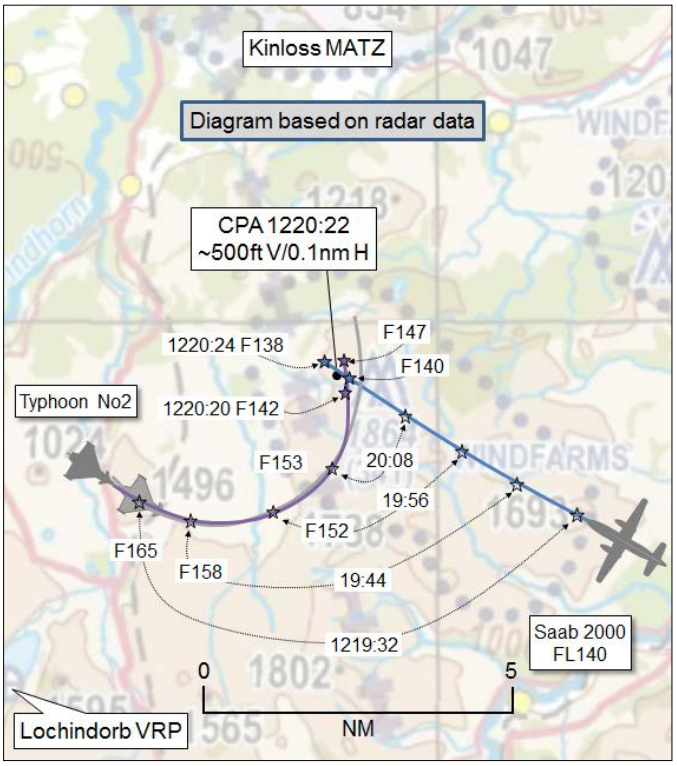
AIRPROX REPORT No 2017210

Date: 25 Aug 2017 Time: 1220Z Position: 5729N 00333W Location: 15nm S Lossiemouth

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Saab 2000	Typhoon No2
Operator	CAT	HQ Air (Ops)
Airspace	Scottish FIR	Scottish FIR
Class	G	G
Rules	IFR	IFR
Service	Deconfliction	Traffic
Provider	Prestwick	Lossiemouth
Altitude/FL	FL139	FL147
Transponder	A,C,S	A,C (S off)
Reported		
Colours	White	Grey
Lighting	NK	HISLs, nav
Conditions	VMC	VMC
Visibility	10km	NK
Altitude/FL	FL140	FL147
Heading	NK	NK
Speed	260kt	300kt
ACAS/TAS	TCAS II	Not fitted
Alert	RA	N/A
Separation		
Reported	NK	600ft V/NK H
Recorded	~500ft V/0.1nm H[1]	



THE SAAB 2000 PILOT states that while working Scottish in receipt of a Deconfliction Service at FL140, they were made aware of two Typhoons in their 10 o'clock, working down to 1000ft above their cleared cruise level of FL140. Scottish ATC again made them aware of Typhoons operating above their level. The First Officer called TCAS 'Prox' traffic in their 10 o'clock, the captain then had control ready in case of a TCAS RA. The first Typhoon crossed left-to-right above their level, the second Typhoon appeared to descend towards their aircraft resulting in a TCAS RA descent, which was initiated immediately by the Captain down to FL132. The First Officer announced to ATC 'TCAS RA descending'. The Typhoon pilot also appeared to take evasive action. The flight returned to FL140 and continued without any further incident to Stornoway.

THE TYPHOON PILOT reports that he was the pilot of the No2 Typhoon of a flight of 2, operating in the block FL150-FL170 in receipt of a Traffic Service having completed a Close Air Support training mission 15nm south of RAF Lossiemouth. The formation recovery to Lossiemouth was delayed by a single contact, routing east-to-west, 1nm north of the Close Air Support exercise NOTAM at FL140. During the rejoin to close formation, he became temporarily distracted by cockpit management tasks and descended 600ft below the cleared level. The error was noticed and corrected after 10 seconds.

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

THE PRESTWICK MORAY LOW SECTOR CONTROLLER stated that the Saab 2000 pilot departed Aberdeen for Stornoway via RIMOL, his routing taking him through the Class G airspace between the ADN and RIMOL. There were 4 fast-moving radar contacts wearing Lossiemouth squawks to the southeast of RIMOL by 15-20nm; they had been operating in this area for approximately 1 hour in a racetrack-type holding pattern, occupying FL150, 160, 180 and FL190. Due to the Saab 2000's routing and requested flight level of FL160, he decided to carry out coordination early with

[1] Interpolated between the radar returns at 1220:20 and 1220:24.

Lossiemouth Radar before the Saab 2000 pilot called on his frequency and before he had left controlled airspace. This was just in case it may have been necessary to route the aircraft around the area occupied by the Lossiemouth traffic to the north or south. He telephoned the Lossiemouth controller to request coordination on his traffic, the lowest of which being, he believed, a 1731 [in fact 3714] squawk. The Lossiemouth controller confirmed the squawks of the 2 lowest aircraft operating with the group of 4. He identified the Saab 2000 to the Lossiemouth controller and informed him of the Saab 2000's routing and requested Flight Level. To be helpful, he offered to climb the Saab 2000 to FL140 only, to remain 1000ft below the lowest level of the Lossiemouth traffic and said that he would give the Saab 2000 pilot further climb when in the Inverness overhead, clear of the Lossiemouth traffic. The Lossiemouth controller agreed with this coordination, so he restated that the Lossiemouth traffic would not be below FL150 and he would not climb the Saab 2000 above FL140 until in the Inverness overhead. Shortly after this telephone call, the Saab 2000 pilot called on frequency. He informed him that he was identified and agreed to provide a Deconfliction Service to him on leaving controlled airspace. He informed him at this time that there was military traffic operating to the east and south of Inverness and that he had agreed coordination with Lossiemouth radar that this traffic would not be below FL150 if the Saab 2000 climbed initially to FL140, with further climb if required after Inverness. Having agreed coordination with Lossiemouth and after informing the Saab 2000 pilot of the military traffic he turned his attention to other traffic in his sector, which was moderately busy for a combined Tactical/Planner role. He did, however, monitor the Saab 2000, especially because he had other traffic in the same area. When the Saab 2000 was midway between Aberdeen and RIMOL, he observed 2 of the Lossiemouth aircraft descending below the coordinated level of FL150 and then continue their descent on a track towards Lossiemouth. They remained clear of the Saab 2000 but this made him pay closer attention to the remaining two aircraft. A short time later, when the Saab 2000 was approximately 15-20nm southeast of RIMOL, he observed that both the remaining Lossiemouth aircraft were at the same level, FL150, and carrying out a tight left-hand turn in formation, approximately 5nm to the west of the Saab 2000. He believed that Short Term Conflict Alert triggered at this time, despite both aircraft appearing to be in level flight. He decided to pass Traffic Information to the Saab 2000 pilot as a precaution, although still believing that there was no immediate concern due to the earlier coordination. The Saab 2000 pilot acknowledged his Traffic Information but, whilst doing so, said that he had a TCAS RA. He acknowledged this. By this time the Saab 2000 and the Lossiemouth traffic contacts had merged, so it was difficult to see just how close the Lossiemouth traffic had passed to the Saab 2000 but, given the relative speed of closure, he would estimate that they passed within 1nm and he recalled seeing the Mode C of at least one of the Lossiemouth returns indicate FL142. The Lossiemouth traffic continued descending on a track towards Lossiemouth. The Saab 2000 pilot regained his cleared Flight Level and reported that he believed that one of the Lossiemouth aircraft had taken avoiding action on him. He stated too that he would be filling a report.

THE LOSSIEMOUTH RADAR CONTROLLER reports that he had agreed coordination with the Moray Low Sector against 2 Typhoon Flights. They were to be not below FL150 whilst conducting Close Air Support against civil traffic routing to the INS not above FL140. All parties had acknowledged this. As the civil traffic approached his aircraft, the subject Typhoon Flight called for a visual recovery. They were reminded to be not below FL150 and the civil traffic was called to them. As they got closer to each other, the Typhoon pilot said they would be Min Fuel in 1 minute and needed to descend soon. He advised them to maintain FL150 as the coordinated traffic was directly below them at FL140. At this point the other Typhoon Flight, who were closer to the aerodrome, called for visual recovery before saying that they were visual and switching to Tower. The Deps controller then told him that she thought the civil traffic had taken an avoiding action descent and that, for one sweep, one of the subject Typhoon's callsigns had shown FL147 on Mode C.

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

THE LOSSIEMOUTH ATC SUPERVISOR reports that he did not witness the incident, but it was seen by the two radar controllers in position. He answered the Moray telephone line and the controller informed him that Lossiemouth had broken co-ordination between the Close Air Support traffic and his aircraft. He said that his Supervisor would be calling. He spoke to the Moray Supervisor and informed him that the pilots of the Lossiemouth traffic had been instructed to remain at FL150

when they called for recovery. The Mode C on one of them had subsequently been seen to read FL147. The Moray Supervisor said that the pilot of the civil aircraft had received a TCAS RA and would be filing a report. He said that they would be submitting a DASOR to reflect the level bust.

Factual Background

The weather at Lossiemouth was recorded as follows:

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EGQS 251150Z 05006KT 9999 SHRA FEW005 BKN070 16/13 Q1012 BLU TEMPO 6000 SHRA WHT
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Analysis and Investigation

CAA ATSI

The Typhoon was one of four similar types which had been observed by the Scottish controller to have been operating in the area to the south of Lossiemouth for approximately one hour. With the Saab 2000 due to leave controlled airspace on departure from Aberdeen, the controller initiated early coordination (at 1208) with the Lossiemouth controller against the Typhoons. It was agreed that the Saab 2000 would not be above FL140, (although flight-planned to cruise at FL160), with the Typhoons to be not below FL150. At 1211:51 the Scottish controller instructed the Saab 2000 pilot to climb to FL140 advising that they would be leaving controlled airspace in 10nm and requested the type of ATC service they required. A Deconfliction Service was agreed and at 1212:47 the controller advised the Saab 2000 pilot of the presence of the Typhoons, stating that there might be an opportunity for further climb once clear of them. The controller went on to pass updated Traffic Information on the Typhoons at 1215:20 (Figure 1).

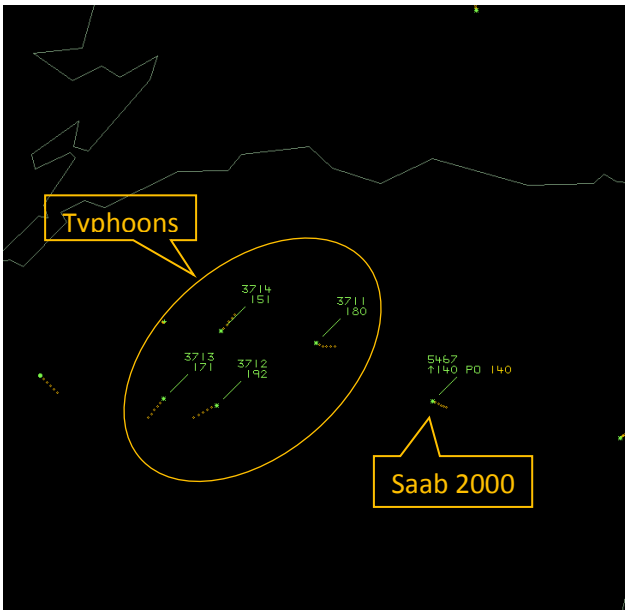


Figure 1 – 1215:20.

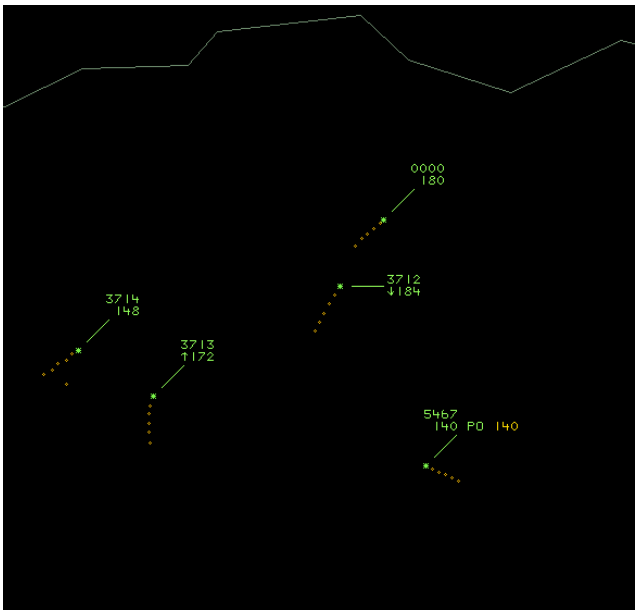


Figure 2 – 1217:25

At 1217:25 the Saab 2000 pilot requested a right turn of 15° to avoid weather, which was approved (Figure 2).

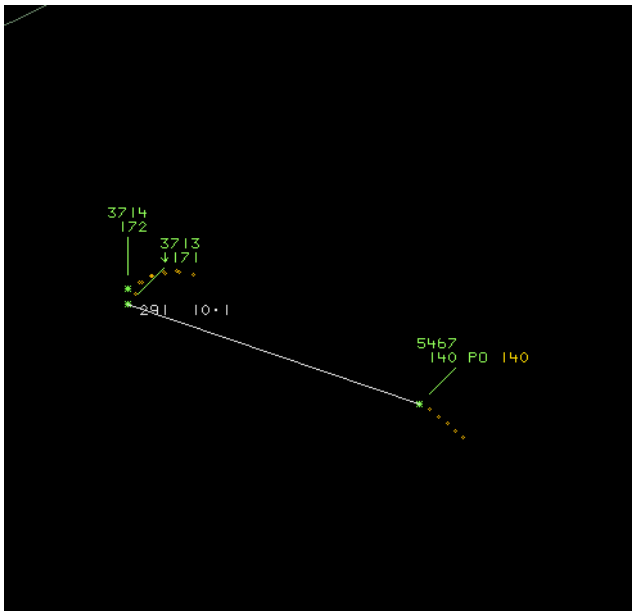


Figure 3 – 1219:10.

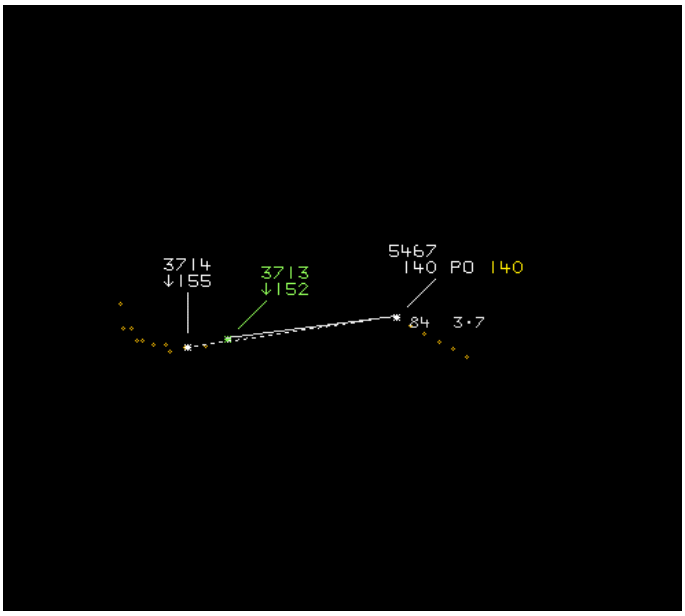


Figure 4 – 1219:50.

Between 1217:40 - 1219:10 the controller was dealing with other traffic (Figure 3 at 1219:10).

At 1219:50 the controller passed Traffic Information on the Typhoon to which the pilot replied that they (the Typhoons) were passing overhead (Figure 4).

At 1220:07 the Saab 2000 pilot reported receiving a TCAS RA (Figure 5).

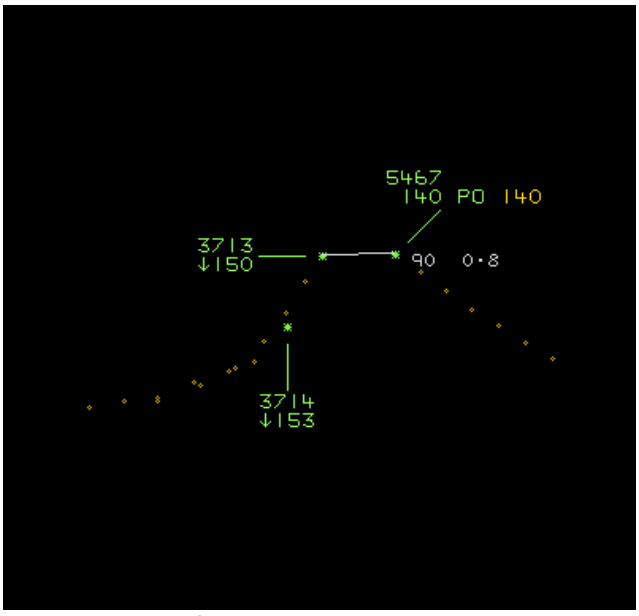


Figure 5 – 1220:07.

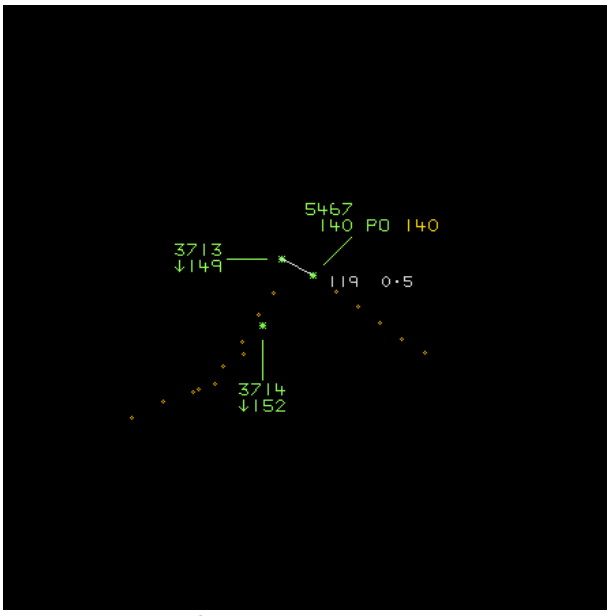


Figure 6 – 1220:13.

The first Typhoon passed ahead of and 1000ft above the Saab 2000 at 1220:13 (Figure 6).

CPA with the second Typhoon took place at 1220:21 with the aircraft separated by <0.1nm laterally and 800ft vertically (Figure 7).

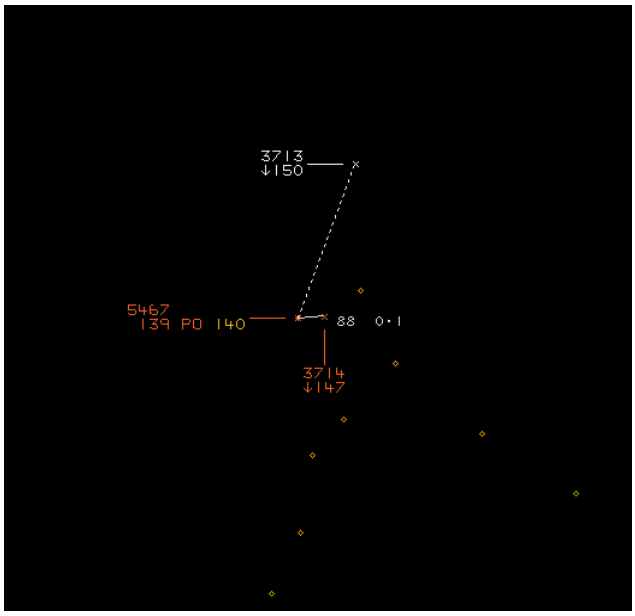


Figure 7 – 1220:21.

The NATS investigation highlighted that although the coordination which took place between the controllers was not conducted in accordance with the procedures detailed in CAP493[2], both parties appeared to be clear as to what was being agreed, and that it would cover all four Typhoons.

Because both pilots were operating in Class G airspace the pilots were responsible for their own collision avoidance.

Military ATM

Figures 8-15 show the positions of the Saab 2000 and the Typhoons (operating as two pairs) at relevant times in the lead up to and during the Airprox. The screen shots are taken from a replay using a NATS radar, which is not used by Lossiemouth ATC, therefore is not representative of the picture available to the Lossie Approach Controller.

At 12:16:15 (Figure 8), the Lossie Approach Controller requested that all elements of the two pairs of Typhoons under his control remain not below FL150 for coordination. The lead pilot of pair (3711/2) acknowledged, but the lead pilot of the Airprox pair (3713/4) did not.

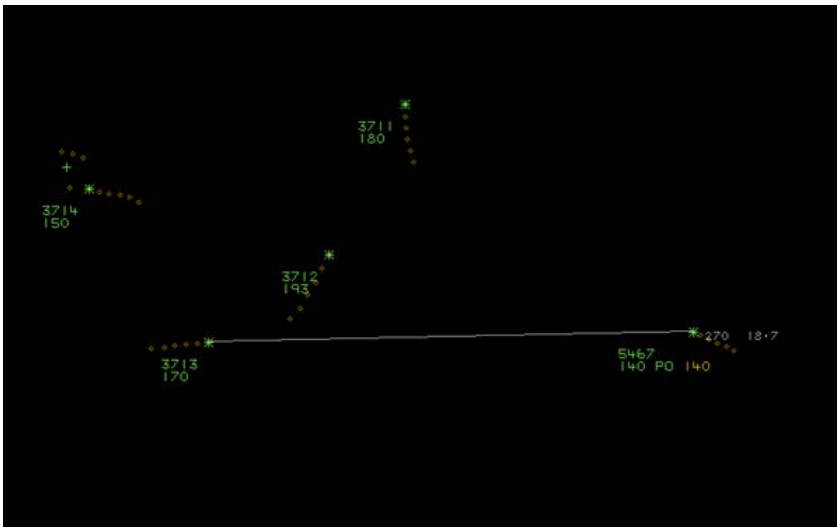


Figure 8: Geometry at 12:16:15 (Saab 2000 5467; Typhoons 3713/4).

[2] Section 1, Chapter 11.

At 12:17:38 (Figure 9), the Lossie Approach Controller instructed the other pair of Typhoons, now clear of the coordinated Saab 2000, to descend for recovery back to RAF Lossiemouth.

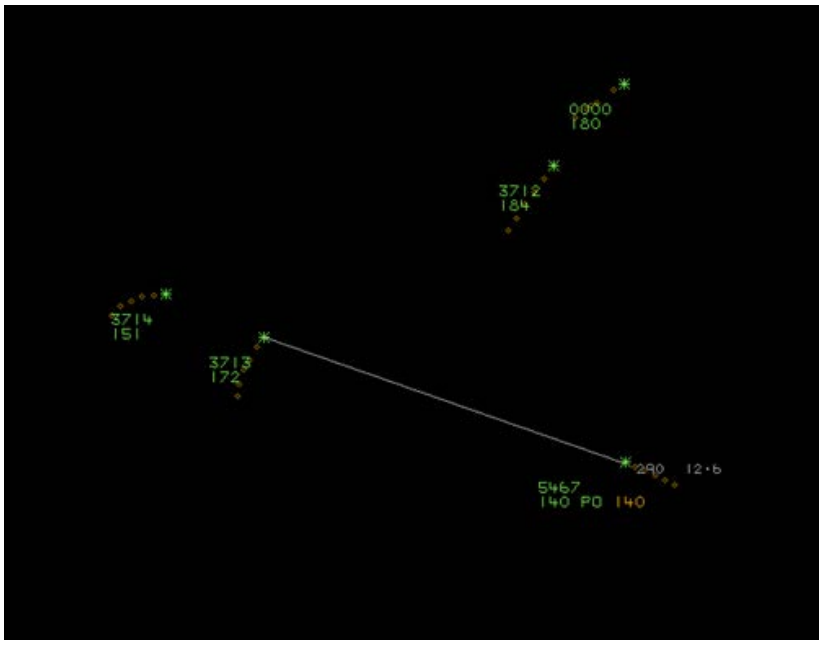


Figure 9: Geometry at 12:17:38 (Saab 2000 5467; Typhoons 3713/4).

At 12:18:47 (Figure 10), the Lossie Approach Controller requested that the Airprox pair of Typhoons, now ready for recovery to RAF Lossiemouth, remain not below FL150 for coordination. The lead pilot gave a readback of not below FL50, which the Controller heard and corrected. The lead pilot then read back FL150.

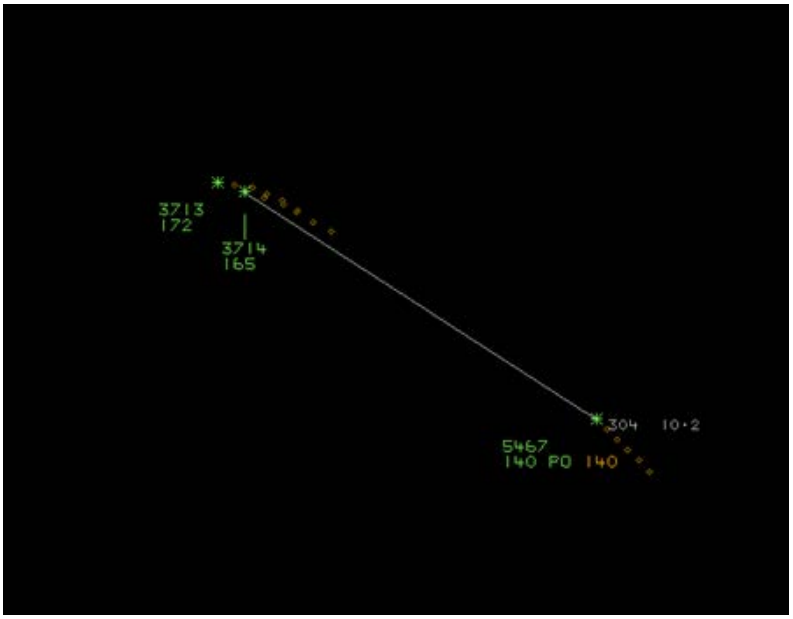


Figure 10: Geometry at 12:18:47 (Saab 2000; 5467; Typhoons 3713/4).

At 12:19:40 (Figure 11), the Lossie Approach Controller passed Traffic Information to the Typhoon pair on the traffic coordinated below at FL140.

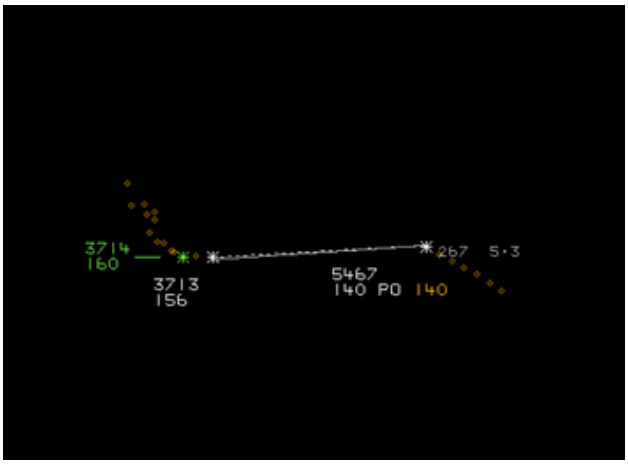


Figure 11: Geometry at 12:19:40 (Saab 2000 5467; Typhoons 3713/4).

At 12:20:05 (Figure 12), the lead Typhoon pilot stated that the pair would be at minimum fuel in one minute, requesting to begin descent. The Controller responded that the pair was 'on top of' the coordinated traffic, which was acknowledged by the lead pilot.

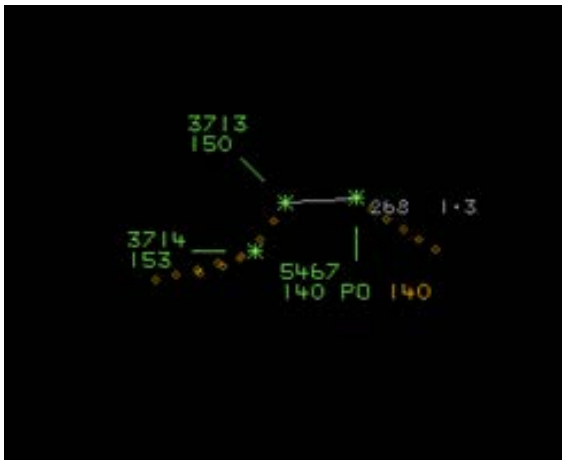


Figure 12: Geometry at 12:20:05

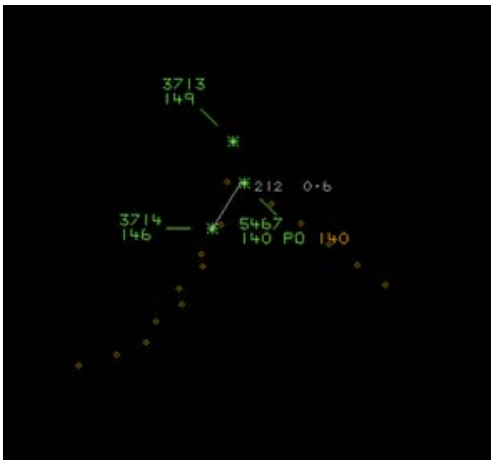


Figure 13: Geometry at 12:20:16

(Saab 2000 5647; Typhoons 3713/4).

At 12:20:16 (Figure 13), the second Typhoon mode C was seen to read FL146, followed by FL142 (Figure 14), before climbing back up to FL147 as the Saab 2000 began to descend (Figure 15).

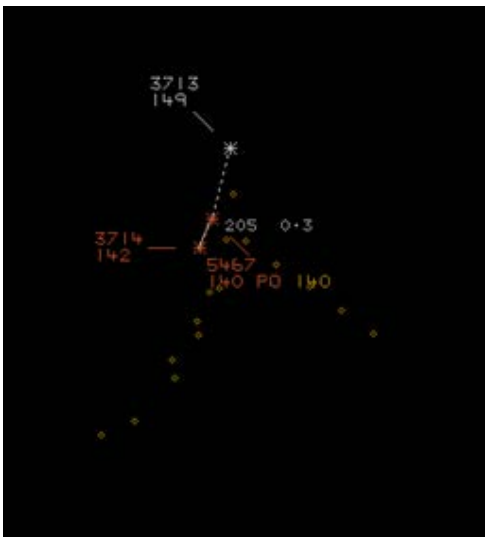


Figure 14: Geometry at 12:20:20

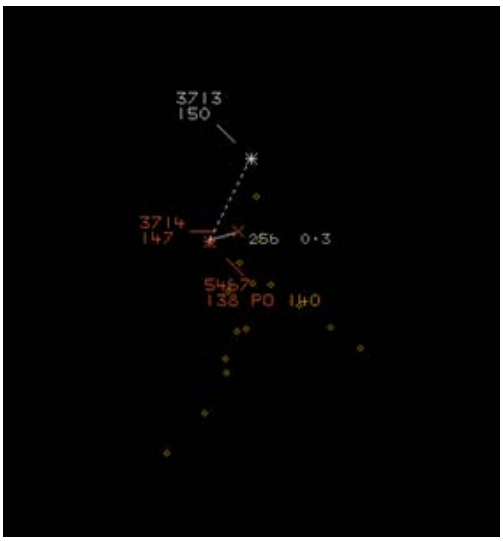


Figure 15: Geometry at 12:20:24

(Saab 2000 5467; Typhoons 3713/4).

Although standard phraseology was not used, the Lossiemouth Approach Controller coordinated with the Moray Low controller to agree that the pair of Typhoons squawking 3713/4 would operate not below FL150 while the transiting Saab 2000 would remain not above FL140. Because the Typhoons were already operating in a block with lower level FL150, there was no need to achieve any further verbal agreement form the pilot at that time. When the two pairs of Typhoons reported almost ready for recovery to Lossiemouth, with the Saab 2000 approaching the operating area, the Controller instructed both pairs of Typhoons to remain not below FL150 for coordination, though only the lead pilot of the other pair responded, and this pair had not been coordinated with Moray Low. The other pair was allowed to descend for recovery once safely established away from the Saab 2000.

When the lead pilot of the Airprox Typhoon pair reported ready for recovery, the Controller asked them to remain not below FL150 due to coordinated traffic, and corrected a readback of FL50, before turning his attention to the pair already recovering, who were being transferred to the Lossiemouth Aerodrome Controller (ADC). Further Traffic Information was passed to the Typhoon pilots when the Saab 2000 was 5nm east, tracking north west at FL140. At this time, the lead Typhoon pilot stated that they were approaching minimum fuel and requested to begin descent. The Controller responded that the Typhoons were 'on top of' the coordinated traffic, implying that descent was not approved, before going back to the ADC to check that the other Typhoon pair had changed frequency. In this time, and over a period of less than 10 seconds, the second Typhoon descended to indicate FL142 before climbing back up to FL150, this was enough to cause a TCAS RA descent in the Saab 2000.

UKAB Secretariat

The Saab 2000 and the Typhoon pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard[3]. If the incident geometry is considered as converging then the Typhoon pilot was required to give way to the Saab 2000[4].

The following 4 NOTAMs were published concerning the Close Air Support Exercise:

H4996/17
Q) EGPX/QWELW/IV/BO/W/000/233/5744N00542W005
AIR EXER. MULTIPLE FAST JET ACFT WILL CONDUCT HIGH ENERGY
MANOEUVRES IN SUPPORT OF GROUND OPS WI 5NM RADIUS 574348N 0054144W
(VCY GAIRLOCH, HIGHLAND). PROFILES MAY INVOLVE DYNAMIC LATERAL AND
VERTICAL MANOEUVRING OF AIRCRAFT AT SPEEDS OF UP TO 450 KNOTS IAS.
ACFT MAY BE UNABLE TO COMPLY WITH RAC. FOR FURTHER INFO AIC Y056/2017
REFERS. OPS CTC 358.650 OR TEL 01343 526356. 17-07-0612/AS4
LOWER: SFC
UPPER: 23300FT AMSL
FROM: 21 AUG 2017 08:00 **TO:** 31 AUG 2017 18:00
SCHEDULE: 21-25 29-31 0800-1800

H4993/17
+ **Q)** EGPX/QWELW/IV/BO/W/000/250/5736N00514W005
AIR EXER. MULTIPLE FAST JET ACFT WILL CONDUCT HIGH ENERGY
MANOEUVRES IN SUPPORT OF GROUND OPS WI 5NM RADIUS 573542N 0051411W
(VCY KINLOCHEWE, HIGHLAND). PROFILES MAY INVOLVE DYNAMIC LATERAL AND
VERTICAL MANOEUVRING OF AIRCRAFT AT SPEEDS OF UP TO 450 KNOTS IAS.
ACFT MAY BE UNABLE TO COMPLY WITH RAC. FOR FURTHER INFO AIC
Y056/2017 REFERS. OPS CTC 371.5 MHZ OR TEL 01343 526356.
17-07-0612/AS4
LOWER: SFC
UPPER: 25000FT AMSL
FROM: 21 AUG 2017 08:00 **TO:** 31 AUG 2017 18:00
SCHEDULE: 21-25 29-31 0800-1800

[3] SERA.3205 Proximity.
[4] SERA.3210 Right-of-way (c)(2) Converging.

H4994/17
+ **Q)** EGPX/QWELW/IV/BO/W/000/235/5727N00247W005
AIR EXER. MULTIPLE FAST JET ACFT WILL CONDUCT HIGH ENERGY MANOEUVRES IN SUPPORT OF GROUND OPS WI 5NM RADIUS 572651N 0024710W (HUNTLY). PROFILES MAY INVOLVE DYNAMIC LATERAL AND VERTICAL MANOEUVRING OF AIRCRAFT AT SPEEDS OF UP TO 450 KNOTS IAS. ACFT MAY BE UNABLE TO COMPLY WITH RAC. FOR FURTHER INFO AIC Y056/2017 REFERS. OPS CTC 244.750 MHZ OR TEL 01343 526356. 17-07-0612/AS4
LOWER: SFC
UPPER: 23500FT AMSL
FROM: 21 AUG 2017 08:00 **TO:** 31 AUG 2017 18:00
SCHEDULE: 21-25 29-31 0800-1800

H4995/17
+ **Q)** EGPX/QWELW/IV/BO/W/000/242/5720N00337W005
AIR EXER. MULTIPLE FAST JET ACFT WILL CONDUCT HIGH ENERGY MANOEUVRES IN SUPPORT OF GROUND OPS WI 5NM RADIUS 571944N 0033634W (GRANTOWN ON SPEY, HIGHLAND). PROFILES MAY INVOLVE DYNAMIC LATERAL AND VERTICAL MANOEUVRING OF AIRCRAFT AT SPEEDS OF UP TO 450 KNOTS IAS. ACFT MAY BE UNABLE TO COMPLY WITH RAC. FOR FURTHER INFO AIC Y056/2017 REFERS. OPS CTC 234.775 OR TEL 01343 526356. 17-07-0612/AS4
LOWER: SFC
UPPER: 24200FT AMSL
FROM: 21 AUG 2017 08:00 **TO:** 31 AUG 2017 18:00
SCHEDULE: 21-25 29-31 0800-1800

Occurrence Investigation

An OSI was convened to investigate the circumstances surrounding a TCAS RA experienced by a Saab 2000 pilot approximately 15nm to the southwest of RAF Lossiemouth. The Saab 2000 was coordinated against Typhoon traffic operating with Lossiemouth Approach and the crew reacted to the TCAS RA by descending. The OSI centred upon interviews with the Typhoon pilot and Lossiemouth ATC; consultation with the airline and National Air Traffic Services (NATS); examination of the Lossiemouth Approach and Moray Low (Prestwick) ATC transcripts; examination of the Typhoon mission video and NOTAM documentation. The OSI Team was also granted access to the Saab 2000 pilot's MOR and the NATS Safety and Initial Watch Management Investigation reports. The outcome was that the crew of the Saab 2000 reacted to a TCAS RA and descended from FL140 to FL132. The cause of the TCAS RA was that one of the Typhoon pilots inadvertently descended below his coordinated level of FL150, triggering the TCAS RA in the Saab 2000, his altitude had temporarily dropped from his scan/work cycle. The OSI Team identified 6 Causal factors (CF), primarily concerning distraction experienced by the Typhoon pilot, and made one observation. The CFs attracted 2 recommendations. Examination of the aircraft video for Typhoon C/S22 revealed a descent to approximately FL144.5 and an approximate horizontal separation of 1.0nm between the 2 aircraft. The incident occurred at the cessation of the Close Air Support portion of the sortie, with both Typhoons approximately 4nm outside the NOTAM defined area. The subject Typhoon pilot recollected that his altitude had dropped from his scan and he had not detected the initial excursion below FL150; however, as soon as he saw his altitude was below FL150 he took corrective action. He considered it likely that he had become distracted from monitoring his altitude through a combination of possible factors. Firstly he considered that he was trying to expedite a re-join with his leader, who was in a left-hand turn, in order to facilitate a prompt recovery; this turning re-join manoeuvre involved a descent and increased rate of turn "to cut the corner" in order to reduce separation. Secondly, he recalled trying to manage mission materials, including a kneeboard in preparation for recovery; the kneeboard had become uncomfortable. He also commented that it was possible that, due to extended periods utilising the altitude hold function of the auto-pilot during the Close Air Support Exercise portion of the sortie, he may have considered it to be engaged whilst trying to re-join. He stated that he had commenced Close Air Support training in the month preceding the incident and he had also completed several Close Air Support training sorties in the simulator. The Saab 2000 pilot confirmed that he had become visual with both Typhoons and that it appeared to him that the

second aircraft took avoiding action. He stated that he initiated descent as a result of receiving the TCAS RA. He was aware of the warning NOTAM for the Close Air Support training and was content that the aircraft's planned route remained well clear of it. The Lossiemouth controller recalled the incident sortie and was satisfied that the Typhoon and the Saab 2000 were appropriately coordinated; however, he did not recall the excursion below FL 150 as he was handing over the other Typhoon Flight at the time. He was informed of the possible level bust by another controller on an adjacent position at the time.

Comments

HQ Air Command

A thorough safety investigation was undertaken by the Typhoon pilot's home unit and a number of causal factors were identified, centred mainly around the distraction of the Typhoon pilot that led to him inadvertently descending below his cleared level. Training in Close Air Support (CAS) is a very high workload mission and demands a lot of the pilot. However, the tactical portion of the sortie was complete and the aircraft were recovering to base, a seemingly much more 'straightforward' element of the sortie. It seems likely that the pilot of the Airprox Typhoon identified this as an appropriate time to prepare for the recovery and, by his own admission, allowed the aircraft altitude to drop out of his scan. It is often during the most seemingly benign tasks that are common to all sorties – such as recovery to home base – that distraction is most likely to become a factor. There was little that the controller could have done to assist as, by the time the height readout indicated that the Typhoon had descended below its cleared altitude, the pilot had already noticed the excursion and was taking action to correct it. Similarly, whilst organising his cockpit for the recovery and rejoining on his leader it is entirely possible that his lookout for other aircraft may have been degraded. There is no ACAS currently fitted to Typhoon, but work is ongoing to identify a suitable solution to provide on-board alerting of proximate traffic for Typhoon. That said, the transponder on the Typhoon interacted as expected with the TCAS on the Saab 2000 to provide its pilot with an RA, to which he responded. Recommendations from the safety investigation included the fitting of a CWS to Typhoon aircraft and a review of the submissions of NOTAMs for CAS exercises to ensure that they more accurately reflect the times and locations of the exercises

Summary

An Airprox was reported when a Saab 2000 and a Typhoon flew into proximity at 1220 on Friday 25th August 2017 in Class G airspace of the Scottish FIR. The Saab 2000 pilot was operating under IFR in VMC, tracking north-west to Stornoway in receipt of a Deconfliction Service from the Prestwick Moray Low Sector. The Typhoon pilot was No2 of a pair returning to Lossiemouth after a Close Air Support exercise operating under IFR in VMC, in receipt of a Traffic Service from Lossiemouth Approach.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

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

The Board first discussed the actions of the Typhoon pilot. The Board noted that, at the time of the Airprox, the pair of Typhoons had just finished their Close Air Support exercise and were approximately 4nm outside the area notified in the associated NOTAM as they prepared for a visual recovery to Lossiemouth. They had been operating in a band between FL150-170 in receipt of a Traffic Service and, together with another pair of Typhoons returning to Lossiemouth ahead of them, they had been requested to maintain not below FL150 for co-ordination. At the time, only the pilot of the other flight acknowledged this transmission. However, the subject Typhoon flight did subsequently acknowledge another transmission restricting them to FL150, and were advised that the Saab 2000 was 8nm southeast of them at FL140.

The HQ Air Command member was able to brief the Board on the outcome of the military OSI which discussed why the Typhoon No2 pilot had descended through FL150. It was apparent that the pilot had become distracted and did not monitor his altitude as he made a left turn to follow his leader and simultaneously tidy up his cockpit and adjust a kneepad that had become uncomfortable. The Board agreed that the Typhoon No2 pilot's distraction by in-cockpit activity at a critical point was a contributory factor. Noting that the formation had called that they were minimum fuel, some members wondered whether they had become preoccupied with their recovery to Lossiemouth and had lost situational awareness of the Saab 2000. They opined that the fact that the formation had requested to begin descent when virtually overhead the Saab 2000 indicated that they might not have assimilated its position relative to them. The HQ Air Command member commented that in theory they would not be too concerned about the Saab's position because the plan was to have 1000ft vertical separation, and that their call for recovery was simply to alert ATC to the fact that they now required to route towards Lossiemouth and descend as soon as possible. Noting that the Typhoons were at the bottom of their height block with only 1000ft vertical separation between the Saab and the Typhoons, one member with fast-jet experience commented that formation joins were often quite dynamic manoeuvres in which the joining pilot can sometimes become task-focused on the leader to the detriment of other parameters; he opined that it would perhaps have been prudent for the Typhoon leader to have ensured a buffer on the base height as the No2 joined formation. This would have prevented the incident by allowing for human factors, distractions and potential task overload during the join.

The Board commended the Moray controller for instigating early coordination with Lossiemouth, and commented that both controllers had readily agreed a plan that would have separated the Saab 2000 and the 2 Typhoons. Traffic Information had been passed to the pilots by their respective controllers, and there was nothing the controllers could do to remedy the situation because the Typhoon No2 pilot had unexpectedly descended through FL150 when he was in close proximity to the Saab 2000.

The Board then turned their attention to the cause and risk of the Airprox. Noting that the incident would not have occurred if the Typhoon No2 pilot had complied with the coordinated level, it was quickly agreed that the cause of the Airprox was that the Typhoon No 2 pilot descended below his coordinated level and into confliction with the Saab 2000. Turning to the risk, members discussed at length the dynamics of the situation and the likely outcome of the Saab 2000 TCAS RA. Noting that the Saab 2000 pilot had been manually flying his aircraft ready and in anticipation of a potential TCAS RA event, the Board were mindful that TCAS was mechanised to provide RAs in much less dynamic circumstances. As such, they wondered whether the Saab 2000 pilot's control inputs would have materially increased separation in this case (he had only descended 100ft by the time the Typhoon passed). Turning to the radar replay screen-shots, the Board had to interpolate between screen shots to understand what the risk was in this dynamic circumstance. The radar recordings showed that when the two aircraft were 0.3nm apart they were only separated vertically by 200ft. However, by the time the horizontal distance had reduced to 0.1nm, the vertical separation was 800ft as the Typhoon No2 pilot coincidentally pulled up (unaware of the Saab 2000 that he was converging with). Notwithstanding the finally achieved height separation, it was clear to the Board that, although a collision had thus been averted, safety had been much reduced below the norm and the incident was assessed as risk Category B.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The Typhoon No2 pilot inadvertently descended below his coordinated level and into confliction with the Saab 2000.

Contributory Factor: The Typhoon No2 pilot was distracted by in-cockpit activity.

Degree of Risk: B.

Safety Barrier Assessment[5]

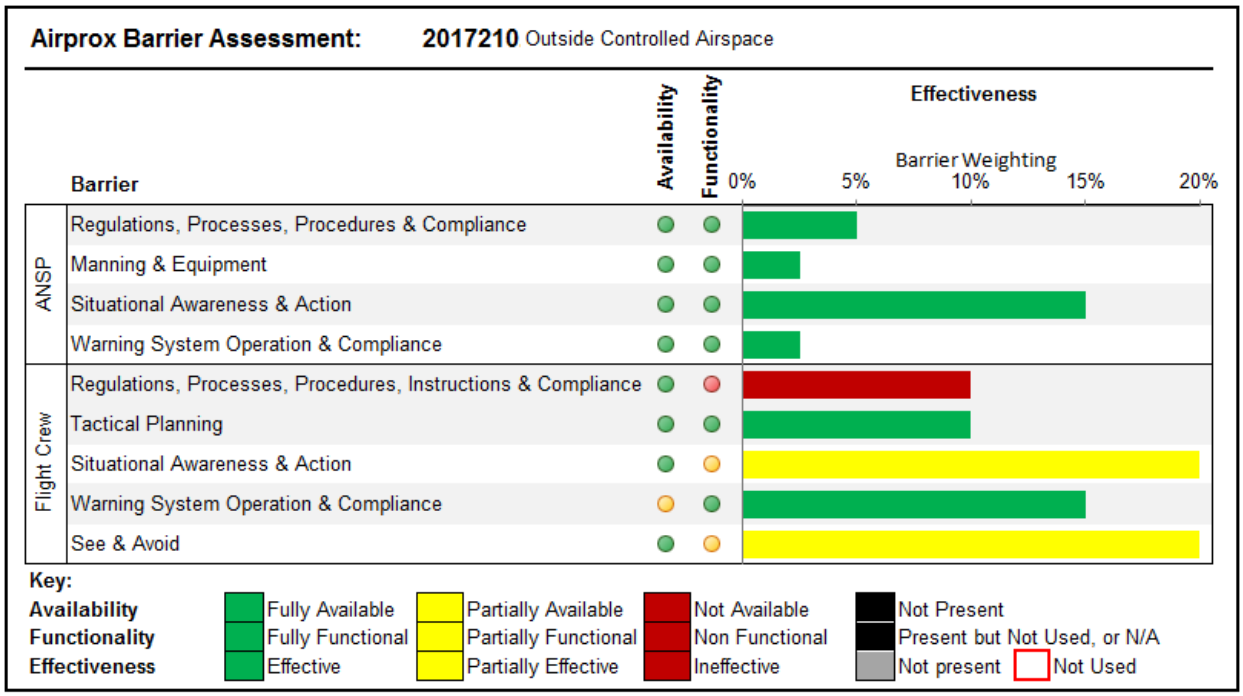
In assessing the effectiveness of the safety barriers associated with this incident, the Board concluded that the key factors had been that:

Flight Crew:

Regulations, Processes, Procedures, Compliance and Instructions were assessed as **ineffective** because the Typhoon No2 pilot descended below his cleared level.

Situational Awareness and Action were assessed as **partially effective** because the Typhoon pilots were generally aware of the presence of the Saab 2000 in the area but not its exact position relative to their aircraft.

See and Avoid were assessed as **partially effective** because only the Saab 2000 pilot saw the other aircraft, and that was at a late stage when he had few options to increase separation.



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