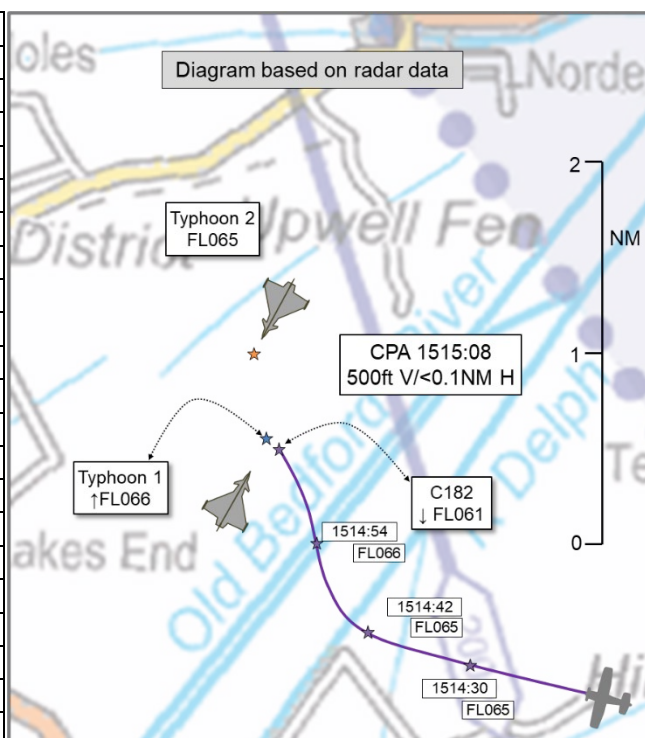


AIRPROX REPORT No 2023040

Date: 04 Apr 2023 Time: 1515Z Position: 5233N 00017E Location: 4NM SW Downham Market

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Typhoon (A)	C182
Operator	HQ Air (Ops)	Civ FW
Airspace	London FIR	London FIR
Class	G	G
Rules	VFR	VFR
Service	Traffic	Traffic
Provider	Swanwick Mil	Marham LARS
Altitude/FL	FL067	FL060
Transponder	A, C	A, C, S
Reported		
Colours	Grey	White
Lighting	'Typhoon SOP'	Strobes/Beacon
Conditions	VMC	VMC
Visibility	>10km	>10km
Altitude/FL	6750ft	6700ft
Altimeter	RPS (1019hPa)	QNH
Heading	NR	NR
Speed	250kt	130kt
ACAS/TAS	Not fitted	PilotAware
Alert	N/A	None
Separation at CPA		
Reported	200-300ft V/0.0NM H	100ft V/1.0NM H
Recorded	500ft V/0.1NM H	



NB – The diagram shows the path of the C182 to CPA and the Typhoon at CPA (prior to this point Typhoon 1 and 2 had been in a BFM exercise in this general area).

THE TYPHOON PILOT reported that, whilst conducting 1v1 BFM (Basic Fighter Manoeuvres) in the EAMTA (East Anglia Military Training Area), approximately 20NM due south of Holbeach AWR¹, Typhoon 1 (lead aircraft of a pair) had an Airprox with a white Cessna 182. The visually assessed miss-distance was 200-300ft vertically with no lateral separation. The narrative of events from Typhoon 1's mission recording is below:

1508 - Typhoon 1 left Holbeach AWR at 15,000ft on the RPS 1019hPa. [Formation callsign] had been conducting academic dry strafe profiles in the AWR whilst receiving a Traffic Service with bespoke squawks from Swanwick Mil on frequency 269.475MHz. [Formation callsign] requested the operating block 5000-22,000ft on 1019hPa, in the EAMTA,² which was approved by Swanwick Mil. The plan was to conduct 1v1 BFM, high aspect sets with a Traffic Service from Swanwick Mil.

1514:44 - In the middle of a left-hand rate fight at 6750ft Swanwick called traffic to Typhoon 1 at 1NM to the SW, manoeuvring, indicating FL65. This is the first time the traffic was called to [formation callsign].

1514:57 - Typhoon 1 got tally with a white Cessna, directly below heading in the opposite direction. The height separation was visually assessed to be between 200-300ft vertically. Typhoon 1 immediately commenced a climb away from the traffic, whilst rolling wings level.

¹ Air Weapons Range.

² See extract from Mil AIP regarding EAMTA altitude blocks.

1514:58 - Typhoon 1 called a 'knock it off' to Typhoon 2, whilst continuing to climb through 9000ft. Typhoon 2 called visual with the traffic and commenced a climb.

1515:44 - Once [formation callsign] was safely clear of the traffic and heading away, Typhoon 1 declared an Airprox and asked Swanwick Mil if they had any info on the traffic.

1516:13 - Swanwick Mil came back with a squawk, 3660, and consulted Marham for the aircraft details. Whilst re-joining for a recovery, Swanwick Mil informed [formation callsign] that the aircraft was a Cessna 182, Typhoon 1 reiterated that they were declaring an Airprox and initiated a benign recovery to [destination airfield].

The pilot perceived the severity of the incident as 'High'.

EAMTA – Extract from the Military AIP

ENR 5 - 2 - 6

UK MIL AIP

19 MAY 22

ENR 5.2 MILITARY EXERCISE AND TRAINING AREAS AND ADIZ

Continued.

5.2.3.6 EAMTA Procedures.

5.2.3.6.1 **Low.** EAMTA Low is a fixed volume FL245 to FL285. Bookings can be requested via MAMC iaw the timelines laid down in ENR 5.1.5.3. This will be promulgated via NOTAM. On receipt of a booking outside of TRA 003 routine activation hours, MAMC will automatically activate TRA 003.

5.2.3.6.2 **High.** EAMTA High has a base level of FL285 but the top level is variable up to FL660. Bookings can be requested via MAMC iaw the timelines laid down in ENR 5.1.5.3. This will be promulgated via NOTAM. On receipt of a booking request MAMC will automatically activate EAMTA Low and TRA 003.

THE C182 PILOT reported they were on a Traffic Service with Marham. Heading northwest towards the VFR waypoint 'Brigg'. The controller gave them a more westerly vector due to departing jets. The C182 pilot took up the vector and was then instructed to follow their own navigation therefore they took up a similar heading as before. As soon as the C182 pilot did, they saw two manoeuvring jets in front of them, very close and slightly higher in what can only be described as 'a dog fight'. The C182 pilot immediately descended 500ft to avoid. At the same time, Marham reported traffic to the C182 pilot. The C182 pilot asked the controller if the [pilots of the] jets were visual with them. The controller had to call Swanwick to find out if they were and they called back to confirm they were. The C182 pilot was not convinced this was the case at the time they saw the Typhoons and took avoiding action.

The pilot assessed the risk of collision as 'High'.

THE SWANWICK MIL CONTROLLER reported that they were controlling East Tac R with a pair of Typhoons, [formation callsign], on a discrete frequency. The controller also had the ICFs with no aircraft on frequency. The [formation] pair had previously been working in D207, Holbeach Range, on a listening watch with Swanwick Mil, the pair then vacated to general handle south of the range in East Anglia. During this time the Swanwick Mil controller started to take prenotes and admin calls for aircraft departing Humberside for the north to Aberdeen, an ERKIT inbound track from PC East to Newcastle as well as a Phenom pre-noted from TC Mids to Cranwell. During this time, the Swanwick controller asked the Supervisor to bring in another Tac. The Swanwick controller looked back to [formation callsign] and noticed traffic and called it immediately to the Typhoons, although this was a late call at 1NM due to them only just seeing the radar return. The Typhoon pilot called visual with the traffic and at this time RAF Marham rang for Traffic Information on the Typhoons. Once the Swanwick Mil controller had completed the phone call, Typhoon 1 pilot confirmed with them that they would be reporting the Airprox and requested the callsign and squawk for the traffic to affect. The Swanwick Mil controller called Marham and passed the information to Typhoon 1. [Formation callsign] flight then called ready for RTB (return to base) and a handover to [destination airfield] was completed.

The controller perceived the severity of the incident as 'Medium'.

THE MARHAM CONTROLLER reported the C182 pilot free-called for a Traffic Service en route [destination airfield] at FL65 1NM north of Lakenheath. They were requested to fly westerly to allow a pair of F35s to depart Marham. At this time there were 2 Typhoons general handling in the vicinity of Marham FL45-220 with Swanwick Mil under squawks 6060/6061. As the jets departed, the C182 pilot was given own navigation with the Typhoons indicating FL100. As the radar contacts were passing within 1NM of each other the Typhoons indicated height jumped from ~FL95 to FL68. Traffic was called to the C182 pilot who was visual with the traffic, although unsure if the [pilots of the] Typhoons were. Swanwick Mil was called, and they confirmed they (the Typhoon pilots) were visual.

The controller perceived the severity of the incident as 'Medium'.

THE MARHAM SUPERVISOR reported that Traffic Information had been sought on the 6061 and 6062 [squawk] Typhoons by the RA controller and passed to the LARS controller. The Supervisor had seen the C182 pilot call LARS and asked the level it was climbing to and asked the LARS controller if they could get them to avoid the climb-out lane due to 2 jets departing, also asking what level it called passing, to ensure a potential turn below terrain safe level was not issued. At this point the Supervisor's focus went back to the 2 jets about to depart. Listening to Ground, ADC and RA at this point, just before the LARS controller gave own navigation, the Supervisor had moved the squawks for 6061 and 6062 as they couldn't clearly see the height information. They were at this point FL100 and FL110. Upon hearing the LARS controller give own navigation to the C182 pilot, the height separation was a lot less and a couple of seconds later the LARS controller called the traffic. They reported that the aircraft was visual and then rang Swanwick Mil to ask if the pilots of the jets were visual with the C182.

Factual Background

The weather at Marham was recorded as follows:

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METAR EGYM 041450Z 20006KT CAVOK 13/M00 Q1026 NOSIG RMK BLU BLU=
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Analysis and Investigation

Military ATM

Typhoon 1 was part of a pair conducting Basic Fighter Manoeuvres within the East Anglia Military Training Area in receipt of a Traffic Service from the Swanwick Military controller. The C182 was conducting a northwest-bound VFR transit in receipt of a Traffic Service from the Marham Zone controller.

Sequence of Events:

Utilising occurrence reports and information from the local investigation, outlined below are the key events that preceded the Airprox. Where available they are supported by screenshots to indicate the positions of the relevant aircraft at each stage. The screenshots are taken from a combination of replays using both Unit and NATS radars. As NATS radars are not available to the [Marham] controllers they may not be entirely representative of the picture available, however the Unit radars provide the exact radar view seen by the [Marham] controllers.

The Marham Zone controller was providing a Traffic Service to a single C182 conducting a northwest-bound VFR transit at FL65.

The Swanwick Military controller was providing a Traffic Service to a pair of Typhoons conducting Basic Fighter Manoeuvres in the altitude block of 5000ft-22,000ft within the East Anglia Military Training Area, alongside two pre-notes for civilian transits within the area of responsibility.

The Typhoon formation is referred to as Typhoon 1 and Typhoon 2 in accordance with formation callsigns. Typhoon 1 was the aircraft involved in the Airprox.

At 1511:13, the Swanwick Military controller received a phone call from Terminal Control Midlands prenoting a Phenom departing the airways inbound RAF Cranwell. The phone call ended at 1512:22.

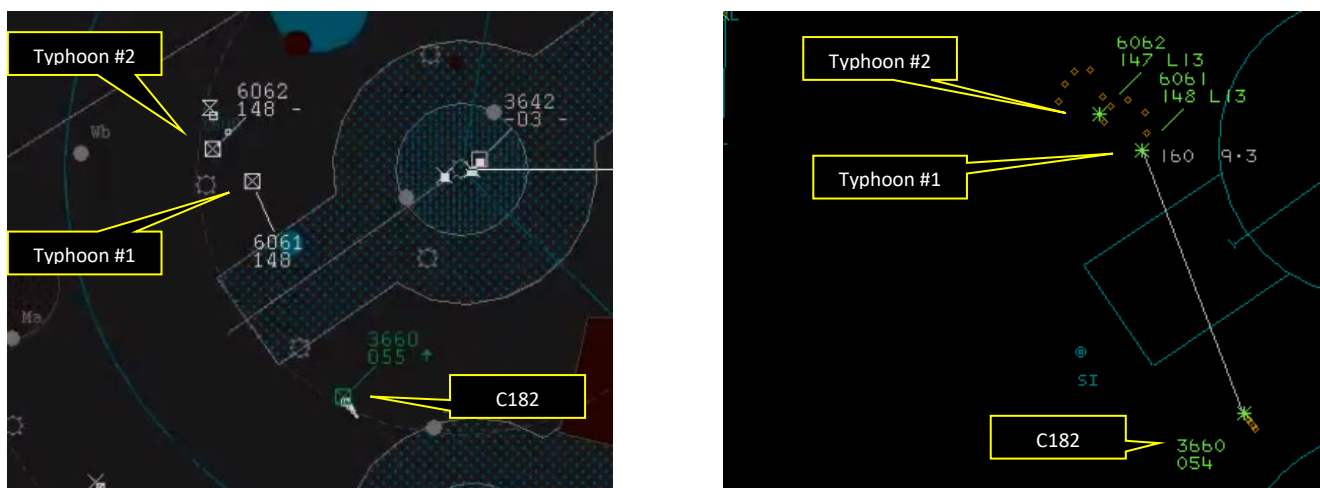


Figure 1 (1511:50): Marham Zone controller requested C182 fly a westerly heading. (Separation 9.3NM)

At 1511:50, the Marham Zone controller requested the C182 pilot fly a westerly heading to deconflict from fast jet departures expected from RW24 RAF Marham. The C182 pilot accepted the request and was issued an initial heading of 280°.

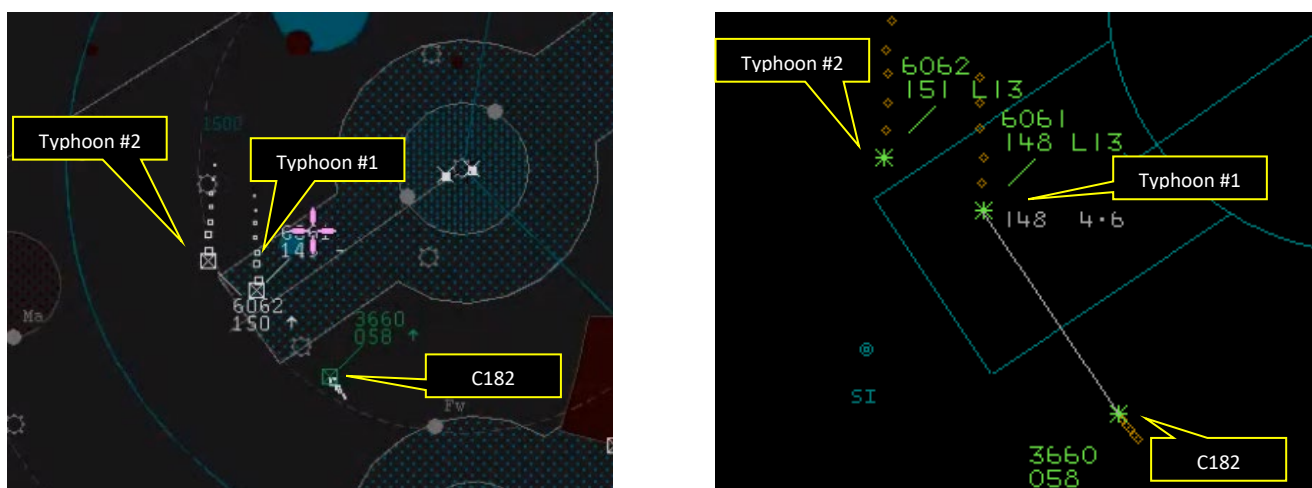


Figure 2 (1512:26): Lateral separation between Typhoon 1 and C182 fell below 5NM. (Separation 4.6NM)

At 1512:26, the lateral separation between Typhoon 1 operating in the altitude block of 5000-22,000ft and the C182 climbing through FL58 fell within 5NM. No Traffic Information was provided by the Swanwick Military controller.

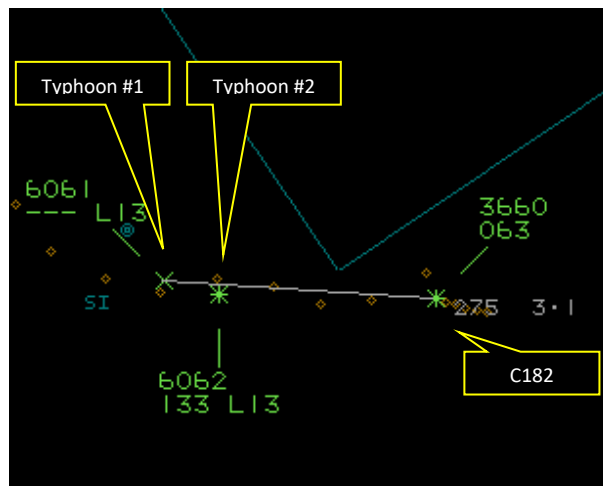
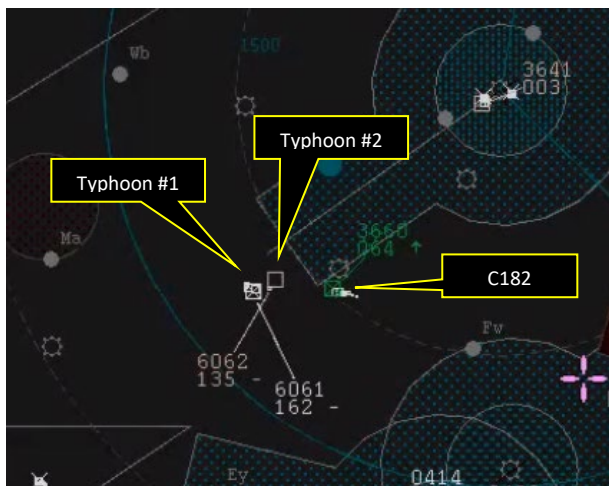


Figure 3 (1513:10): Mode C information on Typhoon 1 ceased for the Swanwick Military controller. (Separation 3.1NM)

At 1513:10, as Typhoon 1 commenced a descent, the Mode C information displayed to the Swanwick Military controller ceased and was not displayed again until intermittently at 1514:19 and continually at 1514:46. The Marham Zone controller retained Mode C information with the vertical separation remaining more than 5000ft.

At 1513:12, the Swanwick Military controller received a phone call from Coningsby Ground prenoting a Typhoon formation for a mid-level transit. The phone call ended at 1513:43. The Swanwick Military controller informed the Swanwick Military Supervisor of the prenote and requested an additional controller be established.

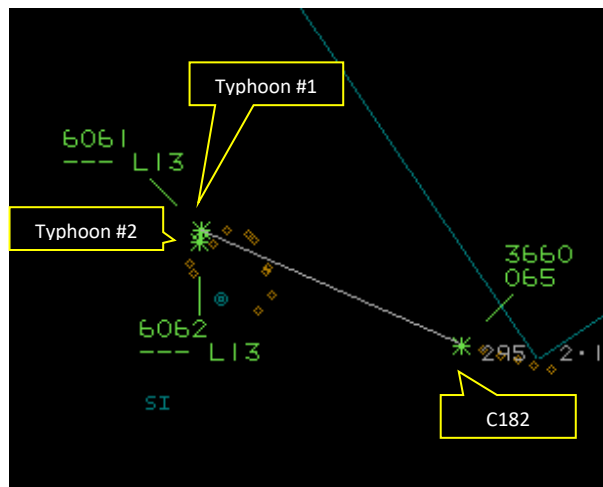
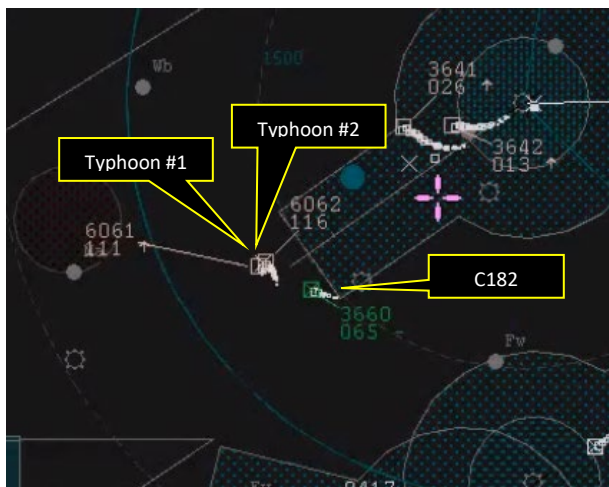


Figure 4 (1514:03): Vertical separation between Typhoon 1 and C182 fell below 5000ft. (Separation 2.1NM)

At 1514:03, the vertical separation between Typhoon 1 operating in the altitude block of 5000-22,000ft and the C182 at FL65 fell within 5000ft. At 1514:08, the vertical separation subsequently fell within 3000ft, with horizontal separation at 2.1NM.

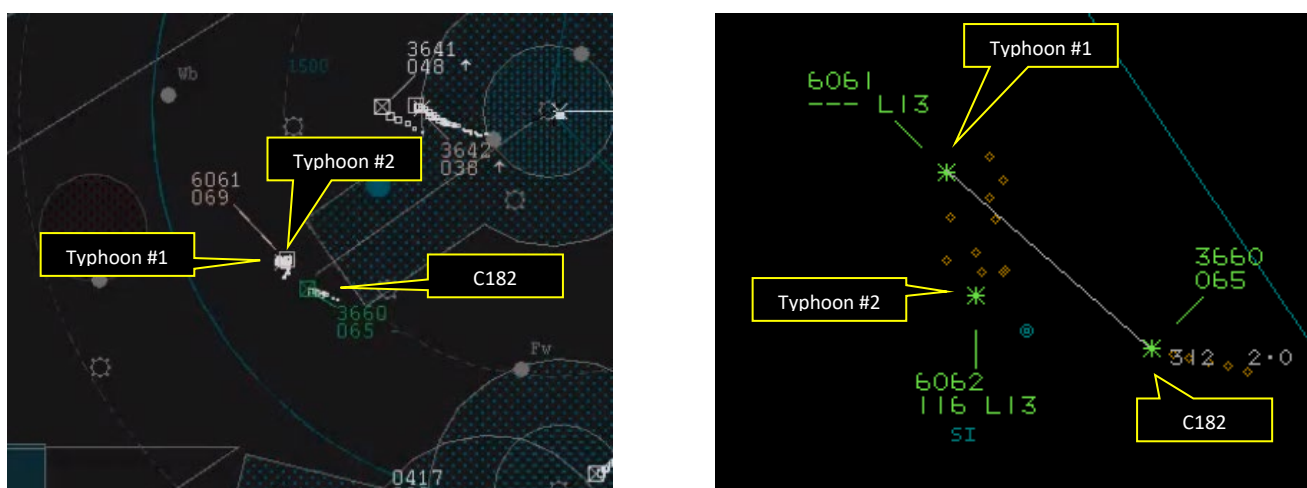


Figure 5 (1514:29): Traffic information provided to the C182 on the Typhoon formation by the Marham Zone controller. (Separation 2.0NM)

At 1514:21, the Marham Zone controller informed the C182 pilot that they could resume own navigation from the previously requested westerly heading. This was immediately followed at 1514:29 by Traffic Information to the C182 pilot on the Typhoon formation, “Traffic, north, 1 mile, tracking south, indicating 300ft above”. Concurrently, an STCA was received by the Marham Zone controller at 1514:30. The C182 pilot reported visual with the traffic at 1514:40.

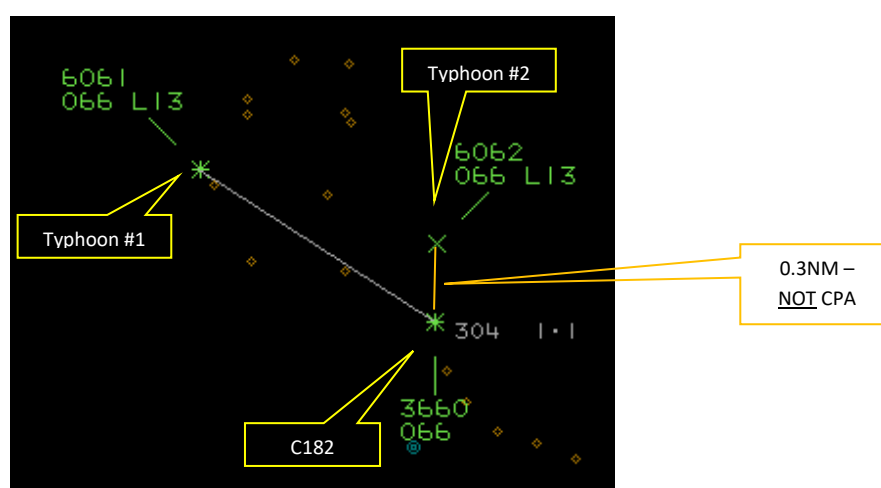


Figure 6 (1514:54): Traffic information provided to the Typhoon formation on the C182 by the Swanwick Military controller. (Separation 1.1NM)

At 1514:54, the Swanwick Military controller provided Traffic Information to the Typhoon formation “Traffic, southeast, 1 mile, manoeuvring, indicating FL65”. Typhoon 1 reported the traffic as visual.

Local BM Investigation:

The local investigation conducted by RAF Marham identified the cause of the Airprox as a loss of safe separation between non-cooperating aircraft due to inaccurate hazard assessment/perception by the controller. A BM-related causal/aggravating factor was then identified that was believed to have contributed to the Airprox:

A relatively inexperienced controller with limited exposure to fast jet Basic Fighter Manoeuvre profiles, particularly the rapid rate of descent.

As a result of the causal factors identified, the following mitigation for local action was proposed by RAF Marham:

Remedial training for the controller was conducted and recorded.

The local investigation conducted by 78 Sqn (Swanwick Military) identified the cause of the Airprox as a loss of safe separation between non-cooperating aircraft due to inaccurate hazard assessment/perception by the controller. A BM-related causal/aggravating factor was then identified that was believed to have contributed to the Airprox:

The controller incorrectly prioritised administration of the prenote and Electronic Flight Strip creation rather than Traffic Service application. This was exacerbated with the initial Electronic Flight Strip being created incorrectly and requiring amendment.

As a result of the causal factors identified the following mitigations for local action were proposed:

- i. Briefing of Supervisors regarding their responsibilities to support controllers.
- ii. Re-issue of orders to highlight the importance for controllers to inform Supervisors when accepting prenotes that increase bank workload.
- iii. A Supervisor forum instigated to discuss the occurrence and direct intervention techniques.

2 Gp BM Analysis:

The Marham Zone controller was proactive in providing the C182 [pilot] with a suitable routing to deconflict from the fast jet departures and then subsequently removed the restriction at the earliest opportunity. Whilst Traffic Information was passed to the C182 pilot on the Typhoon formation, it was late; a factor identified by the local investigation.

The Swanwick Military controller, whilst receiving prenotes, was only providing an active Traffic Service to the Typhoon formation. As the local investigation has identified, incorrect prioritisation of administration resulted in distraction and ultimately an ineffective Traffic Service with late Traffic Information being provided only after a loss of [safe] separation had occurred.

In addition to the local investigation, the following BM-related causal/aggravating factor was identified by 2 Gp BM:

Whilst Mode C information was not displayed to the Swanwick Military controller in the period preceding the Airprox, which may have delayed the controller recognising the confliction, the provision of Traffic Service was incorrect for a significant period prior. With the Typhoon formation operating within the altitude block of 5000-22,000ft Traffic Information should have been provided on the C182 at FL65 from as early as 1512:26 in accordance with [CAP 774](#) Ch 3 Para 5 –Traffic Information, as it was at this point that the lateral separation became less than 5NM. The provision of such Traffic Information would have enabled the Typhoon formation to effectively assess/amend the suitability of the Basic Fighter Manoeuvre profile in line with the C182's profile.

UKAB Secretariat

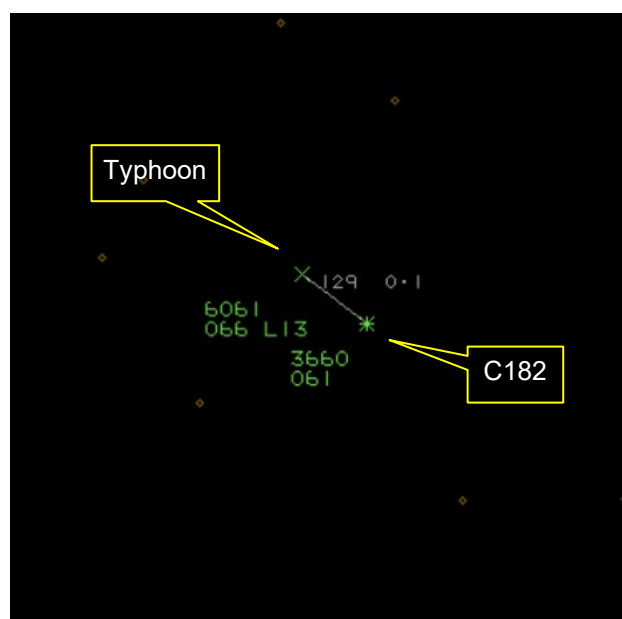


Fig 7: CPA 1515:08

The Typhoon and C182 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

Comments

HQ Air Command

Whilst conducting BFM, Typhoon pilots operate the aircraft up to its performance limits. This places a physical demand on the pilot during a period of complex and dynamic manoeuvring against a similar type, and collision avoidance is prioritised against the opponent. For this reason, it's preferable to operate in segregated airspace to reduce the lookout burden in such challenging conditions. Given that segregated airspace was unavailable and the aircraft were operating in Class G [airspace], it is considered best practice to obtain a Radar Service from ATC whilst under VFR. The Typhoon formation requested this from Swanwick Mil within an altitude block across the entire portion of airspace in which they expected to operate. It is unfortunate that awareness of the C182 was only obtained at a range of 1NM, co-altitude. This gave the Typhoon pilot no time to alter the plan and provide better de-confliction. Had earlier Traffic Information been passed, the leader would have taken the formation elsewhere to conduct the manoeuvres.

AOPA

Both aircraft were on the best Air Traffic Service available to them thereby increasing safety in the air. On this occasion controllers became distracted, which shows the importance of effective lookout, and in this case helped to mitigate the risk of a mid-air collision.

Summary

An Airprox was reported when a Typhoon and a C182 flew into proximity 4NM SW of Downham Market at 1515Z on Tuesday 4th April 2023. Both pilots were operating under VFR in VMC, the Typhoon pilot in receipt of a Traffic Service from Swanwick Mil and the C182 pilot in receipt of a Traffic Service from Marham LARS.

³ (UK) SERA.3205 Proximity. MAA RA 2307 paragraphs 1 and 2.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from both pilots, radar photographs/video recordings, reports from the air traffic controllers involved and reports from the appropriate operating authorities. Relevant contributory factors mentioned during the Board's discussions are highlighted within the text in bold, with the numbers referring to the Contributory Factors table displayed in Part C.

The Board discussed the role played by both Marham LARS and Swanwick Military Radar; members opined that the C182 pilot had followed the correct course of action in selecting a service, transponding appropriately and reacting positively to inputs from Marham LARS and that the Typhoon formation was considered to have been with the correct radar unit (Swanwick Military) despite their proximity to Marham (they noted that Marham is limited in its service to 19,000ft whereas their preferred operating window sat between 5000-22,000ft). The Board noted the distraction of the Swanwick controller (**CF5**), unnoticed by their Supervisor (**CF2**), and the resulting late passing of Traffic Information to the Typhoon formation (**CF1**). Although the Marham controller had been aware of departing aircraft (from Marham) and the operation of the Typhoon formation, the momentary loss of height readout from the formation had also meant a late Traffic Information call from the Marham controller to the C182 pilot and resulting late situational awareness and conflict detection by both Air Traffic units (**CF3, CF4, CF6**). The Board agreed that the Marham controller had received an STCA at the same time as they had made their late Traffic Information call to the C182 pilot (**CF7**).

The Board agreed that both the Typhoon formation pilots and the C182 pilot had been heavily reliant on the services offered by Swanwick Military and Marham for situational awareness, but the C182 had also carried a TAS which should have alerted the C182 pilot to the presence of traffic in the immediate area; that alert was not reported as present and therefore, the Board concluded, had contributed to reduced situational awareness and late-sighting on the part of the C182 pilot (**CF8, CF9, CF10**) resulting in a near collision (**CF11**).

When determining the risk of collision, the Board agreed that safety margins had been much reduced below the norm through the late-sighting of the pilot of each aircraft and that there had been emergency avoiding action by the C182 pilot which had materially increased separation at the last minute. As such, the Board assigned a Risk Category B to this Airprox.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK

Contributory Factors:

	2023040			
CF	Factor	Description	ECCAIRS Amplification	UKAB Amplification
Ground Elements				
• Regulations, Processes, Procedures and Compliance				
1	Human Factors	• ATM Regulatory Deviation	An event involving a deviation from an Air Traffic Management Regulation.	Regulations and/or procedures not fully complied with
• Manning and Equipment				
2	Human Factors	• ATM Leadership and Supervision	An event related to the leadership and supervision of ATM activities.	
• Situational Awareness and Action				
3	Human Factors	• ANS Traffic Information Provision	Provision of ANS traffic information	TI not provided, inaccurate, inadequate, or late
4	Human Factors	• Conflict Detection - Detected Late	An event involving the late detection of a conflict between aircraft	
5	Human Factors	• Task Monitoring	Events involving an individual or a crew/team not appropriately monitoring their performance of a task	Controller engaged in other tasks
6	Contextual	• Traffic Management Information Action	An event involving traffic management information actions	The ground element had only generic, late, no or inaccurate Situational Awareness
• Electronic Warning System Operation and Compliance				

7	Technical	• STCA Warning	An event involving the triggering of a Short Term Conflict Alert (STCA) Warning	
Flight Elements				
• Situational Awareness of the Conflicting Aircraft and Action				
8	Contextual	• Situational Awareness and Sensory Events	Events involving a flight crew's awareness and perception of situations	Pilot had no, late, inaccurate or only generic, Situational Awareness
• Electronic Warning System Operation and Compliance				
9	Human Factors	• Response to Warning System	An event involving the incorrect response of flight crew following the operation of an aircraft warning system	CWS misinterpreted, not optimally actioned or CWS alert expected but none reported
• See and Avoid				
10	Human Factors	• Identification/ Recognition	Events involving flight crew not fully identifying or recognising the reality of a situation	Late sighting by one or both pilots
• Outcome Events				
11	Contextual	• Near Airborne Collision with Aircraft	An event involving a near collision by an aircraft with an aircraft, balloon, dirigible or other piloted air vehicles	

Degree of Risk: B.

Safety Barrier Assessment⁴

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

Ground Elements:

Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because the Swanwick Military controller did not pass Traffic Information to the Typhoon pilot in a timely manner.

Manning and Equipment were assessed as **partially effective** because the Supervisor within Swanwick Military did not adequately react to the controller's attention being diverted by tasks relating to other traffic within their AOR.

Situational Awareness of the Confliction and Action were assessed as **ineffective** because the opportunity to identify and pass timely Traffic Information to both the Typhoon formation and the C182 was missed by the Swanwick Military and Marham controllers, leading to late and reduced situational awareness for the pilots.

Flight Elements:

Situational Awareness of the Conflicting Aircraft and Action were assessed as **partially effective** because Traffic Information was delivered at a late stage, leading to reduced and late situational awareness for both pilots involved.

Electronic Warning System Operation and Compliance were assessed as **ineffective** because the C182 was equipped with an Electronic Conspicuity device which should have recognised and alerted to the conflicting Typhoon.

See and Avoid were assessed as **partially effective** because both pilots sighted the other aircraft at a later than optimum point.

⁴ The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the [UKAB Website](#).

Airprox Barrier Assessment: 2023040 Outside Controlled Airspace

	Barrier	Provision	Application	Effectiveness					
				Barrier Weighting					
				0%	5%	10%	15%	20%	
Ground Element	Regulations, Processes, Procedures and Compliance	✓	⚠						
	Manning & Equipment	✓	⚠						
	Situational Awareness of the Conflicition & Action	✓	✗						
	Electronic Warning System Operation and Compliance	✓	✓						
Flight Element	Regulations, Processes, Procedures and Compliance	✓	✓						
	Tactical Planning and Execution	✓	✓						
	Situational Awareness of the Conflicting Aircraft & Action	⚠	✓						
	Electronic Warning System Operation and Compliance	⚠	✗						
	See & Avoid	⚠	⚠						
Key:		<u>Full</u>	<u>Partial</u>	<u>None</u>	<u>Not Present/Not Assessable</u>	<u>Not Used</u>			
Provision	✓	⚠	✗	●	○				
Application	✓	⚠	✗	●	○				
Effectiveness									