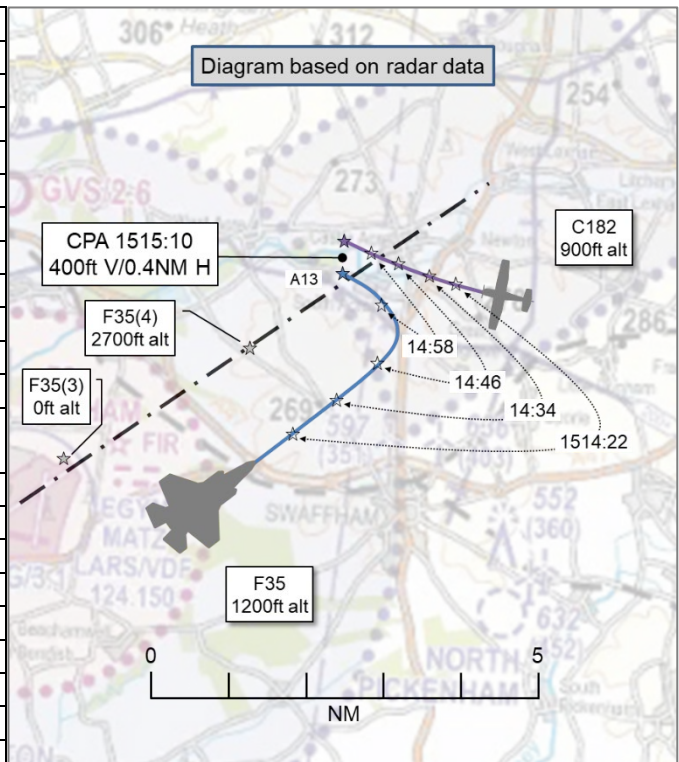


AIRPROX REPORT No 2022100

Date: 09 Jun 2022 Time: 1515Z Position: 5242N 00040E Location: 5NM NE RAF Marham

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	F35	C182
Operator	HQ Air (Ops)	Civ FW
Airspace	Marham MATZ	London FIR
Class	G	G
Rules	VFR	VFR
Service	ACS	Traffic
Provider	Marham Tower	Marham Zone
Altitude/FL	1300ft	900ft
Transponder	A, C	A, C, S+
Reported		
Colours	Grey	Blue, white
Lighting	Nav, HISL	Land, taxi, nav, anti-col, strobes
Conditions	VMC	VMC
Visibility	>10km	>10km
Altitude/FL	1000ft	900ft
Altimeter	QFE (1013hPa)	RPS (NK hPa)
Heading	Turning left	NK
Speed	200kt	NK
ACAS/TAS	Not fitted	TAS
Alert	N/A	None
Separation at CPA		
Reported	300ft V/1/4NM H	200ft V/1NM H
Recorded	400ft V/0.4NM H	



THE F35 PILOT SUPERVISING OFFICER reports that the F35 pilot was a student pilot on their first ‘live’ flight, with another F35 as the chase aircraft. The formation was joined in the circuit by a further 2 F35s, who elected to conduct practise straight-in Precautionary Flameout (PFO) profiles. At the end of downwind, the student F35 pilot was requested by Tower to extend downwind to allow the other 2 F35s to complete their PFOs. The student pilot was visual with the first of the other 2 F35s, and was also looking for the other to break cloud to gain visual and start their turn inbound. As the student pilot extended downwind at 1000ft, traffic was called, northeast at 1NM, 100ft below. The student pilot did not have [radar] contact and was not visual (additionally, limitations at the time prohibited interrogation of Mode 3/A/C). A climb was initiated and the turn commenced inbound as soon as the student pilot was visual with the second of the other 2 F35s. The student pilot did not see the called traffic, but asked the Tower controller for an update, who called that the traffic was no longer a factor. Post flight analysis of ATC radar showed that CPA was [approximately] 1/4NM and 300ft.

The supervising officer assessed the risk of collision as ‘High’.

THE C182 INSTRUCTOR reports that on approaching the Marham MATZ, a zone transit was ‘denied’ by the Zone controller. They asked if it was acceptable to climb above the MATZ and remain in Class G airspace, but were told this was not acceptable. Instead, they confirmed the lower limit of the MATZ stub as 1077ft and descended to maintain 900ft on the RPS as confirmed by the Zone controller. This ensured they were clear of the MATZ. They were advised of fast-jet circuit traffic to their left, with which they were visual. The jet was seen to be turning left-base for Marham RW24. They were also visual with a second jet that appeared to be descending steeply in the aerodrome overhead.

The pilot assessed the risk of collision as ‘Low’.

THE MARHAM TOWER CONTROLLER reports that F35(1) and F35(2) were in the visual circuit at RAF Marham. F35(1) pilot was on a first [live] flight. Multiple visual circuits were being conducted when the controller received a phone call from the supervisor stating F35(3) and F35(4) were inbound for a trails radar approach. F35(1) was number 1 priority and made an approach to RW24, F35(2) was asked to go around at circuit height to allow the radar traffic number 2 priority. F35(2) replied stating they would go out to initial. F35(3/4) formation were cleared to low-approach (LA) in-trail on radar followed by a call from F35(2) at initial. The controller replied, one short final (F35(4)), one upwind (F35(3)) and one downwind (F35(1)). F35(3) and (4) requested to climb to 10000ft QFE to conduct straight-in PFO in trail, which was approved. F35(1) then conducted a LA, followed by F35(2). The controller then noticed F35(1) extend upwind and F35(2) broke downwind first. F35(2) was cleared to LA. F35(3) reported leaving high key (10 miles, 10000ft for RW24) followed by F35(4) in trail. With the speed and descent of a PFO they asked F35(1) (late downwind) to extend downwind. They would have sent them around at circuit height, however, with F35s(3/4) descending rapidly from above they were unable to do so. With F35(2) soon to join downwind they were also unable to request F35(1) conduct an orbit. They then noticed traffic on the ATM, crossing the approach lane (squawk 3660, Mode C readout 009). They called the traffic, 12 o'clock, 3 miles, crossing right-to-left 100ft below (the Supervisor was also in the Visual Control Room (VCR) at this time and informed the controller of the traffic). With 4 aircraft in the visual circuit, they were trying to maintain visual, keep the pinboard up to date, select ring-road lights and check the runway. At this point they didn't have the capacity to inform the approach controller that an [F35] was extending downwind. Once F35(1) was visual with the second PFO they reported turning inbound. The controller immediately called the traffic again and reported when clear. The two aircraft were about 300ft apart. All the [F35s] conducted several more circuits before landing.

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

THE MARHAM SUPERVISOR reports they were initially in the Approach Control Room (ACR), because it was very busy, when F35(1/2) formation called to join. When F35(3/4) formation were changed to Tower, the Supervisor was able to go to the Visual Control Room (VCR) to assist the Tower controller. Due to the level of intensity, they were liaising with the Zone controller to pass Traffic Information about F35s(3) and (4) climbing for high key. F35(2) called downwind LA, then F35(1) for the same. Two aircraft climbed for straight in PFO and the first called 'high key' as F35(2) called final. The Tower controller elected to suggest to F35(1) to extend downwind. The Supervisor assessed they would have done the same, as to send F35(1) around could have introduced a risk of collision with the F35s(3) and (4), inbound. The LARS controller called and passed Traffic Information on the LARS traffic, not above 900ft on the Chatham RPS. Tower called the Zone traffic [C182] to F35(1), 12 o'clock 4 miles indicating 100ft below, which was below the MATZ. The F35(1) pilot called visual with the second PFO traffic and said turning-in, at the 5 mile point. The Tower controller acknowledged and called the LARS [Zone] traffic [C182] again, north 1 mile indicating 100ft below. F35(1) remained within the confines of the MATZ and the LARS traffic remained outside. The aircraft appeared to get within 1/2 mile and 100ft. Once shutdown, the pilot of F35(1) rang to discuss and a replay was initiated, SATCO was informed and tapes were impounded.

Factual Background

The weather at Marham was recorded as follows:

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METAR EGYM 091550Z 23015KT 9999 FEW040 BKN090 19/10 Q1015 NOSIG RMK BLU BLU=
METAR EGYM 091520Z 22015KT 9999 FEW040 BKN110 19/10 Q1015 NOSIG RMK BLU BLU=
METAR EGYM 091450Z 23011KT 9999 FEW040 BKN120 19/10 Q1015 NOSIG RMK BLU BLU=
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Analysis and Investigation

Military ATM

An Airprox occurred on 9 Jun 22 at approximately 1515UTC, in the RAF Marham MATZ between an F35 and a C182. The F35 was in receipt of an Aerodrome Control Service and the C182 was in receipt of a Traffic Service from Marham LARS.

The Marham [Tower] controller was bandboxed with the Ground position, however it is believed there was no communication on the Ground frequency. The [Tower] controller had four F35s operating in the visual circuit, conducting a mixture of visual circuit and visual approach profiles. Two F35s departed the visual circuit to conduct practice straight-in Precautionary Flame Out's (PFO) climbing to 'high key'. The other two, one of which was the Airprox F35, remained within the visual circuit, conducting standard approaches. The [Tower] controller requested the Airprox F35 pilot extend downwind, to enable the PFO recoveries priority ahead. Due to the complexity of the visual circuit and high controller workload, the primary management tools used by the [Tower] controller were the pinboard and lookout. Once prompted by the Supervisor, Traffic Information was passed to the F35 pilot which was later updated. It was reported that lookout [from the Tower] was restricted due to the aircraft's position and the ATC Tower infrastructure.

The Marham LARS controller was providing a Traffic Service to the C182 pilot, it is unknown whether there was any other traffic under their control. The LARS controller denied the C182 pilot's request for a MATZ transit due to the volume of the circuit traffic, requesting them to route outside the MATZ to the east. The C182 pilot initially requested whether it would be appropriate to climb above the MATZ with the LARS controller advising that it would not be as they were expecting circuit traffic to depart out to 10NM for straight in approaches. The C182 pilot then advised that they were descending to 900ft. The LARS controller confirmed that they would be routing below the MATZ stub, and issued a terrain warning. Traffic Information was passed to the C182 pilot regarding the F35 position twice prior to CPA and it was also passed to the [Tower controller] via the Supervisor. Due to the C182 pilot routing on the edge of the MATZ and the proximity of the visual circuit traffic, they were requested to adjust to a northerly heading with the C182 pilot advising they would remain outside the MATZ.

The Marham Supervisor was initially located within the Approach Control Room (ACR) due to the complexity of traffic. When the situation dictated, they relocated to the Visual Control Room (VCR) to assist the Marham [Tower] controller with administrative duties, informing the Approach controller of the F35 extending downwind. They received Traffic Information from the Marham LARS controller regarding the C182 which was passed to the [Tower] controller.

Figures 1-5 show the positions of the F35 [squawk 3651] and the C182 [squawk 3660] at relevant times during the Airprox. The screenshots were taken from a replay using radars which are not utilised by the Marham controllers and, therefore, may not be entirely representative of the picture available.

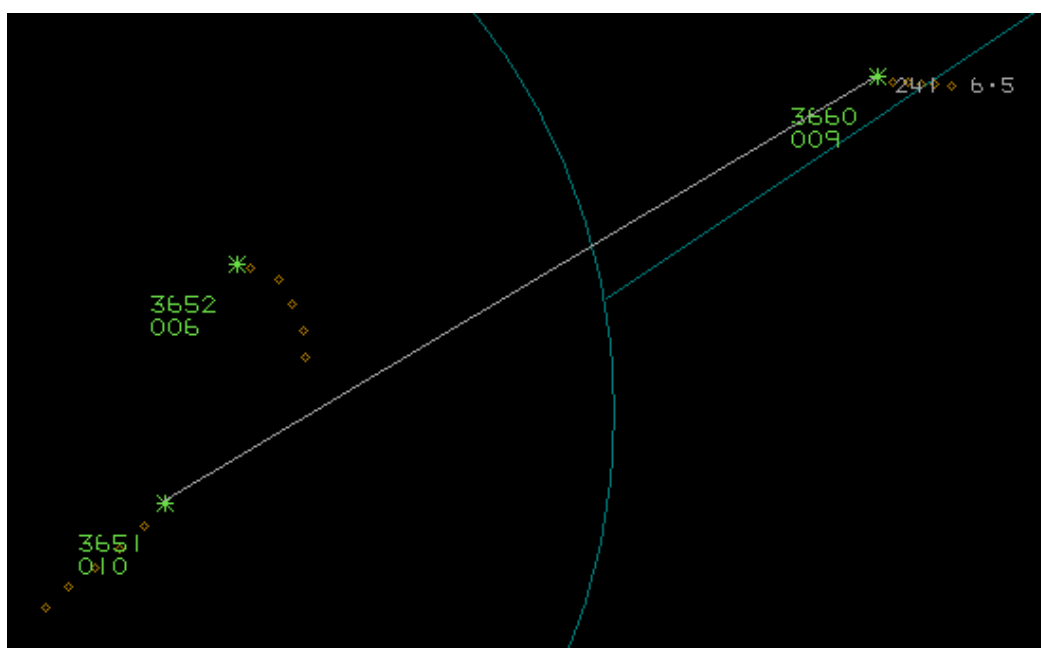


Figure 1: ATC requested F35 pilot to extend downwind.

Marham [Tower] controller requested the F35 to extend downwind for sequencing purposes against other visual circuit traffic and visual joining traffic from a straight-in PFO approach. The C182 pilot advised they would descend to 900ft and route beneath the MATZ stub. Separation was measured at 6.5NM and 100ft [Figure 1].

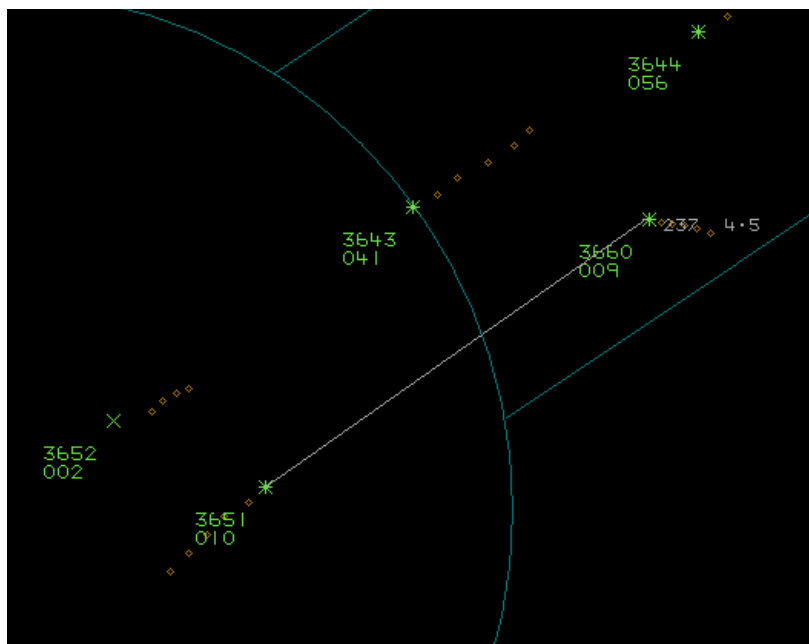


Figure 2: ATC requested F35 to maintain heading.

Twenty-three seconds later the Marham [Tower] controller requested the F35 pilot to maintain their heading for sequencing behind the second aircraft joining the visual circuit from a straight-in PFO approach. Separation decreased to 4.5NM and 100ft [Figure 2].

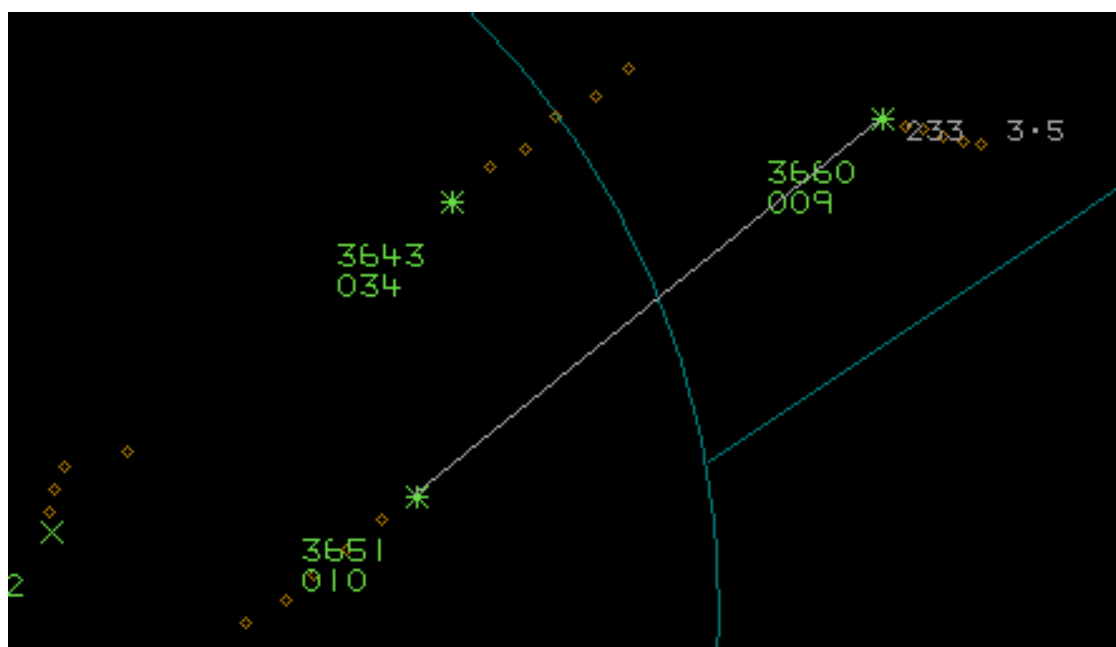


Figure 3: Traffic Information passed by the Marham [Tower] controller.

Eleven seconds later the Marham [Tower] controller passed Traffic Information to the F35 pilot regarding the C182. Five seconds prior to Figure 3, the LARS controller passed Traffic Information to the C182 pilot regarding the F35 which was acknowledged by the C182 pilot. Separation decreased to 3.5NM and 100ft [Figure 3].

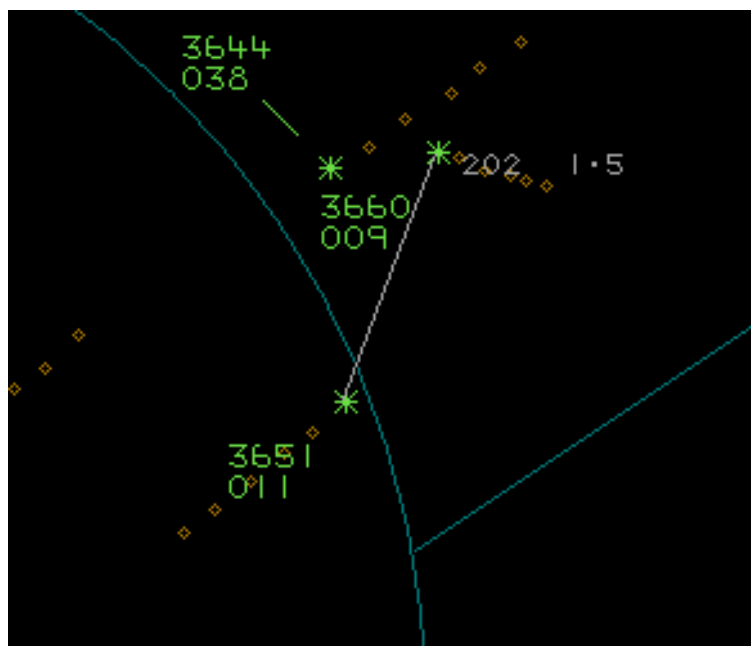


Figure 4: F35 Pilot turns inbound.

After passing Traffic Information to the C182 pilot the LARS controller passed Traffic Information to the ADC controller via the Supervisor. After passing the Traffic Information, the Marham [Tower] controller issued instructions to the first PFO recovery aircraft before requesting confirmation that the F35 pilot was visual with the second PFO recovery aircraft. The F35 pilot confirmed they were and reported turning inbound. This was acknowledged by the Marham [Tower] controller who updated the Traffic Information on the C182. Separation decreased to 1.5NM and 200ft [Figure 4].

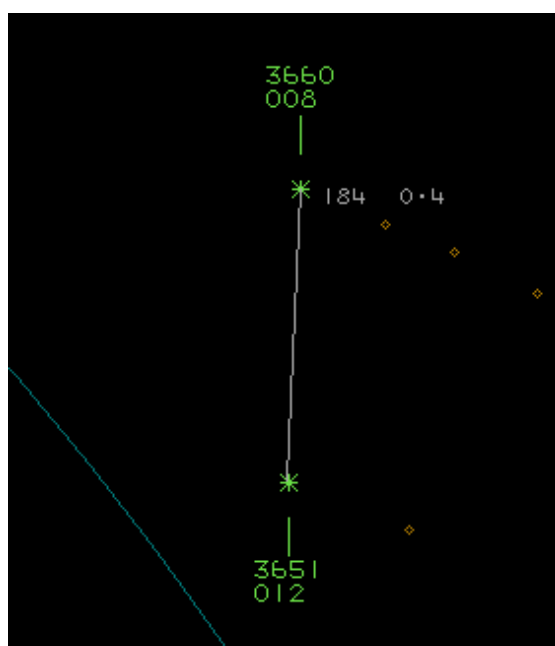


Figure 5: CPA.

Sixteen seconds prior to CPA the LARS controller updated the Traffic Information to the C182 pilot, however it is unknown whether the traffic was sighted as the RT was clipped. The F35 pilot appeared to climb as they turned inbound and did not report visual with the C182. Four seconds prior to CPA, the LARS controller requested the C182 pilot to “pick up a northerly heading” to maintain clear of the visual circuit. CPA was measured at 0.4NM and 400ft [Figure 5]. Shortly after CPA, the Marham [Tower] controller informed the F35 pilot they were clear of conflict.

The [Tower] controller acted positively by asking if the F35 pilot could accept a downwind extension to ensure that there was not a conflict between the F35 and the two practice PFO recoveries. However, the controller was perceived to be operating at capacity and was unable to utilise the ATM to assess the airspace picture prior to requesting the F35 pilot extend downwind. The Supervisor had relocated from the ACR to the VCR to support the controller due to the volume of traffic, which enabled the LARS controller to pass Traffic Information regarding the C182. The Supervisor's prompt to the [Tower] controller ensured that Traffic Information was passed in a timely manner, and they should be commended for their intervention.

Marham compiled a comprehensive investigation which identified that there was a misunderstanding over the priority that should be given to practice PFOs and use of correct terminology, both of which are being reviewed by ATC. The C182 pilot's denied request for a MATZ transit and overflight by the LARS controller was appropriate given the status of the visual circuit and the intended profiles of the F35s. Although the request to the C182 pilot to adjust to a more northerly heading was appropriate due to decreasing separation from the visual circuit traffic, the request came only four seconds prior to CPA. The request could have been made to the C182 pilot earlier which would have enabled them to adjust their heading. However it should be noted that the pilot was under no obligation to adjust their heading although an earlier request could have allowed greater separation to be maintained.

UKAB Secretariat

The F35 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.¹ If the incident geometry is considered as converging then the F35 pilot was required to give way to the C182.² If the incident geometry is considered as overtaking then the C182 pilot had right of way and the F35 pilot was required to keep out of the way of the other aircraft by altering course to the right.³ An aircraft operated on or in the vicinity of an aerodrome shall conform with or avoid the pattern of traffic formed by other aircraft in operation.⁴

UK AIP ENR 2.2 (OTHER REGULATED AIRSPACE), Section 2 (MILITARY AERODROME TRAFFIC ZONES) states as follows:

2.1.1 At certain military aerodromes, Military Aerodrome Traffic Zones (MATZ) have been established to provide a volume of airspace within which increased protection may be given to aircraft in the critical stages of circuit, approach and climb-out. A MATZ acquires the status of the airspace classification within which it lies; however, additional mandatory ATC requirements are invariably specified for military pilots. In the airspace outside the Aerodrome Traffic Zone (ATZ), observation of MATZ procedures is not compulsory for civil pilots.

2.1.3 In general, the dimensions of a MATZ are as follows:

- a. The airspace within 5 NM radius of the mid-point of the longest runway, from the surface to 3000 FT AAL.
- b. The airspace within a stub or stubs projected from the above airspace, having a length of 5 NM along the centre-line(s) aligned with the selected final approach path(s), and a width of 4 NM (2 NM either side of the centre-line) from 1000 FT AAL to 3000 FT AAL.
- c. Exceptions to the above exist; however, for details of the dimensions of specific zones and the associated stub(s) see paragraph 2.4 and ENR 6-59 (chart).

2.2.2 ... In the interests of flight safety and good airmanship, it is strongly recommended that all pilots not previously receiving an ATS obtain a MATZ penetration 'approval' from the MATZ operating authority prior to entering a MATZ. It is recognised that most MATZ crossing/penetration 'approvals' will be obtained via RTF by pilots in receipt of a UK FIS; however, it should be possible for a pilot to request a MATZ crossing/penetration 'approval' without the use of radio (i.e. by prior agreement via telephone). In

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

² (UK) SERA.3210 Right-of-way (c)(2) Converging. MAA RA 2307 paragraph 12.

³ (UK) SERA.3210 Right-of-way (c)(3) Overtaking. MAA RA 2307 paragraph 14.

⁴ (UK) SERA.3225 Operation on and in the Vicinity of an Aerodrome. MAA RA 2307 paragraph 17.

accordance with Class G Airspace classification and the rules of UK FIS, pilots are ultimately responsible for maintaining their own separation against other airspace users within the MATZ. Occasionally, a change in service may need to be negotiated in order to facilitate the MATZ crossing and the advisory information and/or instructions passed by the ATSU will accord with the service being provided. In the event of no radar being available, a non-radar Basic Service, and/or routing instructions, might be provided to aircraft penetrating the MATZ.

2.2.3 Where a MATZ penetration approval cannot be issued, pilots are advised to avoid the MATZ, notwithstanding any action necessary to maintain the safety of the aircraft and/or its occupants.

The Marham excerpt from paragraph 2.4, as follows:

MATZ Designation/ Mid-point of Longest Runway	ADElevation(FT) (AMSL)	MATZ Core Radius/Limits	1st Stub Heading °T to AD/Distance/Limits	2nd StubHeading°T to AD/Distance	Controlling Aerodrome/ATS unit callsign/frequency/language	Hours of applicability	Remarks
1	2	3	4	5	6	7	8
Marham 523854N 0003302E	76	Radius: 5 NM Upper Limit: 3000 FT AGL Lower Limit: SFC	057 5 NM Upper Limit: 3000 FT AGL Lower Limit: 1000 FT AGL	237 5 NM Upper Limit: 3000 FT AGL Lower Limit: 1000 FT AGL	Marham MARHAM DIRECTOR 124.150 MHz English	—	—

Comments

HQ Air Command

This Airprox was subject to a very thorough Occurrence Safety Investigation (OSI), where 6 recommendations were accepted. The occurrence happened during a very busy period within the visual circuit, made more complex by the mixed profiles. Everyone involved was certainly working to capacity with a very testing environment for an ab initio student's first live flight. It is heartening to see that, as the situation developed, the ATC Supervisor correctly assessed that the VCR [controller] required more help and was able to add value by alerting the controllers of the conflicting traffic under the MATZ stub. The Occurrence Review Group, after much deliberation, felt that the [Tower] controller had no choice but to extend F35(1) downwind in this situation. Traffic Information was passed twice to the F35 pilot on the C182; with the high workload, coupled with the first live flight and trying to maintain SA on the PFO traffic, it is possible that this information wasn't fully assimilated. However, a shallow climbing turn was evident whilst turning base leg, improving the height separation to 400ft. With the C182 pilot also being visual throughout meant that there was little risk of collision. The supervising F35 pilot (in the chase aircraft), owing to the satisfactory performance of F35(1) pilot, made a conscious decision to separate from them resulting in degraded supervision in a very complex environment.

To help prevent reoccurrence, the following recommendations from the investigation have been implemented:

- ATC are to retain current overhead PFO procedures and enhance the straight-in PFO approach procedures to a similar level of detail. This includes a reminder that ATC can break off an approach at any stage as necessary. Both procedures required positive clearance to descend from high key.
- Operational Conversion Unit students on their first F35 sortie will suffix 'TANGO' to their callsign to indicate their lack of experience on type. E.g. "[C/S], TANGO". All Lightning Force pilots (along with Marham ATC) should afford 'TANGO' callsigns suitable consideration and prioritisation, particularly when operating in and around the visual circuit.
- Remind all parties the term PFO is normalised for all training events and does not require any additional priority. Emergency events requiring a PFO profile will always be preceded by the relevant PAN or MAYDAY prefix.
- Release To Service Authority Clearance For IFF-Interrogation
- Procedures on how to conduct Chased Sortie supervision (with QFI aircraft positioning requirement) to be written and included within Orders and also to identify to which OCU syllabus sorties it will apply (all/some FAM Phase sorties). QFIC Training course for instructor pilots/QFIs

should include specific guidance on instructor Air Vehicle positioning throughout chased sorties and how direct and/or remote supervision in the air of students is to be conducted.

- [Experienced and suitably qualified] pilots must have achieved at least 4 events in a rolling 31-day period (of which 2 can be synthetic).

Turning to the actions of the C182 pilot, it is heartening and commendable that they were in receipt of a Traffic Service from RAF Marham, whilst also requesting a MATZ crossing (subsequently denied), whilst maintaining positive lookout and clearance of the MATZ. Their level of SA in a complex situation is also commendable, meaning that they were visual with the conflicting aircraft throughout. This demonstrates how early and positive engagement with a military ATSU, requesting a Traffic Service, can build SA for all parties and provides an extra barrier in MAC prevention and should be actively encouraged.

The Occurrence Review Group concluded that, 'In summary, the GA [aircraft] was allowed to operate close to the Marham MATZ and the conflicting [F35] was boxed into a corner by having to extend downwind. By highlighting these FAM sorties and actively controlling PFO descents, we will now install suitable barriers to prevent this type of event happening again. The [F35] pilot losing SA is a product of conflicting and complex circuit patterns at the time. The airborne supervision of under-training pilots balanced against chase aircrew currency requires careful consideration for future events. This AIRPROX and the introduction of PFO profiles is a timely reminder to review orders/procedures to ensure this type of unfamiliar activity is covered across all defence aerodromes that F-35 could operate/divert to'.

Summary

An Airprox was reported when an F35 and a C182 flew into proximity at RAF Marham at 1515Z on Thursday 9th June 2022. Both pilots were operating under VFR in VMC, the F35 pilot in receipt of a military ACS from Marham Tower and the C182 pilot in receipt of a Traffic Service from Marham Zone.

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 was first briefed by the military aircrew member on the Marham investigation. They emphasised that the ATC Supervisor deserved credit for their management of the situation, including assistance to the Tower controller resulting in Traffic Information being passed to the F35 pilot. For their part, the C182 Instructor was also commended on their conduct; establishing 2-way communication with Marham, establishing a Traffic Service and crossing the busy airspace in the vicinity of Marham using a method by which to remain clear of the MATZ. The military aircrew member also noted that service release clearance had now been obtained for IFF interrogation, which will increase F35 pilot situational awareness with regard to other 'transponding' traffic. Finally, the military aircrew member acknowledged that the F35 was a new platform to the RAF and that procedures were evolving in light of increased use and understanding of its performance and capabilities. The Board members agreed that both the Marham Supervisor and C182 Instructor should be commended for their actions. Members discussed the degree of complexity in the visual circuit at Marham and agreed that the Airprox F35 pilot, conducting their first 'live' flight, should have been given priority over the F35 pilots conducting PFOs (**CF1**). The increase in complexity and workload from the 'mixed traffic' resulted in the Tower controller requesting that the F35 pilot 'extend downwind' but without assimilating the C182 pilot's potentially conflicting track (**CF2**), which unfortunately placed the F35 into proximity with the C182 (**CF3**). The Board noted that STCA was not used at Marham due to technical limitations (**CF4**). The Supervisor was able to bring the Tower controller's attention to the C182 and Traffic Information was passed on it, albeit at a relatively late stage (3.5NM separation). The Board discussed regulations pertaining to giving-way and agreed that the situation was not clear; on the one hand it could be considered that at a range of 5NM from the airfield, the F35 pilot was no longer in the visual circuit and therefore that they were

required to give way to traffic converging on the right. On the other hand, the C182 pilot was operating 'in the vicinity of an aerodrome' and was required to 'conform with or avoid the pattern of traffic formed by other aircraft in operation'. The Board discussed the interaction between the LARS controller and the Tower controller but initially were not able to do so productively, due to the lack of a UKAB copy of the LARS controller transcript. The military ATM member was able to brief the Board on the contents of the LARS controller transcript, from which it was established that the C182 pilot had been requested to turn north (not northeast) shortly before they crossed the Marham extended centreline, at about the same time as CPA. The lack of compliance with the request to turn north was therefore discounted as a contributory factor. Some members felt that the C182 pilot had been too obliging, in that their willingness to accommodate the Marham LARS controller's requests had resulted in them transiting underneath the MATZ 'stub', at times as low as about 650ft agl. Members thought that in a piston single-engine aircraft this increased risk for the C182 occupants in a way that the Marham controllers may not have been aware. (It was brought to the CAA advisor's attention that the MATZ vertical dimensions specified in paragraph 2.1.3 of UK AIP ENR 2.2 did not accord with the table at paragraph 2.4, in that the table incorrectly specified vertical dimensions as being 'AGL' when they should be specified as 'AAL'.) Members discussed the issue of MATZ transit 'approval' and agreed that, although it was not required by non-military pilots, and in fact that flight above, through or under a MATZ could not be denied by a military controller, this Airprox highlighted the potential degree of traffic quantity and complexity around a military airfield. Members agreed that by far the best approach was to contact military airfield ATC in good time and establish communication such that the requirements of all parties could be established and a plan achieved, as the C182 Instructor had accomplished in this case. Despite this being the Board's considered 'best practice', members wondered whether some military controllers fully understood that non-military traffic in Class G airspace in fact did not require permission to cross a MATZ and that their participation in a MATZ crossing 'approval' was dependent on their willingness to participate. The military aircrew member highlighted that the ORG comment that the C182 pilot was 'allowed to operate close to the Marham MATZ' was simply a statement that the regulations allowed such conduct in Class G airspace and was not intended as a statement that they had been given permission to do so. In the event, although the C182 TAS did not alert as expected (**CF5**), the C182 pilot had been visual with the F35 and was not concerned by its proximity which, given the separation at CPA, the Board felt was justified. Members felt that the F35 pilot probably did not have a high degree of situational awareness on the position of the C182 but that, although it could not be said that normal procedures had pertained, there was no risk of collision.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK

Contributory Factors:

2022100				
CF	Factor	Description	ECCAIRS Amplification	UKAB Amplification
Ground Elements				
• Regulations, Processes, Procedures and Compliance				
1	Organisational	• Aeronautical Information Services	An event involving the provision of Aeronautical Information	The Ground entity's regulations or procedures were inadequate
• Situational Awareness and Action				
2	Human Factors	• Conflict Detection - Detected Late	An event involving the late detection of a conflict between aircraft	
3	Human Factors	• Traffic Management Information Provision	An event involving traffic management information provision	The ANS instructions contributed to the Airprox
• Electronic Warning System Operation and Compliance				
4	Technical	• Conflict Alert System Failure	Conflict Alert System did not function as expected	The Conflict Alert system did not function or was not utilised in this situation
Flight Elements				
• Electronic Warning System Operation and Compliance				
5	Human Factors	• Response to Warning System	An event involving the incorrect response of flight crew following	CWS misinterpreted, not optimally actioned or CWS alert expected but none reported

			the operation of an aircraft warning system	
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Degree of Risk: C.

Safety Barrier Assessment⁵

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

Ground Elements:

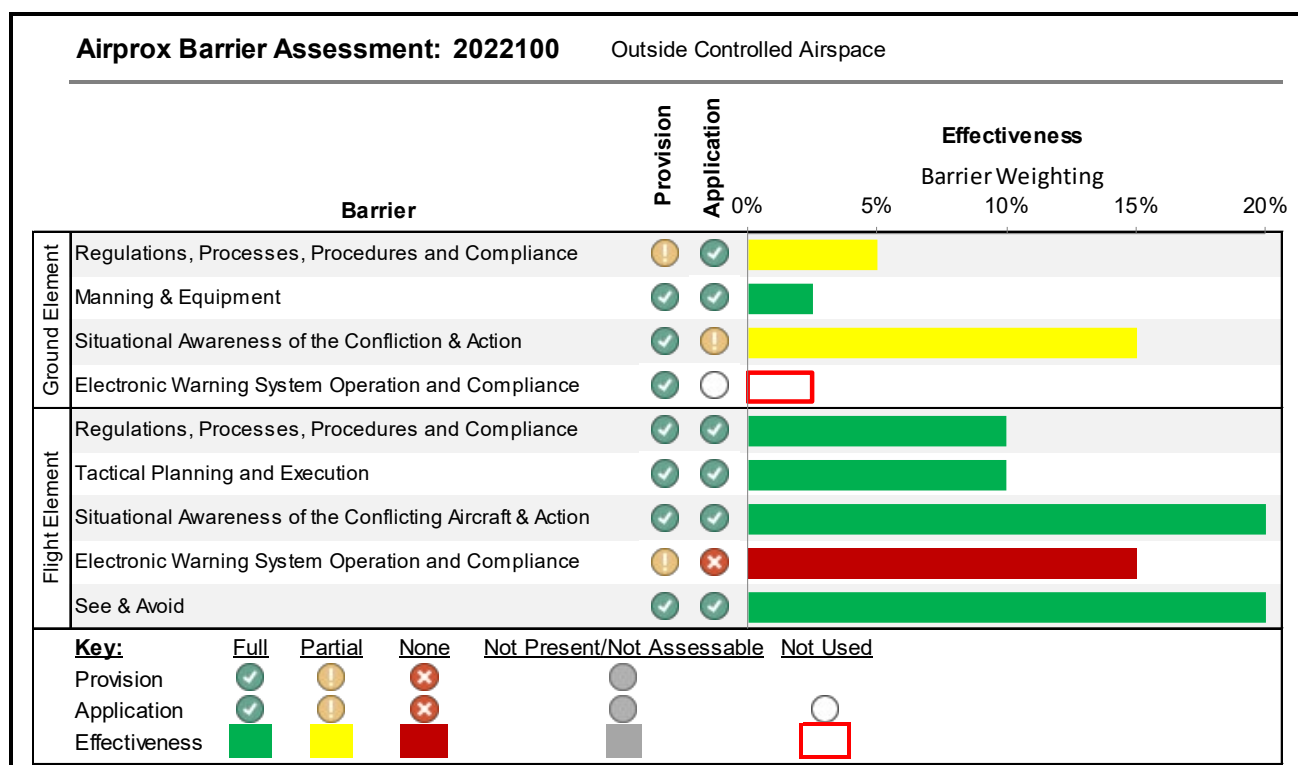
Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because traffic priority was not given to the F35(1).

Situational Awareness of the Confliction and Action were assessed as **partially effective** because Traffic Information was passed at a late stage and the ATC request to extend downwind placed the F35 into proximity with the C182.

Electronic Warning System Operation and Compliance were assessed as **not used** because technical limitations prevented its use at Marham.

Flight Elements:

Electronic Warning System Operation and Compliance were assessed as **ineffective** because there was no alert from the C182 TAS when one could have been expected.



⁵ The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the [UKAB Website](#).