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Safety Investigation Report

Ref. AAIU-2020-11-26-02
Issue date: 26 November 2025
Status: Final

Scope: Limited

As per ICAO Annex 13 and EU regulation EU 996/2010, decisions regarding whether to conduct a civil aviation safety investigation, and the extent of an investigation, are based on many factors, including the level of safety benefit expected to be drawn from such an investigation.
For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.

SYNOPSYS

Occurrence class	Serious Incident
Occurrence category	Abrupt maneuver (AMAN)
Date and time[1]	Thursday 26 November 2020 17:13 UTC
Location	Airport of Brussels (ICAO code: EBBR)
Aircraft	Airbus A300 B4-622R
Aircraft category	Fixed wing - Large aeroplane (MTOW > 5700 kg)
Location of departure	Airport of Brussels (ICAO code: EBBR)
Planned destination	Airport of Vitoria, Spain (ICAO code: LEVT)
Type of operation	Commercial Air Transport - International - Cargo
Phase of flight	Takeoff
Injuries	None
Aircraft damage	Minor

What happened

At take-off on Runway 25R (RWY 25R) of Brussels Airport (EBBR), at rotation, the captain (CPT) sensed an anomaly; the aircraft would not lift off. Subsequently, he decided to abort the take-off. The airspeed of the aircraft at this moment was above the calculated V_1 speed.

[1] All time data in this report are indicated in UTC, unless otherwise specified

1. THE OCCURRENCE

The airplane arrived in EBBR on Wednesday 25 November 2020, and was scheduled for a flight to the airport of Vitoria in Spain (ICAO: LEVT) on the same day. Due to a technical problem, the flight was cancelled for the necessary repairs to be performed. A new flight was planned for the day after, 26 November.

During the night, after troubleshooting, the maintenance replaced several components, including the Flight Warning Computer #1 (FWC1) and a proximity sensor and performed a take-off configuration warning test. During these works, the trim wheel was moved and was no longer in the position left by the crew; the trim wheel position was changed from 0.7 degrees nose-up to 1.1 degrees nose-down.

The flight BCS841 was a cargo flight. The crew, upon arrival, prepared the aircraft for the flight. The technical log informed them that the engine N°2 Thrust Reverser was inoperative.
The crew determined the engine and aircraft settings and contacted Air Traffic Control (ATC) for the departure and requested the full length of RWY 25R before taxiing to the take-off position.

The following has been reconstructed with the help of radar and flight data recordings:

The aircraft was aligned on RWY 25R via taxiway W41, with an available take-off distance of circa 3545 m (out of the 3638 m Take Off Distance Available (TODA).
The aircraft was cleared for take-off at 17:12:23.

During the take-off run, the First Officer (FO), who acted as Pilot Monitoring (PM), called out "100" at 17:13:01. The aircraft had travelled 515 m and was at 3030 m from the runway end.

The FO called out "V_1" at 17:13:13, immediately followed by "Rotate". At the V_1 callout, the aircraft had travelled 1287 m from the start and was at 2258 m from the runway end. At the "Rotate" callout, the aircraft had travelled 1409 m from the start and was at 2136 m from the runway end.

At 17:13:21, the CPT, who was Pilot Flying (PF), called out "Stop" and initiated the rejected take-off actions. The Digital Flight Data Recorder (DFDR) showed a calibrated airspeed of 178 knots (kt). The aircraft at the time was 1714 m from the runway end. Traces of braking start at 1568 m from the RWY 25R end.

The aircraft came to a stop at 17:13:45 with the nose of the aircraft standing at 624 m from the runway end. The aircrew announced "Aborted take-off" via the radio. When asked for the reason, they reported "Engine surge and unable to rotate".

Initially, ATC instructed to vacate via Bravo 10 and hold on Outer 1 for a check by the fire department. After the aircraft taxied for about 150 m further down the runway, ATC revised its initial instruction and instructed to hold at that position.
The fire brigade observed that the wheels and brakes of the main landing gear were extremely hot (which was confirmed by the crew stating that the ECAM[2] indicated 700 °C), and that all tyres were blown off.

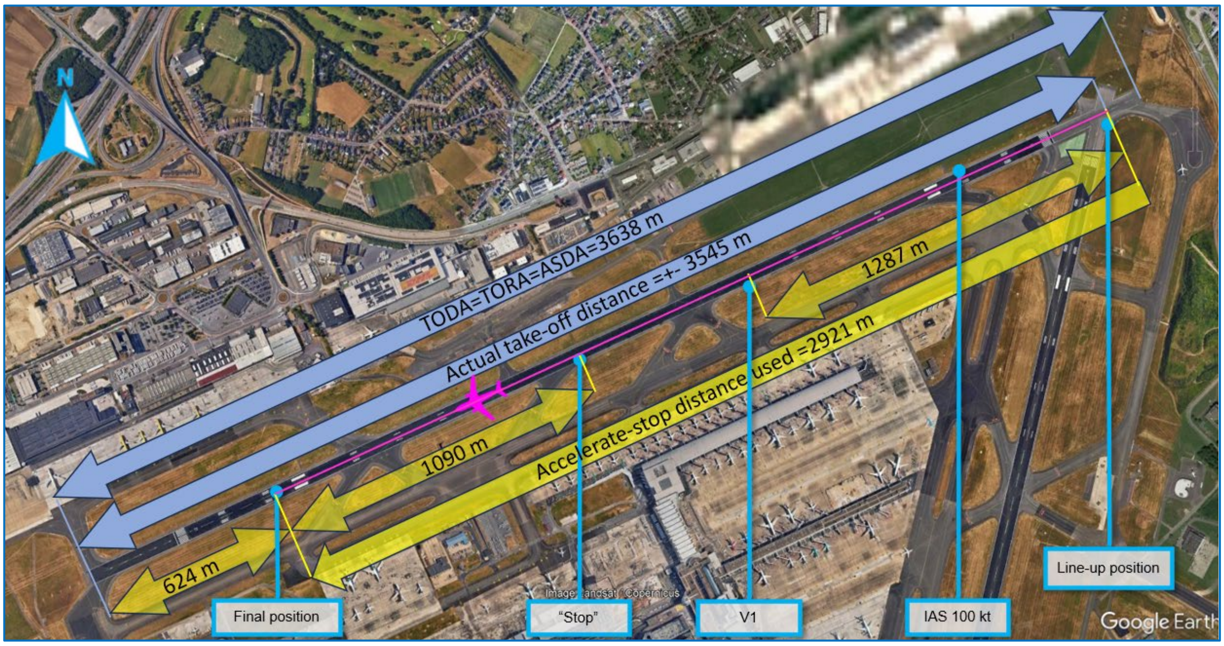


Figure 1 : the sequence of the take-off

Afterwards, the crew reported a normal acceleration of the aircraft during the take-off run. They felt airframe vibrations before reaching V_1. The CPT looked at the engine indicators - as he suspected an engine surge - but those showed nothing abnormal. He further reported having no difficulty to maintain the aircraft on the centreline of the runway.

Upon rotation, the yoke reacted normally, the nose of the aircraft went up, but the aircraft wouldn't lift-off. The captain increased the back pressure on the yoke, without success and decided to abort the take-off. On the Cockpit Voice Recorder (CVR), the CPT can be heard informing the FO that they experienced a 'rollback on the engine'.

After evaluation, this event was considered a 'serious incident' based on the rejected take-off at a speed exceeding V_1.

[2] ECAM: Electronic Centralised Aircraft Monitoring

2. CONTEXTUAL INFORMATION

2.1 Damage to the airplane

All tyres from the main gear blew off and the generated heat overheated the wheel axle.

Figure 2 : blown tyres of the LH main gear

2.2 Personnel information

Table 1 : Licence and ratings

	Captain	First Officer
Age	53	29
License	ATPL(A), first issued on 21 April 2008 by the BCAA (Belgian Civil Aviation Authority)	CPL(A), first issued on 22 November 2012 by the German Civil Aviation Authority (German: Luftfahrt Bundesamt - LBA)
Ratings	Airbus A310/300-600–CATII/III, valid until 31 August 2021	Airbus A310/300-600, valid until 31 July 2021
Checks	Last proficiency check on 21 August 2020	Last proficiency check on 18 June 2020
Medical certificate	Class 1, valid until 11 March 2021	Class 1, valid until 19 February 2021

Table 2 : Declared experience

	Captain	First Officer
Total FH	6803:54 FH (Flight Hours)	987:02 FH
Total FH on the type	2126:02 FH	784:17 FH
FH previous 90 days	55:08 FH	55:08 FH
FH previous 30 days	14:48 FH	15:49 FH

2.3 Aircraft information

The Airbus A300 is a wide-body airliner developed and manufactured by Airbus.
Officially designated A300 B4-600, this version is slightly longer than the A300 B2 and B4 and has increased interior space from using the A310 rear fuselage and horizontal tail. It has higher-power General Electric CF6-80 (-B4-605 model) or Pratt & Whitney PW4158 engines and uses the Honeywell 331-250 Auxiliary Power Unit (APU). Other changes include an improved wing featuring a re-cambered trailing edge, the incorporation of simpler single-slotted Fowler flaps, the deletion of slat fences, and the removal of the outboard ailerons after they were deemed unnecessary on the A310. The A300 B4-600 made its first flight on 8 July 1983.

Airbus A300-600 is not a fully fly-by-wire aircraft; while it introduced electrical signalling for secondary flight controls, it retained a yoke (control wheel) and traditional mechanical systems for primary flight control.

Table 3 : Airframe data

Model	A300 B4-622R
Manufacturer	Airbus S.A.S
Serial number	637
Year of manufacture	1992
Registration	Registered by German LBA since 2013
Total airframe time	34881 FC (Flight Cycles)/ 46036 FH (Flight Hours)

Table 4 : Engine data

	Engine #1	Engine #2
Type	dual-spool, axial-flow, high-bypass turbofan	
Model	PW4158	
Manufacturer	Pratt & Whitney	
Serial numbers	P728508CN	P728515CN
Year of built	1996	1997
Total flight cycles / hours	27659 FC / 33541 FH	23573 FC / 31104 FH
Time since last shop visit	430 FC / 495 FH	2003 FC / 2468 FH

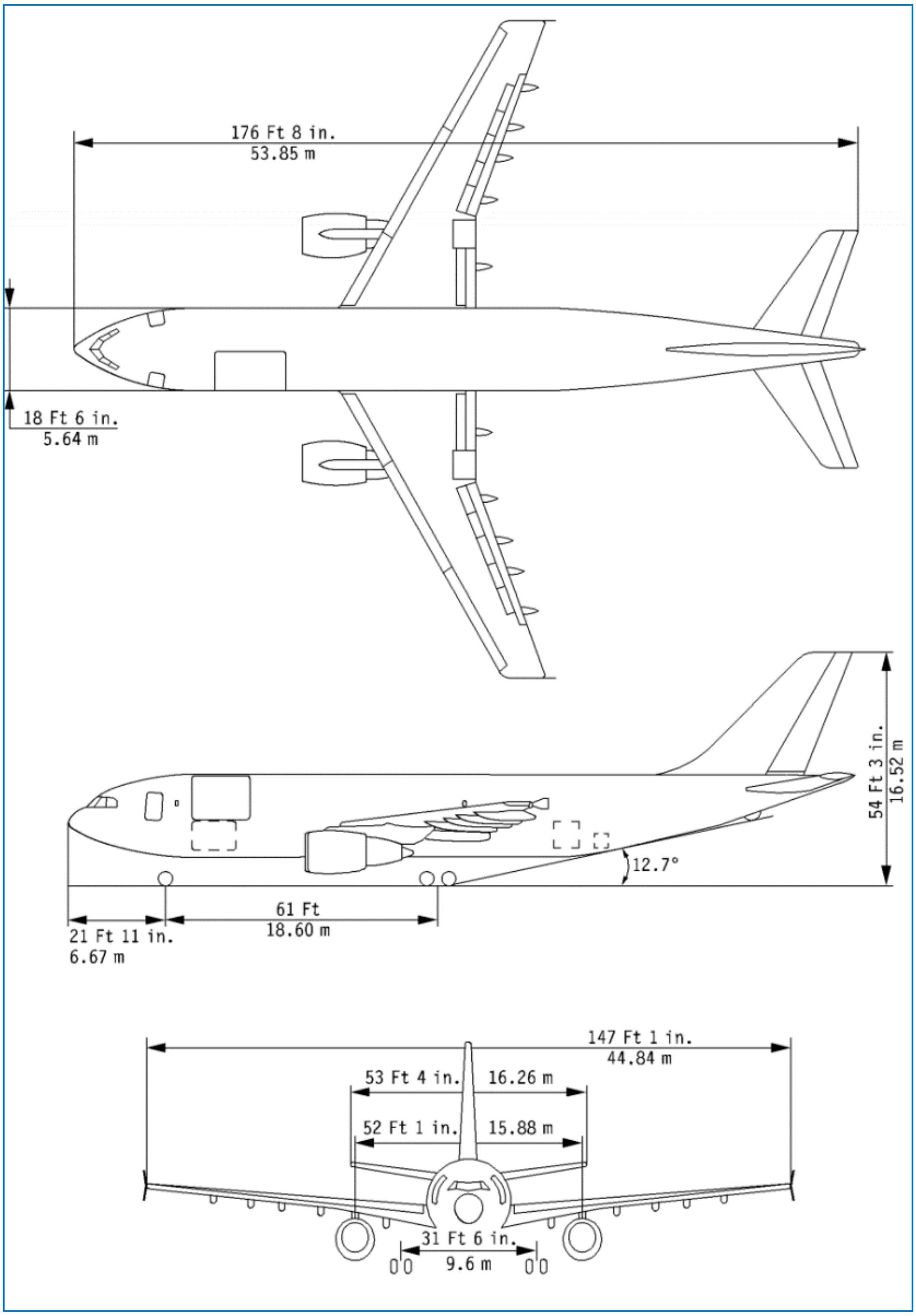


Figure 3 : Aircraft 3-view

2.3.1 Maintenance actions

Last L-Check:	23.09.2020; 34718 FC / 45833 FH
Last B-Check:	15.08.2020; 34636 FC / 45737 FH

The flight was initially cancelled due to repetitive take-off configuration warnings on the ground (once a minute).
Maintenance engineers replaced FWC #1, PROX Electronics unit, and performed a 'take-off configuration warning test'. During this maintenance action at circa 01:33 UTC, the trim was changed from +0.7 degrees to -1.1 degrees.

2.3.2 Weight and balance

FROM/TO	FLIGHT	A/C REG	ACM	DATE	TIME
BRU/VIT	QY841	DAEAI	0	26-Nov-2020	17:00

Data Rev. Date:

ALL WEIGHTS IN LB

UPPERDECK

	A	B	C	D	E	F	G	H	J	PR	RS	ST
R	2937	0	2138	3232	3303	3056	0	2597	2712			
C										2937	2412	3073
L	2597	0	1944	2738	3047	4819	0	2469	2509			
IDX	-30.01	0.00	-11.85	-9.81	-2.43	6.91	0.00	17.26	24.36	16.86	16.00	23.12

LOWERDECK

	11P	12P	21P	22P	31	32	33	41	42	51	52	53
R									287			
C	1045	1411	2355	2610	514	1790	2033	2086		0	0	0
L									1138			
IDX	-5.52	-6.20	-8.05	-6.61	0.89	4.23	6.07	7.53	6.03	0.00	0.00	0.00

		WGT LB	INDEX
DRY OPERATING WGT		184100	4.98
BALLAST		0	0.00
ACM		0	0.00
TOTAL TRAFFIC LOAD		63786	48.79
ZERO FUEL WEIGHT	(Max: 286600)	247886	53.77
TAXI FUEL		825	0.03
TAKE OFF FUEL		64175	5.68
TAKE OFF WEIGHT	(Op. Max: 328426)	312061	59.45
TRIP FUEL		19776	-4.59
LANDING WEIGHT	(Max: 308650)	292285	64.04
ALLOWED PAYLOAD		80151	

CAPTAIN
FUEL TANK STATUS: STANDARD / NORMAL

TAIL TANK: 0 LB

CAPTAINS INFO BEFORE LMC

IMBALANCE 0.3%
NOTOC YES

ACTUAL WEIGHT USED FOR CARGO

BALANCE CONDITIONS

		FWD		AFT
ZFW MAC	27.1 %	16		34
TOW MAC	27.4 %	19		35
LDG MAC	28.2 %	18		37
STABTRIM	FLAP 0 0.11	FLAP 15 1.11	FLAP 20 1.61	

UNDERLOAD BEFORE LMC: 16365 LB

I CERTIFY THAT THIS A/C IS LOADED IN ACCORDANCE WITH THE CURRENT LOADING INSTRUCTIONS. CARGO SCREENING MEETS DHL GLOBAL SECURITY STANDARDS. ALL CARGO IS TENDERED TO THE OPERATOR BY APPROVED ICAO/EU REGULATED AGENT OR NATIONALLY EQUIVALANT REGIME.
AIRCRAFT SEARCH CONDUCTED YES/NO
NAME OF PREVIOUS STATION __/__/__

LOAD SUPERVISOF (PRINT NAME)

(SIGNATURE)

CPT ACCEPTANCE (SIGNATURE)

LAST MINUTE CHANGES			
DEST	SPEC	CL/CPT	WGT

Figure 4 : The load sheet

2.3.3 Used take-off parameters

The parameters for the take-off were:

TODA: 3638 m – Runway Dry – THR: 102 ft
Take off Weight (TOW): 312061 lb (141.54 ton) – CG 27.3% - Trim +1.1
Slats/Flaps: 15/15 – Anti/ice: off
V_1: 159 kt – V_R: 159 kt – V_2: 161 kt

FLEX take-off with an assumed temperature of 53 °C[3]

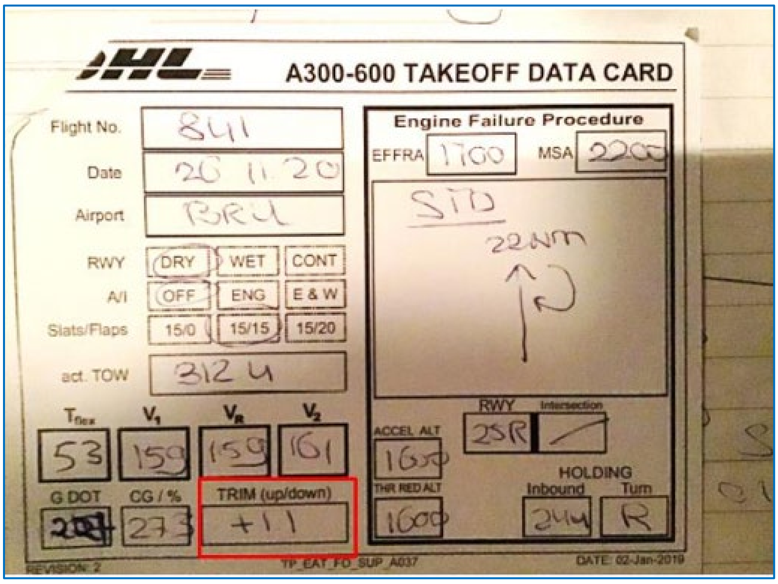


Figure 5: Data card logging the take-off parameters

[3] Certain aircraft can optimise the engine thrust used during take-off by using less than the maximum thrust available. This reduces engine wear and improves reliability whilst providing sufficient power to achieve take-off under the prevailing conditions. On Airbus aircraft this is referred to as 'FLEX'. The take-off power is adjusted by entering an artificial "assumed" Outside Air Temperature (OAT) into the Flight Management System (FMS). The higher the FLEX temperature used, the lower the thrust generated.

2.3.4 Trimmable Horizontal Stabilizer (THS) setting

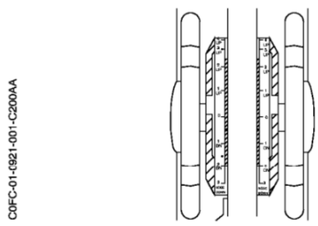
The following is stated on the take-off THS (or pitch trim) setting in the operator's *Flight Crew Training Manual* (FCTM):

"The main purpose of the pitch trim setting for take-off is to provide consistent rotation characteristics.
The aircraft performs a safe take-off, provided the pitch trim setting is within the green band on the pitch trim wheel.

The pitch trim setting significantly affects the aircraft behaviour during rotation:
- *With a forward CG and the pitch trim set to the nose-down limit, the pilots will feel an aircraft "heavy to rotate" and aircraft rotation will be very slow in response to the normal take-off control column displacement.*
- *With an aft CG and pitch trim set to the nose-up limit the pilots will probably have to counteract an early autorotation until V_R is reached.*

In either case the Pilot Flying (PF) may have to modify the expected control input to achieve the desired rotation rate but should be cautious not to overreact."

PITCH TRIM WHEELS



- The pitch trim wheel provides mechanical feedback of THS movement and position. The THS position (in degrees) is indicated on the trim wheel scale.

  The green band indicates the normal THS position for takeoff (the takeoff trim range provides a THS setting to have the aircraft trimmed for the second segment climb at approximately 1.3 Vs with two engines operative).

  The white band indicates the normal range for the THS position in cruise according to various cruise conditions and according to : R

  – an average CG for the small range R

  – the whole certified CG range for the large range. R

  Therefore, usual operation leads to a trim setting in cruise inside the small range (provided current CG is controlled by the CGCC). R

	NOSE UP	NOSE DOWN	
SMALL BAND	– 0.3	+ 0.7	R
LARGE BAND	– 2.6	+ 1.1	R

- If manually operated by the pilot, the wheel mechanically controls the THS. When the manual trim wheel is used to override an electrical trim order, both PITCH TRIM levers drop.

Figure 6 : FCOM extract on the pitch trim wheel

2.3.4.1 Standard Operating Procedures (SOPs)

One of the items of the 'AFTER LANDING' checklist is that the pitch trim is set 1° nose-up. This presets the aircraft for the next flight and maintains the pitch trim in the green area, facilitating the fine-tuning of the trim setting for the next flight.

PF	PM
	Depending on local regulation, ATC transponder may be operated in mode S. **RADAR................OFF and SELECT TEST** Turn off RADAR to prevent RADAR emissions. Then in case of inadvertent switching of the RADAR to ON, no RADAR emission will occur. PITCH TRIM.........................1° NOSE UP **SLATS/FLAPS....................................0/0** It is recommended to retract FLAPS step by step to minimize the possibility of jamming (mainly on bumpy taxiways).

Figure 7 : FCOM extract from 'AFTER LANDING' checklist

Before each flight, the pitch trim setting is verified as part of the 'AFTER START' checklist. During this procedure, the PF confirms the correct trim position, while the PM executes the checklist sequence.

CM1	CM2
	SLATS and FLAPS..................SET for T/O Set SLATS/FLAPS and KRUGER for T/O, and check position on SFPI. If the OAT is below - 40° C extend the SLATS/FLAPS step by step. If there is snow or slush on the taxiways, maintain the slats/flaps retracted until reaching the holding point before takeoff. **GROUND SPOILERS..........................ARM** **AIL TRIM and RUD TRIM..................ZERO** **PITCH TRIM............................SET for T/O**

Figure 8 : FCOM extract from 'AFTER START' checklist

2.3.4.2 Maintenance requirements

THS maintenance procedures in the Aircraft Maintenance Manual (AMM) require placing the pitch trim control wheel in neutral position after having performed operational tests, as rigging is also performed at 0°.

Similarly, parking and storage procedures require a neutral trim setting. Although the specific rationale for the A300-600 is not explicitly documented, this is presumably to minimize wind loads on the horizontal stabilizer, as observed on other programmes.

2.4 Meteorological information

The Brussels METARs mentioned the following:

EBBR 261650Z VRB01KT CAVOK 09/07 Q1019 NOSIG=
EBBR 261720Z 04001KT CAVOK 08/06 Q1020 NOSIG=

Table 5 : Decoded METARs

Time:	16:50 UTC	17:20 UTC
Average wind directions and speed:	Variable – 1 kt	040° - 1 kt
Visibility and sky condition:	Ceiling and visibility OK: Visibility of 10 km or more, no clouds below 5000 ft and no clouds of operational significance	
Temperature	09°C	08°C
Dew point	07°C	06°C
Altimeter (QNH)	1019 hPa	1020 hPa
Trend forecast	No significant change	No significant change

There was no rainfall in Brussels that day, and the runways remained dry.

The sunset was at 15:43 UTC that day.

2.5 Aerodrome information

Brussels airport is located at 6,5 NM (12 km) NE (north-east) of the city of Brussels, on the coordinates 50°54’05’’N, 004°29’04’’E. The elevation is 175 ft Above Mean Sea Level (AMSL).

The airport has three bi-directional runways: 07L/25R, 07R/25L and 01/19, with hardened asphalt and anti-slip layer (type Possehl). All three runways are certified to ICAO reference code “4E” (this code interrelates the numerous specifications concerning the characteristics of aerodromes, including the length of runways and the size of aircraft it can accommodate).

At the time of the incident parallel runways 25R and 25L were both in use for arrivals. RWY 25R was the only in use for departures.

Table 6 : Main characteristics runway 25R

Actual bearing	245.38°
Length	3638 m
Width	45 m
Slope	+ 0.21%
Take-off run available (TORA)	3638 m
Take-off distance available (TODA)	3638 m
Accelerate-stop distance available (ADSA)	3638 m
Landing distance available (LDA)	3339 m
TORA from intersection with taxiway B1	3266 m
Runway strip dimensions	3758 m x 300 m
Runway end safety area (RESA)	516 m x 90 m

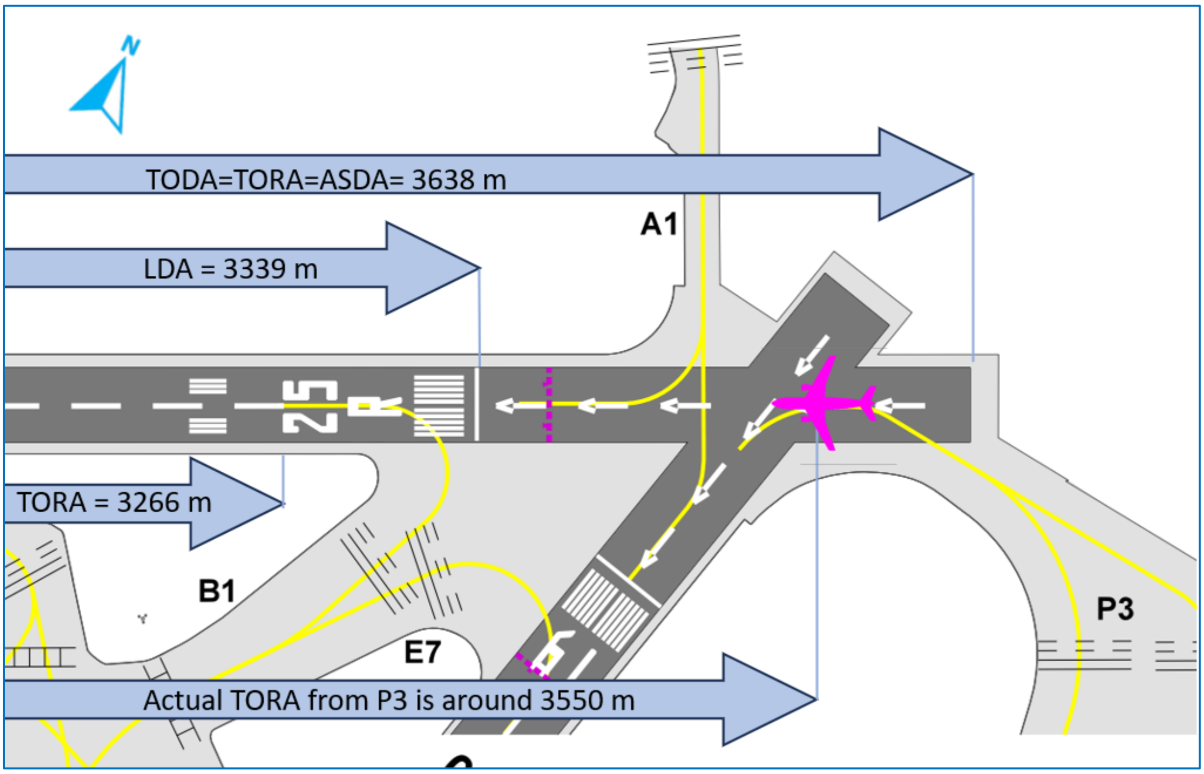


Figure 9 : Beginning of RWY 25R showing some relevant distances

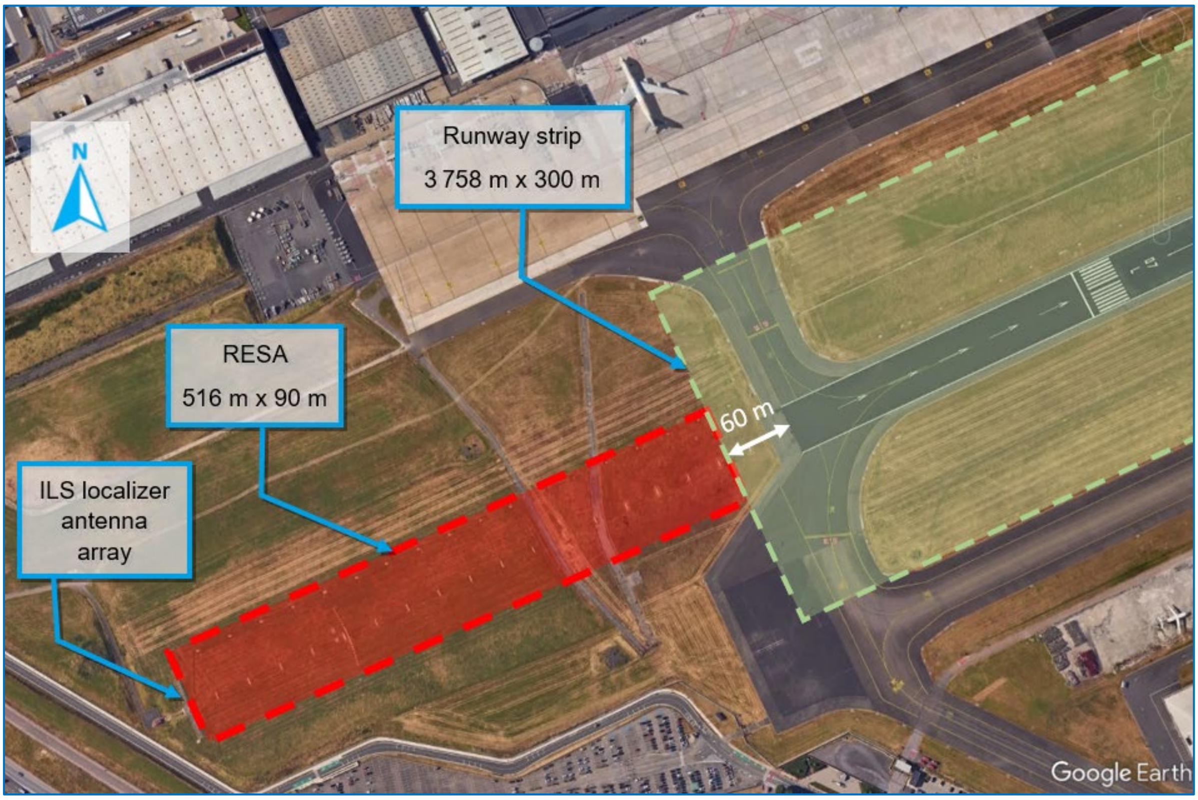


Figure 10: End of RWY 25R indicating the strip and RESA dimensions

The Runway End Safety Area (RESA) is a cleared, graded area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway. The International Civil Aviation Organisation (ICAO) standard requires a 90-meter (300 ft) RESA for Code 3 and 4 runways, extending from the end of the runway strip, and recommends a 240-meter RESA where practicable. For RWY 25R the length of the RESA is 516 m.

2.6 Recorded data

The airplane is equipped with:

- A Cockpit Voice Recorder (CVR)
- A Digital Flight Data Recorder (DFDR)

The two recorders were retrieved from aircraft on 26 November 2020 and sent for read-out to the German Safety Investigation Authority (German: Bundesstelle für Flugunfalluntersuchung - BFU).

2.6.1 CVR

2 hours of cockpit sounds were available. Below is an extract of relevant recordings when the crew went through the "AFTER START" checklist when the aircraft had just started up at the apron.

Table 7 : CVR transcript of the "AFTER START" checklist

Time (UTC)	Crew member	Transcript
16:59:04	CPT (Captain)	And when ready AFTER START checklist
	FO (First Officer)	AFTER START... pitch trim
	CPT	Is euhm, 1 point 1 up – Set
	FO	Rudder trim
	CPT	0
	FO	Slats/flaps
	CPT	15/15 set
	FO	Spoilers
	CPT	Armed
	FO	Anti-ice
	CPT	Initially not required
	FO	ECAM status
	CPT	Normal with the bleeds off
	FO	Hand signal
	CPT	Received
	FO	AFTER START checklist completed

2.6.2 DFDR

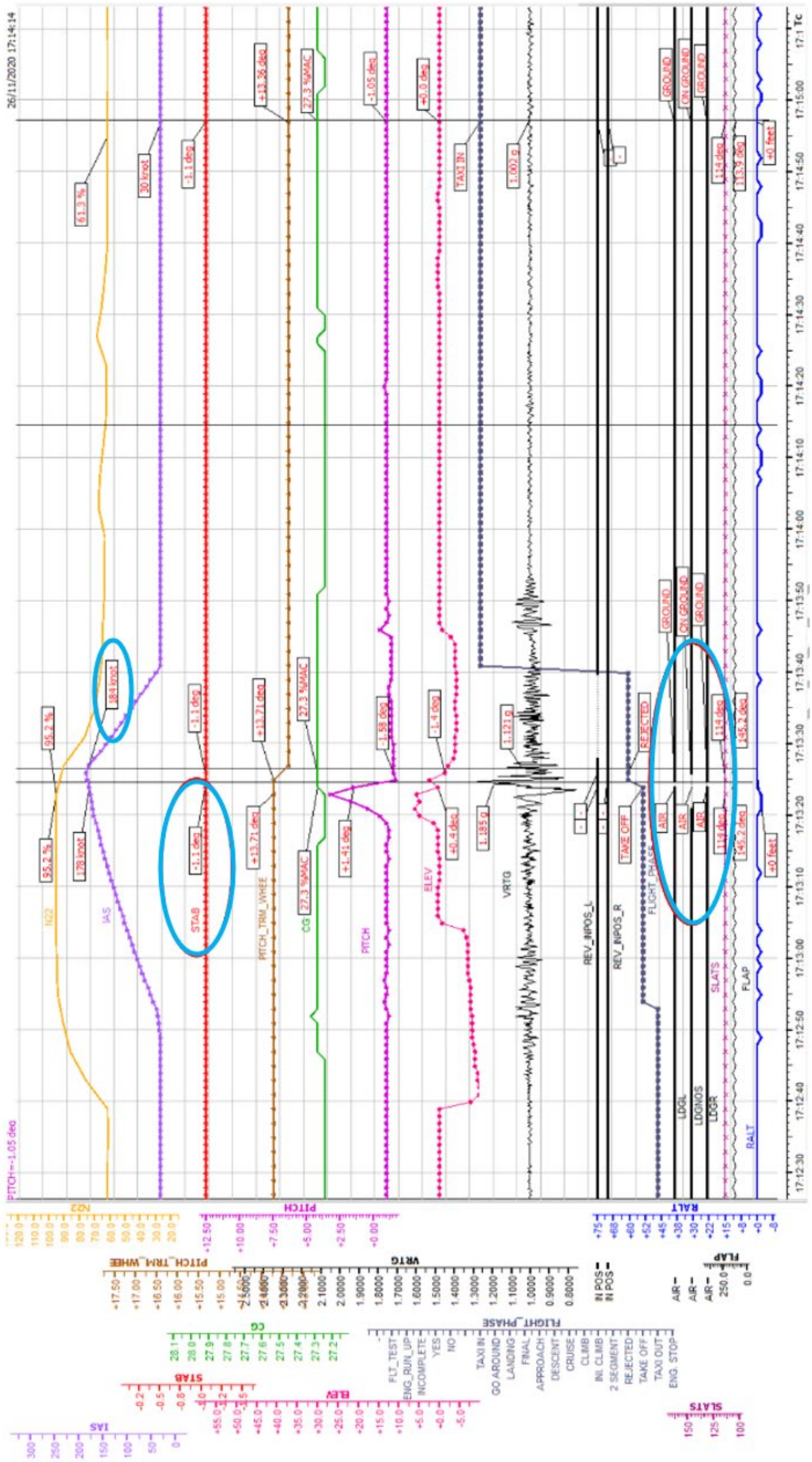


Figure 11 : Flight data recordings

The recordings show among others the following:

- Take-off was rejected at 178 kt, although speed increased further to 184 kt before starting to decelerate.
- Engine parameters were consistent with throttle lever settings.
- Pitch trim setting was 1.1 nose-down
- The aircraft was airborne for 1 second upon the decision to abort (showed by both the nose and main gear squat switches).

2.7 Survival aspects

The fire brigade was called at 17:13 UTC and the first intervention vehicles moved at 17:15 and arrived at 17:18 at the aircraft still standing on the runway.

2.8 Speeds at take-off

The decision speed V_1 is the maximum speed at which a rejected take-off should be initiated in the event of an emergency.
V_1 is also the minimum speed at which a pilot can continue take-off following an engine failure.

According to the manufacturer, the crew must always be prepared to make a “GO/NO-GO” decision prior to the aircraft reaching V_1.
Doing otherwise exposes the aircraft to an unsafe situation where there either may not be enough runway left to successfully stop the aircraft - therefore resulting in a longitudinal runway excursion-, or maximum brake energy is exceeded, and the brakes catch fire.

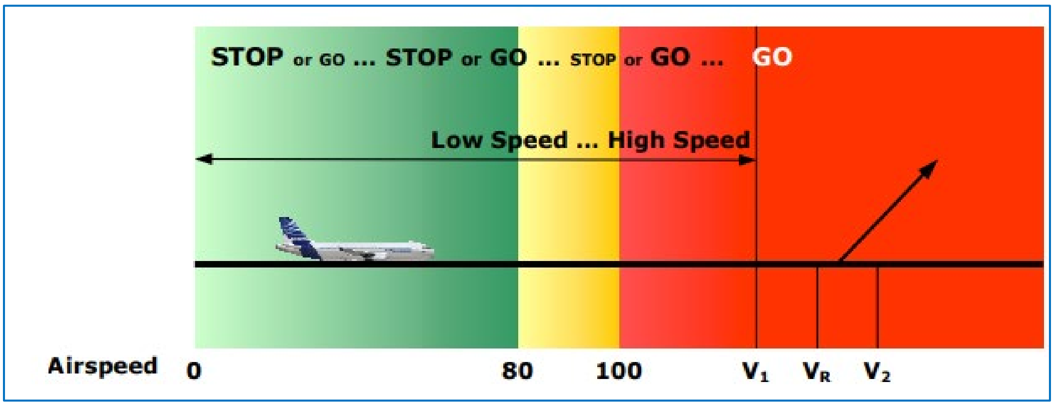


Figure 12 : Airspeed gates to develop the proper STOP or GO mindset (Airbus)

The aim of the “100 knots” callout is:

- To check the coherence of both Captain’s and FO’s airspeed indication (i.e. both Airspeed Data Computers)
- To indicate that the aircraft is entering the high-speed take-off roll segment.

2.9 Review of the performance

2.9.1 Weight and balance

The airplane was offloaded, and the cargo was re-weighed, however no notable discrepancy was found with the original load sheet.

2.9.2 Calculated speeds

The values as entered in the flight management system were correct (V_1: 159 kt – V_R: 159 kt – V_2: 161 kt).

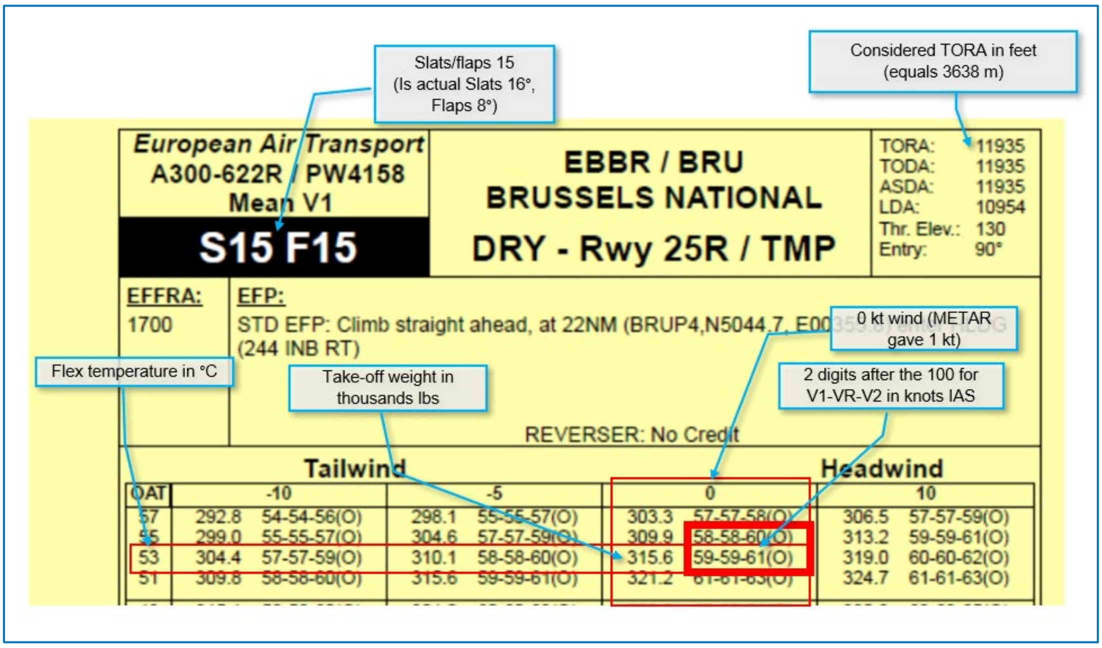
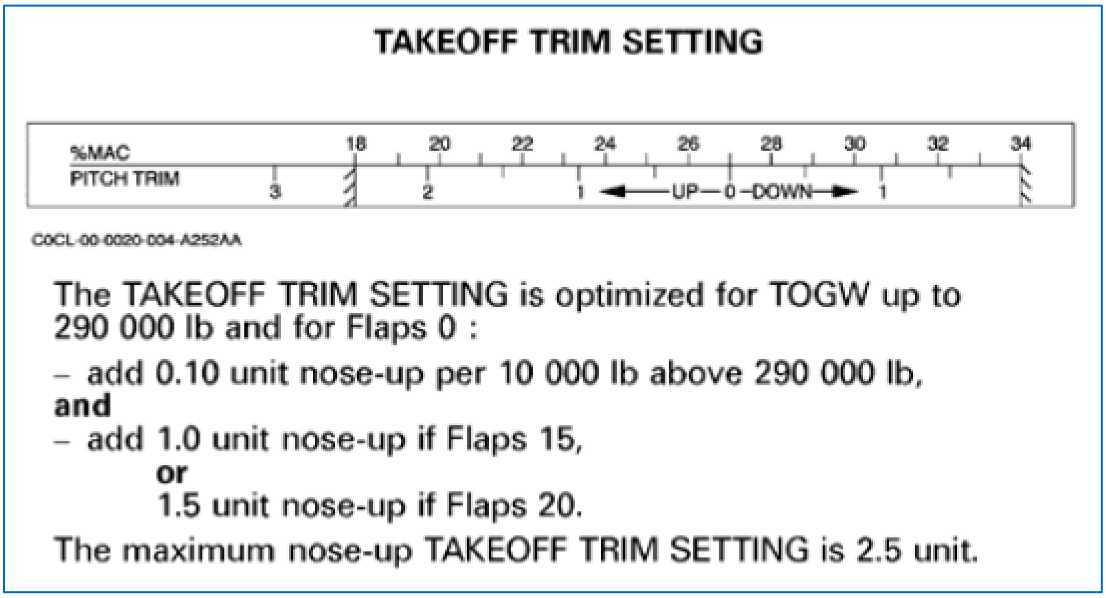


Figure 13 : take-off speed from the Take-Off data calculation sheets

2.9.3 Take-off trim setting

The aircraft Center of Gravity (CG) being 27.4%, the aircraft weight 312061 lb and with the slats/flaps configuration, the take-off trim setting can be computed from the QRH:


TAKEOFF TRIM SETTING

The TAKEOFF TRIM SETTING is optimized for TOGW up to 290 000 lb and for Flaps 0 :

– add 0.10 unit nose-up per 10 000 lb above 290 000 lb,
and
– add 1.0 unit nose-up if Flaps 15,
or
1.5 unit nose-up if Flaps 20.

The maximum nose-up TAKEOFF TRIM SETTING is 2.5 unit.

Figure 14 : QRH extract for the calculation of the take-off trim setting

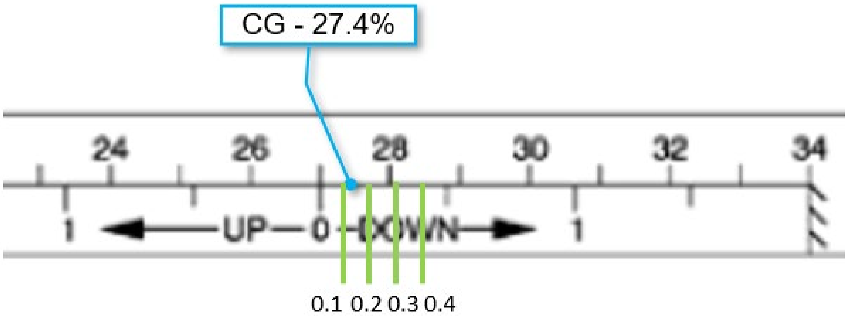


Figure 15 : CG of 27.4% gives 0.1 nose-down

Table 8 : Calculation in accordance with QRH

Trim for CG 27.4%		0.1 nose down
0.1 nose-up per 10 000 lb above 290 000 lb	+ 0.1 nose-up x (31.2 - 29)	+ 0.2 nose-up
1.0 nose-up for flaps 15		+ 1.0 nose-up
Total		1.1 nose-up

3. ANALYSIS

3.1 Technical factors

The DFDR recordings show that the aircraft was airborne for one second at the moment the decision to abort was made, indicating that the aircraft was able to lift off. Nevertheless, we will discuss further some technical factors that may have played a role in what the flight crew experienced.

3.1.1 Engine performance

The DFDR-data show normal parameters for both engines consistent with the setting of the throttle lever. There were no signs of any engine surge, as initially assumed by the captain.

3.1.2 Vibration

The take-off roll was compared with another reference flight by the operator, but no significant vibration (represented by vertical G-load 'VRTG') was observed. As the aircraft went shortly airborne at the same time the captain called 'stop' to interrupt the take-off, the feeling the captain got might have been induced by the variation of the weight on the wheels immediately prior to this moment.

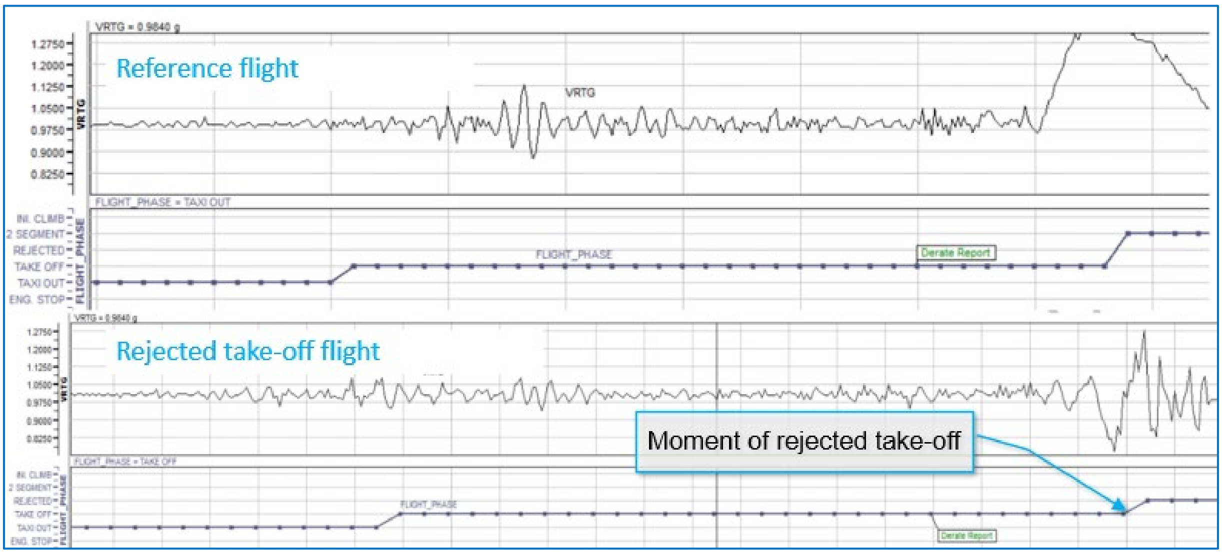


Figure 16 : Take-off roll comparison

3.1.3 Airspeed indication

During the take-off roll, the First Officer (FO) acted as pilot monitoring, checking parameters such as the airspeed indications. The 100-knot crosscheck - designed to detect any airspeed discrepancy between the Captain's and FO's displays - was correctly executed with the callout "100." This confirms that the airspeed indications were accurate and did not contribute to the event.

3.2 Trim setting and its influence

The performance of the aircraft during the rejected take-off was reviewed. See chapter 2.9 of this report. The engines and aircraft speed settings made by the crew were confirmed to be correct, as well as the weight and balance.

However, the DFDR data showed that the pitch trim was in a 1.1 nose down-position instead of nose-up. Although the marking on the take-off data card (see Figure 5) does not correspond to the convention in the FCOM (see Figure 6), this did not play a role. On the CVR, it is clearly audible that the captain says "1.1 nose-up" during the "AFTER START" checklist, and which was also the required setting.

The error was therefore due to a misreading of the trim wheel (mis-recognition) by the Pilot Flying. The fact that it must be set to 1.0 nose-up after every flight anyway may have unconsciously led to the assumption that the wheel was correctly positioned when the PF saw it near '1', without further checking whether this was nose-up or nose-down (expectancy).

During the preceding maintenance, the pitch trim control wheel was left at -1.1 nose-down, although according to the procedures in the AMM it should have been set to the neutral position. This constitutes an incorrect maintenance action. However, the investigation was unable to determine why it was not carried out as required.

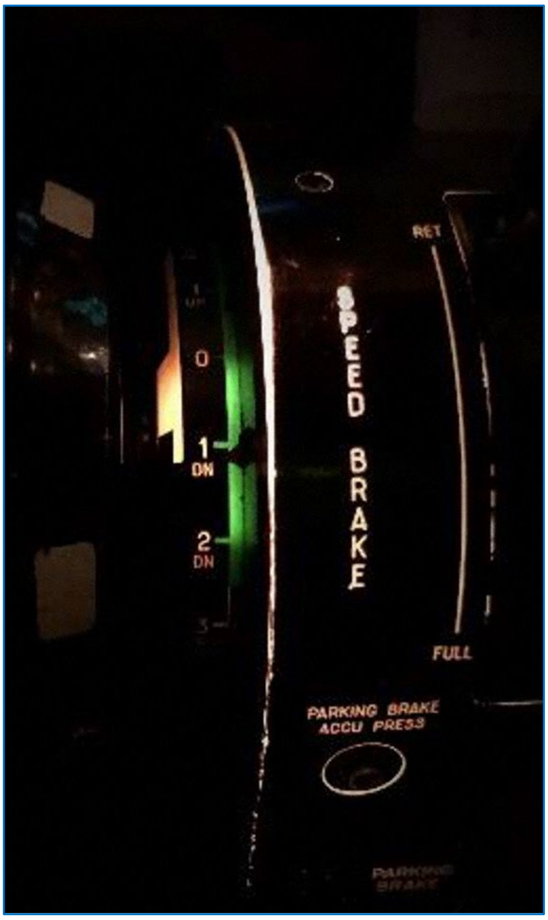


Figure 17 : pitch trim wheel in 1.1 nose-down

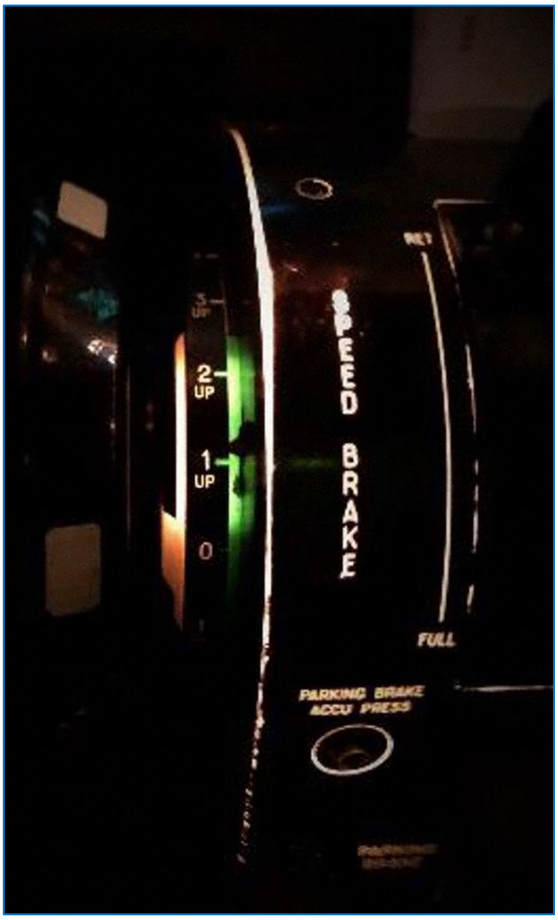


Figure 18 : pitch trim wheel in 1.1 nose-up as required

The reason for the trim not in the 1.0 nose-up position was that it was changed from 0.7 degrees nose-up to 1.1 degrees nose-down during maintenance actions at 01:33 in the morning of the flight.

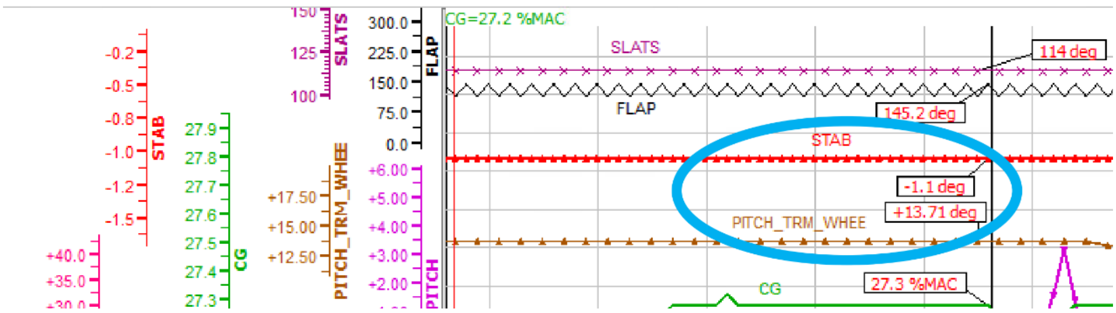


Figure 19: Trim position record

This means that when the crew wanted to raise the nose of the aircraft, it had to overcome the forces induced by this wrong setting before seeing the aircraft react as needed.
Looking further into the influence of the trim setting on the crew actions, Airbus stated the following;

- *Providing the THS setting is adequate, about 3° deflection up of the elevator are necessary to perform a rotation of about 2°/s rate, the lift-off occurs at approximately 7° of pitch attitude around 5 s after the initiation of the rotation.*

- *1° of THS corresponds to 2° of the elevators. Therefore, a 2° difference in trim setting (to nose down setting) corresponds to 4° of elevators deflection. In this condition, the similar rotation rate of 2°/s for the flight conditions of the event normally obtained with 3° deflection up of the elevators will be obtained with a 7° deflection up of the elevators (3° up + 4° to counteract the trim setting). During the event, the 5° to 6° of elevators up deflection applied at rotation led to a 1.5°/s of rotation rate.*

- *When moving the control column, the pilot does not sense the actual forces acting on the flight controls. A system provides an artificial feel, variable with flight conditions that simulates the actual forces and therefore gives the crew a model of the actual reactions of the aircraft. The pitch artificial feel is computed as a function of the trim position and of the aircraft speed so that at aft CG, the effort needed to deflect 1° of the elevator is higher compared to the one needed to deflect 1° of the elevator in the case of forward CG.*

- *For the event, the wrong trim setting leads to a THS position (1.1° down instead of 1.1° up) corresponding to a CG more aft than the one computed on the load sheet. Therefore, the pitch artificial feel was higher than expected. In normal case, with a THS setting of 1.1° up, the effort on the control column would have been 1.12 daN per degree of elevator. Therefore, if we consider a rotation rate of 2°/s, the crew was expected to apply a force of 1.12 x 3 = 3.36 daN while the 2° difference in THS setting they had to apply a force of 1.7 x 7 = 12 daN for getting the same effect.*

- *During the event, the crew applied a force of 10 daN before aborting the take-off.*

- *The taking-off of the aircraft was fully feasible, however a stronger force needed to be exerted on the column.*

The operator replayed the event on the simulator (8 times with four different pilots in the A300-600 flight simulator) and confirmed the yoke aft movement was significantly harder.

3.3 Stop distance

The computation of the take-off speeds results from an optimisation that takes into account various constraints such as the climb gradient, the obstacles after take-off, the runway length versus the rejected take-off, etc. Depending on the flight conditions and the environmental conditions, some of these constraints will directly impact the take-off speeds values whereas some others will not.

In this A300-600 event, the runway length versus the Rejected Take-Off (RTO) was not a sizing constraint of the computation of the characteristic speeds.

Indeed, the calculated Available Stop Distance (ASD) was in this case (with a flex temperature of 53°C) roughly 2800 m whereas the runway length used was 3545 m.

During this RTO performed at V_1+ 20 kt, the aircraft stopped 624 m before the runway end, which is 121 m above the calculated ASD.

4. FINDINGS

4.1 Findings as to causes and contributing factors

- No technical anomaly was found
- Abnormal feel in the aircraft control column upon rotation, as experienced by the captain, was due to an inadequate pitch trim setting.
- The pitch trim wheel setting should have been 1.0 nose-up after last flight but was changed and left to 1.1 nose-down during maintenance actions in between the flights.
- However, procedures in the AMM require placing the pitch trim control wheel in neutral position after having performed operational tests (*incorrect maintenance action*).
- This was not seen during the ‘after start’ checklist due to a misreading of the trim wheel (*mis-recognition*).
- The fact that it must be set to 1.0 nose-up after every flight may have unconsciously led to the assumption that the wheel was correctly positioned when the Pilot Flying saw it near ‘1’, without further checking whether this was nose-up or nose-down (*expectancy*).

4.2 Findings as to risk factors

- The decision to reject take-off after decision speed V_1 (*decision-making – incorrect action selection*)

4.3 Other findings

- The aircraft was airborne for 1 second upon the decision to abort.
- The taking-off of the aircraft was fully feasible, however a stronger force needed to be exerted on the column.

5. SAFETY ACTIONS AND RECOMMENDATIONS

*A **safety issue** is a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organization or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.*

*A **safety action:** the steps taken or proposed to be taken by an organization or agency on its own initiative in response to a safety issue.*

*A **safety recommendation** is a proposal by the safety investigation authority in response to a safety issue and based on information derived from an investigation and/or study. It's aimed to improve the safety of an organisation and/or system and therefor always addressed to an organisation and/or agency, never to a specific individual. The sole purpose of a safety recommendation is the <u>prevention</u> of accidents or incidents and the <u>reduction of the consequences</u> of such occurrences. It, in no case has the purpose of creating a presumption of blame or liability for an accident or incident. Neither does it reflect the level of contribution to a specific accident or incident.*

*A **safety lesson learned** is the knowledge and insight gained through an individual's experience, intended to be applied to prevent similar events from occurring in the future.*

*A **safety message:** An awareness which brings to attention the existence of a safety factor and the lessons learned. AAIU can distribute a safety message to a community (of pilots, instructors, examiners, ATC officers), an organization or an industry sector for it to consider a safety factor and take action where it believes it appropriate. There is no requirement for a formal response to a safety message.*

Safety actions

The Safety Department of the operator stated that the following actions had been executed following this incident:

- The 'AFTER START' checklist-item for verifying correct pitch trim has been revised to include the qualifier "both", indicating that the verification is now a dual-pilot task instead of a check by the Pilot Flying (PF) alone. This change establishes a formal crosscheck procedure.
- Safety alert was issued to remind crews for the importance of the correct trim setting.
- All pilots of the A300 fleet completed recurrent (simulator) training addressing incorrect trim setting.

AAIU Belgium supports these initiatives and has no further safety recommendations.

ABOUT THIS REPORT

General	
What?	Safety investigation reports are a technical document that reflects the views of the investigation team on the circumstances that led to the accident or serious incident and is conducted in accordance with Annex 13 to the Convention on International Civil Aviation and Regulation (EU) No 996/2010.
Objective	**The sole objective of safety investigations is the determination of the causes, and to define safety recommendations in order to prevent future accidents and incidents. It is not the purpose of this investigation to apportion blame or liability.** In particular, Article 17-3 of Regulation (EU) 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility.
Investigation authority	The Air Accident Investigation Unit of Belgium (AAIU for the rest of this publication). It is the Belgian permanent national civil aviation safety investigation authority as defined in Article 4 of Regulation (EU) No 996/2010 and established in accordance with the Royal Decree of 26 December 2022. This unit is part of the Federal Public Service Mobility and Transport and is functionally independent from the Belgian Civil Aviation Authority and other interested parties.
This investigation	
Investigation initiation	AAIU was notified of the incident by Brussels Airport at 18:15 UTC on 26 November 2020. 2 investigators arrived at the aircraft at 19:00 UTC to conduct the on-site examination.
Scope	Limited For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors.
Other parties involved	For this investigation, the AAIU Belgium got the support of • the German BFU, with the airline as adviser, • the French BEA, with the aircraft design and manufacturer organisation, Airbus as adviser.
	AAIU would like to thank the mentioned parties above and all other entities and individuals that have contributed to this safety investigation.