

2005: B747 Manchester

■ General context

- Scheduled commercial flight Los Angeles-Heathrow
- 18 crew members & 352 passengers
- Night time
- RA

2005: B747 Manchester (con'd)

■ Operational context

- Take off
- At gear retraction
- Problem with #2 engine
 - ➔ Banging sound
 - ➔ Pax and ATC report flames
 - ➔ Crew assess a **surge** leading to engine being shut down
- Captain:
 - ➔ Assess situation
 - ➔ Contact company operations
 - ➔ In accordance with approved policy
 - ➔ **Continue** the flight to destination rather than jettison fuel and return to LA

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■ Decisional factors

1. “*Eng Out*” fuel indicated a landing with about 7 tons (required minimum was 4.5 tons)
2. **Additional engine failure was considered**, and regard to performance, it was deemed safe to continue.
3. Initial routing was across continental USA where numerous suitable diversion airports were available
4. Present situation does not justify an overweight landing, and it would take 40 mn to jettison 70 tons of fuel

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■ Decisional factors (end)

5. #2 engine was shut down with normal windmilling parameters
6. Company policy was to continue to destination as long as the A/C is in a safe condition
7. QRH procedure for *ENGINE LIMIT/SURGE/STALL* does not require a landing at the nearest suitable airport.

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■ Cruise context

● Across the USA

- FL270, M0.75
- Forecast fuel at Heathrow: 10 tons

● New assessment reaching the east coast of USA

- No indications of further abnormality
- Adequate predicted arrival fuel
- The crew decided to continue to the UK

● North Atlantic crossing

- FL290
- Forecast fuel at Heathrow: 7.2 tons

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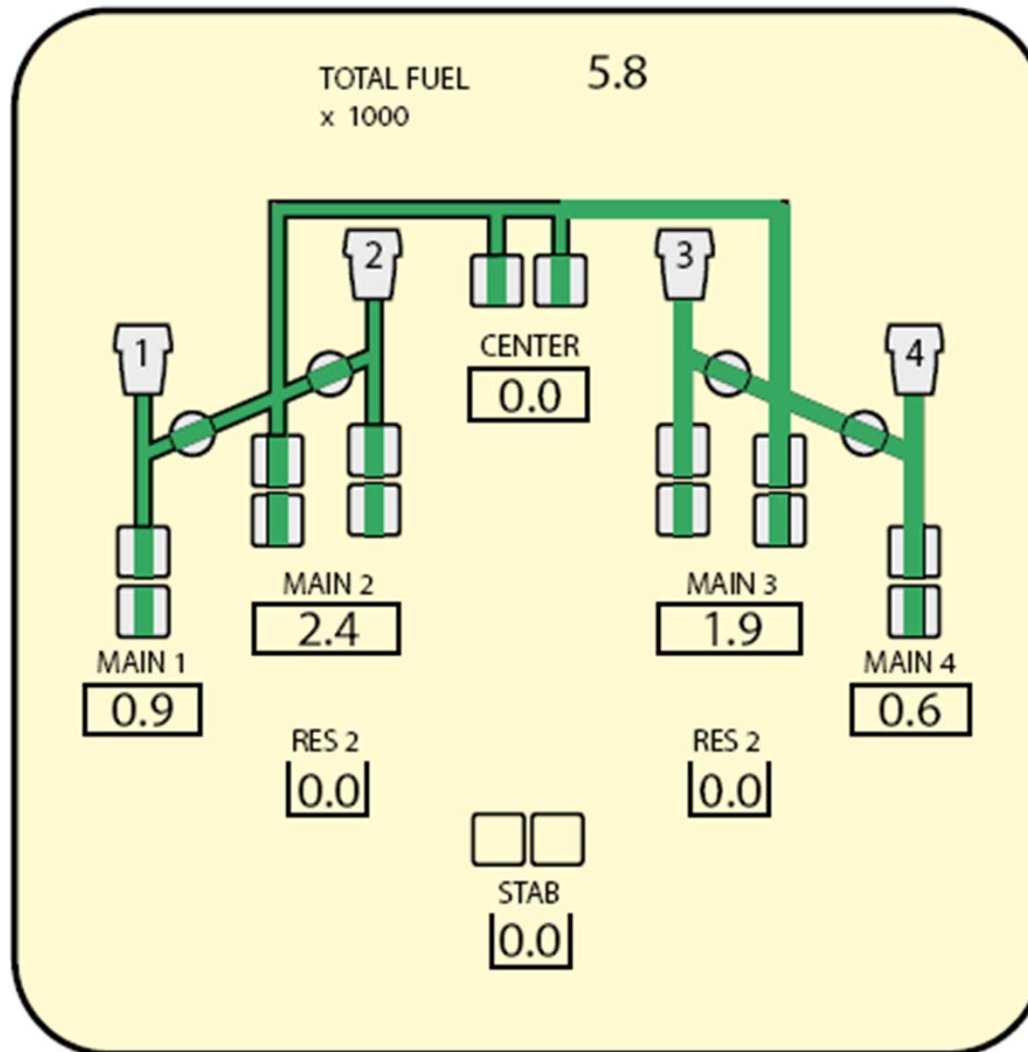
- Cruise context (end)
 - Approaching the Ireland
 - FL350
 - Winds appear less favorable than anticipated
 - Forecast fuel at Heathrow: 6.5 tonnes
 - Crew decide to divert to Manchester

2005: B747 Manchester (con'd)

■ Descent / landing contexts

- Crew face some difficulties in balancing the fuel quantities in the four main tanks
- One tank contents might be unusable
- **FUEL QTY LOW** caution message on EICAS
- Complete QRH procedure
- Captain concerned that **fuel at landing would be below the minimum reserve fuel** (4.5 tons)
- Declare an **emergency**
- Land with low contents in both outboard main tanks (although the total fuel quantity was in excess of the planned reserve: 5.8 tons)

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■ Analysis

● A huge dispute with the FAA

- Who wanted the A/C to come back in LA
- Even though the FAR (Part 121.565) requires a landing at the nearest suitable airport following an engine failure or IFSD, except for an aircraft with three or more engines.
- In this case, the commander:
 - ✗ 'May proceed to an airport he selects if he decides that this is as safe as landing at the nearest suitable airport'
 - ✗ Having considered a number of factors. These included:
 - » the nature of the malfunction
 - » possible mechanical difficulties,
 - » fuel requirements,
 - » weather,
 - » terrain
 - » and familiarity with the chosen airport.

2005: B747 Manchester (con'd)

■ Analysis (con'd)

- No effects of extended continued flight with engine windmilling for a period of 12 hours or more
- B747 4-engined aircraft is designed and certificated to tolerate the loss of a second engine following an initial IFSD, without losing essential systems or necessary performance capabilities.
- Engine manufacturer says for the last 12 month the IFSD rate achieved had been 1 for 137,000 engine flight hours

2005: B747 Manchester (end)

■ Analysis (end)

● Flight continuation policy

- ✗ Operator policy, **approved by CAA**
- ✗ QRH for ENGINE LIMIT/SURGE/STALL does not require landing at the nearest suitable airfield
- ✗ A/C is designed and certificated to tolerate the loss of a second engine without losing essential systems