Reims Cessna F150M, G-BFRO

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Aircraft Type and Registration:	Reims Cessna F150M, G-BFRO
No & Type of Engines:	1 Continental O-200-A piston engine
Year of Manufacture:	1977
Date & Time (UTC):	6 May 1997 at 0730 hrs
Location:	3 nm north of Cumbernauld Airfield, Scotland
Type of Flight:	Aerial Photography
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - Fatal - Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Basic Commercial Pilot's Licence with Instrument Rating
Commander's Age:	22 years
Commander's Flying Experience:	731 hours (of which 241 were on type)
	Last 90 days - 151 hours
	Last 28 days - 13 hours
Information Source:	AAIB Field Investigation

History of the Flight

The pilot had planned to conduct aerial photography in an areato the north of Cumbernauld Airport. He arrived at the airportat approximately 0700 hours and completed the pre-flight checkson the aircraft; whilst at the airport he did not obtain any meteorologicalinformation. The forecast conditions for the area were for avisibility of 40 km with no significant weather or cloud and witha temperature of 0_C at 1,000 feet. However, there was a freshto strong north-westerly wind which was forecast to produce moderateturbulence below 6,000 feet. An aftercast obtained from the MetOffice confirmed the validity of this forecast and noted thatthe wind at 2,000 feet was 330_/30 kt.

The aircraft took off from Cumbernauld Airfield at 0719 hours. Analysis of recorded radar data from the radar head at LowtherHill, in Dumfries and Galloway, indicates that after take offthe aircraft flew on a northerly track directly towards the areaof Carron Bridge which is on the B818 road 1 km to the east ofthe Carron Valley Reservoir. The radar data shows that the aircraftthen

generally followed the B818 road in an easterly directiontowards Denny, but that it was manoeuvring around the houses andfarms along this road. Photographs obtained from the film usedduring this flight show these identifiable buildings in the sameorder suggested by the radar data. The final recorded radar datashows the aircraft manoeuvring 800 metres to the north of thecrash site at 0728 hours.

At about this stage the aircraft was observed to be flying a seriesof turns in an anti-clockwise direction; all of the witnessesdescribed the aircraft flying very slowly at a height estimatedto be between 150 to 300 feet above the ground. The aircraftmotion was described as 'swaying from side to side' with the 'nosedipping and rising'. The aircraft then banked abruptly and wentdown nose first crashing onto the B818 before coming to rest inan adjacent field. Shortly after impact a fire started in thewreckage, a number of passers-by attempted to quell the fire withwater from a nearby stream but they were moved back by the policewho feared an explosion; the fire services arrived at 0746 hours.The pilot had sustained fatal injuries in the crash.

Pilot Experience

The pilot had obtained his Private Pilot's Licence in 1992 andupgraded to a Basic Commercial Pilot's Licence (BCPL) in 1995: he also held an Instrument Rating and a Multi-Engine Rating. He had recently completed the requirements for a Commercial Pilot'sLicence (CPL) which was issued in May 1997. He had spentthe previous two summers flying for parachuting clubs and hadthen gone to the United States in February 1997 for two monthsto fly the Cessna 152 in order to increase his total flying hours. When he returned home in April 1997 he contacted an aerial photographycompany who offered him employment as a pilot/photographer. Aspart of his familiarisation with this role he was given a fulldemonstration of how to operate the camera. When he first usedthis in the air there was another pilot flying the aircraft, hethen gradually assumed more of the responsibilities for flyingthe aircraft whilst taking photographs until, after four flights,he was able to conduct the entire operation unassisted. Aftertwo solo training flights, during which he produced satisfactoryaerial photographs, he positioned the aircraft at CumbernauldAirfield from where it was planned to operate during the summer.

Medical and Pathological Information

The pilot had earlier been diagnosed as having a malignant diseaseof his lymphatic system which had been successfully treated withchemotherapy. One of the agents used in this treatment is knownto be toxic to the heart. During the post-mortem examinationextensive fibrosis was noted in the heart and this could possiblyhave given rise to a disturbance of cardiac rhythm which couldhave led to the collapse of the pilot before the accident. Despitethis evidence it is not possible to determine whether or not thepilot was conscious at the time of impact.

As a consequence of his medical history the pilot's Class 1 medicalcertificate was endorsed with a restriction that limited him toflying 'as or with a co-pilot'; he also held a valid and unrestrictedClass 3 medical certificate. A Class 1 or Class 2 medical certificateis required for professional flying, whilst a Class 3 medicalcertificate is only applicable to private flying. The CAA generallyregard an individual who is fit for a Class 1 medical certificatewith an 'as or with co-pilot' restriction as being fit for unrestrictedClass 3 medical certification because a higher standard of medicalfitness is considered necessary for professional flying purposesthan for private flying. This pilot, when flying solo, was thereforeonly flying within the privileges of his licence when engagedin private flying.

With the advances in the treatment of many cancers the problemof patients who have been successfully treated and wish to returnto flying will become more common. Many of the modes of treatmentare themselves very toxic. This accident has demonstrated thatoccult cardiotoxicity may have occurred and other organ damagemay occur with other forms of treatment. It is therefore recommendedthat the Medical Department of the CAA Safety Regulation Groupshould obtain advice from an appropriate source as to the measuresthey should employ to detect toxic heart or other organ damagewhen examining candidates for medical certificates who have beentreated for cancer (Recommendation 97-52).

Examination of the wreckage and airworthiness aspects

The aircraft crashed on to the B818 road about three quartersof a mile north-west of the village of Frankerton. Marks on theroad and damage to the aircraft itself showed that it had descendedon to the road upright but banked to the left and in a steep nosedown attitude on a heading of 240_M. It had then bounced overthe fence and hedge at the side of the road and had come to restin the field alongside the road. Both fuel tanks had been rupturedand a fire had badly damaged the nose and cockpit.

The body of the pilot, the only occupant, was in the left seat. The lap belt of his safety harness had been partially consumedby fire but the buckle was found locked. The diagonal strapwas not attached, as found. The body was in a seated positionbut collapsed forward and a camera body was found under the torso,effectively on the pilot's lap. A detachable telephoto lens wasfound beside the pilot's legs. The camera body and lens bothhad damage which was consistent with them having been broken apart. The full weight of the camera and lens was 2.6 kg and their assembled length was 30.5 cm.

Examination showed that the aircraft had been structurally intactat impact with all flying and control surfaces properly attached. There were some mechanical failures in the flying control systembut these appeared to have been caused by the impact with theground and no failures or disconnections were identified as havingoccurred before the crash. The flaps were retracted.

The propeller had become detached in the crash. One blade wassimply bent rearwards but the other was severely twisted and scoredand showed all of the characteristics normally associated withhigh power at impact. There was also a gouge in the road surfacewhich, because of its position relative to the other marks madeby the aircraft, was attributed to the propeller. It was concludedthat the propeller had been rotating under power but the severityof the impact with the road had almost stopped the propeller andhad broken it off within half a rotation. Both fuel tanks hadsuffered bulging distortion and this indicates that there hadbeen a large amount of fluid in them at impact.

The throttle was found partially open and this was consistentwith the indications of power from the propeller. The fuel valvewas open. The fuel/air mixture control was at 'FULLYRICH'. The carburettor air control was selected to 'COLD'but given the indications of power being supplied to the propellerat impact it cannot be shown that a power loss due to carburettoricing had been encountered in flight. The fuel primer was locked. The magneto switch was at 'OFF' and its positionwas, therefore, in conflict with the evidence that the enginewas producing power at impact. The key handle had been bent downwardsand slightly twisted. The direction of twist was towards the'OFF' position and it seems probable thatthe key was rotated towards the 'OFF' positionduring the crash by some impact.

The aircraft crashed at a nose down angle of about 20_ below thehorizontal and banked about 10_ to the left. There was no evidenceto indicate that it was in a stalled condition at that time butit could have been in a late stage of recovery. The pointer onthe Air Speed Indicator was positioned at 82 mph (normalstalling speed is 55 mph) but no evidence could be found to relatethis instrument position to impact. The internal mechanism, whichbalances a pressure capsule against a spring may simply have settledat this position during the fire.

The pilot's seat was examined. The seat back had not collapsedrearwards and damage to the seat rail and the pin which engagesthe rail to lock the seat in position showed that the seat hadbeen properly located and locked at impact.

The records showed that the aircraft had been maintained to therequired maintenance schedule with the exception of the periodfrom 24 April until 1 May 1997 when it was operated outside theperiod of validity of the previous maintenance certificate; itwas within the 50 operating hours limit but was outside the calendarlimit of 62 days. However, an inspection was carried out whenthe aircraft arrived at Cumbernauld.

Aerial Work

The business operation of the registered owners of G-BFRO included arrangements for the aerial photography of properties. The printsof these photographs were then offered for sale to the propertyowners or the general public. In order to accomplish this taskthe company provided the pilot with an aircraft for which theypaid the operating costs; they also provided a hand held camerafitted with a zoom lens, a supply of films and a map indicatingthe areas to be photographed. The pilot was paid for the exposedfilms with the proviso that these prints were of a satisfactorystandard. Article 119 (1) of the Air Navigation (No 2) Order1995 defines aerial work as 'any purpose (other than public transport)for which an aircraft is flown if valuable consideration is givenor promised in respect of the flight or the purpose of the flight).' This flight appears to fall within the definition ofaerial work and the pilot was thus required to hold a professionalpilot's licence with an appropriate medical certificate (Class1 or 2). The medical restrictions on this pilot's licence prohibitedhim from flying in a professional capacity except 'as or witha co-pilot'.

Single pilot aerial photographic operation

When flying as a single pilot and taking aerial photographs witha hand held camera the aircraft would typically be flown at aspeed of about 60 KIAS and at heights down to 700 feet agl. Onceover an appropriate location the pilot would then release theflight controls for a period of 3 to 5 seconds whilst using thecamera to take photographs. The camera used for this task wasa Cannon EOS 1N fitted with a 35/350 mm lens; the camera bodywas 16 cm wide by 11 cm in height and with the lens fully extendedwas approximately 24 cm long, the combined weight of the lensand camera was 2·6 kg.

Flight at low level in uncontrolled airspace requires constantand close attention to the avoidance of collision with other aircraftor even ground based obstructions, this requires a positive andcontinuous monitoring of the visual scene by the pilot. Whena pilot is flying an aircraft and regularly taking photographswith a hand held camera fitted with a large zoom lens he is incapableof maintaining an adequate look out for other aircraft or obstacles. Furthermore, the pilot's ability to cope with an engine failureor difficult wind conditions and the associated down draughtswhilst flying at such low speeds and close to the ground mustbe doubtful. This problem would be compounded by the presenceof a loose, bulky camera in a small cockpit. A second crew

member,allowing for clearly defined responsibilities for the separatetasks of photography and piloting, is a much safer option. Itis therefore recommended that the CAA should consider suitableregulations relating to the conduct of aerial photography of acommercial nature in order to eliminate the dual role of pilotand photographer (Recommendation 97-53).

Safety Recommendations

Recommendation 97-52

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