

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-140, G-BCJN
No & Type of Engines:	1 Lycoming O-320-E3D piston engine
Year of Manufacture:	1974 (Serial no: 28-7425350)
Date & Time (UTC):	4 August 2022 at 0935 hrs
Location:	Cotswold Airport, Gloucestershire
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Minor) Passengers - 1 (Minor)
Nature of Damage:	Beyond economic repair
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	24 years
Commander's Flying Experience:	526 hours (of which 230 were on type) Last 90 days - 71 hours Last 28 days - 32 hours
Information Source:	AAIB Field Investigation

Synopsis

During an attempted go-around the aircraft veered left from the runway track. The instructor was unable to establish a climb and the aircraft touched down approximately 350 m from the end of the runway, tracking approximately perpendicular to the left of the runway track. As the aircraft touched down it passed between two parked, out of use, airliners and its right wing tip struck the nose landing gear of one of the parked aircraft. The outer portion of the right wing was severed and the aircraft continued across the grass. It passed through the airfield perimeter fence, crossed the A429 road and came to rest in a ditch adjacent to the road.

There had been a confused handover of control between student and instructor that meant the go-around actions were not completed effectively. This resulted in the aircraft flying at very low height at an airspeed that was probably below the minimum power speed, leaving it with insufficient power to climb away.

History of the flight

The intended flight was a circuit training detail for a PPL student. The instructor and student had flown together previously and met in the flying school to discuss the sortie content. The instructor's preference was to conduct circuits at Bristol Airport, where the operator is based, as he felt this would be the most beneficial for the student. However, circuit training at Bristol was not available due to high traffic levels and so the instructor selected Cotswold Airport (Kemble) as an alternate. The plan was to transit to Kemble, join the circuit, then do one circuit to a powered approach before moving to glide circuits.

The student went to the aircraft (Figure 1) and completed the pre-flight checks.



Figure 1

Piper PA-28-140

On arriving at the aircraft, the instructor checked the engine oil level and decided to add an extra quart of oil to ensure there was sufficient for the day's flying.

The student carried out the engine start. On the first attempt the engine immediately cut out as the fuel cock had been left at shut off. The engine started successfully on the second attempt and the subsequent taxi out and power checks were uneventful. The aircraft departed from Runway 27 at 0851 hrs.

During the takeoff the student rotated the aircraft at 52 kt rather than 60 kt and continued to have difficulty with speed control during the climb-out.

The aircraft then flew to Kemble to join for the intended circuit training. For the overhead join the student allowed the aircraft to fly approximately 300 ft below the intended altitude but the instructor decided to allow him to continue. There was another aircraft in the circuit and the student positioned on base leg too close behind it, so the instructor took control and flew a go-around. He then repositioned the aircraft for the student to conduct a powered approach from base leg. During the final approach the student allowed the airspeed to become too low, so the instructor took control, added power and completed the touch and go. On the climb the instructor returned control to the student for another circuit to a powered approach. This approach was successfully carried out, though the student still required some assistance from the instructor.

On the third approach the instructor left more of the workload to the student. The student began his approach right of the centreline and then began to "snake" either side of it. Initially, the aircraft was too high on the approach, but the student recognised this and reduced power to idle to correct. The student then allowed the aircraft to descend below the approach path and added power, but as the aircraft pitched up to recover to the path the airspeed reduced. The aircraft was left of centreline by this point and at approximately 300 ft agl. The instructor considered that the approach was unsatisfactory and again decided to go around.

CCTV from the airport showed that the aircraft continued descending to touch down near the threshold of the runway, then turned sharply left and became airborne again. Once airborne, the aircraft continued to turn left but only climbed to approximately 20 ft agl. It passed over a fence approximately 100 m from the left side of the runway and then continued towards a row of parked airliners on Taxiway C, close to the southern perimeter (Figure 2). The aircraft descended as it approached the line of parked aircraft. It passed under the wing of an Airbus A319 and touched down as it passed between the A319 and an Airbus A321. The right wing tip struck the nose landing gear leg of the A321 severing the outboard section of the right wing. The aircraft then continued across the grass, passed through the aircraft perimeter fence and crossed the A429 road, which runs just outside the airport perimeter. The aircraft encountered no cars as it crossed the road, but struck trees surrounding a vehicle yard and came to rest in a ditch alongside the road.

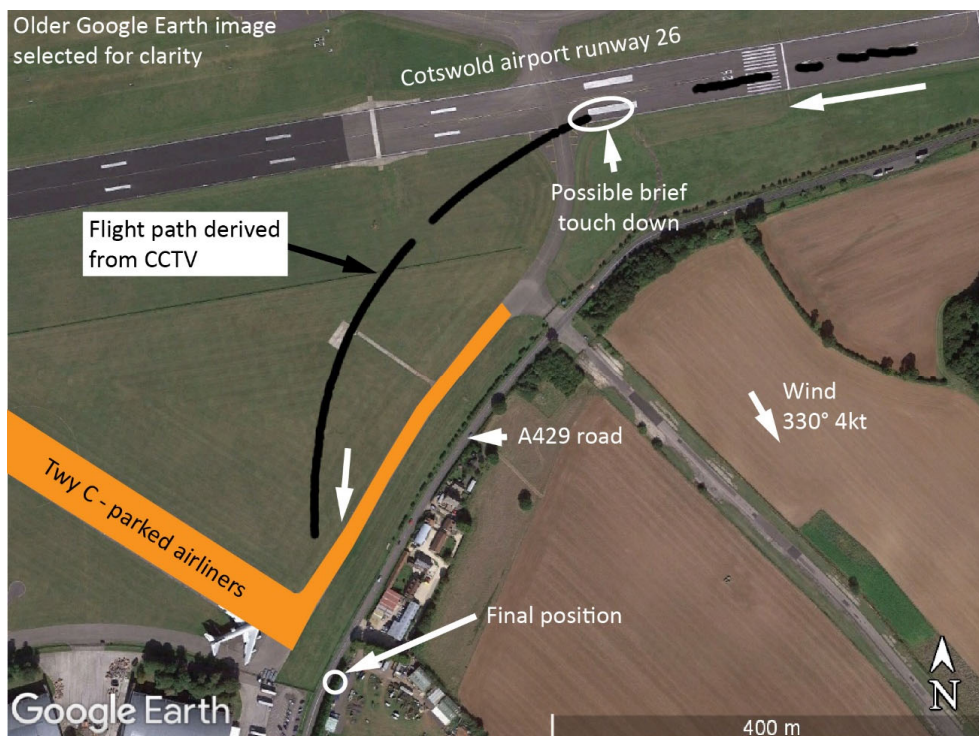


Figure 2

Kemble Airport diagram

Both pilots were assisted from the aircraft by the RFFS, exiting through the broken windshield. Both sustained minor injuries and were taken to hospital for precautionary medical examination, but both were released from hospital on the evening of the accident.

Pilots' recollections

The instructor recalled stating "I have control" at approximately 100 ft agl. The instructor applied full power and retracted the flaps to 25° which is standard for a go-around. At this point the airspeed was approximately 60 kt whereas the planned approach speed was 70 kt.

As the instructor applied power, he recalled the aircraft pitching up more than he expected and rolling left. The instructor noticed that the student was continuing to make control inputs. He described using explicit language to encourage the student to fully relinquish control. The instructor did not recall the student stating “you have control” at any point nor did he recall stating “I have control” a second time.

The instructor described the aircraft’s nose-up attitude as being above a level flight attitude and recalled there being 10 to 15° of left angle of bank. The speed was between 50 and 60 kt. He recalled wondering why the climb was stagnating but then recalled nothing else until the aircraft had stopped in a ditch alongside the A429.

The student recalled the nose being “steeply up” in the go-around which impeded his view ahead. He recalled seeing the parked airliners ahead but did not recall anything else until the aircraft had come to a stop.

Accident site

The accident site was located at the south-east corner of the airfield where several airliners were parked on Taxiway C. The first ground marks were made by the G-BCJN’s left landing gear tyre as it touched the grass under the left wing of the A319 (Figure 3). There was a section of outboard right wing from G-BCJN attached to the nose landing gear of the A321 and several pieces of fairing scattered just beyond. There were ground marks from both G-BCJN’s main landing gear tyres across the grass until the airfield perimeter fence, which had four posts knocked over.

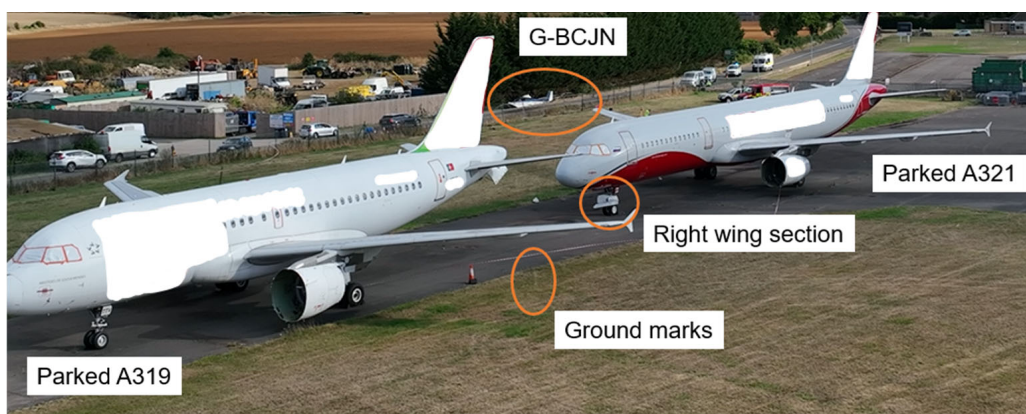


Figure 3
Accident site

The wire link fence was lying over towards the A429 road and there was evidence of fuel from the left fuel tank of G-BCJN across the road surface (Figure 4). G-BCJN had come to rest in a drainage ditch on the far side of the road with its right wing bent upwards and its left wing pointing forwards. There were marks on the tall fir trees from an impact with the nose of the aircraft.

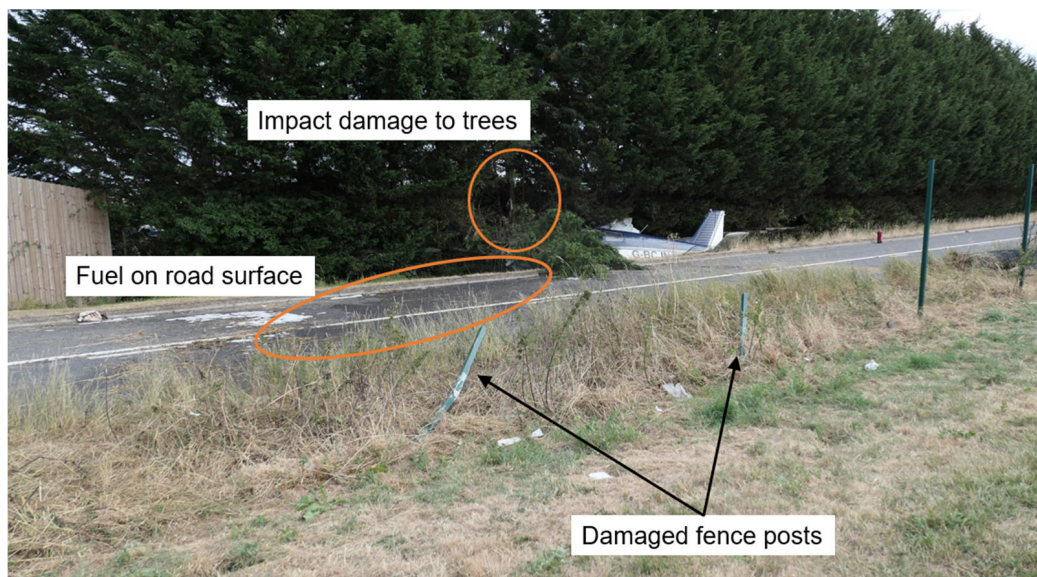


Figure 4
Accident site

Recorded information

The aircraft was not fitted with any devices that record aircraft position. An aviation app was being used on a mobile phone that records position, but this stopped tracking the aircraft before the accident landing. External tracking of the aircraft provided an overview of flight path information but no detail close to the ground.

A number of airfield CCTV cameras captured various stages of the approach, landing and attempted go-around. This was the best available source of information to track the aircraft movements from just prior to touch down through to the final aircraft position. The aircraft was small and pixelated in the CCTV recordings and suffered from video compression processes; this meant it was not always possible to track the aircraft accurately. CCTV recordings of the aircraft from different locations on the airfield enabled photogrammetry techniques to be used to determine the flight path and ground speed of the aircraft (Figure 2), albeit with errors and breaks in the data due to the quality issues. The altitude and groundspeed associated with this period are shown in Figure 5.

The recordings gave an impression of pitch attitude and heading but would not support calculation of orientation without significant errors. Figure 6 shows a significant change in heading over the space of 6 seconds. This period possibly included a brief touch down. After that, the pitch appears to have been held relatively high.

A CCTV recording was provided from a business situated across the A429 road from the airport. Figure 7 shows the aircraft touching down close to the parked A319 on Taxiway C, striking the nose landing gear of the A321 parked behind the A319, and crossing the road.

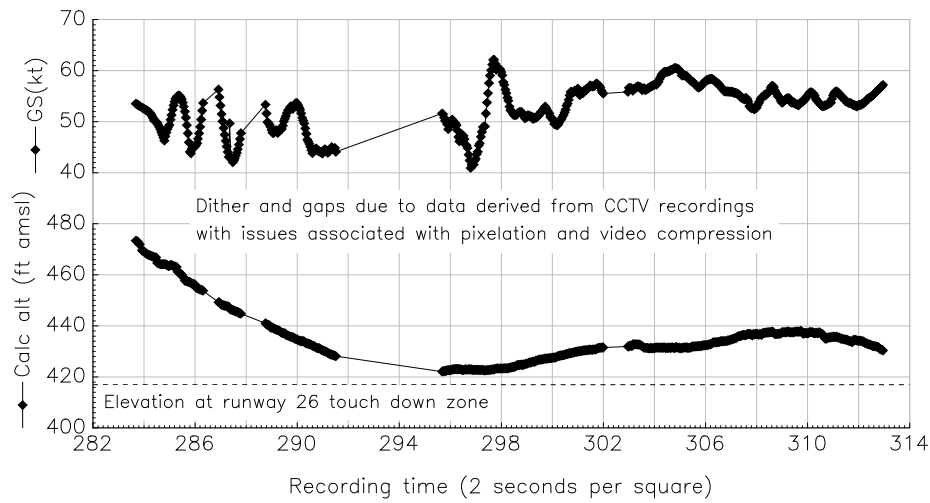


Figure 5

Altitude and ground speed derived from CCTV recordings



Figure 6

Four cropped CCTV images, two seconds apart, overlaid to show change in heading

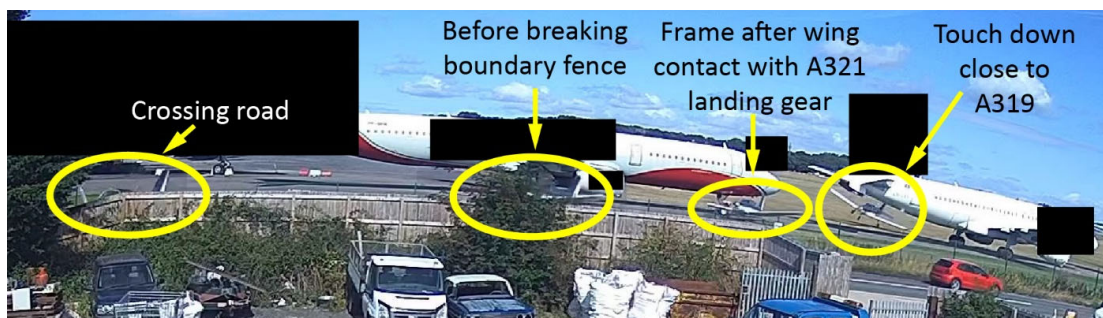


Figure 7

Four cropped CCTV images, one second apart, overlaid to show the final touch down, contact with a parked aircraft and the crossing of the A429 road

Aircraft information

G-BCJN was a 48-year-old Piper PA-28-140 powered by a Lycoming O-320-E3D engine. The aircraft is a conventional aluminium construction low wing aircraft with capacity for four people, and it has tricycle landing gear. The wing outboard trailing edge is equipped with an aileron and the inboard with a flap which can be deployed to 10°, 25° and 40°.

Airspeed indications

The student had flown the accident aircraft three times previously, but it is fitted with a different ASI to the other aircraft he had flown in his limited experience. The aircraft's ASI (Figure 8) has two concentric scales with mph on the outer scale and kt on the much smaller inner scale.



Figure 8
G-BCJN ASI

The student had difficulty with speed control in a previous sortie and had discussed this with the instructor, who had suggested that the student was focusing his attention on the outer scale and thus using speeds which were too low.

Aircraft examination

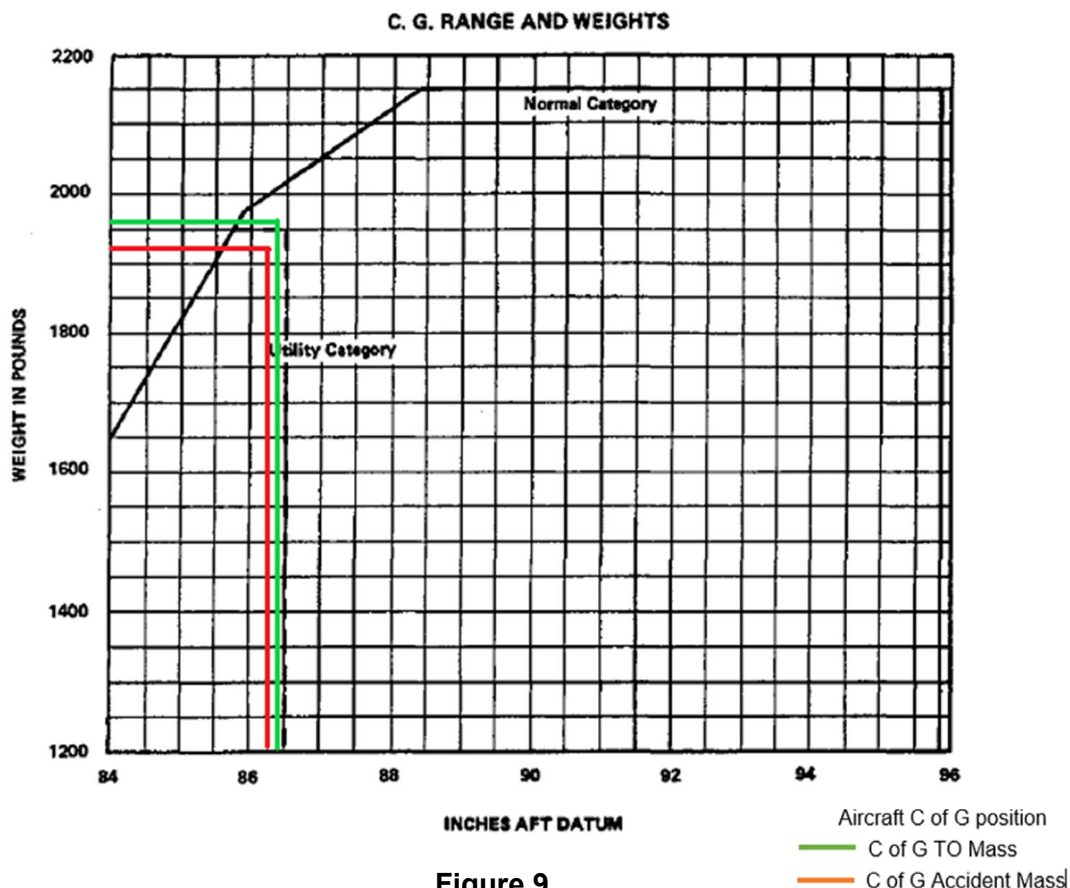
The aircraft was recovered to the AAIB facilities and examined for control continuity and engine performance. The investigation determined that before the impact there were no pre-existing defects that would have affected normal performance of the aircraft.

Aerodrome information

Cotswold Airport is a private general aviation airport, near the village of Kemble in Gloucestershire. Located 4.5 nm (8.3 km) southwest of Cirencester, it is used by flying schools, clubs, and industry as well as for the storage and recycling of retired airliners. The accident aircraft was operating on the asphalt Runway 26 which is 2,009 m long.

Weight and balance

The aircraft departed Bristol with a fuel load of 50 US gallons. The weight and CG position were calculated for takeoff and for the time of the accident (Figure 9). The aircraft was within the CG envelope throughout the flight.



Meteorology

The last weather report generated by the control tower at Kemble before the accident was at 0900 hrs, and it stated that the wind was from 340° at 6 kt, visibility was greater than 10 km, there were 1-2 oktas of cloud at 800 ft and 3 to 4 oktas of cloud at 4,000 ft. As the aircraft was operating on Runway 26 there was a crosswind from the right. When the aircraft reported “Final” to ATC the responding RTF call gave a surface wind of 330° at 4 kt.

The closest airfield which generates a TAF is RAF Brize Norton and the details are as follows:

For the period 0900 hrs on 4 August until 0900 hrs on 5 August the wind was forecast to be from 300° at 8 kt and the cloud was expected to be 2 to 4 oktas at 4,500 ft.

Personnel

The student had begun his flying with a different operator but had difficulty in finding consistent instruction and felt he was not making good progress. He therefore transferred to the accident operator in an effort to improve his progress. However, despite an improvement in the continuity of instruction, his progress remained slow. The student had repeated difficulties in the circuit with control of the approach and landing. He found managing ATC and RTF a challenge and this distracted him from key operational tasks. He had set a financial budget for PPL training and was concerned that his progress was insufficient to reach the required PPL standard within that budget.

The week before the accident the student had a discussion with his instructor and the operator's Chief Flying Instructor (CFI). At the meeting the CFI shared his view that it was unlikely that the student would reach the required standard for issue of a licence within his budget. The student had taken a view that he wished to continue flying to enjoy the experience if in the knowledge it would be unlikely to lead to the issue of a PPL. The accident sortie was the last instructional sortie before the student moved to more experiential content.

Other information

The operator used the Pooleys Instructor manuals as a source of briefing material. The handover/takeover is expressed in a standard exchange, with the instructor saying: "I have control", the student response being to relinquish control and respond "you have control". Should there be no response from the student then the instructor should repeat his order. In this event the instructor recalls making the "I have control" instruction, but the student does not recall hearing it. He did feel the instructors' inputs on the controls but uncertain of what was intended he continued to make control inputs in the belief he was assisting the instructor. The instructor does not recall repeating the "I have control" order and was confused with regard to the actions of the student. He did ask what the student was doing but the situation was not satisfactorily resolved and so there was uncertainty between the pilots as to what actions were being taken.

Drag curve

The aerodynamic drag on an aircraft is made up of components of zero lift drag and lift dependant drag. Both components vary with airspeed and a typical total drag diagram is shown in Figure 10. Minimum drag speed is the point at which the lowest total drag is achieved. It coincides with the speed for best lift/drag ratio.

If an aircraft slows below minimum drag speed, then the total drag on the aircraft is increasing. The shaded area is the minimum product of drag and airspeed at any point on the total drag curve, and it occurs at the minimum power speed. If the aircraft slows below this speed, then the power required to remain in level flight will increase. The minimum power speed for a PA-28 is not identified in the Pilots Operating Handbook. When the power required to remain in level flight equates to the maximum power available the aircraft will not be able to accelerate without descending to increase airspeed.

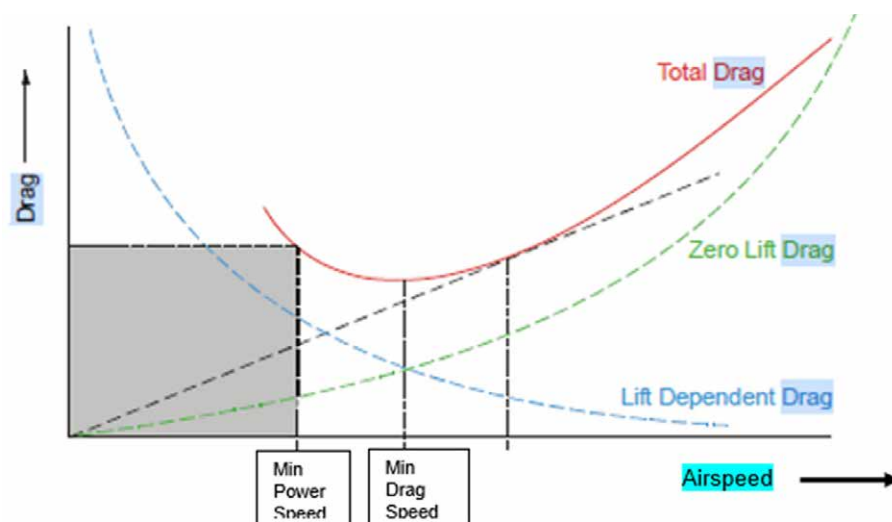


Figure 10
Typical Drag diagram

Engine overhaul

The aircraft was subject to a maintenance programme developed to comply with the requirements of Part-ML. The programme contained inspections at 50 hours, 100 hours and annual intervals. The engine maintenance programme was to be completed in accordance with the engine manufacturer's published instructions. The aircraft owner had contracted a Part-CAO organisation to manage the aircraft's continuing airworthiness and maintenance programme and to perform the required maintenance.

The engine manufacturer had published Service Instruction 1009 '*Time between overhaul (TBO) schedules*' which contains the standard overhaul time and any applicable extensions. The standard TBO for the O-320-E3D engine is 2,000 hours or 12 years, whichever is the sooner. If the engine is a new engine from the manufacturer, overhauled by the manufacturer or by an overhaul organisation using approved parts then an additional 200-hour extension can be granted. A further 200 hours can be applied if the engine is '*in frequent use accumulating 40 hours or more per month and has been so operated consistently since being placed in service*'. The engine fitted to G-BCJN had accumulated 2,366 hours at the time of the accident.

A review of the engine logbook revealed that it had been zero-hour overhauled in 2014 by an overhaul organisation using approved parts, but in only 20% of the 95 months the engine had been in service had it accumulated more than 40 hours of running time. Therefore, the engine had only qualified for a 200-hour extension.

The maintenance organisation reviewed its procedures and put in place more stringent checks regarding operating hours and the granting of life extensions.

Analysis

During a circuit training detail, the instructor was not satisfied with the student's handling of an approach. He recalls directing a go-around, but this order was not acknowledged by the student and nor did the instructor repeat his order when he did not receive the correct response from the student. Both pilots felt the other continue to make control inputs and there was confusion between them as to what actions were being taken. As a consequence, the go-around was not effectively instigated. The instructor believed the go-around actions of applying full throttle and retracting one stage of flap were carried out at 100 ft agl but the actual point of application is unclear. The CCTV images show that the aircraft descended and briefly touched the runway before lifting off again. It is therefore likely that full throttle was applied much lower than recalled by the instructor.

The aircraft touched the runway left wheel first causing it to yaw left. As the left wheel exited the runway onto the grass, the drag on the wheel caused the aircraft to yaw further left. It then became airborne at low speed and continued to fly across the grass at low speed and low height in a significantly nose-up attitude. With the flaps at 25° and at very low airspeed the aircraft was likely below the minimum power speed and therefore did not have sufficient performance to either accelerate or to climb.

The aircraft continued across the grass in a shallow bank to the left, increasing the divergence of heading from the runway. As the aircraft approached the line of parked airliners it descended and touched down just as it passed between two of them. Neither pilot recalls taking any action to avoid a direct impact with the parked aircraft and it is likely that this was the result of an instinctive action.

As the aircraft passed between the two airliners, its right wing struck the nose landing gear leg of one of them, the A321. The outer portion of G-BCJN's right wing was severed but the aircraft continued across the grass, running on its wheels. Neither pilot recalled closing the throttle and it is likely that the aircraft remained under power at this point. The aircraft's speed was nonetheless quite low, and it was further reduced by the collision with the airfield perimeter fence. As a result, the energy of the collision with the trees surrounding the vehicle yard was quite low and allowed the pilots to escape with only minor injuries. It was fortuitous that the aircraft encountered no traffic as it crossed the road.

Conclusion

A go-around was mishandled as a result of a confused handover of control between student and instructor. The go-around actions were not effectively instigated, and the aircraft diverged from the runway at low height and speed. The aircraft had insufficient performance to climb away, struck a parked airliner, exited the airfield, crossed a public road and collided with some trees.

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