get hold of the changes of the ground wind to provide BR-806 with the information about the dramatic change of the ground wind.
7. The flight crew did not utilize ND and MCDU in the cockpit to get wind information, so they could not acknowledge the change of wind before landing.
8. The aircraft landed with the left hand and right hand main gears and nose gear at the same time and the landing model during the period between drifting and landing was abnormal, which did not meet the requirement of MD-90 standard operating manual.
9. When the aircraft landed with 2 main gears and nose gear at the same time, the captain did not take over immediately.
10. The flight crew did not follow UNI AIR MD-90 standard operating manual to call out before landing. The airlines' existing training and audit mechanism cannot reflect the error that the two flight crew members did not follow the standard operating manual.
11. The captain neglected to check the status of spoilers after landing and did not manually extend spoilers when spoilers were not automatically extended.
12. The more probable cause to why the spoilers did not automatically extend after landing might be that pilots did not set the speed brake to ready position and failed to check accordingly before landing, which led the spoilers not automatically extend after landing.
13. When Approach controller's work was over loaded, supervisors and coordinators did not take the air traffic and the work load into consideration to initiate the re-allocation of manpower to dispatch feeders to share the workload from Taoyuan South sector.
14. From the occurrence investigations in recent years, it was found 2 cases that controller on duty did not follow "Air Traffic Management Procedures" to provide the aircraft with important weather information, which showed that the mechanism of audit and inspections to controllers were not yet improved.

Other Findings

1. The flight crew's flight qualifications met the existing civil aviation regulations.
2. There was no evidence to show any mental, physical, medical and alcoholic impacts on pilots during flight.
3. The weight and balance of the aircraft was within limit and there was no evidence to show that the occurrence was related to neither maintenance nor airworthiness.
4. At the time of landing there were conditions and environment for drifting to take place. However the left main gear was off ground at the 3rd and 4th seconds after landing and the right main gear was off ground at the 6th and 7th seconds, then the aircraft veered off the runway. Therefore the runway excursion occurrence was not caused by drifting.

5. During the period between the aircraft's radio altitude at 200ft and main gear touching down, wind shear hazard factor was lower than 0.1, CVR and FDR records showed that the wind shear alerting and guiding system was not activated, and there was no wind shear warning from the ground observation; therefore there was no wind shear phenomenon.
6. The three parameters "brake position", "brake pressure" and "ground spoiler position" recorded by FDR were not any of the 32 mandatory parameters mandated by national regulations, but were the mandatory parameters according to the standard and recommendations from ICAO Annex 6 Revision 9.
7. After some flight operations supervisors left UNI AIR, CAA Flight Operation Inspector did not request UNI AIR to assign new supervisors according to Flight Operation Manual.
8. National civil aviation regulations did not list it as a mandatory requirement that flight operation supervisors in civil aviation transportation industry should be civil aviation pilot and have experiences in flight operation related supervisor or management.
9. The cross slope of Taoyuan Airport Runway 06/24 pavement met "Specifications of Civil Aerodrome Design and Operations" - requirement. However, heavy rainfall might have had result in more depth of water at the runway pavement.
10. CAA had no regulations concerning the guideline of inspecting flatness of runway. Besides Taoyuan Airport did not perform the flatness of Runway 06/24.
11. After the occurrence the friction coefficient of Taoyuan Airport Runway 06/24 was higher than that of maintenance standard and minimum anti-ski standard.
12. The unscheduled patrol procedures from "Patrol and Maintenance Operating Procedures at Taiwan Taoyuan International Airport Movement Area" did not follow the recommendations from "Guidance Notes to Civil Aerodrome Airside Operations" to explain clearly hazard weather conditions (ex. strong wind, heavy rain, fog or low visibility).
13. Pilots notified ATC of runway braking condition was "poor" after landing, which was amended to ATIS, but ATC did not inform Flight Operations of Taoyuan Airport Corporation.
14. Taoyuan Airport Corporation did not follow the recommendations in "Specifications of Civil Aerodrome Design and Operations" and "Guidance Notes to Civil Aerodrome Pavement Conditions" to add the condition of extra special anti-ski inspections into the relevant procedures in "Taiwan Taoyuan Airport Runway Pavement Friction Inspection and Maintenance Operations Regulations".
15. Taoyuan Airport Runway 06/24 was used mostly by aircraft with high landing speed and the 60 meters of the runway width met the condition to set up runway center line light which was recommended by "Specifications of Civil Aerodrome Design and Operations".

FLIGHT SAFETY RECOMMENDATIONS

To UNI Airways Corporation

1. Reinforce MD-90 fleet captains, when acting as PM, to take over when PF performs an abnormal landing.
2. Reinforce MD-90 fleet flight crew's landing and operating skill under crosswind and wet runway conditions, including the use of thrust reverser when conducting crosswind landing with drifting effect.
3. Reinforce MD-90 fleet flight crew training and audit concerning following standard operating procedures and plans in operation and training manuals.
4. Reinforce MD-90 fleet flight crew's situation alertness and information exchange concerning crew resources management mentioned in flight operation manuals.
5. Review and consider revising existing MD-90 fleet flight crew's operation, inspection procedures and methods for speed brake before landing, including the check of speed brake position before landing to ensure the extension of the ground spoilers after landing.
6. Review MD-90 fleet operation and training manuals to add the utilization of ND and FMS MCDU Progress page to obtain wind related information.
7. Review the assignment of Flight Operations supervisors following Flight Operation Manual.
8. Review the annual inspection procedures of FDR and the calibration of its sensing device to ensure the accuracy of the parameters recorded by FDR.
9. Review the reasons why flight data analysis system cannot obtain and analyze crucial parameters for the risks in aircraft veering off runway and study to reinforce the function of the flight data analysis system.

To CAA, Ministry of Transportation and Communications

1. Supervise UNI AIR to reinforce MD-90 fleet flight crew's landing and operating skill under crosswind and wet runway conditions, including the use of thrust reverser when conducting crosswind landing with drifting effect.
2. Supervise UNI AIR MD-90 fleet flight crew's training and audit concerning following standard operating procedures and plans (including inspections and standard call-out) in operation and training manuals.
3. Supervise UNI AIR MD-90 fleet flight crew to have situation alertness and to perform information exchange concerning crew resources management mentioned in flight operation manuals.
4. Supervise UNI AIR to review and consider revising existing MD-90 fleet operation, inspections and methods of speed brake before landing for flight crew, including the speed brake position check before landing to ensure the extension of the ground spoilers after landing.
5. Supervise Air Navigation and Weather Services ATC operation to review and implement management and policies of ATC services, to ensure that supervisors and coordinators fulfill their duties.

6. Review regulations of ATC training, inspection and controller audit and supervise ATC operation to make training inspection and controller audit functioning to ensure that ATC services meet the regulations.
7. Supervise Air Navigation and Weather Services to evaluate the workload and work environment of controllers, to implement the regulations in "Air Traffic Management Procedures" to provide weather information.
8. Supervise UNI AIR to review MD-90 fleet to add the utilization of ND and FMS MCDU Progress page in cockpit to obtain wind related information into operation and training manuals.
9. Supervise UNI AIR to review the designation of Flight Operations supervisors following Flight Operation Manual.
10. Supervise UNI AIR to review the annual inspection procedures of FDR and the calibration operation of its sensing device to ensure the accuracy of the parameters recorded by FDR.
11. Supervise UNI AIR to review the reasons why flight data analysis system cannot obtain and analyze crucial parameters for the risks in aircraft veering off runway and to study a solution to reinforce the function of the flight data analysis system.
12. Implement to follow the regulation in Air Traffic Management Procedures that ATC shall inform airport authorities and relevant departments when braking condition on the runway is reported.
13. Consider adding guidelines and regulations concerning inspection of airport flatness; supervise Taoyuan Airport Corporation to add the conditions to activate unscheduled patrol operating procedures and to add a mechanism to have special anti-ski inspection or other alternative responses when pilots report braking situation on the runway.

To Taoyuan Airport Corporation

1. Add the conditions to activate unscheduled patrol operating procedures, and add a mechanism to have special anti-ski inspection or other alternative responses when pilots report poor braking condition on the runway.