1. Possible causes of aircraft crash due to retracted wings, wheels remained low & nose pointing upwards
   https://www.theweek.in/news/india/2025/06/12/flaps-up-and-wheels-down-aviation-expert-explains-what-went-dangerously-wrong-in-ahmedabad-air-india-crash.amp.html

   https://www.theweek.in/news/india/2025/06/12/flaps-up-and-wheels-down-aviation-expert-explains-what-went-dangerously-wrong-in-ahmedabad-air-india-crash.amp.html

   https://www.nytimes.com/2025/06/12/business/india-plane-crash-causes.html

2. The plane seems to be taking off and landing which is extremely weird
   https://www.nytimes.com/2025/06/12/business/india-plane-crash-causes.html

3. How do flaps, slats & wheels retract during takeoff
   https://www.youtube.com/watch?t=34&v=x99cSdu576Y&feature=youtu.be

   https://youtu.be/JEJQRXYIg5w?t=12

4. Temperature could be one of the reasons for crash
   https://www.newindianexpress.com/web-only/2025/Jun/13/auw-could-air-india-flight-ai-171s-weight-have-doomed-it.

5. Even if the flaps were not deployed, a stall could still be avoided with increased thrust adding that incorrect thrust settings due to human error could be one cause
   https://www.theguardian.com/world/2025/jun/13/air-india-crash-cause-theories-experts-flight-171-ahmedabad?utm_source=chatgpt.com.

6. What are the other factors that could have caused the accident
   https://timesofindia.indiatimes.com/india/ahmedabad-plane-crash-what-caused-the-crash-engine-failure-bird-hit-among-several-theories/articleshow/121813073.cms

7. Generally what is the probability of pilot errors in a plane crash, roughly around 65%
   https://timesofindia.indiatimes.com/india/ahmedabad-air-crash-why-accidents-are-common-during-take-offs-landings/articleshow/121806197.cms.

8. Spanair aircraft on 20th August 2008 crash was similar to the Ahmedabad crash, which was due to flat flaps and slats, pilot distraction & alarm relay R2-5 failed to sound for not following protocols
   https://www.theguardian.com/world/2008/aug/20/madrid.spain2

   https://en.wikipedia.org/wiki/Spanair_Flight_5022

   https://en.wikipedia.org/wiki/Spanair_Flight_5022

   https://en.wikipedia.org/wiki/Spanair_Flight_5022.

   https://asn.flightsafety.org/reports/2008/20080820_MD82_EC-HFP.pdf

9. Spanair aircraft reached a height of 40ft before crashing
   https://asn.flightsafety.org/asndb/321656

10. One more similar accident took place in Detroit in the year 1988 by NW flight 255 caused due to human error
    https://asn.flightsafety.org/asndb/321656.

    https://www.freep.com/story/news/local/michigan/2023/08/16/flight-255-northwest-airlines-romulus-crash-anniversary/70601261007/

11. Boeing 787 Plane status-height, distance, before landing
    https://www.aljazeera.com/news/2025/6/12/catastrophic-air-india-plane-crash-near-ahmedabad-what-we-know

12. Chances of failure of one engine and both engines
    https://www.rosenaviation.com/blog/how-are-airplanes-able-to-fly-with-a-failed-engine

    https://en.wikipedia.org/wiki/Turbine_engine_failure

13. What was the speed of AI171 before crash was 174 knots or 322km/hr
    https://www.hindustantimes.com/india-news/moments-leading-up-to-air-india-plane-crash-in-ahmedabad-a-blow-by-blow-account-101749728177873.html

14. One observation made in the previous crashes of Spanair and NW flight 2025 was that the tilt/bank was more than required
    https://en.wikipedia.org/wiki/Spanair_Flight_5022.

    Bank angles of NW Flight 2025 varied from 15-90 degrees

15. Causes of Crash after analysing all possible factors
    https://timesofindia.indiatimes.com/city/kolkata/dual-engine-failure-or-human-error-pilots-on-edge-over-cause/articleshow/121836465.cms.

16. Air crash survivor interview
    https://www.theguardian.com/world/2025/jun/13/saw-people-dying-british-survivor-describes-air-india-plane-crash

    https://people.com/sole-survivor-air-india-plane-crash-doesnt-know-how-survived-saw-people-die-11754062.

17. Every aircraft has two black box of which one is cockpit voice recorder and flight data recorder of which one has been retrieved.
    https://www.theguardian.com/world/2025/jun/13/one-of-two-black-boxes-recovered-from-air-india-wreckage-police-sources-say

    https://www.livemint.com/news/india/explained-what-black-box-holds-inside-and-what-can-it-reveal-about-air-india-plane-crash-11749861698929.html

18. DGCA does not have strict regulations on violation of rules, it imposes a penalty of 1 lakh to max of 1 crore, however other agencies like FAA has filed a fine of 140 million on Boeing
https://www.dgca.gov.in/digigov-portal/?dynamicPage=aircraftRules1934Content/101/3297/viewDynamicRuleContLvl2&mainaircraftRules1934/101/0/viewDynamicRulesReg

https://www.theguardian.com/business/article/2024/jun/16/faa-investigation-southwest-plane-drop-dutch-roll

https://www.justice.gov/archives/opa/pr/boeing-charged-737-max-fraud-conspiracy-and-agrees-pay-over-25-billion

19. As per international Montreal Convention AirIndia has to pay 1.8 crore to each victim in the crash, however AirIndia will receive an insurance amount of 2400 crore
https://www.newindianexpress.com/business/2025/Jun/12/air-india-may-have-to-pay-rs-18-crore-to-kin-of-each-of-the-ahmedabad-crash-victims.

https://www.ndtvprofit.com/economy-finance/air-india-crash-to-become-indias-most-expensive-aviation-claim-with-a-potential-rs-2400-crore-demand

20. DGCA rules are lenient, In 2023 DGCA suspended Captain Rajeev Gupta for only a month despite inadequate safety prevention spot-checks
https://www.ndtvprofit.com/economy-finance/air-india-crash-to-become-indias-most-expensive-aviation-claim-with-a-potential-rs-2400-crore-demand

https://www.moneycontrol.com/news/india/dgca-suspends-air-indias-flight-safety-chief-amidst-safety-concerns-11402351.html#google_vignette

21. There have been several complaints reported by passengers of AirIndia, which was not taken seriously
https://youtube.com/shorts/pdAim5uvyQA?si=X_xeOi7TKLvHhi6X

https://youtube.com/shorts/Wql37S4y8xk?si=BhsIs4NL7IxDC7ML

https://youtube.com/shorts/S3Ke9suGWhc?si=ECR1ms3fa8zE38_8

https://www.instagram.com/reel/DKzp18CoViw/?igsh=MWs1Z3A1d3Vqcmp4ZA%3D%3D%C2%A0

22. Sam Salehpour Boeing whistleblower and other whistleblowers who died Joshua Dean aur John Barnett
https://www.instagram.com/iwtkquiz/reel/DK2MLXWImvI/

https://www.bbc.com/news/world-us-canada-68834525.

https://fortune.com/2024/05/02/boeing-whistleblower-dead-joshua-dean-45-sudden-severe-infection/

https://www.livemint.com/news/world/who-was-john-barnett-former-boeing-employee-flagged-safety-lapses-in-dreamliner-programme-11749805051683.html.

Why a plane like Boeing 787-8 Dreamliner may not be able to Take off/ climb with 0 degree flaps and slats and 1 Engine. (Even with 2 engines)

- Airplane Weight: 500,000 pounds (227,000 kg) – like a fully loaded plane with passengers and fuel.
- Runway Length: 3.5 km (11,483 feet) – the distance to speed up.
- Temperature: 38°C – hot weather makes air thinner, so it's harder to lift off.
- Air Density: At 38°C and sea level, air density is about 1.11 kg/m³ (thinner than normal 1.225 kg/m³).
- Wing Area: 377 m² – the size of the wings making lift.
- Lift Power (CLmax): With flaps and slats at 0 (clean wings), it's 1.2 – this measures how much lift the wings make.
- One Engine Thrust: The 787-8 has two engines, each giving ~70,000 pounds of thrust. With one engine, we get 70,000 pounds (311,000 Newtons).
- Speed Needed (Stall Speed): The slowest speed to fly without falling.
- Takeoff Speed: About 1.2 times stall speed for safety (to climb safely).
- Acceleration: How fast the plane speeds up with one engine.
- √ = Square root of the all

See, how he Flap angle directly influences the lift coefficient (CL)

First let's find out if the plane can reach a fast enough speed on the runway to lift off with one engine and no flaps or slats.

1. *Find Stall Speed* (speed where wings stop lifting):
    - Formula: $V_s = \sqrt{((2 \times \text{Weight}) / (\text{Air Density} \times \text{Wing Area} \times \text{Lift Power}))}$
    - Weight = 227,000 kg × 9.81 m/s² = 2,226,870 Newtons.
    - Air Density = 1.11 kg/m³.
    - Wing Area = 377 m².
    - Lift Power (CLmax) = 1.2.
    - Plug in: $V_s = \sqrt{((2 \times 2{,}226{,}870) / (1.11 \times 377 \times 1.2))}$
    - Do the math: $V_s = \sqrt{(4{,}453{,}740 / 502.554)} \approx \sqrt{8{,}860} \approx 94$ m/s.
    - Convert to knots (1 m/s ≈ 1.94 knots): 94 × 1.94 ≈ 182 knots.

2. *Find Takeoff Speed*:

- Takeoff speed = 1.2 × Stall Speed = 1.2 × 182 ≈ 218 knots (400 km/h or 112 m/s).
-

3. *Can It Speed Up on the Runway?*
    - One engine gives 311,000 Newtons of thrust.
    - Acceleration = Thrust ÷ Mass = 311,000 / 227,000 ≈ 1.37 m/s².
    - Runway is 3,500 m. Use: Speed = √(2 × Acceleration × Distance).
    - Plug in: √(2 × 1.37 × 3,500) ≈ √9,590 ≈ 98 m/s.
    - Convert to knots: 98 × 1.94 ≈ 190 knots.

4. *Compare Speeds*:
    - Needed: 218 knots to take off safely.
    - Reached: 190 knots on the runway.
    - 190 < 218, so the plane *can't* reach the speed to lift off.

The plane needs 218 knots to fly with no flaps or slats in hot weather, but with one engine on a 3.5 km runway, it only gets to 190 knots. It's too slow to take off safely and would risk crashing. Turning on Flaps and Slats would significantly help by lowering the needed speed, but without them, it's too close of a call.