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COMISIÓN DE
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AVIACIÓN **C**IVIL

Report IN–041/2016

Incident involving an Airbus A-321-211 registration D-ASTP, operated by Germania, at the Fuerteventura Airport, Canary Islands, Spain on 16 July 2016

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO

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COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Tel.: +34 91 597 89 63
Fax: +34 91 463 55 35

E-mail: ciaiac@fomento.es
http://www.ciaiac.es

C/ Fruela, 6
28011 Madrid (España)

Foreword

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

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.5 of Regulation (UE) nº 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1., 4. and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

Contents

Abbreviations

° ' "	Sexagesimal degrees, minutes and seconds
° C	Degrees centigrade
ACARS	Aircraft communication addressing and reporting system – coded communication system between an aircraft and a ground station
ACMS	Aircraft condition monitoring systems
AIP	Aeronautical information publication
AOG	Aircraft on ground
ATPL (A)	Airline transport pilot license
CIAIAC	Comisión de Investigación de Accidentes e Incidentes de Aviación Civil (Spanish AIB)
CPL (A)	Commercial pilot license
CPT	Captain
CTR	Control zone
CVR	Cockpit voice recorder
DFDR	Digital flight data recorder
DMU	Data management unit
ECAM	Electronic centralized aircraft monitor
FO	First Officer / Copilot
ft	Feet
ft/min	Feet/minute
g	Acceleration due to gravity, 9.8 m/s2
GCFV	ICAO code for the Fuerteventura Airport
GMC	Ground movement control
GS	Glide slope
h	Hours
hPa	Hectopascals
IAS	Indicated airspeed
ICAO	International Civil Aviation Organization
ILS	Instrument landing system
Km	Kilometers
Kt	Knots
LDA	Landing distance available
LH	Left hand

m	Meters
MCDU	Management control display unit
METAR	Aerodrome meteorological report
MHz	Megahertz
MOC	Maintenance Operations Control
PAPI	Precision approach path indicator
P/N	Part number
QNH	Altimeter subscale setting to obtain elevation when on the ground
RA	Radio-altimeter
RH	Right hand
rpm	Revolutions per minute
S/N	Serial number
TD	Touchdown
UTC	Coordinated universal time

Synopsis

Owner:	SASOF II (E) Aviation Ireland Limited.
Operator:	Germania
Aircraft:	Airbus A-321-211, D-ASTP, S/N: 0684
Date and time of incident:	Saturday, 16 July 2016 at 08:26 UTC
Site of incident:	Fuerteventura Airport, Las Palmas, Canary Islands, Spain
Persons onboard:	215 passengers, 7 crew, none injured
Type of flight:	Commercial air transport – Scheduled – International – Passenger
Date of approval:	June 28th of 2017

Summary of the event:

The Germania flight, callsign GMI3700, flying from Düsseldorf to Fuerteventura (Canary Islands, Spain), was landing on runway 01 at the Fuerteventura Airport after making an ILS approach.

The crew reported that they were going around, explaining, at the tower controller's request, that it was due to an unstabilized approach on short final and to a bounced landing. The aircraft flew a visual traffic pattern, landed on runway 01 and taxied to its assigned stand to disembark the passengers.

The captain contacted the airline's maintenance operations center (MOC) in Germany to coordinate and aid in making the decisions relative to the aircraft following the hard landing. He also carried out an external check of the aircraft, finding no anomalies.

Due to the absence of maintenance support at the Fuerteventura Airport, and to the MOC's misjudgment regarding the meaning of the codes in the hard landing report, the crew decided to make the return trip to Düsseldorf with passengers. The aircraft took off for the return flight, callsign GMI3701, at 09:58 that same morning and landed without incident at the destination airport. In Düsseldorf, the aircraft was taken out of service (AOG).

The first information on the event was received on 30 August 2016, but it was not until the first half of November that the seriousness of the damage to the landing gear, caused by the high load factor experienced when contact was made with the runway (3.32 g), was confirmed.

The column of the left main landing gear leg and its strut, along with the right leg strut, had to be replaced before the airplane was returned to service, in keeping with the instructions of the manufacturer, Airbus.

The serious incident was caused by the execution of an unstabilized final approach, caused by a drop in speed and descending below the glide slope, and the late decision to perform a go-around.

Contributing to the incident is the fact that the maneuver was carried out without any automatic systems engaged to control the airplane's attitude/trajectory or thrust.

The decision made after the event to continue to operate the airplane with passengers was risky and unsafe, and resulted from an incorrect assessment of the seriousness of the hard landing.

The exchange of information between the captain and the airline's MOC was fluid, but the MOC did not provide reliable data or valid criteria to aid in the captain's decision making. As concerns the airplane's operability after the event, the suitability of keeping the airplane in service was not evaluated in time, and the incorrect decision was also made to make the return flight with passengers. As a result, a safety recommendation is issued to the operator, Germania.

REC 55/2017 - It is recommended that air transport operator Germania establish a training program for its MOC personnel that ensures they provide correct support so that safe decisions are made in every aerodrome at all hours of operation.

1. FACTUAL INFORMATION

1.1. History of the flight

Germania flight GMI3700, from Düsseldorf to Fuerteventura (Canary Islands, Spain) was cleared by the airport control tower to land on runway 01 at the Fuerteventura Airport after making an ILS approach.

At 08:26, the crew informed the tower that they were going around, explaining, at the tower controller's request that it was due to an unstabilized approach on short final and to a bounced landing.

At 08:35, after flying a visual traffic pattern, the aircraft landed on runway 01 and taxied to its assigned stand to disembark the passengers.

The crew conducted an external check of the aircraft and found nothing wrong. The captain contacted the airline's maintenance operations center (MOC) in Germany to coordinate and aid in making the decisions relative to the aircraft following the hard landing.

Due to the absence of maintenance support at the Fuerteventura Airport, and to the MOC's misjudgment regarding the meaning of the codes in the hard landing report, the crew decided to make the return trip to Düsseldorf with passengers.

The aircraft took off for the return flight, callsign GMI3701, at 09:58 that same morning and landed without incident at the destination airport.

In Düsseldorf, the aircraft was taken out of service (AOG).

The first information on the event was received on 30 August 2016, but it was not until the first half of November that the seriousness of the damage to the landing gear, caused by the high load factor experienced when contact was made with the runway (peaking at 3.32 g), was confirmed.

The column of the left main landing gear leg and its strut, along with the right leg strut, had to be replaced before the airplane was returned to service, in keeping with the criteria of the manufacturer, Airbus.

1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious				
Minor				Not applicable
None	7	215	222	Not applicable
TOTAL	**7**	**215**	**222**	

1.3. Damage to aircraft

Airbus and Safran Landing Systems conducted a complete load analysis based on the data recorded in the DFDR, and recommended the following actions as a result:

a) Left main gear: the main fitting experienced excessive loads and is not serviceable. Replace the shock absorber subassembly, including the sliding tube, which is not serviceable due to excessive loads. All other components can be returned to service after the hard landing inspection. No other findings.

b) Right main gear: replace the shock absorber subassembly, including the sliding tube, which is not serviceable due to excessive loads. All other components can be returned to service after the hard landing inspection. No other findings.

c) Wheels, axle sleeves, brakes and tires: can be returned to service after the hard landing inspection. No other findings. The brake fans should also be checked in a functional test before being returned to service.

1.4. Other damage

There was no additional damage.

1.5. Personnel information

1.5.1. Captain

The captain was a 38-year old male with an Airline Transport Pilot License (ATPL(A)) issued in January 2015, an A-320 type rating, instrument flight rating and an A-320 type instructor rating. His English proficiency level was IV.

He had a total of 6830 flight hours, of which 2678 had been on the type. In the previous three months he had flown 161 hours. He had a medical certificate that was valid until 31 August 2016.

1.5.2. Copilot

The copilot was a 30-year old male with a Commercial Pilot License (CPL(A)) issued in May 2016, an A-320 type rating, instrument flight rating and a multiengine rating. His English proficiency level was IV.

He had a total of 325 flight hours, of which 96 had been on the type. In the previous three months he had flown 96 hours, all of them on the aircraft type. He had a medical certificate that was valid until 15 February 2017. He was line flying under supervision.

1.6. Aircraft information

- Manufacturer: Airbus.
- Model: A-321-211.
- Serial number: 0684.
- Year of manufacture: 1997.
- Registration: D-ASTP.
- Airworthiness review certificate: T515ARC4385/2014, issued in July 2014 and renewed on 13 July 2016, valid until 15/07/2017.
- Engines, number/manufacturer and model: 2 x CFMI CFM56-5B3/P.
- Maximum takeoff weight: 89,000 kg.
- Total airplane hours: 42,919.
- Total cycles: 21,790.
- Landing gear: LH P/N:201523001 S/N: M-DG-0009; RH P/N:201523002 S/N: M-DG-0010.

1.7. Meteorological information

The 08:30 METAR, from four minutes after the event, indicated the following: wind from 040º at 7 kt, cloud ceiling and visibility good, temperature 26º C and dew point 16º C, QNH 1015 hPa.

The weather data provided in the METAR from 30 minutes earlier was similar to that shown above.

1.8. Aids to navigation

The crew were making an ILS approach to runway 01, entering from the north on a wide right base until they intercepted the localizer at 006º, based on the instrument approach chart for the ILS Z approach to runway 01 published by AIP Spain.

1.9. Communications

The captain, who was the pilot monitoring, was in radio contact with the Fuerteventura control tower on the main frequency of 118.475 MHz.

- At 08:21:43, he made the initial contact while flying right base for runway 01.
- At 08:25, he was cleared to land on 01 and was informed that the wind was from 040º at 6 kt.
- At 08:27, he reported they were doing a go-around. The controller asked that they execute the standard go-around maneuver and asked the reason for the go-around: destabilization on short final and on final in the landing flight path.
- They then asked for a visual approach to 01, maintaining an altitude of 1500 ft and entering in the right downwind leg with no traffic in the CTR.
- At 08:31, the airplane was cleared to land on 01. At 08:34, the crew reported entering on final, requested clearance to land and received wind information, from 020º at 8 kt.
- At 08:37, the captain informed the tower they were leaving the runway.

The crew made contact on the ground control (GMC) frequency, 121.700 MHz, at 09:55 to start the return flight to Düsseldorf.

1.10. Aerodrome information

The Fuerteventura Airport, with ICAO location indicator GCFV, is located on the east of the island by the same name and 5 km south of the island's capital, Puerto del Rosario. Its reference point is at an elevation of 25 meters (83 ft), and it has an asphalt runway in a 01/19 orientation that measures 3,406 x 45 m.

The runway 01 threshold is displaced 1000 m, meaning that the landing distance available (LDA) is 2,406 m. This runway has Category-I precision approach lighting that is 900 m long, runway threshold markings, a 3rd category PAPI, and centerline and edge lighting. It also has rapid exit taxiway indicator lights (E4).

1.11. Flight recorders

The cockpit voice recorder (CVR) was not preserved before the start of the return flight, and as a result it was taped over and the recording of the landing was lost.

The digital flight data recorder (DFDR) was removed from the aircraft after the decision was made to ground the aircraft upon arriving in Düsseldorf so that it could be inspected. The DFDR was delivered to the manufacturer, Airbus, so that it could determine the seriousness of the hard landing and specify the inspection actions to be taken to determine the scope of the damage.

The following significant data and the peak G-loads were obtained for the hard landing:

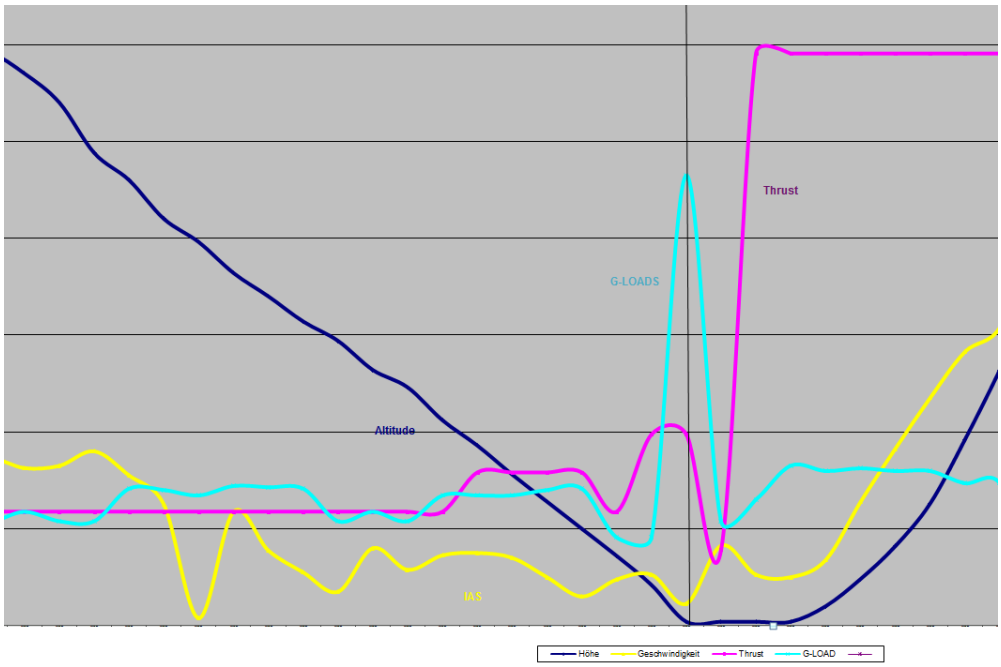

Figure 1. Curves for the altitude, IAS, thrust and G-load parameters during hard landing

Indicated airspeed – 142 kt
Vertical speed – 1000 ft/min
Airplane pitch angle – 3.9° up (or positive)
Maximum vertical acceleration – 3.32 g, with two values in excess of 2.2 g in the

previous 1/8 second readings.
Engine RPM (N1) – 60 and 66%.

The following data were taken from the flight scenario in the operator's flight report, which is based on the data in the recorders and on an analysis of the flight:

The airspeed target was set at 158 kt, between 1000 and 600 ft of RA.Between 500 and 200 ft of RA, the speed target decreased to146 kt.

At around 400 ft, the captain (CPT) informed the copilot (FO) that he was slightly below the glide slope (GS). The FO reduced thrust from 60% to 53% of N1 to counter an aircraft speed exceedance above the speed target.

On short final, the CPT again said they were slightly below the GS.

The FO corrected the slope but did not increase thrust sufficiently.

In the final 200 ft before touchdown, the speed ranged between 146 and 141 kt.

At around 120 ft, the CPT advised the FO to increase thrust, which he did to 60% of N1 by 60 ft. The speed was still 141 kt.

At an altitude of 57 ft of RA, the FO pushed his sidestick forward (3.5 seconds before touchdown).

The aircraft reacted to this input, and the nose pitched down from 2.8º to 1.1º in 2.5 seconds.

As the pitch angle dropped below 1.8º, the FO commanded a slight pitch up angle at an altitude of 35 ft.

At 20 ft, 1.6 seconds before touchdown, the CPT commanded a sharp up angle (brief DUAL INPUT) until touchdown. The airplane's vertical speed was 1100 ft/min.

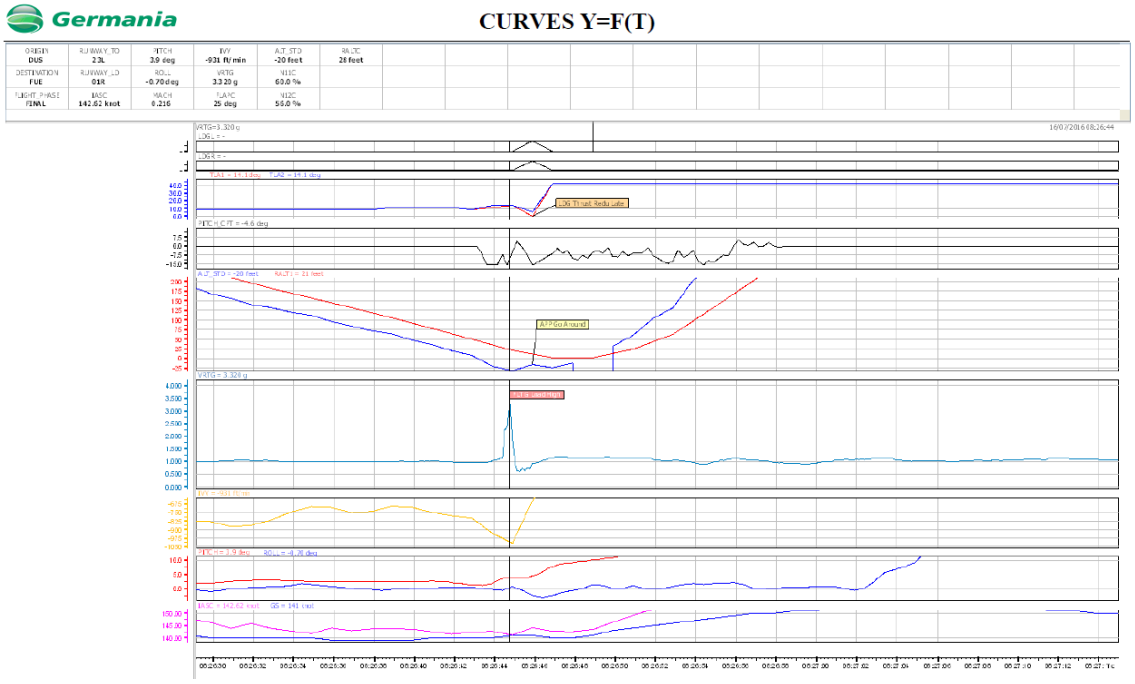

Figure 2. Graphs for the main DFDR parameters during the approach and landing

During the initial contact, there was a load of 2.242 g, the landing gear was compressed further and the N1 thrust setting was 60%.

0.25 seconds after the contact (TD), the maximum load reading was recorded (3.32 g).

0.50 seconds after TD the airplane started to bounce. Thrust was at idle.

0.75 seconds after TD, the aircraft indicated a load of 0.602 g.

The CPT began to increase the nose up input.

1.5 seconds after TD, the CPT commanded maximum thrust.

2.8 seconds after TD, the engines spooled up to the values commanded by the CPT.

9 minutes later, at 08:35, the second landing, made by the FO, was normal and satisfactory.

1.12. Wreckage and impact information

As a result of the hard landing at the Fuerteventura Airport, the aircraft generated an A15 hard landing load report, which is sent by ACARS to the operator and manufacturer. This report is not printed automatically in the airplane cockpit, but it is accessible through a menu on the MCDU (Management Control Display Unit) for entering into the ACMS (Aircraft Condition Monitoring Systems) and the DMU (Data Management Unit), which generates this report.

The crew did not check the A15 report for this event. They simply felt that it had been a rough landing, but less intense than a hard landing.

The captain spoke with the Maintenance Operations Center (MOC) in Berlin, where the operators were unfamiliar with the parameters encoded in the A15 report received directly from the airplane.

In light of the uncertainty over the aircraft's condition, the captain and the MOC decided that the captain should check the airplane to evaluate any potential damage. The captain found no apparent damage during his inspection, and thus decided to continue with the rotation and return to Düsseldorf with passengers.

1.13. Medical and pathological information

Not applicable.

1.14. Fire

There was no fire

1.15. Survival aspects

The accelerations and forces sustained during the hard landing of the aircraft did not threaten the survival of the passengers and crew.

1.16. Tests and research

The operator, Germania, informed the manufacturer, Airbus, of the hard landing, and the latter analyzed the information contained in the flight data recorder. Based on the high vertical acceleration values withstood by the aircraft's structure, Airbus conducted a load analysis to determine if the design limits of the components and structure had been exceeded.

As a result of this analysis, Airbus laid out an inspection program for the aircraft before and after it was moved in order to complete the inspection of the airplane before it could resume its commercial flight activity.

1.17. Organizational and management information

The operator has just one provider in Fuerteventura to assist with stopover operations.

At its Maintenance Operations Center (MOC) in Berlin, it has supervisors who work alternating 12-hour shifts on weekends, but there was a replacement who was not a member of MOC management.

The CIAIAC had access to the internal report, summary and analysis conducted by Germania. Some of the analyses, causes and corrective actions adopted are mentioned here, without going into more internal aspects of the operator or mentioning already established facts:

The MOC received the A15 hard-landing report and informed the captain that they would need time to identify the codes and arrange for the maintenance in Fuerteventura. The organization was also informed of a possible delay.

After making some calls, the captain was informed that the maintenance could not be conducted at the airport.

The MOC asked the captain to inspect the outside of the airplane and report any problems detected (such as damage, fuel or hydraulic leaks).

When the captain reported seeing no problems during his inspection, he was asked if he would accept the airplane for the return flight with passengers.

During the return flight, the MOC identified the peak load in the A15 report, which was very high (3.32 g), meaning that the airplane should not be flown again. As a result of an internal discussion at the MOC, it was decided to ground the airplane (AOG) once it arrived in Düsseldorf.

The operator acknowledged that its Airbus crews are generally not well trained on manual approaches due to the routine practice of using automatic systems.

The operator prohibited flying manually with manual thrust in visual approaches during supervised flights, starting in the week after the event, on 22 July 2016.

The operator will define the requirements, conditions and restrictions for flying manually on visual approaches during training flights.

New procedures will be defined and proposed for the flight manual involving manual flight/manual thrust and work overload when not using automatic systems.

1.18. Additional information

A summary of the captain's account is given below:

The captain stated that it was his first time flying with the copilot, whom he deemed, with almost 100 hours of flight experience, to be sufficiently proficient to be able to use fewer automatic flight systems. He also stated that this was supported by the copilot's training records.

During the flight, they discussed the visual impression caused by the 1,000-meter displaced threshold at Fuerteventura, the wind conditions and if he would be able to make the approach without electronic aids. He also told the copilot of his experience involving most pilots in training, who were reticent and hesitant to use manual power/thrust. He then suggested flying the approach without the autopilot or auto-thrust. The copilot had done this before and was confident and wanted to do it, and was thankful for the opportunity.

They requested a visual approach to shorten the ILS approach. The copilot flew it well. The airplane was not always centered, but he corrected it and knew how to do it.

They increased the reference speed by 5 kt to correct for the wind. When established on final, the copilot disengaged the auto-thrust. On short final, the speed dropped and they fell below the glide slope. The captain pointed this out and the copilot corrected it, but the increase in thrust was not sufficient, so the captain repeated the suggestion. The captain then realized that the aircraft was sinking very close to the ground.

The captain took control and started a go-around, but they could not avoid the impact. Everything happened very fast and close to the ground. He was unable to describe the exact sequence of events.

The captain flew the go-around and once more turned the control over to the copilot on the left base, after confirming that the copilot wanted to do it and that he was OK. The copilot made the ILS approach with the automatic systems, including auto-thrust, which concluded in a normal landing.

The copilot later stated that he was cautious with the thrust readings and that he also looked at the N1 reading, which may not be the best indication during the final landing phase.

They reported that they did not see the load factor (G LOAD) indication on the lower ECAM display (which is normal as the indication is displayed only, if the excessive load is confirmed for more than 2 seconds). In the event, the pick of load lasted less than 1 second. The high workload lasted more than 5 seconds and it was probably gone by the time they checked it. They did not receive neither on paper that they had exceeded the vertical acceleration limits, something that he would have expected.

To make sure, they called the Maintenance Operations Center (MOC) and asked if they had received a hard-landing report. The MOC checked on the computer and confirmed that they had, but the MOC could not correctly interpret or decipher the A15 report.

The captain asked for help in finding it in the onboard avionics systems, if it was available, that way he would be able to see it for himself. But the MOC was unable to help the crew locate the A15 hard-landing report in the airplane.

The captain felt he had no convincing evidence. All of the data were in Berlin, at the MOC, and he had to rely on the advice of the mechanics. He did an in-depth check of the airplane on the ground and found nothing. There was no printed copy of the A15 and apparently no ECAM message. He called Berlin again after about 40 minutes, and the mechanic on duty cleared them to fly back to Düsseldorf. For his part, he stated his belief that the safety of the passengers, crew or airplane were not compromised.

1.19. Useful or effective investigation techniques

No special techniques were used.

2. ANALYSIS

2.1. General

The copilot, along with the captain, who had an instructor rating, decided to make the approach with thrust and control in manual. This resulted in a go-around after making contact with the runway. Until that moment, the flight had been uneventful. During the final approach phase, the approach unstabilized, primarily due to a drop in speed and to the airplane falling too low, and the captain executed a go-around.

The aircraft touched the runway surface at a slight nose-up angle and zero bank angle, but at a high descent rate, resulting in a hard landing.

The airplane went to the air and the crew flew a visual circuit to make a new ILS approach to runway 01 again, this time with the automatic systems engaged.

The captain spoke with the Maintenance Operations Center (MOC) in Berlin to assess the damage to the aircraft and determine its operability. The aircraft automatically generated and sent, via ACARS, an A15 hard-landing report to the company's control center and to the manufacturer.

The joint decision was made to go ahead with the return flight with passengers, with that flight departing half an hour behind schedule. Once at the destination, the airplane was grounded (AOG).

The event was not reported for over a month, and the inquiry to ascertain its seriousness and significance took an additional two months, after which the event was deemed to have been a serious incident and an investigation was opened.

2.2. Operation of the flight

2.2.1. Landing in Fuerteventura

The flight crew, consisting of a highly experienced captain with an instructor rating, and a copilot who was still undergoing line training, decided to attempt the approach and landing in Fuerteventura with the airplane's automation systems disengaged, with the controls and thrust being operated manually. The weather conditions at the destination did not pose any difficulties, and the crew had even visually evaluated the runway and the displaced threshold.

The final approach, with the copilot at the controls and the captain as the pilot monitoring, unstabilized gradually but continuously, with the airplane's flight path

falling below the glide slope as its vertical descent rate increased. The captain's instructions did not manage to correct these conditions, and he ended up taking control and initiating a go-around. The captain's action to take control was somewhat delayed. It should be noted that the operator has already proposed and implemented some corrective actions (Point 1.17 – Organizational and management information) to better define and regulate flying without automatic systems.

Thanks to the level attitude of the airplane upon contacting/impacting the ground, with a small nose-up angle on the order of 2° and a zero bank angle, the damage to the airplane was limited to the structural components of the landing gear, as the overload was spread out evenly to both legs of the landing gear. There was no visible damage to the landing gear components.

2.2.2. Decision-making after the landing

Due to its physical effects, the crew realized that they had had a hard landing, and the captain apologized to the passengers and explained to them what had happened as they waited to be disembarked. But the crew did not have any conclusive data on the seriousness and significance of the overload sustained by the aircraft, so the incorrect decision was made to make the return flight with passengers.

On the one hand the crew did not know how to find the A15 hard landing report in the airplane, and on the other the detailed exterior inspection of the airplane on the ground yielded no findings. The operator did not have maintenance support in Fuerteventura, and the most important means of support for the safe operation of the airplane, which should have been consulting with the Maintenance Operations Center at the operator's main base, did not provide any assistance to the crew.

Without going into details on why the crew support structure did not work at a remote aerodrome, and why no local maintenance support was available, what is certain is that the interpretation of the data in the A15 report was delayed. As a result, the suitability of the airplane to remain in service could not be evaluated in time, and the less safe, though most economic, decision was made to make the return flight with passengers. Because of this, a safety recommendation is issued to the operator, Germania, to have it improve the aptitude of its MOC personnel to ensure they provide correct support so that safe decisions are made in every aerodrome at all hours of operation.

3. CONCLUSIONS

3.1. Findings

- The members of the flight crew had valid licenses and medical certificates. The captain had an instructor rating and the copilot was in line training.

- The aircraft had valid documentation and it was airworthy.

- The weather conditions during the landing, and the fact that the threshold on runway 01 is displaced 1000 meters, did not affect the outcome of the final approach and the landing.

- The pilot flying was the first officer and in agreement with the captain, they decided to make the ILS approach to runway 01 with no supporting automatic systems, with manual control of the attitude/flight path and thrust.

- The final approach became unstable when the speed dropped and the flight path fell below the glide slope. The instructions of the captain and the actions of the pilot flying were insufficient to correct it.

- The captain initiated a go-around shortly before touchdown.

- When the aircraft touched down on/impacted the runway, it had a zero bank angle and a slight pitch up angle, but the vertical descent speed was very high, leading to an impact in which the vertical acceleration peaked at 3.32 g.

- The aircraft generated and sent an A15 hard-landing report.

- The captain, aware of the hard landing, requested help from the airline's Maintenance Operations Center to ascertain the severity of the landing.

- MOC personnel were unable to interpret the codes in the A15 report and could not provide reliable data or criteria concerning the condition of the aircraft.

- The captain conducted a visual check on the ground to look for problems, damage or fluid leaks, but found none.

- Based on the result of his inspection, and with no further instructions from the MOC, they decided to make the return flight to Düsseldorf with passengers.

- During the return flight, the MOC noticed the high vertical acceleration value recorded and included in the A15 report, and the airplane was removed from service upon arrival (AOG) until a hard-landing inspection could be completed.

3.2. Causes/Contributing factors

The serious incident was caused by the performance of an unstabilized final approach, resulting from a decrease in airspeed and falling below the glide slope, as well as from the late decision to execute a go-around.

Contributing to the incident is the fact that the maneuver was performed without automatic systems to control the airplane's attitude/flight path or thrust.

The decision made after the event to continue to operate the airplane with passengers was risky and unsafe, and resulted from an incorrect assessment of the seriousness of the hard landing.

4. SAFETY RECOMMENDATIONS

The exchange of information between the captain and the airline's maintenance operations center (MOC) was fluid, but the MOC did not provide reliable data or valid criteria to aid in the captain's decision making. As concerns the airplane's operability after the event, the suitability of keeping the airplane in service was not evaluated in time, and the incorrect decision was also made to make the return flight with passengers. As a result, a safety recommendation is issued to the operator, Germania.

REC 55/17. It is recommended that air transport operator Germania establish a training program for its MOC personnel that ensures they provide correct support so that safe decisions are made in every aerodrome at all hours of operation.