



MINISTÉRIO DA ECONOMIA E DO EMPREGO
GABINETE DE PREVENÇÃO E INVESTIGAÇÃO DE ACIDENTES COM AERONAVES
GPIAA

AIRCRAFT INCIDENT INVESTIGATION

The investigation of this incident was started by an investigator who ceased its collaboration with the GPIAA. This report was written based on information collected by this investigator.

This report is a process conducted for the purpose of accident prevention which includes the collection and analysis of information, the determination of causes and, when appropriate, the making of safety recommendations, in accordance with Annex 13 to the Convention on International Civil Aviation, with Regulation (EU) N° 996/2010 of the European Parliament and of the Council, October 20, 2010, and with paragraph 3 of art. 11 of Dec.-Law No. 318/99 of 11 August. It is not the purpose of any such accident investigation and the associated investigation report to apportion blame or liability.

Date/time: 12/07/2010 @ 21:00 UTC ¹		Proc. N° 10 /INCID/2010
Handling Operator: Portway	Type of Incid.: Pushback truck struck aircraft	
Aircraft: Airbus A319, G-EZIV, EZY256G, s/n 2565. MTOM = 64 000 kg		
Local: Lisbon Airport (LPPT)		
Flight Type: Transport	Operation : pushback	
Persons on board: 102	Pax: 96	Injuries: NIL
Damage to Aircraft: The aircraft suffered damage in nacelle and casing of engine #2.		

*This report has been released in Portuguese and English Languages.
In case of conflict, Portuguese version will take precedence*

SYNOPSIS

The aircraft was being pushed back from stand 146 to the taxiway R1 at Lisbon Airport. During the final phase of the manoeuvre, the towbar shear pin broke detaching the truck from the aircraft. The aircraft continued to move forward and struck the tug causing considerable damage in the nacelle and casing of the engine #2.

There were not personal injuries.

The investigation concluded that the incident was due to the failure of towbar shear pin.

The poor condition of the tug tyres was considered a contributing factor.

Two safety recommendations have been made.

The times referred to in this report are UTC = Coordinated Universal Time. Legal Time = UTC + 1:00

1. FACTUAL INFORMATION

1.1 History of the event.

On July 12th 2010, by 21:00, at Lisbon Airport, the Airbus 319-111 aircraft, registration G-EZIV, was being pushed back from stand 146 (N 384635.67 W 0090754.74-INS) to taxiway R1, using a tug and a towbar. In the final phase of the manoeuvre, the towbar shear pin broke detaching the tug from aircraft. The aircraft continued to move forward and hit the tug suffering considerable damage in the engine nacelle and casing of the engine #2. On site, the ramp has a slope of about 2%.

The flight crews were fully rested for the flight. The captain had approximately 10 000 hours of flight experience, 2000 on type, and the co-pilot had approximately 3100 hours flight experience, 2850 on type. The ground handling crew consisted of a tug driver a manoeuvre assistant and a headset operator, who was to relay information between the flight crew and the tug driver.

The tug driver moved the aircraft (pushback) to along the taxiway, to a position before the "hill", where commences a new downhill, because he felt that would be more difficult to pull the aircraft beyond that point. The pilots had already started engine #2 and were made the procedures for starting the engine #1.

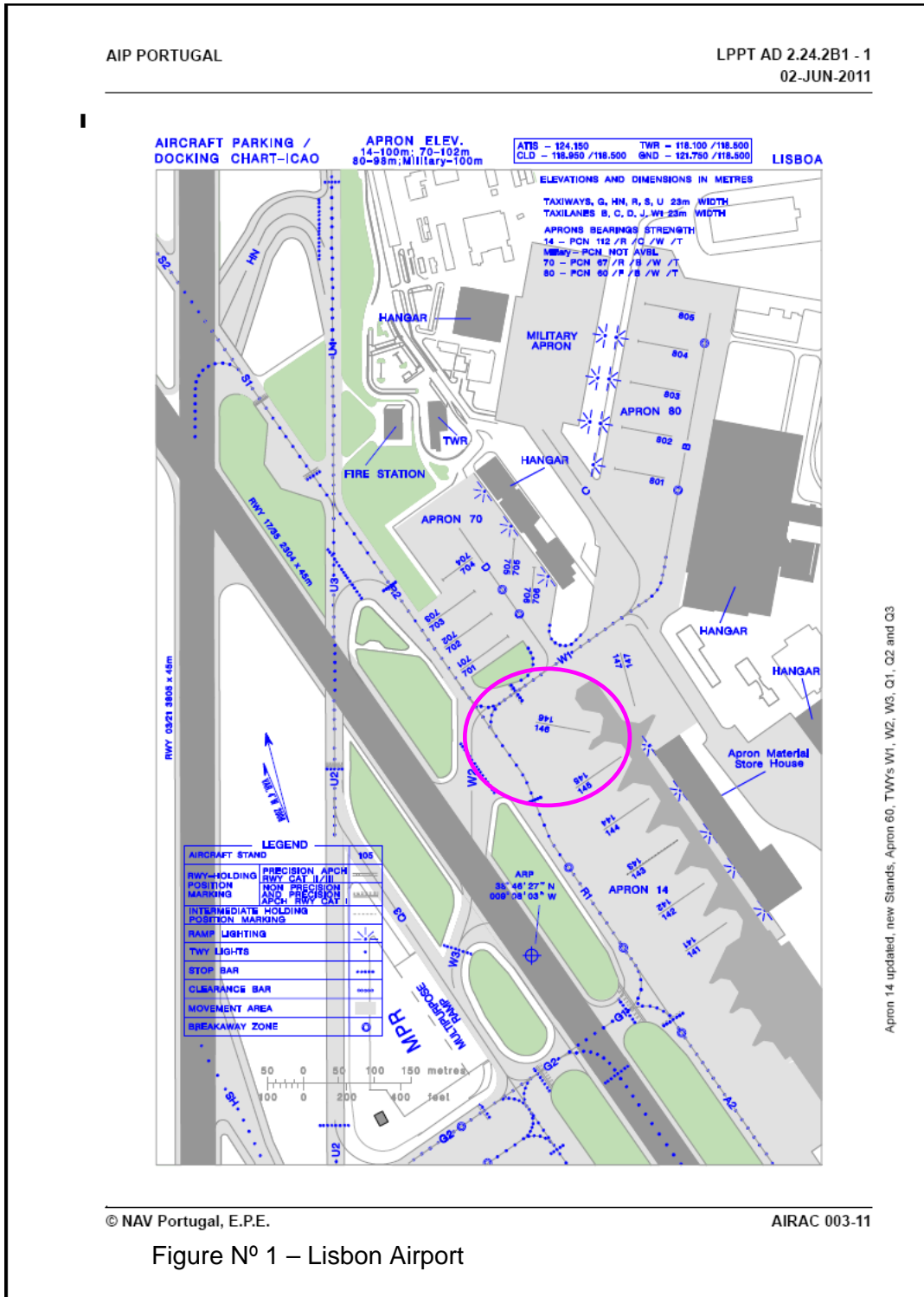
On the beginning of pull ahead, the tug driver drove the tug from the left to the right side of the aircraft. During this manoeuvre, the towbar shear pin broke detaching the tug from the aircraft.

The driver saw the aircraft moving in his direction and warned the assistant to pull away, while he also jumped from the tug, just before the engine # 2 hit the tug. Later on, he claimed had no opportunity to warn the headset operator, due to lack of communication system and because it was dark. The headset operator maintained communications with the crew and was watching the area behind the aircraft but with the headphones and the noise of the engines hasn't heard the crackling of breaking the screws. He realizes the situation when has noticed that the towbar made an angle with the nose wheel gear. At this time he warned the pilots repeating: cut engine # 2, set brakes on.

The pilots, with limited downward visual field by the aircraft structure not realised what was happening on the ground. When informed, immediately reacted by applying brakes and stopping the engines without, however, avoid the collision between the aircraft and the tug.

The entrainment of the tug has left brands on asphalt with about three meters long.

The aircraft suffered damage in nacelle and casing of engine #2. The 6 crew members and 96 passengers aboard the aircraft, as well as the ground staff, did not have suffered any injury. The incident took place during the night with moderate wind from Northwest.



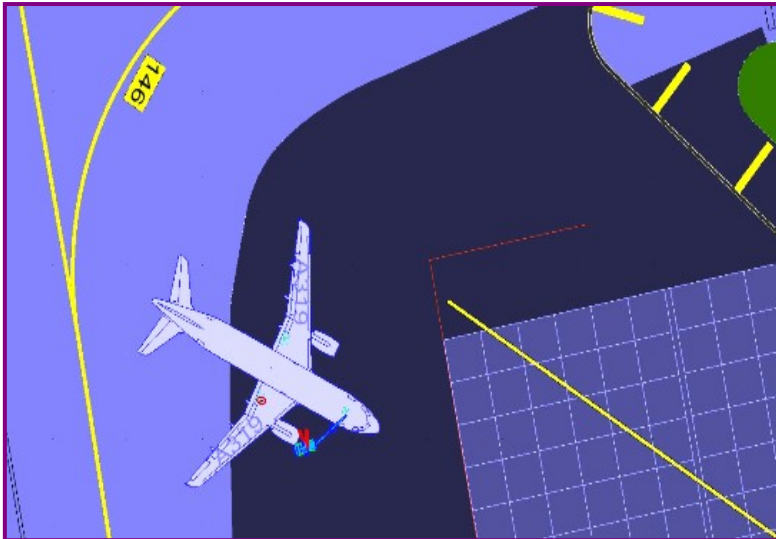


Figure N° 2 – Diagram of incident.



Figure N° 3 – Location of incident

1.2 Handling Operator

The handling operator is a certified company based at Lisbon airport.

The company had the equipment dully number labelled and kept records of quality control and maintenance actions.

Training activities were recorded in own templates.

1.3 Tug

The tug was a "MULAG" Comet model 12, S/N 944326, manufactured in 1994, with 12 200 kg of mass. It was submitted to maintenance at 12/29/2009 (500 hours) and at 7/2/2010 (1500 hours) and inspected in July 2010 (10 days before the incident). These works were recorded in the work sheet model 860 issued by the company. This model does not provide a check on the condition of the tyres (XTE2 9.5 R 17.5). This item also did not appear explicitly in the check list of operational pushback procedures.



Fig N°4–right front tire. Fig N°5–original tire. Fig N°6–right rear tire. Fig N°7–ground brands.

1.4 Towbar

The towbar was made by "Cavotec". It was inspected in 5/29/2010, 44 days before the incident

Handling Operator kept records of the condition and maintenance of the towbar in particular: *Certificate of the pins; Declaration of conformity; Statement of original manufacture and Maintenance sheets.*

The screws were certificates. They had been in use since 3/2/2010.

The examination of the fractures has concluded that the fracture surfaces were consistent with the good state of repair of screws.

1.5 Operational push-back procedures

The pushback procedures checklist had 11 items which should be checked by the tug driver. The checklist is a description of procedures that, for selection of the tug, indicates the query of another publication (HMA 955). The list gives emphasis to the suitability of the equipment, its operating condition and to the safety aspects, in particularly the speed of the manoeuvre.

"... In adverse atmospheric conditions the operator must perform their manoeuvring pushback with even more attention, as well as reduction in speed of the manoeuvre. In areas where deck has a downward slope, the operator must maintain a much reduced speed to not run the risk of aircraft exceeds the pushback.

Recommended speeds, according to the HMA 955 will be:

Manoeuvring an empty aircraft – 25 km/h/15 mph.

Manoeuvring a loaded aircraft – 12 km/h/7.5 mph

Pushback operation should start very slowly, gradually increasing the speed. ..."

1.6 Personnel education and training

The programmes of Education and Training include procedures, communications, surveillance and risk of the manoeuvres of "pushback" and a certificate of fitness.

The tug driver had attended a "Ramp safety refresh course" in 7/17/2009 and held the qualification "pushback" valid until 8/19/2011.

The headset operator was the holder of a certificate of supervisor valid until 1/3/2011. He attended the "Ramp safety refresh course in 3/25/2010 and the" load control refresh "in 4/6/2009.

1.7 DFDR

The DFDR data were analyzed by Airbus and reveal the following:

- ❖ 157903.5 parking brake was placed off;
- ❖ 157914.5 aircraft began to move in straight heading;
- ❖ 157920 (N22 parameter) was released the engine #2;
- ❖ 157963 (N21) was released the engine #1.

Particular attention was paid to anomalies in acceleration, with the aim of identifying the moment of rupture of towbar and impact against the tug. Thus, at 158013.3 was registered a slowdown of -0,2Gs, indicated by the parameter of longitudinal acceleration (LONG). The ground speed decreased from 2Kts to 0 (zero). The anomaly traces the impact because it was followed by a final cessation – break launches took place earlier.

Left and right pedals (LBRK, RBRK) were never applied before the anomaly of acceleration. They intervened at the same time, before the crew actuate the parking brake and have made stopping the engines.

The levers of the engines remained in idle (LLA1 during the entire TLA2) sequence.

In conclusion:

- (1) The crew did not apply the brakes nor has increased the engine power during the phase of pushback
- (2) The rupture of the towbar did not result in an action of the crew on the commands of the aircraft.

2. ANALYSIS

The aircraft was pushed back in direction of approximately 310 and stopped before the taxiway, so as not to exceed the highest elevation of the place considering that would have more difficulty in manoeuvring to win the slope of 2%. After that, the driver has reversed the tug and the aircraft began to move forward to the taxiway. At this end, the driver drove the tug on the left to the right side of the aircraft carrying out a large turning angle.

The situation could be described as follows: it was dark; the tug was pushing back in the right side of the aircraft which, in turn, had tendency to move straight ahead, due to the inclination of the plate; the moderate tail wind and by some power from engines at idle.

The sum of these vectors would have to be countered by the tug driver, towing in reverse a tug whose weight was at the lower limit of the minimum specifications to tow this type of aircraft. Also the fact the tug to have tyres in bad condition and the towbar hitched on front decreased its ability to grip.

Sometime during the pull-ahead, the aircraft began to push the tug dragging it by the asphalt. The tension applied on the towbar shall have caused the collapse of the pins detaching the tug from the aircraft. The driver was overtaken by events and saw him in the contingency of having to abandon the tug. The headset operator was placed behind the aircraft and had his attention focus on rear side of the aircraft, and with the tug on his back. This, associated with the noise emitted by the engines and the darkness, would have made it difficult to have the perception of the seriousness of the situation and can explain the consequent delay of information reach the crew.

The DFDR records reveal that, during the event, the engine power has remained at idle position, the aircraft speed has not exceeded 2 Kts and that the brakes were applied only after the collision.

The pushback speed recommended (by Handling Operator) in the "pushback checklist", is 25 km/hour (we believe that this is a recommended speed for towing not for pushback). For the selection of the tug the checklist also refers to the query of another publication (HMA 955). The "pushback" manoeuvre differs substantially from the operation of towing and should deserve a differentiated treatment. On the other hand, a checklist must be sufficiently explicit and of easy consultation avoiding references to other publications whose query becomes impractical.

3. CONCLUSIONS

3.1 FINDINGS

1. The incident occurred in low light conditions which made it harder to manoeuvre and delayed the perception of the situation by the headset operator;
2. The event took place outside the angle of vision of the crew, covert by the aircraft structure;
3. On site, the asphalt had a slope of about 2% which contributed to force the movement of the aircraft;
4. The tail speed wind with 16 Kts also contributed to help moving the aircraft;
5. The tug had the minimum mass requirement (12,000 kg) established to perform towing of aircraft with a MTOM of less than 150 000 kg;
6. The tyres of the tug had excessive wear suggesting a decrease in their ability to grip;
7. At the beginning of the pull ahead the tug made a sharp turn to the right;
8. The engines of the aircraft were working at idle position;
9. The flight crew did not carry out any type of braking before impact neither increased engine power. The action of the crew has not contributed to the incident
10. The towbar shear pin broke during pull ahead;
11. The pushback procedures checklist used by tug driver was not adequate.

3.2 Cause of the Incident

The incident was due to shear pin breakage.

3.3 Contributing factors

- Pushback manoeuvre carried out with excessive steering angle.
- The poor condition of the tyres of the tug.

4. RECOMMENDATIONS

It is recommended to the National Civil Aviation Authority that ensures, in the national airports, the application of standards and recommended practices to all vehicles and mobile equipment used in the vicinity of aircraft. **Safety Recommendation N° 11/2011.**

It is recommended to the National Civil Aviation Authority to analyse the manuals of procedures and training programmes of “handling operators” in order to ensure their conformity with the standards and recommended practices for the pushback operations. **Safety Recommendation N° 12/2011.**

Lisbon 04th November 2011

The Investigator in Charge



Fernando Lourenço

ACRONYMS

°	Degrees
Art.º.	Article
DFDR	Digital Flight Data Recorder
ICAO	International Civil Aviation Organization
INAC	Instituto Nacional de Aviação Civil
INCID	Incident
MTOM	Maximum Take off Mass
NIL	Nothing, zero
Kg	Kilogram
Kts	Knots
TPT	Transport