

Cause Mapping®

Thank you for taking time to review our current understanding of the DCA mid air collision.

This document is a sample of a ThinkReliability incident analysis report, offering a comprehensive view of the DCA mid air collision. 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
- Technical RCA guidance and expertise
- Neutral third-party perspective for multi-departmental or multi-company investigations
- Efficient RCA execution, minimizing time and manpower demands
- Capability to manage complex investigations seamlessly
- Expert facilitation of RCA interviews and meetings
- Support in organizing and presenting RCA findings
- Experience in handling Privileged and Confidential investigations
- Clear communication of RCA outcomes to management

If you'd like to explore how we can assist with your incident investigations, call our office (281-412-7766) or submit a



Download a copy of this template for yourself

The graphic features a green background with a white circle containing a Microsoft Excel icon. Below the icon, the text reads "Cause Mapping® Investigation Template" in white, followed by "Investigate, Document and Present All in One, 20-Worksheet File" in a smaller font. At the bottom, there is a white button with the text "DOWNLOAD".

Watch the 45-minute webinar review of this case study

The graphic has a blue background with a white circle containing a play button icon. Below the icon, the text reads "Facilitating and Documenting a Root Cause Analysis (RCA)" in white. Underneath, it says "Explore Cause Mapping RCA with this 45-minute webinar using this case study" in a smaller font. At the bottom, there is a white button with the text "LEARN MORE".

Try it out! Have us build a similar report for your incident

The graphic has a grey background with a white circle containing a grid of colored dots (blue, green, and grey). Below the icon, the text reads "ThinkReliability Facilitation Services" in white. Underneath, it says "Root cause analysis experts helping to investigate your incidents" in a smaller font. At the bottom, there is a white button with the text "LEARN MORE".

Need Help 281-412-7766, info@thinkreliability.com

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American Airlines 5342 Mid-Air Collision

Location of Incident	Reagan National Airport
Date of Incident	January 29, 2025
Date of Report	DRAFT - March 10, 2025

Cause Mapping®



SUMMARY FILE - Contents

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Prepared by: Ben Dellsperger, *ThinkReliability*

Incident Description

For a more detailed sequence of events, see Timeline.

On January 29, 2025, at 8:47 p.m., a PSA Airlines Bombardier CRJ700 (American Airlines Flight 5342) and a U.S. Army Sikorsky UH-60 Black Hawk collided midair over the Potomac River near Ronald Reagan Washington National Airport, killing 67 people.

Problem Outline

		American Airlines 5342 Mid-Air Collision	
What	Problem(s)	Mid-air collision, CRJ-700 and UH-60 in same airspace	
	When	Date	January 29, 2025
		Time	8:47 PM
Where	Different, unique, abnormal	ATC changed arrival runway from 01 to 33 before flight, busy airspace, UH-60 Blackhawk performing night ops check ride	
	Facility, site, location	Reagan National Airport	
	Unit, area	Final Approach Runway 33	
	Equipment, tools	CRJ-700, UH-60, ATC command	
	Task(s), operation being done	Landing Runway 33 at DCA	
			} <i>Diagrams, Photos</i>
			} <i>Process Map</i>
Impact to Goals		<i>Quantify the specific negative consequence to each one below</i>	
Safety		67 fatalities, 64 on CRJ-700, 3 on UH-60 Helicopter	
Environmental		Aircraft Debris in Potomac River	
Customer		Loss of confidence in Commercial Aviation?	
Production, Schedule		Shutdown of runway 15/33 DCA Airport for 13 days	
Equipment, Property		Complete loss of CRJ-700	
Labor, Time		Complete loss of UH-60	
			\$ 23,000,000
		2 weeks of clean up	
		This incident	
Frequency	1x commercial mid air collision, 13 mid air collisions in US since 2000, highest consequence US aviation since 2001 American Airlines flight 587, killing 265.		

American Airlines 5342 Mid-Air Collision

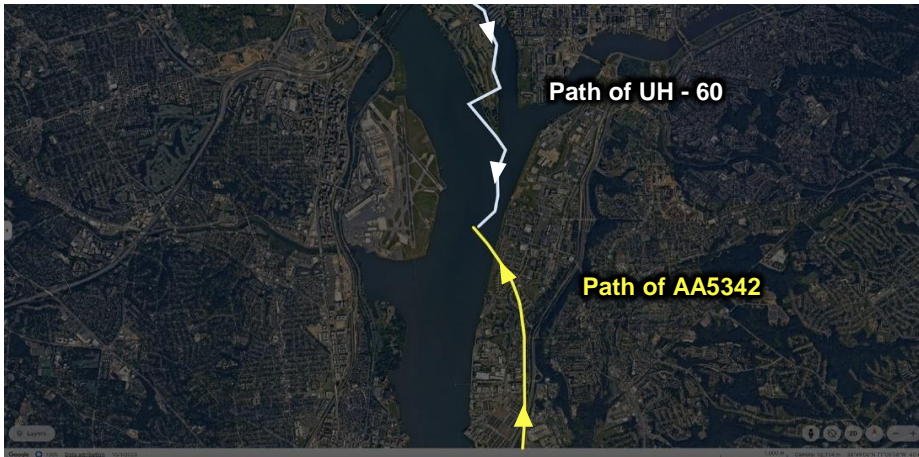
Date	Time	Description	Altitude Readings		Source, Reference, Note
			AA5342	UH-60	
January 29, 2025	5:18 PM CDT	American Flight 5342 (CRJ-700) departs Dwight D. Eisenhower National Airport in Wichita.			Flight Radar 24
	8:15 PM EST	AA5342 left 37,000 feet pressure altitude for an initial decent	37,000 ft		AA5342 FDR
	~ 8:30:00 PM	Blackhawk Helicopter (UH-60) began traveling generally southbound after maneuvering near Laytonsville, Maryland Cockpit Voice Recorder (CVR) from the UH-60 indicated the instructor pilot was the pilot monitoring and transmitting on the radio, and the pilot was the pilot flying			Blackhawk FDR ATC Radar Blackhawk CVR
	8:33 PM	the UH-60 crew requested helicopter route 1 to 4 to davidson army air field Air Traffic Controller (ATC) Approved			ATC Radar
	8:38 PM	The UH-60 reached the intersection of the DC Beltway and the Potomac River After briefly turning westbound, the Blackhawk turned back to the east Blackhawk began descending as it picked up Helicopter route 1			Blackhawk FDR Blackhawk FDR Blackhawk FDR
	8:39:10 PM	ATC cleared AA5342 for the Visual approach to runway 01	4,000 ft		AA5342 CVR
	8:40:46 PM	AA5342 rolled out of a left turn, and established on the ILS localizer for Runway 01	3,850 ft		AA5342 FDR
	8:43:06 PM	AA5342 made Initial contact with DCA ATC tower ATC requested AA5342 to land runway 33 AA5342 confirmed land runway 33	3,745 ft		AA5342 CVR AA5342 CVR AA5342 CVR
	8:43:48 PM	UH-60 located about 1.1 Nautical miles west of the key bridge, pilot flying indicated 300 ft. Instructor pilot indicated they were at 400 ft. Discrepancy not noted in the cockpit	2,778 ft	300 - 400 ft	Blackhawk CVR Blackhawk CVR Blackhawk CVR
	8:44:27 PM	The Blackhawk approached the key bridge, the instructor pilot indicated the Blackhawk was at 300 ft and descending to 200 ft		300 ft	Blackhawk CVR
	8:44:49 PM	AA5342 approximately 6.2 miles from the airport, landing gear deployed and plane fully configured for landing	2,000 ft		AA5342 FDR
	8:45:27 PM	AA5342 Autopilot disconnected, located 5 nautical miles south of airport	1,575 ft		AA5342 FDR
	8:45:30 PM	UH-60 passed over the memorial bridge, instructor pilot told the pilot flying they were at 300 ft and needed to descend to 200 ft	1,525 ft	300 ft	Blackhawk CVR
	8:45:58 PM	UH-60 crossed over the Washington tidal basin and followed the channel on route 1			ATC Radar
	8:46:01 PM	ATC to UH-60 informing that traffic just south of bridge CRJ-700 at 1000ft to land runway 33	1,100 ft		Blackhawk CVR
	8:46:08 PM	UH-60 crew responded they had traffic in sight and requested visual separation Visual separation approved by DCA Tower			Blackhawk CVR Blackhawk CVR
	8:46:29 PM	AA5342 Crew received automated 1000 ft elevation notification	1,000 ft	~300 ft	AA5342 FDR
	8:46:47 PM	DCA tower cleared other jet traffic on runway 01 with no delay			ATC Radar
	8:47:27 PM	UH-60 passed the southern tip of Hains Point		~300 ft	Blackhawk FDR
	8:47:28 PM	AA5342 began left roll to turn to runway 33, 133 kts	516 ft		AA5342 FDR
	8:47:29 PM	Crew received automated 500 ft elevation notification	500 ft	~300 ft	AA5342 FDR
	8:47:39 PM	Radio transmission from DCA ATC asking UH-60 if they had the CRJ in sight			Blackhawk CVR

CVR - Cockpit Voice Recorder
FDR - Flight Data Recorder
ATC - Air Traffic Control

American Airlines 5342 Mid-Air Collision

Date	Time	Description	Altitude Readings		Timeline
			AA5342	UH-60	Source, Reference, Note
	8:47:40 PM	UH-60 Crew received automated "traffic, traffic, traffic" notification from the Traffic Alert and Collision Avoidance System (TCAS)			Blackhawk FDR
	8:47:42 PM	DCA ATC advised UH-60 to pass behind CRJ CVR data from the Blackhawk indicated that the portion of the transmission "pass behind the" may not have been received			Blackhawk CVR Blackhawk CVR
	8:47:44 PM	UH-60 crew indicated that traffic was in sight and requested visual separation Visual Separation approved by the DCA tower UH-60 pilot monitoring told pilot flying they believed ATC was asking for the UH-60 to move left towards the east bank of the Potomac			Blackhawk CVR Blackhawk CVR Blackhawk CVR
	8:47:52 PM	AA5342 rolled out on final for runway 33, 143 kts	344 ft	278 ft	AA5342 FDR
	8:47:58 PM	AA5342 crew had verbal reaction, CRJ-700 began to increase pitch, elevators at maximum		278 ft	AA5342 CVR
	8:47:59 PM	Sounds of impact audible UH-60 and CRJ-700 collide mid air	313 ft	278 ft	AA5342 CVR

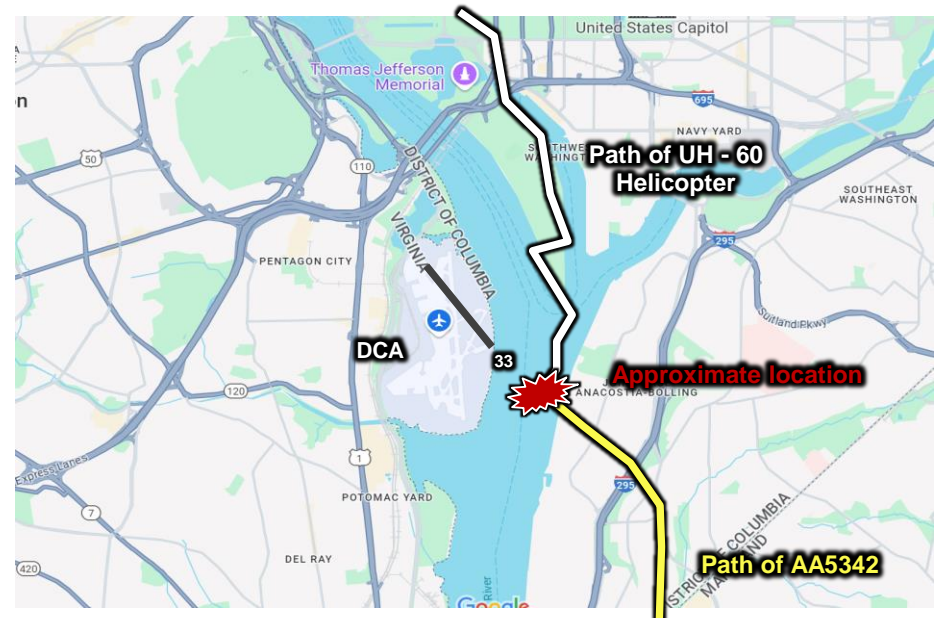
Diagrams



Top down view of AA5342 and UH-60 from top down - Credit Google Earth

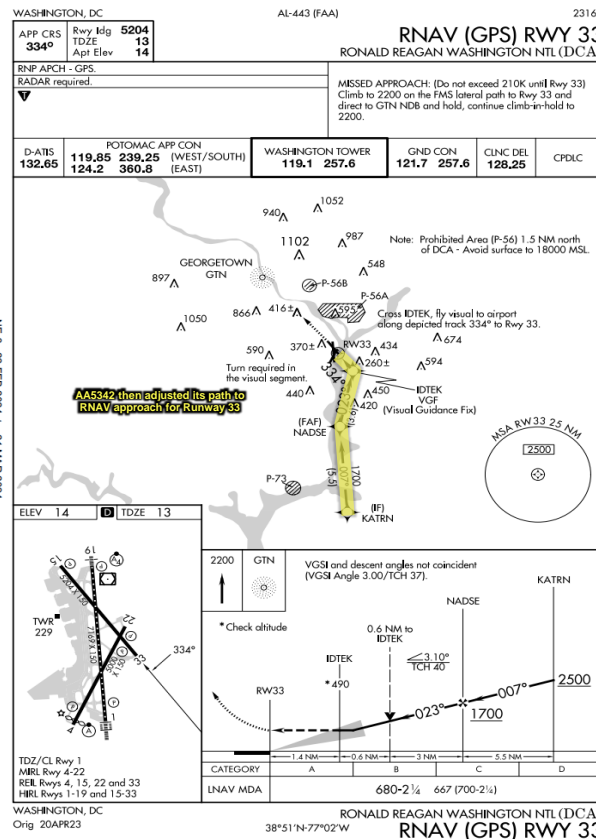
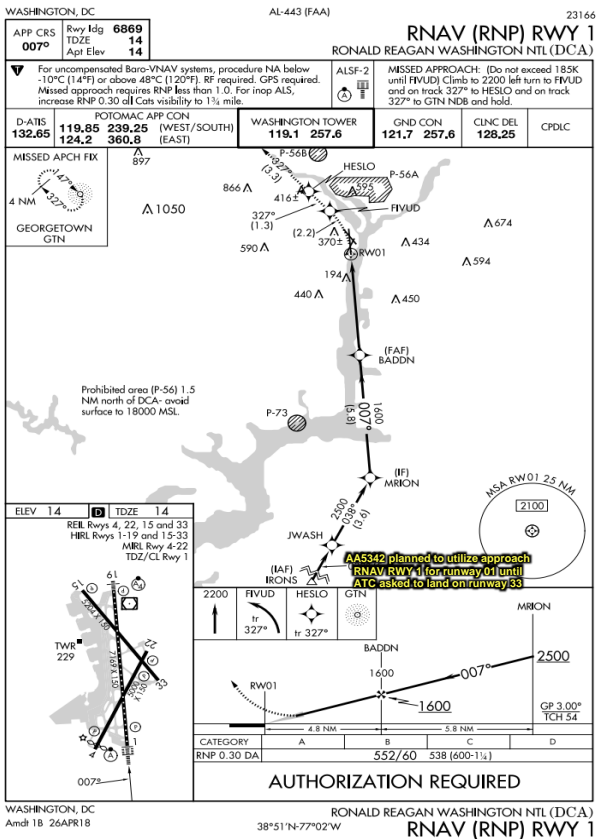
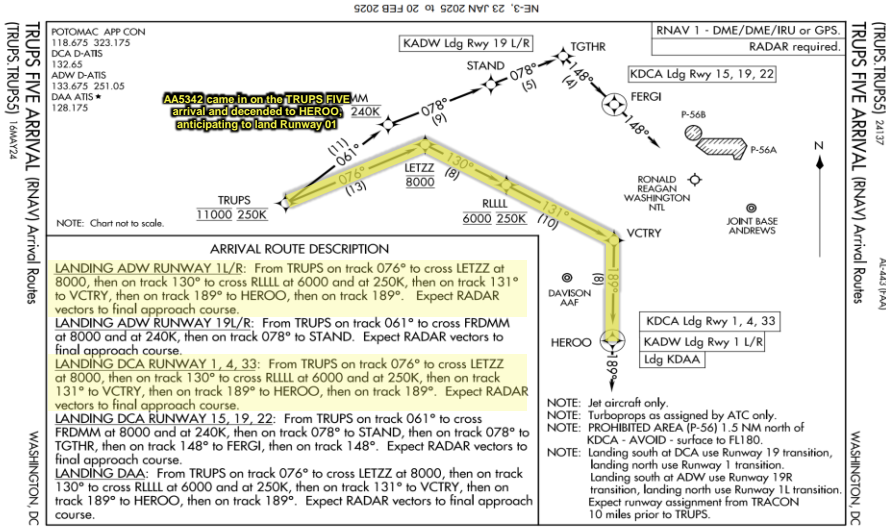


Isometric view of AA5342 and UH-60 - Credit Google Earth

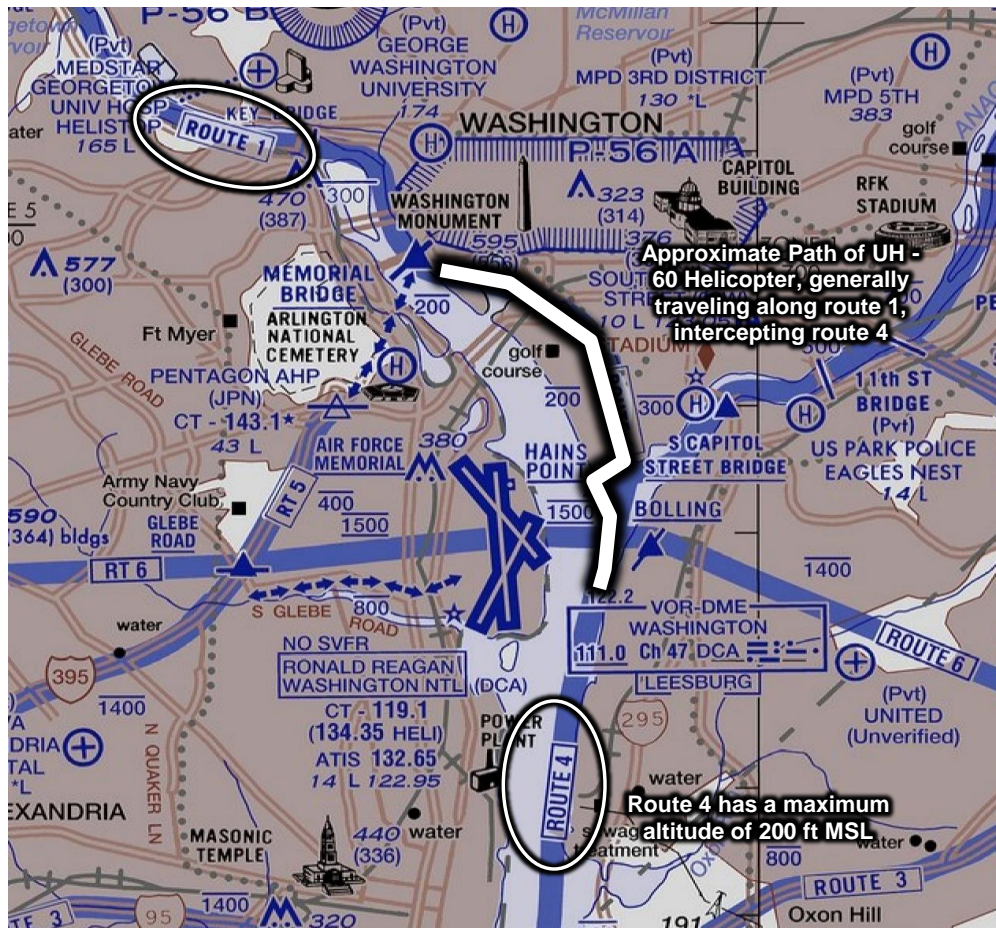


Map of both paths overlaid on Google Maps - Credit Google Maps

Diagrams



Diagrams



RT 1: AMERICAN LEGION BRIDGE OVER POTOMAC RIVER, EAST OF ROOSEVELT ISLAND TO THE TIDAL BASIN. OVER WASHINGTON CHANNEL TO ANACOSTIA RIVER. NORTHEAST OVER ANACOSTIA RIVER TO RIVERDALE AND VIA BALTIMORE WASHINGTON PARKWAY TO GREENBELT.

ALTITUDES: AMERICAN LEGION BRIDGE AT OR BELOW 1300 FEET MSL, CHAIN BRIDGE AT OR BELOW 700 FEET MSL, KEY BRIDGE AT OR BELOW 300 FEET MSL, MEMORIAL BRIDGE AT OR BELOW 200 FEET MSL NOT ABOVE 200 FEET MSL UNTIL JAMES CREEK MARINA, AT OR BELOW 300 FEET MSL TO 11TH STREET BRIDGE, AT OR BELOW 500 FEET MSL TO PENNSYLVANIA AVENUE, AT OR BELOW 700 FEET MSL FROM PENNSYLVANIA AVENUE TO RIVERDALE, AT OR BELOW 1300 FEET MSL TO GREENBELT. (HELICOPTERS CROSSING POTOMAC RIVER TO OR FROM THE PENTAGON SHALL BE AT OR BELOW 200 FEET MSL).

RT. 4: FORT WASHINGTON OVER POTOMAC RIVER TO WILSON BRIDGE. THEN VIA EAST BANK OF POTOMAC RIVER TO ANACOSTIA RIVER. INTERCEPT ROUTE 1 AT ANACOSTIA RIVER.

ALTITUDES: AT OR BELOW 1000 FEET MSL AT FORT WASHINGTON, DESCEND TO 600 FEET MSL ABEAM BROAD CREEK INLET, BEGIN DESCENT FROM 600 FEET MSL TO ARRIVE AT 300 FEET MSL OVER WILSON BRIDGE, THEN AT OR BELOW 200 FEET MSL NORTH OF WILSON BRIDGE.

Photos



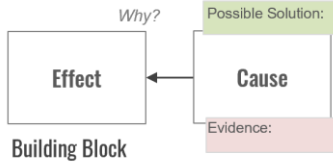
Picture of UH-60 Blackhawk (Typical, not actual helicopter involved in incident) *Credit: Wikipedia*



AA5342 N709PS CRJ-700 involved in DCA mid-air collision
Credit: Wikipedia

American Airlines 5342 Mid-Air Collision

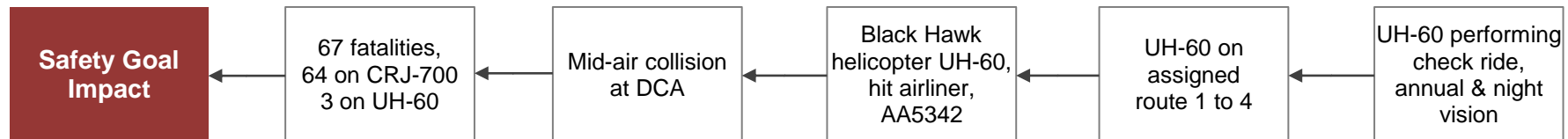
Cause Mapping®



A 5-Why Cause Map is a starting point for the cause analysis. It provides a basic understanding of the initial causes that 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

Helicopter Location



How To Read a 5-Why Cause Map

This 5-Why Cause Map starts with a Safety Near-Miss 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 67 fatalities, 64 on the American Airlines CRJ-700 and 3 on the Black Hawk Helicopter UH-60

Why were there 67 fatalities?

Because there was a mid air collision at DCA..

Why was there a mid air collision at DCA?

Because a Black Hawk helicopter, UH-60, hit an airliner, AA5342.

Why did a Black Hawk helicopter, UH-60, hit an airliner, AA5342?

Because the helicopter was on assigned route 1 to 4 at DCA.

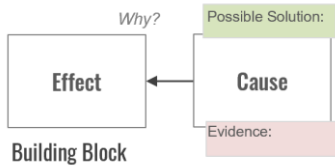
Why was the helicopter was on assigned route 1 to 4 at DCA?

Because the helicopter was performing a check ride, annual and night vision test.

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.

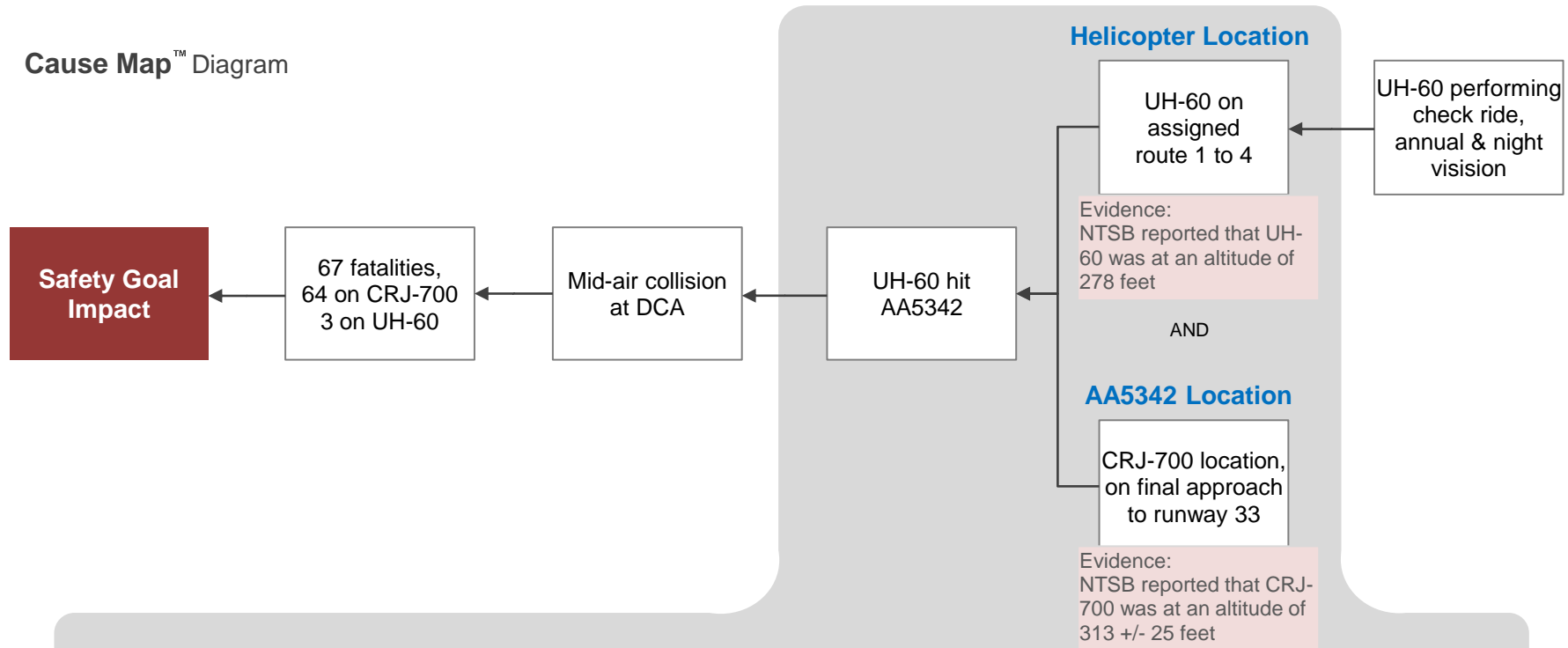
American Airlines 5342 Mid-Air Collision

Cause Mapping®



As the Cause Map begins to expand, it's 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 "Helicopter (UH-60) hit Airplane (AA5342) to occur, it requires both the helicopter and the airliner to be in the exact same place, at the same time.

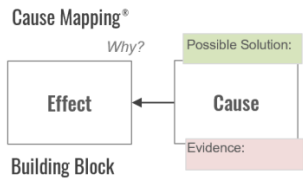
This cause and effect relationships reads

The Helicopter (UH-60) hit Airplane (AA5342) because the UH-60 was on Route 1 to 4, AND the CRJ-700 was on final approach.

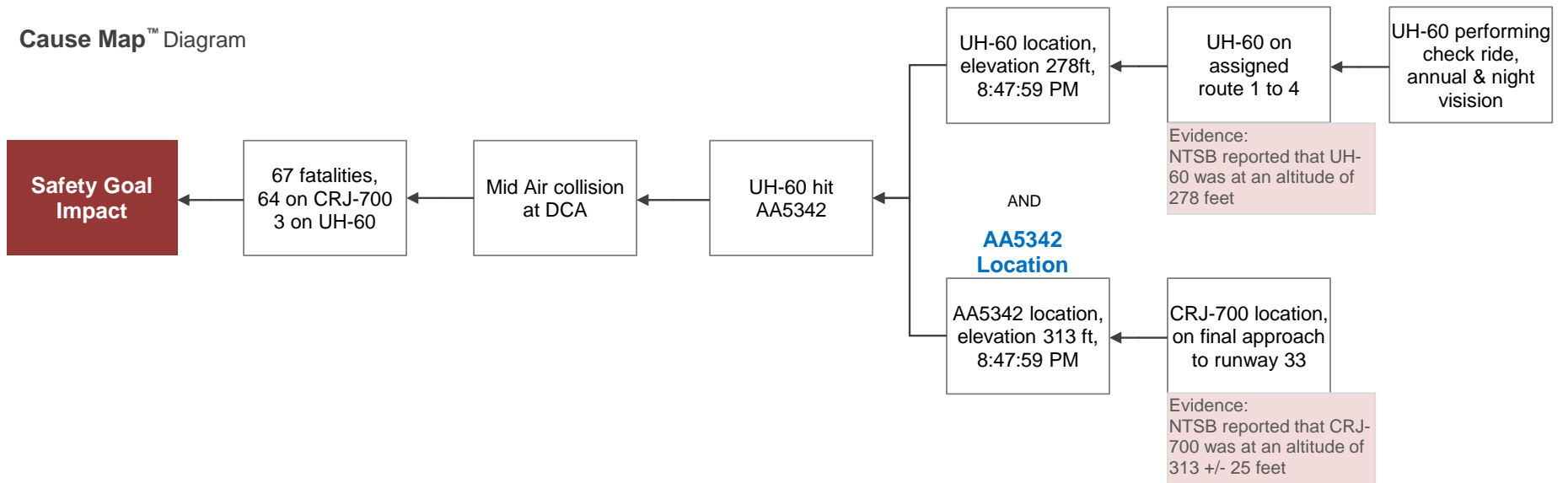
Because of this relationship, we can either control either the location of the helicopter or the airliner to lower the risk of this incident occurring again.

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

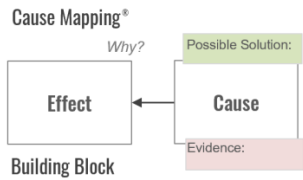
American Airlines 5342 Mid-Air Collision



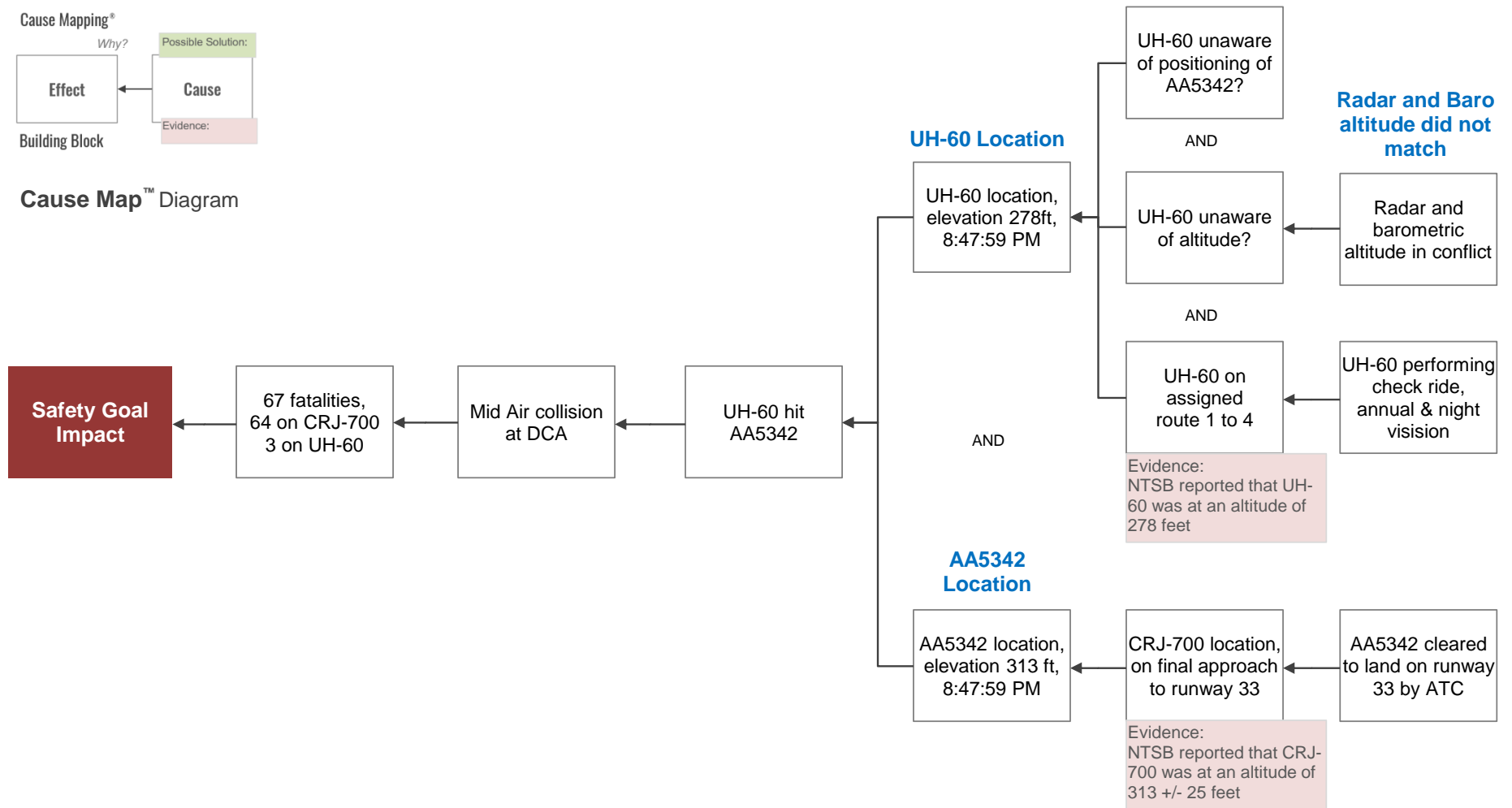
Cause Map™ Diagram



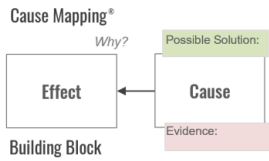
American Airlines 5342 Mid-Air Collision



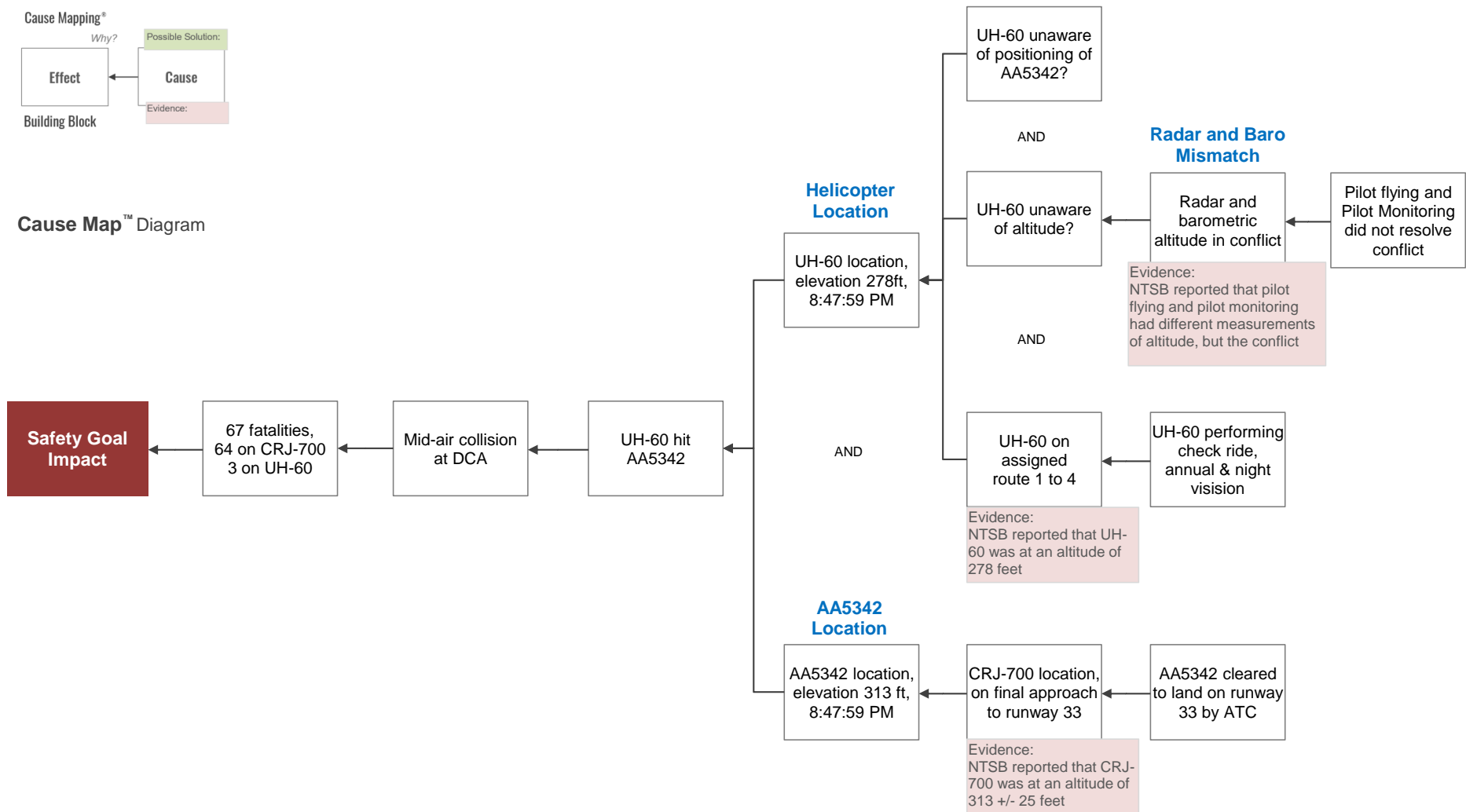
Cause Map™ Diagram



American Airlines 5342 Mid-Air Collision



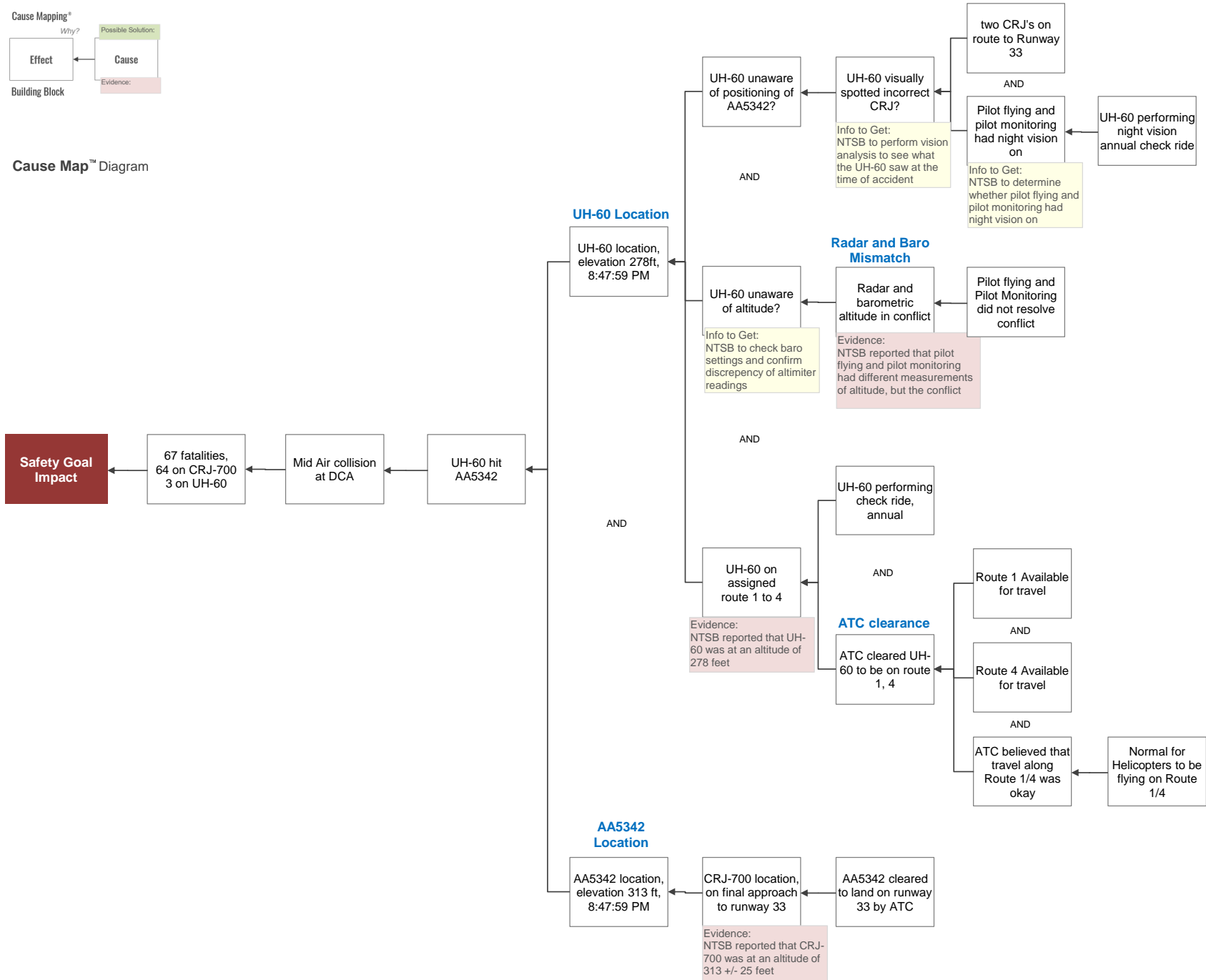
Cause Map™ Diagram



American Airlines 5342 Mid-Air Collision



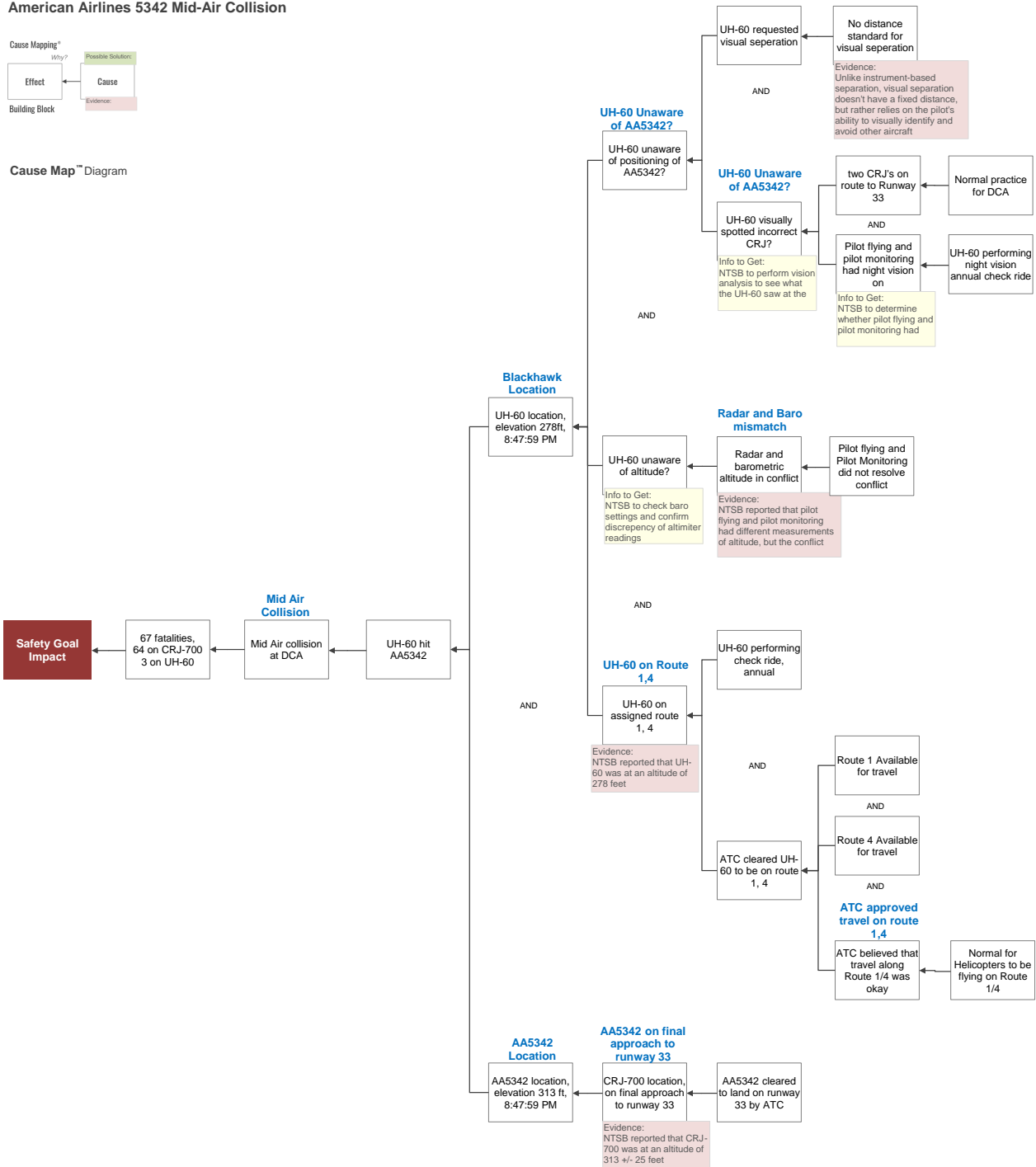
Cause Map™ Diagram



American Airlines 5342 Mid-Air Collision



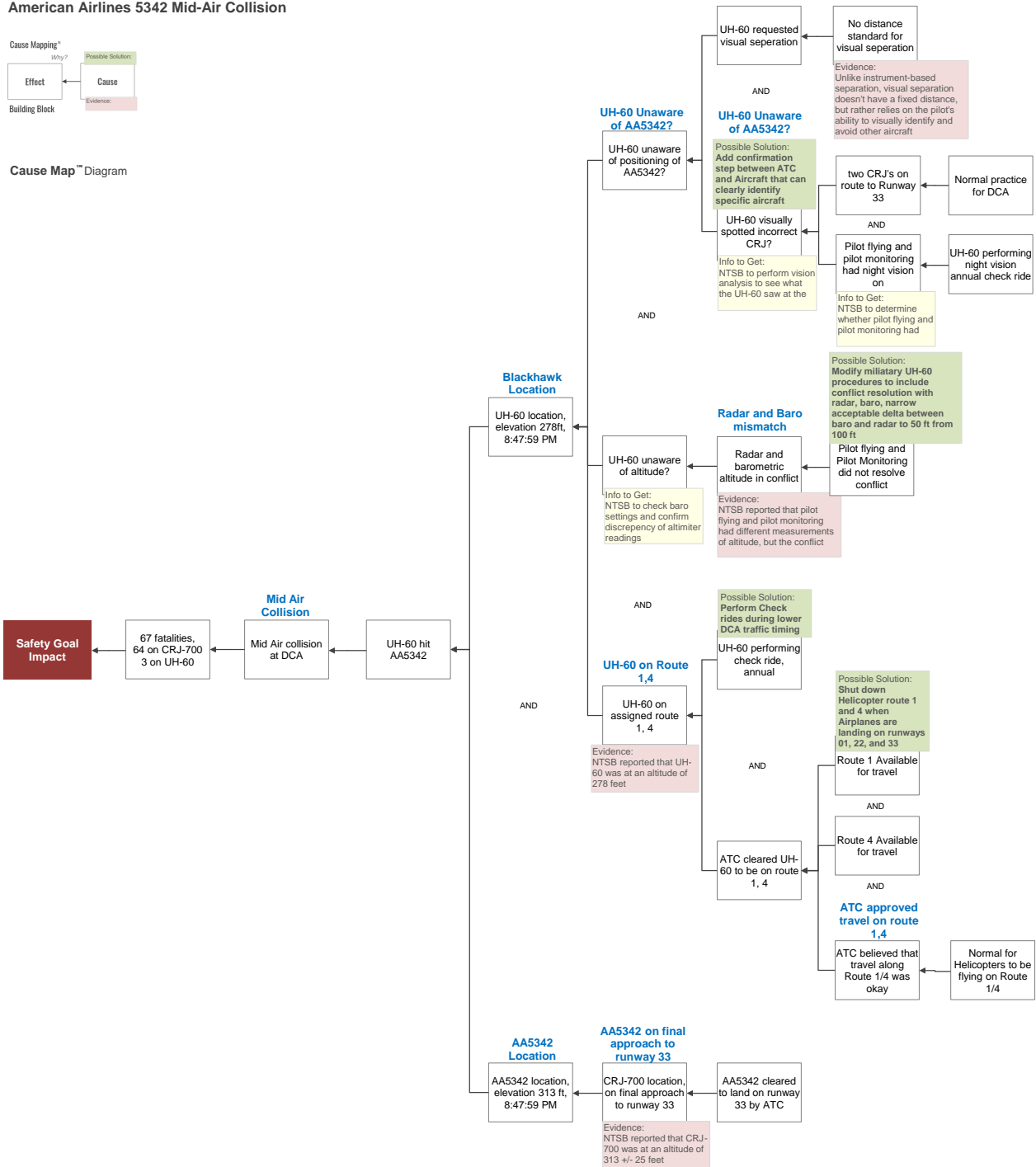
Cause Map™ Diagram



American Airlines 5342 Mid-Air Collision



Cause Map™ Diagram



Information to Get

No.	Information and Evidence to Collect	Owner	Date Created	Due Date	Status	Completed
1	NTSB to perform vision analysis to see what the UH-60 saw at the time of accident	NTSB	February 14, 2025			
2	NTSB to determine whether pilot flying and pilot monitoring had night vision on	NTSB	February 14, 2025			
3	NTSB to check baro settings and confirm discrepancy of altimeter readings	NTSB	February 14, 2025			

American Airlines 5342 Mid-Air Collision

Solutions - Action Items, Recommendations

	<i>Recommendation, action, control, idea</i>	<i>Cause to be controlled</i>	<i>Administrative Controls</i>	<i>Engineering Controls</i>				<i>Evidence it was effective</i>
Ref.	Possible Solution	Cause	Changes to Work Process, Task Procedures, Policies, Instructions	Changes to Equipment, Hardware Tools, Software, Technology	Owner(s)	Due Date	Status	Measurement Auditing
<p>Solutions to be formlized after NTSB investigation concludes</p>								

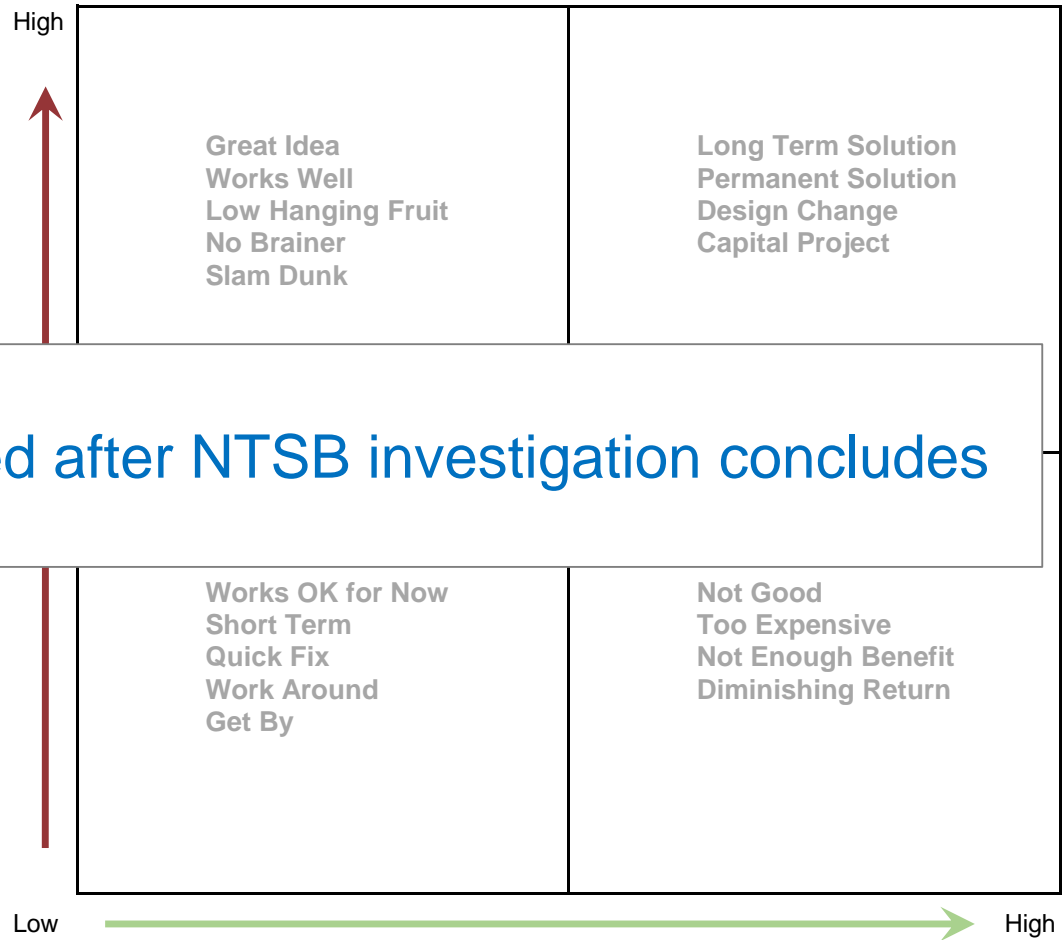
Evaluate the Different Possible Solutions

Possible Solution:
Idea, suggestion.

A E
E F

Solutions to be formalized after NTSB investigation concludes

1 2 3 4
5 6 7 8



Estimated **COST** of Solution
Expected Effort In
 - Scope-Function-Quality
 - Time-Schedule
 - Cost-Budget
 - Resources