Bundesstelle für
Flugunfalluntersuchung

German Federal Bureau of
Aircraft Accident Investigation

Investigation Report

The investigation was completed stating facts only, i.e. no analysis and conclusions.

Identification

Type of Occurrence:	Accident
Date:	9 February 2024
Location:	Leipzig/Halle Airport
Aircraft:	Airplane
Manufacturer:	Airbus Industry
Type:	A300F4-622R
Injuries to persons:	No injuries
Damage:	Aircraft substantially damaged
Other Damage:	Runway damage
State File Number:	BFU24-0073-1X

Abstract

On landing, the airplane bounced and during the second touchdown, the tail section had contact with the runway, i. e. a so-called tailstrike occurred.

Factual Information

History of the Flight

The Airbus A300F4-622R (A300) was on a cargo flight from Tel Aviv, Israel, to Leipzig/Halle, Germany. Two pilots were on board of the airplane. At 0821 hrs[1] on the day of the occurrence, the two pilots had taken off with the airplane from Leipzig/Halle Airport and flew to Tel Aviv, where they landed at 1252 hrs local. At 1449 hrs, the airplane took off from Tel Aviv for the return flight after it had been unloaded and re-loaded. For the landing at Leipzig/Halle, an instrument approach procedure to runway 26L was planned and performed.

At 1722 hrs, the pilots performed the approach briefing. At 1747 hrs, the airplane captured the localizer and the pilots received the clearance for an ILS approach 26L. At 1749 hrs, the Pilot In Command (PIC) in his function as Pilot Monitoring (PM) reported “localizer established”. The approach was flown manually and the engine thrust levers were controlled manually. During the approach, the landing checklist was completed and at 1753:20 hrs, at 1,000 ft, the co-pilot, as Pilot Flying (PF), determined the approach as stabilised. The PIC confirmed it and the approach was continued. As the runway was reached, the co-pilot initiated the flare of the airplane and attempted to align it with the runway from a crosswind approach.

At 1754:31 hrs, the airplane touched down for the first time. It lifted off again, rolled right and at 1754:34 hrs, touched down again. At 1754:37 hrs, both pilots almost simultaneously said “go-around” and the PIC intervened in the steering. From 1754:38 hrs on, engine thrust increased again. The PIC performed the go-around and acted as PF until the landing at 1812 hrs on runway 26R.

During the aborted landing, a tailstrike occurred where the aft, lower fuselage structure and the surface of runway 26L were damaged.

[1]All times local, unless otherwise stated.

Personnel Information

Pilot in Command

The 50-year-old PIC held an EU Airline Transport Pilot License ATPL(A) last issued by the Luftfahrt-Bundesamt (LBA) in accordance with Part-FCL. The licence listed the rating for the type A310/300-600 and the respective instrument rating; each valid until 30 November 2024, among other ratings. In addition, he held the flight instructor rating (FI(A)) and the instructor rating for type rating (TRI) C525 and various examiner certificates.

His class 1 medical certificate was valid until 17 May 2024.

According to his statement, he had a total flying experience of 8,475 hours, of which 2,399 hours and 665 landings were acquired on type, according to the operator. So far, in real flight operations he had performed two go-around.

Both pilots had been flying together several times. The PIC stated that he had complete confidence in the co-pilot. During the previous landings there had never been any problems.

Co-pilot

The 30-year-old co-pilot held an EU Commercial Pilot License (CPL(A)) issued on 31 May 2022 by the LBA in accordance with Part-FCL. The licence listed the rating for the type A310/300-600 and the respective instrument rating; each valid until 31 December 2024. In addition, the ratings MEP(land) and IR were listed, but expired.

Her class 1 medical certificate with the restriction VDL[2] was valid until 4 September 2024.

According to the operator, she had a total flying experience of 589 hours, of which 433 hours and 115 landings were acquired on type. Up until the occurrence, she had not performed a go-around in real flight operations as PF.

[2] VDL: Correction for defective distant vision

Aircraft Information

The Airbus A300 is a low-wing aircraft in all-metal construction and retractable landing gear in nose wheel configuration. It is designed as transport aircraft for passengers and freight and any combination thereof. It was equipped with two twin-shaft turbofan engines (Fig. 1).

In 1972, the maiden flight of this type occurred. In 2007, production of the airplane ended. According to the internet, 561 airplanes were produced.

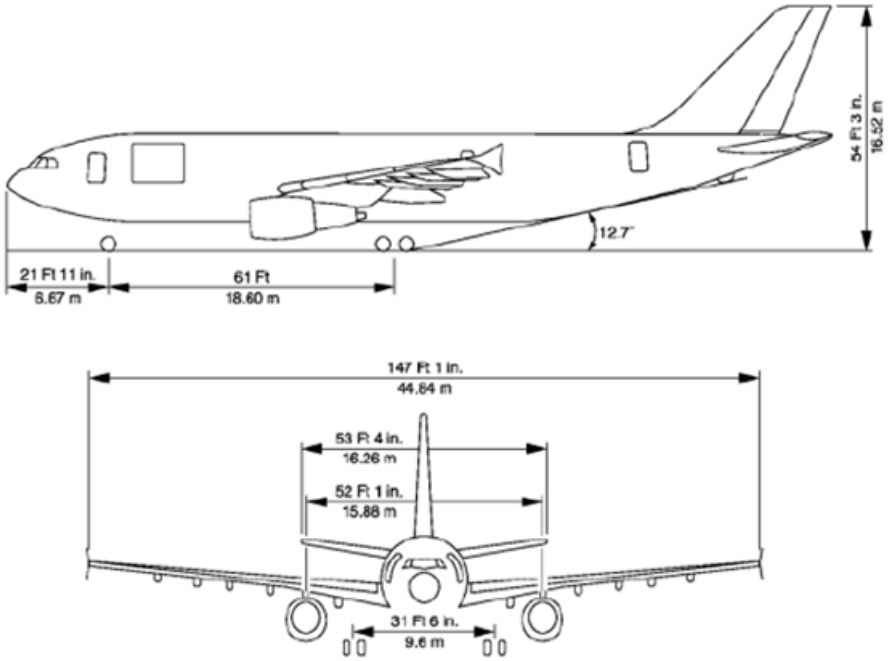

Fig. 1: Side and front view of the A300 Source: Operator, OM-B

According to the manufacturer, contact with the ground can occur with the appropriate pitch and roll angles (Fig. 2).

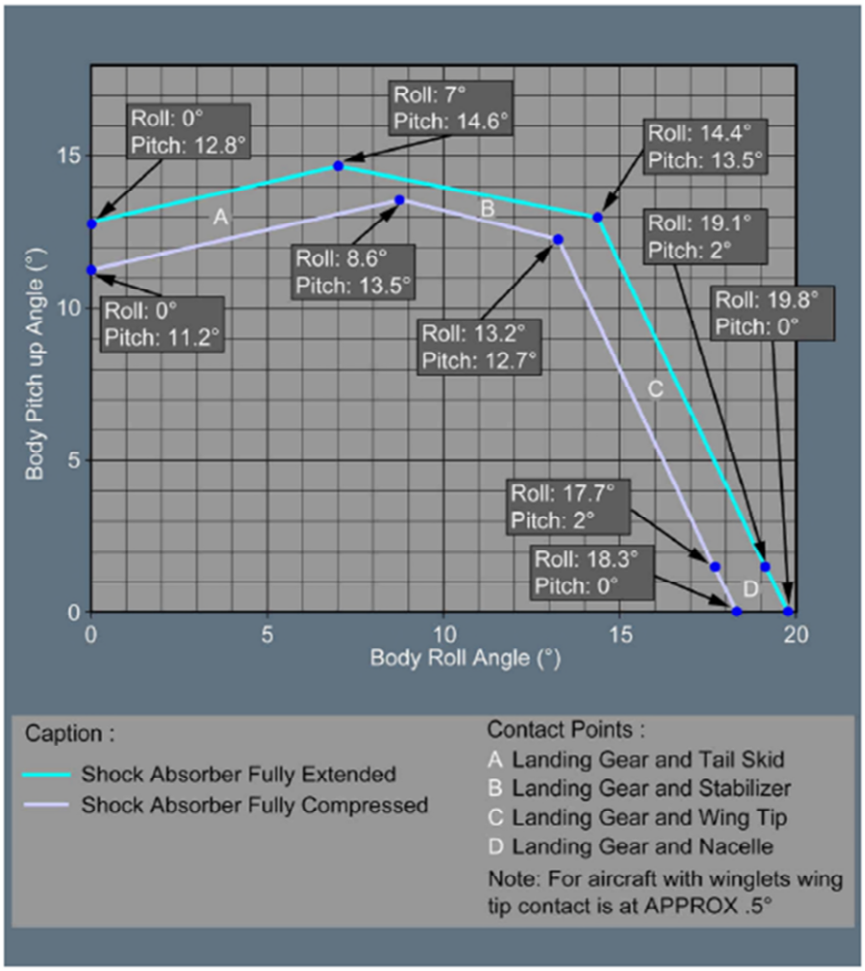

Fig. 2: DSC-20-GROUND CLEARANCE DIAGRAM Source: Operator, FCOM

The Airbus A300F4-622R involved with the manufacturer's serial number 0872 was built in 2006. The airplane was designed as freight aircraft without passenger cabin. The last airworthiness review certificate was issued on 21 March 2023. It had a total operating time of about 18,293 hours and 10,613 landings.

During the occurrence flight, it was loaded with 101,134 lbs freight. At Tel Aviv, it was refuelled with 75,000 lbs fuel. According to the loadsheet of 9 February 2024 at 1147 UTC, mass and centre of gravity were within the permissible range during take-off and landing. The landing mass was calculated with 304,887 lbs and the centre of gravity with 35.6% tail-heavy. The permissible range extended from 18% nose-heavy to 37% tail-heavy. Fuel quantity after the landing was 18,400 lbs.

The aircraft had a German certificate of registration and was operated by a German freight operator.

Meteorological Information

According to the aviation routine weather report (METAR) of 1750 hrs of Leipzig/Halle Airport, the following weather conditions prevailed:

Wind:	190° / 8 kt
Visibility:	More than 10 km
Cloud:	CAVOK
Temperature:	12°C
Dewpoint:	8°C
QNH:	989 hPa

At the time of the landing clearance, local wind was communicated with 190° and 10 kt.

The wind direction and force calculation of the Air Data Inertial Reference Unit (ADIRU) determined the following values during approach and flare (Fig. 3):

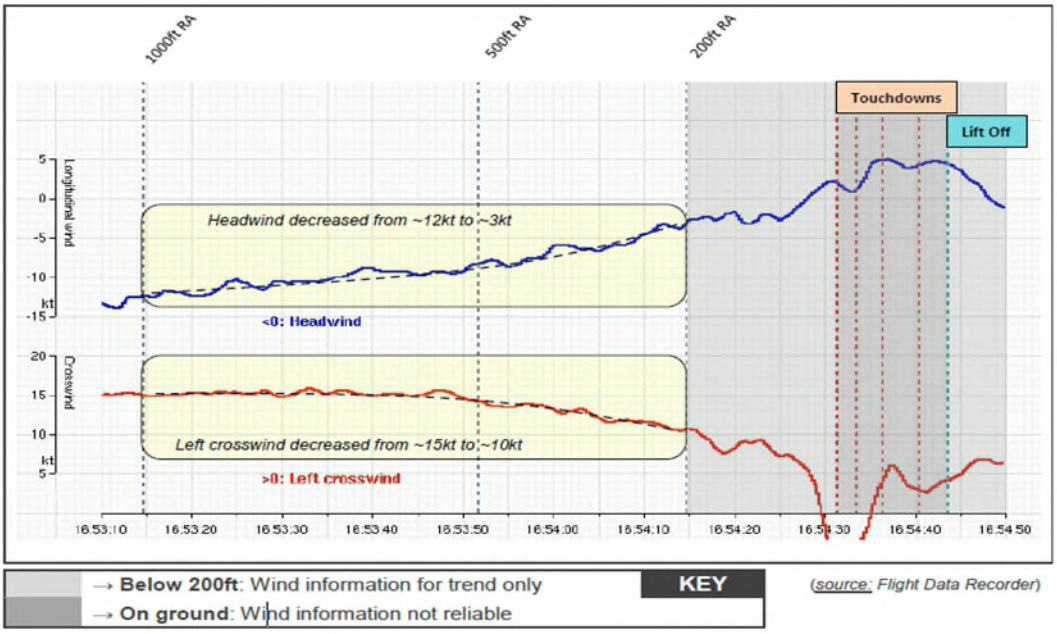

Fig. 3: Wind direction and force calculation Source: Airbus

In Leipzig sunset was at about 1715 hrs. At the time of the approach and the tailstrike it was dark.

Aids to Navigation

The tailstrike occurred during the attempt to land after an ILS approach to runway 26L. During the go-around, the Standard Missed Approach Procedure was applied. The final landing occurred on runway 26R after an RNP approach.

Radio Communications

Radio communications between the flight crew and the air traffic control units were part of the CVR recording and available for the investigation. Essentially, it was performed by the respective PM in English.

Aerodrome Information

Leipzig/Halle Airport (EDDP) is located about 6.5 NM north-west of Leipzig City. Aerodrome elevation is 470 ft AMSL

It was equipped with two asphalt runways with a length of 3,600 m and the markings 08/26. The south runway was 60 m wide and north runway 45 m.

The airport was considered the fourth largest freight hub in Europe. It was the home base of the airplane involved.

Flight Recorder

Information on Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR).

Manufacturer CVR	Honeywell
Part number	980-6022-001
Serial number	3659
Manufacturer FDR	Honeywell
Part number	980-4700-042
Serial number	4258

CVR and FDR were seized by the BFU. The data of both recorders could be read out at the avionics laboratory of the BFU.

The data of the aborted landing with the tailstrike and the final landing were examined (Fig. 4 and 5). According to the data, during the landing with the tailstrike an interaction

between yaw and roll movement occurred. During the flare, engine thrust was still present and speed was higher than during the final landing.

Data at the time of the respective first touch-down of the main landing gear:

Parameter	Landing - Tailstrike	Final Landing
COMPUTED AIRSPEED (knots)	136	128
ENG N1-L / N1-R (%RPM)	56.8 / 54.1	32.5 / 32.7
PITCH ANGLE (deg)	6	7
ROLL ANGLE (deg)	-1	0
HEADING MAGNETIC (deg)	266	260
	1.62	01:22:00

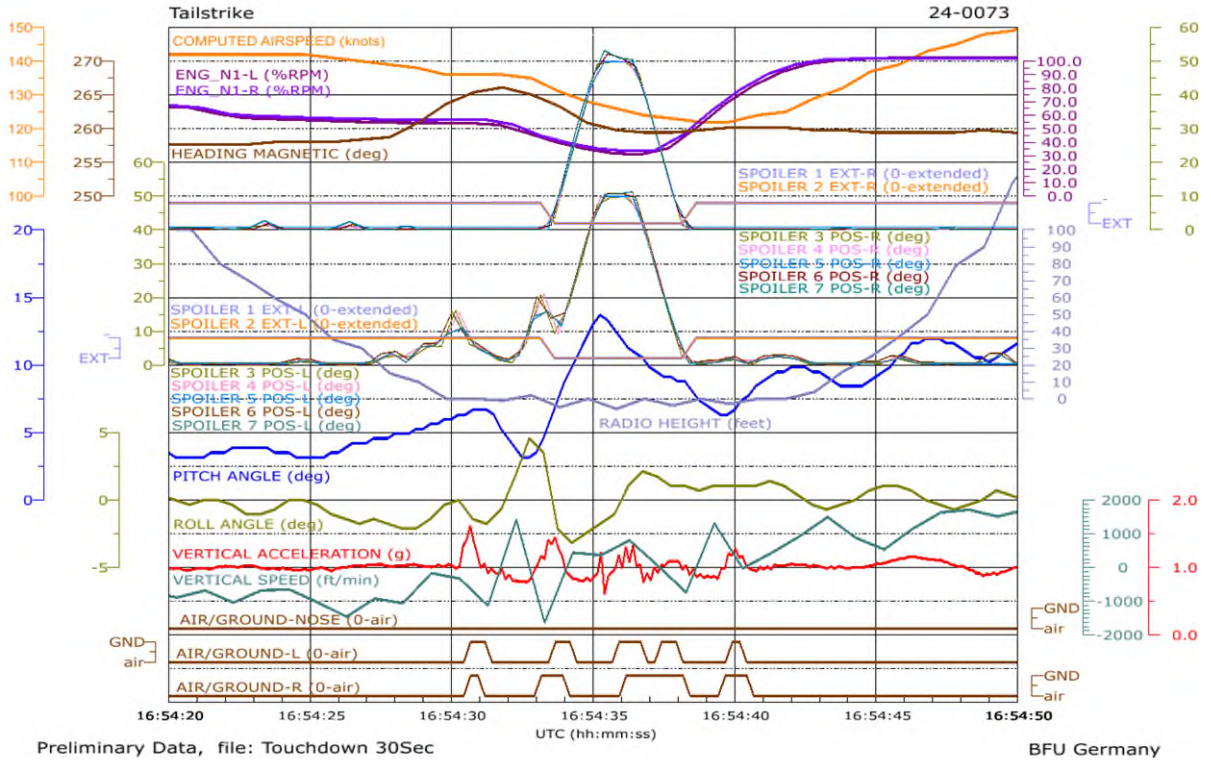

Fig. 4: Excerpt of relevant FDR data of the landing with tailstrike and go-around Source: BFU

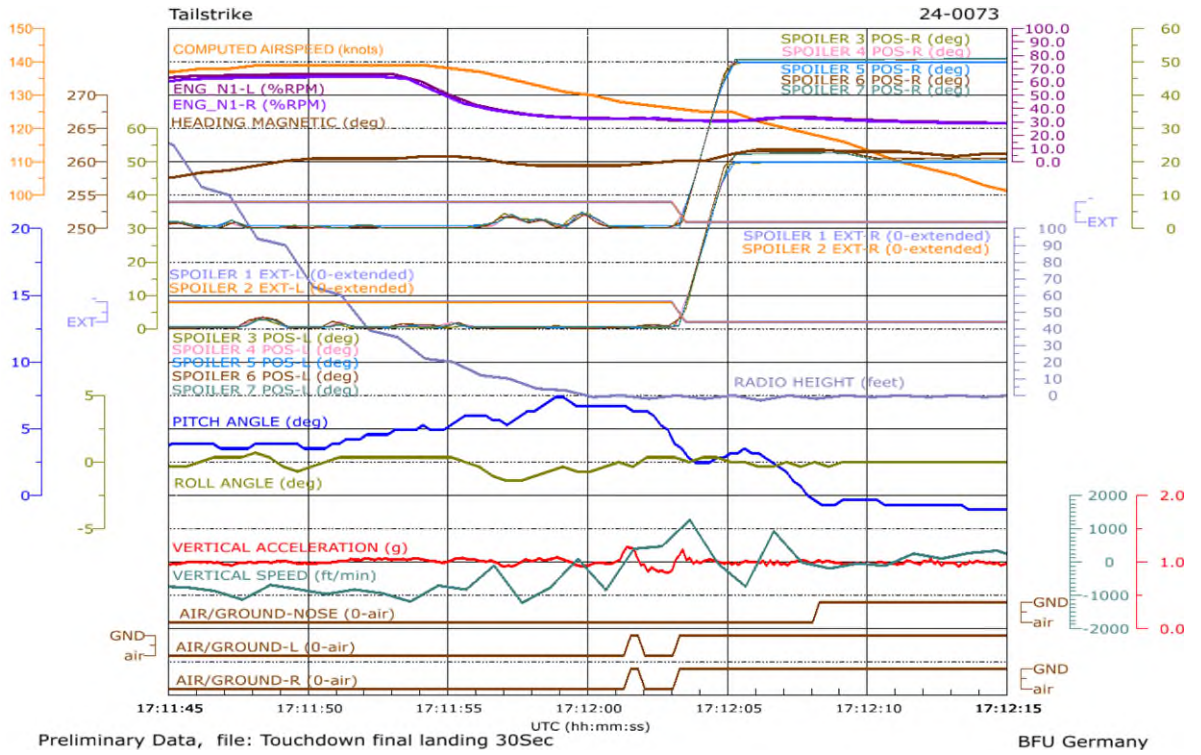

Fig. 5: Excerpt of relevant FDR data of the final landing for comparison Source: BFU

Wreckage and Impact Information

The tailstrike occurred on runway 26L of Leipzig/Halle Airport in the area of the H8 and S6 intersections (Fig. 6).

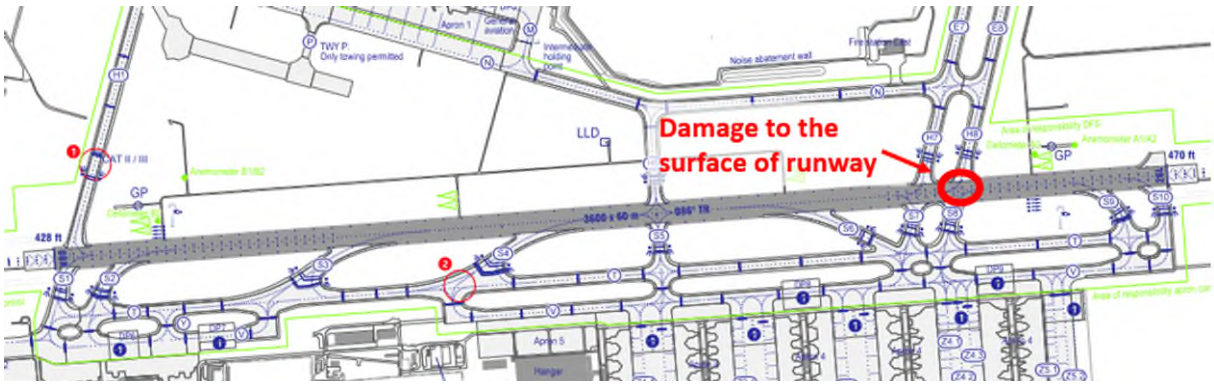

Fig. 6: Position of the damage on runway 26L Source: DFS, adaptation BFU

The runway surface was scratched on a length of several meters (Fig. 7).

Fig. 7: Damaged surface of runway 26L, view towards the west Source: BFU

After the aborted landing, several small parts which could be assigned to the tail section of the airplane involved, were found on the runway (Fig. 8).

Fig. 8: Aircraft parts found on runway 26L Source: BFU

The outer, aft lower fuselage of the A300 showed scratch marks of several meters in length. The fuselage covering was abrade in several places. The tail bumper was pushed in and the skin / covering behind it torn (Fig. 9).

Inside the aft lower fuselage area, bent and torn structure elements (stringer, brackets, fittings, angles, sheer plates) and loose rivet joints were found.

On 26 February 2024, operator and experts of the aircraft manufacturer determined the damage and the subsequent repairs.

Fig. 9: Damage at the outer skin / covering at the lower aft fuselage Source: BFU

Fire

There was no evidence of any fire during the tailstrike or the landing.

Organisational and Management Information

The airplane involved was operated by a German freight operator. At the time of the occurrence, they operated Airbus A330, Boeing B757 and 24 Airbus A300.

In 2023, pilots of the fleet conducted a total of 28,905 landings and 257 go-around.

According to the Operation Manual, Part B 2.15.9.1, “Bounce Recovery – Rejected Landing” the procedure read as follows:

2.15.9.1 Bounce recovery – Rejected landing

A. **Introduction**

A rejected landing (also referred to as an aborted landing) is defined as a go-around maneuver initiated after touchdown of the main landing gear or after bouncing.
Although a rare occurrence, a rejected landing is a challenging maneuver decided and conducted in an unanticipated and unprepared manner.

The objective of this section is to define:

- Applicable decision criteria for:
  - Full-stop landing; or,
  - Rejected landing and go-around; and,
- Procedures and techniques for bounce recovery, including:
  - Continued landing; or,
  - Rejected landing (i.e., go-around).

B. **Statistical Data**

No global statistical data are available on rejected landing incidents or accidents but the following three events illustrate the circumstances that may lead a flight crew to reject the landing, and the possible consequences of such a maneuver:

- Tailstrike following a go-around initiated due to directional control difficulties after thrust reverser selection;
- Climb performance limitation following the undue selection of reverse thrust during a touch-and-go and failure of one reverser to stow; and,
- Loss of control following a go-around initiated after thrust reverser selection (because of a vehicle obstructing the runway) and failure of one reverser to stow.

C. **Bouncing and Bounce Recovery**

Bouncing at landing usually is the result of one or a combination of the following factors:

- Windshear;
- Thermal activity;
- Excessive sink rate;
- Late flare initiation;
- Incorrect flare technique;
- Excessive airspeed; and/or,
- Power-on touchdown (preventing the automatic extension of ground spoilers, as applicable).

Recovery from a high bounce (by more than 5ft)

In case of a high bounce, do not attempt to land, as the remaining runway length might not be sufficient to stop the aircraft.

Note: *In any case, if reverse thrust has been selected, a full stop landing must be completed.*

The following go-around technique can be applied:

- Maintain a normal landing pitch attitude;
- Initiate a go-around by advancing throttles while triggering go-levers;
- Ignore the takeoff configuration warning, if any;
- Maintain the landing gear and flaps configuration;
- Be ready for a possible second touchdown;
  - Do not try to avoid a second touchdown during the go-around. Should this happen, the second touchdown would be soft enough to prevent damage to the aircraft, if pitch attitude is maintained;
- When safely established in the go-around and no risk of further touchdown exists (i.e., with a steady positive climb), follow normal go-around procedures; and,
- Reengage automation, as desired, to reduce workload.

Note: *If there is any reason to believe that the landing was hard – or firmer than normal – an entry **"Hard landing suspected"** shall be made by the crew in the ATL so that a conditional maintenance inspection is performed to ensure the airplane´s airworthiness.*

According to the Recurrent Training and Check Lesson Plan of summer 2020, winter 2020/2021 and 2022/2023, the topic Bounce Landing and the respective procedures were also part of the recurrent simulator trainings of the operator's flight crews.

Additional Information

In 2005, Airbus published the Flight Operations Briefing Notes regarding "Bounce Recovery - Rejected Landing" and in 2007, "Landing Techniques - Preventing Tailstrikes at Landing". The content of the publications essentially corresponded with the OM-B texts.

The aircraft manufacturer analysed the FDR data. They came to the following results (Fig. 10):

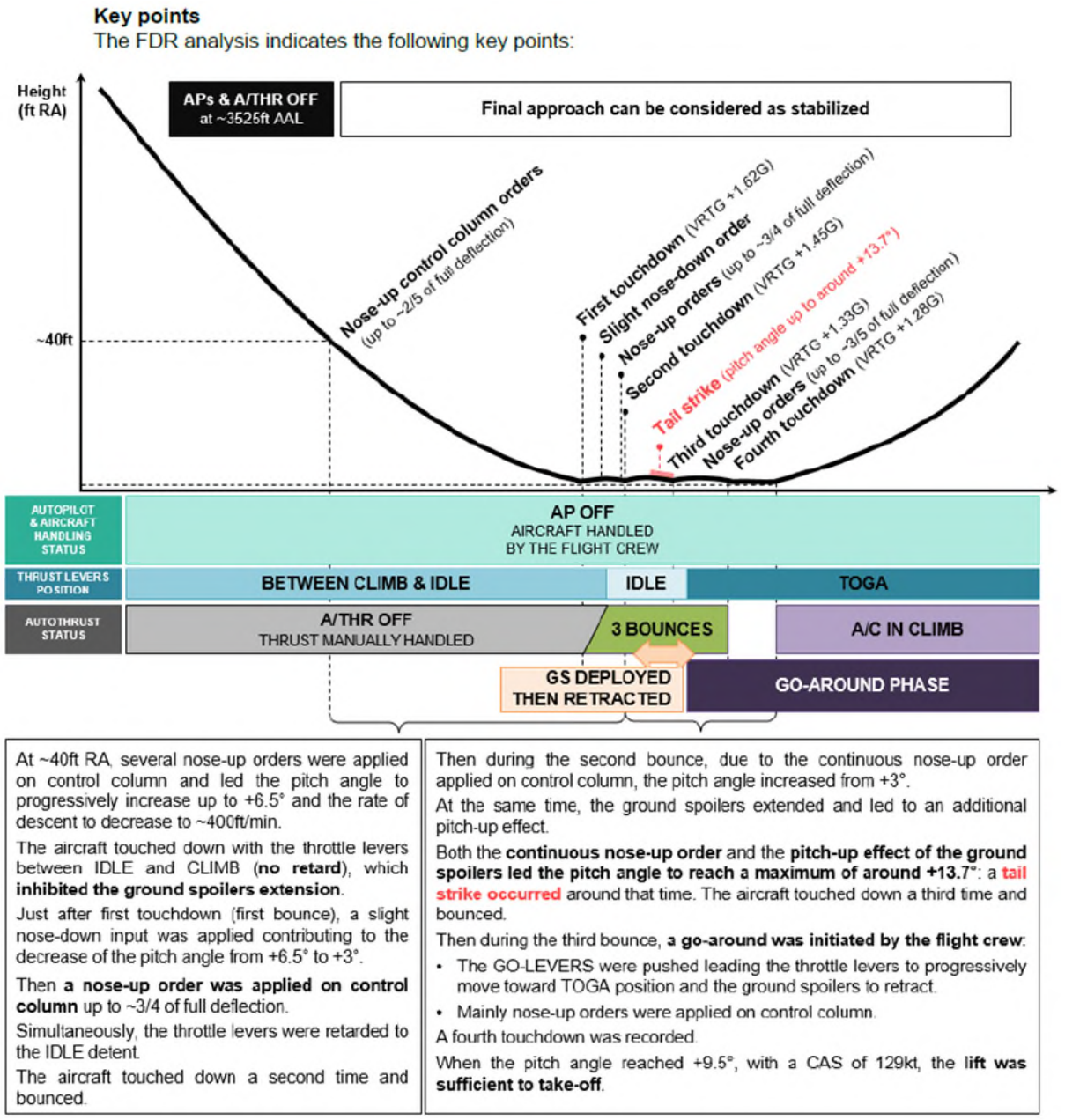

Fig. 10: FDR data analysis by the manufacturer Source: Airbus Report, Tech-Request 81354526

In conclusion, the manufacturer referred to the following Operational Considerations:

Close to the ground, it is important to control the pitch attitude so that it does not further increase beyond the critical angle. As previously described, a continuous nose-up order applied on control column (maintained in nose-up position during the second bounce) participated to an increase of the pitch angle (up to +13.7°) close to the ground and led to a tail strike.

As a general reminder about the control of the pitch attitude close to the ground:

FCTM PR-NP-SOP-190: FLARE AND TOUCHDOWN => DEROTATION

After touchdown, the flight crew should:

• "Fly" the nose wheel smoothly, but without delay, onto the runway.

• Be ready to counteract any pitch-up effect of the ground spoilers.

FCTM PR-NP-SOP-190: TAIL STRIKE AVOIDANCE => BOUNCING AT TOUCH-DOWN

In the case of bounce at touchdown, the flight crew can be tempted to increase the pitch attitude to ensure a smooth second touchdown:

• In the case of a light bounce, maintain the pitch attitude and complete the landing.

• In the case of a high bounce, maintain the pitch attitude and configuration, initiate a go-around.

FCTM PR-NP-SOP-200: CONSIDERATION ABOUT GO-AROUND => GO-AROUND NEAR THE GROUND

If the flight crew performs a go-around near the ground, the PF should avoid excessive rotation rate, in order to prevent a tail strike.

Safety Recommendations

Safety Actions

Due to several tailstrikes in February 2024, among other things, the freight operator has taken measures.

An internal Safety Alert “Tail Strike Avoidance” and the following safety recommendations were distributed to all flight crew members:

- *Initial brake latest in 30 ft RA*
- *Ensure that all thrust levers are set to IDLE at the latest at touchdown to ensure ground spoilers extension at touchdown*
- *Low bounce: Maintain pitch and continue landing. High bounce: Maintain pitch and perform a go-around.*

- *Be aware of different go-around procedures before / after main gear touch-down and FD command with pitch above 11° (tail strike limit)*
- *As pilot monitoring, it is your responsibility to closely monitor the pitch attitude during flare and landing. It is of utmost importance to precisely follow the SOP in case of pitch values of 9 degrees or more as described in OM-B Chapter 2.12 "Normal Landing". In these cases it is mandatory to make the respective callouts "pitch, pitch" accordingly.*
- *In addition, please make yourself familiar with the contents of FCN A300 2024-01*
- *Crews to review the Safety Alert "HARD LANDINGS" and complete the CBT[3] "Hard Landing Avoidance" which will be rolled out asap*
- *Crews to review the correct handling of the thrust lever and their individual "muscle memory"*

In addition, an internal Safety Alert "Hard Landings" and the following safety recommendations were send to all flight crew members:

- *Review training and documentation of initial break landing technique*
- *PM should give prompt inputs, e.g., in case of high sink rates or unusual pitch*
- *Crews should review the landing technique*
- *Crews should review the procedure for bounce recovery and include it in their approach briefing*
- *PM shall monitor the attitude during landing according SOP (A300-600 and B757 limit: 9°, A330 limit: 7,5°) and must announce the calls according SOP ("PITCH, PITCH" for all Airbus or "CHECK PITCH" for B757)*
- *Introduction of bounce recovery training in recurrent training*

Furthermore, a computer-based training was established and activated for topics like "Hard Landing Avoidance" including "Bounce Recovery", "Go-around Technique" and "Tail Strike Avoidance".

An additional simulator training for flight crews and trainers was scheduled and described in the Lesson Plan - Special Landing Training on FSTD OM-D.

[3] Computer Based Training

Investigator in charge:	Axel Rokohl
Assistance:	Michel Buchwald, Martin Beckert
Documentation on site:	BFU representative at the airport
Braunschweig,	29 August 2024

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FlUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

Published by:

Bundesstelle für
Flugunfalluntersuchung
Hermann-Blenk-Str. 16
38108 Braunschweig

Phone +49 531 35 48 - 0
FAX +49 531 35 48 - 246

Mail box@bfu-web.de
Internet www.bfu-web.de