

## **AIRPROX REPORT No 2013096**

Date/Time: 5 Aug 2013 1515Z

Position: 5622N 0022W  
(19nm E Leuchars Airfield)

Airspace: Scottish FIR/TRA007A  
(Class: C)

Reporting Ac      Reported Ac

Type: E145              Typhoon FGR4

Operator: CAT              HQ Air (Ops)

Alt/FL: FL240              FL240

Conditions: IMC              IMC

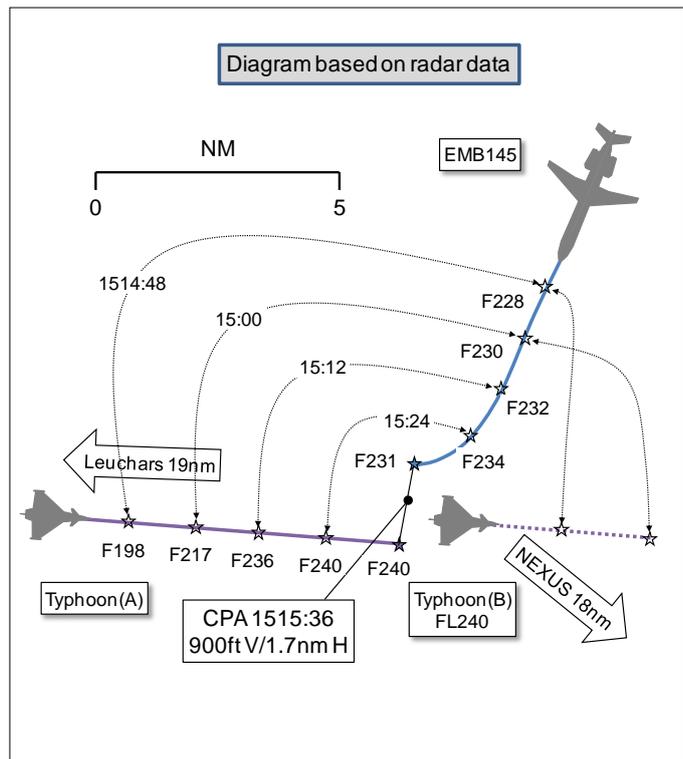
Visibility: NK              In Cloud

Reported Separation:

200ft V/1.3nm H      NK

Recorded Separation:

900ft V/1.7nm H



### **PART A: SUMMARY OF INFORMATION REPORTED TO UKAB**

**THE EMBRAER EMB145 (E145) PILOT** reports flying IFR, in IMC, on a southerly heading and in receipt of a Deconfliction Service from Scottish control. SSR Modes C and S were selected; no comment was made in his report about which of his lights were illuminated. He was passing through approximately FL240 in the climb to the cleared level of FL250. ATC instructed him to turn right approximately 10° onto a heading of 190° due to traffic. He observed two TAs on the TCAS display at roughly 10 o'clock and 2 o'clock. The crew were unable to locate the traffic visually due to the weather conditions and monitored the display closely. ATC then gave his aircraft a heading of 270°, quickly followed by a further instruction to 'turn immediately' onto a heading of 350°. In accordance with the airline's operating procedures, the autopilot was disconnected and the aircraft was rolled quickly using 45-60° AOB toward the heading. At the same time he received a TCAS RA to descend, which was followed; he descended approximately 1000ft, after which he was able to resume normal flight. The non-handling pilot informed ATC using standard phraseology and a subsequent conversation with ATC suggested that the separation between them and the other aircraft was 1.2-1.5 nm horizontally and 100-300ft vertically. He was informed that the traffic was a pair of military jets that had lost contact with their controller.

He assessed the risk of collision as 'High'.

**THE TYPHOON(A) PILOT** reports operating an IFR flight outbound from RAF Leuchars; he was receiving a Traffic Service from Leuchars Departures (DEP). SSR Modes C and S were selected; strobe, navigation and formation lights were illuminated. Before departure he was cleared for a SID 2, FL240. The aircraft was airborne 12min later than planned due to aircraft issues on crew-in and he executed the SID 2 climbing at 350kts and 15° nose-up in accordance with Typhoon SOPs. On contacting Leuchars DEP, he recalled that he was re-cleared to FL240. During the climb he noticed a radar contact on a compass bearing 063°/17nm at 22,000ft but the track subsequently faded. Shortly afterwards, as the aircraft was passing FL224, with a reduced climb angle of 10° nose-up to level at FL 240, Leuchars DEP called for him to stop climb at FL220 but he did not comprehend whether the call was for him or for another Typhoon(B), which was 10nm ahead, also on a SID 2. Simultaneously a role-call was initiated on Radio 2. Leuchars DEP then called his aircraft for a radio check but he did not understand whether the call was for him or for the other aircraft. Leuchars DEP then called his aircraft again for a further radio check. As he levelled at FL240 the pilot of Typhoon(B) relayed a message for him to stop climb at FL220 and that was when he became

aware that the previous radio calls were for him. Simultaneously, radar contact on the aircraft with which there was a confliction was gained, with a track displayed at 5nm co-level (indicated by the Elevation Format) and 45° left. There was no Read Out Line information on the track. He hesitated momentarily on what action to take but then bunted to 30° degrees nose down to level at FL220; as he levelled, radar contact was lost on the conflicting track. There were numerous subsequent radio transmissions on his secondary Radio but he did not adjust this radio's volume. He did not see the conflicting traffic due to IMC conditions. Subsequently, the mission was continued as briefed with no further incident.

He assessed the risk of collision as 'High'.

**THE PC TAY SECTOR PLANNER CONTROLLER** reports that traffic levels were moderate (with considerable military activity around). He observed a 7413 squawk [Typhoon(B)] depart from RAF Leuchars heading eastbound, which was in potential conflict with the E145, routeing southbound. He advised the Tactical controller to "watch that traffic" and telephoned Leuchars to request information, and possible co-ordination, on the 7413. The Leuchars controller advised that the 7413 squawk was under a Traffic Service and was climbing to FL240. The Tay Sector controller, in turn, advised that the E145 was climbing to FL250 under a Deconfliction Service. During the call he assessed that the 7413 was out-climbing the E145 and decided further information or the need for co-ordination was not required. He was then transferred to another person who identified themselves as "Leuchars Departures", who was aware that some discussion had taken place between himself and Leuchars regarding the situation. On being informed that another aircraft, a 7414 squawk, [Typhoon(A)] was coming out behind the 7413 he immediately requested co-ordination on that traffic (against the E145). He requested that the 7414 squawk restrict its climb to 1000ft below his traffic until clear, which was agreed with the phrase "roger". To clarify, he sought confirmation that they had agreed "co-ordination", which was agreed and then repeated by Leuchars. Very quickly he observed that the climb rate on the 7414 was rapid, and sensed that the agreed co-ordination would not be complied with. He immediately telephoned Leuchars to confirm that the 7414 would stop climb at FL220 (the E145 was now climbing through FL230) and the controller confirmed that it would stop at FL220. At this point, he observed the 7414 passing FL223 climbing, in breach of the agreed co-ordination. The Leuchars controller advised that communication had been lost with the 7414. SSR Mode C on the 7414 indicated that it reached FL238 before dropping out, then seconds later it reappeared at FL220. The Tactical controller was aware of the agreed co-ordination at all times.

**THE PC TAY SECTOR TACTICAL CONTROLLER** reports that, at 1515, she was working the E145 east of Leuchars climbing to FL250. An aircraft squawking 7413 was airborne from Leuchars heading east and climbing fast. The Planner was co-ordinating with Leuchars, so she gave the E145 pilot a precautionary turn onto heading 210°, although the military aircraft was already climbing through the level of her aircraft. A second aircraft, squawking 7414, was seen departing Leuchars following the same track eastwards. Traffic information was passed to the pilot of the E145 whilst the Planner was co-ordinating with Leuchars for the 7414 to level off, 1000ft below the E145, at FL220. Co-ordination was agreed. As the military aircraft was seen to climb through its agreed level, further traffic information and a turn was issued to the E145. The E145 received a TA. A further turn was given, and the E145 reacted to an RA by descending to FL230.

**THE RAF LEUCHARS DEP CONTROLLER** reports that he was monitoring a trainee at the time of the Airprox. The trainee was controlling multiple VFR departures of light aircraft on VHF due to a General Aviation (GA) 'fly-in' day at Leuchars. Intensity was moderate at this point and pre-notes were received for two fast-jet IFR departures. The first aircraft was given traffic information on climb-out regarding two Scottish Civil tracks. Scottish Civil called on landline, which was answered by the Approach (APP) controller. The APP controller asked the DEP trainee to pick up the landline for co-ordination. The Scottish Civil controller soon realised that the first aircraft was out-climbing his track and co-ordination was not required. The DEP trainee pointed out to the Scottish Civil Controller that she had another aircraft behind (Typhoon(A)) climbing to FL240. Scottish Civil requested that she co-ordinate this to remain 1000ft below his aircraft. This was agreed by the trainee without asking the pilot of Typhoon(A) if he could accept it. The trainee, realising the imminent 'danger' and small amount of time to apply co-ordination, transmitted to the pilot of Typhoon(A) "*stop climb FL220*"

several times but did not receive a response. The mentor recalled that the tracks passed within 2-3nm of each other, with Typhoon(A) climbing through the Scottish Civil track's level (observed to be around FL230). Typhoon(A) levelled at FL240 then the pilot of Typhoon(B) relayed the message to Typhoon(A)'s pilot to stop climb at FL220. The pilot of Typhoon(A) acknowledged this and descended again through the Scottish Civil track's level to FL220. Although now, as a result of the Scottish Civil controllers avoiding action, the two tracks appeared to pass within around 3-4nms of each other. Throughout the situation the pilot of Typhoon(B) was making multiple calls requesting further climb and own navigation, thereby reducing the trainee's capacity whilst coordinating. This resulted in him taking over the RTF however, with hindsight, this was too late.

**THE LEUCHARS ATC SUPERVISOR** reports that as the incident was building he was engaged on administrative duties at the Supervisor's desk whilst monitoring the adjacent DEP/Zone position. He ended this task when he became aware of the trainee DEP/Zone controller being unable to contact the pilot of Typhoon(A), after she had agreed co-ordination with Scottish Civil. After several unsuccessful attempts by the DEP/Zone controller to raise the pilot of Typhoon(A) he instructed her to transmit blind to effect the co-ordination. Both aircraft were in close proximity as Scottish Civil initiated avoiding action. He relieved both the trainee and Screen controllers for a debrief. After receiving a call from the ScATCC(Mil) Supervisor, who informed him that Scottish Civil were filing an Airprox, he instructed the DEP/Zone Screen to complete a Defence Air Safety Occurrence Report (DASOR).

## **Factual Background**

The base of Class C Controlled Airspace is notified in the UK AIP<sup>1</sup> as FL195. The Airprox occurred in Class C airspace, within a Temporary Reserved Area (TRA 007A).

The UK AIP<sup>2</sup> describes TRAs:

'In complying with the EC Regulation lowering Class C Airspace to FL 195, Temporary Reserved Areas (TRA) between FL 195 and FL 245 have been established to accommodate the various VFR UK airspace users including military autonomous operational requirements above FL 195. TRAs may be used simultaneously by both civil and military aircraft, including aircraft in en-route transit through a TRA. Operations will be conducted in accordance with the Rules of the Air, or as agreed via the Unusual Aerial Activities regulations, and required equipment carriage and operation. Although the background classification between FL 195 and FL 245 within UK airspace is Class C, to avoid operational restrictions, military aircraft may operate autonomously or be in receipt of an ATS from approved ATS units within a TRA. ATS in TRAs will be provided in accordance with the rules for Air Traffic Services Outside Controlled Airspace (ATSOCAS). IFR flights within a TRA should conform to the Quadrantal Rule within an active TRA.'

CAP 774-UK Flight Information Services defines Deconfliction Service and Traffic Service as follows:

**Deconfliction Service**<sup>3</sup>. A surveillance based ATS where, in addition to the provisions of a Basic Service, the controller provides specific surveillance-derived traffic information and issues headings and/or levels aimed at achieving planned deconfliction minima, or for positioning and/or sequencing. However, the avoidance of other traffic is ultimately the pilot's responsibility.

**Traffic Service**<sup>4</sup>. 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.

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<sup>1</sup> ENR 1.4-4 Paragraph 2.3

<sup>2</sup> ENR1.1-30 Paragraph 5.1.5

<sup>3</sup> Chapter 4

<sup>4</sup> Chapter 3

The MAA MMATM states that: 'In order to comply with CAA regulations put in place to support the safety nets of TCAS and Short Term Conflict Alert (STCA), a restriction of Rate of Climb and Descent (ROCD) of 8000 fpm was imposed within UK controlled airspace'.<sup>5</sup>

## Analysis and Investigation

### CAA ATSI

An Airprox occurred when an E145 and a Typhoon came into conflict at FL230, 19nm east of RAF Leuchars.

The E145 departed Aberdeen (ABZ) for a commercial IFR flight; the pilot was in communication with the PC TAY sector. The E145 pilot had flight planned to route ABZ – NEXUS – UP18 – NATEB... at FL370. Airway P18 was not available at the time of the E145's flight<sup>6</sup>. The E145 was transponding Mode A code 1455.

ATS were being provided within PC TAY airspace by a Tactical and a Planning controller using Prestwick Multi Radar Tracking (MRT)<sup>7</sup>. Traffic loading was described as moderate but complex due to military activity in and around the sector<sup>8</sup>.

After handover to PC TAY from ABZ the E145 entered Class G uncontrolled airspace. No level of service was requested by the pilot or offered by the controller. CAP 774 states that pilots shall determine the appropriate ATS for the various phases and conditions of flight and request that service from the controller. If a pilot fails to request an ATS, the controller should normally ask the pilot to specify the ATS required<sup>9</sup>. The incident was reviewed immediately after it had happened by PC Watch Management and Unit Competency Examiners. The Tactical controller's omission was noted; however, it was also noted that all other phraseology associated with ATSOAS during the Tactical's period of operational duty had been exemplary. No level of service had been annotated on the controller's Flight Progress Strip (FPS) for the E145. The E145 pilot subsequently reported that a Deconfliction Service was being received. Therefore, for the purposes of this report, the controller is considered to be operating in accordance with the requirements of a Deconfliction Service.

ATSI had access to reports from the controllers, the E145 and Typhoon(A) pilots, the PC unit investigation, area surveillance recordings and recordings/transcription of the Tay sector and associated telephone calls.

At 1508:13 the E145 pilot contacted PC TAY on a heading of 185°, climbing to FL110<sup>10</sup>. The E145 was 11.5nm south of Aberdeen passing FL084 within Class D airspace of the Aberdeen Control Area-2. PC TAY identified the E145 and instructed the pilot to turn right heading 190° and to climb to FL150. The heading on transfer and subsequent right turn were issued to the E145 pilot against a B737 inbound to ABZ.

At 1509:28 PC TAY instructed the E145 pilot to climb to FL250. This was co-incident with the E145 exiting controlled airspace.

At 1513:00 a call commenced between the PC TAY Planner and 'Leuchars Approach': the Planner requested information on a 7413 squawk and was informed it was climbing to FL240

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<sup>5</sup> MMATM Chapter 12, Paragraph 28, Page109

<sup>6</sup> Airway P18 between ADN and NATEB is a Category One Conditional Route; and as such is only available at prescribed times. This portion of P18 is not available on Mondays. See UK AIP ENR 3.1-100.

<sup>7</sup> All references to Mode C levels in this report are made using Prestwick MRT unless otherwise stated. It should be noted that MRT has a predictive element associated with the calculation of displayed data.

<sup>8</sup> The Central Managed Danger Area complex (D613A, B and C) was active from 1500 UTC.

<sup>9</sup> Chapter 1 paragraph 7.

<sup>10</sup> Aberdeen correctly transferred the E145 to PC TAY (as opposed to Scottish Mil) as the E145's filed level was FL370.

under a Traffic Service. The Planner then pointed-out the E145 to which Leuchars Approach stated that the traffic had been called. After this exchange the Leuchars Approach controller transferred the call to the 'Leuchars Departure' controller, which appeared to momentarily confuse the Planner. However, the Planner observed that the 7413 was going to 'out-climb' the E145 and that the E145 would track behind this traffic.

At 1513:29 PC TAY informed the E145 pilot, "... there is traffic off Leuchars presently in your two o'clock range twelve miles heading east indicating flight level 193 climbing" (Figure 1). The E145 pilot acknowledged this information by reporting that he was, "...india mike." The Tactical controller, now aware that the 7413 squawk was out-climbing the E145, instructed the E145 pilot to turn right heading 210° to improve the geometry between the two aircraft.

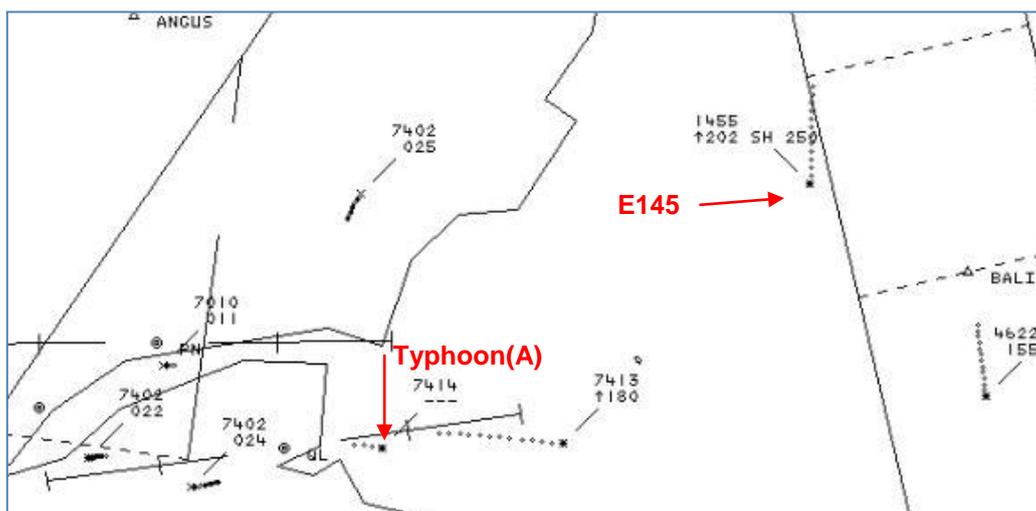


Figure 1: Prestwick MRT – 1513:29

The previous telephone conversation between Leuchars and the TAY Planner had continued and at 1514:00 the Planner requested co-ordination on the 'one behind' [the 7413 squawk]. The Planner requested that this traffic, Typhoon(A), remain 1000ft below the E145. This was co-ordinated at 1514:30 and the call terminated (Figure 2). The Tactical controller subsequently recalled being aware of this second co-ordination as it was taking place and issued a turn and passed traffic information as described below [after Figure 3].

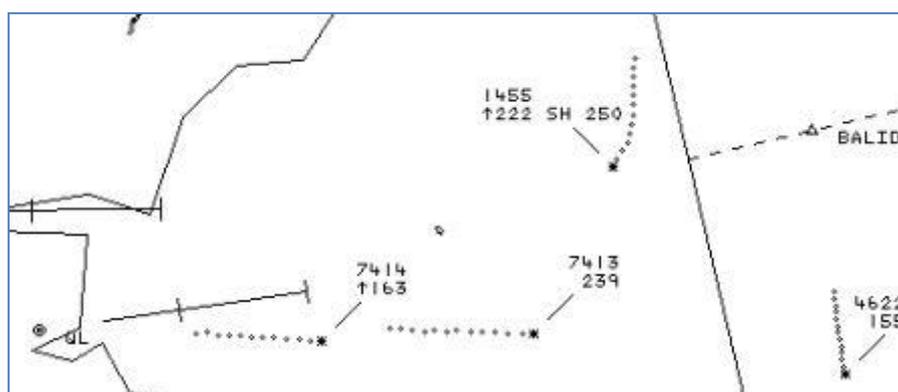


Figure 2: Prestwick MRT – 1514:30

Shortly afterwards, at 1514:54, the Planner called Leuchars back to confirm that Typhoon(A) was going to stop at FL220. Leuchars stated that it was stopping at FL220; however, there then followed an exchange in which the Planner observed that Typhoon(A) had 'bust' this level and Leuchars indicated that communications had been lost with the aircraft.

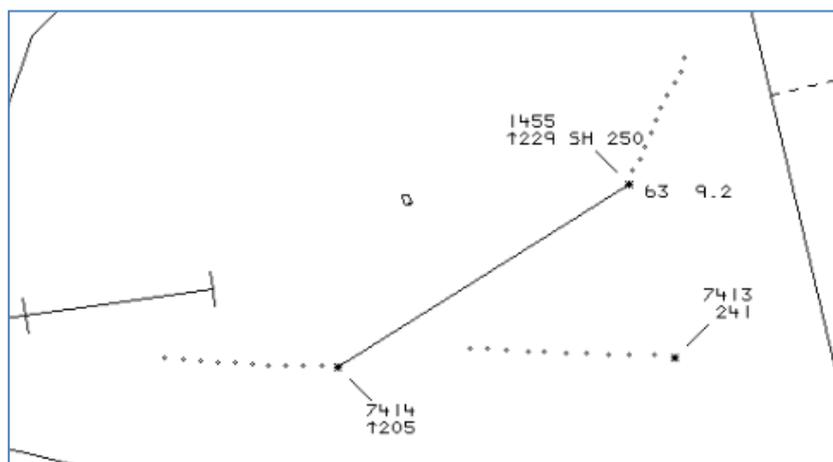


Figure 3: Prestwick MRT – 1514:55

The rate of change of the Mode C of Typhoon(A) indicated that it was climbing at approximately 10,500fpm. The Tactical controller recalled being aware of Typhoon(A)'s very high rate of climb and, remembering that the E145 was IMC, at 1514:55 she instructed the E145 pilot, "...turn right heading 280 degrees traffic off Leuchars in your two o'clock [1515:00] range six miles heading east supposed to be stopping below you but indicating flight level 217 climbing." The E145 pilot read back the turn instruction and reported, "...and yeah we're having a ch- T A..."

Prestwick MRT showed that, at 1515:05, the vertical distance between the two aircraft had reduced to 800ft (Typhoon(A) passing FL223; the E145 passing FL231); lateral distance was 7.1nm. On the next update of the radar, 4 seconds later, Typhoon(A) was passing FL230 and the E145's level remained at FL231; lateral distance had reduced to 6.4nm.

Immediately after being informed of the TA, at 1515:13, the PC TAY controller instructed the E145 pilot to, "...turn right heading 350 degrees immediately traffic indicating flight level 239 heading east." Low-level STCA activated. The E145 pilot responded, "...TCAS R A and descending." This was acknowledged by the controller. Subsequently the Tactical controller was aware that avoiding action phraseology had not been used; however, the unit believed that an appropriate urgency had been conveyed to the E145 pilot and that the crew had responded accordingly.

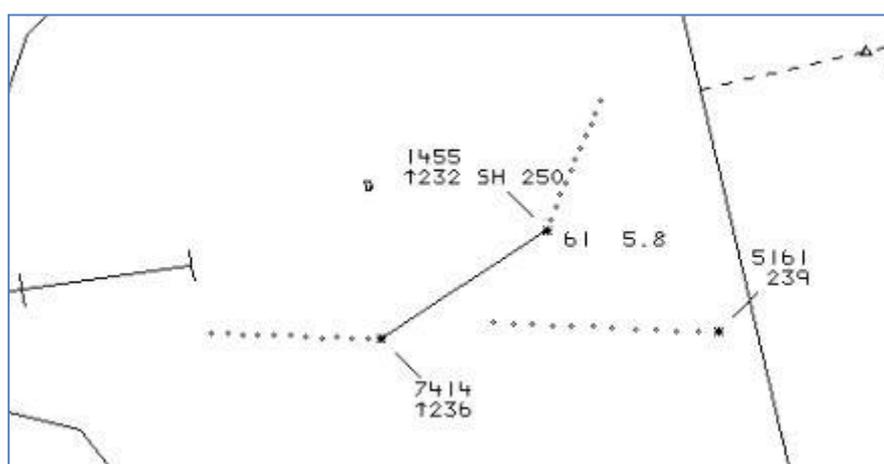


Figure 4: Prestwick MRT – 1515:13. NOTE: the Typhoon was now above the E145

Two RAs were recorded by Mode S downlink from the E145: a 'Descend' RA at 1515:19 (as Typhoon(A) had climbed above the E145) followed by an 'Adjust Vertical Speed' RA.

Deconfliction Minima was lost at 1515:20 when the distance between the two aircraft became 4.3nm laterally and 600ft vertically; where 5nm and/or 1000ft was required (Figure 5).

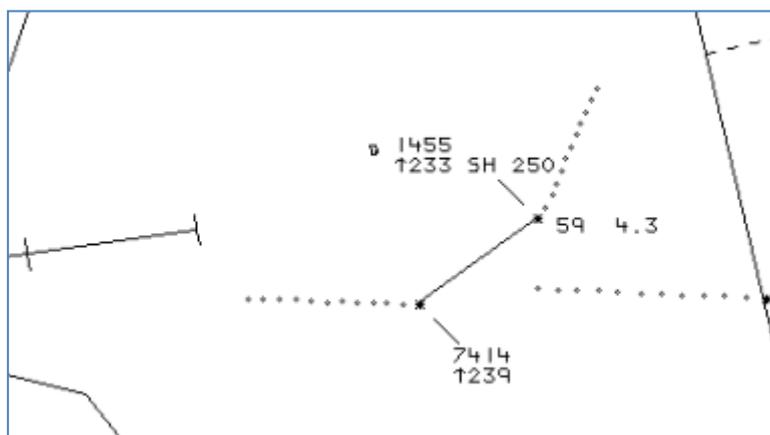


Figure 5: Prestwick MRT – 1515:20. Deconfliction Minima lost.

The E145 reached FL234 before descending as it turned right to pass north of Typhoon(A). Minimum distance between the two aircraft, as determined by MRT, occurred at 1515:37 when the E145 passed 1.7nm north of Typhoon(A) and 900ft below (Figure 6). Analysis of various single source surveillance recordings also showed that the closest lateral distance between the two aircraft occurred around 1515:38 (1.6 to 1.8nm); however, the Mode C of Typhoon(A) had not been displayed at this time. Immediately prior to losing Mode C detection, the single sources showed Typhoon(A) between FL239 and FL241. The NATS Separation Monitor Function (SMF) recorded a minimum distance at 1515:36 of 1.6nm and 300ft.

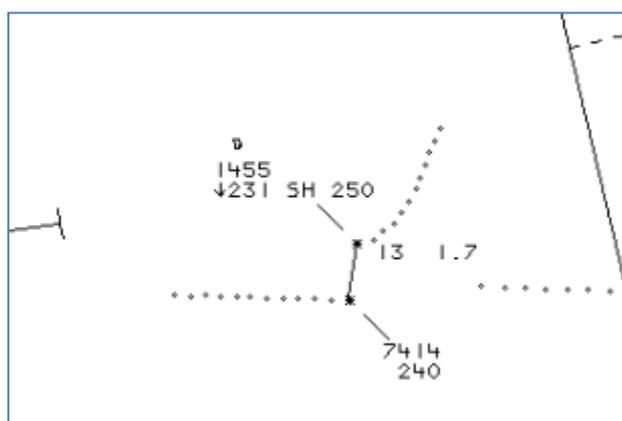


Figure 6: Prestwick MRT – 1515:37. Minimum distance between E145 and Typhoon as recorded by MRT.

After 1515:37, Typhoon(A)'s Mode C was no longer displayed for approximately 30 seconds by MRT. Lateral minima was restored at 1516:02 as the E145 pilot continued his right turn at FL229. At the same time the E145 pilot was instructed to resume his own navigation to NATEB and he responded to this instruction by stating that the flight was clear of conflict and returning to FL250.

The Typhoon(A) pilot's report indicated that he then descended from FL240 at 1515:25 to FL220 at 1515:35. Single source surveillance recordings and MRT did not show the rapid descent of the aircraft; however, from approximately 1516:00 Typhoon(A)'s Mode C was detected as FL220.

MRT indicated the distance as 1.7nm/900ft, whereas SMF indicated 1.6nm/300ft. All surveillance sources appear to indicate Typhoon(A)'s descent and second level change with the E145 took place as lateral distance was increasing.

### Military ATM

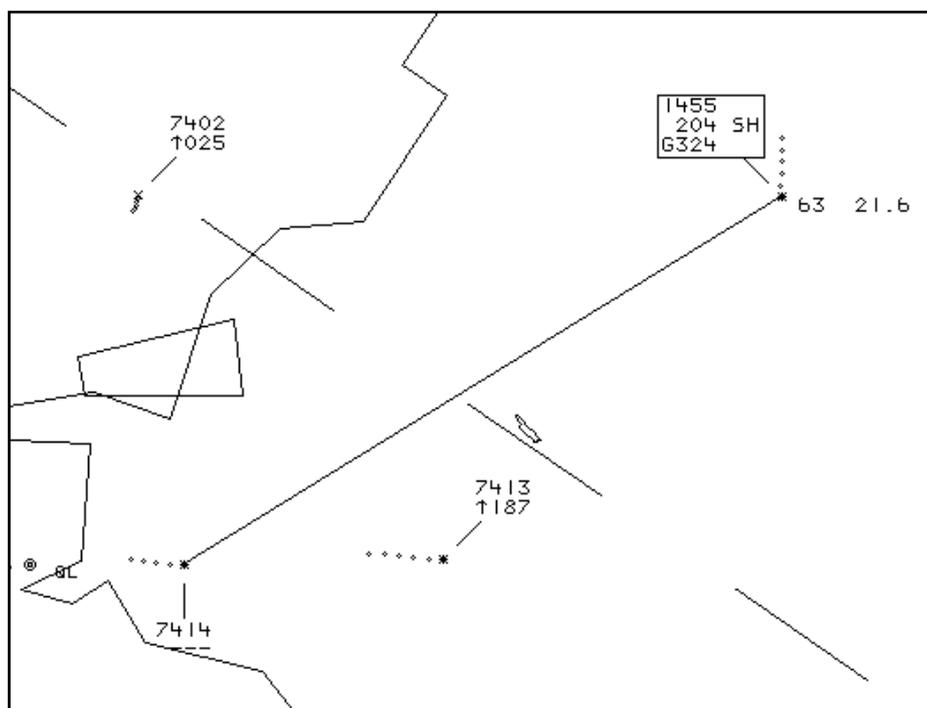
The Airprox incident occurred 19.1nm E of RAF Leuchars at 1515:37, between a Typhoon and an E145. Typhoon(A)'s pilot had departed Leuchars en-route to Danger Areas EGD613 B and C and was in receipt of a Traffic Service from Leuchars DEP.

All heights/altitudes quoted are based upon SSR Mode C from the radar replay unless otherwise stated. 'Live-mic' recording was available to inform the investigation. Minor discrepancies (+5 secs) were noted between the times cited by the pilot of Typhoon(A) from his HUD recording and the Leuchars RTF transcript, although there appeared a reasonable correlation between the RTF transcript and the radar replay.

The crews of both Typhoon(A) and the E145 reported IMC. The pilot of the Typhoon(A) was a foreign military officer on exchange service with the RAF. Leuchars DEP was manned by a relatively inexperienced instructor and an ab-initio student, albeit that he had completed the majority of his training for that control position. They reported their workload as high, providing ATS to six aircraft, operating in a 'band-boxed' DEP/Zone control position, a standard configuration for Leuchars ATC; they did not assess the complexity of the task. On the day of the incident, Leuchars had been hosting a 'fly-in' day for local GA pilots and, at the time of the Airprox, these GA aircraft had begun to depart.

The incident sequence commenced at 1512:53 as the pilot of Typhoon(A) contacted Leuchars DEP after departure, requesting a Traffic Service. Typhoon(A) was identified, placed under a Traffic Service and instructed to climb to FL240. Typhoon(A) became visible on NATS radar at 1513:17, 23.7nm SW of the E145, tracking easterly, with no SSR Mode C; the E145 was tracking southerly, indicating a climb through FL197, with a SSR Mode S Selected Flight Level (SFL) of FL250. The SFL would not have been visible to Leuchars ATC.

The Tay sector contacted Leuchars via landline and the call was initially answered by Leuchars Approach (APP). Once it became clear that co-ordination was required, the call was transferred to Leuchars DEP at 1513:33; unfortunately, the audio from the Leuchars APP position was not impounded, thus the initial part of the call between Leuchars APP and the Tay sector was not available to BM SPA. Figure 1 depicts the incident geometry at this point; SSR 3A 7414 was Typhoon(A), SSR 3A 1455 was the E145, SSR 3A 7413 was Typhoon(B) in receipt of a Traffic Service from Leuchars DEP.



**Figure 1:** Incident Geometry at 1513:33.

Figure 2 is a transcription of the conversation between the PC Tay sector Planner and Leuchars DEP, between 1513:10 and 1514:32.

15:13:10	Approach	"Leuchars Approach"
15:13:11	Planner	"Tay Planner, Information on your #7413 please?"
15:13:14	Approach	"#7413 is ah, climbing FL240, traffic service"
15:13:20	Planner	"Ok if you see my traffic E145 C/S on #1455?"
15:13:24	Approach	"Contact"
15:13:24	Planner	"Ok we're deconfliction service in the climb to FL250"
15:13:28	Approach	"Deconfliction service?"
15:13:29	Planner	"Yeah"
15:13:30	Approach	"We've called you, standby"
15:13:33	Approach	"Pick up Scottish, they wanna do some coordination as well, they're climbing 250, deconfliction service, we're climbing 240."
15:13:38	Departures	"Leuchars departures"
15:13:41	Planner	"Are you, whats.."
15:13:43	Departures	"My flights climbing to FL240"
15:13:45	Planner	"Ok I think you're gonna be outclimbing me now so we're gonna go right to turn behind but you are outclimbing us anyway so. Are you staying at 240"
15:13:54	Departures	"Sorry?"
15:13:55	Planner	"Are you staying at FL240?"
15:13:58	Departures	"We will be doing – yes. There's another track behind him, about 6 miles"
15:14:01	Planner	"Ok can we take coordination on the one behind then"
15:14:03	Departures	"Roger go ahead"
15:14:03	Planner	"Ok my traffic, can you climb 1000 feet underneath. My traffics going to go to a higher level but can you climb 1000 underneath? Until clear to the East?"
15:14:14	Departures	"Uh, roger, can do"
15:14:14	Planner	"Ok"
15:14:15	Departures	"I'll remain 1000ft below"
15:14:17	Planner	"Ok so your #7414 will be 1000ft below my track the #1455"
15:14:25	Departures	"Uh roger"
15:14:27	Planner	"Ok coordination?"
15:14:27	Departures	"That is coordination"
15:14:28	Departures (OJTI)	"Coordinated and we're soon to be handing it off, will be changing squawk soon"
15:14:30	Planner	"Ok"
15:14:31	Departures	"Cheers"
15:14:32	Planner	"Thank you"

Figure 2

MMATM11 states: 'When describing the height, level or altitude of an aircraft for the purposes of passing traffic information or agreeing coordination, the terms "Not Above", "Not Below" or "Maintaining" should be used as appropriate'; CAP 493 contains no equivalent Regulation.

CAP 49312 states that 'When requesting co-ordination, a controller shall: make verbal contact with the appropriate controller and, after identifying himself, open the dialogue with the words "Request Co-ordination"; refer to his aircraft and the aircraft upon which co-ordination is requested in the order most appropriate to the situation; propose a course of action upon which agreement is requested and obtain a clear decision on that proposal. To ensure clarity and avoid misunderstandings, before terminating the call, parties shall explicitly state the action required of their aircraft to achieve the agreed course of action. For example, an appropriate response to a request for an aircraft to maintain FL120 may be, "My traffic maintaining FL120". A response that does not reaffirm the details of the agreement, such as "Roger", is not acceptable'.

<sup>11</sup> Chapter 10 Paragraph 5

<sup>12</sup> Chapter 10 Paragraph 3

CAP 49313 states that ‘Great care must be taken when co-ordinating aircraft that are climbing or descending, or are expecting further climb or descent, to ensure that accurate information is given and that any agreement takes account of the actual or proposed flight profile and/or cleared level. Where aircraft are climbing or descending, controllers may include the provision of horizontal separation until a flight profile is achieved that will provide adequate vertical separation with the conflicting traffic. For example, “I will take 5 miles until above FL210”, or, “I will take 5 miles until 1000 ft above/below on Charlie”. In the absence of an RT report from the pilot of passing or reaching the required level, the criteria for level assessment of Mode C shall be applied. Where combinations of horizontal and vertical separation are used in co-ordinating aircraft, controllers shall closely monitor aircraft tracks and levels to ensure that standard horizontal separation is maintained until the requisite vertical separation exists’.

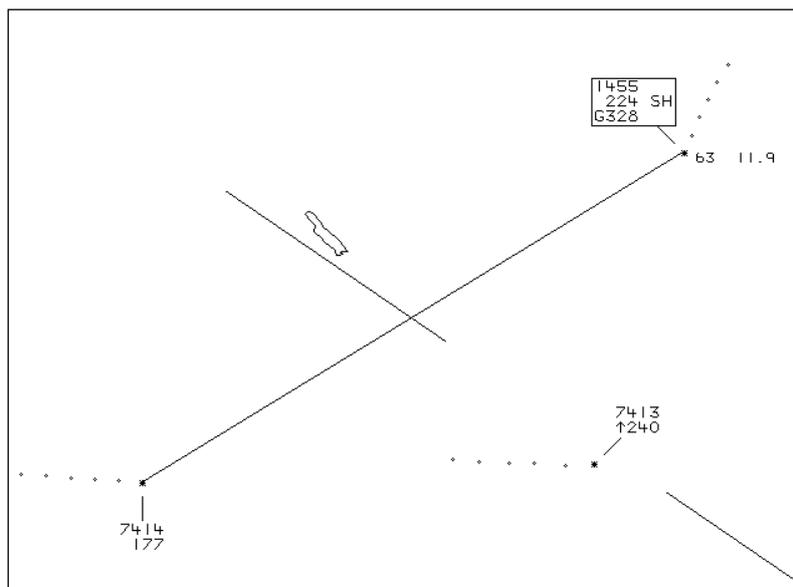
The only differences between these CAP 493 references and the relevant military regulation (MAA RA 3010(1) and MMATM Chapter 10 Para 10- 12) is that the MMATM uses the word ‘should’, whereas CAP493 uses the word ‘shall’.

[UKAB Note (1): CAP 49314 states the specific meanings of ‘shall’ and ‘should’:

‘shall’ ‘means that the instruction is mandatory.’

‘should’ ‘means that it is strongly advisable that an instruction is carried out; it is recommended or discretionary. It is applied where the more positive ‘shall’ is unreasonable but nevertheless a controller would have to have good reason for not doing so.’]

The radar replay highlights that, during this landline exchange, the E145 adopted a south-westerly track from 1514:13. As the landline exchange was finishing, at 1514:25, the pilot of an unrelated GA aircraft departing Leuchars called DEP on VHF, overlapped by a further call at 1514:28 from Typhoon(B)’s pilot requesting “own nav”; both these transmissions and the transmission from the GA pilot at 1514:08 were unanswered. At 1514:33, the pilot of Typhoon(B) called Leuchars DEP again requesting a “radio check” and was advised “readability 5.” He then re-stated his request for “own nav” and was advised, at 1514:39, “err negative, remain this heading for coordination” which was acknowledged. This suggests that Leuchars DEP may have begun to confuse the identities of the two Typhoons on the RTF, as the co-ordination applied to Typhoon(A) alone. Figure 3 depicts the incident geometry at this point.

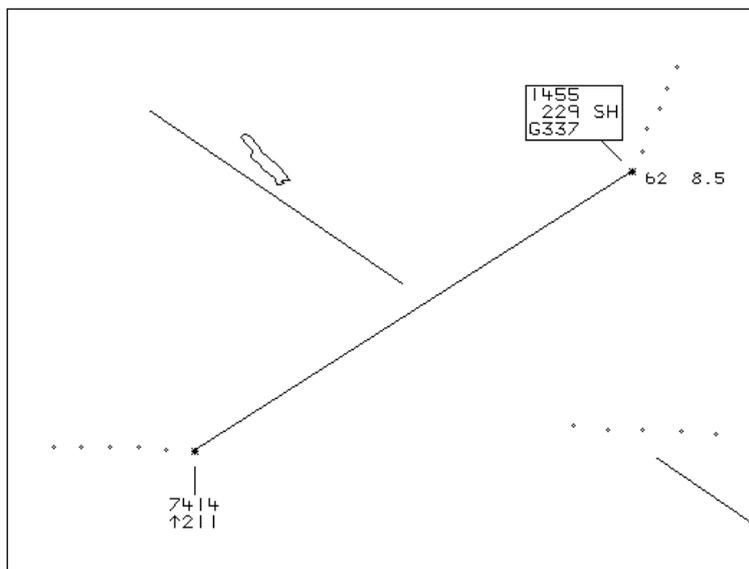


**Figure 3: Incident Geometry at 1514:39.**

<sup>13</sup> Chapter 10 Paragraph 4

<sup>14</sup> Foreword, Page 1, Chapter 4

At 1514:44, Leuchars DEP instructed Typhoon(B)'s pilot to "squawk 5-1-6-1" in preparation for handing the aircraft over to CRC Hotspur. At 1514:50, the pilot of the GA aircraft who had called Leuchars DEP earlier called again. The trainee was heard on the 'live-mic' expressing frustration and the instructor was heard saying "you're ok mate." The trainee then responded to the GA pilot, instructing him to stand-by and, at 1514:58, a voice was heard on the 'live-mic' asking "is he [Typhoon(A)] stopping at 2-2-0?" Figure 4 depicts the incident geometry at this point.



**Figure 4:** Incident Geometry at 1514:58.

Subsequent investigation has determined that the voice heard on the 'live-mic' was another controller who had entered the Ops room. This controller observed that the 'Tay Landline' was ringing and as the Leuchars Supervisor and APP were busy on landlines he decided to answer the call from the Tay sector at a vacant control position. Unfortunately, the audio was not impounded from this control position; however, the controller recalled that the Tay sector asked him to confirm that the Typhoon(A) would level at FL220 and, having identified that the aircraft was being worked by Leuchars DEP, he leant across and asked DEP "is he [Typhoon(A)] stopping at 2-2-0?"

One second later, at 1514:59, Leuchars DEP instructed Typhoon(A)'s pilot to "stop climb Flight Level 2-2-0" which was not acknowledged. The pilot of Typhoon(A) has reported that, based on a review of the HUD recording, at the point that he received this instruction he was passing FL224. The radar replay shows Typhoon(A) indicating a climb through FL223 at 1515:04, the approximate time that Leuchars DEP would have finished passing the instruction. At 1515:07 and again at 1515:12, Leuchars DEP requested a radio check with Typhoon(A)'s pilot, calls that went unanswered. At this latter point, the E145 was 7.1nm NE of Typhoon(A), indicating a climb through FL231, Typhoon(A) was indicating a climb through FL236. At 1515:17, Typhoon(B)'s pilot relayed to the pilot of Typhoon(A) to "stop climb Flight Level 2-2-0", which was again unanswered. The Leuchars Supervisor reported that he had been 'engaged on administrative duties at the Supervisor's desk whilst monitoring the adjacent DEP/Zone position' and 'ended this task as [he] became aware of the trainee DEP/Zone controller being unable to contact Typhoon(A)'s pilot. After several unsuccessful attempts by the controller to raise [Typhoon(A)'s pilot], at 1515:24, the Supervisor instructed Leuchars DEP to "transmit blind to him [Typhoon(A)'s pilot]". Leuchars DEP responded by calling the pilot of Typhoon(A) again, asking whether he was "on this frequency?" Simultaneously, the radar replay highlights that the E145 had begun to turn onto a westerly track. At this point, the E145 was 3.6nm NE of Typhoon(A), indicating a climb through FL234; Typhoon(A) was indicating level at FL240.

At 1515:32 in response to Leuchars DEP question, Typhoon(A)'s pilot replied "[Typhoon(A) C/S] 2-2-0." The Leuchars DEP trainee was then heard on the 'live-mic' saying "I don't know what's going on" and then acknowledged Typhoon(A) pilot's transmission. The CPA occurred during



the airspace in which this incident occurred. The UK AIP states, in Section ENR 1.1 para 5.1.5.1.2, that within a TRA the background classification between FL 195 and FL 245 is Class C, which may have led to the Tay controller assuming that the maximum permissible rate of climb or descent (ROCD) is 8000fpm. However, the UK Mil AIP states, in section ENR 1.1 para 2.5 that the ROCD restriction does not apply to aircraft operating in active TRAs. This may well explain why the TCAS on the Embraer did not issue an RA (to descend) until after the Typhoon had climbed through its level. It could be argued that a more prudent course of action from the Typhoon pilot would have been to remain at FL240 to prevent further exacerbation of the confliction by presenting a predictable height from which the controllers could conduct coordination. It may also be worth reviewing the Leuchars SIDs with a view to capping the climb out to FL190, irrespective of the condition of TRA 007A.

## **Summary**

Both pilots were operating under IFR in IMC within the TRA: the E145 pilot was in receipt of a Deconfliction Service from the PC Tay sector; the Typhoon(A) pilot was in receipt of a Traffic Service from Leuchars DEP. The Tay sector and Leuchars ATC had co-ordinated that Typhoon(A) would remain 1000ft below the E145's level. However, the pilot of Typhoon(A) had been previously cleared to climb to FL240 and, with a high rate of climb and missed/unassimilated radio calls, the Typhoon climbed through the E145's level. Subsequent to the Leuchars/PC Tay Sector co-ordination, and as Typhoon(A) was passing FL224, Leuchars instructed the pilot to stop his climb at FL220, a level which would have ensured separation from the E145 at FL230. However, the pilot of Typhoon(A) did not assimilate this instruction and climbed to his cleared level (FL240). The de-confliction minima were lost after Typhoon(A) had climbed through the E145's level. Meanwhile, the Tay controller had observed the high climb-rate of Typhoon(A) and, not convinced that it would level off 1000ft below the E145, issued the latter's pilot with avoiding turns, both before and after Typhoon(A) had passed through the E145's level. The pilot of the E145, subsequently, reported receiving a TCAS RA to descend. Both pilots assessed the risk of collision as high.

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

Information available included reports from the pilots of both aircraft, transcripts of the relevant frequencies and associated telephone calls, area surveillance recordings, reports from the controllers concerned, and reports from the appropriate ATC and operating authorities.

The Board first considered the airspace aspects of this Airprox and noted that, although the Airprox occurred in Class C controlled airspace, importantly the airspace concerned was classified as a Temporary Reserved Area (TRA) where ATS is provided in accordance with the rules for ATSOCAS. Many Board members wondered whether CAT pilots were aware that they were not being provided with a Radar Control Service in such airspace i.e. between FL195 and FL245. There was also ambiguity as to the specific restrictions which might apply within TRAs. For example, the Board sought clarification about whether the ROCD restriction of 8000fpm within CAS should apply within a TRA. A Civil advisor pointed out that the UK AIP does not state that ROCD restrictions do not apply within TRAs and that therefore they should be considered to be in force as the default for controlled airspace. However, since the meeting it has been established that the Military AIP specifically states that the ROCD restrictions do not apply to aircraft operating in active TRAs. The Civil ATC controller member also commented that he was not aware that the SIDs from Leuchars result in aircraft climbing unrestricted to FL240. In his opinion, none of the controllers valid on the Tay sector would be aware of this clearance and he and other Members considered that direct climbs to FL240 were not 'fail-safe'. After a very protracted discussion, these and other ambiguities led the Board to make Safety Recommendations that the CAA and MAA should review the suitability of ATS procedures within the Class C airspace of TRAs, and that the suitability of military SIDs with top heights of FL240 (i.e. above the FL195 start of CAS) should also be reviewed.

The Board then considered the actions of the pilot of the E145 (and his operating company) in planning to operate outside CAS and within a TRA effectively under an ATSOCAS Deconfliction Service (for which the pilot retained the ultimate responsibility for collision avoidance), rather than

routeing via the airways system. Although the Board realised that it would add to the aircraft's routeing, if the flight had remained within airways, the pilot would have received a full Radar Control Service from ATC. However, subject to the operating company acknowledging the associated additional risks of doing so, the pilot was entitled to operate outside the airways system and, if the agreed co-ordination had been implemented, the E145 would have been adequately separated from Typhoon(A). A Board advisor commented that, from her experience, the airline company concerned had been using this routeing for a number of years. A civil ATC Area controller added that he estimated that about 70% of Aberdeen's CAT traffic use routeing outside CAS airways. Notwithstanding the attempted coordination by ATC, strictly speaking, within his TRA ATSOCAS service, the E145 pilot was required by Rule 9 of the Rules of the Air to give way to Typhoon(A), which was on his right as they converged.

Turning to the Typhoon(A) pilot, it was assessed that, notwithstanding communication difficulties, he had, understandably, simply complied with his last assimilated instruction to climb on the SID to FL240. Nevertheless, under ATSOCAS Traffic Service rules he also retained responsibility for collision avoidance irrespective of the LEU DEP controller's advice. Given that he was IMC, a Deconfliction Service may have been more appropriate (albeit LEU DEP was effectively providing such a service anyway). It was also noted that, on this occasion, the pilot of Typhoon(A) was climbing in excess of 8000fpm as he entered the CAS TRA; subject to the limitations of radar replay interpretation it appeared that Typhoon(A)'s rate of climb was in the region of 10000fpm (the TCAS II upper limit). Although this rate of climb was in accordance with military procedures within TRA CAS, this (and the fact that Typhoon(A) was geographically near to the boundary of the theoretically calculated TCAS RA envelope as the E145 started its avoiding turn) may explain why the E145 pilot did not receive a TCAS RA before Typhoon(A) had climbed through his level. The high rate of climb of Typhoon(A) was considered by the Board to be a contributory factor to the Airprox.

The Board then considered the actions of the Leuchars controllers. The Military ATC member explained that it had been a busy flying day with not only a number of IFR departures but also a GA 'fly-in'. He confirmed that the OJTI monitoring the trainee on the combined DEP/Zone sector, although inexperienced as a trainer, was qualified to carry out the duty. However, the Board considered that the OJTI should have intervened much earlier in the proceedings as the workload increased, and that this was a contributory factor to the Airprox. The Military ATC member stated that he believed that a lack of adequate management had allowed the sector to become 'overloaded', and the Board noted that the Supervisor had reported being engaged on administrative duties whilst monitoring the DEP/Zone position. This later aspect led to another lengthy discussion by the Board members about the wisdom of supervisors conducting administrative duties when they should be focused on operational matters.

When considering the civil ATC aspects of the Airprox, the Board noted that, although not receiving a formal request from the E145 pilot, the Tay Tactical controller was providing him with a Deconfliction Service, albeit not informing him accordingly. However, despite this omission, it was agreed that the E145 pilot was operating on the assumption that he was receiving a Deconfliction Service in the period leading up to the Airprox. The Board noted that the Tactical controller had reported that she had been aware of the co-ordination which had taken place between the Planner and Leuchars, and a Civil ATC Area member with experience of the Tay sector, (and who had also been on duty at the time of the Airprox) explained that the Tactical controller had nevertheless been concerned about the high ROC of Typhoon(A) and whether its pilot would be able to level-off 1000ft below the E145. Accordingly, she had taken the precaution of instructing the E145 pilot to turn onto a westerly heading away from the track of Typhoon(A) and had issued Traffic Information. When the E145 pilot reported receiving a TCAS TA, she issued an avoiding action turn, whereupon the pilot reported receiving a TCAS RA. The Board commended the actions of the Tay Tactical controller for taking positive action in instructing the E145 pilot to turn before vertical separation was lost. As a consequence, horizontal separation between the two aircraft at CPA had fortunately been increased.

In considering the cause of the Airprox, the Military ATC member agreed that, despite the correct co-ordination phraseology not being used, there was no doubt in the minds of the Leuchars DEP/Zone controllers that they had agreed to separate Typhoon(A) vertically from the E145. However, in his

opinion, the controller should not have agreed this co-ordination without first confirming with the pilot that he would be able to carry out any required level restriction to ensure separation. The Board considered this to be another contributory factor to the Airprox. Furthermore, having agreed the coordination, the trainee controller then communicated with two other aircraft before instructing the pilot of Typhoon(A) to stop his climb at FL220. This delay in communicating the level-off contributed to the fact that Typhoon(A) had already passed that level and, consequently, into conflict with the E145<sup>15</sup>. Therefore, the Board determined that the Airprox had occurred because the DEP controller did not achieve the agreed coordination with Typhoon(A) which climbed into conflict with the E145. Turning their attention to the associated risk, the Board opined that although the timely actions of the Tay Tactical controller had prevented any risk of collision, safety margins had been much reduced below the normal.

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

Cause: Leuchars Departures did not achieve the agreed co-ordination with the Typhoon which climbed into conflict with the E145.

Contributory Factors:

1. The Typhoon pilot exceeded an 8000fpm rate of climb in CAS.
2. Leuchars Departures did not agree coordination with the Typhoon pilot prior to him passing the co-ordinated level.
3. The Leuchars OJTI did not intervene early enough.

Recommendations:

1. HQ Air Command reviews Leuchars' SIDs with respect to Class C airspace in the vicinity.
2. The CAA and MAA review the suitability of ATS procedures within the Class C elements of TRAs.

Degree of Risk: B.

ERC Score<sup>16</sup>: 50

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<sup>15</sup> Albeit, also contributory was the fact that no response was received by the pilot of Typhoon(A) to the climb restriction or further RTF calls. The Board noted that the pilot, on a foreign exchange, had subsequently reported to the Air Safety staff at Leuchars that the issue was one of language translation rather than a lack of understanding that the instruction was for him. The Military Training member commented that pilots of the country involved used English when flying in their own country and he found it difficult to understand that there could have been a language issue on this occasion.

<sup>16</sup> Although the Event Risk Classification (ERC) trial had been formally terminated for future development at the time of the Board, for data continuity and consistency purposes, Director UKAB and the UKAB Secretariat provided a shadow assessment of ERC.