



that Swanwick(Mil) called on the landline with an unprenoted handover on the Typhoon. At the start of the shift the Supervisor had put out a request for practice diversions for PAR controller training, and the Typhoon was responding to the request. The Typhoon was in the Marham overhead at FL160 so, in order to fit him into the radar pattern, the controller turned him onto a heading of 030° and gave a descent to FL50. The Typhoon was to be number 3 in the pattern, and so was given a wider pattern than normal to allow for the Tutor ahead. The Typhoon was vectored around Little Snoring, descended to 2000ft QFE, and then turned onto a final heading of 240°. He was then given further descent to 1600ft QFE and asked to complete checks. At the same time the controller noticed a Marham “Basic Service” squawk appear in front of the Typhoon, and so he immediately passed Traffic Information. The Typhoon pilot responded with details of the C152/172 passing approximately 300ft above, the controller did not recall seeing the conflicting traffic prior to giving Traffic Information.

He perceived the severity of the incident as ‘High’.

**THE MARHAM LARS CONTROLLER** reports being the OJTI for a trainee who was in the early stages of training; the training session was going well and the workload was low. The instructor recalls being aware that the Approach controller was vectoring a Typhoon to the north-east of the aerodrome. At the same time a C172 free-called, the pilot only provided his callsign and a request for a Basic Service on his initial call. The trainee responded by applying the Basic Service and giving a squawk and the regional QNH all in one call; the pilot read back the information correctly and added “stand-by” to the end of his transmission. A brief silence then ensued, and the instructor prompted the trainee to request the flight details of the C172, at which point the pilot stated he was flying from a small airfield north-east of Marham to another one to the south-east at 2500ft. The controller does not remember seeing the squawk in the vicinity of the pilot’s position report, and subsequently didn’t see it until the C172 was 3nms south of the Typhoon. The C172 pilot did not report the Airprox on the RT, and requested a frequency change to Norwich, which was approved.

He perceived the severity of the incident as ‘High’.

**THE MARHAM SUPERVISOR** reports that Marham was operating SSR only. The PAR controller was under examination from the Local Examining Officer (LEO) and there had been a paucity of station-based traffic due to operational commitments, so the Supervisor had accepted practice diversions from non-station based aircraft to allow the examination to be conducted. The approach room was manned in all positions with suitably qualified personnel, except for the Director position which was being covered by the Approach controller: lunch breaks had been delayed until traffic levels reduced. The Supervisor assessed that the Approach controller was working within capacity at medium-high intensity, and the LARS controller was working at a low-medium intensity taking into consideration the stage of the training. The Supervisor did not see the Airprox because he was liaising with the PAR controller and the LEO. However, he was made aware of it by the Approach controller and subsequently spoke to the Typhoon pilot and the C172 pilot on the telephone.

He perceived the severity of the incident as ‘High’.

## **Factual Background**

The weather at Marham was reported as:

METAR EGYM 310950Z 23010KT 9999 FEW035 22/13 Q1013 BLU NOSIG

## **Analysis and Investigation**

### **Military ATM**

At 1107:18, Marham Approach, identified the Typhoon at FL160 and applied a Traffic Service; the service was limited for working SSR only. At 1109:05, Marham Zone transmitted, “[C172 callsign] *Marham Zone good afternoon Basic Service squawk 3667 Chatham 1009.*”

The C172 pilot replied with, “3667 *er standby*” at 1109:15. At 1109:50 (Figure 1) the SSR code appeared on the Claxby Radar.

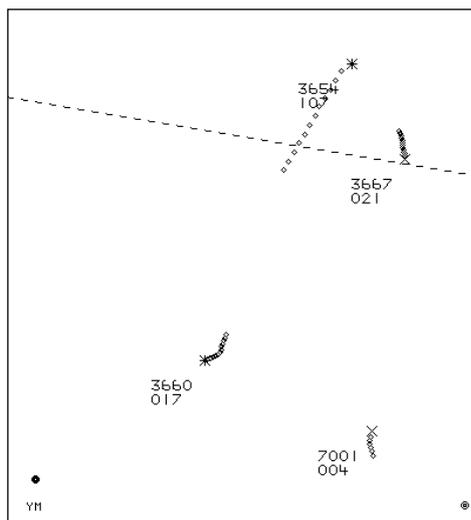


Figure 1: Geometry at 1109:50, Typhoon squawk 3654; C172 squawk 3667).

At 1110:32 (Figure 2), the Typhoon was turned right onto 240°; Marham were using RW24.

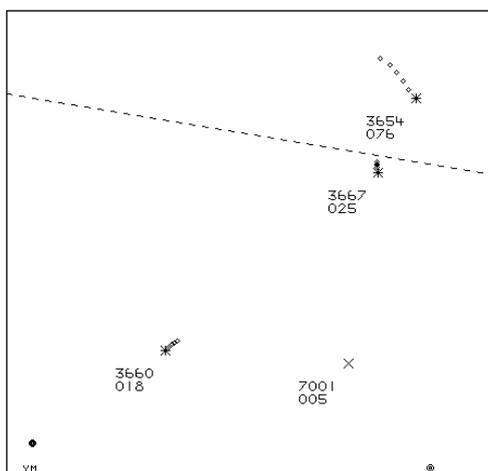


Figure 2: Geometry at 1110:32, as Typhoon turned onto 240 degrees.

Marham Zone requested the C172’s aircraft type, transit altitude and destination. At 1110:45 (Figure 3), the C172 pilot replied with his details.

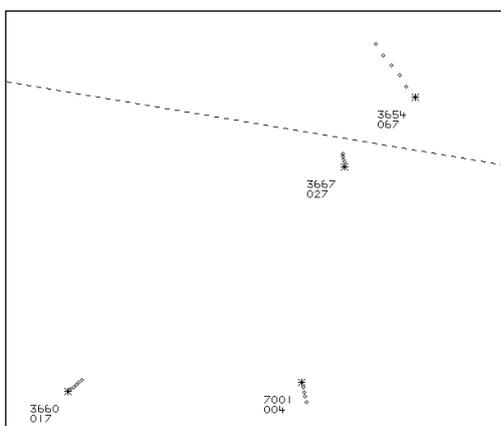


Figure 3: Geometry as C172 passed type, route and altitude.



The C172 pilot had called Marham for a Basic Service and displayed the non-discrete conspicuity squawk, with Mode C, as requested. Under a Basic Service, the pilot was responsible for collision avoidance and he reported the need to maintain a good lookout in the area. On this occasion, the pilot did not spot the Typhoon until it had flown past probably due to the geometry of the incident and the high-wing of his aircraft. The comment about Marham not choosing to provide Traffic Information may demonstrate a lack of understanding of the Basic Service, as Marham were not responsible for identification of the C172 or the provision of information, as per CAP774.

The Typhoon pilot had a late sighting of the C172, after receiving Traffic Information called at 2nm (radar replay shows the range as closer to 0.6nm). There are inherent lookout difficulties between a fast jet and a white GA aircraft, especially as the Typhoon was descending and the canopy bow of the aircraft could have partly obscured the view. Furthermore, the Typhoon is not fitted with ACAS and the pilot did not have radar contact. To compete with the lookout demands, the pilot, in a single seat Typhoon, had a moderate workload on an instrument approach and had been instructed to complete cockpit checks. The choice of a Traffic Service suited the weather conditions and would have supplemented lookout, however on this occasion with information on transponding aircraft only.

The Approach controller was working two frequencies (Approach and Director) and was largely doing the Director role with three aircraft in the radar pattern. The workload was high to medium and the integration of a Tutor with two fast-jets would have tested spacing and vectoring skills. The three different aircraft types and the briefings to the non-station based Typhoon would have added to the workload. Approach was working with SSR only and there appears to be an issue with Marham controllers detecting the transponder from the C172. The C172 was approximately 15nm to the northeast of Marham, at 2,600ft but the SSR feed was from RAF Honington, placing the C172 25-30nm on the Honington 010 radial. The C172 was effectively at the base of the radar coverage but not in an area associated with known poor SSR cover. The SSR code appeared when the C172 was in close proximity to the Typhoon, without Mode C (there was no height information in the Traffic Information). Approach had not been passed Traffic Information on the C172 from Zone, and was unaware of the C172's position until it popped up on radar; a shortened and effective form of Traffic Information was passed. (The radar replay used for investigation has the benefit of selecting the best NATS radar coverage and the Claxby Radar detected the C172, with Mode C, approximately 90 seconds before it appeared on the Marham Secondary Radar feed). The information passed by Approach would have assisted the Typhoon pilot in seeing the C172 and given him the opportunity to take avoiding action.

The trainee and OJTI Zone controllers only had the C172 on frequency and they were both aware of the radar pattern traffic. The C172 was under a Basic Service with a non-discrete squawk. The C172 flight profile was established at 1110:45 (49 seconds prior to the CPA) and, although the SSR code did not display on the screen, no information was passed to Approach. If the C172 appeared on the Approach Radar just prior to CPA, it may have been available to Zone at the same time but the controller reported seeing the C172 moments after the Airprox, when it was 3nm south of the Typhoon. As the C172 was passing 15nm east of Marham, it was not a MATZ crosser and, therefore, it would not usually be a factor for traffic in the RTC; although on this occasion, the Typhoon was vectored on a wider pattern to sequence and to lose height. The OJTI had to prompt the trainee to obtain routing information from the C172 following the 'standby' from the pilot. As it was the early stages of training, the trainee was reliant on the OJTI, and the low workload may have provided a distraction either through low arousal or an opportunity to use the time productively with other training points.

The lookout barrier worked for the Typhoon pilot, albeit at a late stage; however, the C172 pilot was unaware of the Airprox until the Typhoon had passed by. Radar derived Traffic Information, to aid lookout, was a barrier that was partially absent because the Marham SSR feed did not detect the C172 until immediately prior to CPA. The Approach controller called the traffic as it appeared on radar, as per the provision of a Traffic Service; the C172 pilot was under a Basic Service and the controller was not responsible for providing Traffic Information. However, the Zone controller could have assisted Approach by passing information on the track of the C172,

whilst waiting for the transponder code to appear. Neither aircraft was fitted with an Airborne Collision Avoidance System.

### **UKAB Secretariat**

Both pilots shared an equal responsibility for collision avoidance and for not flying into such proximity as to create a danger of collision<sup>2</sup>. If the geometry was considered to be a 'converging' situation, the Typhoon pilot was required to give way<sup>3</sup>.

### **Comments**

#### **HQ Air Command**

This Airprox appears to be as a result of a combination of Marham ATC working SSR only, the delayed passage of routing information by the Cessna pilot and a lack of information from the Zone controller to the Approach controller once the Cessna's flight profile had been verbally established. The Cessna pilot could have reasonably expected that his planned routing and altitude would have kept him clear of any traffic in the Marham radar pattern; his selection of a Basic Service over a Traffic Service in this instance probably made little difference as the Cessna would not have been identified by the Zone controller until after the incident occurred. The Typhoon pilot was in a reasonably busy phase of flight, descending and configuring his aircraft for an approach, so his lookout would have been compromised. This incident highlights the fact that pilots should be extra vigilant when conducting approaches from outside an ATZ and also when flying in the vicinity of the extended centreline of an airfield.

### **Summary**

An Airprox was reported when a Typhoon and a C172 flew into proximity on 31 July at 1111z . The Typhoon was in the radar training circuit, in the descent to 1600ft and receiving a Traffic Service from Marham Approach. The C172 was receiving a Basic Service from Marham LARS on a local detail flying at 2500ft. The Typhoon pilot received Traffic Information when the C172 was almost at CPA, the C172 pilot did not receive any Traffic Information.

### **PART B: SUMMARY OF THE BOARD'S DISCUSSIONS**

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

The Board first considered the actions of the C172 pilot. He had called Marham ATC on the telephone prior to getting airborne to give them information on his transit, so he could reasonably have expected that they would know about him when he first called on frequency. He was receiving a Basic Service, under which ATC were not required to give him Traffic Information, but he was not identified at that point anyway because they didn't see him on radar until after CPA. The Board felt that the C172 pilot had done his best to inform Marham of his intentions to fly close to their radar pattern, had called them on the radio, and had attempted to route away from their normal radar pattern. They commended him for his pro-active actions which, but for circumstances on the day would have provided early cues to ATC. In the end though, the Board opined that there was no substitute for good look-out in Class G see-and-avoid airspace, acknowledging that the geometry of the event and his aircraft structure had conspired against him.

Turning to the Typhoon pilot, the Board noted that he had gone to Marham in response to their call for practice diversions but it was not known whether he was aware that Marham were SSR only prior to his handover from Swanwick(Mil). He was descending in the radar circuit and undertaking cockpit

<sup>2</sup> Rules of the Air 2007 (as amended), Rule 8 (Avoiding aerial collisions).

<sup>3</sup> *ibid.*, Rule 9 (Converging).

checks when he received very late Traffic Information, but this had probably enabled him to see the C172 and dive down to avoid it. The Board noted that the Typhoon was not fitted with a TAS/ACAS which may have provided an earlier warning in this instance. The Board made the same comment to the Typhoon pilot as to the C172 pilot, in Class G see-and-avoid airspace, the primary means of collision avoidance remains good lookout, especially when ATC are operating with reduced radar capabilities.

In looking at the actions of Marham ATC, the Board first questioned the wisdom of accepting practice diversions on a day when they were SSR only, particularly because the SSR is fed from Honington, resulting in the base of SSR radar cover being higher in the Marham area. Turning to their specific actions, the Board considered that there was a lack of teamwork within the ACR. The LARS controller should have already known about the C172 if the information from the telephone call had been passed on, and he should therefore have known from the moment the C172 first called what his routing would be and where he had got airborne from. Even without this information, once he knew the routing, the LARS controller could have passed generic Traffic Information to APP before positive identification on the radar, and also could have warned the C172 about the Typhoon in the area. The Board noted that the Supervisor was liaising with the PAR controller (who was being examined), when he may have been better placed in helping information flow throughout the ACR given their reduced radar capability. Ultimately, the Board considered that it was the late 'pop-up' Traffic Information passed by the APP controller that probably enabled the Typhoon pilot to see and avoid the traffic, albeit late.

The Board discussed at length the cause of the Airprox and eventually agreed that Marham ATC had allowed the Typhoon pilot to fly into conflict with the C172. There were a number of contributory factors: firstly, that Marham could not detect the C172 on radar; secondly, that Marham LARS did not provide Traffic Information to APP; and thirdly that Marham invited PDs when SSR only. The Board quickly agreed that the risk was Category A, the incident had just stopped short of an actual collision where safety margins had been reduced to the minimum.

### **PART C: ASSESSMENT OF CAUSE AND RISK**

Cause: Marham ATC allowed the Typhoon pilot to fly into conflict with the C172.

Contributory Factor(s):

1. Marham could not initially detect the C172 on radar.
2. Marham LARS did not provide Traffic Information to Approach.
3. Marham invited PDs when SSR only.

Degree of Risk: A.

ERC Score<sup>4</sup>: 20.

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<sup>4</sup> Although the Event Risk Classification (ERC) trial had been formally terminated for future development at the time of the Board, for data continuity and consistency purposes, Director UKAB and the UKAB Secretariat provided a shadow assessment of ERC.