



**Aviation Safety Council  
Taipei, Taiwan**

**EMERALD PACIFIC AIRLINES  
BELL-206B-3 HELICOPTER,  
NATIONALITY MARK REGISTRATION  
NO.B-31135 CRASHED DURING  
INSULATOR WASHING IN TAICHUNG  
CITY**

**Executive Summary**

## **Executive Summary**

Emerald Pacific Airlines, aircraft type Bell-206B-3 helicopter, registration no.B-31135, departed from Taichung Shui-nan Airport at 0711 am on September 3, 2001, executing Taiwan Powered Company commissioned insulator washing duty. Pilot A was pilot flying during departure, the aircraft landed at a temporary operation site by Hefu Rd. and Junfu Rd. in Taichung City at 0720, Pilot B got off on standby, the maintenance personnel boarded and performed as hydraulic nozzle operator.

At 07:32, the aircraft departed from the temporary operation site and performed insulator washing. At around 08:00, they finished the first operation and returned to the operation site. Departed at 08:04 and landed at 08:21, they finished the second operation. Departed at around 08:23 and landed at 08:40, they finished the third operation. 21 Gallons of fuel remained after landing, fuel truck of Emerald Pacific Airlines refueled to 35 gallons, at this point pilot A got off and pilot B took control as pilot flying. At around 08:45, the aircraft departed for the fourth time from the operation site to the No.11 pylon, got hooked and struck electric cable of Taiwan Power Company on the way and crashed.

At around 08:49, Taichung City Police Duty Command Center received a telephone report saying: "A helicopter crashed in the bamboo forest near Ln. 98, Jungong Rd., Taichung City". Aviation Safety Council, Executive Yuan arrived at the scene to collect evidences after received the notification and discovered the accident aircraft was totally destroyed and the two members in the

cockpit were sent to the hospital by rescuers, where they died of their wounds.

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

1. The aircraft was in the temporary operation area, during the fourth flight abnormal sounds occurred in the engine flameout suspected; it passed civilian houses then descended to the left, disintegrated and crashed after striking the power cable.
2. Massive amount of water got into the end section of the aircraft's fuel system, laboratory tests had proved that the fluid collected contained 96~98% of water.
3. According to the actual test result with another 250C-30 engine (the engine model of the accident aircraft was 250C-20), when water content in the fuel reached 30~50%, the engine would flame out.
4. The Operation and Aircraft Maintenance Manuals of the engine type mentioned "when fuel is contaminated with water or other contaminants, engine flameout or power lost could occur".
5. Test result showed the water content at the bottom of the fuel truck tank reached 99.9%, judgment could be made that the fuel truck did not conduct water drain operation that day.
6. The engine of the aircraft operated normally within 99 minutes after started, crashed four minutes after the first refuel.
7. The filament curling phenomenon of "Engine Flameout Warning Light" indicated the engine could lose power during the accident.

8. When the aircraft conducted forced landing, due to the possibility of losing power and insufficient safe altitude, after the tail boom hooked and struck the electric cable, it crashed and disintegrated.

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

1. The flight operation and maintenance personnel of Emerald Pacific Airlines had accepted the fuel tank water drain operation training for the aircraft type, but the training did not include the identification methods of water content in fuel.
2. The flight operation and maintenance personnel conducted fuel tank water drain operation according to their personal judgments, and did not confirm the existence of residual water in the fuel.
3. The Flight Inspection Manual and preflight checklist only listed water drain items, and lacked for the identification methods of water content in fuel.
4. Civil aviation authorities and Emerald Pacific Airlines did not establish the auditing standards and operation instructions of the specifications and usage of fuel tanks on fuel trucks. Without fuel usage and equipment maintenance records, the operators had nothing to follow.
5. The water drain valve was not at the bottom of the aircraft fuel tank, residual water cannot be drain completely, and it did not comply with the certification requirements of the aircraft type.
6. The passenger in the backseat did not fasten seatbelt, leading to severe compressive injuries caused by inertia.

## **Other Findings**

1. Pilot B possessed various valid licenses for commercial pilots.
2. The airworthiness certificate is valid, weight and balance was within limits, no abnormalities in the maintenance records.
3. The crew complied with the regulation “Flight crew should be composed of a minimum of one pilot and the pilot should be seated on the right seat to control the helicopter” listed in the certificate of the aircraft type and the flight manual.
4. The insulator washing complied with the preflight preparation and the Emerald Pacific regulations like “Aviation Insulator Washing Standard Operation Procedure” and “Helicopter 206B-3 Insulator Washing Standard Operation Procedure” etc...
5. No abnormal situations presented except the aircraft’s structural damage caused by crashing when it hooked and struck the electric cable.
6. When the aircraft hooked and struck the electric cable, the longitudinal axis of the aircraft might be 354 degrees magnetic, horizontal axis was left bank 67.5 degrees. When the aircraft impacted the ground, the falling track might be 153 degrees magnetic and the longitudinal axis of the fuselage kept 45 degrees included angle with the ground, the included angle between flight track and the ground was around 40 degrees.
7. The filament curling phenomenon of “Main Rotor Low RPM Warning Light” did not occur, the main rotors struck the ground and fractured causing pits on the ground, showing the main rotor still possessed relatively high RPM at that time.

8. The filament curling phenomenon of “Fuel Pump Low Pressure Warning Light” showed when the aircraft struck the electric cable and fell, the failed fuel suction of the booster pumps could be caused by the attitude change and fuel gathered in the front part or corner of the fuel tank.

## **Safety Recommendations**

### **Accident Investigation Interim Flight Safety Bulletin**

Date of notification: Thursday, September 27, 2001

Accident description: On Sep 3, 2001, an airlines helicopter type BELL 206B-3 crashed on the way to the operation site.

Notification Items:

1. Pilots and maintenance personnel should have Standard Operating Procedures for water drain of aircraft fuel tank and confirmation methods of water content in fuel and actually implement.
2. Before fueling the aircraft from ground fueling facilities, there should be Standard Operating Procedures for water drainage and confirmation of water content in fuel and should actually implement.

## **Safety Recommendations**

### **To Emerald Pacific Airlines**

1. Establish Standard Operating Procedures for “Water drain for Fuel Truck Tanks” and “Water Content Identification in Fuel”. (ASR-02-07-001)
2. Implement the training of “Water Content Identification in Fuel” for pilots and maintenance personnel. (ASR-02-07-002)

3. Establish work order items and steps in the “Water Content Identification in Fuel” for aircrafts and fuel trucks.  
(ASR-02-07-003)
4. Actually require passengers to fasten seatbelts.  
(ASR-02-07-004)

#### **To Civil Aeronautics Administration, CAA**

1. Strengthen civil air transport enterprises the audit and the supervision of the management and usage of ground equipment. (ASR-02-07-005)
2. Strengthen the supervision of pilots and maintenance personnel with the execution of the “Water Content in fuel Identification” operation. (ASR-02-07-006)
3. Strengthen the supervision of passenger safety.  
(ASR-02-07-007)

#### **To BELL Helicopter Manufacturer**

1. Re-evaluate the design of drain valves of fuel tanks for the aircraft type. (ASR-02-07-008)

#### **Aviation Safety Recommendation completed by Emerald Pacific Airlines**

2. Redesigned and manufactured two fuel truck tanks effectively enhance the checking function of water drain of fuel tanks.
3. Complete the development of inspection and test procedures of aircraft and fuel tank water drain for helicopter special operations.

4. Revise standard operating procedures for helicopter insulator washing and report to Civil Aeronautics Administration, CAA.
5. Recruit New Zealand flight instructor to implement academic subjects and technical subjects for insulator washing operation to increase operation skill level.



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