

Spitfire Tr.9, G-TRIX

AAIB Bulletin No: 10/2000 **Ref: EW/C2000/04/02** **Category: 1.2**

Aircraft Type and Registration: Spitfire Tr.9, G-TRIX

No & Type of Engines: 1 Packard Merlin 266 piston engine

Year of Manufacture: 1944

Date & Time (UTC): 8 April 2000 at 0804 hrs

Location: Goodwood Airfield, Chichester

Type of Flight: Private

Persons on Board: Crew - 2 - Passengers - None

Injuries: Crew - 2 - Fatal - Passengers - N/A

Nature of Damage: Aircraft destroyed

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 49 years

Commander's Flying Experience: 8,440 hours

Last 90 days - 160 hours

Last 28 days - 40 hours

Information Source: AAIB Field Investigation

History of the aircraft

This aircraft, registered as G-TRIX but generally known by its service serial number PV202, had been built at Castle Bromwich in 1944 as a Spitfire Mark IX. It saw extensive operational service within Western Europe between October 1944 and May 1945, principally in the service of No 412 (RCAF) Squadron. In July 1945 the aircraft was put into storage where it remained until July 1950, when it was bought by Vickers Supermarine for conversion into a two-seat trainer, Mark Tr.9, for sale to the Irish Air Corps. In 1960 the aircraft was withdrawn from service and used as an instructional airframe at Baldonnel, near Dublin, until 1968.

Between 1968 and 1980 the aircraft was held by a number of private owners and then underwent an extensive rebuild over 10 years, flying again in February 1990. One feature of this rebuild was deletion of the 'bubble' rear canopy, replacing it with a conventional Spitfire canopy. The aircraft was owned and operated by one individual between 1991 and July 1999 and was displayed extensively at airshows both in the United Kingdom and mainland Europe.

Background to the flight

Ownership of the aircraft had been transferred in July 1999; the new owner was a South African national. He decided that the aircraft should remain in the United Kingdom for an indeterminate period.

For clarity, in this Bulletin the new owner of the aircraft is referred to as 'the owner' and the pilot who was supervising him during his familiarisation flying is referred to as 'the pilot'.

The Spitfire is classified as a single engine aeroplane (landplane) of which the maximum total weight authorised does not exceed 5,700 kg therefore the owner was entitled to fly the aircraft in the UK under the privileges of his South African Licence. The flights were not for the award or renewal of a licence or rating, consequently the pilot did not require a Flying Instructor rating in order to supervise the owner.

On all the pertinent flights, including the accident flight, it was the pilot who had signed the Technical Log and is therefore recognised as the aircraft commander. He wrote comments in the Remarks column of his Flying Log Book and these entries provided some insight into the purpose of each flight. The owner's name/initials were used in these entries and are denoted by '*' in this Bulletin.

The owner first flew with the pilot on 12 September 1999, at Goodwood. On this occasion he occupied the rear seat and the pilot recorded "FAMIL-(* BACKSEAT)" in his Log Book. The following day four flights were recorded. The first, at Goodwood, lasted 20 minutes and was annotated "TRG-(* F.SEAT)". The next three flights were from Goodwood to RAF Wittering to Duxford to Goodwood; a total time of 2 hours. These were each annotated "TRANSIT TRG(*FS)". It is reasonable to assume that (*FS) indicates that the owner occupied the front seat. On 14 September 1999 there was a 40 minute flight from Goodwood to RAF Halton, again annotated "TRANSIT TRG(*FS)". A second 50 minute flight that day ended in a diversion to Luton because of poor weather.

Shortly after this the owner returned to South Africa. He had flown a total of 3:50 hours in the front seat of G-TRIX most of which was in transit and none of which was solo.

The owner returned to the UK on 1 April 2000 and arrangements were made for him to fly G-TRIX during the following week. It is understood that the purpose of the series of flights was for the owner to achieve a satisfactory standard to fly the aircraft solo.

Visual circuit

The normal circuit height at Goodwood is 1,200 feet agl but it was the usual practice in the Spitfire to fly an oval visual circuit at a height of about 900 agl. This gives optimum visibility from the front cockpit and is particularly important for the rear seat occupant as forward visibility is obstructed by the front cockpit and its occupant, and downwards visibility is obstructed by the wing. After take off the aircraft is flown in a continuous climbing turn onto the downwind leg and spacing is achieved by tracking the wingtip along the runway. When the wingtip is opposite the planned touchdown point a continuous descending turn is flown onto final approach, aiming to roll the wings level shortly before the touchdown point. Ideally, the airspeed at this point should be about 85 mph.

History of the flight

On Saturday 8 April 2000 at 0728 hrs, the owner and the pilot arrived at Goodwood Airfield in a Super Cub. They then pushed the Spitfire out of the hangar and were seen to carry out a 'walkround' pre-flight inspection. At 0752 hrs, the pilot called the Flight Information Service Officer (FISO) and said that they were taxiing and would like to use Runway 32 if the wind was acceptable. The FISO told him that it was southeasterly less than 5 kt. There was more discussion about the wind as the aircraft taxied and when, at 0800 hrs, the pilot said that they were ready for departure, the FISO replied:

"TAKE OFF AT YOUR DISCRETION - RIGHT HAND CIRCUIT - SURFACE WIND EASTERLY LESS THAN FIVE".

The first circuit was uneventful and culminated in a touch-and-go landing. On the second circuit, there was a Downwind call from the aircraft at 0803:33 hrs. This circuit to the end of the downwind leg appeared similar to the first with eye witnesses estimating the height to be around 900 feet agl. Eye witnesses also made various observations about the aircraft and engine during this time, however none could be meaningfully related to the subsequent outcome.

The FISO saw the aircraft in the base leg turn and, as no 'Final' call was received, at 0803:48 hrs he transmitted:

"INDIA XRAY LAND AT YOUR DISCRETION - WIND CALM".

He recalled that the aircraft was about half way round the final turn at the time, however there was no acknowledgement of this transmission. The FISO did not notice anything about the aircraft's position or height at this point which caused him any great concern for its safety.

Several informed witnesses observed the aircraft in the later stage of the right turn onto final approach; it appeared to be very low and the nose attitude higher than normal. They heard the power increase and saw the aircraft roll through the wings level attitude to more than 30° left bank. The left wing passed through a small tree and struck the banking alongside the motor racing track. The aircraft continued to roll to the left, impacted the racetrack inverted and continued across it before coming to rest on the grass.

The AFS were rapidly on the scene and quickly extinguished a small fuel fire. Several people who had seen the accident also went to the scene to render assistance.

Meteorology

A local observation was made at the time of the accident:

Surface wind	090°/<5 kt
Visibility	3,000 metres
Cloud	Nil
QNH/QFE	1025/1022 mb

There was no other significant weather.

Engineering examination

The wreckage was examined by AAIB both at the accident site and after removal to the AAIB at Farnborough. This examination showed that, at the initial impact with the embankment, G-TRIX was structurally intact and the flying controls were intact and properly connected. The landing gear was 'down and locked' and the trailing edge flaps (which are pneumatically operated and can only be fully extended or fully retracted) were in the fully extended position.

At the accident site the small tree and the ground marks showed that the aircraft was approximately 45° left wing down. Impact with the banking removed the left wing at its root. The residual lift on the right wing then caused the aircraft to become rapidly inverted as it crossed the racetrack and slid to a halt in a total distance of some 105 metres from the first impact.

The wooden propeller blades had disintegrated during their impact with the top of the embankment and the fragments had been thrown laterally, showing rapid propeller rotation. A series of ground marks made by the propeller were evenly spaced at 1.60 metres, indicating engine speeds (through the reduction gearing) of, for instance, 2,625 RPM at 75 mph ground speed or 2,275 RPM at 65 mph. These engine speeds are consistent with the witness reports of a rapid power increase and the sudden drop of the left wing.

The general condition of G-TRIX had clearly been very good, with a high level of maintenance and good technical documentation. The only recent Defect entry in the Technical Log had been on 18/3/00 as "REAR ASI STICKS NIL OTHER", written by the pilot. This intermittent fault had been discussed with the previous owner and it had been decided to defer rectification until the next significant maintenance input.

Pilot's flying experience

During previous service with the Royal Navy the pilot had qualified as a Helicopter Flying Instructor in 1985 and had continued as a helicopter instructor with the Royal Naval Reserve until recently. He held a UK ATPL and was a Captain with a UK operator. Outside airline flying he had gained considerable experience on a variety of other types. These included 'historical' aircraft such as the Harvard, Mustang and single seat Spitfire Mk XVI. He did not have a civilian Flying Instructor rating.

The Pilot's Flying Log Book which was examined by the AAIB started in December 1993. A total of about 93 hours Spitfire flying was recorded. The first recorded flight in a dual seat Spitfire was in G-TRIX on 28 June 1996. Apart from a flight on 22 August 1996, he did not fly G-TRIX again until 9 May 1998 from when he flew it regularly to the date of the accident by which time he had achieved about 35 hours in the aircraft. The majority of this time was with two people in the aircraft, however the flights were in the main recorded as "Solo" in the "Co-pilot or Student" column of the Log Book. Apart from one flight with the previous owner, the evidence suggests that on all these flights, the other occupant was a passenger and that the pilot would have flown the aircraft from the front seat. The flights with the owner were the only ones which included a name in the "Co-pilot or Student" column and the comment "TRNG" in the "Remarks" column. The implication is that the pilot had limited experience in the rear seat of the Spitfire.

Owner's flying experience

The owner was an experienced pilot with a total of about 5,053 hours. Prior to the accident flight he had about 8 hours flying in Spitfire G-TRIX of which 5 hours 10 minutes were between the 2 and 7 April 2000. He held a South African Airline Transport Pilot's Licence and was in regular flying currency. He had flown many different aircraft of small to medium size both single and twin engined. In older aircraft, he had some experience in Tiger Moth and Super Cub aircraft, however, there was no evidence that he had previously flown a Spitfire other than G-TRIX or any other historic aircraft of comparable performance.

Entries in a computer record of his flying hours confirmed the detail of the flights recorded in the pilot's Log Book.

Medical and pathology

Post mortem examination revealed that both occupants died almost instantaneously from lacerations of the brain, due to a fractured skull and a fractured neck. There was no evidence in either, of any natural disease which may have caused or contributed to the accident.

Toxicology tests revealed a significant amount of Diphenhydramine in the pilot's blood. This is an antihistamine preparation which is used in a number of cough or decongestant preparations on sale to the public. It is known that it may cause drowsiness which in turn may effect the performance of skilled tasks. Indeed Diphenhydramine is produced in proprietary brands to aid the relief of sleep disturbance.

The pilot's wife stated that, when she had spoken to him on the telephone on Thursday 6 April, he had mentioned that he thought he had "a cold coming on". She said that he was someone who made light of illness, nevertheless he had kept several proprietary cold treatment medicines at his home. Of those found in his home after the accident there were at least five different antihistamine preparations, however none of these contained diphenhydramine. Despite this the pathologist believed that he had taken a preparation which did contain diphenhydramine probably as relief for the cold that he mentioned to his wife on Thursday.

Relevant Aeronautical Information Circulars (AIC)

AIC 114/1996 dated 3 December

This AIC is titled "Medication, Alcohol and Flying" and two pertinent paragraphs are reproduced below:

Paragraph 1

"Recent research has shown that 'human factors' may be involved in up to 75% of aircraft incidents. Indeed accidents and incidents have occurred as a result of pilot's flying while medically unfit and the majority have been associated with what have been considered relatively trivial ailments. Although the symptoms of colds, sore throats, diarrhoea and other abdominal upsets may cause little or no problem whilst on the ground they may become dangerous in the flying environment by distracting the sufferer and degrading his/her performance in various flying tasks. The in-flight environment may also increase the severity of the symptoms which may be minor while on the ground. The effects may be compounded by the side effects of the medication prescribed or bought over the counter for the treatment of such ailments. The following are some of the more widely used medicines which are normally considered incompatible with flying."

Paragraph 5

"Antihistamines can cause drowsiness. They are widely used in cold cures and the treatment of hayfever, asthma and allergic rashes. They may be in tablet form or be a constituent of nose drops or sprays. In many cases the condition itself may preclude flying, so that if treatment is necessary advice from an aviation medicine specialist should be sought so that modern drugs, which do not degrade human performance, can be prescribed."

AIC 41/1997 dated 22 April

This AIC is titled "Piloting Old Aircraft and their Replicas" gives general advice on handling these types of aircraft and particularly draws attention to the fact that light elevator forces may allow inadvertently large excursions in pitch attitude and speed.

Human factors

The pilot's activities on the day prior to the accident were examined. He lived near Gatwick Airport and on the morning of Friday 7 April 2000 he travelled to a farm strip near Billingshurst. Between 0755 hrs and 1820 hrs he flew 8 sectors. The total flight time was about 4:15 hours, 2:45 hours of which were in a Super Cub and the remainder in Spitfires G-BKMI and, with the owner, in G-TRIX.

He left the farm strip at about 2030 hrs and drove to the Flight Simulator complex near Gatwick. He participated in a privately arranged simulator detail between 2215 hrs and 2315 hrs.

The following morning he travelled from his home to the farm strip. He then flew the Super Cub to Goodwood where he landed at 0728 hrs. He took off in G-TRIX at 0801 hrs.

The pilot's commercial flying commitments were not a contributory factor in the accident as his last duty period prior to the accident flight was ground training, between 0800 hrs and 1630 hrs on 4 April 2000. However, in the course of the investigation it was noted that, at the time of the accident, he was still rostered for a transatlantic flight the reporting time for which was 1130 hrs that same morning.

Discussion

Apart from the reported fault with the rear cockpit ASI, no evidence was found of any technical defect which could have contributed to the accident. The pilot was aware of the ASI defect and evidently considered it safe to conduct the flight with this unserviceability.

The majority of the pilot's Spitfire flying appears to have been in the single seat version or the front seat of G-TRIX. No evidence was found that he had carried out supervisory flying of this nature before in a two seat Spitfire.

The role of the pilot, while not formally defined, was to give the owner whatever supervision he needed to achieve his aim to fly the aircraft solo. It would be normal for him to express his opinion on whether a satisfactory standard had been reached. As the aircraft commander he was responsible for the safe conduct of the flight and would be expected to intervene if safety margins were eroded.

Ideally, the supervising pilot would not intervene until the other pilot had a chance to demonstrate his ability to recognise and recover from an error. If the latter does not appear to recognise his shortcomings, it may even be necessary to leave the intervention until a late stage to 'prove the point'. Because the visibility from the rear cockpit is so poor the timing of this intervention is critical and, if left too late, it may no longer be an option.

The owner had no previous experience on this genus of aircraft and would probably have been slower to achieve a suitable standard than someone who had flown, for example, the Harvard. This fact would have made the supervising pilot's task much more difficult.

The aircraft descended below the ideal flight path during the final approach and the owner's inexperience was probably a factor in this. Witness evidence suggests that the power application was initiated as the wings were being rolled level. It is probable that the subsequent roll to the left was because insufficient right rudder had been applied to counteract the 'torque roll' associated with power application. This implies that the owner still had control, as the pilot was experienced on the Spitfire and would probably have anticipated and controlled this effect.

The pilot's activities during the period immediately prior to the accident, and his relatively short period of night rest, may have led to a level of fatigue which affected his ability and judgement. This would have been exacerbated by any drowsiness induced by the use of a preparation containing Diphenhydramine.