

# CIAIAC

COMISIÓN DE  
INVESTIGACIÓN  
DE ACCIDENTES  
E INCIDENTES DE  
AVIACIÓN CIVIL

## Interim Statement A-022/2012

Accident involving a Bell 412 aircraft,  
registration EC-KSJ, operated by Inaer,  
at the La Forata Reservoir (Valencia)  
on 2 July 2012



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DE ESPAÑA

MINISTERIO  
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DE ACCIDENTES E INCIDENTES  
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## **Important notice**

This document constitutes the interim statement envisioned in Article 16.7 of Regulation (EU) no. 996/2010 of the European Parliament and of the Council, as well as in paragraph 6.6 of Annex 13 to the Convention on International Civil Aviation. The statement includes the details of the progress of the investigation and the most important operational safety issues revealed to date. The information provided herein is subject to change as the investigation proceeds

Pursuant to the contents of Regulation (EU) no. 96/2010 of the European Parliament and of the Council and of Annex 13 to the Convention on International Civil Aviation, the investigation is purely technical in nature and is not intended to determine or apportion blame or liability. The investigation is being conducted without necessarily resorting to evidentiary procedures and for the sole purpose of preventing future accidents.

Consequently, the use of this information for any purpose other than to prevent future accidents may result in faulty conclusions or interpretations.

## **Abbreviations**

BEA	Bureau d'Enquêtes d'Accidents (France)
CPL (H)	Commercial Pilot License (Helicopter)
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
GEAS	Special Group of Subaquatic Activities (Civil Guard, Spain)
Km	Kilometer
M	Meter
°	Sexagesimal degrees

**DATA SUMMARY****LOCALIZACIÓN**

Date and time	<b>Saturday, 2 July 2012 at 13:53 local time</b>
Site	<b>La Forata Reservoir - Yátova (Valencia)</b>

**AIRCRAFT**

Registration	<b>EC-KSJ</b>
Type and model	<b>BELL 412</b>
Operator	<b>INAER</b>

**Engines**

Type and model	<b>PRATT &amp; WHITNEY PT6A-3D</b>
Number	<b>2</b>

**CREW**

Pilot in command

Age	<b>58</b>
License	<b>CPL (A)</b>
Total flight hours	<b>3,992</b>
Flight hours on the type	<b>1,400</b>

**INJURIES**

	Fatal	Serious	Minor/None
Crew	<b>1</b>		
Passengers			
Third persons			

**DAMAGE**

Aircraft	<b>Destroyed</b>
Third parties	<b>None</b>

**FLIGHT DATA**

Operation	<b>Aerial work. Commercial aviation. Firefighting</b>
Phase of flight	<b>Loading water</b>

**REPORT**

Date of approval	<b>30 May 2013</b>
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## 1. HISTORY OF THE EVENT

On 2 July 2012, a Bell 412 helicopter, registration EC-KSJ, departed from the Siete Aguas base at 12:55<sup>1</sup> to take part in fighting a large fire that had broken out five days earlier in Cortés de Pallás. The helicopter flew toward the La Forata Reservoir, located 20 km further south, in the municipality of Yátova<sup>2</sup>.

Its mission consisted of wetting down the ground where the flames had already been extinguished. It was carrying a tank for picking up water from the reservoir, which it then dropped over the burned ground.

The water loading operation was being conducted in the central part of the reservoir. The approach to the chosen spot was executed by flying from west to east. The pilot then hovered over said spot and, while continuing to hover, descended to fill the tank, then climbed and proceeded to drop the water on the hillsides located north of the reservoir.

Each water pick-up and drop cycle involved flying along an elliptical route, always returning to the same part of the reservoir to take on more water.

By 13:53, the pilot had made several water drops. While making the approach to the reservoir to take on more water, the aircraft fell in and sank.

Moments later, when the fire coordinators realized they had lost radio contact with the pilot, they started an aerial search using the other aerial assets that were in the area.

After an hour, parts of the wreckage were found on the north shore, near the site where the pilot had been taking on water. There was also a large fuel slick on the water.

Divers from the regional Valencian firefighting brigade found the aircraft at about 13:30 on the following day in the same area. The pilot's body was recovered at 15:00 by divers from the Civil Guard's Submarine Activities Group (GEAS).

## 2. CONDUCT OF THE INVESTIGATION

While the helicopter was submerged, the divers were able to verify that the load hook was open and the tank detached. The wires from which it hung had been wrapped around the forward part of the right skid, and the electrical wires used to control it had detached after the impact.

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<sup>1</sup> All times in this report are local unless otherwise specified.

<sup>2</sup> All three municipalities are in the province of Valencia.

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One of the four main rotor blades (the one labeled as "blue") detached at the moment of impact. It was ripped at the root and subsequently found, still joined to its attaching assembly, very close to the spot where the helicopter was found. About halfway down its length there was a significant amount of material missing along its chord, except for the leading edge.

The helicopter was refloated by GEAS divers on 11 July and towed by two boats along the water to the dam located 1,800 m east of the place where it had been submerged. It was lifted out of the water by a crane positioned on the road that crosses the dam.

Once out of the reservoir the wreckage underwent an initial inspection that revealed that the other three blades remained anchored to the rotor, damaged to varying extents. The orange blade was practically intact. It had some small scratches on the lower surface near the root and on the top surface 1 m away from tip.

The other two blades had extensive damage. The gray-red blade was missing about a third of its length. It had also lost material along its lower surface. The green blade had material missing along two important sections of its lower surface. This blade was inside the cockpit when the helicopter was recovered.

All of the damage and material loss exhibited by the blades was along the same direction, at a 45° angle with respect to the longitudinal axis.

The two flight recorders were recovered as soon as the helicopter was removed from the water. Missing on both units was the part that housed the memories, which had detached on impact.

Clear evidence was found during the investigation that the memories on the recorders had detached, because they had been struck by one of the blades, shearing the screws that attached them to the body of the recorder, probably when the helicopter impacted the water.

After the initial inspection, the helicopter was taken to a hangar, where various inspections were conducted over the course of several weeks. The study of the wreckage included a detailed analysis by experts from the aircraft and engine manufacturers.

The strongest impact was noticeable at the front of the helicopter, at the top of the cockpit. The front crossbars that supported the doors were broken: the right one along the bottom and the left one along the middle and top.

The entire cockpit was shifted left, as seen from the front of the helicopter, although the central crossbar that divides the windshield was in its normal position.

The area of the main rotor had also sustained significant damage. There was continuity in the transmission though the rods and cams of the pitch control system were significantly bent or broken.

The stringers on the blue and green blades exhibited bending fractures consistent with the forces produced on impact.

The inspection also showed signs that the tank had struck the left horizontal stabilizer, damaging its lower surface along with its leading edge. When the attaching cables were stretched to the maximum length possible, it was noted that they reached as far as the left horizontal stabilizer, exactly to the area where the impact had occurred.

It was also noted that both the load hook and the top of the tank had struck the lower part of the helicopter, deforming the fairing. The marks on the lower part of the helicopter that extended aft had been made by the wires that held the tank. The impact had affected the control bars on both engines' throttles, which were broken at several points along their length. As for the tank, it was not significantly damaged.

The tail rotor blades did not exhibit any damage. Neither did the first two segments of the driveshaft (horizontal section). The third segment, however, attached directly to the rotor, had sustained a torsional fracture halfway along its length.

The fairing along the area of the torque indicator, situated on the left side of the tail cone, had a considerable amount of scratching.

The ring located on the rear part of the left skid, used to route the sling that attaches to the tank, had been torn from left to right. The deformation exhibited a slight upward angle.

During the inspection of the wreckage, an exhaustive check was made of the powerplant. This check ruled out any failure of the engines and concluded that all of the damage to these components had been as a result of the impact with the water.

Neither engine had sustained significant external damage. All of the components visible to the naked eye showed signs of having been submerged. The structure, electrical connections and the fuel and lubrication system were in their proper places and exhibited little damage.

Most of the damage sustained by this system was confined to the tubes and engine control shaft, and were consistent with the overload caused by the impact. All of the fractures noted had been produced by static overloads consistent with the impact with the water.

The external covers on both the left and right engines did not exhibit any apparent impact damage. Both sets of fuel pumps, manual fuel control systems, automatic fuel control units,

tachometers and fuel manifolds were in the proper places and intact. The air intake to the left engine, however, was dented in a direction that was practically transversal to the flow of air.

All of the air lines were intact and exhibited continuity. All of the accessories were in good condition. Only one of the lines was bent.

The hydraulic fluid tanks were torn from their anchor points to the helicopter fuselage. The tank for the right engine hydraulic system was missing.

The cam on the left engine throttle was in the idle position, and matched the position of the control for this engine both when the helicopter was found in the water and when it was taken out.

The throttle control for the right engine, on the other hand, was in a position near maximum acceleration.

The combining gearbox and its accessories had only minor damage but were jammed.

On 24 July 2012, a search was started for the units containing the memory with the information from the recorders. To search for these units under water, the CIAIAC relied on the assistance provided by the French investigation agency (Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile – BEA), which sent two specialists to aid in the recovery efforts.

A PRS275 submersible hydrophone capable of locating the signal emitted by the beacons was used to track and locate the units, a task that also involved personnel from a Guardia Civil GEAS team.

The search was conducted from a vessel, with the omnidirectional receiver on the hydrophone being submerged to check for the presence and direction of the signal. Then, using a directional receiver, the vessel was steered in the direction of the highest signal strength and this process repeated several times until the site from which the signal was being emitted, and where the recorder would theoretically be, was located by means of triangulation.

Once the search area was narrowed down, the locator on the hydrophone was disassembled so that a diver could use it directly under water. The same process was used as on the vessel, but in a much smaller area. This method managed to reduce the search area to a circle some 30 m in diameter in an area where the water was approximately 15 m deep. This area was marked using buoys and its coordinates recorded.

From then on the search continued using the methods normally employed by the GEAS, that is, going to the bottom of the reservoir and feeling along the 1.5- to 2-m thick layer of mud (where visibility is zero). This layer limits the use of a metal detector to aid in the search and location.

Also involved in the search was a specialized company that helped in the efforts by using a side-scan sonar, which managed to detect some faint signals in the area near the site from which the helicopter was recovered.

Even though the search went on for several days, neither memory unit was found.

On 5 September 2012, this same company started a new search using an underwater proton magnetometer<sup>3</sup>, which narrowed down the search area even more, as shown in Figure 1.

As a result of this search, GEAS divers were able to recover the DFDR memory in the vicinity of point (1).

Once recovered it was placed in fresh water to prevent contact with the air from corroding any of its components.



Figure 1. Points referenced in the proton gradiometer.

<sup>3</sup> This device detects differences in the magnetic field caused by buried objects or structures.

Este aparato detecta las diferencias en la intensidad del campo magnético, motivadas por objetos o estructuras enterradas.

The memory unit was sent to the BEA to see if the data recorded on it could be extracted. The BEA first checked the serial number to confirm that it was in fact the memory from the DFDR installed on the helicopter, and then downloaded the data from the accident flight recorded on it.

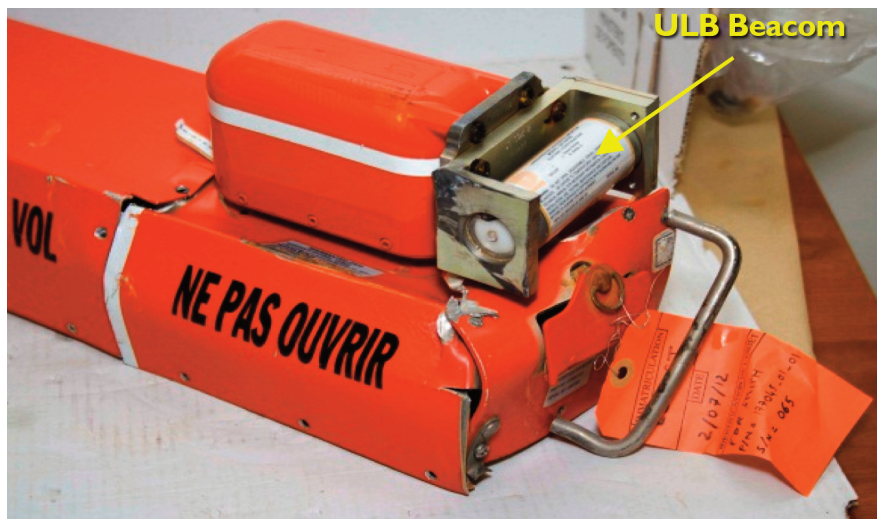


Figure 2. DFDR memory in its normal position.

Efforts to locate the CVR memory continued for the next two months to no avail. The decision was eventually made to call off the search since the information extracted from the DFDR provided sufficient data to reconstruct the flight. This, along with the other evidence found during the investigation, would allow for a determination of the cause of the accident.

In addition to the DFDR and the CVR, the helicopter had two fleet tracking systems, one belonging to the operator and the other to the Ministry of Agriculture, Food and the Environment, which was the agency for which the operator was involved in the firefighting work.

The first of these devices was working and provided position, speed and altitude data. The second was not operational.

### 3. STATUS OF THE INVESTIGATION

The draft of the accident report is nearing completion and will be presented for approval at a plenary meeting of the CIAIAC to be held in June 2013.