DATA SUMMARY

LOCATION

Date and time	**Friday, 21 January 2012; 07:30 h[1]**
Site	**San Sebastian Airport (Spain)**

AIRCRAFT

Registration	**EC-HCG**
Type and model	**ATR-72-212A**
Operator	**Air Nostrum**

Engines

Type and model	**PRATT & WHITNEY PW127F**
Number	**2**

CREW

	Captain	First officer
Age	**39 years old**	**41 years old**
Licence	**ATPL(A)**	**ATPL(A)**
Total flight hours	**7,074 h**	**5,357 h**
Flight hours on the type	**5,254 h**	**4,791 h**

INJURIES

	Fatal	Serious	Minor/None
Crew			**4**
Passengers			**24**
Third persons			

DAMAGE

Aircraft	**Minor**
Third parties	**Ground Power Unit (GPU)**

FLIGHT DATA

Operation	**Commercial air transport – Scheduled – Domestic – Passenger**
Phase of flight	**Parking**

REPORT

Date of approval	**30 October 2013**

[1] All times in this report are local. To obtain UTC, subtract 1 hour from local time.

1. FACTUAL INFORMATION

1.1. History of the flight

An ATR-72-212A aircraft, registration EC-HCG, operated by Air Nostrum, was preparing to start flight IBE8317 to Madrid, which was scheduled to depart San Sebastian at 07:30 local time.

Once the passengers were onboard, the crew began the engine start procedure, which begins with the no. 2 (right) engine in "H" mode (with the propeller brake engaged).

The handling crew consisted of two individuals, a coordinator and an operator. The former was in visual contact with the crew, with which she communicated through the use of standard visual signals. The latter was in charge of operating the ground power unit (GPU) and its associated tow truck, and handled the disconnection of the GPU, removing the chocks and moving the GPU.

After the right engine was started, the captain signaled the coordinator to disconnect the GPU. He then initiated the start sequence for the left engine, which does not have a propeller brake. Once that engine was stable, they released the propeller brake on the right engine. The captain then signaled the coordinator to remove the chocks. She in turn relayed this order to the operator, who removed the chocks, placing them in the tow truck. As he was entering the truck to move the GPU, he heard screaming and noticed that the airplane was moving forward, its right propeller about to strike the GPU, so he quickly moved away.

Moments later the propeller struck the GPU, causing all six propeller blades to break, the detached fragments of which were projected outward, with some of them impacting the fuselage of the aircraft.

The crew stopped the engines and, after evaluating the situation, ordered the passengers to be disembarked.

1.2. Damage to aircraft

All six blades on the right propeller broke as a result of its impact with the GPU (see Figure 1). Each blade lost about 56 cm of material.

The door for the right main landing gear wheel well also impacted the GPU and was damaged.

The aircraft's fuselage is reinforced near the area of the propellers (see Figure 1) so that it can withstand an impact from material ejected by the propellers, such as chunks of ice that may be thrown outward by the blades by the action of the anti-ice system, pebbles, etc. Some of the blade fragments that detached impacted the fuselage of the aircraft, most of them striking this reinforced area and causing only small dents.

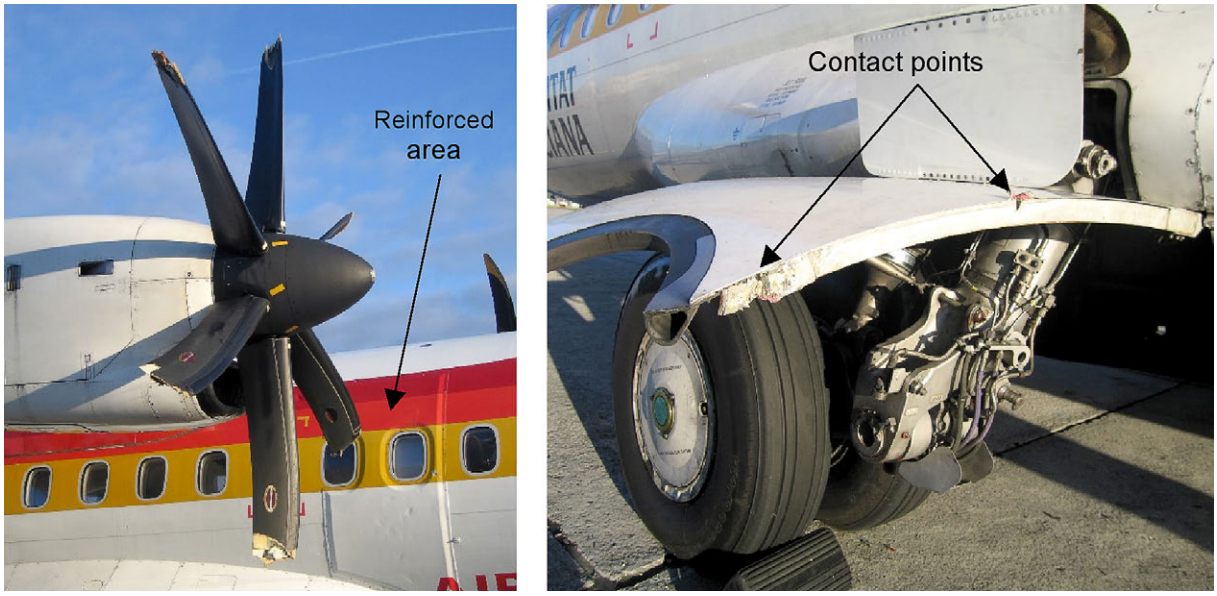


Figure 1. Photographs of the damage to the propeller and to the right main landing gear door

A stronger impact took place at the top of the fuselage, opening a crack that penetrated all the way into the passenger cabin.

1.3. Additional damage

The right propeller hit the rear of the ground power unit (GPU), causing significant damage to the cover in this area. The fire extinguisher outfitted on the GPU was located at the back right of the unit, and thus it was also struck by the propeller, as a result of which it was thrown outward to the other side of the aircraft, where it was found.

Figure 2. Photographs of the GPU. Left: impact marks on the rear of the unit. Right: Close-up of the impact marks

The left rear part of the GPU was struck and damaged by the right main landing gear door.

1.4. Personnel information

1.4.1. *Captain*

Age:	39 years old
Nationality:	Spanish
License:	ATPL (A), valid until 17/06/2014
Ratings:	• ATR42/72 valid until 05/10/2012 • IR valid until 05/10/2012
Class 1 medical certificate:	Valid until 22/06/2012
Total flight hours:	7,074 h
Flight hours on the aircraft type:	5,254 h
Duty time in the previous 90 days:	164:30 h
Duty time in the previous 30 days:	48:23 h
Duty time in the previous 24 h:	0:0 h
Rest prior to the flight:	58:15 h
Start of duty period:	05:45

1.4.2. *First officer*

Age:	41 years old
Nationality:	Spanish
License:	ATPL (A), valid until 11/11/2014
Ratings:	• ATR42/72 valid until 03/11/2012 • IR valid until 03/11/2012
Class 1 medical certificate:	Valid until 02/04/2012
Total flight hours:	5,357 h
Flight hours on the aircraft type:	4,791 h
Duty time in the previous 90 days:	193:55 h
Duty time in the previous 30 days:	61:32 h

Duty time in the previous 24 h:	0:0 h
Rest prior to the flight:	58:15 h
Start of duty period:	05:45

1.4.3. *Flight coordinator*

Age:	40 years old
Nationality:	Spanish
Category:	Coordinator
Experience:	7 years
Training received in previous 12 months:	• First-aid refresher. • Apron safety. • Rcat10 – category 10 (flight dispatch) hazardous cargo refresher. • Online airport safety course (Avsec).

1.4.4. *Handling operator*

Age:	43 years old
Nationality:	Spanish
Category:	Ramp operator
Experience:	13 years
Training received in previous 12 months:	• First-aid refresher. • Apron safety. • Airplane surface de-ice refresher • PRL mechanical vibrations

1.5. Aircraft manufacturer

Manufacturer:	ATR
Model:	ATR72-212A
Serial number:	580
Year of manufacture:	1999
Airworthiness review certificate:	Valid until 21/03/2012
Engines, number/manufacturer and model:	Two (2)/Pratt & Whitney, PW127F

Propellers, part number (P/N) and model:	Two (2) 815500-3, 568F-1
Dry weight:	13,243 kg
Maximum takeoff weight:	22,000 kg
Dimensions:	• Wingspan: 27.05 m • Length: 27.16 m • Height: 7.72 m • Wheelbase: 4.10 m
Hours:	27,230 h
Cycles:	32,608

Maintenance status:

Inspection name	Description	Frequency	Last performed			Next	Remaining
			Hours	Cycles	Date		
A-AT7	A-CHECK	500 FH	27,208	32,582	17/01/12	27,708 FH	472 FH
C-AT7	C-CHECK	5,000 FH	24,831	29,615	17/01/11	29,831 FH	2,595 FH
C2-AT7	C2-CHECK	10,000 FH	20,455	23,883	23/01/09	30,455 FH	3,219 FH
C4-AT7	C4-CHECK	20,000 FH	14,671	16,168	06/02/06	34,671 FH	7,435 FH
SC1-3000-AT7	3,000CY[2]	3,000 FC	26,844	32,137	21/11/11	35,137 FC	2,525 FC
SC7-3000-AT7	12,000CY	12,000 FC	20,455	23,883	23/01/09	35,883 FC	3,271 FC
SC8-3000-AT7	6,000CY	6,000 FC	24,831	29,615	17/01/11	35,615 FC	3,003 FC
YE1-AT7	1 year	Annual	27,208	32,582	18/01/12	17/01/13	260 days
YE1-AT7	12 years	12 years	24,831	29,615	17/01/11	14/01/23	3,909 days
YE1-AT7	2 years	2 years	24,831	29,615	17/01/11	16/01/13	259 days
YE1-AT7	4 years	4 years	24,831	29,615	17/01/11	16/01/15	989 days

1.5.1. *External power*

The AC and DC electrical systems can be energized from ground power units that are connected to two separate external power receptacles located on the right side of the fuselage, just behind the nose wheel.

The panel for the external power receptacle (Figure 4), which is located in the right front of the fuselage (Figure 3), has a plug for connecting the interphone (headphones), shown as number 3 in Figure 4, which makes it possible for handling personnel to communicate with the crew.

[2] CY: Structural inspection.

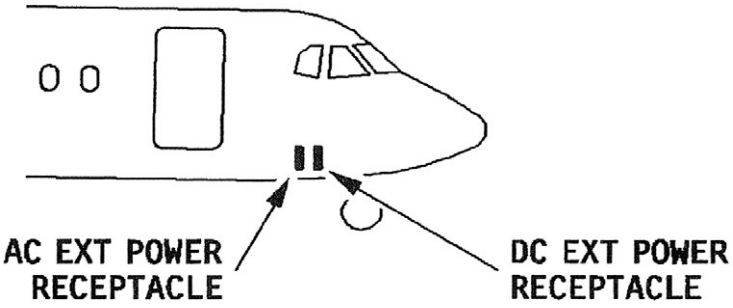
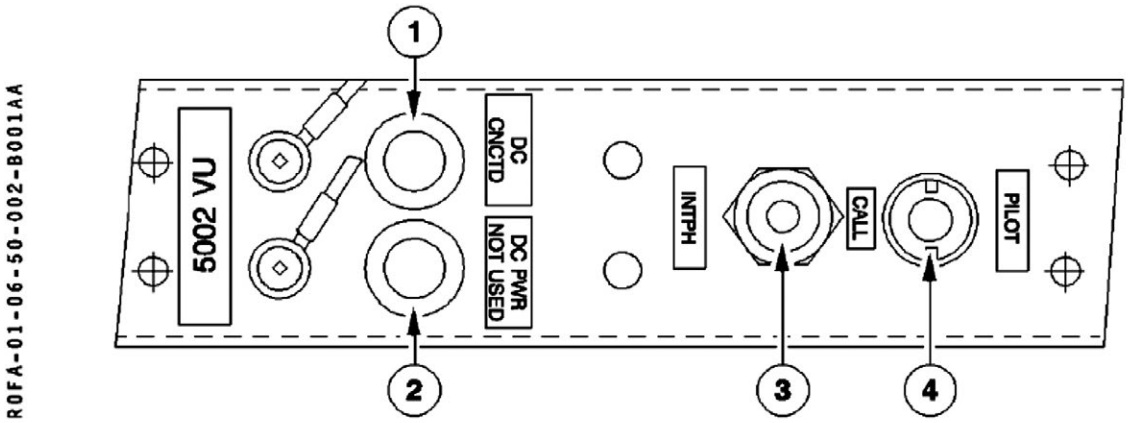


Figure 3. Location of the external power receptacles



① "DC connected" light (white)
Is on when DC external power is connected to the aircraft.
② "DC Power not used" light (white)
Is on when DC external power is connected to the aircraft, and DC SVCE BUS is not used.
③ Interphone Jack
Used by ground mechanic to connect a headset to communicate with crew.
④ Pilot call button
When pressed in, sends a call (aural and visual) to the cockpit : "Mechanic call" light illuminates on the overhead panel.

Figure 4. Description of the DC external power receptable panel

1.5.2. *Wheel braking system*

The four main gear wheels are outfitted with multidisc carbon brakes, each one operated by a set of five hydraulic pistons.

There are two braking methods available:

- **Normal:** controlled by the pilots' brake pedals and actuated by the green hydraulic system.

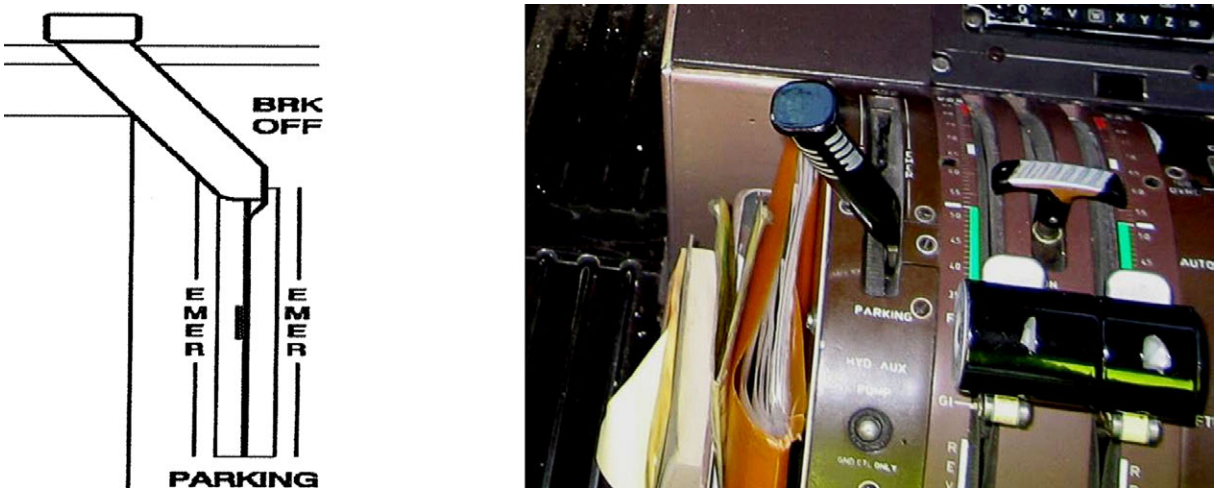


Figure 5. Photograph of the parking brake lever (right) and diagram showing its positions (left)

- **Emergency and parking:** controlled by the emergency and parking brake lever and actuated by the blue hydraulic system.

The lever has two positions:

- BRK OFF: No braking force is applied.
- PARKING: Full pressure applied to the brakes.

The amount of braking power applied between these two extremes is proportional to the length of travel between the two positions.

The system has an accumulator that ensures braking force in the absence of hydraulic pressure.

1.5.3. *Attitude and heading reference system (AHRS)*

As its name indicates, the function of this system is to supply attitude and heading data to the instruments that provide this information to the pilot.

It consists basically of an inertial measurement unit (IMU) that has three gyroscopes and three accelerometers lined up with the airplane's axes. The signals received are corrected using information from the flow valves (compass) and true airspeed (TAS) from the air data computer (ADC).

1.6. Meteorological information

The 06:00, 06:30 and 07:00 UTC METARs for the San Sebastian Airport were as follows:

210600Z 00000KT 5000 -DZ SCT008 OVC015 11/10 Q1032=
Wind calm, visibility 5,000 m, drizzle, scattered clouds at 800 ft and overcast at 1,500 ft. Temperature 11 °C, dew point 10 °C and QNH 1,032 hPa.

210630Z VRB01KT 9999 -DZ SCT008 BKN015 OVC022 11/10 Q1032=
Variable wind direction at 1 kt, visibility equal to or greater than 10 km, drizzle, scattered clouds at 800 ft, broken at 1,500 ft and overcast at 2,200 ft. Temperature 11 °C, dew point 10 °C and QNH 1,032 hPa.

210700Z VRB02KT 9999 -DZ SCT008 BKN015 OVC022 12/11 Q1032=
Variable wind direction at 2 kt, visibility equal to or greater than 10 km, drizzle, scattered clouds at 800 ft and overcast at 1,500 ft. Temperature 12 °C, dew point 11 °C and QNH 1,032 hPa.

Sunrise was at 07:34 UTC, meaning that lighting conditions at the time of the incident, along with the fact that the sky was overcast and it was raining, did not allow for good visibility.

1.7. Communications

1.7.1. *Communications with ANE8317*

At 07:34:01 UTC, the crew of aircraft EC-HCG established radio contact with the San Sebastian Airport control tower, identifying itself as ANE8317 and stating they were ready.

The controller replied, approving engine start-up and providing wind (240/3), temperature (11 °C) and QNH (1,032) information, which the crew correctly acknowledged.

The controller then asked the crew to confirm the runway they would use, to which they replied they preferred to use 14 if that was acceptable.

The controller authorized them to use this runway and provided the remaining clearance information: destination Madrid, PPN1B departure, initial climb to 080, squawk on 0040. This information was acknowledged by the crew.

Finally, the controller asked the crew to call back when they were ready to taxi.

This was the last exchange between the control tower and the aircraft.

1.7.2. *Communications with ANE8519*

At 08:04:43, the crew of Air Nostrum flight ANE8519, a CRJ200 aircraft from the same company and also headed to Madrid, called the air tower to request aerodrome information.

The controller replied, "Runway at your discretion, wind 240 at 4 kt, temperature 12° C and QNH 1,032 hPa".

The crew acknowledged the information and added they would be delayed since they were taking on passengers from another flight, the ATR, which was not leaving.

The controller replied that he had no news, though he thought it strange that they had not started up yet.

The crew replied that the other airplane (ANE8317) had had a small mishap and was grounded.

1.8. Aerodrome information

The San Sebastian Airport (LESO) is located in the municipality of Hondarribia (Guipúzcoa), 22 km away from the capital. The airport's hours of operation in the winter are from 07:30 to 21:30 local time.

It has one paved asphalt runway in a 04/22 orientation. It is 1,754 m long and 45 m wide.

It has a rectangular parking apron located west of the runway. It measures 475 m long by 65 m wide, with its long side parallel to the runway.

The apron is connected directly to the runway via three taxiways called A, B and C.

The apron is lit by lights located atop six towers located on the west side of the apron.

The incident aircraft was parked at the south end of the apron (see Figure 6), with its longitudinal axis parallel to the long side of the apron and with its nose pointing southwest.

This part of the apron does not have parking marks on the pavement.

1.9. Flight recorders

The aircraft was equipped with a cockpit voice recorder (CVR) and a flight data recorder (FDR). Both were recovered in good condition and with no apparent damage.

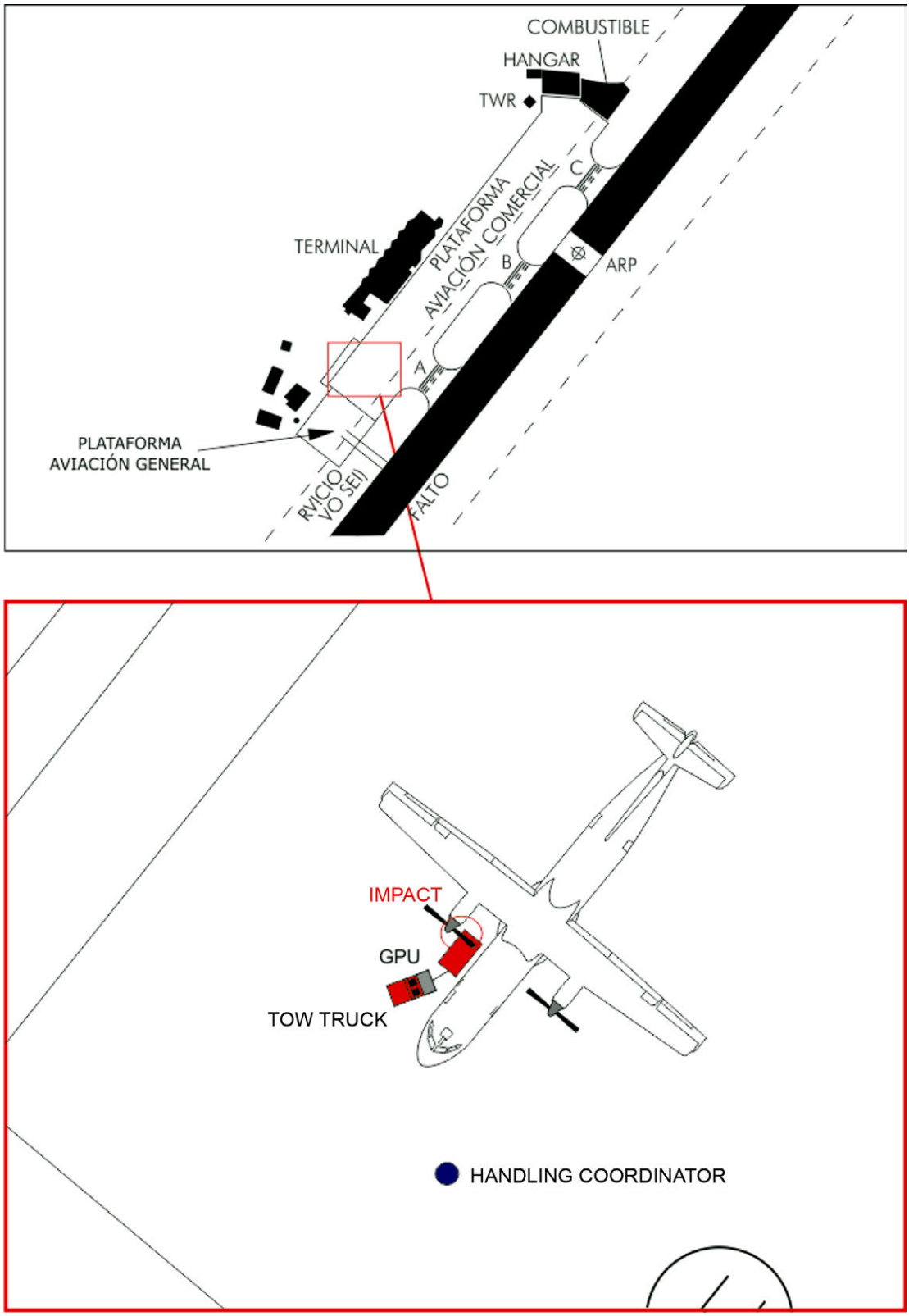


Figure 6. Portion of the San Sebastian Airport map (top) and close-up of the stand where the incident took place showing the locations of the aircraft, the GPU, the tow truck and the handling coordinator (bottom)

The CVR was an L3 Communications FA2100 model, P/N 2100-1020-02 and S/N 000547133. It was a solid-state unit with four high-quality tracks lasting 30 minutes each and two standard-quality tracks lasting two hours.

The FDR was a Fairchild F1000, a solid-state unit with P/N S800-2000-00 and S/N 02266.

The aircraft was also equipped with a flight data recording unit called multipurpose computer (MPC), which stores aircraft data primarily for use by the maintenance department.

1.9.1. *Cockpit voice recorder (CVR)*

The information on the CVR (the four high-quality tracks lasting 33 minutes and the two standard-quality tracks lasting 2 hours 4 minutes) was downloaded.

They all had information, though the most useful was that contained on channel 4, which recorded the sounds captured by the area microphone in the cockpit. This recording was very noisy and low in volume, which made it very difficult to transcribe the conversations. The sound was processed to clean it up, but even so parts of the recording were impossible to transcribe.

The data from the MPC and the CVR were synchronized using the conversations held with the airport's control tower and the discrete parameter contained on the MPC that records when the communications button (PTT) is pressed.

The first recorded exchange took place at 07:32:55 UTC and involved the two crewmembers. Although only individual words can be made out in the low quality recording, they seemed to be talking about a piece of equipment on the aircraft.

Between 07:33:15 and 07:33:59, they talked about the flight plan and flight preparations. During this interval the first officer expressed how fatigued he was at the start of the duty day.

At 07:34:01, the first officer called the control tower to report they were ready for engine start-up.

The communications with the controller lasted for 1:05 minutes, concluding at 07:35:05.

The crewmembers then talked among themselves for the next 57 s, though the exchange was unintelligible.

At 07:36:05, a knocking sound was heard, with the first officer asking what had happened four seconds later.

At 07:36:27, the buzzer on the interphone for communicating with the cabin crew went off. The call was answered by the captain, who told the flight attendant that everything was alright and that they would talk later.

At 07:38:54, the captain reported they were deplaning. At 07:39:00, handling personnel confirmed they had struck the GPU. At 07:43:59, the cabin crew reported that the passengers had all been disembarked.

The CVR recording ended at 07:44:05.

1.9.2. *Flight data recorder (FDR)*

The unit was downloaded at the CIAIAC laboratory.

The file size obtained was typical for this type of recorder. The data were subsequently converted into engineering units.

When the information was analyzed, the final part was noted not to correspond to the date or time of the event, but was instead from 19 January, that is, two days earlier. The coordinates were checked and verified to match those for the airport where the aircraft had been at that day and time, as per the scheduling information provided by the airline.

Additional checks were then made and other hardware and software used to download the data again. The result was the same, with the final data recorded being from 19 January.

This led investigators to conclude that the flight data recorder had stopped working on 19 January, meaning there were no data from the event. The aircraft continued flying without the crew identifying any problems with the flight data recorder, since no warnings were triggered in the cockpit. In fact, prior to the incident flight the aircraft had made a total of 12 flights for which there was no information on the recorder.

The unit was sent to the manufacturer, L3 Communications, for inspection.

The check made by the manufacturer confirmed that the failure of the FDR to record data was due to a fault of a portion of the solid-state memory. There was also no information being sent on the data bus.

Whenever recording faults like those present in the FDR's solid-state memory are present, the FDR itself sends a signal to warn of the malfunction that turns on a caution light in the cockpit. This light also turns on if the electricity to the FDR is interrupted or cut off. This STATUS SYST caution light is shown in Figure 7.

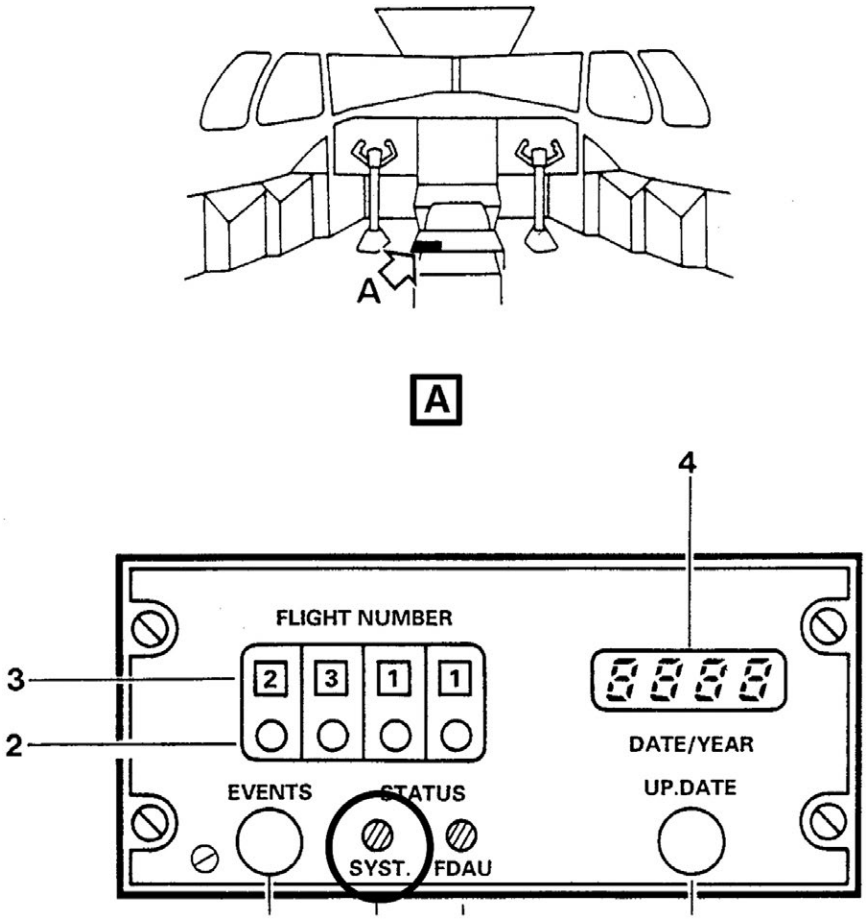


Figure 7. Data Entry Panel

The circuit that issues the signal to this caution light was not checked for proper operation during the inspection conducted by the recorder's manufacturer.

The flight crew did not report seeing this light energized in the cockpit. The checks made in the airplane revealed that the STATUS SYST light was not burned out, since when another recorder was installed, the light turned on when the FDR was deenergized, as expected.

Various checks were then carried out:

- First, another FDR with the same part number was installed on the incident aircraft, and the MPC was replaced. No system status lights came on and the information was confirmed to have been correctly recorded on the FDR.
- The MPC in use in the aircraft on the day of the incident was then installed and the data verified to have recorded properly with no caution lights.
- Once the manufacturer confirmed the fault in the FDR's memory, the FDR was once again installed on the incident aircraft. Investigators confirmed that the STATUS SYST remained off even though the FDR indeed was not recording any information.

Figure 8. Aircraft pedestal

- Finally, with the FDR still installed on the incident aircraft, it was confirmed that opening the FDR feeder breaker caused the STATUS SYST light to turn on in the panel in the cockpit.

The initial hypothesis considered as to the reason why the FDR fault caution did not activate was that it involved a fault in the system within the FDR itself that generates this caution, such that no fault indication was produced.

So as to check whether the FDR was correctly generating a fault signal, it was installed on a similar aircraft, where the STATUS SYST light did turn on to indicate a problem with the data recorder. This indicated that the FDR was correctly generating a fault signal.

During the investigation into the FDR, the operator was in the process of returning the aircraft to the manufacturer following the decision made earlier not to renew the lease contract. This process required that repairs and modifications be made to the aircraft, along with checks to ensure the adequacy of the actions taken. This included a check of the operation of the recorder and the aircraft's monitoring system. This check was carried out as specified in a procedure included in the maintenance manual. The check was conducted using another recorder installed in the aircraft, the result of which was satisfactory.

1.9.2.1. Procedures for checking the FDR system

The manufacturer confirmed that the cockpit preparation checklists require performing a check to ensure the proper operation of the flight recorders at least prior to the first flight of the day. The checklist provided by ATR was as follows:

– CVR AND DFDR TESTS.....PERFORM

CVR and DFDR test on GPU:

Press on the RCDR PB (on the RCDR panel) and check ON light is illuminated.
CVR: when pushing on the CVR TEST PB, the CVR pointer has to be in the green arc.
DFDR: the status SYST light (on the FDEP or RCDR panel) has to be extinguished.
Note: it can take over 1 minute to be extinguished after aircraft power up.
Press on the RESET PB (on the RCDR panel) and check ON light is extinguished.
The status SYST light (on the FDEP or RCDR panel) has to be illuminated.
Note: it can take over 1 minute to be illuminated after RESET PB action.

This test evaluates two different aspects of the system:

- Whether the FDR is working correctly, in which case the STATUS SYST light would turn off after pressing RCDR.
- Also checked is the monitoring system, which is responsible for transmitting the fault signal generated by the FDR when the conditions for doing so exist. If this system works properly, the STATUS SYST light should go out once the RESET button is pressed.

As for the operator's checklists, these were as follows:

COCKPIT VOICE RECORDER ..... TEST

- Can be performed with GPU only, by depressing the RCDR p/b on the pedestal.
- Check ON blue light illuminates on the p/b.
- Depress the TEST p/b. Check the needle in the green arc.
- Stop the CVR by depressing RESET p/b on the pedestal.

FLIGHT RECORDER.....SET

Check FDAU time base, adjust if necessary
Enter flight number on the data entry panel (numbers between 0000 and 7999 only)

A comparison of the manufacturer's and operator's checklists shows that the parts involving the FDR are different, mainly in that the latter do not include a check of the proper operation of the flight data recorder or the monitoring system.

1.9.3. *MPC*

This unit stores flight data information on a memory card that was recovered at the time of the incident. The information contained on it was obtained with the help of the aircraft manufacturer.

The data for the 5-minute period from 07:34:00 to 07:39:00 were studied, in particular the data on the longitudinal acceleration and that associated with the following engine parameters:

- NH(X): high-pressure turbine rotation rate (engine no.)
- NP(X): propeller rotation rate (engine no.)
- TQ(X): torque supplied by the engine (engine no.)

The table below shows the values for these parameters at various critical moments during the incident:

Time	NH1 (%)	NP1 (%)	TQ1 (%)	NH2 (%)	NP2 (%)	TQ2 (%)	Long. g's
7:34:00	0	0	0	65.00	0	0	0.0031
7:34:16	0	0	0	65.00	26.00	22.50	0.0010
7:34:53	33.00	0	0	75.00	70.50	60.00	0.0010
7:35:25	76.00	62.50	72.50	76.00	70.75	57.50	0.0031
7:35:57	75.00	70.75	62.50	76.00	70.75	57.50	–0.0092
7:36:03	75.00	70.75	62.50	76.00	64.50	120.00	–0.0214
7:36:05	75.00	70.75	62.50	78.00	64.00	95.00	0.3957
7:36:06	75.00	70.75	62.50	76.00	70.75	60.00	–0.0987
7:37:33	75.00	68.75	65.00	68.00	37.75	82.50	–0.0010
7:37:37	66.00	0	0	65.00	0	0	0.0010
7:38:09	0	0	0	65.00	0	0	0.0010

As the table shows, by 07:34:00 the no. 2 (right) engine was already running.

At 07:34:16, rotation data on the no. 2 engine propeller started coming in, followed by the data on the torque supplied by this engine.

The no. 1 engine started turning at 07:34:53.

By 07:35:25, the parameters for both engines may be regarded as stable.

At 07:35:57 the aircraft started moving on a heading of 222° at a ground speed (GS) of 0.5 kt.

At 07:36:03 a high torque value was recorded for the no. 2 engine (120%). At the same time there was a decrease in that propeller's rotation rate from 70.75% to 64.50%.

At 07:36:05, the longitudinal acceleration, which until then had been on the order of thousandths of a g, recorded a relatively high value for one second, 0.3957 g's. At that same instant a knocking sound can be heard on the CVR recording.

The values for the no. 2 engine propeller rotation rate and for the torque supplied by that engine returned to normal at 07:36:06.

At 07:36:07, the aircraft stopped on a heading of 224°.

After 07:37:37, both propellers stopped and the torque being supplied by both engines was zero.

The no. 1 engine stopped at 07:38:09, at which time the no. 2 engine's rotation rate was at 65%. Its corresponding propeller had stopped.

This unit also recorded the times when communications were made on the VHF frequencies. These data were used to synchronize the times in the airplane and the control tower, the conclusion being that the clock on the airplane was 5 seconds slower than the one in the control tower.

The position of the parking brake is not recorded on this aircraft.

1.9.4. *Airport security cameras*

The event was recorded by one of the cameras that cover the parking apron at the San Sebastian Airport.

Despite this camera's distance from the aircraft and the adverse visibility conditions, investigators were able to determine the exact times at which the aircraft started and stopped moving, enabling them to conclude that the aircraft was in motion for a total of ten seconds.

The information recorded on the MPC revealed that the propeller impacted the GPU at 07:36:03 and that the aircraft stopped 2 seconds later, possibly when the right main landing gear door struck the unit. The aircraft had started moving at 07:35:57.

1.10. Organizational and management information

1.10.1. *Operations Manuals*

1.10.1.1. Applicability of the normal procedures

In its B Operations Manual (PRM, Pilot Reference Manual), the operator devotes several points to the application of the airplane's normal procedures in an effort to standardize their use as an essential part of operations.

A checklist is always preceded by a procedure in every phase of flight considered. All pilots must know which items of the checklist are his responsibility and which are

performed by the other pilot, with each pilot monitoring the other. Before each flight, the CM2 (or maintenance personnel if present) must conduct a walkaround check, the first step of which is to check the pressure in the parking brake accumulator. Before the day's first flight the following lists must also be completed: safety inspection, cockpit preparation and before start.

The procedures are carried out on the ground as requested by the CM1[3] or if a specific event occurs (e.g., start-up clearance).

The manual contains a table based on the execution sequence that shows that the Safety Inspection checklist is of the "read and do" type, while the Cockpit Preparation and Before Start lists are two-way lists (challenge and reply).

Before reading any challenge and reply checklist, each step of the procedure must be completed first. The checklist then confirms that all of the steps in the procedure were properly completed.

The challenge and reply must always be performed such that the other crewmember can listen to the list without interfering with ATC communications.

The PRM underscores the importance of the monitoring and cross-checks between crew members, which are intended to achieve three important functions:

- Keep the crew's attention focused on the airplane's current condition.
- Help the crewmembers catch their own mistakes.
- Aid in the detection of conditions that could lead to an unsafe situation.

The manual likewise warns that interruptions and distractions are the main source of crew error by making them vulnerable to forgetting to execute steps in the procedures. Well established procedures and habits are the main barrier to this type of error.

Flight monitoring is achieved through cross-checks and standardized call outs, as well as through the use of standard checklists and procedures. The proper use of the lists ensures that important actions are not omitted. Adhering to procedures ensures that each crewmember knows what is expected of him and what to expect from the other crewmember. The call outs help to keep each crewmember informed of changes to systems and to the airplane's configuration. The captain, as the leader of the crew, is responsible for generating a work environment where the principles of monitoring and cross-checks are constantly enforced so that if an emergency or abnormal condition occurs, the crew will continue applying these same techniques in a normal fashion.

The table below shows the workload in the cockpit for a standard flight until the taxi procedure.

[3] CM1 refers to the pilot seated in the LH seat. CM2 is the pilot in the RH seat. PF (pilot flying) and PM (pilot monitoring) refer to the piloting functions, with the PF being the one who handles the airplane's controls and the PM the one who actively monitors the PF's actions and helps the PF as needed.

Flight event	Procedure	Checklist	Ordered by:	Done/read by:
Arrival at flight dispatch	Flight preparation procedure		CM1/CM2	CM1/CM2
On entering airplane	Safety inspection procedure			CM2
Full safety inspection	Walkaround			CM2
Takeoff data received		Cockpit preparation checklist	CM1	CM2
Start-up clearance received and doors closed	Before start procedure		CM1	CM1/CM2
Before start procedure complete		Before start checklist	CM1	CM2
Engines running		After start checklist	CM1	CM2
Taxi (off ramp)	Taxi procedure		CM1	CM1/CM2
Taxi procedure complete		Taxi checklist	CM1	CM2

1.10.1.2. Normal lists

Item 11 in the Cockpit Preparation checklist includes a check of the status of the parking brake.

COCKPIT PREPARATION	
+ COCKPIT DOOR LOCKING SYS	CHECK & OFF
+ ADC SW	SET TO ADEQUATE ADC
BAT	ON
MFC	AUTOTEST
CBs	CHECK
+ GEAR PINS	3 STOWED
+ EMERGENCY EQUIPMENT (*2)	CHECK
EXTERNAL LIGHTS	AS REQRD
CABIN SIGNS / EMER. LTs	ON / ARMED
OVERHEAD PANEL	SCAN, WHITE LTs OFF
PARKING BRAKE	SET / CHECK PRESS.
FLIGHT RECORDER	SET
ENGINE & FIRE TEST	PERFORMED
+ TRIMS	CHECK
+ PEDESTAL	SCAN
+ ENGINE PANEL	CHECK
+ LATERAL PANELS	CHECK
+ OXYGEN MASKS	TEST
EFIS / RDR / NAV	TEST / STBY / SET
MEMO PANEL	CHECK
LANDING ELEVATION	SET
FUEL QTY & BALANCE / USED	CHECK / RESET
CAP	CHECK, NORMAL
SAFETY BRIEFING	COMPLETE
TAKE-OFF DATA BUGS	SET
+ APM TEST	PERFORMED
APM / TAKE-OFF WEIGHT	ON / SET
TRIMS	SET FOR TAKE-OFF
ALTIMETERS	SET & X-CHECKED
STEERING (*3)	AS REQRD

—COCKPIT PREPARATION CHECKLIST COMPLETED—

Chapter 1.1.3 of the PRM provides additional information on the checklist items, indicating that the actions associated with this item in the procedure are:

PARKING BRAKE ..... SET / CHECK PRESS

Check BRAKE ACCU pressure (min. 1,600 PSI).
Use the HYD AUX PUMP is necessary.
Place the lever in the PARKING position.

There are no further references to the parking brake lever until the normal Taxi checklist, where the procedure specifies to release the brakes and check their normal and emergency operation. As item 1.2.1.G in this same manual states, this list should not be performed until the airplane is clear of any congested maneuvering areas.

1.10.1.3. Communications with personnel on the ground

The PRM states that engine start-up must always be performed with assistance from personnel on the ground (except for the start-up of the no. 1 engine during taxi) and that, if possible, communications are to be established with said personnel through the interphone.

In this same manual the start-up sequence includes a note stating that engine start-up is to be performed with headphones on so as to have permanent, two-way communications with personnel on the ground (except for the start-up of the no. 1 engine when taxiing on a single engine).

1.10.2. *Handling Manuals*

The handling company for Air Nostrum aircraft at the San Sebastian Airport was Iberia.

Iberia's Human Resources/Training Department has a document called "Airplane departures for coordinators" that details the procedures for departing airplanes.

Point 2.4 in this document, devoted specifically to "connecting headphones to the airplane", does not contain specific instructions on the obligation/recommendation to use the headphones and basically limits itself to indicating where the headphone jacks are on the various aircraft types included in the document, which are:

- A320 family.
- Boeing family (narrow body).
- MD family.
- A340 family.
- Boeing family (wide body).

No mention was found in this document of ATR-type aircraft.

The instructions for airplanes departing from remote stands with a GPU are given in a dedicated section that states to pull the interphone plug from the jack once the chocks, if installed, are removed.

In terms of the instructions or procedures to be used in the event of an incident during the departure of the aircraft, no such indications were found in this manual.

1.11. Additional information

1.11.1. *Statements*

1.11.1.1. Captain

He arrived at the airport office before 06:45 since the check-in time was stipulated as 45 minutes before the flight.

On the day of the event it was raining. The aircraft was not at its usual parking stand, being located instead in the south part of the apron, which does not have good lighting and which had a lighting blind spot.

The two pilots knew each other well since they had flown many times together. They always held a briefing with the flight attendants before the flight, though if there were no departures from normal operations then nothing was said since, by virtue of being a small base, all of the crews knew each other and flew together regularly.

He stated that they never wore headphones during operations at the San Sebastian Airport. Similarly, they did not typically wear them at other airports, like Melilla, but did normally wear them at Madrid-Barajas.

Once onboard the aircraft they received an EFIS COMP indication. The first officer focused on resolving the problem.

They had problems due to the time involved in resolving the EFIS problem in the cockpit, as well as due to the presence of an armed Civil Guard and a company employee who was traveling as an extra crewmember, all of which required verifying personal documentation, asking for stamped service orders, etc.

When preparing the cockpit they did not read the relevant checklists (Cockpit Preparation and Before Start), doing them from memory instead to save time.

Communications with the coordinator were typically handled through the com hatch, which they also used to exchange all the documentation.

He stated that they started the engines and checked them for proper operation using a sequence he qualified as routine. He recalled it was 07:30 local time, since there are restrictions at the airport if they start taxiing before that time.

Afterwards he ordered the chocks to be removed. The initial problem was solved. They were still waiting for the affected instrument to finish aligning, so both crewmembers waited while they watched the first officer's instruments. He stated that the airplane braked better with the parking brake than with the pedals, which is why he used it. The aircraft did not have a lot of inertia.

He heard a noise that was not very loud that sounded as if the wheel had caught on and run over something. He set the parking brake, noting it had been in the BRK OFF position. He was not aware of the extent of the incident until he heard the coordinator yelling through the com hatch.

He contacted the flight attendants and informed the passengers of the incident. They were disembarked normally. The passengers did not seem to be nervous.

When he assessed the situation he saw that the GPU was about 20-30 cm away from the airplane and the blades were broken.

After contacting the Fleet Manager, the operator sent them on a ferry flight to Madrid to continue their rotation to Melilla. The company asked him to submit a report.

When describing the procedure, he noted that the engines are started in "H"[4] mode. Once the right engine is running and acting as an auxiliary power unit, the pilot instructs that the GPU be removed.

They were carrying little weight on this flight and he had the throttle at idle the whole time. He noted that with a low weight the airplane has traction even at that power so that if the airplane moved due to the parking brake not being set, it would run up against the chocks, making it very hard to remove them.

The parking brake worked correctly. He thought that he may have inadvertently released it and not realized it when asking that the chocks be removed. He was seated properly with his feet on the pedals, but he never actually actuated them.

He described it as a situation involving an exceptionally heavy workload. The airplane moved very slowly, as if not accelerating, meaning they did not feel the movement since they were looking inside the cockpit.

[4] In mode H the propeller is not engaged with the engine, which is used as an Auxiliary Power Unit to provide electricity and air pressure.

He regarded the non-use of headphones as having a large effect on the incident since it hampered communications with ground personnel.

He said that they usually read the checklists as a matter of routine even if they know them from memory.

They were in a hurry. He stated that he could have delayed the flight but that company codes for justifying a delay for an extra crewmember and a weapon onboard do not exist.

He stated that time is always taken into consideration since their daily operations are complicated by factors such as short layovers, assignment of remote parking stands, ATC problems, etc.

The start-up procedure is usually performed by the captain, though occasionally he can delegate this task to the first officer.

1.11.1.2. First officer

The preparation workflow in the cockpit was normal until he detected the fault indicated by an EFIS COMP warning that the AHRS (Attitude and Heading Reference System) was not aligning properly. He then concentrated on correcting this fault while the captain commenced the engine start procedure.

Prior to this there had been two interruptions in the cockpit from the body guard of a passenger and a company stewardess traveling as an extra crew with her family.

He noted that the use of headphones by handling personnel was inconsistent. At the four airports where they usually operated, they used the headphones in Madrid and Malaga and never in San Sebastian and Melilla.

He was unaware of the captain's actions during engine start-up as he was focused on correcting the malfunction. He did not consult the QRH for the EFIS COMP fault since the procedure had a memory item that involves identifying the defective instrument and slaving it to the other.

He thought that the AHRS problem fixed itself when the engine was started, at which time he felt the airplane moving. He was looking inside the cockpit, searching for a plate. He looked up and saw the coordinator trying to get their attention. He yelled out (watch out, watch out!), to which the captain reacted by setting the parking brake. He had felt the airplane move forward but could not estimate how far or how fast it had gone.

He heard a clanking noise that he initially associated with the intermittent braking sensation felt when the antiskid system is active. He then saw that the two condition levers were in AUTO, but did not hear any warnings in the cockpit after the event. He was not aware of having impacted anything and it was the coordinator who informed them of the damage.

They stopped the airplane and disembarked normally. He thought the passengers did not even notice the incident and that nobody was seating near the affected engine. Everything was normal in the airport and he did not recall any unusual activity in the cockpit.

Under normal conditions the captain starts up the engines while the first officer monitors with a series of callouts. He can also delegate the task to the first officer. He also stated that occasionally, the PF starts the engines and the PM prepares the cockpit, at the captain's discretion.

He explained that the no. 2 engine is normally started first in H mode, unless there is a tailwind or the ground crew is in the right baggage hold. The instruction is then given to disconnect the GPU, the no. 2 propeller is engaged and finally the no. 1 engine is started.

The first officer prepares the cockpit and then they read the checklist. He did not recall whether the parking brake was set or not, but he completed his normal scan without noticing anything out of the ordinary.

The chocks off request can be made just before they start taxiing by whoever does the engine start-up.

The pilot who had last flown the airplane the day before told him that he clearly remembered leaving the parking brake set. The action of setting the parking brake after the final stop seems to be procedural, meaning this action is done mechanically.

He stated that he flies over 800 hours/year and borders on the maximum duty time allowed by law.

The refresher courses do not consider the actions to take after an incident/accident. They only train up to the evacuation phase. He did state, however, that there is a guide in the manuals on what actions to take depending on the damage observed.

1.11.1.3. Flight coordinator

Once the passengers boarded she headed to the front of the plane to guide it out.

She indicated that communications with the crew were handled like they always were: visually through the use of standard signals. This requires that she stand a few meters in front of the aircraft. She added that they always do it this way with propeller aircraft,

such as the ATR. However, with other aircraft like the CRJ or Airbus A319, which they service at the San Sebastian Airport, communications are handled through the use of headphones.

When asked about the reason for not using headphones with the ATR, she said that she thought they could not be used since she had been taught to do it that way and had never seen anyone connect the headphones.

As for when the GPU is connected to the aircraft, she stated that the unit is connected when the airplane arrives the night before and is left connected all night, since it might be needed for maintenance operations.

The start-up procedure always begins with the no. 2 engine and that day was no exception. Once the engine was running, the captain signaled her to remove the GPU, which she relayed to the operator, who went to the junction box where the GPU is plugged in, disconnected the cable, picked it up and left it on the GPU.

In the meantime the crew had started the no. 1 engine, after which the captain gave the chocks off signal, which she relayed to the operator, who went to the nose wheel, removed the chocks and then walked to the GPU to drop off the chocks.

At that moment she realized that the aircraft started moving. She tried to warn the crew of the situation, but was unable to because the pilots were operating something in the overhead panel and could not see her. They could not hear her either due to the noise.

The operator did hear her yell and both started to run to get away from the aircraft, which continued moving until the right engine struck the GPU, at which point it stopped. Both engines were still running.

She then went toward the cockpit and, after the captain opened the window, explained to him what had happened. They stopped the engines and the captain told her they would disembark the passengers, so she proceeded to the rear of the aircraft to aid in this operation.

The passengers deplaned normally and were taken to a lounge in the terminal building. She did not notify the airport operations office of the event.

1.11.1.4. Handling operator

As is commonplace, before the passengers were boarded he removed the chocks from the main wheels, leaving only the front wheel chocked. After the right engine was started, the coordinator signaled to him to disconnect the GPU, which he did, picking up the cable and leaving it on the cart.

The coordinator then signaled to him to remove the chocks. He went to the nose wheel, removed the chocks and turned around to walk back to the GPU so as to drop off the chocks and move the GPU. He did not notice having to exert more force than usual to remove the chocks, as he was able to remove them without any problem.

Halfway to the GPU cart he heard the coordinator yell, turned around and saw the aircraft moving toward him. He noticed that the right propeller was about to impact the GPU, so he started running to move away from the aircraft and avoid being injured.

1.11.1.5. Marshaller

The *marshaller* did not witness the incident. He approached the crew to ask about the delay, at which time the crew informed him of the event. He took several photographs of the damage and proceeded to the operations office (CECOPS) to report the event.

1.11.1.6. Operations technician (CECOPS)

They were unable to see the incident even though the operations office is in the terminal building, looks out over the air side and has a large window that provides a clear view of the entire aircraft parking apron.

At 08:05 he heard a radio transmission from the crew of ANE8519 notifying the tower that they were moving up their departure time due to a problem with another airplane. He then called the control tower to find out what had happened. The controller told him that the airplane had had a small mishap on the ground and would not be departing.

Shortly thereafter, at around 08:20, the marshaller arrived at the operations office and provided him with detailed information on the incident.

1.11.1.7. AMT Air Nostrum maintenance chief at the San Sebastian base

When an aircraft overnights at the airport after its final flight of the day, the AMT (aviation maintenance technician) who services the airplane will typically go into the cockpit to check its condition. Once of the things they always check is the position of the parking brake. The amount of charge in the brake accumulator is visible from the outside and is one of the items that is verified during the walkaround check. On that day no maintenance activities were performed that involved releasing the parking brake.

Braking and braking effectiveness tests were conducted and noticed that even though the pressure indicated for the accumulator from the outside gauge was 2,000 psi, the

wheels were not braking fully. The mechanic had to use the electrical auxiliary hydraulic pump to apply full braking pressure.

The difference in the wear pins with the brakes set and disengaged was not substantial, which indicated that the brakes were in good condition.

1.11.2. *Prior events*

Included in incident report IN-045/2006 was safety recommendation REC 03/10, directed at Air Nostrum, which stated:

REC 03/10. It is recommended that the operator, Air Nostrum, enhance the training of its flight crews in the following regards:

- Calm leadership and decision-making techniques in abnormal and emergency situations.
- Task allocation among crewmembers in abnormal and emergency situations.
- Guidelines and procedures for identifying, reporting and prioritizing faults in abnormal and emergency situations.
- Strict adherence to procedures in abnormal and emergency situations to avoid confusing other crewmembers.
- Appropriate use of automation for each situation.
- Use of standard terminology in abnormal and emergency situations.

In reply to this recommendation, Air Nostrum approved and implemented in its training programs a series of measures intended to enhance the training of its crews in the areas of human error and reliability, leadership and teamwork, safety culture and threat and error management.

The CIAIAC analyzed the measures taken by Air Nostrum and, believing them to address all of the points mentioned in 03/10, closed out the recommendation, assigning it the status "Closed. Response satisfactory".

2. ANALYSIS

2.1. General

On 21 January 2012, the company Air Nostrum was preparing to start flight IBE8317, assigned to an ATR-72-212A aircraft, registration EC-HCG. The flight's destination was Madrid and was scheduled to depart San Sebastian at 07:30 local time.

The flight crew had valid licenses and its training was up to date.

The members of the crew met at the flight dispatch office, where they held their briefing. As per the crew's own statement this briefing was not long since the scheduled flight from San Sebastian was typically the same. Moreover, few crewmembers were stationed at that airport and they all knew each other well.

They proceeded to the aircraft, which was not parked in its usual position. In the crew's opinion, the parking stand was not well lit which, when combined with the fact that it was raining, hampered visibility.

When they boarded the aircraft the crew made their checks using the normal cockpit preparation workflow when they noticed the EFIS COMP warning.

The first officer focused his efforts on correcting the malfunction associated with this warning while the captain asked that the passengers be boarded so as not to delay the flight.

The captain stated that time pressure was a factor since their daily operation was complicated by factors such as short layovers, remote parking stands, ATC problems and so on.

During the boarding procedure the captain was distracted by having to attend to the boarding of an armed Security Forces officer and to facilitate the transit of an airline crewmember who was traveling as an extra crew.

Once the passengers were onboard, the captain commenced the engine start procedure, which begins with the no. 2 (right) engine in "H" mode (with the propeller brake engaged), while the first officer continued with the procedure for recovering and aligning the AHRS, as required by the EFIS COMP warning.

In his haste to regain the lost time and depart on time, the captain started the engine, doing the checks by himself from memory, without reading the procedures or asking the first officer to help him in these tasks, as is required.

Communications with the coordinator were being done using visual signals.

The operator, in turn, received his instructions via the visual signals given by the coordinator. The operator's task was to run the ground power unit (GPU) and its associated tow truck, as well as to disconnect the GPU, remove the chocks and then move the GPU.

After starting the right engine, the captain instructed the coordinator to disconnect the GPU while he commenced the start sequence on the remaining engine. He then

released the propeller brake on the right engine and signaled the coordinator to remove the chocks.

This instruction was relayed to the operator, who removed the chocks, leaving them in the tow truck.

As he was preparing to climb the tow truck to move the GPU, he heard screams and realized that the airplane was moving and that the right propeller was about to strike the GPU, causing him to run out of the way.

Shortly afterwards the propeller hit the GPU, causing all six blades on the propeller to break. The fragments that detached were ejected some distance away, some of them impacting the aircraft fuselage.

The captain completed the steps required to taxi and focused his attention on the alignment of the first officer's side instruments, which the first officer was still trying to recover. This is why neither crewmember was aware of the aircraft's motion.

On realizing the situation, the pilots noticed that the parking brake was not set. The captain set the brake and stopped the engines and, after evaluating the situation, ordered that the passengers be disembarked.

Despite the detached fragments, there were no injuries to any of the ground personnel.

At no time were the airport's operations personnel informed of the incident, either by the crew or by the handling operator.

Some 15 minutes later the marshaller reported to the aircraft to ask about the delay in the operation. It was then that he was informed by the crew of the incident. It was this marshaller who reported what had happened to the airport operations office (CECOPS).

2.2. Application of procedures and checklists

Checklists are intended to aid memory processes and help ensure that the critical actions necessary to guarantee the safe operation of the aircraft are not omitted or forgotten.

These lists are a very important tool for linking the pilot to the aircraft. In addition to helping configure and operate the airplane properly, they also provide a method and a sequence for verifying the overall operation of every system.

The lists, however, are of no use if a crew is not committed to using them properly. Without the discipline and dedication needed to apply the lists at the right time, the likelihood of making a mistake is greatly increased. Crewmembers who fail to take the

proper execution of checklists seriously are prone to complacency, relying entirely on their own memories. They thus lose awareness of their own reliability and fail to realize that some of the errors that result from the poor application of the checklists could lead to a fatal accident.

According to the crew's statement and as specified in the company's operating documents (PRM), CM2 started the cockpit preparation procedure. As a challenge and reply list, the items are performed from memory in keeping with an established pattern. Their execution is then checked by reading the list. While carrying out the checklist items, the problem with the alignment of the AHRS was detected, which then absorbed all of the first officer's attention. This interrupted the normal sequence, since the Captain finished the cockpit preparation checks and executed the associated items in the before start procedure, followed by the after start and taxi procedures, without verifying them using the checklists and without the first officer's cross-check.

Reading the cockpit preparation list would have confirmed the status and the proper setting of the parking brake. The taxi list instructed that the brakes be released and checked. Had this item been properly executed the crew would have taken notice of the condition of the airplane's braking system.

The deviation from procedures was justified by the captain, who stated that in a high workload setting, where he was simultaneously focused on regaining the normal use of the equipment, preparing for engine start-up and boarding passengers with special requirements, led to a stressful situation.

Moreover, the desire to adhere to the schedule and complete the flight program on time in the face of external factors such as adverse weather, ATC restrictions and the like, conditioned the crew's actions and contributed to the crewmembers' attention deficit, resulting in their mistake.

The desire to avoid delays caused the captain to ignore the operating procedures, carrying out actions of his own accord without reading the checklists.

After executing the start-up and taxi procedures from memory and without the cross-check or the checklist to verify them, the captain focused his attention on the first officer's efforts to recover the faulty equipment, oblivious to the fact that the parking brake had been released and the chocks were off. A stressful situation affects short-term memories by replacing them with new elements, thus making it easy to forget previous actions.

Furthermore, the early hour of the operation along with the improper rest noted by one of the crewmembers and heard on the CVR recording, could be indicative of a possible state of fatigue that could have contributed to their failure to pay attention to the actions taken and to the required mutual supervision.

A factor that influences the execution of procedures is monotony. The operation being conducted in San Sebastian was always the same with the same schedules, destinations and even crewmembers, one in which recent actions can be confused for actions carried out in the past in a similar situation and in a familiar setting.

Carrying out an operation under the same conditions can also lead to complacency, believing things are like they have always been. The crew should have required, as specified in the PRM, the coordinator to use the headphones. This would have facilitated communications with the auxiliary personnel on the ground. They used them at other airports but not at LESO, despite having the ability to do so.

All of these factors that contributed to the crew's attention deficit could have been avoided through the rigorous application of the established checklists and operating procedures.

As such, this incident reveals that some of the deficiencies that gave rise to the issuance of recommendation REC 03/10 have reoccurred. Specifically, the aspects detected that still exhibit shortcomings are:

- Calm leadership and decision-making techniques in abnormal and emergency situations.
- Task allocation among crewmembers in abnormal and emergency situations.
- Strict adherence to procedures in abnormal and emergency situations to avoid confusing other crewmembers.

However, of the information gathered it is not possible to determine if this incident can be considered as an isolated case or if, on the contrary, any of the deficiencies noted is still present in the organization. As a result, a new safety recommendation is issued to the aircraft operator so that it undertake a supervision procedure of the measures implemented in response to REC 03/10, so that it allows determining its effectiveness, and whether additional measures are necessary to be taken.

2.3. Analysis of the impact

As the handling operator stated, taking the chocks off the aircraft did not require any unusual effort on his part. From this it may be deduced that the aircraft was not pushing against the chocks at that instant. This could be because the engines were not producing sufficient thrust to move the aircraft or because the parking brake was set.

The pilot should have ordered that the GPU be disconnected once engine no. 2 was stable (07:34:53).

The GPU operator stated that as he was disconnecting the GPU, the crew went ahead with the start of the no. 1 engine and that by the time he was given the instruction to remove the chocks, this engine was already running.

The no. 1 engine was started at 07:34:53, that is, at the same time as the other engine was stabilizing.

The aircraft ran into the GPU at 07:36:05, at which time the aircraft stopped.

The security camera footage revealed that the aircraft was moving for ten seconds, meaning that its motion must have started at 07:35:55, at which time both propeller RPMs were at 70.75%.

As indicated in 1.9.3, both engines and propellers were stable by 07:35:25, so from that moment until the time of the impact they must have been providing the same thrust.

The aircraft, therefore, should have started moving at 07:35:25. Since this was not the case, there must have been a force being applied at that time that was opposing the aircraft's motion. This force could only have been provided by the parking brake or the chocks. The latter can be ruled out, since had that been the case the operator would not have been able to remove the chocks. As a result, the only force that could have been holding the aircraft in place until it started to move was being provided by the parking brake.

Consequently, it is believed that the aircraft's parking brake was set until 07:35:55, at which time it was disengaged by the crew.

2.4. Handling operations

The use of headphones is recommended in any situation, but is particularly important in reduced visibility conditions, as is the case during nighttime or adverse weather operations. This is why their use is recommended in the operator's manuals.

The operations to prepare the aircraft for departure were conducted while it was still dark. It was also raining, so the headphones should have been used for communications.

Communications between the crew and the flight coordinator were handled using visual signals. The personnel never used the headphones in San Sebastian even though the aircraft was equipped for their use.

It is worth noting, however, that in accordance with the departure procedures, once the order to remove the chocks is given, the headphones must then be unplugged. As a result it is logical to assume that even if the headphones had been used, by the time the aircraft started moving the headphones would have already been disconnected, meaning they could not have been used to alert the crew.

In any case, even if the non-use of the headphones did not affect the outcome of the incident, the reason given for not using them demonstrates that the handling personnel lacked sufficient knowledge of the aircraft they were supposed to service, which warrants the emission of a safety recommendation.

The investigation into this event also underscores the presence of another circumstance, namely the failure to report the event to the airport. Even though this omission did not have any effect on the incident itself or on other operations, it could in other similar events.

As stated in 1.10.2.2, the handling manuals do not contain any procedures providing instructions or steps to take in the event of an incident during an aircraft's departure, meaning that the handling personnel's actions were consistent with their procedures.

In light of this it seems that a review of the handling operator's manuals is in order so that these manuals include guidelines on what actions handling personnel should take in the event of an incident during an aircraft's departure. A safety recommendation is issued in this regard.

2.5. Flight data recorder (FDR)

As mentioned in 1.9.3, the flight data recorder had internal damage that resulted in no flight information being recorded since two days before the incident.

Under these conditions, the FDR should have generated a fault signal, which in turn should have been relayed by the monitoring system to the cockpit, triggering a STATUS SYST light. This did not happen on this airplane.

The tests performed on a similar aircraft with the FDR involved in this incident revealed that the FDR was emitting the fault signal correctly.

This implies that the problem that resulted in the FDR fault warning light not illuminating in the cockpit of the incident aircraft should have had its root in said aircraft's monitoring system, as it is this system that activates the warning light in the cockpit when the FDR generates a fault warning.

This hypothesis could not be confirmed since by the time the FDR was verified to be issuing the fault signal correctly, the necessary actions had been taken in preparation for returning the aircraft, including a maintenance test that showed that the monitoring system was working properly.

It is possible that these actions fixed the fault that might have existed in the monitoring system.

The fault in the monitoring system, however, should have been detected had the "CVR AND DFDR TEST" indicated by the aircraft manufacturer been performed. This is the first test mentioned in point 1.9.3.1.

The test contained in the operator's manuals, however, and which its crews performed, did not actually check the status of the FDR monitoring system, any fault that may have existed in the system could have gone unnoticed.

It would be worthwhile, then, to modify the operator's checklists such that they reflect the correct procedure to check the flight recorder. However, since this aircraft model is no longer a part of the operator's fleet, no safety recommendation is issued to the operator in this regard.

3. CONCLUSIONS

3.1. Findings

- The crew's planning of the flight rotation was routine.
- The crewmembers knew each other from having worked together frequently. They were assigned to the same base, as was the coordinator.
- The aircraft was not parked in its usual location, being parked instead in an area with less intense lighting.
- The existing weather and lighting conditions hampered visibility.
- The coordinator did not use headphones, using instead standard visual signals to communicate with the crew.
- An alignment problem with the attitude and heading reference system (AHRS) distracted the crew's attention toward solving the problem.
- The presence of a police officer with his service weapon and handling the accommodations for an airline crewmember who was traveling as extra crew distracted the captain's attention.
- The pressure on the captain to stay on schedule forced him to execute procedures from memory and without coordinating with the first officer.
- The captain's hurry to start the flight on time led him to disengage the parking brake in haste while paying attention to how the first officer solved the problem with the AHRS.
- This focusing of attention within the cockpit made it possible for the aircraft to move without the crew noticing the movement or seeing the coordinator's warning signals.
- The aircraft's right propeller struck the ground power unit. The aircraft stopped when the right main landing gear door impacted the GPU.
- There were no injuries and the crew disembarked the passengers using the normal procedure.
- Neither the aircraft's crew nor the handling personnel reported the incident to the airport's Operations Coordination Center (CECOPS).

- When the data were downloaded from the FDR, investigators found that no data had been recorded since two days before the incident.
- An analysis of the FDR revealed that the unit was faulty and not recording correctly.
- The crew was unable to identify the fault because the light in the cockpit that informs of the improper operation of the system did not turn on.
- The absence of the FDR warning light could have been due to a fault in the monitoring system that went undetected because the test contained in the operator's manuals used to check this system was incomplete.

3.2. Causes

The incident analyzed in this report occurred as a result of the aircraft starting to move forward without this movement being noticed by the crew. The aircraft was able to move because the parking brake had been released, without the crew being consciously aware of having done so.

The cause of the incident was the failure of the crew to adhere to procedures.

The low visibility at the time of the event could have contributed to hampering the acquisition of visual references outside the cockpit.

4. SAFETY RECOMMENDATIONS

The investigation into this event has revealed the existence of certain deficiencies on the part of the handling company (Iberia Airport Services) personnel in terms of their level of knowledge of the airplanes they service. Investigators likewise determined that Iberia's handling manuals contain no instructions or procedures regarding the need to inform the airport of any incident or accident that occurs during handling operations. As a result, the following safety recommendations are issued:

REC 54/13. It is recommended that Iberia Airport Services review its handling personnel training program so as to ensure said personnel have an adequate level of knowledge of the aircraft they service.

REC 55/13. It is recommended that Iberia Airport Services include procedures in its handling manuals that ensure that any incident or accident that occurs during handling operations is reported to the airport.

REC 56/13. It is recommended that Air Nostrum undertake a supervision procedure of the measures taken in response to REC 03/10 so that it allows determining its effectiveness, and whether additional measures are necessary to be taken.