AIRCRAFT ACCIDENT REPORT 1/82

Accidents Investigation Branch

Department of Trade

Report on the accident to Pilatus PC-6/B2-H2 Turbo Porter G-BHCR at Peterborough (Sibson) Aerodrome, on 15 February 1981

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List of Aircraft Accident Reports issued by AIB in 1981/1982

No	*Short Title*	*Date of Publication*
11/81	Piper PA 31–112 Tomahawk G–BGGH Wood Farm, Kiddington, Oxfordshire May 1980	February 1982
1/82	Pilatus PC–6/B2–H2 Turbo Porter G–BHCR Peterborough (Sibson) Aerodrome February 1981	

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Department of Trade
Accidents Investigation Branch
Kingsgate House
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8 February 1982

The Rt Honourable John Biffen MP
Secretary of State for Trade

Sir

I have the honour to submit the report by Mr C C Allen, an Inspector of Accidents, on the circumstances of the accident to Pilatus PC–6/B2–H2 Turbo Porter G–BHCR which occurred at Peterborough (Sibson) Aerodrome, on 15 February 1981.

I have the honour to be
Sir
Your obedient Servant

G C Wilkinson
Chief Inspector of Accidents

Aircraft Accident Report No 1/82
(EW/C732)

Operator:		Peterborough Parachute Centre Ltd
Aircraft:	*Type:*	Pilatus PC–6/B2–H2 Turbo Porter
	Nationality:	United Kingdom
	Registration:	G–BHCR
Place of Accident:		Peterborough (Sibson) Aerodrome 52° 33′ N 00° 23′ W
Date and Time:		15 February 1981 at about 1450 hrs All times in this report are GMT.

Synopsis

The accident was notified to the Accidents Investigation Branch by the London Air Traffic Control Centre at 1515hrs on 15 February 1981 and the investigation was commenced the same day.

The aircraft was making a parachuting flight in fine weather and was being flown by a pilot who held a Private Pilot's Licence. Almost immediately after becoming airborne the pilot found he had to use both hands on the control column to counter a strong nose-up out of trim force. The aircraft gained about 250 feet in a semi-stalled condition, then yawed to the left and lost height until it struck the ground, suffering serious damage but not catching fire. Three of the nine parachutists on board received serious injuries and the other occupants received minor injuries.

The report concludes that the accident was the result of loss of control of the aircraft following a take-off with an incorrect horizontal stabiliser trim setting. Contributory factors were the incorrect loading of the aircraft, the difficulty of re-trimming the horizontal stabiliser rapidly and an inadequate standard of aircraft operation.

1. Factual Information

1.1 History of the flight

The aircraft was owned and operated by the Peterborough Parachute Centre (PPC) for the purpose of dropping parachutists. On the day of the accident it was flown exclusively by the same pilot. Some flights were devoted entirely to a group of trainees under the control of a jumpmaster and others to a load of experienced parachutists with no jumpmaster. During the morning the aircraft made 10 short parachuting flights. The procedure followed was that after each landing the aircraft was taxied to an emplaning point where the next group of parachutists boarded. The pilot stated subsequently that it was his practice to carry out the Before Take-off checks while at the emplaning point, including setting the flaps to the 'take-off' setting (28°) and moving the horizontal stabiliser trim from the 'approach' position of full nose-up to the full nose-down position which he had found it necessary to use for take-off.

After a break for lunch another series of parachuting flights was undertaken. On the first of these, 10 parachutists were carried. The pilot reported that no difficulty in handling the aircraft was experienced. After 3 more uneventful flights the aircraft taxied to the emplaning point at about 1445 hrs, where 9 parachutists boarded.

The pilot stated that to the best of his recollection he carried out the Before Take-off checks, as usual, at the emplaning point. He taxied on to runway 25 and started his take-off run at about 1450 hrs. The pilot subsequently stated that he did not notice the unstick speed but that it was normally about 40 knots. All seemed normal until just after the aircraft left the ground when the stall warning horn sounded and he suddenly realised that he was holding a strong push force on the control column and that he needed both his hands for this task. He shouted to the parachutist sitting alongside him to 'move the trim on the roof' because he assumed that a mis-set stabiliser trim was the problem; however his call was not understood. He believes that, at this time, he did not try to move the horizontal stabiliser trim himself because he was absorbed with attempting to control the aircraft's pitch attitude. However, as the aircraft passed over a copse of trees at the upwind end of the runway he took his right foot off its respective rudder pedal and applied it to the control column while now attempting to re-trim the horizontal stabiliser with his right hand. He believed he had not succeeded in moving the stabiliser trim at all, as the aircraft promptly yawed left about 70° and started to sink; however, two of the parachutists confirmed that he had operated the trim control an appreciable amount. At this point the airspeed indicator was reading about 40 knots and the stall warning system was still operating. The pilot stated that, as the aircraft yawed, he returned his right foot to its rudder pedal. The aircraft seemed to him to be completely stalled; it struck the ground in a steep descent and stopped without any ground run. He recalled nothing further until he found himself standing alongside the crashed aircraft watching the last person being helped out.

Additional evidence concerning the short flight was provided by two of the parachutists who had been on board. This was to the effect that the aircraft left the ground at about 55 knots, that the stall warning operated intermittently at first and then continuously, and that at one stage the pilot had indicated that he wanted those on board to move further forward. However, this had proved difficult because of the steep nose-up attitude assumed by the aircraft as it climbed to a height estimated at about 250 feet and because the parachutists

were already close together. One of the parachutists subsequently saw the pilot maintaining the control column fully forward as the aircraft lost height, in apparently stalled flight, until it struck the ground. Following the impact, those on board were able to free themselves or were extricated by their uninjured colleagues.

1.2 **Injuries to persons**

Injuries	*Crew*	*Passengers*	*Others*
Fatal	0	0	0
Serious	0	3	0
Minor/None	1	6	—

1.3 **Damage to aircraft**

The aircraft sustained extensive damage to the forward fuselage and the engine separated from the airframe. The main landing gear was collapsed and the right wing detached at the root. Both elevator tips suffered downwards bending and the horizontal stabiliser attachment points and local structure suffered distortion as a result of the impact.

1.4 **Other damage**

There was no other damage.

1.5 **Personnel information**

Pilot:	Male, aged 27
Licence:	Private Pilot's Licence, endorsed for land-planes groups A and B
Medical certificate:	Last medical on 22 May 1979, Class 3, no restrictions
Company check:	Last test on PC–6 was on conversion to type on 22 January 1981. Last test on Britten-Norman Islander was on 6 January 1981
Total pilot hours:	580
Total hours on PC–6:	21.30
Total hours in last 28 days:	36.05
British Parachute Association authorisation to drop parachutists:	Authorised for Cessna 172, 185 and 206 types on 11 April 1980. Authorised for BN Islander and Pilatus PC–6 on 2 February 1981.

1.6 Aircraft information

1.6.1 *Leading particulars*

Type:	Pilatus PC–6/B2–H2 Turbo Porter
Registration:	G–BHCR
Manufacturer:	Pilatus Flugzeugwerke AG, Switzerland
Date of Manufacture:	1970
Manufacturer's serial Number:	732
Certificate of Airworthiness (C of A):	
Category:	Private
Issued:	7 December 1979
Valid to:	6 December 1982
Registered owner:	Peterborough Parachute Centre Ltd since September 1979
Engine:	One Pratt and Whitney Type PT6A–27
Propeller:	Hartzell HC–B3–TW–3D
Total airframe hours:	3,570
Maintenance:	Was in accordance with the Approved Maintenance Schedule No CAA/LAMS/FW/ 1978. The last Check Certificate was issued on 17 January 1981 at 3545-50 total aircraft hours and was valid for 50 flying hours
Maximum authorised weight:	4,850 lbs (2,200 kg)
Estimated take-off weight:	5,222 lbs (2,369 kg)
Centre of gravity limits:	Forward limit: 8.2 ins aft of datum at 3,200 lbs (1,451 kg) or less Forward limit: 18.7 ins aft of datum at 4,850 lbs (2,200 kg) Aft limit: 25.44 ins aft of datum at all weights, with straight line variation between points given

Centre of gravity at take-off (estimated):	27.28 ins aft of datum
Type of fuel:	Jet A–1

The aircraft's refuelling log had been maintained by the pilot since 22 December 1980. In the place where the name of the person refuelling the aircraft was required to be entered the pilot had written his first name only. The log had been completed in pencil since 31 December 1980 and all 9 entries for 1981 were incorrectly dated 1980.

1.6.2 *Elevator and pitch trim system*

The aircraft has a manually controlled elevator operated by cables and push-pull rods from the control column. Pitch trim is achieved by varying the incidence of the horizontal stabiliser through the rotation of a crank positioned on the cockpit roof on the centreline of the aircraft. This crank has a range of 19½ turns (clockwise as viewed by the pilot) from the full nose-down trim position to the full nose-up position. A trim position indicator adjacent to the handle is calibrated linearly from 7 divisions nose-up , through zero, to 5 divisions nose-down.

1.6.3 *Climbing and stalling speeds*

The following data is extracted from the aircraft's Flight Manual, as applicable to a gross weight of 4,850 lbs (2,200 kg):

Recommended normal climb speed (take-off power, flaps 28°)	56 knots IAS
Recommended climb speed for maximum performance (take-off power, flaps 28°)	45 knots IAS

Note: The manufacturer states that the aircraft must be flown accurately if the aircraft is climbed at the maximum performance climb speed.

Stalling speed (power off, flaps 28°, wings level)	45 knots IAS

Note: The stalling speed with power on is not given, but will be a lower value.

1.7 Meteorological information

No meteorological observations are made at Peterborough (Sibson) Aerodrome. An aftercast obtained from the Meteorological Office, Bracknell, assessed the weather at the time of the accident as follows:

'General situation	Ridge extending westwards over the southern half of UK from an anti-cyclone centred over North Germany.
Surface wind	Southwesterly 3 to 6 knots

Visibility	3,000 to 5,000 metres
Weather	Smoke haze
Cloud	Virtually nil and certainly no low cloud
Surface temperatures	Dry bulb 4° C Dewpoint –2° C
MSL pressure	1,023 mb.'

1.8 Aids to navigation

Not relevant.

1.9 Communications

The aircraft was in contact with Sibson Radio on the Peterborough (Sibson) Aerodrome Air/Ground frequency of 122.3 MHz when it took off at about 1450 hrs, and no further message was received from the aircraft.

1.10 Aerodrome and ground facilities

Peterborough (Sibson) is a grass aerodrome operated by the Peterborough Aero Club, which is also used by the PPC, who are based there. The airfield is 100 feet above mean sea level (amsl) and runway 07/25 is 724 metres x 74 metres.

1.11 Flight recorders

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder, nor were these required to be fitted.

1.12 Wreckage and impact information

The aircraft had descended with little or no forward speed to crash on a heading of 180° across a hedge and ditch separating a field from the grass verge of a road. The impact attitude was slightly nose-down with wings level, causing significant damage to the forward fuselage, collapsing the main landing gear and virtually separating the engine from the airframe. The right wing had detached at the root fittings and came to rest propped up in the hedge ahead of the fuselage. The left wing remained attached and appeared undamaged. The mass balance weights of both elevators had caused downward bending of both elevator tips during the impact. The stabiliser attachment points and local structure had suffered distortion. The nature of this distortion, along with the right wing detachment and throw, was indicative of the aircraft yawing to the left at impact.

The propeller exhibited damage consistent with rotating under power at impact.

Approximately 30 gallons of kerosene were removed from the left wing fuel tank, whereas the right tank had been holed and only a few pints of fuel remained.

The left flap remained extended to approximately the 30° position, the right flap was free to move following flap control linkage failure when the right wing detached from the fuselage.

Examination of the flap actuator confirmed that 'take-off' flap had been extended at impact.

Detailed examination of the structure and flying controls revealed only damage consistent with the ground impacts.

1.13 Medical and pathological information

There was no evidence that any medical condition contributed to the accident.

1.14 Fire

There was no fire.

1.15 Survival aspects

All the occupants of the aircraft survived the accident.

Peterborough (Sibson) Aerodrome was equipped with a Landrover fire/crash vehicle operated by the Peterborough Aero Club Ltd. The PPC owned a wheeled 50 kg dry powder extinguisher capable of being towed by their Mini Minor van, which in addition carried two small dry powder extinguishers and one CO_2 extinguisher.

The crash site was on the verge of a road ½ kilometre from the airfield buildings. An alarm was raised just after 1450 hrs by observers on the airfield who saw G–BHCR lose height and disappear soon after take-off.

The Mini Minor van towing the wheeled extinguisher got away promptly, closely followed by the PPC's Managing Director and two other members in a car. On arrival they found that all 10 occupants were out of the aircraft, having either freed themselves or been helped out by their uninjured colleagues. There was no fire, but smoke was coming from the aircraft's engine bay and so the dry powder extinguisher was employed to spray this area.

The Aerodrome Manager and an assistant manned the Landrover but could not start it. After about 3 to 4 minutes attempting normal starting procedures they managed to start it by towing it behind a car. On arrival at the crash site they found all the aircraft occupants were clear.

Passing motorists also stopped and gave assistance. Police, fire and ambulance service vehicles were on the scene soon after the accident and all the aircraft's

ten occupants were taken to hospital in Peterborough. Of these, three were detained with serious injuries, the remainder sustaining only minor injuries.

1.16 Test and research

The manufacturer provided the following information, gained from flight tests, relevant to elevator control forces:

Aircraft weight:	5,520 lbs (2,504 kg)
C of G:	25.5 ins aft of datum
Trim:	Full nose-up
Flaps:	38°
IAS:	60 knots
Power:	Maximum
Required control force:	250 to 300 n (25 to 30 kg) push.

The manufacturer added that this condition was the closest available to those which obtained on the accident flight. However, it was considered that greater stick forces would be required at lower airspeeds and with more aft positions of the C of G.

1.17 Additional information

1.17.1 Aircraft load control

Neither the PPC nor the pilot had any effective system of weight and C of G control for the PC–6 aircraft operation. Each load of parachutists were manifested by name only and no account was taken of their weights, nor of the gross weight of the aircraft for each flight. The pilot has stated that it was not his practice to count the number of persons boarding the aircraft and he did not do so on the accident flight.

On at least one flight earlier on the same afternoon the aircraft took off with a heavier fuel load and 10 parachutists on board. The take-off weight would therefore have been greater than on the accident flight and its C of G further outside the aft limit.

1.17.2 Aircraft stabiliser trim information

The aircraft's manufacturer has stated that the correct horizontal stabiliser setting for take-off at the maximum gross take-off weight of 4,850 lbs (2,200 kg), with the C of G at the aft limit of 25.44 ins aft of the datum, is the zero setting and that this setting allows full control for take-off at any permitted weight and C of G position.

The pilot stated that on a previous occasion he had carried out a take-off in G–BHCR with the horizontal stabiliser trim inadvertently set at the fully nose-up position, when carrying a load of between 7 and 9 parachutists (he could not recall the number exactly, nor the fuel load). The stick force was high but he was able to control the aircraft's attitude by operating the control column with his left hand whilst re-trimming with the right.

He also stated that during his conversion to the PC–6 he had carried out an overshoot initiated with the aircraft in the approach configuration and with the trim fully nose-up.

1.17.3 *Parachuting approval*

The aircraft is approved by the manufacturer and by the UK Civil Aviation Authority (CAA) for parachuting operations subject to certain conditions being complied with. The conditions relevant to this accident were stated in a supplement to the approved Pilatus PC–6/B2–H2 Flight Manual issued by the Swiss Federal Air Office, as follows:

> '8. During parachuting and supply dropping through an open or removed cabin door, the following shall apply:
>
> (k) All occupants, including pilot, must wear parachutes.
>
> (l) Number of occupants: maximum 8, excluding pilot. (Weight and C of G location with limits)'.

The Managing Director of the PPC was not aware of these limitations. The pilot stated that he thought they only applied within Switzerland. Both believed that 10 parachutists could legally be carried, as this was the maximum number of passengers permitted on transport flights.

The pilot was not wearing a prachute and said that he had ordered one at his own expense, but it had not yet been delivered. The Managing Director of the PPC stated that two parachutes were available for the use of pilots; however, the pilot was apparently not aware of this.

1.17.4 *Control of sporting parachute operations in the UK*

Article 39(2) of the Air Navigation Order (ANO) 1980, makes parachuting from civil aircraft in the United Kingdom illegal except in an emergency. The CAA therefore issues an Exemption from this Article (see Appendix 1), in accordance with its powers under Article 91 of the ANO, to enable clubs and Display Teams to train and carry out the sport of free fall parachuting within the United Kingdom. The Exemption covers all Articles of the Order and all the Regulations which apply to the public transport of passengers. The PPC possessed the required Exemption at the time of the accident. The CAA have stated that it is their policy to encourage the national associations of the various sporting activities within General Aviation to organise and control their own club activities and that the Authority's policy is one of a light regulatory touch. In respect of parachuting, the CAA therefore receives guidance and expert advice from the British Parachute Association Ltd (BPA), who employ a full time National Coach and Safety Officer. The CAA do not themselves inspect parachuting clubs or monitor standards of the operation of their aircraft.

The BPA, in its Regulations, prescribes Minimum Standards, Operational Procedures and Safety Regulations for BPA member clubs. The Regulations also postulate minimum qualifications for pilots who wish to fly parachute dropping sorties and call for their names to be registered with the BPA. They also define which aircraft may be used for parachuting and how they shall be prepared (see Appendix 2).

Since the accident, the CAA has arranged with the BPA that the latter shall, in co-operation with the CAA, produce an Operations Manual.

The BPA's National Coach and Safety Officer carries out biennial checks on parachute clubs. He is a highly experienced parachutist, not a pilot, and his checks are mainly, but not exclusively, concerned with the *parachuting* aspect of the total activity of carrying and dropping parachutists. The BPA state that the PPC was checked in April 1980, shortly after the accident, and graded as satisfactory in all respects. No check was carried out in the period that the PC–6 was in operation at the PPC.

The BPA also state that senior officers of the Association, who are qualified pilots, undertake spot checks on parachute clubs.

1.17.5 *Standard of flying operations at the PPC*

The pilot was converted to the Pilatus PC–6 type on 22 January 1981 by a professional pilot who had himself undergone a comprehensive course of training on the PC–6 at the manufacturer's base and who held a Commercial Pilot's Licence with single and multi-engine instructor's ratings. This instructor stated that he was retained by the PPC to supervise the training and currency of their pilots on their PC–6 and Britten-Norman Islander aircraft and to give the PPC advice as requested on matters concerning the operation of their aircraft. The Managing Director of the PPC described this instructor as the 'Chief Pilot' and stated that his responsibilities were to check out any new pilot and occasionally to fly the PPC aircraft as a relief pilot. The Managing Director added that the 'Chief Pilot' was not responsibile for the standard and control of the flying operations on a day to day basis, each pilot being responsible for his own flying operations, subject to the Managing Director's overall decision whether flying was to take place or not. At the time of the accident the pilot of the PC–6 was the only full time pilot employed by the PPC and had worked at the centre for 3 months. There were two other part time pilots.

The BPA Regulations (see Appendix 2) state in part: 'The pilot is responsible for the loading of the aircraft and must satisfy himself that the payload for each lift is within the limits allowed as stated in the Weight Schedule for the aircraft.'

The pilot's flight training on the PC–6 consisted of 3 hours' dual instruction in three sorties. It included two parachutist dropping flights and was apparently a comprehensive exercise. The instructor stated that, a week prior to the flight training, he ensured the pilot had a copy of the aircraft's Flight Manual and also a copy of a booklet issued by the manufacturer of the aircraft's engine entitled 'Status and Information Report PT6 and ST6 Gas Turbine Engines 1978'. This was a sales information brochure, not an instructional manual and contained only limited technical information.

The instructor stated that on 21 January he made sure that the pilot had read these two documents and knew the pertinent points about the aircraft and its engine. He further stated that he showed the pilot around the aircraft and also showed him a pre-flight inspection.

Following the accident the pilot was questioned regarding his knowledge of the PC–6. Of particular relevance to the accident, he believed that the horizontal stabiliser trim control required 6 full rotations to move from full nose-up to full nose-down whereas the figure was 19½, and that 10 parachutists could legally be carried instead of the 8 prescribed in the Flight Manual.

1.17.6 *Changes in operating procedures of the PPC following the accident*

Since the accident the Managing Director of the PPC has instituted a number of changes designed to improve the standard of flight operations at the Centre.

1.17.7 *Previous accidents involving aircraft engaged in parachuting operations*

An accident occurred on 2 July 1980 to an Edgar Percival EP9 aircraft near Ashford, Kent. The report on the accident (Aircraft Accident Report No 6/81) concluded that the accident was caused by the aircraft stalling at a height from which recovery was impossible. Water contaminated fuel and the absence of the mandatory stall warning system were probable contributory factors.

This was the first fatal accident in the UK involving an aircraft engaged in parachuting operations in the 19 years since the formation of the BPA and also the first fatal accident (concerning the operation of the aircraft) in the history of UK sport parachuting. There was an accident to a Cessna Skylane in October 1975, in which two occupants were seriously injured, but there is no indication that aircraft operating standards were involved.

2. Analysis

2.1 General

From the available evidence, there is no doubt that control of the aircraft was lost to the extent that the aircraft ultimately reached a stalled condition, in which it descended until it struck the ground.

Subsequent detailed examination of the aircraft did not reveal any technical defect which could have given rise to the excessive forces described by the pilot as being required to maintain control in the pitching plane. It might, therefore, have been considered that the excessive out of trim moment was due solely to the inadvertent mis-setting by the pilot of the horizontal stabiliser trim, as he himself believed at the time of the flight. However, the pilot subsequently stated that he had, on a previous occasion, taken off with the trim inadvertently set fully nose-up and that on that occasion he was able to control the aircraft's attitude in pitch with one hand on the control column whilst he re-trimmed the aircraft with the other. It must therefore be concluded that on the accident flight, the aircraft was not only grossly mis-trimmed in the nose-up direction, but its C of G was probably further aft than on the previous, mis-trimmed, flight. In this connection it is noteworthy that on the accident flight the aircraft's C of G was well outside the permitted aft limit; this was associated with the fact that the aircraft was some 370 lbs (168 kg) overweight.

Earlier that afternoon, the same pilot had successfully completed a flight with the aircraft loaded to an even higher weight and with its C of G even further aft. It must be concluded that on that occasion the stabiliser trim was probably set at the fully nose-down position which the pilot said he had 'found it necessary' to use for take-off and that with this setting the aircraft could be handled satisfactorily, even though its C of G was well outside the aft limit.

On the accident flight, with the stabiliser trim set, almost certainly, fully nose-up and at an extreme aft C of G, it is not surprising that the aircraft showed a strong nose-up tendency immediately after take-off. The tests undertaken by the manufacturer, although made with the aircraft loaded to a more forward C of G than on the accident flight, demonstrated a control force requirement of 25-30 kg at 60 knots airspeed. Moving the C of G further aft and reducing the airspeed, as must have been the case on the accident flight, would in each instance tend to increase the control force required to prevent the nose rising and the airspeed decaying even further.

By the time the pilot removed his right foot from its rudder pedal, the aircraft was no doubt at an exceptionally low speed and diverging directionally, with the result that the aircraft yawed and then stalled at a height such that recovery was impossible. Due to the brevity of the flight and the proximity of the ground, it would have been impracticable for any of the occupants to escape from the aircraft using their parachutes.

2.2 Horizontal stabiliser trim

The gearing of the pitch trim (ie horizontal stabiliser) control on Pilatus PC–6 aircraft is such that it is impossible to make significant changes of trim rapidly. Thus the pilot was unable to correct for the grossly mis-trimmed stabiliser before

he lost control of the aircraft. Had the pitch trim been electrically operated, or had the manual trim been positioned so as to work in the natural, fore and aft, sense with a higher gearing, quick re-trimming would have been facilitated. However, it must be said that on the PC–6 there is no requirement in normal circumstances for a sudden large pitch trim correction, and that this should never have been necessary had the aircraft trim controls been set correctly prior to take-off.

2.3 The standard of the PPC flying operations

The Managing Director of the PPC stated that he had always tried to maintain as high a standard of flying as that of parachuting and, indeed, there was no evidence to suggest that the parachuting part of the PPC's activities was conducted to other than a high standard. Prior to the subject accident, the PPC had held an excellent safety record. However, during the investigation, certain deficiencies in the standard of operation of the PC–6 became apparent, for example:

(i) No effective system of aircraft load and balance control was exercised either by the pilot, the Managing Director or other personnel of the Centre.

(ii) Neither the pilot nor the Managing Director appreciated that the maximum number of occupants during parachuting flights was limited to 8, excluding the pilot and that all occupants must wear parachutes. Up to 10 parachutists had regularly been carried; and the pilot did not wear a parachute as required by the conditions of the aircraft's Flight Manual.

(iii) The pilot displayed an inadequate knowledge of the aircraft. In particular, he was unaware of some of the operating limitations in the Flight Manual and he believed that the horizontal stabiliser trim required 6 full turns to move over the full range of movement, whereas, in fact, it needed nearly 20 revolutions.

(iv) The refuelling record for the PC–6 was not maintained to a satisfactory standard.

These shortcomings indicate a lack of supervision on the flying side of the operation. It is clear that the instructor, or so-called 'Chief Pilot', was in no way intended to be responsible for the day to day operation of the PPC aircraft. The Managing Director, a highly experienced parachutist but not a pilot, left this to the individual pilots, of whom the pilot involved in the accident was the only one in full time employment with the PPC. Although the BPA Regulations make clear that each pilot is responsible for the proper loading of his aircraft, in this instance further supervision was demonstrably needed in order to ensure that the overall operation was conducted to a safe standard.

It might have been expected of a pilot of over 500 hours flying experience that he would have conducted his flying in a responsible manner, if only from an instinct for self-preservation. However, it is quite clear from the evidence that he did not do so. On the accident flight, only by good fortune and the excellent slow flying qualities of the PC–6 were 10 fatalities avoided.

2.4 Control of Parachuting Club flying operations

The CAA delegate control of sport parachuting to the BPA, and the BPA have in turn prescribed comprehensive rules for parachuting. They also provide certain rules and guidance for the pilots concerned, regarding the flight operational aspects. However, it is clear that the extent of the BPA supervision has been principally, although not exclusively, directed towards the regulation and monitoring of the *parachuting* aspects. This arrangement seems to have worked satisfactorily in the past, as evinced by the good safety record applicable to UK civil parachuting operations until 1980. However, the fact that there have now been two serious accidents involving *operational* shortcomings in parachuting flying within one year suggests that tighter supervision of this aspect is desirable.

Although a sporting club activity, the carriage of civil parachutists is also, in some respects, a public transport operation. In the UK, all public transport operations and also aerial application (crop spraying) operations – where no passengers are carried – are monitored by the CAA, and it would be logical for the flight operating standards of parachuting operations to be so monitored.

2.5 Pilot qualifications for parachuting flights

Bearing in mind the type of flying under consideration and that any number of parachutists may be carried – depending only on the aircraft's Flight Manual limitations – the minimum qualifications prescribed by the BPA, with CAA approval, for the pilots concerned (see Appendix 2) is considered to be inadequate. In particular, the concept that a pilot possessing only a Private Pilot's Licence and possibly less than 150 hours' flying experience may be permitted to fly an aircraft capable of carrying a large number of civilian parachutists, cannot be consistent with an appropriate level of flight safety. It is considered that the required minimum standards should be raised substantially to reflect the fact that the flying of parachutists is often carried out at high intensity and that a considerable number of lives can be at risk at one time. Accordingly, such pilots should be required to obtain the same standard of technical knowledge of their aircraft as holders of Commercial Pilots' licences.

3. Conclusions

(a) *Findings*

(i) The aircraft had been maintained in accordance with an approved maintenance schedule. However, on the accident flight its C of G was substantially outside the aft limit and its take-off weight was some 370 lbs (168 kg) above the maximum permitted.

(ii) The pilot was medically fit and held a valid licence, but his conduct of the flight did not meet the standards to be expected in such an operation.

(iii) The take-off was made with a horizontal stabiliser trim setting which was incorrect and probably fully 'nose-up'.

(iv) Shortly after take-off the pilot experienced nose-up forces of such magnitude that he lost control of the aircraft whilst attempting to re-trim the horizontal stabiliser. The aircraft consequently stalled, at a height too low to permit recovery.

(v) The PC–6 flight operation at the Peterborough Parachute Centre was inadequately supervised.

(b) *Cause*

The accident was the result of loss of control of the aircraft following a take-off with an incorrect horizontal stabiliser trim setting. Contributory factors were the incorrect loading of the aircraft, the difficulty of re-trimming the horizontal stabiliser rapidly and an inadequate standard of aircraft operation.

4. Safety Recommendations

It is recommended that:

4.1 The CAA should regularly monitor the operating standards of civil parachuting flying organisations.

4.2 The minimum qualifications required of pilots engaged in parachuting flying be raised substantially in respect both of flying experience and knowledge of their aircraft.

C C Allen
Inspector of Accidents

Accidents Investigation Branch
Department of Trade

February 1982