Aircraft Type and Registration:	Schleicher Ka-8B, FKJ
No & Type of Engines:	N/A
Year of Manufacture:	1977
Date & Time (UTC):	1 June 2002 at 1400 hrs
Location:	Hinton-in-the-Hedges Airfield
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 Fatal Passengers - N/A
Other Injuries	Free-Fall Parachutist - 1 Fatal
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Silver C Gliding Certificate (Issued 1989)
Commander's Age:	69 years
Commander's Flying Experience:	547 hours Last 90 days - 3 hours Last 28 days - 2 hours
Information Source:	AAIB Field Investigation

Synopsis

During free-fall from 12,000 feet, three parachutists were practising formation descents. At a height of some 4,000 feet, the formation separated in preparation for deployment of their parachutes at 2,200 feet. Shortly after, one of the parachutists became aware of a glider about 800 feet below him. He fell past and very close to it and then pulled the release for his main canopy. As he looked up to check its deployment, he was aware of wreckage falling around him and it quickly became apparent that one of his colleagues had collided with the glider. Both the parachutist and glider pilot, who was not wearing a parachute, were killed in the accident. The skydiving centre and the gliding club, where the glider was based, had operated at the same airfield for a number of years.

Supervision of parachuting and gliding operations

The day to day task of ensuring the safe conduct of sport parachuting activities is largely carried out by the British Parachute Association (BPA), but the Civil Aviation Authority (CAA) retains overall

responsibility. Civil Aviation Publication (CAP) 660 sets out minimum standards, which the CAA requires to be satisfied prior to the grant or renewal of parachuting permissions and any related exemptions. It also indicates the CAA requirements for the conduct of parachuting operations. The BPA produce an Operations Manual, which represents the accepted standard for sport parachuting in the United Kingdom. The skydiving centre at Hinton is a member of the BPA.

The British Gliding Association (BGA) is the national authority for sporting gliding in the United Kingdom under delegation from the Royal Aero Club. Apart from the Rules of the Air (contained within the Air Navigation Order), aviation safety regulation does not apply to private gliding activities and the CAA has no legal powers or responsibility for the conduct of private gliding. In practice, the BGA seeks to ensure the safety of private gliding but has no legal status or legal powers. The gliding club at Hinton is a member of the BGA.

Background to accident

At the private airfield of Hinton-in-the-Hedges, the two main aviation activities are gliding and skydiving; both activities use powered aircraft. To promote safety for all airfield users, an agreed operating procedure had been produced and signed by representatives of the gliding club and the skydiving centre. When both activities were due to operate concurrently, this written procedure required the gliding club Duty Instructor (DI) to meet with the parachute Drop Zone (DZ) Controller and agree, among other aspects, the main runway and circuit pattern to be adopted and the DZ area to be used by the parachutists. It also included the following pertinent information for both organisations:

1. *'Except during departure and when returning to land no glider or power aircraft will a) Operate within the airfield boundary or, b) Operate within the designated DZ.*

2. *The daily running of the DZ will be managed by the nominated DZ Controller. He is responsible for giving a "Clear Drop" signal to the parachute lift plane and a 3 minute warning of intention to jump to all other airfield users on the Hinton Traffic frequency 119.45 MHz.*

3. *It should be appreciated that when training and low experienced parachutists are jumping they may not land within the designated landing area, however the whole area is cleared by the CAA and BPA (British Parachute Association) for landings therefore special care and consideration should be given by all pilots operating from the field.*

4. *Free fall and tandem jumps are conducted from 6,000 or 12,000 feet upwind from the airfield in the DZ. .*

5. *Free fall parachutes are opened at 2,200 feet, tandem parachutes opened at 5,000 feet.'*

Current aeronautical publications included the information that parachutists may be expected in the Hinton area up to Flight Level 150. The BPA Operations Manual detailed the rules for the conduct and control of sport parachuting and included certain definitions. The parachute landing area (PLA) was defined as the area where it is intended that the parachutists will land. The DZ was defined as a notified portion of airspace within which parachute descents are made; the normal radius is 1.5 nm and up to the altitude notified. At Hinton, the DZ area referred to earlier in this report would be more accurately described as a cone of operation and is so described in the rest of this report.

The gliding club at Hinton-in-the-Hedges was and remains a member of the BGA. The BGA has published a booklet on 'Laws and Rules for glider pilots'; the latest 'Edition 13' is dated July 2001. The preface to the booklet contains the following statement: '*The booklet contains that part of aviation law, which concerns every glider pilot. It also sets out the Operational Regulations of the BGA, these being mandatory for all members and member clubs of the BGA. In addition, Recommended Practices are described; while these are not mandatory, a prudent pilot would do well to observe them'*. Operational regulation 6.12 requires that: '*No glider shall enter cloud unless all its occupants are wearing parachutes and have been instructed in their use'*. Recommended Practice 16 states that: '*A parachute is considered to be personal equipment and not part of the aircraft.'* Recommended Practice 17 states that: '*Serviceable parachutes should be worn by the occupant(s) of gliders operated from BGA sites, subject to the glider being fitted to accept the occupant(s) wearing parachute(s)'*. Recommended Practice 44 deals with parachute drop zone procedures for gliders transiting such zones and contains the following information:

6. *'The list of parachute sites and the appropriate contact ATC frequency is on the aviation maps as a block of information.* (Note: This information is now contained on a separate 'frequencies' card supplied with each map.)

7. *Contact the ATC unit and they will be able to say if the site is active. The glider pilot can then request the Dropping Zone (DZ) frequency to obtain the current activity.*

8. *By talking directly to the parachute site, one may be allowed to cross safely, if they are having a break, or fly around the zone if they are busy.*

9. *In the event of receiving a nil response from the parachute site frequency, the glider pilot should act on the strategic information given by the ATC unit and remain clear of the site.*

10. *YOU WILL NEVER SEE A FREE FALL PARACHUTIST IN TIME TO TAKE AVOIDING ACTION.* ***IF IN DOUBT KEEP OUT.***

11. *The major sites at Langar, Peterborough / Sibson and Weston-on-the-Green are very busy.*

12. *Be sure to make in-flight calls to ascertain actual status of DZs on your route. A Radio Telephony (R/T) licence is not required.'*

For some years, the gliding club has required that all gliders operating from Hinton airfield have a serviceable radio fitted, and also require that pilots listen out on 119.45 MHz when they are within 5 nm of the airfield. Gliders returning from cross-country flights are expected to change to this frequency as they approach the airfield.

Operations on 1 June

The forecast weather for 1 June was good and the DZ controller had received a forecast for the wind directions at 5,000 feet and 10,000 feet; this indicated that the wind at 10,000 feet would be from 210° M, and at 5,000 feet from 190° M. The surface wind was south-easterly. In conjunction with the Chief Club Instructor (CCI) of the skydiving centre, the DZ controller decided that their aircraft would maintain a track of 190° M for dropping the parachutists. The cone of operation decided upon by the CCI and based on the location of the controller, would be from 140° M to 230° M, as shown on Figure 1. These details were reportedly marked on a map located at the skydiving centre.

On the day of the accident, in accordance with the letter of agreement, the gliding club DI came to the DZ controller to agree the operating procedures for the day. The DZ controller briefed the DI as to the parachute aircraft heading and the cone of operation. The DI's understanding was that the aircraft would run in on a track of 190°M and that the cone of operation would encompass 30° either side of this track, ie, 160°M to 220°M, as shown in Figure 1. It was also initially agreed that all aircraft would use tarmac Runway 24. The DI then briefed the glider pilots who were present at the launch area on the agreed procedures. Pilots arriving later in the day would normally check with the DI as to the procedures in operation.

Subsequent to this initial brief, the gliding club decided to use grass Runway 15 for takeoff with a left hand circuit, and to use grass Runway 24 for landing; this information was passed to the DZ controller. Additionally, the parachute aircraft final approach track was changed from 190° M to

180° M after the first few runs; this change was not passed to the gliding club DI, as the CCI considered that there was no change to the cone of operation.

The skydiving centre was using two aircraft for parachute dropping. A Turbolet 410 had completed nine lifts and the crew had a 30 minute break before commencing the tenth lift, which included the parachutist involved in the fatal accident. A Cessna 206 was also involved in carrying parachutists and had completed three lifts; this aircraft was airborne and holding clear of the airfield at 3,500 feet amsl when the accident occurred.

The flight log of the gliding club indicated that the first takeoff was at 1003 hrs. A total of 20 launches had been recorded before the accident, using a tug aircraft each time; all takeoffs were from grass Runway 15. The gliding club DI was giving flight instruction during the day and noted that there seemed to be good separation between the parachutists and the gliders. The DZ controller also considered that the co-ordination had been effective throughout the morning.

Accident flight

The pilot of FKJ had arrived at the airfield about lunchtime and assisted another club member to push the glider onto the launch area. The other club member had been the pilot to fly FKJ immediately prior to the accident flight. He had taken off at 1310 hrs and had flown for a total of 13 minutes. He subsequently confirmed that the aircraft was serviceable and confirmed that the radio was operating and was selected to frequency 119.45 MHz. This pilot did not normally wear a parachute in this type of glider due to his size and did not use one for his flight. One other club member then assisted the accident pilot to complete his pre-flight checks of FKJ, checked that the radio was on and noted that there was no parachute in the aircraft. He commented on this to the pilot but he replied that "It'll be alright". One other club member remembered that the pilot of FKJ was strapped in to the glider and that the canopy was fitted correctly. With the checks completed, this club member waited with the pilot, for the tug aircraft, and during this time the pilot of FKJ discussed the gliding conditions and seemed happy with them. Take-off was recorded at 1350 hrs.

The tug pilot recalled that the pilot of FKJ released the tow rope at approximately 2,000 feet and that he, the tug pilot, then returned to the airfield for another glider launch. At approximately 1355 hrs, the gliding club DI was preparing for take-off and saw FKJ at about 2,000 to 2,500 feet to the east of the airfield and heading east. Subsequent to the accident, an attempt was made to try and identify the track of FKJ from primary radar returns. There were no primary returns noted in the area at the time of the accident, although indications from the radar source were that primary returns would not be seen in that area below an altitude of approximately 3,500 feet. The radar track of the

Turbolet 410, however, was identified and this is shown (within a resolution of approximately 100m) on Figure 1.

The Turbolet 410 had been tasked with a run at FL 120 with a final track of 180°. On board, there were 17 personnel under the control of an allocated Jumpmaster. Amongst many other duties, he had to liaise with the pilot to ensure the correct altitude and track for the parachute drop. He was also responsible for watching for the internal light signals, which indicated that the crew had received the 'clear drop' signal from the DZ controller and from London ATC; this required the crew to monitor two frequencies. Additionally, once the appropriate light signals had been received, the Jumpmaster would make a visual check of the area before allowing the parachutists to leave the aircraft.

As briefed, the Turbolet pilot established the required track and altitude and, with the appropriate clearances, initiated the light signals to confirm the clearance to drop. With no conflictions seen below the aircraft, the Jumpmaster cleared the first three parachutists to exit the aircraft. These three had already completed two descents that day and had planned and briefed this further free fall jump to practice formation changes on the descent. The exit went as planned and the formation changes continued until 4,000 feet, which was when the individuals had briefed to separate in preparation for parachute deployment. As he tracked away, one of the parachutists suddenly saw a glider about 800 feet below him and to his right. He estimated that he fell past and very close to it and then pulled the release for his main canopy; his on-board equipment indicated that his canopy deployed at 2,569 feet. When he looked up to check correct deployment of his canopy, he was aware of wreckage around him. Looking around, he could see one of his colleagues with his main parachute deployed, and another with his reserve parachute deployed. Shortly after these three had left the Turbolet 410, the other parachutists, including the Jumpmaster, had all made uneventful exits and descents. Some of these descents were filmed air to air and this indicated that the exit from the aircraft by the parachutists had been in the normal area.

The DZ controller had been watching the Turbolet 410 aircraft on the approach and visually considered that it was on the pre-briefed route; the controller was facing south. He heard the Turbolet crew request clearance for a "Live Drop" on frequency 119.45 MHz, acknowledged this message and also transmitted that the aircraft was running in for the live drop in 3 minutes. Then, as the DZ controller was visually monitoring the area, he became aware of a glider to his left which seemed to be approaching from the north at about 2,500 feet. He immediately transmitted on frequency 119.45 MHz: "Glider in the overhead, parachutists imminent. Please leave the area". With no response on the radio and no apparent change in direction from the glider, the DZ controller repeated his message. Shortly after, he transmitted on the same frequency for the Turbolet 410 to cancel the drop. There was no reply and he again transmitted to the glider to advise that it should

leave the area. The glider appeared to make a 20° turn to the left and the DZ controller saw what he initially thought was a parachute but quickly realised that it was the wing of the glider. He immediately initiated his emergency procedures.

The Turbolet 410 crew did not hear any of the messages relating to the glider or the instruction to cancel the drop although the pilot of the Cessna 206, which had been holding, heard drop clearance messages between the Turbolet and the DZ controller, the warning message to the glider, and the call to the Turbolet to cancel the drop. The tug pilot also heard a call on 119.45 MHz about a glider entering the area and a call to cancel the drop. Neither the tug pilot nor the pilot of the Cessna 206 heard any acknowledgements to these later transmissions.

Engineering information

The glider had struck the ground in the middle of a field, approximately 80 metres south of the airfield perimeter track and 870 metres from the DZ control point on a bearing of 137° M. The glider's impact had been nose first and at high speed and it was assessed that the airframe had been structurally intact at impact with the exception of the left wing, which was missing outboard of the airbrake box. This is located some 2 metres outboard from the fuselage. The pilot, who was not wearing a parachute, was found in the wreckage of the fuselage.

The remainder of the left wing was found in a trail of wreckage leading to the north-west, along a line orientated 328°M from the fuselage. The largest item was the outboard 5 metres of the left wing. This had fallen onto long grass within the area bounded by the runways but had sustained little further damage. The main structural member in a Ka-8 wing is a substantial wooden spar with a plywood leading edge forming, with the spar, a closed 'D' section and this supports the bending and torsional loads of the wing. The damage to the wing indicated that its separation had been caused by a large impact onto this leading edge 'D' section and that the remaining light items, of wood and fabric, had been released as a result of the spar failure.

The parachutist was found further along this line of wreckage, at a distance of 1,080 metres from the glider fuselage. The main parachute, which required manual deployment, was found intact within its container. The reserve parachute had deployed and this appeared to be as a result of the activation of the AirTec CYPRES 'automatic activation device'. Detailed examination by the AAIB and a representative from the BPA showed that the reserve parachute was intact and that the CYPRES device had fired. The same examination showed that the main parachute was correctly packed and rigged and would have operated if the ripcord had been pulled. The CYPRES unit was returned to its manufacturer in Germany for analysis, which confirmed correct operation of the unit, that the maximum aeroplane height before the final jump had registered as 12,041 feet agl and that the

CYPRES had activated at approximately 830 feet above the take-off altitude, 62 seconds before the parachutist reached the ground.

A simple 'wind-drift' analysis was performed for the accident, using as data the plotted position of items of glider wreckage, their descent rates and the wind velocity. This analysis concluded that the position of the impact between the parachutist and the glider was approximately 120 metres upwind of the point where the glider wreckage was found and close to the 140° M radial from the DZ control point. This was consistent with a similar analysis for the drift of the reserve parachute after deployment.

Aftercast weather information

The synoptic situation at midday on 1 June 2002 showed a high pressure system centred over the southern North sea, with a stable south-east to southerly airflow over southern England. Surface observations at 1400 hrs, in the region of Hinton, showed a south easterly surface wind of 7 to 12 kt with no significant cloud. Surface temperatures were around 20° to 21° C with a surface pressure of 1023 mb. The wind profile over Hinton at this time was estimated to be as follows:

18,000 feet: 230°/ 20 kt
10,000 feet: 200°/ 15 kt
5,000 feet: 180°/ 15 kt
2,000 feet: 180°/ 15 kt
1,000 feet: 160°/ 15 kt

Medical information

Post mortem examinations were performed on the glider pilot and the parachutist. The pathologist concluded that the glider pilot had died from impact with the ground and that the parachutist had died at the time of the airborne collision. There was no indication of any pre-existing medical condition in the parachutist which may have contributed to the accident. It was not possible to determine from examination of the glider pilot if there was any disease, which may have contributed to the accident.

Analysis

Both the gliding club and the skydiving centre had operated from Hinton for a number of years and both the glider pilot and parachutist were experienced and regular participants in their respective sporting aviation activities at the airfield. To enable both activities to operate safely together, agreed

procedures had been produced by the two organisations. This required the DZ controller and the gliding DI to meet on the day of any planned mutual activities to brief and agree their operating procedures for the day. This had been done, but the subsequent collision between the glider and the parachutist indicated that these procedures were not fully effective or had not been fully adhered to by one or both of the organisations. To resolve these issues, calculations were firstly made to determine where the airborne collision had occurred.

Figure 1 shows the airfield together with the location of the parachutist and the glider wreckage. The height of the collision was estimated to be approximately 2,800 feet based on the evidence from the equipment carried by one of the surviving parachutists. With the known wind direction and strength from that height to the ground, estimates were made of the likely starting point for the parachutist and the items of glider wreckage. This indicated that the collision occurred at or near the position shown on Figure 1.

Evidence from the skydiving centre personnel was that the cone of operation was within an arc bounded by 140° M and 230° M and based on the apex at the location of the DZ controller; this is shown at Figure 1. However, the understanding of the gliding club DI was that the cone of operation was within an arc bounded by 160° M and 220° M; this is also shown at Figure 1. Additionally, the agreement between the two organisations was that no aircraft would 'operate within the airfield boundary' or the 'designated DZ' (cone of operation) except when taking off and landing. The point at which the collision occurred was determined to have been some 180 metres south of the southern perimeter track, on the edge of the cone of operation as understood by the skydiving centre but outside of the cone of operation as understood by the gliding club. Without radar information, it was not possible to determine the exact track of the glider prior to the collision but, from witness evidence, it was tracking from the north. Nevertheless, the important point is that both organisations believed that they were operating in accordance with agreed procedures. However, each had a different interpretation of the exact parameters to be used. Furthermore, the radar track of the Turbolet 410, as shown on Figure 1, indicated that it was tracking slightly east of the apex of the cone of operation, although the accuracy of this track as shown was estimated to have been only within approximately 100m. These aspects contributed in total to the situation whereby the glider and parachutists were in the same area of sky.

The operating procedures of the two organisations were also considered. The parachutist would have had no control over where he exited the jump aircraft and all the associated procedures appeared to have been followed. The glider pilot would have had more autonomy but there was no available evidence to show that he had been specifically briefed on the dimensions of the cone of operation for the day. He was aware of the agreement between the two organisations, as he had been briefed on this agreement during his most recent dual check with the gliding club Chief Flying

Instructor on 11 May 2002. The pilot had also been at the airfield for some time on the day of the accident and would have seen the ongoing activities. The fact that he did not appear to have infringed the area, as understood by the glider personnel, leaves the possibility that he may have had a verbal briefing from a fellow club member. However, with two very different airborne activities operating in the same area, there should have been a more rigid system in place to ensure that all active participants were clearly aware of the activities and of the operating boundaries.

One other aspect to be considered was the decision of the glider pilot to fly without a parachute. It was not possible to determine if the pilot of FKJ would have been able to use a parachute following the collision. The loss of the left outer wing would have resulted in extreme uncontrolled manoeuvres by the glider and the time from collision to ground impact would have been less than 30 seconds. Nevertheless, a parachute would have provided the only chance of survival following this collision. The BGA recommend the use of a parachute on all flights but only mandate it for flights in cloud; a parachute is considered to be personal equipment. Complicating factors are that some pilot/glider combinations are such that a mandatory requirement to have a parachute on all flights is not practicable. Therefore, the current BGA position to leave it as a personal choice is a reasonable compromise.

One final aspect was the attempt by the DZ controller to cancel the drop. This transmission was heard by other aircraft in the area, but not by the crew of the Turbolet 410. With no radio recording of 119.45 MHz, it was not possible to determine exactly when this call was made. It is possible that this call was made after the last parachutist had left the aircraft; at that time the crew would be talking to London ATC to co-ordinate the return to the airfield. Nevertheless, it would be sensible to have a procedure whereby the crew inform the DZ controller when the last parachutist has left the aircraft.

Although the skydiving centre at Hinton has already instituted this procedure, it would also be appropriate for the BPA to include this as a requirement in their Operations Manual. Therefore, the following recommendation is made:

Safety Recommendation 2002-54

It is recommended that:

The British Parachute Association include in their Operations Manual a requirement for the crew of an aircraft involved in dropping parachutists, to inform the DZ controller when each run is complete.

Conclusion

The collision occurred between two individuals operating from the same airfield with each believing that he was within agreed operating limits. Unfortunately, these perceived limits were different for each organisation.

Following the accident, both organisations at the airfield have reviewed their procedures, particularly with regard to the daily co-ordination meeting. This is now more formal and allows for the cone of operation to be agreed, and marked on an airfield map at each meeting, and for a buffer zone to be included between it and the edge of the operating area for the gliders. A copy of this map will be retained by both organisations; for the gliding club, it will be displayed for self-briefing by pilots prior to flying. Any change in parameters during the day will be formally agreed and updated maps produced, and such changes will also be passed by radio to any tugs/gliders flying locally and gliders returning from cross-country flights. Additionally, regular meetings between the organisations at the airfield have been established to review operating procedures and highlight areas of concern.

The BPA and the BGA are reviewing the procedures at all their associated venues where concurrent parachute and gliding activities take place. In addition, the BGA will include the parachuting site at Hinton-in-the-Hedges, along with others that have become 'busy' sites in recent years, in their Laws and Rules for Glider Pilots booklet. In the light of all these actions, no additional formal recommendations are considered necessary.

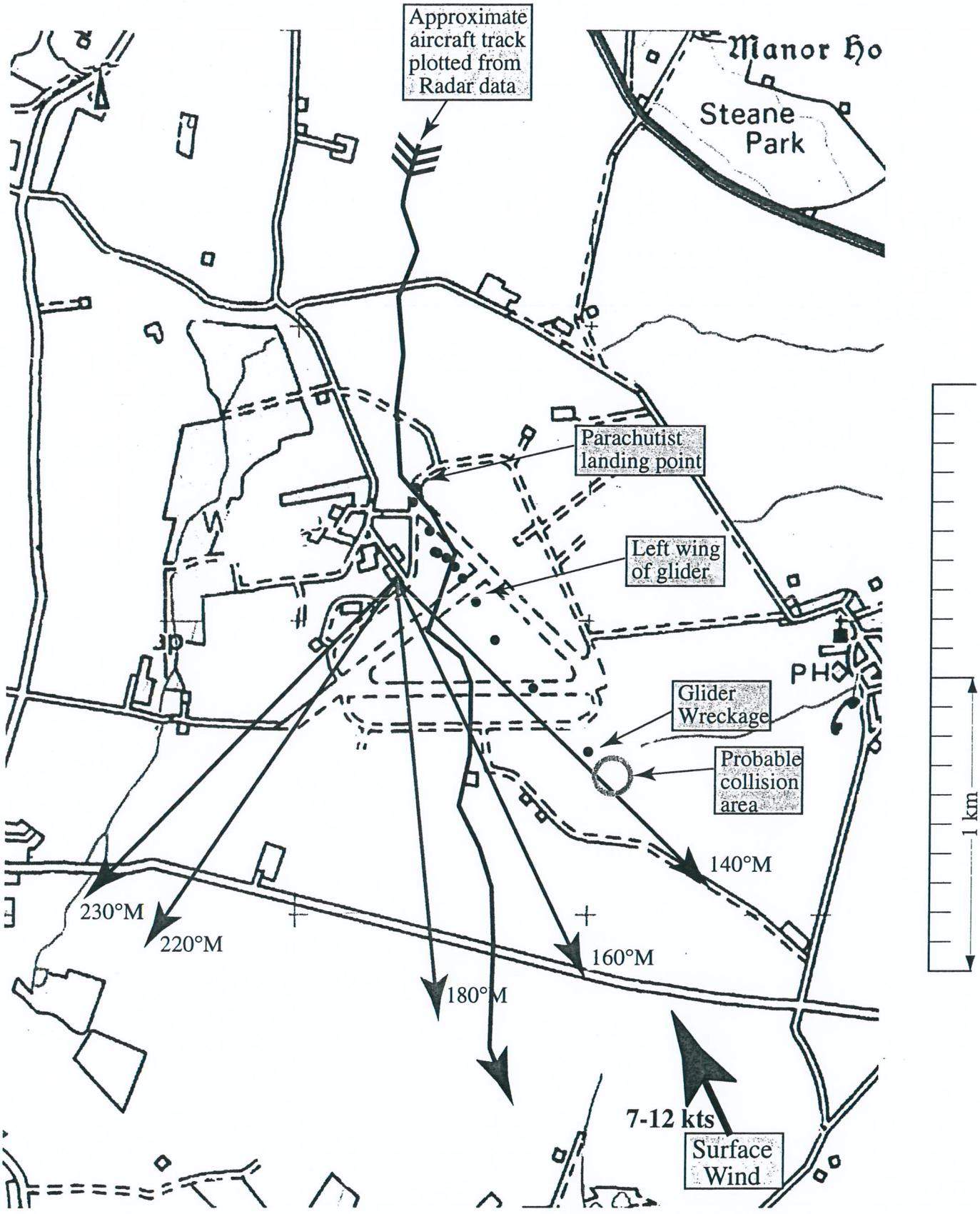

Figure 1

Map showing cones' of operation, estimated point of collision and approximate track of parachutists' dropping aircraft