



**KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA**

FINAL

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Aircraft Accident Investigation Report

PT Smart Cakrawala Aviation

Cessna Caravan C208B EX; PK-SNW

Runway of Sinak Airport, Papua

Republic of Indonesia

30 August 2022

2025

This Final Report is published by the Komite Nasional Keselamatan Transportasi (KNKT), located on the 3rd floor of the Transportation Building, Jalan Medan Merdeka Timur No. 5, Jakarta 10110, Indonesia.

The report is the result of an investigation conducted by the KNKT in accordance with Annex 13 to the Convention on International Civil Aviation, the Indonesian Aviation Act (UU No. 1/2009), and Government Regulation (PP No. 62/2013).

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Jakarta, 8 December 2025
**KOMITE NASIONAL
KESELAMATAN TRANSPORTASI
CHAIRMAN**



SOERJANTO TJAHJONO

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ABBREVIATIONS AND DEFINITIONS

AFCS	:	Automatic Flight Control System
AIP	:	Aeronautical Information Publications
AOC	:	Air Operator Certificate
ATC	:	Air Traffic Controller
BMKG	:	<i>Badan Meteorologi Klimatologi dan Geofisika</i> (Bureau of Meteorology, Climatology, and Geophysics)
CASR	:	Civil Aviation Safety Regulation
CVR	:	Cockpit Voice Recorder
CVDR	:	Cockpit Voice and Data Recorder
DH	:	Decision Height
EDR	:	Excessive Descent Rate Caution
FF	:	Fuel Flow
GPS	:	Global Positioning System
HDG	:	Heading
HSI	:	Hot Section Inspection
IAS	:	Indicated Airspeed
ILS	:	Instrument Landing System
ITI	:	Imminent Terrain Impact
ITT	:	Inter Turbin Temperature
KNKT	:	<i>Komite Nasional Keselamatan Transportasi</i> (National Transportation Safety Committee)
MDA	:	Minimum Descent Altitude
MFD	:	Multi-Function Display
MSL	:	Mean Sea Level
OAT	:	Outside Air Temperature
OM	:	Operation Manual
PF	:	Pilot Flying
PIC	:	Pilot in Command
PM	:	Pilot Monitoring
POH	:	Pilot Operating Handbook
SD Card	:	Secure Digital Card
SIC	:	Second in Command
TIBA	:	Traffic Information by Aircraft
TAWS	:	Terrain Avoidance and Warning System
TO	:	Take-Off
UTC	:	Universal Time Coordinated

VFR : Visual Flight Rules
VHF : Very High Frequency
VMC : Visual Meteorological Conditions
VS : Vertical Speed

SYNOPSIS

On 30 August 2022, a Cessna 208B EX aircraft, registered PK-SNW, operated by PT. Smart Cakrawala Aviation (Smart Aviation) was conducting unscheduled cargo and passenger flights.

At 0326 UTC (1226 LT), the aircraft departed from Timika to Sinak, conducting the seventh flight of the day, and climbed to a cruising altitude of 13,000 feet. Prior to the departure, and during the previous six flights on that day, there were no records or reports of the aircraft system malfunctions.

On board this flight were two pilots, two passengers, and 1,048 kg of cargo. One of the passengers was the family of the aircraft operator's owner. The Pilot in Command (PIC) acted as Pilot Flying (PF), and the Second in Command (SIC) acted as Pilot Monitoring (PM).

At 1306 LT, when the aircraft was on final approach to Runway 35, the Cockpit Voice and Data Recorder (CVDR) recorded aural Terrain Avoidance Warning System (TAWS) alert of "Sink Rate" and "Pull Up". The PIC requested the SIC to extend the flap, which was acknowledged by the SIC. A few seconds later, another aural "Pull Up" alert was recorded.

At 1307 LT, the Garmin G1000 flight data logging of the aircraft indicated that the aircraft touched down on the runway and bounced. The PIC applied reverse thrust and brakes. A few seconds later, the aircraft touched down again. During the landing roll, the PIC repeatedly requested assistance from the SIC in braking the aircraft.

The aircraft impacted an embankment and came to a stop beyond the end of Runway 35. The pilots and the passengers evacuated the aircraft safely on their own.

The investigation identified contributing factors to the occurrence as follows:

- The higher altitude and Indicated Airspeed (IAS) above the reference speed when passing the runway threshold made the aircraft touchdown the runway beyond the touchdown zone marking. These conditions resulted in insufficient distance to stop the aircraft on the runway.
- The excessive sink rate and IAS above the reference speed prior to touchdown might have made the aircraft bounced, increasing the severity of the runway excursion.
- Plan continuation bias combined with self-imposed pressure to complete a flight might contribute to the decision to land despite the approach condition no meeting the stabilized approach criteria.

KNKT acknowledges the safety actions taken by the aircraft operator and considers that the safety action(s) was/were relevant to improve safety, however, there are safety issues that remain to be considered. Therefore, KNKT issued safety recommendations to the aircraft operator addressing safety issues identified in this report.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 30 August 2022, a Cessna 208B EX aircraft, registered PK-SNW, operated by PT. Smart Cakrawala Aviation (Smart Aviation) was conducting unscheduled cargo and passenger flights.

The flight schedule for the day of the aircraft and the PIC included following route: Timika¹ – Ilaga – Timika – Sinak² – Timika – Kenyam – Timika – Sinak – Timika. These flights were planned to be conducted in accordance with Visual Flight Rules (VFR).

At 0326 UTC³ (1226 LT), the aircraft departed from Timika to Sinak, conducting the seventh flight of the day, and climbed to a cruising altitude of 13,000 feet. Prior to the departure, and during the previous six flights on that day, there were no records or reports of the aircraft system malfunctions.

On board this flight were two pilots, two passengers, and 1,048 kg of cargo. One of the passengers was the family of the aircraft operator's owner. The Pilot in Command (PIC) acted as Pilot Flying (PF), and the Second in Command (SIC) acted as Pilot Monitoring (PM). The flight was uneventful until the aircraft started the descend for the landing approach.

At 1301 LT, the aircraft initiated the descent, and the PIC conducted approach and landing briefing. During the briefing, the PIC stated that the approach speed would be about 82 to 85 knots Indicated Airspeed (IAS). The PIC also stated that if the aerodrome was not visible at altitude of 7,500 feet, he would climb to 8,000 feet then enter a holding circuit before making another attempt of landing approach.

At 1302 LT, the Cockpit Voice and Data Recorder (CVDR) recorded the approach checklist being read. While conducting the checklist, a brake check was also performed by pressing the brake pedals. The pilot felt pressure in the brake pedals. At the end of the checklist reading, the PIC stated that the aerodrome was in sight and proceeded with the landing approach.

At 1306 LT, when the aircraft was on final approach to Runway 35, the CVDR recorded aural Terrain Avoidance Warning System (TAWS) alert of "Sink Rate" and "Pull Up". The PIC requested the SIC to extend the flap, which was acknowledged by the SIC. A few seconds later, another aural "Pull Up" alert was recorded.

At 1307 LT, the Garmin G1000 flight data logging of the aircraft indicated that the aircraft touched down on the runway and bounced. The PIC applied reverse thrust and brakes. A few seconds later, the aircraft touched down again. During the landing roll, the PIC repeatedly requested assistance from the SIC in braking the aircraft.

The aircraft impacted an embankment and came to a stop beyond the end of Runway 35. The pilots and the passengers evacuated the aircraft safely on their own.

¹ Mozes Kilangin International Airport, Timika (TIM) will be named as Timika for the purpose of this report.

² Sinak Airport, Puncak (NKD) will be named as Sinak for the purpose of this report.

³ The 24-hours clock in Universal Time Coordinated (UTC) is used in this report to describe the local time as specific events occurred. The Local Time in Sinak is UTC + 9 hours.



Figure 1: The aircraft condition after it stopped

1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	1	-	1	Not applicable
None	1	2	3	Not applicable
TOTAL	2	2	4	-

All of the occupants were Indonesian.

1.3 Damage to Aircraft

The aircraft was substantially damaged. The nose landing gear collapsed, and the propeller assembly detached from the propeller gearbox. All propeller blades were found bent.



Figure 2: The damaged of the nose section and the propeller

1.4 Other Damage

There was no other damage to property and/or the environment.

1.5 Personnel Information

1.5.1 Pilot In Command

Gender	: Male
Age	: 33 years
Nationality	: Indonesia
Marital Status	: Married
Date of joining company	: 26 August 2020
License	: Commercial Pilot License (CPL)
Date of issue	: 12 February 2020
Aircraft type rating	: Single Engine (SE) – Land
Instrument rating validity	: 13 December 2016
Medical certificate	: Class 1
Last of medical	: 21 July 2022
Validity	: 21 January 2023
Medical limitation	: Holder shall possess glasses that correct for near vision.
Last line check	: 5 March 2022

Last proficiency check : 6 December 2021

Flying experience

Total hours : About 4,200 hours

Total on type : About 2,700 hours

Last 90 days : 152 hours and 52 minutes

Last 30 days : 85 hours and 3 minutes

Last 7 days : 10 hours and 4 minutes

Last 24 hours : 3 hours and 51 minutes

This flight : 41 minutes

1.5.2 Second in Command

Gender : Male

Age : 33 years

Nationality : Indonesia

Marital Status : Married

Date of joining company : 26 August 2018

License : CPL

Date of issue : 21 October 2021

Aircraft type rating : SE – Land

Instrument rating validity : 5 October 2021

Medical certificate : Class 1

Last of medical : 9 August 2022

Validity : 18 February 2023

Medical limitation : None

Last line check : 21 June 2022

Last proficiency check : 8 February 2022

Flying experience

Total hours : 469 hours and 34 minutes

Total on type : 290 hours and 49 minutes

Last 90 days : 119 hours and 47 minutes

Last 30 days : 60 hours and 10 minutes

Last 7 days : 37 hours and 57 minutes

Last 24 hours : 6 hours and 4 minutes

This flight : 41 minutes

1.6 Aircraft Information

1.6.1 General

Registration Mark	:	PK-SNW
Manufacturer	:	Textron Aviation Inc.
Country of Manufacturer	:	United States
Type/Model	:	Cessna 208B EX
Serial Number	:	208B-5579
Year of Manufacture	:	2020
Certificate of Airworthiness		
Date of issue	:	8 December 2021
Validity	:	7 December 2022
Category	:	Normal
Limitation	:	None
Certificate of Registration		
Number	:	4283
Date of issue	:	8 December 2020
Validity	:	7 December 2023
Time Since New	:	2,143 hours 50 minutes
Cycles Since New	:	3,475 cycles
Last Major Check	:	HSI (Hot Section Inspection)
Last Minor Check	:	100-hour inspection

1.6.2 Engine

Manufacturer	:	Pratt & Whitney Canada
Type/Model	:	3076226-01-BS1294
Serial Number	:	PCE-VA0651
Time Since New	:	2,143 hours 50 minutes
Cycle Since New	:	3,475 cycles

1.6.3 Propellers

Manufacturer	:	McCauley
Type/Model	:	P7785550-01
Serial Number	:	190815
Time Since New	:	2,143 hours 50 minutes
Cycle Since New	:	3,475 cycles

1.6.4 Weight and Balance

According to the weight and balance sheet for the occurrence flight, the takeoff weight was 8,790 lbs, within the maximum allowable limit of 9,062 lbs. The estimated landing weight was about 8,590 lbs, below the maximum landing weight of 9,000 lbs. The aircraft was operated within the weight and balance envelope.

1.6.5 Garmin 1000 system

The aircraft is equipped with Garmin G1000 system, which has the capability to record flight data logging and navigation. The flight data logging is stored in the Secure Digital Card (SD Card) installed in one of the slots in the Multi-Function Display (MFD). The detailed information of the Garmin G1000 flight data logging is described in subchapter 1.11.

1.6.5.1 The Audio Control Panel

The Garmin G1000 system is equipped with the Audio Control Panel GMA 1347, which has the capability to connect to external audio sources, such as a mobile phone or other music player. The connection can be made via Bluetooth or through a direct cable.

The GMA 1347 also has the capability to split the audio system between the PIC and the SIC. For instance, music sound can be configured so that the music is only heard on one side, either by the PIC or the SIC.

1.6.5.2 Terrain Avoidance Warning System

The Garmin G1000 system installed in the aircraft is equipped with Terrain Awareness and Warning System (TAWS), which has aural and visual alerts to increase situational awareness and aid in reducing the risk of controlled flight into terrain. The TAWS alert of “Sink rate” and “Pull up” indicated that the aircraft was on Excessive Descent Rate (EDR). The purpose of the EDR alert is to provide timely notifications when the aircraft is determined to be closing (descending) toward terrain at an excessive rate.

1.6.6 Stall Warning

The airplane is equipped with a vane-type stall warning unit located on the leading edge of the left wing. This unit is electrically connected to a stall warning horn located overhead of the pilot's position.

The vane senses the changes in airflow over the wing and activates the warning horn at airspeeds between 5 and 10 knots above the stall speed, in all configurations.

The stall warning component is as follows:

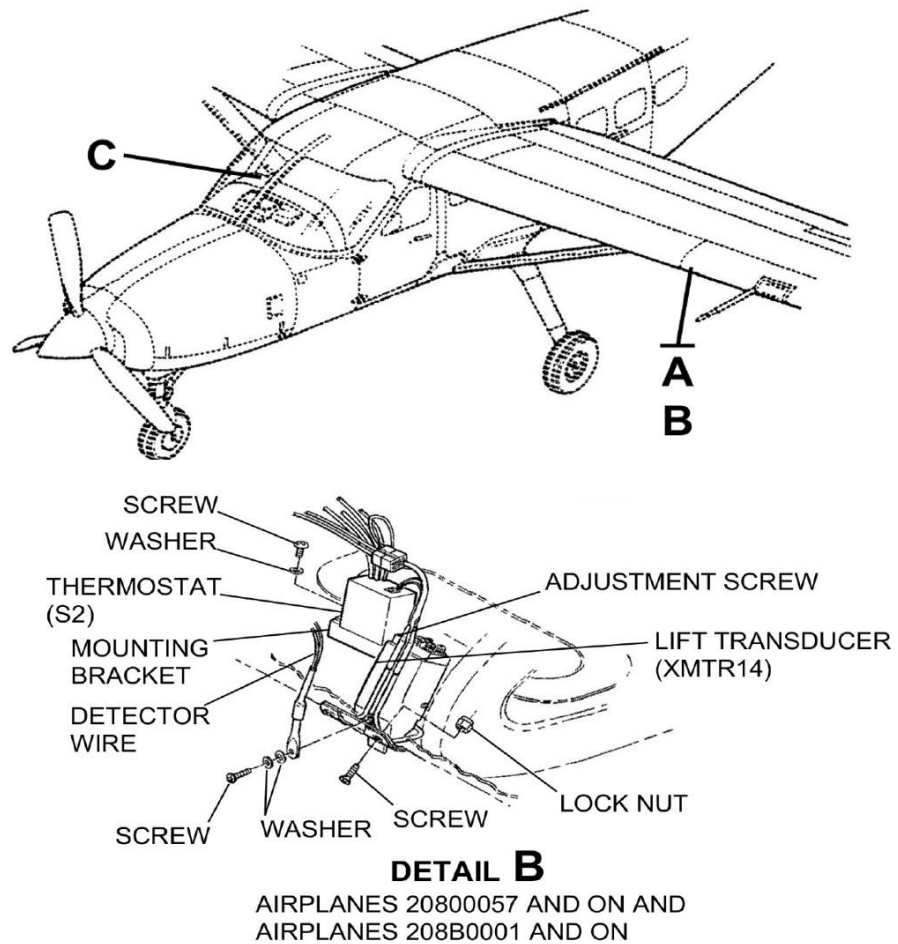


Figure 3: The Stall Warning component and installation

1.7 Meteorological Information

There was no meteorological station at Sinak, and the pilot relied on visual observation reported by ground personnel or other pilots.

The pilots recalled that it was slightly raining while approaching Sinak. During the landing approach, the weather was clear, and the runway was wet. Based on Garmin G1000 flight data logging, when the aircraft touchdown, the wind direction was 156° with a velocity of 9.4 knots.

1.8 Aids to Navigation

There was no ground-based navigation aid at Sinak. The aircraft operator developed an approach chart for Sinak, which included information about the area, routes, and aerodromes for internal use as follow:

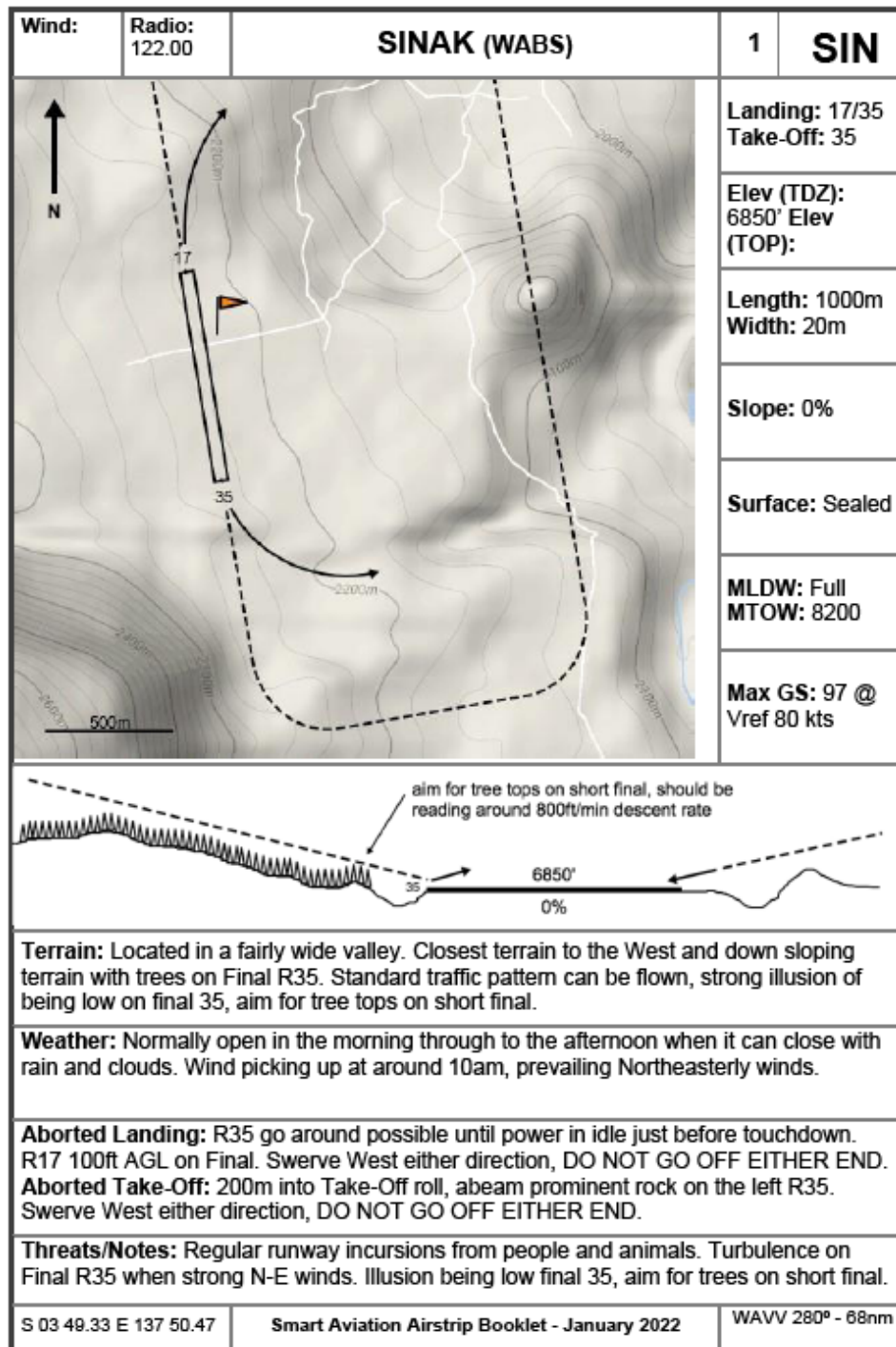


Figure 4: The Approach Chart of Sinak Aerodrome as stated in Smart Aviation Papua Airstrip Booklet

1.9 Communications

The pilot used two-way Very High Frequency (VHF) radio communication, which was recorded by the Cockpit Voice and Data Recorder (CVDR). An excerpt of relevant radio communication is included in subchapter 1.11 Flight Recorders.

1.10 Aerodrome Information

Sinak Aerodrome was listed in the Aeronautical Information Publications (AIP) Indonesia with a revision date of 12 August 2021. The aerodrome information published in the AIP is as follows:

Airport name	: Sinak Airport
Airport identification	: WABS
Airport operator	: Directorate General of Civil Aviation (DGCA)
Coordinate	: 3°49'19" S; 137°50'17" E
Elevation	: 7,299 feet
Runway direction	: 35/17
Runway length	: 1,100 meters
Runway width	: 23 meters
Surface	: Asphalt

1.11 Flight Recorders

The aircraft was fitted with a Cockpit Voice and Data Recorder (CVDR), which recorded both cockpit voice and flight data. The CVDR was manufactured by L-3 Communications with part number 2100-3083-51 and serial number 001169102. The aircraft is also equipped with a Garmin G1000, which has the capability for flight data logging. The Garmin G1000 is able to store various data on a Secure Digital (SD) card.

The CVDR unit and the SD card from the Garmin G1000 were transported to the KNKT recorder facility and successfully downloaded.

The CVDR data contained 124 minutes of voice recordings and 170 flight data parameters covering a total of 251 flight hours including the occurrence flight. However, the ground-air parameter recorded by the CVDR was found to be unreliable. The SD card of Gamin G1000 documented 146 flight data logging files, and the file for the occurrence flight contained 57 parameters over a duration of 47 minutes and 5 seconds.

1.11.1 Flight Data

The figure below shows the combined parameters retrieved from the CVDR and the Garmin G1000 flight data logging. The parameter terms in this report follow the nomenclature of the Garmin G1000 flight data logging. Significant parameters are shown in the figure below.

PK-SNW Cessna-208B Caravan EX

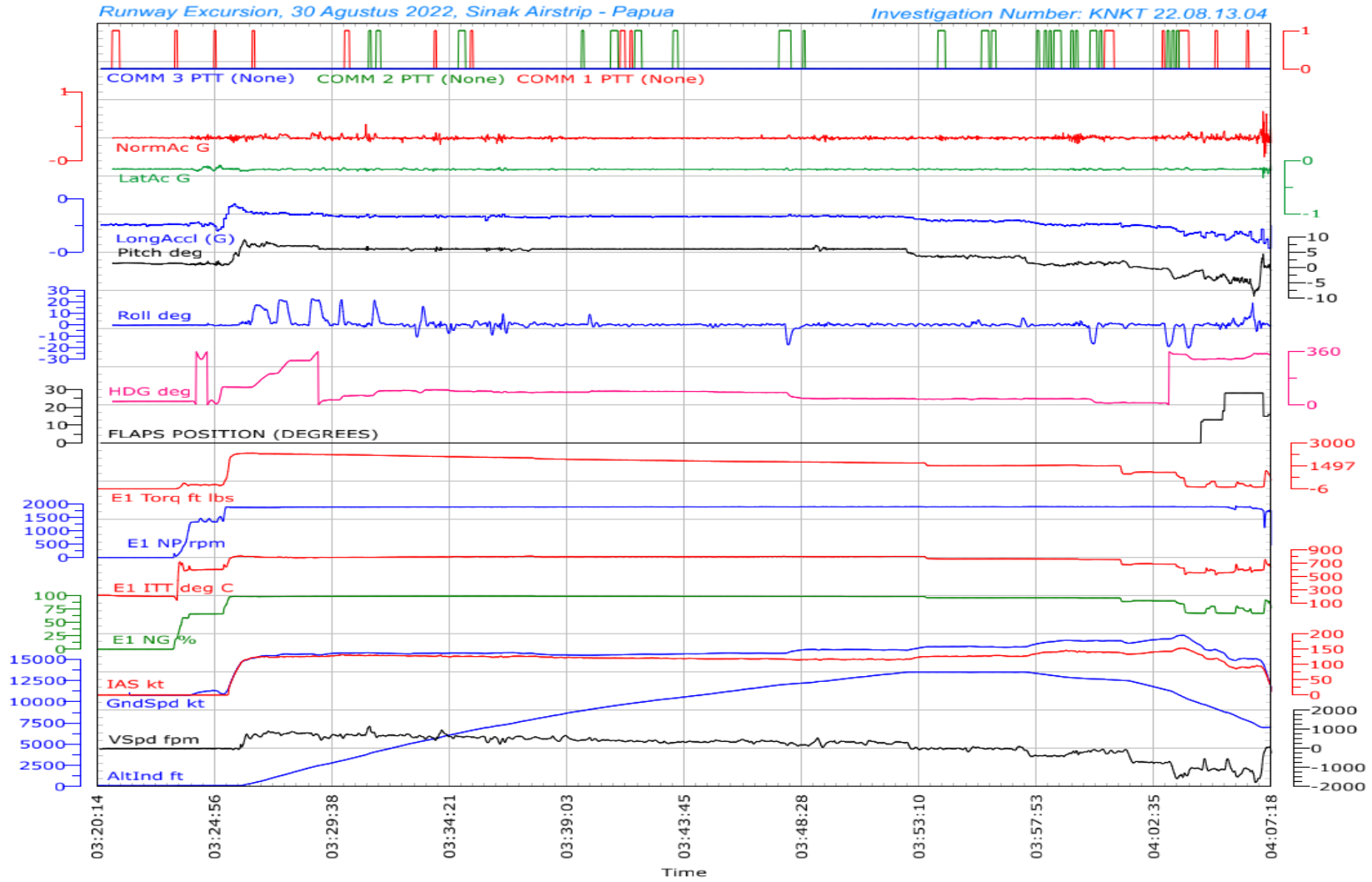


Figure 5: The significant parameters of the occurrence flight

PK-SNW Cessna-208B Caravan EX

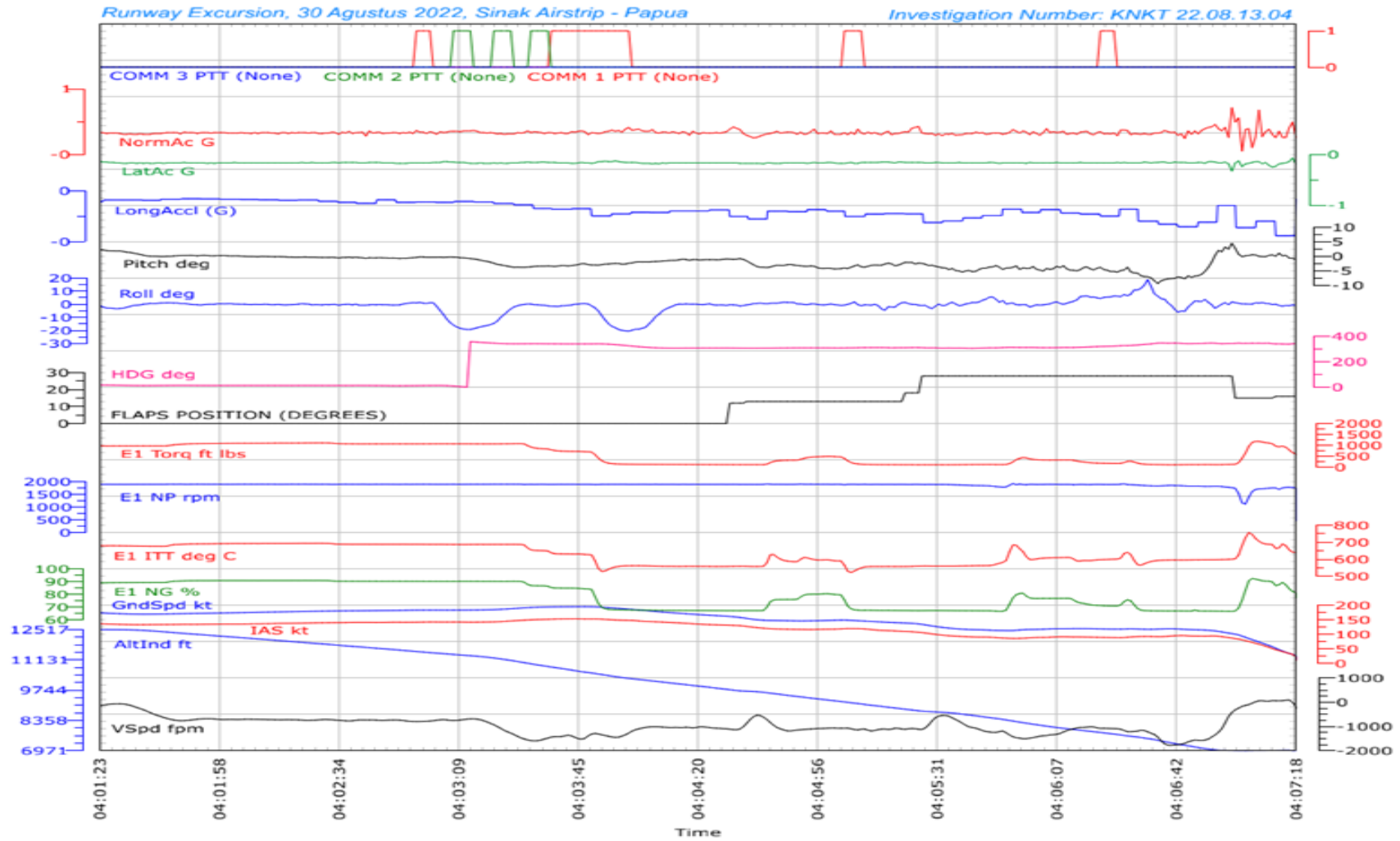


Figure 6: The significant parameters during the aircraft approach to the landing.

The significant event from the flight data is as follows:

1. At 03:52:52 UTC, the aircraft reached the top of the climb with a recorded altitude indicator (AltInd) of 13,500 feet.
2. At 03:57:22 UTC, the vertical speed showed negative value followed by the decreasing of the altitude which indicated that the aircraft was descending. The Indicated Airspeed (IAS) recorded at 139 knots.
3. At 04:04:30 UTC, the flap was extended from 0° to 12°.
4. At 04:05:16 UTC, the autopilot was disengaged when the AltInd was recorded at 9,397 feet. The IAS was 113 knots, and the vertical speed was -1,103 feet per minute.
5. At 04:05:22 UTC, the flap was extended to 18°.
6. At 04:05:27 UTC, the flap was extended to 28° when the AltInd was recorded at 8,784 feet with vertical speed of -1,121 feet per minute (aircraft on descend), and the IAS was 106 knots.
7. At 04:06:36 UTC, the aircraft heading was 343° when the AltInd was recorded at 7,482 feet with vertical speed of -1,329 feet per minute, and the IAS was 93 knots.
8. At 04:06:41 UTC, the highest vertical speed was recorded at -1,777 feet per minute when the AltInd was recorded at 7,332 feet, with an IAS of 94 knots.
9. At 04:06:51 UTC, the recorded coordinates showed that the aircraft was passing the Runway 35 threshold when the AltInd was 7,069 feet with vertical speed of -1,562 feet per minute. At this moment the aircraft heading was 344°, pitch angle was -5° (nose down) and the roll angle was 4° to the Right. The IAS was recorded on 94 knots and the Engine Torque (TQ) was 116 foot pound. The Outside Air Temperature (OAT) was recorded 14°C.
10. At 04:06:51 UTC, the AltInd was 6,990 feet and the aircraft pitch angle was at 0°.
11. At 04:06:56 UTC, the AltInd was 6,990 feet, with an IAS of 92 knots, the vertical speed was -1,090 feet per minute, the aircraft pitch angle increased from 2° to 3° (nose up). The recorded coordinate showed the aircraft was about 320 meters from the beginning of the runway.
12. At 04:06:59 UTC, the normal acceleration (NormAcc)⁴ was recorded at +0.57 G. At this moment, the AltInd was 6,984 feet with vertical speed of -421 feet per minute. The aircraft heading was 343°, pitch angle was 5° (nose up) and the roll angle was 2° to the right. The IAS was 87 knots, and the ground speed was 102 knots. The recorded coordinates showed the aircraft was approximately 480 meters from the beginning of runway. The wind direction was 156° with velocity of 9.4 knots.
13. At 04:07:00 UTC, the flap was retracted from 28° to 15°.
14. At 04:07:02 UTC, the NormAc was recorded at -0.42 G and the pitch angle was 0°. The recorded coordinates showed the aircraft was about 625 meters from the beginning of runway.

⁴ If the normal acceleration (NormAcc) is 0 then the aircraft is in a steady state.

15. At 04:07:05 UTC, the engine TQ increased from 947 feet pound to 1,133 feet pound and the ground speed was 82 knots. The AltInd was 6,982 feet, with vertical speed of -39 feet per minute. The aircraft pitch angle was 0° (aircraft level) and the roll angle was 0°. The recorded coordinate showed the aircraft was approximately 760 meters from the beginning of runway.
16. At 04:07:06 UTC, the vertical speed increased from -39 feet per minute to 22 feet per minute (the rate of descend was reduced).
17. At 04:07:07 UTC, the NormAc was recorded at +0.52 G. At this moment, the AltInd was 6,984 feet. The aircraft pitch angle was 0° and the roll angle was 0°. The IAS was 66 knots and the ground speed was 74 knots. The recorded coordinates showed the aircraft was approximately 840 meters from the beginning of runway.
18. At 04:07:11 UTC, the TQ was reduced from 1,075 feet pound to 960 feet pound. At this moment, the AltInd was 6,988 feet The IAS was 51 knots, and the ground speed was 57 knots. The recorded coordinates showed the aircraft was approximately 970 meters from the beginning of runway.
19. At 04:07:12 UTC, the IAS was recorded at 47 knots and the ground speed was 52 knots. At this moment the AltInd was 6,988 feet. The aircraft pitch and roll angle remained 0°. The recorded coordinates showed the aircraft was approximately 995 meters from the beginning of runway 35.
20. At 04:07:16 UTC, the IAS was recorded at 34 knots and the ground speed was 34 knots. At this moment, the AltInd was 6,996 feet with vertical speed of 96 feet per minute. The aircraft pitch and roll angle were -1°. The recorded coordinates showed the aircraft was approximately 1,075 meters from the beginning of runway.
21. At 04:07:17 UTC, the NormalAc was recorded as 0.24 G, IAS was 30 knots, and the ground speed was 31 knots. At this moment, the AltInd was 6,979 feet with vertical speed of -2 feet per minute. The aircraft pitch angle and roll angle were 0°. The recorded coordinates showed the aircraft was approximately 1,090 meters from the beginning of runway.
22. At 04:07:19 UTC, the Garmin G1000 and the CVDR stopped recording.

1.11.2 Cockpit Voice Data

The downloaded process successfully retrieved voice data from four separate channels with 124 minutes of audible audio. The audio channels were as follows:

- Channel 1 was dedicated to the Cabin and Passenger Address (PA) audio. This channel contained no audio.
- Channel 2 was identified as the First Officer (SIC) channel.
- Channel 3 was identified as the Pilot (PIC) channel.
- Channel 4 was identified as the Cockpit Area Mike (CAM).

The beginning of the audio recording was identified as the flight from Kenyam to Timika. An audible music was recorded on channel 3 until the aircraft landed at Timika, while no music was heard on channel 2 and channel 4.

The relevant excerpts of the CVR transcript on the occurrence flight are as follows:

Time (UTC)	Event
03:39:27	The background music started to hear on Pilot (PIC)'s channel.
03:53:53	The SIC broadcasted in the frequency of 122.9 MHz that the aircraft was about 17 Nm from the Agandugume Gap reaching an altitude of 13,500 feet and provided the estimated time arrival at the Agandugume Gap and Sinak. The Agandugume Gap is located about 6.8 Nm from Sinak on bearing 315°.
04:00:36	The SIC broadcasted in the frequency of 122.9 MHz that the aircraft was passing the Agandugumu Gap, the aircraft was on descent passing 12,600 feet, and the estimated time of arrival at Sinak would be 0403 UTC.
04:01:53	The SIC asked the PIC to conduct the Before Descend Checklist and the PIC conducted the approach briefing.
04:01:59	The PIC conducted briefing by stating that the PIC would like to use the speed of 82 to 85 knots (IAS). The PIC stated that if at altitude of 7,500 feet, the Sinak Aerodrome was in sight the PIC would continue the landing approach and if the aerodrome not in sight, the PIC would climb to 8,000 feet and make a holding.
04:02:26	The pilots started to perform the Approach Checklist.
04:02:36	The TAWS alert of "Caution Terrain" active twice.
04:02:41	The PIC advised the SIC "TAWS inhibit" and continued to perform the Approach Checklist including the brake check.
04:02:49	The Approach Checklist was completed.
04:06:05	The SIC conducted the Final Checklist.
04:06:39	TAWS sounded "Sink rate" and "Pull up".
04:06:45	TAWS sounded "Pull up".
04:06:53	The PIC requested to extend the flap. The SIC stated that the flap was selected to approach configuration.
04:06:54	Sound similar of stall warning.
04:06:57	Sound similar of stall warning followed by sound similar of aircraft touchdown the runway.
04:06:58	Sound similar of an engine power increased.
04:07:05	Sound similar of aircraft touchdown the runway.
04:07:06	The PIC requested the SIC to assist the braking and responded by the SIC that the SIC was assisting the brake, for several times.
04:07:12	Sound similar of stall warning.
04:07:15	Sound of impact several times.

Time (UTC)	Event
04:07:18	Sound similar of an engine spooling down.
04:07:19	The PIC apologized to the passenger several times.
04:07:23	The background music on Pilot (PIC)'s channel stopped.
04:07:31	Sound similar of an engine being shut down.
04:07:36	End of recording.

1.12 Wreckage and Impact Information

The right tire marks found on the left side of the runway centerline, approximately 670 meters from the beginning of Runway 35.



Figure 7: The tire mark found on the runway

1.13 Medical and Pathological Information

No medical or pathological investigations were conducted as a result of this occurrence, nor were they required.

1.14 Fire

There was no evidence of in-flight or post-impact fire.

1.15 Survival Aspects

After the aircraft stopped, the pilots and passengers evacuated the aircraft on their own. Several hours later, all occupants were transported to Timika, and the pilot, who had sustained minor injuries, was taken to the hospital.

1.16 Tests and Research

1.16.1 Cross Wind Component Calculation

Based on the Garmin G1000 flight data logging, when the aircraft touched down the runway, the wind direction was 156° with velocity of 9.4 knots. The runway heading at Sinak was 345° . The calculation of the tail wind component was as follows:

$$\begin{aligned}\text{Crosswind component} &= \text{windspeed} \times \sin(\text{wind direction}) \\ &= 9.41 \times \sin(156.2) \\ &= 3.79 \approx 4 \text{ knots}\end{aligned}$$

$$\begin{aligned}\text{Head/tailwind component} &= \text{windspeed} \times \cos(\text{wind direction}) \\ &= 9.41 \times \cos(156.2) \\ &= 8.609 \approx 9 \text{ knots}\end{aligned}$$

1.16.2 The Landing Profile in Sinak Runway

The investigation compared the Garmin G1000 flight data logging from several flights to determine the landing profile at Runway 35. The comparison included the occurrence flight of PK-SNW, the 5th and 19th flight prior to the occurrence, and other Cessna 208B EX aircraft operated by Smart Aviation. The following events were examined:

- a. the touchdown point
- b. the activation of the reverse thrust,
- c. the deactivation of the reverse thrust, and
- d. the point where the aircraft reached taxi speed and continued taxiing to the apron.

The touchdown point was estimated where the Garmin G1000 recorded a normal acceleration greater than $+0.1$ G when the aircraft's coordinates (latitude and longitude) were in the runway area.

The activation of reverse thrust was identified using the Engine Torque parameter where the value increased by more than 1,000 feet-pounds for several seconds. The deactivation was identified when the value dropped below 1,000 feet-pounds, in which the engine still provided power for aircraft movement.

The point where the aircraft reached taxi speed and continued taxiing to the apron was estimated a few seconds before the aircraft changed heading to execute 180 degree turn. At this time, the IAS value was zero, but the ground speed was still providing a value.

The investigation used the haversine equation which utilizes the latitude and longitude of between points to define their distance.

The haversine equation to determined distance between points is as follows:

$$ACOS(SIN(lat1) \times SIN(lat2) + COS(lat1) \times COS(lat2) \times COS(lon2 - lon1)) \times \text{earth radius}$$

ACOS	:	The arccosine. The arccosine function is the inverse function of the cosine function and calculates the angle for a given cosine.
SIN and COS	:	The sine and cosine trigonometric functions of an angle.
lat1 and lat2	:	The latitudes of points 1 and 2 which should be presented in decimal degrees and converted into a radian angle (if the computation is performed in the Excel worksheet). The radian angle is a Standard International unit to measure the angle.
lon1 and lon2	:	The longitudes of points 1 and 2 which should be presented in decimal degrees and converted into a radian angle if the computation is performed in the Excel worksheet.
Earth Radius	:	The radius of the earth is 6370.973 kilometers

The unit of measurement result of the computation will be kilometers and should be multiplied by 1,000 to derive the distance in meters.

The result of the calculation is as follows:

Event	Distance from the beginning of the runway (meters)			
	Occurrence Flight	19 th flight before occurrence	5 th flight before occurrence	Other Cessna 208B EX aircraft
Touchdown point #1	485	5	82	155
Touchdown point #2*	846	257	-	-
Reverse Thrust Activation	768	364	-	423
Reverse Thrust Deactivation	977	538	-	723
Aircraft reached taxi speed and continued taxiing to the apron**	1105	683	972	785

*Touchdown point #2 data will be available, if the aircraft are bouncing.

** On the occurrence flight, this event replaced when the aircraft stopped

All the event above were plotted on Google Earth and visualized it as follows:

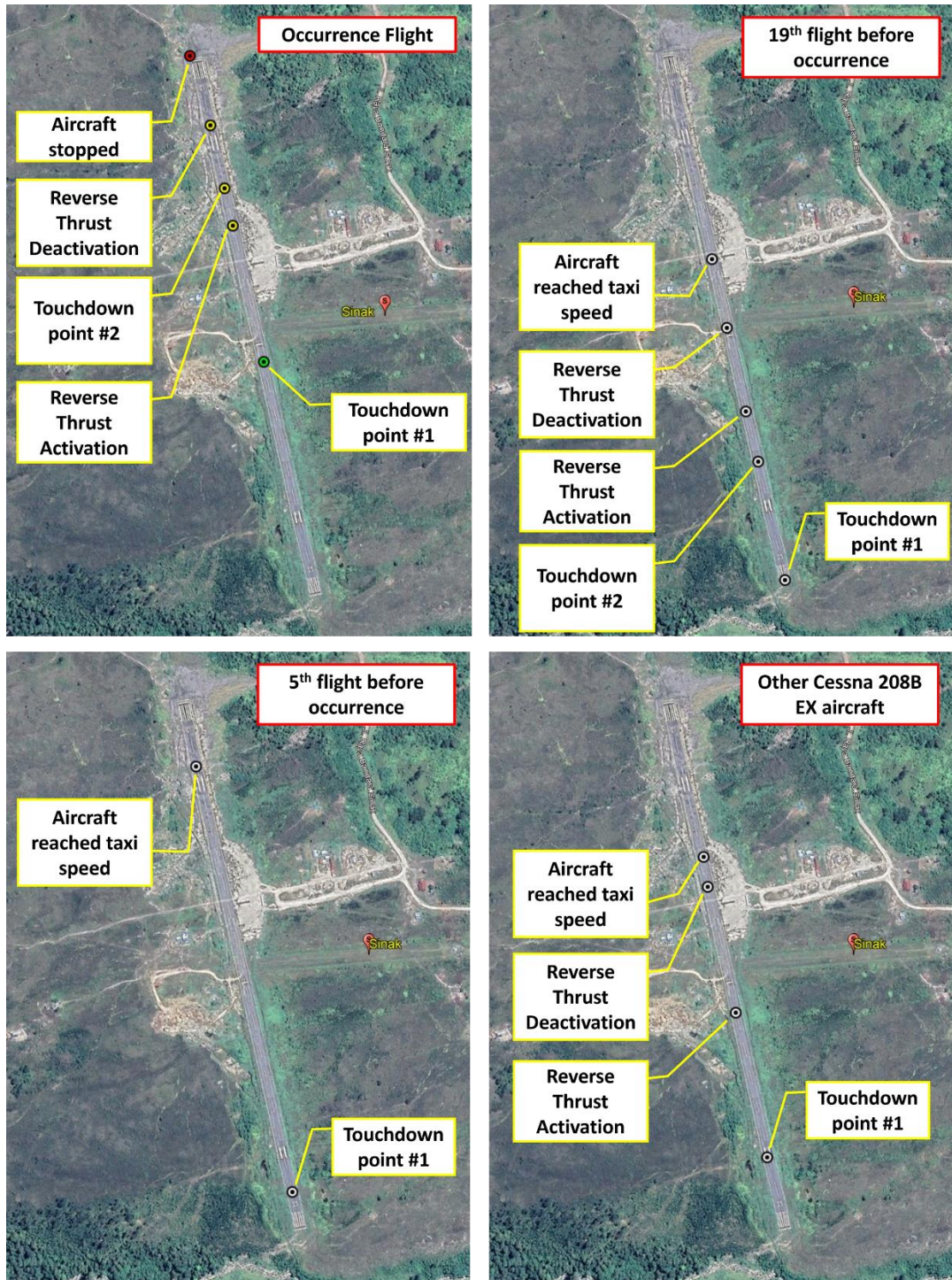


Figure 8: The comparison of aircraft landing behavior in Sinak Airport

Compared to the previous flights to Sinak, the touchdown point of the occurrence flight was beyond the touchdown zone marking of the Runway 25.

The 19th flight before the occurrence indicated that the aircraft experiencing a bounced landing. Meanwhile, the 5th flight before the occurrence, the thrust reverser was not activated and the aircraft deceleration utilized the wheel brake. The remaining runway was sufficient for both flights to reach the taxi speed.

The investigation calculated the ground roll of the occurrence flight using Short Field Landing Distance table provided in the Pilot’s Operating Handbook and FAA Approved Airplane Flight Manual applicable for PK-SNW aircraft (POH). Based on the weight and balance sheet of the occurrence flight, the estimated landing weight was about 8,590 lbs. Therefore, the investigation used the following Short Field Landing Distance table:

**CARGO POD INSTALLED
SHORT FIELD LANDING DISTANCE**

CONDITIONS:

Flaps **LAND**

Zero Wind

Maximum Braking

PROP RPM Lever **MAX**

Paved, Level, Dry Runway

POWER Lever **IDLE** after clearing

obstacles. **BETA** range (lever against spring) after touchdown.

Refer to Sheet 1 for appropriate notes applicable to this chart.

8500 Pounds:

Speed at 50 Feet:

78 KIAS

Pressure Altitude Feet	-10°C		0°C		10°C	
	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst
Sea Level	915	1715	950	1765	985	1810
2000	985	1810	1025	1865	1060	1915
4000	1060	1915	1100	1970	1140	2025
6000	1145	2030	1185	2090	1230	2150
8000	1235	2150	1280	2215	1325	2280
10,000	1330	2285	1380	2355	1435	2420
12,000	1440	2430	1495	2500	1550	2575

Pressure Altitude Feet	20°C		30°C		40°C	
	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst
Sea Level	1020	1860	1055	1910	1090	1955
2000	1100	1965	1135	2020	1175	2070
4000	1180	2080	1225	2135	1265	2190
6000	1275	2205	1315	2265	1360	2325
8000	1375	2340	1420	2405	---	---
10,000	1485	2485	1535	2555	---	---
12,000	1605	2645	---	---	---	---

Figure 9: Short Field Landing Distance Table

The Sinak elevation was 7,299 feet, and the recorded Outside Air Temperature (OAT) was 14°C. The investigation then employed an interpolation equation using the Short Field Landing Distance from Figure 11 (the details of the interpolation are available in subchapter 6.3). Based on the interpolation result, the calculated ground roll distance was 1,311 feet or 399.6 meters.

A note in the Short Field Landing Distance table described that for operations with tailwind up to 10 knots, the ground roll would increase by 10% for every 2 knots, and the utilization of maximum reverse thrust after touchdown would reduce the ground roll distance by 10%. During the occurrence flight, the calculated tailwind component was 9 knots, and the pilot applied reverse thrust after touchdown. The calculation for the ground roll distance of the occurrence flight was as follows:

$$399.6 \text{ meters} + (399.6 \text{ meters} \times 45\%) - (399.6 \text{ meters} \times 10\%) = 539.46 \approx 540 \text{ meters.}$$

The Short Field Landing Distance table used for the calculation was based on dry runway conditions. As the aircraft landed on a wet runway, the actual ground roll distance might have been longer than 540 meters.

1.16.3 The Brake Examination

After the occurrence, the engineers from the aircraft operator performed a brake test by pressing the brake pedals and found that the feedback pressure from both brakes were normal. Both brake units were then disassembled to check their condition, and all brake linings were visually considered as acceptable.





Figure 10: All brake linings condition

1.17 Organizational and Management Information

The aircraft was operated by PT Smart Cakrawala Aviation (Smart Aviation) which held a valid Air Operator Certificate (AOC) number 135-062. Smart Aviation is authorized to conduct air transportation of passengers and cargo for both scheduled and non-scheduled operations under Civil Aviation Safety Regulation (CASR) Part 135 within and outside Indonesia.

Smart Aviation developed Operation Manuals (OM) which contain policies and procedures approved by the Directorate General of Civil Aviation.

1.17.1 Stabilized Approach Procedures

The procedure of the stabilized approach describes in the Operation Manual Part A: General (OM-A) as follows:

10.8. STABILIZED APPROACH PROCEDURES

10.8.1. General

A stabilized approach is one of the key features of a safe approach and landing in public transport operations. A stabilized approach is characterized by a constant angle, constant-rate descent approach profile.

If at any time during an approach there is doubt that any element of the stabilize approach can not be achieved or maintained, the approach should be discontinued.

All Smart Cakrawala Aviation flights must be stabilized by 500 feet above airport elevation in visual meteorological conditions (VMC).

An approach is stabilized when all of the following criteria are met:

- 1. The aircraft is on the correct flight path;*
- 2. Only small changes in heading/ pitch are required to maintain the correct flight path;*
- 3. The aircraft speed is not more than VREF+20 knots indicated airspeed and not less than VREF;*
- 4. The aircraft is in the correct landing configuration;*
- 5. Sink rate is no greater than 1,000 feet per minute; if an approach requires a sink rate greater than 1,000 feet per minute, a special briefing should be conducted;*
- 6. Power setting is appropriate for the aircraft configuration and is not below the minimum power for approach as defined by the aircraft operating manual;*
- 7. All briefing and checklists have been conducted;*
- 8. Specific types of approaches are stabilized if they also full fill the following: instrument landing system (ILS) approaches must be flown within one dot of the glide slope and localizer; during a circling approach, wings should be level on final when the aircraft reaches 300 feet above airport elevation;*
- 9. Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.*

An approach that becomes un-stabilized below 500 feet above airport elevation in VMC requires an IMMEDIATE GO-AROUND.

DO NOT ATTEMPT TO LAND FROM AN UNSTABLE APPROACH AN APPROACH THAT BECOMES UNSTABILIZED BELOW 1,000 FEET AFE IN IMC OR BELOW 500 FEET AFE IN VMC REQUIRES AN IMMEDIATE GOAROUND

1.17.2 Electronic Devices

The OM-A subchapter 10.16.6 describes policy on the usage of electronic devices as follows:

Electronic devices may cause interferences with navigation or communication system of the aircraft on which they are used. To avoid any risk of interference, the use of the following electronic Devices are prohibited on board at all times:

- Cellular phones (after the aircraft doors are closed before take-off and until the aircraft doors opened after landing)*
- PDAs (Personal Digital Assistants such as Palm, Blackberries even if they have flight mode capability)*
- Portable televisions*

- *Radio receivers*
- *Radio transmitters*
- *Remotely controlled units such as toys*
- *Any electronic devices that have not been determined as not causing Interferences with aircraft systems.*

Devices approved for use during all flight phases except take-off, climb, approach, final approach and landing:

- *Personal audio/video devices i.e. CD, VCD, DVD, MP3 players*
- *Photographic devices, i.e. digital camera, video camera and portable VCR*
- *Computer and peripheral devices, i.e. Laptop, Electronic dictionary, Calculator*
- *Electronic games without remote control*
- *Video and audio tape recorders*
- *Electric shavers*
- *Portable personal listing devices (compact disc, cassette players)*
- *Portable voice recorder* *Devices approved for use during all phases of flight:*
- *Hearing aids*
- *Heart pacemakers*

If the captain suspects the aviation system is interrupted due to passenger use of electronic devices which are not prohibited, he may request the passenger stop using the electronic device.

1.17.3 Stall Speeds

The stall speeds of the Cessna C208B EX describe in section 5 of the POH as follows:

STALL SPEEDS

CONDITIONS:
 8807 Pounds
 POWER Lever **IDLE**
 FUEL CONDITION Lever **HIGH IDLE**

MOST REARWARD CENTER OF GRAVITY

Flap Setting	Angle of Bank							
	0°		30°		45°		60°	
	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	63	78	68	84	75	93	89	110
TO/APR	56	66	60	71	66	78	78	93
LAND	48	60	52	64	57	71	68	85

MOST FORWARD CENTER OF GRAVITY

Flap Setting	Angle of Bank							
	0°		30°		45°		60°	
	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	63	78	68	84	75	93	89	110
TO/APR	57	67	61	72	68	80	81	95
LAND	50	61	54	66	59	73	71	86

NOTE

1. Altitude loss during a stall recovery may be as much as 300 feet from a wings-level stall, and even greater from a turning stall.
2. KIAS values are approximate.

Figure 5-6

1.17.4 The Short Field Landing Procedure

The Section 4 of the POH states the Short Field Landing procedure as follows:

SHORT FIELD LANDING

For short field landings, make a power approach at 78 KIAS with the PROP RPM lever at MAX (full forward) and with wing FLAPS FULL. After all approach obstacles are cleared, reduce power to idle. Maintain 78 KIAS approach speed by lowering the nose of the airplane. Touchdown should be made with the POWER lever at IDLE, and on the main wheels first. Immediately after touchdown, lower the nose gear, reposition the POWER lever against the spring in the BETA range, retract WING FLAPS to UP and apply heavy braking as required.

For maximum brake effectiveness after all three wheels are on the ground, hold full nose up elevator, apply maximum possible brake pressure without sliding the tires and retract the flaps to UP.

The landing performance shown in Section 5, Performance, Figure 5-26 or Figure 5-43, Short Field Landing Distance is based on the above procedure. A reduction in ground roll of approximately 10% will result from the use of reverse thrust (POWER lever full aft to provide increased power from the gas generator and a reverse thrust propeller blade angle).

CAUTION

To minimize propeller blade erosion or possible propeller blade damage, reverse thrust should be used only when necessary to shorten the ground roll. Bringing the propeller out of reverse before decelerating through approximately 25 knots will minimize propeller erosion.

1.18 Additional Information

Plan Continuation Bias and Cognitive Fixation⁵

Research in flight operations and human factors has identified plan continuation bias and cognitive fixation as common conditions influencing pilot decision-making during approach and landing.

The plan continuation bias describes a tendency for flight crews to continue with an intended course of action despite cues indicating that conditions have changed or that the current plan is no longer safe. This behavior may occur due to high workload, time pressure, expectation of a successful landing, or the belief that the situation will improve.

According to the Flight Safety Foundation's Approach-and-Landing Accident Reduction (FSF ALAR) Briefing Notes, continuation of an unstabilized approach is often associated with overconfidence, inadequate monitoring, or delayed decision to go around. Such conditions may reduce situational awareness and impair timely decision-making during the final approach phase.

1.19 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with the KNKT approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

⁵ The description of this subchapter is based on the Flight Safety Foundation (FSF) Approach and Landing Accident Reduction (ALAR) Tool Kit Briefing Note 2.1 – Human Factors and 7.1 – Stabilized Approach

2 ANALYSIS

The investigation determined that there was no issue related to the aircraft system malfunction. The analysis will therefore discuss the aircraft landing performance and the pilot decision making.

2.1 Aircraft Landing Performance

The aircraft operator Operation Manual Part A: General (OM-A) subchapter 10.8.1 requires Smart Cakrawala Aviation flight to be stabilized by 500 feet above airport elevation in Visual Meteorological Conditions (VMC). If an approach becomes unstabilized, the pilot must initiate a go around maneuver immediately. The OM-A described stabilized approach criteria, which require the aircraft to be on the correct flight path, with only small changes in heading or pitch required to maintain the correct flight path. The other criteria require the approach sink rate to not exceed 1,000 feet per minute, and if a greater sink rate is required, a special briefing should be conducted.

The available flight data did not record parameters indicating aircraft altitude above airport elevation. The investigation used the touchdown point based on the recorded normal acceleration greater than +0.1 G. In the occurrence flight, the aircraft touched down when the altitude indicator (AltInd) was 6,984 feet.

Cockpit voice and flight data showed that during the landing approach, the aircraft aligned with the runway's final path on a heading of 344°. At that moment, the altitude indicator (AltInd) was 7,482 feet or 498 feet above airport elevation. Three seconds later, the aircraft's rate of descent exceeded 1,000 feet per minute, triggering the sink rate alarm twice. The highest descend rate of 1,777 feet per minute was recorded five seconds after the aircraft aligned with the runway's final path. Cockpit voice data did not record any special briefing during the landing approach suggesting that the pilot did not intend to exceed the stabilized approach criteria for sink rate. Cockpit voice data also revealed that upon reaching an altitude of 7,449 feet (465 feet above airport elevation), the aircraft's pitch changed from -9° (nose down) to 0° (level) at 7,011 feet of AltInd (27 feet above airport elevation), followed by a nose up pitch of 4° at touchdown. The roll attitude exhibited a similar pattern, shifting from 6° right at 7,449 feet (465 feet above airport elevation) to 6° left at 7,274 feet (290 feet above airport elevation). The change of aircraft pitch and roll attitude indicated that the aircraft was not maintaining the correct flight path.

The excessive sink rate exceeding 1,000 feet per minute without special briefing, along with the deviation from correct flight path when the aircraft altitude was below 500 feet above airport elevation indicated that the aircraft did not meet the stabilized approach criteria, and pilot must have initiated a go around maneuver immediately. The aircraft passed the runway threshold at an AltInd of 7,069 feet (85 feet above airport elevation). At that time, the Indicated Airspeed (IAS) was recorded at 94 knots, 16 knots above the reference speed of 78 knots. The higher altitude and IAS when passing the runway threshold resulted in the aircraft touching down the runway at a distance far beyond the touchdown zone marking. A few seconds after passing the runway threshold, the NormAcc (Normal Acceleration) recorded +0.57 G, with the aircraft's pitch at 5° (nose up) and a roll of 2° to the right. The investigation considered

that at that time, the aircraft touched down on Runway 35. The recorded touchdown coordinates were about 485 meters from the beginning of the runway.

The calculated ground roll distance with dry runway condition for the occurrence flight was 540 meters (see subchapter 1.16.2). Therefore, the total landing distance would be more than 1,025 meters for a wet runway. With the available runway length of 1,100 meters, the remaining distance was insufficient to stop the aircraft on the runway. The normal acceleration showed negative value after the aircraft touched down, indicated that the aircraft bounced. It was very likely that the excessive sink rate and higher IAS prior to touchdown contributed to this bounce. When the aircraft bounced, the recorded coordinates indicated that the aircraft at about 625 meters from the beginning of the runway. Reverse thrust was applied about six seconds after the first touchdown, or about three seconds after the bounce, at position 768 meters from the beginning of the runway. A few seconds after the reverse thrust activation, the Normal Acceleration recorded +0.52 G, marking the second touchdown at 846 meters from the beginning of Runway 35. Thereafter, approximately 977 meters from the beginning of Runway 35, the reverse thrust deactivated. Between the first and the second touchdown, vertical speed values were positive (ranging from 59.38 to 67.99 feet per minute), which indicated that the aircraft was floating above the runway. Although the bounce was not significantly high, it reduced traction between the wheels and the runway hence the braking became less effective and decreased the aircraft's deceleration.

The higher altitude and IAS were above the reference speed when passing the runway threshold made the aircraft touchdown the runway beyond the touchdown zone marking. These conditions resulted in insufficient distance to stop the aircraft on the runway. The excessive sink rate and IAS prior to touchdown might contribute to the bounce, increasing the severity of the runway excursion.

2.2 Pilot Decision-Making

The previous analysis indicated that the occurrence flight did not meet the stabilized approach criteria. In accordance with the OM-A subchapter 10.8.1, if an approach becomes unstabilized, the pilot must initiate a go around maneuver immediately rather than continue with the landing. However, the pilot continued approach and landed.

During the approach, several parameters indicated that the aircraft did not meet the stabilized approach criteria. The flight data indicated a descent rate exceeding 1,000 feet per minute when the aircraft was below 500 feet above the airport elevation, and the aural TAWS alerts "Sink Rate" and "Pull Up" were activated. In response, the PIC requested the SIC to extend the flap, which was acknowledged, and the approach continued.

The cockpit voice recording did not record any discussion or callout referring to an unstabilized approach condition. This suggests that the pilots were responding to individual cues as part of their normal flight management, but the overall situation may not have been perceived as requiring a go-around.

The continuation of an un-stabilized approach indicates a possible plan continuation bias. This condition is common human performance factor where pilots persist with an intended plan despite cues suggesting that a change, such as a go-around, would be safer.

It could not be determined whether the presence of the company owner's family on board influenced the pilot's decision making. However, such contextual factors might create self-imposed pressure to complete a flight as a plan.

Plan continuation bias combined with self-imposed pressure to complete a flight as a plan might contribute to the decision to land in un-stabilized approach.

3 CONCLUSIONS

3.1 Findings

The findings are statements of all significant conditions, events or circumstances in the accident sequence. The findings are significant steps in the accident sequence, but they are not always causal, or indicate deficiencies. Some findings point out the conditions that pre-existed the accident sequence, but they are usually essential to the understanding of the occurrence, usually in chronological order.

In this occurrence, the KNKT identified several findings as follows:

1. The aircraft had a valid Certificate of Airworthiness (C of A) and a valid Certificate of Registration (C of R).
2. The aircraft is equipped with Garmin G1000 system, which has the capability to record flight data logging and navigation as well as capability to connect to external audio sources, such as a mobile phone or other music player.
3. The Garmin G1000 system installed in the aircraft is also equipped with Terrain Awareness and Warning System (TAWS), which has alert of “Sink rate” and “Pull up” that indicated that the aircraft was on Excessive Descent Rate (EDR).
4. Prior to the departure on the occurrence flight, and during the previous six flights on that day, there were no records or reports of the aircraft system malfunctions.
5. During the occurrence flight, the aircraft was operated within the weight and balance limitations.
6. Both pilots held valid licenses and qualified as Single Engine – Land pilots.
7. The Pilot in Command (PIC) and Second in Command (SIC) held valid Class 1 medical certificates. The PIC has medical limitations to possess glasses that correct near vision and the SIC did not have medical limitations.
8. One of the passengers was the family of the aircraft operator’s owner.
9. The runway at Sinak was 1,100 meters in length, constructed of asphalt, and was wet at the time of landing with a slight tailwind component.
10. Sinak Aerodrome was not equipped with meteorological station nor ground-based navigation aid.
11. The pilots recalled that it was slightly raining while approaching Sinak. During the landing approach, the weather was clear, and the runway was wet.
12. Based on Garmin G1000 flight data logging, when the aircraft touchdown, the wind direction was 156° with a velocity of 9.4 knots.
13. The aircraft operator Operation Manual Part A: General (OM-A) subchapter 10.8.1 requires flight to be stabilized at 500 feet above airport elevation in Visual Meteorological Conditions (VMC). If an approach becomes unstabilized, the pilot must initiate a go around maneuver immediately.
14. Cockpit voice and flight data showed that during the landing approach the sink rate exceeded 1,000 feet per minute without special briefing, along with the deviation from correct flight path when the aircraft altitude was below 500 feet above airport elevation. Those data indicated that the aircraft did not meet the stabilized approach criteria as approach criteria outlined in OM-A subchapter 10.8.1.

15. Cockpit voice data recorded that music was played on the pilot's channel from the climb phase until the aircraft impacted the embankment. While the OM-A permits the use of music player outside critical flight phases, this raises safety concerns during takeoff, approach and landing.
16. The use of music could potentially help alleviate mental stress, however, it is important to recognize that playing music during critical phases of flight may distract the pilot, impairing focus and situational awareness.
17. The cockpit voice recording did not record any discussion or callout referring to an unstabilized approach condition. This suggests that the pilots were responding to individual cues as part of their normal flight management, but the overall situation may not have been perceived as requiring a go-around.
18. Flight Safety Foundation Approach and Landing Accident Reduction (ALAR) Tool Kit Briefing, defines plan continuation bias as a tendency for flight crews to continue with an intended course of action despite cues indicating that conditions have changed or that the current plan is no longer safe.
19. The investigation could not determine whether the presence of the company owner's family on board influenced the pilot's decision making. However, such contextual factors can sometimes create self-imposed pressure to complete a flight as a plan.
20. Plan continuation bias in the pilot's decision-making process combined with self-imposed pressure to complete a flight as a plan might contribute to the decision to land in un-stabilized approach.
21. The aircraft passed the runway threshold at an AltInd of 7,069 feet (85 feet above airport elevation). At that time, the Indicated Airspeed (IAS) was recorded at 94 knots, 16 knots above the reference speed of 78 knots.
22. The investigation identified that the aircraft touched down 485 meters from the beginning of Runway 35. The calculated ground roll distance with dry runway condition for the occurrence flight was 540 meters.
23. The total landing distance calculation for a wet runway would be more than 1,025 meters, with the available runway length of 1,100 meters, the remaining distance was insufficient to stop the aircraft on the runway.
24. The recorded flight data indicated that the aircraft bounced. Although the bounce was not significantly high, it reduced traction between the wheels and the runway hence the braking became less effective and decreased the aircraft's deceleration.
25. The higher altitude and Indicated Airspeed (IAS) above the reference speed when passing the runway threshold made the aircraft touchdown the runway beyond the touchdown zone marking. These conditions resulted in insufficient distance to stop the aircraft on the runway.
26. The excessive sink rate and IAS above the reference speed prior to touchdown might have made the aircraft bounced, increasing the severity of the runway excursion.

3.2 Contributing Factors

Contributing factors is defined as actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the

probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident.

The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability. The presentation of the contributing factors is based on chronological order and not to show the degree of contribution.

The KNKT concluded the contributing factors as follows:

- The higher altitude and Indicated Airspeed (IAS) above the reference speed when passing the runway threshold made the aircraft touchdown the runway beyond the touchdown zone marking. These conditions resulted in insufficient distance to stop the aircraft on the runway.
- The excessive sink rate and IAS above the reference speed prior to touchdown might have made the aircraft bounced, increasing the severity of the runway excursion.
- Plan continuation bias combined with self-imposed pressure to complete a flight might contribute to the decision to land despite the approach condition no meeting the stabilized approach criteria.

4 SAFETY ACTION

At the time of issuing this report, the KNKT had been informed of safety actions resulting from this occurrence taken by the related parties.

4.1 PT Smart Cakrawala Aviation

On 8 November 2022, KNKT issued safety recommendations in the preliminary report as follows:

04.O-2022-13.2

The aircraft was fitted with Global Positioning System (GPS) Garmin G1000 which has capability to provide navigation data and flight log. The flight log consists of several flights information and aircraft (including engine) performance which can be utilized as a simple flight data analysis and aircraft condition monitoring. The investigation revealed that the information of the Garmin G1000 never been reviewed.

Therefore, KNKT recommend the operator to utilize the Garmin G1000 flight data log to monitor the pilot and aircraft performance.

Responding to the safety recommendation 04.O-2022-13.2, the aircraft operator has established flight data monitoring program which utilized Garmin G1000 flight data logging.

On 23 December 2022, the aircraft operator issued an operation notice which included reminders to all pilots:

- to review the approved Operation Manuals and implement the policy or procedure described in the manuals; and
- to perform effective crew resource management including providing or accepting the others input during flight.

5 SAFETY RECOMMENDATIONS

The KNKT acknowledges the safety actions taken by PT Smart Cakrawala Aviation and considers that the safety actions were relevant to improve safety, however, there are safety issues that remain to be considered. Therefore, the KNKT issued safety recommendations to address safety issues identified in this report.

The safety recommendation in this investigation report is made with the intention of preventing accidents or incidents and in no case has the purpose of creating a presumption of blame or liability for an accident or incident.

5.1 PT. Smart Cakrawala Aviation

5.1.1 04.O-2022-13.1

On 8 November 2022, KNKT issued safety recommendations in the preliminary report as follows:

04.O-2022-13.1

About 1,000 feet AGL, the Enhanced Ground Proximity Warning System (EGPWS) aural warning “Sink Rate” activated twice. The SIC noticed that the aircraft speed was higher than normal and called out “speed” then the PIC responded by a call “correcting”. The operator provided the procedure of the stabilized approach criteria which described in the OM-A chapter 10.8.

The EGPWS warning and the SIC called out indicated that the aircraft was in unstabilized approached condition which require a go around according to the OM-A.

Therefore, KNKT recommend the operator to review the implementation of the stabilized approach as described in the OM-A.

Responding to the safety recommendation number 04.O-2022-13.1, the aircraft operator reminded all pilots to review the approved Operation Manuals and implement the policy or procedure described in the manuals. The aircraft operator has more than one Operation Manuals and without any specific action to ensure the implementation of the stabilized approach as described in the OM-A, the reminder is not sufficient to address the safety issue of the continuation of an unstabilized approach to land. Therefore, KNKT encourage the aircraft operator to implement the KNKT safety recommendations number 04.O-2022-13.1 appropriately.

5.1.2 04.O-2022-13.3

Cockpit voice data recorded that music was played on the pilot's channel from the climb phase until the aircraft impacted the embankment. While Operation Manual Part A (OM-A) permits the use of music player outside critical flight phases, this raises safety concerns during takeoff, approach and landing. Although the use of music could potentially help alleviate mental stress, it is important to recognize that playing music during critical phases of flight may distract the pilot, impairing focus and situational awareness.

Therefore, KNKT recommends the aircraft operator to ensure music players are not used during critical flight phases so it cannot distract the pilot, impairing focus and situational awareness.

6 APPENDICES

6.1 Garmin G1000 Flight Log for Distance Calculation

	Occ	Radian	19Blk	Radian	05Blk	Radian	Other reg
T/D 1 lat	-3.82276030	-0.06671975	-3.82706380	-0.06679486	-3.82629590	-0.066781462	-3.8256598
T/D 1 lon	137.8394623	2.40575246	137.8403931	2.40576870	137.8402557	2.405766304	137.840088
T/D 2 lat	-3.8195956	-0.06666452	-3.82476520	-0.06675475		0	
T/D 2 lon	137.8387451	2.40573994	137.8398895	2.40575991		0	
T/R Act lat	-3.82027980	-0.06667646	-3.82382770	-0.06673838		0	-3.8233104
T/R Act lon	137.8388977	2.40574260	137.8396606	2.40575592		0	137.839554
T/R Deact lat	-3.81844640	-0.06664446	-3.82230280	-0.06671177		0	-3.8206735
T/R Deact lon	137.8384857	2.40573541	137.839325	2.40575006		0	137.838974
A/C Stop lat	-3.81720660	-0.06662282	-3.821032	-0.06668959	-3.81849720	-0.066645349	-3.8201184
A/C Stop lon	137.8381195	2.40572902	137.8390503	2.40574527	137.83845520	2.405734879	137.838898

6.2 Spectrum Analysis of Stall Warning Sound

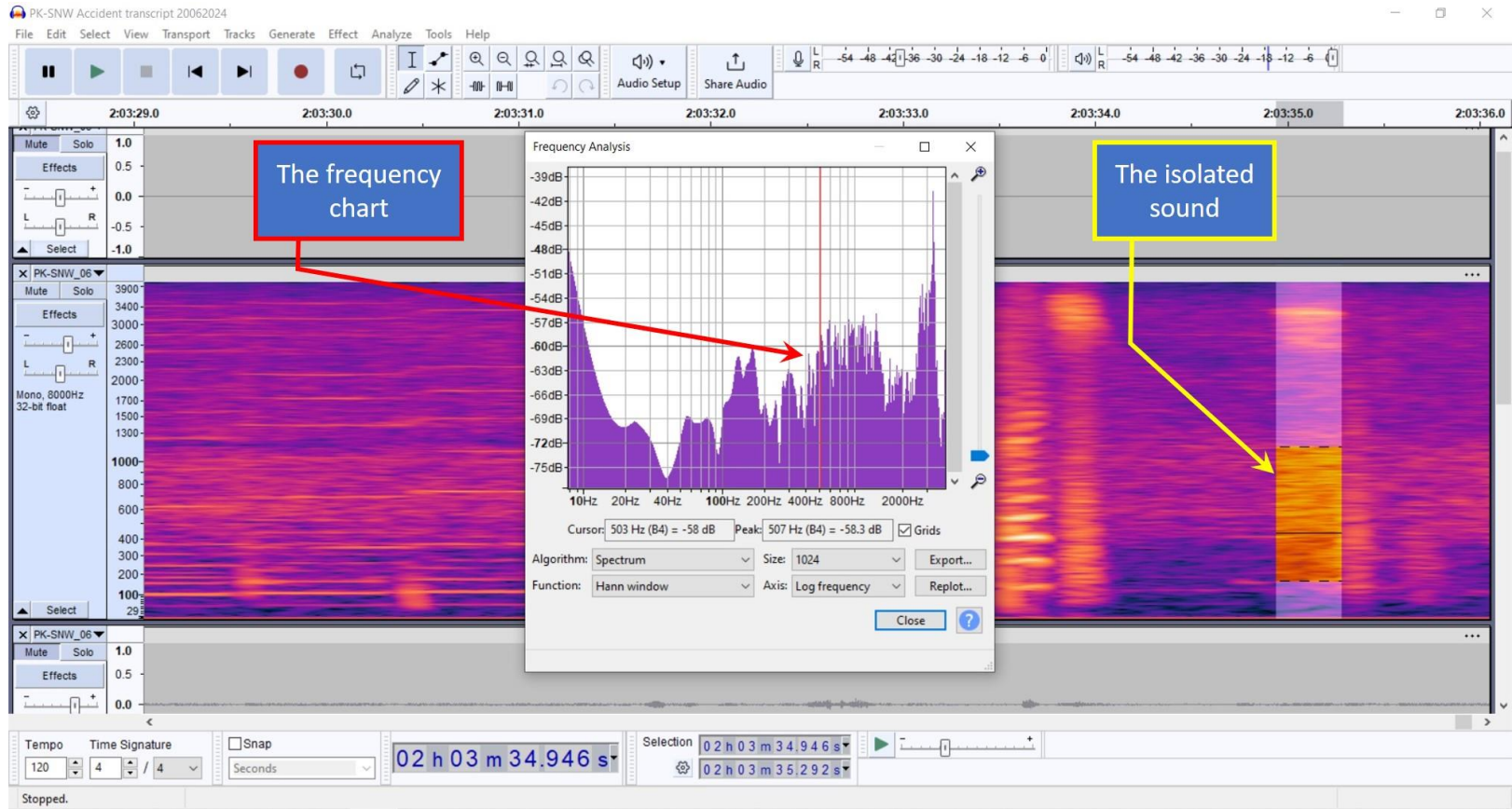


Figure 11: The isolation of Stall Warning aural waveform at 04:06:54 UTC

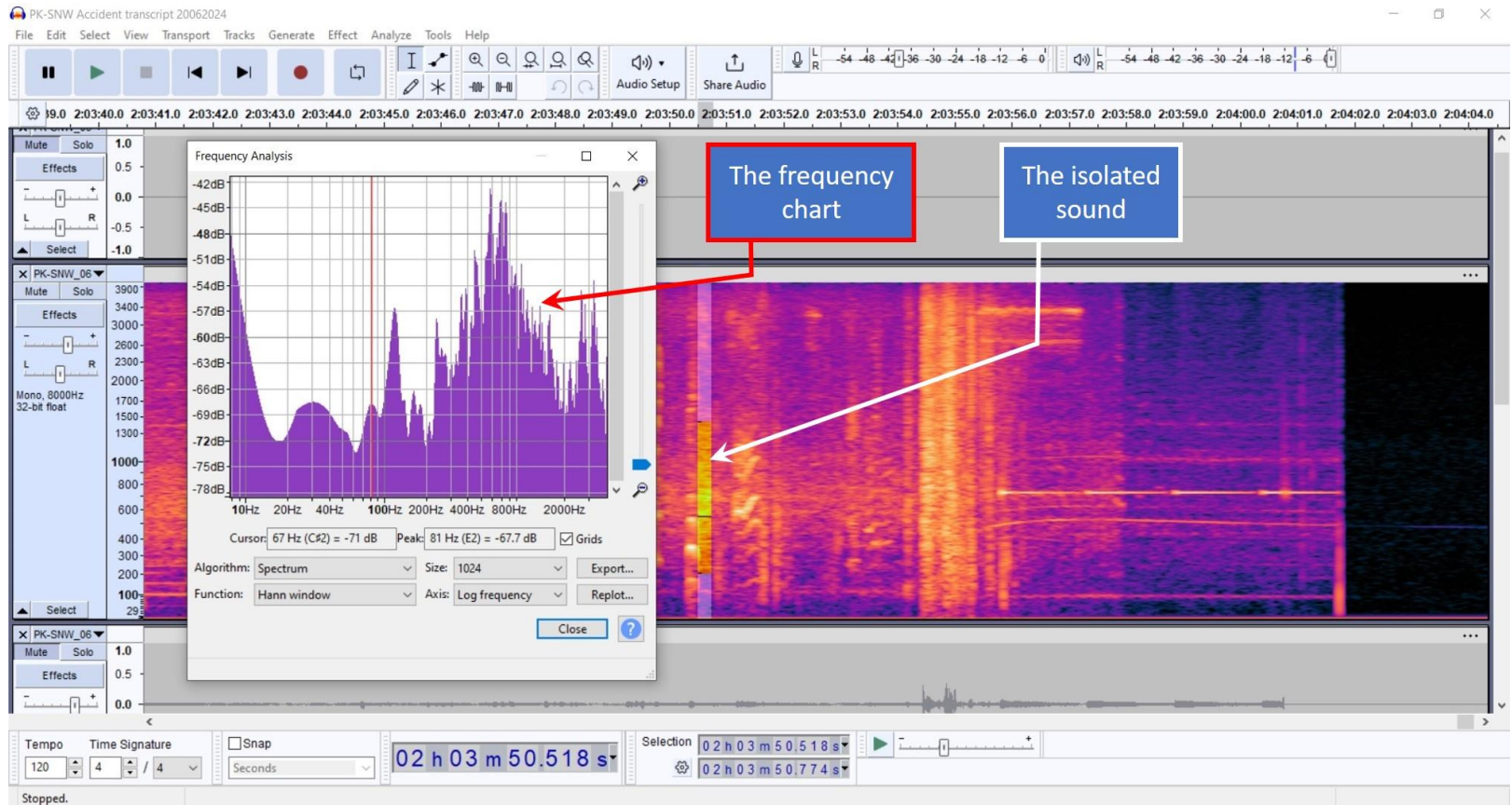


Figure 12: The isolation of Stall Warning aural waveform at 04:07:12 UTC

6.3 Ground Roll Interpolation

The Short Field Landing Distance table provided in the Pilot’s Operating Handbook and FAA Approved Airplane Flight Manual applicable for PK-SNW aircraft (POH) contained limited conditions. Therefore, the investigation employed an interpolation equation to estimate the required ground roll distance of the occurrence flight.

Based on the weight and balance sheet, the landing weight was estimated to be about 8,590 lbs. The Sinak elevation was 7,299 feet and the recorded Outside Air Temperature (OAT) was 14°C.

The investigation used the Short Field Landing Distance table for aircraft with landing weight of 8,500 lbs (see figure 11). The Short Field Landing Distance table in the POH defined the values as follows:

- OAT of 10°C and elevation of 6,000 feet, then the ground roll distance would be 1,230 feet.
- OAT of 10°C and elevation of 8,000 feet, then the ground roll distance would be 1,325 feet.
- OAT of 20°C and elevation of 6,000 feet, then the ground roll distance would be 1,275 feet.
- OAT of 20°C and elevation of 8,000 feet, then the ground roll distance would be 1,375 feet.

The interpolation equation employed in this report is:

$$y = y_1 + (x - x_1) \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

Where:

y = a new value of linear interpolation

x = independent variable in which in this interpolation was the OAT 14°C

x₁ and x₂ = values of the function at one point

y₁ and y₂ = values of the function at another point

The interpolation result was as follows:

OAT	Elevation			
	6,000	7,229	8,000	1,000
10	1,230		1,325	1,435
14	1,248	1,311	1,345	
20	1,275		1,375	1,485

The result of the ground roll distance for the OAT of 14°C and the elevation of 7,299 feet was 1,311 feet or 399.6 meters.

KOMITE NASIONAL KESELAMATAN TRANSPORTASI REPUBLIK INDONESIA

Jl. Medan Merdeka Timur No.5 Jakarta 10110 INDONESIA

Phone : (021) 351 7606 / 384 7601 Fax : (021) 351 7606 Call Center : 0812 12 655 155

website 1 : <http://knkt.dephub.go.id/webknkt/> website 2 : <http://knkt.dephub.go.id/knkt/>

email : knkt@dephub.go.id