REPORT IN-003/2010

DATA SUMMARY

Date and time	Saturday, 30 January 2010; 09:25 UTC ¹		
Site	Malaga Airport (LEMG)		
AIRCRAFT			
Registration	EC-IJI		
Type and model	PIPER PA-28-R 200 "Cherokee Arrow II"		
Operator	Private		
Engines			
Type and model	LYCOMING IO-360-C1C		
Number	1		
LICENCE	CPL		
Pilot in command			
Licence	CPL		
	1,911.35 h		
Total flight hours	1,911.35 h		
Total flight hours Flight hours on the type	1,911.35 h 758.83 h		
Total flight hours Flight hours on the type NJURIES	1,911.35 h 758.83 h Fatal	Serious	Minor/None
Total flight hours Flight hours on the type NJURIES Crew	1,911.35 h 758.83 h Fatal	Serious	Minor/None 1
Total flight hours Flight hours on the type INJURIES Crew Passengers	1,911.35 h 758.83 h Fatal	Serious	Minor/None 1 1
Total flight hours Flight hours on the type NJURIES Crew Passengers Third persons	1,911.35 h 758.83 h Fatal	Serious	Minor/None 1 1
Total flight hours Flight hours on the type NJURIES Crew Passengers Third persons DAMAGE	1,911.35 h 758.83 h Fatal	Serious	Minor/None 1 1
Total flight hours Flight hours on the type NJURIES Crew Passengers Third persons DAMAGE Aircraft	1,911.35 h 758.83 h Fatal 4	Serious	Minor/None 1 1
Total flight hours Flight hours on the type INJURIES Crew Passengers Third persons DAMAGE Aircraft Third parties	1,911.35 h 758.83 h Fatal 4 	Serious	Minor/None 1 1
Total flight hours Flight hours on the type INJURIES Crew Passengers Third persons DAMAGE Aircraft Third parties FLIGHT DATA	1,911.35 h 758.83 h Fatal 4 	Serious	Minor/None 1 1
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¹ All times in this report are in UTC unless otherwise specified. To obtain local time, add one hour to UTC.

1. FACTUAL INFORMATION

1.1. Description of event

On 30 January 2010, a Piper PA-28R-200 Cherokee Arrow II aircraft, registration EC-IJI, belonging to GAMISA AVIACIÓN, took off from Malaga Airport (LEMG) for the Casarrubios aerodrome (LEMT) so as to undergo the inspection necessary for the renewal of its Airworthiness Certificate. Onboard were the pilot and one passenger.

The aircraft took off at 08:15 with callsign GMJ-11. It was flying behind an aircraft from the same company (callsign GMJ-01) that was going to perform the same flight. Minutes later, as they approached point N of the Malaga CTR², both aircraft decided to return due to adverse meteorological conditions.

During the approach phase, the pilot realized that the landing gear was not fully locked. He informed the control tower and made a go-around maneuver. After making several fly-bys of the tower, several controllers informed the pilot that the front gear leg was fully retracted and that the main gear legs were between 30 and 45° from the horizontal. The pilot then decided to proceed to point E1 of the CTR, where he performed the emergency procedure for lowering the gear. After several failed attempts, he decided to remain airborne to burn fuel and then, after declaring an emergency to the control tower, proceeded to land on the taxiway, as proposed by air traffic control. Neither the pilot nor the passenger were injured. The underside of the fuselage, landing gear doors and propeller blade tips were damaged.



Figure 1. Photograph of aircraft after the incident

² Airspace Control Zone centered around an airport to facilitate the arrival/departure of traffic. See Appendix A.

1.2. Personnel information

The pilot, a Spanish national, had a valid and in force commercial pilot license (CPL(A)) issued by Spain's Civil Aviation General Directorate (now AESA). He also held valid SEP, MEP, IR(A) and $FI(A)^3$ ratings.

His class 1 and 2 JAR-FCL medical certificate was also valid and in force.

As for flight experience, the pilot had a total of 1,911.35 flight hours at the time of the incident, of which 758.83 had been on the type. Of these total hours, 214 had been as pilot in command in VFR conditions, 227 in IFR and 277.83 as instructor in VFR.

The pilot also had experience on other single-engine aircraft types, such as the PA-38-112, PA-28-181, PA-8-201T, CESSNA 172, CESSNA 177, YAK-52, and on twin-engine aircraft like the P-68C and PA-34T.

1.3. Aircraft information

The Piper PA-28R-200 aircraft, registration EC-IJI and S/N 28R-7335013, is a singleengine low-wing retractable gear aircraft with seating capacity for four. It is outfitted with a 310-HP IO-550-N TCM engine (S/N 689121) and a PHC-J3YF-1RF/F7491D1 Hartzell propeller (S/N FP4647B).

The aircraft's documentation included the following:

- Registration certificate issued on 21 February 2003.
- Airworthiness certificate valid until 24 January 2010.
- Extension of the Airworthiness Certificate and Aircraft Station License valid until 24 February 2010 issued by the Aircraft Safety Office of Spain's State Aviation Safety Agency (hereinafter AESA).
- Aircraft Station License Certificate.
- Insurance certificate valid until 3 January 2011 that allowed the aircraft to be used for club, school, rental (for private use) and tourist flights by members of the club.
- Aircraft Maintenance Program and approval of said program by AESA, and which specified SINMA AVIACION as the CAMO⁴ JAR-145 Maintenance Center.

³ SEP- Single-Engine Piston.

MEP- Multi-Engine Piston.

IR(A)- Instrument flight rating.

FI(A)- Flight instructor rating.

⁴ CAMO- Continuing Airworthiness Management Organization.

1.3.1. Aircraft systems information

The information below describes the structure, operation and maintenance tasks applicable to the landing gear, as well as the procedures required to lower the gear, whether normally or manually (in emergency).

1.3.1.1. Structure and operation of landing gear

The retractable landing gear is hydraulically operated by an electrical reversible pump. There is an actuating lever on the instrument panel to the left of the control quadrant that is used to select the gear to the UP or DOWN position. The different gear positions are indicated by way of three green lights underneath the gear actuating lever for the "gear down and locked" position. There is a yellow light situated at the top of the instrument panel for the "gear in transit" position, whether up or down. There is no light to indicate that the gear is fully retracted, the only such indication being that all of the other lights are off (see Figure 2).

There is a switch on each gear leg that, when the leg is down and locked, turns on the green light associated with that leg. When all three switches are activated, the electric pump turns off. If the panel lights are on, the ones for the gear can be dimmed. When the gear is being retracted and the aforementioned switches turn off, the yellow intransit light illuminates and remains lit until the gear is up and the switches are



Figure 2. Photo of gear lever and associated lights

activated.

There is a red warning light to the left of the yellow one (see Figure 3) that operates in conjunction with an aural warning and has a dual purpose: to warn when thrust is reduced below approximately 14 inches of intake pressure and the gear is not down and locked; and to warn that the gear lever is in the UP position with the aircraft on the ground or at a speed below that required to close the hydraulic valve and the switch for the backup gear extender (BGE) pump (see Section 1.3.3).

Each leg is retracted and extended by a single hydraulic cylinder. While the leg is in transit, the doors move with it through a mechanical link. The legs are kept in the up position by hydraulic pressure in the cylinder. There are no retainers holding the legs, and a loss of



Figure 3. Photo of the gear in transit lights (yellow) and gear unsafe light (red)

hydraulic pressure would allow the legs to gravity drop. It is preferable for the gear to be lowered and raised using the gear actuating lever. In the event of a loss of hydraulics or an electrical fault, the gear can be lowered by pushing down on the **emergency extension** lever located between the pilot seats, or by actuating the **BGE** (can only lower legs if the speed falls below approximately 105 mph (90 kt) and no thrust is applied, at which time the hydraulic valve on the BGE opens to release hydraulic pressure).

1.3.1.2. Arrangement of the emergency extension system (Backup Gear Extender (BGE))

The system for lowering the gear in an emergency was conceived as a safety device to aid in avoiding inadvertently landing the aircraft with the landing gear retracted and prematurely retracting the gear during takeoff. When properly operated and maintained, the system lowers the gear automatically when speed and power reach a pre-set value. It also aids in keeping the gear from being retracted before pre-set speed and power values are obtained.

As described in the Pilot's Operating Handbook, the system is controlled using the difference in air pressure across a diaphragm that is mechanically linked to an electronic valve and to an electronic switch that turns the electrically powered hydraulic pump pump on. The system that provides information on the static and ram pressure at the diaphragm is located in the left part of the fuselage above the wing (see Figure 4). Any obstruction of the ports could cause the gear to lower.

When the BGE is installed, the emergency gear lever can be in one of three positions: OVERRIDE (BGE system deactivated), AUTO (BGE system activated) and EMERGENCY DOWN (gravity deployment system).



Figure 4. View of the pitot/static tube that supplies information to the BGE. Emergency gear lever

When this lever is in the top position, the system is overridden and the gear position is controlled only by the gear lever, regardless of the power/speed combination. There is a pin that blocks the travel of the lever and keeps the system in the override position, meaning that placing the system in override requires pulling up on the lever and inserting the pin. When the system is deactivated, the system overridden light (located under the gear actuating lever) flashes yellow. The pin is spring loaded to aid in unlocking the system, such that pulling on the lever and releasing the spring returns it to its position and the light stops flashing. The system must also be overridden when training on stalls with the gear up.

When the system is used to emergency lower the gear, the lever releases hydraulic pressure to allow the gear to gravity drop. According to the Pilot's Operating Handbook, the lever must be kept in the down position to emergency lower the gear.

The manufacturer issued a Service Letter⁵ (No. 810) associated with this system to give guidelines for replacing the BGE diaphragm due to its being a leading cause for the faulty operation of the system.

Additionally, given the occurrence of cases in which the non-operation of this system would have contributed to certain accidents, the manufacturer issued a Service Bulletin that required the removal of the system (SB866A)⁶.

⁵ Service Letters are issued by the manufacturer to provide information on improvements to an aircraft product or service.

⁶ It should be noted that although the manufacturer considered compliance with Service Bulletins mandatory, given their importance, compliance is not mandatory since they are not Airworthiness Directives.

1.3.1.3. Emergency gear lowering procedure

According to the Emergency Procedures in the Pilot's Operating Handbook, the following steps are required to emergency lower the gear:

- 1. Master Switch– Check On
- 2. Breakers Check
- 3. Panel lights Off (in daytime)
- 4. Gear indicating lights Check

If the gear does not go to a down and locked position:

- 5. Reduce speed below 100 mph.
- 6. Move gear lever to "gear down" position.
- 7. If the gear does not lock in an aircraft equipped with the BGE (Backup Gear Extender), raise the emergency gear lever to the "Override Engaged" position.
- 8. If the gear still fails to lock, move and **maintain**⁷ the emergency gear lever in the "Emergency Down" position.
- 9. If the gear still fails to lock, yaw the aircraft sharply from side to side with the rudder.

NOTE

If electrical power has been lost, the landing gear must be deployed using the emergency procedure described above. The gear position indicating lights will not be operational.

1.3.1.4. Inspection for water damage, immersion in water

Some weeks before the incident, there were storms in the area that flooded the general aviation platform at the Malaga Airport. The aircraft was parked in an affected area and its legs were submerged in water almost up to the airframe, based on photographs provided by the owner.

According to the Maintenance Manual, there is a series of unscheduled maintenance inspections that include one to check for damage from flooding or immersion in water. Said inspection requires the performance of the following actions, among others:

Determine the level reached by the water. Determine which operational and/or electrical components were exposed to water.

⁷ This terminology is reflected in the February 2005 revision to the Aircraft Flight Manual. The July 1973 revision in use by the owner did not specify this method of holding the lever down.

If any of the following components (only those involved with the incident in question are shown) were submerged, inspect them carefully to determine the extent of the damage:

Component	Inspection	Inspection interval	
Landing gear and associated components	Jack airplane and cycle landing gear oleos and torque links to ensure proper operation	lf immersed, each event, before further flight	
Electrical systems	Replace all switches and circuit breakers. Remove electrical motors and electric pumps, etc.	lf immersed, each event, before further flight	

1.3.1.5. Maintenance information

The owner had contracted an approved Maintenance Center and CAMO to conduct the maintenance as well as to oversee the aircraft's entire maintenance program. Section M.A. 710 (Airworthiness review) of Commission Regulation (EC) No. 2042/2003 of 20 November 2003 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organizations and personnel involved in these tasks, states that:

To satisfy the requirement for an M.A. 902 airworthiness review of an aircraft, a full documented review of the aircraft records shall be carried out by the approved continuing airworthiness management organization in order to be satisfied that:

- 1. airframe, engine and propeller flying hours and associated flight cycles have been properly recorded;
- 2. the flight manual is applicable to the aircraft configuration and reflects the latest revision status;
- 3. all the maintenance due on the aircraft according to the approved maintenance program has been carried out;
- [...]

The 50-hour inspection had been carried out on 28 April 2008 with 3951:45 hours on the aircraft. The last 1,000-hour inspection (4,000:05 h) had been performed on 20 February 2009. The next scheduled inspection was at 4,050:05 h, and coincided approximately with the annual inspection and the airworthiness certificate review, and was the reason for the trip that was scheduled for the day of the incident. The owner normally attached to the aircraft documentation any discrepancies noted on successive pre-flight inspections so as to call the Maintenance Center's attention to them and check them. In this case, one of the annotations was that the aircraft had been submerged and to thoroughly check the gear for possible traces of mud. It does not

appear as though the owner checked with the maintenance center on how to proceed following this immersion prior to any flight.

The Pilot's Operating Handbook (equivalent to the flight manual) used by the school was not up to date.

1.4. Pilot's statement

The pilot reported that he took off from Malaga Airport at 08:15 with callsign GMJ-11. His destination was Casarrubios del Monte (LEMT).

When he was over point N of the Malaga CTR (see Appendix 1), the adverse weather conditions (strong headwind with downdrafts of up to 1000 ft/min and cloud ceiling above 8,000 ft) forced him to return to Malaga, which he did after informing ATC.

Once on approach, the pilot noted that the landing gear was not fully locked, so he proceeded to go around. He then requested that the control tower give him a visual confirmation of the actual condition of the gear. He was informed by several controllers that the nosewheel leg was retracted and that the main gear legs were 30 to 45° from the horizontal. The pilot decided to head to point E1 of the CTR to try to lower the gear using the emergency procedure. After several failed attempts, he decided to remain airborne to burn fuel in preparation for making an emergency landing with the gear up. Once informed by ATC that emergency equipment and services were standing by and that he was cleared to land, he proceeded to make an emergency landing without gear on the taxiway, as proposed by ATC.

1.5. Pre-flight data

According to the flight plan, the aircraft was scheduled to depart from LEMG at 08:00. The estimated travel time to the Casarrubios aerodrome (LEMT) was 2 hours and 30 minutes. The average airspeed would be 90 kt and the flight would be in VFR conditions.

The weather data checked by the pilot included the 06:30 METAR, which reported 14 kt winds from 310°, visibility greater than or equal to 10 km in Malaga with few clouds at 5,000 ft and similar conditions at the Getafe aerodrome (LEGT), the closest to LEMT.

The low-level significant weather map indicated broken clouds or locally broken clouds throughout the entire first segment of the flight, with stratus clouds with bases at 500-1,000 ft and ceilings at 1,500-2,500 ft, and stratocumulus and cumulus with bases at 1,200-3,500 ft and ceilings at 4,500-7,500 ft.

The wind map for the area showed 15-kt winds from the northwest at 5,000 ft and 35-kt winds from the northwest at 1,0000 ft.

1.6. Meteorological information

The METAR information for Malaga Airport was as follows:

09:00-METAR LEMG 300900Z VRB01KT 9999 FEW040 12/06 Q1012 NOSIG 09:30-METAR LEMG 300930Z 32007KT 290V350 9999 FEW040 12/06 Q1012 NOSIG

Based on this information, the winds at 09:00 were variable at 1 kt and from 320°, and at 7 kt at 09:30, varying between 290 and 350°.

1.7. Aerodrome information

The Malaga Airport is located 8 km SW of the city at an elevation of 52 ft. It has one main landing runway in a 13/31 orientation, and one taxiway parallel to and north of the runway. The main runway is 3,200 m long and 45 m wide. There are six rapid exits to the taxiway, three on runway 13 (C-4, C-2 and C-1) and three on runway 31 (C-3, C-5 and C-6). The taxiway is 23 meters wide and was paved out to 45 meters since it was used as a runway some time ago when work was being done on the main runway.



Figure 5. Aerial view of the Málaga airport (LEMG)

1.8. ATC communications

According to ATC communications, aircraft EC-IJI, callsign GMJ11, contacted on approach frequency at 08:17:26 to report that it was above point E1 at 1,000 ft and requested to climb to 7500 and proceeded to point N, following the preceding aircraft from the same company, GMJ01. Approach approved the request, as well as the one at 08:34:24 to climb to 8500 ft. At 08:37:47, aircraft GMJ01 contacted approach once more to report, on behalf of both GMJ01 and GMJ11, that they were returning to the field because passing the Malaga mountain range was quite complicated at that time since the wind was "throwing" them down. After contacting the tower again and decide which of the two would be the first to initiate the approach, GMJ11 was cleared to land on runway 31 at 08:51:44, while GMJ01 held in a circling pattern above E1. At 08:55:23, aircraft GMJ11 reported that it was doing a go around due to a gear failure. At 08:55:50, the tower cleared the other aircraft, GMJ01, to land.

The tower confirmed that the front leg was not extended and that the main gear legs were down. At 08:56:51, the tower suggested that it head toward point E1 to circle and conduct gear tests. At 08:58:34, the aircraft contacted the tower once more to request another visual check of the status of the gear. Two minutes later the tower confirmed that the front gear was retracted and that the main did not appear to be fully extended, as a result of which the pilot decided to return to E1 and continue cycling the gear. At 09:09:21, the pilot contacted the tower again to report that the gear was not extending and that he would continue circling to burn fuel. The tower supervisor spoke to the pilot to inquire about the problem and told him that they had seen how the main gear was not fully extended and that the front gear was retracted. He also proposed the possibility to the pilot of landing on the second half of the taxiway in the direction of runway 31 and to have the firefighting service standing by there. At 09:14:25, the pilot declared an emergency at the tower's request after it was explained that such a declaration was required in the procedure for deploying emergency services.

Two minutes later the aircraft was on the final approach course and, after doing a 360 at the tower's request, was finally cleared to land on the taxiway at 09:21:22. The wind was from 310° at 10 kt. At 09:25:43, the tower reported approach control the successful landing to approach, saying that both occupants were exiting under their own power and that firefighters were applying foam as a precautionary measure.

The aircraft was towed to the North Apron and the taxiway declared operational at 09:43:38.

1.9. Inspection of aircraft

The aircraft was taken to the apron and inspected a few days later. It was resting on the bottom of the fuselage and had been cordoned off by the Civil Guard. After conducting a visual inspection of the outside and taking some initial photographs, the cockpit was inspected before any other actions were taken with the aircraft. Inside the cockpit it was noted that the flaps lever was in the flaps retracted position (though information provided during the investigation confirmed that at least one notch of flaps was used during the landing), the gear lever was down, and the emergency lever in AUTO. The circuit breaker panel situated at the right of the cockpit was not visible to the naked eye and was protected by a cosmetic lid like that used for a glove box. When opened, it was noticed that the breaker for the landing gear pump was open (see Figure 6).



Figure 6. Close-up of the position of the landing gear pump breaker

There were clear signs of water on the cockpit floor. The owner reported that a few weeks earlier the apron had flooded, though the airport informed him that the water level had not risen to 50 cm (though photographs supplied during the investigation appear to show that it was flooded almost to the bottom of the airframe). In any event, there was water on the cockpit floor and when the pump compartment was inspected, it also exhibited signs of water. At first sight the electrically powered hydraulic pump appeared to be in good condition, though the dipstick did not show any traces of hydraulic fluid.

Once this initial inspection was concluded, the aircraft was placed on jacks so that the gear could be cycled in an effort to detect possible anomalies.

Before turning on the MASTER switch, the emergency lever was used to activate the gear, which lowered and locked. The MASTER switch was then turned on but the gear down and locked lights did not turn on, even though the gear was physically locked. The condition of the lights was verified to be good by replacing them with other lights. According to the Pilot's Operating Handbook, it is recommended that the panel lights be OFF because otherwise the gear lights might appear dim. This switch was in the DIM, but not OFF, position, and the lights did not turn on in either case. After several attempts it was noted that there was a problem with the dimmer knob (potentiometer)

and that on occasion, when it was turned slightly, it made contact and the lights turned on.

The tripped pump breaker was then connected with the emergency handle in the OVERRIDE position. In this position, the yellow indicating AUTO EXT. OFF was lit, though it was not flashing, as stated in the manual; rather it was steady. When the gear was cycled up, the pump turned on, though it made intermittent sounds, probably due to the lack of hydraulic fluid. Despite this, the pump functioned normally and without any faults for at least the 15 additional cycles used to check the gear operation without the hydraulic fluid tank being refilled.

- The yellow "gear in transit" flashing light also remained on even after the gear was up and locked and the nosewheel switch was pressed.
- The gear was cycled several times and worked properly.
- Another test was conducted on the emergency system by actuating the emergency lever. Result: gear down and locked.
- Another test was conducted simulating a situation in which the gear starts to lower with the pump initially in operation and then interrupted, with the gear continuing to drop in emergency by gravity. Result: gear down and locked.
- Another test was conducted to simulate the possibility of having operated the system in AUTO instead of EMERGENCY, with the BGE system engaged and the aircraft at speed. Result: gear down and not locked.

The area of the BGE (Backup Gear Extender) was accessed and the system was visually verified to be in good condition, though its proper operation could not be confirmed since that can only be done in flight. The anemometer was removed to check whether its readings were correct in comparison to those from the BGE system. The anemometer was sent to a specialized center for calibration. The result was satisfactory.

Tests were conducted on another aircraft of the same characteristics. The manufacturer later confirmed that the emergency lever must be pressed for at least seven seconds before the train is fully extended. According to the Pilot's Operations Manual, this is the estimated normal gear extension time.

2. ANALYSIS

The aircraft was flying from Malaga (LEMG) to the aerodrome in Casarrubios (LEMT) so as to undergo the annual inspection required to renew its Airworthiness Certificate, whose validity had been extended until 24 February 2010. It was being accompanied by another aircraft from the same company.

Due to the adverse weather conditions found as they approached point N of the Malaga CTR, both aircraft decided to return to Malaga Airport.

During the approach leg, the pilot realized that the gear did not appear to have completed the extension cycle and decided to go around. He then asked ATC to verify the condition of the gear. After several checks, ATC confirmed that the nose gear was in fact not extended and that the main gear appeared to be between 30 and 45° from the horizontal.

After cycling the gear several times unsuccessfully, the pilot decided to remain airborne to burn fuel and then land without the gear down. ATC suggested that he land on the taxiway, which the pilot did, demonstrating great skill to avoid further damage. The dimensions of the taxiway were verified to be correct for an aircraft of those characteristics to land.

During the inspection of the aircraft a week later, it was noted that in the breaker panel located in the right side of the cockpit and shielded by a cover, breaker 25 A (CB), associated with the landing gear pump, was tripped. The pilot did not mention having reset this breaker, though he did make reference during his statements that he had carried out the emergency procedure. Item 2 in this procedure requires a check of the condition of the breakers, though it should be noted that in an emergency, this check cannot be made quickly without first removing the cover that hides the breakers and which is located on the side of the cockpit opposite the pilot's seat.

When the condition of the electrically powered hydraulic pump was checked, it was noted that there was standing water on the floor of its compartment at the rear of the aircraft and that the dipstick did not show any traces of there being any hydraulic fluid left in the reservoir. In spite of this, during a check of the system the gear was cycled several times with the pump in constant operation, though it did make intermittent noises, possibly due to the lack of fluid in the system's internal lines.

This aircraft features a special system for extending the gear and that incorporates a BGE system (Backup Gear Extender), which is responsible, on the one hand, for lowering the gear automatically under certain power and speed conditions that indicate landing conditions, and, on the other, for keeping the gear from retracting (even if the gear lever is actuated) under specific power and speed conditions that indicate that the aircraft is taking off.

The system can be overridden using a lever located between the two front seats so as to allow, for example, school training aircraft to simulate stalls (conditions similar to those under which the gear would extend) without the system engaging. The incident aircraft had this system engaged (Override Engage). When attempting to emergency lower the gear, the system must be unlocked by removing the locking pin, which would leave the system in AUTO (that is, BGE system engaged). When the lever is pressed downward and held, the gear would emergency extend by gravity. The pilot assured having performed this procedure. It has been verified, however, that, according to the Pilot's Operating Handbook in possession of the school and in the aircraft, the procedure for lowering the

gear only mentioned pushing the lever forward. This differs from the updated Aircraft Manual which states that in addition to pushing the lever forward, it must be held (this last word being highlighted in the procedure). Tests conducted on another aircraft of the same characteristics, as well as confirmation received from the manufacturer, reveal that the lever must be held for at least seven seconds in order for the gear to fully extend. This is also the estimated normal gear extension time specified in the Pilot's Operating Handbook. According to Regulation (EC) No. 2042/2003 (see Section 1.9.5), updating the flight manual (Pilot's Operating Handbook in this case) is the responsibility of the CAMO. The AESA was consulted on this point to check whether there is anything in its CAMO approval and monitoring procedures that specifically checks whether the Flight Manuals are updated. The AESA replied that its checklists did not include such an item. A safety recommendation is thus issued in this regard.

A contact was also verified to have been faulty in the panel lights. Even though the manufacturer warns that the lights must be off in daylight conditions in order for the gear lights to be perfectly visible, it was noted during the inspection that the lights were set to DIM. Even had they been off, however, the gear lights did not illuminate when the gear was down and locked. When the dimmer switch was rotated, there was a point where the lights did turn on, but as soon as the switch was moved from this point the lights turned off again. It was also noted that the yellow "gear in transit" light, located in the top left part of the instrument panel in the cockpit, remained on after the gear was fully retracted and the associated gear switches were actuated. Additionally, the aircraft had been in flooding conditions while parked on the platform. The owner was initially told that the water level was only 50 cm, though the photographs he provided, as well as the water found during the inspection of the aircraft. indicate that the water probably reached up to the bottom of the airframe.

In these cases, the Maintenance Manual requires performing a series of inspections of the systems exposed to water. It specifically states to cycle the gear several times with the aircraft raised on jacks in order to ensure its operability. Any affected electrical systems should also be inspected and breakers and switches replaced and electrical pumps and motors removed.

The owner had not performed any of these items. He simply made an annotation in the list of discrepancies he sent annually to the Maintenance Center so that the relevant check could be made. In this case, the owner should have made the maintenance center aware of this fact so as to decide on how to proceed before making any flights. It is this lack of an effective system of communications between CAMO and owner that prompted the issuance of two safety recommendations.

It could not be determined whether every anomaly involving the switches and lights stemmed from defective aircraft maintenance or from the effect on these systems of the presence of water during the flooding. The only anomaly not influenced by the presence or absence of water was the lack of hydraulic fluid.

During the inspection, the breaker associated with the power supply to this pump was reset, after which the gear was extended and retracted through several cycles. This seems to indicate that the presence of water in the pump compartment could have resulted in the breaker tripping from its original position during the first attempt to extend the gear. The pilot did not reset this breaker, so it is not known whether, had he reset it, the gear would have worked as it did during the tests conducted later with the aircraft on the ground. It should be emphasized that the check of the breakers does not appear to be an action that is performed immediately and intuitively, and less so during an emergency, due to the presence of a cosmetic cover on the breaker panel. As a result, a safety recommendation is issued in this regard.

3. CONCLUSIONS

3.1. Findings

After presenting and analyzing the information gathered on this incident, the following conclusions can be reached:

- The pilot had a valid and in force license and medical certificate and was sufficiently experienced in piloting the aircraft involved.
- The aircraft's documentation was valid. The AESA had issued an extension to its Airworthiness Certificate that was valid until 24 February 2010.
- The pilot had filed a flight plan for the trip he was going to make. He had the weather information necessary to conduct the flight.
- ATC suggested the use of the taxiway for the landing.
- The dimensions and condition of the taxiway were suited for landing an aircraft of these characteristics.
- Breaker 25A, associated with the gear pump, was found in a tripped position.
- In its factory condition, the breaker panel is concealed by a cover, which prevents quick checks in the event of an emergency.
- The aircraft had been parked on a general aviation platform that had been flooded by water, which affected the aircraft.
- The unscheduled maintenance tasks detailed in the Maintenance Manual section on water damage and water immersion were not performed.
- The owner did not ask the maintenance center what to do in this situation before making any flights, merely noting this fact as a remark in the list of discrepancies that accompanied the aircraft's documentation.
- There were still signs of water in the compartment housing the electrically powered hydraulic pump.
- The PANEL LIGHTS switch did not make good contact, which prevented the lights from turning on.
- The "gear in transit" light did not turn off even with the gear fully extended or retracted.

• The emergency procedure was not performed properly. The status of the breakers was not checked as required by the Manual, and the emergency lowering of the gear was not completed correctly due to the use of an obsolete manual.

3.2. Causes

Based on the information available, the incident is considered to have been caused by a one-time malfunction (short circuit) of the landing gear's electrically powered hydraulic pump, possibly due to the presence of water and moisture around its housing. This tripped the breaker for the gear's electrical system. The failure to check the status of the breakers and the use of the outdated procedure to emergency lower the gear contributed to the gear's failure to lower fully.

4. SAFETY RECOMMENDATIONS

This incident was caused mainly by the failure to apply specific unscheduled maintenance procedures following a water immersion and by the anomalies detected in electrical circuits and in the behavior of the gear as a result of failing to carry out tasks expressly indicated in the Maintenance Manual. An obsolete emergency procedure to lower the gear was also used, the proper application of which is essential to achieving full gear deployment in manual mode. Furthermore, the presence of a cosmetic cover on the breaker panel means that in tense situations, such as in an emergency, an immediate check of the breaker status is neither practical nor feasible. These facts necessitate the issuance of the following recommendations:

- **REC 56/11.** It is recommended that the CAMO, SINMA Aviación, establish a system for two-way communications with operators so as to be informed in real time of any anomaly or discrepancy affecting an aircraft for which it is responsible.
- **REC 57/11.** It is recommended that Spain's State Aviation Safety Agency (AESA) establish the procedures and means necessary for ensuring that approved CAMOs establish a system for two-way communications with operators so as to be informed in real time of any anomaly or discrepancy affecting an aircraft for which it is responsible.
- **REC 58/11.** It is recommended that PIPER evaluate the possibility of modifying the design of the cover that shields the breakers in the Piper PA-28R-200 aircraft so as to allow for greater visibility when checking the status of these breakers, especially in emergency situations.

APPENDIX A

Visual approach chart – LEMG

