Technical report
IN-016/2023

Incident on 16 July 2023 involving an AIRBUS A320-214 aircraft operated by Vueling Airlines S.A., registration EC-JTR, at Barcelona Airport (Barcelona, SPAIN)

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GOBIERNO DE ESPAÑA
MINISTERIO DE TRANSPORTES Y MOVILIDAD SOSTENIBLE
SUBSECRETARÍA
COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Notice

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission regarding the circumstances of the accident that is the object of the investigation, its probable causes, and its consequences.

In accordance with Article 5.4.1 of Annex 13 to the Convention on International Civil Aviation; and as provided for in Articles 5.6 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 and Articles 1 and 21.2 of RD 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent their recurrence. The investigation is not intended to attribute any blame or liability, nor to prejudge any decisions that may be taken by the judicial authorities. Therefore, and according to the laws specified above, the investigation was carried out using procedures not necessarily subject to the guarantees and rights by which evidence should be governed in a judicial process.

As a result, the use of this report for any purpose other than the prevention of future accidents may lead to erroneous conclusions or interpretations.

CONTENTS

ABBREVIATIONS

° ‘ “	Sexagesimal degrees, minutes and seconds
%	Per cent
°C	Degree Celsius
ADIRU	Air data inertial reference unit
ADM	Air data module
ADR	Air data reference
AESA	Spain’s National Aviation Safety Agency
AOC	Air Operator Certificate
ASDA	Accelerate-stop distance available
ASI	Air speed indicator
ATC	Air traffic control
ATPL (A)	Airline transport pilot license
BEA	Bureau d'enquêtes et d'analyses pour la sécurité de l'aviation civile
BSCU	Brake and steering control unit
CAS	Calibrated air speed
CCTV	Closed-circuit television
CFDS	Centralised fault display system
CGA	Airport Management Centre
CGR	Network Management Centre
CIAIAC	Comisión de Investigación de Accidentes e Incidentes de Aviación Civil
COA	Observation and Alarm Centre
CVR	Cockpit voice recorder
DGO	Department of Operational Management
DMC	Display management computer
DMCVU	Department of Airfield Maintenance and Development
DSO	Department of Operational Safety
EASA	European Aviation Safety Agency
ECAM	Electronic centralised aircraft monitor
ENG	Engine
FCOM	Flight Crew Operating Manual
FCTM	Flight Crew Techniques Manual
FDR	Flight data recorder
F/CTL	Flight control
F/O	First officer
FOD	Foreign object debris
ft	Foot
g	Gram
GS	Ground speed
h	Time
HP	High pressure

hPa	Hectopascal
IFR	Instrument flight rules
IR	1 (licences) - Instrument Rating 2 (AIRBUS) - Inertial reference
kg	Kilogram
km	Kilometre
kt	Knot
L	Left
LEBL	ICAO code for Josep Tarradellas Barcelona – El Prat Airport
LEZL	ICAO code for Seville Airport
LT	Local time
m	Metres
METAR	Aviation routine weather report (in aeronautical meteorological code)
ND	Navigation display
N1	Low pressure compressor speed (two-stroke compressor) or fan speed (three-stroke compressor) (in %)
ICAO	International Civil Aviation Organisation
PF	Pilot flying
PFD	Primary flight display
PFR	Post-flight report
PM	Pilot monitoring
PMP	Main Command Post
PMR	Passenger with reduced mobility
psi	Pound per square inch
PWR	Power
QNH	Altimeter setting to obtain elevation above sea level when on the ground
QRH	Quick reference handbook
R	Right
RPMA	Forward Command Post Manager
SCF	Wildlife Control Service
SA	Spanish Public Limited Company
SD	System display
SMA	Airport Medical Service
S/N	Serial number
SPP	Runway and Apron Service
SSEI	Rescue and Firefighting Service
TCP	Cabin crew
TWR	Control tower
T1	Terminal 1
T2	Terminal 2
UTC	Coordinated universal time
V1	Decision speed

Synopsis

Aircraft operator:	Vueling Airlines S.A.
Aircraft:	AIRBUS A-320-214, registration EC-JTR, S/N 2798
Date and time of the incident:	Sunday, 16 July 2023, 07:45 h[1]
Site of incident:	Barcelona Airport (Barcelona, SPAIN)
Persons on board:	6+185
Type of operation:	Commercial air transport – Scheduled – Domestic – Passengers
Phase of flight:	Take-off - take-off run
Flight rules:	IFR
Date of approval:	18 of December , 2024

Summary of the incident:

On Sunday, 16 July 2023, at 07:45 UTC, an Airbus A-320-214, registration EC-JTR, operated by Vueling Airlines S.A., was taking off from Barcelona Airport (LEBL) on runway 24L when it was involved in a bird strike during its take-off run.

At the time of impact, the aircraft was running at high speed, and its captain decided to reject the take-off due to an almost instantaneous 38 kt drop in speed on his anemometer.

The aircraft stopped without issues and with 600 m of runway remaining.

The pilots noticed a smell of burning rubber and noted that the temperature of the tyres was increasing. They tried to apply thrust to clear the runway, but the aircraft would not move. They decided to initiate an emergency evacuation.

Fifteen passengers received medical assistance for minor injuries. The aircraft sustained minor damage.

The investigation concluded that the incident was caused by a bird striking the captain's Pitot tube, which led to him rejecting the take-off after exceeding the decision speed.

[1] Time in UTC. Local time can be calculated by adding 2 h to the UTC. Unless otherwise indicated, all times in this report are expressed UTC.

1. THE FACTS OF THE INCIDENT

1.1. Summary of the incident

On the morning of Sunday, 16 July 2023, the A320-214 aircraft with registration EC-JTR, operated by Vueling Airlines S.A., was parked at stand 240 at Josep Tarradellas Barcelona-El Prat Airport (LEBL) in preparation for a flight to Seville Airport (LEZL).

A total of 191 people were on board the aircraft, 6 of whom were crew (two pilots and four cabin crew). It was the first flight of the two they had been assigned for that day. On this flight, the co-pilot was the pilot flying (PF).

After requesting clearance for start-up, ATC advised the pilots that the runway had changed to 24L, and the pilots updated the take-off performances. The take-off was thus planned with a decision speed[2] (V1) of 142 kt and flexible thrust of 49ºC, with the flaps lever in position 1+F (flaps at 18º and slats at 10º).

The start-up and taxi proceeded normally, and at 07:44:34, the aircraft commenced its take-off run on runway 24L.

At 07:44:50, the aircraft speed[3] reached 100 kt, and the captain (PM) announced "*one hundred knots*" (100 kt).

Six seconds later, at 07:44:56, with a speed of 129 kt and a ground speed (GS) of 134 kt, the co-pilot saw a bird on his right and exclaimed, "*bird!*". This was followed by the sound of a thud on the flight deck, whereupon the captain's anemometer showed a sudden drop of 38 kt in speed[4].

At 07:44:59, The GS was 147 kt. There is no reliable record of the CAS after the bird strike.

At 07:45:00, within the same second as the co-pilot announced "*V1*" with the GS at 151 kt, the captain said *"stop"* and, a second later, pulled back the thrust levers to begin the rejected take-off manoeuvre.

When asked the captain whether he checked the standby anemometer or the co-pilot's anemometer to compare (or contrast) the abnormal speed displayed on his anemometer before aborting the take-off, the captain replied that he did not look at them.

When asked the co-pilot whether his anemometer showed any indication that could be considered anomalous or inconsistent during the take-off run (including the moment of the bird impact and subsequently), the co-pilot replied that his indications were normal at all times and that V1 was reached progressively, just like any other take-off.

[2] According to the EASA definition, V1 is the maximum speed in the take-off at which a pilot must take the first action (e.g. apply brakes, reduce thrust, deploy speed brakes) to stop the aeroplane within the accelerate-stop distance.

[3] Calibrated airspeed (CAS) is the airspeed displayed by the anemometer on this aircraft.

[4] A 32 ft change in the altitude displayed to the captain was also recorded.

The take-off was performed with the automatic braking system in the MAX position and the subsequent rejection with the thrust reversers deployed and activated in the MAX position. The aircraft came to a complete stop at 07:45:19, approximately 600 m from the end of the runway.

After a few seconds, the pilots moved the thrust levers forward to taxi the aircraft with the intention of leaving the runway, but they noticed that it didn't move and that the temperature of the brakes was increasing. In addition, they began to smell what they described as a strong *"smell of burning rubber"* and decided to order an evacuation of the aircraft.

At 07:46:31, the pilots notified the control tower that they were unable to taxi, that they needed assistance from the fire brigade, that the temperature of the wheels was increasing and that they were going to initiate an evacuation.

The control tower acknowledged and reported that firefighters were on their way. The crew ordered the evacuation, and everybody on board exited the aircraft.

The evacuation was carried out via 5 of the 8 available emergency exits. One of the exits located over the left wing and the two exits located over the right wing were not opened by the passengers seated next to them.

There was no fire.

Once the occupants had evacuated the aircraft, approximately 4 minutes after the evacuation began, firefighters arrived at the aircraft and cooled the wheels (which were subsequently replaced on the runway at the position where the aircraft was stopped), and finally, at 09:34, they towed the aircraft to a parking stand, leaving the runway clear.

The airport medical services treated 15 passengers with minor injuries as a result of the evacuation. One passenger was taken to hospital but discharged in less than two hours.

1.2. Injuries to persons

Injuries	*Crew*	*Passengers*	*Total*	*Others*
Fatal				
Serious				
Minor		15		
None	2+4	170		
TOTAL	6	185		

1.3. Damage to the aircraft

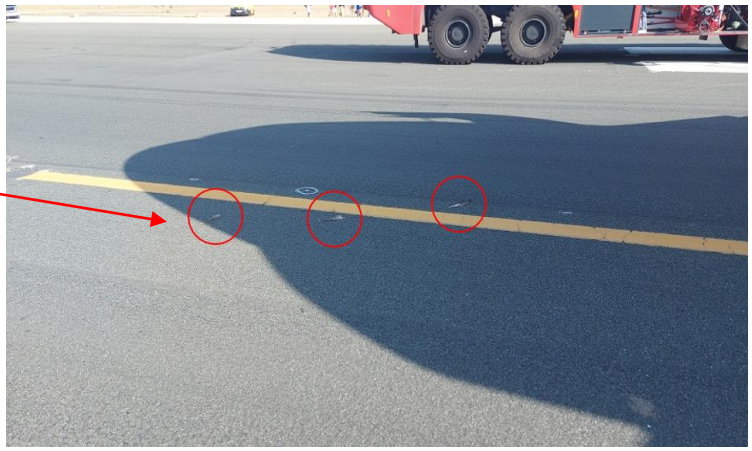
The aircraft sustained minor damage as a result of the bird strike, the high-speed rejected take-off and the subsequent evacuation. These are detailed in paragraph 1.12.

1.4. Other damages

During the check carried out by the airport's wildlife control service after the impact, the intact lifeless body of a wild 900 g female ringed peregrine falcon was found, with 4 feathers missing (1 primary and 3 rectrices). It was found to the left of runway 24L, in line with rapid exit G6 (see 3 in figure 15).

Figures 1 and 2: Carcass of the bird involved in the impact with the EC-JTR aircraft.
Figure 1 shows the bird as it was found, and Figure 2 shows the 4 feathers in their original corresponding positions.

Four bird feathers were found on the tarmac a few metres in front of the nose of the aircraft, which were confirmed by the airport wildlife control service as belonging to the dead peregrine falcon found during the search.



Figures 3 and 4: Location of the four bird feathers found on the runway.

1.5. Information about the personnel

1.5.1. Information about the flight crew

The 45-year-old captain held an Airline Transport Pilot Licence (ATPL(A)) issued on 21 December 2010 by the Spanish Aviation Safety Agency (AESA) with A320 and IR(A) ratings valid until 31 July 2024. He also held a Class 1 medical certificate valid until 5 March 2024 and his English language proficiency level was 5, valid until 28 February 2029. He had a total of 12000 flight hours, of which 8000 h were on the type of aircraft involved in the incident. He had been working for the operator since 2011 and had been a captain since 2015.

The 45-year-old co-pilot held an Airline Transport Pilot Licence (ATPL(A)) issued on 30 September 2021 by AESA with A320 and IR(A) ratings valid until 31 March 2024. He also held a Class 1 medical certificate valid until 10 May 2024, his English language proficiency level was 4, valid until 31/12/2025. He had a total of 4000 flight hours, of which 2500 h were on the type of aircraft involved in the incident. He had been working for the operator since 2019. He previously flew the same type of aircraft for another operator.

1.5.2. Information about the cabin crew

Flight attendant no. 1

The purser was 43 years old and held a Cabin Crew Attestation issued by AESA on 21 October 2016. He also had a valid cabin crew medical certificate in force until 15 September 2023. He had been working for the operator since 2007.

His type rating (A319/320/321) was valid until 30 September 2023.

Flight attendant no. 2

The flight attendant number 2 was 39 years old and held a Cabin Crew Attestation issued by AESA on 8 November 2016. He also had a valid cabin crew medical certificate in force until 28 August 2025. He had been working for the operator since 2007.

His type rating (A319/320/321) was valid until 30 September 2023.

Flight attendant no. 3

The flight attendant number 3 was 30 years old and held a Cabin Crew Attestation issued by AESA on 19 May 2017. He also had a valid cabin crew medical certificate in force until 13 July 2026. He had been working for the operator since 2018.

His type rating (A319/320/321) was valid until 30 June 2024.

Flight attendant no. 4

The flight attendant number 4 was 41 years old and held a Cabin Crew Attestation issued by AESA on 25 March 2014. He also had a valid cabin crew medical certificate in force until 19 September 2024. He had been working for the operator since 2014.

His type rating (A319/320/321) was valid until 30 June 2024.

1.6. Information about the aircraft

The Airbus A320-214 aircraft, registration EC-JTR and serial number 2798, was built in 2006 and registered with AESA's aircraft registry on 6 September 2006.

This aircraft has a maximum take-off weight of 71,500 kg, a maximum landing weight of 64,500 kg and was equipped with two CFM56-5B4/P turbofan engines, whose serial numbers were 697757 (engine 1) and 779550 (engine 2). At the time of the incident, Engine 1 had 35564 flight hours and 21750 cycles. Engine 2 had accrued 47994 flight hours and 34204 cycles.

It had an Airworthiness Certificate issued by the AESA, the latest revision of which was valid until 27 July 2024.

The aircraft was operated by Vueling Airlines S.A., whose Air Operator Certificate (AOC) was last renewed on 20 February 2023. The AOC allowed for the operation of A320 aircraft, such as the EC-JTR.

At the time of the incident, the aircraft had 42105 flight hours and 31291 cycles.

The last scheduled maintenance overhaul was performed on 15 July 2023. The aircraft received its certificate of release to service on the same date when it had 42101:47 flight hours and 31288 cycles. The overhaul consisted of a nitrogen refill in the hydraulic system tanks and an oil refill for both engines.

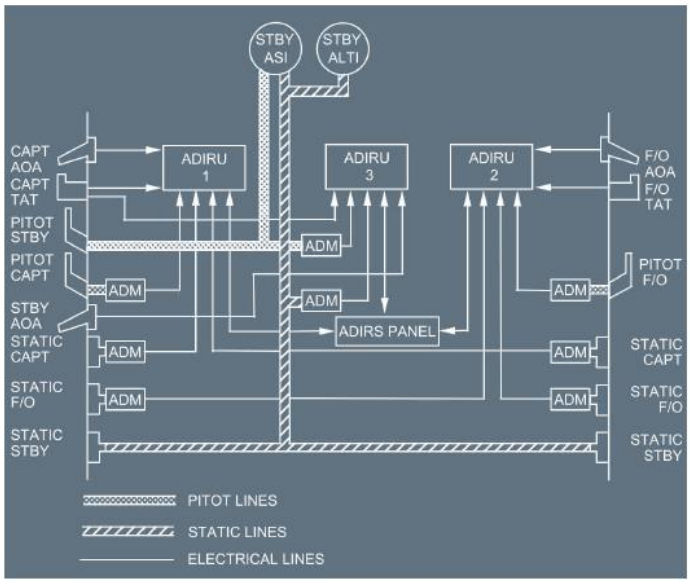
The aircraft's deferred list included the ENG 1 HP VALVE FAULT, which was associated with an operational procedure for pilots according to the MEL[5].

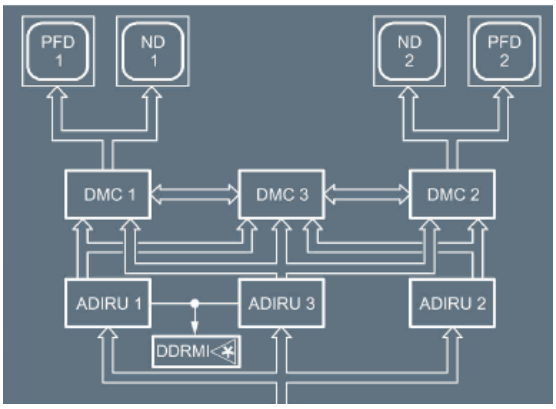
1.6.1. Speed measurement and display on the EC-JTR aircraft

On the EC-JTR aircraft, the pressure detected by the PITOT tubes and static probes is converted, via the air data modules (ADM), into numerical data in order for the air data and inertial reference[6] units (ADIRU) to calculate the airspeed. Through the display management computers (DMCs), this information is then displayed on the primary flight display (PFD) and navigation display (ND).

[5] The associated operational procedure indicated that during the taxi, the pilots had to select BLEED OFF for engine 1 and set the CROSSBLEED to the OPEN position. Prior to take-off, the pilots were to select BLEED ON for engine 1 and set the CROSSBLEED to the AUTO position.

[6] Each ADIRU is divided into 2 parts (ADR and IR). The ADR (air data reference) part provides the airspeed information and the IR (inertial reference) part provides the ground speed information.





Figures 5 and 6: Schematic outline of the air data system (source: AIRBUS).

In the standard configuration, the speed displayed on the airspeed indicator (ASI) on the captain's PFD is obtained from ADIRU 1 and from the PITOT CAPT (located on the left side of the aircraft nose) and STATIC CAPT probes (located on both sides of the aircraft nose). The co-pilot's PFD is supplied by ADIRU 2 and the PITOT F/O (located on the right side of the aircraft nose) and STATIC F/O (located on both sides) probes.

Figure 7: Location of the PITOT CAPT and PITOT STBY probes, highlighted in red and yellow, respectively.

Additionally, the aircraft is equipped with a standby airspeed indicator (STBY ASI). This indicator is directly connected to the PITOT STBY (located on the left side of the aircraft nose) and STATIC STBY probes (located on both sides).

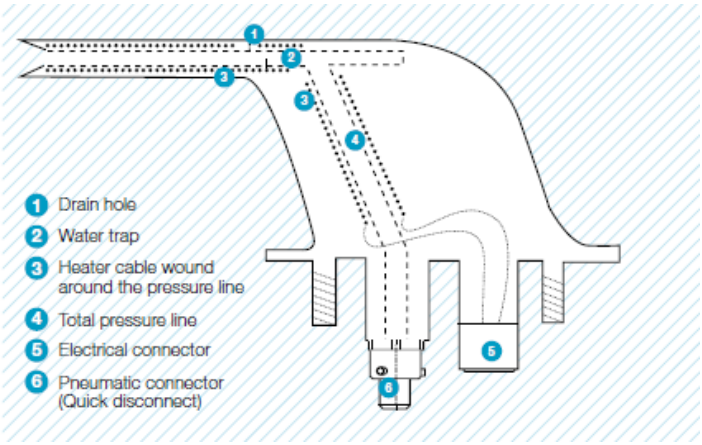


Figure 8: Diagram of the PITOT tube applicable to the A320 (source: AIRBUS Safety first no. 22).

Any obstruction of the probes can cause erroneous speed readings to be displayed to the pilots.

The figure below shows the location of the three cockpit anemometers. From left to right: the captain's anemometer, the standby anemometer and the co-pilot's anemometer.

Figure 9: Location of the 3 anemometers on the EC-JTR aircraft. The captain's (on the left) and co-pilot's (on the right) PFDs are shown in red and the standby instrument in yellow.

1.6.2. Brake system on the EC-JTR aircraft

The four main gear wheels of the EC-JTR aircraft are equipped with hydraulically actuated multi-disc carbon brakes.

The normal braking system uses the hydraulic pressure of the green system, and braking is controlled electronically through the brake and steering control unit (BSCU) by command from the pilot's pedals (pilot action) or automatically by command from the automatic braking system or AUTOBRAKE.

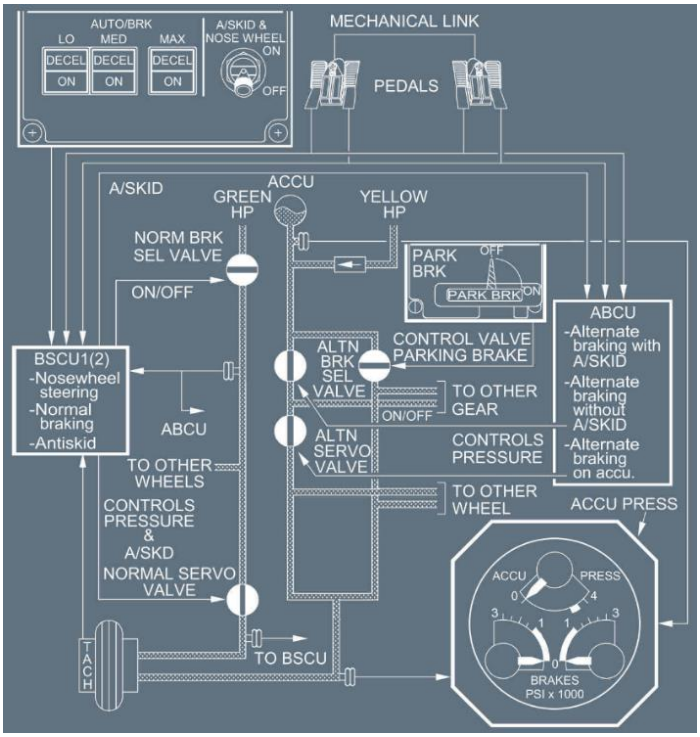


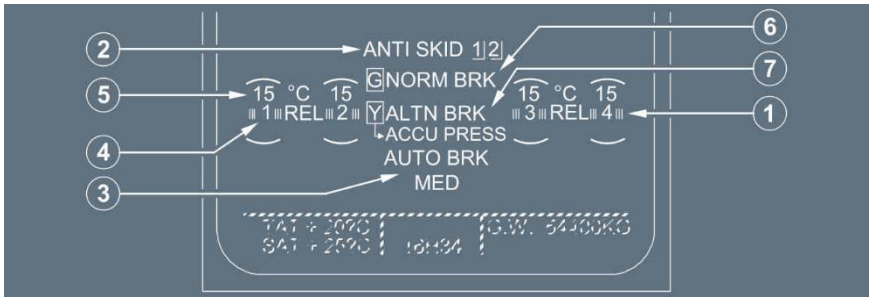
Figure 10: Schematic outline of the brake system on the EC-JTR aircraft.

When using the automatic braking system, the flight crew selects the desired deceleration rate of LO, MED or MAX (low, medium or maximum, respectively). In the case of take-offs, the MAX mode is selected (by pressing the MAX pushbutton on the panel in front of the pilots) to automatically apply maximum brake pressure in the event of a rejected take-off.

The automatic braking system is deactivated:

- If the system is disarmed (by pressing the brake selector pushbutton again or by applying sufficient brake pedal deflection[7]) or,
- If the ground spoilers retract.

Additionally, the BSCU monitors the brake temperature, displaying its value in green on the system display (SD) of the electronic centralised aircraft monitor (ECAM) (see ⑤ in the figure below).



[7] 61º on one brake or 42º on both brakes. The maximum angular travel of each brake pedal is 79.4º.

Figure 11: ECAM rendering of the EC-JTR aircraft brake information.

When the brake temperature exceeds 300ºC, the temperature indication changes to amber, and the BRAKES HOT caution activates on the ECAM.

The wheels of the main gear are equipped with six thermal fuses. Depending on their location, these thermal fuses melt at temperatures of 300ºC or 183ºC, deflating the wheels to prevent the tyres from bursting due to the wheels reaching these temperatures as a result of excessive brake overheating.

Parking brake

Pressure for the parking brake is supplied by the yellow hydraulic system or by accumulator pressure through the CONTROL VALVE PARKING BRAKE, which opens, allowing full pressure to be applied to the brakes on the main gear wheels (see Figure 10).

When the parking brake is applied, the normal braking system is deactivated.

1.6.3. Rejected take-off manoeuvre

The manufacturer's A320 Flight Crew Techniques Manual (FCTM) covers the rejected take-off manoeuvre and provides information for flight crews, an extract of which is provided below:

> The decision to reject a take-off is the captain's responsibility and must be made before V1 speed. It is a potentially hazardous manoeuvre and time for decision-making is limited. To assist in the decision making process, the take-off is divided into low and high-speed regimes, with 100 kt being chosen as the dividing line. The speed of 100 kt is not critical but was chosen in order to help the captain make the decision and avoid unnecessary stops from high speeds.
>
> If a situation or malfunction occurs before V1, for which the captain does not intend to reject the take-off, the captain will announce the intention by calling "*GO*". If a decision is made to reject the takeoff, the captain calls "*STOP*". In the latter situation, the captain immediately assumes control without the need to verbalise, *"I have control"*.
>
> Above 100 kt, and below V1
>
> The captain should be "*go-minded*" and very few situations should lead to the decision to reject the take-off, like:
>
> 1. Fire warning, or severe damage
> 2. Sudden loss of engine thrust.
> 3. Malfunctions or conditions that give unambiguous indications that the aircraft will not fly safely
> 4. Any red ECAM warning

5. Any amber ECAM caution listed below:

- F/CTL L(R) SIDESTICK FAULT
- ENG 1(2) FAIL
- ENG 1(2) REVERSER FAULT
- ENG 1(2) REVERSE UNLOCKED
- ENG 1(2) THR LEVER FAULT

The V1 call has precedence over any other call[8].

With speed above V1, the take-off must be continued because it may not be possible to stop the aircraft within the runway limits.

The figure below shows an extract of the distribution of tasks during the rejected take-off manoeuvre. Note that once the aircraft is stopped, the captain stows the thrust reversers and engages the parking brake, then alerts the cabin crew ("*ATTENTION CREW AT STATIONS*") and asks the co-pilot to perform the corresponding ECAM actions.

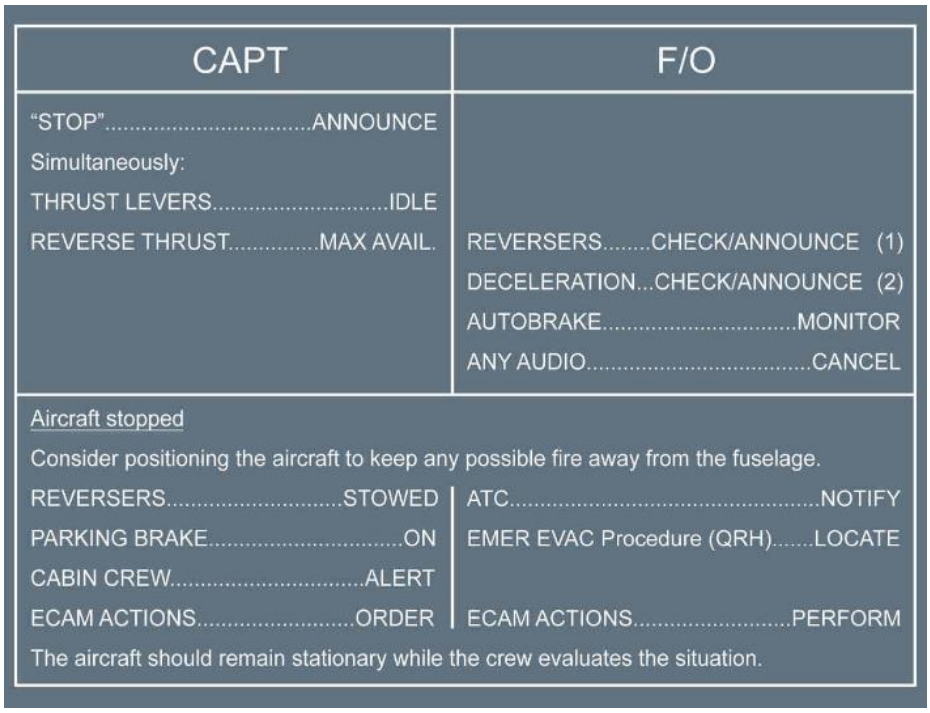


Figure 12: Distribution of tasks during the rejected take-off manoeuvre.

Full reverse available thrust may be used until coming to a complete stop. But, if there is enough runway available at the end of the deceleration, it is preferable to reduce reverse thrust when passing 70 kt.

If a rejected takeoff is initiated and MAX autobrake decelerates the aircraft, the captain will avoid pressing the pedals.

[8] This means that once the "*V1*" call has been given, the take-off must no longer be rejected, and the manoeuvre must be continued to go airborne.

After a rejected takeoff, if the aircraft comes to a complete stop using autobrake MAX, the brakes have to be released prior to taxi by disarming the spoilers.

The captain must use all possible means to obtain a clear and complete picture of the situation. He may use direct communication with any relevant person, e.g. cabin crew, ATC, ground staff, Rescue and Fire Fighting Services. The decision to evacuate must depend on the captain's judgement based on his assessment of the overall situation. The main factors that may lead the crew to initiate an emergency evacuation are uncontrollable fire, dense smoke and severe structural damage[9].

Specificities of high-speed rejected take-offs

During high-speed rejected take-offs, the brakes must dissipate a high amount of kinetic energy in the form of heat, resulting in very high temperatures in the brake assembly. This heat is transferred to the wheels, causing the thermal fuses to melt if they reach an excessive temperature and deflating them to prevent them from bursting.

The regulations address these situations through maximum energy braking tests during the certification of the aircraft[10].

1.6.4. Post-flight report (PFR)

The purpose of the Centralised Fault Display System (CFDS) is to facilitate maintenance by displaying fault messages on the cockpit instrumentation. It provides access to maintenance reports, as well as to the PFR.

The following table is an extract from the PFR provided by the operator after the incident flight:

P.	Event date	Flight phase	Event type	Message	ATA	Source	Class	Identifiers
	16 Jul 2023 07:39	02 - ENG START	FAULT	PISA(602RH114) SR 20 L	237341	CIDS 1	-	-
	16 Jul 2023 07:44	02 - ENG START	FAULT	HP BLEED-V 4000HA1 OR SENSE LINE	361151	BMC 1	-	-
	16 Jul 2023 07:45	08 - TOUCH DOWN	WARN	F/CTL	270000	-	-	-
	16 Jul 2023 07:45	08 - TOUCH DOWN	FAULT	ADR1	341234	EFCS 1	-	AFS, ,EFCS 2
L	16 Jul 2023 07:45	08 - TOUCH DOWN	WARN	AIR PACK 1 2 FAULT	216100	-	-	-
M	16 Jul 2023 07:45	09 - 80 KTS	WARN	BRAKES HOT	320000	-	-	-
	16 Jul 2023 09:19	01 - ELEC PWR	FAULT	NO FWC 1 DATA	315334	CFDS	-	-
	16 Jul 2023 09:19	01 - ELEC PWR	FAULT	NO ADR 1 DATA	341234	CFDS	-	-

Figure 13: Extract from the PFR for the incident flight.

[9] AIRBUS Safety first - December 2020 (Attention crew at stations).

[10] AIRBUS Safety first - January 2014 (Airbus brake testing) and www.airbus-win.com Maximum Energy Braking.

The different flight phases being as follows:

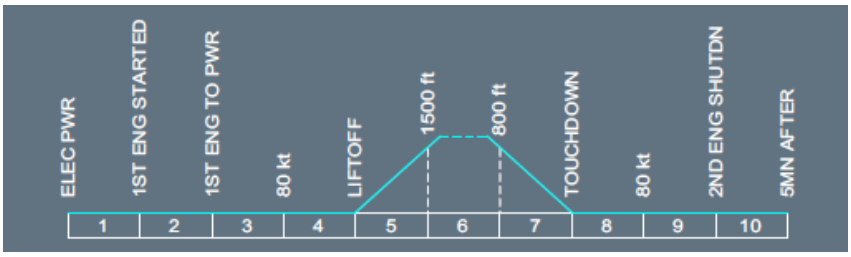


Figure 14: Numbers assigned to the different flight phases.

1.7. Meteorological information

The 07:30 METAR report is shown below (the event took place at 07:45).

METAR LEBL 160730Z 11006KT 9999 SCT044 26/19 Q1016 NOSIG

Wind 6 kt from 110º. Visibility greater than 10 km. Scattered lower clouds at 4400 ft. Temperature 26ºC and dew point 19ºC. QNH 1016 hPa.

No significant changes were forecast for the two hours following the observation time.

1.8. Aids to navigation

N/A.

1.9. Communications

The communications have been incorporated in section 1.11

1.10. Aerodrome information

Josep Tarradellas Barcelona-El Prat Airport (ICAO code LEBL) is located 10 km south-west of the city of Barcelona. Its elevation is 14 ft (4 m). It has three runways: 02/20, 06L/24R and 06R/24L.

On the day of the incident, the aircraft made the take-off run on runway 24L, which has a length and ASDA of 2660 m (both coincide) and a width of 60 m.

1.11. Flight recorders

The aircraft was equipped with a flight data recorder (FDR) and a cockpit voice recorder (CVR), which recorded the last 25 and 2 hours of flight, respectively.

- The flight data recorder (FDR) was from the manufacturer Honeywell, part number 980-4700-042 and serial number 4606.

- The cockpit voice recorder (CVR) was from the manufacturer Honeywell, model, part number 980-6022-001 and serial number CVR120-08287.

The FDR was downloaded in the laboratory of the Comisión de Investigación de Accidentes e Incidentes de Aviación Civil (CIAIAC). On finding that some of the downloaded data was inconsistent (mainly the CAS of the standby instrument), the CIAIAC requested a second opinion on the data download and validation from the aircraft manufacturer (AIRBUS). The conclusions provided by AIRBUS corroborated those of the CIAIAC. The CVR download was carried out in France at the facilities of the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA). The audio quality of the latter suggests that the pilots were probably not using headphones with a microphone.

This section combines the information extracted from both flight recorders with communications from the air traffic control services and the closed-circuit television (CCTV) images provided by LEBL airport. Graphs depicting the relevant data in this section can be found in the appendix (section 5.1).

- At 07:43:18, as the aircraft approached the holding point on runway 24L, LEBL control tower cleared it for take-off on runway 24L, reporting the wind conditions (120º/4 kt). The flight crew acknowledged the clearance for take-off.

    - The autobrake was set to the MAX position
    - Flaps were in position 1+F
    - The weight of the aircraft was 67800 kg
    - The take-off was planned with a V1 speed of 142 kt and a flexible thrust of 49ºC

<u>Take-off run and bird strike</u>

- At 07:44:34, the co-pilot (PF) advanced the thrust levers to the FLEX position, and the aircraft commenced the take-off run. At that time, the brake temperatures were 113ºC / 115ºC / 173ºC / 151ºC[11].

- At 07:44:50, the captain (PM) called *"one hundred knots"*, and the co-pilot responded, *"checked"*. The GS was 105 kt.

- At 07:44:56, the co-pilot (PF) called *"bird"*. The recorded CAS[12] was 129 kt and the GS was 134 kt.

[11] Indicates the brake temperatures associated with wheels 1/2/3/4, in that order.

[12] The FDR records the CAS reading on the captain's ASI and also the STBY system's ASI (ISIS CAS), but the latter's data was inconsistent and has not been useful for the investigation. Furthermore, the CAS displayed on the co-pilot's ASI is not recorded by this type of FDR, so we cannot know what its reading was at any point in time.

- A second later, at 07:44:57, a thud-like sound and an unintelligible exclamation from the co-pilot was heard. The CAS registered on the captain's anemometer changed to 96 kt, and the GS was 138 kt.

After the bird hit the aircraft, the recorded CAS reading is unreliable. The recorded reading for GS, however, is reliable, and up to the moment of impact and the rejected take-off, the evolution of both velocities was as follows:

Time (UTC)	CAS (kt)	GS (kt)
07:44:50	100	105
07:44:52	110	115
07:44:54	120	125
07:44:56	129	134
07:44:58	--	142
07:44:59	--	147
07:45:00	--	151

Rejected take-off manoeuvre

- At 07:45:00 (GS 151 kt) consecutively, almost simultaneously:

  - The co-pilot (PF) called "*V1*".
  - The captain (PM) called *"STOP"*.
  - A sound similar to that heard when the thrust levers are pulled out of one of their fixed positions (detent) was heard.

  Note: The "*V1*" call should have been made by the captain[13], as he was the pilot monitoring (PM). However, when the aircraft reached that speed, his anemometer was displaying erroneous data and he didn't look at the other two available anemometers. The way in which the "*V1*" call was made constituted a non-compliant operation.

- At 07:45:01, the thrust levers were recorded passing through the idle position. The maximum GS was reached, which was 153 kt.

- At 07:45:02, the thrust levers were set to the maximum reverse position, the ground spoilers were deployed, and the pressure in the normal brake system increased to 2496 psi (this was maintained until one second before the end of the recording). The thrust levers were in the maximum reverse position until 07:45:08.

- At 07:45:07, while the aircraft was decelerating through approximately 100 kt GS, the co-pilot informed the tower that they were aborting the take-off manoeuvre due to a bird strike.

- At 07:45:09, the thrust levers were set to the reverse idle position. The GS was 75 kt.

[13] Additional information in this regard is provided in section 1.18.1.

- Between 07:45:09 and 07:45:16, the brake pedals were pressed. A maximum deflection of 32º on the left pedal and 36º on the right pedal was reached.

- At 07:45:11, the MASTER CAUTION activation was recorded (it remained activated until 07:45:46).

- At 07:45:15, LEBL tower informed the pilots that they were in sight and asked them to communicate their intentions.

- At 07:45:17, two seconds before stopping, the GS was 11 kt, and the angular travel recorded on the brake pedals went to zero.

Throughout the aircraft's acceleration and deceleration phases on the runway, both engines responded as expected and were consistent with the thrust lever positions.

Aircraft at a standstill on the runway

- At 07:45:19, the GS was 0 kt and the reversers stowed. The pressure in the normal brake system was 2496 psi.

- At 07:45:21, the co-pilot replied to LEBL tower that he would call back in one minute.

- At 07:45:22, the brake temperature of wheel 1 exceeded 300ºC.

- At 07:45:26, the captain announced over the passenger announcement system, "*ATTENTION CREW AT STATIONS*" (twice).

- Between 07:45:32 and 07:46:01, the pilots had a conversation in which they commented that they could not taxi, that they *"smelled smoke"*, that the speed reading had dropped and mentioned *"the flat tyres"*. During this period:

  - At 07:45:46, the deactivation of the MASTER CAUTION was registered.
  - At 07:45:54, the thrust levers were recorded as being advanced from the IDLE position, and the N1 of the engines increased from 20% to 33% before they were moved back to IDLE. The pressure in the normal brake system remained at 2496 psi.
  - The brake temperature of wheel #3 (the hottest of the 4) increased from 396ºC to 568ºC. Wheel no.1 had the lowest temperature at 475ºC.

- At 07:46:05, the captain asked the co-pilot for the evacuation checklist, and they began to read it.

- At 07:46:27, the captain notified LEBL tower that they were unable to taxi, that they needed assistance from the fire brigade, that the temperature of the wheels was increasing and that they were going to initiate an evacuation.

- At 07:46:42, LEBL tower informed the flight crew that all information had been copied, that the fire service had been alerted and that they were standing by.

- At 07:46:51, the brake temperature (last available record) was 617ºC / 638ºC / 738ºC / 668ºC.

- At 07:46:54, the pilots verbalised that they were shutting down engines 1 and 2.

- At 07:47:00, the recordings on the recorders ended. The normal brake system pressure remained at 2496 psi until 1 second before the end of the recording, which was when the activation of the parking brake was recorded. The ground spoilers remained deployed.

Evacuation and arrival of the Rescue and Firefighting Service (SSEI)

- At 07:47:29, LEBL tower asked the crew if they were evacuating the aircraft in these terms: *"VLG80BU are you confirming evacuation on the runway?.... right, everything is in sight."*

- At 07:47:35, the flight crew replied in the affirmative, this being the last communication between the flight crew and LEBL tower.

- According to the pilots' statement, they recalled that the brake temperature reached approximately 800ºC.

- At 07:50:05, the SSEI command vehicle informed the tower that it and three heavy vehicles were approaching the aircraft.

- At 07:50:24, LEBL tower informed the aircraft that the fire service was already in front of the aircraft. There was no reply from the aircraft.

  - At 07:50:29, the CCTV footage shows the command vehicle arriving at the front of the aircraft.
  - At 07:50:51, the CCTV footage shows the three heavy vehicles arriving at the front of the aircraft.

- At 07:55:16, the SSEI informed the tower that they were cooling the aircraft's brakes.

- At 08:06:24, the SSEI informed the tower that both landing gears were deflating.

1.12. Aircraft wreckage and impact information

The aircraft entered the runway from taxiway G1 (see 1 in the figure below) and finally came to a stop between taxiways G8 and G9 approximately 600 m from the end of the runway (see 2 in the figure below). The remains of the bird were found on the left side of runway 24L, close to rapid exit G6 (see 3 in the figure below).

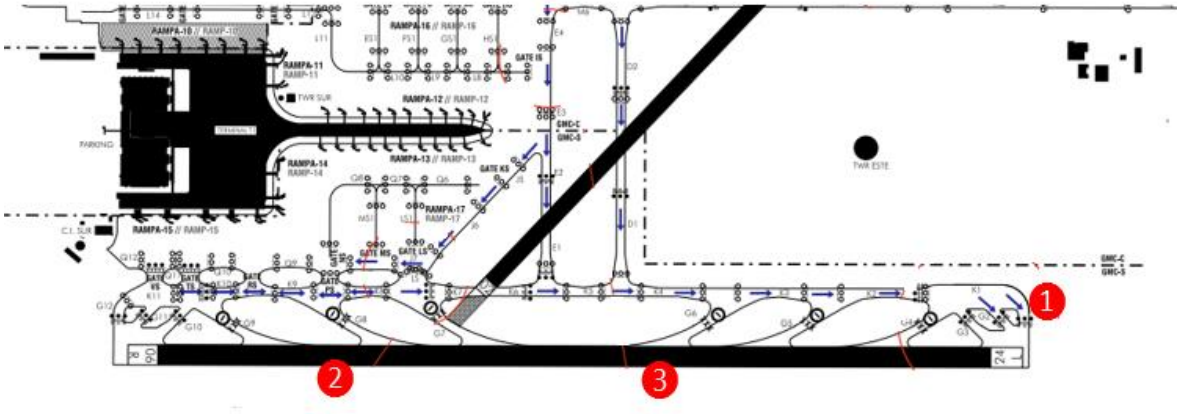


Figure 15: Extract from LEBL airport map the relevant positions of the EC-JTR aircraft and the bird that hit it.

As a result of the high-speed rejected take-off, three of the four wheels (2, 3 and 4) on the main gear deflated after the aircraft had stopped due to the triggering of their thermal protection fuses. In addition, the deployment of the evacuation slides caused minor damage to the aircraft.

A temperature connector on the right main gear was damaged by the water sprayed onto the wheels to cool them by the fire brigade.

Pitot tube number 3 (or PITOT STBY) appeared (at first glance) to be damaged (witnesses stated "*bent/curved or dented*"). However, on further inspection, it was found to be undamaged. Furthermore, the PITOT STATIC system was purged, and the functional checks specified in the aircraft maintenance manual were performed satisfactorily.

During the evacuation, 5 of the 8 available emergency exits were opened, and the corresponding slides were deployed. The 2 emergency exits positioned over the right wing and one of the emergency exits over the left wing were not opened by the passengers who should have done so. In addition, the emergency exits and ramps were checked and operationally tested and found to be satisfactory.

Following the event, all the main gear wheels (left and right) and their associated brakes were replaced, in addition to the right main gear temperature connector, before towing the aircraft off the runway. The functional tests performed were satisfactory.

No similar events or failures have been reported since the aircraft was put into service.

Figures 16 and 17: Condition of the main gear wheels after the incident. Figure 16 (on the left) shows wheels 1 and 2, and Figure 17 shows wheels 3 and 4.

1.13. Medical and pathological information

N/A.

1.14. Fire

No fire broke out.

1.15. Survival aspects

1.15.1. General

The EC-JTR aircraft was equipped with four Type I aircraft access doors, two on each side. These doors, found at the front and rear of the aircraft, are typically used to board and disembark passengers.

It also has four Type III emergency exits over the wings on each side of the aircraft.

All of the doors are equipped with evacuation slides for the emergency evacuation of passengers and crew.

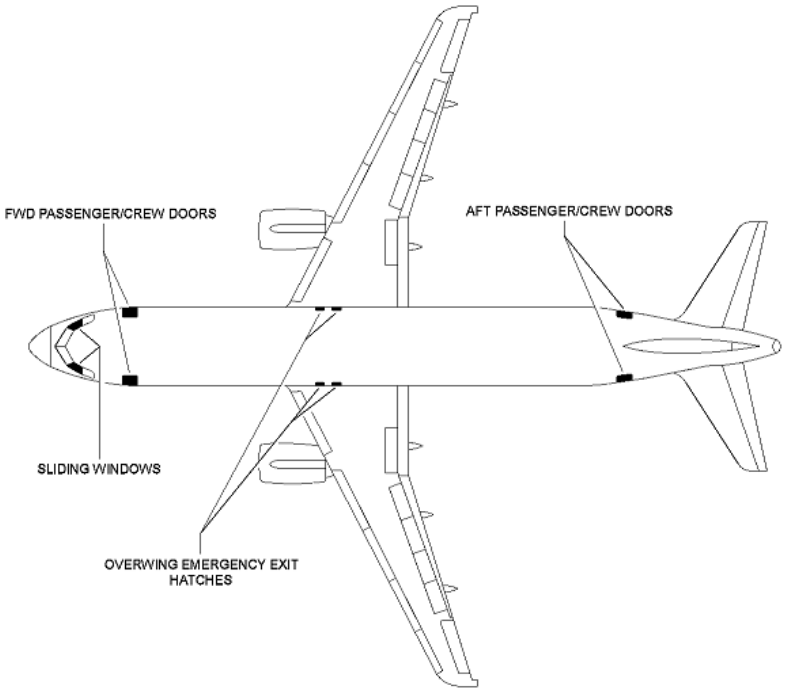


Figure 18: Layout of the doors and emergency exits on the EC-JTR aircraft.

1.15.2. Evacuation of the aircraft

According to the statements made by the cabin crew, after hearing the evacuation announcement, they started to evacuate the aircraft. In the moments leading up to the evacuation, the passengers were calm.

The evacuation was carried out via 5 of the 8 available exits. The 2 front and 2 rear exits were opened and their slides deployed, while only one of the 4 emergency over-wing exits was opened (one of the 2 over the left wing, with the associated slide being deployed).

In other words, one of the over-wing emergency exits on the left and the two on the right were not opened.

The cabin crew stated that they had told the passengers seated next to the doors[14] how to open them in the event of an evacuation. Although the passengers agreed with the instructions they had received, when the time came, they did not take the necessary action to open the emergency exits.

[14] The passenger who sits next to each of these four emergency exits receives instructions from the cabin crew on how to open them should they have to evacuate.

Figure 19: Photograph of the EC-JTR aircraft taken after the evacuation.

During the evacuation, some of the passengers took packages or hand luggage with them.

After evacuating the aircraft, the passengers moved away to either side of the aircraft in two groups and were then transferred in buses to the airport terminal.

The medical attention provided following the evacuation consisted of treatment anxiety attacks and minor injuries sustained while descending the slides.

1.15.3. Response from the emergency services

The following is an extract of the actions taken during the activation of the Local Aircraft Incident Alert scenario (AL01) from the J.T. Barcelona – El Prat Airport Emergency Plan after the rejected take-off of the EC-JTR aircraft.

Time (LT)	Action
09:45 LT	After the rejected take-off, the control tower (TWR) asks the Runway and Apron Service (SPP) to go to runway 06R/24L for an inspection. F08 and F02 attend.
09:46 LT	Pilot requests assistance and the presence of the SSEI due to high brake temperatures. The slides are deployed to disembark the passengers.
	The tower supervisor **presses the alarm**[15], and it sounds at the Airport Management Centre (CGA), Observation and Alarm Centre (COA) and Airport Medical Service (SMA).
09:47 LT	Two heavy firefighting vehicles (H1 and H11) depart SSEI South.
	Ground Movement Control South gives F08 clearance to access the runway via G12 at a slow speed to supervise the evacuation of

[15] The response time for the rescue and firefighting services was 3 minutes. See EASA *AMC5 ADR.OPS.B010 (a) (2) COMMISSION REGULATION (EU) No 139/2014 of 12 February 2014 laying down requirements and administrative procedures related to aerodromes pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.*

	passengers.
	The passengers are evacuating the aircraft.
09:48 LT	The first two SSEI vehicles arrive at the VS gate (H1 and H11).
	Two other SSEI South vehicles leave the park (H3 and VM1). VM1 being the Command Vehicle.
	SSEI VM1 communicates with TWR and requests permission to enter the runway. TWR tells them to stand by.
09:49 LT	The service executive proceeds to activate scenario AL01 of the Airport Emergency Plan in response to a "Local Aircraft Incident Alert", establishing the Team Assembly Point at stand 400 (subsequently moved to stand 425). Communications are initiated on the Emergency Channel. The Main Command Post (PMP) is set up in the Airport Management Centre (CGA).
	SPP vehicles F08 and F02 are supervising the evacuation area.
	TWR asks VM1 to enter the runway via G12, drive slowly, and switch to frequency 118.
	Vehicles VM1, H1, H3 and H11 start to move from gate VS.
09:50 LT	The last passenger is evacuated from the aircraft.
	SSEI vehicles arrive at the scene of the incident, begin reconnaissance of the area and analyse the situation.
09:52 LT	The SSEI begins to deploy hoses from 2 vehicles.
09:58 LT	After analysing the situation, the SSEI starts cooling the main landing gear.
09:59 LT	The Guardia Civil, buses and PRM (Passenger with Reduced Mobility) vehicle arrive at the scene of the incident.
10:00 LT	The service executive arrives at the scene of the incident and assumes the role of Forward Command Post Manager (RPMA).
	CECOPS (Operations Control Centre) coordinates with SPP to guide the buses and PRM vehicle to pick up the passengers and take them to the Terminal 1 (T1) Affected Persons Room.
10:03 LT	TWR changes to WRR[16] configuration, to proceed to take-offs from 24R.
10:10 LT	The last bus leaves the scene of the incident. All the passengers have been collected for transfer to the Affected Persons Room in T1.
10:13 LT	The passengers are in buses on their way to the Affected Persons Room.
	The RPMA activates the Disabled Aircraft Transfer procedure OPE_SEI_011.
	The passengers will be attended in the Affected Persons Room in T1 by the Airport Medical Service. The wheels of the aircraft's main gear are changed on the runway so that it can be towed to a remote stand.

[16] In the WRR configuration, both take-offs and landings are made on runway 24R.

11:36 LT	The RPMA deactivates the AL01 scenario, communicating it through the emergency channel.
11:45 LT	With the aircraft on stand 425, the service executive deactivates the Disabled Aircraft Transfer procedure OPE_SEI_011.
	The service executive informs the airport manager, the Network Management Centre (CGR) and the CIAIAC.
	In the Affected Persons Room in T1, the Airport Medical Services from both T1 and T2 confirm 15 injured persons (all with minor injuries). Of these, 1 person is transferred to Bellvitge Hospital as a precaution. An ambulance is requested from the Emergency Medical Service to carry out the transfer.
11:47 LT	The inspection of runway 06R/24L is completed, and it is deemed operational.

The image in the figure below shows the time (07:50:51) that the three heavy rescue and firefighting vehicles arrived at the aircraft, extracted from the airport CCTV recordings (the image shows local time).

Figure 20: Arrival of the three SSEI heavy vehicles at the aircraft. Image extracted from the airport's CCTV footage (the time shown is local time, LT)

1.16. Special tests and investigations

N/A.

1.17. Organisational and management information

J.T. Barcelona-El Prat Airport

After the incident, Barcelona Airport analysed the actions undertaken as a result of the activation of the J.T. Barcelona-El Prat Airport Emergency Plan's Local Aircraft Incident Alert scenario (AL01) following the rejected take-off of the EC-JTR aircraft on runway 24L, with the aim of improving future interventions and/or the procedures of the Emergency Plan.

The analysis identified possible areas for improvement with regard to optimising the response time of the Rescue and Firefighting Service (SSEI). The following two observations stand out:

Observation 2: The first SSEI vehicles to arrive at Gate VS were not accompanied by the Command Vehicle and waited for it to arrive so they could enter the runway together.

> *Anticipated Action 2.1: Advise the SSEI that the extinguishing vehicles determine the response time and that they do not need to wait for the Command Vehicle to request access to the runway.*
>
> *Anticipated Action 2.2: Hold SSEI workshops during shifts to evaluate the different interventions and work on lessons learned.*

Observation 3: Improvements can be made to communications between the SSEI and TWR, both at the SSEI level, in terms of expediting runway access, and at the Observation and Alarm Centre (COA) level, where more training would expedite SSEI deployment.

> *Anticipated Action 3.1: Discuss the event in the SSEI-TWR communications working group with SSCC and ENAIRE in order to enhance communications with TWR and establish measures for improvement.*
>
> *Anticipated Action 3.2: Set up a working group with SSEI volunteers to improve the actions and communications of the COA.*

Operator of the EC-JTR aircraft

Following the incident, the operator adopted the following measures aimed at facilitating decision-making process for flight crews when it comes to evaluating whether or not to evacuate an aircraft:

- *The new 'pilot notes' template created by the training department will be used to create a video explaining the steps to follow when deciding whether or not to evacuate an aircraft. Emphasis will be placed on trying to use all available resources and conducting an appropriate analysis of the situation.*

- *Furthermore, a scenario in which the decision not to evacuate should be made (using the evacuation checklist anyway) will be added to flight crew simulator training.*

The operator explained that these actions have been implemented and are being carried out in the simulator training that started in December 2023.

1.18. Additional information

1.18.1. Take-off decision speed callout

The following information appears in the Vueling Airlines S.A. FCTM, under Procedures - Normal procedures - Standard operating procedures - Take-off:

TAKEOFF ROLL

Ident.: PR-NP-SOP-120-00018792.0001001 / 04 NOV 20
Applicable to: ALL

Once the thrust is set, the PF announces the indications on the FMA. The PM must check that the thrust is set by 80 kt and must announce "Thrust Set".
The Captain must keep his hand on the thrust levers when the thrust levers are set to TOGA/FLX notch and until V1.
During the take-off roll, the PM monitors the PFD and ENG indications to ensure early detection and appropriate decision making in the case of malfunction. By scanning the airspeed indications, the PM will detect any inconsistent airspeed indications between instruments or absence of airspeed indications.

In addition, the following information is included in the Vueling Airlines S.A. FCOM (Flight Crew Operations Manual), under Procedures - Normal procedures - Standard operating procedures - Take-off:

AT V1

V1..... ANNOUNCE | PM

VLG EC-JTR For A/C: EC-JTR PRO-NOR-SOP-12 P 2/6
FCOM ← A → 15 FEB 23

1.18.2. Wildlife Control Service - Wildlife Risk Management Programme

After the event, the Wildlife Control Service found the body of the bird involved, a wild peregrine falcon.

It was a young female, ringed as a chick on 19/04/2023 in a nest located at the Escuela Técnica Superior de Ingeniería Industrial de Barcelona (about 11 km from the point where the incident occurred).

The main remains of the animal were found on the left side of runway 24L, on a level with rapid exit G6. The aircraft came to a stop at taxiway G8, where 4 feathers of the same animal were also found (see Figures 3, 4 and 14).

In the censuses carried out at Barcelona Airport, this species ranks 40th in terms of abundance, with an annual average of only 14 sightings between 2011 and 2022. However, a growing trend in their numbers was recorded in 2023.

Since 2015, this species has been identified in four collisions inside Barcelona Airport (one in 2015, two in 2016 and one in 2018), and five other carcasses have been found and logged as animal FOD (foreign object debris of animal origin) in the manoeuvring area, although no probable cause of death could be established.

The presence of juveniles (such as the one involved in this collision) scattered around the airport grounds and surroundings is common at the time of year in which the incident took place, and the trend towards growing numbers in 2023 is attributed to the increase in the overall population and the reduced availability of suitable hunting grounds in the areas surrounding the airport.

According to the risk assessment conducted in the “Wildlife Collision Risk Study”, the peregrine falcon has been assigned a LOW overall risk level (medium collision risk and low level of presence). In an effort to reduce its presence and the risk it poses, the airport manager has incorporated the following measures into its “Wildlife Risk Management Programme”:

GHA 3. Removal of roosting sites from the airfield.

GHA 4. Removal of trees from the airfield and adjacent areas.

EXC 2. Installation of anti-roosting devices on airport equipment.

EXP 3. Use of acoustic scaring devices.

EXP 4. Use of pyrotechnics (blanks).

OME 1. Protocol for collecting information in case of impact.

OME 2. Procedure OPE-SGP-007 for wildlife management in the movement area.

OME 3. Dissemination and coordination with external agents, airlines, maintenance personnel and ground handling agents.

OME 4. Monitoring of wildlife populations.

OME 5. Quarterly coordination meetings between the Department of Operational Safety (DSO) and the Department of Airfield Maintenance and Development (DMCVU), and annual coordination meetings with the Department of Operational Management (DGO).

On 02/08/2023, a meeting of experts was held to approve the proposed risk management and mitigating measures. Some of the proposed mitigating measures include the following:

- MM 5. Liaise with Barcelona City Council to obtain information about the programme to reintroduce the Peregrine Falcon to the city and the origin of the ringed birds detected at the airport.

  Measure closed. On 17/08/2023, a meeting was held with the biodiversity division of the City Council, and the company contracted to monitor peregrine falcons and other species nesting in the city centre. At the meeting, information was shared on the peregrine falcon population and the possible causes of its presence in the vicinity of the airport. It was agreed that more information would be shared and that the council would evaluate the possibility of altering the current monitoring and management of the population.

- MM 6. Step up the removal and capture efforts of the Wildlife Control Service (SCF) to prevent the settlement of individuals that may identify the airport compound as a suitable hunting ground.

  Measure in process of implementation (deadline: 15/07/2024). On 09/08/2023, the Department of Operational Safety issued a communication to the SCF to formalise the implementation of the measure. An analysis of the feasibility of the captures will be carried out.

1.18.3. Post-mortem examination of the bird involved

The following is an extract from the report on the post-mortem examination of the bird involved.

> *The primary cause of death is suspected to be trauma to the rear pelvic area. This trauma caused an intracellular haemorrhage in the renal area and very possibly paralysis of the hind limbs, rendering the bird incapable of flight control. The loss of central tail feathers and tearing to the skin suggests a very abrupt pulling of the feathers, possibly as a result of being caught in some part of the aircraft's structure.*
>
> *The remaining skin injuries, head trauma and scapular fracture may have been sustained on impact with the ground.*

1.19. Special investigation techniques

N/A.

2. ANALYSIS

2.1. Information downloaded from the recorders

Based on the information extracted from the CVR and FDR, it's been determined that the engine thrust was as expected for the positions of the thrust levers set by the pilots. It can be concluded that at no time was there a lack of thrust that could have resulted in a decrease in acceleration or speed.

The sudden decrease in calibrated airspeed shown on the captain's anemometer resulted from the bird impacting the probes (or some of them, at least) that supply its air data. From the moment of impact, neither the calibrated airspeed data displayed on the captain's anemometer nor that recorded on the FDR based on air data captured by said probes were reliable.

The FDR of the EC-JTR aircraft does not record the calibrated airspeed data displayed on the co-pilot's anemometer, however, in his statement, he reported that his anemometer did not indicate any anomaly during the take-off run.

The FDR on board the EC-JTR aircraft does record the calibrated airspeed data displayed by the standby anemometer. However, this data was of no use to the investigation as it was not properly recorded, and therefore, the data that was downloaded and validated (both at the CIAIAC laboratory and at the laboratory of the aircraft manufacturer AIRBUS) on the calibrated airspeed registered by the standby anemometer was inconsistent and could not be used in this investigation.

The FDR data shows that the take-off (and its rejection) was performed with the automatic braking system set to the MAX position. During the rejected take-off, the thrust reversers were deployed and engaged in the MAX position.

The automatic braking system was set to MAX position until the end of the recording; it was not deactivated at any time. Under these conditions, the aircraft would be unable to move even if thrust was applied.

2.2. Bird strike, decision to reject take-off and relevant speeds

The following sequence of relevant events has been reconstructed based on an analysis of the data provided by the CVR and the FDR on the EC-JTR aircraft:

Time (UTC)	CAS (kt)	GS (kt)	Comments
07:44:50	100	105	The anemometers of the two pilots show no discrepancy between them
07:44:52	110	115	
07:44:54	120	125	
07:44:56	129	134	The co-pilot calls *"bird"*

07:44:57	A thud is heard and the CAS on the captain's anemometer stops being reliable		
07:44:58	--	142	The aircraft continues to accelerate
07:44:59	--	147	
07:45:00	--	151	The co-pilot calls "*V1*", the captain calls "*stop*", and the thrust levers are retarded

The difference between GS and CAS recorded during the 7 seconds prior to the bird strike was +5 kt in favour of GS. Three seconds elapsed between the impact and the retard of the thrust levers, during which time the engines continued to provide thrust correctly, and the take-off run continued on its normal course. It is reasonable to assume that the CAS was still 5 kt lower than the GS during those three seconds.

Thus, at 07:44:59, the GS was 147 kt and the CAS is estimated[17] to have been 142 kt, i.e., coincident with the V1 decision speed. The co-pilot saw this number on his anemometer and then verbalised it[18]. This verbalisation occurred one second later, at 07:45:00, by which time the GS was 151 kt (the aircraft was still accelerating), and the estimated CAS was 146 kt. The captain decided to abort the take-off by calling "*stop*" just after this, at which time V1 had already been exceeded. As a result, it was a non-compliant operation.

The captain, who was acting as a pilot monitoring (PM) on take-off, was supposed to be monitoring the flight and engine parameters. When his anemometer displayed an anomalous reading, he should have looked for alternative information on the standby instrument. However, the captain did not look at either the standby anemometer or the co-pilot's anemometer (although the latter was further away) to compare the unexpected data that his anemometer began to display with the other two instruments available before making the decision to reject the take-off. In addition, the engine parameters did not change in any way that would indicate that the engines were no longer working properly. Three seconds elapsed between the bird strike and the thrust levers being retarded.

2.3. Deceleration and emergency evacuation

The aircraft performed a strong deceleration and came to a stop about 600 m short of the end of the runway at 07:45:19.

The brake temperatures rose considerably, as was to be expected: at 07:46:01, the brake temperature of wheel 3 was 568ºC, and the lowest temperature (wheel 1) was already at 475ºC. The conditions were met for the protective deflation of the wheels.

A smell of burning rubber was perceived in the cockpit.

[17] Estimated by subtracting 5 kt from the GS.

[18] The 'V1' call should have been made by the captain, as he was the pilot monitoring. However, when the aircraft reached that speed, his anemometer was displaying erroneous data and he didn't look at the other two available anemometers.

The pilots applied thrust to leave the runway, but the aircraft did not move. This was because the automatic braking system was still set to the MAX position. The pilots were not aware of this fact.

The smell of burning rubber, the high temperature of the wheels and the fact that the aircraft could not move prompted the captain to make the decision to evacuate.

2.4. Rescue and firefighting services (SSEI) at the airport

With regard to the performance of the airport's rescue and fire-fighting services:

Time (UTC)	Comments
07:46:27	The captain of the EC-JTR aircraft informed LEBL tower that they intended to initiate an evacuation
07:47:29	LEBL tower asked the crew if they were evacuating the aircraft
07:46:42	LEBL tower informed the flight crew that all information had been copied, that the fire service had been alerted and that they were standing by
07:47:35	The flight crew replied in the affirmative, this being the last communication between the flight crew and LEBL tower
07:50:05	The SSEI command vehicle informed the tower that it and three heavy vehicles were approaching the aircraft
07:50:29	The CCTV footage shows the command vehicle arriving at the front of the aircraft
07:50:51	The CCTV footage shows the three heavy vehicles arriving at the front of the aircraft

Between the time the tower notified them of the alarm (07:46:42) and the time the heavy vehicles appeared in the footage (07:50:51), 4 minutes and 9 seconds elapsed.

Under the applicable regulations, the response time of the rescue and firefighting services should have been no more than 3 minutes.

2.5. Corrective measures taken by the various parties involved

The measures taken by the aircraft operator (Vueling Airlines S.A.) to facilitate the decision-making process for flight crews when it comes to evaluating whether or not to evacuate an aircraft are considered to be adequate and no safety recommendations are issued in this regard.

The measures taken by the airport service provider (AENA) to minimise the response time of the SSEI are considered to be adequate and no safety recommendations are issued in this regard.

The measures taken by the airport service provider (AENA) to reduce the presence and associated risks posed by birds on the airfield are considered to be adequate and no safety recommendations are issued in this regard.

3. CONCLUSIONS

3.1. Findings

- The EC-JTR aircraft commenced take-off on runway 24L at Barcelona Airport with the autobrake set to the MAX position and with a decision speed (V1) of 142 kt.
- The FDR on the EC-JTR aircraft records the calibrated airspeed displayed by the captain's anemometer and the standby anemometer but does not record the co-pilot's anemometer.
- A bird struck the EC-JTR aircraft before the decision speed was reached.
- The calibrated airspeed data from the captain's anemometer recorded by the FDR on the EC-JTR aircraft was inconsistent after the bird strike.
- The calibrated airspeed data from the standby anemometer recorded by the FDR on the EC-JTR aircraft did not provide information that could be used in the investigation.
- The captain rejected the take-off after the decision speed had been reached and exceeded.
- The autobrake system was operating in the MAX position throughout the deceleration. The thrust reversers were deployed and engaged in the MAX position.
- The aircraft came to a stop 600 m before the end of the runway.
- After coming to a stop, the aircraft was unable to move when the pilots applied thrust because the autobrake system was still in the MAX position, having not been disengaged at any time.
- The captain ordered an emergency evacuation because the aircraft would not move, there was a smell of burning rubber, and the tyre temperatures were becoming very high.

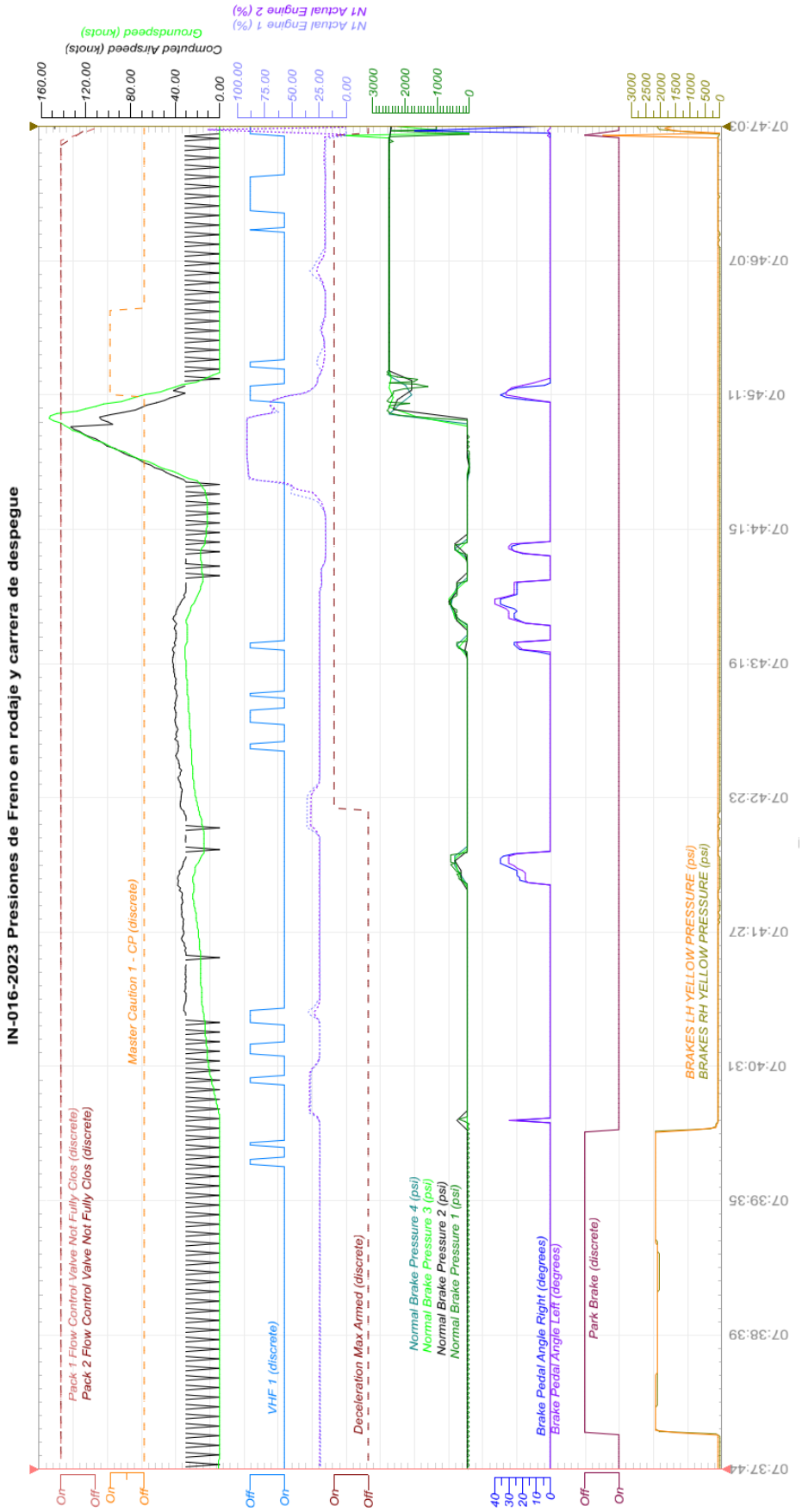
3.2. Causes/contributing factors

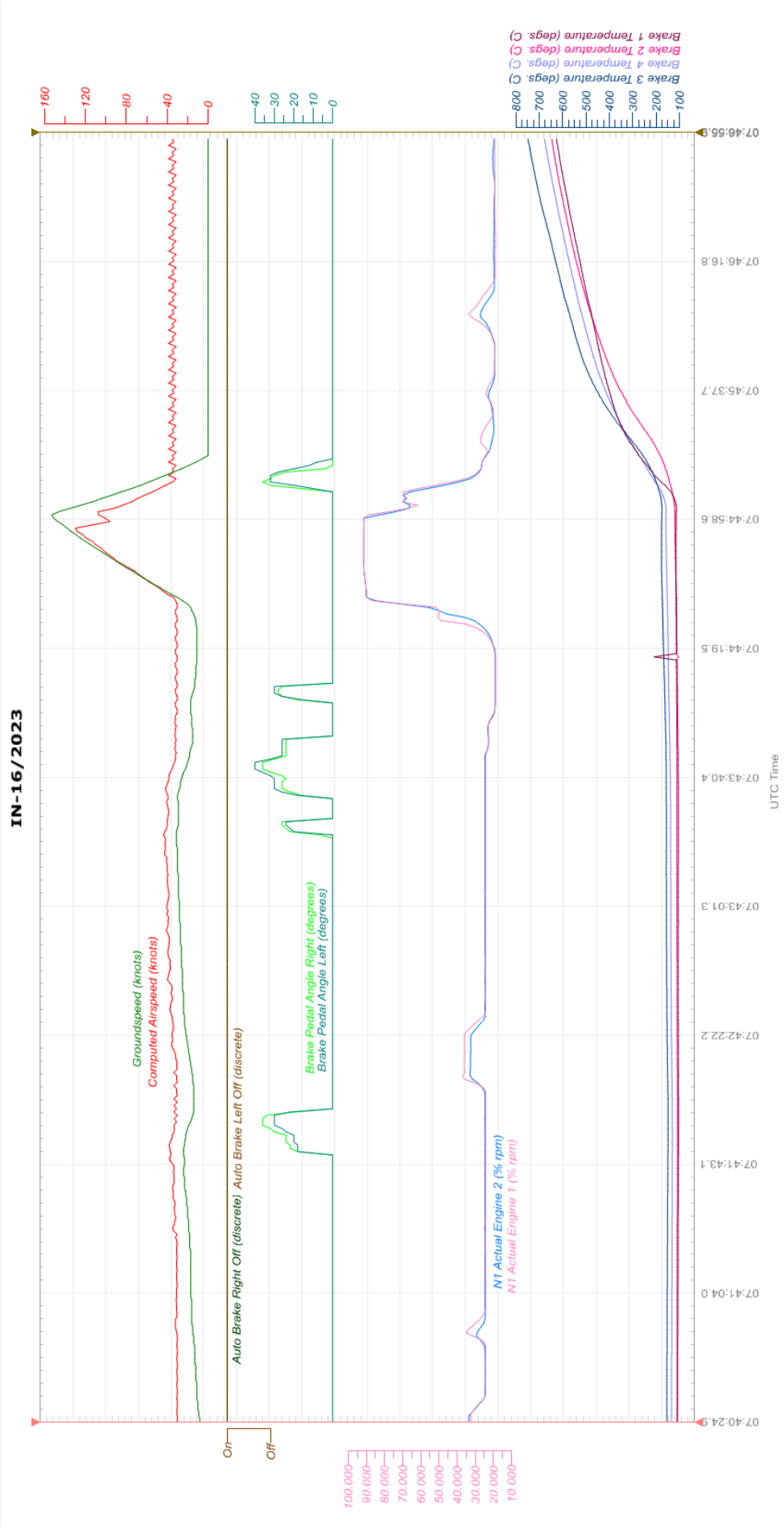
The investigation has concluded that the incident was caused by a bird striking the captain's Pitot tube, which led to him rejecting the take-off after exceeding the decision speed.

4. OPERATIONAL SAFETY RECOMMENDATIONS

None.

5. APPENDIX


IN-016-2023 Presiones de Freno en rodaje y carrera de despegue
Computed Airspeed (knots)
Groundspeed (knots)
N1 Actual Engine 1 (%)
N1 Actual Engine 2 (%)
Pack 1 Flow Control Valve Not Fully Clos (discrete)
Pack 2 Flow Control Valve Not Fully Clos (discrete)
Master Caution 1 - CP (discrete)
VHF 1 (discrete)
Deceleration Max Armed (discrete)
Normal Brake Pressure 4 (psi)
Normal Brake Pressure 3 (psi)
Normal Brake Pressure 2 (psi)
Normal Brake Pressure 1 (psi)
Brake Pedal Angle Right (degrees)
Brake Pedal Angle Left (degrees)
Park Brake (discrete)
BRAKES LH YELLOW PRESSURE (psi)
BRAKES RH YELLOW PRESSURE (psi)
07:47:03
07:46:07
07:45:11
07:44:15
07:43:19
07:42:23
07:41:27
07:40:31
07:39:35
07:38:39
07:37:44


IN-16/2023
Brake 3 Temperature (degs. C)
Brake 4 Temperature (degs. C)
Brake 2 Temperature (degs. C)
Brake 1 Temperature (degs. C)
800
700
600
500
400
300
200
100
160
120
80
40
0
40
30
20
10
0
07:46:55.9
07:46:16.8
07:45:37.7
07:44:58.6
07:44:19.5
07:43:40.4
07:43:01.3
07:42:22.2
07:41:43.1
07:41:04.0
07:40:24.9
UTC Time
Groundspeed (knots)
Computed Airspeed (knots)
Auto Brake Right Off (discrete)
Auto Brake Left Off (discrete)
Brake Pedal Angle Right (degrees)
Brake Pedal Angle Left (degrees)
N1 Actual Engine 2 (% rpm)
N1 Actual Engine 1 (% rpm)
On
Off
100.000
90.000
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000