Reims Cessna FRA150L, G-BANE

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Aircraft Type and Registration:	Reims Cessna FRA150L, G-BANE
No & Type of Engines:	1 Continental Motors O-240-ECA piston engine
Year of Manufacture:	1972
Date & Time (UTC):	28 August 1998 at approximately 1030 hrs
Location:	Near Ardglass, County Down, Northern Ireland
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - Nil
Injuries:	Crew - Fatal - Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	30 years
Commander's Flying Experience:	84 hours (of which 24 hours were on type) Last 90 days - 24 hours Last 28 days - 20 hours
Information Source:	AAIB Field Investigation

History of the flight

The pilot had planned to conduct a VFR flight in the south coastal area of County Down, to the south east of Belfast International airport. The forecast meteorological conditions for the flight were good. Prior to departure the pilot arranged for the aircraft to be refuelled, each tank had a capacity of 14·5 imperial gallons (66 litres). He uplifted 40 litres of fuel and the refueller noted that each tank was filled to within about 2 inches of the top of each tank. Allowing for any unusable fuel this would have been sufficient for approximately 4 hours of general flying.

The aircraft was cleared to take off from Belfast International airport at 0920 hrs and was handed over to the approach controller for a visual departure to the south east. At 0927 hrs the pilot contacted the approach controller at Belfast (City) airport since his intended route would take him across the extended centreline of their in use runway. He confirmed that he was at 1,000 feet, VFR and routing to the south where he intended to operate for about 30 minutes, he was asked to report when at the coast. At 0947 hrs the pilot reported that he was now in the area of Bishops Court (a

disused airfield) and confirmed his intention to operate in that area for about 30 minutes whilst remaining below 2,000 feet. At 1020 hrs another light aircraft contacted Belfast (City) approach to say that it was operating in the same area at 1,800 feet and the pilots were informed of the presence of the G-BANE. The pilot of G-BANE then called to say that he had heard the previous transmission and was looking for the other traffic. There were no further radio calls from the pilot on either the frequency in use or on the emergency frequency of 121·5 MHz.

Meteorological conditions

The synoptic situation indicated a slow moving anticyclone of 1027 mb centred near Waterford with a light westerly flow over the area in which the accident occurred. An aftercast issued by the Meteorological Office at Bracknell indicated that the visibility was between 15 to 20 km with no significant weather. The cloud was few with a base of 1,000 feet and broken with a base of 2,000 feet. The surface wind was 270û/05 kt with a temperature of +13ûC and a dewpoint of +8ûC. This aftercast was in close accord with the briefing details that were available to the pilot prior to the flight. The pilot of the other aircraft that entered the area at 1020 hrs described the visibility as excellent with well broken cloud with a base between 2,000 feet and 2,500 feet; she described the overall conditions as excellent for light aircraft operations.

At the declared operating altitude of 2,000 feet the temperature was +7ûC and the dew point was +4ûC. Using performance charts produced by the CAA, this places the aircraft in a condition of temperature and humidity where serious carburettor icing can occur at any power setting.

Pilot experience

The pilot had commenced training for his Private Pilot's Licence in the US on 4 May 1998. He successfully completed his course on 29 May 1998 having flown a total of 60 hours on the PA 28 aircraft. He began flying from Belfast (International) on 20 July 1998 and flew two dual flights with a flying instructor for a total of 2 hours and 10 minutes. His flying was assessed as satisfactory for solo flying and no significant weaknesses were identified. Since these initial flights the pilot had flown solo navigation and general handling exercises with the intention of increasing his total flying hours in order to gain a commercial pilot's licence. All of his flying at Belfast had been on this particular aircraft.

Eyewitness accounts

Two separate eye witnesses saw a white, high wing aircraft that appeared to conducting a normal stalling exercise; the description of the aircraft matched that of G-BANE. One described the aircraft diving briefly towards the ground before climbing away, the other described the nose appearing to fall, the engine revving up and the aircraft climbing away. Both witnesses saw the aircraft complete this manoeuvre twice before flying away, in controlled flight, towards Bishops Court.

Later, another eye witness saw an aircraft spiralling down at a low altitude. He heard the engine clearly and was sure that there was no smoke or fire from the aircraft whilst in flight. He saw the

aircraft hit the ground nose first still in a spiral. Another witness heard the engine noise of an aircraft which was flying low over her house. She looked out of a window and saw the aircraft heading towards the ground. It appeared to be in a dive with the wings level and then went out of sight behind some trees still going down.

It is difficult to reconcile these two latter accounts of the aircraft motion prior to impact, but both witnesses were clear that they could hear the engine noise. Since the evidence from the wreckage indicated no aircraft rotation when the aircraft struck the ground any airborne rotation must have been arrested prior to impact.

Engineering investigation

The aircraft had crashed into a wheat field about 1·5 miles northeast of Ardglass and 2 miles south of an airfield at Bishops Court. It was also about half a mile from the coast. The crushing and distortion suffered by the aircraft showed that it had been about 35 degrees nose down at impact and yawed slightly nose left. Its descent path had been almost vertical. After the initial impact it did not move horizontally in any direction and it showed no sign of having been rotating or rolling at impact. This evidence indicates that the aircraft was in a stalled condition but not spinning when it crashed. The aircraft was orientated in a direction such that a normal pull out from the dive would have taken it in a south-south-easterly direction.

Examination showed that the aircraft had been structurally intact at impact with all flying and control surfaces properly attached. There were a number of failures within the flying control system but these appeared to have been caused by the impact with the ground and none could be identified which had occurred before the crash. The flaps were retracted.

The propeller showed some signs that it had been rotating at the time of the ground impact but it showed none of the gross twisting and distortion that is normally seen if it is rotating at high speed or under high power at impact. Its state was consistent with a low power or 'windmilling'. However, the pilot's throttle control was closed and the lack of power indications may be due simply to the throttle position. The stalk had been bent and trapped in the extended position at impact and this is considered to be a reliable indication of its pre-crash position. One of the pilot actions in the standard recovery from a spin is to close the throttle. Throttle closure would also be a rational response to any other situation in which temporary loss of control resulted in the aircraft adopting a steep nose down flight path.

The cockpit controls and the instrument panel were fragmented but information was obtained from some of the other controls in the cockpit. The mixture control was at 'FULLY RICH' and the carburettor heat control was found selected to 'COLD'. The fuel primer was correctly locked. The magneto switch was selected to the left magneto. The key handle had been bent and broken off and it seems probable, therefore, that the key was rotated from 'BOTH' to the adjacent 'LEFT' position during the crash by some impact. The electrical functioning of the switch was checked and found to be correct.

The engine was stripped at an overhaul agency. There was no mechanical defect or failure in the engine which could have caused it to lose power. One magneto was damaged and could only be checked to a limited extent by testing its individual components. Apart from some wear no fault was found. The other magneto was operated successfully for 30 minutes.

Both aluminium fuel tanks had suffered bulging distortion which indicated that there had been a large amount of fluid in them at impact but it had drained away after the crash and no fuel was recovered from the tanks. Forty seven ml of clean fuel was recovered from the bowl of the main fuel filter (Gascolator) but 20 ml of fluid which was recovered from the carburettor bowl proved to be water with some particulate contamination. Chemical analysis showed that the solid contamination matched very closely a sample of soil from the accident site and this must have entered the carburettor bowl at impact. The hollow metal floats within the bowl had been slightly crushed and this was an indication of the pulse of air pressure which had passed through the engine's induction system at impact. The bowl had remained intact after impact but the carburettor had broken off from the engine and had been crushed rearwards against the oil sump.

The presence of water in the carburettor bowl cannot be explained in a fully satisfactory way. The bowl of the airframe fuel filter acts as a water trap and it is the lowest point of the whole aircraft fuel system. That clean fuel was found there should indicate that there was no gross contamination in the system. If there had been fuel in the carburettor at impact then it could have been lost, partially through drainage as the carburettor was probably lying on its side, and partially through evaporation as it was underneath a hot engine. If water had also been present at impact it would not have evaporated as quickly as the petrol. It is possible for a small amount of water to lie in the bottom of the carburettor bowl and for the engine to run normally. Then, some in-flight disturbance could cause the water to slop around and be carried up through the fuel jet and into the engine. This would result in a power interruption. If the engine continued to rotate then fuel would once more enter the engine and it would restart. The volume of water found here was more than the small amount that could have lain in the bottom of the carburettor. If this amount of water had been present before flight then much of it would have been sucked into the engine during start-up. The only way in which it could be envisioned that this water was the cause of an engine stoppage during the accident flight would be if the carburettor was being fed a large amount of water from the aircraft's fuel system. However, the fuel recovered from the filter bowl showed no sign of water contamination. The alternative possibility is that the water in the carburettor found its way there, as did the soil contamination, when the engine was partially buried in the ground after the crash. The fire crew reported that they did not spray the wreckage with water and the local ground did not appear to be particularly wet so there is no evidence to show how this could have happened. It may be possible that there was ice in the carburettor air passage at impact and that this was the source of the water which found its way into the carburettor bowl.

No other defect was found in the aircraft's fuel system. The main fuel valve was open. Strainers within the system were clear. All the pipe breakages appeared to be the result of the crash, and the tank venting system, including a vented fuel filler cap on the right wing, was clear. The flexible hose between the engine and the airframe pipework was intact and clear. Some effects of moisture were found in the system; a small area of surface corrosion in the carburettor bowl, more under the gasket in the airframe fuel filter, a small amount of a fine deposition of precipitated metallic salts in the flexible hose and a small amount of a gelatinous substance at the feed holes to the idle jet system. All appeared to be long term effects and none could be taken to signify a sudden in flight problem at the time of the accident.

There have been cases of pilot's seat disengagement or collapse and the pilot's seat was examined for any evidence that it might have become disengaged or that the backrest might have collapsed. The pilot's backrest had broken under gross overload and there was no evidence that there had been any failure in the seat before the crash. Damage to the seat rail and the locking pin showed that the pin had been engaged at impact. The engagement had been in the furthest aft hole and this raised

the possibility that the seat had originally been located further forward but had slipped rearwards but the pilot was 6 feet 1 inch tall and may well have adjusted the seat fully aft himself.

Previous aircraft incident

On 15 June 1998 an incident occurred involving this aircraft and was reported in AAIB Bulletin No 10/98. The engine began to lose power whilst in the cruise and ran roughly. The pilot on that occasion suspected carburettor icing and applied carburettor heat but the engine continued to run roughly so he returned the carburettor heat control to 'cold' and carried out a successful forced landing in a field. No contamination was found in the fuel or the aircraft's fuel system but the fuel on board was changed and, after some ground running, the aircraft was flown back to Belfast Airport. Some more checks were carried out by the maintenance company and immediately afterwards the aircraft was given its annual inspection. As no defects were found it was suspected that carburettor icing had been the problem. At the time of the accident the aircraft had been operated for 81 flying hours (87 flights) since the incident involving the forced landing.

Medical and pathology

The pilot had died of multiple injuries and the accident was not survivable. Post mortem examination of the pilot revealed no evidence of any disease which may have caused or contributed to the accident. However, toxicological examination detected the presence of a prescription drug in both the blood and the urine. The normal use for this particular medication is as an antidepressant although it is also prescribed for other conditions. The datasheet for this drug contains the warning that it may impair the ability to perform potentially hazardous tasks such as driving a car or operating machinery. Possible side effects include: nausea, tremor and dizziness. The Air Navigation Order, at Article 22 (9), states that: "A person shall not be entitled to act as a member of the flight crew of an aircraft registered in the United Kingdom if he knows or suspects that his physical or mental condition renders him temporarily or permanently unfit to perform such functions or to act in such capacity".

There is no manner in which it can be positively determined if the drug played any role in the accident but medical opinion is that the pilot should not have been flying an aeroplane whilst he was being treated with this medication.