ANSV AGENZIA NAZIONALE PER LA SICUREZZA DEL VOLO

FINAL REPORT

SERIOUS INCIDENT
Airbus A320-214 registration marks CN-NML,
Catania Fontanarossa International Airport (Italy),
20th of September 2025

OBJECTIVE OF THE SAFETY INVESTIGATION

The Agenzia nazionale per la sicurezza del volo (ANSV), instituted with legislative decree No 66 of 25 February 1999, is the Italian Civil Aviation Safety Investigation Authority (art. 4 of EU Regulation No 996/2010 of the European Parliament and of the Council of 20 October 2010). **It conducts, in an independent manner, safety investigations.**

Every accident or serious incident involving a civil aviation aircraft shall be subject of a safety investigation, by the combined limits foreseen by EU Regulation No 996/2010, paragraphs 1, 4 and 5 of art. 5.

The safety investigation is a process conducted by a safety investigation authority for the purpose of accident and incident prevention, which includes the gathering and anlysis of information, the drawing of conclusions, including the determination of cause(s) and/or contributing factors and, when appropriate, the making of safety recommendations.

The only objective of a safety investigation is the prevention of future accidents and incidents, without apportioning blame or liability (art. 1, paragraph 1, EU Regulation No 996/2010). Consequently, it is conducted in a separate and independent manner from investigations (such as those of Judicial Authority) finalized to apportion blame or liability.

Safety investigations are conducted in conformity with Annex 13 of the Convention on International Civil Aviation, also known as Chicago Convention (signed on 7 December 1944, approved and made executive with legislative decree No 616 of 6 March 1948, ratified with law No 561 of 17 April 1956) and with EU Regulation No 996/2010.

Every safety investigation is concluded by a report written in a form appropriate to the type and seriousness of the accident or serious incident. The report shall contain, where appropriate, safety recommendations, which consist in a proposal made with the intention of preventing accident and incidents.

A safety recommendation shall in no case create a presumption of blame or liability for an accident, serious incident or incident (art. 17, paragraph 3, EU Regulation No 996/2010).

The report shall protect the anonymity of any individual involved in the accident or serious incident (art. 16, paragraph 2, EU Regulation No 996/2010).

This report has been translated and published by the ANSV for the English-speaking concerned public. The intent was not to produce a factual translation and as accurate as the translation may be, **the original text in Italian is the work of reference**.

GLOSSARY

(A): Aeroplane.
AC: Advisory Circular, it is a non-regulatory publication issued by the Federal Aviation Administration to provide guidance, best practices, and acceptable methods for complying with Title 14 of the Code of Federal Regulations.
ACCEL ALT: Acceleration Altitude
AD: Airworthiness Directive.
AMM: Amman;
ANSV: Agenzia nazionale per la sicurezza del volo (Italian Civil Aviation Safety Authority).
AOT: Airbus Alert Operator Transmission.
AP: Auto Pilot. AP1 is referred to the activation from the left seat, Cpt side,, while AP2 is referred to the activation from the right seat, the co-pilot side.
ASR: Air Safety Report.
ATIS: Automatic Terminal Information System.
ATPL: Airline Transport Pilot Licence.
ATS: Air Traffic Services.
BEA: Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile.
BEA Morocco: Bureau d'Enquête Technique sur les accidents et incidents d'aviation civile marocain.
CAM: Cockpit Area Microphone.
CAS: Computed Air Speed.
CFDS: Centralized Fault Display System.
CG: Centre of Gravity.
CMN: Mohammed V International Airport.
CPL: Commercial Pilot Licence.
CRM: Crew Resource Management.
CTA: Catania.
CVDR: Cockpit Voice and Data recorder.
CVR: Cockpit Voice Recorder.
EASA: European Union Aviation Safety Agency.
ECAM: Electronic Centralized Aircraft Monitor.
EFB: Electronic Flight Bag.
EGPWS: Enhanced Ground Proximity Warning System.
ELAC: Elevator aileron computer.
EW: Empty Weight.
FADEC: Full Authority Digital Engine Control.
FCOM: Flight Crew Operating Manual.
FCTM: Flight Crew Techniques Manual.
FD: Flight Director.
FDM: Flight Data Monitoring.
FDR: Flight Data Recorder.
FIR: Flight Information Region.
FLEX o FLX: flex take-off, an Airbus technique where pilots set a hypothetical "flex temperature" higher than the actual outside air temperature to reduce engine thrust during take-off.

FMA: Flight Mode Annunciator.
FMS: Flight Management System.
FPM: feet per minute.
FWC: Flight Warning Computer.
FWD: forward.
G: acceleration is standard gravity on Earth, relative to free fall. It measures the force per unit mass 9.80665 m/s^2.
GPWS: Ground Proximity Warning System.
GW: Gross Weight.
IMC: Instrument Meteorological Condition.
LOFT: Line Oriented Flight Training.
MCDU: Multipurpose Control and Display Unit.
MCT: Maximum Continuous Thrust.
METAR: Meteorological Aerodrome Report.
MLW: Maximum Landing Weight.
MSAW: Minimum Safe Altitude Warning.
MTOW: Maximum Take Off Weight.
NCD: Not Coded Data.
NLG: Nose Landing Gear.
NOTAM: notice to airmen.
NPA: Notice of Proposed Amendments.
NTSB: National Transportation Safety Board.
MCDU: Multi-Function Control and Display Unit.
OCC: Operative Control Centre.
OP CLB: open climb.
PIC: Pilot in Command.
PF: Pilot Flying.
PM: Pilot Monitoring.
PFR: Post Flight Report.
PMO: Palermo;
RA: Radio Altitude.
RMT: Rule Making Task.
RWY: Runway.
SAW: Sabiha Gökçen International Airport.
SHJ: Sharjah International Airport.
SIA: Safety Investigation Authority.
S/N or SN: Serial Number.
SRS: Speed Reference System.
TCAS: Traffic Collision Avoidance System.
T3CAS: integrated TCAS/TAWS/Transponder equipment providing traffic collision avoidance and terrain awareness alerting functions.
TO: take off.
TOGA: Take-Off Go Around.
TOR: Terms of Reference.
TOS: Take Off and Surveillance.
TOURNAROUND TIME: time between on-block and off-block.

TOW: Take Off Weight.

UTC: Universal Time Coordinated. Local time, at the time of accident, was UTC+2 hour.

V1: is the maximum speed at which a rejected take-off can be initiated in the event of an emergency. It is also the minimum speed at which a pilot can continue take-off following an engine failure.

V2: is the minimum speed an aircraft must maintain after liftoff to ensure a safe climb and proper control, even if an engine fails.

VERT: vertical.

VFE: maximum flap extended speed.

VR: rotation of the aircraft should be initiated to take-off attitude.

ZFW: Zero Fuel Weight.

All the times shown in this investigation report, unless otherwise specified, are expressed in **UTC** (Universal Time Coordinated), which, on the date of the event corresponded to the local time minus 2h.

FOREWORD

The event occurred on September the 20th, 2025, at 21:57 and involved an Airbus A320-214 registered in the Maroc with marks CN-NML, during a positioning flight from Catania Fontanarossa Airport (LICC, Italy) to Amman (OJAI, Jordan).
The aircraft took off from runway 08 at 21:56 and shortly after started to descend until GPWS alerts triggered. The trajectory was recovered when it was close to the sea surface.
The flight continued to the destination, where an uneventful landing was performed. The ANSV was informed of the event on October the 1st 2025. The deemed notifications were sent in accordance with the international and EU regulations (ICAO Annex 13 and Regulation EU 996/2010). Indeed, the event was notified to the States of the aircraft manufacturer (France, BEA), of the engine manufacturer (United States and France, NTSB and BEA respectively) and to the State of the operator (Morocco, BEA Morocco). All the above appointed an accredited representative. EASA also appointed a technical adviser to the Italian investigator-in-charge, in accordance with Regulation (EU) 996/2010.

SERIOUS INCIDENT
Airbus A320-214 registration marks CN-NML,
Catania Fontanarossa International Airport (Italy),
20th of September 2025

Aircraft type and marks
Airbus A320-214 registration marks CN-NML, S/N 4848.

Date and time
20th of September 2025, 21.57'.

Location of the event
Catania Fontanarossa International Airport (LICC), Sicily, Italy.

Narrative
On the 20th of September 2025 the A320-214 registration marks CN-NML, Air Arabia Maroc flight MAC991, from Catania (LICC, Italy) to Amman (OJAI, Jordan) for a positioning flight, took off from runway 08 at 21.56. Shortly after, the aircraft started to descend and GPWS alerts triggered. The aircraft trajectory was recovered when it was close to the sea surface. The minimum recorded RA was 41 ft (12,5 m).
The flight continued to the destination, where an uneventful landing was performed.
The event was reported to the ANSV by the operator after their FDM analysis, following an ASR from the captain of the flight.

Operator
Air Arabia Maroc.

Type of flight
Positioning flight for scheduled maintenance.

Persons on board
2 pilots, 4 cabin crew and 0 passengers.

Damage to the aircraft
None.

Injuries.
None.

Flight crew information
The duty of the crew for the day of the event was scheduled to start at 16:15.
A first flight Casablanca (GMMN) – Catania (LICC) was scheduled at 17:15. At 16:40 it was rescheduled at 17:40 due to late arrival of the aircraft. The actual departure of the flight Casablanca

(GMMN) – Catania (LICC) occurred at 18:01. The CN-NML landed in LICC at 20:51. The turnaround time in Catania was 53'.

Captain
Age 47 years, Tunisian.
ATPL (A).
A320 Rating, Instrument Rating.
Class 1 Medical Certificate.
Total flight experience 14396h.
Rest time before the event day: 27h 25'.

The captain received communication of a different flight schedule via e-mail on the 29th of August 2025. The text advised he was assigned on the 20th of September to operate CMN-CTA-AMM and on the 22nd of September from AMM to CMN instead of the original scheduled CMN-SAW-SHJ flight.

First Officer
Age 36 years, Moroccan.
CPL (A).
A320 Rating, Instrument Rating.
Class 1 Medical Certificate.
Total flight experience 3696h.
Rest time before the event day: 18h 02'.

Aircraft information
The A320-200 series is narrow body airliner with metallic primary structure (Figure 1).

MTOW: 77000 kg;
MLW: 66000 kg;
Wingspan: 34,1 m;
Length: 37,6 m;
Engines: CFM56-5B4/P.

Airbus A320-214 registration marks CN-NML S/N 4848, Certificate of airworthiness dated 8.6.2017. Airworthiness Review Certificate dated 7.4.2025. It is equipped with two CFM56-5B4/P.
At departure of the flight of the event, the Load sheet reported:

Zero Fuel Weight Actual: 42541 kg;
Take off fuel: 11400 kg;
Take off weight actual 53941 kg.

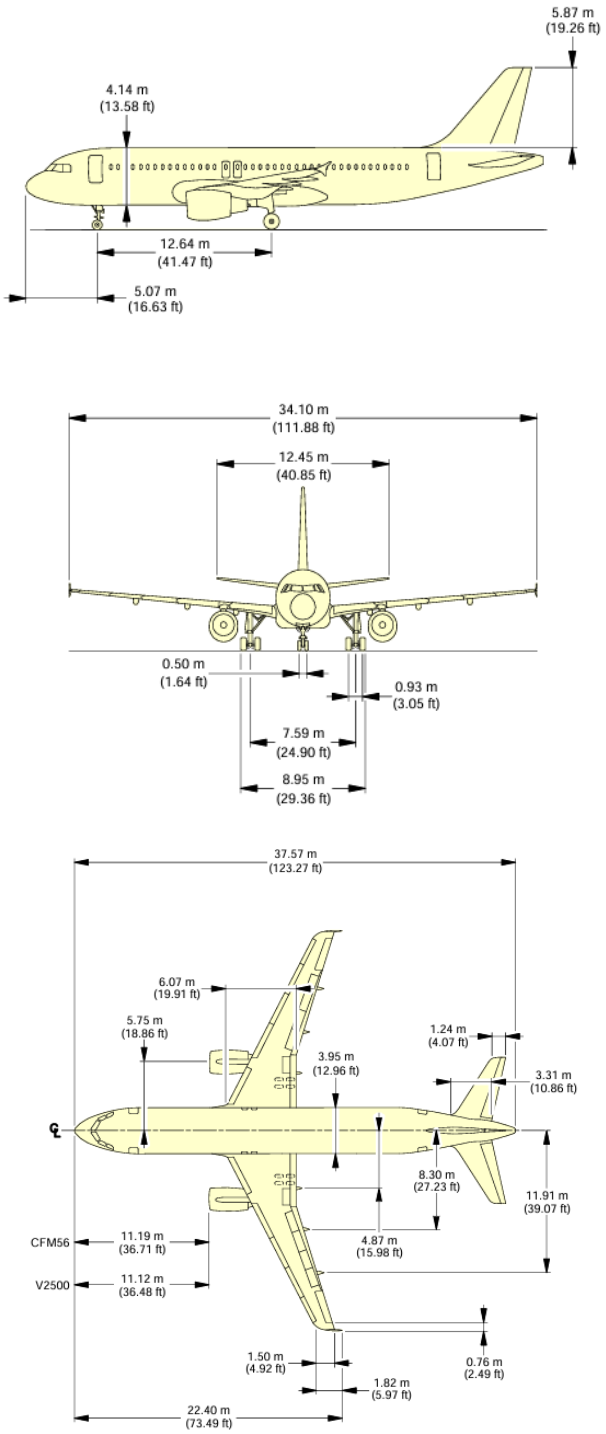
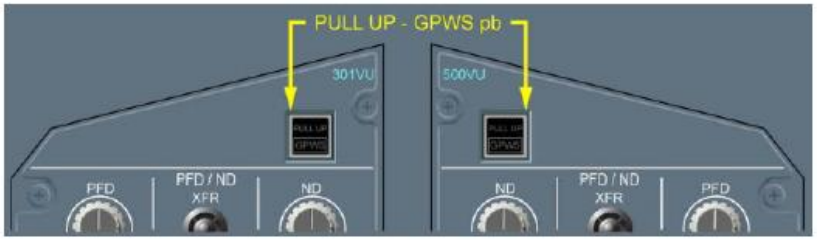


Figure 1: A320-200 series dimension.

In the framework of this serious incident, it is worth to discuss some features of the aircraft alarming system. In more detail, the FDR keep information about the following parameters:

- GPWS G/S VISUAL ALERT MODE 5
- GPWS WNG MODE 1-4 + TERRAIN ALERTS IF EGPWS INST

They both correspond to the status of the PULL UP - GPWS pushbutton lights in the cockpit, respectively the GPWS light and the PULL UP light indications (please see following pictures from FCOM).





Comes on when the second boundary of mode 1 is penetrated or when the mode 2 is activated.
A "PULL UP" or "TERRAIN - TERRAIN PULL UP" aural alert is associated.



Comes on when any other mode is activated. It is associated with a corresponding aural alert.

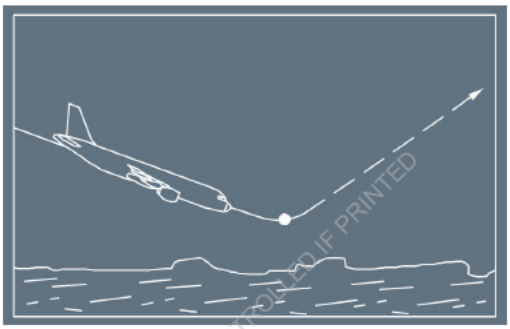
In particular:

- if the PULL UP part of the light illuminates, which is in case an alert that contains message "PULL UP" is triggered, then parameter GPWS MODE 1-4 activates in the FDR;

A320 FLIGHT CREW OPERATING MANUAL	AIRCRAFT SYSTEMS SURVEILLANCE GPWS - GPWS BASICS MODES

MODE 1 : EXCESSIVE RATE OF DESCENT

Ident.: DSC-34-SURV-40-20-00015115.0004001 / 13 JAN 14
Applicable to: ALL



Mode 1 triggers aural and visual alerts about excessive rates of descent, based on the radio height, and the rate of descent of the aircraft.
Mode 1 is active for all phases of the flight.

	CAUTION	WARNING
AURAL ALERT	"SINK RATE, SINK RATE"	"PULL UP" (repeated as long as MODE 1 is triggered)
VISUAL ALERT	GPWS The GPWS amber lights come on	PULL UP The PULL UP red lights come on

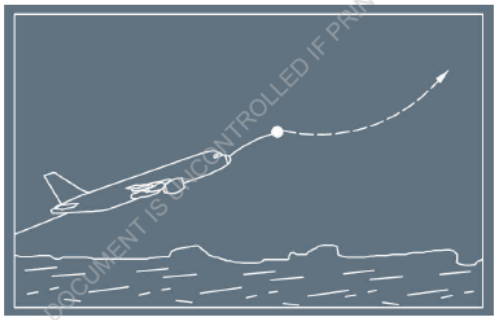
- if the GPWS part of the light illuminates, which is in case an alert that contains another aural message than "PULL UP" is triggered, the parameter GPWS MODE 5 activates in the FDR. This corresponds to mode 3 TAWS parameter activation.

A320 FLIGHT CREW OPERATING MANUAL	AIRCRAFT SYSTEMS SURVEILLANCE GPWS - GPWS BASICS MODES

CONFIGURATION	Flaps in landing position + Landing Gear Down (Mode 2B)
AURAL ALERT	CAUTION "TERRAIN" (repeated as long as MODE 2 is triggered)
VISUAL ALERT	 The GPWS amber lights come on

MODE 3 : ALTITUDE LOSS AFTER TAKEOFF

Ident.: DSC-34-SURV-40-20-00015117.0004001 / 19 SEP 13
Applicable to: ALL



THIS DOCUMENT IS UNCONTROLLED IF PRINTED

Mode 3 triggers aural and visual alerts when the altitude significantly decreases after takeoff, and go-arounds with landing gear or flaps not in landing configuration.

	CAUTION
AURAL ALERT	"DON'T SINK, DON'T SINK" (repeated as long as MODE 3 is triggered)
VISUAL ALERT	 The GPWS amber lights come on

In more detail about the TO configuration of the event flight, post flight computation made with the *Flysmart* (Figure 2) EFB software led to the following TO speeds calculated for CONFIG 1+F:

Flex: 68°

V1: 131 kt
VR: 131 kt
V2: 133 kt

TOGA

V1: 123 kt
VR: 124 kt
V2: 129 kt



Figure 2: *Flysmart* TO speed computation.

In order to understand the event, the following procedures from the FCOM are considered important. In the specific event some specific automation modes were involved.
In more detail, the take-off data insertion in the MCDU is an important step to highlight.

TAKEOFF DATA INSERTION (PERF TAKEOFF PAGE):

The PF inserts the takeoff data in the PERF TAKEOFF page of the MCDU.

	* T.O SHIFT	INSERT AS RQRD	PF
L2	*If the aircraft takes off from an intersection, insert a T.O shift value (even when GPS PRIMARY is active) to increase flight crew awareness of the runway length reduction.*		
L1	* V1, VR, V2	INSERT	PF
	* FLX TO TEMP	INSERT	PF
	* THR RED/ACC altitude	SET or CHECK	PF
	* ENG OUT ACC altitude	SET or CHECK	PF
	* FLAPS/THS reminder	INSERT	PF
L2	*The THS can be left blank until the loadsheet is received. When entered in the MCDU, the THS value will be used to trigger the F/CTL PITCH TRIM/MCDU/CG DISAGREE alert.*		

According to the FCOM, the pilot monitoring check all the data entered in the FMS by the pilot flying. The Normal Checklist also refers to this dual check.

Ident.: PRO-NOR-SOP-06-D-00015496.0001001 / 14 NOV 24
Applicable to: MSN 04848-07080

CHECK OF FMGS PREPARATION:

* FMS PREPARATION..... CROSSCHECK | PM

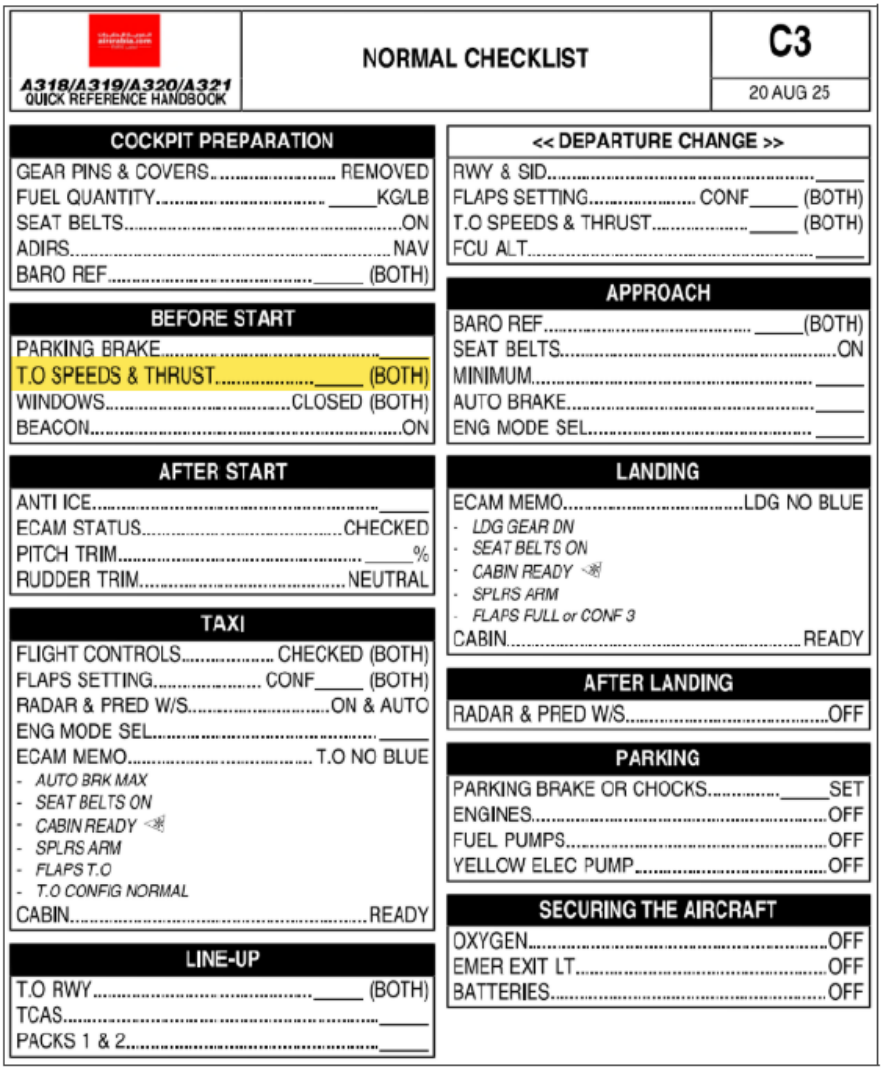
L2 *After the PF prepares the FMS, the PM checks all the data entered in the FMS. This check includes a crosscheck between:*

- *Waypoints of the expected departure route that include constraints*
- *Waypoints of the flight plan and the computerized flight plan*
- *Initial cruise altitude and the computerized flight plan*
- *Total track miles and the computerized flight plan*
- *Fuel remaining at destination and the computerized flight plan*
- *Performance data displayed on the PM's EFB with the FMS PERF TAKE OFF page. This includes modifications of the THR RED/ACCEL/EO ACCEL settings, if applicable*
- *TRANS ALT in the FMS PERF TAKE OFF page*
- *Setup of the SEC flight plan.*

L1 L2 The PM should have the same mental image of the intended departure procedure, trajectory, and constraints as the PF. The PM should check with the PF if anything is not clear.

L1 * EFB/MCDU GREEN DOT.....COMPARE | PM

L2 *The PM compares the Green Dot speed computed by the FMGS and the Green Dot speed computed by the EFB takeoff performance application. A discrepancy indicates a difference in the TOW used in both systems (EFB/FMGS).*



A318/A319/A320/A321
QUICK REFERENCE HANDBOOK

NORMAL CHECKLIST

C3
20 AUG 25

COCKPIT PREPARATION
GEAR PINS & COVERS..... REMOVED
FUEL QUANTITY..... ____KG/LB
SEAT BELTS.....ON
ADIRS.....NAV
BARO REF..... ____ (BOTH)

BEFORE START
PARKING BRAKE.....____
T.O SPEEDS & THRUST.....____ (BOTH)
WINDOWS.....CLOSED (BOTH)
BEACON.....ON

AFTER START
ANTI ICE.....____
ECAM STATUS.....CHECKED
PITCH TRIM..... ____%
RUDDER TRIM.....NEUTRAL

TAXI
FLIGHT CONTROLS..... CHECKED (BOTH)
FLAPS SETTING..... CONF____ (BOTH)
RADAR & PRED W/S.....ON & AUTO
ENG MODE SEL..... ____
ECAM MEMO..... T.O NO BLUE
- *AUTO BRK MAX*
- *SEAT BELTS ON*
- *CABIN READY*
- *SPLRS ARM*
- *FLAPS T.O*
- *T.O CONFIG NORMAL*

CABIN.....READY

LINE-UP
T.O RWY..... ____ (BOTH)
TCAS.....____
PACKS 1 & 2.....____

<< DEPARTURE CHANGE >>
RWY & SID.....____
FLAPS SETTING..... CONF____ (BOTH)
T.O SPEEDS & THRUST..... ____ (BOTH)
FCU ALT.....____

APPROACH
BARO REF..... ____(BOTH)
SEAT BELTS.....ON
MINIMUM..... ____
AUTO BRAKE.....____
ENG MODE SEL..... ____

LANDING
ECAM MEMO.....LDG NO BLUE
- *LDG GEAR DN*
- *SEAT BELTS ON*
- *CABIN READY*
- *SPLRS ARM*
- *FLAPS FULL or CONF 3*

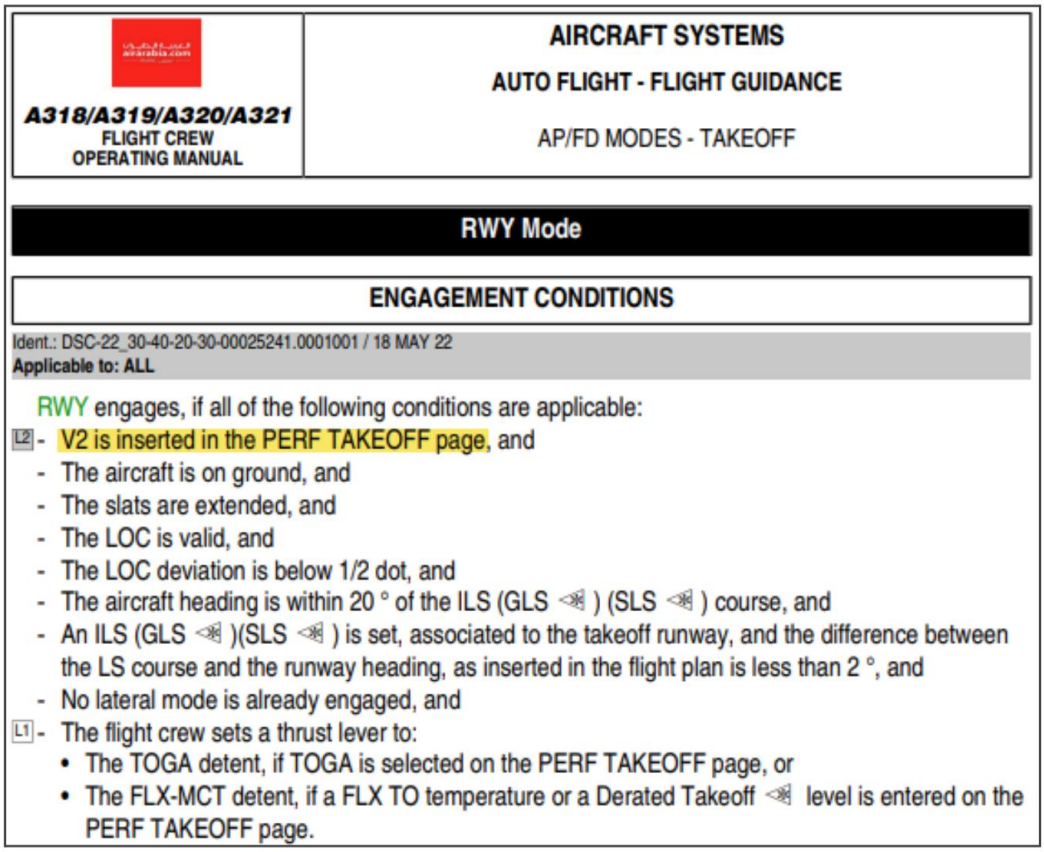
CABIN.....READY

AFTER LANDING
RADAR & PRED W/S.....OFF

PARKING
PARKING BRAKE OR CHOCKS.....____SET
ENGINES.....OFF
FUEL PUMPS.....OFF
YELLOW ELEC PUMP.....OFF

SECURING THE AIRCRAFT
OXYGEN.....OFF
EMER EXIT LT.....OFF
BATTERIES.....OFF

In the FCOM applicable at the date of the event, the RUNWAY (RWY) mode provides lateral guidance to the aircraft during take-off. The FCOM, version published at the time of the event, states that this mode engages if several conditions are satisfied (see the following extract), including the V2 is inserted in the MCDU. However, verification of this specific feature during the investigation has established the RWY mode to engage does not need the V2 to be inserted. Therefore, the manufacturer took action to amend the FCOM (see the paragraph *safety actions*).



A318/A319/A320/A321
FLIGHT CREW
OPERATING MANUAL

AIRCRAFT SYSTEMS
AUTO FLIGHT - FLIGHT GUIDANCE
AP/FD MODES - TAKEOFF

RWY Mode

ENGAGEMENT CONDITIONS

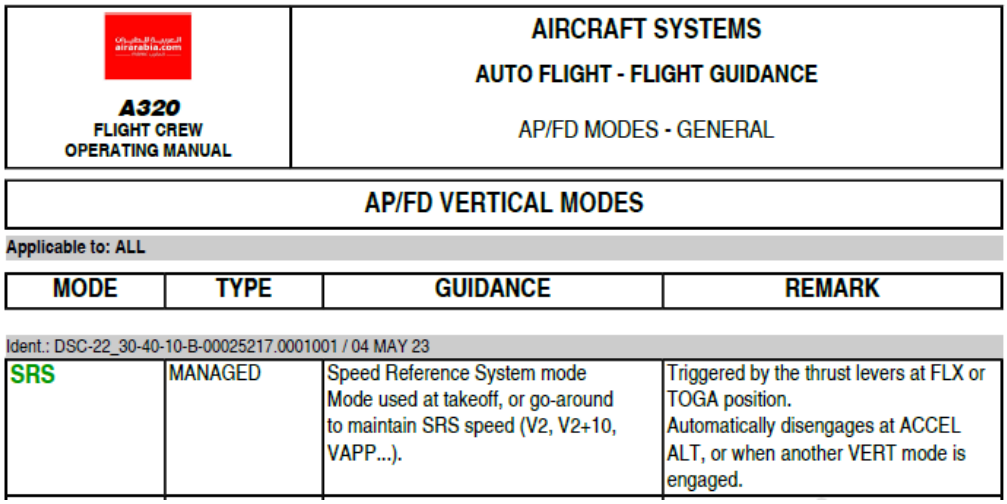
Ident.: DSC-22_30-40-20-30-00025241.0001001 / 18 MAY 22
Applicable to: ALL

RWY engages, if all of the following conditions are applicable:

L2 - V2 is inserted in the PERF TAKEOFF page, and
- The aircraft is on ground, and
- The slats are extended, and
- The LOC is valid, and
- The LOC deviation is below 1/2 dot, and
- The aircraft heading is within 20 ° of the ILS (GLS) (SLS) course, and
- An ILS (GLS)(SLS) is set, associated to the takeoff runway, and the difference between the LS course and the runway heading, as inserted in the flight plan is less than 2 °, and
- No lateral mode is already engaged, and

L1 - The flight crew sets a thrust lever to:
- The TOGA detent, if TOGA is selected on the PERF TAKEOFF page, or
- The FLX-MCT detent, if a FLX TO temperature or a Derated Takeoff level is entered on the PERF TAKEOFF page.

The SPEED REFERENCE SYSTEM (SRS) is the AP/FD vertical mode used at take-off, or go around, to maintain the reference speed (V2, V2+10 kt, Vapp, etc.). The mode (managed) is triggered by the thrust levers at FLEX or TOGA position and it automatically disengages at WHEN ACHIEVED THE acceleration altitude (ACCEL ALT) or when another vertical mode (VERT) is engaged.
On take-off, in order to engage SRS mode, the V2 has to be inserted in the PERF TAKEOFF page of the MCDU.
If V2 has not been inserted, V/S mode engages 5 seconds after lift-off on the current V/S value.



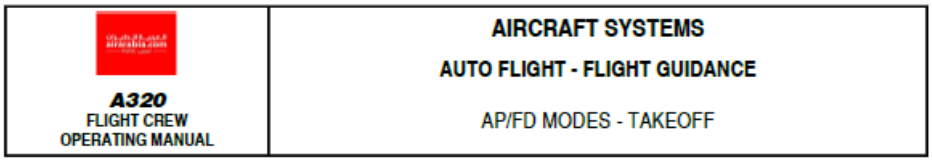
A320
FLIGHT CREW
OPERATING MANUAL

AIRCRAFT SYSTEMS
AUTO FLIGHT - FLIGHT GUIDANCE
AP/FD MODES - GENERAL

AP/FD VERTICAL MODES

Applicable to: ALL

MODE	TYPE	GUIDANCE	REMARK
Ident.: DSC-22_30-40-10-B-00025217.0001001 / 04 MAY 23			
SRS	MANAGED	Speed Reference System mode Mode used at takeoff, or go-around to maintain SRS speed (V2, V2+10, VAPP...).	Triggered by the thrust levers at FLX or TOGA position. Automatically disengages at ACCEL ALT, or when another VERT mode is engaged.



A320
FLIGHT CREW
OPERATING MANUAL

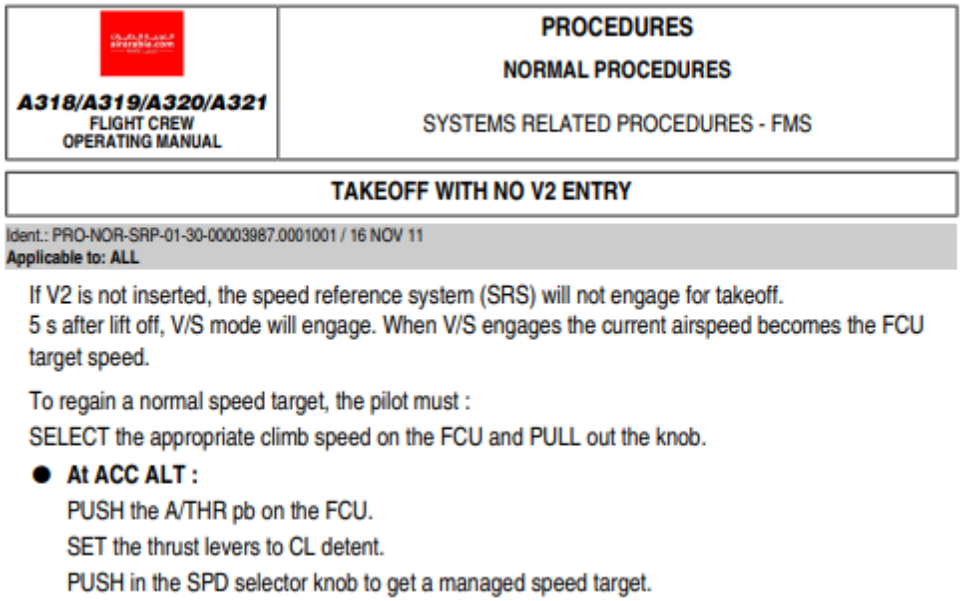
AIRCRAFT SYSTEMS
AUTO FLIGHT - FLIGHT GUIDANCE
AP/FD MODES - TAKEOFF

- V2 is inserted in the PERF TAKEOFF page

L2 If V2 has not been inserted, V/S mode engages 5 s after lift-off on the current V/S value.

L1 - The flight crew sets at least one thrust lever:
  - To the TOGA detent, or
  - To the FLX-MCT detent, when a FLX TO temperature or a Derated Takeoff is entered in the PERF TAKEOFF page.

Note: *When V2 is inserted, or SRS TO is engaged, the speed automatically becomes managed. For more information about engagement conditions of managed speed, Refer to DSC-22_30-60-20 Engagement Conditions.*



A318/A319/A320/A321
FLIGHT CREW
OPERATING MANUAL

PROCEDURES
NORMAL PROCEDURES
SYSTEMS RELATED PROCEDURES - FMS

TAKEOFF WITH NO V2 ENTRY

Ident.: PRO-NOR-SRP-01-30-00003987.0001001 / 16 NOV 11
Applicable to: ALL

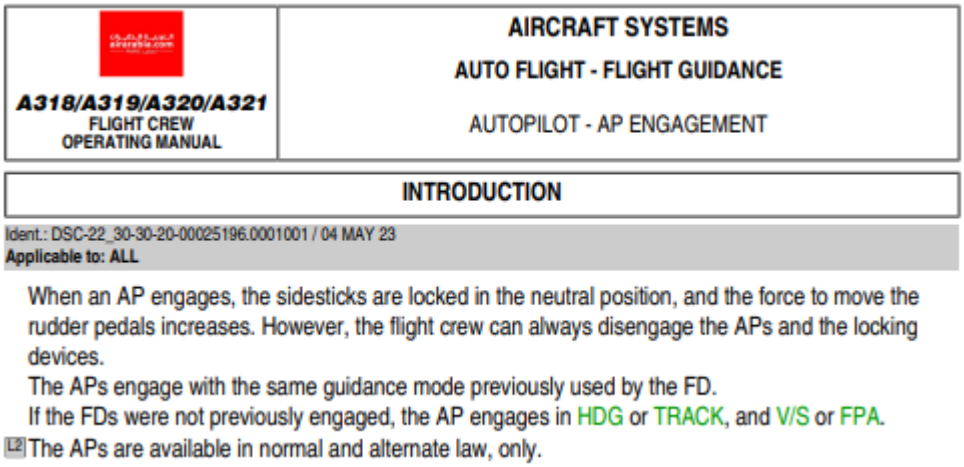
If V2 is not inserted, the speed reference system (SRS) will not engage for takeoff.
5 s after lift off, V/S mode will engage. When V/S engages the current airspeed becomes the FCU target speed.

To regain a normal speed target, the pilot must :
SELECT the appropriate climb speed on the FCU and PULL out the knob.

- **At ACC ALT :**
  PUSH the A/THR pb on the FCU.
  SET the thrust levers to CL detent.
  PUSH in the SPD selector knob to get a managed speed target.

The A320 CN-NML was equipped with FMS2 Thales release 1A software operational program with TOS1 function[1].
When the FMS2 release 2 software operational program modification is applied instead[2], in case the take-off speeds are not inserted, caution message "TO speeds not inserted" will be displayed on the ECAM at the first engine start when the flight crew presses the T.O CONFIG push button, or the engines are set to take-off power and inhibited above 80 kt. The CN-NML at the time of the event did not have the modification fitted.
About the AP engagement, the FCOM provide the following information.

[1] TOS1 improves the checks performed on flaps and trim settings and adds a check of the performance parameters entered in the FMS (aircraft weight and take-off speeds).
[2] FMS are provided for the A320 family from two sources, Thales and Honeywell. The CN-NML had FMS from Thales. In this framework, Release 1A and Release 2 are generic names covering Airbus FMS standards. These standards are applicable to both the two sources, Thales and Honeywell.



A318/A319/A320/A321
FLIGHT CREW
OPERATING MANUAL

AIRCRAFT SYSTEMS

AUTO FLIGHT - FLIGHT GUIDANCE

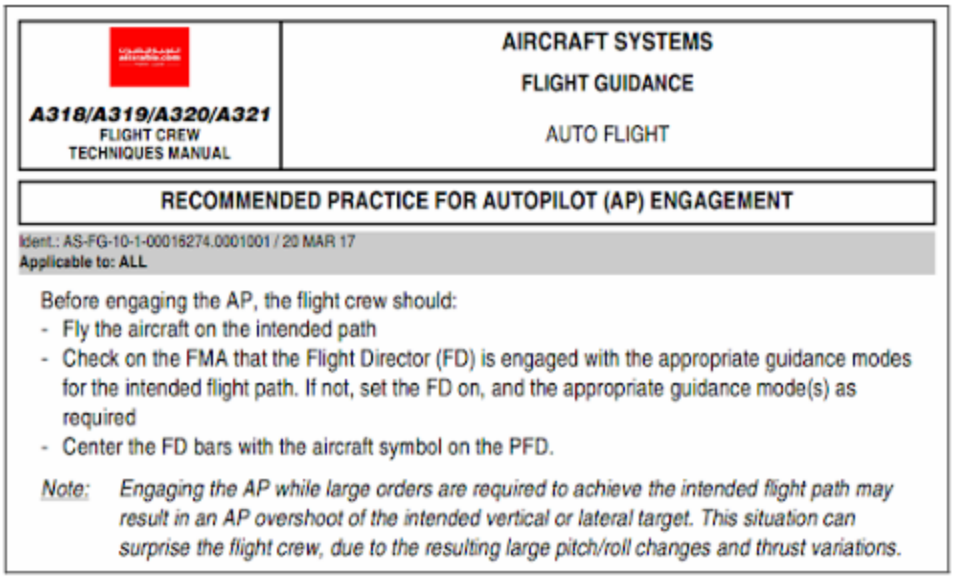
AUTOPILOT - AP ENGAGEMENT

INTRODUCTION

Ident.: DSC-22_30-30-20-00025196.0001001 / 04 MAY 23
Applicable to: ALL

When an AP engages, the sidesticks are locked in the neutral position, and the force to move the rudder pedals increases. However, the flight crew can always disengage the APs and the locking devices.
The APs engage with the same guidance mode previously used by the FD.
If the FDs were not previously engaged, the AP engages in HDG or TRACK, and V/S or FPA.
L2 The APs are available in normal and alternate law, only.

It is worth to highlight that the AP engages with the same guidance mode previously used by the FD. On the other hand, the FCTM reports the following recommended practice about being already on the desired flight path before engaging the AP so that targets will be coherent with it.



A318/A319/A320/A321
FLIGHT CREW
TECHNIQUES MANUAL

AIRCRAFT SYSTEMS

FLIGHT GUIDANCE

AUTO FLIGHT

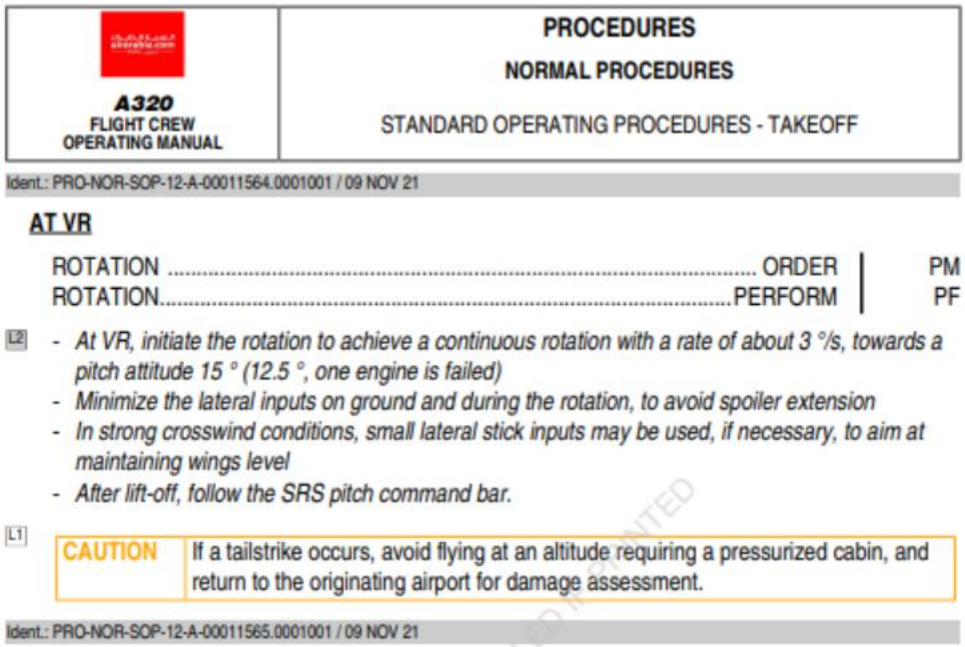
RECOMMENDED PRACTICE FOR AUTOPILOT (AP) ENGAGEMENT

Ident.: AS-FG-10-1-00016274.0001001 / 20 MAR 17
Applicable to: ALL

Before engaging the AP, the flight crew should:
- Fly the aircraft on the intended path
- Check on the FMA that the Flight Director (FD) is engaged with the appropriate guidance modes for the intended flight path. If not, set the FD on, and the appropriate guidance mode(s) as required
- Center the FD bars with the aircraft symbol on the PFD.

Note: Engaging the AP while large orders are required to achieve the intended flight path may result in an AP overshoot of the intended vertical or lateral target. This situation can surprise the flight crew, due to the resulting large pitch/roll changes and thrust variations.

About the take-off in normal conditions, the following procedure applies, establishing attitude 15° pitch up at rotation speed as standard pitch angle in that condition.



A320
FLIGHT CREW
OPERATING MANUAL

PROCEDURES
NORMAL PROCEDURES
STANDARD OPERATING PROCEDURES - TAKEOFF

Ident.: PRO-NOR-SOP-12-A-00011564.0001001 / 09 NOV 21

AT VR

ROTATION ..... ORDER	PM
ROTATION..... PERFORM	PF

L2
- *At VR, initiate the rotation to achieve a continuous rotation with a rate of about 3 °/s, towards a pitch attitude 15 ° (12.5 °, one engine is failed)*
- *Minimize the lateral inputs on ground and during the rotation, to avoid spoiler extension*
- *In strong crosswind conditions, small lateral stick inputs may be used, if necessary, to aim at maintaining wings level*
- *After lift-off, follow the SRS pitch command bar.*

L1

CAUTION	If a tailstrike occurs, avoid flying at an altitude requiring a pressurized cabin, and return to the originating airport for damage assessment.

Ident.: PRO-NOR-SOP-12-A-00011565.0001001 / 09 NOV 21

Some PFR[3] and ECAM leg reports that are relevant for the CN-NML investigation are depicted in the following pictures.

In Picture 1, the PFR from 20:54 of the 20th September. No warning messages. There is some fault messages raised from 17:55 to 17.56: the Flight Warning Computer 1 (FWC1) temporarily stopped receiving data from CVDR1; a fault related to FADEC 2 was detected; a fault in the forward drain mast heater was present. These 3 faults were reported also in the previous PFR from 16:50 and relevant to time 15:00.



```
A/C ID    DATE    GMT     FLTN      CITY PAIR
.CN-NML   20SEP   2054    MAC485Y   GMMN LICC

+--------------------+
|    MAINTENANCE     |
| POST FLIGHT REPORT |
+--------------------+

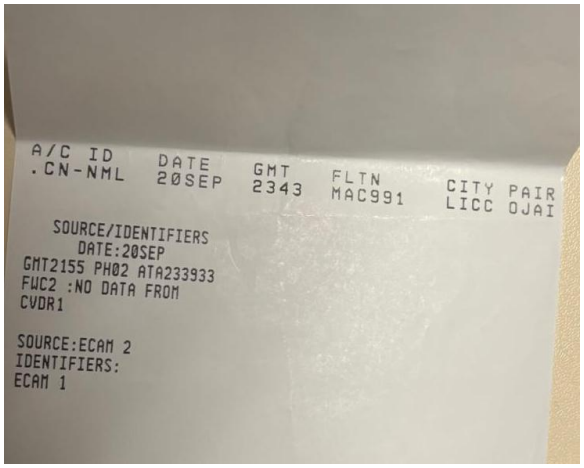
A/C ID   DATE    GMT         FLTN      CITY PAIR
.CN-NML  20SEP   1755/2054   MAC485Y   GMMN LICC

WARNING/MAINT.STATUS MESSAGES
-----------------------------
 NO WARNING MESSAGE

FAILURE MESSAGES
----------------
GMT  PH ATA                                SOURCE   IDENT.
1755 02 23-39-33 FWC1 :NO DATA FROM          ECAM 2   ECAM 1
                 CVDR1
1756 02 73-21-60 AFS:FADEC2                  AFS 1
1756 02 30-71-51 DRAINMAST HEATER FWD/       CIDS 1
                 DEU-B(300RH1)
```

Picture 1: PFR from 20.54.

[3] A maintenance Post Flight Report (PFR) is printed at the end of each flight. The PFR allows association of ECAM warnings and CFDS maintenance messages.



Picture 2: ECAM report from 23.43.

The ECAM report from 23:43, printed in flight, still shows no data from CVDR1 (Picture 2).



Picture 3: ECAM report from 23.44.

The PFR from 23:44, printed in flight, shows an event of AP OFF at 21.57 (Picture 3). The PFR printed in flight did not show faults relevant to the FADEC2 neither to the drain mast heater FWD.



Picture 4: PFR from 00:55.

The PFR from 00:55 of the 21st September, printed in after flight in Amman, shows an event of AP OFF at 21.57 and the messages, together with the already present faults relevant to CVDR1 and drain mast heater (Picture 4). No indication about FADEC2.
A review of the CN-NML aircraft defect history associated with the installed MCDU, FMS, and T3CAS systems were reviewed, covering the period from January to October 2025. No anomalies, recurring defects, or recorded discrepancies emerged.
Finally, in November 2025 the A320 fleet was involvement in a retrofit of the ELAC avionic system following EASA AD 2025-0268-E / Airbus AOT A27N022-25. This retrofit was not applicable on the CN-NML.

Airport information

The following table reports the data of the runway used for the take-off.

Designazione NR RWY Designation	QFU	Dimensioni RWY Dimension of RWY (M)	Resistenza e superficie di RWY Strength and surface of RWY	Coordinate THR THR coordinates	THR ELEV, MAX TDZ ELEV della RWY per APCH di precisione THR ELEV, MAX TDZ ELEV of precision APCH RWY
1	2	3	4	5	6
08	082°	2435 x 45	PCN 50/F/B/W/T ASPH	37°27'56.59"N 015°03'13.66"E	37.7 FT / 38 FT
26	262°	2435 x 45	PCN 50/F/B/W/T ASPH	37°28'04.27"N 015°04'44.90"E	17.6 FT / 18 FT

Designazione NR RWY Designation	Pendenza di RWY-SWY Slope	Dimensioni SWY SWY dimension (M)	Dimensioni CWY CWY dimension (M)	Dimensioni strip strip dimension (M)	Dimensioni RESA RESA dimension (M)
1	7	8	9	10	11
08	Longitudinale/longitudinal: -4 per mille / per thousand Trasversale/trasversal: NIL Vedi anche/See also AOC	NIL	60 x 300	2555 x 300	90 x 90
26	Vedi/see AOC	NIL	60 x 300	2555 x 300	90 x 90

Designazione NR RWY Designation	OFZ Obstacle free zone (OFZ)	Note Remarks
1	12	13
08	Non applicabile Not applicable	1) DTHR 95 m 2) Testate in calcestruzzo/heads in concrete
26	NIL	1) DTHR 85 m 2) Testate in calcestruzzo/heads in concrete

13	DISTANZE DICHIARATE	DECLARED DISTANCES

Designazione RWY RWY designator	TORA (M)	TODA (M)	ASDA (M)	LDA (M)
1	2	3	4	5
08 Start Point INT TAKE-OFF B*	2435 2130	2495 2190	2435 2130	2340 -
26 Start Point INT TAKE-OFF F*	2435 1925	2495 1985	2435 1925	2350 -

At the date of the event the NOTAM B41725 was in force: from 25.8.25 to 25.10.25 night closure RWY 08/26 from 22:00 to 4:59.

Organizational information

Crew briefing pack for the day of the event and revised OFP.

The document contained several information about routes, weather, airports, fuel etc. Among this information the following are considered useful to describe the event, beside the NOTAM B41725 about the night closure of RWY 08/26 from 22:00 to 4:59.

LICC/26 N0365F190 ALUDU5F ALUDU M871 ERNAM/N0407F290 DCT SUBOK DCT ABNAT M871 TIPAC M978 INKOP/N0432F350 DCT DEMAG UM978 SIT UL612 KUMBI L612 BLT/N0436F370 Y188 DATOK L550 KARIK B411 ULINA M319 QTR01 R652 LOSIL LOSIL1E OJAI/08R

T/O ALTN: LICJ
DST ALTN LICJ/07

In more detail, the take-off from LICC was initially planned for RWY 26, and the Destination alternate was initially LICJ (Palermo).

When in Catania, the crew requested to the dispatch office to revise the flight plan. Following an excerpt of the revised OFP released at 21.27' on the 20th September 2025.

LICC/26 N0352F190 ALUDU5F ALUDU M871 ERNAM/N0396F290 DCT SUBOK DCT ABNAT M871 TIPAC M978 INKOP/N0417F350 DCT DEMAG UM978 SIT UL612 KUMBI L612 BLT/N0422F370 Y188 DATOK L550 KARIK B411 ULINA M319 QTR01 R652 LOSIL LOSIL1E OJAI/08R

T/O ALTN: LICJ
DST ALTN DIST FL WC TIME FUEL TRK ROUTE
HECA/23R

The departure RWY in LICC was still 26, but the destination alternate changed into HECA (Cairo).

CVR preservation policy
About the CVR preservation the Operation Manual contain provisions to avoid the possibility of overwriting important information for the safety investigation. Following the relevant part of the OM.

2.1.9.7 Cockpit Voice Recorder Data

All Air Arabia Maroc aircraft are equipped with Cockpit Voice Recorder (CVR. The CVR is capable to preserve the information recorded during at least the last 2 hours of its operations.

Following an accident or major incident, the crew will be requested to pull CVR circuit breaker, if so requested by the Authority. The CVR will be removed by the Maintenance department and shall be kept in secure and guarded storage.

Recordings from the CVR may not be used for any purpose other than the investigation of an accident or an incident that is subject to obligatory notification, except with the consent of all crew members concerned.

If Printed

In more detail, the crew is requested to pull the CVR circuit breaker in case of an accident or a incident, if the Authority requests so.

Operator's employment policy after the event
The operator decided to terminate the employment contract with the flight crew. The motivation of this decision was gross negligence from the operator's standpoint.

Weather information
Following the METAR at the time of the serious incident in LICC.
21:50 30005KT CAVOK 23/20 Q1021=
22:20 30003KT CAVOK 23/20 Q1020=
The reported sea conditions for Southern Ionio Sea applicable at the date and time of the event were:
Level 4 Douglas Sea Scale – moderate.
At the date and time of the event the Moon was under the horizon, not visible. It would have been anyway a new Moon phase, 0.8% visibility.

Air-Ground communications
ATIS has reported for departure RWY08 in use, with 4 knots to zero tailwind.
Radio communications did not highlight anything, apart from two reminders from TWR to speed up operations due to the imminent closure of the airport. The airport TWR was not equipped with MSAW.

Following the AIR-GROUND communications between the CN-NML and the Air Traffic Service Provider (ENAV).

21.46.50	MAC991	Catania, good evening Arabian Air Maroc nine nine one stand 327 request start up and clearance to Amman.
21.47.01	LICC TWR/GND	Arabian Air Maroc nine nine one unable to approve start up we need an update your flight plan sir.
21.47.05	MAC991	Roger.
21.47.11	LICC TWR/GND	Arabian Air Maroc nine nine one if you want I can send a delay message for you.
21.47.15	MAC991	Please thank you very much [not readable] grazie.
21.48.46	LICC TWR/GND	Arabian Air Maroc nine nine one start up and push back approved runway zero eight.
21.49.00	LICC TWR/GND	Arabian Air Maroc nine nine one start up and push back approved runway zero eight.
21.49.05	MAC991	Push and start approved runway 08 Arabian Air Maroc nine nine one grazie mille.
21.49.24	LICC TWR/GND	Arabian Air Maroc nine nine one please expedite, we'll close the airport at midnight.t
21.51.21	MAC991	Arabian Air Maroc nine nine one we didn't copie ATC clearance.
21.51.25	LICC TWR/GND	Arabian Air Maroc nine nine one cleared to destination Oscar Juliet Alpha India via ALUDU5K six thousand feet squawk four three one six.
21.51.37	MAC991	cleared to Amman via ALUDU5K six thousand feet squawk four three one six Arabian Air Maroc nine nine one.
21.51.48	LICC TWR/GND	Arabian Air Maroc nine nine one readback is correct expedite operation.
21.51.51	MAC991	Roger we'll expedite.
21.53.42	MAC991	Arabian Air Maroc nine nine one request taxi.
21.53.48	LICC TWR/GND	Arabian Air Maroc nine nine one taxi to holding point Alpha zero eight.
21.53.52	MAC991	Taxi to Alpha runway zero eight Arabian Air Maroc nine nine one.
21.55.08	MAC991	Reaching Alpha ready for departure Arabian Air Maroc nine nine one.
21.55.13	LICC TWR/GND	Arabian Air Maroc nine nine one runway zero eight clear for take off wind 280 degrees three knots.
21.55.19	MAC991	Clear for take off runway zero eight Arabian Air Maroc nine nine one.
21.57.43	LICC TWR/GND	Arabian Air Maroc nine nine one contact radar 119,250 ciao
21.57.49	MAC991	119.250 Arabian Air Maroc nine nine one.

Flight Recorders

FDR

Following the sequence of the event as recorded by the FDR (Figure 3).
At 21:53:56 the aircraft started taxi (groundspeed increasing).

At 21:56:24 the aircraft was lined up for take-off on RWY 08. The data allowed to establish the PIC was the PF.
Both FDs were engaged with no associated mode on the FMA.
Slats/Flaps were CONF 1+F.
CG was 24.8%.
STAB position was -0.8° (nose-up).
TAWS terrain was displayed on first officer side.
Weather radar was displayed on captain side.
The take-off speeds MCDU entries are not included in the FDR recorded parameters. However, the event flight is the only one in the FDR recording for which the FLEX TEMPERATURE parameters stayed NCD during the whole recording sequence.
At 21:56:28 the thrust levers were moved initially to FLEX and after 4 seconds (at CAS of about 50 kt) the thrust levers were moved further forward to TOGA (21:56:32). FDs mode changed and engaged to RWY mode. SRS mode was not engaged. Auto-thrust was not active. During take-off the acceleration peaked about -0.38 G, being higher than in the previous take-off recorded in the FDR (peak about -0.24 G). In addition, compared to the previous take-off, the aircraft was lighter and the TOGA mode was used instead of the FLEX mode.
From 21:56:43 to 21:56:46 the CAS was between 127 and 144 kt. While no sidestick input was applied, the NLG was recorded uncompressed twice (Figure 3).
At 21:56:46 the rotation was initiated at CAS 144 kt.
At 21:56:49 the aircraft lifted off at CAS 157 kt and pitch +7°[4] and increasing to 11°.
At 21:56:52 CAS was 167 kt increasing, RA 49 ft and the gears selected UP. V/S +1520 fpm.
At 21:56:53 FDs lateral mode changed from RWY (LOC SUB MODE RUNWAY) to NAV (TRAK SUB MODE NAV), Figure 3. RA was 62 ft, CAS 168 kt, pitch +10,5°.
At 21:56:54 RA 91 ft, 5 secs after lift-off, FD engaged in vertical mode “V/S” (target V/S +1900 fpm). Current V/S was +1968 fpm. AP was not engaged.
At 21:56:55 aircraft pitch reached a maximum of +11°. RA was 123 ft.
At 21:57:01, at 309 ft (RA), while CAS was 188 kt, V/S +1408 fpm, and pitch 7°, pitch down was commanded from captain sidestick.
At 21:57:04, at 370 ft (RA), CAS was 200 kt, V/S +592 fpm, and pitch +2.1°, flaps config 0 selected, while pitch down command 7.2° was still observed from captain sidestick.
At 21:57:06, at 383 ft (RA), while CAS was 211 kt, V/S -1200 fpm, and pitch 0° (aircraft started descending), pitch down command still observed from captain sidestick.
At 21:57:08, at 348 ft (RA), AP1 engaged (for only 3 seconds) in NAV / V/S. The vertical speed target changed to "V/S -1900", CAS was 222 kt, V/S -2064 fpm, aircraft pitch -2.1°. During the timeframe the AP1 was engaged, sidestick movements to pitch down from captain side were recorded.

[4] As per FCOM the pitch in this phase should be 15°.

At 21:57:09, at 328 ft (RA), V/S -2320 fpm. At CAS 230 kt, thrust reduction started from TOGA to 16° (position between “climb” and “idle” detent) in one second.
At 21:57:10, at 288 ft (RA), a first TAWS mode 1 parameter of “Sink Rate” triggered for 2 seconds, V/S -2480 fpm, pitch -3.2°.
At 21:57:11 AP1 disengaged, flaps actual position reached 0° (fully retracted), slats were still retracting, CAS 239 kt, (VFE 230 kt), V/S -2784 fpm, FD target V/S -1920 ft/min, RA 209 ft.
At 21:57:12, a second mode 1 TAWS alert of “Pull Up, Pull Up” warning triggered for 5 seconds.
At 21:57:13, at 162 ft (RA), TOGA was applied while CAS was 243 kt, V/S -2416 fpm, pitch -3.2°, and pitch up command was observed from captain sidestick (full deflection).
At 21:57:17, at 55 ft (RA), a third TAWS of “Don’t Sink” mode 3 parameter triggered for 4 seconds, while CAS was 268 kt, V/S -544 fpm, pitch 0.7° and momentary pitch down command observed from captain sidestick followed by pitch up from the same side.
At 21:57:18, at 45 ft (RA), CAS was 268 kt, pitch 1.4° and pitch up command was observed from captain sidestick 13.5° (2/3 of full deflection).
At 21:57:19, CAS was 272 kt, pitch 3.8° and pitch up command was observed from captain sidestick 8.6°. This occurred when the aircraft reached the lowest height of this event, 41 ft RA.
At 21:57:29, auto-thrust and OP CLB mode engaged at 737 ft (RA), CAS was 283 kt, V/S 5800 fpm and pitch 12.7°, while AP was still not engaged.
At 21:57:51, AP1 engaged at baro-altitude 2838 ft (QNH 1021), pitch 14.4°, CAS was 261 kt, V/S 5968 fpm.

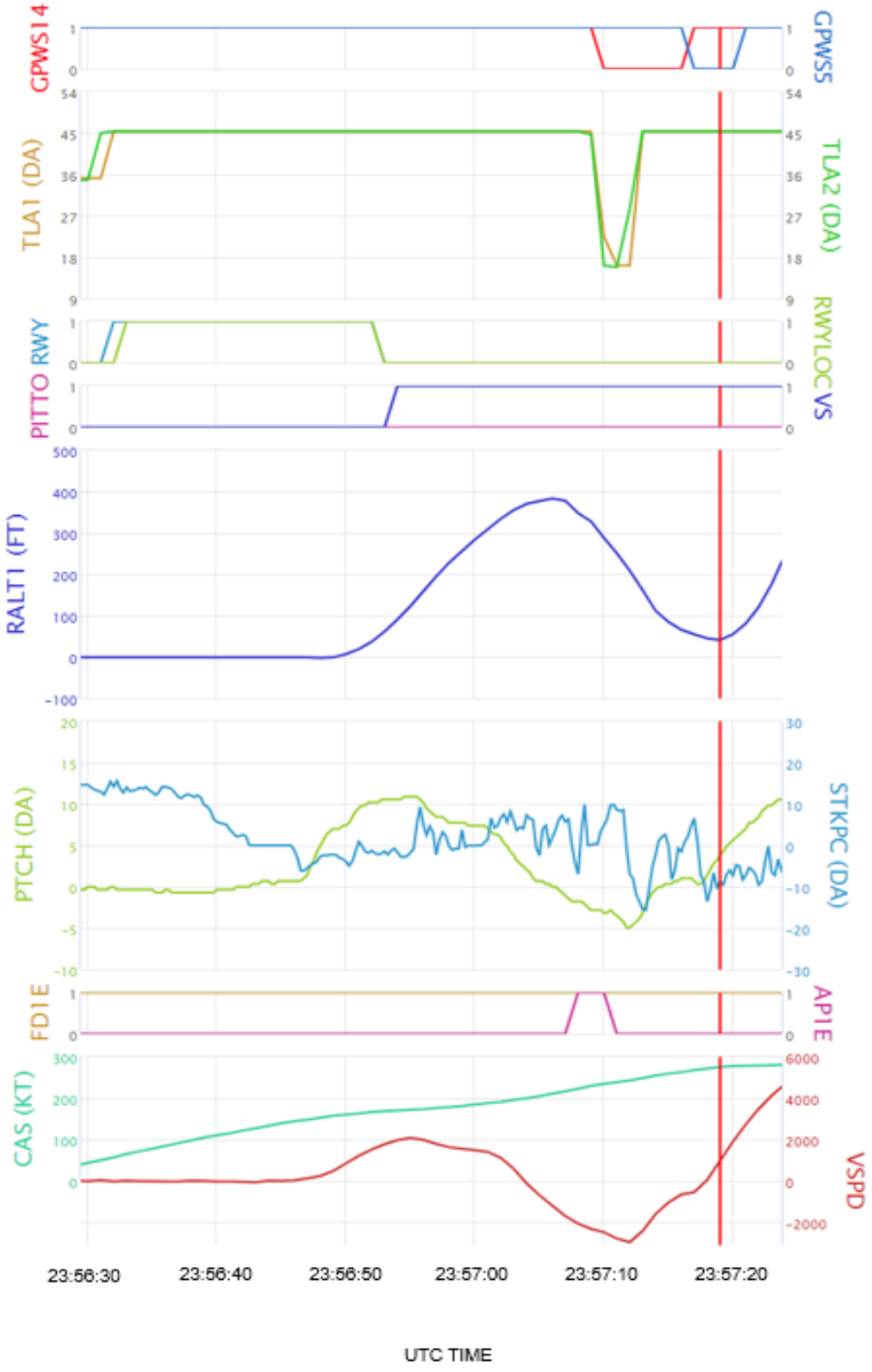


Figure 3: selection of FDR parameters. GPWS 14 and 5 (TAWS alert parameters, GPWS 1-4 relevant mode 1 parameters and GPWS 5 relevant to mode 3 parameters, see also "Aircraft information" and "Detailed analysis of the TAWS data" paragraphs), TLA (Throttle Lever Angle 1-left, 2-right), RWY and RWY LOC (FD lateral modes), PITTO (corresponds to SRS mode), VS (FD vertical mode), RALT (Radio altitude), pitch (aircraft pitch), STKPC (captain stick position, >0 pitch down input), FD1 (Flight Director 1 ON/OFF), AP1 (Auto Pilot 1 ON/OFF), CAS (Computed Air Speed), VSPD (Vertical speed).

CVR recordings

The CVR installed in the CN-NML was able to record 4 tracks, 3 of them lasting 2 hour 10' and the fourth (CAM) maximum 3 hours 12'.

The recordings of the flight event were most probably overwritten due to the length of the flight itself (2h 57') followed by taxi and different powering ups during maintenance activity. It is worth to mention newer aircraft have 25 hours of duration as a requisite[5].

Detailed analysis of the TAWS data

The T3CAS unit, also providing the TAWS function including the GPWS Modes 1-5, was downloaded in order to receive more information on the alerts received.

Indeed, it was possible to ascertain that the GPWS activated alerts were actually the following:

- 21:57:10 a Mode 1 "Sink Rate" Caution alert for 1.5 seconds;
- 21:57:12 Mode 1 "Pull Up Pull Up" Warning alert for 4-5 seconds;
- 21:57:17 a Mode 3 "Don't Sink" Caution alert for around 4 seconds, occurred while the aircraft was changing vertical speed to the pull up manoeuvre.

In the framework of the TAWS specification, it is worth noting the following AC 25.1322-1 provisions.

> **b. Multiple Aural Alerts.**
>
> (1) Aural alerts should be prioritized so that only one aural alert is presented at a time. If more than one aural alert needs to be presented at a time, each alert must be clearly distinguishable and intelligible by the flightcrew (§ 25.1322(a)(2)).
>
> (2) When aural alerts are provided, an active aural alert should finish before another aural alert begins. However, active aural alerts must be interrupted by alerts from higher urgency levels if the delay to annunciate the higher-priority alert impacts the timely response of the flightcrew (§ 25.1301(a)). If the condition that triggered the interrupted alert is still active, that alert may be repeated once the higher-urgency alert is completed. If more than one aural alert requires immediate awareness and the interrupted alert(s) affects the safe operation of the airplane, an effective alternative means of presenting the alert to the flightcrew must be provided to meet the requirements of § 25.1322(a)(1) and (a)(2).

Statements

captain statement released to the operator on the 26th September 2025.

« [omissis, mail header and salutation] WHAT HAPPENED

On the 20th of September operating a flight CMN/CTA/ AMM. The flight was rescheduled crew was not informed.

All crews arrived early and they were arguing about per diem[6]. I informed dispatch and called the chief pilot who solved the problem for the F/O.

_ First leg was a routine flight.

[5] CAT.IDE.A.185 (Cockpit voice recorder), Reg UE 2015/2338.

[6] Daily payment.

AT CTA I had a hard time with dispatch to convince them to correct OFP since they put PMO as alternate to AMM. This change took 35 min.
We got clearance at the gate to depart runway 08 and briefed accordingly.
We did 2 engines taxi since I wanted to do quick taxi to catch the closure of the airport.
All procedures were performed according to SOP.
During rolling take off we had no flex on FMA I put TOGA and read the FMA which apparently was not there and got checked from PM (confirmed my FMA)
Focusing on take-off roll I remarqued no speeds target on PFD. I asked PM he told he reader them [sic].
After rotation I had FDs I flowed [sic] them and engaged A/P. Which [sic] disconnected rapidly and aircraft entered in a speed increase and abnormal attitude. Which lead to GPWS alert. memory Item was performed immediately.
In any time of this situation I have heard a call out from my F/O to aware me of the deviations.
We have not heard any GPWS alarm like do not sink.
And the alarm of A/P disconnected.
We continued the flight to destination. Upon arrival I raised an ASR and contacted by phone safety department.
WHY HAPPENED

1- *Rush because of airport closure.*
2- *V2 not inserted*
3- *Perception of routine FMA*
4- *Somatogravic illusion*
5- *PM non active monitoring*

LESSONS LEARNED

1-Be more vigilant about FMS parameters
2- stuck more to the procedure
3- check an involve more F/O in positive monitoring.
4- brief about Somatogravic illusion and come back to basic IFR and trust instruments.
5- if I had to fill in ASR fill in maximum details. [omissis, signature and salutation]».

Captain interview at the ANSV premises on the 21st January 2026.
The captain stated he joined Air Arabia in 2015 and he had good professional records. No other position within the operator beside being a pilot (captain). In more detail, he reported that he did not have any negative record at the recurrent trainings and no specific problems within the company. He mentioned that in the last six months a new Chief pilot had a different way how to manage the operations, stricter. He also reported that the day of the event the Chief pilot briefed the First Officer about one hour prior the first flight of the day. He did not know the content of the conversation; however, he thought it was inappropriate. About the salary, usually the payment for the flights is made in advance; that day was different and he was instructed to anticipate personally the payment for the FO.
About his medical fitness the captain reported he felt ok and good rested. The day before the event he did not fly, he was in standby.
Before the first flight of the day the crew regularly briefed the flight. They immediately realized the OFP contained some mistakes to correct. In particular, the leg Catania-Amman was planned flying

over Israel, that should have been avoided for security reason. In addition, the destination alternate was Palermo (LICJ) in Sicily, while an alternate closer to the destination, for example Cairo (HECA), would have been more reasonable. The pilot reported that this change of plan required about 40 minutes call with the OCC in Casablanca to be made. The pilot reported that was something stressful for him due to the short time they had in LICC.
The captain realized the need for a change of the flight plan since the beginning of his duty, but he thought he would have enough time to do that in LICC. However, the arrival in Casablanca of the aircraft was delayed and this delayed also the arrival in LICC, shortening the time available.
Only after landing in LICC on RWY 08 the crew was noticed the airport would have closed at 22.00'.
No previous notice from the operator of the night closure of LICC airport. The captain reported spent almost the turnaround time in the cockpit reporting the long phone call to change the flight plan. He left the cockpit and went down the aircraft only to verify the refuelling activity. The captain reported that no RWY change occurred, it was 08. He also reported that they (the crew) inserted the performance in the boxes: V1, V2, Flex, Flaps. The performance evaluation is made by iPad using the Flysmart app.
He also referred that sometime FMS could time-out, coming back to normal operations after few seconds. Therefore, the captain provided the ANSV with a hypothesis of FMS temporary malfunction, which may have deleted the V-Speeds while taking off.
The overall feeling reported by the captain was being in a bit stressed state, due to the long call to the dispatch to change the flight plan and the time pressure due to the imminent closure of the airport.
During the interview the captain described the actions during taxi and rolling take off as normal up to the point, at about 60 knots, he realised no flex was selected on the FMA. He referred he did not abort the take off because the airport was closing and he knew how to manage the take-off anyway. The rotation was slow, since he feared a tail strike. While taking off he remembered to have seen the SRS indication, but during the interview he also admitted to not being sure. He knew the rotation speed would have been 130/131 knots and he rotated. After few seconds he engaged the autopilot as usual, but it came to his head that he did not see the speeds. At the same time the speed of the aircraft was increasing very fast and so he asked flap zero. When checking the flap were actually zero, he also checked that the aircraft speed was still increasing and he wanted then to select the speed. At that time, he referred to the ANSV, he may have touched the sidestick. He also tried to regulate the thrust. He wasn't totally sure of the exact order of actions. However, he reported he did not receive any of the following alarms: "autopilot disconnect", "don't sink" and "sink rate". He did receive the "pull up" alarm, but only when he had already realized the descending trajectory and when he was already pulling up. In more detail he started to pull when he saw 370 ft on the radio altimeter. The captain suggested the warning computer could have been possibly in a not properly working condition.
About the physical feelings during the take off the captain reported that was unusual for him to take off in TOGA mode and the aircraft felt very light. Discussing the acceleration and the dark environment, the captain reported he couldn't say if he was disoriented or not. Nonetheless, he did not think he underwent spatial disorientation during the event.
At the time of the event the captain did not know what the consequence of taking off without SRS would be. About how to fly without V2 inserted, the captain said that he practiced on this point in 2005 and never after: he did not receive any recurrent training. On the other hand, in his opinion it was not a difficult task to manage the take off without V2 inserted. However, the captain wanted to clarify that after the FDM analysis in September he was told to admit in a statement he did not insert

the V2 in order to close the matter and continue flying. In the reality he was put in st by without flying.
About the role of PM, he reported not having heard any call for “no FMA”. He remembered the call for VR and alert for “pull up” when he was already pulling up while the alerting system was also annunciating pull up.

First officer statement released to the operator on the 26th September 2025.

« [omissis, mail header and salutation] Flight from CTA to AMM, captain PF and first officer PM. We were waiting for new OFP and during this time we briefed all the flight to AMM. We got ATC clearance and ATC inform us that airport will be closed in few minutes. We started our push back, two engines taxi everything under control. During taxi we got clearance for take off RWY 08. It was rolling take off captain put MAN FLEX first then I announce NO FMA then he put MAN TOGA. My second call was 100 knots then at this time we saw that we don't have V1 and V2 on PFD. Then I saw aircraft climbing good vertical speed.
WHY?
captain ask me what's V1 and VR and I told him 133 knots.
He started rotation at around 140 knots then I announce positive climb then he told me:"GEAR UP".
Then things started very fast AP1 was engaged by captain and confirmed by myself.
Then FMA show us +1900 ft/min so I was understanding that we are climbing but 2 seconds later I saw negative vertical speed then I told to captain to pull at the same time we got this alarm from Aircraft. I screamed two times:"PULL PULL", then "PULL UP TOGA".
I think to be honest after reviewing the FDM the speeds was [sic]not inserted in the FMS that's why we don't get V1 and V2 on the PFD.
Then after the take off even without V2 we should fly TOGA 15 degrees pitch to be in the safe side as per Airbus recommendation.
We lost A/P after take off but it was checked by the captain and confirmed as well by myself then it disappears without ECAM and single chime.
LESSON LEARNED
Always be SOP whatever happened even with captain doesn't want to follow their SOP.
To be assertive and active monitoring and don't hesitate to take over control to the captain even if he is well experienced in the line.
For any doubt check and crosscheck any time even if you are sure that's well done.
Follow strictly Standard Callout for any deviation and don't hesitate to scream in the cockpit to be hear.
To be aware that at anytime something can happen so to be ready anytime to apply [sic] Memory items and if it's not correctly apply to take over control even if the captain will not be happy at this time.
[omissis, signature and salutation] ».

First officer interview at the ANSV premises on the 21st January 2026.
The ANSV interview started discussing the first officer career. He started Aviation School in Montpellier Aviation Academy in September 2011. He completed the school in 2013. He was hired in Air Arabia in April 2019 and he completed the type rating in June 2019. His first flight on the

A320 was in August 2019. The Covid-19 pandemia hit severely in 2020, limiting the flight activity. Therefore, he started his line training in September 2020, completing at the end of January 2021. In his opinion the training activity provided by the operator was very good. In 2022 he was moved first to Nador, then in 2023 to Tangier and finally to Casablanca in February 2024. He didn't recall anything noticeable in his flight experience, up to the LICC event. The first officer, while discussing any organizational change before the event, reported that there has been a change of the head pilot. However, he had nothing but positive feelings about this. The possible no-blame policy was also discussed, highlighting his work position after the event: the operator kept him on ground. Before the event he was flying about 70/80 hours per month. He reporting having a good relationship with the OCC.

About the medical fitness at the day of the event, he felt in good shape. Nothing to highlight in this respect. The first officer confirmed a change on the 29th of August in his flight schedule, inserting the flight of the event. However, he did not mention this constituted an issue for him. The day of the event he signed in about 20' before of the reporting time. The PF for the first flight was the first officer, while the PF for Catania-Amman was the captain. The landing in LICC was for RWY 08. After landing the information about the closure of the airport at 22:00 was provided by the ATC. The closure of the airport was in his opinion a factor of pressure together with the idea of flying on a country in war (Israel).

The first officer reported that, even though the captain thought the flight plan needed a change for the Catania – Amman leg, they didn't change the flight plan before arriving in Catania because they expected to receive from the OCC an updated and correct flight plan at the Catania arrival. Once in Catania, since no update was received, the captain decided to deal with the flight plan issue He called the OCC at least 3 times. The calls to the OCC kept the captain busy for about 40'. In the meantime, the first officer proceeded with the walkaround inspection and refuelling, about 11 tons of fuel. The final fuel was additional 400/500 kg. Then the captain asked the first officer to prepare the MCDU, since he had to walk a little bit before the next flight. The RWY for take-off was checked with the tower, it was 08. The first officer stated he inserted and checked RWY 08 and the reference take-off speeds, previously calculated by the EFB app Flysmart. When the captain returned, he checked the MCDU and it was correct. The speed calculation was made and inserted. Everything was done correctly and they asked the push-back. The taxi for normal. It was a rolling take-off. When at 40/50 kt, the captain said "MAN FLEX". The first officer replied "NO FMA".

About the possibility of aborting the take-off when they realized of the no FMA was available, the first officer could not say what he would have done if it was his decision. The safest choice would have been to abort; on the other hand, if the captain felt he could fly the aircraft without inconvenience, nothing would have been against, providing he could actually manage the situation.

However, after they realized no FMA was available, the captain said, "TOGA continue". He requested "speed speed speed". The first officer called 100 kt. The rotation was done at 140 kt. After the take-off anything seemed normal. There was positive climb then the landing gear was retracted. The autopilot was engaged by the captain. The speed was increasing very fast. He did not select the speed, he screamed "flap flap flap" to request flap retraction. The first officer reported he did not recall any aural signal about the autopilot disconnection, as it would be usually expected. He then saw on the FMA the brown area and -2000ft/min. At that time, he listened the aural warning "pull up" and at the same time the captain saying, "pull up pull up pull up". The first officer reported the "pull up" aural warning was the only received: no "sink rate", no "don't sink". Then, when in cruise,

they checked the aircraft to understand what happened. The captain printed the PFR They saw a fault in FADEC2 and that the autopilot disconnected. He also stated that, apparently, in the flight before their first flight of the day, the captain of that flight reported "the computer one was dead too".
While reconstructing the sequence of events, the ANSV investigation team showed data from FDR and commented them. The first officer reported that in his memories the AP was engaged before in time and not while the aircraft was on a descending trajectory. In more detail, after lift-off the first officer recalled the gear up call quickly followed by AP engagement. Then, when the captain saw the speed increasing very fast, he asked to retract the flap. At that point the first officer saw the negative attitude of the aircraft. In his mind it was a very fast sequence of events, estimated in 8 seconds. In his opinion the behaviour of the FD was not helping in that situation and possibly misleading. In his opinion it shouldn't be an issue taking off without the V2. However, the relevant procedure is not a memory item, therefore in his opinion would have been safer to revert to *unreliable speed* procedure.
For the first officer it was not the first time he took-off without passengers, it occurred before during the COVID period in 2021. Nonetheless, he also reported that he never take-off during normal operations without SRS.
About the dark environment, the first officer reported he was mainly concentrated on the instruments, therefore he didn't feel spatial disorientation could play a role on him in that situation. On the other hand, he could not exclude the darkness and high acceleration of the aircraft could affect the captain that was flying looking outside. After the event the crew did some check to understand what happened. They could not explain what happened and they supposed some faults in the system.

Simulator session

A simulator session was done in presence of the BEA. The simulator was configured as an A320 equipped with CFM56-5B engines. The FMS installed was first the one installed on the aircraft at time of event.

Runway change

The flight plans (original and revised) indicated RWY 26 would have been used. In the reality take off took place for RWY 08. This occurrence was simulated to assess the possible impact on the data entered in the MCDU. If the RWY is changed while V1, VR and V2 have already been inserted in the MCDU, then V1, VR and V2 are deleted and the relevant fields revert to amber boxes. The FMS issues a first message on the MCDU scratchpad: "CHECK TAKE OFF DATA" (Picture 5).

The previously entered values are recalled on the right of the amber boxes. A prompt is displayed "CONFIRM TAKE-OFF DATA" to permit to re-renter the 3 values at once. But without pilot action they remain invalid (field blanked).

Insertion of wrong take-off speeds format or insertion of inconsistency between take-off speeds

Some possible insertion mistakes were simulated. If a speed value is in an incorrect format, (for example, a value of excessively low VR, such as for example, 14 kt, the message FORMAT ERROR immediately displayed on the MCDU and the value (14 kt in the example) is not taken into account by the system. On the other hand, if V speeds inserted are not consistent among them (for example VR<V1), then a message V1/VR/V2 DISAGREE followed by a message T.O. SPEEDS TOO LOW would appear.

Event sequence replay

The event was replayed with no take-off speeds inserted; with the take-off sequence performed during the event (ex. rotation performed at 140kt, gears retraction at 164kt, nose-down input at 380ft, etc.). However, due to the dynamics of the events, it was not possible to exactly match the resulting altitude and speeds experienced during the event. The main results are summarized below. In Figure 4 and Figure 5 the sequence of the events as reconstructed at the simulator.



Picture 5: RWY change effect on the take-off speeds inserted in the MCDU.

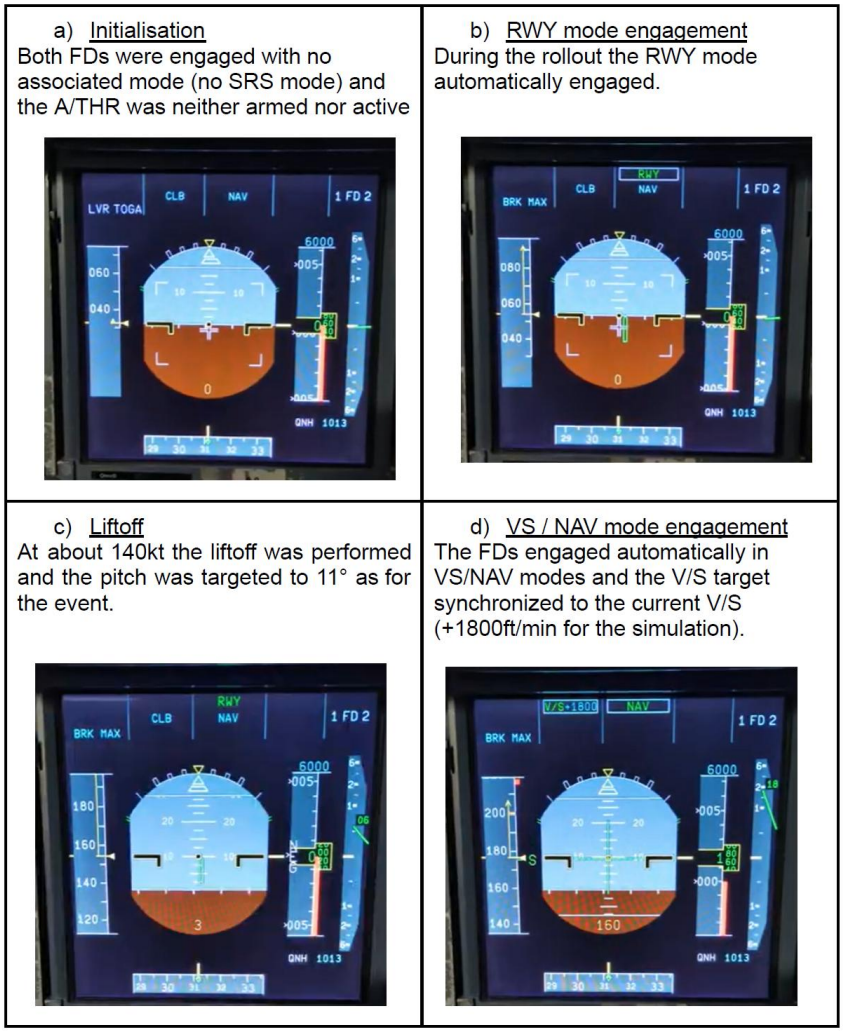


Figure 4: event sequence replay - a) initialization; b) RWY mode engagement; 3) liftoff; 4) VS/NAV mode engagement (source Airbus).

e) Pitch down order

Approaching 400ft RA, a pitch down was ordered. The V/S became negative.



f) Autopilot engagement

Autopilot 1 was engaged. As the FDs were already engaged in VS/NAV modes, the AP1 engaged on the same modes and synchronised to the current V/S (-1000ft/min for the simulation).
The difference between the V/S target displayed on FMA (-1000ft/min) and the displayed vertical speed (-3300ft/min), is due to the computation delay and the dynamic of the event.



g) Recovery

Further to the GPWS alerts, a side-stick nose-up input was applied. AP1 disconnected, FDs stayed engaged in VS/NAV modes.



Comment:

During the simulation, the GPWS alerts SINK RATE and PULL UP were triggered, but not the message DON'T SINK.
It is explained by the dynamic of the event and the way the GPWS envelope's modes was activated.

Figure 5: event sequence replay – e) pitch down order; f) autopilot engagement; g) recovery (source Airbus).

Somatogravic illusion[7]

Based on the FDR data is possible to estimate the perceived attitude of the aircraft by the crew[8].
The following hypothesis were considered for the computation:

- Start of the computation at time of lift-off
- Initialization of the outputs using the FDR recorded attitudes PITCH, ROLL, HEADING
- Acceleration at pilot position was estimated from FDR recorded accelerations (measured at centre of gravity) and assumed distances between the center of gravity and the captain seat position
- Longitudinal distance from CG = 12.64 + 5.07/2 = 15.18 m (see Figure 1). Hypothesis is that the seat is half way in the 5.07 m distance between radome and nose wheel landing gear
- Lateral distance from CG = 1.5 m. Hypothesis that the seat is offset by 1 m from the centre line of the aircraft. The width of the fuselage is 3.95 m.
- Vertical distance from CG = 2.5 m. the windshield is 4.56 m above ground, from the floor of the wheels. Centre of gravity is located around the belly of the aircraft, on top of the wheel.

Through this computation, it has been evaluated that:

- ✓ the pitch angle values that could have been perceived by the captain were around 20° during the initial climb, from 21:56:47 to 21:57:01. During this time period, the Captain reduced his efforts to pitch up (neutral position) and then increased efforts to pitch down;
- ✓ while the recorded pitch angle started to decrease, as the altitude decreased from 21:57:01 to 21: 57:12, the pitch angle that could have been perceived by the captain increased and stayed above 20°. Most of the side stick orders were to pitch down;
- ✓ from 21:57:12, the difference between the potential perceived pitch and the recorded pitch decreased. Side stick orders increased to pitch up. The event occurred during night, which most probably did not allow the crew to acquire visual reference.

Indeed, the somatogravic illusion is also known as the dark night take-off illusion, the pitch-up illusion and the inversion illusion. At the heart of this illusion is a strong sensation of pitching up during aircraft acceleration, as would be experienced during take-off. The illusion generally occurs in conditions of poor visual cues, such as night operations or instrument meteorological conditions (IMC). During a take-off in such conditions, the vestibular system (in particular, the otolith organs) will accurately register the linear acceleration involved in the take-off process. However, in the absence of visual information that would confirm the actual flight path of the aircraft, the brain instead assumes that the linear acceleration is in fact a pitch up event. The unwitting pilot then pushes forward on the control column, in order to cancel out the sensation of too much pitch up, and to achieve a feeling of normal pitch. This manoeuvre then results in a pitching down of the aircraft, and since this illusion generally occurs during a low altitude setting with take-off, the inherent risk is that the aircraft is flown into the ground. Such an illusion of strong pitch-up during a take-off at night is potentially very dangerous and has resulted in several accidents over the years.

[7] An overview of spatial disorientation as a factor in aviation accidents and incidents – ATSB.
[8] Following the scientific research of Daniel Merfeld from 2001, the BEA developed the Perceived Orientation Estimation Model based on the FDR data applied in this safety investigation.

On this topic, the manufacturer also promoted safety by means of the journal Safety First[9]. In more detail Figure 6 provide with a clear explanation of a somatogravic illusion.

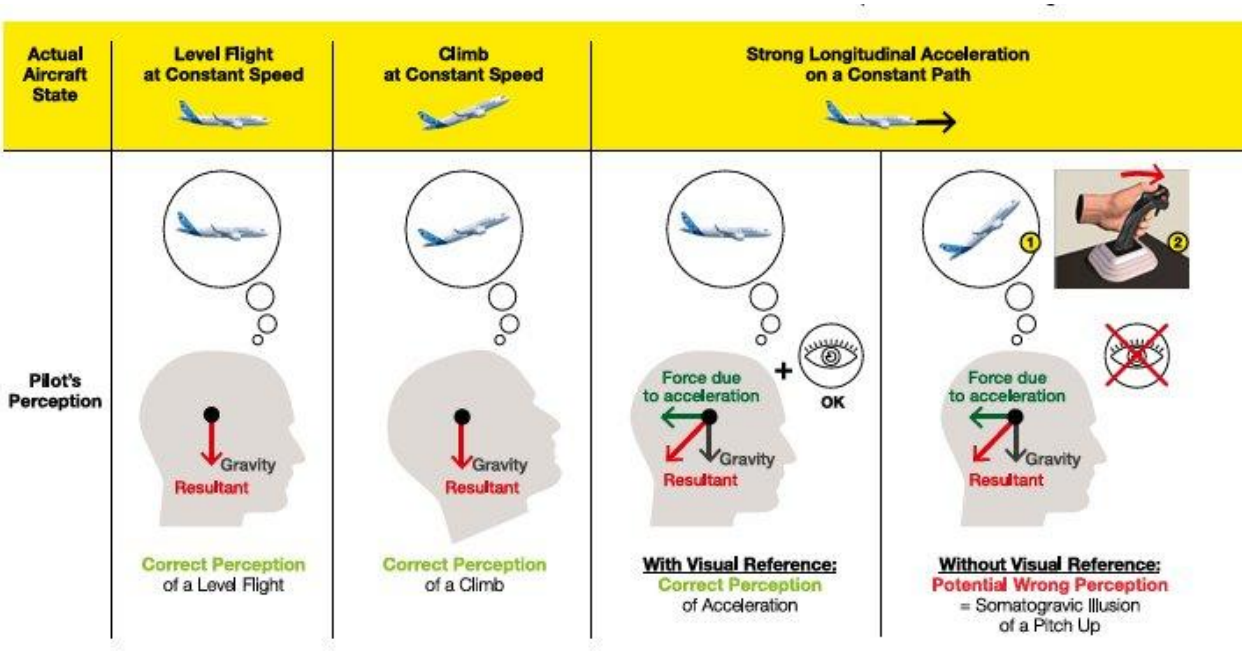


Figure 6: explanation of a somatogravic illusion (source: Airbus).

Safety Actions

Operator's safety actions after the event

Among several safety initiatives taken by the operator in the aftermath of the event, the following are considered of high relevance:

- the complete implementation of FMS2 release 2 software operational program has been expedited for the whole A320 fleet;
- CRM/LOFT scenario in simulator sessions were integrated with a focus on early recognition and intervention for "take-off with no speeds inserted" events.

Manufacturer's safety actions after the event

Differently to what was referred in the FCOM, the RWY mode engagement is not linked to V2 as previously mentioned in the FCOM. The FCOM has been updated accordingly with the release of May 2026.

Erroneous take-off parameters[10]

Incidents and accidents involving large aeroplanes used in commercial air transport have occurred in the past years as a result of:

[9] Safety First article on Go Around and somatogravic illusion n.23 January 2017.

[10] Main reference for this sections s the ANSV final report relevant to the accident of the Boeing B777-300ER, registration marks PT-MUG, Milan Malpensa "Silvio Berlusconi" Airport, 9th of July 2024. https://ansv.it/wp-content/uploads/2026/02/Relazione-PT-MUG-1.pdf

- the use of erroneous take-off performance parameters due to either errors made during the performance parameters calculation or errors made during the entry in the aeroplane flight management system (FMS) of correctly calculated performance parameters. The following errors appear to be the most common ones:
  - wrong weight values used, from various causes such as: use of a wrong zero fuel weight (ZFW) value for take-off weight (TOW) calculation, use of ZFW value or other value (e.g. empty weight (EW)) instead of TOW, use of previous flight TOW, various errors made when using the electronic flight bags (EFBs), typing errors when entering weight values in the FMS, and errors in the load sheet provided to the flight crew;
  - wrong available runway length used, e.g. not taking into account a notice to airmen (NOTAM) (maintenance work), use of wrong runway chart, error made during re-calculation after a runway change;
  - wrong assumed temperature used for thrust reduction calculation;
  - wrong thrust selection in the FMS (e.g. fix derate);
  - **wrong reference speeds entered in the FMS (calculation or typing errors) or no speeds entered;**
  - wrong pitch trim setting due to erroneous determination of the centre of gravity (CG) (e.g. in the load sheet) or due to changes in the actual passenger distribution compared to load sheet assumptions; and
- errors in the positioning of the aeroplane for initiation of the take-off: e.g. take-off from a runway position providing a length shorter than that assumed for the take-off performance parameters calculation (i.e. wrong runway, wrong runway intersection), take-off from a wrong runway or from a taxiway.

As a result, several investigations were conducted by different SIAs and several safety recommendations were issued to address the problem.

In view of this and considering that the technology for onboard detection and warning systems is now mature (in some cases already certified), EASA launched the ToR RMT.0741[11] regulatory initiative in 2023, which led to NPA 2025-01 in 2025[12].

This proposal includes amendments to the certification specifications (CS-25), additional airworthiness requirements (Part 26 of Regulation (EU) 2015/640), and guidance material (CS-26). In summary, it provides for:

- For new large aircraft designs (new CS-25 type certifications), the requirement to equip a Take-Off Performance Monitoring System (TOPMS) with functions:
  - F1 – verification and alerting of errors in take-off performance parameters;
  - F2 – verification and alerting of errors in the position and orientation of the aircraft at the moment of take-off;

[11] Within EASA, a "Term of Reference" (ToR) for a rulemaking activity is a document that defines the purpose, objectives, scope, and responsibilities of a working group or committee tasked with developing new regulations or amending existing ones. Essentially, the ToR provides clear and detailed guidance on what needs to be done and how, ensuring that the rulemaking process proceeds efficiently and consistently. In particular, ToR RMT.0741 can be consulted at the following link: https://www.easa.europa.eu/en/document-library/terms-of-reference-and-rulemaking-group-compositions/tor-rmt0741.

[12] An NPA, or "Notice of Proposed Amendment," is a proposal to amend or update a regulation or technical specification by EASA (European Aviation Safety Agency). It is a document that is published to inform industry, stakeholders, and the general public of a proposed change to aviation safety regulations or certification specifications.

    - F3 – real-time monitoring of performance during take-off (required only for so-called “large transport aeroplanes”).
- For aircraft already certified but still in production, intended for commercial air transport, the compliance obligation will apply to those with airworthiness certificates issued after a cut-off date, expected to be six years after the entry into force of the amended regulation (assuming that the RMT ends in 2027, approximately from 2033).

These measures aim to standardize protection against take-off errors in the fleet of large aircraft, imposing requirements proportionate to the risk and encouraging the adoption of technologies already available on the market.
NPA 2025-01 does not provide for mandatory retrofits for aircraft already in service (i.e., those that have already received their airworthiness certificate before the established date).
In fact:

- The requirement to install TOPMS would apply only to large aircraft (CS-25) that:
    - receive new type certifications after the amendment to CS-25 enters into force; or
    - receive their first individual airworthiness certificate starting from 6 years after the entry into force of the amendment to Regulation (EU) 2015/640 (i.e., approximately from 2033).

During consultations with manufacturers, EASA rejected the retrofit option for the following reasons:

- high cost and technical complexity of adapting existing systems;
- lack of standardization in onboard avionics systems;
- opinion shared by many stakeholders (Airbus, Boeing, Embraer, ATR, Dassault, De Havilland, etc.) that a generalized retrofit would not be justifiable in terms of cost/benefit ratio.

However, some manufacturers (e.g., Airbus) offer optional retrofits on a voluntary basis for certain types of aircraft that are already certified, responding to demand from operators interested in improving the safety levels of their fleets.
In this framework and with specific reference to the CN-NML event, for the whole A320 fleet across the different operators, the latest figures available regarding the FMS standard is the following:

- FMS Release 2 (that allows to upgrade the TOS1 function, with an additional message TO SPEEDS NOT INSERTED displayed on ECAM): 53.1% of the fleet;
- FMS Release 1A (such as the configuration of the CN-NML at the time of the event): 45.3% of the fleet;
- others: 1.6% unknown.

Analysis

Conduct of the flight

The day of the event the CN-NML departed with some delay from Casablanca due to late arrival of the aircraft. This led to late arrival in Catania at 20:51 landing for RWY 08. At the time of the event it was in force a night closure of the airport starting from 22:00 (NOTAM B41725). Therefore, the turnaround time was about 53', considered enough for the refuelling activity and change of the flight plan. This was due mainly to the destination alternate, originally Palermo airport, not really suitable for a flight to Amman in Jordan. The captain explained he expected the dispatch office to realize autonomously the need for change and to find the flight plan already corrected in CTA. This did not happen, adding the activity of changing the flight plan during the turnaround. The revised OFP released at 21:27 and based on the captain statement it required a big effort beside about 35' minutes of phone calls. The revised OFP still reported like the previous departure RWY 26, while the crew declared to be aware the RWY for take-off would have been 08. The captain reported also that the above situation of short time and need for change on the flight plan, created a little stress a sense of urgency. This was increased also from the ATC reminders while departing about the imminent closure of the airport.

The crew reported the calculated take off characteristic speeds were correctly calculated on the iPad by the Flysmart EFB application and inserted into the MCDU by the first officer and revised by the captain. Based on the statements, during the rolling take-off, the crew realized that the SRS and auto-thrust indications on the FMA were not available. This situation would be not compatible with correct insertion of the take-off speeds in the MCDU. At that time, the speed was about 60 kt for the captain, slightly less in the first officer opinion, however well below V1, calculated as 131 kt. Therefore, the abort of take-off could be an option. Nonetheless, in the captain opinion, the task to manage the take off without V2 inserted was not difficult in addition to the fact that the airport was closing. This led to continue the take-off. Compared to the previous take off, the aircraft was relatively light, and the TOGA mode was used instead of the FLEX mode, leading to a higher acceleration. From the FDR, at 21:56:49 the aircraft lifted off at CAS 157 kt and pitch +7° at rotation, then the pitch increased to 11°. The FCOM prescribes 15° pitch up attitude in initial climb.

At 21:56:54 RA 91 ft, 5 secs after lift-off, FD engaged in vertical mode "V/S" (target V/S +1900 fpm) while the current V/S was +1968 fpm. AP was not engaged.

At 21:57:06, at 383 ft (RA), while CAS was 211 kt, V/S -1200 fpm, and pitch 0° (aircraft started descending), pitch down commands is observed from captain sidestick. Although during the interview the captain did not report he felt spatially disoriented, the situation was highly prone to induce spatial disorientation due to the high acceleration associated with lack of visual reference (take-off in a dark night having the sea in front). Indeed, in this instance the captain remembered to have started giving pitch up inputs, while the recorded data show the opposite.

At 21:57:08, at 348 ft (RA), AP1 engaged (for only 3 seconds) in NAV / V/S. The vertical speed target changed to "V/S -1900", CAS was 222 kt, V/S -2064 fpm, aircraft pitch -2.1°. During the timeframe the AP1 was engaged, sidestick movements to pitch down from captain side were recorded.

At 21:57:09, at 328 ft (RA), V/S -2320 fpm. At CAS 230 kt, thrust reduction started from TOGA to 16° (position between "climb" and "idle" detent) in one second.

At 21:57:10, at 288 ft (RA), a first TAWS mode 1 parameter of "Sink Rate" triggered for 2 seconds, V/S -2480 fpm, pitch -3.2°.

At 21:57:11 AP1 disengaged, flaps actual position reached 0° (fully retracted), slats were still retracting, CAS 239 kt, (the VFE is 230 kt), V/S -2784 fpm, FD target V/S -1920 ft/min, RA 209 ft.
At 21:57:12, a second mode 1 TAWS alert of "Pull Up, Pull Up" warning triggered for 5 seconds.
In the 3 seconds the AP was engaged the aircraft lost about 140 ft of height.
Both the crew members remembered at that time the speed was increasing very fast, reasonably due to the lightness of the aircraft. This possibly explain the late retraction input for flaps and slats.
At 21:57:13, at 162 ft (RA), TOGA was applied while CAS was 243 kt, V/S -2416 fpm, pitch -3.2°, and pitch up command was observed from captain sidestick (full deflection).
The crew reported having received a pull up aural messages almost at the same they realized they were descending toward the sea, and the recovery input was given.
At 21:57:17, at 55 ft (RA), a third TAWS of "Don't Sink" mode 3 parameter triggered for 4 seconds, while CAS was 268 kt, V/S -544 fpm, pitch 0.7° and momentary pitch down followed by pitch up command observed from captain sidestick.
At 21:57:19 the minimum height of 41 ft (RA) was achieved while the attitude of the aircraft was already positive with pitch 3.8° and pitch up command was observed from captain sidestick of 8.6°.
The aircraft started to climb and at 21:57:51 the AP1 was engaged.
In the subsequent flight the crew discussed what possibly happened. The flight proceeded without further inconvenience to the Amman airport.

Technical factor
During the investigation the CVR was successfully downloaded. However, the audio tracks were relevant the maintenance activities held after the event, since the relevant part had already been overwritten. The PFR are related times compatible with the interruptions of power related to the normal stop of functioning after the termination of the flights. In addition, in the FDR data there were no indication of CVR faults. During the interview the captain stated he forgot to pull the relevant circuit breaker, confirming the functionality of the CVR, excluding at the same time any possibility of recovering the relevant content that went overwritten by the length itself of the flight to Amman.
It is worth to mention that the operator's procedure in relation to the CVR de-activation from the crew after an event, specifies: *if so requested by the authority*. This could not be done in time due to the fact the flight after the event lasted enough to overwrite the event itself.
During the interview, both the crew member commented the efficiency of the aircraft. In this framework, the captain provided the ANSV with a hypothesis of FMS temporary malfunction, which may have deleted the V-Speeds while taking off. The PFR show at 21.57 an entry related to the AP. However, this is consequence of the disconnection occurred during the event.
In order to explore the possibility a review of the CN-NML aircraft defect history associated with the installed MCDU, FMS, and TAWS systems were reviewed, covering the period from January to October 2025. No anomalies, recurring defects, or recorded discrepancies emerged.
Furthermore, in November 2025 the A320 fleet was involvement in a retrofit of the ELAC avionic system following EASA AD 2025-0268-E / Airbus AOT A27N022-25. This retrofit was not applicable on the CN-NML. Despite the alleged connection by the media with the CN-NML event, the evidence collected during the investigation lead to consider the abovementioned AD has no link with the SINCID discussed in this report.

About the first AP engagement after take-off , at 21:56:54, 5 secs after lift-off, FD vertical mode was in “V/S” (target V/S +1900 fpm) while at 21:57:08, AP1 was engaged and the vertical speed target changed to "V/S -1900".
Indeed, during the timeframe the AP1 was engaged, the aircraft was already on a descending path and sidestick movements from captain side were recorded.
However, the FCTM recommended practice for autopilot engagement states: *before engaging the autopilot, the flight crew should:*

- *fly the aircraft on the intended path;*
- *check on the FMA that the FD (FD) is engaged with the appropriate modes for the intended flight path. If, not, set the FD on, and the appropriate guidance mode(s) as required;*
- *center the FD bars with the aircraft symbol on the PFD.*

Therefore, these recommendations were not followed and, as a result, the autopilot synchronised on the path ordered by the pilot, with a negative V/S (-1900 ft/m) instead.
The simulator session and an in-depth review of the system logic with the manufacturer showed that this behaviour of the aircraft is the expected one.
The aural alerting system was also analysed. In more detail, the crew reported not having received alerts from the TAWS except the *pull up* call while they were about to realize or just realized the need to recover the attitude.
The FDR and T3CAS data showed a first TAWS mode 1 parameter of “Sink Rate” activation at 21:57:10 triggered for 2 seconds and at 21:57:12, a second mode 1 TAWS alert of “Pull Up, Pull Up” warning triggered for 5 seconds.
At 21:57:13, at 162 ft (RA), TOGA was applied and pitch up command was observed from captain sidestick (full deflection).
At 21:57:17, at 55 ft (RA), a third TAWS of “Don’t Sink” mode 3 parameter triggered for 4 seconds.
The AC 25.1322-1 provisions about multiple alerts provide indication how to deal with almost simultaneous need for alerting the crew of different priorities risks. This would lead to avoid truncation of higher priority alarms. In this framework, the simulator session confirmed that due to the fast sequence of different aircraft states in the event, the last *don’t’ sink* alert, although recorded in the FDR and T3CAS, may have not been produced acoustically. The lack of CVR recordings makes difficult to make further analysis on this aspect, thus including also the alleged not perceived sound of the AP deactivation by the crew. On the other hand, the data from FDR, GPWS and the simulator session provided sufficient evidence alerting system entered in function in advance to the imminent danger, as expected. Indeed, the PF commanded TOGA and full pitch up deflection slightly after (estimated within 3 seconds) the *sink rate* activation and immediately after the *pull up* activation (estimated one second).

Human factor
The crew was properly licensed and trained for the flight of the day. Their medical certificate was valid and both had adequate rest before taking duty on the day of the event.
The crew duly described the day of the event and they reported a certain degree of stress in LICC due to the long call to the dispatch to change the flight plan and the time pressure due to the imminent closure of the airport. However, also considering the late arrival of the aircraft, it is worth to mention the flight plan could have changed in advance or later on in flight to Amman. However, they both reported to the ANSV having completed in LICC all the necessary pre-flight activities, including the

V-speeds calculation using the EFB and MCDU preparation, inserting these V-speeds in it by the first officer and verification by the captain. Because the MCDU entries are not recorded, the investigation could not confirm the manual actions from the crew. Both crew member reported no change in the RWY: beside what was reported in the flight plan (RWY 26), they landed for RWY 08 and they were aware the RWY in use was 08.
The subsequent description of the event, together with the FDR data, are coherent with the behaviour of the aircraft for which no V-speeds were inserted prior to take-off. The lack of any evidence of malfunction in the FMS led the investigation to consider the possibility the crew did not actually inserted the V-speeds in the MCDU. The pressure felt both by the captain and the first officer may have contributed to the omission of this important step of pre-flight activities.
Nonetheless, the crew realized the anomaly when still at low speed about 60 kt, having the possibility to abort the take-off. However, the captain decided to continue the take-off evaluating himself able to manage the situation. The awareness about aborting the take-off would have resulted in postponing the departure to the day-after due to the imminent closure of the airport could have played a role in the decision to continue in that unusual configuration.
During the take-off the longitudinal acceleration was higher than usual, reasonably due to the fact it was a positioning flight with no passengers and, therefore, relatively light. The physical reaction to linear acceleration in lack of visual reference may explain in this phase the attitude at the rotation, lower than expected. Indeed, the visual clues in front of the crew were lessening while moving closer to the sea. In this framework, when in-flight, the FDR data show pitch down inputs, leading to a slightly descending trajectory. Based on the evidence available and on the estimated of the perceived attitude this can reasonably relate to a somatogravic illusion that may have affected the capability of the PF of properly sense the attitude of the aircraft. The crew did not report to have experienced any sense of disorientation; however, it seems reasonable the effect of the somatogravic illusion to be subtle enough to not being recognized. In these moments, the PF gave order to pitch down with its sidestick and engaged the AP, leading the aircraft to point downward, losing about 140 ft in 3 seconds up to the disengagement. Following the specific recommendations in the FCOM/FCTM would have avoided this altitude loss. Nevertheless, just instants before the sea surface, also alerted by the *pull up* GPWS warning, the crew was able to realize the negative attitude and recover the aircraft. On this topic, the effectiveness of the alerting system before the recovery manoeuvre is discussed in the technical factor paragraph. However, from the human factor perspective, the potential missed recognition by the crew of the first *sink rate* alert was potentially due to the fact this Caution was played while their attention was fully channelized in managing the unusual acceleration (fast increase of the speed reported by both the crew members) and retracting the flaps within the VFE. The VFE was exceeded for the slats, indeed at 21:57:11 flaps were fully retracted, but slats were still retracting while the CAS was 234 kt.
The lack of CVR recording impedes a deep analysis on the CRM of the crew during the event. Nonetheless, the correct application of the CRM concepts would expect the PM acting with adequate assertiveness. The fact the take-off was not aborted, the pitch up command during initial climb was lower than expected by procedure, the VFE was not respected, and the attitude was recovered just in time, leads to consider, beside the discussion about the decisions and actions by the PF, also the possibility of a lack of assertiveness by the PM.

Environmental factor

The METAR applicable at the time of the serious incident in LICC were consistent with a CAVOK condition. On the other hand, the low visibility of the Moon made the visual environment basically a dark night with poor visual cues. This situation created a necessary pre-condition for a somatogravic illusion that is considered an active contribution for the event to occur.

Organizational factor

The crew reported a different organizational climate occurred in the last times due to the new Chief pilot. However, while the first officer discussed this change positively the captain reported the new management to be stricter. However, there is no evidence this may have actively affected the flight of the event. An issue related to the payment of the first officer, but it was reported to be settled directly by the captain before the first flight of the day. Also, in this case this possible organizational issue does not seem to actively contribute to the event.

On the other hand, the probable missed insertion of the V-speeds into the MCDU may have actively contributed to the occurrence of the event. At the same level, it is most likely that no adequate oversight and control of this activity was performed. Therefore, the operator's procedures were not properly applied. The reason for that may be found in the feeling of pressure felt by the crew due to the time critical activities managed in Catania in order to take-off before the night closure of the airport. In more detail, there has been an effort from the captain to change the flight plan, that was not properly issued by the operator's dispatch office. Therefore, since this aspect induced higher workload for the crew during the turnaround time, some possible improvements of organization may be foreseen in the flight planning procedures.

On the topic of the erroneous take-off parameters, this event is one of the many in which this issue manifested. In the recent years a big effort was made by EASA to analyse the situation, leading to ToR RMT.0741 and NPA 2025-01. While the issue may be relatively rare in comparison to the large number of commercial flights, it may have an extremely severe consequence. Nonetheless, any hard barrier funded in making mandatory retrofit of the on-board systems of the actual planes in use to avoid the erroneous take off parameters selection (or even completely missing parameters) was basically postponed to future generations of aircraft. This was motivated by cost-effectiveness analysis and technical complexity of the implementation. However, some manufacturers offer optional retrofits on a voluntary basis for certain types of aircraft that are already certified, responding to demand from operators interested in improving the safety levels of their fleets. This is the case for Airbus, in particular for the possible error in the insertion of the V-speeds in the MCDU. Indeed, slightly more than 50% of the whole A320 fleet across the different operators are modified to embody the modification FMS2 release 2 software operational program modification. When this is applied, in case the take-off speeds are not inserted, caution message "TO speeds not inserted" will be displayed on the ECAM at the first engine start when the flight crew presses the T.O CONFIG push button, or the engines are set to take-off power and inhibited above 80 kt.

The CN-NML at the time of the event did not have the modification fitted, lessening the possibility of stopping the human error in this specific framework. As a safety action the operator after the event expedited the modification of its fleet. In addition, the operator also arranged specific CRM/LOFT scenario in simulator sessions a focus on early recognition and intervention for "take-off with no speeds inserted" events.

Cause

Based on the evidence collected, the cause of the serious incident is related to a temporary loss of situational awareness.

The following factors most likely contributed the event to occur:

- a flight plan not completely correct, prepared from the operator's dispatch office. In this instance, although the captain could ask to correct before the departure from Casablanca, the missing self-correction from the dispatch office itself induced the captain to spend a significant quantity of time to change the flight plan during the stop in Catania;
- the perceived pressure by the crew before the take-off from LICC, due to the imminent night closure of the airport;
- the missed application of the operator's procedures relevant to the insertion and verification of the V-speeds;
- the aircraft software version not capable of providing a warning relevant to the missing V-speeds, in contrast to the upgraded version that would provide such alert;
- the overconfidence of the PF in deciding to take-off even when the crew realized no V-speeds were available;
- the lack of assertiveness by the PM during the execution of the take-off and subsequent phase of the event;
- a somatogravic illusion induced by high acceleration and lack of visual reference that may have affected the capability of the PF of properly sense the attitude of the aircraft.

Safety recommendations

Based on the gathered evidence, the ANSV deems as necessary to issue the following safety recommendations.

RECOMMENDATION ANSV 13/238-25/1/SI/26

Type of safety recommendation: -

Rationale: the erroneous take off parameter is a safety issue well known in commercial aviation. It impacts in different ways several fleet. Indeed, the NPA 2025-01 deeply discuss the overall matter concluding the future aircraft generation will embody systems able to increase safety on the commercial aviation aircraft, covering the potential problems that may arise in the preparation made by the crew of the take-off configuration, thus mitigating the possible human factor in this framework. On the other hand, retrofits to provide increased safety on the aircraft nowadays in use has been considered not cost-effective.

While the general criteria for this decision may be agreeable, also considering some implementation that may be particularly complex or costly, the same analysis on some specific cases may be reconsidered. In more detail, the missed insertion of V-speeds in the MCDU were recognized to be an active contributing factor in the SINCID of the A320 CN-NML. This occurrence supports the initiative of the manufacturer to provide the modification of the FMS software for A320 family that, in the release 2, provide clear alert to the crew of missing V-speeds.

The recognition of the issue by the aviation stakeholders (operators, manufacturers, Civil Aviation Authorities, Safety Investigation Authorities), together with the already in place availability of a modification, lead to believe this kind of feature should be mandatory across the A320 family fleet.

Addressee: EASA.

Text: the serious incident occurred to the CN-NML, in which the missed insertion of V-speeds in the MCDU were recognized to be an active contributing factor, demonstrates the possibility of increasing safety in a framework in which a possible solution has been already made available by the manufacturer. Therefore, the ANSV recommends considering the embodiment across the all A320 family fleet of the modification FMS software release 2, capable of alerting the crew of the possible incorrect/missed insertion of the V-speeds.