

Wassmer WA 40, OY-DHV

AAIB Bulletin No: 4/2003	Ref: EW/C2001/7/2	Category: 1.3
Aircraft Type and Registration:	Wassmer WA 40, OY-DHV	
No & Type of Engines:	1 Lycoming 0-360 A1A piston engine	
Year of Manufacture:	1962	
Date & Time (UTC):	22 July 2001 at 1215 hrs	
Location:	Near Lichfield, Hampshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - Fatal	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Private Pilots Licence	
Commander's Age:	33 years	
Commander's Flying Experience:	114 hours (of which 47 were on type)	
	Last 90 days - 19 hours	
	Last 28 days - 7 hours	
Information Source:	AAIB Field Investigation	

The pilot intended to fly to the UK from Montpellier in Southern France on 10 July 2001 but due to a delayed departure decided to interrupt his journey with an overnight stop in Perigueux (LFBX) near Limoges. Continuation of his flight to the UK the next day was not possible due to poor weather over the Channel so he left the aircraft at Perigueux and returned home via a commercial flight. The flight on the day of the accident was to complete the journey and return his aircraft to its home airfield of Peterborough Sibson.

The time the pilot departed Perigueux on the 22 July 2001 could not be ascertained but it appears that his flight through French airspace was without incident. Progress of the flight as the aircraft approached the Channel was recorded by several UK based radars positioned at Jersey, Pease Pottage (West Sussex) and Heathrow. The radar recordings showed that at 1020 hrs the aircraft was approximately 20 nm south of the Channel coast on a steady track towards Cherbourg. From there it headed directly for the Southampton (SAM) VOR. The aircraft then appears to have routed directly northwards towards the Popham area of Hampshire.

At 1112:41 hrs the pilot made RT contact with the Farnborough Radar controller stating that he was flying from LFBX (Perigueux) to EGSP (Peterborough) and was currently 5,600 FEET, 3 MILES WEST NORTHWEST OF POPHAM, VFR, (VFR definition: minimum flight visibility of 5 km, 1,500 m horizontally and 1000 feet vertically clear of cloud and in sight of the surface) REQUESTING A FLIGHT INFORMATION SERVICE (FIS). Almost immediately however he went on to state that he had just overflowed a bank of cloud that had now become solid and he had lost VFR. He transmitted that he was AWARE OF THE RESTRICTED AREAS AND AIRWAY AROUND HERE AND IM WONDERING IF YOU COULD ADVISE A TRACK THAT WOULD KEEP ME CLEAR OF THOSE WHILE I FIND VFR CONDITIONS AGAIN. In response he was asked by the radar controller whether the aircraft was equipped with a transponder. He confirmed that it was and that it was selected to squawk 7000. The controller instructed the pilot to change the code to 0430, which he did. The controller then reported that he had received reports from an aircraft in the Compton area, 10 to 12 miles to the north, that the cloud base was approximately 1,500 feet and went on to report that at Farnborough there was scattered cloud at 2,000 feet and overcast cloud at 3,300 feet. The pilot replied that he had noted the weather. Almost immediately another pilot, flying in the Compton area and on the same frequency, transmitted that at his position the cloud base was broken at 1,700 feet with a visibility of 25 miles beneath. The pilot of HV replied YES, I COPY THAT, DESCENDING THROUGH CLOUD TO LEVEL. 24 seconds later, at 1113:10 hrs, the pilot transmitted HOTEL VICTOR, LOST CONTROL OF AIRCRAFT, CRASH LANDING IMMINENT. The controller replied, OSCAR HOTEL VICTOR, CAN YOU CENTRALISE THE CONTROLS, CENTRALISE THE CONTROLS.. AND YOUR POSITION?..... No further transmissions from the pilot were recorded. A police air support helicopter located the wreckage of the aircraft and was on the scene at 1253 hrs. They reported that the aircraft was on fire and that the pilot had received fatal injuries.

Witnesses

At approximately 1115 hrs a witness walking on Wayfarers Way and looking to the south-east heard an aircraft engine as if the aircraft was carrying out aerobatics ie the engine noise was going up and down. This witness saw an aircraft, that was tracking to the north-east below the cloud base, pull out of a dive then nose dive. The aircraft hit the ground followed by debris floating down like falling leaves.

Another witness heard an aircraft engine revving for a few seconds. He looked up to see an aircraft emerge from the cloud base, estimated to be at 2,000 feet, spinning with either a wing missing or folded back. The aircraft descended vertically in a spin with the engine revving all the time. This was confirmed by another eye witness who saw the aircraft emerge from a 2,000 to 2,500 feet cloud base spinning with a wing missing. The spin became progressively tighter and faster with bits detaching from the aircraft. He believed that the tail plane was still attached but could not remember if the fin and rudder were present.

Weather

The synoptic situation at 1200 hrs on the day of the accident showed a cold front clearing Hampshire to the east and a light, slightly unstable, west south westerly flow beginning to establish itself over the area. The weather conditions were NIL but rain and drizzle had crossed the area earlier and was clearing away to the east by 1130 hrs. Surface visibility was 25 to 30 km, with initially few to scattered clouds at 2,000 feet, and broken cloud with a base of 2,500 to 3,000 feet. At the time of the accident cloud cover had improved to give a few to scattered cloud with a base of

2,000 feet and broken cloud with a base of 4,500 to 5,000 feet. The surface wind was 230°/08 kt increasing and veering to 260°/15 to 20 kt at 4,000 feet.

The meteorological observation for RAF Odiham, several miles to the east south-east of the crash site, issued at 1150 hrs, gave a surface wind of 190/06kt, visibility greater than 10 km, few clouds at 1,200 feet, scattered cloud at 1,800 feet, broken cloud at 4,000 feet with a temperature of 18°C, dewpoint 15°C and a sea level pressure of 1017 mb.

Radar analysis

The track of OY-DHV was derived from data from the Pease Pottage and Heathrow 23 cm radars. The data from the two radar sites showed the aircraft tracking in a northerly direction. This was consistent with the declared destination. The final track of the flight is shown at Figure 1 (*jpg 118kb*) superimposed on an Ordnance Survey map of the area.

Previous flights

The aircraft departed Peterborough on 30 June 2001 at 1250 hrs and arrived at Perigueux at 1645 hrs. On 6 July 2001 the pilot accompanied by a passenger departed Perigueux with the intention of flying direct to St Tropez. Shortly after departure however the aircraft was struck by lightning and was forced to land at Figeac because of poor weather and heavy rain.

Approximately an hour later the aircraft departed Figeac bound for St Tropez but en-route encountered severe thunderstorms. RT and Radar recordings of this flight were obtained with the assistance of the French Bureau Enquetes-Accidents (BEA). The radar information showed that between 1549 hrs and 1610 hrs the aircrafts flight path was extremely erratic with numerous turns through 360° and rates of descent of 2,800 fpm. Between 1557 hrs and 1601 hrs the aircrafts height above the local terrain varied between 100 feet and 600 feet and at one point the aircraft was recorded as being only 77 feet above ground level. Recorded ground speed for this period varied between 181 kt and 54 kt.

The passenger travelling with the pilot reported that whilst flying in the severe weather the aircraft was shaking so much that she had to hold on to the latch of the sliding canopy to prevent it from opening. The pilot had to hold onto the instrument panel and at times the stall warning light illuminated and the stall warning horn sounded. Furthermore, on occasions, the aircraft exceeded its maximum speed.

The pilot transmitted a PAN call that he eventually upgraded to a MAYDAY and with the assistance of ATC he was able to make a successful landing at Montpellier arriving at 1621 hrs. The remainder of his journey to St Tropez was completed by road.

The pilot and passenger returned to the aircraft, at Montpellier, 4 days later on 10 July 2001, planning to depart at 1215 hrs and fly, with one refuelling stop, to the UK. Due to an unserviceability with the aircraft however the departure was delayed until 1800 hrs. Because of the late departure and fading light conditions the pilot decided to curtail the flight and land at Perigueux.

Before the pilot and his passenger departed Montpellier an engineer was called to attend to the aircraft. The pilot explained to the engineer that there was a problem with the landing gear and that the rudder bars were not working. The engineer stated that the pilot thought the steering was broken

and that the aircraft had been struck by lightning. The pilot and engineer met with a second engineer to inspect the nose landing gear. The nose gear was found to be serviceable but the rudder had seized at the mechanical stop. After maintenance action the rudder bars returned to their normal position and a taxi check confirmed the correct operation of the steering. The engineers explained to the pilot that the rudder jam had occurred because the aircraft had been parked outside in strong winds without the control locks applied. Furthermore the engineers pointed out that the paint at the rear of the fuselage was cracked one metre in front of the fin and that the fabric had folds visible at the rear of the fuselage and on the fin. The pilot was advised to have the aircraft inspected in view of these problems but that they (the engineers) were not competent to carry out this inspection and there was no one so qualified at the airfield. The pilot replied that the aircraft was already in this state before he came to Montpellier and that these problems were not linked to the wind gusts encountered on the ground during the recent storms. The pilot stated that he had to be at work the next day and would have the aircraft checked on his return to the UK.

Aircraft description

OY-DHV was a Wassmer WA-40 Super IV built in 1962 at Issoire in France by Wassmer Aviation SA. The WA-40 is a low wing monoplane with four or five seats, a large sliding canopy, retractable landing gear and a 180 HP Lycoming O-360 engine, driving a McCauley constant speed propeller. The fuselage is primarily of welded steel tube and the wings, fin, tailplane and control surfaces are constructed of wood with plywood and fabric covering. At the time of the accident there were no WA-40 aircraft on the UK register, although there were a number of the later WA-41 Baladou, variants.

Initial engineering examination

The wreckage of OY-DHV was distributed over a distance of about one kilometre of fields and woodland and the spread of the wreckage showed that the aircraft had suffered a number of structural failures in flight. The locations of the significant items were plotted by GPS and this showed the direction of the wreckage trail as 050°M, the direction of the wind at the time of the accident.

The main area of wreckage included the fuselage structure, landing gear, engine and propeller and in this immediate area there had been a severe ground fire following the ground impact. The steel fuselage structure, the steel engine attachments and the steel wing attachments had all survived the ground fire and had clearly remained attached to their local wooden structure up to the ground impact.

There was little of either wooden wing structure attached to the fuselage at the main impact site. The major part of the left wing was found a few metres from the fuselage and was clearly attached at the first impact with the ground. The right wing, however, was much more fragmented and portions of it were found throughout the length of the wreckage trail, showing that it had been part of the in-flight breakup.

The items of fin, rudder and the all-moving tailplane were also found away from the fuselage wreckage. The fin and rudder were separate but both were intact and found in the same general area of the wreckage trail. The right tailplane was found as one item but the left tailplane was more fragmented. The pattern of damage indicated that the flying controls were intact up to the point of the in-flight breakup. Simple calculations based on the wind speed, the distribution of wreckage

and the approximate velocities of the falling items showed that the major structural failures had occurred at a height greater than 1,000 feet above the ground.

Examination of the wooden structure

The wooden structure was subject to further examination by a specialist in this area.

The failures in the empennage indicated that the final structural failure of the fin had been to the right, the final failure of the right tailplane had been downwards and the final failure of the left tailplane was upwards. There were also indications within the fin and right tailplane failures that these components had previously been subjected to high loads in the opposite direction (loading the fin to the left and the right tailplane upwards). The compressive portion of these earlier loads had caused compression kinks in the wood cell walls and reduced the resistance of these components to later tensile and bending stresses. It was not possible to tell whether this damage had occurred just before the final failures or earlier.

The right wing was found in many portions. The inboard structure, still attached to the steel wing attachments, had been damaged by the ground fire. It was not possible to determine either the direction in which the wing had failed or the sequence of failure within the wing, although there were some indications that the right wing may have failed downwards.

The specialists view was that the aircrafts wooden components had been well constructed with, in general, a good spread of adhesive and good bonding. Around the torsion box linking the left and right portions of the tailplane and around the rear spar of the fin structure, however, there were areas of debonding. This appeared to have been due to moisture ingress in areas where UF (urea-formaldehyde) resin had been used. As well as the areas showing evidence of moisture ingress there were other indications, consistent with the age of the aircraft, of airframe repairs; a small piece of oak had been used in the right wing tip in a position where spruce had been used in the left wing.

Aircraft documentation

The aircraft had been brought onto the Danish aircraft register in 1970 and the first Certificate of Airworthiness granted by the Danish Directorate of Civil Aviation was dated September 1970. Thereafter the Certificate of Airworthiness was renewed at regular intervals up to the most recent renewal in August 1998 (valid to August 2001). An Annual check and 100 hour Inspection were performed in Denmark in September 1999.

The aircraft was sold by its Danish owner and ferried to the United Kingdom during the summer of 2000, with the next Annual Inspection due in September 2000, by an engineer with Danish approvals. To date there has been no evidence presented that this Inspection was performed but, over the months to May 2001, there was work performed on OY-DHV, at the request of its new owner, by a UK light aircraft maintenance organisation. The available evidence indicates that, up to May 2001 at least, OY-DHV appeared to be in a satisfactory and airworthy state.

Previous engineering events

The engineer at Montpellier had indicated cracking of the paint skin forward of the fin. This was an area of steel tube structure and this portion of the fuselage was found to be intact after the accident.

The surface of the fin was found to be smooth therefore reference to folds in this area would have been on the fabric fairing the fin to the aft fuselage.

The Danish authorities were able to provide information on the previous history of OY-DHV, over the period 1970 to 1999. This included an engine shock loading in June 1970 and landing gear collapses in June 1971, November 1979 and August 1985. There had also been major repair in 1976 following damage during a landing.

Discussion

The degree of fragmentation and the spread of the wreckage indicated that the break-up sequence was complex and occurred at an airspeed higher than the normal cruising speed of the aircraft. It is possible that the stresses imposed on the aircrafts structure causing such a break-up may have been brought about by an attempted recovery following a loss of control in instrument conditions. The pilot had no instrument flying qualifications.

The final bending failures of the fin and tailplanes were all in a clockwise sense (viewed from the rear) suggesting that they had a common cause. If this cause was the structural failure of the right wing, then it would have needed to have been a downward failure.

The final failure of the tail surfaces appears to have been assisted by compression kinks that reduced their resistance to later bending and tensile loads. This damage could have occurred when the aircraft was parked at Montpellier but wind damage during this time would have been more likely to affect the fin rather than the tailplane. It is also possible that the compressive damage occurred during the aircrafts flight from Perigueux to Montpellier on 6 June 2001. However the previous damage could have occurred at anytime in the aircrafts 38 year history.

The deterioration of wooden aircraft structure with the passage of time is a long-standing concern both in the UK and elsewhere. As a result Airworthiness Notices on this topic have been published since 1957. UK CAA Airworthiness Notice No 50 (Issue4, dated 29 Oct 2001) is the current one on this subject. Airworthiness Notice No 50 includes the following paragraph:

Examination of older type wooden aircraft has highlighted several serious structural failures, and continued vigilance is therefore essential if the integrity of wooden aircraft structures is to be maintained. Deterioration has occurred in those assemblies where normal inspection is impossible and has not come to light until the adjacent structure has been disturbed to embody repairs or modifications, or during extensive overhaul. These closer examinations have revealed failure of glued joints in the primary structure and patches of timber in a state of decay as a result of exposure to extremes of atmospheric conditions.

General conclusions which have been drawn from the results of these examinations are:

- (a) The external appearance of wooden aircraft may give little or no indication of the condition of the timber and glued joints beneath the surface.
- (b) Aircraft built with glued ply and timber torsion box construction are the most vulnerable.
- (c) Under extreme conditions, deterioration can be very rapid indeed.

(d) Lack of proper drainage can be a significant contributory factor, particularly when associated with (c) above.

(e) Many glues, especially those in use before 1950, lose strength with age/or cycles of humidity and temperature.....