Piper PA-28-161, G-BSLE and Piper PA-28-161, G-BFZG

AAIB Bulletin No: 10/2000 Ref: EW/G2000/05/21 Category: 1.3

Aircraft Type and Registration:	i) Piper PA-28-161, G-BSLE ii) Piper PA-28-161, G-BFZG
No & Type of Engines:	i) 1 Lycoming O-320-D3G piston engine ii) 1 Lycoming O-320-D3G piston engine
Year of Manufacture:	i) 1981 ii) 1978
Date & Time (UTC):	31 May 2000 at 1130 hrs
Location:	Oxford Airport, Kidlington, Oxfordshire
Type of Flight:	Training
Persons on Board:	i) Crew - 2 - Passengers - None ii) Crew - 2 - Passengers - None
Injuries:	None
Nature of Damage:	i) Damaged right aileron, flap and stabilator ii) Damaged propeller and left wing leading edge
Commander's License:	i) Commercial Pilot's Licence ii) Commercial Pilot's Licence
Commander's Age:	i) 36 years ii) 28 years
Commander's Flying Experience:	i) 1,250 hours (of which 277 hours were on type) Last 90 days - 110 hours Last 28 days - 40 hours ii) 1,319 hours (of which 225 hours were on type)

Last 90 days - 77 hours

Last 28 days - 48 hours

Information Source: Aircraft Accident Report Forms submitted by the pilots, ATC reports and subsequent inquiries by the AAIB

History of the flight

Two aircraft, G-BSLE, (callsign Oxford 67) and G-BFZG, (callsign Oxford 64), were being used for flying training, each with an instructor and student pilot. They collided shortly before both touched down on Runway 20. Oxford 67 was completing an instrument flying (IF) sortie with IF screens fitted and was carrying out an NDB/DME procedural approach to Runway 20 at Oxford (Kidlington). The IF screens, fitted to the student's windscreen (left hand) and side window complied with the CAA requirements for such modifications. The screens comprise a set of vertical plastic louvres that are inclined towards the instructor, who retains an adequate outside view, whereas the student is obliged to fly solely by reference to instruments.

Oxford 64 was conducting circuits and landings on Runway 20 in the left hand visual circuit and, just prior to the accident, was number two of three aircraft in the circuit. Oxford 64 had completed a 'touch and go' on Runway 20 and had followed the visual circuit pattern with three aircraft ahead and one, Oxford 55, which had joined from overhead behind him. Oxford 67 was at that time on the outbound leg of the instrument procedure. The three aircraft ahead of Oxford 64 had made their downwind calls in sequence stating their intentions, which were for the first two to 'touch and go' and the third 'to land'. Oxford 55 called 'downwind, to land' when abeam the tower and was advised by ATC to 'report final, three ahead in the circuit and one straight in not yet four miles'. Oxford 55 acknowledged the transmission. Oxford 64, who was ahead of Oxford 55, called 'downwind, touch and go'. The controller requested him to 'report final, four ahead in the circuit and one straight in not yet four miles', which Oxford 64 acknowledged. Shortly after this Oxford 67 contacted the tower and called 'four D to land' and was requested to 'report again at two (nm)'.

At this point Oxford 55, realising that he would not be able to land from that circuit, elected to go-around early from the end of the downwind leg. Oxford 64 was turning from the base leg onto final approach and the commander, looking over his right shoulder had visual contact with Oxford 67 above and behind his aircraft at a distance he estimated to be 2 nm. Oxford 67 called 'two D to land' and was instructed to 'continue'. Immediately after Oxford 67, Oxford 64 called 'finals touch and go' and the controller also instructed him to 'continue' which he correctly acknowledged.

The controller advised Oxford 67 that he had 'one ahead for a touch and go' which he acknowledged and stated that he did not have the other aircraft in sight. The controller confirmed the position of Oxford 67 as approximately 'half a mile' and then asked Oxford 64 if he had the 'one ahead in sight' to which he responded that 'he had one high finals'. This referred to his earlier sighting of Oxford 67 over his right shoulder. From the tower, the controller could see both aircraft one above the other, but, due to the short distance between the two aircraft, he could not be sure which aircraft was which. He asked Oxford 64 to confirm the other aircraft was ahead. The only aircraft visible to the crew of Oxford 64 was the aircraft ahead of them in the circuit, Oxford 40 T which was about to clear the runway having just landed. Oxford 64 therefore responded to ATC ' er negative one on the runway and er we're about to cross the threshold'. The controller continued to try and identify which of the two aircraft visible to him was Oxford 64. By this stage both aircraft

were on very short finals and in close proximity to each other. He asked Oxford 64 if he was 'the orange one' to which the pilot replied 'affirm'. The controller having correctly identified Oxford 64 as the lower aircraft intended to pass him a landing clearance but instead transmitted 'six seven clear to land', this was acknowledged by Oxford 67. The commander had taken control of the aircraft and had asked the student to remove the IF screens when they levelled at the MDA, which was 500 feet above threshold elevation. He maintained control of the aircraft which had been flown at an IAS of 95 kt during the procedure and when given the landing clearance reduced speed and selected flap 40° intending to position the aircraft for the student to carry out the landing.

The controller transmitted the words 'Oxford 64' but did not give any instructions or request any information before ceasing his transmission. Oxford 64 immediately called '64 is going around', the instructor took control, looked back and up over his right shoulder and, seeing no other traffic, commenced a go around. He applied full power, raised the nose of the aircraft and selected flap 25°. Almost immediately he saw the right wing of Oxford 67 and heard a loud bang as the two aircraft collided. In the collision, at an estimated height of 30 to 50 feet, Oxford 67 was pitched nose down and banked to the left. The commander was able to recover the aircraft to wings level and land straight ahead on or near the threshold of Runway 20. Oxford 64 corrected a turn to the right and turned towards Runway 20 whilst transmitting a Mayday distress call. He landed approximately one third of the distance along Runway 20.

None of the occupants of either aircraft was injured and they exited through the normal aircraft doors, which were undamaged. The airfield Rescue and Fire Fighting Service attended immediately.

The weather at the time of the accident was fine with a wind of 150°/05 kt, visibility was greater than 10 km, cloud few at 4,000 feet, OAT +16°C.

Aircraft damage

The collision occurred when the lower aircraft, Oxford 64, was in a climbing attitude and the higher aircraft, Oxford 67, which was descending was just to the left of Oxford 64. The tail tie down plate, of Oxford 67 sliced through the port wing leading edge skin of Oxford 64. The propeller of Oxford 64 contacted the right hand flap and aileron of Oxford 67, parts of which detached from the aircraft.

Analysis

The aerodrome controller

The aerodrome controller had transferred to Oxford some six months previously. Before this he had worked at another ATS unit for 15 years. During his integration into the unit, leading to his validation some two months before the accident, he had to make the transition to a quite different operational environment from his previous experience. He was acquainted with local procedures designed to accommodate the busy circuit at Oxford; this included use of the pin-board as an aid to the aerodrome controller's task.

Air Traffic Control

The Manual of Air Traffic Services Part 1 (Page 2-1) states:

'Aerodrome control is responsible for issuing information and instructions to aircraft under its control to achieve a safe, orderly and expeditious flow of air traffic and to assist pilots in preventing collisions between aircraft flying in and in the vicinity of, the aerodrome traffic zone.'

The circuit was busy with, at one time, five aircraft in the visual circuit, of which three were on circuit training and two had rejoined. Whilst there is a maximum limit of four aircraft carrying out dedicated circuits and landings at any one time, other traffic, both visual and those on instrument approaches, are permitted to arrive and land. The departure of two other aircraft was also being co-ordinated by the tower controller. Added to this was the instrument approach traffic carrying out the procedure. The spacing between the aircraft on the downwind leg had reduced, thereby creating a situation where the controller had only a short time to issue a late landing clearance between traffic clearing the runway and aircraft on approach. The controller's difficulties were further compounded by his need to sequence the instrument approach aircraft into the circuit traffic. The controller, in order to maintain a visual plot of the relative position of the aircraft in the circuit, used a pin-board, which depicted the circuit pattern and aircraft locations. The updating of this by the controller reduced the amount of time spent visually monitoring aircraft positions.

The flying training organisation Flying Order Book infers that Instrument traffic on a straight-in approach has priority over circuit traffic. The distance calls made by Oxford 67 were based on the DME, which is located near the threshold of Runway 02. The DME distance is factored by 6 nm from the threshold of Runway 20 to the facility. Therefore, the calls made by Oxford 67 at 4d and 2d would have been at 3.4 nm and 1.4 nm from the Runway 20 threshold respectively.

Whilst a controller may identify a possible conflict between circuit traffic and aircraft making an instrument approach as early as the downwind leg, it is not until the latter stages of the instrument approach and the beginning of the base leg of the circuit that the exact degree of confliction between the two aircraft can be established. There is little opportunity for the controller or pilots to adjust the landing order by extending the downwind leg because Danger Area EG (D)-129 is located at the end of it. This controller relied on pilots in the visual circuit positioning their aircraft in order to give priority to instrument approach traffic.

The two aircraft reached a point where they were in such close proximity to each other that it was difficult for the controller to identify the aircraft by their respective callsigns and to determine which aircraft was ahead on the final approach. Having decided that Oxford 64 was the lower aircraft it was the controller's intention to clear that aircraft to land but instead of using the callsign Oxford 64 as intended, he mistakenly used the callsign Oxford 67.

The training aircraft

When the commander of Oxford 64 turned onto the final approach he considered that adequate spacing existed between himself and Oxford 67. His observation over his right shoulder of Oxford 67 as 'two miles astern, right and high', was correct in relative positioning but, given the difficulty in judging accurately the distance from other aircraft, Oxford 67 was probably much closer. If both aircraft were flying at the same airspeed the actual distance may have been adequate for safe spacing as judged by Oxford 64. With Oxford 67 overtaking Oxford 64 at a speed differential of 30 kt, it was calculated, using the RT tape timings, that an approximate distance of 840 metres would have been closed between the two aircraft from the 2d call to the point of impact. Time was allowed for Oxford 67 to be configured for landing and slowed to a speed approaching that of Oxford 64. The calculation also assumes that the 2d call was made at the correct distance.

The degree of visibility between the screens fitted to the left hand windscreen and side window of Oxford 67, the plastic louvres of which are inclined towards the instructor, would have allowed the commander of Oxford 67 to see Oxford 64 before the nose of his aircraft obscured his view forward and down. His monitoring of the student's flying accuracy at the final stages of the instrument approach may well have degraded his lookout.

The decision by the commander of Oxford 64 to go around given that he was approaching the runway threshold and that another aircraft had been given a landing clearance is understandable.

Conclusions

The visual circuit for Runway 20 is left hand. The dimensions of the circuit are constrained by the Brize Norton Zone to the south, the village of Kidlington to the east and the previously mentioned Danger area of Weston on-the Green to the north east. Whilst adequate airspace is available for the number of aircraft permitted in the circuit, the options for adjusting spacing are limited.

The downwind call made by Oxford 64 after Oxford 55 led to an increase in workload of the already busy controller by requiring him to reorganise his pin-board at a time when his full concentration was needed to determine the identity of these two particular aircraft.

The need to optimise the use of the airfield in order to provide maximum training value for students creates peak periods of activity. Instructors are faced with the need to extract training value whilst operating in a busy circuit environment. ATC at Oxford facilitates the needs of the flying training organisations. On this occasion the level and intensity of operations were close to capacity. Once the two aircraft involved in the collision were no longer visible to each other the controller had some difficulty in identifying each aircraft by its correct callsign and, accordingly, which aircraft should receive a landing clearance appropriate to its position in the traffic pattern. His incorrect transmission of 'Oxford 67' instead of 'Oxford 64' could not be explained, but was most likely the result of his high workload and short space of time available to him to make the necessary identification. The controller thought he had achieved this through a process of elimination.

The problems of conducting instructional flights in a busy circuit environment, where the need for constant lookout is paramount, are well known. What may not be so readily appreciated is the speed at which seemingly large separation distances are eroded by relatively small airspeed differentials.

Follow up actions

An internal report on the accident by the ATS provider at Oxford made a number of recommendations concerning the provision of ATS and these are in the course of implementation in association with the resident airfield users.

Circuit reporting procedures have been reviewed and a Temporary Operating Instruction (TOI) issued by the Manager ATC. This has resulted in more positive control instructions being given by controllers without restricting circuit training. A comprehensive re-write, partially covered by the TOI, is underway. Moreover, ATC limit traffic in the circuit positively to allow for current conditions and training requirements.

Regular meetings (monthly) will take place between the ATC Manager, the Chief Pilot and the Head of Training.

The problem of traffic bunching in the late downwind and base leg position leading to unplanned go-rounds had been identified during a 1999 inspection of Oxford by Air Traffic Services Standards Department (ATSSD), Southern Region Inspectorate of the CAA Safety Regulation Group (SRG).

ATS Investigations of SRG, having investigated the ATC aspects of this accident, recommend that the problem should be re-addressed, with the ultimate aim being to facilitate a safe and orderly flow of traffic and to reduce the number of unnecessary go-rounds. ATSSD and Flight Crew Licensing Department of SRG intend to monitor and approve progress towards this aim. Therefore, any further recommendations by the AAIB are not appropriate at this stage.