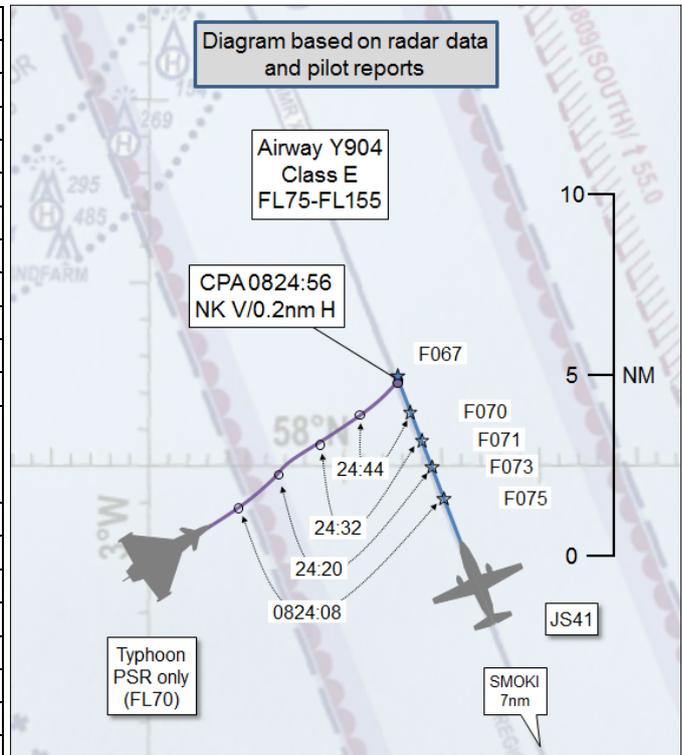


**AIRPROX REPORT No 2017117**

Date: 14 Jun 2017 Time: 0825Z Position: 5802N 00247W Location: 27nm SE Wick

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

Recorded	Aircraft 1	Aircraft 2
Aircraft	JS41	Typhoon
Operator	CAT	HQ Air (Ops)
Airspace	Scottish FIR	Scottish FIR
Class	G	G
Rules	IFR	VFR
Service	None	Traffic
Provider	(Scottish)	Swanwick Mil
Altitude/FL	FL67	No Mode C/S
Transponder	A,C,S	Unserviceable
Reported		
Colours	Company	Grey
Lighting	Strobes, conspicuity, beacon, nav	Strobes, nav
Conditions	VMC	VMC
Visibility	45km	50km
Altitude/FL	FL78	FL70
Heading	340°	070°
Speed	230kt	350kt
ACAS/TAS	TCAS II	Not fitted
Alert	None	N/A
Separation		
Reported	~250ft V/NK H	Not seen
Recorded	NK V/0.2nm H	



**THE BAE JETSTREAM 41 PILOT** reports that having not long passed 'SMOKI', Scottish Control instructed them to descend to FL060, squawk 7000 and contact Wick. They then told them of a Primary Radar contact, 10nm in their left 10 o'clock fast-moving, no height information. The Pilot Flying (PF) (the Captain) looked left but saw nothing. The weather was good with excess of 40km visibility. PF maintained a look-out to the left whilst entering the descent using the auto-pilot. PF then saw the Typhoon, 'ballooning' in the window in the 9 o'clock position closing fast. PF deemed a collision was close, disconnected the auto-pilot, and pushed the nose down to increase separation. The Typhoon's flight path remained constant throughout; straight-and-level. Once assuredly clear of the conflict, the rate of descent was normalised, an Airprox was declared, and communications established with Wick. Both Captain and First Officer were somewhat unsettled by this event; however, the subsequent visual approach to land on RW13 was normal. It was agreed by both pilots that they were within 250 feet +/- 50 feet separation having pushed the nose down; markings on the Typhoon were clear and no pilot's head was seen in the canopy.

He assessed the risk of collision as 'High'.

**THE TYPHOON PILOT** reports that his task was 'Red Air' No3 of a formation for a 2v1 workup sortie. He was unaware of the Airprox until informed during his in-brief after the flight. The Airprox occurred under the Y904 Airway in Class G airspace during a transit to Danger Area (D809). On departure, he was radar identified by RAF Lossiemouth Approach and given a Traffic Service. He was then handed over to Swanwick Military also with a Traffic Service. After departure from RAF Lossiemouth he levelled at FL70 and flew at 350kts until within the Danger Area. On entry to D809, Swanwick cleared him to use the Block FL50 to FL550. No traffic was called on either frequency. The Airprox had apparently occurred shortly after handover to Swanwick Military after he had flown straight-and-level for approximately 20nm. He was No3 of the 3 ship and tasked to go ahead to check the weather.

When it became evident that his transponder was not working he discussed with the Flight Lead whether they should stay as a formation. The Flight Lead had already crewed out and into the spare aircraft. The previous day the same Flight Lead and Wingman ended up using too much fuel avoiding weather and had only partially completed the task so there was a perceived imperative to send the No3 ahead to assure fuel was used wisely. They opined that he could stay VFR, it was clear skies with excellent visibility, and he would fly the short distance to D809 below the Class E Airway at FL70. With hindsight, after a further failure of his radar, this decision contributed to the Airprox; his unserviceable transponder denying the other aircraft's TCAS warning system. Without a working radar, he was also heavily reliant on ATC to call traffic. Because he had multiple failures, he could have upgraded his Air Traffic Service to a Deconfliction Service, which would have placed more onus on ATC to call traffic to him and possibly have avoided the Airprox. His look-out scan was also reduced because he was probably spending too long head-in trying to sort out his radar issue rather than carrying out an effective look-out scan.

**THE SWANWICK N TAC RIGHT CONTROLLER** reports that he had been on console for less than half an hour. He had been called in unexpectedly because he had not been informed that his shift had been changed from a 10am start to a 7am start. He made his way to Swanwick as soon as possible and went onto console as soon as he arrived. After taking over, he was pre-noted and handed a Typhoon at 0825 that was non-squawking. The aircraft was transiting for general handling (GH) within the D809 complex that Swanwick had primacy use of. The aircraft was handed over from Lossiemouth at FL070 prior to heading underneath airway Y904 to remain clear of this Class E airspace. He saw one civil aircraft at FL100 within the airway but he could not recollect its callsign. Because the Typhoon was non-transponding, his attention was diverted towards the Supervisor to clarify the procedures regarding a non-transponder aircraft operating GH with other aircraft that were transponding. Whilst he was distracted, he did not see the other civil track (that he was informed later was the JS41), change squawk and then descend through the Typhoon's level. The Typhoon transited beneath the airway, entered the D809's and commenced GH. His traffic was in Class G airspace in receipt of a Traffic Service throughout the incident. A few minutes later he was informed that the JS41 pilot was filing an Airprox against the Typhoon. Upon watching the radar replay he saw the JS41 squawk 7000 and descend out of the airway on top of his track. The JS41 was within 5nm of the Typhoon's track as soon as it squawked 7000.

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

**THE SWANWICK SUPERVISOR** reports that prior to this incident he had a single controller in position with no traffic. It was brought to his attention that a Typhoon, pre-noted to work in the D809 complex had an unserviceable transponder. The controller asked him to clarify the rules for working in an MDA primary-radar only. After this he listened to the handover from Lossiemouth and heard the plan to take the Typhoon under Y904 (Class E airspace, base level FL75) at FL070, with which he was happy. He did not look closely at the traffic on radar because his controller was only working the one Typhoon pilot and was well within capacity. The Typhoon pilot proceeded into D809 followed by the other two Typhoons playing catch-up, without incident. The Typhoon pilot did not report seeing the conflicting traffic. 10mins later he received a telephone call from Lossiemouth informing him that the JS41 pilot that had just landed at Wick would be filing an Airprox against the Typhoon estimating the separation as 300ft vertically. On questioning, his Tac controller said that he did not remember seeing any aircraft in the airway that came within the limits required to be called under a Traffic Service. A radar replay was requested and viewed which showed the JS41 in Y904 level at FL080 prior to squawking 7000 and beginning descent. The JS41's Mode C indicated FL069 (descending) when the radar contacts merged. The Tac controller was re-briefed on the rules for operating primary only in Class G and E airspace and on other courses of action which could have been utilised to eliminate the incident.

**THE LOSSIEMOUTH APPROACH RADAR CONTROLLER** reports that she was watching the departure of the Typhoon from Lossiemouth. She was not aware that his transponder was unserviceable until he came onto the Departures frequency. The Deps controller applied a Basic Service and instructed a climb to FL150 as requested while liaison took place with Swanwick Mil to see whether they could accept him in D809. All of the Typhoon pilot's transmissions were heavily

clipped and, at approximately 15nm from Lossiemouth, the aircraft changed frequency unannounced to stud 4 [preselect frequency 4] to improve communications. The Typhoon pilot informed the controller that he was levelling at FL070 and was asked if he would be VFR through the Class E airspace to which he said he would be VMC but would remain at FL070 to transit underneath the airway. At this point, the Supervisor was on the telephone to Swanwick Mil and requested that he open the line to complete a handover to the controller. She gained the TACAN range and bearing from the Typhoon pilot and identified him under a Traffic Service in order to facilitate the handover. She could see two squawks in the Class E airspace approximately 15nm southeast of the aircraft but the two data-blocks were merged so she did not observe their height readouts. She completed a full radar handover with Swanwick Mil with no issues and instructed the Typhoon pilot to contact Swanwick Mil on the pre-brief frequency. It was only a couple of minutes later when the two aircraft returns in the Class E airspace separated, that it became apparent that one had levelled off at the same reported level of the Typhoon, under a 7000 squawk. The two primary returns were converging and eventually merged, with the contact showing serviceable SSR displaying a marked dip in height. As the confliction became apparent, the Lossiemouth Supervisor attempted to call either Swanwick Mil or Wick to make them aware of the situation but was unable to gain communication.

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

**THE LOSSIEMOUTH SUPERVISOR** reports that the Typhoon pilot was handed over to Swanwick Military by the Lossiemouth Approach controller after the pilot had free-called Lossiemouth Approach on departure from Lossiemouth because it had been experiencing 2-way UHF communication issues on the Departures frequency. The Typhoon was northeast of Lossiemouth by approximately 15nm tracking 035°, non-squawking and level at FL070 with no conflicting traffic when the handover was completed. A short time later, the Moray sector controller at the NATS Centre at Prestwick called him for Traffic Information on 2 aircraft northeast of Lossiemouth tracking 040° (the other two Typhoons) and, during this conversation, the Moray controller asked if he knew which the non-transponding aircraft was 15nm ahead of them. He informed him that it was a single Typhoon (the Airprox aircraft) wherein the Moray controller informed him that the Typhoon had been involved in an Airprox with the JS41 approximately 25nm northeast of Lossiemouth. He initiated the appropriate actions and informed the Swanwick Mil Supervisor because they were controlling the Typhoon pilot at the time of the Airprox. Between these 2 events, he was monitoring the aircraft tracks of the Typhoon and what later transpired to be the JS41, and saw that the JS41 had changed its squawk to 7000 as it descended through about FL78. This indicated to him the possibility that it had been transferred to Wick ATC Procedural control (no radar at Wick) and he could see that both aircraft returns would merge with the JS41's Mode C at, or very close to, the last reported level of the Typhoon. Because both aircraft were under the control of other ATC agencies providing them with an ATS, he did not have enough situational awareness from the information available to suspect that the aircraft were flying into direct confliction vertically without being visual with each other. He did attempt to call Wick ATC to ask if they had had Traffic Information on the Typhoon but they did not answer the landline.

**THE PRESTWICK CENTRE (PC) MORAY-LO TACTICAL/PLANNER** reports that at approximately 0825 he instructed the JS41 pilot to descend out of Class E airspace airway Y904 for arrival to Wick. As he terminated the Radar Service and transferred the aircraft he noticed a primary contact consistent with that of a fast-moving jet. Due to the proximity of Lossiemouth, an active danger area, and another set of transponding jets following a similar route in trail, he immediately followed the transfer instruction with Traffic Information [to the JS41 pilot] about the unidentified primary contact. He mentioned that the target was primary only, but appeared to be crossing behind (he was unable to assess this as accurately as an SSR contact because it is not possible to use the 'predict vector' without SSR returns). He then gave Traffic Information to a pilot behind and above the JS41. He believed at this point that the fast-jet aircraft may have been above the Class E airspace airway and informed the pilot of this. He also mentioned that he did not believe it to be in the airway due to the slight protection offered by Class E. Shortly afterwards, it was ascertained that the JS41 pilot had obtained visual contact with the military jet. The JS41 pilot reported that it was as close as 300ft with no attempt to adjust its flight to increase the separation. The JS41 pilot mentioned that if he had not started his descent that it would have been "very close". He asked the JS41 pilot if he would be filing paperwork on the event to which he replied 'Yes'. He then called Lossiemouth to attempt to identify

the military jet. It was his understanding that this event took place in Class G airspace approximately 25nm southeast of Wick.

## Factual Background

The weather at Wick was recorded as follows:

EGPC 140820Z 16008KT 9999 FEW012 16/13 Q1012=

A transcript of the Scottish Control frequency was provided, as follows:

From	To	Speech Transcription
JS41	Scottish	Scottish good morning [JS41 C/S] flight level eight zero direct SMOKI
Scottish	JS41	[JS41 C/S] Scottish roger thanks it's class echo radar control
JS41	Scottish	Class echo radar control [JS41 C/S] (0815:40)
Scottish	JS41	[JS41 C/S] descend when ready flight level six zero
JS41	Scottish	Descend whe- descend when ready flight level six zero (0823:20) [JS41 C/S]
Scottish	JS41	And er [JS41 C/S] squawk seven thousand, this service terminates er contact Wick approach one one nine decimal seven, they expect you descending six zero
JS41	Scottish	Seven thousand and Wick one one nine decimal seven and with the clearance [JS41 C/S]
Scottish	JS41	Thanks and [JS41 C/S] actually just before you go I've got a fast moving primary contact (0823:40) just to your er ten o'clock, range about seven miles at the moment, there's er no mode charlie no height information but it appears to be crossing just about a mile or two behind you
JS41	Scottish	Roger [JS41 C/S]
Scottish	SF340	Thanks er [SF340 C/S] Scottish
SF340	Scottish	Go ahead
Scottish	SF340	Okay er that fast moving primary contact er is (0824:00) just your ten o'clock at the moment, range about five miles, no height information, tracking northeast, crossing with you er no transponder implies he shouldn't be within the airway though
SF340	Scottish	Roger [SF340 C/S]
JS41	Scottish	[JS41 C/S] er to Wick now one one nine seven
Scottish	JS41	Affirm do you see anything to the er nine ten o'clock (0824:20) by any chance?
JS41	Scottish	Negative [JS41 C/S]
Scottish	JS41	Okay well just keep look out, you can contact Wick approach one one nine seven thanks for your help
JS41	Scottish	Right thank you one one nine decimal seven [JS41 C/S] bye (0824:40)
Scottish	SF340	Er [SF340 C/S] that jet's er just crossing with you right at the moment, it could be underneath or above you, I believe it is a fast jet heading to the danger area to the northeast
SF340	Scottish	Yeah visual he just er passed below the nose there [SF340 C/S] a good couple of thousand feet (0825:00) below
Scottish	SF340	Roger thanks are you visual with the traffic into Wick by any chance?
JS41	Scottish	[part simultaneous transmission] [partial JS41 C/S]
SF340	Scottish	[part simultaneous transmission] he's just below the nose, I can't see him now
JS41	Scottish	[JS41 C/S]
Scottish	JS41	Er yeah did you get visual with the jet?
JS41	Scottish	Yeah was very close, was about four hundred feet just over us
Scottish	JS41	Roger thanks are you making a report (0825:20)
JS41	Scottish	Yes please [JS41 C/S]

From	To	Speech Transcription
Scottish	JS41	Roger thanks er I'll put an observation my end and now you were outside controlled airspace for it but I'll, I'll definitely report on it anyway
JS41	Scottish	Alright we go to Wick now one one nine seven thanks
Scottish	JS41	[unintelligible] affirm thanks
JS41	Scottish	[change of voice] Last minute he made no appearance to deviate from flight path, I had to take the autopilot out and start (0825:40) descending, erm otherwise that would have been really close
Scottish	JS41	Er okay [JS41 C/S] could you er possibly call the centre when you land then, I'll speak to you later
JS41	Scottish	Affirm wilco [JS41 C/S] thanks

## Analysis and Investigation

### CAA ATSI

ATSI had access to reports from the pilots of the JS41 and the Typhoon, the Prestwick Centre air traffic controller involved, and the local unit investigation. The area radar and radio recordings were also reviewed. Screenshots produced in this report are provided using recordings of the Prestwick MRT Radar. Levels indicated are Flight Levels (FL). All times UTC.

At 0823:12 (Figure 1) the MOR-LO (Moray Low) controller issued a clearance to the JS41 pilot to descend when ready to FL60 (and therefore leave controlled airspace), and terminated the service. An instruction to contact Wick Approach was then given.

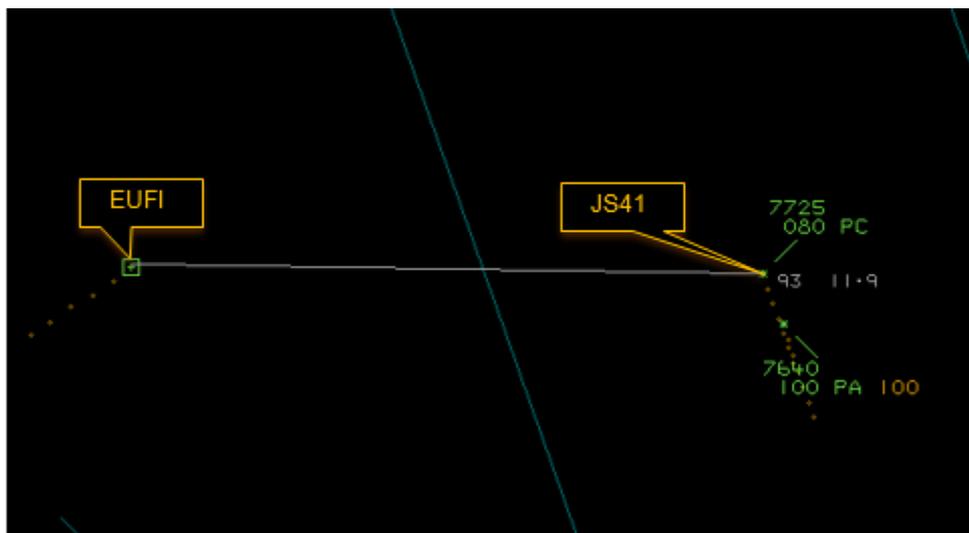


Figure 1 – 0823:12

At 0823:37 (Figure 2), the MOR-LO controller, (after receiving the read-back of the previous instruction), issued Traffic Information to the JS41 pilot about a fast-moving contact approaching from the west. There was no height information available on the primary-only Typhoon track (labelled as EUFI on the diagram but unknown to the MOR-LO controller at the time). The controller estimated that the track's trajectory would take the unknown aircraft behind the JS41 by one to two miles; he advised the JS41 pilot of this. The controller went on to issue the same Traffic Information to an SF340 not involved in the Airprox (SF34 - code 7640), which was on a similar track to the JS41 but 2000ft higher, commenting that it was not known whether the unknown traffic was above or below the airway.

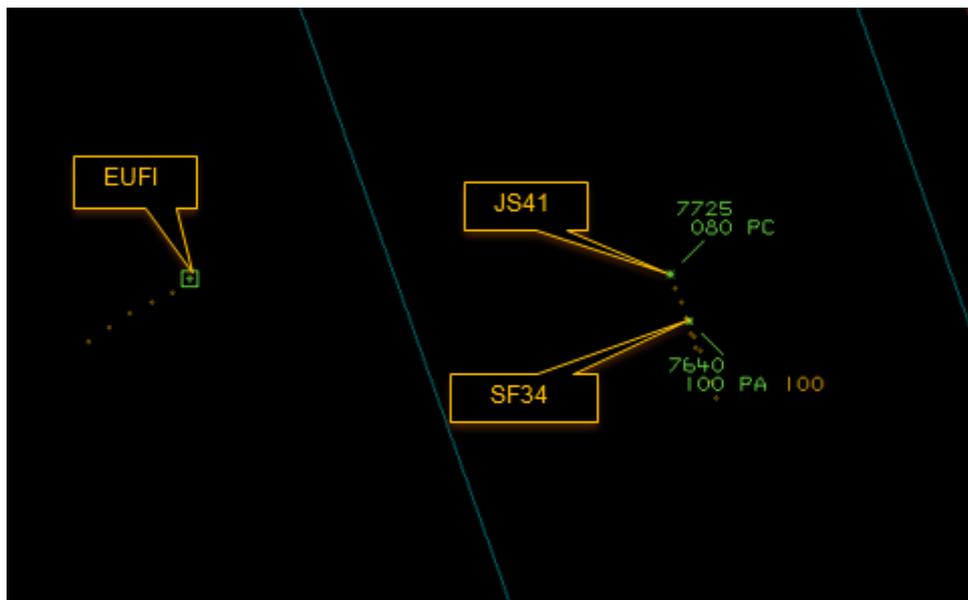


Figure 2 – 0823:37

At 0824:16 (Figure 3) the JS41 pilot called to confirm that they could still call Wick, and the MOR-LO controller queried if they had seen the traffic yet, advised them to keep looking out, and gave approval to contact Wick. The SSR code changed to 7000 as they began their descent to leave controlled airspace (the base of which was FL75).

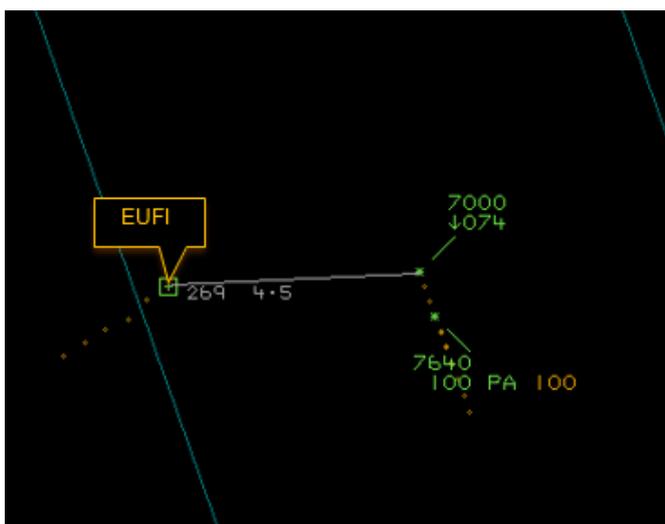


Figure 3 – 0824:16

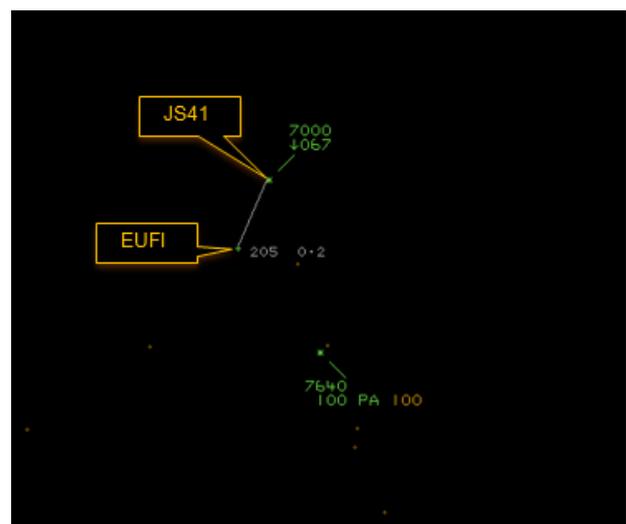


Figure 4 -0824:56

CPA occurred on the recording at 0824:56 (Figure 4) with an indicated lateral distance of 0.2nm.

Following CPA the JS41 pilot reported back on the MOR-LO frequency stating that they had seen the Typhoon and that the captain had taken the aircraft out of autopilot and had manually increased the rate of descent, initially reporting a vertical separation of approximately 400ft. The SF340 pilot also reported sighting the Typhoon and that it flew under their nose at least 2000ft below them (they were at FL100).

Y904 is a Class E airway, which is considered controlled airspace; the base of Y904 is FL75 and the top is FL155. The JS41 was inbound to Wick and was descending outside controlled airspace in line with normal operating procedures. The Moray controller had issued a transfer of communication instruction to the JS41 pilot just as he became aware of the primary-only radar contact approaching from the west. The descent instruction given to the JS41 pilot had been issued when the unknown contact was 11nm west of the JS41. The controller began providing

Traffic Information as soon as was feasible once the JS41 pilot had read-back the instruction to change frequency, at which point the Typhoon was still 9nm west of the JS41.

The JS41 pilot had been under a Radar Control Service and although that ATC service had been terminated, the Moray controller still passed Traffic Information on what he considered to be a conflict as the JS41 left controlled airspace. It was fortunate that the JS41 pilot had not yet changed frequency and that the controller's Traffic Information provided enough time for the JS41 pilot to assimilate the potential conflict and begin to look for the Typhoon. The vigilance of the Moray controller, despite having no SSR data or co-ordination with either Lossiemouth or Swanwick Mil, enabled timely Traffic Information to be passed to the JS41 pilot. This resulted in an avoiding action descent being implemented by the crew of the JS41 on sighting the Typhoon. Analysis of the radar data showed that the JS41 was initially descending at a rate of approx 900-1000fpm but this temporarily increased to approx 2800fpm. The JS41 pilot's initial estimate of 400ft vertical separation is credible given that the recorded radar data at CPA indicates the JS41's level as FL67 and the Typhoon pilot had previously reported being level at FL70.

### Military ATM

An Airprox occurred at approximately 0825, 30nm southeast of Wick, between a JS41 and a Typhoon; the Typhoon pilot was receiving a Traffic Service from Swanwick Mil while in transit from RAF Lossiemouth to its operating area. Figures 5-10 show the positions of the JS41 and the Typhoon at relevant times in the lead up to, and during, the Airprox.

At 0821:31 (Figure 5), the primary contact of the Typhoon first began to paint on this radar picture.

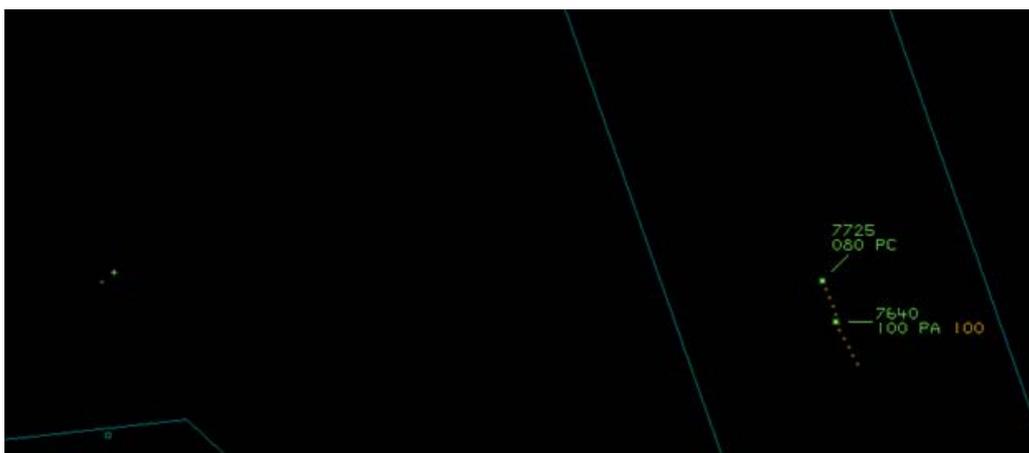


Figure 5: Geometry at 0821:31 (Typhoon primary only; JS41 7725).

At 0823:25 (Figure 6), the Lossiemouth Approach controller began handing over the Typhoon to the Swanwick Mil North controller.

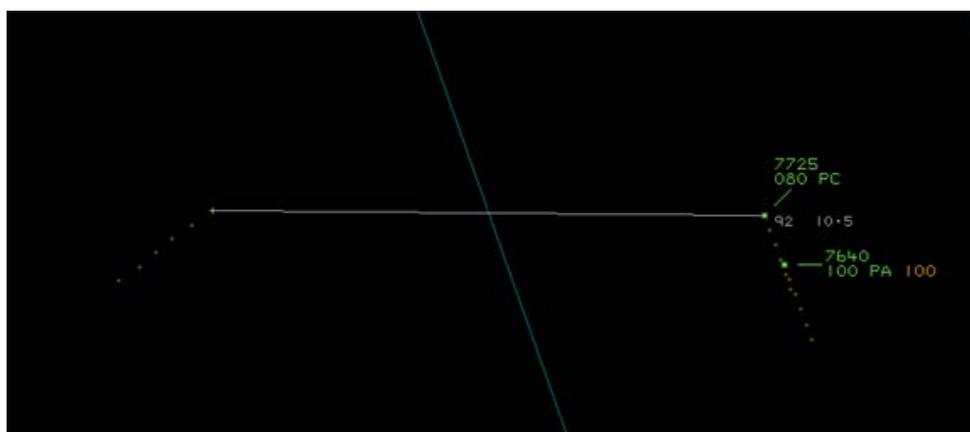


Figure 6: Geometry at 0823:25 (Typhoon primary only; JS41 7725).

At 0823:43 (Figure 7), the handover of the Typhoon was completed without either the Lossiemouth or Swanwick Mil North controller mentioning the JS41 traffic 8.3nm away and 1000ft above, and inside Controlled Airspace. The JS41's SSR code had changed by one digit during this time.

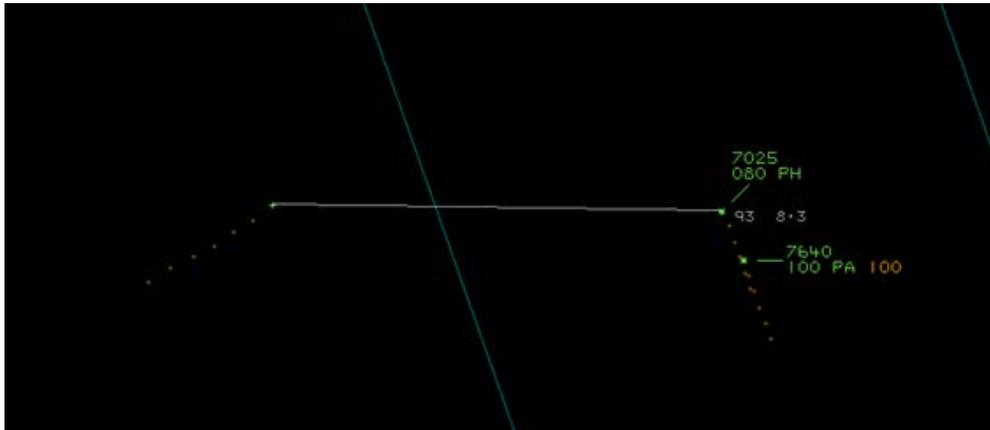


Figure 7: Geometry at 0823:43 (Typhoon primary only; JS41 7025).

At 0823:57 (Figure 8), the Typhoon pilot checked in with the Swanwick Mil North controller. By this time, the JS41 had changed SSR code to 7000 and had commenced descent.

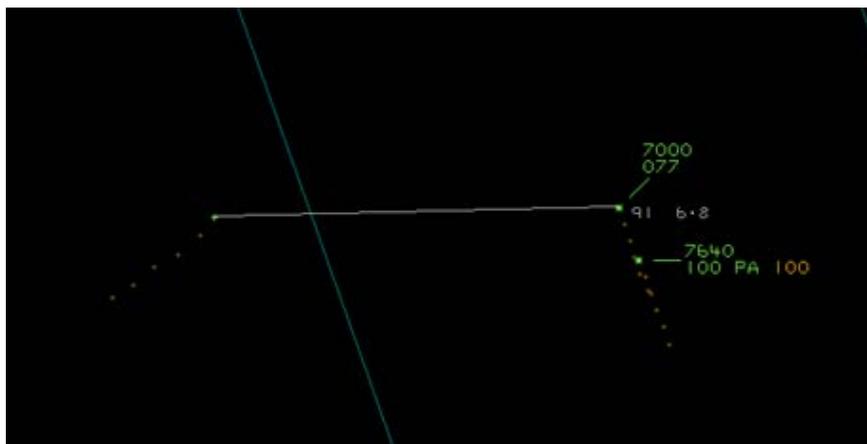


Figure 8: Geometry at 0823:57 (Typhoon primary only; JS41 7000).

At 0824:47 (Figure 9), the two aircraft were co-altitude [the Typhoon pilot had reported being level at FL70], with the JS41 now outside CAS.

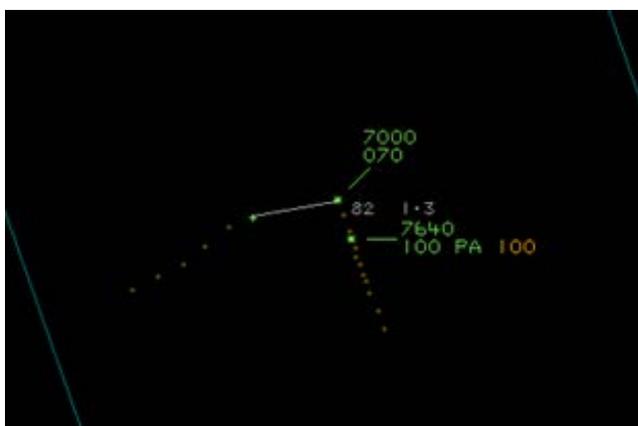


Figure 9: Geometry at 0824:47



Figure 10: Geometry at 0824:56

At 0824:56 (Figure 10), the two aircraft were in proximity, with the JS41 300ft below the Typhoon [reported at FL70].

Although the Typhoon pilot was aware on the ground, Lossiemouth ATC were not informed that the Typhoon's transponder was unserviceable until the aircraft was airborne and came onto the Departures frequency, where the situation was exacerbated by all its transmissions being clipped. While the Departures controller began liaison with Swanwick to ascertain whether they would be able to accept the Typhoon for the planned sortie, the pilot switched to Lossiemouth Approach unannounced, in order to improve communications.

The Lossiemouth Approach controller established that the Typhoon would transit beneath controlled airspace at FL70, identified the aircraft, and applied a Traffic Service before commencing handover to Swanwick Mil North. Although she saw that there were two civil aircraft within airway Y904 (Class E), the data blocks were overlapping and the Lossiemouth Approach controller did not assimilate that there was an aircraft (the JS41) in transit 1000ft above the Typhoon's reported level. No Traffic Information was passed to the Typhoon pilot on the JS41 prior to or during the handover to Swanwick Mil North, and the receiving controller did not question whether or not Traffic Information had been passed, as would be expected if there was a conflict identified. On completion of the handover, the two aircraft had 8.3nm lateral and 1000ft vertical separation and were on converging tracks. CAP 774 states that Traffic Information should be passed by range 5nm if traffic will pass within 3nm and 3000ft, therefore it was reasonable to expect that Traffic Information would be passed by the Swanwick Mil North controller.

The Swanwick Mil North controller had not been made aware of a shift change (from a 10am to a 7am start) and had therefore been called in earlier than expected and reported feeling less positive than normal. Having taken control of the transiting Typhoon, he began a discussion with his Supervisor to clarify the procedures for controlling non-transponding aircraft. Although the controller reported seeing aircraft within Y904 at FL100 and FL80, they held a mental model that both would maintain their levels. Although an equipment replay showed that the controller hovered their cursor over the JS41's label on several occasions (with such behaviour usually indicating that a controller has noticed something relevant), the controller stated that they did not see the JS41 change SSR code and then descend from FL80 through the Typhoon's level, citing distraction by the conversation. The fact that no Traffic Information was passed to the Typhoon pilot, who was converging at FL70, indicates that the controller did not assimilate the information displayed in the JS41's label. The unexpected lack of transponder led to confusion and distraction of the Swanwick Mil North controller, who then needed to adapt their plan and clarify procedures for this less common scenario. They also did not manually label the non-transponding Typhoon, which would normally be expected and may have alerted him to the conflict with the JS41. This overall lack of familiarity with the scenario of non-transponding aircraft, coupled with preparation for receiving a following pair of Typhoons, drew the controller's attention away from the developing conflict.

The Swanwick Mil North Supervisor was assisting the Swanwick Mil North controller from an adjacent seat. Although he was listening in, he was not viewing a radar screen and recalled his focus being on the protracted handover and conversation with the controller to confirm that the non-transponding aircraft could be accepted for the sortie. The Lossiemouth ATC Supervisor observed that there was a likely conflict that could lead to an Airprox and attempted to contact Wick ATC to pass information; however, the line was unanswered and the JS41 pilot had remained on frequency with the Moray controller.

An in-depth investigation, with contribution from all parties involved in the Airprox, found multiple contributory factors, from equipment failures and poor communication through to distraction and loss of situational awareness. Of the six recommendations made, three were designed to reduce the effects on ATS provision. It has been requested that Typhoon operators pass relevant aircraft limitations and departure plan changes to ATC prior to or during taxi in order that the correct planning can be effected before they are airborne. Swanwick controllers will practice non-transponding aircraft operations as part of their events-based currency after the next simulator exercise update. A final recommendation was for Swanwick to ensure that its system for notification of rosters changes is optimised in order to reduce the number of late changes.

## UKAB Secretariat

The JS41 and 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<sup>1</sup>. The incident geometry was converging and the Typhoon pilot was required to give way to the JS41<sup>2</sup>.

## Comments

### HQ Air Command

The Typhoon pilot had planned and briefed this mission in accordance with extant regulations and procedures and, when it became apparent that the transponder was unserviceable, considered a number of impacts that this had and adjusted the mission plan accordingly. There is no current regulation that prohibits an aircraft launching with an unserviceable transponder (with certain caveats on the type of airspace to be penetrated and the level at which the aircraft intends to operate); indeed, there are even ATC procedures to facilitate the provision of Air Traffic Services to non-transponding aircraft. A wide-ranging safety investigation was conducted by the unit concerned and the investigators were also permitted to interview the civil controller and the pilot of the Jetstream. A number of recommendations have been made, including a revision of the guidance for local controllers when handling non-transponding aircraft and emphasising the importance of informing ATC when notified departure details and intentions are changed. Furthermore, higher-level orders concerning launching with a known transponder failure have been reviewed and, where necessary, amended in order to reduce the likelihood of a recurrence of the circumstances leading to this incident. A major lesson to take from this Airprox is how a lack of SSR information increases the workload of all those that would usually expect to have access to that information. All controllers involved had to devote extra effort to establishing exactly where the aircraft was (in 3 dimensions) and what its pilot's intentions were. The Moray controller is to be applauded for his persistence in calling the contact to the Jetstream pilot in a location where it is quite common for fast-jet traffic to be seen at low-level; it is this persistence that cued the Jetstream pilot's eyes onto the conflicting Typhoon with sufficient time for him to take action to increase separation. This incident also highlights once again the importance of lookout as a barrier to MAC, as other barriers – namely TCAS and ATS in this example – may be weakened or missing entirely without any warning to other pilots.

## Summary

An Airprox was reported when a JS41 and a Typhoon flew into proximity at 0825 on Wednesday 14<sup>th</sup> June 2017. The JS41 pilot was operating under IFR in VMC. He had been in receipt of a Radar Control Service from Scottish Control but, at the time of the Airprox was being transferred, outside CAS, to a non-radar ATSU. Traffic Information was issued about the Typhoon before the JS41 pilot had left the Scottish Control frequency. The Typhoon pilot was operating under VFR in VMC, in receipt of a Traffic Service from Swanwick Mil, but with SSR failed which rendered him a primary-only track on ATC radars.

## **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 Moray-Low Sector controller. The Board noted that he had been providing a Radar Control Service to the JS41 pilot, who was routing northbound on Airway Y904 (Class E airspace) at FL80. The JS41 was inbound to Wick and had been released to contact Wick ATC at 35DME and cleared to descend, 'when ready', to FL60. This clearance would take the JS41 outside CAS (the base of Y904 was FL75) for the approach to Wick, which is situated outside

<sup>1</sup> SERA.3205 Proximity.

<sup>2</sup> SERA.3210 Right-of-way (c)(2) Converging.

CAS. Shortly after issuing this release, the controller advised the JS41 pilot that radar service was terminated, to squawk 7000 and to contact Wick; the JS41 was still at FL80 at that time. Members commented that the radar recordings showed that there was a primary-only track (the subject Typhoon) 15nm northeast of Lossiemouth, in the JS41's 10 o'clock position at 12nm at the time but that this traffic was not 'known' to the Moray controller. However, having subsequently noticed this track, and as soon as the JS41 pilot had readback the descent clearance, the controller issued Traffic Information about the fast-moving primary traffic (the Typhoon) in his 10 o'clock, range about 7nm (actually 9nm), which appeared to be crossing a mile or two behind. Fortunately the JS41 pilot had not yet left the frequency and heard and acknowledged the information. The JS41's Mode C indicated that, at this point, it was now descending out of FL80 and, as the JS41 left CAS below FL75, the Typhoon was 5nm from it, on a conflicting track. The JS41 pilot reported transferring to Wick and the Moray controller asked if the pilot could see any traffic in his 9 or 10 o'clock. The JS41 pilot reported that he did not have visual contact and was advised to keep a good look-out. Some Board members wondered if the Moray controller could have taken action to keep the JS41 within the protection of CAS once he saw the potential confliction. Although the level of the track was unknown, it should not enter Airway Y904 (Class E airspace) without a transponder, and they opined that the controller could have instructed the JS41 to climb back into the safety of Y904. However, ATC members considered that the controller's actions were appropriate given that the controller did not know the height of the track and could have reasoned that the primary-only traffic was operating at low-level because this was not an unusual scenario in that area. They felt that he had satisfied his remit by issuing Traffic Information about the track to the JS41 pilot before he had left CAS and commended him for his persistence in updating the Traffic Information until the JS41 pilot was visual with the Typhoon. They further added that, if the JS41 pilot had been concerned he could himself have delayed his descent and remained at FL80 within the Airway given that he had been cleared to descend 'when ready'.

For his part, the JS41 pilot did not seem overly concerned by the Traffic Information at the time because he reported changing to Wick before he had established visual contact with the Typhoon. Some members wondered whether this was because the Moray controller had informed him that the track would pass behind, or perhaps the JS41 pilot had also assumed that the track was probably either at low-level or above Y904. In transferring to Wick, the JS41 pilot would have been aware that the Wick controller would not have been able to update him about the position of the conflicting track because Wick is not equipped with radar surveillance equipment. The Board noted that pilots operating flights to airports outside CAS that are not equipped with radar would be operating in a 'see-and-avoid' environment, and that their operating authorities would presumably have taken this into account during their risk management analysis. In this respect, although the JS41 had a TCAS capability, it could not provide protection against non-transponding aircraft such as the Typhoon in this incident. In the event, the Traffic Information given by the Moray controller had cued the JS41 pilot to seeing the Typhoon, albeit late, because the PF had maintained a look-out to the left whilst they descended.

The Board then turned its attention to the Swanwick Mil N Tac controller's actions. The Board noted that he had reported being called into work for an earlier start-time than expected but, other than affecting his mood, there was no suggestion that this had affected his ability to carry out his operational duties. At the time of the Airprox, he was controlling only one flight (the Typhoon), and this would normally be well within his capabilities. Members noted that he had received a pre-note of the Typhoon departing Lossiemouth for D809 and, subsequently, received a telephone call from Lossiemouth identifying and handing over the traffic. Although he was informed that the Typhoon's transponder was unserviceable, no mention was made by either controller about the traffic in Y904 (the JS41 at FL80 and further traffic behind at FL100). The Board opined that if this had been mentioned then it would probably have been agreed between them whether either the Lossiemouth or the Swanwick controller would pass Traffic Information to the Typhoon pilot in accordance with CAP774. At the completion of the handover, the Typhoon and JS41 were 8.3nm apart, with the Typhoon pilot reporting being level at FL70. In such circumstances, CAP774 calls for Traffic Information to be passed by 5nm. On contact, the Swanwick controller provided the Typhoon pilot with a Traffic Service and the Typhoon pilot reported maintaining FL70, but no Traffic Information was passed to the Typhoon pilot. The radar recordings showed that the two aircraft were then 6.8nm apart and the JS41 had changed squawk to 7000, commenced descent and was passing FL77. The

Swanwick controller reported that, during this period, he became distracted by discussing with the Supervisor the procedure for aircraft operating in D809 without a transponder. The investigation reports indicated that the controller had hovered his cursor over the JS41 at FL80 (and was therefore aware of it in the airway), but the distraction of the conversation with the Supervisor about the lack of SSR and likely preparation for receiving two more Typhoons on frequency meant that he did not assimilate that the JS41 had changed squawk and had started to descend. The Board considered that contributory factors to the Airprox were therefore that the Swanwick controller was distracted by the lack of Typhoon SSR and did not assimilate that the JS41 was descending. Also, it was considered that the lack of Traffic Information by the Swanwick controller to the Typhoon pilot about the aircraft in Y904 was another contributory factor. Military Controller members commented that it was usual practice for controllers to manually label a non-transponding aircraft such as the Typhoon on their radar screens so as to provide a reminder of their altitude but that this did not happen. Notwithstanding, they commented that whether this would have helped the controller identify the potential conflict could not be known, and it would not have shown on the Moray Sector controller's display anyway.

Turning next to the actions of the Typhoon pilot, the Board was then briefed by the HQ Air member on the circumstances leading up to the Airprox relative to the Typhoon's operation. The Board were informed that the Typhoon pilot had been aware before taxiing for departure that his transponder was not working, and had checked with his Flight Lead whether to proceed with the mission. Noting that their task had been only partially completed the previous day, the HQ Air member commented that there may have been a certain amount of pressure to complete the sortie. Notwithstanding, he confirmed that, except for certain circumstances (such as entry into controlled airspace), there was no requirement at the time for Typhoon aircraft to fly with a serviceable transponder and so the Typhoon pilot's decision not to do so did not contravene any rules or procedures. Members noted this but commented that it was presumably unusual for Typhoon's not to operate with a serviceable transponder, and that had the Typhoon pilot informed Lossiemouth ATC at an early stage then this information could have been passed to Swanwick ahead of his departure; this might have prevented the distraction subsequently caused to the Swanwick controller, and would also have allowed him to liaise with the Moray controller about the Typhoon's lack of altitude information. The Board underlined that the implications of the Typhoon's lack of SSR information were that the Moray controller had no altitude information with which to provide deconfliction advice, and that TCAS was not available to the JS41; the lack of Typhoon SSR was thus considered to be a contributory factor to the Airprox.

Once airborne, members noted that the Typhoon pilot had then experienced further problems: he could not establish satisfactory communication with Lossiemouth Departures (and had therefore had to change autonomously to the Approach Radar frequency), and had also suffered a radar failure. Recognising that this now placed him in a high workload situation that appeared to result in him being more 'head-in' the cockpit (which had then reduced his capacity to see-and-avoid), they noted that he had sensibly requested a Traffic Service intended to afford him more information from ATC. It had been unfortunate that this information had not been forthcoming, but members reiterated that such information was intended only to supplement collision avoidance by the pilot, and that it remained the Typhoon pilot's fundamental responsibility in Class G airspace to avoid collisions primarily by maintaining a robust lookout at all times. Although he was not aware of the JS41 and therefore could not comply, members noted that, ultimately, it was for the Typhoon pilot to give way to the JS41, which was converging on his right.

Notwithstanding the contributory ATC issues that had influenced events, the Board quickly and unanimously agreed that, because they were both in the see-and-avoid environment of Class G airspace, the cause of the Airprox had been a late-sighting by the JS41 pilot and a non-sighting by the Typhoon pilot. The Board then turned its attention to the risk and noted that, although the two aircraft had passed close to each other horizontally, it seemed from the JS41 pilot's report that, after his manoeuvre, they had probably been separated by about 300ft vertically. Although this was clearly a worrying incident, the Board did not consider that it represented a situation where separation had been reduced to the minimum (risk Category A); the JS41 pilot had seen the Typhoon, albeit at a late stage, and had taken action, subject to the capability of his aircraft, to increase vertical separation.

Consequently, it was assessed that, although safety margins had been much reduced below the norm, the incident was risk Category B.

The Board were heartened to hear from the military members that the handling of non-transponding aircraft is now included within the Swanwick Mil controller training scenarios, and that Typhoon departures without a serviceable SSR are now not permitted other than for exceptional operational requirements.

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

**Cause:** A late sighting by the JS41 pilot and a non-sighting by the Typhoon pilot.

**Contributory Factors:**

1. A lack of Traffic Information to the Typhoon pilot by the Swanwick controller.
2. Typhoon SSR unserviceability meant Moray had no altitude information, and TCAS was not available to the JS41.
3. The Swanwick controller was distracted by the lack of Typhoon SSR.
4. The Swanwick controller did not assimilate that the JS41 was descending.

**Degree of Risk:** B.

### **Safety Barrier Assessment<sup>3</sup>**

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

#### **ANSP:**

**Regulations, Processes, Procedures and Compliance** were considered as **partially effective** because the Swanwick Mil North controller did not manually label the non-transponding Typhoon, which would normally be expected, and neither he nor the Lossiemouth controller passed TI to the Typhoon pilot about the traffic in Y904.

**Situational Awareness and Action** were assessed as **ineffective** because the controllers were not aware of the potential conflict between the two aircraft; this was exacerbated by the fact that the Typhoon was not transponding.

**Warning System Operation and Compliance** was **ineffective** because it relied on both aircraft transponding.

#### **Flight Crew:**

**Tactical Planning** was assessed as **partially effective** because the Typhoon pilot did not inform Lossiemouth ATC prior to departure that his transponder was not functional. This would have allowed ATC extra time to coordinate a plan.

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<sup>3</sup> The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the [UKAB Website](#).

**Situational Awareness and Action** were considered as **partially available** because only the JS41 pilot was issued with Traffic Information, which was not able to include the Typhoon's level.

**Warning System Operation and Compliance** were assessed as **ineffective** because the Typhoon was not transponding.

**See and Avoid** was **partially effective** because the JS41 pilot obtained only a late sighting of the Typhoon and was able to take emergency avoiding action; but the Typhoon pilot did not observe the JS41 at all.

