

AIRPROX REPORT No 2012139

Date/Time: 7 Sep 2012 1449Z

Position: 5213N 00004E (4.5nm
W Cambridge – elev 47ft)

Airspace: LFIR (Class: G)

Reporting Ac Reported Ac

Type: Gulfstream Hawk T Mk1
Galaxy

Operator: Civ Comm HQ Air (Trg)

Alt/FL: 5000ft 4000ft↑
QNH RPS (1018hPa)

Weather: VMC NR VMC NR

Visibility: NR 30km

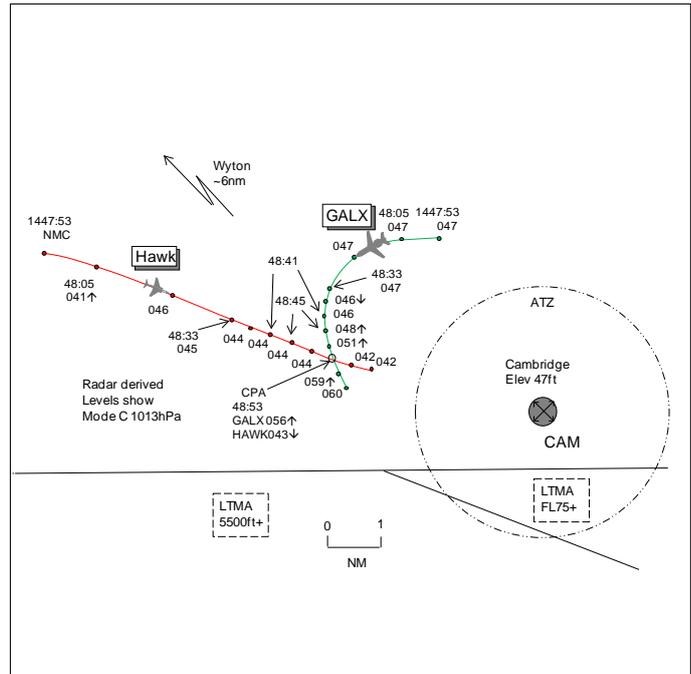
Reported Separation:

200-300ft V/Nil H 300ft V

Recorded Separation:

200ft V/1.1nm H

Or 1300ft V/0.1nm H



PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

THE GULFSTREAM GALAXY PILOT reports inbound to Cambridge, IFR and in receipt of an AFIS, he thought, from Cambridge on 123.6MHz, squawking an assigned code with Modes S and C. They were on the final stage of their flight already established on the LOREL 4C STAR. As they approached BPK they were instructed to maintain 220kt and to descend to FL80 before they were transferred to Essex Radar and were given radar vectors for Cambridge and descent clearance to altitude 5000ft. After some radar vectors they were instructed to route to CAM NDB which was about 10nm N of their position. As they were getting close to CAM they asked for instructions after CAM. The instruction received was to hold over CAM at 5000ft but when it was issued they were already passing O/H the Locator; he believed it was too late for ATC to issue that order. They were then transferred over to Cambridge Approach. The Capt, PF, initiated a turn to the W for a parallel entry whilst the FO, PNF, was trying to input the hold into the FMS. Whilst turning their TCAS generated a TA and the conflicting traffic was identified on the NAV display to the W of them at a lower altitude, climbing. Almost immediately an RA 'descend' was commanded, ROD >3000fpm, probably about 4000fpm or more; separation was about 1nm. The PF disengaged the A/P and A/T and initiated a steep dive whilst the PNF called out loud the TCAS instruction 'descend, descend'. After a very short time, maybe 3-7sec, TCAS called 'clear of conflict'. Both pilots looked for the conflicting traffic on the NAV display and after a couple of seconds TCAS commanded an RA 'climb' at 4000fpm or more. The PNF called out this instruction loudly again whilst the PF initiated an aggressive full-power climb, which set the ac climbing at over 4000fpm. By now the ac was in a shallow banked turn to the L passing through a S'y heading which placed the conflicting ac out to the W on their starboard side. The PNF seated on the RHS looked out, trying to find the traffic, and saw it and on realising the close proximity he emphasised the climb instruction, which the PF promptly followed. He estimated the ac passed 200-300ft below with almost nil horizontal separation. Some seconds later TCAS called again 'clear of conflict' and both the PF and PNF saw the traffic off to their port side in a steeply banked attitude to its L turning towards the N. The PF resettled the ac into a straight and level flight whilst the PNF reported the 'near miss' to Cambridge Approach. The controller informed them that the conflicting ac, a Hawk, was supposed to be low level traffic (later updated to 1000ft below) and asked the crew if they wanted vectors for the approach or if they wanted to perform a visual

approach. They asked for the visual approach and the rest of the flight was uneventful. He assessed the risk as high.

The Capt opined that the instruction to hold over CAM was given too late since they were almost over the Locator at 220kt and the transfer from Essex Radar to Cambridge Approach was given at the same time, which was too late. The Locator is the initial approach fix for both the ILS and NDB DME approach to RW23 so before initiating the approach the flight should have been in contact with Cambridge. The conflicting traffic should have been 1000ft or more below but had climbed well over that, up to at least their altitude of 5000ft. The Cambridge controller later told them that he was not informed that the conflicting traffic was going to climb but instead that it was going to maintain low-level, 1000ft or more below. The first the Approach controller knew that this traffic was climbing and thus creating a hazard was when the controller saw it climbing on his radar screen with little or no time to react. This, added to the late transfer of communication, made it almost impossible for Approach to issue instructions to try and avoid the situation that seconds later developed between the 2 ac.

THE HAWK T MK1 PILOT reports transiting from Valley to Duxford, VFR and in receipt of a BS from Cambridge Approach on 123.6MHz, squawking 7001 with Modes S and C. The visibility was 30km in VMC and the ac was coloured black with nav, strobes and landing lights all switched on. After low-flying in Wales and pulling-up for the Lichfield Corridor it was realised that there was still plenty of fuel so additional low-flying practice was carried out to the NW of Cambridge and to the S of Wyton; a BS was acquired from Cambridge. When S of Wyton, heading 120° flying out of sun, the Capt (rear-seater) manoeuvred the ac into a climb from low-level in Class G airspace. Any information from ATC about traffic in the vicinity was not heard in-cockpit if the controller did pass any. As the ac was in a climb passing 4000ft QNH 1018hPa he, the front-seater, noticed an ac [the G200 Galaxy] flying from L to R but didn't take control as he thought the Capt in the back seat was visual and didn't assess the closure to be safety critical although he knew it was quite close. He assessed the closest point to be 300ft clear. The rear-seater was not visual with this ac at any point. The rear-seater handed control over to him, the front-seater, when level and was initially confused as to why he was asking the rear-seater to apologise to ATC. After explaining the situation the rear-seater spoke to ATC but this was not acknowledged as the RT was busy. On landing the rear-seater rang Cambridge to explain the situation as the other ac was under Cambridge control at the time. He assessed the risk as low.

THE CAMBRIDGE APPROACH CONTROLLER reports that at about 1435Z he was pre-noted about a Hawk inbound to Duxford from the NW. The Hawk pilot called about 35nm NW of Cambridge at high-speed (>400kt) descending through 5000ft requesting a BS. This was given and the pilot stated he would be holding low-level to the W of Cambridge before transiting to Duxford. He was informed about a lot of gliding activity at Gransden Lodge [10nm WSW Cambridge] and the ac's squawk changed from 7000 to 7001 and he noticed the ac passing through 1000ft. At about 1445 the GALX entered the CAM hold at 5000ft owing to a late release and transfer from Essex Radar. Unfortunately, this turned the GALX towards an area of intense aerial activity to the SW of Cambridge. Without warning a 7001 squawk climbed at 2-500ft per second in a zoom climb towards the GALX. He started a transmission to the GALX flight stating that traffic was approaching from the W climbing quickly (at this time it was through about altitude 2000ft) and without a pause called the unknown traffic "R 2 o'clock passing 4000ft, passing 4700ft, may go just behind you". The contacts merged with Mode C readouts for both ac changing rapidly. The Hawk's squawk then changed back to 7000. He believed both ac were in extreme close proximity to each other.

ATSI reports that the Airprox was reported when a Gulfstream Galaxy (GALX) and a Hawk T1 came into proximity in Class G uncontrolled airspace, 4.5nm W of Cambridge at FL048.

The GALX was operating IFR on a flight from Madrid-Torrejón to Cambridge airport and was in receipt of a service from Cambridge Radar on frequency 123.6MHz. The Hawk was operating VFR on a training flight from RAF Valley to Duxford and was in receipt of a BS from Cambridge Radar on frequency 123.6MHz.

CAA ATSI had access to written reports from the pilot of the Hawk, the Stansted INT controller and the Cambridge Radar controller, together with area radar recordings and RT recordings of the Cambridge Radar frequency 123.6MHz and the Stansted INT frequency 120.625MHz.

The Cambridge METARs were:

EGSC 071420Z 25010KT 220V290 CAVOK 25/08 Q1023= and EGSC 071450Z 24011KT CAVOK 25/05 Q1023=

[UKAB Note (1): The UK AIP promulgates the CAM hold for RW23 as a RH racetrack, inbound track 092°.]

At 1442:00 the pilot of the GALX contacted Stansted INT descending to FL080 and was instructed to continue on his present heading.

The written report from the Cambridge controller stated that he had been pre-noted about a Hawk inbound to Duxford from the NW. At 1442:20 the pilot of the Hawk contacted Cambridge Radar requesting a BS and advised Cambridge that they would be operating, "...*low level to the west of your field initially before routeing to Duxford*", a BS was agreed. Radar replay shows a 7000 squawk 38nm to the NW of Cambridge with a speed and track that correlated with that expected from the Hawk; however, the Hawk was not formally identified by Cambridge.

At 1444:20 the traffic squawking 7000 changed its transponder code to 7001. At 1445:10 the pilot of the Hawk was informed of glider activity in the vicinity of Gransden. A 7001 squawk may be selected at pilot's discretion to indicate Military Fixed-Wing Low Level Conspicuity and Climb-out.

At 1445:20 the service given to the GALX by Stansted INT was changed to a TS outside CAS. The GALX flight was instructed to descend to altitude 5000ft and instructed to take up the NDB [CAM] hold at Cambridge. The Stansted INT controller contacted Cambridge by telephone to agree a course of action for the GALX. The Cambridge controller requested that the GALX be transferred to the Cambridge Radar frequency. The service to the GALX flight was terminated and the GALX crew was instructed to contact Cambridge on frequency 123.6MHz.

At 1447:04 the 7001 squawk is manoeuvring 11.5nm WNW of Cambridge indicating FL015. At 1448:05, as the pilot of the GALX contacted Cambridge, "...*on course to Charlie Alpha Mike er holding ready for approach*", the 7001 squawk is still manoeuvring with NMC level information being detected.

At 1448:05 the Mode C of the 7001 reappeared, indicating FL041, 6.1nm W of the GALX and now tracking ESE. The controller asked the pilot of the GALX what type of approach he required and the pilot replied, "*visual approach*". The GALX is in a L turn to join the hold. The controller replied (1448:30), "*roger continue the left turn there is traffic er south er correction west of you right one o'clock er range of two miles manoeuvring now climbing er through your level four thousand five hundred feet possibly a Hawk aircraft high speed*".

At 1448:33 the 7001 squawk showing FL045 is 2nm WSW of the GALX indicating FL047. The tracks of the 2 ac are converging and at 1448:41 the distance between the 2 ac is 1.1nm with the 7001 squawk indicating FL044 and the GALX indicating FL046. Another 7000 squawk is manoeuvring low level where the 7001 squawk had previously been operating. The controller transmitted to the GALX, "(GALX c/s) *that traffic's just passing underneath three hundred feet unknown to me*". This was followed by a transmission from the Hawk, "*that's us passing below visual*". The GALX climbs as the 2 tracks cross, the Hawk is indicating FL043 and the GALX FL056, lateral separation 0.1nm, the CPA.

At 1449:00 the pilot of the GALX advised the Cambridge controller that they had responded to a TCAS RA to traffic that was, "*at our nine o'clock same level well actually behind us and er looks like*

a fighter something like that". The Cambridge controller confirmed that it was a Hawk that climbed up from low level.

At 1451:10 the pilot of the GALX requested the registration or callsign of the Hawk as, "he was very very very near to a collision".

When the pilot of the Hawk contacted Cambridge he advised them that they would be operating at low-level. Although the Cambridge controller did not formally identify the Hawk, the 7001 squawk followed the expected track and level of the Hawk and could be seen on radar replay manoeuvring low level until 1448:06, which may have reinforced in the controller's mind an expectation that the Hawk would remain low level.

The pilot of the Hawk requested a BS. Under the terms of a BS there is no requirement to monitor the flight or to identify it. The Cambridge controller stated that the conflicting traffic was possibly a Hawk as he could not be certain that the 7001 squawk was the Hawk traffic until it was confirmed by the pilot. Another 7000 squawk was operating low level where the 7001 squawk had been operating. As the Cambridge controller probably had an expectation that the Hawk was going to remain low-level this may have caused him to doubt whether the 7001 squawk was in fact the Hawk.

The service being provided to the GALX was not agreed although the controller's report indicated that a TS was being provided. It is likely that the controller intended to provide a TS; however, as the situation deteriorated rapidly after the first call from the GALX, it is likely that the need to provide a traffic warning to prevent a collision precluded the agreement of service provision.

As the Airprox occurred in Class G airspace collision avoidance was ultimately the responsibility of both pilots. In the very short time available (approximately 20sec between the initial action taken by the controller and the GALX responding to the TCAS RA), the controller provided a traffic warning to the GALX flight in order to assist the pilot in discharging that responsibility.

NATS SAFETY INVESTIGATIONS provided a TCAS Performance Assessment using InCAS simulation and Eurocontrol's automatic safety monitoring tool (ASMT).

CODE	DESCRIPTION	CODE	DESCRIPTION
TA	Traffic Alert	DCL	Don't Climb
RA	Resolution Advisory	DE	Descend
COC	Clear of Conflict	RCL	Reversal Climb
DDE	Don't Descend	CL	Climb

GALX Alert Time	Alert Description	Altitude (FL)	Intruder Range (Nm)	Vertical Sep. (ft)
14:48:20	TRAFFIC ALERT	47	3.56	264
14:48:25	MONITOR V/S	47	2.85	87
14:48:27	DESCEND	47	2.60	63
14:48:30	CLIMB NOW	47	2.25	159
14:48:31	CLIMB (sim artefact)	47	2.13	143
14:48:35	CLEAR OF CONFLICT	46	1.65	79
14:48:37	CLIMB	46	1.40	162
14:48:47	ADJUST V/S	51	0.28	694
14:48:54	CLEAR OF CONFLICT	58	0.36	1491

CPA Time	Horizontal Sep. (NM)	Vertical Sep. (ft)
14:48:49	0.15	943

Assessment of TCAS Performance

Eurocontrol's automatic safety monitoring tool (ASMT) recorded five RAs relating to this encounter as shown in the Mode S Downlink table. All recorded RAs were downlinked from GALX and hence it was assumed that Hawk was not TCAS-II equipped.

By combining timing information from all radars that receive a downlinked RA it is possible to estimate the time that each RA was issued to the pilot; this information is used to assess the accuracy of the InCAS simulation. Of the five RAs, 3 were simulated within the actual timeframe they would have been issued to the pilot; the other 2 were 1sec outside the window. This indicates the simulated tracks are well matched to the tracks flown by each ac.

It should be noted that immediately after a reversal, InCAS always generates a superfluous RA; hence the Reversal Climb (RCL) is immediately followed by a Climb (CL). The Climb RA is simply an artefact of the simulation.

The simulation shows that the first RA was a Monitor Vertical Speed (MVS) which InCAS classified as a don't climb message. A corrective Descend RA was subsequently issued, which was countermanded 3-5sec later by the Reversal Climb (RCL). There was a gap of approximately 10sec between the RCL and the subsequent CL. The InCAS simulation suggests a Clear of Conflict (CoC) message could have been issued in this gap, but no recorded information is available to confirm this. The CL RA at around 14:48:40 appears to cause the pilot of the GALX to climb strongly, however it is possible this was a reaction to the earlier RCL. At the time of the Adjust Vertical Speed (AVS) RA (which InCAS classified as DDE - don't descend) the estimated vertical rate of the GALX was approximately 6000fpm.

HQ AIR TRG comments that whilst the crew comprised 2 Tac Weapons students, the rear-seater captain had just completed a 'creamie' tour as a QFI on the Hawk, and the front-seater had graduated and was holding awaiting an OCU course. The crew had informed Cambridge of their intentions when they had descended to low-level some 10min before the event, but they did not inform them that they had pulled up, making it difficult if not impossible for the controller to inform them of the traffic that was now in the O/H. Whilst the crew were operating well clear of the ATZ and in good VMC at all times, such a call and a request for a TS might have improved their SA. Whilst they were aware from the RT of traffic talking to Cambridge, they remained unaware of its position until it was sighted by the non-handling front-seater passing O/H.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from the pilots of both ac, transcripts of the relevant RT frequencies, radar video recordings, reports from the air traffic controllers involved and reports from the appropriate ATC and operating authorities.

Controller Members agreed that the Cambridge controller had done all that was expected in the timescales that pertained. The TC Stansted INT had informed the Galaxy crew that a TS would be provided after the ac left CAS, descended the Galaxy flight to 5000ft and instructed the crew to take-up the hold at the CAM NDB. Although the crew may have expected a more expeditious arrival through radar vectoring or by carrying out a visual approach, without onward clearance beyond the CAM, the hold was the only initial option until an alternative course of action had been agreed. The transfer of communication/control was effected late, close to the Cambridge O/H. This was probably owing to the LTS Stansted INT retaining control until the Galaxy was clear of LTC traffic and clearing CAS by descent; the base of CAS just S of Cambridge is 5500ft. Pilot Members were surprised that the Galaxy crew was apparently unprepared, such that the hold had not been programmed into the ac's FMS prior to arrival. That said, Members opined that the ac would probably have been in roughly the same place had the FMS hold been activated.

The Cambridge controller's mental-model was based on the Hawk flight operating low-level (i.e. <2000ft) and out to the W, which it had over 11nm away, immediately prior to the Airprox. He had not placed any 'restriction' on the Hawk flight (report before climbing above 2000ft) or given the crew information that the Galaxy was inbound from the S at 5000ft to hold O/H. Under a BS there was no requirement for the Hawk crew to inform ATC of their manoeuvre; however, the controller's SA would have been improved had the Hawk crew informed him of their intention to turn towards Cambridge and climb. The Hawk crew would have been unaware of the Galaxy's position, the Galaxy's RT exchange with ATC had only mentioned "on course to the CAM, holding, ready for approach" before ATC passed TI on the Hawk to the Galaxy crew. Nevertheless, with the incident occurring in Class G airspace, both crews were responsible for maintaining their own separation from other traffic through see and avoid. The Hawk Capt, seated in the rear, executed the climb towards Cambridge but had not seen the Galaxy at all although it should have been visible, being within the crew's field of view in the airspace into which he was intending to fly. The front-seat pilot saw the Galaxy as the Hawk climbed through 4000ft but did not inform the Capt. The 2 military pilot Members were disappointed that the Capt had not seen the Galaxy and commented that there had been a CRM issue within the Hawk cockpit as the front-seat pilot should have pointed out the Galaxy to the rear-seat Capt before they had closed into close proximity. The Hawk front-seat pilot might also have anticipated that an ac like the Gulfstream would be fitted with TCAS and a close pass would generate warnings and manoeuvres that were easily preventable.

Although the Cambridge controller had not agreed a service with the Galaxy crew, Members agreed that this had not materially altered the outcome as the Hawk's turn and climb into conflict only became apparent during the RT exchange between the Galaxy crew's first call and establishing which type of approach was required, too late to take any effective action. The controller quickly passed TI on the converging Hawk to the Galaxy crew during their turn inbound to the CAM NDB as they joined the hold. The Galaxy crew was cognisant of the Hawk's presence from TCAS and, following the receipt of a TA and then RA commands, they visually acquired the Hawk just before it passed below. The Hawk's flightpath triggered the TCAS to generate reversal RAs, a not uncommon occurrence when only 1 ac is TCAS II equipped such that the generated commands are uncoordinated. The Hawk had levelled-off 200-300ft below the Galaxy however it's climb profile caused TCAS to activate on the Galaxy flightdeck and this had led to the Galaxy initially descending momentarily before climbing steeply as the 2 ac approached the CPA, resulting in 1300ft vertical separation as they crossed 0.1nm apart. Members agreed that it was the Hawk crew's climb towards the Galaxy that had caused the Airprox. However, with the Hawk front-seat pilot and the Galaxy PNF both gaining visual contact and the Galaxy crew responding correctly to the TCAS RAs, the Board were persuaded that any risk of collision had been quickly and effectively removed.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The Hawk crew climbed into conflict with the Gulfstream Galaxy.

Degree of Risk: C.