FINAL REPORT

AAIU Formal Report No: 2009-027
State File No: IRL00908082
Published: 22/12/2009

Operator:	Private
Manufacturer:	Piper Aircraft Corporation
Model:	PA 28-180 Archer
Nationality:	United Kingdom
Registration:	G-BGTJ
Location:	Corriebracks Mountain (Mt), Co. Wicklow, at position N53° 03' W006° 003'
Date/Time:	25 October 2008, time not determined[1]

(Note: All times are Universal Time Co-ordinated (UTC) unless otherwise stated)

SYNOPSIS

The aircraft was on a private flight from Gloucestershire Airport in the UK, to Kilrush Airfield, Co. Kildare, Ireland. The last radar contact was observed at 11.26 hrs with the aircraft on a westerly heading at an altitude of 3,300 ft in the vicinity of Glenmacnass Waterfall, northeast of Tonelagee Mt, Co. Wicklow. Weather conditions at the time were difficult, with strong winds, low cloud and poor visibility. The aircraft was found, impacted into boggy terrain, near the summit of Corriebracks Mt. in Co. Wicklow. The four occupants were fatally injured.

NOTIFICATION

It became apparent that the aircraft was overdue when a member of the Pilot syndicate that owned the aircraft called the airfield owner at Kilrush enquiring about the aircraft's arrival. At 17.26 hrs, Dublin Air Traffic Control (ATC) was advised by Shannon Aeronautical Information Service (AIS) of an overdue aircraft identified as G-BGTJ. All airfields in the southwest region were contacted by ATC, and following a negative response, the Emergency Services were advised that an aircraft was missing. The Air Accident Investigation Unit (AAIU) was informed by the Station Manager Dublin ATC at 19.35 hrs that G-BGTJ had not arrived in Kilrush as planned and a missing aircraft alert had been issued to the Emergency Services. The search continued overnight in the Wicklow Mts, concentrating in the area to the southeast of Blessington.

[1] **Time not determined**: See end of Section 1.1.2.

The Emergency Services were assisted by four Mountain Rescue Teams. At 09.10 hrs the following morning, the wreckage of G-BGTJ was located by two members of the Glen of Imaal Mountain Rescue Team, and the site was secured by An Garda Síochána at 09.43 hrs. Two Inspectors of Air Accidents, Mr. Graham Liddy and Mr. Leo Murray, arrived by Irish Air Corps helicopter at 11.30 hrs and commenced the Investigation. AAIU personnel were joined later by Mr. Jurgen Whyte, Chief Inspector of Air Accidents and Mr. Frank Russell, Inspector of Air Accidents, who responded with vehicles and extra equipment. In accordance with the provisions of S.I. 205 of 1997, the Chief Inspector of Air Accidents, on 26 October 2008, appointed Mr. Leo Murray as the Investigator-in-Charge to carry out a Formal Investigation into this Accident.

1. FACTUAL INFORMATION

1.1 History of the Flight

1.1.1 Events prior to the accident

On Tuesday 21 October 2008, four days prior to the accident, the Pilot contacted the airfield owner at Kilrush by SMS[2] and advised of his intention to fly into the airfield over the following weekend. No specific date or time was mentioned. No other communications were received regarding the planned flight by the airfield operator. The following day, the Pilot filed an ATC flight plan by FAX with Gloucestershire Airport at 23.41 hrs. The flight plan is reproduced in **Appendix A**. A *General Aviation Report* was also filed regarding the flight with the UK authorities (as required under *Section 7* of the UK *Terrorism Act 2000*).

The Avon and Somerset Constabulary informed the Investigation that on the day before the accident flight, 24 October 2008, the Pilot was the victim of a personal assault by a group of five youths in an unprovoked attack. The Police report indicated that during the attack he received a blow to the back of his head and another to the middle of his back. There were no visible injuries, and as far as they were aware, medical attention was not sought by the Pilot. The Avon and Somerset Constabulary report states that he was suffering from shock.

Another pilot of the syndicate refuelled G-BGTJ to capacity with 143 litres of Avgas 100LL after he had completed his flying on the day before the accident.

1.1.2 Accident flight

On Saturday 25 October 2008, the day of the accident, the aircraft departed Gloucestershire Airport at 08.51 hrs. The flight was filed to operate under Visual Flight Rules (VFR). The Pilot contacted London FIR[3] at 09.02 hrs and remained in contact with ATC until closure of the flight plan with Dublin.

[2] **SMS**: Short Message Service, mobile communication system.
[3] **FIR**: Flight Information Region.

The route flown took the aircraft from Gloucestershire, in a northwesterly direction across Wales, before it turned onto a westerly heading over Caernarfon crossing the Irish Sea to Newcastle, Co. Wicklow directly towards Kilrush. The route flown was in accordance with the filed ATC flight plan.

The aircraft crossed the Irish Sea at Flight Level[4] (FL) 065 and made initial contact with Dublin ATC at 10.12 hrs. At 10.49 hrs the Pilot had descended to FL060 at the request of ATC and reported approaching the FIR boundary, approximately 20 nm east of the Irish coast. At this point the Pilot requested further descent and descended to an altitude of 4,000 ft. At 11.10 hrs the Pilot informed Dublin ATC that he was crossing the coast at Newcastle, and ATC requested that he report closing his flight plan at Kilrush. At 11.17:02 hrs, the Pilot advised Dublin ATC that he was 24 miles from Kilrush, requested to continue on his own navigation and to close his flight plan. Dublin ATC closed the flight plan as requested at 11.17:13 hrs. No further transmissions were received from the aircraft. The last radar contact was observed at 11.26 hrs with the aircraft on a westerly heading at an altitude of 3,300 ft in the vicinity of Glenmacnass Waterfall, Northeast of Tonelagee Mt, Co Wicklow. Weather conditions at the time of the accident were poor, with strong winds gusting in excess of 50 kts, poor visibility and rain. The aircraft impacted into boggy terrain southeast of the summit of Corriebracks Mt at an altitude of 1,500 ft AMSL[5] (**Appendix B**).

There is evidence based on witness statements that suggests the aircraft was manoeuvring at low level for some time prior to the accident. The position of witnesses relative to the intended flight path is illustrated in **Figure No. 1**. Witness A (a pilot himself) recalls hearing a single-engine aircraft '*going over his house on an easterly direction under considerable power'*. The witness's house was situated at Boleybeg, near Brannockstown, Co. Kildare, 8 miles northeast of Kilrush, and 3 miles North of the direct track the aircraft would have taken to Kilrush. He could not see the aircraft due to the low cloud, and he estimated the cloudbase to be approximately 500 ft above the ground. He heard no other aircraft in the area that day.

A second witness, Witness B, located at her house 1 mile to the east of Corriebracks Mt. stated she saw the aircraft '*at low level, in and out of cloud'* heading in a southerly direction to the east of the summit. Neither Witness could recall the time the aircraft passed their location. The exact time of impact could not be established. However considering the last recorded radar contact, position of witnesses, and the location of the accident site, it is probable that the aircraft was airborne for at least 20 minutes after the last recorded radar contact at 11.26 hrs.

At 09.10 hrs the following morning, the wreckage was located by a local Mountain Rescue Team to the south of the summit of Corriebracks Mt at an altitude of 1,500 ft. The accident site was approximately 9 miles west of the last recorded radar position. The four occupants were fatally injured.

[4] **Flight Level**: Three-digit representation of aircraft altitude referenced to standard pressure.
[5] **AMSL**: Above Mean Sea Level.

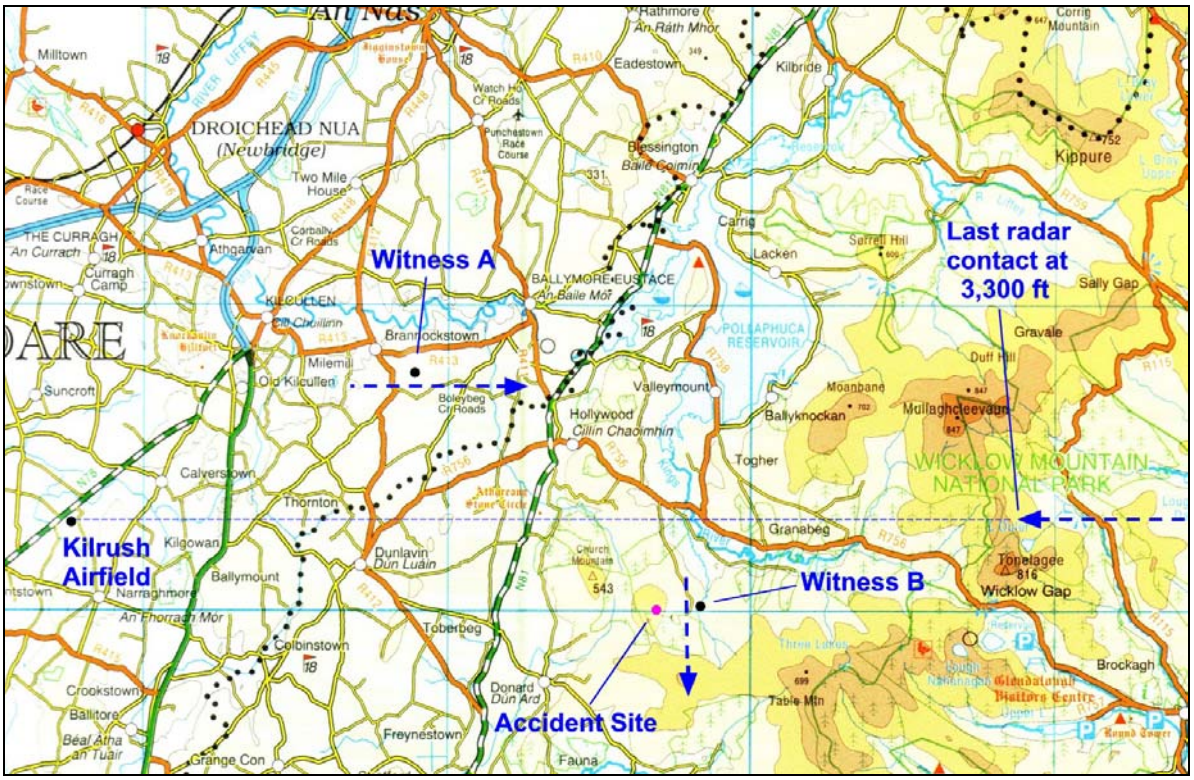


Figure No. 1: Positions of witnesses, known flight paths indicated
(*based on Ordnance Survey 1:250,000*)

1.2 Injuries To Persons

Injuries	Crew	Passengers	Aircraft total	Others
Fatal	1	3	4	0
Serious	0	0	0	0
Minor	0	0	0	0
None	0	0	0	-
TOTAL	1	3	4	0

1.3 Damage To Aircraft

The aircraft was destroyed.

1.4 Other Damage

The nature of the accident site was water-soaked peat bog covered by a thick layer of gorse and heather. Fire crews removed a large amount of peat-material using hand tools to facilitate the removal of the four occupants from the aircraft. Recovery of the wreckage itself required a large excavation to be made with a mechanical digger to allow water to drain away from the aircraft. Following completion of the recovery operation, the excavation was back-filled and made level.

1.5 Personnel Information

1.5.1 Pilot Experience

The Pilot of G-BGTJ was a male, aged 47 years. He held a JAR PPL[6] (Aeroplanes) issued in the United Kingdom, with Night and IMC Ratings[7] (**Section 1.18.1**). The licence was first issued on 5 December 2000, renewed on 10 March 2006, and was current. The Pilot also held a JAR Medical Certificate, Class II, which was valid until 6 December 2008.

The Investigation inspected the Pilot's logbooks, which were accurately kept and up to date. The logbooks indicate he underwent basic training in the USA, commencing on 12 November 2000 and passing the single-engine (piston) skill test on 2 December 2000. All of this training was carried out on the Cessna 150. Apart from this initial PPL training and a brief check-out on a Cessna 172 for hire purposes (in 2007) all of his flying experience was gained on the accident aircraft, G-BGTJ. His logbook reveals an extensive amount of cross-country flying, including regular visits to Kilrush. The Pilot had a total of 763 hours flying time of which 711 hours were on the accident aircraft. According to the Pilot's logbook, he flew a total of 24 hours in the previous 90 days, 11.5 hours in the previous 28 days. The accident flight took approximately 2.5 hrs.

1.5.2 Statement by Flight Examiner

On 8 March 2008, the Pilot underwent a flight test for the renewal of his IMC Rating. The following statement was forwarded to the Investigation by the Flight Instructor concerned: '*I am a flying Instructor at* [airfield name] *and have been for 24 ½ years. I first* met [the Pilot] *about 8 years ago when he joined a group that owned G-BGTJ, a Piper 28-180. I flew with him regularly since then. I last flew with him in March of this year* [2008] *(to renew the IMC Rating). As far as I am concerned* [the Pilot] *held a PPL (A) with a night and an IMC Rating. I would describe him as a competent pilot, he was not afraid of flying in bad weather and I have flown with him in some pretty poor conditions. He was current with his instrument flying and he flew about 100 hours a year. He quite often flew to Kilrush. My opinion of the aircraft, which I have known at this airfield for about 30 years, is that the equipment it had was old and I suspect* [the Pilot] *was using a hand-held GPS.*'

1.6 Aircraft Information

1.6.1 General Information

The PA 28-180 Archer is an all-metal, low-wing cabin monoplane, with a fixed tricycle undercarriage and accommodation for four occupants. The front seats are adjustable and equipped with dual controls; the rear seats are non-adjustable. A baggage compartment is situated in the aft cabin, behind the rear seats. Access to the compartment is gained through a baggage door on the lower right side of the fuselage.

---

[6] **JAR PPL**: Joint Airworthiness Requirements, Private Pilot Licence.

[7] **IMC Rating**: A rating valid only in the UK, which permits operation in Instrument Meteorological Conditions with certain restrictions.

Leading particulars G-BGTJ:

Aircraft type:	PA 28-180 Archer
Manufacturer:	Piper Aircraft Corporation
Constructor's number:	28-7405083
Year of manufacture:	1974
Certificate of registration:	Issued 3 July 1979
EASA Certificate of airworthiness:	Issued 21 December 2007, non-expiring
Airworthiness Review Certificate:	Valid to 20 December 2008
Total airframe hours:	6,465 hrs
Engine:	1 x Lycoming O-360-A4A
Basic empty weight:	1,405 lbs
Maximum authorised take-off weight (MTOW):	2,450 lbs

G-BGTJ was powered by a Lycoming O-360-A4A four-cylinder, horizontally opposed, air cooled piston engine, driving a two-bladed Sensenich fixed-pitch propeller. The engine, serial No. L-12178-36A, was not the original installed on the airframe.

The PA 28-180 Flight Manual specifies a normal operating speed range (with the flaps up) of 52 kts to 124 kts. A rapid turn, particularly in conditions of severe gusting and windshear, can result in a distortion of airflow over the wing, which can cause a gross loss of lift and an aerodynamic stall[8]. Operation at heavier weights increases the speed at which a stall occurs.

1.6.2 Maintenance

The aircraft was maintained by an Authorised Aircraft Maintenance facility based at Gloucestershire. Defect work of a minor nature carried out in 2008 included servicing work on the oleos, treatment of corrosion on the undercarriage, and a cabin door latch repair. Scheduled inspections were carried out in accordance with Light Aircraft Maintenance Schedule CAA[9]/LAMS/A/1999/Issue 2 (dated May 2005) until the 50 hour inspection carried out on 15 April 2008. From 9 September 2008, scheduled inspections were carried out in accordance with CAA LAMP/A/2007 issue 1 (dated October 2007) as the aircraft was now operating on an EASA Certificate of Airworthiness. At the time of the accident, the aircraft had flown a total of 45 hours, including the accident flight, since its 100 hr inspection on 9 September 2008.

[8] **Stall**: Where the airflow over a wing becomes turbulent with a large loss of lift.
[9] **CAA**: Civil Aviation Authority (UK).

On 6 August 2008, the engine was removed and sent (together with the starter motor, left and right magnetos, carburettor and alternator) for the replacement of the alternator-mounting bracket, which had failed. Following replacement of the alternator and its bracket, the engine was re-installed in the aircraft and ground runs satisfactorily carried out. The aircraft logbooks showed the following maintenance inspections were carried out:

Inspection type:	Date:	Airframe hrs:	Engine hrs:
50 hr Inspection:	13 July 2007	6,225:25 TSN	942:05 TSO
150 hr Inspection:	04 October 2007	6,274:25 TSN	991:10 TSO
Annual Inspection:	20 December 2007	6,310:25 TSN	1,027:10 TSO
50 hr Inspection:	15 April 2008	6,360:55 TSN	1,077:40 TSO
Engine removal:	06 August 2008		1,113:05 TSO
50/100 hr Inspection:	09 September 2008	6,421:35 TSN	1,138:20 TSO

TSN: Time Since New TSO: Time Since Overhaul

1.6.3 Aircraft Loading

The Aircraft Operating Manual specifies all weights in pounds (lbs). For consistency with the Manufacturer's specifications Imperial weight units are used in this Report. Calculations of aircraft weight and balance are detailed in **Appendix C**.

1.6.3.1 Determination of baggage load

Baggage and other items were removed from the aircraft at the accident site and weighed. Due to some items being saturated with water, these weights were factored by 40% when wet, and 20% when damp. This calculation, when rounded to the nearest pound (lb), gives an estimated baggage weight of 100 lbs.

1.6.3.2 Calculation of take-off weight

The aircraft was fuelled to capacity the evening before the accident flight. The Pilot's flight plan indicated that he estimated an endurance of 5 hours, which equates to full fuel tanks. This was confirmed by the pilot who refuelled the aircraft on the evening of 24 October 2008, the day before the accident flight. The fuel tank capacity is 50 US Gallons, which equates to 299 lbs of AVGAS 100LL (at a Specific Gravity of 0.718). An allowance of 5 lbs was made for taxi-out and run up of the engine. Calculation indicates a take-off weight of 2,447 lbs; the maximum take-off weight is 2,450 lbs.

1.6.3.3 Calculation of Centre of Gravity (C of G)

The C of G limits are 82.0 to 93.0 inches aft of datum up to a weight of 2,050 lbs. Above this weight the C of G forward limit moves aft in a linear fashion to 87.4 inches at the maximum take off weight of 2,450 lbs.

At the estimated accident weight of 2,303 lbs, the limits are 85.3 to 93.0 inches aft of datum. Calculation estimates the C of G position at 91.2 inches aft of datum at the time of the accident.

1.7 Meteorological Information

1.7.1 General

The Pilot accessed the UK Met Office and Irish Met Service websites through his laptop on several occasions from 20.43 hrs on 22 October 2008 to 22.47 hrs on 24 October 2008, the day before the accident flight. The Investigation found no records of the Pilot accessing weather information on the day of the accident. No weather documentation was found in the aircraft wreckage. However it cannot be ruled out that the Pilot sought weather information using another resource on the day of the accident.

The Pilot accessed the Kilrush Airfield website on 23 October 2008 at 19.31 hrs. This website has a facility allowing pilots to access the actual weather conditions in real time. This website facility is provided as an aid to pilots intending to visit. Data provided includes wind speed and direction, airfield pressure, outside air temperature, dew point, relative humidity and rainfall records. There is no record on the Pilot's laptop of the Kilrush Airfield website being accessed subsequently.

1.7.2 Aftercast of meteorological conditions at the time of the accident

The Investigation examined the meteorological conditions both forecast and existing at the time of the accident. Met Éireann, the Irish Meteorological Service, provided an aftercast for 11.30 hrs, the approximate time the accident occurred. Three SIGMETs[10] were issued that day, the first at 05:30 hrs:

SIGMETs issued by Shannon 25/10/2008

```
WSIE31 EIDB 250530
EISN SIGMET 01 VALID 250531/250931 EINN-
EISN SHANNON FIR SEV TURB OBS LAN N OF A LINE N5300 W01030 TO
N5425 W00810 BLW FL060 MOV E AT 25KT NC=

WSIE31 EIDB 250950
EISN SIGMET 02 VALID 250952/251252 EINN-
EISN SHANNON FIR SEV TURB FCST LAN BLW FL060 NC=

WSIE31 EIDB 251230
EISN SIGMET 03 VALID 251245/251545 EINN-
EISN SHANNON FIR SEV TURB FCST LAN BLW FL060 WKN FM WEST=

No other SIGMETs were issued.
```

Note: (SEV TURB OBS: Severe Turbulence Observed, BLW: Below, MOV: Moving)

[10] **SIGMET**: Significant Meteorological Information.

A very strong southwesterly airflow covered the area. A surface warm front crossed the region, preceded by an earlier upper frontal feature. A very strong and gusty southwesterly wind lay across the entire region. Light, occasionally moderate rainfall may have been experienced at any point along the route.

Wind profile at site:	Surface: 210 degrees, at 20 to 25 kts, gusting 40 to 50 kts 2,000 ft: 230 degrees, at 55-60 kts 5,000 ft: 250 degrees, at 60-65 kts
Cloud at site:	Average ceilings of 2,000-2,500 ft with occasional ceilings in the area ranging 1,000-1,500 ft
Visibility at site:	Generally 7-10 km with occasional 4,000 metres
Weather at site:	Occasional rain or rain and drizzle mixed
Freezing level:	Greater than 10,000 ft, implying no risk of airframe icing at the level the accident occurred
MSL Pressure:	1012-1013 hectoPascals (hPa)
Turbulence:	Severe turbulence from surface up to 6,000 ft was likely.
Mountain Wave:	Tephigram analysis suggests that conditions were appropriate to Mountain Wave formation. This analysis is supported by satellite data showing wave cloud extending North-eastwards from the Kerry Mountains over the region where the accident occurred
Temperatures:	Air Temperature: 12º C, Dewpoint: 10º C

1.7.3 Mountain Waves

Included in the above report is a reference to '*Mountain Wave*' formation. This phenomenon is found when strong winds pass over mountainous terrain, producing strong up and down currents (windshear), the effect of which may extend well above ground level and many miles downwind of the range. Also, on the lee side of the mountain, rotor cloud may form producing severe turbulence (**Figure No. 2**). The area of downdraught can be quite extensive and vertical air movements exceeding 1,000 ft/min have been encountered by glider pilots in this mountain range.

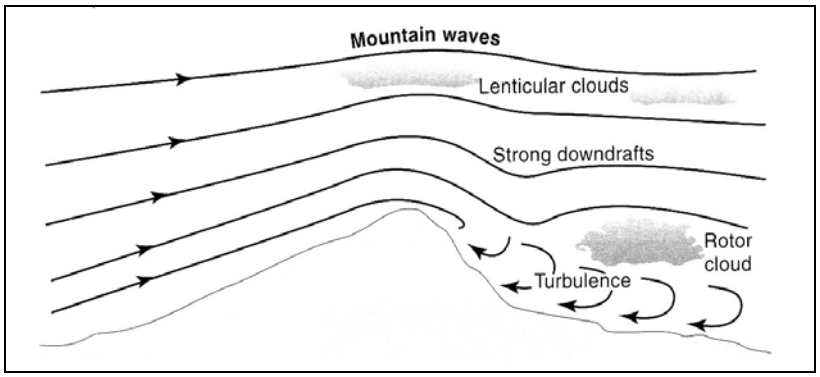


Figure No. 2: Mountain waves and rotor cloud (*Airlife Publishing*)

1.7.4 METAR (actual) weather reports

The following METAR were issued approximately the time the accident occurred.

Dublin Airport METAR

```
25 1130 210/25G38 9999 -RA FEW016 BKN019 BKN026 12/10 Q1014 NS (Note 1)
```

Note 1:
The above meteorological report for Dublin Airport was issued on 25 October 2008 at 11.30 hrs, wind from 210 degrees at 25 kts gusting to 38 kts, visibility in excess of 10 km in light rain, cloud 'few' at 1,600 ft, 'broken' at 1,900 ft, 'broken' at 2,600 ft, temperature 12° C, dewpoint 10° C, QNH[11] 1014 hPa with no significant change expected.

Casement Aerodrome METAR

```
25 1000 210/31 9999 -RA FEW 016 SCT045 BKN080 11/9 1013
25 1100 210/28G46 8000E -RA SCT018 BKN040 BKN080 12/10 1013
```

1.7.5 Forecast weather

The airport of departure has an internet-based Meteorological self-brief facility which provided METAR (current, or actual weather conditions) and Terminal Area Forecasts (TAF) for selected airfields, together with low-level spot wind charts for the UK and Europe. At the time of his departure, the latest information available was as follows (relevant wind speeds in the following reports have been underlined):

Gloucestershire (Staverton) TAF

```
EGBJ 250834Z 250716 20012KT 9999 FEW035= (Note 2)
EGBJ 250905Z 251019 20012KT 9999 SCT035 TEMPO 1019 22016G26KT= (Note 3)
```

Note 2:
Forecast for EGBJ (Gloucestshire) issued on 25 October 2008 at 08.34 hrs, valid between 07.00 hrs and 16.00 hrs, indicates a wind from 200 degrees at 12 kts, visibility in excess of 10 km, with 'few' cloud at 3,500 ft

Note 3:
Forecast valid between 10.00 hrs and 19.00 hrs, wind from 200 degrees at 12 kts, visibility in excess of 10 km, with 'scattered' cloud at 3,500 ft. A 'temporary' change between 10.00 hrs and 19.00 hrs of wind from 200 degrees at 16 kts gusting to 26 kts.

[11] **QNH**: Altimeter barometric setting with reference to mean sea level.

Dublin Airport METAR

```
EIDW 250800Z 20026G40KT 160V230 9999 -RA FEW018 SCT040 BKN100 10/08 Q1016 NS=
EIDW 250830Z 21026G41KT 9000 -RA FEW018 BKN022 BKN050 10/08 Q1016 NS=
```

Dublin Airport TAF

```
EIDW 250300Z 250413 21017KT 9999 SCT030 BECMG 0406 20020G32KT TEMPO 0613
21026G44KT BECMG 0709 -RA SCT015 BKN025 TEMPO 0913 5000 RADZ BKN010=

EIDW 250400Z 2501212 21022G32KT 9999 SCT010 BKN020 TEMPO 1215 21024G40KT TEMPO
1224 5000 RADZ BKN010 BECMG 1518 22017G27 BECMG 1821 23017KT BECMG0003 27015KT
BECMG 0306 SCT020 SCT040 BECMG 0912 26 017G27=

EIDW 250600Z 250716 20022G33KT 9999 SCT030 BECMG 0709 -RA SCT015 BKN025 TEMPO
0713 21026G44KT TEMPO 0916 5000 RADZ BKN 010 BECMG 1315 22020G30KT=(Note 4)
```

Note 4:
Forecast for Dublin Airport issued on 25 October 2008 at 06.00 hrs, valid between 07.00 hrs and 16.00 hrs, indicates a wind from 200 degrees at 22 kts gusting 33 kts, visibility in excess of 10 km, with 'scattered' cloud at 3,000 ft [becoming between 07.00 hrs and 09.00 hrs, light rain 'scattered' at 1,500 ft and 'broken' at 2,500 ft; with a temporary change between 07.00 hrs and 13.00 hrs with wind from 210 degrees at 26 kts gusting to 44 kts with a temporary change between 09.00 hrs and 16.00 hrs, visibility 5 km in rain and drizzle with 'broken' cloud at 1,000 ft becoming between 13.00 and 15.00 hrs wind from 220 degrees at 20 kts gusting 30 kts.

Casement Aerodrome TAF

```
EIME 250300Z 250413 21018G28KT 9999 SCT030 BECMG 0406 20023G34KT TEMPO 0613
21026G44 KT BECMG 0709 -RA SCT015 BKN025 TEMPO 0913 5000 RADZ BKN010=

EIME 250600Z 250716 20023G34KT 9999 SCT030 BECMG 0709 -RA SCT015 BKN025 TEMPO
0713 21026G44KT TEMPO 0916 5000 RADZ BKN010 BECMG 1315 22020G30KT=
```

1.8 Aids to Navigation

Two radio aids were available to the aircraft when approaching the Irish Coast; a VOR-DME[12] situated at Casement Military Aerodrome, operating on frequency 115.800 MHz, and a Non-Directional Beacon (NDB) situated at Killiney, operating on frequency 378.00 kHz. The ADF[13] equipment (used for the reception of NDB signals) was placarded as being unserviceable in the aircraft. A *'Garmin III Pilot'* Global Positioning System (GPS) was recovered from the floor of the cockpit on the Pilot's side. While in use, the GPS was normally held by a bracket on the Pilot's control wheel.

[12] **VOR-DME**: VHF Omni-directional Radio Range with Distance Measuring Equipment.
[13] **ADF**: Automatic Direction Finding.

The unit was powered by internal batteries although provision is made for external power input which was not in use. A power supply lead was installed in the aircraft, but the input socket on the GPS was covered by a rubber seal at the time of impact. No spare batteries for the unit were found in the aircraft.

1.9 Communications

The Pilot first contacted London FIR at 09.02 hrs and remained with London FIR until transferred to Dublin ATC (North Sector) on frequency 129.175 MHz at 10.12 hrs. The aircraft was given a discrete SSR code[14] and a confirmation of the Dublin QNH of 1014 hPa; this information was acknowledged and read back by the Pilot. At 10.13 hrs the aircraft was identified on radar, the Pilot was asked to confirm VFR conditions and his current altitude or Flight Level. A transcript of communications with Dublin ATC is provided in **Appendix D**. The final communication with the aircraft was at 11.17:13 hrs when the Pilot closed his flight plan.

The operator at Kilrush Airfield was present in the tower until approximately 11.30 hrs. He then went for lunch, returning about 1 hour later. The only aircraft movement recorded that day was a helicopter, which refuelled at 07.30 hrs. A painter was working in the reception area throughout the day and heard no transmissions on the tower radio nearby.

1.10 Aerodrome Information

Kilrush Airfield is a privately-owned licensed airfield situated at Kilrush, Narraghmore, County Kildare, elevation 303 ft AMSL. The landing area has two runways. Prior permission is required for operation into the airfield. R/T[15] communications are available on frequency 123.425 MHz. No radio navigation aids were installed at the Airfield.

1.11 Flight Recorders

Not fitted and not required to be fitted.

1.12 Wreckage and Impact Information

1.12.1 General

All components of the aircraft were accounted for at the accident site. The aircraft impacted into wet, boggy terrain and came to rest with the propeller, engine and forward cabin embedded below ground level. The fuselage was found at an angle of approximately 40º to the horizontal and on a magnetic heading of 076º (**Photo No. 1**). Initial ground contact was made by the nose undercarriage, shearing off the leg. The forward fuselage penetrated the bog until the leading edges of the wings made ground contact.

[14] **SSR code**: Secondary Surveillance Radar 4-digit code, used by ATC for identification on radar.
[15] **R/T**: Radiotelephony, two-way radio.

The left wing suffered the more severe contact and separated from the fuselage at the root, coming to rest lying against the fuselage. The inboard leading edge of the right wing also made heavy impact, causing the inboard section to crumple significantly while the outboard leading edge remained virtually intact. As the aircraft penetrated the bog the undercarriage and left wing made ground witness marks on the surface. The undercarriage marks were 1 metre from the rear of the final resting position of the fuselage, consistent with a steep entry angle at low speed. There was no evidence of aircraft rotation at impact.

The propeller was completely embedded in the peat bog and only the lower blade tip sustained minor deformation. The engine bearer showed significant distortion. The aircraft fuselage was substantially intact showing only signs of minor crumpling. The engine turned freely by hand once the sparkplugs had been removed to permit draining of ground water from the cylinders. Except for the extreme tip of the lower blade, the propeller showed no deformation on impact. The aircraft clock and personal wristwatches of the occupants were still functioning when examined by the Investigation.

Photo No. 1: Wreckage impact angle and initial port wing impact (indicated by arrow)

1.12.2 Instruments and controls

The aircraft instrumentation readings and control positions were recorded. The Investigation disconnected and removed the aircraft's battery at the accident site for safety reasons. All primary and secondary flight controls were continuous except for impact damage. The position of the engine controls were unreliable due to the effects of impact. Relevant cockpit indications and settings are set out in **Appendix E**.

On 1 September 2009, the Manufacturer issued Service Bulletin SB1179A, which refers to control wheel shaft inspection. This Service Bulletin supersedes SB1179 and adds a note to the instructions regarding inspection of universal joints, which have no witness inspection hole.

The left (Pilots) control wheel shaft was inspected as per the procedure outlined in SB1179A. The assembly was found to be correct. The right control wheel shaft did not have a witness hole thus requiring the taper pinto be removed to facilitate inspection of the shaft in accordance with the Service Bulletin instructions. Failure of both control wheel shafts was due to impact forces.

1.13 Medical and Pathological Information

1.13.1 General

Post Mortem examinations were carried out on the four occupants. In each case death was due to multiple injuries, at impact or immediately following impact. Toxicology tests were carried out by the State Laboratory and were all negative except for 21 mg% of ethanol, slightly above a trace amount,[16] which was detected in the blood of the Pilot. No Ethanol was detected in his urine sample.

Ethanol is a compound produced by fermentation. The presence of ethanol may be due to direct consumption of alcohol, or may be attributable to a process of microbial fermentation, which can occur under certain conditions post-mortem.

1.13.2 Assault prior to the accident flight

The attack reported to the Investigation as a result of the personal assault on the Pilot were made known to the Pathologist. The Pathologist Report concluded that:

'*There is no evidence to suggest that there was significant injury arising from the assault which had any bearing on the Pilot's ability to fly the aircraft'.*

1.14 Fire

There was no fire.

[16] **Trace amount**: The State Laboratory considers amounts of ethanol up to 20 mg% as trace

1.15 Survival Aspects

The accident was not survivable. All aircraft safety harnesses were properly fastened and remained intact during impact. Due to the closure of the flight plan, it was many hours before a search for the aircraft was initiated. The wreckage was located at 09.10 hrs the following morning by the Glen of Imaal Mountain Rescue Team.

Article 19(2)(c) and Schedule 4 of the UK Air Navigation Order (2005) sets out specific equipment to be carried by non-public transport aircraft when flying over water. This equipment, detailed in Schedule KK to the Order, specifies that a Survival ELT or an Automatic ELT be carried and be capable of transmitting on 121.5 MHz and 406 MHz. However a general exemption (*No. 682*) was issued regarding this requirement from 28 April 2008 until 1 May 2009. In short, no ELT was carried or required to be carried by G-BGTJ.

1.16 Tests and Research

1.16.1 Global Positioning System (GPS)

The '*Garmin III Pilot*' GPS recovered from the accident site was noted to be in a damaged state. The external casing was distorted and this resulted in damage to the internal memory. The Investigation sought the expertise of the Bureau d'Enquêtes et d'Analyses (BEA)[17] to obtain data from the unit. The BEA Report stated that the GPS memory was de-powered during impact and, as the memory was volatile all data was lost. The report indicated that the internal batteries of the unit still contained charge.

1.16.2 Fuel Quality Tests

G-BGTJ was last fuelled by another pilot of the syndicate on 24 October 2008, the day before the accident. Two uplifts of Avgas 100LL were made during the day, one at 09.27 hrs for 59.58 litres, and a later uplift at 17.27 hrs for 143.32 litres. The latter uplift filled the fuel tanks to capacity. Storage checks, carried out by the Airport operator on a daily basis, revealed the colour and appearance of the storage tank in use (Tank No.1) to be '*bright and clear*' with no indication of the presence of free water or sediment. The time of the daily storage check by the Airport Operator (RFFS[18] Fuel Management) was 08.00 hrs.

1.17 Organizational and Management Information

The aircraft was operated by a syndicate of three pilots, two of whom had owned and flown the aircraft since July 1979. The Pilot of the accident flight had joined the other two syndicate members in 2001. To facilitate the group ownership, a limited Company was formed with the aircraft ownership registered in the name of that Company on 3 July 1979.

[17] **Bureau d'Enquêtes et d'Analyses (BEA)**: Accident Investigation Bureau of France.
[18] **RFFS**: Rescue and Fire Fighting Service.

1.18 Additional Information

1.18.1 The IMC Rating

An IMC Rating was held by the Pilot. This rating is particular to the UK licensing system and allows instrument flying privileges to the holder while operating in UK airspace with certain restrictions.

Flight training for the IMC Rating includes a minimum of 15 hours training in instrument flying of which a portion may be in an approved training device. The flight test takes approximately 1.5 hours and the candidate must demonstrate satisfactory manual instrument flying capability in full and limited panel instrument flying, use of Radio navigation aids, let-down and approach procedures and bad weather circuits.

1.18.2 Velocity Profile

The groundspeed profile of G-BGTJ was extracted from radar information recorded by Dublin ATC. This profile is reproduced in **Figure No. 3**. This graph shows the aircraft's groundspeed (kts) vs. distance flown (km) measured at 1 km intervals. The distance scale reflects the final 43 km the aircraft was in radar contact (direction of flight indicated). The data shows the aircraft groundspeed averaging 64 kts and varying between 84 and 42 kts over a distance of 29 km. The erratic groundspeed indicates gusty wind conditions. The Pilot's ATC flight plan showed an intended cruising speed of 110 kts (True airspeed).

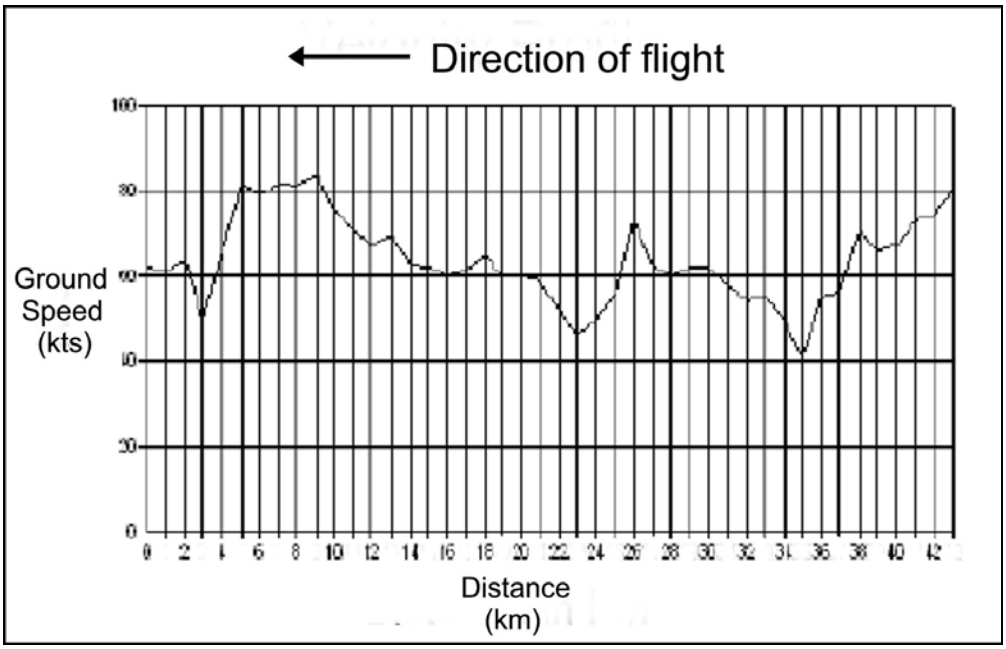


Figure No. 3: Profile of groundspeed (kts) vs distance (km)

1.18.3 Navigation documentation

The Investigation recovered the Pilot's flight bag, enroute charts and kneepad from the aircraft wreckage. The kneepad contained a sketched diagram of the route marked '*Glos-Kildare-Kilrush EGBJ-EIKH*[19]*,* with courses and distances indicated. A list of communication frequencies was made on the right-hand side.

The route plan drawn showed a direct routing over Caernarfon Airfield, in North Wales, across the Irish Sea direct to Killiney. From Killiney, a route was drawn direct to Kilrush, with a second routing via Baldonnel and Naas. The frequencies of all radio nav-aids were noted. Two Aeronautical charts[20] were carried. The 'Ireland' chart had tracks marked in blue similar to the drawing on the kneepad.

1.19 Useful or Effective Investigation Techniques

1.19.1 Pilot's Laptop

The Pilot's personal laptop was recovered from the wreckage. The laptop was examined by the Investigation primarily to check if any computer-based flight planning program was used in the planning of the flight. No such program was found. Inspection of the laptop did however show that the Pilot accessed the UK Met Office website on several occasions in the days prior to the accident as detailed in **Section 1.7 (**Meteorological Information).

[19] **EGBJ-EIKH**: ICAO 4-digit identifiers for Gloucestershire Airport and Kilrush Airfield.
[20] **Aeronautical charts**: 'Ireland', (2172 ABCD) 1:500,000 Edition 2, and 'Northern England and Northern Ireland', (Sheet 2171 AB) 1:500,000 Edition 23

2. ANALYSIS

2.1 Maintenance

The Investigation inspected the aircraft logbooks that were made available by the ownership syndicate. The Investigation noted that there was a 60 hour interval between the final two '50 hr' inspections performed on the aircraft. This is not considered relevant to the accident. Apart from this, it is apparent that the aircraft was well maintained in accordance with the CAA approved maintenance schedule.

2.2 Pilot Experience

As the Pilot had previously operated flights from Gloucestershire to Kilrush, it would be reasonable to assume he was familiar with the route and topography of the area where the accident occurred. The Pilot was experienced on the aircraft having logged 711 hours on G-BGTJ since he joined the syndicate in 2001. The statement made by his Flight Instructor indicates that inadvertent entry into cloud should not have been a major difficulty for the Pilot, considering his overall experience in the aircraft and confidence when flying in poor conditions.

2.3 Meteorology

With a filed departure time of 09.00 hrs, the Pilot had available to him the actual and forecast weather conditions for both Dublin Airport and Casement Aerodrome. The 08.00 hrs METAR (actual) report Dublin indicated southwesterly winds at 26 kts gusting to 41 kts, with visibility decreasing to 9,000 metres in light rain, cloud cover 'broken' at 2,200 ft. A SIGMET issued at 05.30 hrs on the day of the accident, specified severe turbulence forecast below FL060 and moving eastwards at 25 kts across Ireland. Two further SIGMETs were issued at 09.50 hrs and 12.30 hrs respectively.

In addition, the latest TAF (forecast) available, issued at 06.00 hrs, indicated that between 07.00 and 16.00 hrs winds would be 200 degrees at 22 kts gusting 33 kts with a temporary change (between 07.00 and 13.00 hrs) to 210 degrees, 26 kts gusting 44 kts. The forecast also indicated decreasing visibility to 5,000 metres in rain and drizzle with cloud cover lowering to 1,000 ft. The TAF for Casement Aerodrome, situated closer to his intended destination, was also available to the Pilot, and indicated similar conditions to those at Dublin Airport. Notwithstanding the information available in the self-brief facility, the Pilot could have telephoned the destination airfield and enquired as to the weather conditions prevailing close to the departure time. The Investigation found no evidence of any communication with Kilrush on the morning of the flight, nor did the Investigation locate any paperwork regarding meteorological information in the wreckage.

In the two days prior to the accident, the Pilot accessed the UK Meteorological Office web site on several occasions. It is clear he was monitoring the general weather situation several days in advance of the flight.

Prior to departure, the meteorological self-brief facility indicated that the weather in the area of the destination had strong winds, low cloud with rain and drizzle forecast. It was not possible to verify what weather briefing the Pilot obtained immediately prior to the flight. However considering the foregoing, it would seem that he was mindful of the general weather situation and is likely to have accessed the meteorological self-brief facility prior to departure. Irrespective of this, it appears that the Pilot did not fully appreciate the deteriorating en-route weather situation.

The decision to operate the flight may have been influenced by the moderate weather conditions at the departure airfield. However, as the aircraft took off from Gloucestershire, the forecast conditions in the area of the destination continued to deteriorate. The initial cruise portion of the flight would have been largely uneventful. When contact was made with Dublin ATC, no request was made by the Pilot regarding weather reports, although he may have accessed the Dublin ATIS[21] and VOLMET[22] automated broadcasts. Having flown across the Irish Sea and encountered worsening weather, the Pilot elected to continue on his planned route over mountainous terrain. As the Pilot was IMC qualified, he may have felt confident that he could continue the flight in safety should the aircraft encounter deteriorating weather.

When approaching the FIR boundary, the Pilot requested a further descent to 4,000 ft. The decision to descend may have been governed by strong headwinds or turbulence at the existing level. Descending to 4,000 ft only allowed approximately 1,000 ft of clearance with terrain as the Wicklow Mountains were crossed. This reduced the safety margin and may also have increased the turbulence experienced by the aircraft. The groundspeed velocity chart (**Figure No. 3**) indicates that the aircraft encountered significant winds and turbulence while approaching the Wicklow Mountains with groundspeed averaging 64 kts and reducing to 42 kts at one point. It is likely that this turbulence would have increased as the aircraft crossed the higher ground towards Kilrush. The aftercast obtained by the Investigation states that severe turbulence was likely and that conditions were likely to cause mountain wave activity, which can produce strong and sudden downdraughts. It is probable that the aircraft experienced such conditions.

2.4 Events after loss of Radar contact

When closing the flight plan the aircraft was at 4,000 ft on a westerly heading. Shortly after this the aircraft began a descent with the last radar contact indicating the aircraft at an altitude of 3,300 ft and maintaining a westerly heading towards Kilrush. The absence of further radar returns indicates that the aircraft descended and then remained at low level. With two witness reports of the aircraft in the minutes prior to the impact, and no accurate timings for these reports, it was not possible to re-construct the flight path of the aircraft between the last recorded radar position and the point of impact. Witness A reported hearing an aircraft heading east over his house, situated approximately 8 miles to the northeast of Kilrush.

[21] **ATIS**: Automatic Terminal Information Service.
[22] **VOLMET**: Meteorological information for aircraft in flight.

Terrain in the vicinity rises to an elevation of approximately 500 ft with rising terrain 3 miles to the east. This Witness, a pilot himself, confirmed that he heard no other aircraft operating in the area that day. Considering this, it is probable that the aircraft heard by Witness A was the accident aircraft. He estimated the cloudbase to be low at the time, approximately 500 ft. The time the aircraft passed overhead could not be determined but it is likely that this was the earlier of the two witness reports. Witness B, situated to the east of Corriebracks Mt, saw the aircraft low enough to make out the colours on the fuselage as it flew '*in and out of cloud'* on a southerly heading. The sighting by Witness B of the aircraft heading south probably occurred shortly prior to impact.

Shortly after the sighting by Witness B, it is probable that the aircraft carried out a downwind turn to the right. This turn is significant, as it placed the aircraft downwind in severe gusting conditions. It is also highly probable that windshear and severe turbulence were present in this area of mountainous terrain. If the turn was made quickly in these conditions, the effect of drag together with the changes in relative airflow, may have resulted in a substantial loss of lift across the wing precipitating an aerodynamic stall. Ultimately, the aircraft probably entered an aerodynamic stall downwind at a low airspeed. Recovery from such a stall was not possible in the height available.

2.5 Aircraft Performance

A light aircraft such as the PA 28-180 has adequate climb performance under normal flight conditions. It must be borne in mind that these performance capabilities can be negated in conditions of extreme weather especially when the aircraft is carrying a significant load. This significant load while decreasing the climb performance would also increase drag and the stalling speed. Therefore, operation of the aircraft in gusty and turbulent conditions with decreasing visibility would have become a difficult task for the Pilot.

2.6 Flight Planning

The flight documentation recovered from the aircraft included a kneepad with a sketch of a route to Kilrush via Killiney NDB and Naas. The route depicted on the aeronautical chart also reflected this route with several onward tracks marked from Killiney NDB. The route actually flown however, was quite different. As the ATC radar recording shows, the aircraft flew directly from Caernarfon towards Kilrush without the use of radio navigation aids, the Investigation is therefore of the opinion that the Pilot was navigating primarily by means of GPS. The fact that the aircraft was witnessed flying east away from his destination suggests that either the Pilot had lost situational awareness or that he was forced to turn around due to deteriorating visibility. In either case, as the aircraft was heading into an area of high ground with a strong tailwind in poor visibility, it is probable that the Pilot was unsure of his position. At the flight planning stage, it is essential that a log of the intended flight be prepared, with courses and distances indicated. Applying the actual wind will give an accurate time for each sector flown and an ETA[23] for each waypoint.

[23] **ETA**: Expected Time of Arrival.

This method also serves as a cross check on expected winds, for example failure to meet an ETA target might indicate unusually strong winds. Good log keeping, also allows an accurate assessment of the fuel situation. Should a diversion be necessary, the flight log would facilitate the planning of any diversion and 'bottom lines' regarding fuel reserves. Flight planning with due regard for destination, en-route and alternate weather is essential. In addition to any meteorological forecasting facility, there is usually opportunity for pilots to call ahead to the destination airfield and obtain the actual conditions when considering the safety of the flight. All Irish airfields have a requirement for pilots to obtain permission prior to operating a flight (PPR). This requirement allows airfield operators to advise pilots of potential hazards which may be encountered such as sudden flooding or even the temporary closure of the airfield for any reason. Navigation primarily by means of GPS in conditions of deteriorating visibility, can lead to a loss of situational awareness should the GPS cease to function for any reason. In this case the lack of a flight log with tracks and estimates for waypoints, would have contributed to a loss of situational awareness.

2.7 Flight Plan Closure

The Pilot reported no difficulties of any kind to Dublin ATC prior to closing his flight plan. It is not known why the Pilot chose to close the flight plan at that stage. With high ground in the area, he may have considered that R/T communication might be difficult following his descent into Kilrush. In any case the flight plan could have been closed by telephone with Dublin ATC once on the ground.

Earlier in the week, the Pilot contacted Kilrush and advised of his intention to fly into the airfield the following weekend. Although an ATC flight plan was filed for the flight, the Pilot did not advise Kilrush Airfield of the date or estimated time of his arrival (ETA), and therefore was not expected. In addition, having closed his flight plan during the flight, there was no longer a requirement for the Pilot to make telephone contact with ATC to confirm his safe arrival, nor was there a requirement for ATC to confirm his actual arrival at Kilrush. Had the flight plan remained open until landing, ATC would then have expected a telephone call to close the flight plan on arrival, failing to receive such a call would then have initiated an 'aircraft overdue' action by ATC within 30 minutes of the expected landing time. It is the choice of the Pilot-in-Command to file a flight plan or close a flight plan at any time when operating outside controlled airspace. In the case of the accident flight a flight plan was necessary due to the aircraft crossing an FIR boundary as it entered Irish airspace.

2.8 Medical and Pathological Information

The detection of 21 mg% of ethanol in the post-mortem blood of the Pilot is not of significance as this level is slightly above what is regarded by the State Laboratory as a trace amount (20 mg%). For comparison, under the Road Traffic Act, a blood/alcohol concentration above 80 mg% must be proven for driving offences. The Investigation notes that no ethanol was present in the urine sample of the Pilot. The trace of ethanol was probably due to microbial fermentation and occurred after death.

Regarding the personal assault on the Pilot the day before the flight, the Pathology Report found no evidence to suggest there was any significant injury arising from the assault, which would have affected the Pilot's ability to fly the aircraft. As indicated in the Avon and Somerset Constabulary Report, the Investigation accepts that the Pilot was suffering from some degree of shock as a result of the attack. The Investigation was unable to determine whether this had any bearing on the accident.

2.9 Impact Evaluation

Evidence at the accident site revealed the aircraft impacted in a nose-down attitude of approximately 40 degrees at a relatively low forward speed. The nose impacted first followed by the wing leading edges. After the initial impact the aircraft penetrated the water-soaked peat at a steep angle. Distortion of the engine bearer occurred at this point. The engine stopped under increased load during the final forward movement, bending the lower propeller blade tip rearwards. The absence of gross distortion of the fuselage indicates a relatively low impact speed. The lack of engine damage and the condition of the propeller indicates that the engine was under power at the time of impact. Detailed inspection of the airframe and engine at the AAIU facility at Gormanston did not reveal any defects that could have contributed to, or caused a loss of control leading to the accident. The direction of impact corresponded with the aircraft heading downwind. A rapid turn onto a downwind heading could have precipitated a stall, given the weather conditions pertaining at the time.

2.10 Summary

The flight was planned into weather conditions not conducive to safety. Approaching the Irish coast, the flight was continued on a direct track crossing mountainous terrain with a low margin of terrain clearance, given the prevailing conditions. At 24 nm to the destination, the aircraft descended and remained at a low level for the rest of the flight. Close to the destination, for reasons undetermined, the aircraft turned back towards the mountains. While attempting to remain in visual flight conditions at low level with reduced visibility, in mountainous terrain, it is probable that the Pilot lost situational awareness. Strong gusty winds and significant turbulence would have further added to the Pilot's difficulties. In addition, the lack of a plan supported by suitably marked charts and a flight log may have contributed to the loss of situational awareness in the final portion of the flight. Impact with the terrain occurred at 1,500 ft AMSL on a downwind heading of approximately 076° M in a nose-down attitude.

All available evidence points to the Pilot becoming disorientated while unable to locate the destination airfield whilst operating in difficult weather conditions. Manoeuvring in an area of strong turbulence with significant load, it seems probable that the aircraft entered an aerodynamic stall close to terrain, recovery from which was not possible in the height available.

3. CONCLUSIONS

(a) Findings

1. The Pilot was properly licensed.
2. The aircraft was properly registered in the United Kingdom.
3. The aircraft had a valid Certificate of Airworthiness at the time of the accident.
4. The aircraft was adequately maintained in accordance with an Approved Maintenance Programme.
5. The aircraft was loaded correctly in accordance with the PA 28-180 Flight Manual.
6. No defects were found with the aircraft or its powerplant that may have caused, or contributed to the accident.
7. The weather briefing facilities available to the Pilot at the departure airfield were adequate.
8. The weather conditions forecast for the East of Ireland at the time of the accident were not conducive to safe flight in a light aircraft such as the PA 28-180.
9. Adequate consideration was not given to the weather conditions in the area of the destination prior to undertaking the flight.
10. The Pilot did not advise Kilrush Airfield of the date or estimated time of arrival (ETA), and therefore was not expected.
11. The ATC flight plan was closed by the Pilot with Dublin ATC at 11.17:02 hrs while still airborne, and 24 miles from his destination.
12. The last radar contact was at 11.26 hrs when the aircraft was on a westerly heading at an altitude of 3,300 ft. This point is approximately 9 miles to the east of the accident site.
13. The aircraft was flown over mountainous terrain where severe turbulence and mountain wave activity were probably encountered.
14. It is probable that the Pilot lost situational awareness in the final stage of the flight, and flew towards high ground in conditions of poor visibility.
15. Impact evidence indicates a relatively low-speed impact in a nose-down attitude typical of a stall. The direction of impact corresponds with the aircraft heading downwind.
16. The aircraft was reported missing when a member of the pilot syndicate made enquires at the destination airfield on the evening of the accident.

(b) Probable Cause

That the aircraft entered an aerodynamic stall, close to terrain, recovery from which was not possible in the height available.

(c) Contributory Factors

1. The aircraft probably turned downwind prior to impact, in severe gusting conditions, which led to a significant loss of airspeed.

2. The aircraft was operating in turbulent, windy, and gusty conditions with significant downdraughts.

3. The aircraft was manoeuvring at low level with a low margin of terrain clearance.

4. A probable loss of situational awareness in the final stage of the flight, and flew towards high ground.

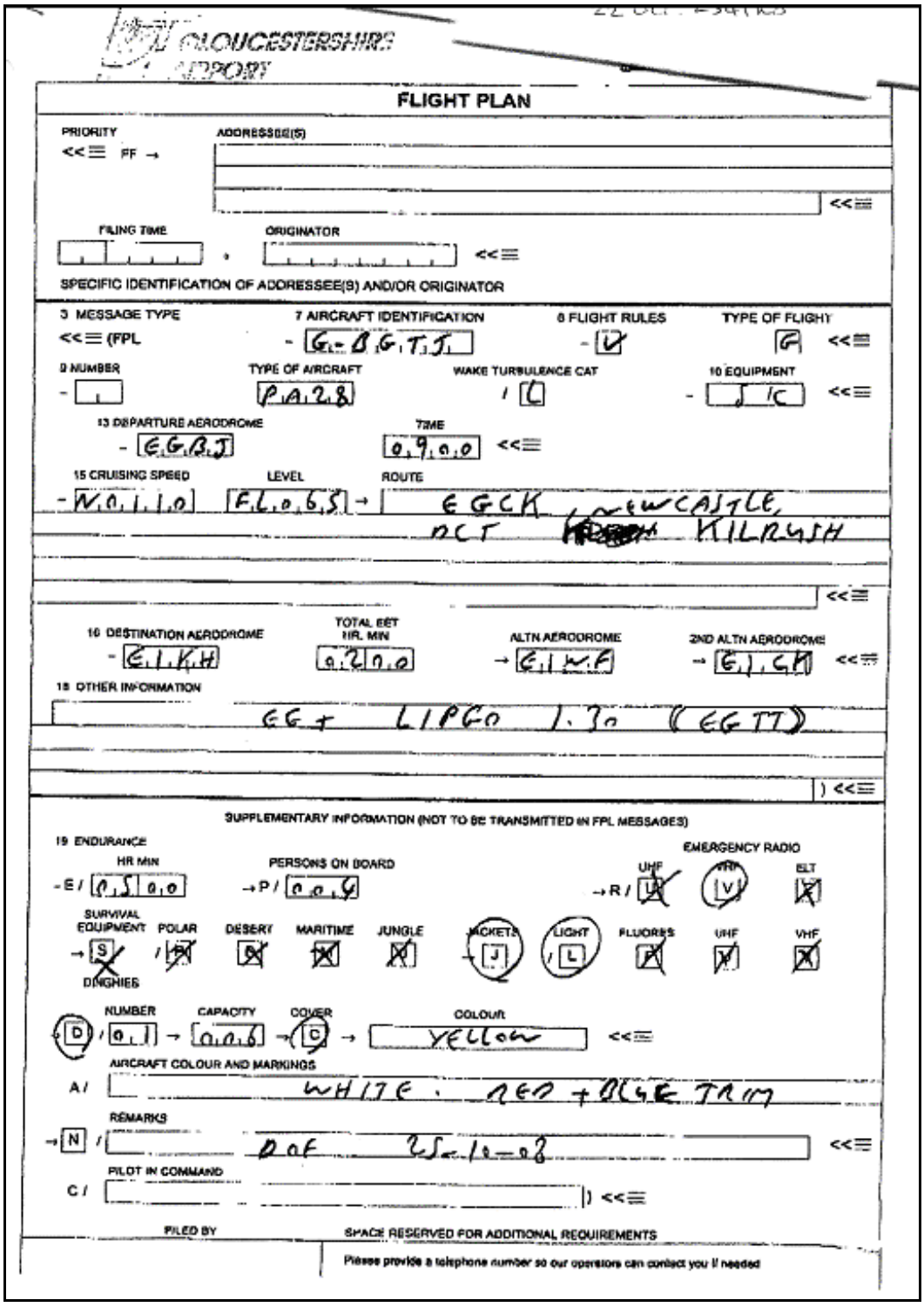
5. Inadequate flight planning contributed to the eventual loss of situational awareness.

4. SAFETY RECOMMENDATIONS

This Investigation does not sustain any Safety Recommendations.

Appendix A

ATC Flight Plan filed with Gloucestershire Airport



GLOUCESTERSHIRE AIRPORT

FLIGHT PLAN

PRIORITY << FF →

ADDRESSEE(S)

FILING TIME

ORIGINATOR

SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR

3 MESSAGE TYPE << (FPL

7 AIRCRAFT IDENTIFICATION - G-BGTJ

8 FLIGHT RULES - V

TYPE OF FLIGHT G

9 NUMBER - 1

TYPE OF AIRCRAFT PA28

WAKE TURBULENCE CAT / L

10 EQUIPMENT - S / C

13 DEPARTURE AERODROME - EGBJ

TIME 0900

15 CRUISING SPEED - N0110

LEVEL F065

ROUTE → EGCK NEWCASTLE, DCT KILRUSH

16 DESTINATION AERODROME - EIKH

TOTAL EET HR MIN 0200

ALTN AERODROME → EIWF

2ND ALTN AERODROME → EICM

18 OTHER INFORMATION

EGT LIPGO 1.30 (EGTT)

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)

19 ENDURANCE HR MIN - E / 0500

PERSONS ON BOARD → P / 004

EMERGENCY RADIO → R / UHF (U) VHF (V) ELT (X)

SURVIVAL EQUIPMENT → S / POLAR (X) DESERT (X) MARITIME (X) JUNGLE (X) DINGHIES

JACKETS (J) LIGHT (L) FLUORES (F) UHF (X) VHF (X)

DINGHIES (D) / NUMBER 01 → CAPACITY 006 → COVER (C) → COLOUR YELLOW

AIRCRAFT COLOUR AND MARKINGS A / WHITE. RED + BLUE TRIM

REMARKS → N / DOF 25-10-08

PILOT IN COMMAND C /

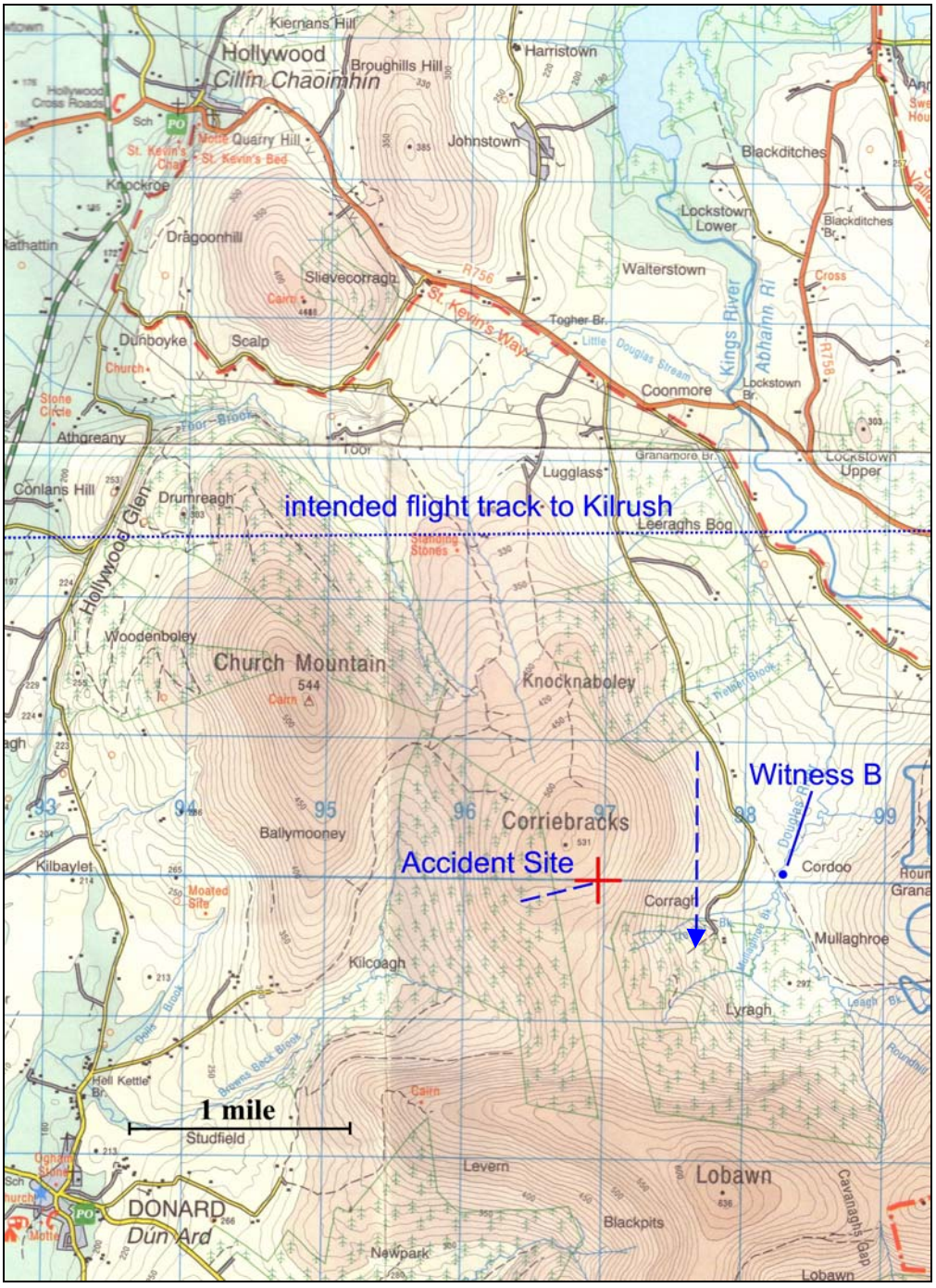
FILED BY

SPACE RESERVED FOR ADDITIONAL REQUIREMENTS

Please provide a telephone number so our operations can contact you if needed

Appendix B

Final witnessed flight path and accident site



(Based on *Ordnance Survey of Ireland* 1: 50,000)

Appendix C

Determination of baggage load G-BGTJ

The following baggage and other items were removed from the aircraft at the accident site and weighed. Due to some items being saturated with water, these weights were factored to 60% when wet, and 80% when damp. The total was corrected to the nearest 1 lb weight:

	Item:	Measured weight: (kg)		(lbs)	Condition:	Estimated dry weight (lbs):
1.	Large holdall bag:	21.75	=	47.95	(wet)	28.77
2.	Large soft holdall:	10.00	=	22.05	(wet)	13.23
3.	Jacket:	0.50	=	1.10	(dry)	1.10
4.	Leather jacket:	4.20	=	9.26	(wet)	5.56
5.	Holdall/red trim:	12.90	=	28.44	(damp)	22.75
6.	Backpack:	2.80	=	6.17	(damp)	4.94
7.	First Aid box:	1.25	=	2.76	(dry)	2.76
8.	Green holdall:	2.90	=	6.39	(damp)	5.11
9.	Flight bag:	1.20	=	2.65	(dry)	2.65
10.	Backpack:	3.95	=	8.71	(damp)	6.97
11.	Handbag:	4.25	=	9.37	(wet)	5.62
12.	High-vis tabards:	0.75	=	1.65	(wet)	0.99
	Total:	66.45 kg		146.5 lbs		100.45 lbs

Weight and Centre of Gravity calculations:

	weight (lbs)	**arm** (inches)	**moment** (lb/inches)
Basic empty weight:	1,405	85.8	120549
Pilot:	198	80.5	15939
Front passenger:	184	80.5	14812
Rear passenger 1:	131	118.1	15471
Rear passenger 2:	121	118.1	14290
Baggage:	100	142.8	14280
Oil:	14	27.5	385
Fuel:	294	95.0	27930
At take-off:	= 2,447	91.4	223656
Max take off weight:	(2,450)		
Estimated fuel used:	-144		
At time of accident:	= 2,303	91.2	209976

Appendix D

Transcript of communications between G-BGTJ and Dublin ATC (Executive Controller, North Sector) on frequency 129.175 MHz between 10.12 hrs and 11.18 hrs UTC on 25 October 2008.

Time:	From:	To:	Transcript:
10.12:29	G-BGTJ	ATC	'Dublin, Golf Bravo Golf Tango Juliet'.
10.12:34	ATC	G-BGTJ	'Golf Bravo Golf Tango Juliet Dublin good morning, squawk zero four zero two, copy QNH one zero one four'.
10.12:41	G-BGTJ	ATC	'[garbled] squawk zero four zero two and the QNH is one zero one four, Golf Tango Juliet.'
10.13:43	ATC	G-BGTJ	'Golf Bravo Golf Tango Juliet I have radar contact, confirm VFR'
10.13:47	G-BGTJ	ATC	'VFR Golf Tango Juliet'
10.13:49	ATC	G-BGTJ	'Roger and your current altitude or flight level ?'
10.13:51	G-BGTJ	ATC	'Ah, flight level six five, Golf Tango Juliet'
10.13:54	ATC	G-BGTJ	'Roger Tango Juliet, not above flight level six five and call me by the boundary'
10.13:57	G-BGTJ	ATC	'Flight level six five and call you at the boundary, Golf Tango Juliet'
10.48:18	ATC	G-BGTJ	'Golf Tango Juliet adjust to flight level six zero please'
10.48:21	G-BGTJ	ATC	Eh, descending to flight level six zero Golf Tango Juliet
10.49:23	G-BGTJ	ATC	'Level six zero and eh, approaching the FIR boundary, and when permitted request to further descend to flight level four zero, Golf Tango Juliet'
10.49:21	ATC	G-BGTJ	'Golf Tango Juliet descend to four thousand feet, Dublin QNH is one zero one four'

Time:	From:	To:	Transcript:
10.49:36	G-BGTJ	ATC	'Eh, descending to four thousand feet on one zero one four Golf Tango Juliet'
10.53:17	G-BGTJ	ATC	'Eh, Dublin Golf Tango Juliet four thousand feet, one zero one four, has just crossed the boundary'
10.53:22	ATC	G-BGTJ	'Thank you, Tango Juliet report the coast inbound and maintain VFR'
10.53:26	G-BGTJ	ATC	'Maintain VFR and report em, coasting in, Golf Tango Juliet'
11.10:03	G-BGTJ	ATC	'Dublin Golf Tango Juliet is coasting in at Newcastle'
11.10:05	ATC	G-BGTJ	'Roger Golf Tango Juliet, report closing your plan at Kilrush'
11.10:08	G-BGTJ	ATC	'Wilco Golf Tango Juliet'
11.16:57	G-BGTJ	ATC	'Dublin… Golf Tango Juliet'
11.17:00	ATC	G-BGTJ	'Golf Tango Juliet go ahead'
11.17:02	G-BGTJ	ATC	'Yeah, two four miles to run to Kilrush, request to continue own nav to Kilrush, one two three decimal four two, and eh squawk seven thousand and eh, if I ask you to close our flight plan please Golf Tango Juliet'
11.17:13	ATC	G-BGTJ	'Roger Golf Tango Juliet, plan closed one one seven, bye bye'
11.17:16	G-BGTJ	ATC	'Golf Tango Juliet thank you, bye bye'

Appendix E

Relevant cockpit indications and settings, G-BGTJ

Horizontal Situation Indicator (HSI):	hdg 065° M, course 262° M, bug 225° M, nav and power flags
Tachometer:	2,220 RPM, 6713.87 hours
Com 1:	set to 123.42 MHz (Kilrush Airfield 123.425 MHz) G-BGTJ was not equipped with 8.33 kHz channel spacing hence the slightly different frequency set)
Com 2:	set to 129.17 MHz (Dublin ATC, North sector 129.175)
Nav 1:	set to 115.80 MHz (Baldonnel VOR)
Nav 2:	set to 115.80 MHz (Baldonnel VOR)
Transponder:	set to 7000, ALT (General VFR setting, Altitude Indicating)
ADF receiver:	set to 278 kHz (placarded as unserviceable)
DME:	set to Nautical Miles, 115.80 MHz (Baldonnel VOR)
Pitot Heat:	on

- END -