AIRCRAFT SERIOUS INCIDENT

FINAL REPORT

SI 02/25

Air Accident Investigation Bureau (AAIB)

Ministry of Transport Malaysia

Fixed-Wing Aircraft Airbus A321-211,

Registration PK-TLG, at Sultan Abdul Aziz Shah Airport, Subang, Selangor

on 14 February 2025

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FINAL REPORT SI 02/25

AIR ACCIDENT INVESTIGATION BUREAU (AAIB) MALAYSIA

REPORT NO: SI 02/25

OPERATOR	**: PT. TRANSNUSA AVIATION MANDIRI**
AIRCRAFT TYPE	**: AIRBUS A321-211**
NATIONALITY	**: INDONESIA**
REGISTRATION	**: PK-TLG**
PLACE OF OCCURRENCE	**: SULTAN ABDUL AZIZ SHAH AIRPORT, SUBANG, SELANGOR**
DATE AND TIME	**: 14 FEBRUARY 2025 AT 1944 LT (1144 UTC)**

The sole objective of the investigation is the prevention of accidents and incidents. In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of this investigation to apportion blame or liability.

All times in this report are Local Time (LT) unless stated otherwise. LT is UTC +8 hours.

INTRODUCTION

The Air Accident Investigation Bureau (AAIB) is the authority responsible for investigating air accidents and incidents in Malaysia, operating under the Ministry of Transport. The AAIB's mission is to promote aviation safety through independent and objective investigations into air accidents and serious incidents. Additionally, the AAIB investigates incidents that reveal potential safety issues.

All investigations by the AAIB are conducted in accordance with Annex 13 to the Convention on International Civil Aviation Organisation (ICAO Annex 13) and the Civil Aviation Regulations 2016. It is important to note that AAIB reports are not intended to apportion blame or determine liability, as neither the investigations nor the reporting processes are designed for those purposes. The sole objective of this investigation and the Final Report is the prevention of accidents and incidents.

In accordance with ICAO Annex 13, notification of the serious incident was sent out on 28 March 2025 to the National Transportation Safety Committee of Indonesia (NTSC), Indonesia as the State of Registry, Bureau d'Enquêtes et d'Analyses (BEA) as the State of Design and Manufacture, and to the International Civil Aviation Organisation (ICAO). The Preliminary Report for this incident was subsequently submitted to the NTSC, BEA and the Civil Aviation Authority of Malaysia (CAAM) on 29 April 2025.

In accordance with ICAO Annex 13 paragraph 6.3, a copy of the Draft Final Report was sent on 8 December 2025 to CAAM, NTSC and BEA inviting their significant and substantiated comments on the report.

Unless otherwise indicated, recommendations in this report are addressed to the investigating or regulatory authorities of the State having responsibility for the matters with which the recommendations are concerned. It is for those authorities to decide what action is to be taken.

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GLOSSARY OF ABBREVIATIONS

A

AAIB	Air Accident Investigation Bureau
AAL	Above Aerodrome Level
ADIRU	Air Data Inertial Reference Unit
AMM	Aircraft Maintenance Manual
AOC	Air Operator's Certificate
APs	Autopilots
ATA	Air Transport Association
ATC	Air Traffic Controller
ATPL	Airline Transport Pilot Licence

B

BEA	Bureau d'Enquêtes et d'Analyses

C

CAAM	Civil Aviation Authority of Malaysia
CAD	Civil Aviation Directives
CAT	Commercial Air Transport
CoA	Certificate of Airworthiness
CoR	Certificate of Registration
CVR	Cockpit Voice Recorder

F

FA	Flight Attendant
FAOC	Foreign Air Order Certificate
FCTM	Flight Crew Training Manual
FDR	Flight Data Recorder
FL	Flight Level
FOD	Foreign Object Debris
fpm	feet per minute
ft	feet
FWD	forward

G

G/S	Glide Slope

H

HFACS	Human Factors Analysis and Classification System

I

ICAO	International Civil Aviation Organisation
ILS	Instrument landing System

K

kg	Kilogramme
KLIA	Kuala Lumpur International Airport
Kts	knots

L

LDA	Landing Distance Available
LH	Left-Hand
LOC	Localizer
LT	Local Time

M

METAR	Meteorological Aerodrome Report
MOR	Mandatory Occurrence Report
MRO	Maintenance, Repair and Overhaul

N

NTSC	National Transportation Safety Committee of Indonesia

P

PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring
POB	Persons on Board

R

RA	Radio Altimeter
RH	Right-Hand

S

SIC	Second in Command

U

UTC	Coordinated Universal Time

V

VRTA	Vertical Recorded Touchdown Acceleration

W

WIB	Waktu Indonesia Barat
WIII	Soekarno-Hatta International Airport, Jakarta
WMSA	Sultan Abdul Aziz Shah Airport, Subang

SYNOPSIS

On 14 February 2025, an Airbus A321-211 aircraft, registered PK-TLG and operated by PT. TransNusa Aviation Mandiri of Indonesia, experienced a severe hard landing upon touchdown at Sultan Abdul Aziz Shah Airport (WMSA). The aircraft was operating as flight 8B699 on a scheduled service from Soekarno-Hatta International Airport, Jakarta (WIII) to WMSA.

The flight departed WIII without any reported abnormalities and was the third sector of the day for the Pilot-in-Command (PIC). The journey was uneventful until the approach phase at WMSA, during which an Instrument Landing System (ILS) approach was conducted for Runway 15. Although no irregularities were reported during the approach, the aircraft experienced a hard landing upon touchdown on Runway 15.

This incident was not reported to the Civil Aviation Authority of Malaysia (CAAM) or Air Accident Investigation Bureau, Malaysia (AAIB) Malaysia through any means by the operator until it only being notified by National Transportation Safety Committee of Indonesia (NTSC) to the AAIB as notification of the incident through email on 27 March 2025.

1.0 FACTUAL INFORMATION

1.1 History of the Flight

On 14 February 2025, an Airbus A321-211 aircraft, registration PK-TLG, operated by PT. TransNusa Aviation Mandiri, was conducting scheduled commercial flight 8B699 from Soekarno-Hatta International Airport (WIII), Jakarta, Indonesia, to Sultan Abdul Aziz Shah Airport (WMSA), Subang, Malaysia. The flight is typically scheduled to depart WIII at 1605 WIB and arrive at WMSA at 1900 local time (LT), with an estimated flight duration of approximately 1 hour and 55 minutes, covering a distance of about 635 nautical miles. While the service generally operates on schedule, occasional minor delays have been observed.

The flight departed from Jakarta with no reported abnormalities. It was the third sector of the day for the Pilot-in-Command (PIC). Prior to the flight, the PIC reported experiencing mild flu-like symptoms and a slight cough. However, he conducted a self-assessment and deemed himself fit to operate the flight without compromising safety. During the flight, Cockpit Voice Recorder (CVR) data indicated that the PIC expressed feeling unwell and bloated. Despite these symptoms, he continued to assess himself as capable of performing his flight duties.. For the Second-in-Command (SIC), this was the first time operating the Airbus A321. He was assigned the Pilot Monitoring (PM) duties for this sector. An engineer from the operator was also on board as a passenger, as the aircraft was scheduled to undergo maintenance at a facility in Subang after arrival.

The flight proceeded normally until the approach phase at WMSA, during which an Instrument Landing System (ILS) approach was conducted to Runway 15. The Air Traffic Controller (ATC) reported surface winds from 300° at 9 knots (kts). The approach was stabilized and met all criteria above 1,000 feet Radio Altimeter (RA). Below 1,000 feet, the aircraft remained on a stabilized approach, with tailwind components varying from 10 kts to 15 kts based on the Air Data Inertial Reference Unit (ADIRU). The cockpit crew were aware of the tailwind conditions, and the PM continuously called out the wind speeds during the approach. The PIC decided to continue the approach to land on Runway 15.

At 390 ft RA, the autopilot was disengaged, and the PIC manually flew the final segment of the approach. A tailwind component of 11 kts was recorded during this phase. The SIC continued to call out the wind speed but did not intervene further. At 43 ft RA, the vertical descent rate was recorded approximately 900 feet per minute (fpm), decreasing to 700 fpm just prior to touchdown. A short flare was initiated, and dual side-stick inputs were recorded upon main gear contact, indicating a simultaneous and possibly uncoordinated input from the SIC. The aircraft subsequently experienced a hard landing.

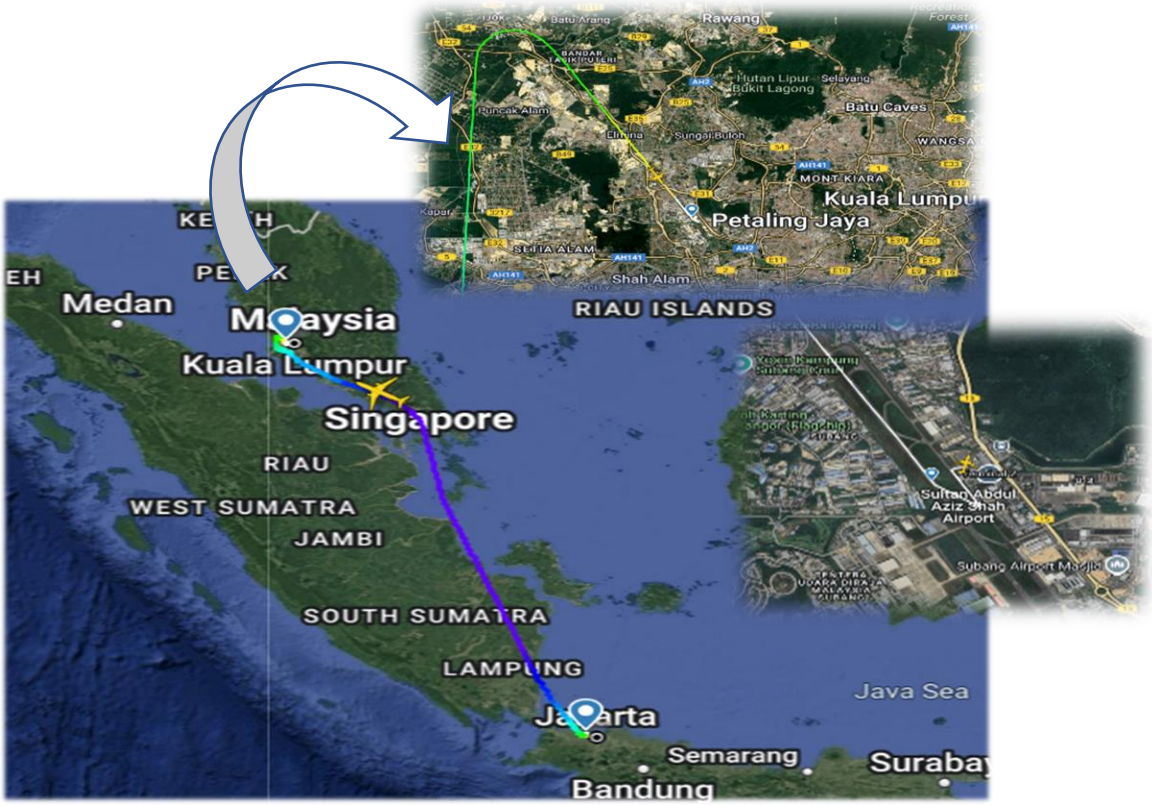


Figure 1: Flight Path of PK-TLG

The aircraft vacated the runway via Taxiway Echo and proceeded to park at Bay 5 of the Skypark Terminal. The cockpit crew were aware of the likelihood of a hard landing, as indicated by the automatic generation of Load Report 15[1] which typically signifies if there are high landing forces occurs. However, the PIC did not report the incident.

[1] The A320 Load Report 15 is a report generated automatically by the Aircraft Condition Monitoring System (ACMS) in response to a hard landing or certain other high load events during landing. It provides critical data about the landing parameters, including vertical acceleration and descent rates, to help assess potential damage to the aircraft

The onboard engineer, suspecting a hard landing, entered the cockpit after parking and inquired whether Load Report 15 had been generated but was denied by the PIC.

As no entry regarding the hard landing was made in the Aircraft Maintenance Log, the aircraft was later towed to the AIROD Hangar for scheduled maintenance later-on. On the night of 15 February 2025, a Flight Line technician downloaded the Load Report 15 data, then identified a Vertical Recorded Touchdown Acceleration (VRTA) value of 2.86 G during landing, indicated a hard landing event. The data was forwarded to Airbus for further technical review.

Following the analysis of Load Report 15, Airbus confirmed that a hard landing had occurred and recommended further inspection in accordance with Aircraft Maintenance Manual (AMM) ATA Chapter 5. A detailed inspection was carried out by the operator's maintenance team on 17 February 2025, revealing thirteen (13) structural defects attributable to the hard landing. The findings were submitted to Airbus for assessment and approval of subsequent repair actions.

The repairs were completed, and the aircraft was returned to service on 26 June 2025. Subsequently, a ferry flight was carried out to WIII on 3 July 2025.

The incident was not reported by the operator to the Civil Aviation Authority of Malaysia (CAAM) or the Air Accident Investigation Bureau (AAIB) Malaysia. The AAIB only became aware of the occurrence following an official notification from the Indonesian National Transportation Safety Committee (NTSC) received via email on 27 March 2025. During the initial inspection conducted by the AAIB, it was noted that certain damages had been repaired; however, the damage to the right-hand (RH) and left-hand (LH) flaps remained unresolved.

1.2 Injuries to Persons

There was no injury to any of the aircraft occupants or personnel on the ground

Injuries	Crew	Passengers	Others	Total
Fatal	-	-	-	**-**
Serious	-	-	-	**-**
Minor	-	-	-	-
None	6	174	-	180

Table 1: Injuries to Persons

1.3 Damage to Aircraft

Investigation indicates several significant damages have been observed on the aircraft after the incident. The Damage Assessment is provided in **Appendix A.** The investigator was unable to determine whether the damage was directly caused by the hard landing, as most of the affected areas had already been repaired by the time of the initial AAIB inspection, due to the delayed reporting of the incident.

1.4 Other Damage

There was no reported damage to airfield facilities or any FOD found on the runway on the date of incident by the airport authority.

1.5 Personnel Information

1.5.1 Pilot A321-211

Status	Pilot in Command (PIC)
Nationality	Indonesian
Age	51 years old
Gender	Male
License Type	ATPL
License Validity	Valid until 31 May 2025

Aircraft Rating	Multi-Engine Land
Instructor Rating	Nil
Total Hours on Type	81.26 hrs
Total Flying Hours	8911 hrs
Rest Period Since Last Flight	00:41 hrs
Date of Medical Examination	31 October 2024

1.5.2 Pilot A321-211

Status	Second in Command (SIC)
Nationality	Indonesian
Age	29 years old
Gender	Male
License Type	ATPL
License Validity	Valid until 28 February 2026
Aircraft Rating	Multi-Engine Land
Instructor Rating	Nil
Total Hours on Type	Nil hrs
Total Flying Hours	3225 hrs
Rest Period Since Last Flight	00:41 hrs
Date of Medical Examination	8 January 2025

Both PIC and SIC were licensed, qualified, and approved to perform the flight in accordance with existing regulations**.**

1.6 Aircraft Information

1.6.1 Aircraft Details.

The aircraft was airworthy when dispatched for the flight and has a valid registration, and also Certificate of Airworthiness (CoA).

Aircraft Type	Airbus A321-211
Manufacturer	France
Year of Manufacturer	2004
Owner	ZI JIANAN Aircraft Leasing (Shanghai)
Registration No.	PK-TLG
Aircraft Serial No.	MSN 2309
C of A Expiry Date	5 November 2025 (**Appendix B**)
C of R Expiry Date	23 September 2027 (**Appendix C**)

Figure 2: Aircraft Data

1.6.2 Load Report

The Load Report reflected code 4100 indicating high vertical load encountered by the aircraft during landing (VRTA 2.86G).

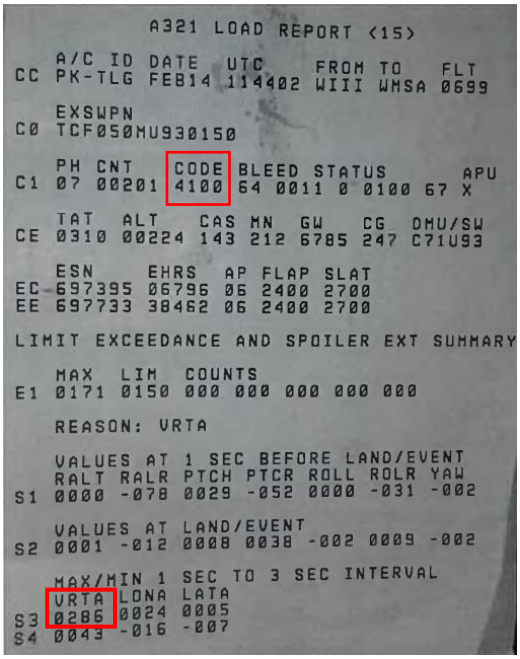


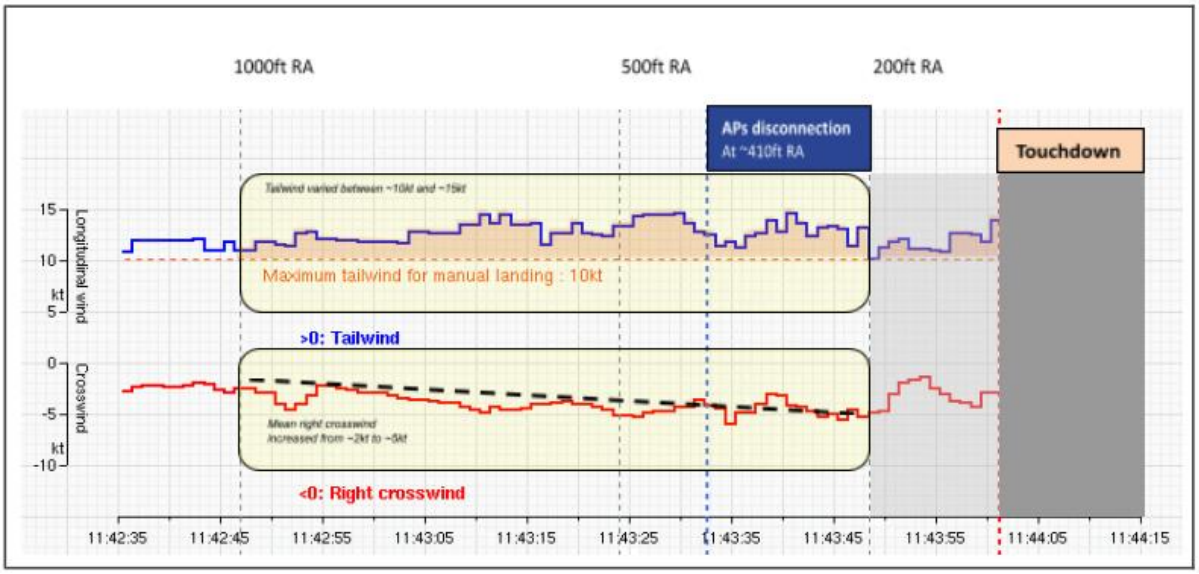
Figure 3: Load Report

1.7 Meteorological Information

The weather conditions at WMSA between 1900 LT and 2000 LT were fine, with visibility reported to be over 10 kilometres and winds from the northwest at 8 kts, varying between 260° and 340°. The following METARs were in effect:

METAR WMSA 141300Z 01003KT 300V100 9999 FEW017CB 29/24 Q1010
METAR WMSA 141200Z 30008KT 280V340 9999 FEW017CB 30/25 Q1009
METAR WMSA 141100Z 29008KT 260V330 9999 FEW017CB 30/25 Q1008

At the time landing clearance was issued, while the aircraft was approaching 1,000 ft, the reported local wind was from 280° at 9 kts, indicating a tailwind condition. However, data recorded by the ADIRU, referenced to the aircraft's longitudinal and lateral axes, indicated an average tailwind component varying between 10 kts to 15 kts, with a corresponding right crosswind component ranging from 2 kts to 5 kts (Figure 2).



Source: Airbus

Figure 4: Wind information computed by the ADIRU (projection on aircraft axes)

In WMSA at that time, the sunset was about 19:28 LT. At the time of the approach and the hard landing incident (19:44 LT), it was an evening civil twilight[2].

[2] Evening civil twilight begins at sunset and ends when the Sun descends 6° below the horizon. During this period, the sky remains faintly illuminated, providing partial visibility of the surroundings before transitioning into complete darkness

1.8 Aids to Navigation

All navigation aids fitted on the aircraft and installed at WMSA were operational at the time of the occurrence.

1.9 Communications

All ATC communication frequencies were operating normally.

1.10 Aerodrome Information

Sultan Abdul Aziz Shah Airport Subang (WMSA), located at Latitude 03°07'52"N and Longitude 101°32'53"E, has an elevation of 89 feet and provides a Landing Distance Available (LDA) of 3,780 feet. Runways 15 and 33 were in use for landing operations at the time of the event, and no abnormalities were reported with respect to runway surface condition.

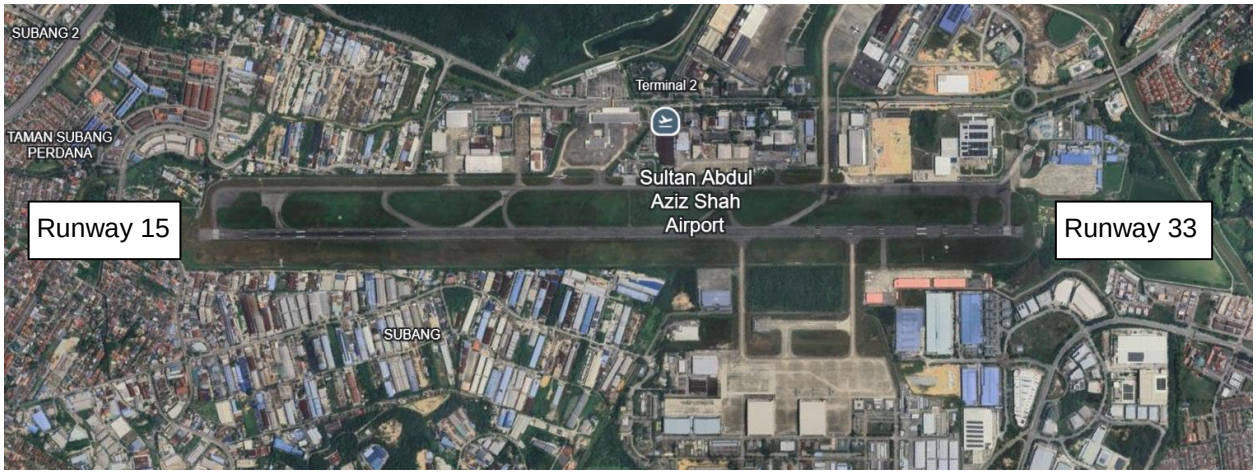


Figure 5: Sultan Abdul Aziz Shah Airport (WMSA)

1.11 Flight Recorders

The aircraft A321-211, Registration PK-TLG was equipped with a FDR and a CVR. The data from both FDR and CVR were downloaded for analysis. The results of the data analysis are described in Section 2. Details of the FDR and CVR are as follows:

Description	Flight Data Recorder	Cockpit Voice Recorder
Part No.	980-4700-042	980-6022-001
Serial No.	3636	CVR120-09432
Manufacturer	Honeywell	Honeywell

Table 2: Aircraft Flight Recorder PK-TLG

1.12 Wreckage and Impact Information

Following the heavy landing incident, a post-flight inspection done by MRO (1st line Maintenance) on 17 February 2025, revealed several defects on the aircraft, as outlined in **Appendix A**. Additionally, the Duty Officer's Runway Inspection Log for the date of the incident reported no foreign object debris (FOD) on the runway and no damage to the runway infrastructure.

1.13 Medical and Pathological Information

As no medical examination was conducted for the pilots immediately after the incident, their health status could not be conclusively verified.

1.14 Fire

There was no indication of fire inflight or after landing.

1.15 Survival Aspects

Upon touchdown, the impact of the hard landing was felt by the passengers, but no injuries were reported among the passengers or crew.

1.16 Tests and Research

Not Applicable

1.17 Organisational and Management Information

1.17.1 Aircraft Operator

PT TransNusa Aviation Mandiri, operating as TransNusa, is an Indonesian airline headquartered in Jakarta. Established on 4 August 2005, the airline initially focused on serving destinations in East Nusa Tenggara, utilizing aircraft chartered from Pelita Air and Trigana Air Service. In August 2011, TransNusa obtained its own Air Operator's Certificate (AOC) and commenced scheduled commercial operations as a regional carrier.

In August 2024, TransNusa became the first foreign airline to initiate scheduled international flights to WMSA. This milestone followed approval from the Malaysian Aviation Commission, positioning TransNusa among a select group of six airlines, including two foreign carriers, authorized to operate from Subang Airport. TransNusa's daily service commenced on 1 August 2024, with flight 8B699 departing WIII to WMSA and the return flight, 8B698, departing from WMSA to WIII.

Despite the introduction of the Subang’s route, TransNusa continued to maintain its existing services, including three daily flights from Jakarta to KLIA and four weekly flights to Johor Bahru.

1.17.2 Proactive Measures Taken by the Aircraft Operator

The aircraft operator implemented a proactive measure by imposing a preventive grounding on both pilot as directed by DGCA. They were also required to undergo recovery training under the supervision of an DGCA Flight Operations Inspector before being permitted to resume flight duties.

1.18 Additional Information

Nil

1.19 Useful or Effective Investigation Techniques

In the course of the investigation, a comprehensive approach was adopted to examine all available evidence. Interviews with involved personnel, analysis of the CVR and FDR data, and application of the Human Factors Analysis and Classification System (HFACS) were undertaken to identify the contributing factors and to establish the probable cause of the occurrence.

1.19.1 Reason's "Swiss Cheese" Model

The Reason 'Swiss Cheese' Model (Figure 6) was applied to illustrate the layered defences within the system, highlighting how both active failures and latent conditions aligned during this event. The analysis of evidence indicated that human factors played a central role, influencing decision-making, situational awareness, and operational performance. Certain organisational factors were also identified as latent conditions that together with individual human performance issues, contributed to the occurrence.

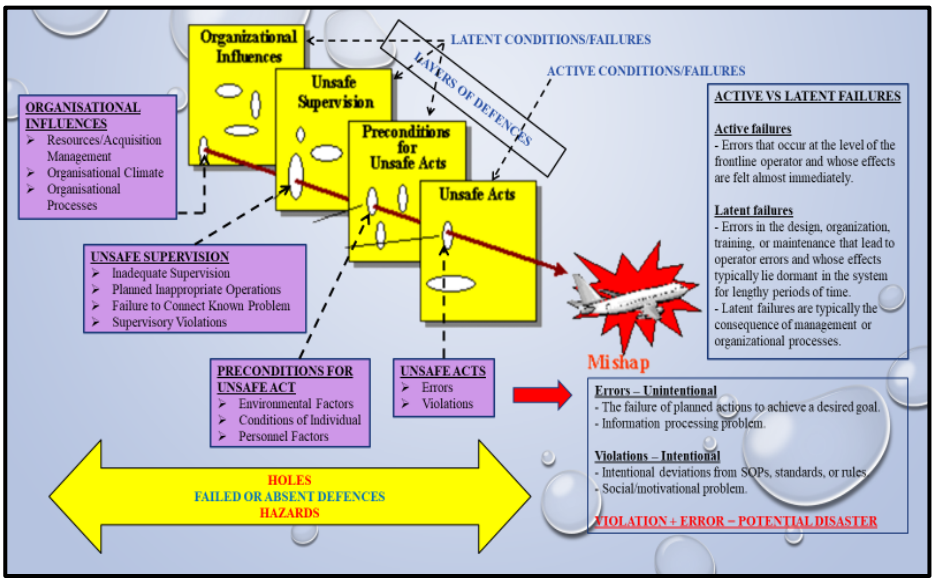


Figure 6: Reason's 'Swiss Cheese' Model Aviation

1.19.2 Human Factors Analysis and Classification System (HFACS)

The HFACS was used to identify the preconditions that led to the unsafe acts in this event, within the framework of the Reason 'Swiss Cheese' Model where active and latent failures may align. The review also considered supervisory and organisational factors that influenced these conditions. As shown in Figure 7, this analysis provides a complete human factors view of the events that led to the occurrence.

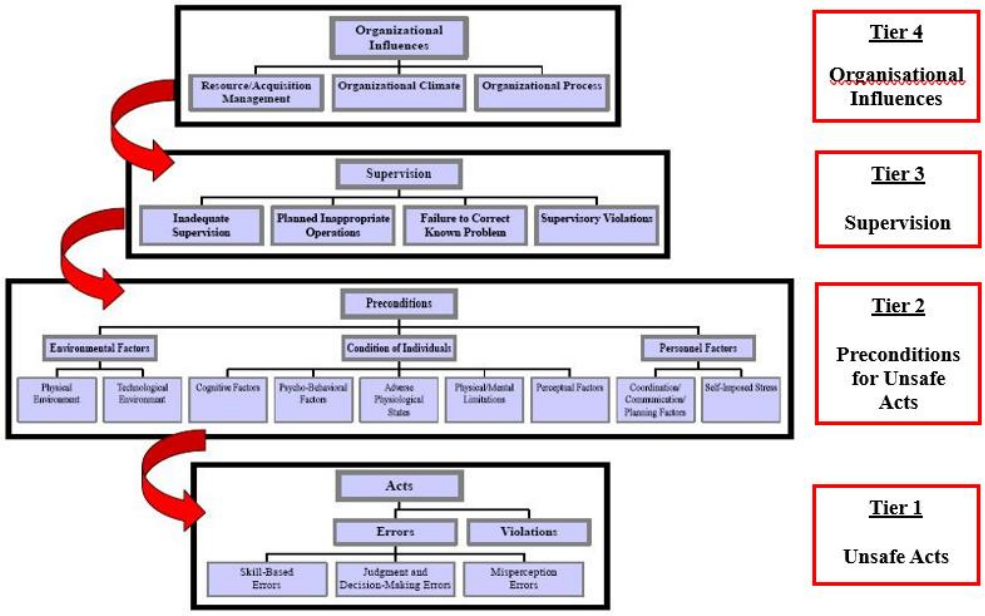


Figure 7: HFACS Model

2.0 ANALYSIS

2.1 CVR Analysis

The CVR was successfully downloaded, and the audio recordings for the occurrence flight were available and satisfactory quality for analysis. The salient points recorded in the CVR is as follows:

The aircraft commenced take-off at 09:57:57 UTC. A normal take-off and climb procedure were conducted for climb to Flight Level (FL) 340, en-route to WMSA.

At 10:11:58 UTC, as indicated in red box in Indonesian language (Figure 8), during the climb from FL215 to FL340, the PIC reported that he had not been feeling well,

noting abdominal bloating (“masuk angin”) since the previous day, which continued into the morning of the incident and resulted in a small episode of vomiting (“ tadi pagi sampe muntah”). When queried by the Flight Attendant (FA), the PIC replied that he felt well (“aman”).

The flight was uneventful until the approach phase. All required approach procedures and checklist items were carried out. The SIC established radio communication with Subang Tower and received clearance to conduct the ILS approach for Runway 15, with surface wind reported as 300°/09 kts. Both flight crew members acknowledged the prevailing tailwind condition and remarked that the maximum allowable tailwind component for landing was 10 kts.

At 11:42:32 UTC, ATC reconfirmed landing clearance for Runway 15, with wind reported at 280°/09 kts. During the final approach, the SIC continued to inform the PIC of tailwind variations ranging between 10 and 8 kts.

Between 11:43:47 UTC and 11:44:01 UTC, the CVR recorded the automated altitude callouts “200, 100, 50, 40, 30 – Retard,” followed by a distinct sound corresponding to aircraft touchdown. The PIC subsequently expressed concern regarding the firmness of the landing and repeatedly asked the SIC for the recorded G-value of the touchdown during taxi to the parking bay. The SIC informed the PIC that the VRTA indicated 2.86G. The CVR recording concluded at 11:53:37 UTC.

Based on the CVR data, the incident of a hard landing was assessed to have been influenced by operational and human factors. The prevailing tailwind during approach was close to the aircraft’s maximum allowable limit for landing. Although both flight crew members acknowledged the tailwind component, the decision was made to continue the approach and landing. This operational decision, combined with the effect of tailwind on landing performance, likely contributed to the higher touchdown impact recorded at 2.86G.

It was also noted that the PIC had experienced abdominal discomfort since the previous day. While the PIC considered that the condition did not significantly affect his performance, the possibility of reduced physical comfort or mild distraction during the critical landing phase cannot be fully ruled out.

CVR Time	Time Conversion	UTC	VOICE	RECORDED	REMARKS
784.18	00:13:04.184	10:10:48.323	CGK Radar	Transnusa SIX NINER NINER good afternoon identified climb passing TWO ONE FIVE climb to THREE FOUR ZERO	
790.18	00:13:10.175	10:10:54.313	SIC	Climb to THREE FOUR ZERO Transnusa SIX NINER NINER	
854.82	00:14:14.819	10:11:58.958	PIC	Saya lagi gak enak badan	
856.19	00:14:16.189	10:12:00.328	FA	Kenapa Capt?	
857.16	00:14:17.165	10:12:01.303	PIC	Masuk angin kemarin	
862.64	00:14:22.645	10:12:06.783	FA	Tapi ni mules mules apa gimana Capt?	
864.90	00:14:24.897	10:12:09.035	PIC	Ha?	
865.27	00:14:25.268	10:12:09.407	FA	Mules mules apa gimana?	
866.89	00:14:26.894	10:12:11.032	PIC	Tadi tadi pagi sampe muntah di [unintelegible]	
871.21	00:14:31.213	10:12:15.351	FA	Hah? sampai muntah Capt?	
872.42	00:14:32.420	10:12:16.558	PIC	Iya cuma sedikit	
874.35	00:14:34.347	10:12:18.486	FA	Tapi masih aman gak Capt?	
875.28	00:14:35.276	10:12:19.414	PIC	Aman	
878.41	00:14:38.411	10:12:22.549	PIC	Kalau ada sih aaa apa teh teh teh aja	
880.97	00:14:40.965	10:12:25.103	FA	Tolakangin gak?	
884.38	00:14:44.378	10:12:28.517	FA	Tolakangin gak mau Capt? Aku ada	
885.91	00:14:45.911	10:12:30.049	PIC	Udah bawa	

Figure 8: CVR Transcript

The investigation further noted that, while all required checklists and approach procedures were completed, the landing flare and touchdown management may have been affected by the tailwind condition. The incident highlights the importance of exercising greater operational caution when approaching environmental or aircraft limitations.

2.2 FDR Analysis

The FDR data for the flight was analyzed in conjunction with the analysis report provided by the aircraft manufacturer (Airbus) and TransNusa Preliminary Safety Investigation Report. The FDR data review encompassed the flight from 1000 ft RA and continuing through touchdown.

2.2.1 Final Approach from 1000 ft RA to ~ 135 ft RA

At 1000 ft RA (11:42:47 UTC), aircraft was in “CONFIG FULL” (Slats at 27°, Flaps at 25°). Both AutoPilots (APs) and Flight Directors were engaged in G/S (vertical) and LOC (lateral) modes. Landing gear was selected down. The rate of descent was approximately 800 fpm and aircraft was on the glide slope and the localizer. PIC is the PF and SIC is the PM.

At 11:43:33 UTC - Both the APs were disengaged at around 410 ft RA, and the aircraft was manually flown by the PIC with Auto Thrust active in Speed mode

Before the APs were disengaged, the pitch angle varied between +3° and +1.5° (nose up) and roll angle varied between +1.5° and - 2°. The rate of descent varied between 850 fpm and 650 fpm. The aircraft was on glide slope and localizer.

After APs disengagement, PIC applied varied pitch angle inputs between +0.5° and +2.5° (nose up) and varied roll angle inputs between +3° and -3.5°. No significant rudder pedal inputs were recorded. The rate of descent varied between 600 fpm and 800 fpm. The aircraft was still on glide slope and localizer

Overall, during this phase of flight, the approach and flight path parameters recorded indicate that the aircraft maintained a stabilized ILS approach throughout the final segment. The transition from autopilot to manual flight at approximately 410 ft RA was conducted smoothly, with no abnormal control inputs or flight path deviations observed. The handling characteristics and control inputs were within normal operating parameters, suggesting that the approach and aircraft configuration were appropriately managed by the flight crew.

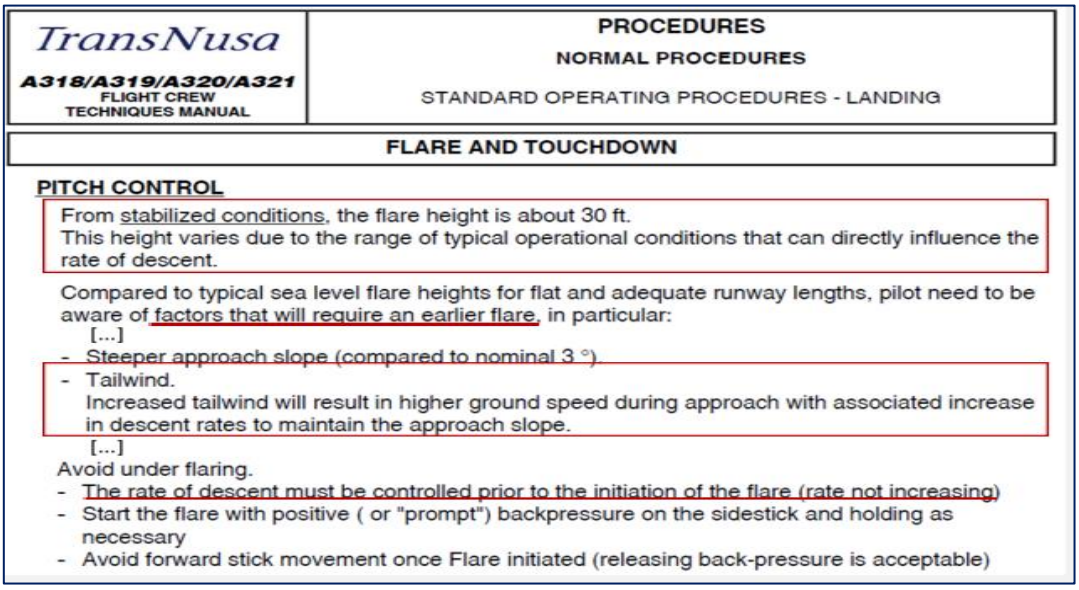
2.2.2 Short Final from ~ 135 ft RA to Touchdown (11:44:01 UTC)

From ~ 135 ft RA to ~ 35 ft RA, PIC applied several pitch stick inputs with nose-down tendency leading to pitch angle progressively decrease from +2.5° to +0.5° subsequently rate of descent increase from about 700 fpm to 950 fpm prior to flare.

At 11:43:59 UTC, ~ 35 ft RA, flare was initiated by PIC with a nose-up stick input up to ~ 2/3 of full deflection leading to pitch angle increased up to +3° subsequently rate of descent decrease to ~ 750 fpm prior to touchdown.

Considering the rate of descent (~ 950 fpm) reached prior to flare, the back stick order, applied at about 35 ft RA, did not sufficiently change the aircraft trajectory before touchdown to avoid a severe hard landing. This suggests that the rate of descent was not adequately controlled during the final segment of the approach, leading to a high sink rate being carried into the flare phase. The flare was initiated at a relatively low height, providing limited time and pitch authority to effectively reduce the descent rate before ground contact.

Flight crews are expected to monitor and manage the rate of descent before initiating the flare to ensure it remains within the stabilized approach criteria. Additionally, initiation of the flare should be adjusted appropriately based on prevailing conditions such as tailwind which can influence the required flare height and descent behavior as recommended in the A321 Flight Crew Techniques Manual (FCTM) in Figure 9.



TransNusa

A318/A319/A320/A321
FLIGHT CREW
TECHNIQUES MANUAL

PROCEDURES
NORMAL PROCEDURES
STANDARD OPERATING PROCEDURES - LANDING

FLARE AND TOUCHDOWN

PITCH CONTROL

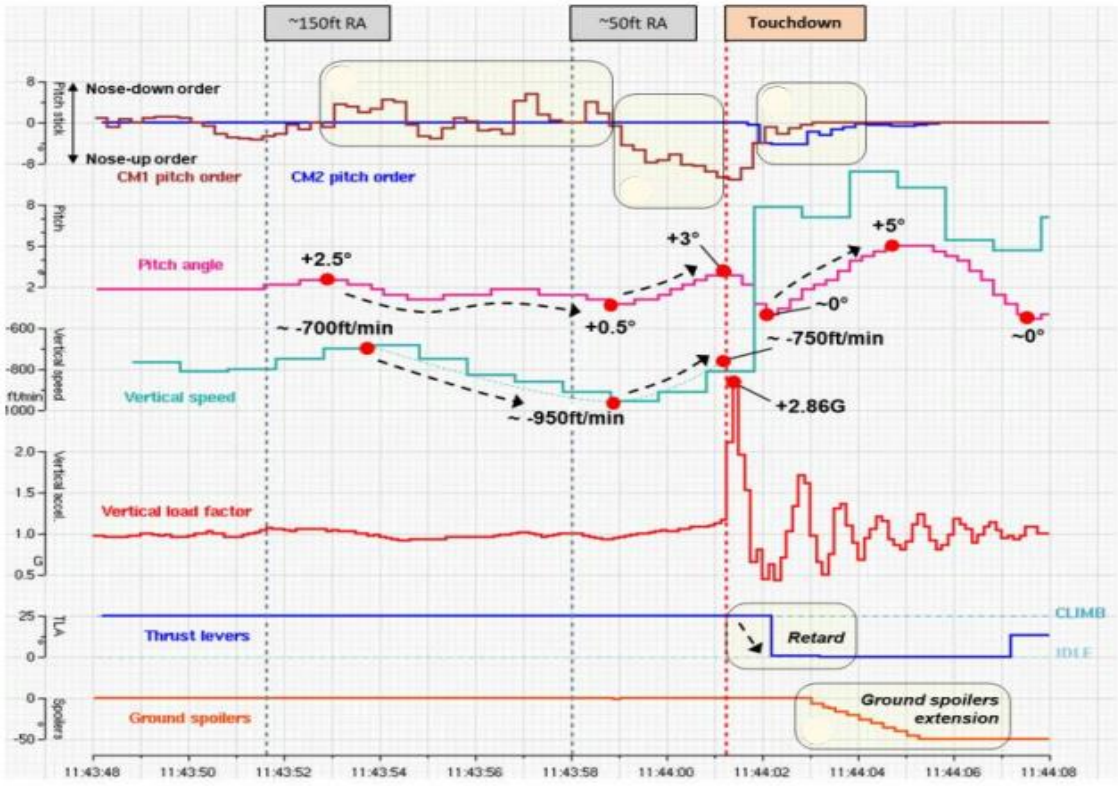
From stabilized conditions, the flare height is about 30 ft.
This height varies due to the range of typical operational conditions that can directly influence the rate of descent.

Compared to typical sea level flare heights for flat and adequate runway lengths, pilot need to be aware of factors that will require an earlier flare, in particular:
[...]
- Steeper approach slope (compared to nominal 3 °).
- Tailwind.
  Increased tailwind will result in higher ground speed during approach with associated increase in descent rates to maintain the approach slope.

[...]
Avoid under flaring.
- The rate of descent must be controlled prior to the initiation of the flare (rate not increasing)
- Start the flare with positive (or "prompt") backpressure on the sidestick and holding as necessary
- Avoid forward stick movement once Flare initiated (releasing back-pressure is acceptable)

Figure 9: FCTM PR-NP- SOP – Landing

Figure 10 presents the FDR data covering the final approach segment from approximately 200 ft RA until touchdown and deceleration, providing the factual evidence relevant to the incident.



Source : Airbus

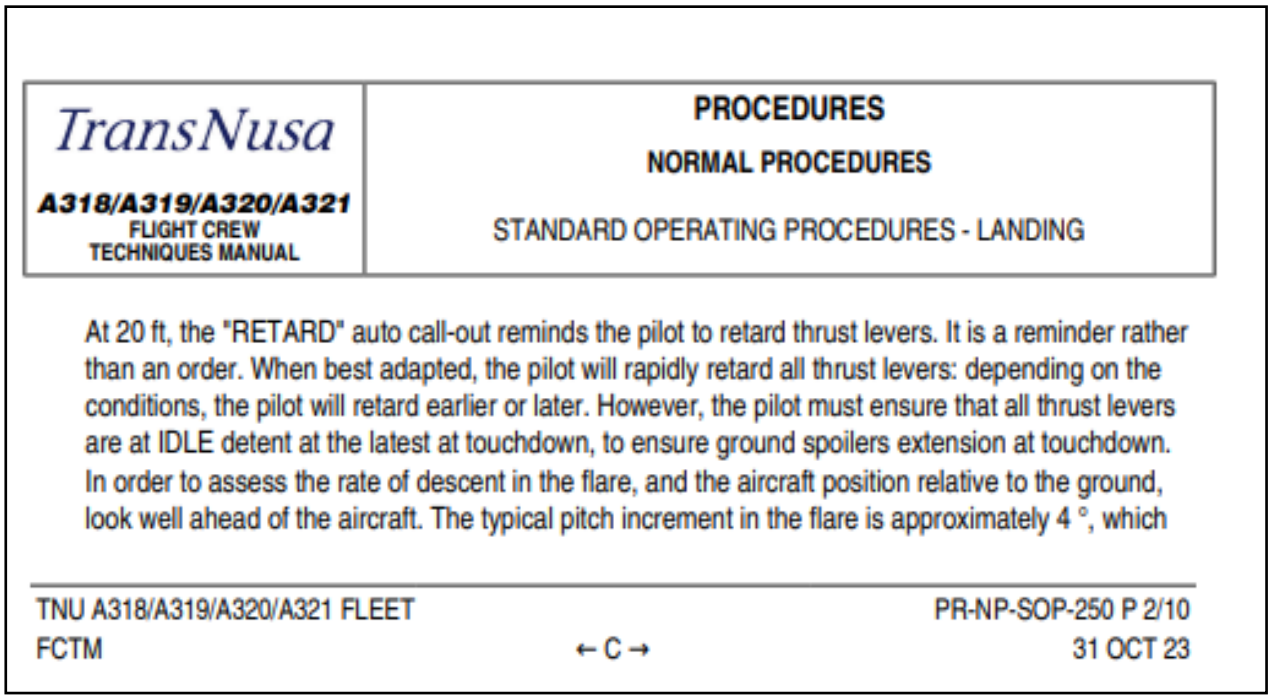
Figure 10: The last ~ 200 ft RA (Longitudinal axis)

2.2.3 Touchdown (11:44:01 UTC)

The aircraft touched down at 11:44:01 UTC with a value of +3° of pitch angle, +0.5° of roll angle and +2.86G of vertical load factor.

Flight data indicated that the aircraft touched down with the thrust levers remaining in the CLIMB detent, which consequently inhibited the automatic deployment of the ground spoilers upon touchdown. The thrust levers were retarded to idle detent about one (1) second after touchdown, extending the ground spoilers.

Airbus FCTM PR-NP-SOP- Landing (Figure 11) specify that the thrust levers should be retarded to the “IDLE” detent no later than touchdown to ensure the automatic extension of the ground spoilers, which assist in deceleration and lift dumping after landing.



TransNusa

A318/A319/A320/A321
FLIGHT CREW
TECHNIQUES MANUAL

PROCEDURES

NORMAL PROCEDURES

STANDARD OPERATING PROCEDURES - LANDING

At 20 ft, the "RETARD" auto call-out reminds the pilot to retard thrust levers. It is a reminder rather than an order. When best adapted, the pilot will rapidly retard all thrust levers: depending on the conditions, the pilot will retard earlier or later. However, the pilot must ensure that all thrust levers are at IDLE detent at the latest at touchdown, to ensure ground spoilers extension at touchdown. In order to assess the rate of descent in the flare, and the aircraft position relative to the ground, look well ahead of the aircraft. The typical pitch increment in the flare is approximately 4 °, which

TNU A318/A319/A320/A321 FLEET PR-NP-SOP-250 P 2/10
FCTM ← C → 31 OCT 23

Figure 11: FCTM PR-NP- SOP – Landing

The “RETARD” aural callout, annunciated from approximately 20 ft RA, serves as a procedural reminder for this action. In this event, the absence of thrust lever retardation prevented automatic ground spoiler deployment, reducing the effectiveness of the aircraft’s deceleration and contributing to the severity of the hard landing.

The incident highlights the importance of timely thrust lever management during the flare and landing phase. High pilot workload, combined with potential distractions during the final approach, can lead to delayed IDLE retarding. Reinforcing SOP compliance and effective use of the **“**RETARD” callout is essential to ensure full functionality of the ground spoilers and optimal landing safety.

2.3 Human Factor Analysis

Human factor issues related to this accident were examined using the Reason’s Swiss Cheese model and HFACS worksheet, provided in **Appendix D**. From the HFACS worksheet, evidence statements are provided for ratings of 2, 3, and 4 as shown in paragraphs 2.3.1 to 2.3.3. The series of latent failures outlined led to the unsafe acts which breached the safety barriers and ultimately caused the mishap are revealed in paragraphs 2.3.1 to 2.3.3.

2.3.1 Tier 1 – Unsafe Acts

AE	ERRORS	EVIDENCE
AE 1	**Skill-Based Errors**	
AE 1.4	**Over-Control/Under-Control.** Over-control/Under-control is a factor when an individual responds inappropriately to conditions by either over-controlling or under-controlling the aircraft/vehicle/system. The error may be a result of preconditions or a temporary failure of coordination	Flare was initiated late and/or with insufficient input during the landing phase, resulting in an inadequate reduction of the descent rate at touchdown
AE 1.5	**Breakdown in Visual Scan.** Breakdown in Visual Scan is a factor when the individual fails to effectively execute learned / practiced internal or external visual scan patterns leading to unsafe situation.	Both the PIC and SIC were primarily focused on the prevailing tailwind conditions and did not adequately monitor or recognize the rate of descent during the approach
AE 2	**Judgment and Decision-Making Errors**	
AE 2.4	**Necessary Action – Delayed.** Necessary Action – Delayed is a factor when the individual selects a course of action but elects to delay execution of the actions and the delay leads to an unsafe situation.	The PIC did not recognize the high rate of descent in a timely manner, resulting in a delayed flare initiation and/or insufficient flare attitude, which led to a hard landing

AE 2.6	**Decision-making During Operation.** Decision-Making During Operation is a factor when the individual through faulty logic selects the wrong course of action in a time-constrained environment.	A lapse in decision-making, as the PIC did not initiate an earlier flare despite the prevailing tailwind conditions

Unsafe acts are the actions most directly linked to the occurrence of a mishap. These acts represent active failures—errors or violations—committed by individuals that contribute to or result in an unsafe condition or event. Unsafe acts are typically categorized as either Errors (unintentional actions or decisions) or Violations (deliberate deviations from rules, procedures, or standard practices).

The late or insufficient flare input reflects a handling technique deficiency and inadequate coordination of pitch control, resulting high impact on touchdown. Both pilots' attention was primarily focused on tailwind management**,** leading to reduced situational awareness and failure to recognize the high rate of descent in time. The PIC's delayed decision to initiate the flare demonstrates a judgment lapse under prevailing tailwind conditions.

Collectively, these unsafe acts indicate shortcomings in flight handling, situational awareness, and decision-making, emphasizing the need to reinforce crew coordination, approach monitoring discipline, and training in landing techniques under variable wind conditions**.**

2.3.2 Tier 2 – Preconditions for Unsafe Acts

PE	EVIRONMENTAL FACTORS	EVIDENCE
PE 1	**Physical Environment**	The presence of tailwind conditions contributed to the pilot's reduced attention to visual scanning of landing parameters, specifically the rate of descent
PE 1.5	**Windblast.** Windblast is a factor when the individual's ability to perform required duties is degraded during or after exposure to a windblast situation.	

PC	CONDITIONS OF INDIVIDUAL	EVIDENCE
PC 3	**Adverse Physiological State**	The PIC reported feeling unwell and bloated during the flight, as recorded on the CVR
PC 3.10	**Trapped Gas Disorders.** Trapped Gas Disorders are a factor when gasses in the middle ear, sinuses, teeth, or intestinal tract expand or contract on ascent or descent causing an unsafe situation. Also capture alternobaric vertigo under this code	

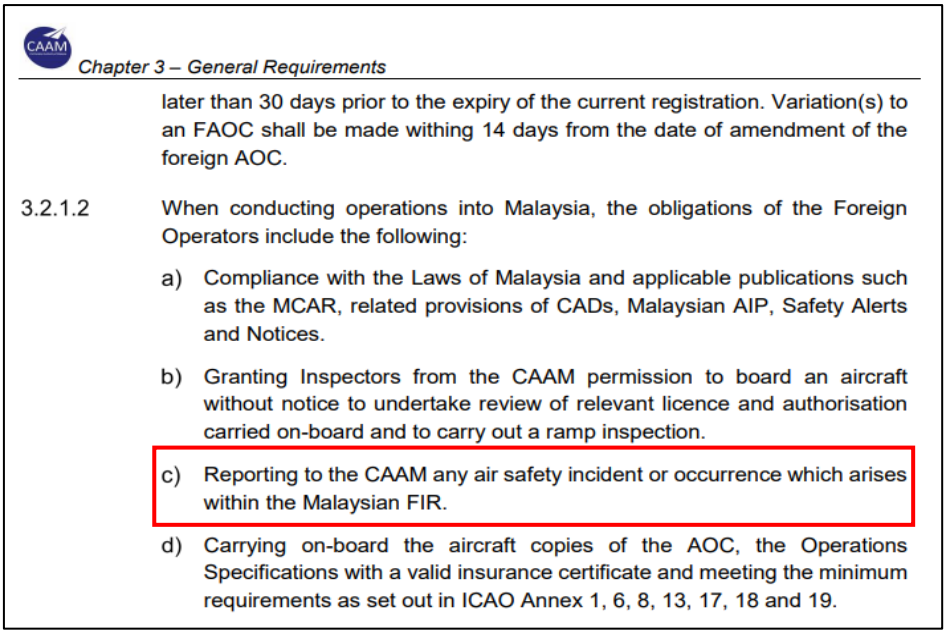
PP	PERSONNEL FACTORS	EVIDENCE
PP 1	**Coordination/Communication/ Planning**	
PP 1.1	**Crew/Team Leadership** Crew/Team Leadership is a factor when the crew/team leadership techniques failed to facilitate a proper crew climate, to include establishing and maintaining an accurate and shared understanding of the evolving mission and plan on the part of all crew or team members	The PIC not log the hard landing incident in the Aircraft Maintenance Log (AML) and not reported to CAAM. Paragraph 3.2.1.2(c) of CAAM CAD 6 Part 1-CAT-Aeroplane require any air safety incident which arises within the Malaysian FIR to be reported to CAAM
PP 1.2	**Cross-Monitoring Performance.** Cross-monitoring performance is a factor when crew or team members failed to monitor, assist or back-up each other's actions and decisions.	During the approach, the PIC appeared to become task-focused, and the SIC did not verbalize deviations in sink rate, potentially affecting the crew’s shared situational awareness

The circumstances indicate several preconditions that contributed to unsafe acts during the landing phase. The presence of tailwind conditions appears to have led to

channelized attention**,** where the pilots focused primarily on managing wind effects, resulting in reduced visual monitoring of critical landing parameters, particularly the rate of descent. Additionally, the PIC's reported physical discomfort—feeling unwell and bloated—may have contributed to adverse mental and physical states, potentially degrading cognitive performance, attention, and timely decision-making.

During the approach, the PIC became task-focused, and the SIC did not verbalize deviations in sink rate, which likely impaired the crew's shared situational awareness and reduced the effectiveness of cross-monitoring responsibilities. These factors collectively reflect preconditions related to adverse mental/physical states, reduced situational awareness, and ineffective crew resource management**.**

The PIC's decision not to report the hard landing incident reflected a lapse in leadership and professional responsibility. The action demonstrated ineffective communication and decision-making, as the PIC did not fulfil the obligation to report the occurrence in accordance with Paragraph 3.2.1.2 of CAD 6 Part 1–CAT–Aeroplane which requires that any air safety incident be reported to CAAM. Such behaviour undermines the integrity of the safety reporting system and restricts opportunities for organizational learning. Strengthening leadership accountability and promoting a transparent, non-punitive reporting culture are essential to prevent recurrence and enhance overall safety performance.



Chapter 3 – General Requirements

later than 30 days prior to the expiry of the current registration. Variation(s) to an FAOC shall be made withing 14 days from the date of amendment of the foreign AOC.

3.2.1.2 When conducting operations into Malaysia, the obligations of the Foreign Operators include the following:

a) Compliance with the Laws of Malaysia and applicable publications such as the MCAR, related provisions of CADs, Malaysian AIP, Safety Alerts and Notices.

b) Granting Inspectors from the CAAM permission to board an aircraft without notice to undertake review of relevant licence and authorisation carried on-board and to carry out a ramp inspection.

c) Reporting to the CAAM any air safety incident or occurrence which arises within the Malaysian FIR.

d) Carrying on-board the aircraft copies of the AOC, the Operations Specifications with a valid insurance certificate and meeting the minimum requirements as set out in ICAO Annex 1, 6, 8, 13, 17, 18 and 19.

Figure 12: CAAM CAD 6 Part 1 – CAT - Aeroplane

2.3.3 Tier 4 – Organisational Influences

OR	RESOURCE/ACQUISITION MANAGEMENT	EVIDENCE
OR 8	**Informational Resources / Support.** Informational Resources/ Support is a factor when weather, intelligence, operational planning material or other information necessary for safe operations planning are not available.	The operator fell short in ensuring that all relevant airline staff were made aware of and adhered to the applicable Directives during operations within Malaysia

OP	ORGANISATIONAL PROCESS	EVIDENCE
OP 3	**Procedural Guidance / Publications.** Procedural Guidance/ Publications is a factor when written direction, checklists, graphic depictions, tables, charts or other published guidance is inadequate, misleading or inappropriate and this creates an unsafe situation.	Insufficient guidance may have contributed to the PIC being unaware of the requirement to report the incident in accordance with CAAM CAD 6 Part 1 – CAT – Aeroplane The operator also did not report the incident since inspection being carried out on 17 February 2025 and only make known to AAIB thru notification email by NTSC on 27 March 2025

The statements indicate that organizational factors contributed to conditions that allowed unsafe acts prolonged after the incident happened. The operator may not adequately ensure all relevant airline staff were adequately informed of and adhered to applicable directives reflects a deficiency in organizational oversight, policies, and dissemination of regulatory requirements. This shortfall may have directly impacted the flight crew’s awareness and compliance with safety obligations.

Additionally, the lack of sufficient guidance and reinforcement regarding mandatory reporting requirements, as stipulated in CAAM CAD 6 Part 1 – CAT - Aeroplane, may have contributed to the PIC's unawareness of the obligation to report the incident, indicating a gap in organizational support and safety management processes.

The incident underscores the critical role of organizational influence on operational safety, highlighting the need for robust safety management systems, clear communication of regulatory requirements, and proactive organizational oversight ensuring that all personnel are adequately trained and informed on directives and mandatory reporting is essential to foster a strong safety culture and prevent recurrence of similar incidents.

3.0 CONCLUSION

3.1 Findings

The findings of this investigation should not be seen as assigning blame or liability to any specific organisation or individual. They highlight safety factors, events, and conditions that have increased risk, including contributing elements that, while not directly linked to the occurrence, are important for improving safety awareness. The report may also include additional findings relevant to the broader context.

3.1.1 Crew/Pilot

3.1.1.1 Both pilots were properly licensed and qualified for the flight.

3.1.1.2 The PIC reported feeling mild physiological discomfort (bloated/unwell) prior and during the flight.

3.1.1.3 The approach was flown with a tailwind component fluctuating between 10–15 kts based on ADIRU, close to or exceeding the aircraft's operational limitation.

3.1.1.4 A progressively increasing rate of descent developed below ~135 ft RA and reached approximately 950 fpm prior to flare initiation.

3.1.1.5 The flare was initiated late and/or with insufficient pitch input, resulting in an inadequate reduction of the descent rate.

3.1.1.6 Thrust levers were not retarded to IDLE before touchdown, causing the automatic ground spoilers to remain inhibited at touchdown.

3.1.1.7 The PIC did not make an entry in the Aircraft Maintenance Log (AML) after becoming aware of the hard landing indications.

3.1.1.8 The PIC did not report the incident to the CAAM as required under CAD 6 Part 1 – CAT – Aeroplane.

3.1.2 Aircraft

3.1.2.1 The aircraft was airworthy when cleared for flight.

3.1.2.2 The aircraft had a valid CoR and CoA at the time of the occurrence.

3.1.2.3 The aircraft experienced a hard landing with a recorded +2.86G VRTA.

3.1.2.4 Some damaged components had already been repaired by the operator before the AAIB inspection, limiting the ability to verify exact impact-related damage.

3.1.3 Meteorological and Aerodrome

3.1.3.1 Weather conditions were suitable for landing, with visibility greater than 10 kilometers.

3.1.3.2 Winds at the time of approach were variable from the northwest, contributing to a tailwind component on Runway 15.

3.1.4 Aircraft Operator

3.1.4.1 The operator did not report the incident to CAAM despite conducting maintenance inspections that confirmed a hard landing.

3.1.4.2 Safety reporting culture and oversight mechanisms were inadequate.

3.1.4.3 Maintenance staff acted proactively by forwarding Load Report data to Airbus.

3.2 Causes/Contributing Factors

3.2.1 Primary Cause

The primary cause of the hard landing was a late and insufficient flare that failed to adequately arrest the descent rate prior to touchdown.

3.2.2 Contributing Factors

The following factors contributed to the hard landing event:

3.2.2.1 Tailwind conditions of approximately 10–15 knots during short final increased the aircraft’s landing distance and flare sensitivity, and likely contributed to a higher-than-normal sink rate as the aircraft approached the runway.

3.2.2.2 Crew attention during short final became channelized toward monitoring fluctuations in tailwind conditions, which reduced the effectiveness of vertical speed monitoring at a critical phase of flight.

3.2.2.3 Crew resource management (CRM) effectiveness was also lessened as the SIC did not verbalize the excessive sink rate deviations, and the PF elected to continue the approach despite tailwind conditions approaching operational limits.

3.2.2.4 The delayed retardation of the thrust levers to IDLE prevented the automatic deployment of the ground spoilers, could reducing the aircraft's lift-dump capability and increasing the severity of the landing impact.

3.2.2.5 The PIC had earlier reported physiological discomfort, which may have mildly affected concentration, decision-making or the timing of control inputs during the landing phase, further contributing to the circumstances that led to the hard landing.

3.2.2.6 The operator's safety management practices and reporting culture did not facilitate the timely reporting of a serious incident, which in turn delayed regulatory oversight and the initiation of a formal investigation.

3.2.2.7 The PIC's decision not to report the hard landing and not to document the event in the Aircraft Maintenance Log (AML) reflected shortcomings in organizational oversight and reinforcement of safety culture.

This serious incident is classified as Abnormal Runway Contact (ARC).

4.0 SAFETY RECOMMENDATIONS

4.1 Immediate Safety Action of Preliminary Report

4.1.1 The Preliminary Report for this serious incident that issued on 29 April 2025 had mentioned "The operator shall put in place clear procedures to ensure all incidents are reported on time to appropriate authority especially to the State of Occurrence authority".

4.2 Safety Recommendation of this Report

The following safety recommendation are issued to the respective organisation to address the safety concerns identified in this investigation:

4.2.1 Aircraft Operator

It is recommended that the aircraft operator to:

4.2.1.1 Strengthen Flight Training Programmes to Enhance Compliance With the A321 FCTM.

4.2.1.1.1 Enhance pilot training on approach monitoring, recognition of excessive sink rate, and correct flare technique, particularly in tailwind or limiting environmental conditions.

4.2.1.1.2 Reinforce training on thrust-lever management and adherence to “RETARD” callout procedures to ensure automatic ground spoiler deployment.

4.2.1.1.3 Reinforce on CRM training focusing on cross-monitoring responsibilities, callouts and intervention criteria during approach and landing.

4.2.1.2 Improve Reporting Culture and Adherence to Foreign State Obligations.

4.2.1.2.1 Review and revise the operator’s internal incident reporting SOPs to ensure they clearly address obligations when operating in foreign States.

4.2.1.2.2 Provide adequate dissemination of foreign aeronautical requirements to all relevant personnel assigned to international operations.

4.2.1.3 Enhance Safety Oversight of Crew Fitness-for-duty Declaration

4.2.1.3.1 Empower flight crew health and fitness-for-duty self-declaration processes and provide refresher guidance on reporting any physiological impairments pre-flight.

4.2.2 CAAM

It is recommended that CAAM to:

4.2.2.1 Review and enhance oversight mechanisms for Foreign Air Order Certificate (FAOC) holders operating in Malaysia focusing on timely occurrence reporting, SMS integration, and compliance with related CAAM Regulation and Directives including CAD 6 Part 1 – CAT – Aeroplane.

5.0 COMMENTS TO THE REPORT AS REQUIRED BY ICAO ANNEX 13 PARAGRAPH 6.3

As required by ICAO Annex 13, paragraph 6.3, the draft Final Report was sent to the State of Occurrence (CAAM), State of Registry/Operator (NTSC) and State of Manufacture/Design (BEA), inviting their significant and substantiated comments on the report. The following is the status of the comments received: -

States/Organisations	Status of Significant and Substantiated Comments
Civil Aviation Authority of Malaysia (CAAM)	No comments.
The National Transportation Safety Committee (NTSC)	Comments that are accepted have been amended accordingly in this report.
Bureau d'Enquêtes et d'Analyses (BEA)	Report received and no comments.

CONCLUDING STATEMENT

This report presents the findings of the investigation into the serious incident involving PK-TLG, with a primary focus on identifying safety factors and areas for improvement. It is emphasized that these findings and recommendations are not intended to assign blame or liability to any individual or organisation but to enhance safety and prevent recurrence. By addressing the identified issues and implementing the proposed recommendations, stakeholders can strengthen operational safety, improve system reliability, and uphold the highest standards of aviation safety.

INVESTIGATOR IN-CHARGE
Air Accident Investigation Bureau
Ministry of Transport Malaysia

APPENDIX A

DAMAGE ASSESSMENT

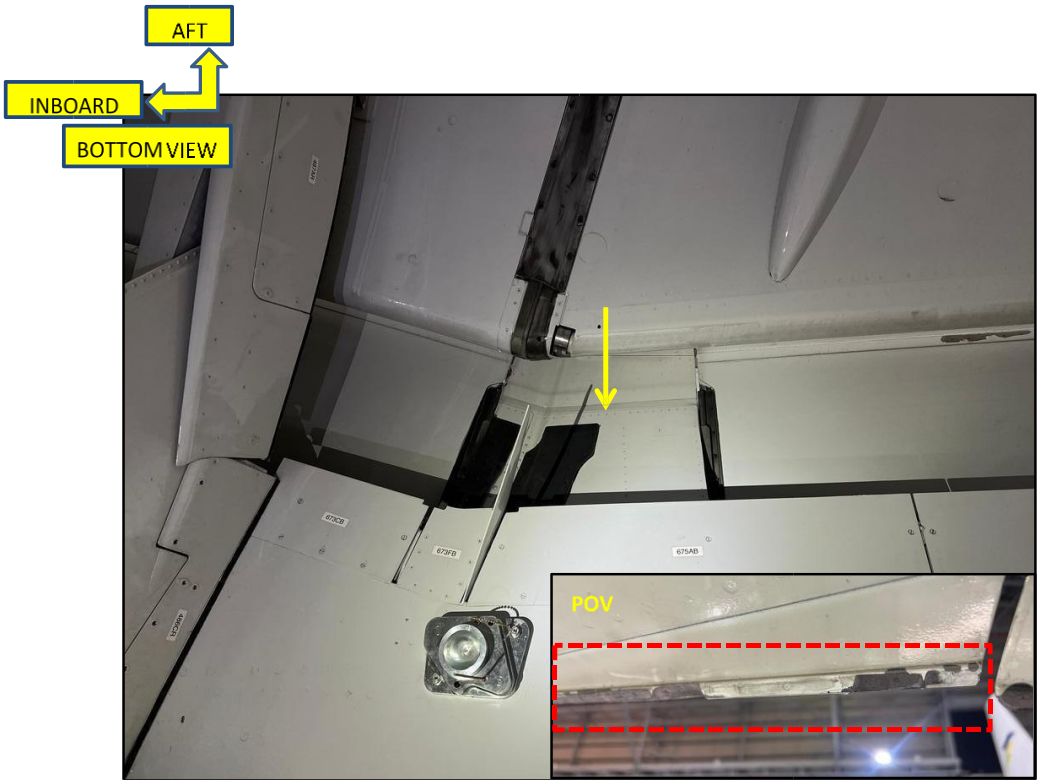


Figure 1: RH Strip Rubbing Trailing Edge Falsework between Spoiler 1 & 2 Chaffing

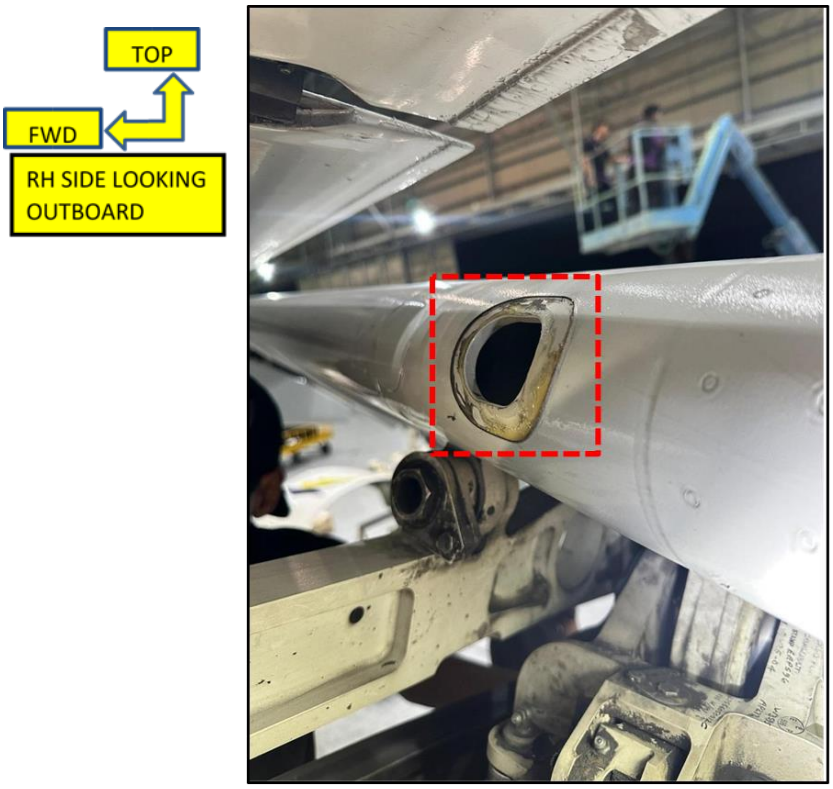


Figure 2 : RH Flap Trap Fairing No. 3 Hoist Patch Missing

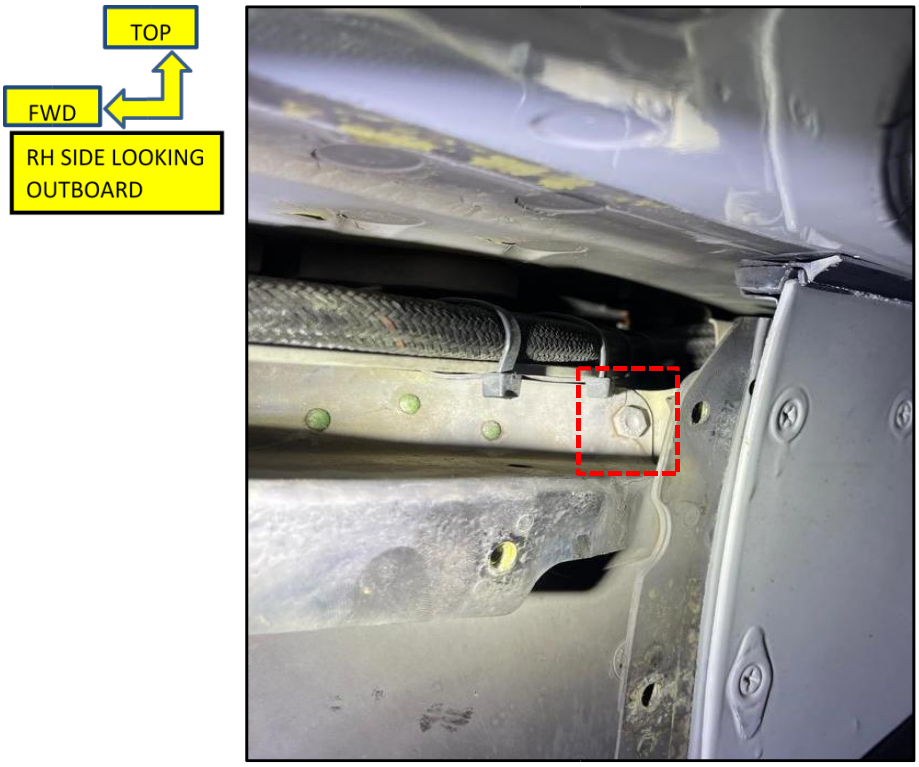


Figure 3: Crack found at Pylon Bracket inboard Engine No. 2

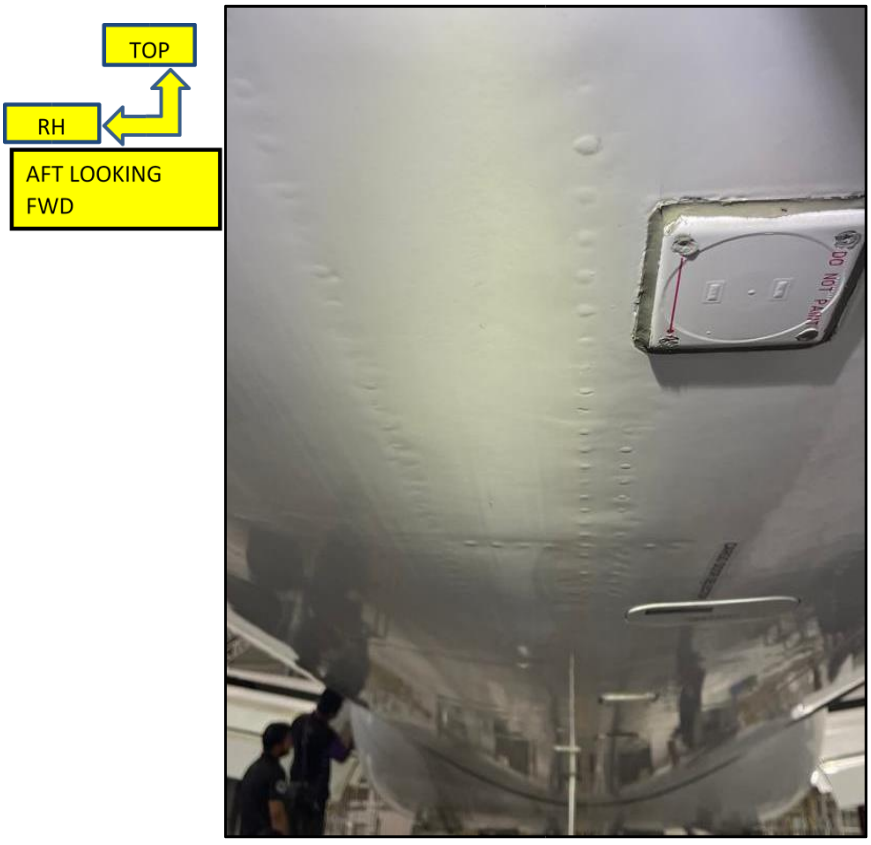


Figure 4: Suspected Skin Buckling at FR50-65

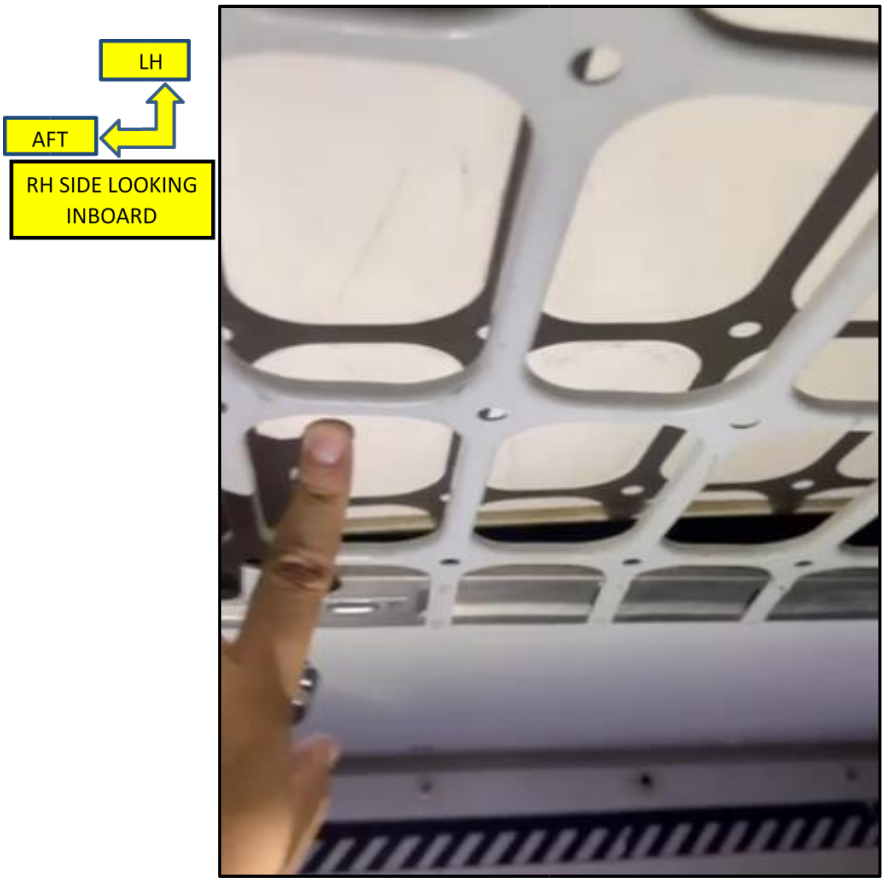


Figure 5: Aft Cargo Decompression Panel Unlatched

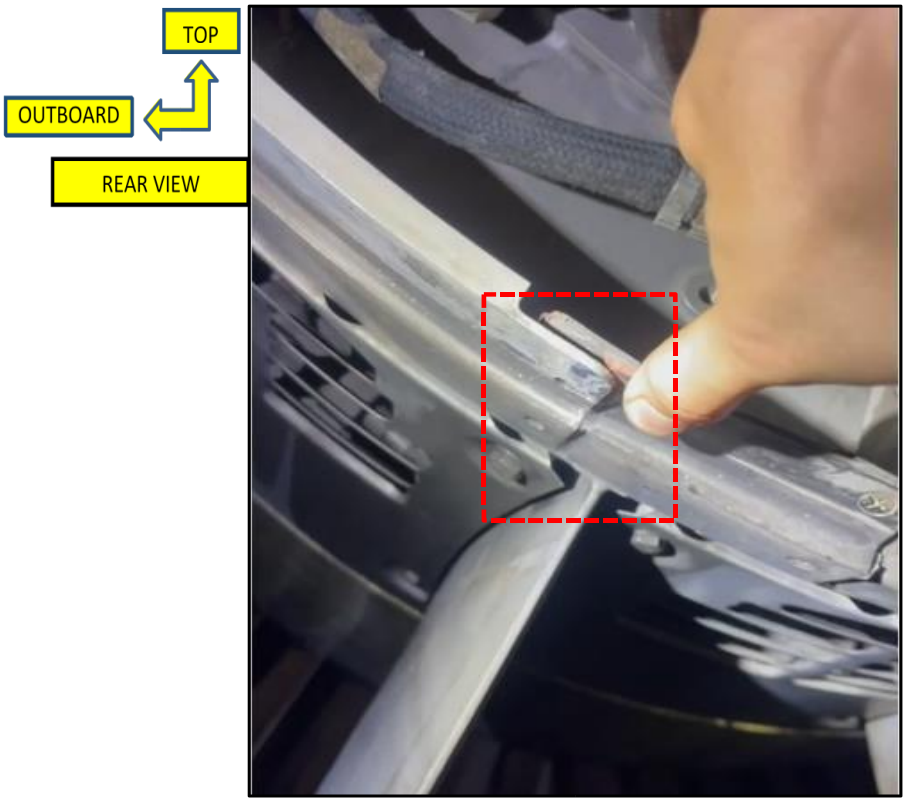


Figure 6: Engine No. 1 Flange Aft of VBV Rivet Pop-Out

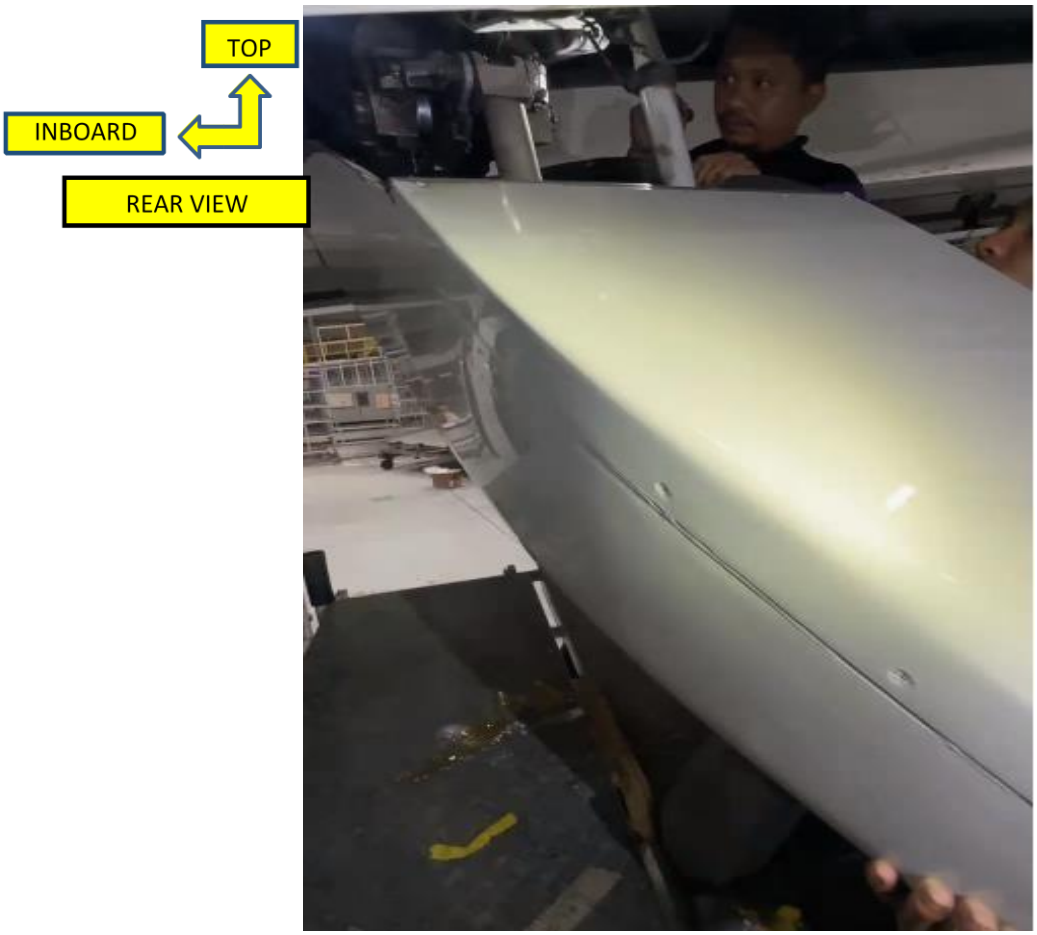


Figure 7: All Flap Fairing High Free-Play

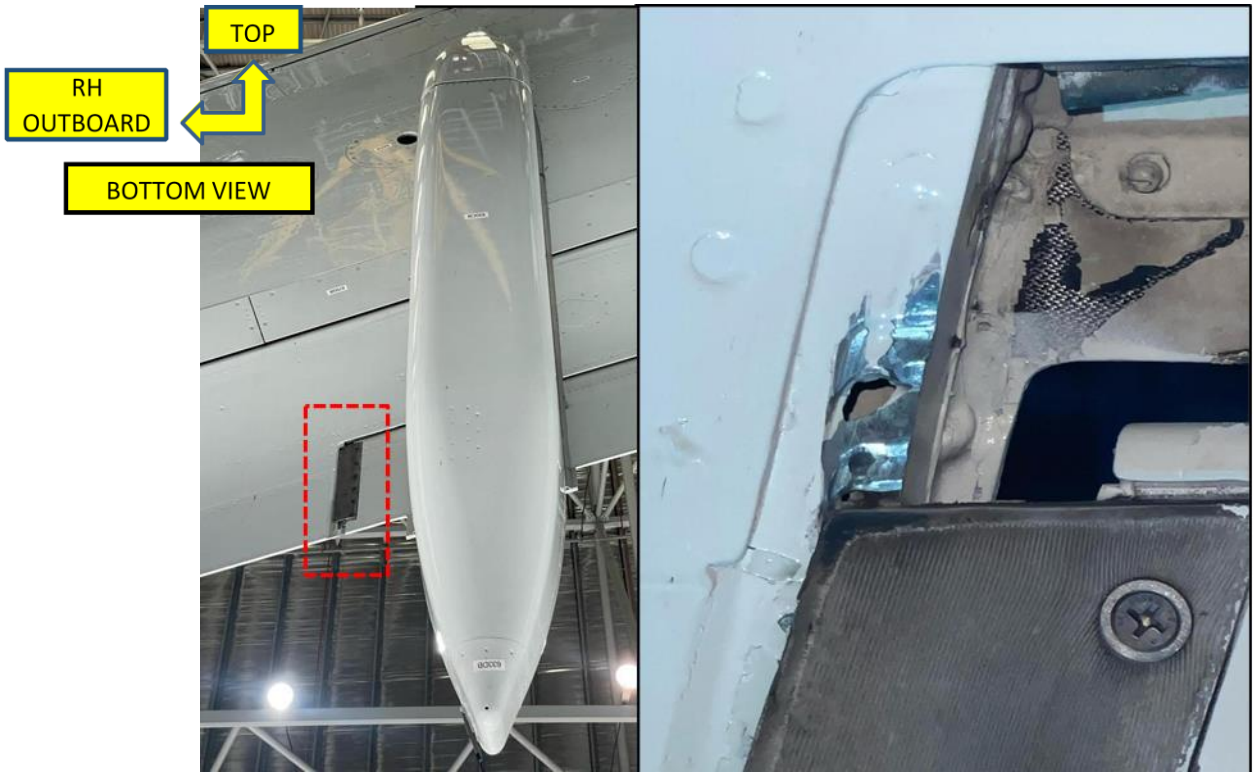


Figure 8: RH Outboard Flap Puntured

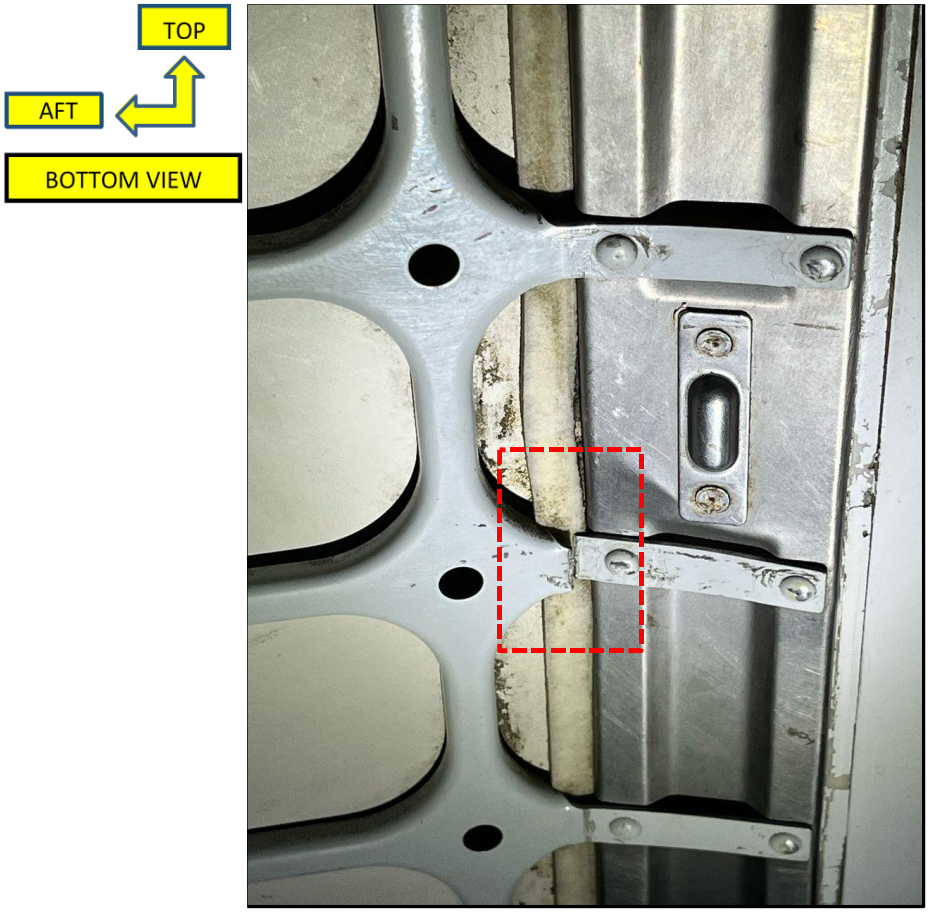


Figure 9: Forward Cargo Decompression Panel Broken

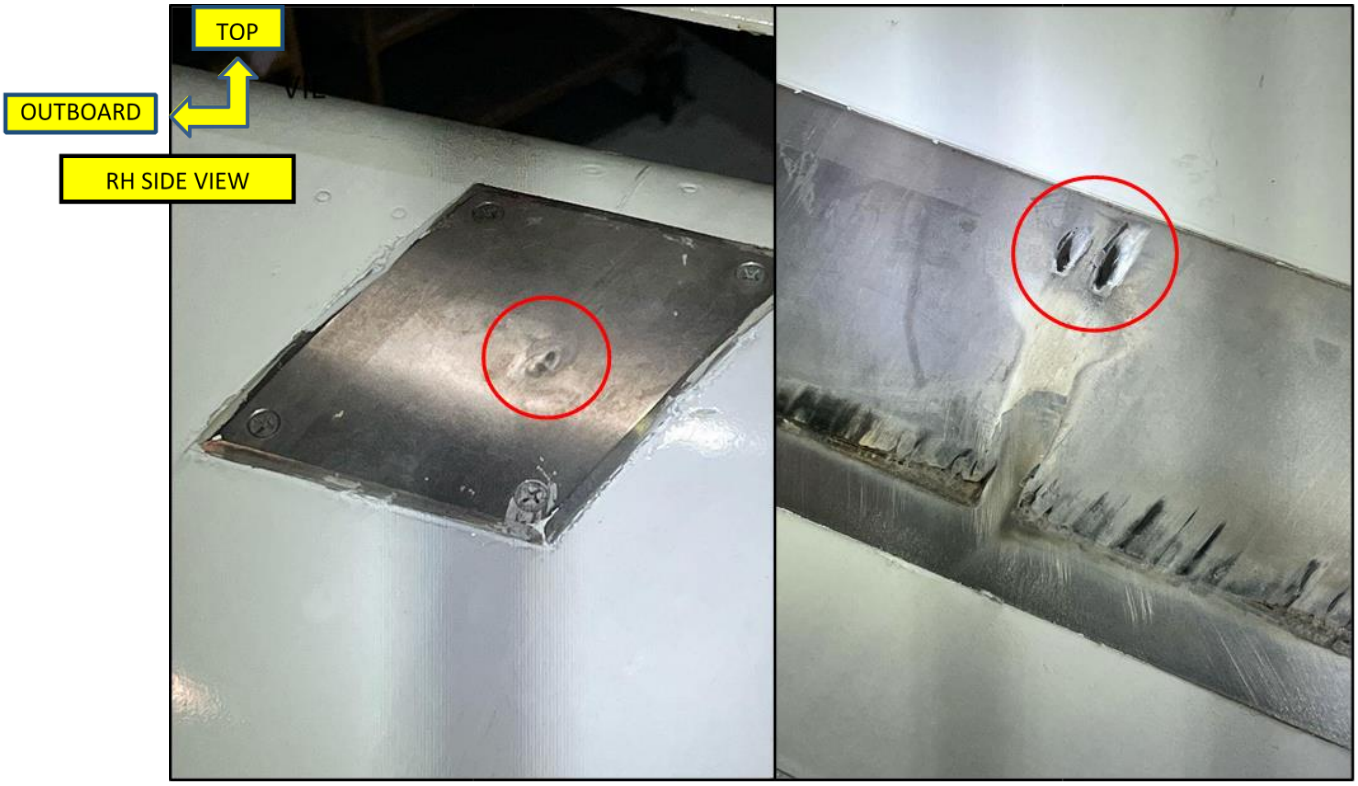


Figure 10: Gouge on LH Flap Rubber Strip

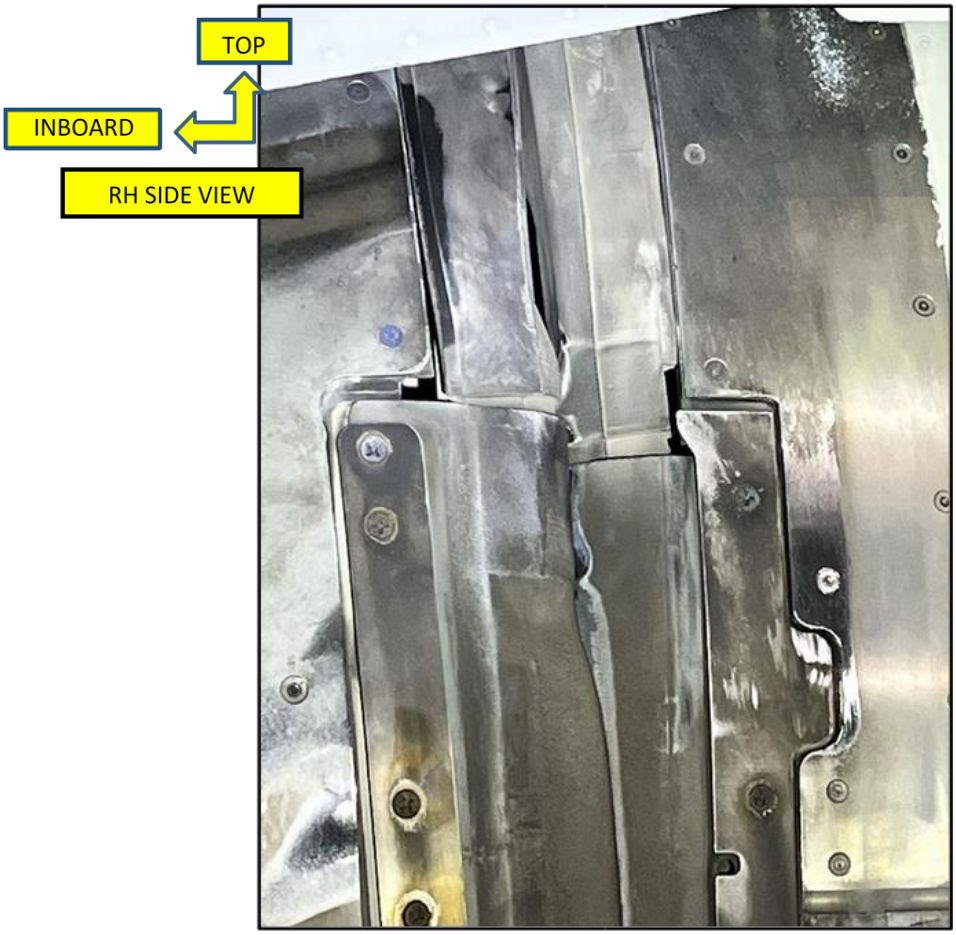


Figure 11: Sign on Seal Distortion on RH Flap

Figure 12: Loose Bearing on Engine No. 1 Pylon Inboard Panel

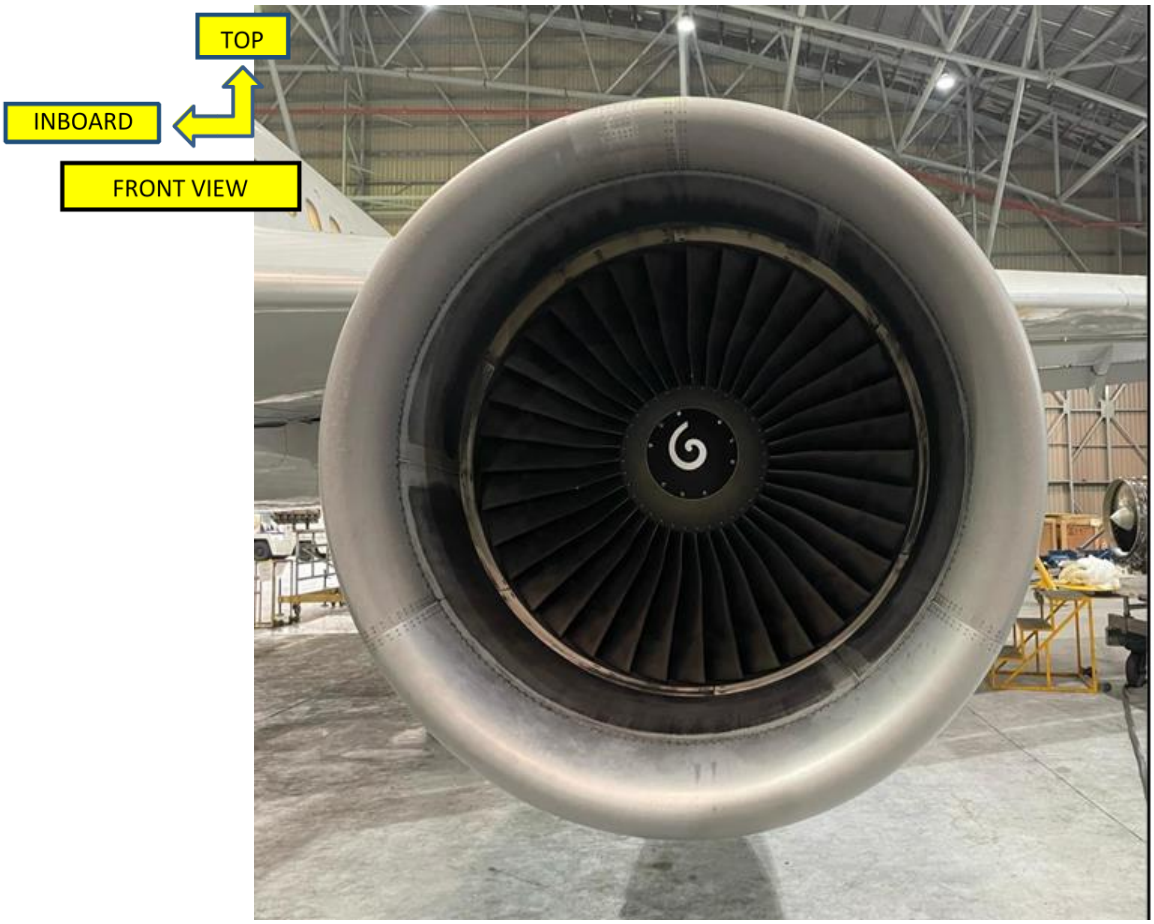


Figure 13: Engine No. 1 Fan Rotor Unsmooth Rotation

APPENDIX B

CERTIFICATE OF AIRWORTHINESS

REPUBLIK INDONESIA
Republic of Indonesia
KEMENTERIAN PERHUBUNGAN
Ministry of Transportation
DIREKTORAT JENDERAL PERHUBUNGAN UDARA
Directorate General of Civil Aviation

SERTIFIKAT KELAIKUDARAAN STANDARD
(Standard Certificate of Airworthiness)

1. Nomor Pendaftaran (Registration Number): **4631**

2. Tanda Kebangsaan dan Pendaftaran (Nationality and Registration Marks)	3. Pabrik Pembuat dan Tipe/Model Pesawat Udara (Manufacturer and Manufacturer's Designation of Aircraft)	4. Nomor Seri Pesawat Udara (Aircraft Serial Number)
PK-TLG	**Airbus S.A.S A321-211**	**2309**

5. Kategori (Category) : **TRANSPORT**

6. Sertifikat Kelaikudaraan ini dikeluarkan berdasarkan Konvensi tentang Penerbangan Sipil Internasional tanggal 7 Desember 1944 dan Undang-Undang Republik Indonesia Nomor 1 Tahun 2009 tentang Penerbangan serta Peraturan Keselamatan Penerbangan Sipil (PKPS) yang berlaku, sehubungan dengan pesawat udara tersebut di atas, dianggap laik udara apabila dirawat dan dioperasikan sesuai dengan batasan-batasan operasional yang berlaku dan terkait.
(This Certificate of Airworthiness is issued pursuant to the Convention on International Civil Aviation dated 7 December 1944 and to the Republic of Indonesia Aviation Law Number 1 Year 2009 and applicable Civil Aviation Safety Regulations (CASRs) in respect of the above-mentioned aircraft which is considered to be airworthy when maintained and operated in accordance with the foregoing and pertinent operating limitations)

Batasan-Batasan / *Limitations* : **None**

7. Tanggal Diterbitkan (*Date of Issuance*) : **06 NOV 2024**

8. Berlaku Sampai (*Valid Until*) : **05 NOV 2025**

An. Direktur Jenderal Perhubungan Udara
(On behalf of the Director General of Civil Aviation)

M. MAULUDIN
Tanda Tangan (Signature)

DGCA Form No. 21-20 (Oct 2017)

APPENDIX C

CERTIFICATE OF REGISTRATION

REPUBLIK INDONESIA
Republic of Indonesia
KEMENTERIAN PERHUBUNGAN
Ministry of Transportation
DIREKTORAT JENDERAL PERHUBUNGAN UDARA
Directorate General of Civil Aviation
DIREKTORAT KELAIKUDARAAN DAN PENGOPERASIAN PESAWAT UDARA
Directorate of Airworthiness and Aircraft Operations

SERTIFIKAT PENDAFTARAN
(Certificate of Registration)

1. No. Pendaftaran *(Registration Number)*	2. Tanda Kebangsaan dan Pendaftaran *(Nationality and Registration Marks)*	3. Pabrik Pembuat dan Tipe/Model Pesawat Udara *(Manufacturer and Manufacturer's Designation of Aircraft)*	4. Nomor Seri Pesawat Udara *(Aircraft Serial Number)*
4631	PK-TLG	Airbus S.A.S A321-211	2309

5. Nama pemilik *(Name of Owner)* : **ZJ JIANAN AIRCRAFT LEASING (SHANGHAI) COMPANY LIMITED**

6. Alamat Pemilik *(Address of Owner)* : **Room 450, No. 188, Yesheng Road, Lingang New Area, China (Shanghai) Pilot Free Trade Zone.**

7. Yang bertanda tangan dibawah ini menerangkan bahwa pesawat udara tersebut di atas telah didaftar dalam Daftar Pesawat Udara Sipil Republik Indonesia sesuai dengan Perjanjian Penerbangan Sipil Internasional tanggal 7 Desember 1944, Undang-Undang Republik Indonesia No. 1 tahun 2009 tentang Penerbangan serta Peraturan Keselamatan Penerbangan Sipil (PKPS) yang berlaku.

It is hereby certified that the above described aircraft has been registered in the Civil Aircraft Register of the Republic of Indonesia in accordance with the Convention on International Civil Aviation dated 7 December 1944, the Republic of Indonesia Aviation Law. No. 1 Year 2009 and applicable Civil Aviation Safety Regulations (CASR).

8. Tanggal Diterbitkan *(Date of issuance)*
24 September 2024

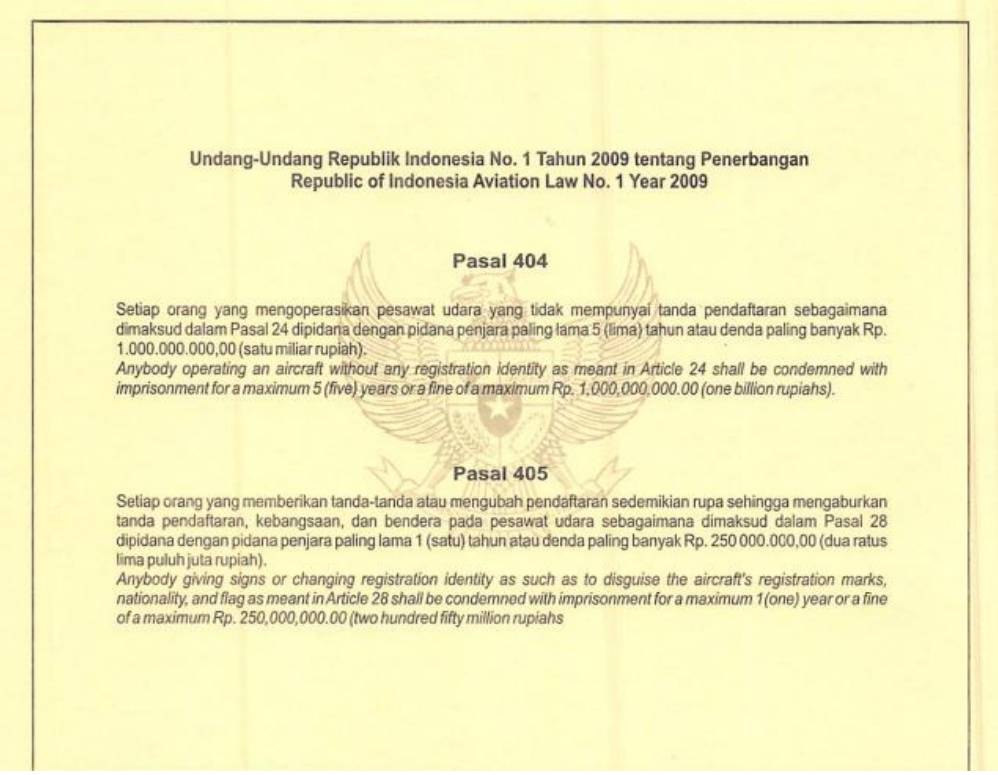
9. Berlaku Sampai : *(Valid Until)*
23 September 2027

10. u.b. Direktur Jenderal Perhubungan Udara
(On behalf of the Director General of Civil Aviation)

Tanda tangan *(Signature)*

M. MAULUDIN

DGCA Form No. 47-02 (Aug 2018)



Undang-Undang Republik Indonesia No. 1 Tahun 2009 tentang Penerbangan
Republic of Indonesia Aviation Law No. 1 Year 2009

Pasal 404

Setiap orang yang mengoperasikan pesawat udara yang tidak mempunyai tanda pendaftaran sebagaimana dimaksud dalam Pasal 24 dipidana dengan pidana penjara paling lama 5 (lima) tahun atau denda paling banyak Rp. 1.000.000.000,00 (satu miliar rupiah).

Anybody operating an aircraft without any registration identity as meant in Article 24 shall be condemned with imprisonment for a maximum 5 (five) years or a fine of a maximum Rp. 1,000,000,000.00 (one billion rupiahs).

Pasal 405

Setiap orang yang memberikan tanda-tanda atau mengubah pendaftaran sedemikian rupa sehingga mengaburkan tanda pendaftaran, kebangsaan, dan bendera pada pesawat udara sebagaimana dimaksud dalam Pasal 28 dipidana dengan pidana penjara paling lama 1 (satu) tahun atau denda paling banyak Rp. 250 000.000,00 (dua ratus lima puluh juta rupiah).

Anybody giving signs or changing registration identity as such as to disguise the aircraft's registration marks, nationality, and flag as meant in Article 28 shall be condemned with imprisonment for a maximum 1(one) year or a fine of a maximum Rp. 250,000,000.00 (two hundred fifty million rupiahs

APPENDIX D

HUMAN FACTOR ANALYSIS
AND CLASSIFICATION SYSTEM (HFACS) WORKSHEET
SI 02/25 Airbus 321-211 PK-TLG

1. This worksheet is on HFACS. It is divided into four (4) sections, having questions pertaining to that area. There are a total of 147 statements, and each statement is to be rated on a 4-point scale, where:

a. **4 - Primary cause**. Main factors that directly contributed to / responsible for accident/incident.

b. **3 - Secondary cause**. Factor was present but not the most important / critical factor responsible for accident/incident and contributed indirectly.

c. **2 -** Factor was present but didn't affect the outcome at all, was not contributory.

d. **1 -** Factor was not present.

2. It is mandatory to rate each statement. Wherever the rating is 2, 3 or 4, the explanation has to be provided for the reasons responsible in a narrative form at the end of the rating sheet.

UNSAFE ACTS

3. **AE - Errors**

		4	3	2	1
AE 1	**Skill-Based Errors**				
AE 1.1	Inadvertent Operation				√
AE 1.2	Checklist Error				√
AE 1.3	Procedural Error				√
AE 1.4	Over-control / Under-control	√			
AE 1.5	Breakdown in Visual Scan		√		
AE 1.6	Inadequate Anti-'G' Straining Manoeuvre				√

		4	3	2	1
AE 2	**Judgment and Decision-Making Errors**				
AE 2.1	Risk Assessment – During Operation				√
AE 2.2	Task Mis-prioritization				√
AE 2.3	Necessary Action – Rushed				√
AE 2.4	Necessary Action – Delayed	√			
AE 2.5	Caution / Warning – Ignored				√
AE 2.6	Decision-making During Operation		√		
		4	**3**	**2**	**1**
AE 3	**Misperception Error**				
AE 3.1	Errors due to Misperception				√

4. **AV – Violations**

		4	3	2	1
AV 1	Violations - Based on Risk Assessment				√
AV 2	Violations - Routine / Widespread				√
AV 3	Violations – Lack of Discipline				√

PRECONDITIONS FOR UNSAFE ACTS

5. **PE - Environmental Factors**

		4	3	2	1
PE 1	**Physical Environment**				√
PE 1.1	Vision Restricted by Icing/Windows Fogging/etc.				√
PE 1.2	Vision Restricted by Meteorology Conditions				√
PE 1.3	Vibration				√
PE 1.4	Vision Restricted in Workspace by Dust/Smoke/etc.				√
PE 1.5	Windblast			√	
PE 1.6	Thermal Stress-Cold				√
PE 1.7	Thermal Stress-Heat				√
PE 1.8	Manoeuvring Forces-In-Flight				√
PE 1.9	Lighting of Other Aircraft / Vehicle				√
PE1.10	Noise Interference				√
PE 1.11	Brownout / Whiteout				√
		4	**3**	**2**	**1**
PE 2	**Technology Environment**				
PE 2.1	Seating and Restraints				√
PE 2.2	Instrumentation and Sensory Feedback Systems				√
PE 2.3	Visibility Restriction				√
PE 2.4	Controls and Switches				√
PE 2.5	Automation				√
PE 2.6	Workspace Incompatible with Human				√
PE 2.7	Personal Equipment Interference				√
PE 2.8	Communications - Equipment				√

6. **PC - Conditions of Individual**

		4	3	2	1
PC 1	**Cognitive Factors**				
PC 1.1	Inattention				√
PC 1.2	Channelized attention				√
PC 1.3	Cognitive Task Oversaturation				√
PC 1.4	Confusion				√
PC 1.5	Negative Transfer				√
PC 1.6	Distraction				√
PC 1.7	Geographic Misorientation (Lost)				√
PC 1.8	Checklist Interference				√

		4	3	2	1
PC 2	**Psycho-Behavioural Factors**				
PC 2.1	Pre-Existing Personality Disorder				√
PC 2.2	Pre-Existing Psychological Disorder				√
PC 2.3	Pre-Existing Psychosocial Disorder				√
PC 2.4	Emotional State				√
PC 2.5	Personality Style				√
PC 2.6	Overconfidence				√
PC 2.7	Pressing Beyond Limits				√
PC 2.8	Complacency				√
PC 2.9	Inadequate Motivation				√
PC 2.10	Misplaced Motivation				√
PC 2.11	Overaggressive				√
PC 2.12	Excessive Motivation to Succeed				√
PC 2.13	Get-Home-It is / Get-There-Itis				√
PC 2.14	Response Set				√
PC 2.15	Motivational Exhaustion (Burn out)				√

		4	3	2	1
PC 3	**Adverse Physiological State**				
PC 3.1	Effects of G-Forces (G-LOC, etc,)				√
PC 3.2	Prescribed Drugs				√
PC 3.3	Operational Injury/Illness				√
PC 3.4	Sudden Incapacitation / Unconsciousness				√
PC 3.5	Pre-Existing Physical Illness/Deficit				√
PC 3.6	Physical Fatigue (Overexertion)				√
PC 3.7	Fatigue – Physiological / Mental				√
PC 3.8	Circadian Rhythm Desynchrony				√
PC 3.9	Motion Sickness				√
PC 3.10	Trapped Gas Disorders			√	
PC 3.11	Evolved Gas Disorders				√
PC 3.12	Hypoxia				√
PC 3.13	Hyperventilation				√
PC 3.14	Visual Adaption				√
PC 3.15	Dehydration				√
PC 3.16	Physical Task Oversaturation				√

		4	3	2	1
PC 4	**Physical / Mental Limitation**				
PC 4.1	Learning Ability / Rate				√
PC 4.2	Memory Ability / Lapses				√
PC 4.3	Anthropometric / Biomechanical Limitations				√
PC 4.4	Motor skill / Coordination or Timing deficiency				√
PC 4.5	Technical / Procedural Knowledge				√

		4	3	2	1
PC 5	**Perceptual Factors**				
PC 5.1	Illusion – Kinesthetic				√
PC 5.2	Illusion – Vestibular				√
PC 5.3	Illusion – Visual				√
PC 5.4	Misperception of Operational Conditions				√
PC 5.5	Misinterpreted / Misread Instrument				√
PC 5.6	Expectancy				√
PC 5.7	Auditory Cues				√
PC 5.8	Spatial Disorientation (Type 1) Unrecognized				√
PC 5.9	Spatial Disorientation (Type 2) Recognized				√
PC 5.10	Spatial Disorientation (Type 3) Incapacitating				√
PC 5.11	Temporal Distortion				√

7. **PP - Personnel Factors**

		4	3	2	1
PP 1	**Coordination/Communication/Planning Factors**				
PP 1.1	Crew/Team Leadership		√		
PP 1.2	Cross-Monitoring Performance		√		
PP 1.3	Task Delegation				√
PP 1.4	Rank / Position Authority Gradient				√
PP 1.5	Assertiveness				√
PP 1.6	Communicating Critical Information				√
PP 1.7	Standard / Proper Terminology				√
PP 1.8	Challenge and Reply				√
PP 1.9	Mission Planning				√
PP 1.10	Mission Briefing				√
PP 1.11	Task/Mission-In-Progress Re-Planning				√
PP 1.12	Miscommunication				√

		4	3	2	1
PP 2	**Self-Imposed Stress**				
PP 2.1	Physical Fitness				√
PP 2.2	Alcohol				√
PP 2.3	Drugs/Supplements/Self-Medication				√
PP 2.4	Nutrition				√
PP 2.5	Inadequate Rest				√
PP 2.6	Unreported Disqualifying Medical Condition				√

SUPERVISION

8. **SI - Inadequate Supervision**

		4	3	2	1
SI 1	Leadership / Supervision / Oversight Inadequate				√
SI 2	Supervision-Modelling				√
SI 3	Local Training Issues / Programs				√
SI 4	Supervision – Policy				√
SI 5	Supervision – Personality Conflict				√
SI 6	Supervision-Lack of Feedback				√

9. **SP – Planned Inappropriate Operations**

		4	3	2	1
SP 1	Ordered / Led on Mission Beyond Capability				√
SP 2	Crew / Team / Flight Makeup / Composition				√
SP 3	Limited Recent Experience				√
SP 4	Limited Total Experience				√
SP 5	Proficiency				√
SP 6	Risk Assessment – Formal				√
SP 7	Authorized Unnecessary Hazard				√

10. **SF - Failure Correct Known Problem**

		4	3	2	1
SF 1	Personnel Management				√
SF 2	Operations Management				√

11. **SV - Supervisory Violations**

		4	3	2	1
SV 1	Supervision – Discipline Enforcement (Supervision act of Omission)				√
SV 2	Supervision – Defacto Policy				√
SV 3	Directed Violation				√
SV 4	Currency				√

ORGANIZATIONAL INFLUENCES

12. **OR - Resource/Acquisition Management**

		4	3	2	1
OR 1	Air Traffic Control Resources				√
OR 2	Air Field Resources				√
OR 3	Operator Support				√
OR 4	Acquisition Policies / Design Processes				√
OR 5	Attrition Policies				√
OR 6	Accession/Selection Policies				√
OR 7	Personnel Resources				√
OR 8	Informational Resources / Support			√	
OR 9	Financial Resources / Support				√

13. **OC - Organisational Climate**

		4	3	2	1
OC 1	Unit / Organisational Values / Culture		√		
OC 2	Evaluation / Promotion / Upgrade				√
OC 3	Perceptions of Equipment				√
OC 4	Unit Mission / Aircraft / Vehicle / Equipment Change or Unit				√
OC 5	Organisational Structure				√

14. **OP - Organisational Processes**

		4	3	2	1
OP 1	Ops Tempo / Workload				√
OP 2	Program and Policy Risk Assessment				√
OP 3	Procedural Guidance / Publications		√		
OP 4	Organisational Training Issues / Programs				√
OP 5	Doctrine				√
OP 6	Program Oversight / Program Management				√

SUMMARY OF HFACS WORKSHEET

TIER 1 – UNSAFE ACTS - ERRORS		**4**	**3**	**2**	**1**
AE 1	Skill-Based Errors	1	1		4
AE 2	Judgment & Decision-Making Errors	1	1		4
AE 3	Misperception Error				1
TIER 1 – UNSAFE ACTS - VIOLATIONS					
AV 1	Violations – Based on Risk Assessment				1
AV 2	Violations – Routine/Widespread				1
AV 3	Violations – Lack of Discipline				1
TIER 1 – UNSAFE ACTS SUB TOTAL		**2**	**2**	**0**	**12**
TIER 2 – PRECONDITIONS FOR UNSAFE ACTS – ENVIRONMENTAL FACTORS					
PE 1	Physical Environment		1		10
PE 2	Technology Environment				8
TIER 2 – PRECONDITIONS FOR UNSAFE ACTS – CONDITIONS OF INDIVIDUAL					
PC 1	Cognitive Factors				8
PC 2	Psycho-behavioral Factors				15
PC 3	Adverse Physiological State		1		15
PC 4	Physical/Mental Limitations				5
PC 5	Perceptual Factors				11

TIER 2 – PRECONDITIONS FOR UNSAFE ACTS – PERSONNEL FACTORS					
PP 1	Coordination/Communication/Planning Factors		2		10
PP 2	Self-Imposed Stress				6
TIER 2 – PRECONDITIONS FOR UNSAFE ACTS SUB TOTAL		**0**	**4**	**0**	**88**

TIER 3 – UNSAFE SUPERVISION					
SI	Inadequate Supervision				6
SP	Planned Inappropriate Operations				7
SF	Failure Correct Known Problem				2
SV	Supervisory Violations				4
TIER 3 – UNSAFE SUPERVISION SUB TOTAL		**0**	**0**	**0**	**19**
TIER 4 – ORGANISATIONAL INFLUENCES					
OR	Resource/Acquisition Management			1	8
OC	Organisational Climate		1		4
OP	Organisational Processes		1		5
TIER 4 – ORGANISATIONAL INFLUENCES SUB TOTAL		**0**	**2**	**1**	**17**
TOTAL UNSAFE ACTS		**2**	**8**	**1**	**136**

Figure 1: Summary of HFACS Worksheet

FINDINGS

1. From the analysis using the HFACS tool worksheet, it has been determined that the above incident primary cause were attributed to:

a. 2 Unsafe Acts (Tier 1) as follows:

i. 1 Over-control / Under-control.

ii. 1 Necessary Action – Delayed

2.. The Secondary causes were attributed to:

a. 2 Unsafe Acts (Tier 1) as follows:

i. 1 Breakdown in Visual Scan.

ii. 1 Decision-making During Operation.

b. 4 Preconditions of Unsafe Acts (Tier 2) as follows:

i. 1 Windblast.

ii. 1 Trapped Gas Disorders.

iii. 1 Crew/Team Leadership.

iv. 1 Cross-Monitoring Performance.

c. 2 Organisational Influences (Tier 4) as follows:

i. 1 Unit / Organisational Values / Culture.

ii. 1 Procedural Guidance / Publications