Cause Mapping®

Thank you for taking time to review our current understanding of the Jeju 2216 accident.

This document is a sample of a ThinkReliability incident analysis report, offering a comprehensive view of the Jeju 2216 incident. 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 request on our website, thinkreliability.com. We'd be happy to discuss how our expertise can add value to your process.



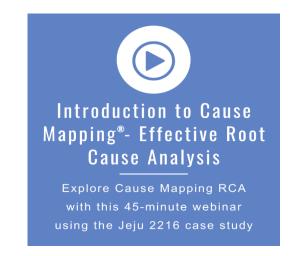




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Watch the 45-minute webinar review of this case study



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





Location of Incident
Date of Incident
Date of Report

Muan International Airport, South Korea
December 29, 2025
January 13, 2025

Cause Mapping®

1. Problem

2. Analysis

3. Solutions

SUM	MARY FILE - Contents	Page
	Incident Description	2
1.	Problem Definition	3
	Timeline (Sequence of Events)	4-5
	Diagrams	6-7
	Photos	8-9
2.	Cause-and-Effect Analysis (5, 6, 9, 12, 16, 35-Why)	10-15
3.	Solutions, Controls	16
	Solutions Matrix	17
	Diagrams - MXW Approach, electrical and hydraulic systems	18-22
	QRH Engine out and One Engine Landing	23-24
	Resources	25

Prepared by: Ben Dellsperger



1 of 25 ThinkReliability

Incident Description

For a more detailed sequence of events, see Timeline.

Jeju Air Flight 2216 was a scheduled international passenger flight operating between Suvarnabhumi Airport in Bangkok, Thailand, and Muan International Airport in South Korea. On December 29, 2024, the Boeing 737-800 aircraft attempted an emergency landing at Muan International Airport following severe complications, reportedly involving a bird strike and other technical issues.

During the emergency landing, the aircraft overran the runway and collided with an earth berm, leading to a catastrophic crash. Of the 181 occupants onboard, 179 lost their lives, making it one of the deadliest aviation disasters involving a South Korean airliner and the deadliest on South Korean soil.

		Jeju Airlines Flight 2216 Crash	
What	Problem(s)	Plane disintegreated at end of runway	Timeline
When	Date	December 29, 2025	
	Time	~ 9:03 AM	
	Different, unique, abnormal	Bird strike, loss of right engine	
Where	Facility, site, location	Muan International Airport, South Korea	→ Diagrams, Photos
	Unit, area	Runway 19	
	Equipment, tools	Boeing 737-800, HL8088	Process Map
	Task(s), operation being done	Attempted landing	<u>'</u>
Impact t	o Goals	Quantify the specific negative consequence to each one below	
-	Safety	179 fatalities, 2 injured	
	Environmental	Fire, debris	
	Customer	Major ?	
	Production, Schedule	Major ?	
	Equipment, Property	Complete loss of aircraft	
	Labor, Time	hrs ?	\$0
		This incident	
	Frequency	1x, deadliest aviation accident in 2024, deadliest aviation accident since 2018 (lion air - 189 fatalities)	
		Annualized cost	\$0

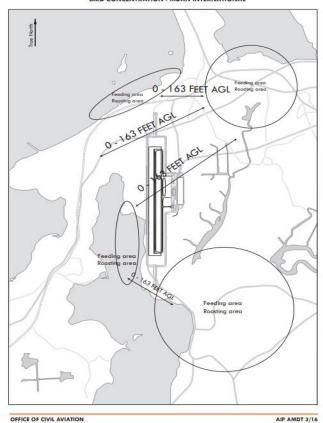
Timeline

Date	Time	Description	Source, Reference, Note
August 19, 2009		First flight of Boeing 737-800 registered to HL 8088 to Ryanair	Plane
2017		Ryanair transferred Boeing 737-800 HL8088 to Jeju Air	Plane
November 27, 2024		Flight spent 62 min on the ground for maintenance, 28 allocated for maintenance	
December 8, 2024		Jeju Air began new flights from Bangkok and Muan, 4x / week	Airport
December 29, 2024	2:11 AM	Jeju air flight 2216 departs from Bangkok, Thailand (BKK) en route to Muan, South Korea (MWX)	Plane
	6:35 AM	Jeju air flight 2216 begins its descend to runway 01 at Muan (MWX)	Plane
December 29, 2024	8:54 AM	Muan airport air traffic control clears the aircraft to land on runway 01	Airport - ATC
	8:57 AM	Air traffic control broadcasts "caution - bird activity" advisory.	Airport - ATC
	8:58 AM	ADS-B data ceased data transmit	Plane
	8:59 AM	Flight 7C-2216 pilot reports bird strike, declares emergency "Mayday Mayday	Plane
		Mayday" and "Bird strike, bird strike, go-around." airplane retracts flaps and landing gear	Plane
		Cockpit voice recorder (CVR) and flight data recorder (FDR) stop recording data	Plane
	9:00 AM	Flight 7C2216 initiates a go-around and requests authorization to land on runway 19, which is by approach from the opposite end of the airport's single runway.	Plane
	9:01 AM	Air traffic control clears the aircraft to land on runway 19.	Airport - ATC
		Jeju air flight 2216 performs teardrop turn to land on runway 19	Plane
	9:02 AM	Flight 7C-2216 touches down on the runway about 1,200m (3940 feet) down on the 2,800m (9184 feet) long runway.	Plane
	9:02:34 AM	Air traffic control alerts "crash bell" at airport fire rescue unit.	Airport - ATC
	9:02:55 AM	Airport fire rescue unit completes deploying fire rescue equipment.	Airport

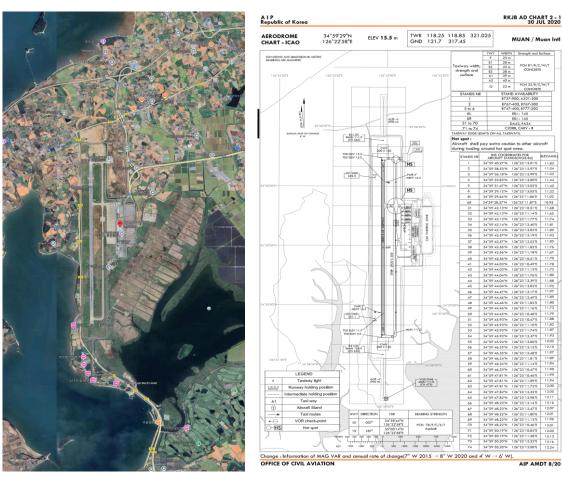
Timeline

Date	Time	Description	Source, Reference, Note
	9:03 AM	Flight 7C-2216 crashes into embankment after over-shooting the runway.	Plane
	9:10 AM	The transport ministry receives an accident report from airport authorities.	Emergency Response
	9:23 AM	One male rescued and transported to a temporary medical facility.	Emergency Response
	9:38 AM	Muan airport is closed.	Airport
	9:50 AM	Rescue completed of a second person from inside tail section of the plane.	Emergency Response
December 30, 2024	6:44 AM 7:20 AM	Jeju Air flight 7C101 has landing gear failure causing a go around at Seoul Flight lands successfully	Jeju Airlines Jeju Airlines
December 31, 2024		Data downloaded from the CVR, but a connector is missing, authorities figuring out how to download data	
January 1, 2025		Investigation team from the USA arrives Cockpit voice recorder has been successfully downloaded Government of South Korea states that the flight data recorder will be sent to USA	
January 11, 2025		South Korea's transport ministry stated that both the CVR and FDR stopped working ~4 min before the crash	



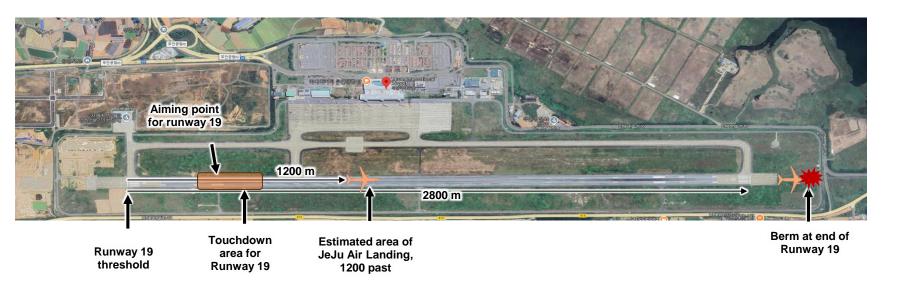


Bird concentration chart around Muan International (MWX)



Muan International (MWX) Airport Overview



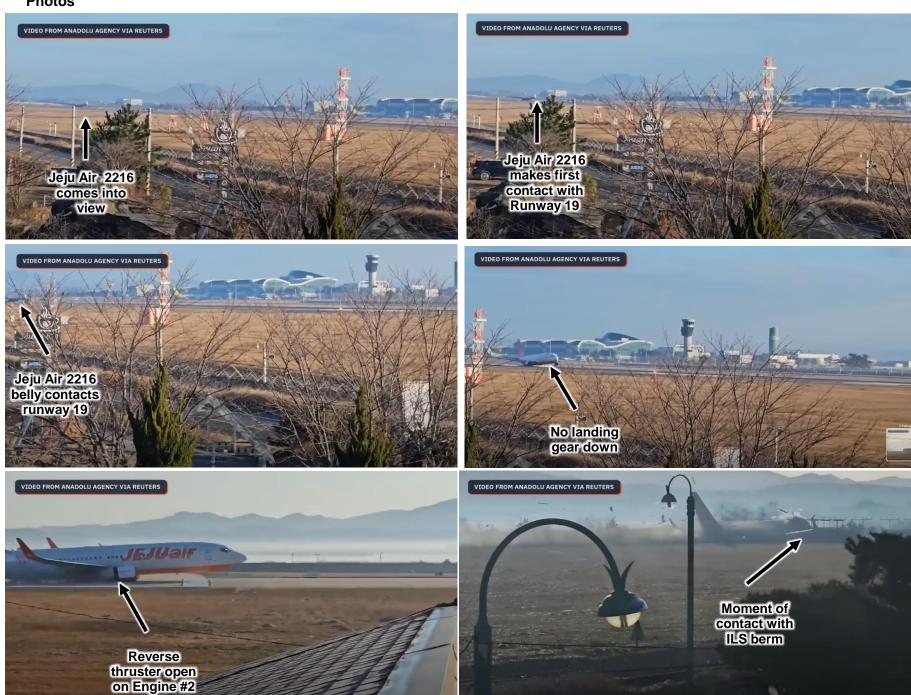


Photos



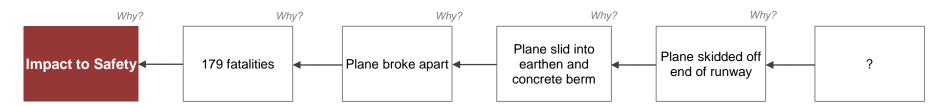


Photos

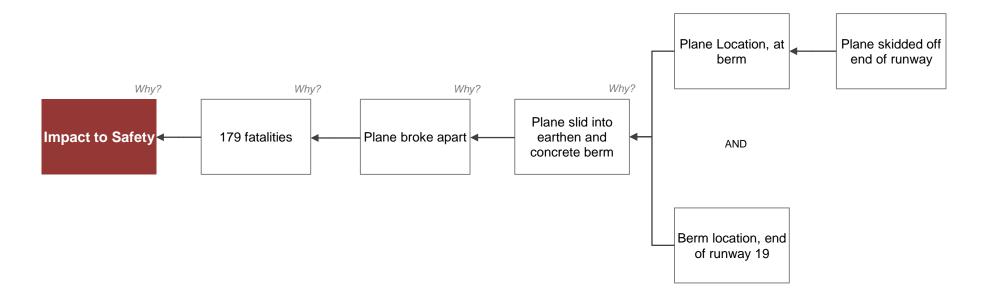




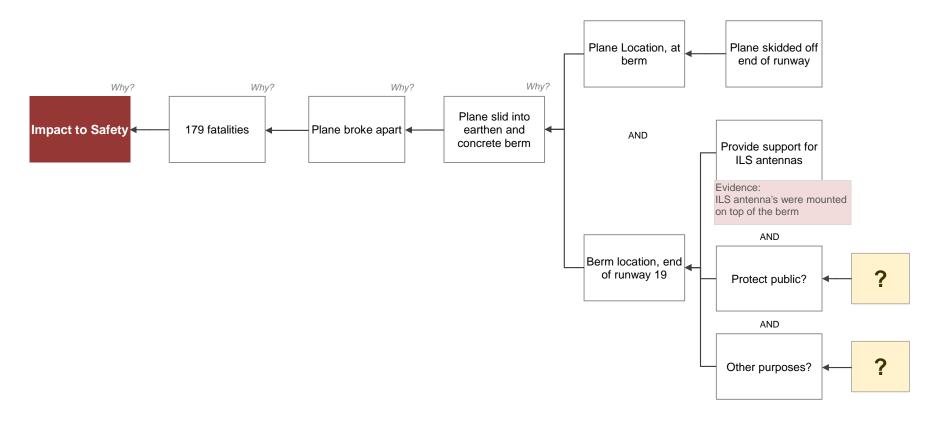
Cause Map[™] Diagram







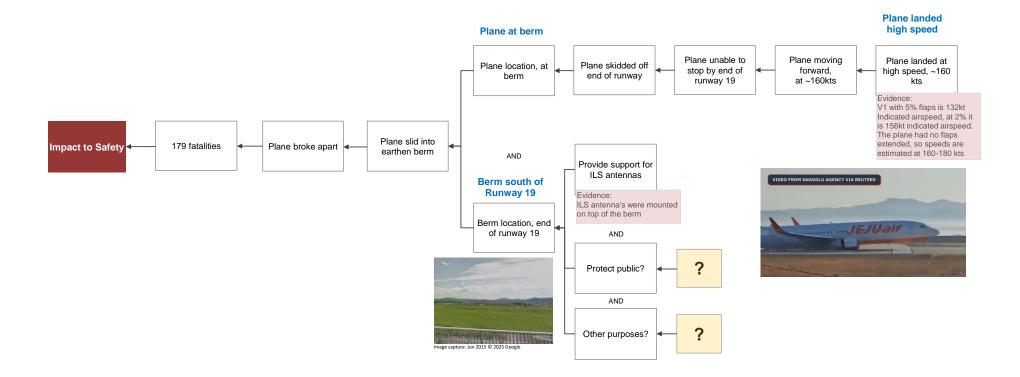


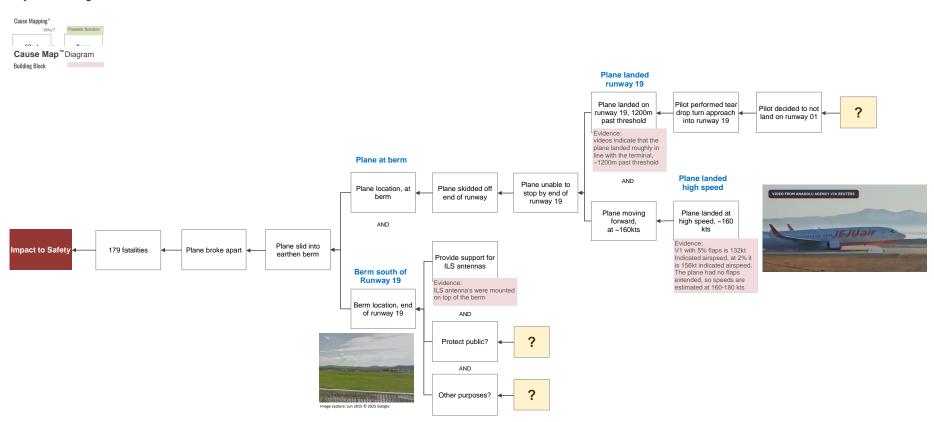


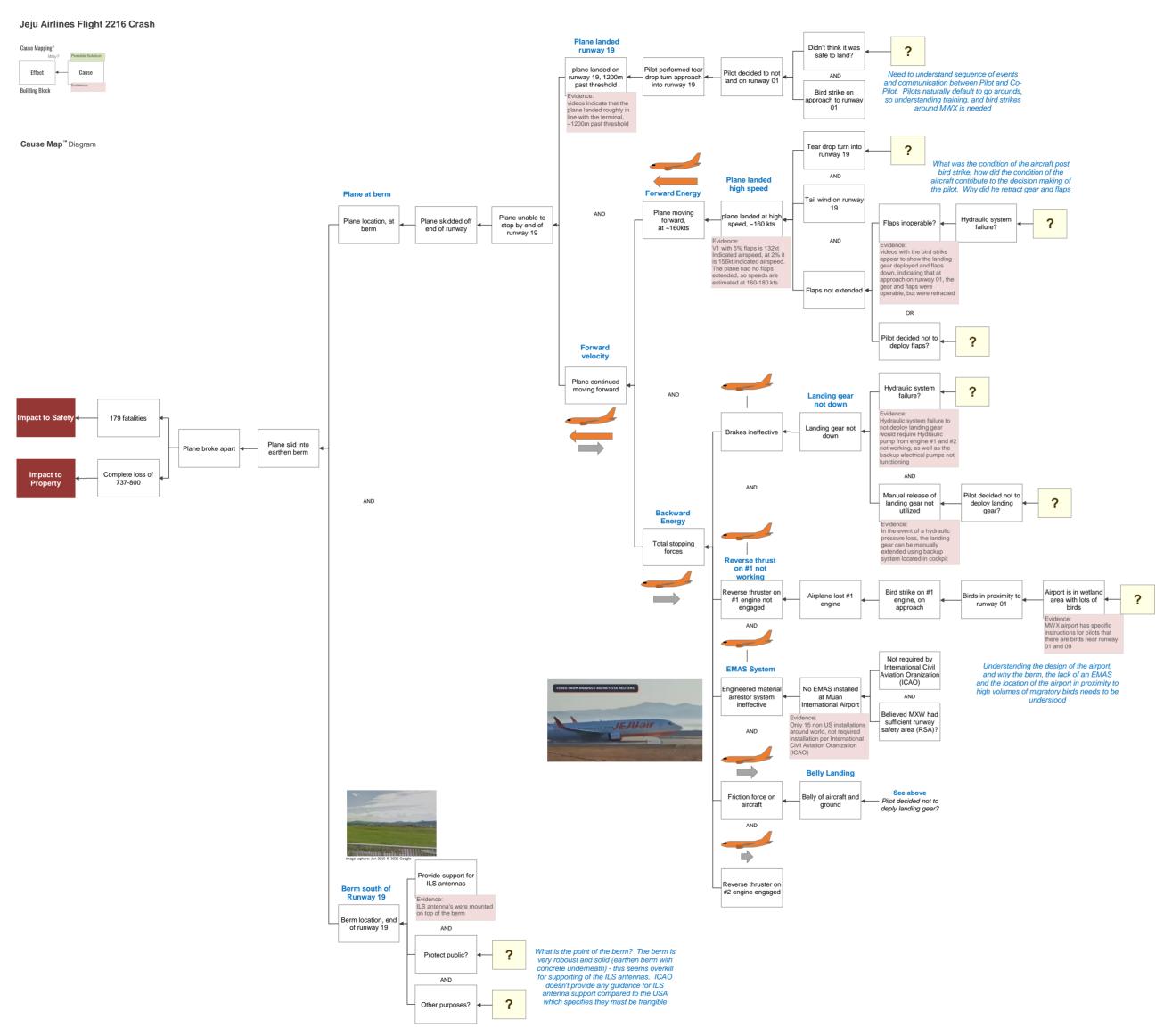
Cause Map[™] Diagram



Cause Map™ Diagram

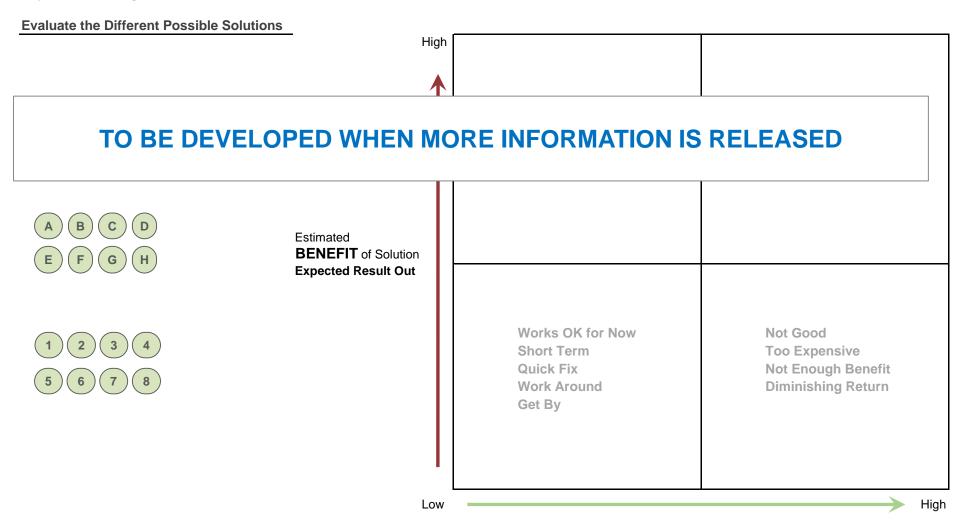






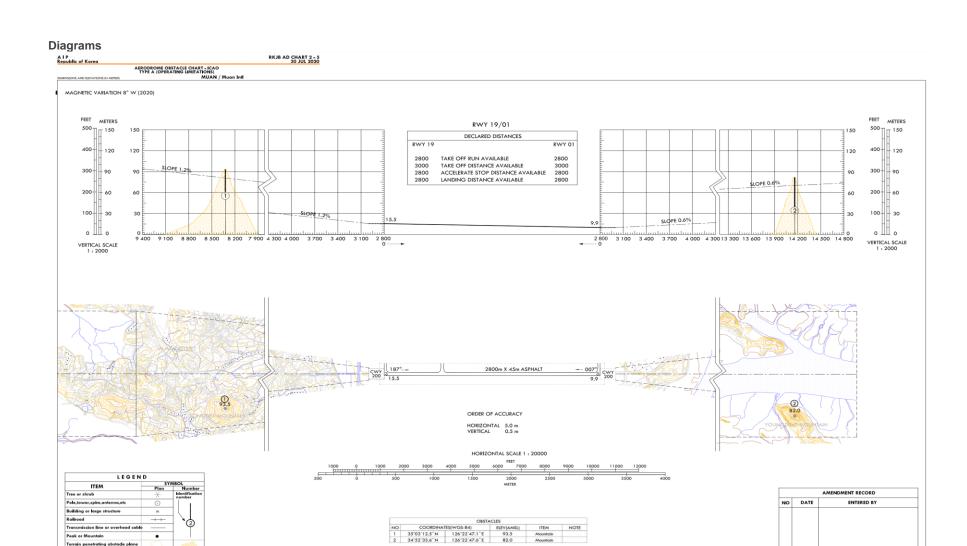
Solutions - Action Items, Recommendations

	Recommendation, action, control, idea	Cause to be controlled	Administrative Controls	Engineering Controls				Evidence it was effective
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
1								
2		TO BE DE	EVELOPED W	HEN MORE IN	NFORMATIO	ON IS RELE	EASED	
3								



Estimated **COST** of Solution **Expected Effort In**

- Scope-Function-Quality
- Time-Schedule
- Cost-Budget
- Resources



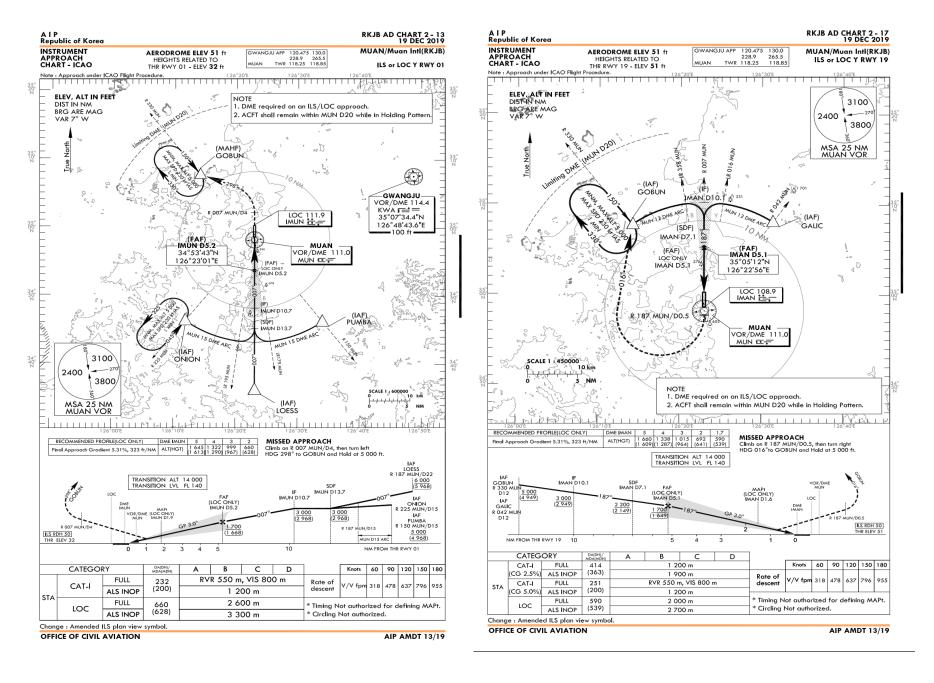
Muan International (MWX) Obsticle Chart

AIP AMDT 8/20

Clearway(CWY)

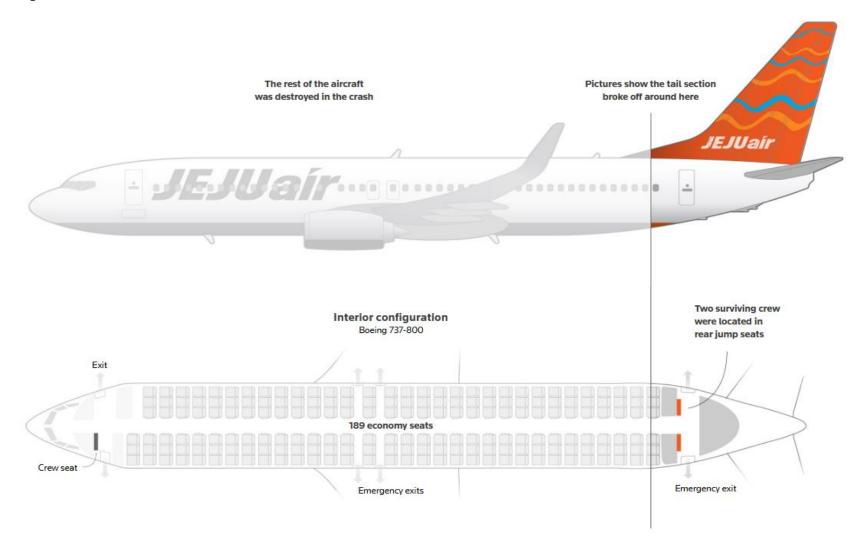
OFFICE OF CIVIL AVIATION

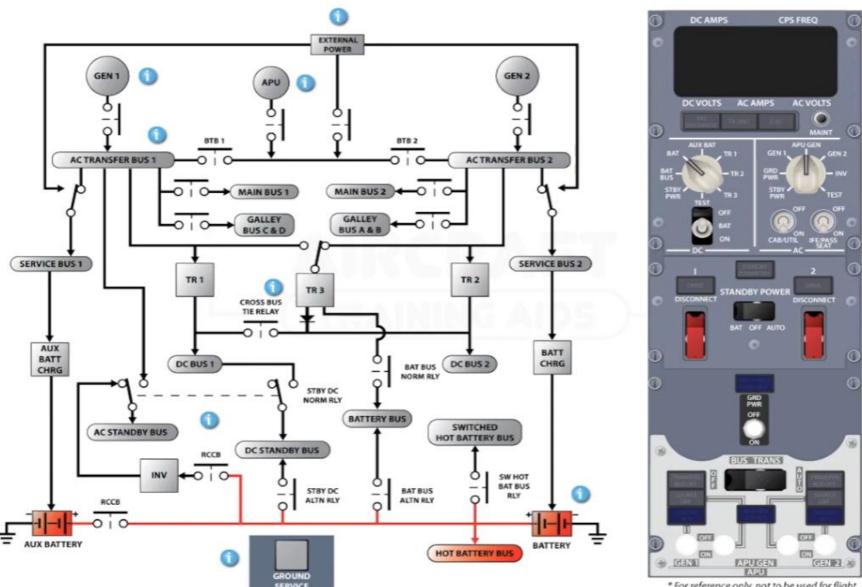
Change : Information of MAG VAR (7° W 2015 → 8° W 2020)

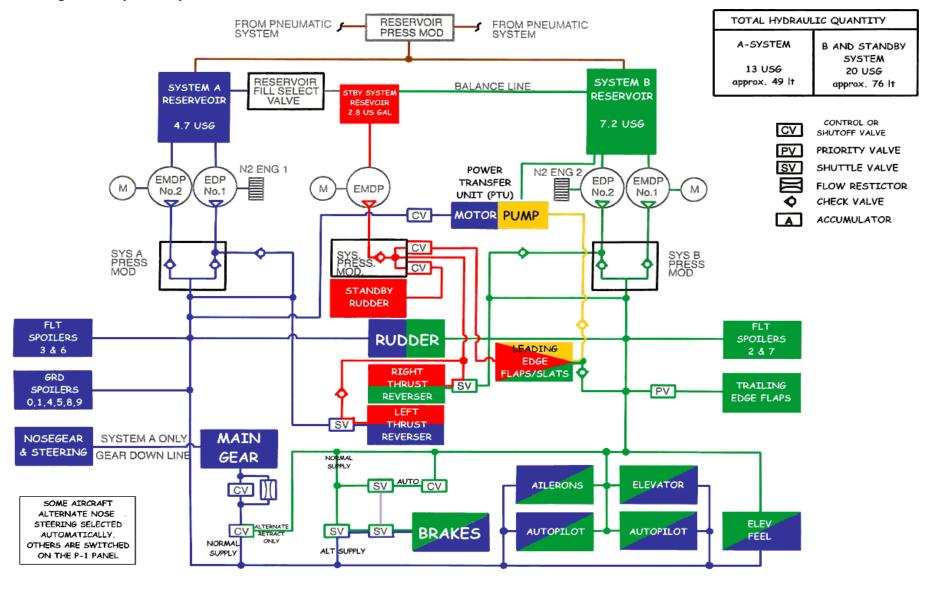


Muan International (MWX) ILS Approach Runway 01

Muan International (MWX) ILS Approach Runway 19







ENGINE FIRE or Engine Severe Damage or Separation

Co	ondition: One or more of these occur: • Engine fire warning • Airframe vibrations with abnormal engine indications • Engine separation.
1	Autothrottle (if engaged)Disengage
2	Thrust lever (affected engine) Confirm Close
3	Engine start lever (affected engine) Confirm CUTOFF
4	Engine fire switch (affected engine) Confirm Pull
	To manually unlock the engine fire switch, press the override and pull.
5	\mathbf{If} the engine fire switch or ENG OVERHEAT light stays illuminated:
	Engine fire switch Rotate to the stop and hold for 1 second
	If after 30 seconds the engine fire switch or ENG OVERHEAT light stays illuminated:
_	Engine fire switch Rotate to the other stop and hold for 1 second
6	If high airframe vibration occurs and continues
0	after the engine is shut down:
	Without delay, reduce airspeed and descend to a safe altitude which results in an acceptable vibration level.
	If high vibration returns and further airspeed reduction and descent are not practicable, increasing airspeed may reduce vibration.
7	ISOLATION VALVE switch CLOSE
	▼ Continued on next page ▼
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8.	2 D6-27370-804-BRI(P2) July 17, 2009

8	PACK switch (affected side) OF
	This causes the operating pack to regulate to high flow in flight with the flaps up.
9	APU BLEED air switch OF
10	Choose one:
	◆APU is available for start:
	APU STAR
	When APU is running:
	APU GEN switch (affected side) ON
	▶▶Go to step 11
	◆APU is not available:
	▶▶Go to step 11
11	. Balance fuel as needed.
12	G-FDZA - G-FDZS ? Transponder mode selector
	This prevents climb commands which can exceed single engine performance capability.
13	G-CDZH - G-CDZM Transponder mode selector
	This prevents climb commands which can exceed single engine performance capability.
14	If wing anti-ice is needed:
	ISOLATION VALVE switch (after fire has been extinguished) AUTO
15	Plan to land at the nearest suitable airport.
•	G-CDZH - G-CDZM, G-FDZJ ▶Go to the One Engine Inoperative Landing <> checklist on page 7.18
•	G-FDZA - G-FDZG, G-FDZR, G-FDZS ▶ Go to the One Engine Inoperative Landing <> checklist on page 7.20

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D6-27370-804-BRI(P2)

July 17, 2009

FIRE or Engine Severe Damage or Separation continued	One Engine Inoperative Landing <>
switch (affected side) OFF	G-CDZH - G-CDZM, G-FDZJ
s causes the operating pack to regulate to n flow in flight with the flaps up.	Condition: Landing must be made with one engine inoperative.
EED air switch OFF	1 Plan a flaps 15 landing.
e one:	2 Set VREF 15 or VREF ICE.
is available for start:	If any of the following conditions apply, set
APU START	VREF ICE = VREF 15 + 10 knots:
When APU is running:	Engine anti-ice will be used during landi
APU GEN switch (affected side) ON	Wing anti-ice has been used any time during the flight
▶▶Go to step 11	Icing conditions were encountered durin the flight and the landing temperature i
is not available:	below 10° C.
▶▶Go to step 11	Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.
e fuel as needed.	3 Maintain VREF 15 + 5 knots or VREF ICE + 5 kno
A - G-FDZS onder mode selector	minimum on final approach to assure sufficient maneuver margin and speed for go-around.
s prevents climb commands which can eed single engine performance capability.	4 Use engine anti-ice on the operating engine only
eed single engine performance capability.	5 Checklist Complete Except Deferred Items
H - G-CDZM onder mode selector TA ONLY	Deferred Items
prevents climb commands which can	Descent Checklist
eed single engine performance capability.	Pressurization LAND ALT _
g anti–ice is needed:	Recall Check
LATION VALVE switch	Autobrake
er fire has been extinguished) AUTO	Landing data VREF 15 or VREF IC
land at the nearest suitable airport.	Minimums
H - G-CDZM, G-FDZJ	Approach briefing Complet
the One Engine Inoperative Landing <> list on page 7.18	Tf additional as assumed the state is used ad-
A - G-FDZG, G-FDZR, G-FDZS	If additional go-around thrust is needed:
the One Engine Inoperative Landing <> list on page 7.20	Configure the pressurization system for a no engir bleed landing when below 10,000 feet.
	WING ANTI-ICE switch O
	▼ Continued on next page ▼

7.18

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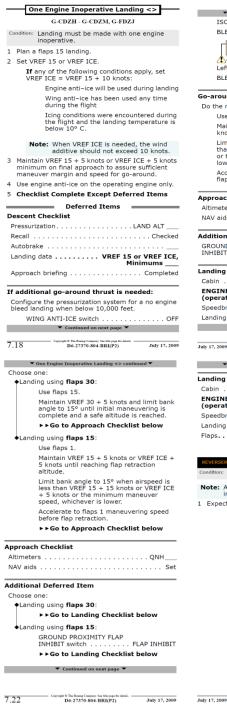
July 17, 2009

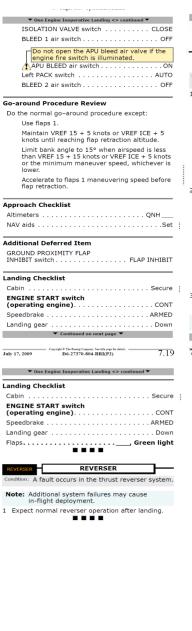
▼ One Engine Inoperative Landing <> continued ▼	
ISOLATION VALVE switch CLOSE	
BLEED 1 air switch OFF	
Do not open the APU bleed air valve if the engine fire switch is illuminated.	
Left PACK switch AUTO	
BLEED 2 air switch OFF	
Go-around Procedure Review	
Do the normal go-around procedure except:	
Use flaps 1.	
Maintain VREF $15 + 5$ knots or VREF ICE $+ 5$ knots until reaching flap retraction altitude.	
Limit bank angle to 15° when airspeed is less than VREF 15 + 15 knots or VREF ICE + 5 knots or the minimum maneuver speed, whichever is lower.	
Accelerate to flaps 1 maneuvering speed before flap retraction.	
Approach Checklist	
Altimeters	
NAV aids	i
Additional Deferred Item	
GROUND PROXIMITY FLAP INHIBIT switch FLAP INHIBIT	
Landing Checklist	
Cabin Secure	:
ENGINE START switch (operating engine)CONT	

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7.19

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	One Engine Inoperative Landing <>
	G-FDZA - G-FDZG, G-FDZR, G-FDZS
4	ndition: Landing must be made with one engine inoperative.
	Choose one:
	Landing using flaps 30 (if performance allows):
	Use flaps 30 and VREF 30 for landing and flaps 15 for go-around.
	▶▶Go to step 4
	Landing using flaps 15:
	▶▶Go to step 2
	Note: Company policy is that all One Engine Inoperative Landings should be made using flaps 15.
	Use flaps 15 and VREF 15 or VREF ICE for landing and flaps 1 for go-around.
	<pre>If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:</pre>
	Engine anti-ice will be used during landing
	Wing anti-ice has been used any time during the flight
	Icing conditions were encountered during the flight and the landing temperature is below 10° C.
	Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.
	Maintain VREF 15 + 5 knots or VREF ICE + 5 knots minimum on final approach to assure sufficient maneuver margin and speed for go-around.
•	ote: Autoland operations are not authorized when landing with flaps 15.
	▼ Continued on next page ▼
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	▼ One Engine Inoperative Landing <> continued ▼
4	Use engine anti-ice on the operating engine only.
5	Checklist Complete Except Deferred Items
	Deferred Items
D	escent Checklist
F	Pressurization LAND ALT
F	Recall Checked
A	Autobrake
l	anding data VREF as directed by checklist, Minimums
A	Approach briefing Completed
	Note: Check authorized autoland weather minima.
If	additional go-around thrust is needed:
	Configure the pressurization system for a no engine bleed landing when below 10,000 feet.
	WING ANTI-ICE switch OFF
	ISOLATION VALVE switch CLOSE
	BLEED 1 air switch OFF
	Do not open the APU bleed air valve if the engine fire switch is illuminated.
	APU BLEED air switch
	Left PACK switch AUTO
	BLEED 2 air switch OFF
G	o-around Procedure Review
[Do the normal go-around procedure except:
	▼ Continued on next page ▼

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7.23

D6-27370-804-BRI(P2)

Resources

Title	Source	Format	Note	Link	
Jeju Air plane flew relentlessly before tragedy with minimal maintenance	The Korea Times	Website		https://www.koreatimes.co.kr/www/nation/2024/12/281 389392.html	
Jeju Air - Flight 2216	Wikipedia			https://en.wikipedia.org/wiki/Jeiu Air Flight 2216	
Crash: Jeju B738 at Muan	Aviation Herald			https://avherald.com/h?article=52225189&opt=512	
Jeju Airlines Crash	Swiss 001	YouTube		https://www.youtube.com/watch?v=eyJHqp6V68Q	
	Reuters	Website		https://www.reuters.com/graphics/SOUTHKOREA-CRASH/MAPS/mova	/awoejova/
Southwest bird strike - New Orleans		YouTube		https://youtu.be/JrFeBr6QRsY?si=1Mp_7pijAzofw_mY	