



**Aviation Safety Council  
Taipei, Taiwan**

**FAR EASTERN AIR TRANSPORT  
FLIGHT EF055 AIRCRAFT TYPE MD-82  
REGISTRATION NO.B-28011 VEERED  
OFF RUNWAY IN KINMEN SHANGYI  
AIRPORT**

**Executive Summary**

# Executive Summary

On August 21, 2003 , Far Eastern Air Transport flight EF055, aircraft type MD-82, registration no.B-28011, at 1113 Taipei time, conducted a scheduled passenger flight from Taipei Songshan Airport to Kinmen Shangyi Airport, carrying 2 pilots, 4 cabin crew, 146 passengers, total 152 people on board.

After the aircraft departed from Taipei, the flight was normal, at 1131, after crewmembers listened to ATIS of Kinmen Shangyi Airport, they decided to use LDA/DME RWY 06 instrument approach, at 1159, the aircraft landed at Kinmen Shangyi Airport, the meteorological condition was drizzling, visibility 3,200m, wind 160 degrees 19 knots , maximum gust 22 knots .

After landing, the aircraft veered left off Runway 24 at around 224 meters from the runway threshold, and came to a full stop on the clearways by the threshold of Runway 24, heading was around 070, no casualties, the aircraft suffered minor damage.

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

1. On the day of the occurrence, Kinmen Area was affected by low pressure system, the weather was unstable. When the aircraft landed at Kinmen Shangyi Airport, the meteorological condition was drizzling, visibility 3,200 meters, wind 160 degrees 19 knots, maximum gust 22 knots.
2. During the last phase of the approach, the altitude was slightly higher, in order to correct altitude, the pilot increased descent rate and therefore speed increased, exceeding the

recommended standards of the company's stable approach criteria; The flight crew decided that the runway length was long enough for landing, and decided to continue without going around, causing the aircraft to touch down with a speed of 27 knots higher than  $V_{ref}$ .

3. The aircraft touched down at 2,366 feet from the threshold of Runway 06, the remaining runway length was 5,924 feet. Since the approach speed was too fast, the runway length required for landing would increase 34%, under the condition of runway wet and slippery which was bad for landing and deceleration, the landing risks greatly increased.
4. The aircraft generally rolled along the direction of the runway after touchdown, till 15 seconds after the main wheels touched down and when the engine reverse thrust EPR value reached 1.5, the heading and track of the aircraft started to shift to the left, and when the reverse thrust EPR value continuously increased to the maximum of left 1.9/ right 2.1, the aircraft continued veering left off the runway centerline, even the pilot used rudders, nose wheel steering and brakes, there was no direction control and eventually veered off the runway.
5. The data provided by McDonnell Douglas for MD-80 aircraft users revealed that when the aircraft landed and rolled, and the reverse thrust was over 1.3 EPR, the aerodynamics force acting on the vertical stabilizer and the rudders would be interfered, hence lowering the abilities of heading control by rudders and vertical stabilizers, meanwhile, the effect of heading directional control by vertical stabilizers and rudders

would decrease along with the increase in reverse thrust EPR value, when the reverse thrust EPR value surpassed 1.6, the vertical stabilizers and the rudders had nearly zero effect on the heading directional control .

6. When the aircraft landed, in order to decelerate and avoid runway excursion, the pilot adapted emergency procedures, used the maximum reverse thrust to decelerate which was over the recommendation by the aircraft manufacturer, causing the rudders and vertical stabilizers of the aircraft unable to effectively control heading direction, and even greatly-used nose wheel steering and brakes were unable to correct direction, leading the aircraft to veer left off the runway under the influences of strong right crosswind .
7. If CM-1 follow the descriptions of the Flight Operation Manual, to put reverse thrust to idle when the aircraft shifted, and reuse reverse thrust when the aircraft returned to the runway centerline, maybe the aircraft could remain on the runway surface, but the possibility was a runway excursion due to the incapability of deceleration.
8. In the Flight Operation Manual of Far Eastern, it defined that if the aircraft was unable to land in normal descent rate or with normal maneuvers, an unstable approach is called, but it did not define the criteria for abnormal descent rate and abnormal maneuver. In the recurrent training instructions, a stable approach criteria defined aircraft speed and descent rate standards, but it was different from the required standards of the non-precision approach training of the company's MD fleet,

it was also different from the recognitions of the pilots of the occurrence flight and flight operation related supervisors.

9. Although Far Eastern Airlines had defined stable approach criteria and had stipulated that if the aircraft was in an unstable flight condition, the pilot monitor had to monitor all cockpit instruments, and report altitude, speed and bearing variations to the pilot flying for reference, however, the phraseology was not unified, therefore when the pilot monitor reminded pilot flying about deviation of stable approach condition, there was no standard phraseology to follow, which made the pilot flying, who was concentrating on maneuvering the aircraft, not effectively use all the available information well for deciding if the aircraft was in a unstable condition which a go-around should be conducted .

### **Findings Related to the Risks**

1. The Runway 06 instrument approach chart of Kinmen Shangyi Airport which the aircraft pilot used on the day of the occurrence was JEPPESEN CHIN MEN, TAIWAN LDA/DME RWY 06, dated March 28, 2003. The chart was not amended according to the third AIP amendment published by CAA on July 10, 2003.
2. The aircraft pilots used the Jeppesen chart which was not updated to conduct LDA/DME RWY 06 instrument approach of Kinmen, Shangyi Airport, which had no relations with the runway excursion after landing, however, using a instrument approach chart which was different with the AIP information published by CAA to conduct an instrument approach could

increase risks .

3. CAA had published CAT C NOTAM C0344/03 to amend Minimum Descend Altitude of Runway 06 LDA/DME instrument approach of Kinmen Shangyi Airport on May 30, 2003, and consequently increased it to the third AIP amendment of 2003 on July 10, the amendment was sent to all Taipei FIR AIP subscribers on July 9. By the time Jeppesen company received the notification, amended chart contents and then sent to all subscribers, it was already September, delayed around 2 months than the published date.
4. The date CAA sent out the AIP amendment was too close to the effective date, which could easily cause that by the time the AIP took effect; relevant units still had not received the amendment notification yet, causing the possibility of amendment time delay.
5. According to the physical examination certificate issued by Aviation Medical Center, CM-1 and CM-2 had to wear eyesight correcting glasses when conducting flight duties, but the two pilots did not wear glasses during routine duties. The Council considered that the eyesight should have no relations with this accident; however, pilots who were supposed to wear eyesight correcting glasses did not wear glasses when conducting duties would increase hidden risk factors to aviation safety.

### **Other Findings**

1. All the flight crew possessed qualified pilot licenses and proper certificate, which were complied with ROC Civil Aviation Act and company requirements.

2. The pilots' duty time, flight time, rest time and personal life conditions etc., did not reveal any medical, behavioral, or mental problems, which could affect the performance on the day of the occurrence.
3. The occurrence aircraft's certificate, lading and maintenance were conformed to Civil Aviation Act, no evidence revealed existed mechanical failure or other structural, flight controls and engines problems etc. which could cause the occurrence to happen, and the aircraft was also conformed to airworthiness standards before the occurrence .
4. After the aircraft landed, the spoilers and brake systems functioned normally, also the wheel/braking system inspection did not reveal any abnormalities on the braking system of the aircraft after the occurrence.
5. After examining the tires after the occurrence, no.2 main wheel tire was discovered with thread hot-melted out, FDR data showed the right main wheel anti-skid system once activated when decelerating during rolling. However, after examining relevant information, the Council was unable to confirm if the aircraft had encountered hydroplaning during rolling after landing.
6. The Council had measured the transverse runway slop of Runway 06 of Kinmen Airport; the measurements were all between 1.12%~1.36%, which was conformed to the Civil Aerodrome Design and Operation Standards, slightly lower than the recommended value 1.5% of ICAO.
7. Runway 06 of Kinmen Airport had not conducted instrument

testing operation of friction characteristics for over 2 years, and had not, according to the recommendation of ICAO Airport Service Manual, conducted visual testing operation and recorded when airport did not have equipments for testing operation of friction characteristics, to confirm that the runway surface was suitable for the maneuverability of the aircrafts.

8. CAA had completed part of the ditch filling operation at Kinmen Airport in 2002 , the covering range of ditches of the ditch filling operation or the underground box culvert design had covered the runway area which the runway excursion of accident aircraft passed , effectively avoid significant accidents from happening such as aircraft rollover .
9. Although CAA had improved part of the runway/taxiway flatness problems in Kinmen Airport, still partial area (such as military trenches or bunks etc.) was not complied with the ICAO Annex 14, SARPS.

## **Recommendations and Actions Taken**

### **To FAR EASTERN AIR TRANSPORT**

1. Amending stable approach criteria and the standard phraseology between flight crew when deviating from a stable approach in the relevant manuals as soon as possible make it more explicit and easily to be distinguished, and ensure all pilots can use the same standards to judge if the aircraft is in a stable condition.

### **Action Taken**

After the occurrence, Far Eastern has inspected all relevant



manuals, unified SOP and requirements, so far they have completed the standard phraseology amendment in MD80s IP Manual, and had started a complete amendment of the Flight Operation Manual, standard phraseology of deviation limits for Stable Approach Criteria, crosswind, wet runway operation procedures during adverse weather etc. are listed in chapter 5 and chapter 8 . Besides, they are negotiating with CAA Operations Inspector to start a complete amendment of Flight Operation Training Manual and MD80s IP Manual according to laws.

2. Strengthen the pilots with the trainings of notes and reverse thrust limits when landing on wet and slippery runways.

### **Action Taken**

Far Eastern had conducted pilot training projects in October , 2003 , the course included standard phraseology , standard operating procedures , low altitude go-around , contaminated runway maneuvering techniques and CRM etc. , and established that standby crew had to indeed conduct standard phraseology trainings in the MOCK-UP every day.

3. Strengthen the propaganda of the definition of stable approach and the executing timing for a go-around. Require pilots to go around when the aircraft has surpassed the stable approach criteria.

### **Action Taken**

In March, 2004, Far Eastern conducted a training project for all pilots and dispatchers, to practice strengthened education about thunderstorm weather and adverse weather and go-around timing

listed in chapter 5 and chapter 8 of the 18th amendment of the Flight Operation Manual, and in May the same year, the standard phraseology training project was completed for all pilots. The company conducted a simulator recurrent course in the second half year of 2004, besides reviewing the defects in 1st half year, CRM, stable approach criteria, go-around timing etc. were also increased, strengthen the recognition of regulation compliance of all pilots.

4. Require all flight crew to put on eyesight-correcting glasses when conducting flight duties in accordance with the regulations.

#### **Action Taken**

For that flight crew who is required to put on eyesight-correcting glasses according to their physical examinations and qualified licenses, Far Eastern has published new amendment for Flight Operation Manual, require the flight crew to indeed put on and use during flights according to article 158 of Civil Aviation Act.

#### **To Civil Aeronautics Administration (CAA)**

1. Supervise Far Eastern Airlines to complete amending the standard phraseology for pilots to remind each other of stable approach criteria and deviations of a stable approach in the company's manual and documents as soon as possible, to make it clear, unified and easy for judgment making.

#### **Action Taken**

CAA has ratified the 18th amendment of chapter 8 of in the Far Eastern Flight Operation Manual on June 30 , 2004 , which clearly

depicts the criteria for a stable approach , established the deviation limitations and standard phraseology for unstable conditions in a stable approach , the maneuver techniques when landing on wet , slippery , icing runways and the usage of reverse thrust .

2. When amending contents of AIP, the current condition of which all units are using Jespersen charts now should be considered, operate in advance, let relevant units (including Jeppesen chart company) have enough operation time to respond to the AIP amendment.

### **Action Taken**

From 2004, CAA has published “Aeronautical Information Services” according to Annex 15 of Convention on International Civil Aviation, all amendments of relevant instrument procedures are published 42 days before the effective date according to “AIRAC”; the routine AIP amendments are published on schedule including the information which already takes effect, and publishes accordingly.

3. Negotiate again with Air Force Headquarters about the possibility of providing CAT C NOTAM of Civil and Military Airports or providing partial NOTAM to Jeppesen Chart Company, USA, or evaluate other applicable methods to inform Jeppesen Chart Company about the changes of airport facilities and procedures in our airport as soon as possible, to avoid the lateness of information delivery causing the charts used by the pilots unable to update in time.

### **Action Taken**

CAA indicated, in order to inform the changes of our airport facilities and procedures to Jeppesen Chart Company as soon as possible, the Bureau has planned to divide NOTAM into three categories A, B, C instead of two categories A, C, and will actively deliberate the feasibility with the Air Force Head Quarters:

1. CAT A release will include information affecting international flights ( maintain current status ) , and distribute nationally and internationally ;
2. CAT B release will include information of civil aviation airports and the civil aviation part of civil and military airports, distribute nationally and also internationally upon request from international units.
3. CAT C release will include information of military airports and the military part of civil and military airports, distribute nationally only.

On October 6, 2004, Air Force Head Quarter has agreed CAA to provide the permanent or long term change of flight information such as airport facilities; radio navigation aids equipments, flight service transmission frequencies and instrument procedures etc. of civil and military airports in the CAT C NOTAMs to Jeppesen Chart Company.

4. Establish the standards of runway surface anti-skid examining operation procedures; conduct the elimination of tire scraps and runway pavement renovation of all airports to strengthen runway skid resistance.

### **Action Taken**

On May 27 , 2003 , CAA published “The Notice of Runway Rubber Removal by Chemical Solvents ” to provide a basis for cleaning the tire scraps to all airports and military . On September 29 the same year, “The Notice of Civil Aerodrome pavement Surface Condition” was published to provide a basis for the examining operation procedures of runway friction coefficient . Now Kinmen Airport has tire scrap elimination operation for runways every year and has established relevant records of visual examinations. On June 24, 2004, the Bureau has outsourcing the friction tests of all airports; Kinmen Airport is tested once every season on the average.

5. Supervise airlines to require flight crew to wear eyesight-correcting glasses duly when conducting flight duties according to the laws and regulations.

### **TO AIRFROCE COMMAND HEADQUARTERS, DEPARTMENT OF DEFENCE**

1. Re-evaluate to consent CAA the possibilities of providing relevant CAT C NOTAMs of Taipei FIR civil and military airports or partial NOTAMs to Jeppesen Chart Company, USA, to enhance flight information service and increase flight safety.

### **Action Taken**

On October 6, 2004, Air Force Headquarters agreed CAA to provide the relevant permanent or long term changes of airport facilities; radio navigation aids equipments, flight service

transmission frequencies and instrument procedures etc. in civil and military airports from CAT C NOTAMs to Jeppesen Chart Company.

**Intentionally Left Blank**