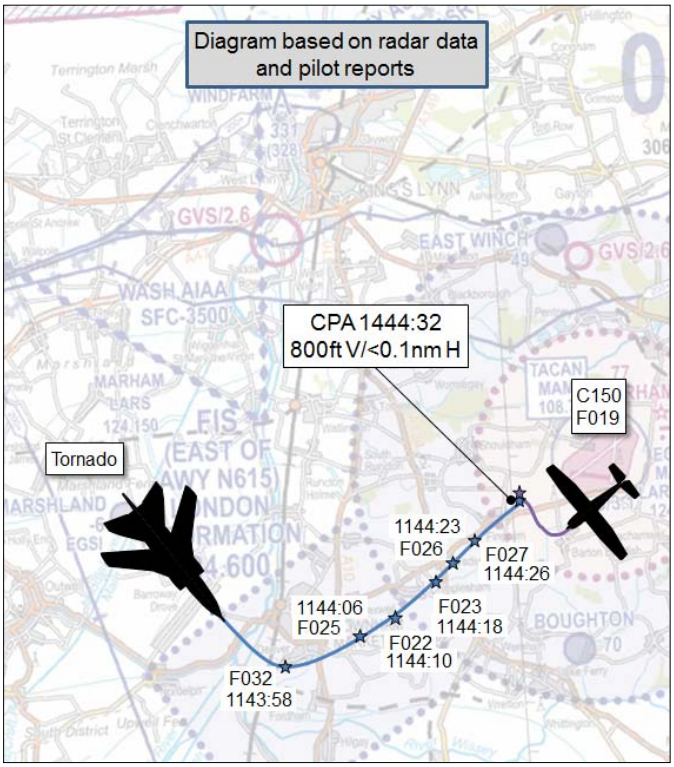
AIRPROX REPORT No 2017088

Date: 11 May 2017 Time: 1144Z Position: 5237N 00030E Location: Marham MATZ

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Tornado	C150
Operator	HQ Air (Ops)	Civ Club
Airspace	Marham MATZ	Marham MATZ
Class	G	G
Rules	VFR	VFR
Service	Aerodrome	Aerodrome
Provider	Marham	Marham
Altitude/FL	FL027	FL019
Transponder	On/C, S	On/C
Reported		
Colours	Military	Blue
Lighting	Anti-Col, Nav	Strobe, Nav
Conditions	VMC	VMC
Visibility	>10km	5km
Altitude/FL	1500ft	1500ft
Altimeter	QFE (994hPa)	QFE
Heading	057°	060°
Speed	400kt	87kt
ACAS/TAS	TCAS II	Not fitted
Alert	TA	N/A
Separation		
Reported	400ft V/50ft H	NK V/2nm H
Recorded	800ft V/<0.1nm H	



THE TORNADO PILOT reports that he was on recovery to Marham when the Approach controller informed the crew that there was a light-aircraft at 1500ft QFE in the circuit taking photos. On switching to Tower, he was informed the circuit was clear. He asked for the location of the light-aircraft. The Tower controller informed the crew that it was "10nm east of you tracking west". The crew at this stage were 8nm on the approach lane descending for Initials and thus built the picture that it was 2nm to the east of the airfield. The aircraft's TCAS displayed a proximate traffic at approximately 5nm directly ahead, below the aircraft. A second request for traffic information informed the crew that the aircraft was "Marham 220 at 2nm". Around this time TCAS alerted a Traffic Advisory warning. In response to this warning, the aircraft was climbed above 2000ft QFE. The crew observed on the TCAS the conflict go directly beneath them, but never became visual with the contact. The TCAS displayed 400ft vertical separation. Once clear of the TCAS conflict the crew descended into the circuit, joined and landed.

He assessed the risk of collision as 'Medium'.

THE C150 PILOT reports that he was not aware that an Airprox had been submitted, he was informed by telephone only on the 19th May that this was the case. He was informed at that time that the Tornado pilot had a TCAS contact at 2 miles and avoided him. He did have visual contact with 2 Tornados at different times but does not know which one made the report. He thanks them for their alertness; however, he opined that the Tornado pilot would have been aware of his presence in the circuit from ATC.

He assessed the risk of collision as 'None'.

THE MARHAM TOWER CONTROLLER reports that she received a landline call from Approach to say [Tornado C/S] was inbound visually to join the visual circuit. She passed to Approach that she

had one light-aircraft flying in the vicinity of the circuit at 1500ft QFE. The C150 was informed that the Tornado was joining and asked that the C150 pilot maintained 1500ft QFE because she expected the Tornado to be at 1000ft when the aircraft would cross paths. When The Tornado called on the tower frequency at approximately 9-10nm, she passed the standard joining instruction of 'Join RW06RH, QFE 994 hPa, Circuit clear but one light aircraft on a photo survey at 1500ft', with a position report relative to the Tornado. The pilot asked 'is that traffic to affect?' and she replied 'affirm' and, having spoken to the Approach controller, she realised that it may be beneficial to pass the traffic information again but this time relative to the airfield to aid clarity for the crew. She used the range and bearing feature on the ATM to ensure as accurate as possible range and bearing was passed to the joining aircraft. Following this information, the Tornado pilot requested a low break and this was approved as she believed the aircraft to be joining through initials below the C150 at 1000ft QFE and was trying to increase his separation further from 500ft to 1000ft. The next call from the pilot was to say climbing to 2000ft with no explanation why, which is when she realised the Tornado pilot had never been below the aircraft at all but had indeed remained above and descending. Traffic information was again passed as 1.5miles 500' below, the Tornado then broke into the circuit and landed. This report was submitted after an Airprox DASOR was received after the event, an Airprox was not declared on frequency at the time of the incident nor was a TCAS RA declared, and therefore her perception of the severity of this incident was negligible as she believed the aircraft to be adequately separated.

She perceived the severity of the incident as 'Low'.

THE MARHAM SUPERVISOR reports that he was ATCO IC and also the approach controller during the incident. Earlier in the day, in his capacity as supervisor, he had spoken to the pilot of the C150 via landline to arrange a suitable time for the photo task. Two Tornados were pre-noted individually from Swanwick, with [second Tornado C/S] joining his frequency first and electing to GH in the Marham overhead at FL100 before recovering visually. Given that [second Tornado C/S] might descend on top of the visual circuit, he spoke to the tower controller and they agreed to apply vertical separation until [second Tornado C/S] was visual and able to integrate. [Second Tornado C/S] was still general handling at FL100 when [Airprox Tornado C/S] was handed over, NW of D207, for a visual recovery. Following the handover, he advised [Airprox Tornado C/S] of the light-aircraft operating in the Marham overhead at 1500ft, which he acknowledged. He did not restrict the descent of [Airprox Tornado C/S] because he was approximately 20nm away from the airfield and there was no reason to expect he would not be at circuit height by the IP, especially as he had been given the traffic information. [Airprox Tornado C/S] turned inbound at 10nm on the extended centreline of runway 06 and called visual, at which point he transferred to Tower. He observed the C150 squawk about 1nm south of the runway tracking west and was listening to the tower frequency as [Airprox Tornado C/S] called to join. He heard the tower controller report the circuit clear but add that there was traffic at 1500ft in the overhead. He believed this to be entirely accurate and would have reported the situation in the same way. Tower then gave traffic information in cardinal/range from [Airprox Tornado C/S] and he recommended she give it relative to the airfield to aid the pilot's lookout. He then noticed the Mode C readout of [Airprox Tornado C/S] was well above circuit height and descending on the centreline. As [Airprox Tornado C/S] reached 3nm on the centreline, his Mode-C read 022, whilst the C150 was crossing the centreline at 1nm with a Mode C of 019. The tower controller passed further traffic information and [Airprox Tornado C/S] advised that he was climbing to 2000ft. [Airprox Tornado C/S] passed the C150 with marginal lateral separation according to the PAR controller, who witnessed the entire incident and observed their contacts almost merge on the PAR display. He is not sure how much vertical separation existed at that point. The pilot of [Airprox Tornado C/S] spoke to the Supervisor on the landline later that day and asked for his opinion of events. The pilot was of the view that the initial traffic information passed by the tower controller led him to believe the conflicting traffic was east of the runway. The pilot did not tell him of his intention to file an Airprox. All things considered he opined that the situation was straight forward: [Airprox Tornado C/S] was aware that there was an aircraft in the Marham overhead at 1500ft; he called visual with the airfield and changed to the tower frequency at 10nm; the pilot chose to descend through the level of the conflicting C150 despite being not visual with it. He opined that traffic information based separation is not a robust way to operate in the visual circuit, if at all. The DAM Annex Q states that visual recoveries are responsible for separating themselves from IFR and VFR traffic. Shortly after the incident, [second Tornado C/S] joined visually and, as planned, he limited his

descent to 3000ft. [Second Tornado C/S] chose to fly 12nm SW in order to lose height. With plenty of lateral separation he descended him further and he joined without incident.

He perceived the severity of the incident as 'Medium'.

Factual Background

The weather at Marham was recorded as follows:

```
METAR EGYM 111050Z 11013KT 8000 HZ FEW250 19/04 Q0997 BLU NOSIG
METAR EGYM 111150Z 10013KT CAVOK 19/05 Q0997 BLU NOSIG
```

Analysis and Investigation

Military ATM

Portions of the tape transcripts between the Marham Approach controller and the Tornado are below:

From	To	Speech Transcription	Time
[Tornado C/S]	Approach	Marham Approach, [Tornado C/S] in the descent flight level one hundred, Golf copied, requesting visual recovery.	11:39:45
Approach	[Tornado C/S]	[Tornado C/S] Marham Approach Identified descending flight level one hundred, traffic service reduced, golf current.	11:39:49
[Tornado C/S]	Approach	Descending flight level one hundred, traffic service reduced [Tornado C/S]	11:39:55
Approach	[Tornado C/S]	[Tornado C/S] radar to vis or just visual recovery	11:40:00
[Tornado C/S]	Approach	Visual recovery [Tornado C/S]	11:40:01
Approach	[Tornado C/S]	[Tornado C/S] roger own navigation descent approved height one thousand six hundred feet, report field in sight	11:40:02
[Tornado C/S]	Approach	Descend to height one thousand six hundred feet on niner niner fife, confirm zero six right hand	11:40:07
Approach	[Tornado C/S]	Affirm zero six right hand, nine nine five hectopascals	11:40:15
Twr	*Approach*	*Twr*	*11:41:04*
Approach	*Twr*	*Approach visual recovery [Tornado C/S]*	*11:41:05*
Twr	*Approach*	*[Tornado C/S] visual*	*11:41:06*
Approach	*Twr*	*Approach*	*11:41:07*
Twr	*Approach*	*Twr*	*11:41:08*
Approach	[Tornado C/S]	[Tornado C/S] QFE nine nine four hectopascals	11:41:23
[Tornado C/S]	Approach	Nine nine four set [Tornado C/S]	11:41:26
Approach	Twr	Approach	11:41:43
Twr	Approach	Err Twr, [C150 C/S] is maintaining one thousand five hundred feet	11:41:46
Approach	Twr	OK	11:41:18
Twr	Approach	Are you happy with that or do you want me to get him up	11:41:50
Approach	Twr	No, more than happy	11:41:50
Twr	Approach	I'm happy with that	11:41:51
Approach	Twr	I'll just tell him ??? before ???	11:41:52
Approach	[Tornado C/S]	[Tornado C/S], one C150 in the Marham visual circuit maintaining 1500ft QFE.	11:42:06
[Tornado C/S]	Approach	That's copied request height	11:42:11
Approach	[Tornado C/S]	Say again	12:42:14
[Tornado C/S]	Approach	Is it a military aircraft or civilian	11:42:15
Approach	[Tornado C/S]	It's a civil, it's [C150 C/S] and it's maintaining 1500ft in the circuit	11:42:17
[Tornado C/S]	Approach	That's copied, [Tornado C/S]	11:42:23

From	To	Speech Transcription	Time
[Tornado C/S]	Approach	[Tornado C/S] field in sight to tower.	11:42:56
Approach	[Tornado C/S]	[Tornado C/S], stud two, b-bye	11:42:59
[Tornado C/S]	Approach	Stud two, [Tornado C/S]	11:43:00

Portions of the tape transcripts between the Marham Tower controller and the Tornado and C150 are below:

From	To	Speech Transcription	Time
Twr VHF	[C150 C/S]	[C150 C/S] no mode Charlie observed	11:41:26
[C150 C/S]	Twr VHF	[C150 C/S]	11:41:31
Twr VHF	[C150 C/S]	[C150 C/S] there is one tornado recovering for a visual recovery shortly are you maintaining one thousand five hundred feet	11:41:32
[C150 C/S]	Twr VHF	Affirmative	11:41:39
Twr VHF	[C150 C/S]	Roger	11:41:40
[C150 C/S]	Twr VHF	Turning downwind	11:41:42
Approach	*Twr*	*Approach*	*11:41:43*
Twr	*Approach*	*Err Twr, [C150 C/S] is maintaining one thousand five hundred feet*	*11:41:46*
Approach	*Twr*	*OK*	*11:41:48*
[Tornado C/S]	Twr UHF	Twr, [Tornado C/S], request join er golf copied with nine nine four set	11:43:02
Twr UHF	[Tornado C/S]	[Tornado C/S], Marham tower good afternoon join runway zero six right hand QFE niner niner four hectopascals, now information code hotel with the new QFE, circuit clear but with one in at one thousand five hundred feet on a photo survey	11:43:07
[Tornado C/S]	Twr UHF	That's c… *transmission break* …ied, do you know the current position of that aircraft, is that to affect	11:43:21
Twr UHF	[Tornado C/S]	[Tornado C/S] er affirm, they are currently err east of you by one zero miles tracking west I'll keep you updated	11:43:25
[Tornado C/S]	Twr UHF	Copied [Tornado C/S]	11:43:34
[Tornado C/S]	Twr UHF	And [Tornado C/S] request low break	11:43:41
Twr	*Approach*	*Twr…???*	*11:43:41*
Twr UHF	[Tornado C/S]	[Tornado C/S] low break approved	11:43:44
[Tornado C/S]	Twr UHF	Low break [Tornado C/S]	11:43:46
Approach	*Twr*	*It might, It might be worthwhile giving it relative to the airfield*	*11:43:47*
Twr	*Approach*	*Yea …, I'll tell him again*	*11:43:50*
Approach	*Twr*	*Yea, that's ok, …, thanks a lot*	*11:43:50*
Twr UHF	[Tornado C/S]	[Tornado C/S] that traffic now Marham two two zero, two miles	11:44:07
[Tornado C/S]	Twr UHF	Ah, that's copied [Tornado C/S], we're climbing to two thousand feet.	11:44:13
Twr UHF	[Tornado C/S]	[Tornado C/S], confirm that traffic is at 1500ft, er currently east of you by one and a half miles indicating 500ft below	11:44:19
[Tornado C/S]	Twr UHF	Is he intending to stay on the centreline	11:44:38
Twr UHF	[Tornado C/S]	[Tornado C/S] err, doing an aerial survey, erm standby	11:44:42
Twr VHF	[C150 C/S]	[C150 C/S], request your intentions and the ??? you plan to work	11:44:48
[Tornado C/S]	Twr UHF	[Tornado C/S] is erm breaking into the circuit one thousand feet	11:45:02
[Tornado C/S]	Twr UHF	[Tornado C/S]	11:45:06
Twr UHF	[Tornado C/S]	[Tornado C/S] that traffic now zero nine zero, one point five miles	11:45:39
[Tornado C/S]	Twr UHF	Errrrm…. [Tornado C/S] downwind land	11:45:48
[Tornado C/S]	Twr UHF	[Tornado C/S] final gear down	11:46:24
Twr UHF	[Tornado C/S]	[Tornado C/S] clear to land	11:46:26
[Tornado C/S]	Twr UHF	Clear to land [Tornado C/S]	11:46:27

Figures 1-6 show the positions of the Tornado and C150 at relevant times in the lead up to and during the Airprox. The screen shots are taken from a replay using the Cromer radar, which is not utilised by Marham ATC, therefore is not necessarily representative of the picture available to the controllers.

At 11:42:06 (Figure 1), the Marham Approach controller informed the Tornado that there was a C150 in the Marham circuit maintaining 1500ft QFE. The information was repeated prior to sending the Tornado to the Marham Tower frequency for visual recovery.

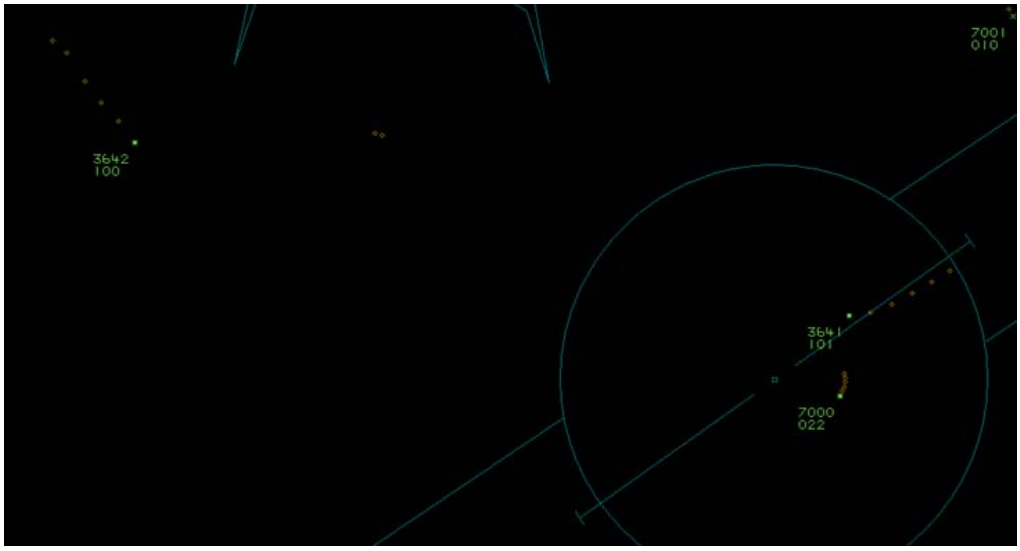


Figure 1: Geometry at 11:42:06 (Tornado 3642; C150 7000)

At 11:43:07 (Figure 2), the Marham Tower controller passed joining details to the Tornado, including information that the visual circuit was clear but that there was one at 1500ft conducting a photo survey.

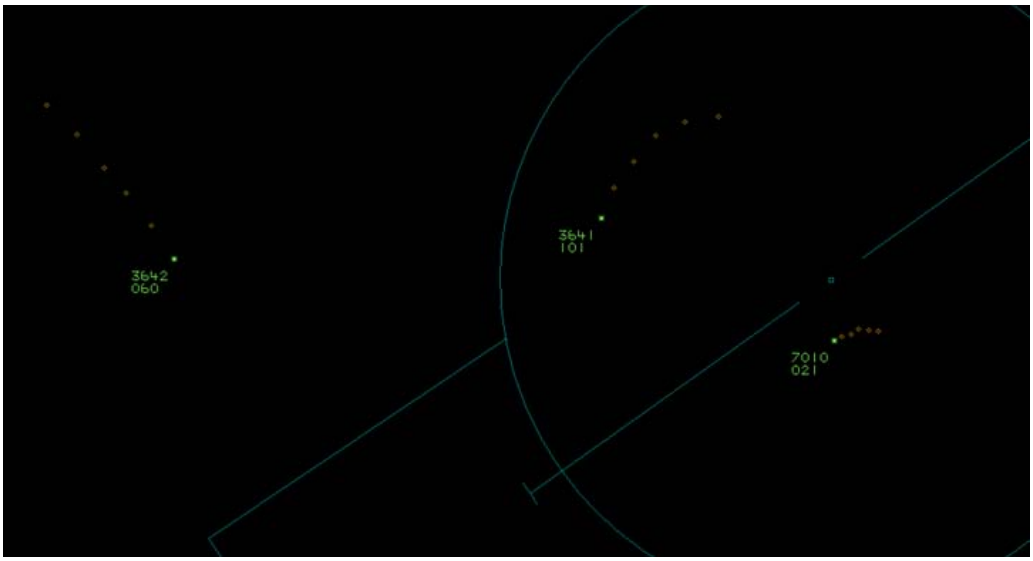


Figure 2: Geometry at 11:43:07 (Tornado 3642; C150 7010)

At 11:43:25 (Figure 3), the Marham Tower controller passed traffic information to the Tornado on the C150, describing its position as east of 'you' by 10nm, tracking west. The C150 was actually 8nm to the east of the Tornado at the time; however the Tower controller only had reference to an ATM from which to glean the information. Shortly afterwards, the Approach controller called the Tower controller and suggested that he pass TI relative to the airfield.

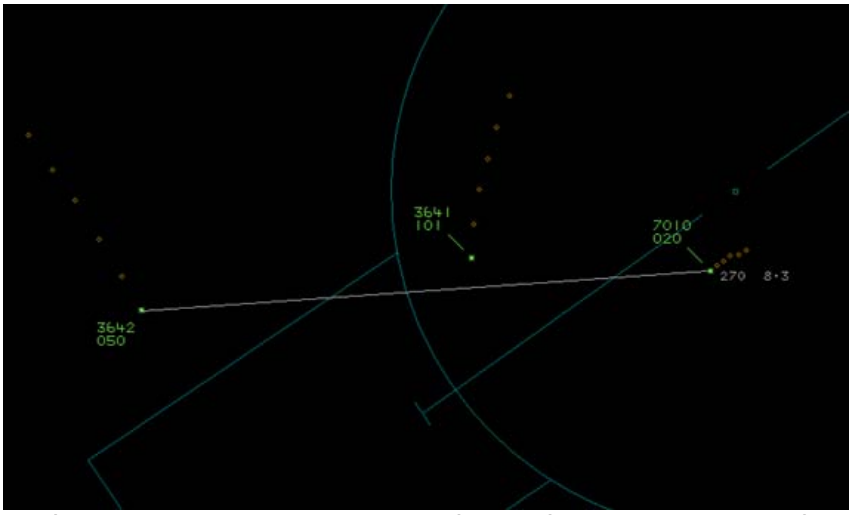


Figure 3: Geometry at 11:43:25 (Tornado 3642; C150 7010)

At 11:44:07 (Figure 4), the Marham Tower controller passed TI to the Tornado on the C150 as Marham 220 [degrees], 2nm; the Tornado pilot responded he was climbing to 2000ft.

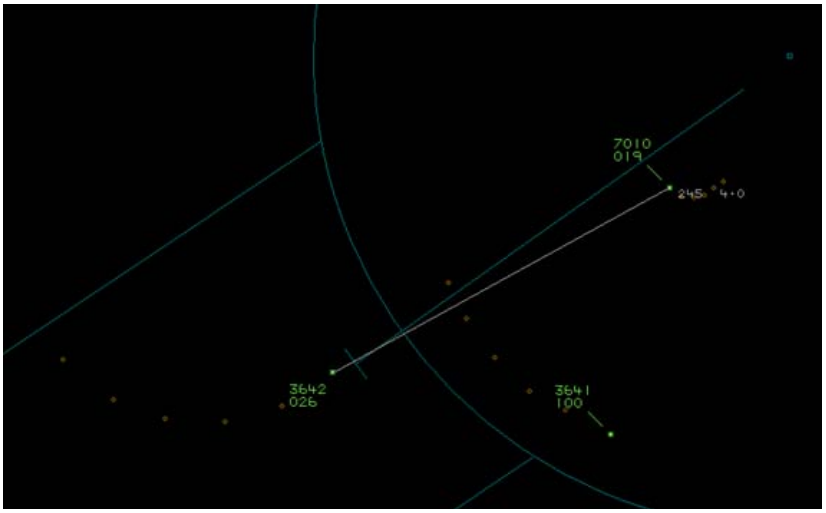


Figure 4: Geometry at 11:44:07 (Tornado 3642; C150 7010)

At 11:44:19 (Figure 5), the Marham Tower controller updated the TI to the Tornado, reiterating that the C150 traffic was at 1500ft. Its position was described as east by 1.5nm, 500ft below.

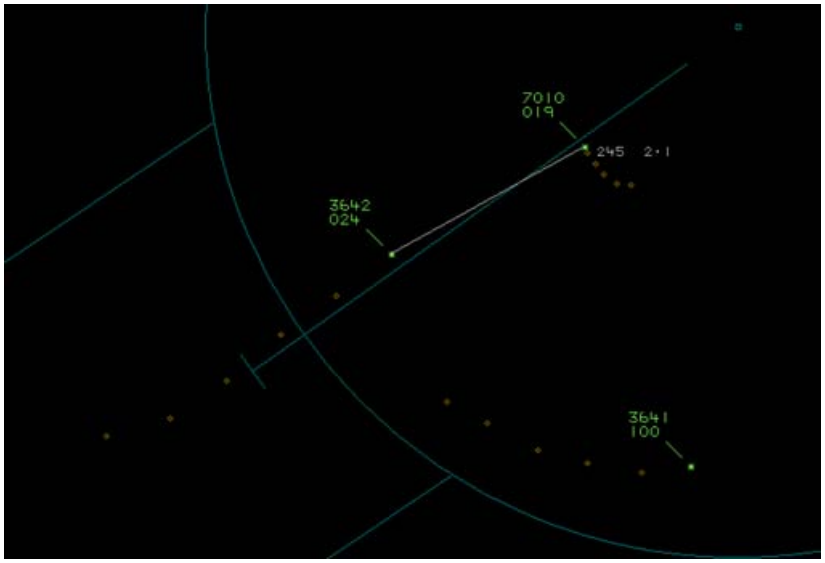


Figure 5: Geometry at 11:44:19 (Tornado 3642; C150 7010)

At 11:44:34 (Figure 6), the 2 aircraft passed at a CPA of approximately 0.1nm laterally and 800ft vertically. The Tornado pilot asked whether the C150 intended to stay on the centreline, prompting the Tower controller to ask the C150 pilot his intentions. Simultaneously, the Tornado pilot stated that he was joining the circuit at 1000ft.

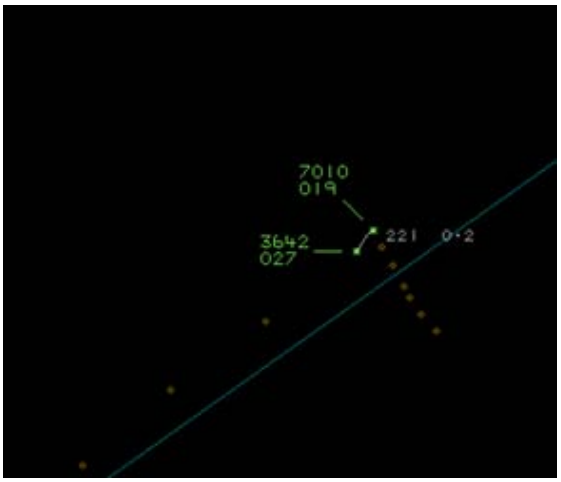


Figure 6: Geometry at 11:44:34 (Tornado 3642; C150 7010)

The Marham Approach controller informed the Tornado pilot that there was a C150 in the visual circuit, maintaining 1500ft QFE, followed by further information that it was a civil aircraft. There was no information about its location or nature of the tasking. A photo survey aircraft is not in the visual circuit and has a different flight profile, therefore this inaccurate information may have initiated the pilot's incorrect mental model of the conflicting traffic.

The Marham Tower controller spoke to the Approach controller by landline, informing him that the C150 was maintaining 1500ft QFE and asking if he should request that the pilot climb to facilitate the Tornado recovery, however the Approach controller stated that he was happy with the height of the C150. The Tornado pilot acknowledged the information and requested the location of the C150, as well as an assessment of whether or not it would affect his approach. The Tower controller responded that the C150 was east of the Tornado's position by 10nm, tracking west, and that he would keep the Tornado pilot updated. The C150 was actually 8.3nm to the east of the Tornado, therefore the information was inaccurate, however the Tower controller was taking the traffic information from an ATM, which is only an aid to Situational Awareness and not a facility to provide accurate range and bearing information. The Approach controller called to suggest that the Tower controller pass TI on the C150 with reference to the airfield, which the Tower controller then did, describing the C150 as Marham 220 [degrees], 2 miles, putting the C150 to the south west of the overhead and directly in the Tornado's approach. There was an expectation by ATC that, due to the low break being approved, the Tornado would be at a maximum height of 1000ft QFE by initials therefore transit beneath the C150. The C150 was informed that a Tornado would be conducting a visual recovery.

Marham ATC was operating with an ATCO IC rather than a dedicated Supervisor at the time of the incident due to low traffic levels[1]. The nominated ATCO IC was also the Approach controller, who had spoken to the C150 pilot earlier in the day and made arrangements for the tasking. Though ATC personnel were aware of the photo survey, the Station-based Squadrons were not informed due to the relatively short notice given.

The Tornado pilot formed a mental model based on information from both the Approach controller and Tower controller, believing that the C150 was to the east of the airfield and not in a position to affect his visual recovery profile, though he was aware that the C150 was at 1500ft QFE. When the Tornado pilot received a TCAS TA on an aircraft below, he did not initially assimilate that it

[1] Marham ATC Administrative Order Book 1.2.1

was the C150, though it quickly became apparent and the pilot elected to climb to 2000ft to deconflict.

A subsequent investigation at RAF Marham found that procedures for a visual join contained within the ATC Operational Orders section of the Defence Aerodrome Manual specify that aircraft will join through initials at 1000ft QFE whereas the Flying Orders section does not specify a height, an issue which has now been rectified to ensure parity. There were also recommendations made for ATC to brief about how best to describe traffic in the vicinity of the visual circuit[2] and for the Tornado Standards and Evaluation team to review guidance on response to TCAS TA alerts in the vicinity of the visual circuit.

UKAB Secretariat

The Tornado and C150 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard[3]. If the incident geometry is considered as head-on or nearly so then both pilots were required to turn to the right[4]. If the incident geometry is considered as converging then the Tornado pilot was required to give way to the C150[5].

Occurrence Safety Investigation Summary

During a visual join, from their interpretation of an information call received from ATC, the crew of the Tornado assessed that the light aircraft operating in the vicinity of Marham would not be a factor. Also, there was an assumption on the crew's part that if the situation changed they would be provided with an update. At the time, the Tower controller believed that she had provided suitable information to allow the crew of the Tornado to carry out their chosen visual approach whilst satisfying their separation obligations. Ultimately it is that disconnect between the communication of information by one party and its assimilation and interpretation by a second, exacerbated by a compressed time line, which led to the situation. It is entirely feasible that had the Tornado crew continued the approach, they would have achieved 1000ft at Initials and remained safely separated from the C150 who was maintaining 1500ft. However, due the unexpected TCAS alert and the momentary confusion this created, the Tornado pilot elected to initiate a climb to ensure safe separation, but afterwards assessed that safety had been compromised. TCAS had operated as expected and in this incident prompted a response from the Tornado crew to traffic in a position they were not aware which has ensured safe separation. Tornado crews are trained to break a TCAS collision risk by climbing or descending and in this case the crew elected to climb thus ensuring a safe outcome.

Comments

HQ Air Command

This incident is a prime example of situational information being transmitted with the intention of sharing accurate SA, but being received and assimilated in a manner that was different to that intended. The Tornado crew received timely TI on the presence of the Cessna but assimilated the information slightly differently to the reality. This led them to believe that the Cessna would not affect their recovery from the west of the airfield as they had already planned to descend lower to allow even more vertical separation. However, when the contact appeared on TCAS it was in a position where their mental model led them to believe that it was not the Cessna; thus they elected to climb to maintain vertical separation on what was, to them, unknown traffic. Only with hindsight did they make the link between the TCAS contact and the Cessna that had already been called to them.

[2] Agreement to provide TI as per CAP 413 5.20
[3] SERA.3205 Proximity.
[4] SERA.3210 Right-of-way (c)(1) Approaching head-on.
[5] SERA.3210 Right-of-way (c)(2) Converging.

Ironically, if the TCAS had not been fitted – or switched off – then the crew would probably have continued with their plan to descend to 500ft from initials and thus would have been safely separated from the Cessna in the vertical plane. The investigation into this incident identified inconsistencies within local orders for aircraft height at initials (which has since been rectified) and also identified scope for more advice to crews on TCAS handling within the visual circuit environment. Notwithstanding, the Tornado crew acted entirely appropriately to what they considered to be an unknown threat to their aircraft and took action to ensure separation.

Summary

An Airprox was reported when a Tornado and a C150 flew into proximity at 1144 on Thursday 11th May 2017. Both pilots were operating under VFR in VMC, the Tornado and C150 pilots both in receipt of an Aerodrome Service from Marham.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of 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 began by discussing the actions of the Marham Tower controller. They were informed that the C150 photo sortie was agreed at short notice and, because of the short notice, the Tornado crew were unaware of the task until they contacted Marham to join the visual circuit. Members agreed that the subsequent initial TI by the Tower controller was well intentioned, and passed with reference to the ATM, but was inaccurate and had therefore resulted in a flawed mental model in the Tornado crew's minds regarding the position and intentions of the C150; the Tornado crew believed the C150 to be to the east of the airfield when in fact it was to the southwest. With regard to managing the situation, some members opined that the controller could have provided a greater level of control over the C150 and asked its pilot to vacate the visual circuit whilst the Tornado recovered. Others commented that, although this was an option, it would have been a finely balanced decision between passing appropriate information versus stopping a task, that was easy in hindsight and may not have been achievable anyway in the circumstances at the time. Some members commented on the fact that the Tower controller had thought the Tornado was already below the C150 whereas it was actually descending from slightly above. In this respect, noted the disparity between the controller and flying orders regarding the height to be at through Initials but, although they were heartened to hear that the disparity had been addressed, they opined that this was not germane to the incident given that the Tornado crew had already decided to request a low break anyway.

The Board then looked at the actions of the Tornado crew. They agreed that the inaccurate TI had resulted in flawed SA for the crew who, on receiving a TCAS TA, perceived that there was a conflict with another unknown aircraft and had reacted appropriately; the Board commended the Tornado crew for responding to the TCAS indication, their actions had ensured that safe separation was achieved.

The Board then considered the cause and risk of the incident. Members agreed that the Tornado pilot had acted appropriately with the available information and SA he had received from his TCAS. As a result, the Board agreed that the cause was the Tornado pilot was concerned by the proximity of the C150 with a contributory factor that inaccurate TI from Marham ATC had contributed to an erroneous mental model in the Tornado crew. Members agreed that the Tornado crew's climb had ensured that, although safety had been degraded, there had been no risk of collision; accordingly, the Board assessed the risk as Category C.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The Tornado pilot was concerned by the proximity of the C150.

Contributory Factor(s): Inaccurate Traffic Information from Marham ATC contributed to an erroneous mental model in the Tornado crew.

Degree of Risk: C.

Safety Barrier Assessment[6]

In assessing the effectiveness of the safety barriers associated with this incident, the Board concluded that the key factors had been that:

ANSP

Regulations, Processes, Procedures & Compliance was assessed as **partially effective** because the Defence Aerodrome Manual sections relating to ATC and flying orders were not consistent regarding aircraft joining heights through Initials, and the TI passed by the Tower controller was not consistent with standard R/T phraseology.

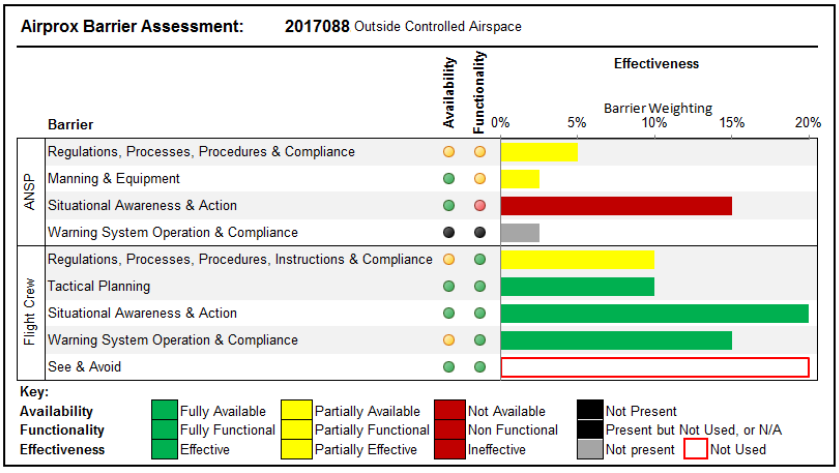
Manning & Equipment was assessed as **partially effective** because the Supervisor was on consol as the Approach controller, this therefore restricted the opportunity for him to provide fully effective oversight of the situation and provide assistance to the Tower controller in the VCR.

Situational Awareness & Action was assessed as **ineffective** because the inaccurate TI passed by the Tower controller resulted in flawed SA in the Tornado crew and, as such, the potential conflict was not effectively communicated by ATC.

Flight Crew

Regulations, Processes, Procedures, Instructions & Compliance was assessed as **partially effective** because although the Tornado crew complied with the flying orders section of the Defence Aerodrome Manual these procedures were inconsistent with the ATC orders for initials joins.

See and Avoid was assessed as **not used** because the Tornado crew initiated an avoiding climb, based on TCAS information, at an early stage in their initials join and before they saw the C150.



[6] The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the UKAB Website.