FINAL REPORT

SriLankan Airlines Flight UL 303, Airbus Industries A330-343, bearing registration 4R-ALP, Go Around due to Wind Shear, during final approach to Bandaranaike International Airport, Katunayake on 05th July 2023

Released by the Civil Aviation Authority of Sri Lanka

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

ACMC	Aircraft Condition Monitoring System
AAIB	Aircraft Accident Investigation Board
ATPL	Air Transport Pilot Licence
BEA	Bureau of Enquiry and Analysis for Civil Aviation Safety
CAASL	Civil Aviation Authority of Sri Lanka
CVR	Cockpit Voice Recorder
DAR	Digital ACMC Recorder
DME	Distance Measuring Equipment
DVOR	Dopler Very High Frequency Omnidirectional Radio Range
EASA	European Union Aviation Safety Agency
FO	First Officer
Ft	feet
ILS	Instrument Landing System
Kt	Knots
METAR	Meteorological Aerodrome Reports
PAPI	Precision Approach Path Indication
PIC	Pilot -In Command
PF	Pilot Flying
PM	Pilot Monitoring
RA	Radio Altitude
RWY	Runway
SOP	Standard Operating Procedures
SPECI	Special Reports of Meteorological Conditions
TAF	Terminal Area Forecast
TOGA	Take Off Go Around Thrust
UL	SriLankan Airlines
UTC	Coordinated Universal Time

SYNOPSIS

On 05th July 2023, SriLankan Airlines flight UL 303 arriving from Changi International Airport, Singapore (WSSS), while approaching to Runway 22 at Bandaranaike International Airport, Katunayake, Sri Lanka (VCBI), carried out a go-around due to wind shear condition experienced by the flight crew. The incident was notified to the Civil Aviation Authority of Sri Lanka (CAASL) by the Flight Safety Section of SriLankan Airlines on 06th July 2023 through a Mandatory Occurrence Report (MOR), which was received by this office.

On 10th, 11th and 27th July 2023 (5 days, 6 days and 22 days after the incident respectively) CAASL received three (03) complaints (complaint no.1, complaint no. 2 and complaint no. 3 respectively) from residents who are living around Runway 22 approach path of VCBI, claiming that, their properties were damaged. Complaint no. 2 reported that they had minor injuries.

All the complaints received were on strong wind condition on 05th July 2023 between 1730 hrs and 1745 hrs (Local time), claiming which was created by the aircraft approaching to the airport at that time. (Appendix A Site observation of the AAIB)

Subsequently, on 17th July 2023 CAASL received letters from Katana and Airport Police stations with regard to the incident and requesting a clarification for onward action.

Therefore, the CAASL, appointed an Aircraft Accident Investigation Board (AAIB) on 20th July 2023, to investigate this incident as per the provisions of Section 56 of Civil Aviation Act No 14 of 2010.

The CAASL notified the incident to the Bureau of Enquiry and Analysis for Civil Aviation Safety (BEA- France) being the State of Manufacturer and the State of Design of the aircraft as per the requirement stipulated in Section 4.1 of ICAO Annex 13.

BEA- France, appointed an investigator as an accredited representative, and technical advisers from Airbus and European Union Aviation Safety Agency (EASA) to assist in the investigation. The AAIB obtained expertise to decode the DAR information and analysis of flight parameters at the time of the incident.

1 FACTUAL INFORMATION

1.1 History of the flight

SriLankan Airlines flight UL303, Airbus A330-343 bearing registration 4R-ALP was a scheduled flight from Changi International Airport, Singapore (WSSS) to Bandaranaike International Airport, Katunayake, Sri Lanka (VCBI) with 196 passengers and 14 crew (a total of 210) on board.

The flight departed WSSS at 0820 UTC on 05th July 2023 and the flight had been uneventful until the approach into VCBI. The aircraft was on a standard arrival for ILS approach for Runway (RWY)

22. At this time the Pilot in Command (PIC) was Pilot Flying (PF) and the First Officer was Pilot Monitoring (PM). As per the flight crew, they were advised regarding the prevailing light shower condition over the airfield and no prior warning had been received about any wind shear condition prior to approach.

Flight UL303 intercepted ILS RWY 22 at 2000 ft and fully configured the aircraft for landing. At around 1100ft at a distance of approximately 3.5NM/6.6 km from RWY 22 Threshold, the flight crew experienced wind shear condition and subsequently, they observed the audio warning. Then PIC had initiated go-around approximately at time 1205 UTC (1735 Local) while informing ATC and requested right turn to avoid the weather patch which was indicated on weather radar.

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As instructed by ATC, flight crew had climbed to 4000 ft and carried out a second approach to RWY 22 for an uneventful landing at 1223 UTC (1753 Local).

Figure 1: Aircraft initiation of Go Around at 1100ft

Figure 2: Aircraft on the climb passing 1200ft

1.2 Injuries to persons

None

1.3 Damage to aircraft

Nil

1.4 Other damages

Nil

1.5 Personnel information

1.5.1 Pilot In Command

Licence : Valid ATPL issued by the DGCA Sri Lanka (CAASL-72-A-10326 valid till 31st May 2024)

Age & Gender: 33 years, Male

Flying experience:

Total flying time	6265:09
Total flying time as PIC	1565:31
Total P1 A330	450:55
Total P1 A320	1114:36

Hours flown in last 24 hrs, 7 days, 90 days and last 30 days;

Hours in Last 24hrs	00:00 hrs	04 July 23
Hours in Last 07 days	10:24 hrs	28 June 23 - 04 July 23
Hours in Last 30 days	68:44 hrs	05 June 23 - 04 July 23
Hours in Last 90 days	214:17 hrs	05 April 23- 04 July 23

Duty time and rest time in the last 48 hrs:

03 July 23 - SIM duty from 0600hrs to 1130hrs - Rest for 1628hrs.
04 July 23 - Standby from 0400hrs to 1600hrs - Rest for 1429hrs.
05 July 23 - Reporting to operate UL302 at 0630hrs.

Recent Training and flight checks:

Training/ Check	Completion date	Expiry date
A320 SIM	21 May 2023	31 May 2024
A330 SIM	20 Nov 2022	30 Nov 2023
A320 Line check	18 April 2023	30 April 2025
A330 Line check	06 Dec 2022	30 April 2024

1.5.2 First Officer

Licence : Valid ATPL (CAASL-72-A-10082) issued by the DGCA Sri Lanka, valid till 30th April 2024

Age & Gender: 39 years: Male

Flying experience:

Total Flying Time	1190:36 hrs
Flying Time A330	135:31 hrs
Flying Time A320	1055:05 hrs

Hours flown in last 24 hrs, 7 days, 90 days and last 30 days;

Hours in Last 24hrs	00:00 hrs	04 July 23
Hours in Last 07 days	24:37 hrs	28 June 23 - 04 July 23
Hours in Last 30 days	91:29 hrs	05 June 23 – 04 July 23
Hours in Last 90 days	157:04 hrs	05 April 23 – 04 July 23

Duty time and rest time in the last 48 hrs:

03 July 23 - Off Day
04 July 23 - DGR Training from 0830hrs to 1630hrs - Rest for 13:58hrs.
05 July 23 - Reporting to operate UL302 at 0630hrs.

Recent Training and flight checks:

Training/ Check	**Completion date**	**Expiry date**
A330 SIM	07 May 2023	30 Nov 2023
A330 Line check	28 May 2023	31 May 2024

1.6 Aircraft information

a) Type and Model: A330/300
b) Manufacturer's Serial No.: 1669
c) Certificate of Registration: No 284, Registered in Sri Lanka Civil Aircraft Register
d) Certificate of Airworthiness: No.239 and valid till 8th Nov 2023
e) Total Airframe Hours: 36573.67 FH/6432 FC (as at 5th July 2023)
f) No. of Engines & Type: 2 numbers & RR TRENT772B

Engine	Serial Number	Total Cycles	Total Hours
#01 TRENT772B60-16	42503	7104	33549.90
#02 TRENT772B60-16	42505	6367	26844.67

g) Weight and Balance: Aircraft load information
Maximum certificated take-off mass: 242000kg
Actual take-off mass: 180338kg
Mass at the time of the incident: 163000kg (approximately)
C of G certificated limits, at take-off and at the time of the incident (Approximately): T/O CG - 23.6, LDG CG - 24.3 (within limits)

1.7 Meteorological information

a) The METAR issued by VCBI Met office

METEAR VCBI **051010Z** 24010KT **210V270** 9999 FEW014 SCT016 29/25 Q1007 NOSIG =
METEAR VCBI **051040Z** 24010KT 9999 FEW014 SCT016 28/25 Q1007 NOSIG =
METEAR VCBI **051110Z** 24008KT **210V280** 9999 FEW014 SCT016 28/25 Q1007 NOSIG =
METEAR VCBI **051140Z** 23006KT 9999 FEW012 BKN016 OVC090 27/25 Q1006 NOSIG=

b) The SPECI issued by VCBI Met office

SPECI VCBI 051158Z 24009KT **210V290 5000 SHRA** FEW014 BKN016 27/25 Q1007 NOSIG=
SPECI VCBI 051210Z **25010G20KT 210V290** 8000 -SHRA FEW014 BKN016 26/24 Q1007 NOSIG=
SPECI VCBI 051240Z 26006KT **210V310 9000** FEW014 BKN016 25/23 Q1008 NOSIG=
SPECI VCBI 051253Z **25011G22KT 230V290** 9000 -SHRA FEW014 BKN016 25/24 Q1008 NOSIG=

c) The TAF issued by VCBI Met office

TAF VCBI 051100Z 0512/0618 **25012G22KT** 9999 SCT016 TX30/0607Z TN26/0600Z PROB030 TEMPO 0512/0514 **25015G30KT 7000 -SHRA** FEW012 BKN016 OVC080
BECMG 0515/0517 23008KT

PROB030 TEMPO 0522/0604 **25015G30KT** 7000 -SHRA FEW012 BKN016 OVC080=

1.8 Aids to navigation

Runway 22 at VCBI equipped with a Category One ILS, DVOR/DME and PAPI system and also runway and approach, lighting system.

1.9 Communications

The flight crew had standard communication with Colombo Director on VHF 132.40 MHz until establish final approach and then transferred to Colombo Tower on VHF 118.70 MHz.

1.10 Aerodrome information

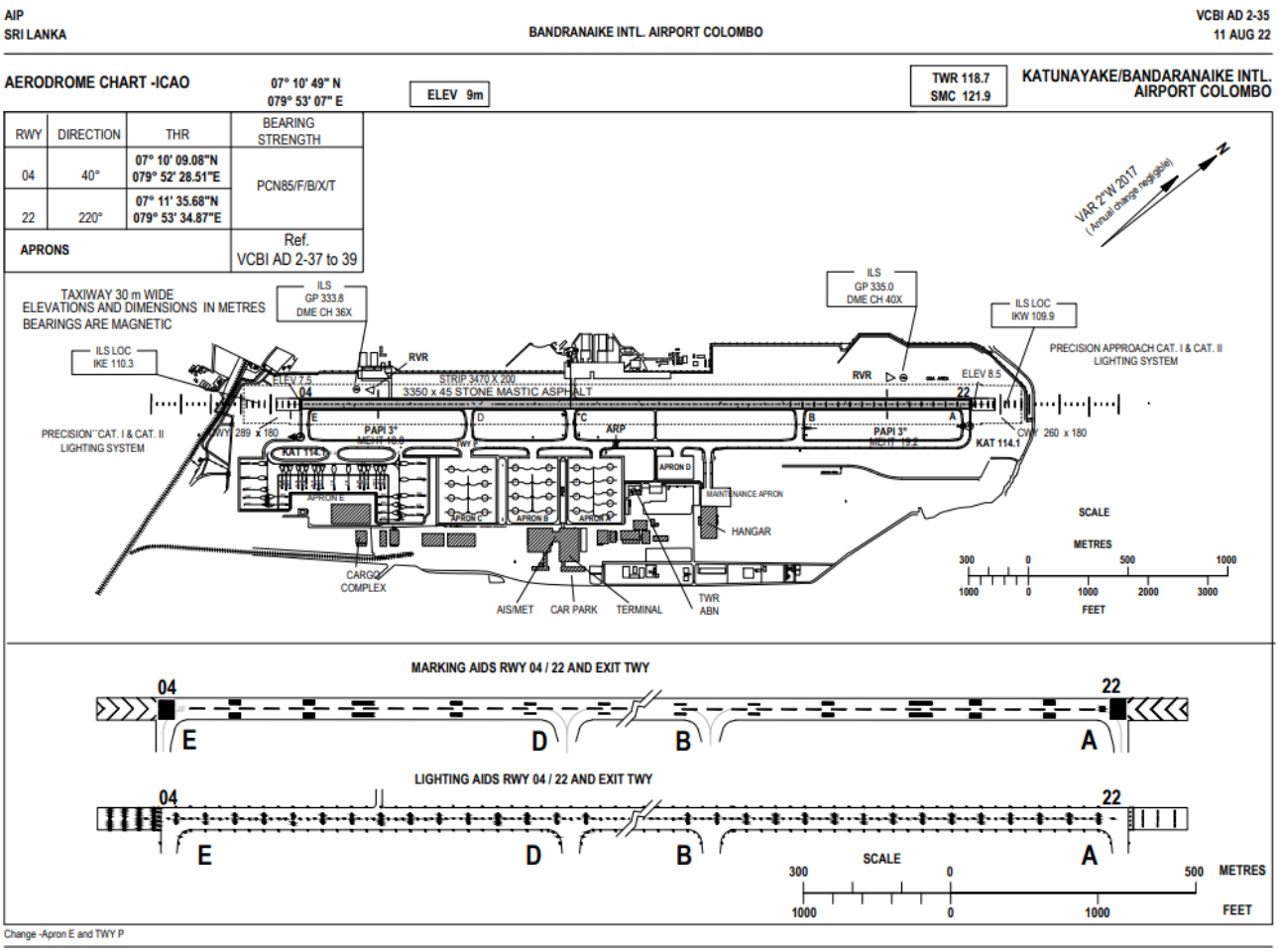

Figure 3: Bandaranaike International Airport Chart (Source: AIP Sri Lanka)

- Name of the aerodrome: Bandaranaike International Airport
- Location indicator: VCBI
- Reference points: $07^0$10’ 49” N : 079^0 53’ 07”E
- Elevation: 9m

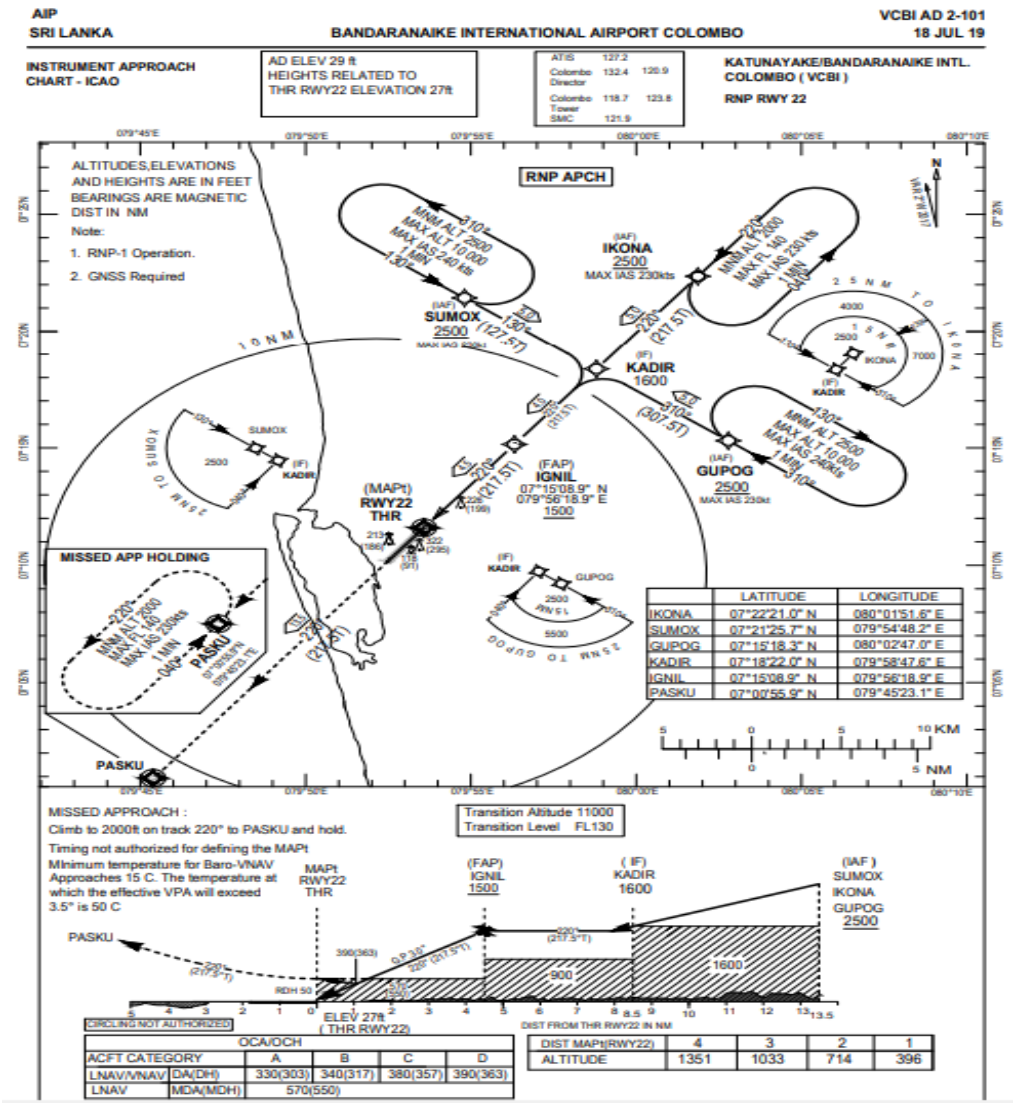

Figure 4: Approach Chart RWY 22 VCBI (Source AIP Sri Lanka)

1.11 Flight recorders

CVR data was not available due to 2 hour recording time limitation (only two hours of recordings are retained). The DAR data was available and shared with BEA France to obtain the decoded data readouts and analysis for the investigation.

1.12 Wreckage and impact information

Nil

1.13 Organizational and management information

Operator: Sri Lankan Airlines is responsible for safe flight operations in compliance with regulations.

1.14 Additional information

1.14.1 Meteorological advisories and reports

Bulletin No.2 issued by Meteorological Department of Sri Lanka (Advisory for strong winds) effective from 01.30 pm on 5th July to 01.30 pm 06th July 2023 and the weather report of the vicinity of VCBI is attached as Appendix B.

1.14.2 Data from DMC

Situation report issued by the Disaster Management Centre (DMC) indicating property damage caused due to high winds in Gampaha district on the 5th July 2023 was considered for investigation, and attached as Appendix C.

1.14.3 Aircraft Go Around data

Aircraft go around is a published procedure for the approach phase of each airport. At VCBI there had been 28 aircraft go around events with no damages to properties on ground during the period of 1st January to 31st July 2023.

1.15 Useful or effective investigation techniques

Investigations conducted as per the procedures and techniques laid down in Manual of Aircraft Accident and Incident Investigation.

2 ANALYSIS

2.1 Aircraft Operation

SriLankan Airlines UL303 A330 aircraft fully configured and fully established on ILS approach for RWY 22 initiated a Go- Around at 1163 ft (RA) on encountering wind shear condition. As per the Standard Operating Procedure (SOP) of FCOM A330 for Go-Around, the flight crew must consider Go-Around if stabilised approach is impossible. In the case of wind shear it is a mandatory requirement for the flight crew to initiate a Go-Around.

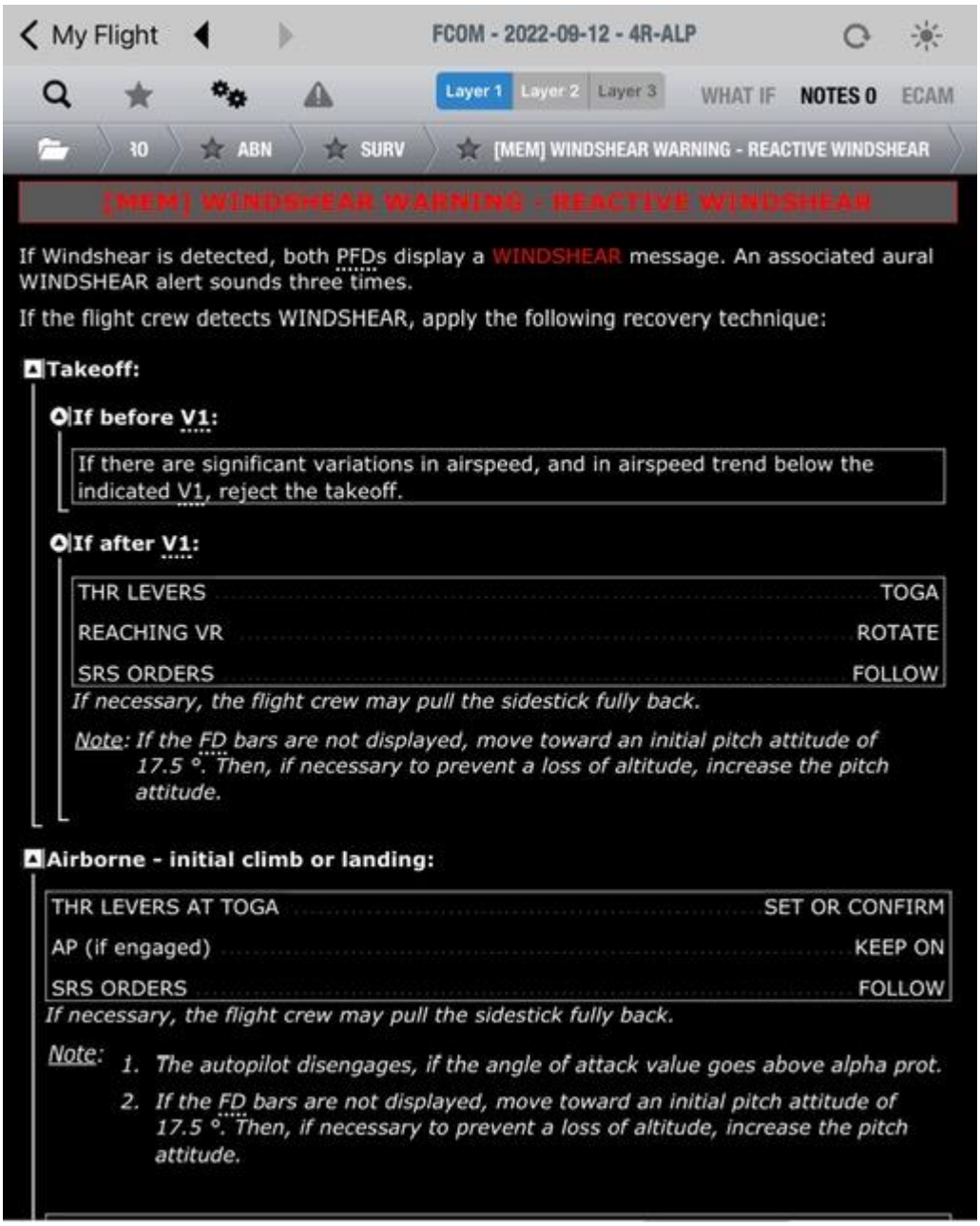

Figure 5: SOP – FCOM A330 for Wind Shear

2.2 Engine exhaust wake

According to the flight crew and DAR data indicated that during go-around the flight crew had applied engine power to TOGA. The maximum danger range of the exhaust wake of TRENT772B engine is 470ft either side of the aircraft longitudinal axis (with a height and width of 30ft approximately) as shown by the figure 6 & 7 below. When the aircraft initiated the go around it was at 1163ft (RA) on the final approach path and the minimum (Computed) distance between the aircraft and ground in the longitudinal axis of the aircraft was approximately 2km (approximately 6500ft) ref Appendix D.

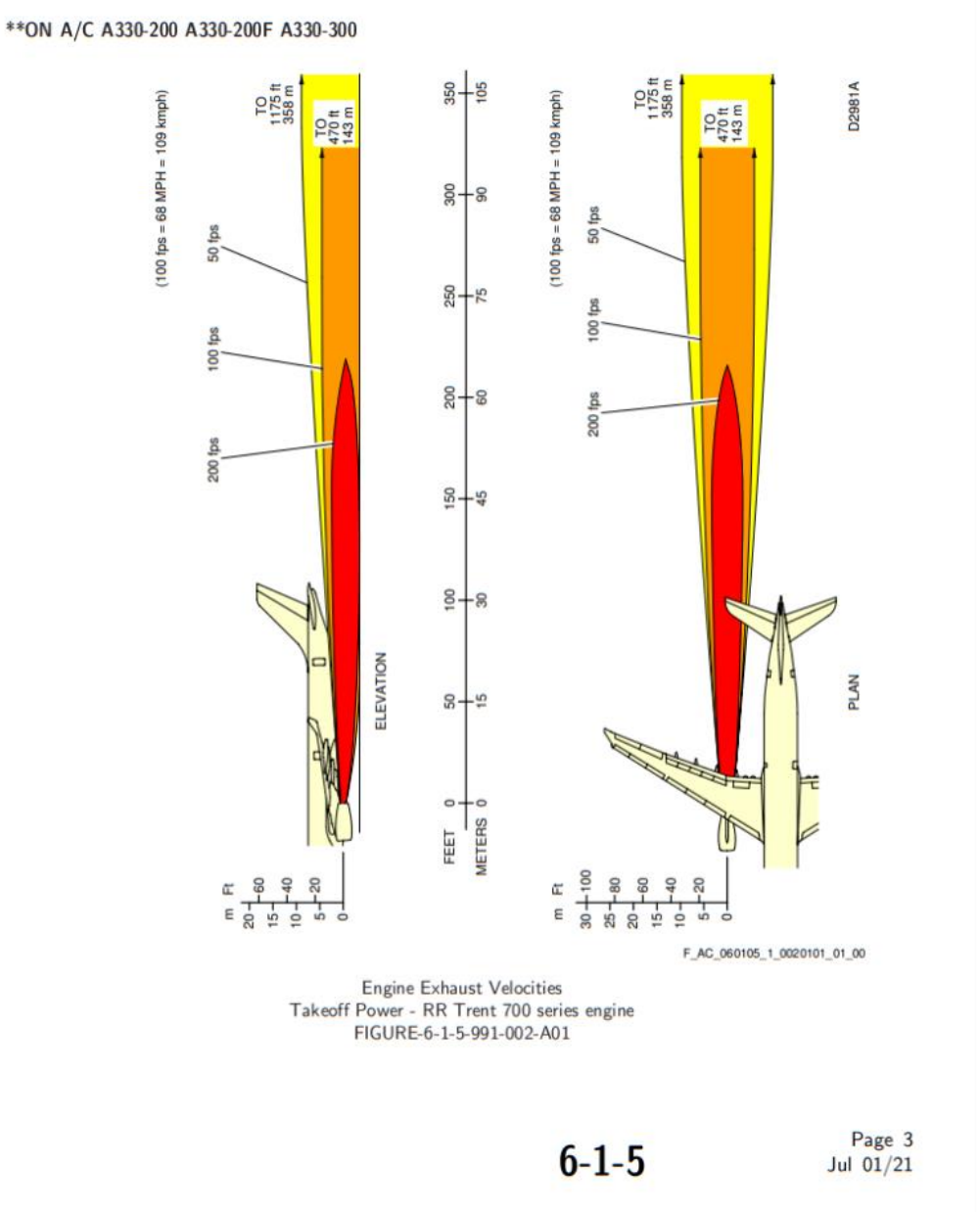

Figure 6: RR Trent 700 exhaust wake velocities (Source: AIRBUS A330-700L Aircraft characteristics airport and maintenance planning.

SriLankan

A330
FLIGHT CREW
OPERATING MANUAL

PROCEDURES

NORMAL PROCEDURES

STANDARD OPERATING PROCEDURES - ENGINE START

GROUND RUN UP-DANGER AREAS

Ident.: PRO-NOR-SOP-08-00011069.0004001 / 03 APR 13
Applicable to: ALL

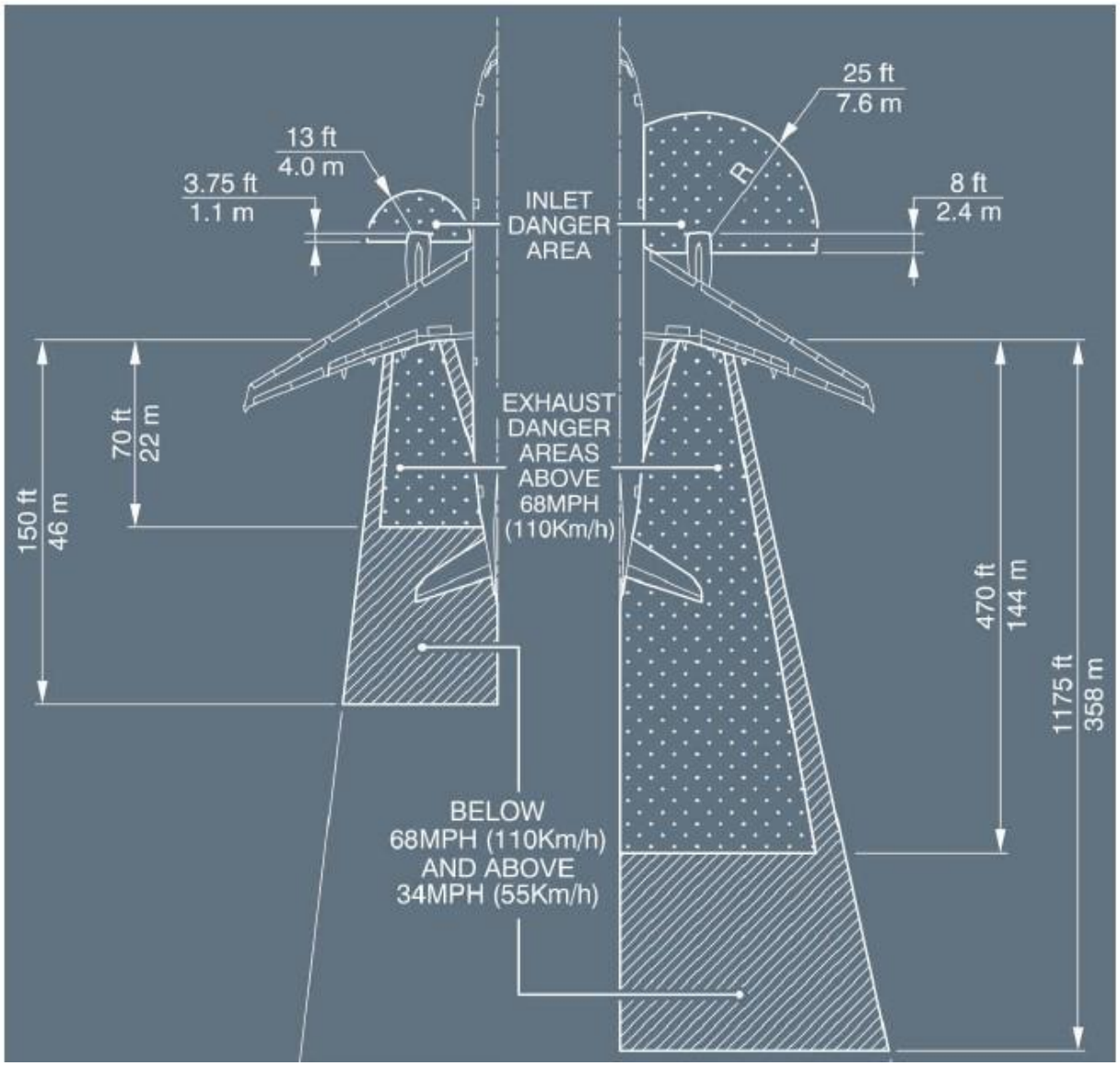

Figure 7: A 330 engine exhaust danger area

2.3 Wind Shear

Wind shear is a sudden change of wind velocity and/or direction which is a hazard for aircraft operations specially during the approach to land. According to the flight crew they have experienced a wind shear condition on approach and computed DAR data has confirmed it. (Note: The computation is only valid before thrust leavers are set to TOGA, till time 12:04:55 UTC)

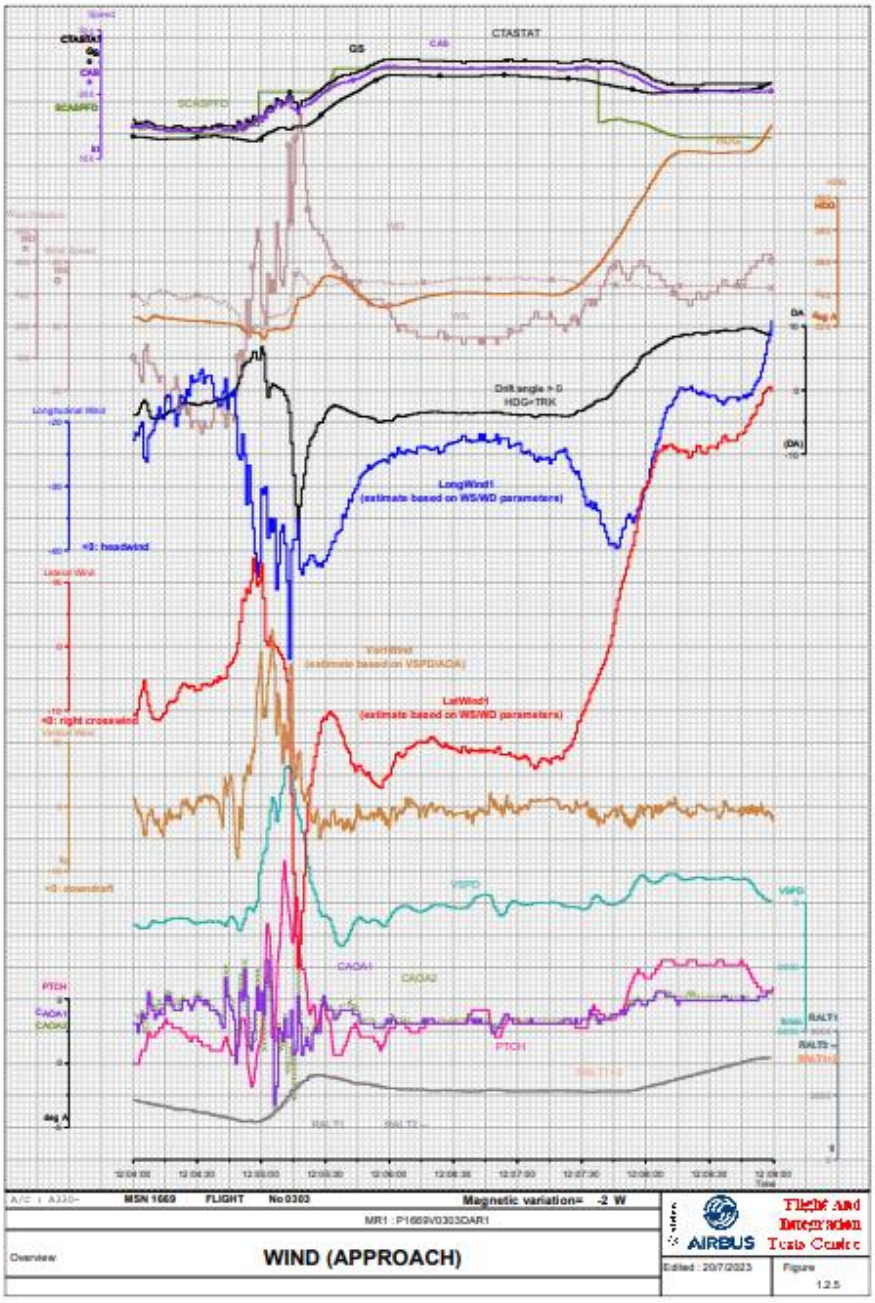

Figure 8: Wind variation along runway approach path (Source: Based on computed DAR parameters)

Based on BEA Report of the event (Refer to Appendix D), computed wind components varied as follows between 12:04:00 UTC and 12:04:55 UTC,

- Tailwind varied between -33 kt and -11 kt.

- Lateral wind varied between -12 kt (right crosswind) and +10 kt (left crosswind).
- Vertical wind varied between -8 kt (downdraft) and +5 kt (updraft).
- Wind speed varied between +13 kt and +34 kt.

Note that only wind speed and direction are recorded in the DAR, other wind components (Lateral, longitudinal and vertical) are results of computation.

According to the Meteorological Bulletin issued for the period of 01.30 pm on 05th July to 01.30 pm on 06th July 2023 by the Department of Meteorology, predicted moderate level of strong wind condition on Western province which generated with the south west monsoons.

The Weather Report (Refer Appendix –C) forwarded by the Meteorological Department for the vicinity of VCBI on 5th July 2023 between 1130 to 1230 UTC indicates presence of strong cross equatorial wind flow over the latitudes of Sri Lanka.

According to the DAR analysis report and all available weather information sources are consistent and highlighted gusty wind conditions during final approach between1204 UTC and 1206 UTC on 05th July 2023.

Situation report issued by the Disaster Management Centre on 05th July 2023 indicated that 660 people (179 families) were affected by high winds conditions in Gampaha district. Further, 01 totally and 176 partially property damages were reported in Gampaha district due to high wind condition which was the highest property damage reported district in Sri Lanka.

2.4 History of aircraft go-arounds at VCBI

During the period from 1st January to 31st July 2023, there had been 28 recorded instances of aircraft go around at VCBI. Among those go-around there had been records with much heavier and higher engine powered aircraft such as Boeing 777. In the history of aircraft operations due to go around manoeuvres there had been no reported ground damages along the approach paths of VCBI.

2.5 Go around of UL303

The figure below indicates the final approach path of the aircraft, go around initiation point and three locations of property damage complaints.

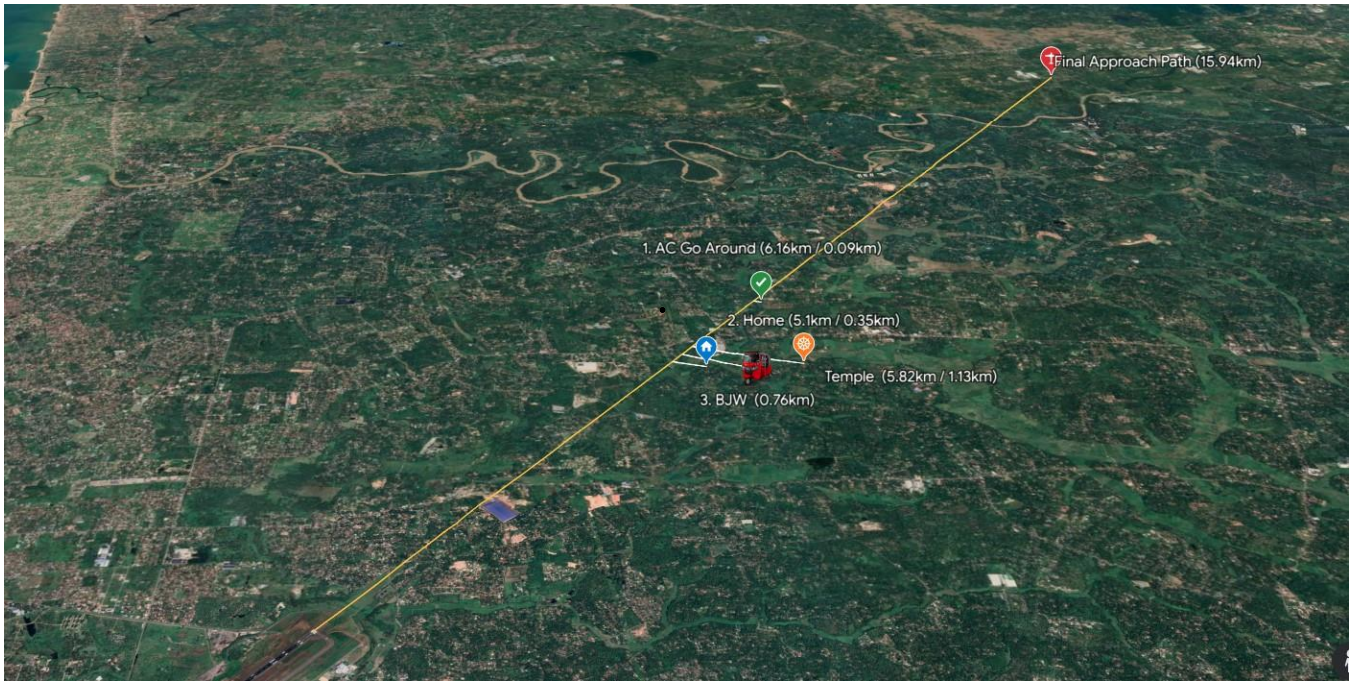

Figure 9: Distances from Runway 22 to damaged properties and go-around initiation point on the standard approach path

1. Go around initiation point approximately 6.16 km from the RWY 22 Threshold

2. Reported damaged house (complain no 1) 5.1km from RWY 22 Threshold and 350 meters approximately left of the approach path.

3. Reported three-wheeler location was identified in between the above house and temple at an approximate distance of 700 meters left of the approach path. (Location was identified based on the direction provided by the Victim of complaint no 2)

4. Reported damaged temple (complain no.3) is approximately 1.13 km left of the approach path.

According to Airbus documentation on engine exhaust velocities, the distances of above locations of reported damages (above 2,3 and 4) are out of the area where the exhaust velocity is still notable.

The diagram below was obtained from BEA analysis report (Ref appendix D) indicates flight path, altitudes (from mean sea level), heights (Radio Heights), times (UTC) and positions. **Point 6** indicates the initial point of go-around at the recorded height of 1163 ft, which is the lowest height reached by the aircraft until the commencement of the second approach. At this point, the aircraft had used TOGA power to initiate the go around (Wind shear escape manoeuvre). This location is approximately at a distance of 1099 meters (approx. 1.1km) prior to the damaged house (complaint number 1).

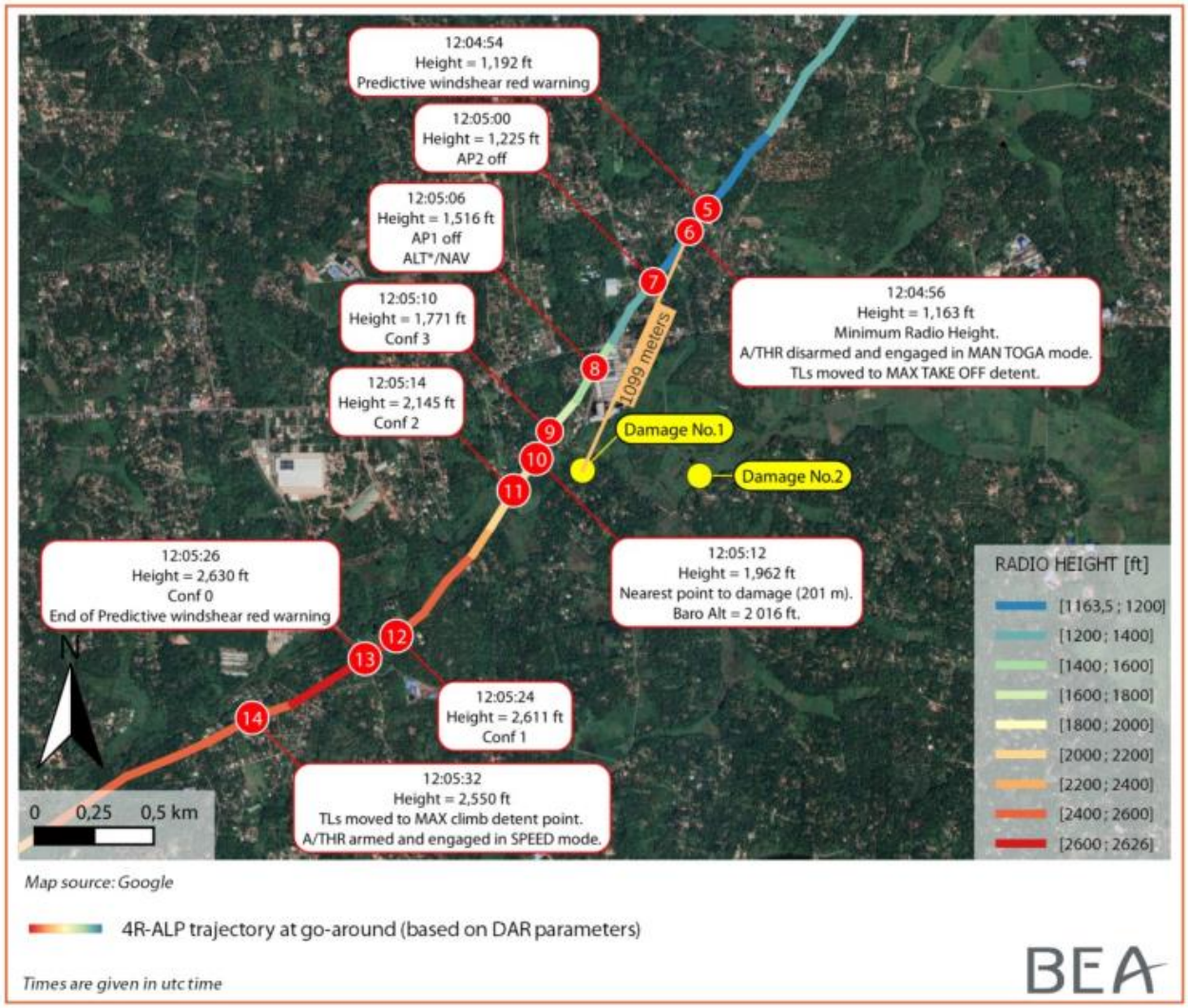

Figure 10: Trajectory of the aircraft during the event (DAR parameters)

Note: Damage No 1& Damage No 2 refer to Complain No.1 & Complain No.2 respectively.

3 CONCLUSIONS

3.1 Findings

a. Flight crew had valid licence.
b. Flight crew carried out the go around manoeuvre as per the company SOP.
c. Aircraft had valid certificate of Airworthiness and Certificate of Registration.
d. A low-level wind shear conditions prevailed during the approach of SriLankan flight UL303.
e. Weather warnings of strong gusty winds issued by Colombo and VCBI meteorological offices for western province.
f. Most of property damages due to strong and gusty winds were reported in the Gampaha district on 5th July 2023.
g. There are no evidences of the go around aircraft caused any property damage.

3.2 Causes

The go around of the aircraft was due to low level wind shear. The wind shear manoeuvre executed by the flight crew was in compliance to the SOP.

The wind shear escape manoeuvre performed by the flight crew does not indicate as a cause for the reported property damage.

4 SAFETY RECOMMENDATIONS

a. The airport operator is recommended to install a Low-Level Wind Shear detection system at VCBI.

APPENDIX: A - SITE OBSERVATIONS OF AAIB

GPS coordinates of the damaged house: N 07^0 13’ 42.2” ; E 079^0 55’ 21.6”

APPENDIX: B - METEOROLOGICAL ADVISORY FOR STRONG WINDS AND WEATHER REPORT – VICINITY OF BIA

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வளிமண்டலவியல் திணைக்களம்
Department of Meteorology

TP : 011 2686686
Fax : 011 2691443
E-mail : metnmc@gmail.com
Web : www.meteo.gov.lk

Bulletin No: **02** WW/L/23/07/05/01
COLOR: Amber

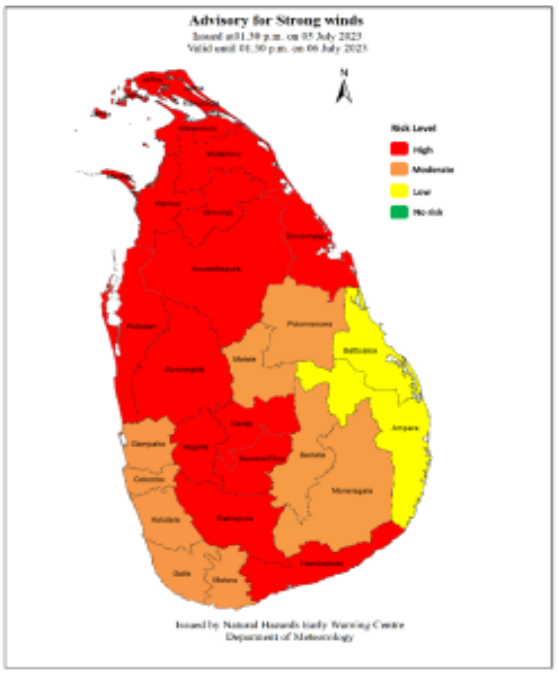
Advisory for Strong winds

Issued by the Natural Hazards Early Warning Centre
Issued at 01.30 p.m. 05 July 2023, valid until 01.30 p.m. 06 July 2023

For Land Areas

PLEASE BE AWARE!

Strong winds about **(50-60) kmph** can be expected at times over at times in western slopes of the central hills, Northern, North-western and North-Central provinces, and in Hambantota and Trincomalee districts due to the active south-west monsoon condition.



Color: -Red
Waning (Take action)

Color: -Amber
Advisory (Be prepared)

Color: -Green
Threat is over

දුරකථන/தொலைபேசிகள்/Telephones:
අධ්‍යක්ෂ ජනරාල් பணிப்பாளர் நாயகம் Director General 2694104
ප්‍රධාන කාර්යාලය பொது அலுவலகம் General Office 2694846 2694847 2681647 2675946
ෆැක්ස් தொலைநகல் Fax 2698311 2691443

කාලගුණ විද්‍යා දෙපාර්තමේන්තුව
வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY

මගේ අංකය எனது இல. My No. NMC/ WR/ /23/36
ඔබේ අංකය உமது இல. Your No.
වෙබ් අඩවිය இணையதளம் Website www.meteo.gov.lk
විද්‍යුත් තැපෑල மின்னஞ்சல் E-mail info@meteo.gov.lk

බුද්ධාලෝක මාවත, කොළඹ 07, ශ්‍රී ලංකාව./ புத்தாலோக மாவத்தை, கொழும்பு 07, இலங்கை. / Bauddhaloka Mawatha, Colombo 07, Sri Lanka.

2023.08.08

Director General,
Civil Aviation Authority of Sri Lanka.

WEATHER REPORT

Location/Area : Vicinity of BIA

Period/Time : 05th July 2023 between 1130-1230 UTC.

This has reference to your letter dated on 07th August 2023 requesting a weather report for the above location/area and the period/time.

According to the data available in the Department of Meteorology, an active southwest monsoon conditions were prevailed over the island during that day.

One of main components of the active monsoon system is the strong cross equatorial wind flow over the lower troposphere, which is known as the monsoon low-level jet (MLLJ). It was appeared over Sri Lanka latitudes during 4th and 5th July 2023.

The figure 01 shows vertical cross section of the wind speed and direction over BIA during 04th and 5th July 2023. It shows a strong wind current at 800hPa level (around 2000m from surface) with maximum wind speed of about (80-90) kmph.

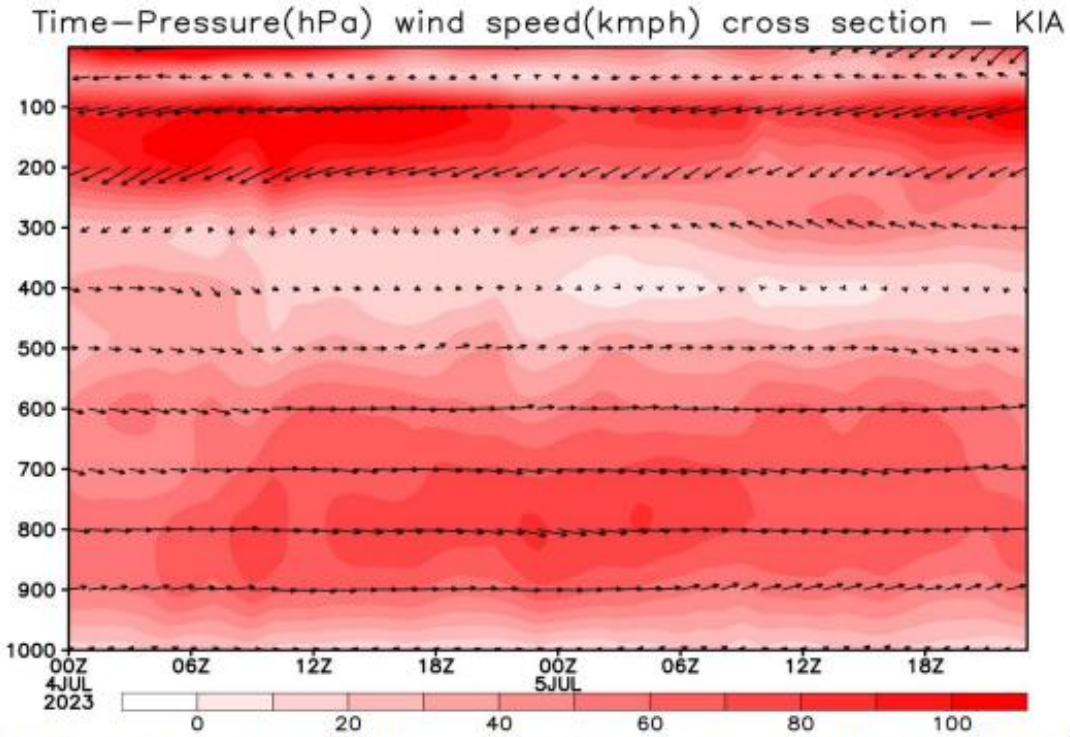


Figure 01: Vertical cross section of wind speed (shaded) and direction (arrows) over BIA during 04th and 05th July 2023; Data: ERA5 hourly reanalysis data from European Centre for Medium-Range Weather Forecasts (ECMWF)

It is also observed by the pilot balloon observations of the Department of Meteorology on 04th and 05th July 2023. Figure 02 & 03 illustrate the pilot balloon observations at 0600UTC and 1200UTC on 05th July 2023.

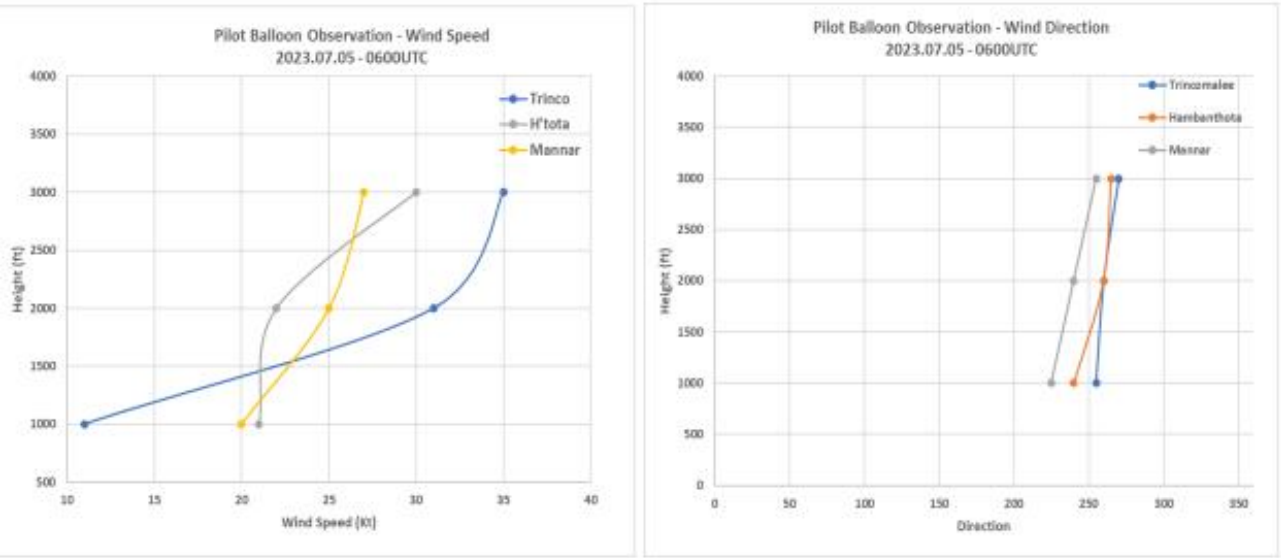


Figure 02: Pilot balloon observation on 05th July 2023 at 0600UTC; Data: Department of Meteorology

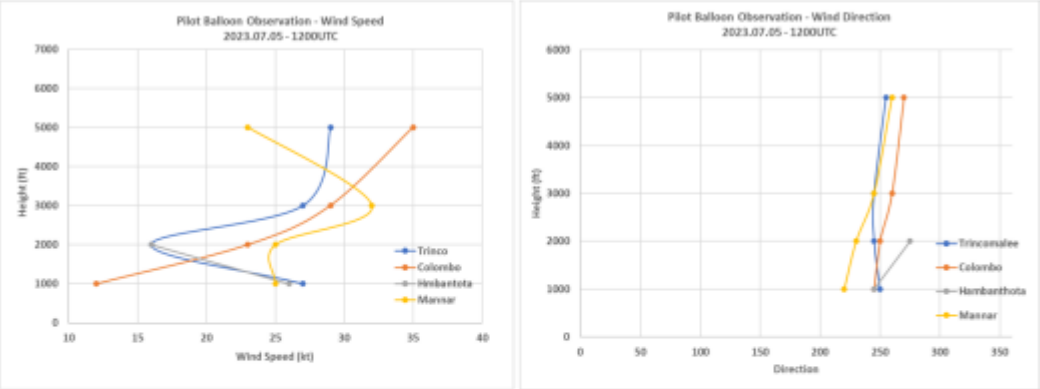


Figure 03: Pilot balloon observation on 05th July 2023 at 1200UTC; Data: Department of Meteorology

Due to prevalence of low-level clouds during the pilot balloon observation period, data is available only up to 3000 feet at 0600UTC and up to 5000ft at 1200UTC. Pilot balloon observation was not available at Colombo Meteorological Office at 0600UTC. According to the balloon observation on 05th July, there were strong winds about (30-35) knots over Sri Lanka from 3000ft to 5000ft above the surface.

Following graphs illustrate observed 10 minutes average wind speed at runway surface ends (Figure 04) and recorded maximum wind gusts at BIA (Figure 05) on 05th July 2023. This observation data is evidenced that, there were strong gusty winds across the BIA area from 05.00hrs to 06.00hrs and from 12.00hrs to 16.00hrs on 05 July 2023.

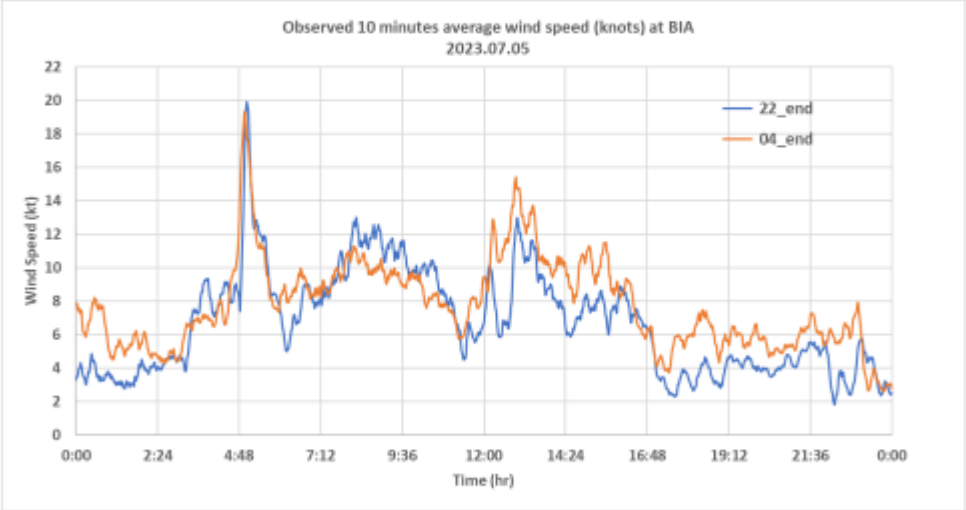


Figure 04: Observed 10 minutes average surface wind speed at BIA on 05th July 2023. Data from BIA

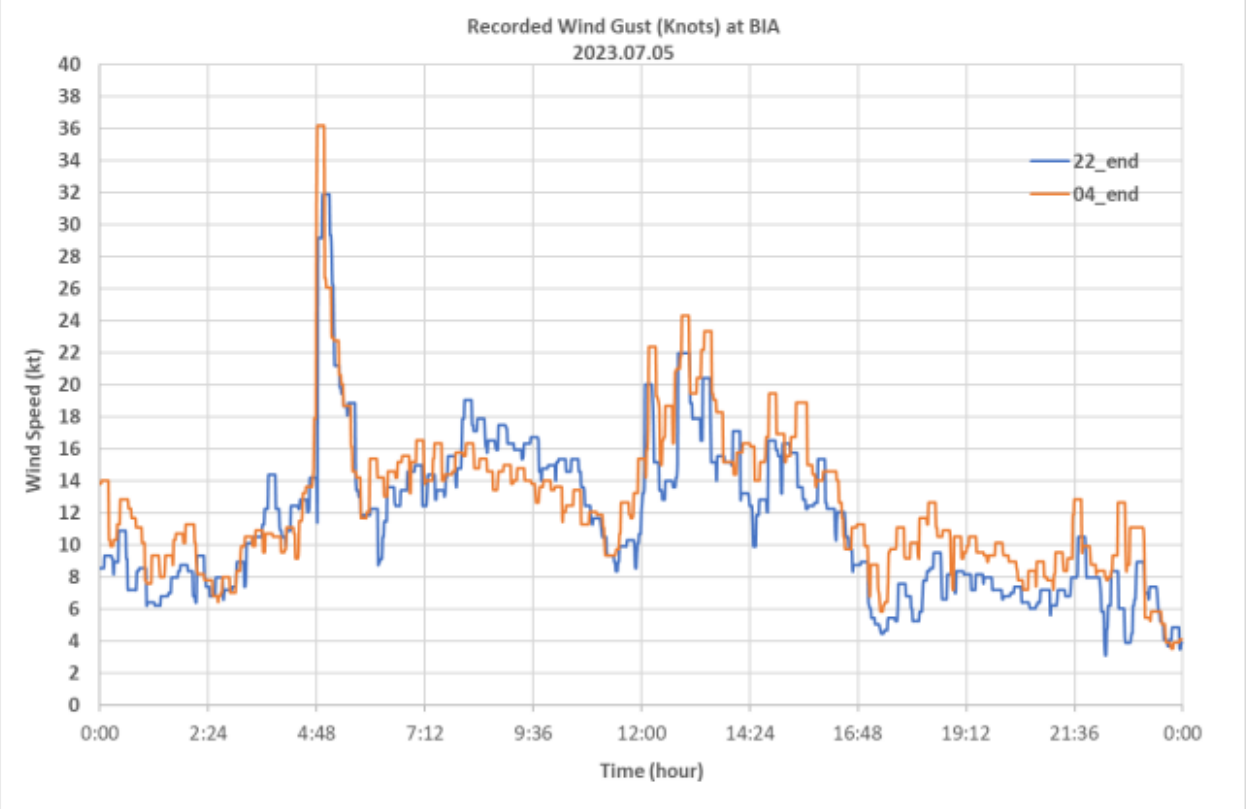


Figure 05: Recorded maximum wind gust at BIA on 05th July 2023. Data from BIA

M. M. P. Mendis
Deputy Director (National Meteorological Centre)
For Director General of Meteorology

APPENDIX: C - SITUATIONAL REPORT FROM DISASTER MANAGEMENT CENTRE

දෛනික තත්ත්ව වාර්තාව-ශ්‍රී ලංකාව/**நிலைமை அறிக்கை-இலங்கை**/Situation Report- Sri Lanka දිනය/**திகதி** /Date :05th July 2023 at 1800hrs

ආපදා කළමනාකරණ මධ්‍යස්ථානය
இடர் முகாமைத்துவ நிலையம்
DISASTER MANAGEMENT CENTRE

04

පළාත **மாகாணம்** Province	#	පරිපාලන ප්‍රදේශය නිර්වාහක් පිරිවු Administrative purview		ආපදාව **அனர்த்தம்** Disaster	ආරම්භක දිනය **அனர்த்தம் ஆரம்பித்த திகதி** Date of commenced	බලපෑමට ලක්වූ **பாதிக்கப்பட்ட** Affected		මිය යෑම් **மரணங்கள்** Deaths	තුවාලවූ පුද්ගලයින් **காயமடைந்தோர்** Injured People	අතුරුදහන් වූ පුද්ගලයින් **காணாமல் போனோர்** Missing People	නිවාස හානි **சேதமடைந்த வீடுகள்** Houses Damaged		වෙනත් හානි විෂය පාතිප්‍රයන් Other Damages		ආරක්ෂිත ස්ථාන **பாதுகாப்பான அமைவிடம்** Safe Location			වෙනත් කරුණු **வேறு குறிப்புக்கள்** Remarks
		දිස්ත්‍රික්කය **மாவட்டம்** District	ප්‍රා.ලේ. කොට්ඨාශය **பிரதேச செ.பி** DS Division			පවුල් සංඛ්‍යාව **குடும்பங்கள்** Families	පුද්ගලයින් **நபர்கள்** People				සම්පූර්ණයෙන් **முழுமை** Fully	අර්ධ හානි **பகுதியளவு** Partially	සුළු, මධ්‍යම හා විශාල පරිමාණ ව්‍යාපාරික ස්ථාන හිමියන්ගේ **நடுத்தர** නිවාසවල්වල් **சேதங்கள்** Small, Medium, Enterprises Damages	ඉහා වැදගත් යටිතල පහසුකම් වලට වූ හානි **அடிப்படைக் கட்டமைப்புக்கள்** Damages to critical Infrastructure	ආරක්ෂිත ස්ථාන සංඛ්‍යාව **எண்ணிக்கை** No. of Safety Locations	පවුල් සංඛ්‍යාව **குடும்பங்கள்** Families	පුද්ගලයින් **நபர்கள்** Persons	
දකුණු පලාත දෙන් මාකාණම් Southern	8	ගාල්ල කාලී Galle	Habaraduwa	High Wind	2023.07.05	12	38					12						
			Baddegama	High Wind	2023.07.05	5	18					5						
			Rathama	High Wind	2023.07.05	5	15					5						
			Akmeemana	High Wind	2023.07.05	3	12					3	1					
			Hikkaduwa	High Wind	2023.07.05	2	5					2						
	දිස්ත්‍රික් එකතුව මාවට්ට කූට්ටුත්තොකෙ District Total					27	88	0	0	0	0	27	1	0	0	0	0	
	පළාත් එකතුව මාකාණ කූට්ටුත්තොකෙ Province Total					27	88	0	0	0	0	27	1	0	0	0	0	
Western මේල් මාකාණම බස්නාහිර පලාත	9	කළුතර කලුත්තුරෙ Kalutara	Horana	High Wind	2023.07.02/04/05	10	36					10						
			Bandaragama	High Wind	2023.07.05	1	2					2						
			Walallawita	High Wind	2023.07.02	3	6					6	1					
			Mathugama	High Wind	2023.07.03	3	11					11						
			Dodangoda	High Wind	2023.07.05	1	4					4						
			Agalawaththa	High Wind	2023.07.05	4	12					12						
			Ingiriya	High Wind	2023.07.05	4	19					19						
	දිස්ත්‍රික් එකතුව මාවට්ට කූට්ටුත්තොකෙ District Total					26	90	0	0	0	0	64	1	0	0	0	0	
	10	ගම්පහ කම්පලුරා Gampaha	Wattala	High Wind	2023.07.05	109	405				1	108						
			Meerigama	High Wind	2023.07.04	3	8					3						
			Dompe	High Wind	2023.07.04	8	33					8	1					
			Aththanagalla	High Wind	2023.07.04	6	24					5						
			Biyagama	High Wind	2023.06.30	1	4					1						
			Minuwangoda	High Wind	2023.07.05	11	39					10		1				
			Gampaha	High Wind	2023.07.05	4	15					4						
			Mahara	High Wind	2023.07.05	37	132					37						
	දිස්ත්‍රික් එකතුව මාවට්ට කූට්ටුත්තොකෙ District Total					179	660	0	0	0	1	176	1	1	0	0	0	
	පළාත් එකතුව මාකාණ කූට්ටුත්තොකෙ Province Total					205	750	0	0	0	1	240	2	1	0	0	0	
මුළු එකතුව **மொத்தக் கூட்டுத்தொகை** GRAND TOTAL						589	2224	0	5	0	2	599	10	4	2	28	121	

ආපදා කළමනාකරණ මධ්‍යස්ථානය /அனர்த்த முகாமைத்துவ நிலையம்/ Disaster Management Centre
හදිසි ඇමතුම් / தொலைபேசி / Hot Lines: 117, 0112670002, 0112136136
ෆැක්ස්/ தொலை நகல் / Fax: 0112670079
විද්‍යුත් තැපෑල් / மின்னஞ்சல் / Email: eocdmc@gmail.com
වෙබ් අඩවිය / இணையம் / Web: www.dmc.gov.lk

K.G.Mahendra Jagath

APPENDIX: D –DAR DATA ANALYSIS REPORT FROM BEA –FRANCE

Technical document

DAR data analysis

Restricted release to the safety investigation members

Document ID:	**BEA2023-0312_tec01**
Registration number:	**4R-ALP**
Aircraft type:	AIRBUS - A330 - 300
Date of occurrence:	5th July 2023
Place of occurrence:	Bandaranaike International Airport (Sri Lanka)

Summary of the event:

The flight UL303 (A330 registered 4R-ALP, MSN 1669) operated by Sri Lankan Airlines Ltd departed from Singapore on July 5th, 2023. During the approach at Bandaranaike International Airport (Colombo, Sri Lanka), the crew performed a go-around due to a predictive windshear warning. The second approach and landing were uneventful.

Following this event, Sri Lankan authorities received complaints regarding damages which had been made to inhabitants and their properties.

1. Damage to a house and coconut cultivation.
   GPS coordinates: N 07°13' 42.2"; E 079°55' 21.6" (see Figure 2).
2. Injuries to two civilians while traveling via a tuk-tuk.
   GPS coordinates: N 07°13' 41.48"; E 079°55' 37.63" (see Figure 2).

Work performed:

The DAR data (WGL files) was sent by the Civil Aviation Authority of Sri Lanka (CAA) to BEA on July 28th, 2023. As the BEA does not currently have the capability to decompress such files, Airbus provided the BEA with the decompressed data file (.dat) for the flight of the event.

The DAR data file (*4R-ALP_20230705123015.dat*) was synchronised with BEA data analysis software. The synchronization level was good and around 4 hours of flight data were recorded at a rate of 512 wps in upk format and using Teledyne words synchronisation.
The raw data was decoded using the dataframe referenced *p512darr_rux* provided by Airbus on August 1st, 2023. The operator dataframe, with P/N D1033RR04C00000, was received on August 7th, 2023, but was not used as the frame is standard (file ending by C00000).

The recorded flight is dated July 5th. According to the time recorded in the DAR, the take-off occurred at 8h47 UTC from Changi Airport (Singapore, WSSS) and the landing occurred at 12h23 UTC at Bandaranaike International Airport (Sri Lanka, VCBI).
The recorded parameters are consistent with the event: go-around at VCBI due to a predictive windshear warning.

Weather:

The METAR in Bandaranaike International Airport around the time of the event was:
METAR VCBI 051110Z 24008KT 210V280 9999 FEW014 SCT016 28/25 Q1007 NOSIG=
METAR VCBI 051310Z 25012G22KT 220V280 9000 FEW014 BKN016 25/23 Q1008 NOSIG=

DAR sequence of events:

The DAR sequence of events starts during the approach at 12h04 UTC, includes the event, and ends at 12:05:31 after the event. The aircraft landed uneventfully after the go-around.

Time (UTC)	Baro Altitude (ft) *Radio height (ft)*	Computed distance to damage n°1[1] (m)	CAS (kt) *GS (kt)*	DAR parameters and comments
START OF THE DAR SEQUENCE OF EVENT Captain is PF and F/O is PM. Both APs and FDs are engaged in **G/S** and **LOC** modes. A/THR is engaged and active in SPEED mode. Throttle levers are set on MAX CLIMB DETENT. Altimeter setting set to QNH, 1007 hPa Heading selection is set to magnetic. Heading is **225**°, CAS is 150 kt, GS is 134 kt, baro altitude is 1 772 ft and radio height is 1 844 ft. S/F conf is CONF **FULL**.				
First approach to VCBI - RWY 22				
12:04:54	1 164 ↓ *1 193* ↓	-1 217	154 *127*	**Predictive windshear red warning** triggered until 12:05:26. GPWS WARN MODE 1-4 (GPWS14) parameter triggered for 2 seconds. *Note: Airbus confirmed that due to a connection between the GPWS and WXR transceivers outputs, the trigger of a PRED W/S warning will trigger the parameter GPWS14, even though there is no GPWS warning.*
12:04:56	1 152 ↑ ***1 163*** ↑	-1 099	152 *127*	**Minimum radio height** was reached. Throttle levers were set on TAKE OFF DETENT. A/THR was disarmed and engaged in **MAN TOGA** mode. EPR actual Eng.1 & 2 increased from 1.01 to 1.6. SRS and GA TRACK modes engaged. ALT mode was armed with selected altitude 2 000 ft. Pitch started to increase.
12:04:57	1 172 ↑ *1 164* ↑		164 *127*	NAV mode engaged.
12:05:00	1 208 ↑ *1 225* ↑	-847	157 ↑ *133* ↑	OPEN CLIMB mode engaged. AP2 disengaged. Selected speed was 200 kt.
12:05:03	1 296 ↑ *1 307* ↑		172 ↑ *140* ↑	Pitch reached 10.9°.
12:05:04	1 368 ↑ *1 374* ↑		172 ↑ *141* ↑	ALT* mode engaged.
12:05:06	1 508 ↑ *1 516* ↑	-434	185 ↑ *145* ↑	AP1 was disengaged by the crew. VFE was exceeded for less than 1 second. *Note: according to the FCOM OVERSPEED procedure, VFE is 180 kt in CONF FULL.*
12:05:10	1 788 ↑ *1 771* ↑	-214	186 ↑ *148* ↑	Conf 3
12:05:11	1 888 ↑ *1 866* ↑	-201		Pitch reached **15.8°** (maximum value during the go-around sequence). Heading started to increase towards 250°.

[1] Distance to damage is negative when the aircraft is north of the damage point, and positive when it is south of the damage point.

12:05:12	2 016↑ *1 962 ↑*	-201	190 ↑ *145 ↑*	VFE was exceeded for less than 1 second. *Note: according to the FCOM OVERSPEED procedure, VFE is 186 kt in CONF 3.*
12:05:14	2 128 ↑ *2 145 ↑*	301	196 ↑ *146 ↑*	Conf 2
12:05:24	2 420 ↑ *2 592 ↑*	1 045	189 ↑ *157 ↑*	Conf 1
12:05:26	2 432 ↓ *2 630 ↓*	1 208	195 ↑ *162 ↑*	Conf 0
12:05:31	2 400 ↓ *2 550 ↓*	1 563	209 ↑ *180 ↑*	Throttle levers were set on MAX CLIMB DETENT. A/THR was engaged and active in SPEED mode. Selected speed was increased to 240 kt.
END OF THE DAR SEQUENCE OF EVENT				
12:25:53	END OF THE RECORDING			

Additional information

- Based on Airbus analysis of the event, **computed wind components** varied as follows between 12:04:00 UTC and 12:04:55 UTC:
  - Tailwind varied between -33 kt and -11 kt.
  - Lateral wind varied between -12 kt (right crosswind) and +10 kt (left crosswind).
  - Vertical wind varied between -8 kt (downdraft) and +5 kt (updraft).
  - Wind speed varied between +13 kt and +34 kt.

  Note that Airbus wind speed computation is **only relevant before thrust levers are set to TOGA**, as the aerodynamics of the aircraft during the go-around impacts these values. These results are consistent with BEA computation of tailwind, lateral wind and vertical wind based on several parameters recorded in the DAR.

- It can be noted that the presence of a windshear area might contribute to the mild VFE exceedances identified in the DAR sequence of events.

- According to the trajectory of the aircraft and the GPS coordinates of the damages of complaint No.1 (see Figure 2):
  - The lowest point on the trajectory (minimum radio height) is located at **1099 meters** (3 606 ft) from the damages n°1 (measured horizontally).
  - The nearest point of the trajectory to damages n°1 is located at a radio height of **1 962 ft** (2 016 ft QNH).

- **In the aircraft longitudinal axis, the distance between the aircraft and the ground** (see Figure 1) has been computed using the radio height and pitch during the go-around. This distance gives an **approximate** value for the **distance that the engine exhaust should reach to meet the ground**.
  The minimum value is ~2086 meters and is obtained at 12:05:11 UTC when the aircraft is at 200 m north of the point of damage (thus in the direction opposite to the damaged house location). According to Airbus documentation on engine exhaust velocities (attached to this report), the computed distances are out of the area where the exhaust velocity is still notable. For the engine exhaust to reach the ground at high speed, the aircraft would need to be quite low and with a high pitch.

Figure 1: Engine exhaust distance to ground

Trajectory of the event

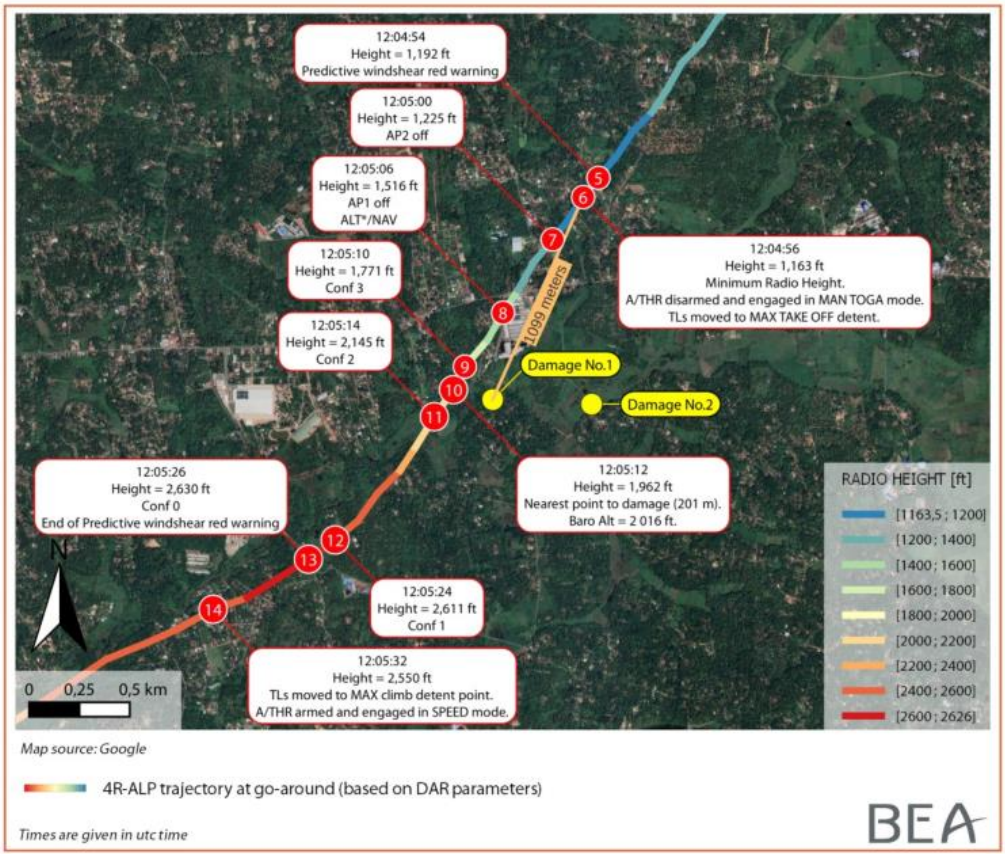


Figure 2: Trajectory of the aircraft during the event (DAR parameters)

Deliverables:

- The present document, describing the technical work conducted by BEA investigators on DAR data.
- The following files supporting the DAR data analysis (.jpg files)
  - Plots (.jpg)
    - Flight identification
    - Event overview
    - Auto flight
    - Altitudes
  - Listings (.csv) corresponding to the parameters plotted on the graphs listed hereabove.
    Note that although the second and third plots are centered around the event, all four listings cover the entire recording (from 08:23:38 UTC to 12:25:53 UTC).
  - Trajectory of the event with the GPS coordinates of Complaint No.1 and Complaint No.2 damages (.png).
- Additional analysis documents provided by Airbus (exhaust velocity versus distance at take-off/go-around power, wind computations)

…….END……