PART 1.3
NARRATIVE OF EVENTS

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Introduction

1. RAF Tutor aircraft G-BYUT and G-BYVN of the University of Wales Air Squadron (UWAS) No 1 Elementary Flying Training School (EFTS) departed MOD St Athan on the morning of 11 Feb 09 to conduct Air Experience Flights (AEF) for 2 Air Training Corps (ATC) cadets. An earlier sortie corroborated that the weather forecast and conditions in the local flying area were good, with visibility in excess of 10 km and very little cloud. The Volunteer Reserve (VR) pilot of G-BYUT was an experienced ex RAF Fast Jet (FJ) pilot and he sat in the primary (right hand) seat with the cadet in the left hand seat. The pilot of G-BYVN was awarded his wings upon graduation from RAF Linton-on-Ouse in Nov 08 and was waiting to commence FJ trg at RAF Valley; he also occupied the right hand seat with the cadet in the left hand seat. The aircraft took off at 1037Z and 1038Z with G-BYUT ahead and maintained a separation of approximately 1 min during a standard visual departure to the west. Radar trace recordings confirm that both aircraft adhered to the published procedure, making radio calls at Nash Point, a local visual reporting point, and then continuing west until clear of the Cardiff Control Area.

Annex A
Witness 1,2
Annex ,B
Annex C
Annex Q
Annex C
Witness 7
Annex D,E

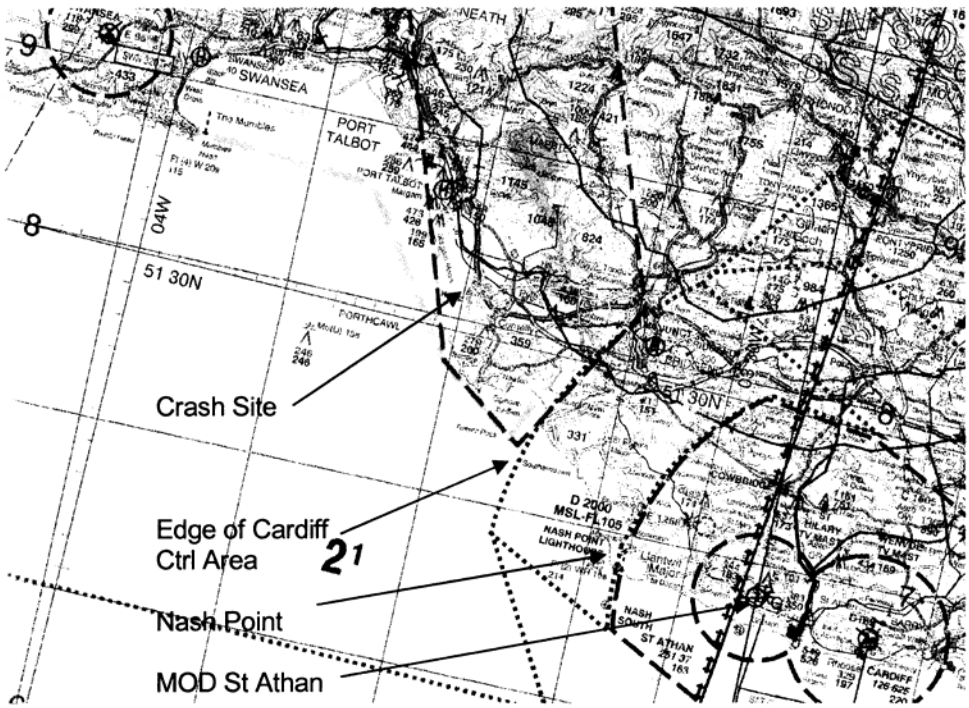


Figure 1. UWAS local flying area.

2. Thereafter, the radar trace data indicates that the aircraft followed independent flight paths and shows G-BYUT manoeuvring briefly in the west and then executing a left turn through south and east onto north, thus closing the separation with G-BYVN as it approached from the east. When G-BYVN entered the same general area it turned slightly to the south before resuming a westerly heading. The resultant flight paths converged and intersected at around 1046:40Z. The radar returns merge at about N51° 31.5 W003° 43.6 at 2800ft (Mode C) and multiple eye-witnesses reported observing a mid-air collision between 2 aircraft.

Annex E
Witnesses S10,S11,S13,S22, S24,S27,S70, S93,S94

3. The collision was catastrophic for both aircraft, with the starboard wing of G-BYUT and the tail section of G-BYVN detaching in flight. There were two main ground impact points, with further debris scattered over a significant

Annex K
Annex F

area, mostly downwind. Both ground impact points were within 500m of the point at which the radar tracks converged. Both occupants of G-BYUT were in the cockpit upon impact with the ground and did not survive. In G-BYVN, the air cadet was in the cockpit at impact with the ground and did not survive. The body of the pilot of G-BYVN was found approximately 23 metres from the aircraft but his parachute had not been deployed and he did not survive. At the main impact point of G-BYVN an intense fire developed. Annex M Annex F

Personnel background

4. Each aircraft was occupied by an aircraft commander and an air cadet:

a. **Captain of G-BYUT**. The pilot of G-BYUT was a 63 yr old Volunteer Reserve Officer who had previously served in the RAF as a FJ pilot. Having joined the RAF in 1970 he retired from full time service as a Wg Cdr in 2002. His last operational flying as a Tornado sqn Flt Cdr was completed in 1988. A series of ground appointments followed prior to his retirement. Before the accident he had accrued over 400 Tutor hrs among 3800 hrs total experience and he had flown 9 hrs in the preceding 30 days. His medical category (A2G1Z1) mandated the wearing of Corrective Flying Spectacles. Annex C

b. **Captain of G-BYVN**. The pilot of G-BYVN was a holding officer awaiting the start of FJ training at RAF Valley. He joined the RAF in 2006 and was 24 yrs old. He had been awarded his wings upon graduation from RAF Linton-on-Ouse in Nov 08, had 81 hrs on Tutor aircraft, over 200 hrs total experience and had flown 19:15 hrs in the preceding 30 days. His medical category was A1G1Z1. Annex C

c. **Air Cadets**. The 2 ATC cadets were from 1004 Sqn ATC based in Pontypridd. Aged 13 and 14 yrs old, the 2 girls were cousins and neither cadet had flown in a Tutor aircraft previously. Annex P

Aircraft background

5. The Grob G 115E Tutor is a single engine low-wing monoplane. It has a cantilever wing and a normal tail unit. The aircraft structure is made from Carbon Fibre Reinforced Plastic (CFRP) which gives a strong but light structure. The semi-monocoque fuselage is a rigid CFRP shell augmented by frames. The vertical stabiliser is part of the fuselage shell and the windscreen arch and instrument panel support add to the structural strength; the seat frames are also part of the primary structure. A one piece sliding canopy contains 2 transparent acrylic panels which are split by a central spine that houses the main canopy opening and emergency jettison mechanism. The one-piece windscreen is also moulded acrylic. The wings, which contain the main fuel tanks, are a semi-monocoque structure comprising CFRP shells with a PVC honeycomb core bonded together; a composite main spar bears the wing structural loads, flaps attach to an auxiliary spar and ribs add rigidity. A sprung-steel fixed main undercarriage is attached to the wing-root rib. Exhibit 1

Figure 2. RAF Tutor aircraft.

6. All RAF Tutor aircraft are owned, maintained and prepared for flight by VT Aerospace (VTAe). As such, they are known as Civil Owned, Civil Registered (COCR) aircraft (and bear civil registration markings) but are operated by military pilots under Civil Air Publication 393 to the Air Navigation Order 2005[1] and RAF 22 (Training) Group Orders Elementary (TGO(E))[2]. Exhibit 1 Annex I

a. Aircraft G-BYUT (Ser no 82104/E) was manufactured in 1999. The aircraft had flown 3375:10 hrs, plus approximately 9 mins leading up to the accident. The last Airworthiness Review certificate was issued on 19/11/08, a 150 hr inspection was completed on 08/10/08 at 3285:50 hrs and the last scheduled inspection was a 50 hr inspection completed on 12/12/08 at 3333:20 hrs. The Check A inspection was carried out at 0830Z on the 11 Feb 09 and it then flew one sortie of 50 mins prior to the accident sortie. After the first sortie on the day of the accident the aircraft was refuelled and there were no faults recorded by the previous pilot. There was no outstanding Scheduled or Corrective maintenance and no entries of Deferred Defects in the aircraft Technical Log. Exhibit 1

b. Aircraft G-BYVN (Ser No 82124/E) was manufactured in 2000. The aircraft had flown 3415:40 hrs, plus approximately 8 mins leading up to the accident. The last Airworthiness Review certificate was issued on 05/06/08 and the last scheduled inspection was a 150 hr inspection completed on 29/01/09 at 3402:25 hrs. The Check A inspection was carried out at 0835Z on 11 Feb 09 and it then flew one sortie of 45 mins prior to the accident. After the first sortie on the day of the accident the aircraft was refuelled and there were no faults recorded by the previous pilot. There was no outstanding Scheduled or Corrective maintenance and no entries of Deferred Defects in the aircraft Technical Log. Exhibit 1

[1] CAP 393 details the arrangements under which military pilots may fly civil registered aircraft operating under contract to the MOD, without a civil licence.
[2] TGOs detail military orders and instructions which may be more restrictive than CAP 393. Military pilots observe the most limiting parameters of either publication.

Pre-accident events

7. **Previous 24 hours**. The Panel examined the 24 hours leading up to the accident.

a. The pilot of aircraft G-BYUT spent a relaxed day at home on 10 Feb 09. He ate a light evening meal and went to bed before midnight; he appeared to be fit and well rested when he attended the UWAS Met briefing at 0830Z on 11 Feb in preparation for an 0915Z take off. ATC cadets were scheduled to fly on the first wave but did not arrive on time. OC UWAS therefore moved the AEF detail to the second wave and elected to fly a first wave UAS instructional sortie. The pilot of G-BYUT remained on the Sqn until the first wave returned. On the return of the first wave OC UWAS verbally updated him on the weather conditions and authorised his sortie.

S90B
Witness 1
Witness 1

b. The pilot of aircraft G-BYVN flew uneventful AEF cadet sorties on 10 Feb prior to attending a UWAS training evening as a leadership mentor for UAS students. He left the Sqn at approx 2115Z and although he was not seen again that evening, the panel believe that he spent the night in the Officers' Mess at MOD St Athan; he was observed by Mess staff the following morning clearing ice from his vehicle at approximately 0800Z. He attended the UWAS met briefing at 0830Z[3] on 11 Feb and appeared to be well rested and fit for duty. The pilot of G-BYVN remained on the Sqn until the first wave returned and he was seen briefly chatting to the pilot of G-BYUT in the crewroom. On the return of the first wave OC UWAS verbally updated him on the weather conditions and authorised his sortie.

Witness 1
Witness 2
Witness 2
Witness 1

8. **Pilot preparation**. Both pilots were properly qualified to undertake the sortie profiles. They were programmed to fly 3 cadets each in accordance with TGO(E) 365, which outlines guidance on cadet preparation for flight as well as suggested sortie profiles, and attended a routine Sqn briefing prior to flight which covered weather information, airfield and navigation warnings and aircraft availability. Both pilots were briefed and authorised for their sorties by OC UWAS, whereupon they walked to their respective aircraft, completed their pre-flight external checks and strapped into their aircraft. Each cadet was then escorted to their respective aircraft and strapped in. Using the guidance within TGO(E) 365, AEF pilots tailor each sortie to accommodate prevailing weather conditions and any preferences expressed by the cadet. While it is not known what each pilot discussed with his respective cadet, it is normal practice to conduct a pre-flight brief, ascertain any sortie preferences and generally put the cadet at ease.

Annex I
Annex I
Witness 1
Witness 7,10,11
Annex I

9. **AEF passenger preparation**. The ATC cadets arrived at UWAS at approximately 0915Z but preparations were not rushed or otherwise altered as a result of their slightly late arrival because of the decision to delay the first cadet wave. Preparation for flight was completed in accordance with TGO(E) 365. Local UWAS procedures devolve responsibility for delivering the mandatory safety briefing to the VTAe Survival Equipment (SE) Fitters; the Panel noted that the assignment of this duty to the SE Fitters was not recorded formally but that this had no bearing upon the accident. After the safety briefing was complete, the SE Fitters equipped the cadets with the requisite Aircrew Equipment Assemblies (AEA).

Witness 1,9
Annex I
Witness 1,3 4,5,6
Annex V
Witness 1, 4,5,6,9,10

[3] A period off duty of 11 hrs 15 mins. From TGO(E)s, each period of crew duty is to be immediately preceded by a period of not less than 10 hrs off duty, with at least 8 hours available for uninterrupted sleep.

a. **Tutor Safety Brief Video**. Having arrived on the Sqn, the cadets were escorted to the VTAe Survival Equipment (SE) staff who met them and initiated a standard Tutor Safety Brief video which details the normal and emergency procedures pertinent to AEF flying in the Tutor. The cadets watched the video under the supervision of the ATC Sqn adult staff. The VTAe SE staff then returned and gave a demonstration of the operation of the Mk 25 Life Saving Jacket (LSJ) which is normally worn for operations from MOD ST Athan and which is not covered by the standard video brief. At this juncture the SE staff gave the ATC cadets the opportunity to ask questions but there were none.

Annex G

Witness 4,5,6,9,10

Witness 5,9,10,S48

b. **AEA fitting**. Two cadets were then selected at random from among the cadets who had not flown before and they proceeded to an adjacent room to be fitted with flying clothing. The VTAe SE staffs make a point of chatting with the cadets to reassure and encourage them and the fitting procedure was further supervised by one of the ATC Sqn adult instructors who also took photographs to populate the Sqn web site. Neither the cadets nor the adult instructor mentioned that the cadets were cousins. Neither cadet was carrying a camera but both confirmed that they had a sick bag. Each cadet was fitted with an EB85/2 parachute and an LSJ.

Witness 5,9,10,S48

Witness 5,6

Witness 5,10

Witness 5,6,7,10,11

10. **Forecast weather**. The met briefing gave wind as 280°, 8-12 kts with surface visibility of 15 km improving to 25 km and FEW (BECMG OCNL SCT) SC[4] at around 3000 ft above aerodrome level.

Annex B

11. **G-BYUT pre-flight preparation**. The pilot completed an outbrief, signed the Technical Log Record sheet at 1025Z, completed the pre-flight walk round and occupied the primary (right hand) seat. The air cadet was escorted to G-BYUT by the ATC staff supervisor who had been present in the fitting room, and he took further photographs which confirm that the pilot was wearing Corrective Flying Spectacles. During strap-in into the left hand seat the cadet was reminded how to release the seat harness. After an uneventful start-up G-BYUT taxied and took-off using the full length of the runway at 1037Z. The pilot of G-BYUT called for taxi as callsign UAW 87 but then informed St Athan tower controller that he was now UAW 87S and the tower acknowledged. The suffix 'S' is used to inform Air Traffic Control (ATC) and local traffic that modified procedures that avoid an over sea track are being employed. This modified procedure is employed if a cadet is not wearing an LSJ but the cadet in G-BYUT was wearing an LSJ.

Exhibit 1
Witness 11
Witness 10
Witness 11
Annex Q

Annex D

Witness 6, Annex Q

12. **G-BYVN pre-flight preparation**. The pilot completed an outbrief, signed for G-BYVN in the Technical Log Record at 1025Z, conducted a pre-flight walk round and occupied the primary (right hand) seat. The second air cadet was escorted to G-BYVN by the same ATC staff supervisor that escorted the cadet to G-BYUT. The cadet was strapped into the left hand seat and reminded how to release the harness. After an uneventful start-up G-BYVN taxied and joined G-BYUT at the holding point where engine checks are completed but had to wait for G-BYUT to take-off before taking the runway. ATC asked the pilot of G-BYVN if he was content to take off from the intersection (obviating the need to backtrack to the threshold) and the pilot confirmed that he was and took off at 1038Z.

Exhibit 1

Witness 10

Witness 7
Annex D

Annex D

[4] FEW (up to 2/8th cloud cover) becoming occasionally SCT(up to 4/8th cloud cover) SC (stratocumulus).

13. **Departure**. G-BYUT (callsign UAW 87S) flew a standard low departure under Visual Flight Rules (VFR) to the west and reported at Nash Point at 10:39:31Z; this was the last known voice transmission from the pilot. G-BYVN (callsign UAW 95) flew the same departure profile and followed a similar ground track, reporting at Nash Point at 10:40:40Z; this is the last known voice transmission from the pilot of G-BYVN. Annex D, E Annex D,E

Accident events

Sortie profile

14. **Radar trace evidence**. The flight paths of both aircraft were recorded following departure and in the accident area by radars at Burrington Head, in Devon, and Cardiff. From Nash Point both aircraft were squawking the IFF conspicuity code of 7000 with Mode C. G-BYUT continued west to the edge of the Cardiff Control Area at Ogmore-by-Sea, as prescribed by the promulgated procedure, then climbed on a steady north westerly heading to approximately 3400 ft before turning left onto a westerly heading and maintaining altitude. The radar trace then shows a change of heading and altitude consistent with an aerobatic manoeuvre prior to commencing a gentle left hand turn through a further 180° while descending to approximately 2800 ft. After Nash Point, G-BYVN also proceeded to Ogmore-by-Sea, approximately one minute behind G-BYUT and climbed steadily north west to approximately 2500 ft. The radar trace shows occasional heading changes from G-BYVN, consistent with pointing out local ground features and/or a lookout weave. The aircraft then turned left onto a westerly heading and continued the climb to 2800 ft; the radar trace recording appears to show a small turn towards the south before resuming a westerly heading shortly before the tracks merge at around 1046:40Z. The collision appears to have occurred between the radar sweeps at 1046:40 and 1046:44 and after assessing the radar trace data the Panel derived a best estimate for the time of collision of 1046:43. Post collision, the first sweep of the Cardiff radar (1046:48/+ 5 secs) shows 2 contacts with north-south separation: based upon the ground impact points, the southerly return at approx 2500 ft (Mode C) would represent G-BYVN; G-BYUT, further north, has no Mode C return; the next sweep (1046:52/+ 9 secs) shows G-BYUT at 1800 ft (Mode C); sweep 3 of the radar (1046:56/+13 secs) shows one primary return which the Panel believes to be G-BYVN (no Mode C); sweep 4 (1047:00/+ 17 secs) showed no returns and sweep 5 of the radar (1047:04/+ 21 secs) shows the final return for G-BYVN at approx 600 ft (Mode C). Annex E

15. **Actual weather**. The automated weather information at MOD St Athan at 1050Z was: wind 280° magnetic at 6 kts; visibility in excess of 10km; cloud FEW SC at 1200ft; temperature 6°C, dew point 5°C; QNH 1018; with high level OCNL SCT CI and FEW becoming OCNL SCT SC at 3000 ft[5] forecast in the local area. Annex B

16. **Radio transmissions**. The Panel listened to recordings of the MOD St Athan ATC frequencies for the period covering engine start-up to collision. Both aircraft departed normally on a low level VFR departure to Nash Point. All recorded transmissions were normal and the last known transmission from each aircraft was as they each passed Nash Point on departure. The Panel was unable to determine if there were any further transmissions on the UHF Annex D

[5] Occasional SCT (up to 4/8th cloud cover) Cirrus cloud becoming SCT (up to 4/8th cloud cover) stratocumulus cloud at 3000 ft.

Sqn quiet frequency between each aircraft but considered that both pilots were likely to have remained on the MOD St Athan tower frequency in accordance with local procedures. Annex H

Mid-air collision damage

17. As a result of the mid-air collision, substantial portions of the Carbon Fibre Reinforced Plastic (CFRP) structures of both aircraft shattered, scattering wreckage over an area that extended to around 2005m downwind. The downwind debris field also contained a substantial amount of canopy and windscreen acrylic, amounting to approximately 37% of a whole windscreen and 26% of a whole canopy. Some pieces of windscreen acrylic bore the characteristic radial shatter lines associated with a direct impact. Fragments of canopy acrylic had scratches and scoring that are also associated with direct contact. Annex F Annex K

a. **G-BYVN**. The tail section of G-BYVN was severed in the mid-air collision and was located separately in an area approximately 504m from the main impact point of G-BYVN, with damage sustained by the mid-air collision and ground impact but not fire. The port undercarriage leg, which is made from sprung steel, was bent inwards by approximately 35° and was still attached to the main wreckage. The port main wheel had detached from the undercarriage leg and was found between the 2 main crash sites (115 m from the main impact point of G-BYVN) with significant structural damage, consistent with having been struck with substantial force. The trajectory of the wheel, while influenced by the aircraft velocity and impact forces, should have fallen with little or no aerodynamic effects and, owing to a short time of descent, would have experienced minimal wind effect. The Panel therefore concluded that the ground impact point of the port main wheel of G-BYVN represented the best evidence from which to estimate the coordinates of the mid-air collision. The wheel was found at E280074.838 N182009.757[6].

b. **G-BYUT**. Most of the outboard section of the right wing of G-BYUT had separated and was found approximately 693m from the main ground impact point, with damage consistent with a mid-air collision and subsequent ground impact. Large sections of the propeller blades were found within the wreckage trail, also with significant impact damage. Additionally, there were rubber scuff marks on the root of one of the blades and blade counterweight. The canopy arch showed signs of damage but this could not conclusively be attributed to the mid-air collision as distinct from subsequent ground impact.

Collision orientation

18. Determination of the precise aspect and orientation of each aircraft relative to each other at collision was dependant upon marrying impact and witness marks caused by the collision, as distinct from subsequent damage as a result of ground impact. Computer Aided Design (CAD) 3D modelling was employed to determine the collision orientation that accounted for the major structural failures of each aircraft (wing of G-BYUT and tail of G-BYVN) as well as other damage such as to the left main undercarriage of G-BYVN and the propellers of G-BYUT. The most likely impact conditions were concluded

[6] OSGM2 as used by JARTS. Coordinates translate to WGS 84 N51° 31.27 W003° 43.48

to be G-BYUT maintaining a moderate angle of left bank which brought the nose area of G-BYUT into contact with the left main gear of G-BYVN and the right wing of G-BYUT striking the tail of G-BYVN. The Panel concluded that only the engine of G-BYUT would have been substantial enough to bend the sprung-steel port undercarriage leg of G-BYVN, which is corroborated by a rubber scuff mark on G-BYUT's blade root and counterweight and the separation of its propeller blades during the mid-air collision. The undamaged outboard section of G-BYUT's starboard wing helps to establish an orientation that accounts for the inboard section of the starboard wing connecting with the fuselage of G-BYVN. The estimated collision orientation is depicted in the diagrams below but it must be recognised that this static representation does not portray the dynamic element of the collision:

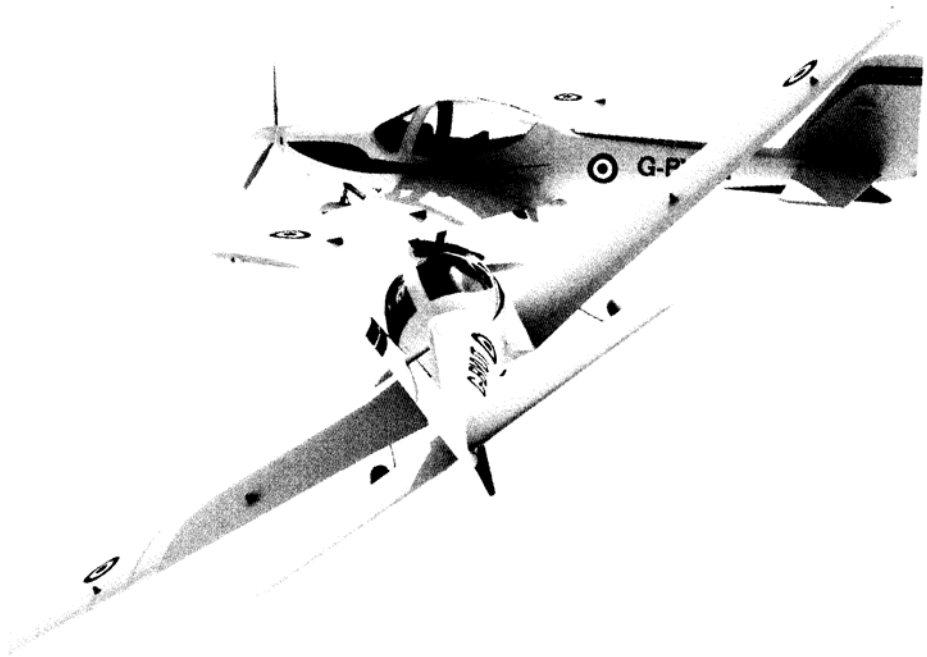


Figure 3. Collision orientation: starboard wing of G-BYUT impacting rear fuselage of G-BYVN.

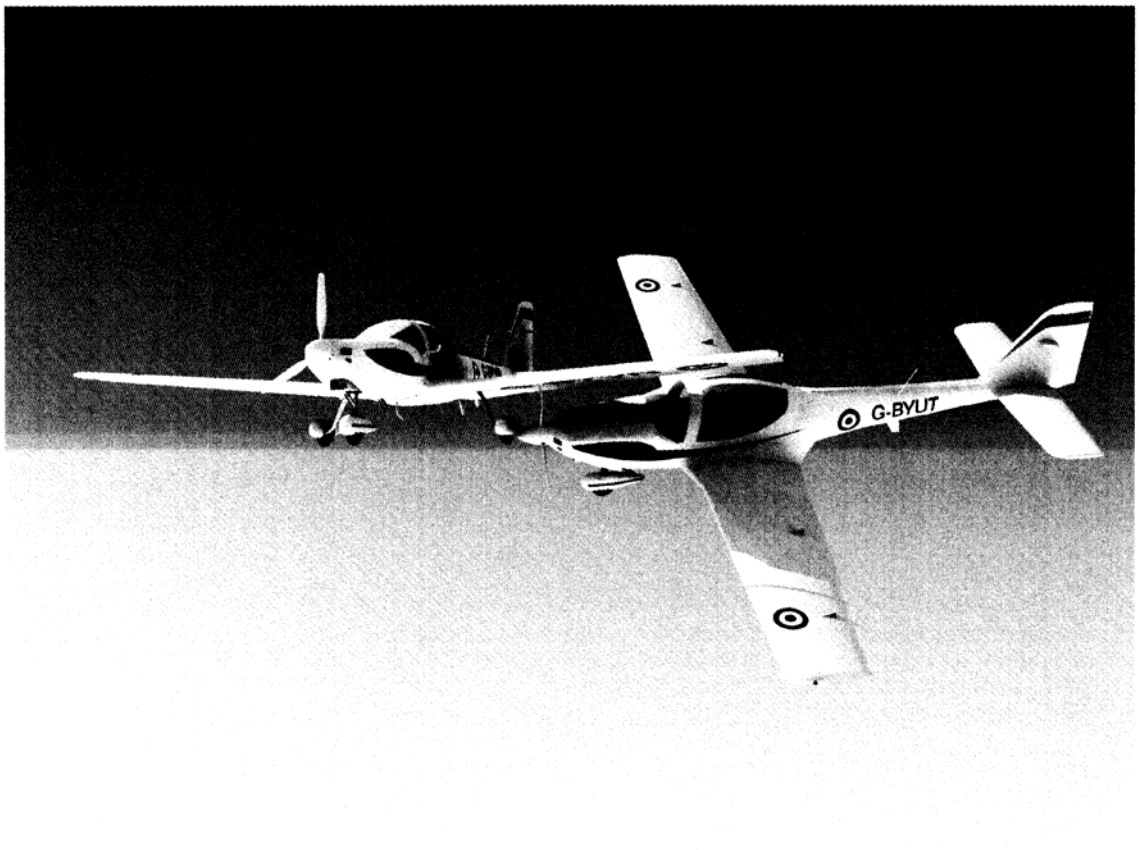


Figure 4. Collision orientation: nose of G-BYUT impacting port main wheel of G-BYVN.

19. While it is not possible to positively associate individual pieces of acrylic within the downwind debris field with either aircraft, the general collision orientation established led the Panel to conclude that at least some of these pieces were likely to have belonged to G-BYUT. This assumption is supported by insufficient windscreen and canopy acrylic at the main impact site of G-BYUT to account for the entire windscreen and canopy. Nevertheless, there was no evidence that the cockpit area was compromised by a substantial intrusion into and through the cockpit, noting that neither the pilot's nor air cadet's helmets bore unusual witness marks and that all of the canopy frame and a substantial amount of canopy and windscreen acrylic had arrived at the main ground impact site. The Panel therefore assessed that while the nose of G-BYUT had struck the wheel of G-BYVN with substantial force, the cockpit of G-BYUT appeared to have suffered a glancing blow which probably shattered the acrylic of the windscreen and canopy but left the canopy frame and cockpit area largely intact. A full breakdown of the wreckage examination is at Annex K. | Annex K

20. The CAD modelling is also consistent with the known flight path radar data and the majority of eye-witness accounts. Post-collision, eye-witness accounts describe the aircraft without its wing (G-BYUT) entering a rolling or spinning manoeuvre which very quickly became a near vertical descent, still rotating; no signs of fire were reported. The aircraft without its tail section (G-BYVN) appears to have attracted the most attention, possibly as a result of being in the air for slightly longer, and most witnesses recall that it reached the ground second. Immediately post collision, G-BYVN was described as entering a flat, rotating manoeuvre for a short while before it pitched into a near vertical descent. Most witnesses recollect that G-BYVN left a trail of smoke and several witnesses describe flames in the latter portion of the descent. | S7,S9,S10,S27, S31,S70,S94 | S7,S9,S10,S14, S27,S31,S36,S93, S94, S70

Survival aspects

21. **G-BYUT**. The Panel believe that the windscreen and canopy of G-BYUT were compromised in the mid-air collision but found no evidence to indicate that either occupant sustained serious injury or was incapacitated during the mid-air collision. Certainly, the pilot appears to have been conscious after the collision because his harness had been released normally prior to impact with the ground. There is evidence to indicate that an attempt had been made to open the canopy with the normal operating handle but with the emergency jettison handle still in-situ; both occupants of G-BYUT were in the cockpit upon reaching the ground and died as a result of the injuries sustained on impact. The ATC cadet was fully restrained and her parachute had not been deployed; the pilot was unrestrained but still in the confines of the cockpit at impact. The aircraft hit the ground vertically in a nose down attitude and the pilot was thrown some distance away from the cockpit area. His parachute had not been deployed.

Annex K
Annex M
Annex J
Annex M
Annex M

22. **G-BYVN**. There was no evidence to indicate that either occupant sustained serious or incapacitating injuries during the mid-air collision. Again, the pilot appears to have been conscious after the collision because his seat harness had been released normally prior to ground impact and his body was found approximately 23 metres from the aircraft; his parachute had not been deployed and he died as a result of injuries consistent with ground impact. The canopy main operating handle mechanism was closed and locked at ground impact; the emergency jettison handle was fractured on one side but it had not been operated. Remnants of the aircraft canopy structure, main canopy handle mechanism and emergency jettison handle were all found within the main impact area but had been severely damaged or destroyed by fire. The air cadet was fully restrained in the cockpit at impact and did not survive the injuries sustained; her parachute was severely disrupted during ground impact but had not been deployed.

Annex K
Annex M
Annex M
Annex J
Annex M

23. **Emergency Services response timeline**. The accident attracted an immediate and substantial civilian emergency services response. A timeline for first responders detailing the arrival of civilian police and paramedic personnel is at Annex W. Some of the timings detailed, when cross referred to witness statements, relate to the time when the individuals were tasked and not when they arrived on scene. However, there were civilian police (including Air Support Unit (ASU)), fire and paramedic (including Helimed) assets on the ground by approx 1100Z.

Annex W
Witness S68, S97, S98, S103

24. **SAR operations**. ARCC Kinloss received a single Emergency Locator Transmitter (ELT) transmission from aircraft G-BYVN at 1047:30Z[7] but no positional data was available[8]. Without positional data, the ARCC cannot initiate SAR procedures but will make immediate enquiries to establish whether the aircraft is in distress and its whereabouts. On 11 Feb ARCC contacted MOD St Athan and when it was established that communication with G-BYVN had been lost a Sea King aircraft operating out of Chivenor (callsign R169) was diverted from a training sortie at 1055Z and arrived on scene at 1115Z. A Police helicopter (callsign P32) was already on scene and coordinated air activity throughout. R169 was directed to G-BYVN with a Helimed aircraft attending G-BYUT. Initially, there was some confusion among the assets on

Annex N

[7] There is a design delay of 50 sec (+/- 2.5 secs) between ELT initiation and transmission of the first signal; thus, initiation would have occurred at between 1046:37.5Z and 1046:42.5Z.
[8] The 406 MHz signal was picked up by the 'detect only' geostationary SAR satellite (SARSAT) system and not the Low Earth Orbit (LEO) constellation which determines position.

scene as to numbers and whereabouts of casualties, principally as a result of the difficulty in positively identifying a body within the burning wreckage of G-BYVN. R169 was tasked to gather sensor footage of the crash site and wreckage before RTB. SW Police GOLD command[9] confirmed that all 4 casualties were deceased at 1510Z.

Aircraft escape facilities

25. The Grob 115E is fitted with a one piece sliding canopy and a windscreen of moulded acrylic. The canopy frame is CFRP with carbon fibre rovings and 2 transparent acrylic panels. The canopy moves along longitudinal guide tracks, one on each side of the cockpit and another on top of the fuselage. Locating pins attach to the rear and bottom of the canopy on each side. Two additional locating pins at the front on each side engage with bushes at the bottom of the windscreen arch. The canopy is locked to the windscreen frame by operating the canopy locking mechanism. There is a red emergency jettison handle fitted to the rear of the canopy locking mechanism. Withdrawal of the jettison handle allows the locking handle to be operated to the rear past the normal 90° limit of travel which in turn withdraws the locating pins on the longitudinal guide tracks allowing the canopy to be jettisoned.

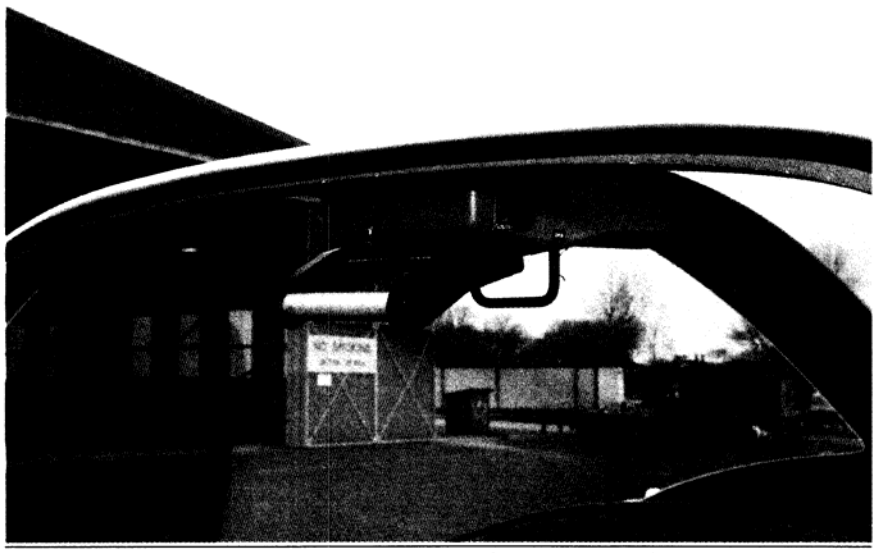


Figure 5. RAF Tutor canopy opening and jettison handle mechanism.

a. **G-BYUT**. Remnants of the aircraft canopy structure, main canopy handle mechanism and red emergency jettison handle were all found within or adjacent to the main impact point. The emergency jettison handle comprises a red handle attached to 2 hinged detent bolts; one of these bolts was still in situ within the main operating handle mechanism. The emergency jettison handle and the second detent bolt were found, still intact, within the impact wreckage but separate from the main operating handle mechanism where it normally resides. However, following detailed analysis by Fleet FS (Air) Materials Integrity Group (MIG), there is evidence that the jettison handle became separated during the accident sequence, most likely at ground impact, and had not been pulled by the cockpit occupants. Additionally, the analysis concluded that the canopy operating

Annex J,K

Annex M

Annex J

[9] GOLD command was located at the SW Police HQ Bridgend. A forward command position, SILVER, was located in a Public House adjacent to the crash site.

mechanism was likely to have been operated and that the canopy was likely to have been open at the point of ground impact. The pilot and cadet were still within the cockpit at ground impact. The pilot's seat harness buckle had been released but the cadet's seat harness buckle was still in the locked position. The parachute operating handles of the pilot and the cadet had not been pulled. Annex M

b. **G-BYVN**. Although the pilot's body was found 23m away from the main impact point of the aircraft, witness marks on the normal canopy release mechanism indicate that the canopy was likely to have been in the closed position and the canopy locked upon impact with the ground. The MIG analysis concluded that it was likely that the emergency jettison handle had not been operated. The pilot's seat harness buckle had been released but the harness release buckle of the cadet was still secured. The parachute operating handles of the pilot and the cadet had not been pulled. Annex J Annex F Annex M

Compound damage to aircraft

26. No evidence has been found of any pre mid-air collision structural or technical failures of either aircraft and both aircraft engines were producing power at the time of impact. Annex K

a. **G-BYUT**. The final position of the wreckage and ground impact marks of aircraft G-BYUT indicate that the aircraft impacted the top of a sand dune in a steep nose down attitude. Witness marks from the leading edge of the remaining wing and the orientation and depth of the engine block in the ground (about 1.5 m in soft sand) led the Panel to estimate the impact angle to be close to vertical. The impact point of this aircraft was approximately 466m to the north of the ground impact point of aircraft G-BYVN. The right wing of G-BYUT was found within the wreckage trail approximately 693m from the main impact point of G-BYUT, with damage consistent with a mid-air collision and subsequent ground impact. The loss of the right wing of aircraft G-BYUT in the mid-air collision would have probably allowed the escape of a significant amount of fuel before the total structural disruption at ground impact which allowed any remaining fuel to escape. Despite this there was no post crash fire in aircraft G-BYUT and the tail section of this aircraft 'telescoped' down on impact, shattering the tail boom and fuselage in the process. All damage to aircraft G-BYUT structure and systems was consistent with the mid-air collision and ground impact. No ELT transmissions were received from G-BYUT and the ELT was recovered from the wreckage and returned to the Original Equipment Manufacturer for analysis[10]. A full breakdown of the aircraft wreckage examination is at Annex K. Annex K Annex F Annex F

b. **G-BYVN**. Eye-witness accounts and the disposition of the wreckage at the main impact site indicate that aircraft G-BYVN impacted the ground in a steep, inverted dive. Eye-witnesses describe G-BYVN as coming 'straight down' in the latter part of its descent but photographs taken soon after impact clearly show that the aircraft was inverted and that the engine block was not buried in the soft sand, noting however that it impacted the slope of a steep sand dune which further complicates the impact conditions. The aircraft structure was largely intact initially and had not 'telescoped' in upon itself Annex K, L Witness S7,S14, S70,S93,S94, Annex Q

[10] As of 22 Jun 09 the Panel was awaiting feedback.

longitudinally. Overall, it was not possible to estimate an impact angle but the Panel concluded that the final descent of G-BYVN was steep and that ground impact that was at least partially inverted (i.e. beyond a 90° dive angle) with the wings level. The slight discrepancy between the steep descent described by witnesses and the inverted wreckage may indicate that the aircraft was bunting, adopting an increasingly negative attitude. The mid-air collision damage to G-BYVN most likely did not breach the fuel tanks but at ground impact a significant amount of fuel escaped and either ignited or fed an existing fire. The resulting sustained fire consumed the entire fuselage and left wing structure of the aircraft, significantly reducing the amount of intact aircraft systems and fuselage available for recovery. The tail section of aircraft G-BYVN was severed in the mid-air collision and was located separately within the wreckage trail, 504 m from the main impact site. All damage to aircraft G-BYVN structure and systems was consistent with the mid-air collision, ground impact and subsequent post crash fire. A full breakdown of the aircraft wreckage examination is at Annex K. | Annex K

Degree of injury

27. The Panel finds that:

a. The pilot of aircraft G-BYUT did not survive the accident. | Annex M

b. The pilot of aircraft G-BYVN did not survive the accident. | Annex M

c. The ATC cadet of aircraft G-BYUT did not survive the accident. | Annex M

d. The ATC cadet of aircraft G-BYVN did not survive the accident. | Annex M

Damage to aircraft, public and civilian property

28. **Aircraft**. As civilian owned and civilian registered aircraft they are not subject to Service damage categorisation. | Exhibit 1

a. G-BYUT was totally destroyed in the accident and has been subject to 'write off' by the aircraft owners and their insurance company. | Annex X

b. G-BYVN was totally destroyed and in the accident and was also subject to an extensive post crash fire and has been subject to 'write off' by the aircraft owners and their insurance company. | Annex X

29. **Public property**. Damage to Public Property:

a. The cost of the Aircrew Equipment Assembly (AEA) worn in the accident was £7100.

b. The total value for the damage to Public Property has been estimated at £7100.

30. **Civilian property**. The accident caused damage to civilian property. This has been assessed iaw QR1282(2) a to c.

a. Both aircraft were civilian owned and registered. | Exhibit 1

b. The tail section of aircraft G-BYVN struck the guttering of a private residence as it fell to the ground. No claim for the cost of

repairs to the guttering has yet been made.

c. The accident debris trail covered a significant area of farm land and nature reserve land. No claim for damage to farm land has yet been submitted. Annex F

d. The crash sites of the 2 aircraft were within the Kenfig Nature reserve and both sites were subject to environmental remediation. Costing for site remediation provided by DE Land was £8027.50. Annex Y

e. The parachutes worn by the pilots and passengers of the aircraft were owned by VT Ae. The costs for the parachutes worn in the accident is Section 43

f. The aircrew protective helmets worn by the cadets (Alpha helmets) were owned by VT Ae. The costs for the helmets worn by the cadets in the accident is £2054.40.

The total value for the damage to Civilian Property is estimated at £11,111.60 (not including the cost of the aircraft).

Loss of, or damage to, classified material

31. There was no loss of, or damage to, classified material as a result of the accident to aircraft G-BYUT and G-BYVN.

Available evidence

Constraints and procedures

32. Primacy for investigating accidents involving civil registered aircraft, which includes RAF Tutors, lies with the Department for Transport's Air Accidents Investigation Branch (AAIB). Furthermore, the Police have primary jurisdiction to investigate all circumstances in which they suspect a crime has been committed. In practice, especially where deaths have occurred, the Police can be expected to take the lead until they are satisfied that a crime has not been committed. In this instance, where the profile of the accident was elevated by the presence of 2 young air cadets, the Police implemented the full procedures associated with a major crime, and initially adopted a posture that was resistant to contribution from other agencies.

33. Difficulties were compounded significantly by the late arrival of the Service Inquiry Panel (SIP); a delay in convening[11] the SIP meant that the Panel members did not arrive at the crash site until 45 hrs after the accident. It was therefore of paramount importance to quickly gain the trust of the Police commanders and AAIB personnel so that the RAF SI could begin without further delay. Fortunately, this was achieved very quickly and an extremely good working relationship established with both the South Wales Civilian Police and AAIB personnel; the importance of developing these key relationships must not be under estimated.

34. By the time the Panel arrived at the crash site, most of the major Post Crash Management (PCM) activities had already been completed; understandably, all aircraft occupants had been removed from the scene, as

[11] LEGAD raised concerns regarding the initial nomination for President (OC OPS at RAF Linton-on-Ouse) when it became apparent that one of the accident pilots had recently completed BFT at the same unit.

had all of the wreckage of G-BYVN, most of G-BYUT and all of the downwind debris. Fortunately, both crash scenes had been captured by a variety of different media, including video surveys and digital images but just tracking down all of the photographs took time and there were inevitably some aspects and details that would have proved useful that were not captured[12]. Inevitably, significant numbers of personnel from the Emergency Services[13] had had access to the crash site before the Panel was able to commence its investigations, further compromising the ability of the Panel to gain an accurate impression of the crash scene. Annex Q

35. The AAIB and RAF investigations had to remain independent, not least to ensure for the record that the RAF did not compromise the impartiality of the AAIB report, conclusions and recommendations. In practice, both investigations benefited from mutually supporting activities in many areas at the working level while remaining careful to ensure that a clear audit trail exists between evidence and conclusions so that each report withstands independent scrutiny. As the lead authority, single source evidence has to reside with the AAIB but the SI had no difficulty securing access to duplicate information. AAIB progress was not as swift as the RAF SI due to the need for AAIB members to manage multiple investigations concurrently and where dependencies upon progress by the AAIB arose then SI progress was affected. There would have been substantial legal obstacles to any attempt by the RAF to insist upon AAIB evidence or data being released and effective cooperation was therefore a critical requirement. With the increase in RAF use of civil-registered aircraft, such as by the Military Flying Training System, the Panel noted that continued development of the relationship between AAIB and the RAF, especially at more senior levels, will greatly assist future investigations. It will also be vital to maintain the trust of the AAIB by treating that information which is released or shared with the utmost care.

36. Additionally, HM Coroner for Bridgend opened a Public Inquest into the deaths arising from the accident and will need to be satisfied that all reasonable steps have been taken to prevent a recurrence; the SI President met with HM Coroner to establish a dialogue, secure agreement to a supporting role by the SW Police and was present when the inquest was opened on 18 Feb 09.

Limitations on available evidence

37. Notably, much of the evidence that might be expected to make a significant contribution to an accident investigation was absent or destroyed; there were no survivors among the aircraft occupants, the Tutor aircraft is not fitted with an Accident Data Recorder (ADR) or Cockpit Voice Recorder (CVR), and flight profile data within the Global Positioning System (GPS) of each aircraft was lost under the conditions of ground impact. The lack of crash-survivable data from the aircraft, compounded by the secondary damage to each aircraft as a result of impact with the ground (including an intense fire that consumed most of G-BYVN) and the lack of survivors complicated the investigation and there are many aspects that could not be determined with absolute certainty.

38. Notwithstanding this, the Panel was quickly able to reconstruct a reasonably accurate account of events leading up to the accident, principally

[12] For example, detailed pictures of all AEA before the bodies were disturbed by the emergency services.
[13] To include the South Wales Police, the Fire Service, the Ambulance Service, Urban Rescue Teams, Police dogs and handlers, and the Joint Aircraft Repair and Transport Sqn personnel.

as a result of 2 separate radar traces that each recorded the flight profile leading to the collision. The 2 radar traces, from different radar heads and with different Antennae Rotation Periods (ARP), are consistent with each other and are further supported by multiple eye-witness accounts which also describe events that broadly match the radar trace data. Annex E

Radar trace data

39. The Burrington radar head in Devon detected each aircraft as they climbed through approximately 2000 ft amsl; it has an ARP of 8 secs. The radar at Cardiff airport tracked both aircraft almost from take-off and has an ARP of just under 4 secs[14] which provides a more frequent update rate. The Burrington radar is synchronised with Greenwich Mean Time (GMT). The timing reference of the Cardiff radar is not guaranteed to be synchronised with GMT although in practice the Panel noted that the Cardiff radar times appeared to be within 1 sec. Despite the different ARPs and radar head locations, the discreet returns from each radar recorded flight paths for each aircraft that are consistent, as shown in Figures 6 and 7. The Panel therefore had no reason to doubt the validity of the radar returns. Annex E

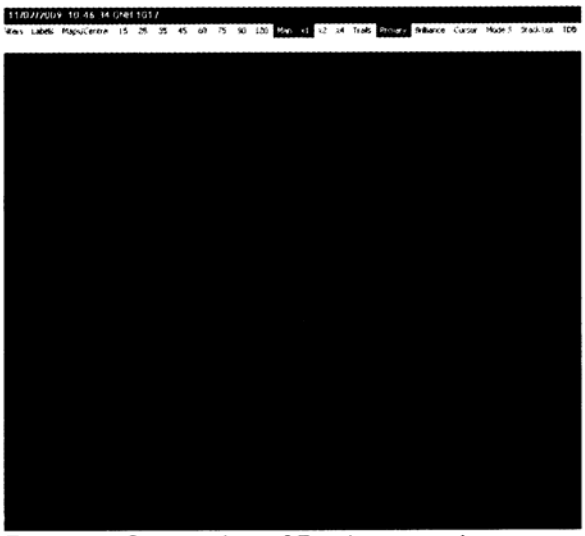


Figure 6. Screenshot of Burrington radar approximately 9 secs prior to the collision.

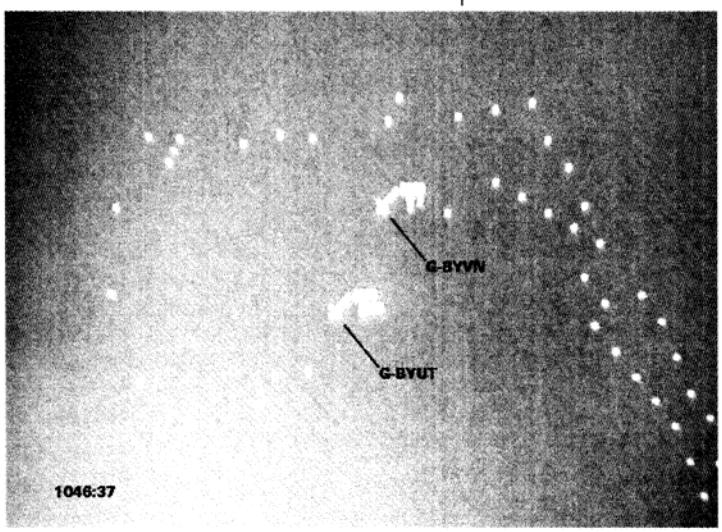


Figure 7. Screenshot of Cardiff radar approximately 6 secs prior to collision.

40. Nevertheless, radars have inherent limitations which must be recognised, such as displaying a flight path trend and not a precise aircraft attitude[15] at any given moment as a result of the ARP. Additionally, the radar signature of an aircraft varies according to its size, shape, orientation and the properties of the materials with which it is made, and these, or the effects of weather, can result in poor or lost returns. The Panel noted that G-BYUT was missing a return at 1045:59 for example, probably due to presenting a poor Radar Cross Section (RCS)[16] during its aerobatic manoeuvre. Radars also have a limit to their capability to discriminate between 2 objects that are in close proximity; range, beam width and Pulse Repetition Frequency (PRF) will determine the size of a 'resolution cell' within which a radar will be unable to provide discreet returns. Within the resolution cell of a radar, the radar is likely to provide a single return for 2 or more contacts, based upon the centroid of Annex E

[14] Every 5th or 6th return shows a time difference of just 3 secs.
[15] For example, although the radar trace may appear to show a smooth turn, an aircraft may actually be varying the angle of bank and rate of turn between each radar sweep.
[16] A measure of the radar reflectivity of an object.

the received radar energy[17]. Data from the Senior Engineer at Cardiff and advice from the Defence Electronic Warfare Centre at RAF Waddington confirmed that at the range of the collision the Cardiff radar would have a resolution cell that is approximately 260 m in range and 310 m in azimuth. The 2 aircraft approached within about 0.2 nm (1216 ft/370 m) at 1046:37 and would thereafter have entered the resolution cell. Over the next 2 sweeps of the radar (1046:40 and 1046:44) G-BYVN is not detected. Annex E

41. Modern displays are also subject to software based interpretation of the raw radar returns; the ARP and resolution limitations can lead to returns being incorrectly ascribed to aircraft that are in close proximity, leading to erroneous data. The returns for G-BYUT appear closer together immediately prior to collision but the aircraft could not have slowed appreciably without extreme aerodynamic manoeuvre. It is more likely that G-BYUT continued to progress at a similar rate to the preceding returns until the collision and the actual position at 1046:44 would have been further north, as illustrated in Figure 8. This revised position matches the estimated time of collision at 1046:43. Annex E

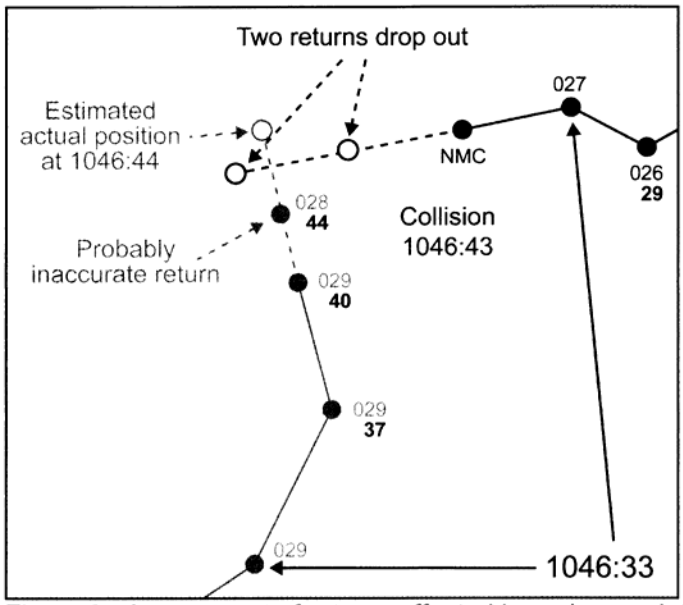
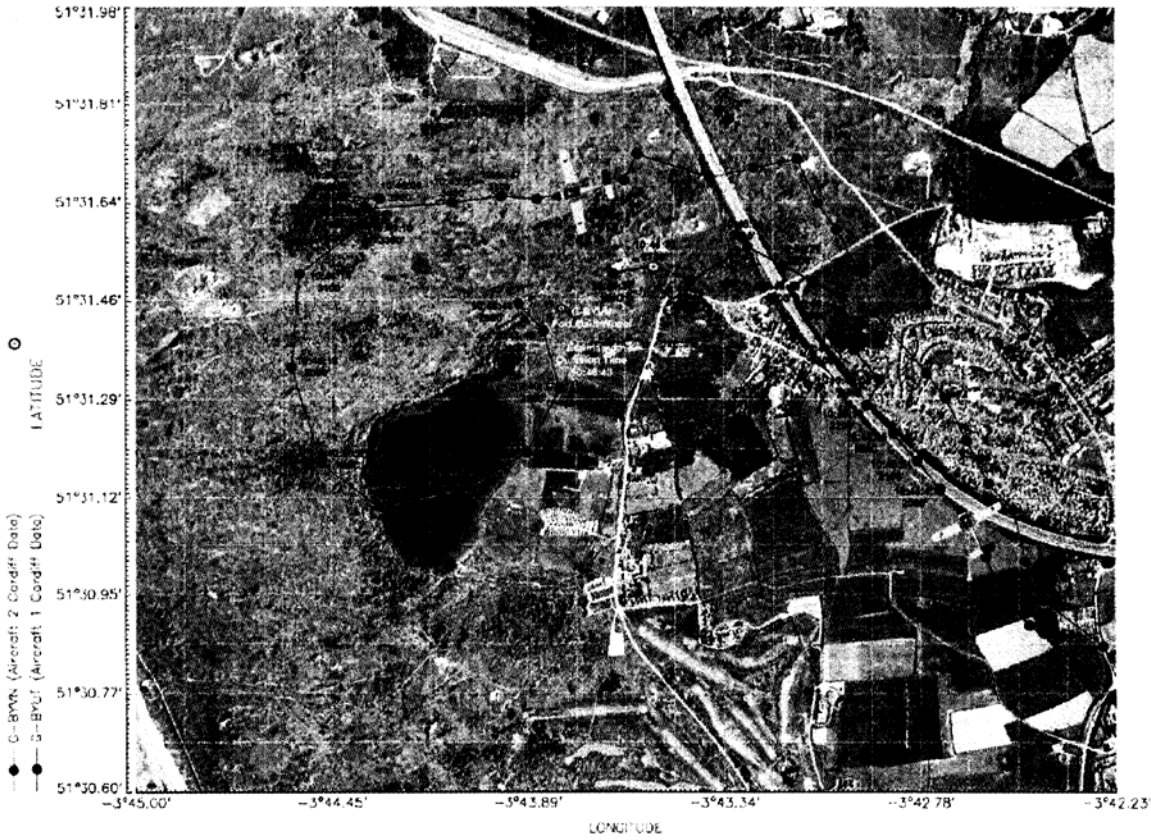


Figure 8. Assessment of returns affected by radar resolution cell.

42. Overall, the radar trace data provided a clear picture of the flight paths of both aircraft leading up to the collision. As the aircraft come together, and in the immediate aftermath, some of the data is missing or inconsistent, as should be expected due to radar resolution limitations, and must therefore be interpreted with caution.

43. **Graphical Data Analysis System**. The Panel contracted QinetiQ to construct a computer model of the flight paths of G-BYUT and G-BYVN leading up to the collision, based upon the radar trace data and with assumptions as to angles of bank and pitch based upon the observed rates of climb and turn. The modelling, based upon the Graphical Data Analysis System (GDAS) tool, cannot be regarded as definitive owing to the radar ARP. Nevertheless, it served to corroborate the overall findings of the Panel and helped to understand the descriptions furnished by witnesses from their respective ground points of observation. The geographical placement of the Cardiff returns is depicted at Figure 9 and a snapshot of the GDAS modelling is presented at Figure 10. Annex Z

[17] This will not necessarily be the mid point between objects as it will depend upon the radar energy reflected by each, which even for identical aircraft will vary according to aspect.



Radar Data Plot

Figure 9. Screenshot of the QinetiQ GDAS plot of the Cardiff radar returns.

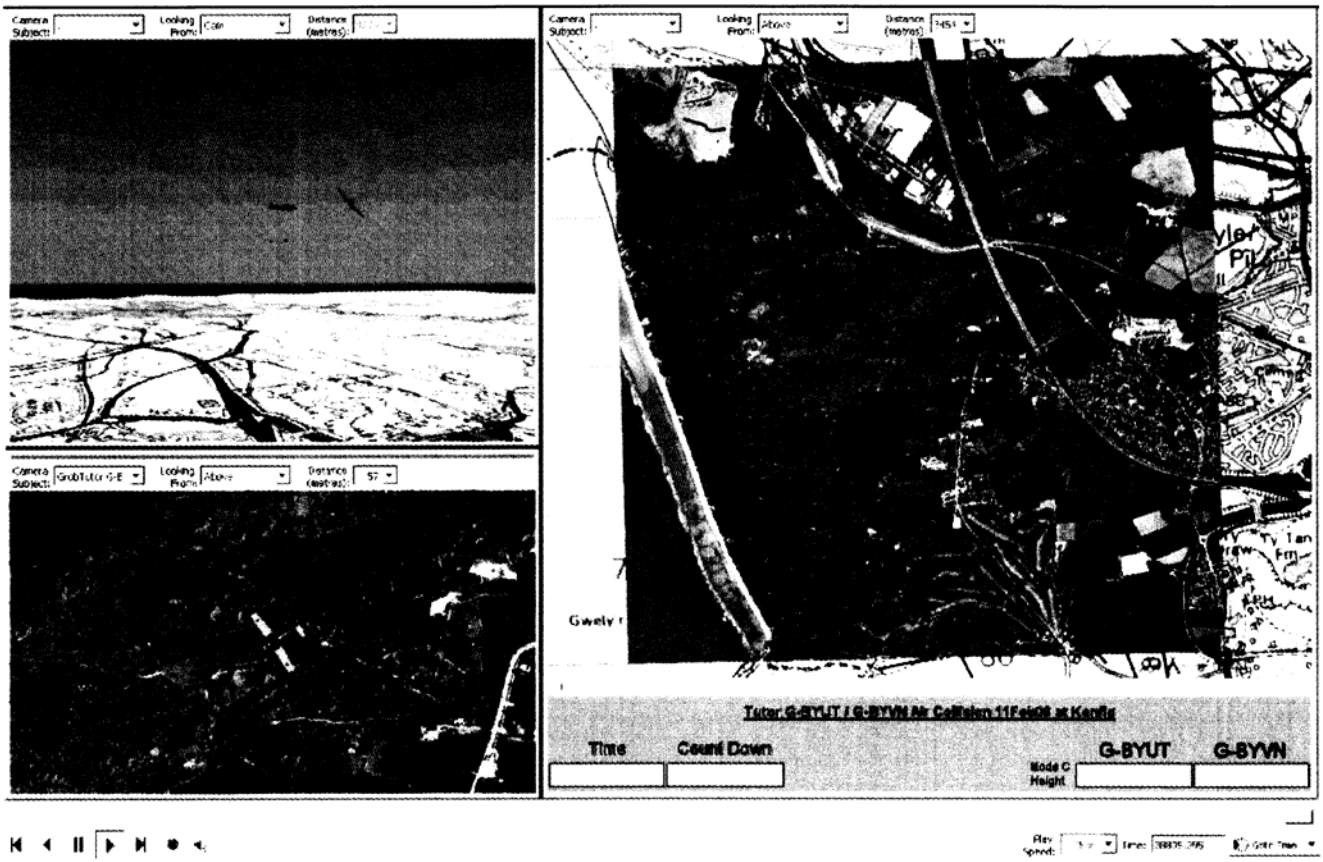


Figure 10. Screenshot of the QinetiQ GDAS modelling of the collision profile.

Eye-witness accounts

44. The SI assessed 44 police statements and reports from eye-witnesses. In most instances, it was the sound of the mid-air collision that drew attention to the accident with only 11 witness statements describing the flight paths immediately prior to the collision. Of these, one report was from a 9 year old boy; his account was credible but from a relatively distant point of observation. He reported being upset by the incident and as his statement revealed nothing new the SI considered it unnecessary to interview him further. Of the remaining reports, 3 were from a family group consisting of a mother with her 17 year old son and a 12 year old niece; their accounts, also from a relatively distant vantage point, were almost identical and therefore only the mother was interviewed[18]. Another witness was interviewed by the AAIB who concluded that he was probably mistaken and in reality also only saw the aircraft from after the collision. The remaining 6 witnesses were interviewed to clarify the details within their initial witness statements to SW Police. In sum, 7 witnesses who reported that they had observed the aircraft prior to collision were interviewed for the purpose of expanding upon their formal police statements to understand the meaning behind the expressions that they had used and to elicit further detail and other nuances that had not otherwise been captured.

Witness D37

Witness S93,S94,D165

Witness S7,S9,S10,S11, S13,S27,S70

45. Additionally, 4 other witnesses who had observed the aftermath of the collision from useful vantage points were also interviewed to elicit further detail on the behaviour of the aircraft post-collision. A summary of all of the interviews conducted is presented at Annex AA. Of the witnesses interviewed, all but one describes the weather as good; the one reference to the aircraft flying through cloud may be as a result of attempting to explain why the aircraft could not be readily acquired visually. Prior to the collision, 3 witnesses describe a single manoeuvre by one aircraft which fits the description of a wing-over. All bar 2 witnesses reported that the aircraft were in steady flight immediately prior to the collision. The 2 witnesses whose initial statements to police appeared to describe sustained aerobatics prior to and immediately before the collision were working together on a nearby golf course. When interviewed to clarify their description it became apparent that there was considerable confusion arising from some of the terminology used, with 'looping around' being used to describe a level turn for example. With the aid of a model, it became clear that one of these witnesses also observed a single wing over before the collision and both described the aircraft as being in steady flight as they approached each other. Only one of these witnesses thought that one aircraft had genuinely looped prior to the collision and was pulling up into another loop; nevertheless, with the aid of the model again, he indicated only a moderate angle of climb.

Witness S31,S58,S93,S36

Annex AA

Witness S11,S27,M18

Witness S27,S70

46. Post collision, the witnesses were reasonably consistent in describing an aircraft without a wing, entering a rotating manoeuvre (terms used include 'spinning', 'rotating' and 'corkscrewing') which rapidly became a steep dive. The descent of G-BYVN was generally described as having had 2 distinct phases; an initial rotating manoeuvre appears to have had a relatively low rate of descent (descriptions include 'spiralling', 'swaying' or 'falling leaf') as compared to its subsequent entry into a steep, nose down dive to the ground.

47. Among all the witnesses, at least 11 describe seeing a person separate from G-BYVN during its descent, with others describing an 'object' separating while remaining unsure whether it was a body or not. Of those that describe 'the pilot', one describes the arms and legs 'waving frantically' and believed the

S7

[18] The SI President conducted joint eyewitness interviews with AAIB.

movements to be deliberate while 2 describe the body as being 'motionless' or like a 'rag-doll' and moving only as a result of the fall. One witness saw someone 'fly out in front', another as 'jumping as if from a step' and others believed that the body separated as a result of the movement and flight path of the aircraft alone. Overall, in regard to the pilot of G-BYVN egressing the cockpit, the witness evidence is inconclusive as to whether he was conscious or unconscious, and whether he jumped positively from the aircraft or was thrown clear involuntarily. The height at which the pilot separated from G-BYVN is similarly difficult to determine with confidence, with estimates ranging between 200-1300 ft, but some useful descriptions that relate the point of separation to the total height lost in descent led the Panel to believe that the pilot of G-BYVN most likely separated from the aircraft at around 700 ft agl or less. S34 S58 S29, S44

48. In many instances witnesses recollected details from one aircraft and transposed them to the other, such as witnesses who were adamant that they only watched one aircraft post collision but describe details that were in reality attributed to both[19]. One witness even asked for an explanation as to how he could clearly recollect seeing the smoke from the crash site before the second aircraft reached the ground but upon approaching the crash sites it was apparent that the first aircraft to reach the ground had not burned. Overall, given the short and dramatic nature of the event for which no forewarning was provided, the eye-witness accounts are remarkably consistent with only relatively minor variations which must be expected. S27

Specialist Human Factors advice

49. The Panel recognised from an early stage of the Inquiry that Human Factors (HF) were likely to have played a significant part in the accident and sought specialist HF advice from the RAF Aviation Psychologist at RAFCAM. Over the course of the Inquiry it became apparent that other accident investigations were also drawing heavily upon this specialist resource and, with only a single incumbent, the Panel frequently had to await HF input; the Panel received the first draft of the HF report on 17 Jun. The Panel also questioned the resilience of the RAF's accident investigation procedures with such reliance upon a digital post.

Summary of evidence

50. A summary of the evidence available to the Panel to assist in its deliberations is listed below:

a. Eyewitness statements.

b. The wreckage of aircraft G-BYUT.

c. The wreckage of aircraft G-BYVN.

d. Engineering documentation of aircraft G-BYUT.

e. Engineering documentation of aircraft G-BYVN.

f. Aircraft fuel sample results.

[19] For example, at least one witness described an aircraft descending with signs of smoke and which burned after impact with the ground; this aircraft was described as missing a wing.

g. Aircraft component testing results.

h. Orders and documentation.

i. ATC transcripts and radar traces.

j. Aircraft Occurrence report.

k. SAR form R.

l. Aircrew documentation.

m. VTAe job profiles.

n. Continuation training records.

o. UWAS incident log.

p. Tutor safety brief video.

q. Air Cadet Record of Service books.

r. Crash site images.

s. Weather reports.

t. MOD St Athan Flying Order Book.

u. R/T transmission recordings and transcripts.

v. Radar traces from Burrington radar and Cardiff airport.

w. Revised departure and arrival procedures.

x. Flight Authorisation sheet.

y. RAFCAM report.

z. RAF Aviation Psychologist report.

aa. FS Air Materials Integrity Group report.

bb. QinetiQ field of view study.

cc. QinetiQ Graphical Data Analysis System.

dd. DEO Land report.

Services

50. To assist the Panel in its deliberations the following services were available:

a. The RAF Centre for Aviation Medicine (RAFCAM).

b. QinetiQ.

c. Joint Aircraft Recovery & Transportation Squadron (JARTS).

d. Air Accidents Investigation Branch (AAIB).

e. Meteorological Office.

f. UK Hydrographic Office.

g. Grob.

h. DAS Service Inquiry Advisor (SIA).

i. VTAe.

Conclusions

51. The Panel concludes that:

a. The crew were on duty.	Witness 1, Annex I
b. The flights of aircraft G-BYUT and G-BYVN were properly authorised.	Annex A
c. The pilot briefings for each flight were completed correctly in accordance with current regulations.	Witness 1
d. The cadet briefings for each flight were completed correctly.	Witness 1
e. Both pilots were properly qualified to conduct AEF sorties and act as aircraft captain with air cadet passengers; all mandatory flying checks and medical examinations were in date.	Annex C
f. The aircraft were serviceable for the flights.	Exhibit 1
g. The weather was suitable for the flights.	Annex B