

He would like to know what might have been done differently in order to avoid this incident. He was very shaken by this and it took a great effort to stay calm while he completed his cct and landing.

The only personal factor that he can identify which might have influenced this, is his interpretation of TWR's instruction to follow the Robin into the cct. He wonders if ATC expected him to actually turn to his R and re-position directly behind the Robin. This would have meant a substantial re-positioning for him and he did not do so - he continued his standard approach to the cct whilst maintaining visual contact with the Robin, intending to position behind him on the downwind leg. This he had done many times before in similar situations. On the other hand, ATC must have been visual with his C172, as they asked him to report his altitude, so they clearly knew exactly where he was. He also had his transponder on, as instructed, so ATC presumably knew his altitude from his Mode C indications anyway. He assessed the Risk as 'high'.

His aeroplane is coloured white and the HISL was on.

THE CESSNA CITATION C680 SOVEREIGN CAPTAIN, the PF, reports departing Biggin Hill for E Midlands on an IFR Flight Plan following the SID from RW21 whilst in receipt of a 'Control Service' from Biggin TWR on 134.8MHz. The assigned code of A5424 was selected with Mode C on; TCAS II is fitted.

After being held for a few mins at the D2 holding point for their departure clearance, TWR instructed him to line-up and issued their clearance to take-off from RW21. No information was given about other possible traffic in their departure clearance or the subsequent take-off clearance. Climbing out at 130-150kt passing about 1000ft they heard TWR say 'have you seen the 172'. In the cockpit he was transitioning from 'pilot handling' to the A/P at this point so he looked up and immediately saw the C172 ahead about 20° to their R and heading away to the R about 200ft higher than his ac. To avoid the C172 he immediately disengaged the A/P and levelled-off as he flew 100ft below and 100m astern of the C172 with a 'low-medium' Risk. Once clear, he rejoined the SID. Neither a TA nor an RA was enunciated by TCAS.

Upon landing at E Midlands he telephoned Biggin ATC and asked why they had cleared him to take-off IFR with the C172 crossing their 'departure', to be told the C172 was not where TWR asked the pilot to be.

His ac has a white and blue livery and all the lighting was on, including the HISL and landing lamp.

THE BIGGIN HILL AERODROME CONTROLLER (ADC) reports that the departing C680 came into conflict with the C172 that was joining from the deadside for RW21. The C172 pilot was asked on two occasions to check his height/altitude as it appeared to be lower than normal. The pilot replied on both occasions that he was at the correct level whereas the Aerodrome Traffic Monitor (ATM) indicated that the C172 was 200ft below the normal cct level. The departing C680 crew were airborne extremely quickly upon receipt of their take-off clearance and proceeded to adopt a very high ROC on departure. It was predicted that the C172 would have passed overhead the runway to the W by the time the C680 had got airborne. However the expeditious departure of the C680 placed it in potential conflict with the C172.

ATSI reports that this Airprox occurred within the Class G airspace of the Biggin Hill ATZ, which is the airspace bounded by a circle radius 2.5nm centred on RW03/21, from the surface to 2000ft above the aerodrome elevation of 599ft. Both flights were receiving an Aerodrome Control Service, with the Aerodrome and Approach functions being split at the time. The ADC was operating as mentor to an experienced trainee, who was shortly to take his Certificate of Competence in Aerodrome and Approach Control at Biggin Hill. All the RT transmissions from TOWER leading up to the incident [but not afterwards] were made by the trainee. The Mentor described his workload as low-medium in the period leading up to the Airprox. Biggin Hill ATC is not equipped to provide any surveillance [radar] services. It is, however, equipped with an ATM in the VCR, which displays radar data provided by LTC Swanwick.

The Biggin Hill 1250UTC METAR was: 280/11kt 240v310; 9999; SCT020; 08/03; Q 1018.

The outbound IFR C680 pilot was cleared to taxi for a RW21 departure at 1254. About 3 minutes later, the ADC issued the flight's departure clearance "*Brookmans Park 2 departure with a right turn at 1 mile inbound Delta Echo Tango climb to altitude 2 thousand 4 hundred feet squawk 5-4-2-4*". The pilot read back the clearance correctly. The UK AIP, at AD 2-EGKB-1-9, states the Standard Departure Routes. Departures to the N are designated Brookmans Park 2 (BPK 2), the route being DETLING-BPK. A note to the routes states, 'Departures from Runway 21, follow Noise Abatement Procedure turning right to pass overhead BIG VOR at 2400ft ALT'. The Noise Preferential Route (NPR) applicable to the C680 flight is: 'As soon as practicable turn right to make good a track of 220°MAG. At 1.0 DME BIG commence right turn to the BIG VOR/DME or establish on track at 2400ft ALT. Remain within 4 DME BIG.' BIG VOR is situated at the centre of the airport, to the E of RW21/03.

At 1257:29, when the C680 crew was receiving its departure clearance on the TOWER frequency, -- the C172 pilot established communication with Biggin Hill APPROACH (APP) to request his rejoining instructions. The pilot reported "*overhead Sevenoaks at 2 thousand 1 hundred feet on 1-0-1-8 [QNH] request rejoin instructions and Basic Service please*". APP replied "*Basic Service you have with me report with 3 miles to run deadside join for 2-1 right hand circuit the 2-1 Threshold QFE 9-9-9 millibars squawk 7-0-4-7*" - A7047 is the LTC THAMES RADAR Biggin Hill SSR conspicuity code. The threshold QFE is issued as the threshold elevation for RW21 is 517ft – the A/D elevation being 599ft. The C172 pilot read back the pressure and clearance correctly confirming that he would report at 3nm. The radar recording, timed at 1257:30, shows the C172, squawking A7000 at 2100ft ALT Mode C, 8-9nm ESE of Biggin Hill airport. Shortly afterwards, TI was passed about an inbound Robin ac, whose pilot had last reported abeam the Brands Hatch area at 2200ft. The C172 pilot later reported sighting the Robin and was instructed to follow it; at 1300:58 the C172 was transferred to the TOWER frequency. The radar photograph, timed at 1301:00, shows the C172, now squawking A7047 as instructed, 4-2nm ESE of the airport at an altitude of 1500ft. The Robin it is following, is to its NW.

At 1258:30, the C680 crew requested their departure clearance to be read again. The ADC complied this time adding "*overhead*" after "*the right turn at 1 mile*". The pilot read back "*I've got that..Brookmans Park 2..after departure right turn overhead and then Detling climbing 2 Thousand 4 Hundred feet...*". The C680 pilot reported ready for departure at holding point D2 at 1259:20 and was informed that a departure release was awaited from THAMES RADAR. Just over 2 min later the C680 was instructed to taxi to D1.

The C172 pilot contacted TWR at 1302:04 reporting, "*..with you 2 point 7 miles DME we..have the..traffic in sight ahead of us and following it in*", whereupon TWR instructed the pilot to, "*continue to join following the traffic ahead*". At 1302:55, the C680 crew was cleared, "*right turn 1 mile report overhead clear to take off 2-1 surface wind 2-8-0 degrees 1-0 knots*". The radar photograph, for this time, shows the Robin ac just passing overhead the centre of the airport. The C172 at an altitude of 1400ft, is 1-8nm SE of the airport, tracking W. The ADC later explained that he had been discussing the traffic situation between the subject ac with his trainee prior to the C680's take-off clearance being issued. He confirmed that both he and his trainee were aware of the position of the C172, both visually and on the ATM. It was calculated that the C172 pilot would have passed overhead the threshold of RW03 and been clear of the RW21 climb-out, before the C680 crew had taken off. Consequently, it was not considered necessary to pass TI about the C172 to the C680 or vice versa.

The UK AIP describes the Biggin Hill cct procedures as:

'Aircraft joining or re-joining the circuit for landing are to fly across the upwind end of the runway in use at 1000ft QFE at 90° to the runway heading, a left turn or right turn (as appropriate) should be made onto the downwind leg'.

Additionally, 'Circuit heights are 1000ft QFE (1600 ft QNH) at all times'.

The ADC mentor commented later that he had observed that the C172 was slightly lower than expected. This was confirmed on the ATM, where the Mode C of the C172 pilot displayed an altitude of 1400ft, rather than 1600ft as expected. Accordingly, the pilot was asked to, “*check your level you should be a thousand feet on the Q-F-E 9-9-9*”. The pilot immediately confirmed he was complying with the level instructions at 1303:50: “[C/S] *at 1 thousand feet on 9-9-9 millibars*”.

The mentor remarked that he and the trainee observed that the C680 commenced rolling quickly and became airborne earlier than expected about half way down the runway. He added that it then appeared to climb quite steeply. Concerned about the relative positions of the subject ac, the C680 crew was asked, “[C/S] *do you have the Cessna in sight*”. The mentor said that as he was about to issue a warning to the C680 crew, the trainee transmitted the information. He commented that the information message was shorter than ideal but in the circumstances, due to the close proximity of the traffic, there was no time to pass a full traffic information call. He believed that the C680 was passing about 600/700ft at about the time the information message was initiated. In any case, both the mentor and trainee believed that the pilot of the C680, by now, would have seen the C172. The C680 crew responded, “*negative [C/S] oh affirm [C/S]*” [before uttering “*whoaaa*” at 1304:30 and then asking, “*what were you doing there sir?*”]. The mentor then commented on the frequency that the C172 should have been at 1600ft on the QNH and the pilot of the C680 stated “*he came straight through our departure*”. The C172 pilot reported, “*just turning downwind at 1 thousand feet on 9-9-9 millibars continuing approach as instructed*”. The mentor commented that, despite being operational at Biggin Hill for a number of years, he had not experienced the type of departure carried out by the C680 crew.

[UKAB Note (1): The radar recording of the incident shows that when the C172 was crossing through the climb out at the upwind end of RW21 (RW03 threshold), its Mode C indicated 1400ft London QNH (1018mb) with the preceding and succeeding radar returns indicating that the C172 was maintaining a constant altitude. Just before the C172 crossed the C680’s 12 o’clock at 0.2nm, the latter indicates an altitude of 1100ft Mode C – some 300ft below the C172. The next sweep, which reveals that the 2 ac have passed each other, shows they are 0.1nm apart, with the C680 indicating 1300ft and the C172 at 1400ft Mode C.]

The UK AIP Biggin Hill entry also states, under the title of ‘Circuit Procedures’ that: ‘Aircraft taking off, ‘going around’ or making ‘touch and go’ landings are to remain at or below 500ft QFE until the upwind end of the runway in use has been passed, when a left or right turn (as appropriate) should be initiated’. Apparently, this procedure is generally only used for training flights and would not have applied to the departure of the C680. Local ATC management report that the information printed in the AIP has been reviewed (see below). Some years ago, there was a restriction, which limited departing jets to an altitude of 1100ft and a speed of 180kts. This restriction was considered unsuitable and removed.

The MATS Part 1, Section 2, Chapter 1, Page 1, states the responsibilities of Aerodrome Control:

‘Aerodrome Control is responsible for issuing information and instructions to aircraft under its control to achieve a safe, orderly and expeditious flow of air traffic and to assist pilots in preventing collisions between: aircraft flying in, and in the vicinity of, the ATZ’.

Accordingly, TWR should have passed appropriate instructions/information to the pilots of the subject ac that would have assisted in preventing any conflict between the two ac. On this occasion, neither pilot was informed about the details of the other flight. If, for example, the C680 crew had been informed about the presence of the C172 prior to departure, it would have allowed them to take appropriate action to avoid the C172. Although the trainee had cleared the C680 crew for take off, the mentor was responsible for the operating position. However, a number of unexpected factors caused the situation to develop. Namely, the C680 crew rolled quicker than anticipated, which meant that it arrived in the vicinity of the upwind end of RW21 before the C172 pilot had cleared the climb-out path. Additionally, the C680 crew rotated earlier than predicted and this was followed by a higher than anticipated ROC.

As a result of this Airprox, a Biggin Hill Supplementary Operating Instruction (SI 01/2010) was issued on 20th January. This states: 'With immediate effect, specific traffic information shall be provided to departing jet and other high performance ac prior to being issued with a take-off clearance with joining ac at or within 3nm approaching from the dead side to that runway - after this specific traffic information has been acknowledged a take-off clearance may be issued'. Additionally, 'A new warning highlighting to departing pilots of the potential for a conflict was sent for publication in the Biggin Hill AIP entry and published in line with the routine AIRAC cycle (25 Mar 2010).

The publication of Biggin Hill SI 01/2010, addresses the type of situation, which occurred on this occasion and should help to prevent it happening in the future.

UKAB Note (2): The UK AIP at AD 2 EGKB AD 2.20 - Local Traffic Regulations - now includes at Para 4 a warning:

'Pilots of departing aircraft are warned of the presence of other aircraft joining the visual circuit from the 'Deadside'. The joining aircraft will fly across the upwind [end] of the runway in use at altitude 1599ft (1000ft aal) at 90° to the runway heading before turning left/right onto the downwind leg. Pilots of high performance fast climbing aircraft should be particularly alert.'

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, a report from the air traffic controller involved and reports from the appropriate ATC authority.

The Board agreed that the C172 pilot had followed the joining instructions given and had done all that was asked of him by TWR, albeit he was concentrating on re-establishing visual contact with the Robin as he was crossing into the live side from the dead side. Whilst it was evident from the radar recording that the C172's unverified Mode C indicated his ac was at 1400ft London QNH (1018mb) and apparently 200ft low on the preceding cct ac, this was within the allowable tolerance even for verified Mode C. Although TWR might rightly question it, ADCs should not be basing any form of separation within the visual cct on the ac's indicated altitude. It was not feasible to determine independently his exact height in the cct apart from what was displayed by Mode C; the C172 pilot had reported that his altimeter was showing his ac to be at the right height with the correct QFE set, but it seems from his own account and the ADC's visual observation that he might well have been a little low compared to other cct ac. However, if the ADC Mentor had been at all concerned he should have warned the departing C680 pilots before he issued a take-off clearance. An experienced controller Member did not believe that the C172's height was intrinsic to the Airprox; the operation of the visual cct relied upon traffic information from ATC to pilots joining the cct or about to depart so that they could integrate into the cct correctly, coupled with appropriate control instructions. However, it was clear to Members that TWR had not passed any traffic information to these two pilots about each other's ac.

The controller had cited the departing C680's quick take-off and very high ROC when airborne, and this Airprox was a salutary example of the difficulties that can ensue when ac of widely contrasting performance operate in the same aerodrome cct. One Member, himself a Citation pilot, believed it was incumbent on pilots of high-performance business jet ac to exercise extreme care when operating in a mixed traffic environment and take due regard of slower piston ac types operating in the cct, but pilots needed to be told about them first in order to avoid them. The operation of business jets such as the C680 from GA A/Ds such as Biggin Hill was commonplace and controllers should be well aware of their slick high performance characteristics; not only does this incident provide a reminder that they needed to be treated with care, but it highlights an issue that will be exacerbated by the introduction of Very Light Jets, many of which have even better take-off/climb performance. Notwithstanding whether the C680's take-off was more expeditious than usual or the climb steeper, and the RoC shown by the radar recording did not seem unduly excessive, with an ac about to cross the climb-out there was a potential for a conflict. In the Board's unanimous view the

ADC should have ensured that TI was passed about the C172 to the C680 crew before their take-off clearance was issued. The Board discussed whether this was an unconscious omission by the trainee that had not been detected by the Mentor. However, it appeared from the ADC's report that it was a misjudgement since they both expected that the C172 would have passed overhead the runway to the W by the time the C680 was airborne. CAT pilot Members also believed that neither of the pilots would have been able to gain SA solely from the RT transmissions and needed TI to highlight the presence of this traffic to them. With TI issued before the take-off clearance, the C680 crew could have judged for themselves whether it was safe to take-off at that point. In concluding the Cause, the Board agreed that this Airprox had resulted because the ADC cleared the C680 for take off without giving appropriate TI and it flew into conflict with the C172 joining the circuit.

Turning to the inherent Risk, the C680 crew were clearly surprised and unprepared when the C172 was first sighted during the climb-out after the trainee ADC's short warning. From the C680 flight deck it seems the C172 was already through the ac's 12 o'clock and drawing to starboard when first seen. Nonetheless it was clear from the radar recording that the C680 PF had also levelled-off to avoid it. He reports passing 100m astern at the CPA, about half of that recorded, but at about 200yd still too close for comfort. The C172 pilot in his slower piston aeroplane was undoubtedly in a vulnerable position and there was little he could do to get out of the way of the fast twin-jet as it climbed up towards him, subsequently passing astern and a little below. Thus despite neither pilot being aware of the other ac before the Airprox occurred, the final geometry and prompt avoiding action taken by the C680 pilot was enough in the Board's view to remove the actual Risk of a collision. Nonetheless, Members agreed unanimously that the safety of these two ac had been compromised.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The ADC cleared the C680 for take off without giving appropriate TI and it flew into conflict with the C172 joining the circuit.

Degree of Risk: B.