

Aviators IG Interesting News #3 – Golden Aviation Route

#AviatorsIGFunFact: B747 was the 1st wide body commercial aircraft

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25 May 2002, a Boeing B747-200, also known as the Queen of the Skies, disappeared from Taiwan radar, 20 minutes after taking off from Taipei Taoyuan International Airport. The aircraft involved in the accident was China Airlines Flight 611 (CI611), call sign “Dynasty 611”, operating from Taipei Taoyuan International Airport to Hong Kong International Airport with a flight time of 1 hour 40 minutes.

Starting from 1990s, most business travellers and tourists widely travelled from Taiwan to Hong Kong as both countries undergo rapid industrialization which contribute high economic growth rates. The route was seen too profitable and significant that it named as a golden aviation route. A total of 225 people onboard China Airlines Flight 611, with 209 passengers and 19 crew members respectively.

China Airlines Flight 611 took off at 1507 (Taiwan Standard Time) with an aircraft weight of 231 tonnes. As scheduled, take-off and initial climb were normal. The flight crew then contacted Taipei approach at 1508 and was instructed to fly direct to navigation waypoint of CHALI. At 1516, Taipei Area Control Centre (TACC) officer gave Dynasty 611 permission to climb and maintain at 35,000 feet (FL350), while flying from CHALI to KADLO.

The flight crew acknowledged the instruction given by TACC and that was the last radio transmission received from the aircraft. Around 1528, radar contact was lost. The Taiwan search and rescue team were immediately deployed. At 1800, debris and wreckage from China Airlines Flight 611 was sighted northeast of Makung, Penghu Islands.

Taiwan Aviation Safety Council lead the investigation of China Airlines Flight 611 and was soon joined with United States National Transportation Safety Board. Over 325km² of area was being search and a total of 640 aircraft debris was retrieved from Taiwan Strait. 25 days after the accident, aircraft flight data recorder and cockpit voice recorder were found.

Initial theories on the cause of accident, for instance, a missile attack from China, airliner bombing attacks was being investigated. However, there was no evidence of explosive on the debris retrieved. A similar in-flight break-up accident (Trans World Airlines Flight 800) due to wiring around central fuel tank spark and ignite causing an explosion was deemed to be the cause of the in-flight break-up of China Airlines Flight 611.

Once more, the investigation team found evidence to prove that there was no explosion on the central fuel tank. The fuel tank on China Airlines Flight 611 was bend inwards, contradicting the Trans World Airlines Flight 800 bending outwards covering with soot. Aircraft cockpit voice recorder was analysed and no evidence was found on the cause of accident. The airplane was operating normally with no emergency was being discussed on the flight deck.

Among the 640 pieces of wreckage, investigators have found that 4 out of the 19 dado panels were in an open position. Dado panels also known as pressure release vent will be open, only

when an aircraft suffered depressurisation. This led the investigator to suspect that the aircraft suffered explosive or rapid decompression. Hence, the investigators intend to know which area of the airframe suffered the break up first.

Aviation Safety Council selected several parts of aircraft wreckage and uses National Transportation Safety Board debris trajectory analysis software to deduce the breakup. It was not long that the investigators found out that the initial break up came from the rear of the airplane.

Investigators shifted their focus towards the rear of the airplane and subsequently found the breakthrough of the investigation. It was debris item 640 that led investigators in solving the mystery. Debris item 640 was a piece of an airframe from the rear of the airplane with a repair doubler installed. A flat-fracture surface (indicative of slow crack growth mechanisms) on the skin at the edge of the repair doubler was found during the field examination.

Item 640 were segmented and sent to Chung-Shan Institute of Science and Technology (CSIST) and Boeing Materials Technology (BMT) for further examination and tests. After disassembling and removal the doubler from the main airframe skin, scratching damage was noticed on the facing surface of the skin.

The damage consists of primarily longitudinal scratching distributed in an area of 120 inches by 20 inches. Evidence of an attempt to blend out these skin scratches, in the form of rework sanding marks, was noted over much of the repair surface. Fatigue cracks and overstress damaged were found from item 640 in the laboratory observation.

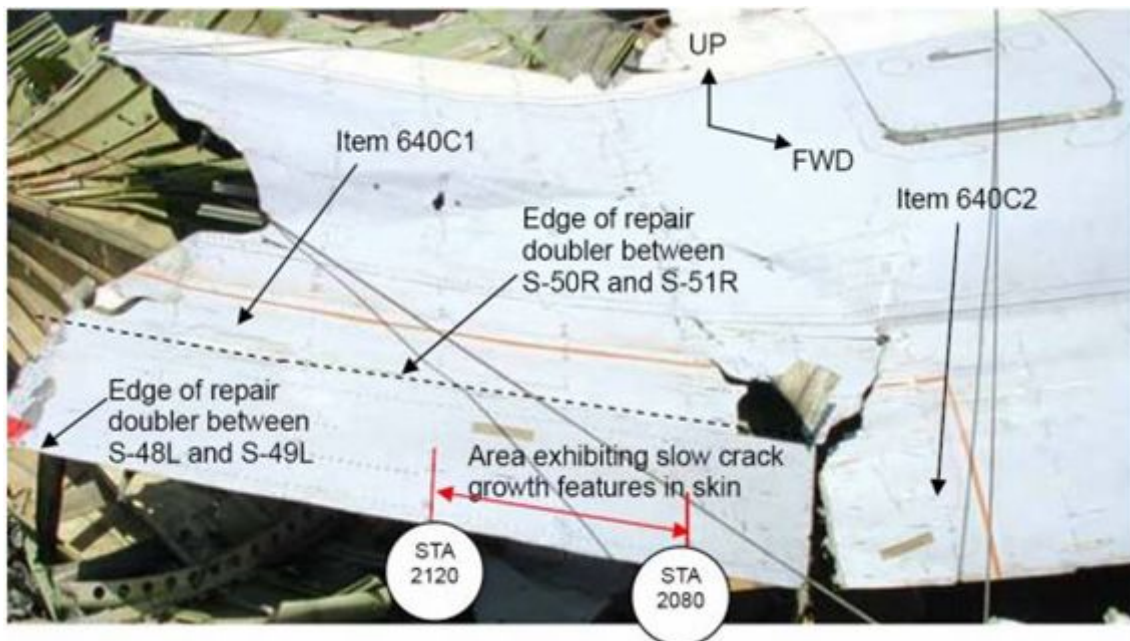


Figure 1. The breakthrough of the investigation was item 640, where a repair doubler and metal fatigue cracks were found.

The investigators were puzzled about the observations and started to look for the maintenance record on this plane. It was found with an entry made in the maintenance logbook stating that a mishap happened on 7 February 1980, which the plane suffered a tail strike while landing at Hong Kong International Airport.

Temporary repair was made the day after and subsequently a more permanent repair was made 3 months later. However, the permanent maintenance was carried out not in accordance with the Boeing Structural Repair Manual (SRM), as the doubler was not entirely covered over the damaged area. Moreover, installing the rivets for the doubler was on the area of the damaged skin.

Nevertheless, it was noted down that the repair was completed as per Boeing SRM. The maintenance repair should be made by replacing the entire skin or cutting out the damaged portion and install a reinforcing doubler plate or installing a doubler over the damaged surface which the doubler must be 1.5x over the size of the damaged area.

After more than 20 years of repeated cycles of pressurization and depressurization during flight, cracks began to form around the exposed scratches. The cracks get bigger and bigger, longer and longer, eventually on 25 May 2002, the rear of the plane could not withstand the maximum stress. The rear broke off and caused an explosive decompression which led to the disintegration of China Airlines Flight 611.

The final report concludes that improper maintenance by China Airlines and metal fatigue on the airframe was deemed as the cause of China Airlines Flight 611 accident which killed 225 passengers and crew members.



(Left) The aircraft involved in the incident; China Airlines Flight 611 (B-18255)

(Right) Re-enactment of the in-flight breakup at the rear of the aircraft.

URL for photograph:

[https://commons.wikimedia.org/wiki/File:Boeing_747-209B_China_Airlines_B-1886,_AMS_Amsterdam_\(Schiphol\),_Netherlands_PP1167244363.jpg](https://commons.wikimedia.org/wiki/File:Boeing_747-209B_China_Airlines_B-1886,_AMS_Amsterdam_(Schiphol),_Netherlands_PP1167244363.jpg)

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