REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

Directorate of Aircraft Accident and Incident Investigations

Aircraft Incident Investigation Final Report

Occurrence number: INCID/02192023/02-02

RELEASE DATE: 18 FEBRUARY 2025

Source : Jet Photos

Aircraft Incident Final Report

Hard Landing
Type of Operation: International Passenger Flight
Aircraft Type: Airbus A330
Registration: D-AXGB
LOCATION: GPS: 22° 29' 7.19" S 17° 27' 26.99" E Hosea Kutako International Airport,
Time: 17:14 19th February, 2023

Foreword

This report presents the factual information, data analysis, conclusions, and safety recommendations reached during the investigation. The purpose of the investigation was to establish the circumstances surrounding this occurrence.

In accordance with part 11 of the Namibian Civil Aviation Act, Act No.6, 2016 and Annex 13 to the Convention on International Civil Aviation Organization, the accident's analysis, conclusions, and safety recommendations contained therein are intended neither to apportion blame nor to single out any individual or group of individuals. The main objective was to identify the systematic deficiencies and draw lessons from the occurrence, which might help prevent future accidents and incidents. To this end, many a time, the reader may be interested in whether or not an issue was a direct cause of the accident (that has already taken place), whereas the investigator is mainly concerned with the prevention of future accidents/incidents.

As a result, the usage of this report for any purpose other than (the latter and spirit of Annex 13 and other relevant statutes) prevention of similar occurrences in the future might lead to erroneous interpretations and applications.

TABLE OF CONTENTS **PAGE**

ABBREVIATION

AD	-	Airworthiness Directives
ADIRU	-	Air Data Inertial Reference Unit
AMO	-	Aircraft Maintenance Organization
AME	-	Aircraft Maintenance Engineer
AIP	-	Aeronautical Information Publication
AOC	-	Air Operating Certificate
ATPL	-	Airline Transport Pilot License
BEA	-	Bureau d'Enquêtes et d'Analyses (French -Bureau of Investigations and Analysis)
BFU	-	Bundesstelle für Flugunfalluntersuchung (German- Federal Bureau of Aircraft Accident Investigation.)
CAS	-	Calibrated Airspeed
DAAII	-	Directorate of Aircraft Accident and Incident Investigation
DFDR	-	Digital Flight Data Recorder
ELT	-	Emergency Locator Transmitter
FMS	-	Flight Management System
ICAO	-	International Civil Aviation Organization
IIC	-	Investigator In Charge
NCAA	-	Namibia Civil Aviation Authority
NAMCARs	-	Namibian Civil Aviation Regulations
NCAA	-	Namibian Civil Aviation Authority
PPL	-	Private Pilot License
PAPI	-	Precision Approach Path Indicator
MPI	-	Mandatory Periodic Inspection
RA	-	Radar Altitude (as measured by the radar altimeter)
SB	-	Service Bulletins
UTC	-	Universal Time Co-ordinated
VHF	-	Very Higher Frequency

Form Number: DAAII RPT 3A

Ministry of Works and Transport

INCID/02192023/02-02

DIRECTORATE OF AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATIONS
INCIDENT REPORT – EXECUTIVE SUMMARY

Aircraft Registration	D-AXGB	**Date of incident**	19th February 2023	**Time of Incident**	17:14 UTC
Type of Aircraft	A330-200		**Type of Operation**	International Passanger Transport	
Pilot- In - command License Type	ATPL	**Age**	61	**License Valid**	Valid
Pilot-In-command Flying Experience	Total Flying Hours	18 000		**Hours on Type**	200
Last point of departure	Frankfurt am Main Airport (EDDF, Frankfurt, Germany)				
Next point of intended landing	Hosea Kutako International Airport (FYWH, Windhoek, Namibia).				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)					
GPS: 22° 29' 7.19" S 17° 27' 26.99" E Hosea Kutako International Airport					
Meteorological Information	Wind direction 300 ° Wind speed: 8kt Visibility: +10 km, , Cloud Cover: CAVOK Temp : 27 ° dew point +5 °C QNH: 1014hPa				
Number of people on board	11+263	**No. of people injured**	0	**No. of people killed**	0

Synopsis

On the 19th of February 2023, an Airbus A330-203 SN 684, with registration D-AXGB, on a flight from Frankfurt to Windhoek, experienced a hard landing, at around 17:14 UTC. On board were 11 crew members and 263 passengers. There were no reported injuries and no visible damage to the aircraft.

The aircraft was on an ILS approach to runway 26 at Hosea Kutako International Airport (FYWH). During the final approach, the aircraft experienced:

- A right crosswind of around 14kt between 1000ft RA and 200ft RA:
- A headwind component decreasing from around 16kt at 1000ft RA to around 8kt at 200ft RA.
-In the last 120ft, the aircraft experienced a progressive headwind decrease of around 13kt.

The flare was initiated late, and the aircraft touched down hard. The landing was performed by the first officer, who was on his first flight on the A330 following the initial type rating. It was also his first flight at a high altitude airport.

The pilot was issued an Airline Transport Pilot License (ATPL) with aeroplane single and multi-engine land and instrument aeroplane ratings. His medical certificate was valid and was issued on 03/02/2023.

The Investigation was organised and conducted by the Directorate of Aircraft Accident and Incident Investigation (DAAII), who were informed telephonically by the Air Traffic Controller (ATC). DAAII instituted an Investigation into the occurrence. The State of Registration (Germany), State of Manufacture (France) and ICAO were notified.

Cause: Hard landing

Contributing factor **(s):**

1. Late initiation of landing flare
2. First flight by Pilot Flying (PF) in a high-altitude airport.
3. Wind component

AIRCRAFT INCIDENT REPORT

Aircraft Type	: Airbus A330-200
Manufacturer	: Airbus
Registration	: D-AXGB
Operator	: EW Discover GmbH (GERMAN)
Location	: GPS: 22° 29' 7.19" S 17° 27' 26.99" E Hosea Kutako
Date	: 19 February 2023

All times given in this report are in Co-ordinated Universal Time (UTC).

Disclaimer:

The report is given without prejudice to the rights of the Directorate of Aircraft Accident and Incidents Investigations, which are reserved.

Purpose of the Investigations:

In terms of the Namibia Civil Aviation Act (Act No. 6 of 2016) and ICAO Annex 13, this report was compiled in the interest of the promotion of aviation safety and the reduction of risk of aviation accidents or incidents and **not to establish blame or legal liability.**

This report contains facts relating to aircraft accidents or incidents that have been determined at the time of issue. The report may, therefore, be revised should new and substantive facts be made available to the investigator (s).

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On the 19th of February 2023, an Airbus A330-203, with registration D-AXGB, on a flight from Frankfurt to Windhoek, experienced a hard landing at around 17:14 UTC. On board were 11 crew members and 263 passengers. There were no reported injuries and no visible damage to the aircraft.

1.1.2 The Pilot Flying (PF), who had just completed his type rating and was on his first flight, performed a stabilised approach in good weather conditions under the supervision of the Pilot Monitoring (PM) also the instructor.

1.1.3 During the final approach, the aircraft experienced:

- A right crosswind of around 14kt between 1000ft RA and 200ft RA:
- A headwind component decreasing from around 16kt at 1000ft RA to around 8kt at 200ft RA. In the last 120ft, the aircraft experienced a progressive headwind decrease of around 13kt.

The flare was initiated late, and the aircraft touched down hard. 'Load report 15' was triggered, and the flight crew confirmed a hard landing. the landing was classified per (Aircraft Maintenance Manual) AMM chapter 05 in Zone 3. Therefore, the required hard landing inspection as per AMM Task 05-51-11-200-802-A has to be performed before the next flight. The Flight Data Recorder (FDR) captured a maximum recorded acceleration of +2.44 G.[1]

1.1.4 The next morning, 20th of February 2023, the DAAII investigator in charge (IIC) did a preliminary investigation on the aircraft's landing gear and airframe and no visible damage was detected. A Quick Access Recorder (QAR) download was initiated however, the QAR Interface Module could not be performed onsite and required the

1 G-force refers to the forces exerted on the aircraft and its occupants due to rapid deceleration upon touchdown. This is typically measured in multiples of gravitational acceleration (g), where 1 g equals 9.81 m/s29.81m/s2. A hard landing can subject the aircraft to G-forces of 2 g or more, depending on the severity of the landing.

interface unit to be sent from the base.

1.1.5 Load assessment to evaluate Loads Exceedances on both main Landing gears (MLGs) was required, AMM 05-51-11 inspections were to be performed except for the tasks requiring Aircraft jacking (no jacks were available on-site). Airbus issued an RDAF (Repair and Design Approval Form), which was used to obtain a ferry flight permit to a repair facility.

1.1.6 The DFDR and CVR were removed and sent to BFU for download and transcription

1.1.7 Parties to the investigation included the Bundesstelle für Flugunfalluntersuchung German Federal Bureau of Aircraft Accident Investigation (BFU), Bureau d'Enquêtes et d'Analyses (BEA-France), Airbus and the operator.

1.2 Injuries to person

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-

1.3 Damage to the Aircraft

The aircraft was inspected by the Investigator in Charge and the line maintenance crew, no visible damage was detected apart from slight compression of the oleo struts. The aircraft was ferried for inspection and maintenance at a third-party Maintenance, repair and overhaul (MRO) facility. The landing gear was sent to the airline's base maintenance facility.

The left-hand main landing gear (L/H MLG) components, including Static Piston, Pitch Trimmer, upper Articulation link, Lower Articulation Link, SL1-5 pins had been detrimentally overloaded and were removed and scrapped by component mutilation.

The right-hand main landing gear (R/H MLG) Components, including the Static piston. Pitch Trimmer, SL pins 1,2,3,4 and 5, Upper and Lower Articulation links and the forward Pintle Pin were also found to have been detrimentally overloaded and were removed and scrapped.

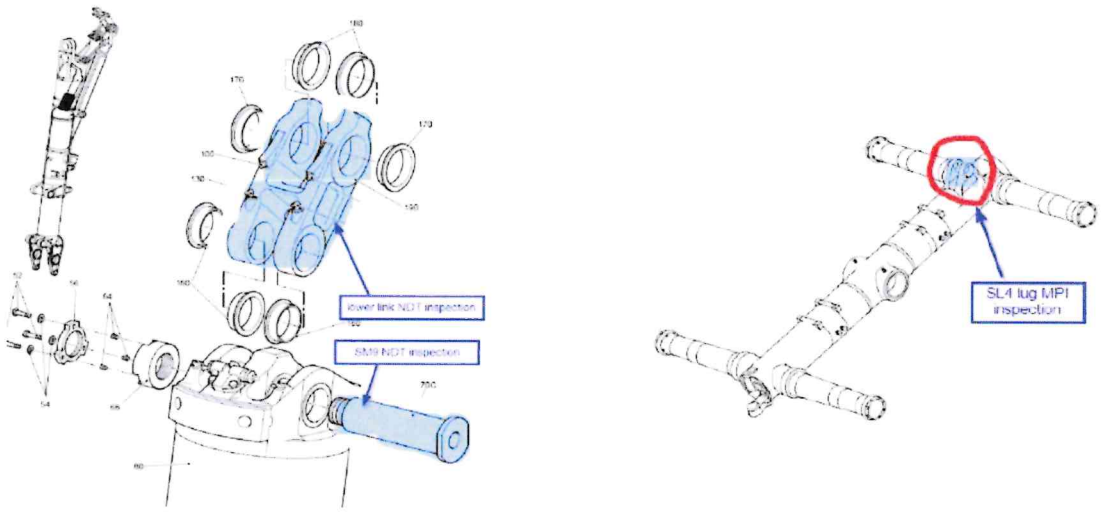


Figure 1: NDT inspection

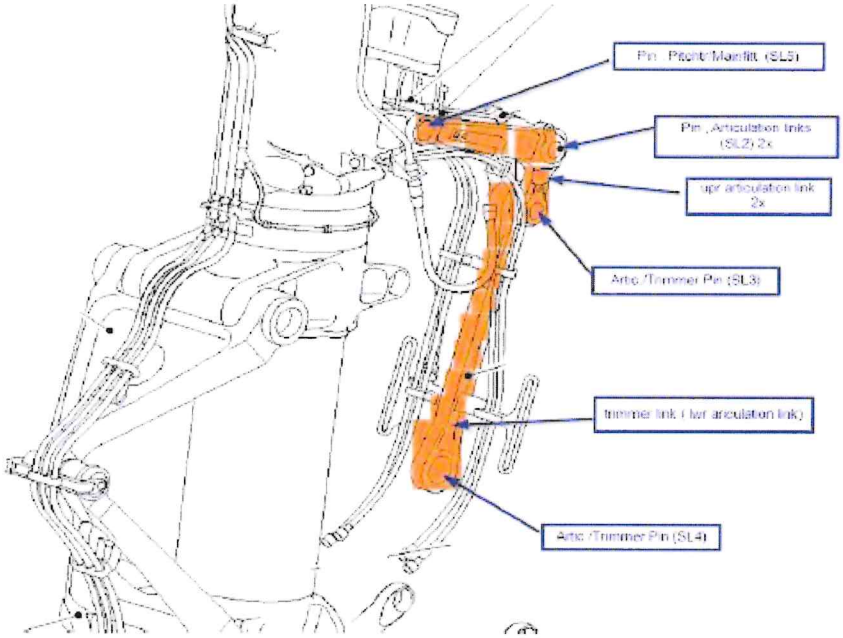


Figure 2: MLG components scrapped

MLG LH:

Description	P/N	P/N / NHA	S/N	HRS	LDG	Finding result
Beam Subassembly	201272307	201272245	SER5719/04	68947	11589	No findings
Lower Link Subay	201488304	201488204	HSM1148	68947	11589	No findings
Pin, Lower Link (SM9)	201488699		10AFA00173	42027	6422	No findings Chrome plating on outer diameter removed

MLG RH:

Description	P/N	P/N / NHA	S/N	HRS	LDG	Finding result
Beam Subassembly	201272307	201272245	SER5721/04	68947	11589	No findings
Lower Link Subay	201488304	201488204	SFG0657HSM/01	71127	12478	No findings
Pin, Lower Link (SM9)	201488699		07AFA00060	48631	7653	No findings Chrome plating on outer diameter removed

1.4 Other Damage

1.4.1 There was no other damage reported.

1.5 Personnel Information

1.5.1 Pilot-in-in command./Pilot Monitoring

Nationality		German			
Licence No	DE FCL3311003937	Gender	Male	Age	61
Licence valid		Valid	Type Endorsed	Yes	
Type Ratings		ATPL (A)			
Medical Expiry Date		05/08/2023			
Restrictions		Valid only with correction lenses.			
Previous Accidents		unknown			

Total Hours	18000
Total Past 90 Days	200
Total on Type Past 90 Days	200

Pilot Flying

Nationality		German			
Licence No	DE FCL 41301	Gender	Male	Age	32
Licence valid		Valid	Type Endorsed	Yes	
Type Ratings		PLC			
Total hours		1580			
Medical Expiry Date		07/03/2023			
Restrictions		None			
Previous Accidents		unknown			

The pilot had successfully completed his training on type. He did his skill test (FC_A330_CCQ FFS 5) on the A330-200 on 11-12-2022. The pilot completed the refresher satisfactorily on 16 February 2023 after 11 landings as PF performed under various wind conditions up to max. crosswind component with (Auto thrust) A/THR on/off,
Conf Full + Conf3.

1.6 Aircraft Information

Airframe:

Type	AIRBUS A330-203	
Manufacture	Airbus	
Year of Manufacture	2000	
Total Airframe Hours (At time of Accident)	71398.04 HRS	19.02.2023
Last MPI (Date & Hours)	71388.35	
Hours since the Last MPI	9 hrs	
C of A	09-06-2021 (Exp 08-06-2022)	
C of R (Issue Date) Present owner	(Issued 19-11-2021 / Wings Aviation Services (Pty) Ltd	
Operating Categories	Standard	

Engine:

Type	General Electric GE
Hours since New	No.1: 21213.9 No.2 67598.8

1.7 Meteorological Information

Wind direction	300°	Wind speed	8kts	Visibility	> 10 km
Temperature	27°C	Cloud cover	5000ft	Cloud base	CAVOK
Dew point	+5°C				

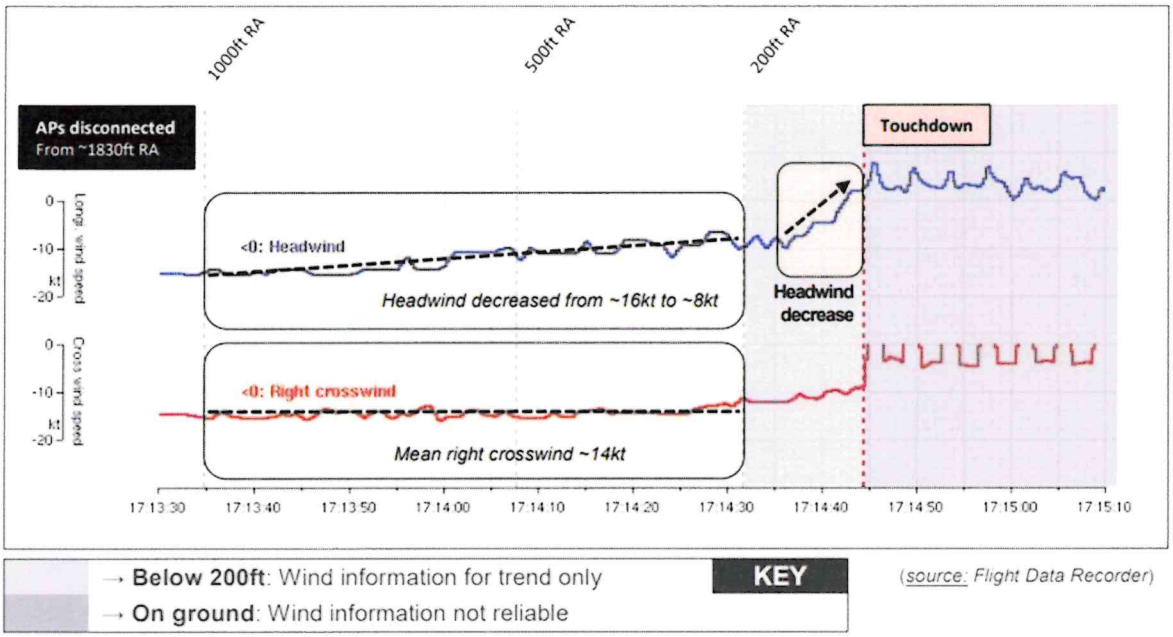


Figure 3 – Wind progression computed by the ADIRU[2]

The longitudinal and lateral wind progression highlighted:

Between 1000ft RA (17:13:35 UTC) and 200ft RA (17:14:32 UTC), the average wind
Recorded by the DFDR

The headwind component was decreasing from ~16kt to ~8kt.
The mean right crosswind component was around 14kt.

In the last 120ft, a progressive headwind decrease of ~13kt was encountered by the aircraft

1.8 Aids to Navigation

1.8.1 There were no difficulties with Ground-based navigation aids and aerodrome visual ground aids or their serviceability. There were no reported difficulties with the on-board navigation aids.

1.9 Communications.

1.9.1 The aircraft was equipped with standard communication equipment as approved by the Regulator for the type.

1.10 Aerodrome Information

The aerodrome was appropriately certified for this operation.

Aerodrome Location	Hosea Kutako InternationalAirport	
Aerodrome Co-ordinates	S 22° 29'09 & E 017° 27'46	
Aerodrome Elevation	5,640 ft / 1,719 meters [3]	
Runway Designations	08	26
Runway Dimensions	4,532m	50m
Runway Used	26	
Runway Surface	Asphalt	

[2] Air Data Inertial Reference Unit (ADIRU). It is a critical component of modern aircraft systems that combines two main functions:

i. Air Data Reference (ADR): Provides information such as airspeed, altitude, and temperature based on measurements from the aircraft's pitot-static system and other sensors.
ii. Inertial Reference (IR): Uses gyroscopes and accelerometers to calculate the aircraft's position, attitude (pitch, roll, and yaw), and heading.

[3] A high-altitude airport is generally defined as an airport situated at an elevation of 5,000 feet (1,524 meters) or more above sea level. At such altitudes, the air density is lower, which affects aircraft performance, including lift, engine power, and braking efficiency. Pilots and aircraft must account for these factors during takeoff, landing, and flight operations. (Source-FAA)

Approach Facilities	ILS (VOR-DME)
Visual aid	PAPI

1.11 Flight Recorders

1.11.1 The Aircraft was equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR) as required by the relevant aviation regulations.

1.11.2 FLIGHT DATA READOUT

In the report:

- CM1 refers to the pilot on the left seat.
- CM2 refers to the pilot on the right seat.

A) INITIAL CONDITIONS

At 1000ft RA (17:13:35 UTC), the aircraft was in the following configuration:

Aircraft configuration

- Gross weight was 164.3t < MLW (182t).
- CG was 32.9%.
- Aircraft was in CONF FULL (Slats/Flaps 23°/32°).
- Landing gear was selected down.
- Ground spoilers were armed.
- Autobrake LOW mode was armed.

AP/FD engagement status

- Both Autopilots (APs) were voluntarily disengaged at ~1830ft RA (17:12:35 UTC), and the aircraft was manually handled by CM2.
- Flight Directors (FDs) were engaged in G/S (vertical) and LOC (lateral) modes.

Speed

- Auto thrust (A/THR) was disengaged at ~1850ft RA (17:12:34 UTC).
- Recomputed VLS was 129kt.
- Speed target was managed at 139kt (VLS+10kt).
- CAS was 140kt (speed target+1kt).
- Attitude and trajectory
- Rate of descent was approximately 750ft/minute.
- The pitch angle was +2.5° (nose-up).
- Heading was 259° (QFU 256°).
- The drift angle was -6° (aircraft nose toward the right of the track).
- The aircraft was on the glide slope and the localizer.

B) FINAL APPROACH

From 1000ft RA (17:13:35 UTC) to ~120ft RA (17:14:37 UTC):

On the longitudinal axis

- Slight nose-up and nose-down orders were applied by CM2:
- Pitch angle varied between +2° and +3.5° (nose-up).
- Rate of descent varied between ~800ft/min and ~600ft/min.
- Speed target decreased from 140kt to 134kt.
- CAS varied between 141kt (speed target+5kt) and 135kt (speed target+1kt).
- Aircraft was on the glide slope until ~670ft RA, then started to go below the glide slope
- and reached around 0.4DOT.

On the lateral axis

- CM2 sidestick input varied between ~1/5 of full right and a quarter of full left deflection:
-The roll angle varied between +2.5° (right wing down) and -3° (left wing down).
- No significant rudder pedal input was recorded.
- Heading varied between 259° and 262° (QFU 256°).
- Drift angle varied between -6.5° and -4.5° (aircraft nose toward the right of the track).
- Aircraft was on the localizer

FROM 120FT RA

From ~120ft RA (17:14:37 UTC) to touchdown (17:14:44 UTC):

On the longitudinal axis

- At ~60ft RA, CM2 applied a progressive third of full nose-up deflection, which was then
- increased up to full deflection ~3s later:
- -Pitch angle increased up to +5.5° (nose-up).
- Rate of descent reached a maximum of ~850ft/min, then decreased to ~650ft/min.
- At ~5ft RA, thrust levers were retarded to the IDLE detent.
- CAS decreased from 136kt (speed target+2kt) to 126kt (VLS-3kt).

On the lateral axis

- CM2 sidestick input varied between ~1/5 of full right and a quarter of full left deflection:
- The roll angle varied between -0.5° (left wing down) and +0.5° (right wing down).
- Leftward rudder pedal input was applied up to ~1/6 of full input.
- Heading was stable around 259° (QFU 256°).
- Drift angle decreased from -5° to -4° (aircraft nose toward the right of the track).
- Aircraft was on the localizer.

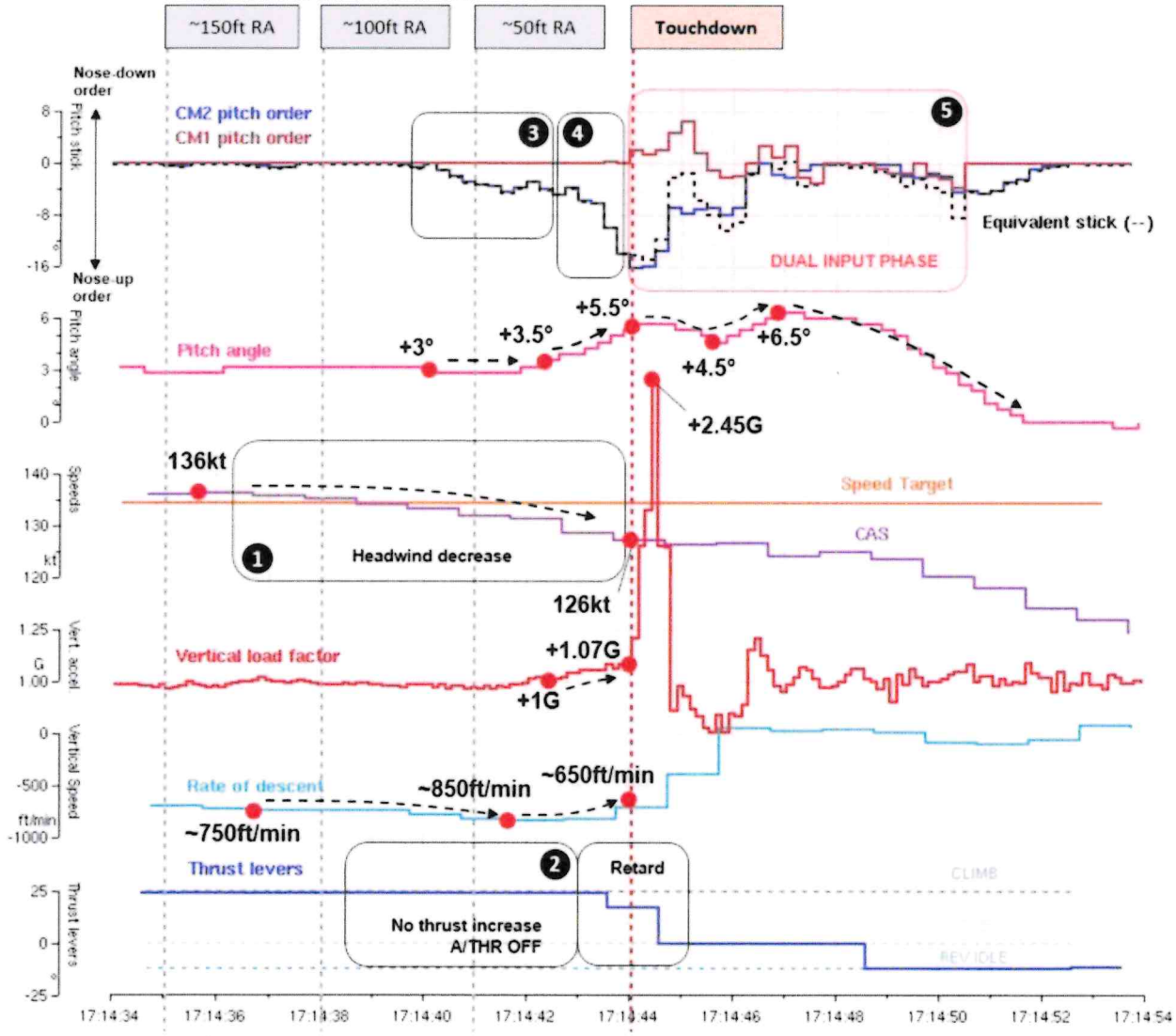


Figure 4 the last 120ft/longitudinal axis

1.11.4 The flight crew disengaged both APs via the sidestick instinctive pushbutton at -1830ft RA (17:12:35 UTC), then the final approach was manually handled by CM2 with the A/THR disconnected.

C. TOUCHDOWN

At 17:14:44 UTC: Touchdown
The aircraft touched down with:

On the longitudinal axis

- +5.5° of pitch angle (nose-up).
- -13ft/s (±2ft/s) of recalculated aircraft vertical speed.
- +2.45G of vertical load factor (ΔVRTG=+1.38G).
- CAS 126kt.
- Ground spoilers started to extend.

On the lateral axis

- Null roll angle.
- 259° of heading (QFU 256°).
- -4° of drift angle (nose toward the right of the track).
- 0.1G of lateral load factor.

D. DECELERATION
From 17:14:44 UTC:

- CM2 nose-up order was released to half of full deflection then to the neutral position. CM1 sidestick input varied between ~2/5 of full nose-down and ~1/5 of full nose-up deflection (dual input) resulting in an equivalent pitch stick order varying between ~2/3 of full nose-up deflection and neutral input:

- Pitch angle varied between +4.5° and +6.5° (nose-up) before decreasing toward 0°.
- Nose landing gear was recorded compressed ~8s after touchdown.

- Ground spoilers were fully extended.
- ~4s after touchdown, REV IDLE thrust was selected for ~26s.
- ~16s after touchdown, manual braking was applied, leading to the deactivation of the auto brake function.
- The aircraft decelerated uneventfully.

1.12 -.Wreckage Distribution and Impact Information

1.12.1 The aircraft was intact.

1.13 Medical and Pathological Information

1.13.1. No medical or pathological investigations were conducted because of this accident, nor were they required.

1.14 Fire

1.14.1. There was no fire.

1.15 Survival Aspects.

1.15.1 This was a survivable incident as the impact forces were minimal.

1.16 Tests and Research.

1.16.1. The aircraft landing gear assemblies were removed and sent to Lufthansa technic for inspection. A Mandatory periodic inspection (MPI) inspection and a Hard landing inspection were carried out.
Non-Destructive Testing (NDT) was done on the

- Bogie Beam subway
- Lower link sub-assembly on both main landing gears

- PINsm9, low,link/inner pistons

1.17 Organizational and Management Information.

1.17.1 Standard Operational Procedures

FCTM extract

discover.

A330/A340
FLIGHT CREW
TECHNIQUES MANUAL

PROCEDURES

NORMAL PROCEDURES

STANDARD OPERATING PROCEDURES - LANDING

FLARE AND TOUCHDOWN

From stabilized conditions, the flare height is about 40 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:

- High airport elevation.
  Increased altitude will result in higher ground speeds 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 (i.e. nominal 3 ° slope and rate not increasing)
- Start the flare with positive (or "prompt") backpressure on the sidestick and holding as necessary
- Avoid significant forward stick movement once Flare initiated (releasing backpressure is acceptable).

Figure 5. Standard Operating Procedures for landing.

FCTM extract

discover.

A330/A340
FLIGHT CREW
TECHNIQUES MANUAL

AIRBUS OPERATIONAL PHILOSOPHY

DESIGN PHILOSOPHY

FLY-BY-WIRE - UTILIZATION PRINCIPLES

USE OF SIDESTICK

Only one flight crew flies at a time.

If the PM wants to act on the sidestick, the PM must:

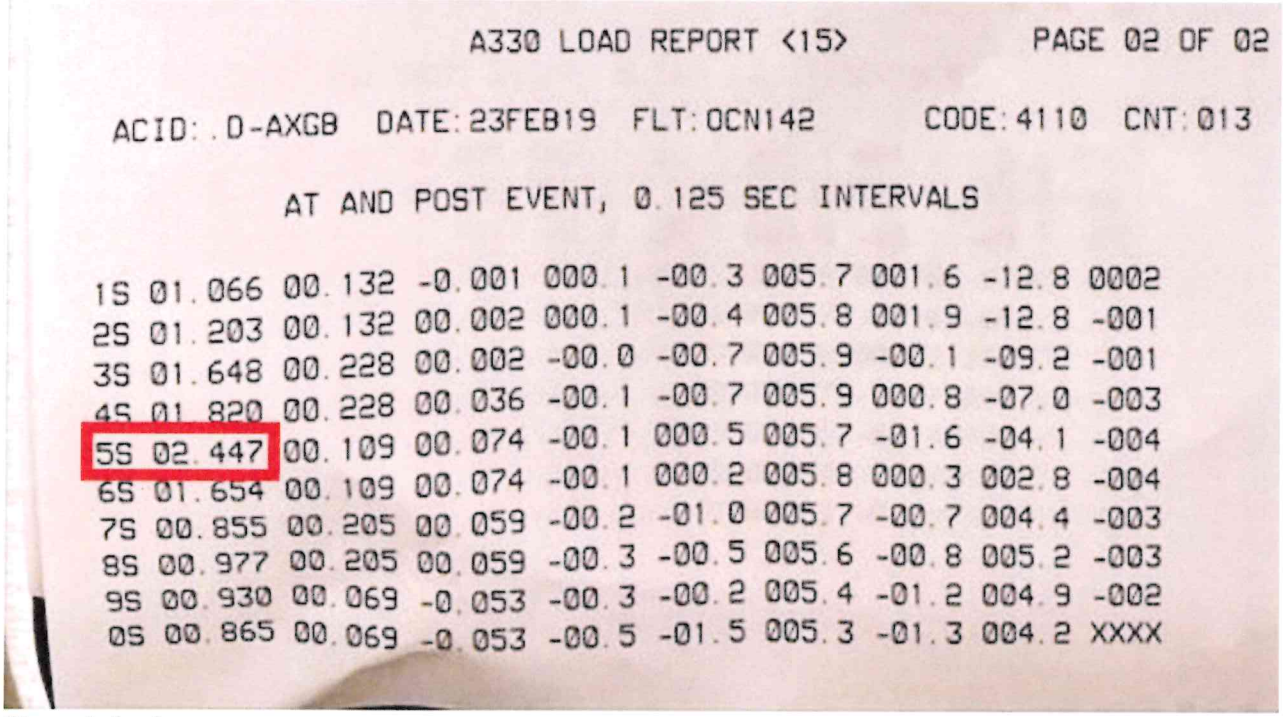
- Clearly announce "I have control"
- Press and maintain the sidestick pushbutton, in order to get full control of the Fly-By-Wire system.

The flight crew should keep in mind that sidestick inputs are algebraically added. Therefore dual inputs must be avoided, and will trigger aural and visual alerts.
Either flight crew can make an input on their sidestick at any time.
Either flight crew can deactivate the other flight crew's sidestick by pressing on their sidestick pushbutton.

Figure 6. FCTM AOP -10-30-20 use of side stick.

1.18 Additional Information

1.18 Load Report 15 was generated and the values indicated were in accordance to the FDR.



A330 LOAD REPORT <15> PAGE 02 OF 02

ACID: .D-AXGB DATE: 23FEB19 FLT: OCN142 CODE: 4110 CNT: 013

AT AND POST EVENT, 0.125 SEC INTERVALS

1S	01.066	00.132	-0.001	000.1	-00.3	005.7	001.6	-12.8	0002
2S	01.203	00.132	00.002	000.1	-00.4	005.8	001.9	-12.8	-001
3S	01.648	00.228	00.002	-00.0	-00.7	005.9	-00.1	-09.2	-001
4S	01.820	00.228	00.036	-00.1	-00.7	005.9	000.8	-07.0	-003
5S	02.447	00.109	00.074	-00.1	000.5	005.7	-01.6	-04.1	-004
6S	01.654	00.109	00.074	-00.1	000.2	005.8	000.3	002.8	-004
7S	00.855	00.205	00.059	-00.2	-01.0	005.7	-00.7	004.4	-003
8S	00.977	00.205	00.059	-00.3	-00.5	005.6	-00.8	005.2	-003
9S	00.930	00.069	-0.053	-00.3	-00.2	005.4	-01.2	004.9	-002
0S	00.865	00.069	-0.053	-00.5	-01.5	005.3	-01.3	004.2	XXXX

Figure 7. load report

1.19 Useful or Effective Investigation Techniques.

1.19.1 Not applicable.

2. ANALYSIS

2.1 Disengagement of Autopilot and Manual Handling

At an altitude of -1830 ft RA (17:12:35 UTC), the flight crew disengaged both autopilots via the sidestick pushbutton. Following this, the final approach was manually handled by CM2 with the auto-thrust (A/THR) disconnected.

2.2 Drift Angle and Crosswind Effect

The negative drift angle observed (with the aircraft nose oriented to the right of the track) is consistent with the right crosswind experienced during the final approach.

2.3 Stabilization at Key Altitudes

At 1000 ft RA (the recommended stabilization height in IMC) and 500 ft RA (the recommended stabilization height in VMC):

- The aircraft maintained the correct lateral and vertical flight path.
- The aircraft was in the appropriate landing configuration.
- The aircraft was at the target speed for approach.
- No excessive deviations in flight parameters were recorded.

2.4 Insufficient Nose-Up Order

The nose-up order provided was insufficient to reduce the descent rate:

- The pitch angle remained stable around +3°.
- The descent rate stabilized around 850 ft/min.
- The vertical load factor stabilized around +1G.

2.5 Flare Technique

As recommended in the following FCTM extract (page 16), the flight crew should:

- Initiate the flare at approximately 40 ft RA from stabilized conditions with a positive (or "prompt") backpressure on the sidestick and maintain as necessary.
- Be mindful of factors such as high airport elevation which necessitate an earlier flare.

Note: *At Windhoek Hosea Kutako International Airport, the touchdown zone elevation on runway 26 is 5508 ft.*

The insufficient back stick order applied by CM2 at ~60ft RA and this late back stick order applied at ~20ft RA did not sufficiently change the aircraft trajectory before touchdown to avoid a hard landing. See figure 4,number 2

2.6 Dual Sidestick Inputs

Immediately after touchdown, a dual sidestick input phase occurred, lasting approximately 6.5 seconds. During this time, sidestick inputs were recorded simultaneously from both CM1 and CM2 without activation of the takeover priority pushbutton. This was not in accordance with FCTM AOP-10-30-20 USE OF SIDESTICK, which stipulates that only one flight crew member should control the aircraft at a time and requires the PM to vocalize their inputs.

Note : This dual sidestick did not provide a direct influence on the hard landing event itself.

3. CONCLUSION

3.1 Findings

3.1.1 The maintenance records indicated that the aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.

3.1.2 The aircraft had a valid Certificate of Airworthiness and Certificate of Registration

3.1.3 The crew were suitable licensed and their medical certificates were valid .

3.1.4 In the last 120ft, a progressive headwind decrease of ~13kt was encountered by the aircraft.

3.1.5 The insufficient back stick order applied by CM2 at ~60ft RA and this late back stick order applied at ~20ft RA did not sufficiently change the aircraft trajectory before touchdown to avoid a hard landing.

3.1.6 Just after touchdown, a dual sidestick input was detected.

3.2 Probable Cause(s)

The **hard landing** was primarily caused by insufficient back stick input from CM2 during the critical final moments of the approach.

Specifically, the back stick order applied at approximately 60 ft RA and the late back stick order at approximately 20 ft RA were not sufficient to adequately change the aircraft's trajectory, leading to the hard landing.

3.2 Contributing Factors

1 Environmental Conditions:

The aircraft encountered a progressive decrease in headwind of approximately 13 knots in the last 120 ft of the approach, which may have influenced the aircraft's descent rate and required adjustments in control inputs.

2 First Flight by Pilot Flying (PF) in a High Altitude Airport:

This was the first flight by the Pilot Flying (PF) in a high-altitude airport. The high elevation of Windhoek Hosea Kutako International Airport (5508 ft at the touchdown zone of runway 26) necessitates earlier and more precise flare initiation, which may have been unfamiliar to the PF, contributing to the improper handling during the final approach and touchdown.

3 Training and Procedures:

The flight crew's actions did not fully align with the recommended procedures in the FCTM for initiating the flare and handling the aircraft during the landing phase, particularly given the high elevation of Hosea Kutako International Airport. This deviation from recommended procedures may have contributed to the improper handling during the final approach and touchdown.

4.0. Safety Recommendations and Safety Actions

*Safety Recommendation number **01/2024 D-AXGB***

Training and Familiarization
DAAII therefore recommends that the Operator Incorporate high altitude airport scenarios into simulator training sessions. This training should include detailed procedures for approach, flare, and landing techniques specific to high altitude conditions.

*Safety Action number **01/2024** **DAXGB***

The Operator had already integrated high-altitude airport scenarios into its simulator training program. The training now focuses on comprehensive procedures for approach, flare, and landing techniques, specifically designed to address the challenges of operating in high-altitude conditions.

Compiled by

Date: 18 FEB 2025

Hafeni Mweshixwa
Investigator-in-Charge

Released by:

P.P

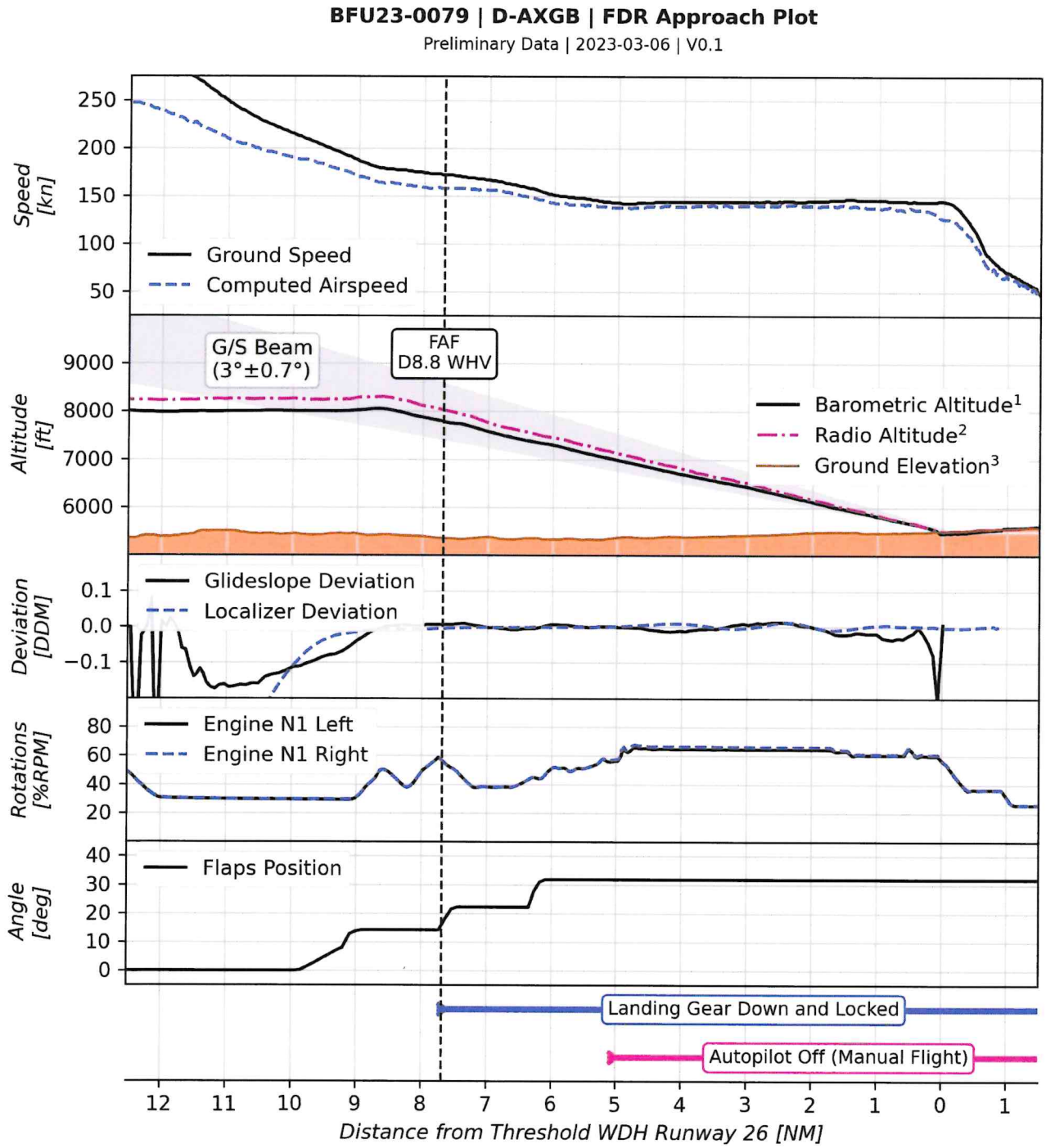
.....

Date: 18 FEB 2025

Phillipine Lundama
Acting Director: Directorate of Aircraft Accident and Incident Investigations

Appendices

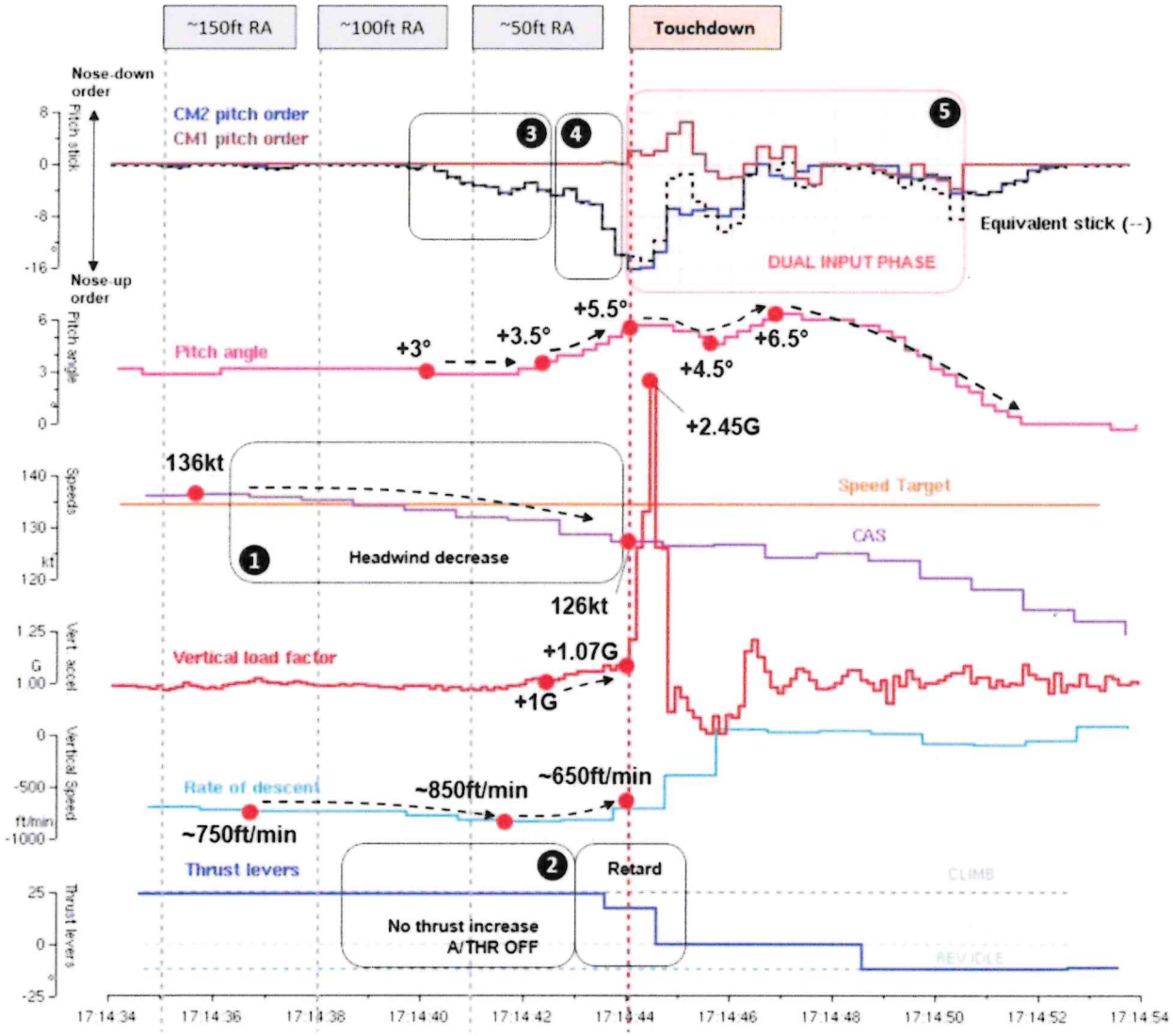
1. FDR



[1] Altitude pressure corrected acc. to WDH airport METAR (QNH = 1014 hPa)

[2] Sum of "Radio Height" from Flight Data Recorder and "Ground Elevation"

[3] Google Maps Elevation API, retrieved March 3, 2023



Source : Airbus h