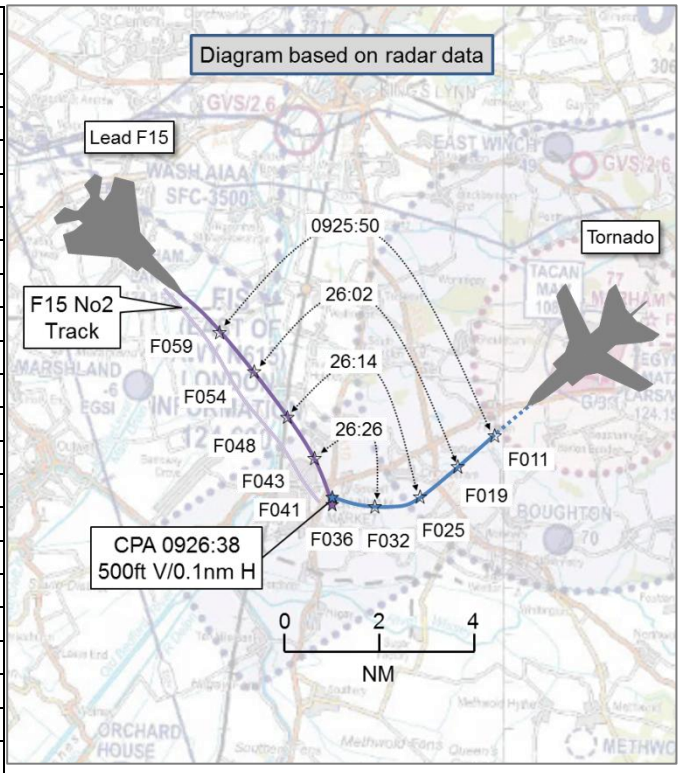
## AIRPROX REPORT No 2015072

Date: 26 May 2015 Time: 0927Z Position: 5236N 00028E Location: 6nm SW Marham

## PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

| Recorded | Aircraft 1 | Aircraft 2 |
|---|---|---|
| Aircraft | Tornado GR4 | F15 x2 |
| Operator | HQ Air (Ops) | Foreign Mil |
| Airspace | London FIR | London FIR |
| Class | G | G |
| Rules | VFR | VFR |
| Service | Traffic | Traffic |
| Provider | Marham | Lakenheath |
| Altitude/FL | FL36 | FL41 |
| Transponder | C/S | C/S |
| **Reported** | | |
| Colours | Grey | Light grey |
| Lighting | HISL, nav | Anti-collision |
| Conditions | VMC | VMC |
| Visibility | 30km | 10nm |
| Altitude/FL | 3500ft | FL40 |
| Altimeter | QFE (1019hPa) | |
| Heading | 280° | 180° |
| Speed | 300kt | 300kt |
| ACAS/TAS | TCAS II | Not fitted |
| Alert | TA | N/A |
| **Separation** | | |
| Reported | 300ft V/500m H | 500ft V/0.5nm H |
| Recorded | 500ft V/0.1nm H | |




**THE TORNADO PILOT** reports that the crew were airborne from Marham at 0925, capped to climb to 5000ft initially to operate in the local area. The Navigator hooked a Link16 track north-west of Marham at 7000ft, noting it was an F-15, but did not recognise the track descending. Once airborne, the crew switched to Marham Zone on Stud 8 as briefed, requesting a Traffic Service. ATC did not respond to the first call on Stud 8, but answered the second call and confirmed the level as 5000ft. The Tornado was in a right-hand climbing turn through a gap in the clouds to remain VMC (cloud base 1800ft, tops 2500ft). Marham Zone then called "Traffic 1 o'clock, 3 miles ...." - The rest of the transmission was missed due to being stepped on by VHF guard, although FL40 was heard. As the Tornado passed through 3500ft he asked for a repeat of the message. At this point, the Navigator spotted a pair of F-15 aircraft conflicting with the Tornado flight-path, and called for the pilot to roll out and level off as the left-hand of the two F-15s passed overhead approximately 300ft above, heading in a southerly direction. The incident aircraft was fitted with Tornado Information Exchange Capability (TIEC)[1] and TCAS. The TCAS was selected to TA-only for the initial departure. On review of the aircraft tape, the TCAS 'Traffic' warning can be heard, although it is co-incident with the ATC call of 'Traffic' and was missed by the crew. The Link16 was selected to 'SILENT' until approx 45sec after take-off, approx 40sec before the Airprox occurred.

He assessed the risk of collision as 'Very High'.

**THE F15 PILOT** reports that the formation of 2 x F15s had just finished a task in East Anglia airspace. After General Handling was complete, they were passed from London Mil to Lakenheath Approach for their return to base. They were in a spread formation with Wardog 11 on the West side flying south towards 'Point Charlie'. Upon contact with Lakenheath Approach they were cleared to

[1] A data-link system.

descend to FL40. Due to weather at around 3000ft, he asked for a lower descent so they could make their way underneath the lower scattered deck and route to Point Charlie for a Charlie-to-Downwind procedure. Approach told them they were unable to descend further due to traffic of unknown altitude climbing out of RAF Marham. Wardog remained wings level at FL40, clear of weather and operating under a Traffic Service. At about that time, Wardog 11 and 12 both picked up visually an RAF Tornado in a climbing right-hand turn approximately 1nm away and 1000ft below their formation, climbing through a break in the clouds at their 10 o'clock position. The Tornado passed approx 500ft below and slightly aft of Wardog 11 flight. After passing, Wardog was cleared to descend to Point Charlie for a 'Charlie–to-Downwind' and to contact Lakenheath Tower.

He assessed the risk of collision as 'High'.

**THE MARHAM ZONE CONTROLLER** reports that he took over the Approach position with the Tornado pre-noted for departure north at FL50. Shortly after he took control, the Tornado crew got airborne and he initiated contact. Unfortunately, he made his initial call on Stud 4, and the crew was on Stud 8, so he immediately repeated the call on the correct frequency, applying a Traffic Service and included Traffic Information on a pair of F15's descending through the climb-out lane. The F15's were spotted initially in the Holbeach area at approximately FL120 heading south on an inbound profile to Lakenheath. Once the Tornado showed on radar, Lakenheath telephoned for Traffic Information and subsequent co-ordination. This call was answered by the Supervisor. The action agreed on the telephone was for the F15 crews to stop decent at FL50, and the Tornado crew to stop their climb at FL40. The stop-climb was passed to the Tornado crew twice, first on the initial call and a second time as the Tornado crew missed his first transmission due to another transmission on a different frequency. By the time they received the information, the tracks were approximately 3nm apart; however, the F15 crews had broken their agreed coordination and had descended to a similar level of the Tornado in a similar airspace. The Tornado crew called visual with the conflictor, took avoiding action, and briefly afterwards reported an Airprox on frequency. The Tornado crew left his frequency en-route without further incident.

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

**THE LAKENHEATH COORDINATOR TRAINEE** reports that Wardog 11 flight was initially handed over to them at about 40nm north-west of Lakenheath. After completion of the handover and upon initial contact, the Approach controller descended Wardog 11 flight to FL40 because there was no traffic in his way at the time, and the pilot was requesting direct to point Charlie. At approximately 7nm north-east of Marham they saw an aircraft depart Marham southwest-bound and climbing fast. As the Coordinator trainee, he called Marham as soon as he noticed the conflict, when the departing aircraft was at about 1700ft. While he was on the line, the Approach controller issued all of the required traffic calls and, he believed, in a timely manner. He believed that there were three traffic calls. During the time the traffic was being issued to Wardog, the coordinator trainee was on the line with Marham Approach, getting coordination. The coordination was for Marham to cap their aircraft at FL40 while they capped Wardog 11 at FL50. He immediately let his Approach controller know, and he relayed the instruction to Wardog 11. At that time Wardog 11 was already at FL46 and still descending. After receiving the instruction to climb back up to FL50, Wardog 11's pilot continued his decent through FL45 saying he had the aircraft in sight. He was told a second time to climb and maintain FL50 but still continued descending. He said the traffic was no factor and requested a further descent to 3000ft. The Approach controller waited until Wardog 11 flight was clear of Marham's MATZ and then descended its pilot into point Charlie.

## Factual Background

The Marham weather was:

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METAR EGYM 260850Z 34009KT 9999 SCT018 13/09 Q1022 WHT NOSIG=
METAR EGYM 260950Z 31008KT 9999 BKN022 14/09 Q1022 WHT BECMG SCT025 WHT=
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## Analysis and Investigation

### Military ATM

The incident occurred 5nm south-west of RAF Marham between a Tornado GR4, under a Traffic Service with Marham Zone, and a pair of F15s under a Traffic Service with Lakenheath Approach. The Radar Analysis Cell captured the incident using the London QNH 1023hPa.

The transcript below shows the RT between Marham Zone and the Tornado GR4 pilot:

| From | To | Speech | Time |
|---|---|---|---|
| Tornado | Zone | Marham radar (Tornado C/S) airborne passing twelve hundred feet for a Traffic Service. | 09:25:41 |
| Zone | Tornado | (Tornado C/S) Marham approach identified traffic service reduced traffic right one o'clock five miles crossing right left indicating flight level six zero descending pair. | 09:25:45 |
| Tornado | Zone | Marham Radar (Tornado C/S) radio check. | 09:25:52 |
| Non – Airprox C/S | Zone VHF | Marham Good Morning (non-Airprox C/S) request information service. | 09:26:04 |
| Zone | Tornado | (Tornado C/S) Marham Talkdown correction Marham Zone identified Flight level er climb flight level five zero Traffic Service reduced traffic right one o'clock three miles crossing right left indicating flight level four five pair stop climb flight level four zero. | 09:26:07 |
| Tornado | Zone | Er say that again for (Tornado C/S). | 09:26:24 |
| Zone | Tornado | (Tornado C/S) stop climb flight level four zero. | 09:26:27 |
| Tornado | Zone | (Tornado part C/S) | 09:26:43 |
| Tornado | Zone | Er (Tornado C/S) declaring an Airprox at this time and request er say again. | 09:26:45 |
| Zone | Tornado | (Tornado C/S) er disregard pair of F15s now clear. | 09:26:52 |
| Tornado | Zone | That's copied (Tornado C/S). | 09:26:55 |
| Tornado | Zone | (Tornado C/S) the pair of F15S were at err approximately three thousand eight hundred feet and we err had to err level off to avoid. | 09:26:58 |

The transcript below is between Lakenheath Approach and the F15 formation:

| From | To | Speech | Time |
|---|---|---|---|
| LAK | F15 | (F15 C/S) roger, descend and maintain FL40, proceed direct Charlie, copy ATIS. | 09:25:01 |
| F15 | LAK | (F15 C/S) request down to 3000? | 09:25:39 |
| LAK | F15 | (F15 C/S) maintain FL40 for now, there is traffic um in Marham airspace. | 09:25:43 |
| LAK | F15 | (F15 C/S) traffic 11 o'clock five miles altitude indicates flight, correction, one thousand six hundred, appears to be west bound, type unknown. | 09:25:59 |
| LAK | F15 | (F15 C/S) climb and maintain FL50 reference traffic in your 12 o'clock, 2 miles, altitude indicates 3000. | 09:26:19 |
| F15 | LAK | (F15 C/S) got traffic in sight. | 09:26:28 |
| LAK | F15 | (F15 C/S) roger, climb and maintain FL50. | 09:26:34 |
| F15 | LAK | (F15 C/S) traffic is no longer a factor, request down to 3000. | 09:26:38 |
| LAK | F15 | (F15 C/S) maintain FL40, expect lower when clear of the MATZ. | 09:26:43 |

The transcript below is between Lakenheath and Marham ATC.

| From | To | Speech | Time |
|---|---|---|---|
| LKH | MRH SUP | Hey Lakenheath request traffic information three six four six code. | 09:25:57 |
| MRH SUP | LKH | Err he's climbing up to five err sorry flight level five zero. | 09:26:00 |
| LKH | MRH SUP | Flight level five zero. | 09:26:04 |
| LKH | MRH SUP | ??? seven down to four err we've kept him at err five and then kept yours at four until past. | 09:26:07 |
| MRH SUP | LKH | Say again sorry. | 09:26:12 |
| LKH | MRH SUP | Errr zero four two seven we kept him at err flight level five zero. | 09:26:13 |
| MRH SUP | LKH | OK we'll stop him at err flight level four zero against your traffic not descending below five even though he's at flight level four five now. | 09:26:16 |
| LKH | MRH SUP | {unreadable} now we're climbing back up. | 09:26:22 |
| MRH SUP | LKH | Ok co-ordinated thanks Marham. | 09:26:24 |
| MRH SUP | MRM Zone | Stop him at four please mate. | 09:26:27 |
| MRH SUP | | {unreadable} he's just given me co-ordination at not below five zero and he's at four one. | 09:26:31 |
| MRH SUP | LKH | Marham approach. | 09:26:41 |
| LKH | MRH SUP | Hey we climbed and he has traffic in sight. | 09:26:42 |

At 0925:41, the Tornado crew called Marham airborne for a Traffic Service. Lakenheath capped the F15 pilot's descent to FL40 at 0925:43. Marham ATC replied to the Tornado crew on the incorrect frequency and the Tornado crew asked for a radio check at 0925:52. The outbound Tornado first appeared on radar at 0925:55 (Figure 1). At 0925:59, Lakenheath requested Traffic Information from Marham and, at 0925:59, Lakenheath called traffic to the F15 pilots as: left 11 o'clock, 5nm, and 1600ft, westbound.

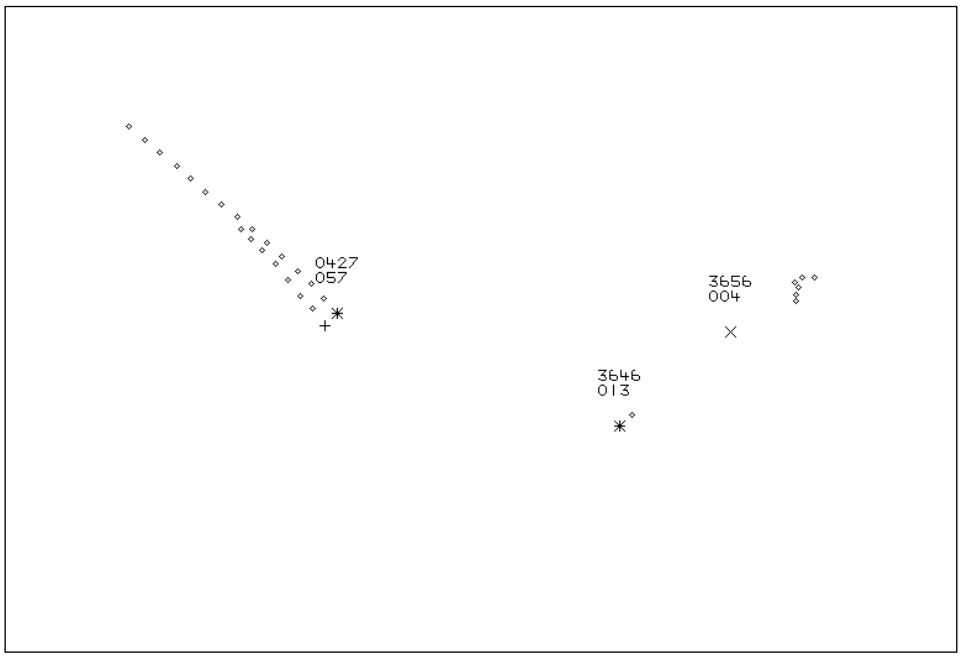


Figure 1: Tornado first appearing on radar replay (Tornado squawk 3646; F15s 0427).

At 0926:07 (Figure 2), Marham transmitted on the correct frequency to provide a Traffic Service, climbing to FL50, with Traffic Information passed as: 1 o'clock, 3nm, crossing right to left, indicating FL45; the controller finished with a stop climb at FL40. At the same time, Lakenheath had offered an agreement of the F15s at FL50 and the Tornado at FL40. [UKAB Note: but this was not finally understood and agreed between the two controllers as formal coordination until 0926:24]

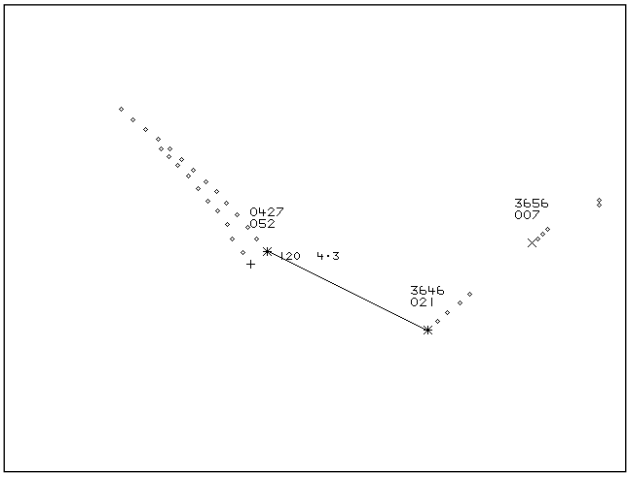


Figure 2: 0926:07: Traffic Information from Marham and height separation requested by Lakenheath.

At 0926:19, Lakenheath instructed the F15 pilots to climb and maintain FL50 for traffic 12 o'clock, 2nm, and indicating 3000ft. [UKAB Note: at this point, the F15 rate of descent indicates that they were already at approximately 4700ft and descending at about 2000fpm]. At 0926:24 (Figure 3), Marham had agreed co-ordination with Lakenheath, and the Tornado crew had asked for a repeat of the previous transmission. At 0926:27, Marham re-iterated the instruction for the Tornado crew to stop climb FL40 [UKAB Note: this was not acknowledged by the Tornado crew until 0926:43, which was after CPA]. At 0926:28, the F15 pilots had called visual with the Tornados [UKAB Note: this was 9sec before CPA].

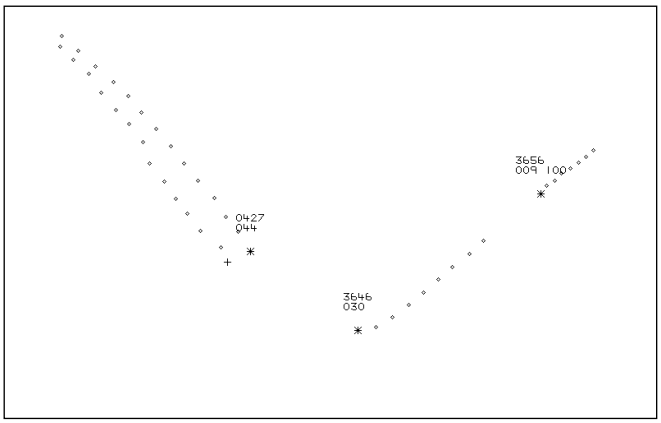


Figure 3: Geometry at 0926:24.

At 0926:31, the Marham Supervisor commented that co-ordination had been at FL50 but the F15s were indicating FL41. At 0926:34 (Figure 4), Lakenheath reiterated the 'climb and maintain FL50' to the F15 pilots.

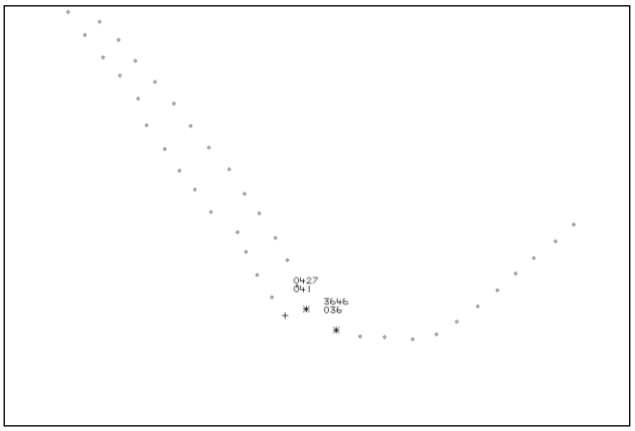


Figure 4: Geometry at 0926:34

The CPA was estimated at 0926:37 (Figure 5) with 500ft and 0.1nm separation. At 0926:38, the F15 pilots stated that the traffic was not a factor and they requested a descent to 3000ft.

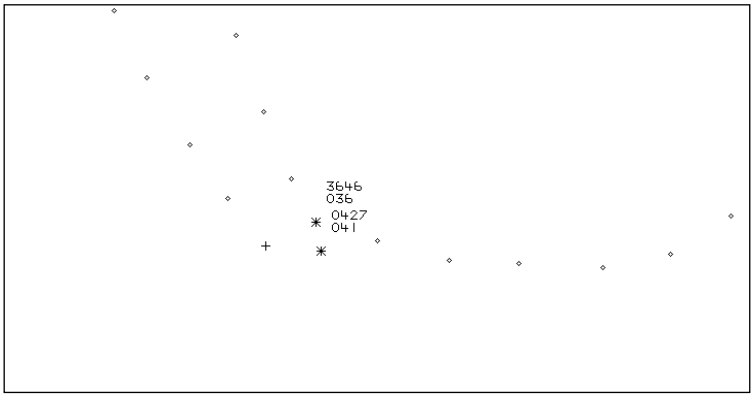


Figure 5: CPA estimated at 0926:37.

The relative positions of the RAF Marham and RAF Lakenheath MATZs are at Figure 6, both with runway configuration of 06/24.

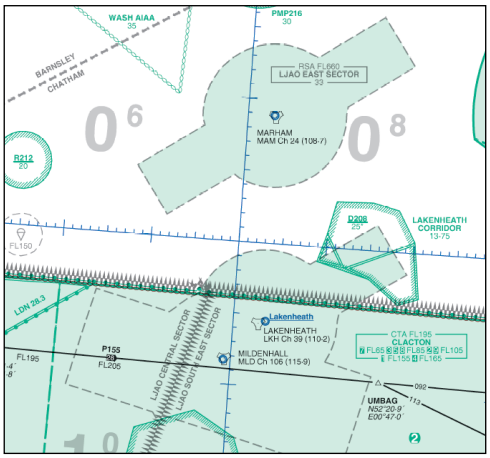


Figure 6: Positions of Marham and Lakenheath MATZs.

The Tornado crew had established contact with the F15s on (TIEC) and TCAS; the F15s were detected 10nm to the north at 7000ft and the crew assumed that the FL50 departure clearance was to coordinate. No coordination had been agreed at this point. The Tornado crew did not get a reply from ATC on initial call, and they turned right to find a gap in the cloud. At the time, there was a lot of radio traffic on Guard, and the crew assimilated the Traffic Information at 3nm but did not assimilate the stop climb at FL40. A post-flight review discovered the TCAS TA, co-incidental with other radio traffic. Both crew members were searching for the F15s and Guard was deselected. The F15s were then spotted, the closest of which was on a confliction path. The navigator instructed the pilot to roll out and level off as the F15 passed 300ft overhead.

The Marham controller was covering Approach, Director and Zone frequencies due to manpower limitations; the workload was 'low' with one aircraft on frequency and one free-calling. ATC believed that FL50 was the aircrew requested level for departure and the unit investigation was not able to find the reason behind the FL50 departure profile. The controller had selected the incorrect frequency when the Tornado crew checked-in, and this led to a delay in providing a service and passing Traffic Information. Due to the delay, there was a compressed timescale to get the information to the Tornado crew. The call from Lakenheath on traffic in Class G, above the MATZ, was considered a courtesy call. As the coordination was finally agreed, the Marham controller had noticed that the F15s were already below the agreed level. The controller queried the situation with Lakenheath and provided the stop climb to the Tornado at FL40, which was not acknowledged; the controller did not get a readback.

The respective controllers passed Traffic Information, as per the provision of a Traffic Service, with Lakenheath passing accurate information at 5nm and 2nm. Marham ATC had attempted to call traffic at 5nm on initial climb-out call but, due to a frequency selection error, the information was passed at 3nm. Lakenheath initiated a call to Marham with 5.8nm horizontal separation and the agreement for height coordination was agreed with 3.9nm separation. As Lakenheath passed the instruction for the F15 pilots to climb and maintain FL50, the aircraft were 2.9nm apart with the F15s at FL46 in the descent. Two climb restrictions were passed by Marham ATC to the Tornado crew but that information was not assimilated possibly due to radio traffic and information overload; as the controller had missed the first call, a lot of information had to be passed to the crew, including type of service, a climb to FL50, reduction in service, Traffic Information and a stop climb at FL40 instruction. The abundance of information to the Tornado crew coincided with other visual/aural sources of information in the cockpit. No readback was obtained by the Marham controller. Lakenheath had shown good practice by attempting to pass information and coordinating, but the time scales left little time for an agreement and for gaining crew approval. [UKAB Note: Lakenheath attempted this coordination 2sec after observing the Tornado aircraft as they appeared on radar departing Marham].

The normal barriers to loss of safe separation would be ACAS, radar-derived Traffic Information, Deconfliction procedures and see-and-avoid. The F15s did not have ACAS but the Tornado crew had information from TIEC and TCAS. Traffic information was passed to both crews, and there appears to be an overload of information to the Tornado crew, which would normally lead to an increase in crew workload. Although the crews were in Class G airspace, more robust local procedures would assist Marham and Lakenheath deconflict their traffic. See-and-avoid was exacerbated by the cloud level and the need for both crews to find suitable gaps to remain VMC; the conditions help explain the F15 pilots' actions to pass below FL50 and look for further descent. The sequence of events had become compressed and, despite best intentions, coordination had been agreed that was difficult to achieve in the time scales. Marham now provide departure instructions that keep Tornados in the MATZ (runway track to 2500ft) until two-way with Approach; this procedure allows a radar controller to act upon conflicting tracks and affords the protection of the MATZ.

**UKAB Secretariat**

Both the Tornado and the F15 crews shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard[2]. Initially the aircraft were on converging tracks; because the F15s were to the right of the Tornado, the latter's crew were required to give way[3]. Subsequently, because the geometry changed to head-on after the Tornado turned, both the crews were required to avoid each other by turning to the right[4].

CAP 774[5] (The UK Flight Information Services) states;

> 'A Traffic Service is a surveillance based ATS, where in addition to the provisions of a Basic Service, the controller provides specific surveillance-derived traffic information to assist the pilot in avoiding other traffic. Controllers may provide headings and/or levels for the purposes of positioning and/or sequencing; however, the controller is not required to achieve deconfliction minima, and the avoidance of other traffic is ultimately the pilot's responsibility.'

CAP 413[6] (Radiotelephony Manual) states:

> 'Messages should not contain more than three specific phrases, comprising a clearance, instruction or pertinent information.'

[2] SERA.3205 Proximity. Rules of the Air 2015.
[3] SERA 3210 Right-of-Way (c) (2) Converging. Rules of the Air 2015.
[4] SERA 3210. Right-of-Way (c) (1) Converging. Rules of the Air 2015.
[5] Chapter 3, Paragraph 3.1.
[6] Chapter 2, Paragraph 2.8-11 Transmitting Techniques

## Comments

### HQ Air Command

The investigation into this incident found that a number of compounding factors ultimately led to a late sighting of the F-15s by the Tornado crew. Many of the shortfalls identified have already been addressed, such as improved coordination between Lakenheath and Marham controllers and a revised VFR departure procedure from Marham. This incident does highlight the importance of clear and timely communication between all agencies involved in aviation and that assumption (such as that exhibited by the Tornado crew when issued an unexplained climb out restriction to FL50) often leads to an inaccurate mental model being formulated and a concomitant increased likelihood of the introduction of a Human Factors aspect – Situation Awareness (SA) is only shared SA if all parties have the same understanding of the same situation.

### USAFE

This Airprox illustrates the difficulty that controllers can experience in making effective coordination agreements with aircraft in receipt of a Traffic Service. That said, anticipation of coordination requirements can resolve most situations but in this incident only 56 seconds elapsed between the Tornado pilot's first call to Marham Approach and the CPA. Marham's amendment to its departure instructions is one step in the prevention of a similar occurrence in the future; a review of procedures and/or profiles where there is interaction between the Lakenheath RAPCON and Marham ATC will be another.

## Summary

The Airprox occurred in Class G airspace south-west of Marham; both the Tornado and F15 crews were VFR and being provided with Traffic Services by Marham and Lakenheath respectively. The Tornado crew were routeing to the south-west from Marham and climbing to FL50. Very soon after the Tornado appeared on radar, Lakenheath instigated coordination with Marham against the F15s, which was eventually agreed as the Tornado to level at FL40 and the F15s to stop descent at FL50. The Marham controller issued Traffic Information to the Tornado crew about the F15s at 1 o'clock 3nm and, in the same call, the crew were instructed to level at FL40; they did not assimilate this level instruction. Meanwhile the F15s had already descended through FL50 before Lakenheath were able to instruct them to stop their descent at FL50. Traffic Information was issued to them about the Tornado, the F15 crews reported visual, and, although being instructed to climb back to FL50, were happy to continue descent. The Tornado crew became visual with the F15s, rolled out and levelled off. The Tornado's TCAS had activated with a TA but this warning was not assimilated. The Tornado passed 500ft below the F15s.

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

Information available included reports from the pilots and controllers concerned, area radar and RTF recordings and reports from the appropriate ATC and operating authorities.

The Board first discussed the actions of the Marham Zone controller. The Board considered that it had been unfortunate that the controller had selected an incorrect frequency when the Tornado pilot had checked-in, and noted that he was covering Zone, Approach and Director at the time due to manpower limitations. His need to make a second transmission on the correct frequency had then resulted in him having to pass a longer and more complex than normal message to the pilot once two-way communication had been established. It was noted that this transmission had not only included information on the ATC service being provided, but had also included Traffic Information and changes to the cleared level. A military controller member considered that it would have been preferable to have restricted the call to just issuing the Traffic Information; the rest of the message could have been made in a subsequent transmission. The Board also noted that the Tornado pilot reported hearing the Traffic Information, and a mention of FL40, but did not hear the full message because it had been stepped on by a transmission on another frequency. Some members wondered

whether the Marham controller should have coordinated the Tornado's departure with Lakenheath prior to it getting airborne. However, military controllers informed the Board that, because the Tornado was on a VFR departure, there had been no requirement for the Aerodrome controller to have requested a departure release from the Zone controller. Consequently, the Zone controller would not have been aware of its departure until either it appeared on his radar display or the pilot contacted him.

The Board noted that Lakenheath had contacted the Marham Supervisor as soon as they had seen the Tornado appear on their radar, and had attempted to agree coordination for the Tornado to maintain FL40 and the F15s FL50. Military Controller members agreed that this coordination should not have been agreed because it had not been achievable. By the time agreement had been reached, the aircraft had been only about 3nm apart; additionally, the F15s had already passed FL50 and were at FL45 descending. The Board opined that there had been no possibility for either ATC unit to have contacted and obtained an agreement from their respective pilots to carry out the action required in time. Some members recalled that there had previously been a Letter of Agreement (LOA) between Marham and Lakenheath establishing a coordination procedure to allow the mutual separation of their arrivals and departures; however, military controller members informed the Board that there was no LOA between the units in existence at the moment. As a result, the Board resolved to recommend that, '*Marham and Lakenheath review their coordination procedures with regard to simultaneous aircraft recovery and departure*'.

The Board then discussed the actions of the Tornado pilot. In view of the weather some Board members wondered whether it was wise to have departed VFR. It was pointed out by military controller members that Tornado crews regularly depart VFR as a standard procedure, and it would have been the pilot's decision whether to change to an IFR departure in view of the reported weather. The Board then noted that the Tornado was equipped with TCAS and TIEC, but they were surprised that the TCAS had been selected to TA-only. A military pilot member explained that there were various times when it was necessary for military aircraft to switch their TCAS to TA–only in order to avoid 'nuisance' TCAS RAs during tactical manoeuvring (e.g. when pilots were carrying out operations where, by necessity, aircraft would be approaching close to each other visually whilst both squawking). He suggested that because Tornados had only recently been fitted with TCAS, the crews had still been discovering the best way to operate it. In his opinion this action had not affected the incident; the crew had information about the F15s from TIEC and TCAS, and Traffic Information had been issued by ATC. Other Board members disagreed, and still considered that, given that the Tornado was operating as a singleton, it would have been appropriate to have had the TCAS fully selected in order to gain maximum benefit. It was understood that Tornado TCAS selection was being reviewed; this information heartened the Board and they recognised that the incident had occurred when Tornado TCAS SOPs were in a process of development. Ultimately, when discussing further the Tornado crews' actions, the Board opined that they had become aware of the F15s on TIEC/TCAS[7] soon after departure (when the F15s had been 10nm to the north and at 7000ft) and, in conducting a VFR departure, were responsible for avoiding conflict with them irrespective of any assistance or Traffic Information they might have received from ATC. Notwithstanding, the Board agreed that their incorrect assumption that the departure cap of FL50 had been imposed to afford them coordination had led them to proceed towards the F15s. The old adage of 'never assume, check' was a relevant reminder to all in this respect.

The Board then turned its attention to the actions of the F15 pilots. They had been carrying out ATC instructions to descend to FL40, and to route close to the Marham climb-out lane. By the time ATC had instructed them to maintain FL50 they had already passed that level. The Board noted that Lakenheath had then instructed them to climb back to FL50 as coordinated with Marham. However, because they had visual contact with the Tornado, the F15 lead had decided to continue descent to FL40. Some Board members were concerned about this action. Although on this occasion the crews had seen the correct aircraft, it was opined that there was always the possibility that the traffic being avoided was not the one that had been visually acquired. Other members thought that the F15 pilot would have had a reasonable expectation that the Tornado was indeed the aircraft on which he had

[7] TIEC does not show level information.

received Traffic Information given that it matched exactly the call he had been given, and that no other aircraft had been called by ATC; they felt that his decision was rational as a result. Notwithstanding, all members agreed that it had been a fine line between him complying with the ATC instruction to climb back up to FL50 and his decision to continue descent contrary to their instructions. Finally, the Board wondered whether the chosen VFR recovery was a wise decision given the weather and the fact that they were descending through what they must have known was the Marham climb-out lane. However, the Board also noted that the F15 pilot had seen the Tornado some 9sec before CPA, which gave an indication as to the actual weather conditions he was operating within as he descended, and that this would also have influenced his decision as to the suitability of his routing.

The Board then carried out a very lengthy discussion to ascertain what actions had actually caused this Airprox. Some members believed that the Marham Zone controller's initial use of the incorrect frequency, followed by an elongated message, had led to the Tornado crew not understanding the traffic situation and that this had then led to the Airprox. Other members considered that the ineffective coordination between Lakenheath and Marham, which was late and not achievable, had resulted in the Airprox occurring. However, these issues, together with the Tornado crew not assimilating their TCAS information, were finally considered to be contributory factors. Although not a unanimous decision the Board decided by a majority that it had been the decision by the Tornado crew to depart under VFR in broken cloud conditions that had led them to fly into conflict with the F15s, which they had been given Traffic Information on but saw only at a late stage.

The Board then turned its attention to the risk. Although the agreed coordination between Lakenheath and Marham had not been achieved, the Board agreed that the F15 crews had been able to keep visual contact with the Tornado after sighting it approximately 1nm and 9sec away. Additionally, the Board noted that the Tornado crew had in the end sighted the F15s, albeit at a late stage, allowing the pilot to take avoiding action to pass about 500ft below them. Because timely and effective action had been taken to prevent the aircraft colliding, it was agreed that the Airprox should be categorised as risk Category C.

## PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The Tornado pilot chose to depart under VFR in broken cloud and flew into conflict with the F15s.

Contributory Factors:

1. An incorrect initial frequency selection by the Marham controller.

2. A non-standard and overly complex RT call to the Tornado crew.

3. The Tornado crew did not assimilate their TCAS information.

4. The agreed Lakenheath/Marham coordination was ineffective and unachievable.

Degree of Risk: C.

Recommendation: Marham and Lakenheath review their coordination procedures with regard to simultaneous aircraft recovery and departure.