Cause Mapping®

ThinkReliability®

Thank you for taking time to review our current understanding of the Air India Flight 171 accident.



This document is a sample of a ThinkReliability incident analysis report, offering a comprehensive view of the Air India Flight 171 given what is currently known. Our Root Cause Analysis (RCA) approach goes beyond surface-level insights, helping teams and stakeholders gain a deeper understanding of the causes behind issues. Instead of a traditional narrative, this report leverages visual diagrams with clear annotations to communicate the incident's details in an accessible and engaging format.

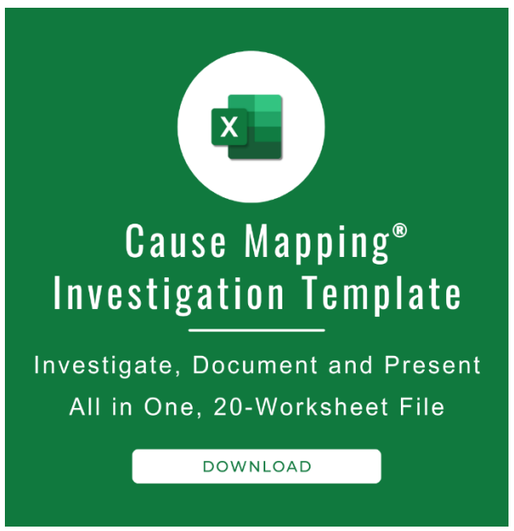
In addition to analyzing public events like this, we offer expert facilitation for your organization's incident investigations. Over 90% of the cases we handle can be conducted remotely, providing flexibility and efficiency. Here's why organizations choose ThinkReliability for RCA support:



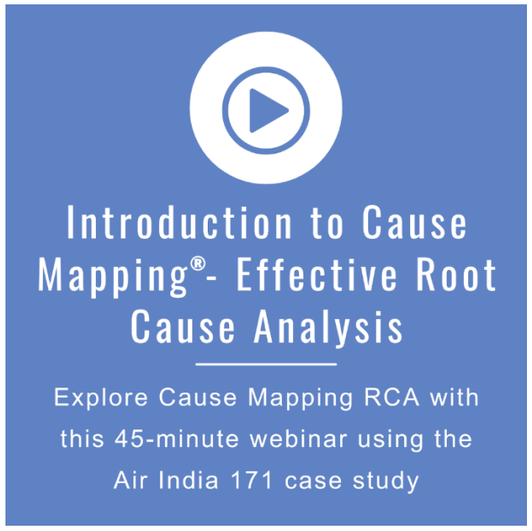
- Deliverables with actionable solutions
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If you'd like to explore how we can assist with your incident investigations, call our office (281-412-7766) or submit a request on our website, thinkreliability.com. We'd be happy to discuss how our expertise can add value to your process.

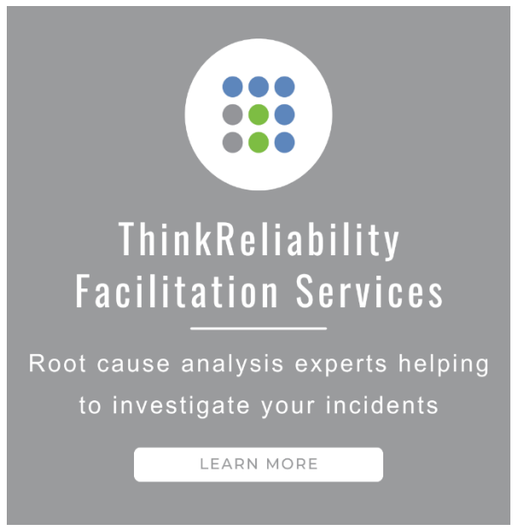
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Watch the 45-minute webinar review of this case study



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AIR INDIA

787 DREAMLINER

Air India Flight 171 Crash, loss of 279 lives

Incident Date	June 12, 2025
Incident Location	Ahmedabad Airport, Ahmedabad, India
Date of Report	DRAFT from Preliminary Report July 12, 2025

Cause Mapping®

1. Problem
2. Analysis
3. Solutions



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Contents

	Page
Description	3
1. Problem Definition	4
Timeline	5
Photos	6 - 7
Diagrams	8
2. Cause-and-Effect Analysis (5, 7, 13, 31-Why)	9 - 12
3. Solutions	13
Matrix	14
Appendix: Supporting Evidence	15
Photos, As found components	16-17
FAA SAIB NM-18-33	18
References	19

Air Flight 171 requested and received taxi clearance

Ben Dellsperger *ThinkReliability*

Description

On 12 June 2025, AAIB was notified of an accident involving Air India's B787 aircraft bearing registration VT-ANB at Ahmedabad. As per the notification, the aircraft was operating Flight AI171 from Ahmedabad to Gatwick and crashed at about 0809 UTC immediately after take-off. The notification was received from the Airport Authority of India and the Airline Operator.

On receipt of the notification, a team of five officers from AAIB including DG, AAIB reached Ahmedabad on the same day. Another three officers from DGCA's Air Safety Directorate arrived from Mumbai to assist in the accident site activities and were put up at disposal of the DG, AAIB. The efforts at the site were led by the DG, AAIB and evidence collection and other site activities were carried out.
The Initial notification of the accident as per ICAO Annex 13 was sent to National Transportation Safety Board (NTSB), USA which represented the State of Design & Manufacture. As per the information notified to AAIB, the fatalities amongst passengers also included citizens from United Kingdom, Portugal and Canada. The initial notification of the accident as per ICAO Annex 13 was also sent the AAIB-UK, GPIAAF-Portugal and Transportation Safety Board (TSB)-Canada which represented the other States whose citizens suffered fatalities in the accident.

NTSB, USA appointed an Accredited Representative and Technical Advisers from Boeing, GE and the Federal Aviation Administration (FAA) to assist in this Investigation. A team led by the NTSB Accredited Representative comprising of representatives from Boeing, GE and FAA arrived at Ahmedabad on 15.06.2025 and participated in the Investigation. A team of officials from AAIB, UK also arrived at Ahmedabad and visited the site with DG, AAIB.

The DG-AAIB, in excise of power conferred to him by the Rule 11 (1) of the Aircraft (Investigation of Accidents and Incidents) Rules 2017, appointed Investigation team comprising Mr. Sanjay Kumar Singh as Investigator-in-Charge, Mr. Jasbir Singh Larhga as Chief Investigator and, Mr. Vipin Venu Varakoth, Mr. Veeraragavan K and Mr. Vaishnav Vijayakumar as Investigators.
Experienced Pilots, Engineers, Aviation Medicine Specialist, Aviation Psychologist and Flight Recorder Specialists have been taken on board as Subject Matter Experts (SMEs) to assist the Investigation in the area of their domain expertise.

Credit: AAIB

Problem Outline

		Air India Flight 171 Crash, loss of 279 lives	
What	Problem(s)	Flight lost airspeed shortly after take off, crashed into building	
When	Date	June 12, 2025	
	Time	13:38 PM	
	Different, unusual, changed	First Dreamliner fuselage loss since 2009, one survivor - seat 11A	
Where	Facility, location	Ahmedabad Airport, Ahmedabad, India	
	Unit, area	Runway 23, crash in residential area of the civil hospital campus	
	Equipment, tools	Boeing 787-8 Dreamliner, VT-ANB, GEnx engines	
	Task, operation being done	Transporting passengers from India to London	

Impact to Goals

Safety	Loss of 279 lives, 241 on plane, 38 people on ground, 1 survivor	
Environmental	Fuel and debris	
Customer	Loss of customer confidence?	
Production, Schedule	Major impacts?	
Property, Equipment	Loss of 787-8 Dreamliner	$ 212,000,000
Labor, Time	Debris clean up, rebuild, inspections into existing Dreamliners?	?
	This incident	$212,000,000

Frequency	Air Flight 171 requested and received taxi clearance	
	Annualized cost	$0

Timeline

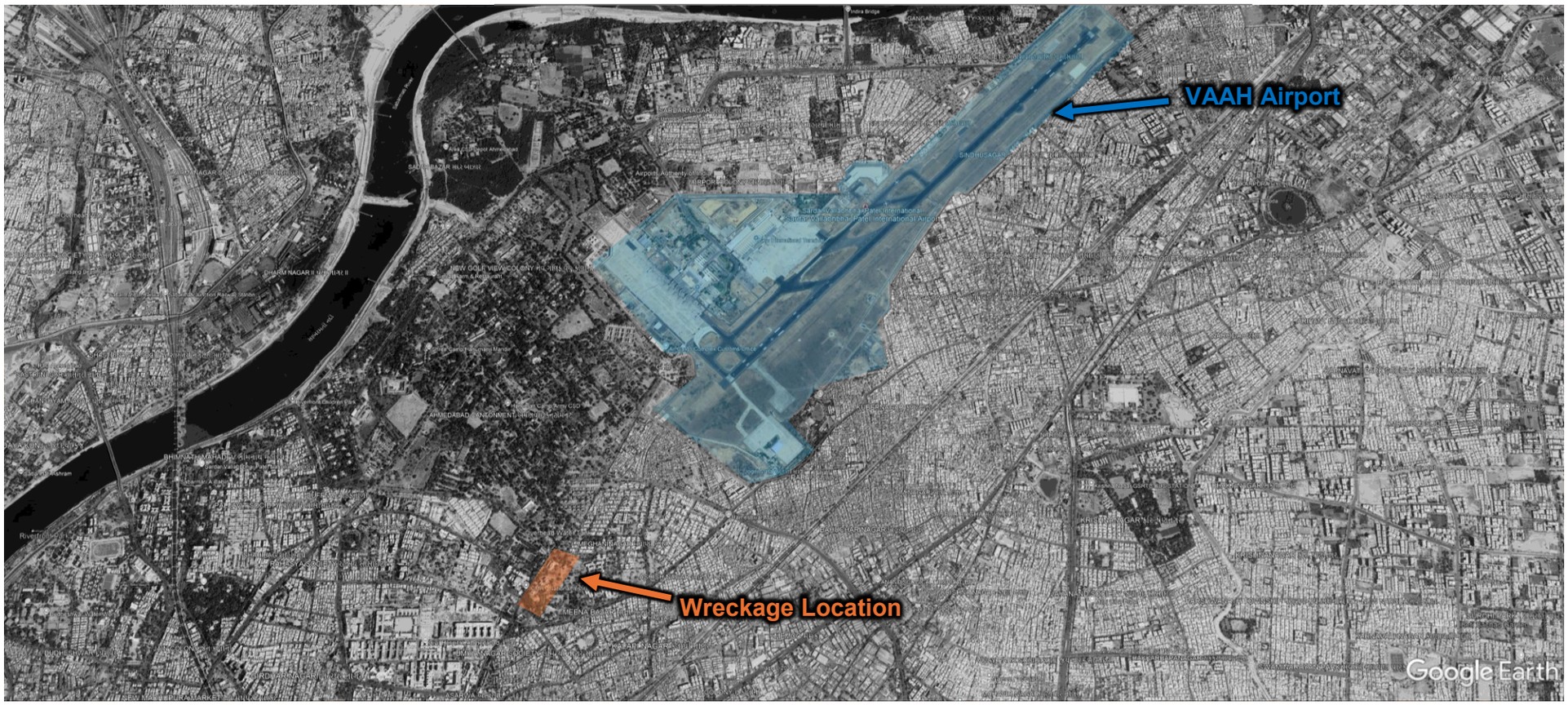
Date	Time	Description	Source, Notes
June 12, 2025	5:47:00 AM	VT-ANB (airplane registration) arrived at Ahmedabad airport as Air India Flight 423 from Delhi	Preliminary Report
		Parked at Bay 34	Preliminary Report
		Crew of previous flight (Air India flight 423) made a Pilot Defect Report (PDF) for STAB POS XDCR	Preliminary Report
	6:40:00 AM	Troubleshooting carried out, and aircraft released	Preliminary Report
		Crew for flight Air India 171 arrived at airport	Preliminary Report
	6:25:00 AM	Crew underwent preflight breath analyzer testing	Preliminary Report
		Crew released and deemed fit to operate for the flight	Preliminary Report
	7:05:00 AM	Crew arrived at boarding gate	Preliminary Report - CCTV
	7:43:13 AM	Air Traffic Control (ATC) approved pushback and startup	Preliminary Report
	7:48:38 AM	Air India departed from bay 34	Preliminary Report
	7:49:12 AM	ATC queried if the aircraft required full length of the runway.	Preliminary Report
		The aircraft confirmed requirement of full length of RUNWAY 23	Preliminary Report
	7:55:15 AM	Air Flight 171 requested and received taxi clearance	Preliminary Report
	7:56:08 AM	Air India Flight 171 left bay 34 at airport	Preliminary Report
	8:02:03 AM	The aircraft was transferred from Ground to Tower Control.	Preliminary Report
	8:03:45 AM	The aircraft was instructed to line up on the Runway 23.	Preliminary Report
	8:07:33 AM	Air India Flight 171 received take-off clearance, Wind 240˚/06 kts	Preliminary Report
	8:07:37 AM	Air India Flight 171 began roll for takeoff	Preliminary Report
	8:08:33 AM	Aircraft achieved V1 speed (153 kts Indicated Air Speed)	Preliminary Report - EAFR
	8:08:35 AM	Aircraft achieved VR (rotate) speed (155 kits IAS)	Preliminary Report - EAFR
	8:08:39 AM	Aircraft air/ground sensors transitioned to air mode, consistent with liftoff	Preliminary Report - EAFR
	8:08:42 AM	**Aircraft achieved maximum recorded airspeed at 08:08:42**	Preliminary Report - EAFR
		Fuel Cutoff switch 1 (Engine 1 - left side) moved to "CUTOFF" position from "RUN"	Preliminary Report - EAFR
	+ 01 seconds	**Fuel Cutoff switch 2 (Engine 2 - right side) moved to "CUTOFF" position from "RUN"**	Preliminary Report - EAFR
		Ram Air Turbine (RAT) deployed	Preliminary Report - CCTV
	8:08:47 AM	RAT began supplying hydraulic power	Preliminary Report - EAFR
	8:08:52 AM	**Fuel Cutoff switch 1 (Engine 1 - left side) moved to "RUN" position**	Preliminary Report - EAFR
	8:08:54 AM	Auxiliary Power Unit inlet door began opening	Preliminary Report - EAFR
	8:08:56 AM	**Fuel Cutoff switch 2 (Engine 2 - right side) moved to "RUN" position**	Preliminary Report - EAFR
	8:09:05 AM	One of the pilots transmitted "MAYDAY MAYDAY MAYDAY"	Preliminary Report
	8:09:07 AM	**Air India Flight 171 crashes into BJ Medical College Hostel, 0.9 Nautical Miles from the departure end of Runway 23**	Preliminary Report

Blue: Significant item related to the event
Red: Incident

Photos



Picture 1: Air India 171 wreckage and building airport
Credit: AAIB



Picture 2: Orientation of Sadar Vallabhbhai Patel International Airport (VAAH) and wreckage location
Credit: Google Earth, annotations by ThinkReliability

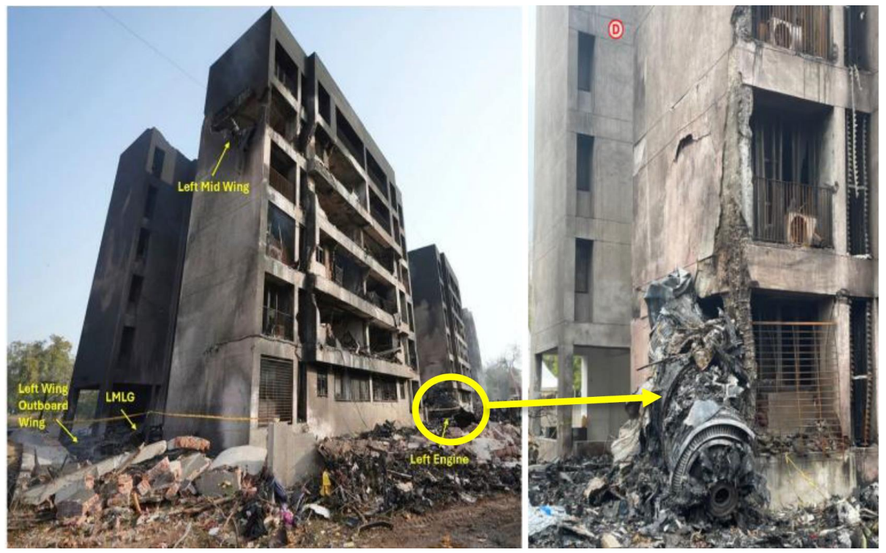
Photos



Picture 3: Wreckage layout from AI171 impact to the BJ Medical College hostel. Damaged buildings labeled for reference
Credit: Picture and annotations by AAIB



Picture 4: AI171 tail section inbedded in Building A
Credit: Picture and annotations by AAIB



Picture 5: AU171 left engine, separated from the airplane, striking north corner of Building D
Credit: Picture and annotations by AAIB



Picture 6: AI171 vertical stablizer adjacent to Building A
Credit: Picture and annotations by AAIB

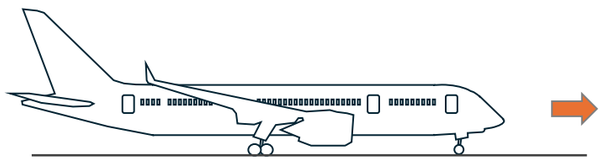


Picture 7-9: AI171 nose landing gear found near building A
Credit: AAIB

Diagrams

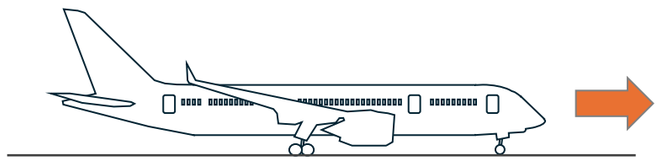
1 **8:0:37 AM**

Air india Flight 171 began roll on runway, full throttle



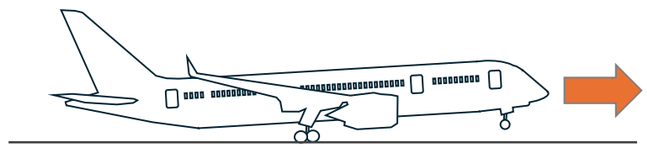
2 +56 seconds **8:07:33 AM**

AI171 reached 153 kts (V1 speed, at which the takeoff should no longer be aborted)



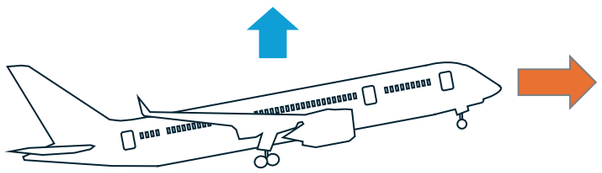
3 +2 seconds **8:07:35 AM**
+58 seconds after roll

AI171 reached 155 kts (VR Speed, at which the pilot begans to apply control inputs, causing the aircraft nose to pitch up, after which it will leave the ground)



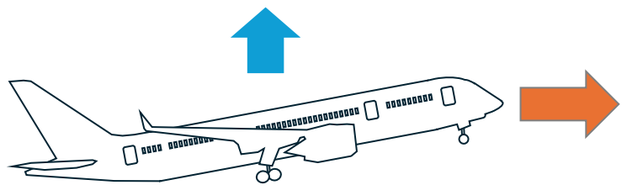
4 +4 seconds **8:08:39 AM**
+62 seconds after roll

AI171 air / ground sensors transitioned to air mode, consistent with liftoff



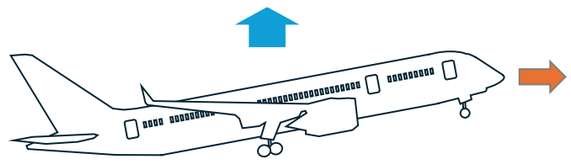
5 +3 seconds **8:08:42 AM**

AI171 reaches maximum recorded airspeed of 180 kts



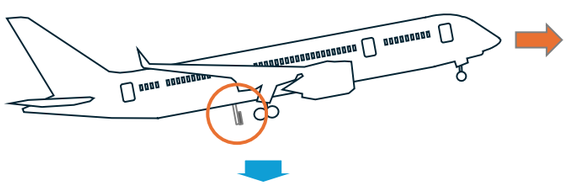
6 Immediately after **8:08:42 AM**
+3 seconds after takeoff

Fuel cutoff switches 1 & 2 moved to "CUTOFF" position from "RUN". Plane abruptly begins slowing



7 +5 seconds **8:08:47 AM**
+8 seconds after take off

Ram air turbine deployed, supplying hydrailic pressure to airplane

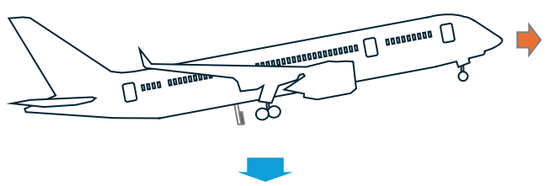


8 +5 seconds **8:08:52 AM**
+13 seconds after take off

Fuel Cutoff 1 switch moved to RUN position,

+9 seconds
+17 seconds after take off

Fuel Cutoff 2 switch moved to RUN position



9 + 9 seconds **8:09:01 AM**
+26 seconds after takeoff

Pilots transmitted "MAYDAY MAYDAY MAYDAY", pilots attempt pulling up.

+ 11 seconds **8:09:03 AM**
+28 seconds after take off.

Air India impacts the BJ medical college hostel at an 8 degree

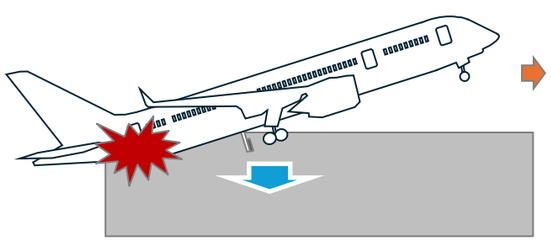
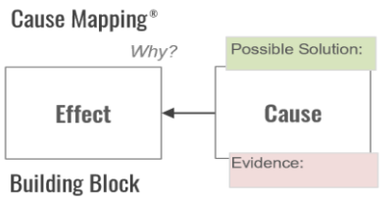


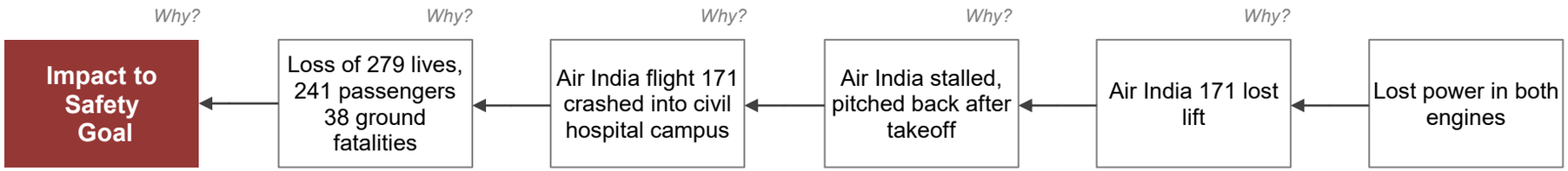
Diagram 1: Sequence diagram of takeoff and subsequent crash into the building
Credit: Diagram and annotations by ThinkReliability

Air India Flight 171 Crash, loss of 279 lives



A 5-Why Cause Map is a starting point for the cause analysis. It provides a basic understanding of the initial causes the produced the incident. While the 5-Why below is accurate, it only represents a partial explanation of the causes that produced the incident. Starting with the 5-Why provides a baseline understanding that can then be expanded as needed to reveal additional causes that contributed to the incident.

Cause Map™ Diagram



How To Read a 5-Why Cause Map™ Diagram

This 5-Why Cause Map starts with a Safety goal being impacted and is then read left to right by asking Why? Questions. For example:

Why did we have an impact to our safety goal?
Because there were 279 fatalities, 241 people on the Air India 171 flight, and 38 civilians on the ground

Why were there 279 fatalities?
Because Air India flight 171 crashed into a civil hospital campus

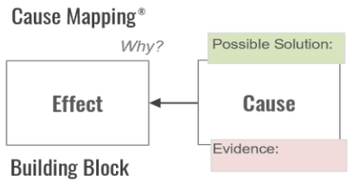
Why did Air India flight 171 crash into a civil hospital campus?
Because Air India flight 171 stalled, pitched back after takeoff.

Why did Air India flight 171 stalled, pitched back after takeoff?
Because Air India flight 171 lost lift.

Why wadid Air India flight 171 lose lift?
Because the airplane lost power in both engines.

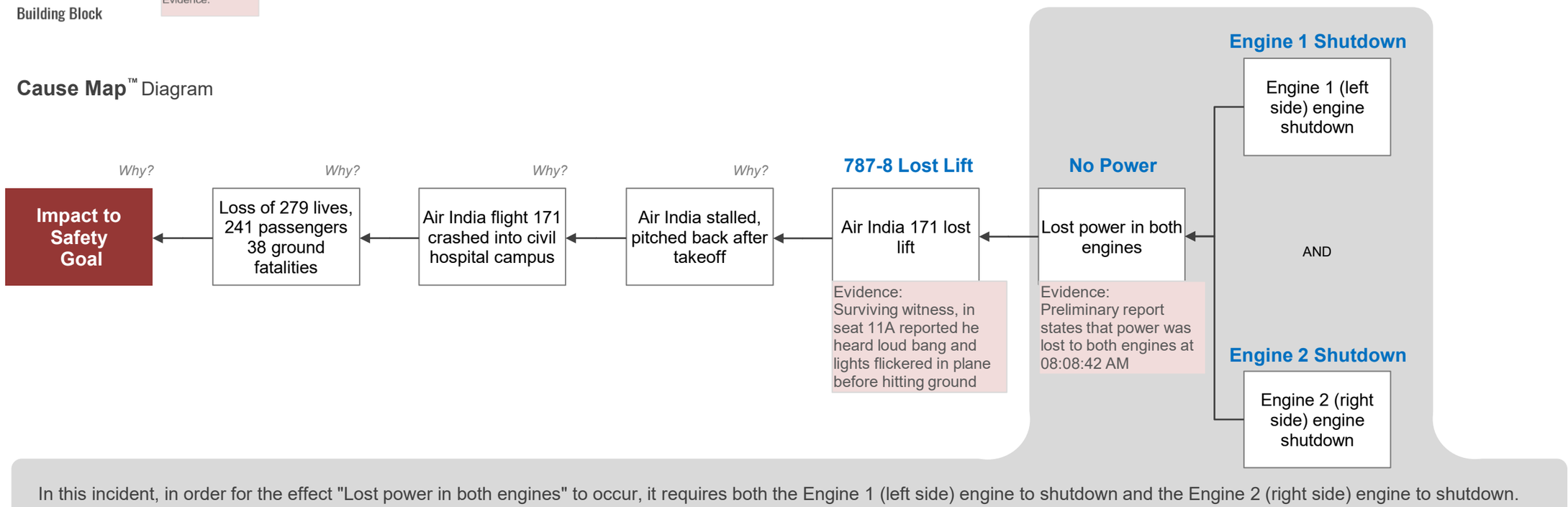
As mentioned above, this is a partial explanation of the event, the subsequent pages will continue to dive into the depth associated with this incident so we can better understand what happened in this case.

Air India Flight 171 Crash, loss of 279 lives



As the Cause Map begins to expand, its common that more than one cause is required to produce the effect. The value of expanding the cause map, is that the more AND relationships that are revealed, the more layers of protection are revealed to implement to lower the risk of the event occurring again

Cause Map™ Diagram



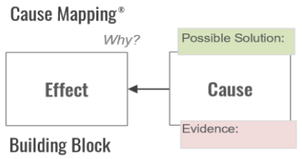
In this incident, in order for the effect "Lost power in both engines" to occur, it requires both the Engine 1 (left side) engine to shutdown and the Engine 2 (right side) engine to shutdown.

This cause and effect relationships reads ....
Air India 171 lost power in both engines because Engine 1 (left side) engine shutdown AND Engine 2 (right side) engine shutdown.

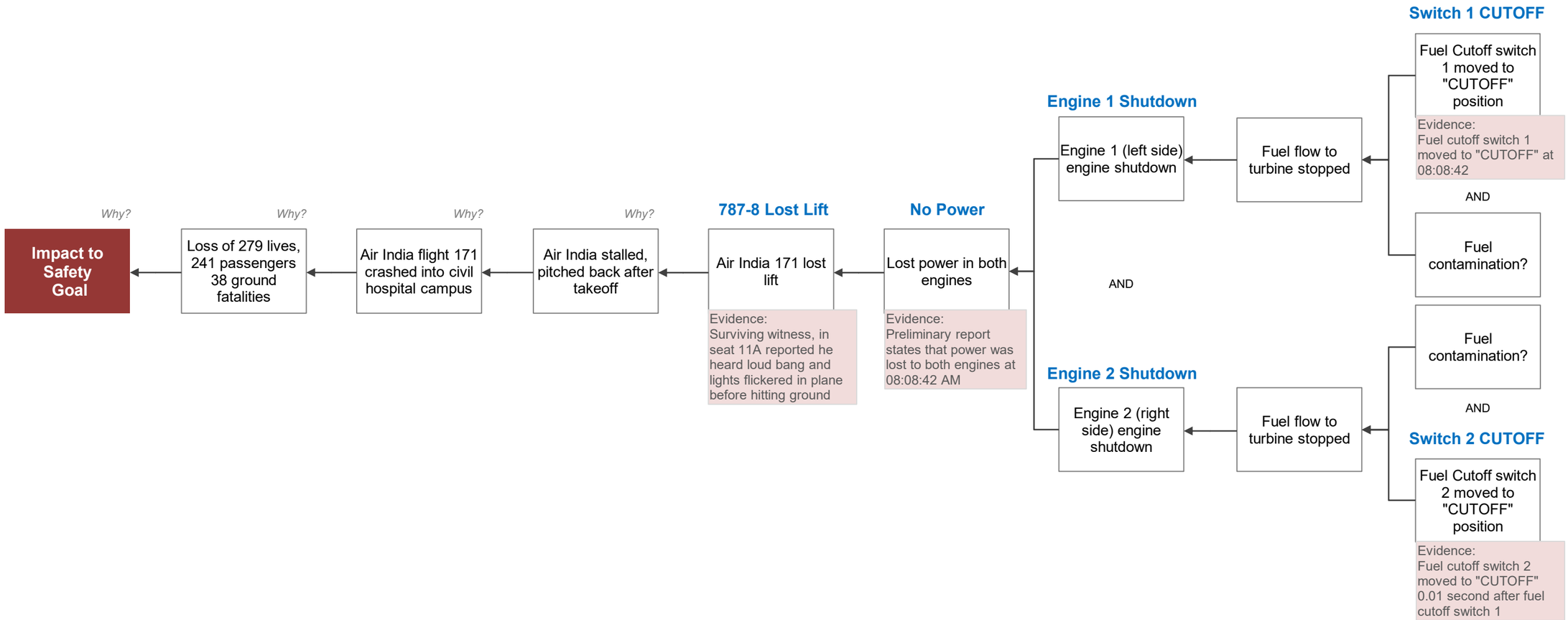
Because of this relationship, we can either control or change either of Engine 1 or Engine 2 to not shutdown to lower the risk of this incident occurring again.

The subsequent Cause Maps will continue to ask the "Why" question to try and reveal more causes related to this incident

Air India Flight 171 Crash, loss of 279 lives



Cause Map™ Diagram



Air India Flight 171 Crash, loss of 279 lives

Cause Mapping®

Why? | Possible Solution:

Effect ← Cause

Evidence:

Building Block

Cause Map™ Diagram

Why? Why? Why? Why?

Impact to Safety Goal ← Loss of 279 lives, 241 passengers 38 ground fatalities ← Air India flight 171 crashed into civil hospital campus ← Air India stalled, pitched back after takeoff ← **787-8 Lost Lift**: Air India 171 lost lift ← **No Power**: Lost power in both engines

Evidence: Surviving witness, in seat 11A reported he heard loud bang and lights flickered in plane before hitting ground

Evidence: Preliminary report states that power was lost to both engines at 08:08:42 AM

AND

Engine 1 Shutdown: Engine 1 (left side) engine shutdown ← Fuel flow to turbine stopped

Engine #1 Turbine Shutdown

AND

Switch 1 CUTOFF: Fuel Cutoff switch 1 moved to "CUTOFF" position

Evidence: Fuel cutoff switch 1 moved to "CUTOFF" at 08:08:42

Fuel contamination?

AND / OR

Moved by Pilot: Moved by pilot to "CUTOFF" position?

Unintentional: Unintentional movement of switch to "CUTOFF"?

Evidence: Pilot flying stated that he did not move the switch

OR

Intentional: Intentional movement of switch to "CUTOFF"?

Evidence: Cutoff switches were moved 1 second after each other, not simultaneously.

Vibrated to "CUTOFF" position?

AND / OR

Hit by loose object in cockpit?

Evidence: Cockpit voice recording asking "why did he cutoff"

AND

Switch Lock: Locking Mechanism Ineffective?

Installed improperly?

OR

Locking mechanism worn out?

AND

Locking mechanism not replaced

Engine #2 Turbine Shutdown

Engine 2 Shutdown: Engine 2 (right side) engine shutdown ← Fuel flow to turbine stopped

AND

Fuel contamination?

Switch 2 CUTOFF: Fuel Cutoff switch 2 moved to "CUTOFF" position

Evidence: Fuel cutoff switch 2 moved to "CUTOFF" 1 second after fuel cutoff switch 1 at 08:08:43

Vibrated to "CUTOFF" position?

AND / OR

Moved by Pilot: Moved by pilot to "CUTOFF" position?

Unintentional: Unintentional movement of switch to "CUTOFF"?

Evidence: Pilot flying stated that he did not move the switch

OR

Intentional: Intentional movement of switch to "CUTOFF"?

Evidence: Cutoff switches were moved 1 second after each other, not simultaneously.

Hit by loose object in cockpit?

Evidence: Cockpit voice recording asking "why did he cutoff"

AND

Switch Lock: Locking Mechanism Ineffective?

Installed improperly?

OR

Locking mechanism worn out?

AND

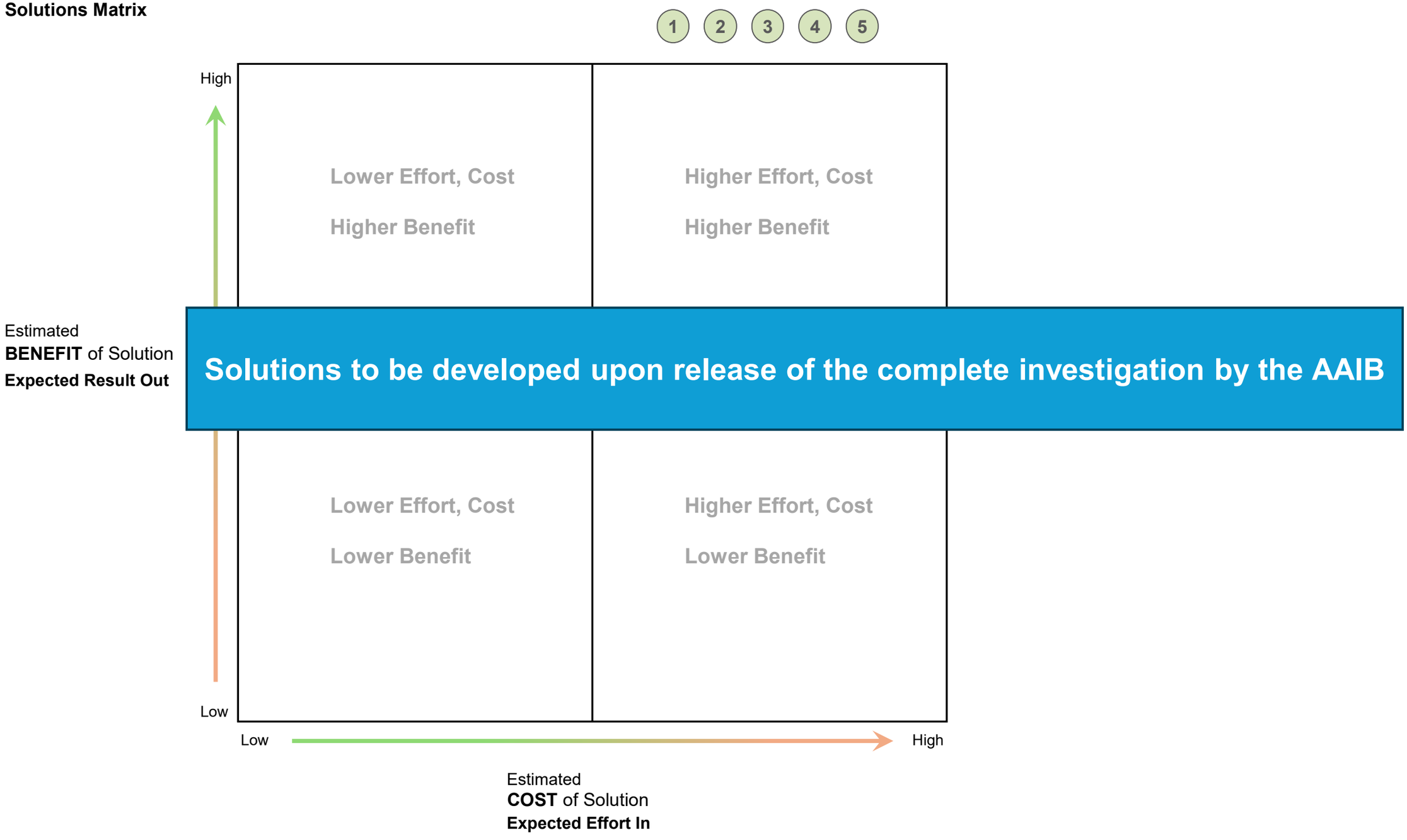
Locking mechanism not replaced

Solutions

Ref.	Possible Solution	Cause	Work Process, Task	Rationale	Specific Action	Owner	Due Date
1							
2							
3							

Solutions to be developed upon release of the complete investigation by the AAIB

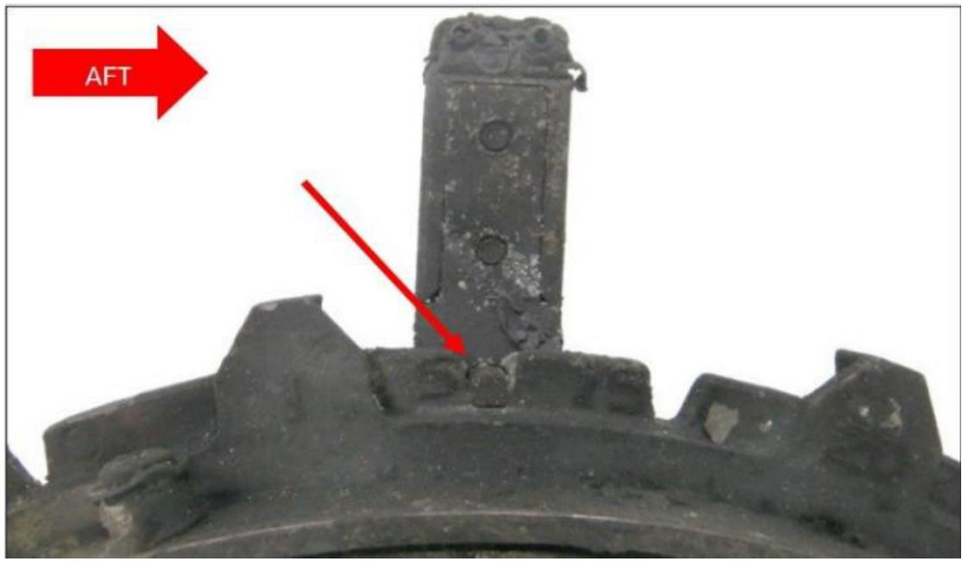
Solutions Matrix



Appendix:
Supporting Evidence for Investigation

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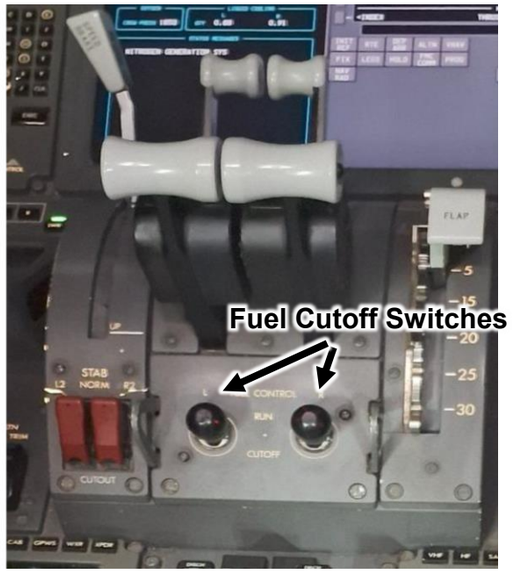
Photos



Picture 10: As found flap handle assembly, which sustained significant thermal damage. The handle was found to be firmly seated in the 5-degree flap position, consistent with normal takeoff setting
Credit: Picture and annotations by AAIB



Picture 11: As found throttle quadrant showing the position of the fuel control switches in "RUN" position
Credit: Picture and annotations by AAIB



Picture 12: Example 787-8 Dreamliner throttle quadrant showing fuel control switches
Credit: Picture by AAIB, annotations by ThinkReliability

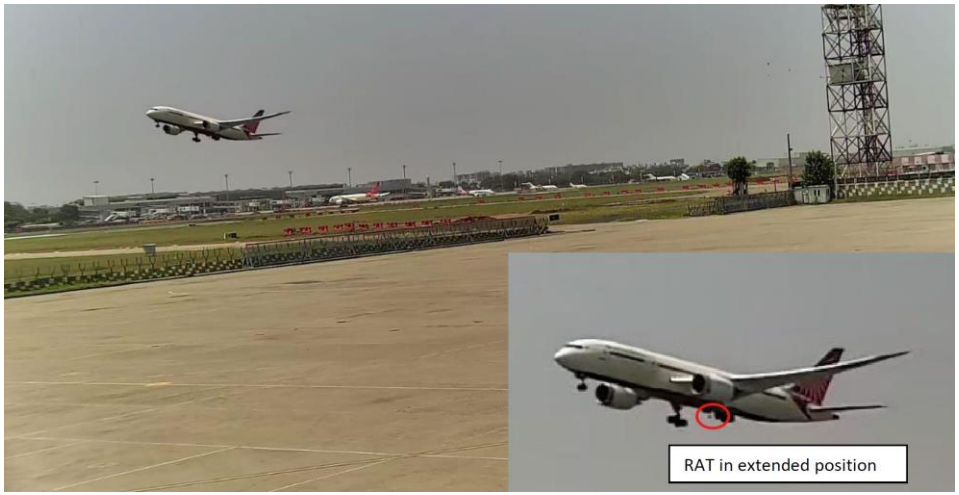


Picture 13: As found landing gear lever, located in the down position
Credit: AAIB



Picture 14: Example 787-8 Dreamliner gear lever control panel
Credit: AAIB

Photos



Picture 15: Air India 171 during initial takeoff, highlighting RAT in extended position
Credit: Picture and annotations by AAIB

FAA
Aviation Safety

SPECIAL AIRWORTHINESS INFORMATION BULLETIN

SAIB: NM-18-33
Date: December 17, 2018

SUBJ: Engine Fuel and Control

This is information only. Recommendations aren't mandatory.

Introduction

This Special Airworthiness Information Bulletin (SAIB) is to advise registered owners and operators of **The Boeing Company Model 717-200 airplanes; Model 737-700, -700C, -800, and -900ER series airplanes; Model 737-8 and -9 airplanes; Model 747-400, -400D, -400F, -8, and -8F series airplanes; Model 757-200, -200CB, -200PF, and -300 series airplanes; Model 767-200, -300, -300F, -400ER, and -2C series airplanes; Model 787-8, -9, and -10 airplanes; Model MD-11 and MD-11F airplanes; and Model MD-90-30 airplanes** of the potential for disengagement of the fuel control switch locking feature.

Based on an assessment utilizing the limited data currently available at this time, the airworthiness concern is not an unsafe condition that would warrant airworthiness directive (AD) action under Title 14 of the Code of Federal Regulations (14 CFR) part 39. The FAA will continue to monitor this issue.

Background

The Boeing Company (Boeing) received reports from operators of Model 737 airplanes that the fuel control switches were installed with the locking feature disengaged. The fuel control switches (or engine start switches) are installed on the control stand in the flight deck and used by the pilot to supply or cutoff fuel to the engines. The fuel control switch has a locking feature to prevent inadvertent operation that could result in unintended switch movement between the fuel supply and fuel cutoff positions. In order to move the switch from one position to the other under the condition where the locking feature is engaged, it is necessary for the pilot to lift the switch up while transitioning the switch position. If the locking feature is disengaged, the switch can be moved between the two positions without lifting the switch during transition, and the switch would be exposed to the potential of inadvertent operation. Inadvertent operation of the switch could result in an unintended consequence, such as an in-flight engine shutdown.

Boeing informed the FAA that the fuel control switch design, including the locking feature, is similar on various Boeing airplane models. The table below identifies the affected airplane models and related part numbers (P/Ns) of the fuel control switch, which is manufactured by Honeywell.

Airplane Model	Honeywell P/N
717-200	3TL32-2-3D
737-700, -700C, -800, and -900ER	766AT613-3D
737-8 and -9	766AT613-3D
747-400, -400D, and -400F	3TL32-3D
747-400, -400D, -400F, -8, and -8F	4TL32-3D
757-200, -200CB, -200PF, and -300	3TL32-12A
767-200, -300, -300F, and -400ER	3TL32-3D
767-2C	50075622-001
787-8, -9, and -10	4TL837-3D
MD-11 and MD-11F	3TL32-1-3D
MD-90-30	3TL32-2-3D

Recommendations

The FAA recommends that all owners and operators of the affected airplanes incorporate the following actions at the earliest opportunity:

1) Inspect the locking feature of the fuel control switch to ensure its engagement. While the airplane is on the ground, check whether the fuel control switch can be moved between the two positions without lifting up the switch. If the switch can be moved without lifting it up, the locking feature has been disengaged and the switch should be replaced at the earliest opportunity.

2) For Boeing Model 737-700, -700C, -800, and -900ER series airplanes and Boeing Model 737-8 and -9 airplanes delivered with a fuel control switch having P/N 766AT613-3D: Replace the fuel control switch with a switch having P/N 766AT614-3D, which includes an improved locking feature.

We request that owners and operators report any failure of the locking feature of the fuel control switch to Boeing (see contact information provided below). The report should include the date the failure occurred, the fuel control switch P/N, airplane model, airplane serial number, and airplane registration number. Under the provisions of the Paperwork Reduction Act (44 U.S.C. 3501 et seq.), the Office of Management and Budget (OMB) has approved the information collection contained in this SAIB, and assigned OMB Control Number 2120-0731.

For Further Information Contact

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For Related Service Information Contact

Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminster Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717.

Document 1: FAA SAIB NM-18-33 bulletin regarding the fuel control switches installed on Boeing 737, 747, 757, 767, 787, and MD-11 and MD-90's.
Credit: FAA, highlights by ThinkReliability

References

Title	Source	Format	Note	Link
Air India 171 Preliminary Report	Aircraft Accident Investigation Bureau	PDF	Preliminary Report into AI 171	https://aaib.gov.in/What's%20New%20Assets/Preliminary%20Report%20VT-ANB.pdf