

ACCIDENT

Aircraft Type and Registration:	Bolkow 208C Junior, D-EGFU	
No & Type of Engines:	1 Roll-Royce/Continental 0-200-A engine	
Year of Manufacture:	1967	
Date & Time (UTC):	2 September 2011 at 1314 hrs	
Location:	Peterborough Sibson Airfield, Cambridgeshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Fatal)	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	52 years	
Commander's Flying Experience:	675 hours (of which 22 were on type) Last 90 days - 6 hours Last 28 days - 0.3 hours	
Information Source:	AAIB Field Investigation	

Synopsis

The aircraft was on final approach to land at Sibson Airfield when it struck the uppermost cable of a set of power transmission lines situated approximately 0.5 nm from the airfield. The runway in use had a significantly displaced threshold to provide aircraft on approach with adequate clearance from the transmission lines. Evidence suggested that the pilot made an approach to the start of the prepared runway surface, rather than the displaced threshold. The pilot's unfamiliarity with the airfield, distraction due to a departing aircraft in front and inadequacies in the briefing material available may have been contributory factors to the accident. Several safety actions have been taken or proposed as a result of this accident.

History of the flight

The pilot planned to fly from Long Marston Airfield, near Stratford-upon-Avon, to Sibson Airfield, near Peterborough. This was his first flight to Sibson and on the morning of the accident he telephoned the airfield operator to make some general enquiries. He did not confirm he would be definitely coming and indicated that should he decide to fly to the airfield that day he would telephone again to book in. As a result, the pilot was not given the usual briefing on operating to the airfield and the aircraft was not added to the booking-in sheet retained by the radio operator, as would have been normal.

The pilot departed at about 1224 hrs from Long Marston and at about 1408 hrs contacted Sibson control tower for joining instructions. He next reported being on a

left base leg, and again later on finals, for Runway 24. All of these transmissions seemed normal with no indications of the pilot experiencing any difficulties.

At the time D-EGFU was approaching the airfield, the pilot of a Cessna Caravan was preparing to depart from Sibson and transmitted that he was taxiing for takeoff from Runway 24. ATS informed the Caravan pilot that D-EGFU was on finals. The Caravan pilot, who was familiar with operating from the airfield, continued to taxi towards the takeoff point for Runway 24 and reported that he would hold short of the runway. He then reported that he had D-EGFU in sight and was lining up for takeoff. The pilot of D-EGFU transmitted that he was on short finals. The pilot of the Caravan continued to line up and take off and later stated that he estimated D-EGFU to be at a range of 2 to 3 nm as he entered the runway.

Witnesses on the airfield who could see both aircraft considered that D-EGFU was too close to the runway to be able to land safely behind the departing Caravan and expected to see it go around. D-EGFU however appeared to continue its approach and was then seen to hit the uppermost cable of an overhead power transmission line¹ running across the approach path to the runway, about 0.5 nm from the displaced threshold. Witnesses report that D-EGFU appeared to be flying in a normal attitude until it hit the cable. The aircraft was then seen to fall vertically, initially tail-first, before hitting the ground and causing fatal injuries to the pilot.

Weather

An aftercast obtained from the Met Office described the weather conditions affecting Sibson at the time of the accident as fine, with little cloud and good visibility. The surface winds were light and from the west-south-west.

It was not possible to determine whether the sun's position would have affected the pilot's ability to see the power transmission lines or airfield. The relative bearing and elevation of the sun recorded at 1300 hrs of 200° and 44° respectively, and at 1400 hrs of 219° and 40° respectively, placed the sun approximately 35° to 40° to the left of the runway during the approach and above the pilot's line of sight when looking towards the ground.

Accident site

The aircraft came to rest inverted in a field on the south-eastern side of the A1 road. The accident site was a level area located close to the extended centreline of Runway 24 of Peterborough Sibson Airfield, some 0.44 nm east-north-east of the displaced threshold. Above the general area of the final impact site were located a set of high tension electrical power distribution cables, supported by metal pylons routed in an approximately north-south orientation. The uppermost of these cables, the earth cable, was damaged.

The earth cable consisted of a small diameter steel stranded core surrounded by a larger cross-sectional area of stranded aluminium cable. The latter strands appeared to be of soft aluminium possessing only low tensile strength. All cables exhibited considerable sag between pylons.

Footnote

¹ Overhead power transmission lines are supported by lattice steel towers and are commonly referred to as pylon lines.

Wreckage information

Detached items of wreckage were mostly located in close proximity to the main aircraft wreckage. The outboard left wing leading edge was lying adjacent to the main wreckage. The left wingtip was located approximately 40 m away, between the two carriageways of the A1 road. The left inboard section of the wing leading edge was not found. Fragments of canopy transparency and part of a headset were found on the northbound carriageway of the A1 (the side nearest the main wreckage). Evidence of cable impact damage was visible on the leading edge of the right wing.

Examination of the aircraft wreckage and the ground markings at the site indicated that the aircraft had struck the ground in a near vertical orientation with a low forward speed. There was no evidence of propeller rotation at the time of impact.

Detailed aircraft examination

The aircraft was recovered by the AAIB and subjected to a detailed examination in order to establish the pre-impact integrity of the aircraft and to deduce the impact sequence.

Examination of the aircraft structure revealed damage to the right wing leading edge consistent with an initial cable contact on the upper surface of the outboard section of the wing, as well as damage on the underside of the inboard section. The leading edge of the left wing had separated from the front spar in a manner consistent with the cutting action of a cable travelling outboard from the wing root. The composite wingtip had separated from the aluminium alloy wing box by application of a force in an outboard direction, approximately along the axis of the wing spar.

No evidence of any pre-impact failure was found in the aircraft's structure or flying controls. A strip examination of the engine similarly did not reveal any failures, other than those resulting from ground impact. The propeller exhibited no evidence of rotation at impact. Functional testing of the magnetos and sparking plugs revealed no significant problems.

During the wreckage recovery operation, it was observed that there was no fuel in the single fuel tank. A subsequent specialist analysis of soil samples for traces of hydrocarbons in the earth at the final impact point was inconclusive. Examination of the fuel tank identified two small impact-related holes close to either side of the forward face, near the top of the tank.

GPS data

A Garmin GPSMAP196 GPS receiver was recovered from the accident site which contained recorded data from ten flights, including the accident flight.

The unit recorded the aircraft taking off from Long Marston Airfield at 1224 hrs and flying in a direct track to Sibson Airfield at an altitude of about 2,300 ft. South of Sibson, the aircraft descended to about 1,200 ft and then tracked to the east before briefly turning north and then carrying out a climbing turn in a wide orbit over the area of Orton Waterville. Halfway through the orbit, the aircraft started to descend once more and joined the left base for Runway 24. The pilot then flew a gentle descending turn onto the final approach, establishing on the runway centreline at about 1.2 nm from the Runway 24 threshold. The last recorded point was approximately 300 m east of the power lines at 1312:52 hrs. Figure 1 shows the GPS recording in the vicinity of Sibson Airfield.

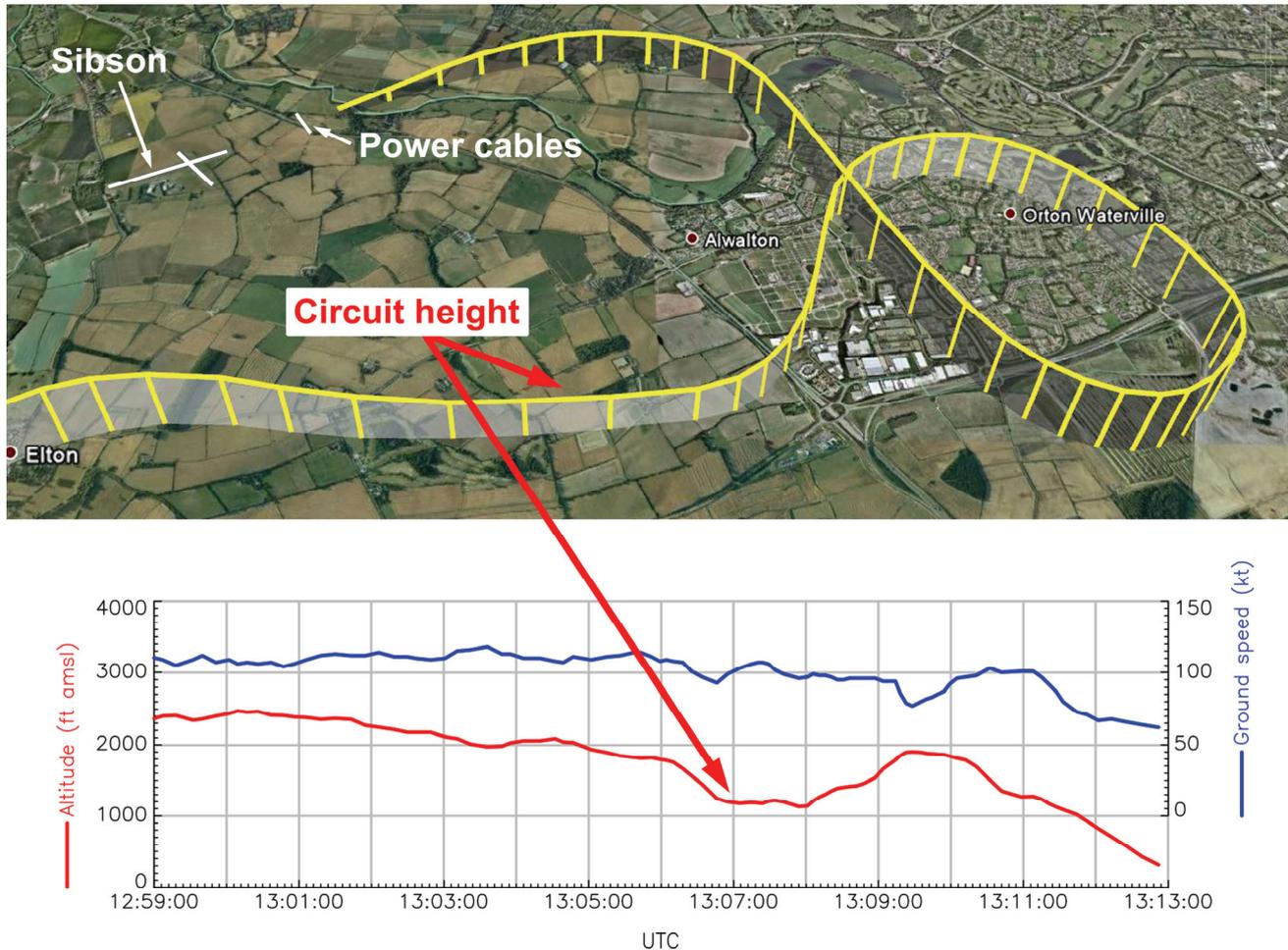


Figure 1

GPS track in the vicinity of Sibson Airfield

Figure 2 compares aircraft GPS height with track distance from the Runway 24 displaced threshold. Superimposed on the chart is the representative position and height of the pylon towers running closest to the runway and the part of Runway 24 between the start of the prepared runway surface and the displaced threshold. The tracks depicted in black were recorded on a number of aircraft flown by pilots familiar with Sibson Airfield. These flights cleared the pylon towers by approximately 150 ft or more. The red track is of the accident aircraft.

Two of the previous landings recorded by the GPS unit recovered from D-EGFU had been to runway thresholds that could be clearly referenced. Figure 3 overlays these approaches, together with the approach from the accident flight, aligning the other runway thresholds with the start of the prepared runway surface (not the displaced threshold) of Runway 24 at Sibson. The comparison, whilst not statistically robust, indicates a possibility that the aiming point for the landing may have been the start of the runway and not the displaced threshold.

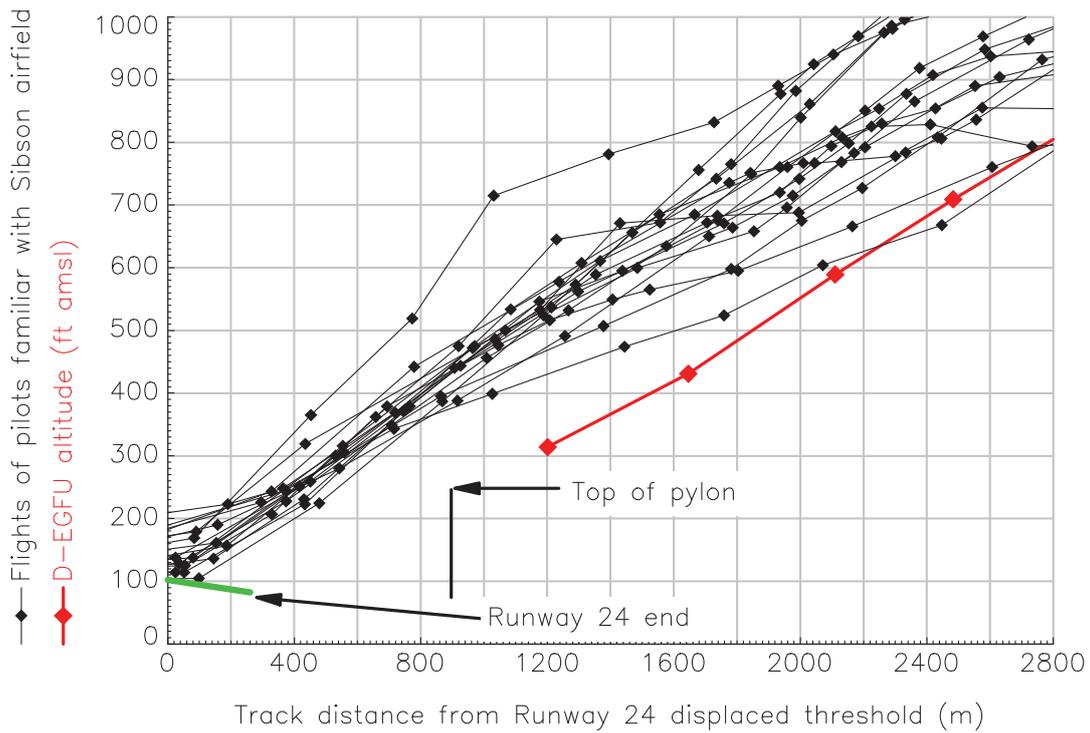


Figure 2

Comparison of the D-EGFU accident approach with approaches made to the same runway by pilots familiar with the airfield

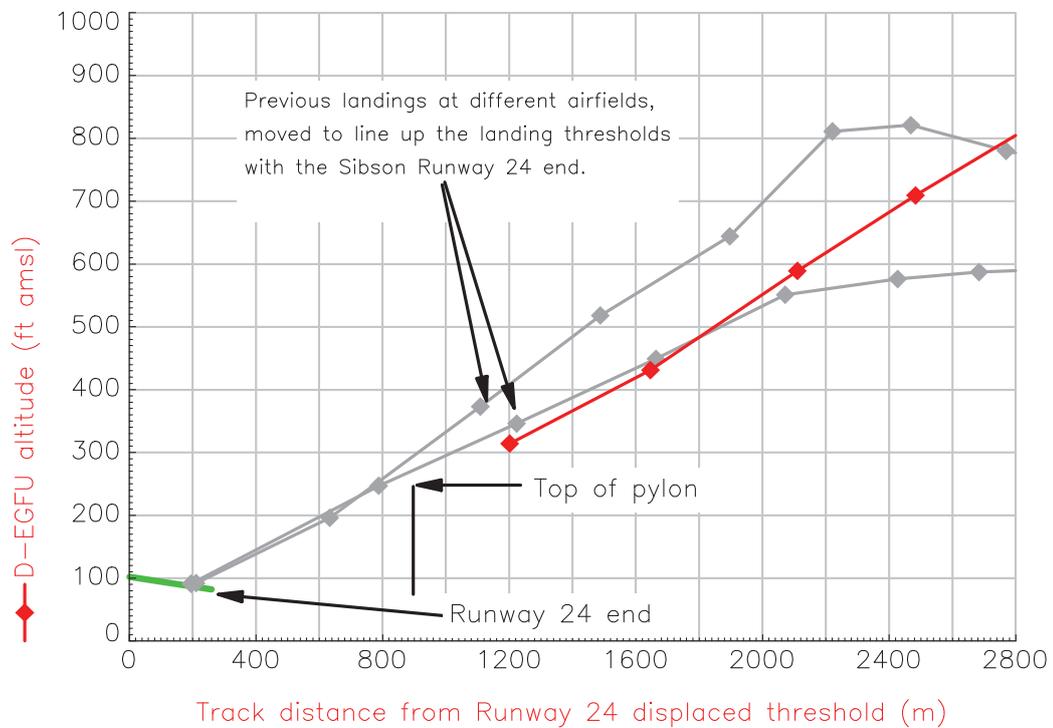


Figure 3

Comparison of the accident approach with approaches at other airfields disregarding the displaced threshold

Radar data

Radar recordings of the accident flight were reviewed and confirmed the validity of the GPS data recovered from D-EGFU.

The radar recordings did not reveal any other aircraft of significance in the vicinity of the airfield at the time of the accident other than the Caravan aircraft which took off from Sibson whilst D-EGFU was on final approach. This aircraft appeared on the radar recording at 1313:46 hrs, after takeoff when it was approximately 700 m beyond the end of Runway 24. This was 54 seconds after the last GPS recorded position of D-EGFU, indicating the departing aircraft was still on the runway at the time of the accident.

Airfield description

Sibson Airfield has two grass runways orientated 15/33 and 06/24 (Figure 1). Runway 06/24 is the main runway and is 935 m long but, due to obstacles at either end, the two thresholds are significantly displaced. The Runway 06 threshold is displaced by 467 m due to trees near the airfield boundary. The Runway 24 threshold is displaced by 259 m due to the presence of the pylon line struck by the aircraft. This creates the illusion of a short runway only 209 m long being available between the two displaced threshold markings.

The airfield is licensed. The flying school, resident at the time of the accident, was responsible for operating the airfield in accordance with the licence. A parachuting centre is also based at the airfield and special procedures exist to allow parachuting operations to continue whilst the airfield remains active. These include the prohibition of deaside and overhead joins for arriving aircraft.

The normal circuit height is 1,000 ft QFE.

Published airfield information

The UK Aeronautical Information Publication (AIP) provides details of airfields in the UK and is the definitive source of information used in the preparation of a number of commonly used airfield guides. The relevant AIP entry for Sibson Airfield includes a section entitled ‘*Aerodrome Obstacles*’ which gives specific information on obstacles affecting all four runways. This included the following statement:

‘Remarks: Line of HT cables 130-160 ft aal 230-261 ft amsl running north-northwest/south-southeast 0.49 nm.’

The pilot was using an extract for Sibson Airfield from a commonly used airfield guide. Information on obstacles on the approach to Runways 06 and 24, as well as a local mast, appeared in a section entitled ‘*Caution*’. The information relating to the pylon line read: ‘*Power lines on Rwy 24 approach*’ without details of their height or distance from the airfield. In addition, the displaced threshold at either end of the runway, whilst marked, was not made obvious by the inclusion of arrows on the airfield diagram.

An examination of the airfield guide, and another established airfield guide produced by a different publisher, revealed a lack of consistency in both regarding the descriptions used when referring to overhead power lines. This made it difficult for users of the guides to differentiate between overhead power distribution lines² and the larger overhead transmission lines. In addition, some entries gave specific details on location of the power lines whilst others did not.

Footnote

² Overhead power distribution lines refer to the smaller power lines often supported by wooden poles and supplying domestic properties.

The airfield had its own website which contained information on operating to the airfield. This too warned of ‘power lines on approach to Runway 24’ but gave no details on their height or distance from the airfield.

Licensed airfield obstacle clearance requirements

CAA document CAP 168 details requirements for the licensing of Aerodromes. Chapter 4 relates to the assessment and treatment of obstacles. It states:

‘The effective utilisation of an aerodrome may be considerably influenced by natural features and man-made constructions inside and outside its boundary. These may result in limitations on the distance available for take-off and landing and on the range of meteorological conditions in which take-off and landing can be undertaken. For these reasons, certain areas of the local

airspace must be regarded as integral parts of the aerodrome environment. The degree of freedom from obstacles in these areas is as important in the granting and retention of an aerodrome licence as the more obvious physical requirements of the runways and their associated runway strips, and is determined by survey in accordance with CAP 232 – Aerodrome Survey Requirements.

The method of assessing the significance of any existing or proposed object within the aerodrome boundary or in the vicinity of the aerodrome is to establish defined obstacle limitation surfaces particular to a runway and its intended use.’

Figure 4 illustrates the obstacle limitation surface as defined in CAP 168 for the category of runway appropriate to Runway 24 at Sibson.

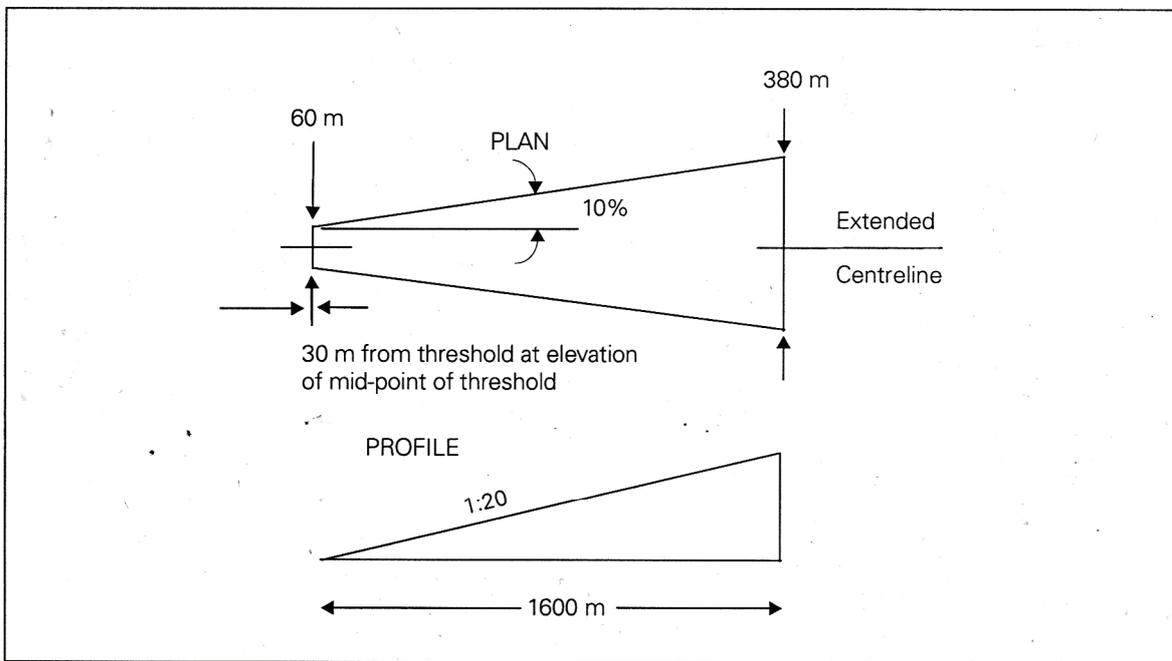


Figure 4.10 Approach surface associated with a non-instrument runway where the code number is 1

Figure 4
Obstacle limitation surface as defined in CAP 168 for the category of runway appropriate to Runway 24 at Sibson

Fuel

No records exist that would allow an accurate determination to be made of the amount of fuel on board the aircraft at the time it departed Long Marston for the flight to Sibson.

However, the aircraft was known to have been refuelled with 25.26 litres of fuel on 24 July 2011 and a further 46.88 litres on 25 July 2011. The pilot's logbook indicates that the aircraft had flown 1 hour 5 minutes between these two refuels and an additional 2 hours 20 minutes after refuelling on 25 July, prior to its departure for Sibson.

The aircraft had a 100 litre capacity fuel tank and a consumption rate of about 23 litres/hr. The aircraft must therefore have had additional fuel on board to that uploaded on 24 and 25 July 2011. Had the aircraft been refuelled on 25 July 2011 so that it was full, there would have been adequate fuel on board for the flight to Sibson and a reserve of about 1 hour 10 minutes. However, without the means of determining exactly how much fuel was on the aircraft after refuelling, it remains possible that the aircraft had little, or no remaining fuel at the time of the impact with the pylon line.

Previous incidents

The AAIB has no records of any other serious incidents or accidents at Sibson Airfield involving the power transmission line hit by the pilot of D-EGFU.

The CAA MOR database records two cases of wire strikes at the airfield. An incident on 14 June 1982 involved a helicopter striking power lines whilst crop spraying. The other incident, on 12 October 1985, involved an aircraft which landed after striking wires. The pilot was subsequently successfully prosecuted for low and reckless flying. Both incidents appear to have involved power distribution lines, not the transmission line struck by D-EGFU.

Pathology

The pilot's medical certificate was valid at the time of the accident and he was not required to wear spectacles whilst flying. The autopsy revealed no apparent medical conditions which may have contributed to the accident.

Analysis

Impact sequence

Given that the aircraft was positioned close to, or on the extended centreline of the runway at the time of the first impact, it is reasonable to assume the aircraft axis was approximately aligned with that centreline and the aircraft was approximately wings level. Allowing for the slight forward sweep of the wing, and taking into account the angle at which the power cables crossed the extended runway centreline, the outboard section of the right wing would have contacted the cable first. The site of the impact being close to the north eastern pylon, the considerable cable sag and very slight wing dihedral would account for the higher position of the initial contact on the upper wing surface. The subsequent contact on the lower wing surface indicates that the cable contact had moved inboard.

The extent to which the wing contact caused the aircraft to yaw to the right, and consequently roll, as well as decelerate and possibly descend, as the wing came into progressive contact with the cable, is not known. It is clear, however, that damage was then inflicted to part of the canopy adjacent to the wing root allowing fragments of transparency to fall onto the carriageway together with cockpit contents (headset). The geometry of the damage and the known orientation of the cable indicate that some time after the initial strike the cable contacted the left wing root with the aircraft banked steeply to the right. It was then deflected relative to the aircraft such that it translated along the front face of the left wing

spar, cutting off the leading edge skin and finally causing the outboard leading edge section to push the attached wingtip outboard, failing its fastenings to the aluminium alloy skin in a lateral direction between the spars.

The inboard section of the left wing leading edge could not be accounted for but the possibility that it fell onto the back of a freight vehicle travelling on the A1 road could not be dismissed. The final orientation of the cutting action of the cable through the left wing, relative to the aircraft axes, indicates that the aircraft orientation was grossly altered from the attitude for straight and level flight.

The location of the aircraft wreckage almost directly below the cable impact damage confirms the almost total loss of forward speed following the strike. After striking the cable the aircraft then fell, adopting a nose-down attitude during its descent.

Progressive re-orientation through the total impact/descent sequence would have almost certainly interrupted the fuel flow and/or inhibited correct carburettor operation, so a loss of engine power would probably have resulted. This, coupled with the almost complete loss of airspeed would lead to the propeller ceasing to rotate and would account for the lack of evidence of rotation at final ground impact.

Engineering analysis

The small holes identified in the fuel tank were orientated such that, with the aircraft inverted and resting with its tail fin in contact with the ground, they were at, or very close to, the lowest point of the tank. This would explain the complete absence of fuel in the tank.

The aircraft and engine examinations did not reveal any evidence of technical defects prior to the impact with the cable.

Operational analysis

The lack of evidence of any technical failure suggests the pilot would have been able to avoid flying into the power transmission line. That he did not indicates he was either not aware of its existence or, if he was, he did not appreciate his position relative to it.

Whilst the AIP entry for Sibson Airfield would have been available to the pilot to review, it is common for pilots to refer to a flight guide, such as the one found with the pilot at the time of the accident, rather than the AIP entry itself. If that was the case in this instance then, with the exception of perhaps his chart, the sources of information available to the pilot to plan and undertake his flight did not provide precise information on either the nature, or the location, of the power transmission line. It is possible, therefore that he was unaware of its presence when he commenced his approach.

From the limited evidence available, it appears the pilot flew a normal approach path angle, but towards the start of the prepared runway surface rather than the displaced threshold. The pilot's unfamiliarity with the airfield and the unusual appearance of the runway created by significantly displaced thresholds at both ends might have contributed to him choosing this approach path. The pilot might have also have been drawn to the start of the runway by the presence of the Cessna Caravan taxiing towards the runway for takeoff.

Sibson Airfield provides various challenges to pilots, not least the inability to join overhead. This denies pilots the opportunity to survey the runway properly prior to landing, which is of particular importance if unfamiliar with the airfield. It is possible that the recorded flight path showing the aircraft descending to circuit height, then climbing again prior to carrying out an orbit, was due to the pilot losing sight of the airfield and trying to re-orientate himself with the runway.

By carrying out the approach to the start of the runway surface, the pylon line represented an obstacle in the aircraft's path. Even if the pilot had been aware of the presence of the power transmission line, the cables would have been difficult to see. This was made all the more difficult by the fact that the lattice steel towers (pylons), which are easier to see, were positioned either side of the approach path, leaving only the power cables across the flight path. In addition, it is considered the pilot might have been distracted by the Cessna Caravan taking off whilst he was on finals. Radar and GPS data, and the statements of witnesses on the ground, suggest D-EGFU was considerably closer than the range of 2 to 3 nm estimated by the pilot of the Cessna Caravan at the time he lined up. The final approach path to Runway 24 is less than 1.5 nm in order to avoid a built-up area. It is not clear at which point in D-EGFU's approach the estimated range was made by the pilot of the Cessna Caravan. The reported nature of the radio transmission by the pilot of D-EGFU in response to the takeoff transmission from the Caravan also indicates that the two aircraft were in relatively close proximity. It is possible that this situation distracted the pilot of D-EGFU at a critical time as he approached the power line.

Safety actions

Consideration has been given to measures which could be implemented to try and prevent a recurrence of such an accident. These include the installation of approach path lighting at the displaced thresholds to indicate the appropriate approach path and aiming point. They also include ways to increase the conspicuity of the transmission lines. Such measures must however be proportionate to the perceived risk and in themselves not introduce additional problems. The owners of the power transmission line have entered discussions with the airfield operator and the CAA to explore the options available.

The airfield operator has stated it will seek to enhance the information provided about the power lines on its website. The publisher of the guide used by the pilot has now revised the entry for Sibson Airfield to incorporate specific details of the power transmission line and to highlight, on the airfield diagram, the existence of displaced thresholds on Runway 06/24. The publisher will also attempt to introduce a more consistent method to record the presence of power lines in their publication, as will the publisher of the other flight guide reviewed during this investigation.