

GOVERNMENT OF NEPAL
AIRCRAFT ACCIDENT INVESTIGATION COMMISSION



PRELIMINARY REPORT ON ACCIDENT INVESTIGATION

of

9N-AME (CRJ 200LR, MSN 7772) Aircraft

Operated

by

Saurya Airlines Pvt. Ltd.

on

July 24, 2024

Submitted By:

Aircraft Accident Investigation Commission

Submitted To:

Government of Nepal

Ministry of Culture, Tourism and Civil Aviation

September 5, 2024

Preface

This Aircraft Accident Investigation Commission (AAIC) was formed on July 24, 2024 by the Government of Nepal to investigate the accident of 9N-AME aircraft, operated by Saurya Airlines Pvt. Ltd. The aircraft was departing for base maintenance from Tribhuvan International Airport, Kathmandu.

The sole objective of AAIC's air accident investigation is the prevention of similar accidents in the future. This investigation does not seek to apportion blame or liability. Accordingly, this report should not be used to assign blame or determine civil or criminal liability.

The information of the preliminary report may change as the investigation progresses.

Foreword

This preliminary report on the accident of 9N-AME, CRJ 200LR aircraft operated by Saurya Airlines Pvt. Ltd. is based on the investigation carried out by the Aircraft Accident Investigation Commission (AAIC) duly constituted as per the provision of the Aircraft Accident Investigation Regulation, 2014 (2071 B.S.) by the Government of Nepal on July 24, 2024.

The objective of the AAIC is to find out the most probable cause of the accident and suggest recommendations as to prevent the recurrence of similar accidents. It is not the function of the AAIC to apportion blame or determine civil or criminal liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

Composition of Commission:

1) Ratish Chandra Lal SUMAN	Chairman
2) Deepu Raj JWARCHAN	Member
3) Sanjay ADHIKARI	Member
4) Dr. Sudip BHATTRAJ	Member
5) Mukesh DANGOL	Member Secretary

Note:

- a) *This report contains the facts which have been determined up to the date of publication.*
- b) *The extracts may be published without specific permission provided that the source is duly acknowledged, the material is reproduced accurately, and it is not used in a derogatory manner or in a misleading context.*
- c) *All times used in this report are Coordinated Universal Time (UTC) unless otherwise stated. Nepal Local Time is five hours forty-five minutes ahead of UTC.*

1. Factual Information

1.1 History of Flight

On July 24, 2024, the CRJ 200LR aircraft (Registration: 9N-AME, MSN:7772) operated by Saurya Airlines was scheduled for ferry flight (Flight Number: SAU-FER) from Tribhuvan International Airport (VNKT), Kathmandu to Pokhara International Airport (VNPR), Pokhara. The flight was approved by Air Transport Division of the Civil Aviation Authority of Nepal (CAAN) on July 23, 2024, with an extension period of 72 hours. The purpose of the ferry flight was to conduct base maintenance of the aircraft.

Table 1 provides the details of the flight.

Table 1: Flight information

Date of Flight	July 24, 2024
Flight Number	SAU-FER
Aircraft Registration	9N-AME
Aircraft Type	CRJ 200LR
Purpose of flight	Ferry flight
Permit Number	CAAN-FP554/2024
VFR/IFR	VFR
Departure	Tribhuvan International Airport, Kathmandu (VNKT)
Destination	Pokhara International Airport, Pokhara (VNPR)
Time of Accident	05:26:10 UTC

The aircraft had been grounded for 34 days before the event flight. The preservation and return to service maintenance checks were carried out. During grounding, the aircraft was parked at the remote parking bay. The aircraft was returned to the domestic parking bay on July 23, 2024.

On the event day, the aircraft lined up on runway 02 at VNKT at around 05:25:35 UTC and prepared for the commencement of take-off roll. The provided V-speeds were $V_1 = 114$ knots, $V_R = 118$ knots and $V_2 = 125$ knots. By 05:25:55 UTC, the recorded weight-on-wheels (WOW) parameter for the nose, left and right landing gears had transitioned from ground to air. After rotation, the aircraft rolled to the right prompting the subsequent events leading up to the accident. The sequence of events is elaborated in Section 2 of this report below. Both stick shakers switched between 'Active' and 'Not Active' multiple times from 05:25:58 UTC to 05:26:04 UTC. The time of the first impact of the right wing on the ground was at around 05:26:10 UTC.

1.2 Injuries to Persons

A total of 19 people were on board the aircraft. The Pilot in Command (PIC) sustained serious injury while 18 other people lost their lives. Details on injuries to persons are given in Table 2.

Table 2: Injuries to persons

Injuries	Crew	Persons on Board		Total
		Adult	Child	
Fatal	2*	15	1	18
Serious	1	-	-	1
Minor	-	-	-	-
None	-	-	-	-
Total	3	15	1	19

* Including one Supernumerary (S/N) Crew

1.3 Damage to Aircraft

- 1- First impact by right wing
- 2- Left engine (detached w/ pylon) & cowl
- 3- Ejected seat & right engine nacelle
- 4- Cockpit (detached aft of cockpit door frame)
- 5- Fuselage & left-wing wreckage

- 6a- Emergency door
- 6b- Detached winglet

1 ← → 2
935 +/- 20 ft

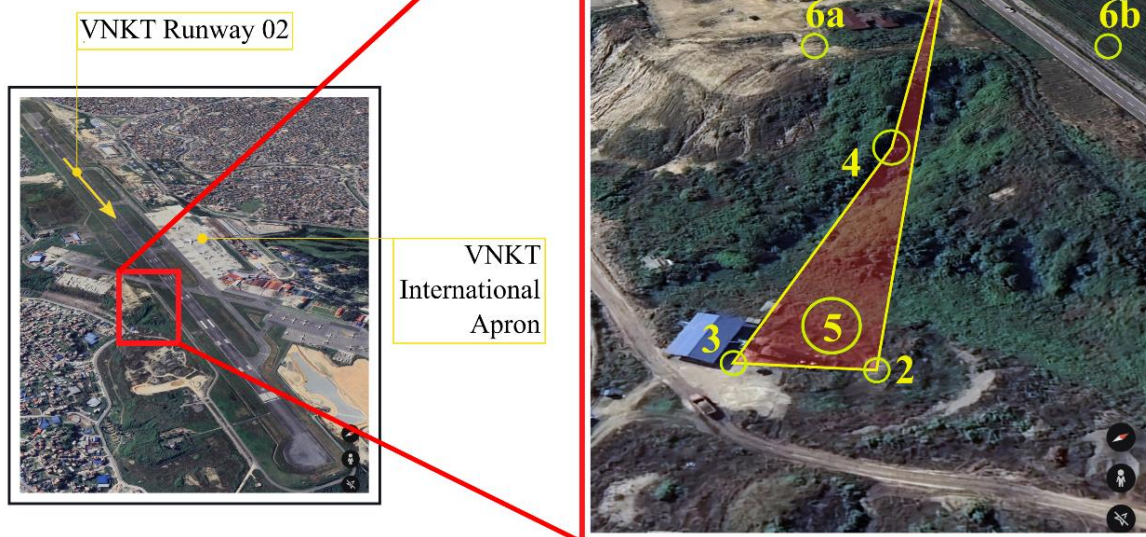


Figure 1: Site corners showing the initial impact and components distribution

The markers on the site of the accident are shown in Figure 1. The right wing first impacted on the ground at '1' (05:26:10 UTC), marking the start of the disintegration of the right wing and the subsequent accident.

- The fuselage of the aircraft lay in two distinct parts, at '4' (cockpit) and '5'.
- The left wing and the right engine were attached to the fuselage at '5'.
- The left engine was found detached at '2'.

The aircraft was destroyed due to high velocity impact, and post impact fire as seen in Figure 2.

The aircraft also collided with the container and shed of Air Dynasty Heli Services Pvt. Ltd. The cockpit portion was stuck on the container and shed which was found at '4', on the eastern side of the airport. Most of the fuselage structure and its components were damaged due to fire



Figure 2: Top: scene at '5', with '4' just above on the hill, bottom: burnt fuselage and empennage sections at '5' and left engine at '2'

1.4 Other Damages

The collision of 9N-AME with the container and shed of the Air Dynasty Heli Services Pvt. Ltd. led to damage of Air Dynasty properties. Mainly, the container of Air Dynasty was dragged from '7' to '4' (see Figure 1 and Figure 4). It was partly destroyed during the impact and further taken apart

during the rescue efforts from the 9N-AME cockpit. The shed at '7' was also damaged. The airport ground infrastructure along the track '1' to '4' in Figure 1 were also damaged during the impact of the right wing and subsequent fire.

1.5 Personnel Information

1.5.1 Pilot in Command

Date of birth	February 17, 1989
Gender	Male
License type	ATPL 324 (A)
Initial issue	August 2011, as a Copilot for Beechcraft 1900 D
Issuing authority	CAAN
License Issued for CRJ-200 as P1	July 31, 2017
Current Aircraft Rating	CL65 (CRJ 200)
Instructor Ratings	Nil
Current PPC	Feb 2024
Last PPC	August 2023
License validity date	July 31, 2028
Medical Certificate Type	Class I
Medical validity	July 2025
Total hours on type	4922:45
Total Hours Flown	6185:10
Flight hours in last 12 months	574:20
Flight hours in last 3 months	148:20
Flight hours in last 30 days	47:00
Flight hours in last 7 days	04:40
Previous rest period	5 Nights and 4 Days
Aviation Language Proficiency	Level 6
Limitation/ Restriction	Beech 1900 C type rating is no more valid
Marital Status	Married
Previous Accident/ Incident	Not available

1.5.2 First Officer

Date of birth	March 15, 1998
Gender	Male
License type	CPL 607 (A)
Initial issue	April 23, 2021
Issuing authority	CAAN
License Issued on CRJ -200	April 23, 2021
Current Aircraft Rating	CL65 (CRJ 200)
Instructor Ratings	Nil
Total Hours on Type	1602:40
Total Hours Flown	1824:16
Total IFR Hours	277:15
Current PPC on	March 10, 2024
Last PPC on	Feb 2023
License validity date	November 30, 2025
Medical Certificate Type	Class I
Medical validity	November 2024
Flight hours in last 12 months	435:45
Flight hours in last 3 months	140:40
Flight hours in last 30 days	65:30
Flight hours in last 7 days	13:00
Previous rest period	1 Nights and 1 Day
Aviation Language Proficiency	Level 4 (operational)
Instrument Rating	April 23, 2021
Limitation/ Restriction	Not available
Marital Status	Unmarried
Previous Accident/ Incident	Not available

1.5.3 S/N Crew

One engineer was onboard as S/N crew.

1.6 Aircraft Information

Aircraft Type	CRJ 200LR
Manufacturer	Bombardier Inc (now owned by MHI RJ Aviation ULC)
Date of Manufacture	March 2003
Manufacturer's Designation of aircraft	CL-600-2B19 (CRJ 200LR)
TTSN	28893:29
TCSN	29788
Certificate of Release to Service	November 24, 2023 (28520:20)
ARC validity	April 17, 2025
Registration	9N-AME
MSN	7772
Engine Make/Model	GE Aerospace / CF34-3B1
Engine (LH) hours/cycles	9896:29/8656
Engine (RH) hours/cycles	9119:59/7152
LH/RH Engine Serial Number	872111/872134
Certificate of Airworthiness	Valid till April 17, 2026
Certificate of Registration	Issued on April 9, 2017
Mobile Radio Station License	Valid till April 17, 2026
Type of Fuel Used	JET A-1

1.6.1 Review of Maintenance Documents

The maintenance documents are under comprehensive review. The following are the preliminary findings from the direct review of the maintenance records of the aircraft.

1. Survey inspection for renewal of Certificate of Airworthiness and Airworthiness Renew Certificate was carried out on March 13, 2024, with main landing gear (MLG) TBO due on April 17, 2024.
2. The aircraft received an extension for both MLGs TBO on April 20, 2024, valid until June 19, 2024.
3. On April 26, 2024, flight release certificate was issued based on CAAN permit to fly number 9N-AME/01/2024. On the same day, test flight was conducted after receiving permit to fly out for renewal of expired Certificate of Airworthiness.

4. After the expiry of the extension, the aircraft was grounded and sent for short-term storage.
5. Initial preparation for short term storage was performed on June 21, 2024.
 - 5.1 Short term storage for 7 days was carried out on June 28, 2024.
 - 5.2 Short term storage for 14 days was carried out on July 05, 2024.
 - 5.3 Short term storage for 21 days was carried out on July 12, 2024.
 - 5.4 Short term storage for 28 days was carried out on July 19, 2024.
6. Return to service check was carried out on July 24, 2024, in the morning of the day of the event flight.

1.6.2 Weight and Balance Information

The load and trim sheet was prepared before the event flight. As per load and trim sheet:

- The take-off weight listed in the load sheet was 18,132 kg, including the baggage weight of 600 kg.
- The number of persons on board was 16 with 3 crew members (1 as an S/N crew).
- The fuel on board was 2000 kg.
- The location of the center of gravity at take-off weight (TOW) was at 20% MAC, and the stabilizer trim setting was at 6.

Review and analysis of information on load and trim sheet is ongoing.

1.7 Meteorological Information

Between 05:00 UTC and 05:30 UTC, the weather was fair with 8 km visibility and the wind was calm. The reported METAR of VNKT were as follows:

- 240500Z 0000KT 8000 FEW010 SCT030 BKN100 26/22 Q1006 NOSIG=
- 240530Z 29003KT 8000 FEW010 SCT030 BKN100 26/22 Q1006 NOSIG=

The METAR data indicates that the wind at 05:00 UTC was 0 knots, while at 05:30 UTC it was 3 knots from westerly direction. There were few clouds at 1,000 feet AGL, scattered clouds at 3,000 feet AGL, followed by another cloud layer at 10,000 feet AGL. Outside air temperature was 26° and QNH pressure was 100.6 kPa. No significant weather was reported.

1.8 Aids to Navigation

The primary navigation aid available at VNKT is DVOR DME. The KTM VOR is located at 27°40'25"N, 085°20'55"E at an elevation of 1330 m. The operating frequency of the KTM VOR is 113.2 MHz.

1.9 Communications

ATS communication facilities are available at VNKT.

1.10 Aerodrome Information

Name	Tribhuvan International Airport, Kathmandu
Aerodrome Location Indicator	VNKT(ICAO), KTM(IATA)
Runway Dimension	10990 ft/150 ft
Runway Slope	1.2%
Runway Surface	Asphalt
ARP Coordinates	27°41'46"N 085°21'38"E
Elevation/Reference Temperature	1339.5m (4395ft)/29.81°C
MAG VAR/Annual Change	0° W
Runway	RWY 02 and RWY 20
AD category for firefighting	Category 9

1.11 Recorder Information

The aircraft was fitted with Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR). The extraction and recoveries of data from both recorders were performed in the facilities of the Transport Safety Investigation Bureau (TSIB), Singapore, under the supervision of AAIC. Accredited representatives from Transportation Safety Board of Canada (TSB) and National Transportation Safety Board (NTSB), USA, were present to witness the data recovery from the FDR and CVR. Advisors of accredited representative from Federal Aviation Administration (FAA), USA and GE Aerospace also participated in the briefings.



Figure 3: Condition of recorders as received by AAIC (left), and after being transported to TSIB, Singapore (right)

The details of both recorders are presented in Table 3. In addition, Figure 3 depicts the condition of recorders.

Table 3: FDR and CVR Information

SN	Recorder	Model	Part No.	Serial Number
1	Flight Data Recorder (FDR)	FA2100	2100-4043-00	000563140
2	Cockpit Voice Recorder (CVR)	FA2100	2100-1020-00	000651792

1.12 Wreckage and Impact Information

The layout of the wreckage distribution as identified on site visit is depicted in Figure 4.

- 7- Air Dynasty container/shed site
- 8- Air Dynasty (mixed) wreckage
- 9- Fuel drum dragged/ejected from 7
- 10- Radome & weather radar



Figure 4: Overall distribution of the wreckage (see Figure 1 for markers '1' to '5')

1.13 Medical and Pathological Information

The medical and pathological information of the aircraft is yet to be obtained from the forensic science laboratory of Nepal police.

1.14 Fire

After the ground impact of the right wing at marker '1', the fuel in the right-wing tank ignited that created a trail of fire from '1' through markers '4' and '5'. Fire also erupted, from fuel in the left-wing tank, after impact at '5'. Fuselage of the aircraft at '5' was largely destroyed by resulting fire.

1.15 Survival Aspect

The aircraft sank approximately 130 feet in 4 seconds. As a result of the blunt impact and disintegration of the aircraft, the most common cause of the death of persons onboard was blunt force trauma, followed by burn injury.

One fire vehicle arrived at marker '7' at 1 minute 40 seconds after impact, and first started spraying water over marker '4' after 15 seconds of arrival. The fire vehicle intermittently sprayed water over markers '4' and '5'. While two other fire vehicles also arrived close to the marker '1' of the accident site, in the meantime, they did not participate in the firefighting efforts simultaneously with the first vehicle.

1.16 Tests and Research

This will be updated later. Preliminary analysis of the FDR data is presented in Section 2.

1.17 Organizational and Management Information

1.7.1 Saurya Airlines Pvt. Ltd.

Saurya Airlines Pvt. Ltd. Obtained Air Operator Certificate (AOC) on November 13, 2014. It possessed three CRJ 200 aircrafts, out of which two were operating in domestic sectors. On July 21, 2024, Saurya Airlines requested Air Transport Department of Civil Aviation Authority of Nepal for approval of ferry flight in VNKT-VNPR sector to conduct Base maintenance of 9N-AME aircraft in the hanger of VNPR.

1.7.2 Civil Aviation Authority of Nepal (CAAN)

Civil Aviation Authority of Nepal act as both regulator and service provider in terms of airport operations and air navigation services amongst others.

1.18 Additional Information

The requirements for aircraft loading and securing of loads is stipulated in Chapter 7 of the operator's Operations Manual Part B, where Chapter 7 states:

Aircraft Loading and Securing of Loads information is given in Ground Handling Manual (Chapter 5, 6 & 7), Operations Manual Part A (Chapter 8) and Mass and Balance Manual.

The Chapter 6, Section 6.2 of the Ground Handling Manual states:

Each unit of cargo should also be secure properly by use of straps, tie-downs or nets by checking the integrity of the netting/straps.

The Procedure Manual for Flight Permissions of the Civil Aviation Authority of Nepal (August 2015) contains the guidance for issuance/renewal of flight schedule and permission under the

rule 56 (c) of Civil Aviation Regulation 2058. The procedure manual also contains the guidance and the procedure for issuance of other type of flight permission including Non-scheduled, Chartered, Diplomatic, Rescue and Relief, Private, Aviation Sports and Drones.

2. Preliminary Observations from FDR Data

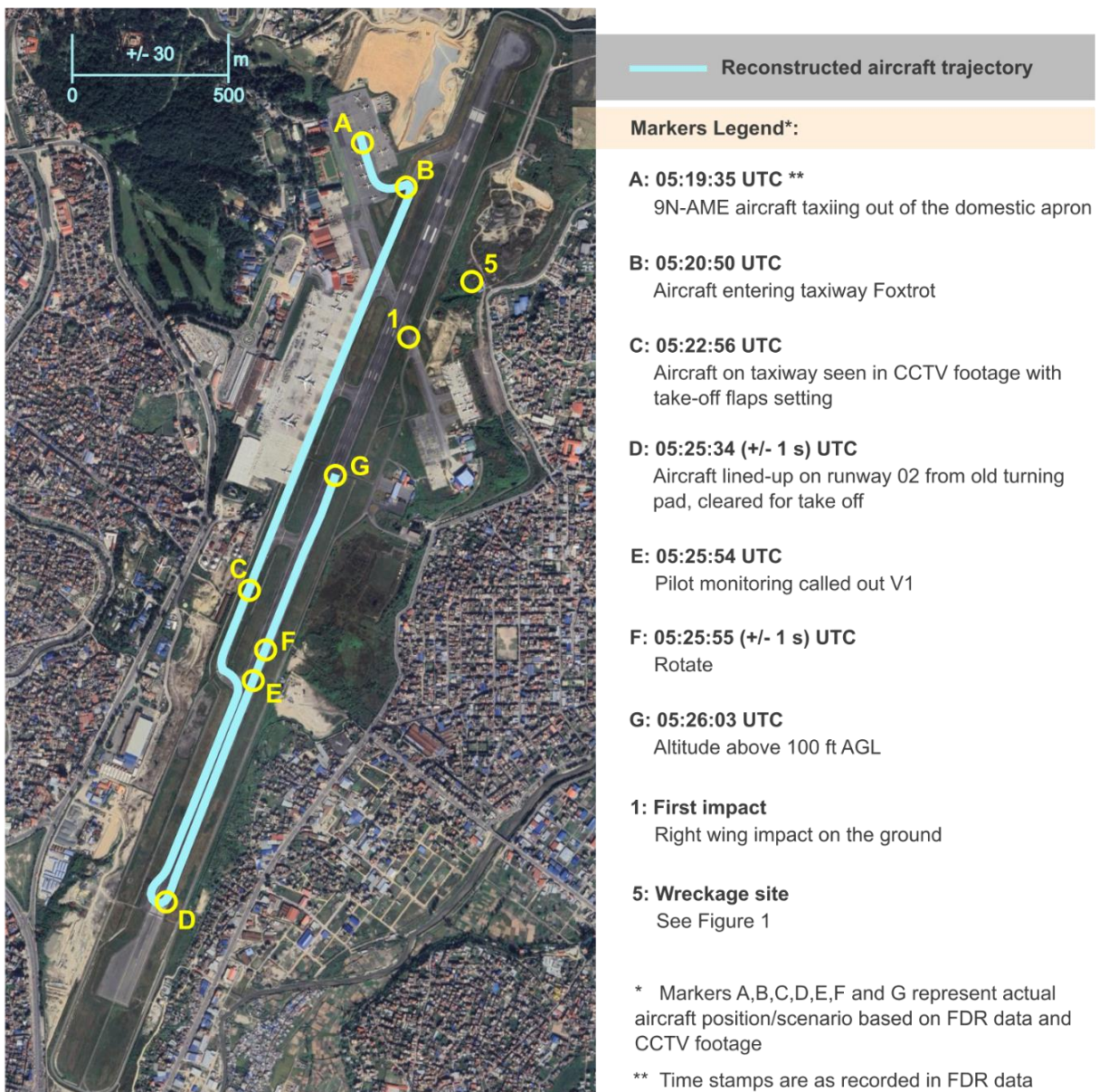


Figure 5: Flight path and event markers

The analysis of FDR data was performed in combination with the investigation of CCTV footages and CVR records. The reconstructed path of the aircraft is shown in Figure 5. The figure includes

the marking on the flight path significant to the comparative observation of the aircraft based on FDR data, CCTV footages, significant CVR audio information, and terrain references. Figure 6 shows the markings C and F as seen in the CCTV footage, while Figure 7 shows the unusual attitudes of the aircraft after take-off leading to the accident. The aircraft underwent a right, left and right bank before the right wing impacted on the ground at '1'.



Figure 6: CCTV footage view of the events (within +/- 1 s) marked **C** and **F** in Figure 5



Figure 7: Event sequence with unusual attitudes leading to the accident, captured by a CCTV camera. Almost immediately after rotation, the aircraft first went into a right wing down attitude, followed by left wing down-right wing down sequence. This sequence can be discerned from Figure 7. In

the duration while the aircraft oscillated about its longitudinal axis, the pilot-in-command (also the pilot flying), provided a series of inputs to the control wheel to correct the aircraft attitude.

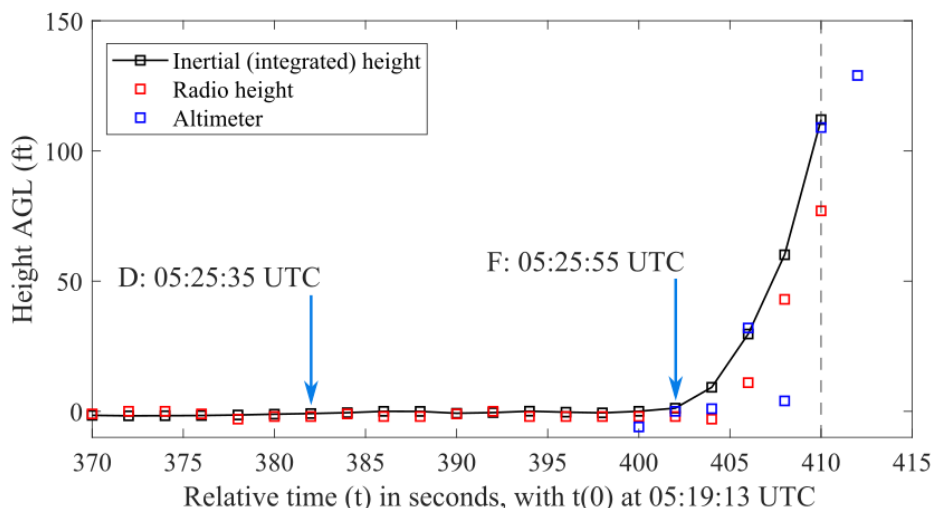


Figure 8: Height of the aircraft during the flight

After rotation for take-off at 05:25:55 UTC, the aircraft attained a height of 50 ft above ground level (AGL) within 5 ± 1 seconds. The height from the radio altimeter and pressure altimeter is shown in Figure 8, which indicates that the aircraft attained a height of slightly above 100 ft AGL by 05:26:03 UTC (marked 'G' in Figure 5, and at $t = 410$ s in Figure 8). At 'G', the aircraft was at 94.6° roll angle with a heading of 24.7° , veering right of Runway 02.

As per the preliminary analysis of the FDR data, no abnormalities were observed on engine parameters during the flight. Further analyses of all engine parameters are currently being performed.

During rotation for take-off, an abnormally high pitch rate was observed in the FDR data, of upto 8.6 degrees-per-second. As per the aircraft's flight manual, a take-off pitch rate exceeding 3 degrees-per-second is considered excessive.

Based on the overall preliminary investigation conducted, the following oversights are deemed critical:

1. Inspection of the crash site, assessment of 9N-ANM, CRJ 200 aircraft and interviews with the ground personnel of Saurya Airlines Pvt. Ltd. revealed that the operator was not complying with the aircraft load weighing, loading and securing of load requirements stipulated in Chapter 7 of its Operations Manual - Part B.

- The V-speeds mentioned in the operation flight plan of the event flight, as well as recorded in the FDR, were inconsistent with the Quick Reference Handbook (QRH). Figure 9 shows the relevant QRH values. Also, the interpolated speedcard of the operator for 18500 kg TOW mentions incorrect V-speeds for take-off.
- The procedure followed to issue the flight permission for ‘ferry’ flight (SAU-FER) was not adequate, as the obtained records did not show completeness and compliance with the Procedure Manual for Flight Permission of the Civil Aviation Authority of Nepal, August 2015.

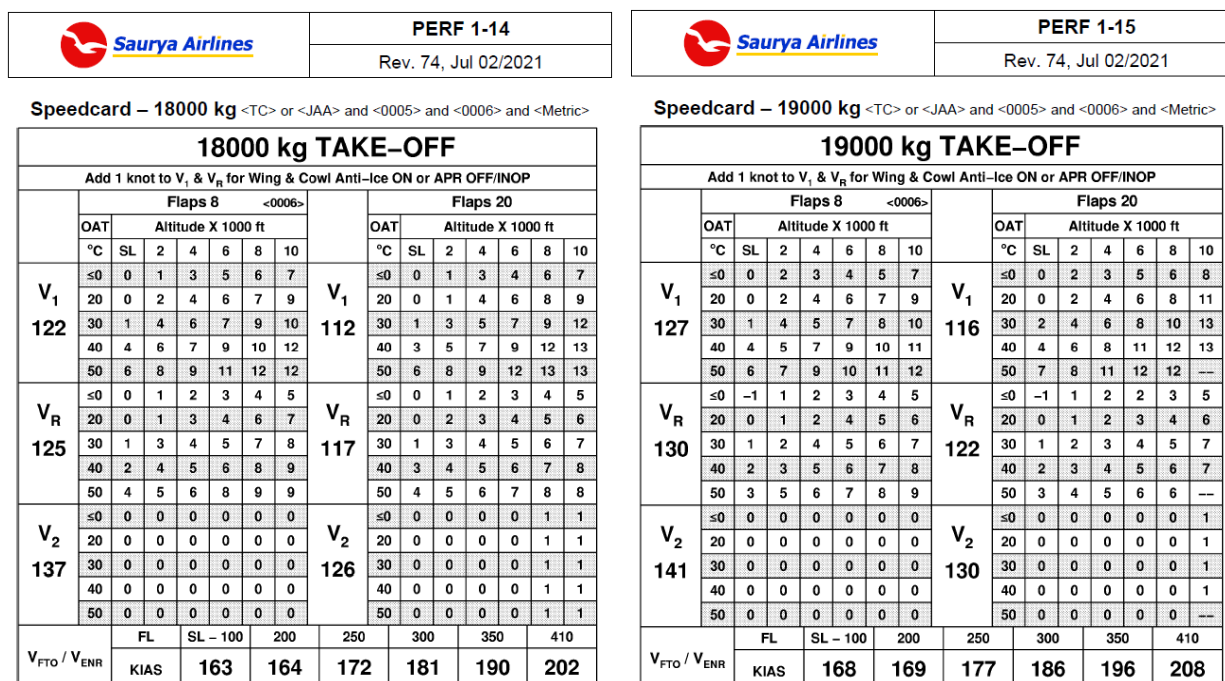


Figure 9: V-speeds references from QRH Vol 1, where the OAT and altitude corrections are also mentioned

3. Scope of Investigation

The investigation will continue to focus on possible causes of unusual behavior of the flight leading to the accident. The aspects being investigated are listed but not limited to:

- Weight and balance of the aircraft
- Aerodynamics and take-off performance of the aircraft
- Operational and flight permission practices
- Human Factors
- Safety Management System

4. Interim Safety Recommendations

The AAIC has provided the following interim safety recommendations:

1. All operators shall immediately review their speedcards and RTOW charts.
2. All operators shall comply with the requirements of the cargo and baggage handling. Baggage and cargo weighing, its distribution and latching should be ensured as stipulated in the operation manual and ground handling manual.
3. Civil Aviation Authority of Nepal shall review and update the procedure and requirements for the permission of non-scheduled flights including all non-revenue and ferry flights.