Air India Flight AIC171
A Plausible Hypothesis

1. Introduction.

Air India Flight AIC171 crashed 30.715 seconds (± 33 ms) after take-off on 12th June 2025. The aircraft registration VT-ANB was a Boeing 787-8 and was carrying 242 passengers and crew. There was one survivor and 241 people lost their lives.

The crash site was 1,620 m beyond the end of the take-off runway at Ahmedabad Airport. The aircraft struck buildings near B.J. Medical College, resulting in 19 additional deaths on the ground.

The aircraft was carrying 52,400 kg of fuel for the planned flight to London Gatwick Airport, which ignited on impact. The aircraft was destroyed due to the impact with the buildings on the ground and subsequent fire.

A MayDay call was made at 08:09:05 UTC and the aircraft crashed 5 seconds later.

2. Timeline of Events.

The timeline of events leading up to the aircraft crash starts with an uneventful push back and engine start from Gate 34 at Ahmedabad Airport International Terminal 2. The aircraft taxied out to Runway 23 and was cleared for take-off by ATC at 08:07:33 UTC. The airport ground radar showed the aircraft started the take-off roll 4 seconds later at 08:07:37 UTC.

V1 air speed of 153 knots was achieved after 56 seconds and Vr rotation air speed of 155 knots was achieved after 58 seconds, according to the FDR data noted in the official Preliminary Report.

3. Reduced Runway Acceleration.

The aircraft weight was 213,401 kg, TOGA thrust, Flaps 5, OAT 37 °C, QNH 1001 hPa. The runway elevation drops from 189 ft to 180 ft over 3,505 m, giving a slight slope of approximately −0.08%. The reported wind was 240°/6 kt on a runway with a 230° orientation, providing a small headwind of about 5.9 kt.

The Preliminary Report states that the calculated V-speeds for the available conditions were V1 153 kt, Vr 155 kt, and V2 162 kt. These values are consistent with the operator's Boeing Aircraft Flight Manual (AFM) - Operational Performance Calculation (OPC) for the inputs used. Without the actual OPC printout, independent verification is not possible, but the figures are not implausible for the stated conditions.

The concern is not that the V-speeds conflict with Boeing data, but that—even with those computed speeds—the time and distance required to reach them (56–58 seconds and approximately 2,120–2,220 m) imply an average ground-run acceleration of only about 1.32–1.35 m/s^2 (~0.135 g). This is noticeably lower than the ~1.8–2.1 m/s^2 (~0.18–0.21 g) typically seen for a Boeing 787-8 at similar weight, flap, thrust, and environmental conditions, especially given the small headwind and slight downhill slope.

From Vr (155 kt IAS, ≈ 149 kt GS with headwind) to V2 (162 kt IAS, ≈ 156 kt GS), the aircraft would have required an additional ~3.6 seconds and ~280–300 m of ground run before reaching V2—corresponding to an average acceleration in this final segment of only ~1.9–2.0 m/s^2. This indicates that while the last few seconds before liftoff approached normal acceleration levels, the earlier part of the take-off roll was significantly slower than expected, contributing to the long time and distance to V1/Vr.

4. Maximum Air Speed.

The Preliminary Report states: “The aircraft achieved the maximum recorded airspeed of 180 Knots IAS at about 08:08:42 UTC and immediately thereafter, the Engine 1 and Engine 2 fuel cutoff switches transitioned from RUN to CUTOFF position, one after another with a time gap of 01 sec. The Engine N1 and N2 began to decrease from their take-off values as the fuel supply to the engines was cut off.”

Vr → V2 segment (155 → 162 kt IAS; ~149 → 156 kt GS): Using kinematics, the additional distance is ~210–290 m over ~2.7–3.7 s, implying segment acceleration of roughly ~1.0–1.35 m/s² (still on the low side).

V2 → 180 kt segment: 162 → 180 kt IAS (~156 → ~174 kt GS) requires ~715–985 m over ~8.4–11.6 s if segment acceleration is ~1.1 to 0.8 m/s² (typical post-rotation acceleration is often lower due to increased drag/climb).

Vr to Vmax requires a total of ≈ 11.1 - 15.3 seconds, whereas the Preliminary Report states Vr was at 08:08:35 UTC and Vmax was at 08:08:42 UTC, which is only 7 seconds.

Acceleration after Vr was higher than earlier in the roll — possibly because once the aircraft rotated, induced drag in the low initial climb was offset by continued full TOGA thrust and a lightening load on the wheels (rolling resistance drops to near-zero when airborne).

The short 7 second interval is more in line with a segment acceleration in the ~1.9–2.2 m/s² range, which is close to “normal” airborne acceleration in a shallow climb at TOGA.

In other words, the “protracted” part of the take-off performance is before Vr, not after — once the aircraft was airborne, it seems to have picked up speed quickly. The 180 knots point was reached rapidly after rotation, and then the fuel cut-offs occurred almost immediately.

5. Post Take-Off Acceleration Recovery.

Based on the Preliminary Report, which states 7 seconds from Vr 155 kt to Vmax 180 kt:

Vr → Vmax (155 → 180 kt IAS, 7 s):

ΔV = 25 kt = 12.861 m/s ⇒ implied average acceleration a ≈ 1.84 m/s² (~0.19 g).

Average IAS during the segment ≈ 167.5 kt = 86.13 m/s ⇒ distance ≈ 603 m (air-distance).

With a ~5.9 kt headwind (~3.0 m/s), the ground-distance would be ~582 m (≈ 603 − 3.0×7).

Vr → V2 (155 → 162 kt IAS) at that same post-rotation acceleration:

ΔV = 7 kt = 3.601 m/s ⇒ time ≈ 1.96 s, distance ≈ 160 m (air-distance).

Contrast with pre-Vr:

Pre-Vr average acceleration we inferred was ~1.32–1.35 m/s², so the post-rotation acceleration (~1.84 m/s²) is ~35–40% higher, i.e., much closer to what you’d expect at TOGA.

The data are consistent with a sluggish ground-run up to Vr, followed by normal/healthy acceleration after rotation, reaching 180 kt quickly (in ~7 s) before the dual fuel cutoffs.

6. Slow Take-Off Roll.

Rolling resistance / brake drag.

- One or more brakes not fully releasing after brake-off.
- High brake temperatures from taxi or previous landing causing fade or drag.
- Slightly mis-set parking brake or hydraulic pressure anomalies.

Gear/tyre drag.

- Under-inflated tyres or a brake/tire issue causing extra rolling resistance.

7. 80 knots call.

The 80-knots call (PM: “80 knots”; PF: “Checked”) is mainly to confirm airspeed agreement and stable acceleration. A much-later-than-normal call is a cue that acceleration is lagging—even if there’s no BRAKE TEMP/EICAS alert.

If the crew didn’t perceive the lag early enough, they’d be inside the V1 decision window by the time it was obvious, making a reject less likely under SOPs.

8. Rejected Take-Off (RTO) call.

Below ~80 kt: Crews may reject for a wider set of issues. If acceleration felt obviously sluggish (e.g., 80 kt arriving ~45–46 s after brake release instead of the typical ~23–29 s), an early RTO would have been reasonable.

80 kt to V1: Most SOPs narrow the reject criteria to engine failure, fire, predictive windshear, configuration/controllability warnings, or any condition making the aircraft unsafe to fly. “Sluggish acceleration” can justify a reject only if the crew positively identifies a serious problem in time (e.g., clear brake drag indication, abnormal wheel/brake temps/pressures, speed brakes not down, or a runway-end/Accelerate-Stop Distance Available (ASDA) concern).

At/after V1 (153 kt here): The call is go. A late reject at those speeds carries major risk (tyre/wheel failures, runway overrun). Continuing is the trained, safer option unless a catastrophic failure occurs.

9. Landing Gear Not Retracted.

If the crew suspected hot brakes/tyre issues or saw a wheel/gear indication, many SOPs/QRHs allow (or recommend) leaving gear down initially to cool/vent and avoid wheel-well heat/smoke risk.

Events unfolded fast: The aircraft achieved Vmax of 180 kt at 08:08:42 UTC, then both fuel cutoffs were moved to CUTOFF, Engine 1 at 08:08:43 UTC and Engine 2 at 08:08:44 UTC.

There may simply not have been time to call “positive rate” and retract before the shutdown action.

10. RAT Deployment,

The RAT was deployed 2 seconds after take-off at 08:08:41 UTC, which is 2 seconds after the transition from ground to air mode and 2 seconds before Engine 1 Fuel Switch transitioned to CUTOFF and 3 seconds before Engine 2 Fuel Switch transitioned to CUTOFF.

Since the RAT deployed at 08:08:41 UTC, which is 2 seconds after weight-off-wheels and before either fuel cutoff, the engines were probably still producing takeoff thrust when the airplane decided it had effectively lost its primary electrical generation. In other words, an electrical power-loss condition occurred first, then the crew shut the engines down seconds later.

The sluggish ground roll remains a separate, earlier issue (most consistent with rolling resistance/ brake drag). The RAT deployment has nothing to do with the roll resistance most likely caused by the brakes.

What confirms the RAT deployment at 08:08:41 UTC is the hard cut off of the Transponder, which is a non essential electrical item at 08:08:50.871 UTC, which is 9.871 seconds after RAT deployment, which is almost exactly when the RAT starts to supply stable electrical supply and the power distribution can switch from Main Battery as emergency backup to the RAT as emergency essential electrical supply.

Electrical sequence after liftoff:

08:08:39 UTC: Weight-off-wheels (air mode).

08:08:41 UTC: RAT deploys.

~08:08:41 → 08:08:50.9: Aircraft rides on standby power (battery/standby inverter path) while the RAT spins up and the system configures essential buses.

08:08:50.871 UTC (~9.87 s later): Transponder cuts out, matching the moment the electrical system finishes the transition to RAT-powered essential buses and non-essential loads are shed.

The Transponder (XPDR) drop is a credible marker, that the airplane left the battery-standby regime and finalised the RAT essential-bus configuration.

11. Separation of Issues.

Brake-related roll resistance explains the slow ground run up to Vr. It’s independent of what happened after liftoff.

RAT deployment at 08:08:41 UTC shows the airplane detected a power-generation AC bus loss in flight while both engines were still producing thrust.

Fuel switches to CUTOFF (ENG 1 then ENG 2) two seconds or three later was a deliberate crew action, not an automatic consequence of either brake drag or RAT deployment.

12. Engine Shutdown.

Whether the electrical failure led the crew to shut the engines is plausible, but unproven from timing alone.

Electrical faults do not command the fuel switches, to move physically.

Any engine shutdown would have been procedural or intentional in response to what the pilots were seeing (e.g., ELEC warnings, smoke/overheat indications, or a perceived “unsafe to fly” state).

Cutting both engines in flight is an extreme action and not commanded automatically by an electrical failure of the FADEC.

It would normally be done, only if a checklist calls for it (e.g., engine fire, severe damage, uncontrollable smoke/fumes, fuel contamination, or a deliberate forced landing).

We don't have the cockpit indications, CVR, or exact EICAS message sequence. that the flight crew saw, although these are available from the EAFR.

The dual engine shutdown probably resulted from intentional movement of the fuel control switches to CUTOFF. While this action was temporally associated with an electrical emergency (RAT deployment), the appropriateness of the shutdown cannot be determined without the EICAS/CVR evidence indicating, what the crew saw and which procedures they applied.

13. Human Factors.

Possible misinterpretation of what's happening:

Without clear engine spool-up cues, pilots might assume the FADEC hasn't "gotten the message" and try to prompt it.

Time compression under stress:

At low altitude with little time before impact, the formal "wait and see" interval feels dangerously long, so the pilots act early.

Moving the Fuel Switches may have been a result of misinterpretation or time stress to attempt to force the FADEC to recommence the relight sequence, especially if it failed at the first attempt.

The working assumption, at this point in the analysis is that the engines were both working fine until the Fuel Switches were both set to CUTOFF.

14. Aircraft Performance.

We observe that the aircraft flew 1,620 m from the end of the runway, much further than the distance of around 324 m calculated for a complete shutdown of both Engines.

Dual Engine Flame Out (DEFO).

Clean Configuration B787: ~17:1 glide ratio (ideal conditions).

Dirty Configuration B787: ~3.5:1 glide ratio.

With gear down + RAT deployed + flaps 5: Massive drag increase.

Estimated degraded Lift-to-Drag ratio (L/D): 3:1 to 4:1 range.

Conservative estimate: 3.5:1.

Approximate horizontal distance from highest point to impact: ~1,060 feet (324 m).

The actual horizontal distance from highest point to impact: ~1,620 m.

Our conclusion is at least one engine must have been producing some thrust.

15. Engines Relight Sequence.

There is vague evidence without any time stamp data from the Preliminary Report that at least one engine relight sequence initially failed:

"The EGT was observed to be rising for both engines indicating relight. Engine 1's core deceleration stopped, reversed and started to progress to recovery. Engine 2 was able to relight but could not arrest core speed deceleration and re-introduced fuel repeatedly to increase core speed acceleration and recovery."

At what time was the EGT observed to be a rising temperature in Engine 1 and Engine 2?

What was the temperature curve of the EGT in Engine 1 and Engine 2?

At what time did Engine 1's core deceleration stop, reverse and start to progress to recovery?

At what time was Engine 2 able to relight?

At what time did Engine 2's core speed start to increase, accelerate and recover?

The Preliminary Report does not tell us, although this data is known to the investigators from the FDR.

16. Causal Timing.

How did the Engines Relight Sequence fit with the time of Engine 1 and Engine 2 shutdown?

At what time did the IDG stop providing AC electrical supply from Engine 1 and Engine 2?

At what time did the Main Battery provide essential DC power?

How did this fit with the time of Fuel Switch 1 and Fuel Switch 2 being moved from RUN to CUTOFF and subsequently back to RUN.

How did this fit with the time of RAT deployment, RAT hydraulic pressure being achieved, RAT electrical generation being achieved and power being switched from Main Battery back to the RAT?

Was the RAT deployed manually or automatically?

The Preliminary Report does not tell us, although this data is known to the investigators from the FDR.

With so much basic and essential information missing from the Preliminary Report, it begs the question, whether a cover up of the true cause or causes was intended?

17. Causal Chain and Key Causal Separations.

```
PRE-TAKEOFF/ROLL
213,401 kg • F5 • TOGA • OAT 37 °C • QNH 1001 hPa
     |
     ├──▶ (Likely) Excess rolling resistance on ground
     |      └── brake drag / residual pressure / tyre or gear misalignment issue
     |
     └──▶ Sluggish acceleration (avg. ≈0.9–1.35 m/s^2) → late 80 kt → long time/distance to V1/Vr

LIFTOFF (AIR MODE)
     |
     ├──▶ Ground-contact drag removed
     |      └── acceleration normalises despite gear down
     |
     └──▶ Electrical generation/distribution failure detected
          └── RAT auto-deploys ~2 s after liftoff

ABNORMAL ENVIRONMENT (SECONDS AFTER LIFTOFF)
     |
     ├──▶ Degraded/changed displays + alerts (ELEC msgs, load shedding)
     ├──▶ Time compression & workload spike (low alt, gear down, RAT)
     └──▶ Possible misinterpretation of engine state/FADEC status

CREW ACTION
     |
     └──▶ Fuel Switch 1 → CUTOFF, then Fuel Switch 2 → CUTOFF (1–2 s apart)
          └── both engines were possibly operating normally up to this action

OUTCOME
     |
     ├──▶ Dual engine shutdown (intentional via switches)
     ├──▶ RAT/essential buses power only; non-essential loads shed (e.g., transponder drop)
     └──▶ Loss of thrust at low altitude → emergency/forced trajectory
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KEY CAUSAL SEPARATIONS

- Brake-related roll resistance ≠ cause of RAT/electrical event.

- Electrical event/RAT ≠ automatic engine shutdown.

- Engine shutdowns were a deliberate action, plausibly driven by misinterpretation under time stress.

18. Timeline of Events from start of the take-off roll.

Time (UTC)	Time (Local Time)	Elapsed Time Before/After T/O Roll (secs)	Leg Time (secs)	Aircraft Location	Event	Source	Latitude (°N)	Longitude (°E)	Pressure Altitude (feet AMSL)	Geome Altitu (feet A
08:07:37	13:37:37	0m 0s	0m 4s	Runway Roll	Start of Take-Off Roll	Preliminary Report - Page 14	23.087395	72.645344		
3m 27s 170ms	13:38:27	0m 50s	0m 50s	Runway Roll	Aircraft nose first comes into view on CCTV	Airport Security CCTV				
8m 28s 39ms	13:38:28	0m 51s	0m 1s	Runway Roll	Aircraft in full view	Airport Security CCTV				
08:08:33	13:38:33	0m 56s	0m 5s	Runway Roll	V1 153 knots	Preliminary Report - Page 14				
08:08:35	13:38:35	0m 58s	0m 2s	Runway Roll	Vr 155 knots	Preliminary Report - Page 14				
3m 35s 191ms	13:38:35	0m 58s	0m 0s	Runway Roll	Rotation on CCTV	Airport Security CCTV				
08:08:39	13:38:39	1m 2s	0m 4s	Take-Off	The aircraft air/ground sensors transitioned to air mode	Preliminary Report - Page 14				
3m 39s 201ms	13:38:39	1m 2s	0m 0s	Take-Off	Take-Off	Airport Security CCTV				
08:08:42	13:38:42	1m 5s	0m 3s	Initial Climb	The maximum recorded airspeed of 180 Knots IAS	Preliminary Report - Page 14				
08:08:43	13:38:43	1m 6s	0m 1s	Initial Climb	Engine 1 Fuel Switch transitioned to CUTOFF	Preliminary Report - Page 14				
08:08:44	13:38:44	1m 7s	0m 1s	Initial Climb	Engine 2 Fuel Switch transitioned to CUTOFF	Preliminary Report - Page 14				
3m 46s 551ms	13:38:47	1m 10s	0m 3s	Initial Climb	ADS-B Data Point	FlightRadar24	23.069138	72.625871	575	
08:08:47	13:38:47	1m 10s	0m 0s	Initial Climb	RAT hydraulic pump began supplying hydraulic power	Preliminary Report - Page 14				
3m 48s 141ms	13:38:48	1m 11s	0m 1s	Initial Climb	ADS-B Data Point	FlightRadar24	23.068176	72.624872	600	
3m 48s 611ms	13:38:49	1m 12s	0m 1s	Initial Climb	ADS-B Data Point	FlightRadar24	23.067844	72.624563	600	
8m 49s 11ms	13:38:49	1m 12s	0m 0s	Initial Climb	ADS-B Data Point	FlightRadar24	23.067611	72.624308	600	
3m 49s 461ms	13:38:49	1m 12s	0m 0s	Initial Climb	ADS-B Data Point	FlightRadar24	23.067379	72.624054	625	
3m 49s 461ms	13:38:49	1m 12s	0m 0s	Initial Climb	Aircraft Position 100m before End of Runway	Preliminary Report Page 6 Figure 1				
3m 49s 921ms	13:38:50	1m 13s	0m 1s	Initial Climb	ADS-B Data Point	FlightRadar24	23.067078	72.623774	625	
3m 50s 391ms	13:38:50	1m 13s	0m 0s	Initial Climb	ADS-B Data Point	FlightRadar24	23.066849	72.623524	625	
3m 50s 729ms	13:38:51	1m 14s	0m 1s	Stall	Maximum Altitude	Airport Security CCTV				≈
3m 50s 871ms	13:38:51	1m 14s	0m 0s	Side Slip	ADS-B Data Point	FlightRadar24	23.066541	72.623189	625	
08:08:52	13:38:52	1m 15s	0m 1s	Side Slip	Engine 1 Fuel Switch transitioned to RUN	Preliminary Report - Page 15				
08:08:54	13:38:54	1m 17s	0m 2s	Side Slip	The APU Inlet Door began opening	Preliminary Report - Page 15				
08:08:56	13:38:56	1m 19s	0m 2s	Side Slip	Engine 2 Fuel Switch transitioned to RUN	Preliminary Report - Page 15				
08:09:05	13:39:05	1m 28s	0m 9s	Descent	MayDay call	Preliminary Report - ATC - Page 12				
9m 9s 916ms	13:39:10	1m 33s	0m 5s	Crash	Crash explosion first seen on CCTV	Airport Security CCTV				
08:09:11	13:39:11	1m 34s	0m 1s	Crash	The EAFR recording stopped	Preliminary Report - Page 15				
08:09:13	13:39:13	1m 36s	0m 2s	Crash	Crash Site	Preliminary Report	23.054943	72.612014		

19. CCTV Evidence.

Airport Security CCTV taken 08:08:45.5 UTC and 08:08:47.5 UTC.

Smoke can clearly be seen in both screenshots. The smoke is possibly related to the brakes overheating during the take-off roll.

Airport Security CCTV at 08:08:45.5 UTC Frame 647

Airport Security CCTV at 08:08:47.5 Local Time Frame 707

20. Possible Root Causes.

There were three separate problems happening in quick sequence:

- sluggish take-off roll and late 80 knot call close to V1.

- electrical failure and RAT deployment 2 seconds after take-off.

- dual engine shutdown either due to the physical movement of both Fuel Switches starting 4 seconds after take-off, within 1 second of each other and completed by 5 seconds after take-off or due to a single point electrical failure.

The sluggish take-off roll disappears, as soon as the aircraft is airborne and the acceleration is restored to normal levels and a Vmax of 180 knots is achieved at 08:08:42 UTC.

1 second before Vmax, the RAT was deployed due to an electrical failure.

1 second after Vmax, the Fuel Switches were moved to CUTOFF.

If the Engines were both running normally when the Fuel Switches were moved to CUTOFF, then the time of Vmax would have been after 08:08:43 UTC and possible after 08:08:44 UTC.

ADS-B data shows the aircraft was still climbing until 08:08:49 UTC, another 5 to 6 seconds after Fuel Switches were moved to CUTOFF, although air speed will have been reducing as the engines spooled down.

Vmax was already achieved 3 seconds after take-off. Engine thrust was decaying rapidly from this point in time onwards.

The root cause is associated with the electrical failure, which occurred 2 seconds after take-off and not with the Fuel Switches, which occurred 4 to 5 seconds after take-off.

Table of Possible Root Causes.

Failure Type	Likelihood	Supporting Evidence for AIC171
EE bay water ingress	High	RAT at +2 sec, simultaneous shutdown, relight later, AD 2025-09-12
Shared DC Bus Failure	Moderate	Technically possible, but requires rare simultaneous contactor failure
IPC Fault (Breaker or Arc)	Low	Could affect both FADECs, but lacks timing and supporting SB/AD
Software-Controlled Isolation	Low	No known case; speculative without SB/AD or history
GCU Software Overflow (AD-2015-09-07)	Ruled Out	Aircraft powered down <140 days ago
PRB-A water ingress (SB-24-212)	Ruled Out	Fake Boeing Service Bulletin

21. Root Cause Analysis.

The following Boeing documentation is used in the Root Cause Analysis:

Manual	Purpose
FCOM (Flight Crew Operating Manual).	Master reference normal and non-normal operations.
FCTM (Flight Crew Training Manual).	How and why of operations.
AMM (Aircraft Maintenance Manual).	System operation and how to maintain components.
SSM (System Schematic Manual).	Detailed logic and signal flow schematics.
WDM (Wiring Diagram Manual).	Interconnect details, pins, signals, and routing.
SDD (System Description Document).	Engineering-level, deeper theory of operation.
CMM (Component Maintenance Manual)	Vendor-specific manuals for components.

The Root Cause Analysis considers the Engines, Fuel System, Electrical System, Avionic Systems both separately and as an integrated Aircraft system.

(a) The Engines were both shutdown, but both Engines were successfully relit. This implies that the FADECs in both Engines did not detect Engine damage, that would prevent a relight sequence.

(b) The Fuel system can cause Engine shutdown, but again both Engines were successfully relit. Any issue with the Fuel System must have therefore been intermittent and cleared quickly to allow relight.

The major components of the Fuel System for the GEnx-1B engine are depicted below. The fuel valves, pumps and filters had to be functioning for a successful relight.

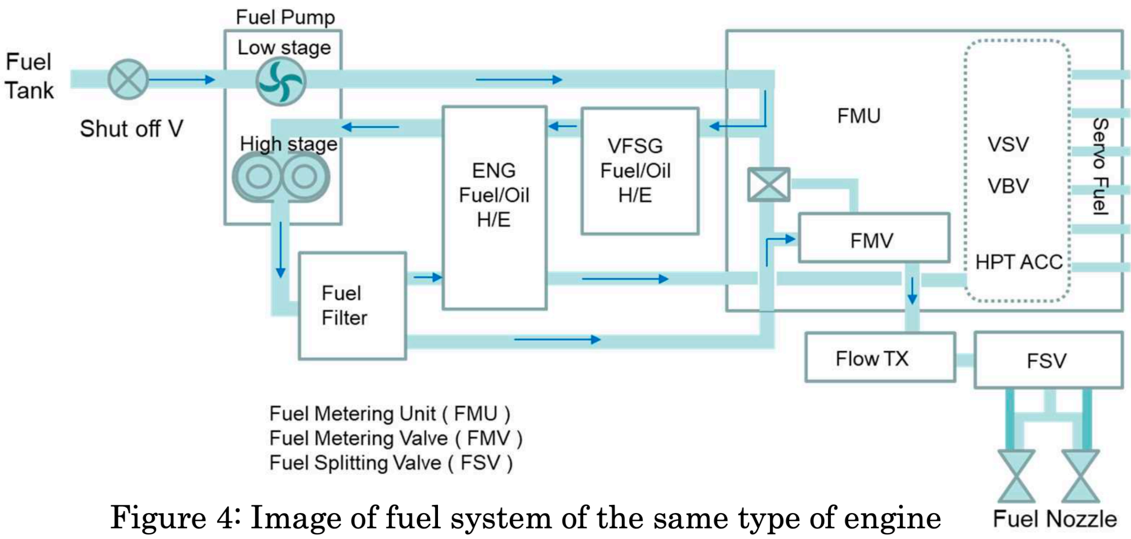
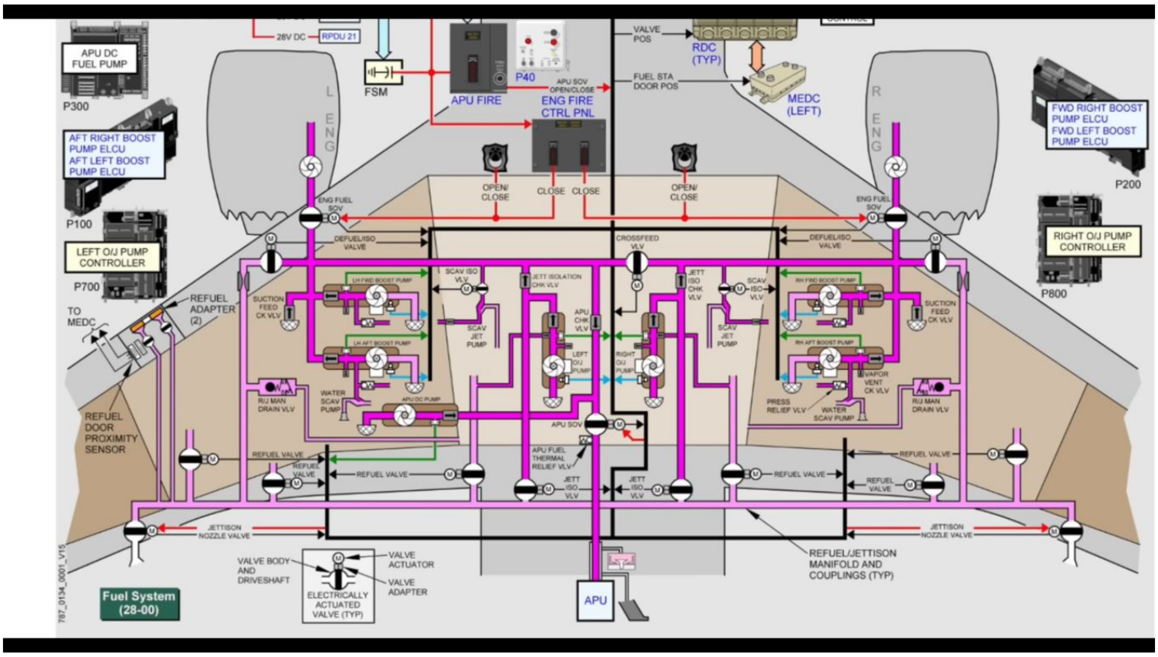


Figure 4: Image of fuel system of the same type of engine

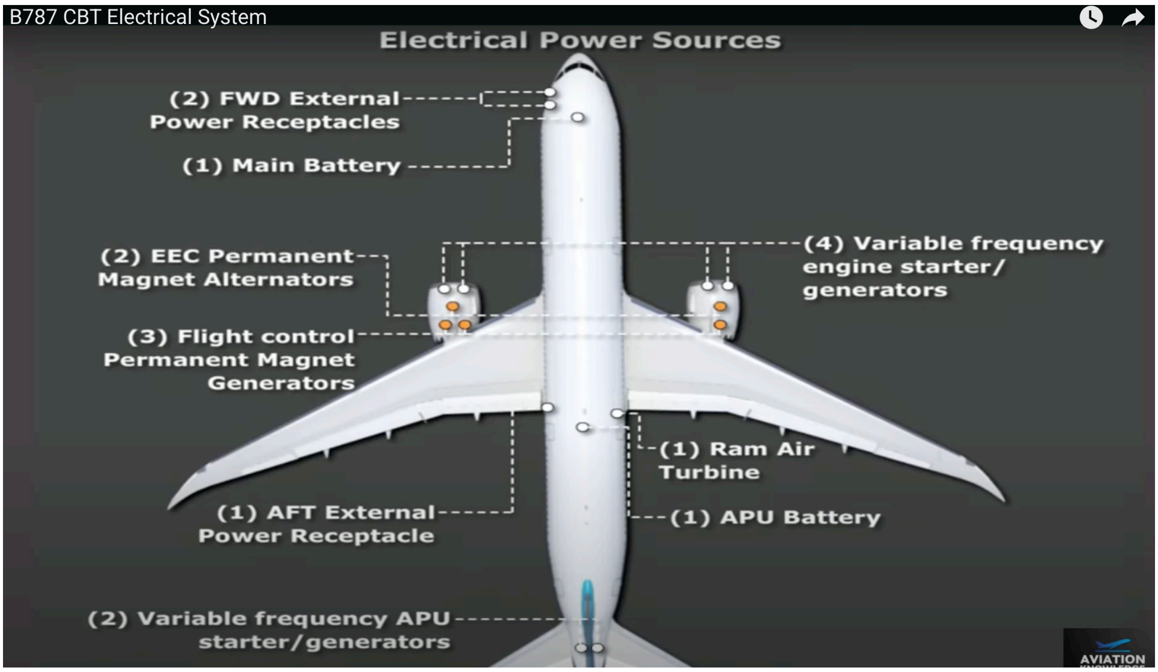
Neither the Fuel Switches were permanently CUTOFF, nor the Fire Handles were operated as evidenced by a successful relight of both engines.



The aircraft experienced an electrical failure 2 seconds after take-off causing the RAT to deploy. Various electrical systems failed on the previous flight and were at least in part cleared: Stabiliser Trim Transducer, In-Flight Entertainment System and Cabin Emergency Lighting flickering.

The Preliminary Report only mentions the Stabiliser Trim Transducer issue was cleared before the next flight: “troubleshooting was carried out as per FIM by Air India’s on duty AME, and the aircraft was released for flight at 0640 UTC.” There is no mention in the Preliminary Report of maintenance work on the In-Flight Entertainment System, Cabin Electrical System or Cabin Air Conditioning System issues reported by several passengers.

Here is an overview of the Electrical Power Sources:

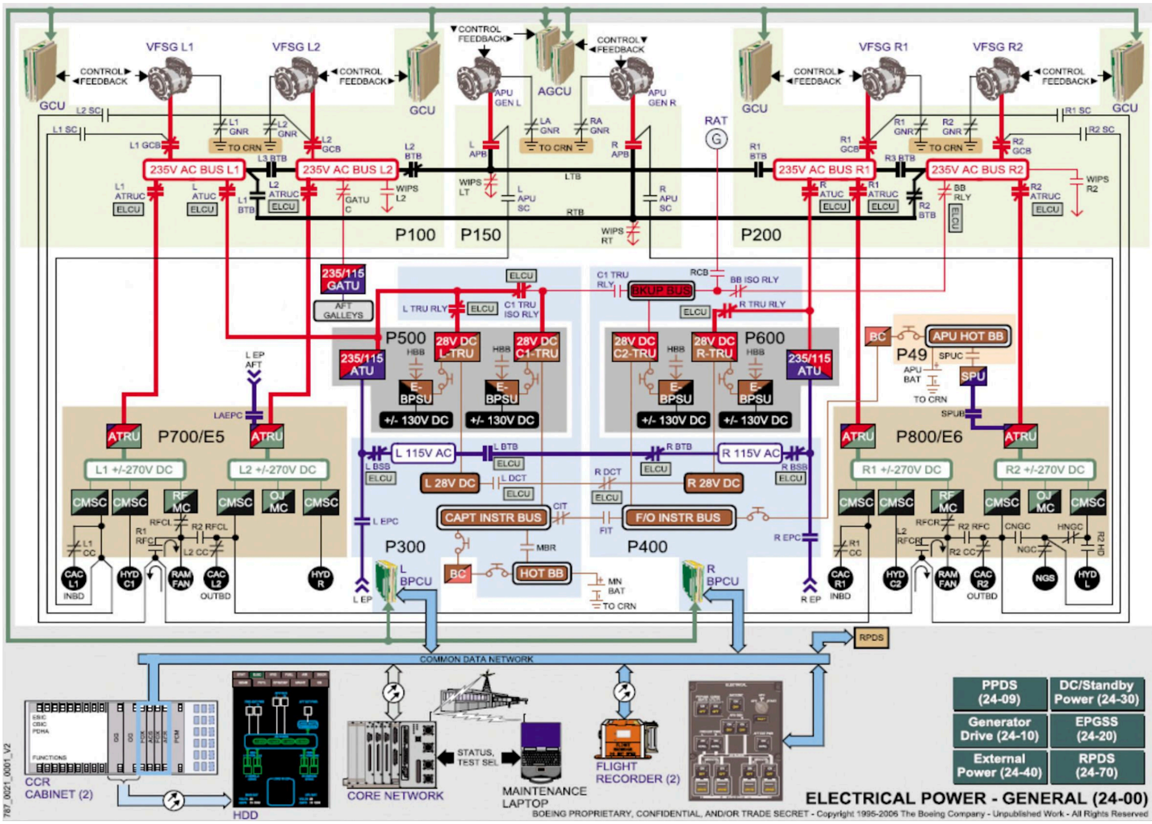


Power-panel/contactor logic transients ("chatter") in the primary distribution path can momentarily de-energise multiple downstream buses.

Water ingress into the EE bays can produce intermittent shorts across multiple panels.

The remote power distribution units and the electrical-load management system shed/restore loads dynamically. A RPDU control fault or ELMS/EPMS mis-timing can induce brief, system-wide power-quality dips before auto-reconfiguration, affecting avionics, pumps, and control electronics on both sides of the aircraft.

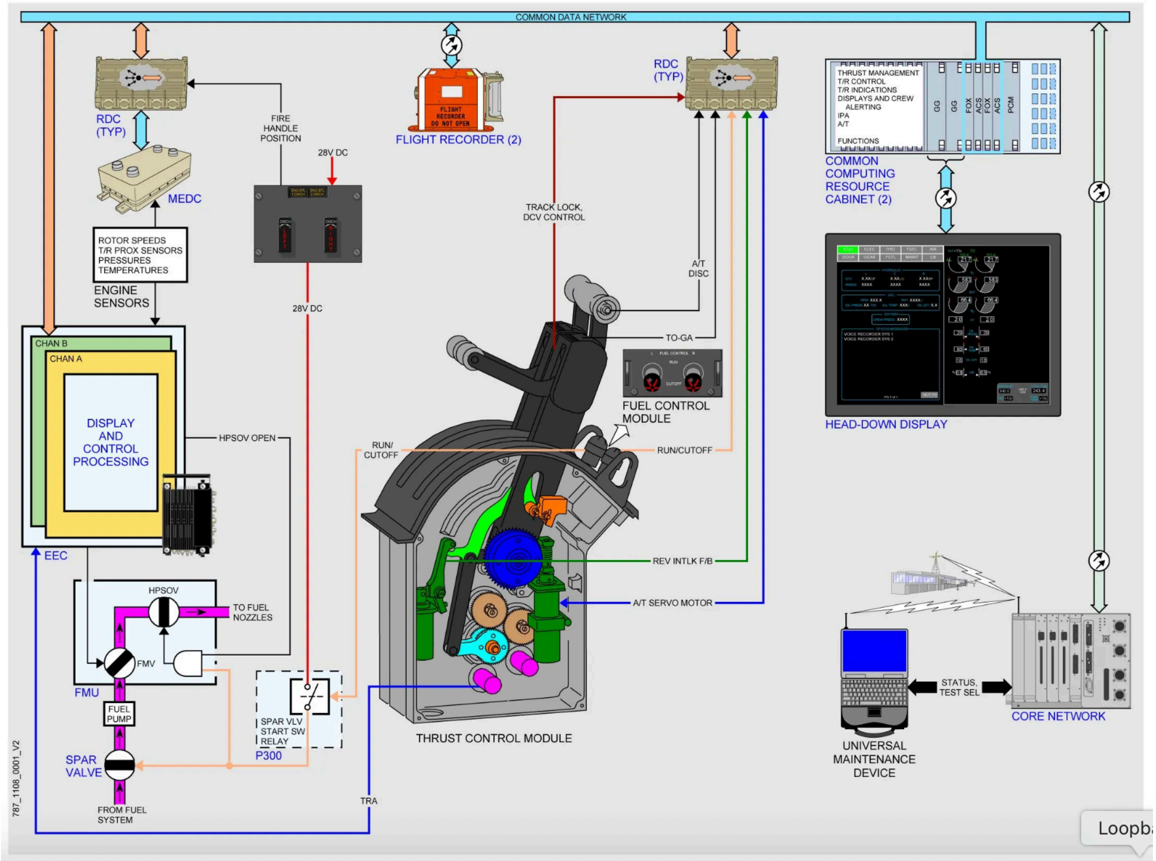
GCU counter overflow after 248 days can be eliminated because the aircraft was completely powered down latest at he last maintenance 140 days prior to the crash.



P100, P150, P200, P700/E5 and P800/E6 are in the Aft EE Bay.

P300, P400, P500 and P600 are in the Forward EE Bay.

The Fuel Control Module RUN/CUTOFF Switches are connected to the SPAR Valve Start Switch Relay (Left and Right) and to the Remote Data Concentrator (RDC) (Left and Right).



The two Fuel Switches are powered by separate Electrical buses and each switch has two separate signal paths. The possibility that all 4 signal paths failed simultaneously is negligible.

A single point intermittent common-mode electrical failure up stream of the Fuel Switches cannot be ruled out. An intermittent common-mode fault (e.g., in the fuel control switch assembly or in shared wiring upstream of the relays or the RDCs) that could command both fuel valves to close simultaneously is feasible.

A catastrophic sequence of system failure can easily take several seconds to unfold in the cadence of individual events unfolding in sequence in a highly redundant system architecture.

The timing of an electrical failure at rotation, aligns with the possibility of water moving and leaking under the forces of motion and gravity.

The Airworthiness Directives and Service Bulletins show that water ingress into the EE Bays was a known issue.

The report explicitly states there was no recorded defect history on this airplane's switches (P/N 4TL837-3D) and references the 2018 FAA SAIB NM-18-33 (advisory, not mandatory) about the locking feature seen on similar switches. That supports the claim that the installed switches were not known defective and that their recorded movements were real. It does not by itself prove there couldn't have been an upstream electrical/logic issue.

Boeing SB B787-81205-SB280015-00 (Fuel) documents a historic latent failure risk in fuel shutoff valve actuators due to microswitch circuitry (since corrected), and notes common input power through microswitches in earlier designs—evidence that common-mode paths have existed in this area of the 787 architecture. That supports the feasibility (not proof) of a single-point/common-mode fault producing unexpected valve behaviour/indication.

There is a long paper trail on water ingress into the EE Bays: AD 2016-14-04 (potable water leaks; require drip shields & sealing), followed by the 2024 NPRM and the final 2025 AD (effective June 18, 2025) expanding actions because water leaking into EE bays could cause electrical shorts and loss of functions essential for safe flight. Multiple Boeing Service Bulletins back this up (e.g., SB530031-00 drip shields; SB380009-00 couplings).

The ADs/SBs establish that in-flight water migration into EE bays has been a real hazard on the 787. The AI171 timing (switch movements seconds after liftoff) could be consistent with a disturbance (acceleration/attitude change) mobilising water, but that's is a plausible hypothesis—the Preliminary Report doesn't yet provide physical evidence of water at the relevant components for this accident.

The hypothesis of Water Ingress is possible and plausible, but unproven.

The preliminary report's hard data are that both fuel control switches transitioned from RUN to CUTOFF about 3–4 s after liftoff, one second apart, and then back to RUN ~9 and 13 seconds later. That sequence fits an inadvertent or erroneous action (or a lock/guard problem) better than a random environmental short—especially the quick return to RUN on both switches.

The FAA's 2018 SAIB warned some Boeing fleets had disengaged locking features on Honeywell switches, and the 787 uses a similar design (P/N 4TL837-3D). Air India told investigators the SAIB checks were not performed because it wasn't mandatory. This doesn't prove pilot action, but it does raise the prior probability, that inadvertent movement was possible.

The 787 signal chain (switch → RDC/FCM → EECs/valves) can admit common-mode faults, and Boeing issued a fuel-valve actuator SB years ago describing common input power through microswitches as a latent-failure risk (different component, but shows such vulnerabilities existed). The Preliminary Report does not rule an upstream electrical cause out. However, we have no physical corroboration (burnt traces, moisture tracks, fault codes) yet.

A combined scenario (e.g., electrical transients from moisture creating nuisance/failure indications at rotation, followed by an intended or unintended switch movement) is also plausible.

The RAT was deployed 2 seconds after take-off, this would only be due to a nuisance indication, if manually deployed.

The hard cut off of the ADS-B data points to a real electrical issue and RAT automatic deployment.

We lack any public physical forensic confirmation (EE-bay traces, wiring marks, RDC logs) to say which electrical path failed and whether water ingress played a role.

Until that evidence is published, we can say: automatic RAT deployment and the ADS-B cutoff is a genuine electrical event, not a mere nuisance.

This is compatible with (and not contradictory to) the combined-cause hypothesis of water ingress and fuel switch movement.

22. Summary of Findings.

Water Ingress remains an open question until maintenance logs are made public. FAA AD 2025-06-18 (as well as the referenced predecessor documents) mandates inspection of moisture protection systems.

We propose that the long take-off roll was likely due to a brake issue, causing the smoke detected by the CCTV footage.

We propose that the RAT deployment was an automatic response to an electrical issue caused by water ingress to the EE Bay.

We propose that the Fuel Switches were moved deliberately but under a cognitive error, possibly triggered by:

- Startle or mode confusion—misperception of situation.

- Misdirected deliberate action—an incorrect but intended response.

- Erroneous memory recall—activation of a mental script, such as an engine fire drill.

We stress this does not indicate a cognitive disorder or malicious intent. Instead, this may reflect cognitive overload or memory lapse under stress.

The Preliminary Report quotes cockpit voice recordings:

"In the cockpit voice recording, one of the pilots is heard asking the other why did he cutoff. The other pilot responded that he did not do so."

This exchange suggests confusion and possible miscommunication—hallmarks of a startle-induced lapse. The delay in resetting the switches likely stems from this momentary confusion.

23. Pilot Mental Health Issues.

Lived Experience & Wellbeing Project (Trinity College Dublin) found 92% of pilots say their work environment contributes to mental health issues.

Eindhoven University: 40% of 1,147 pilots experienced high burnout.

Harvard study: 12.6% of pilots met criteria for clinical depression; 4.1% reported suicidal ideation.

Few pilots feel adequately supported. 112 Air India pilots called in sick on 16th June 2025, 4 days post-crash, citing stress.

ICAO and EASA both highlight how circadian disruption and high duty cycles elevate cognitive risk.

24. Alternatives Scenarios.

In our view, other possible causes can be eliminated:

- FADEC Glitch: A dual software failure across both FADECs is statistically negligible.

- Lithium Battery Fire: No evidence of thermal runaway; no lithium battery fires recorded since 2014.

- Lithium Battery Failure: Only the Main, APU, and the two FADEC batteries are directly integrated into the DC distribution logic, with full redundancy. Each has its own charger/controller with internal diodes and protective electronics. All the other batteries are local and self-contained in various systems, with no role in bus interconnection, and have their own internal protection, including their own miniature diodes or MOSFET-based isolation.

- Tail Fire: Post-crash and contained; not causal.

25. Conclusion.

The most likely cause of the accident involving Air India Flight 171 was triggered by water ingress into the Electronic Equipment (E/E) bay during rotation, leading to simultaneous electrical disruption of Engine electrical power buses or systems, coupled with intended or unintended fuel switch movement.

This resulted in the near-instantaneous shutdown of both engines at low airspeed and low altitude. Due to the extremely limited energy margin, there was insufficient time for the FADEC-controlled engine relight sequence to restore thrust or prevent a loss of control and terrain impact.

If the hypothesis is proven, then the event was preventable and points instead to a root cause as a failure in maintenance oversight and non-compliance with FAA AD 2025-09-12, which specifically addresses water ingress in the EE bay and the need for improved cabin water sealing.

This accident was not the result of pilot error per se, but may have been an intended pilot fuel switch movement to force the engine relight sequence or an unintended pilot fuel switch movement, due to the startle effect or cockpit stress and work overload.

Even if the Fuel Switches had been left in RUN, there was insufficient time, air speed and altitude to successfully relight both engines and save the aircraft. The pilot action to move the Fuel Switches to CUTOFF to force the FADEC relight sequence may or may not have been necessary, but would likely not have changed the outcome.

The Engine relight sequence takes at least 20 seconds, if not much longer, and the flight only lasted 30.715 seconds. Time ran out quickly for Air India flight 171.