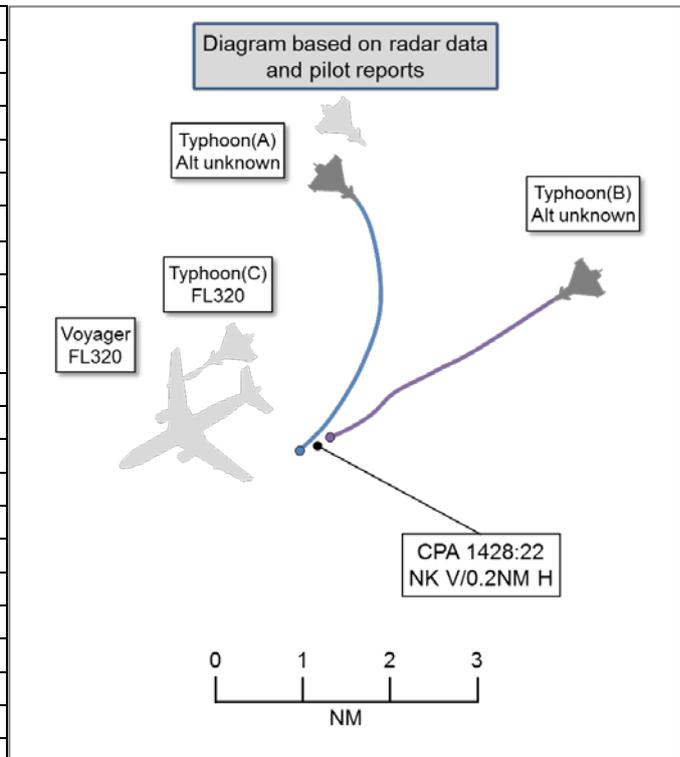


AIRPROX REPORT No 2019329

Date: 05 Dec 2019 Time: 1428Z Position: 5757N 00103W Location: 50NM NE Aberdeen

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Typhoon(A)	Typhoon(B)
Operator	HQ Air (Ops)	HQ Air (Ops)
Airspace	AARA 4	AARA 4
Class	C	C
Rules	IFR	IFR
Service	Radar Control ¹	Radar Control ¹
Provider	Swanwick(Mil)	Swanwick(Mil)
Altitude/FL	NK	NK
Transponder	Standby (as per SOP)	Standby (as per SOP)
Reported		
Colours	Grey	NR
Lighting	Nav lights, strobes	NR
Conditions	VMC	VMC
Visibility	>10km	NR
Altitude/FL	FL310	FL310
Altimeter	1013hPa	1013hPa
Heading	180°	NR
Speed	350kt	NR
ACAS/TAS	Not fitted	Not fitted
Alert	N/A	N/A
Separation		
Reported	0ft V/0.3NM H	0ft V/0.3NM H
Recorded	NK V/0.2NM H	



THE TYPHOON(A) PILOT reports that, upon joining the tanker, his formation joined in front of another aircraft that was joining the tanker at the same time, crossing its level in the process. His post-mission debriefing and analysis confirmed that his formation appeared in the windscreen of Typhoon(B), co-level, and at a range of approximately 1800ft. The Typhoon(B) pilot had radar situational awareness (SA) on them joining at much greater range, but switched his attention to the visual join on the tanker. The Typhoon(B) pilot's SA was next updated when Typhoon(A)'s formation appeared visually in front of him in his windscreen. The Typhoon(A) pilot's situational awareness (from radar, MIDS² and ATC) was that the tanker had '2 chicks in tow'. They were cleared to join at FL310 by Swanwick(Mil) and then changed to the boom frequency. They were surprised to see only one aircraft [Typhoon(C)] behind the tanker when they acquired it visually during the join. On check-in on the boom frequency, it immediately became apparent that they had cut-in ahead of another aircraft that was in the process of joining the tanker. The Typhoon(B) pilot reported (on the boom frequency) that he was visual with them. They were not visual with Typhoon(B) at any point because they were 'belly-up' during the join and he was now in their 6 o'clock. The tanker then re-ordered the formation for them to join ahead of Typhoon(B). The Typhoon(A) pilot's main concern was that they were cleared to a level that was not vacated and it would seem that SA had broken down between all aircraft involved and ATC. It was by luck, rather than judgement, that the 2 aircraft didn't conflict, co-altitude, with Typhoon(B) at a much closer range. In addition to being given a conflicting joining level, there were several aggravating factors:

Not all aircraft had functioning MIDS; the air-to-air TACAN link was not established between Typhoon(A) and the tanker; they changed to the boom frequency relatively late; the tanker was late on-task, meaning the planned AAR³ slots were not running as scheduled – some of the Typhoons had been made aware

¹ The Typhoon pilot was technically under Radar Control as part of the Voyager formation.

² Multifunctional Information Distribution System.

³ Air-to-Air Refuelling.

of this but the Typhoon(A) formation had not, and arrived on-time for their scheduled slot; the other planned formations on the tanker tasking had suffered aircraft unavailability fall-out, confusing the plan further.

The pilot assessed the risk of collision as 'Medium'.

THE TYPHOON(B) PILOT reports that he was cleared by Swanwick(Mil) to FL290 prior to switching to the tanker's boom frequency. At this point, Typhoon(C) was ahead of him and cleared to FL300. The Typhoon(A) formation then came up on the frequency and were cleared to FL280. On contacting the tanker, he was cleared to remain at FL290 and then, once cleared, to expect to climb to FL310. He became visual with the tanker at 3 miles trail and was cleared by the tanker to join visually. The Typhoon(B) pilot then called that he was leaving FL290 for FL310 while he continued to close on the tanker, which was at FL320. At 2 miles trail, the Typhoon(A) formation came up on the tanker frequency requesting to join at FL310. At this point, he was now established at FL310 and, from previous radar SA on the Typhoon(A) formation, knew they were joining from the head sector to his right. He looked right and saw the pair of Typhoons, co-altitude, approximately half-way way around their final turn onto the tanker. He selected his throttles to idle and carried out a small weave in order to build range. Throughout this turn, the tanker crew was trying to establish if the Typhoon(A) formation's pilots were visual with Typhoon(B). The Typhoon(A) pilot called visual with the tanker and one chick in trail (Typhoon(C)). The Typhoon(B) pilot then called visual with the Typhoon(A) formation and that he would remain clear. At this point, the tanker crew cleared the Typhoon(A) formation to continue their join and cleared the Typhoon(B) pilot to descend to FL300. The range between the Typhoon(A) formation and his aircraft was assessed to be around 1800ft at its closest, as the Typhoon(A) formation rolled out in his 12 o'clock.

The pilot perceived the severity of the incident as 'Low'.

THE VOYAGER TANKER PILOT reports that his aircraft was scheduled to refuel 3 pairs of Typhoons between 1230-1300Z. During the joining process he was established at FL320, above the normal allocated AARA block due to the weather below in the area being unfit and a request from the receivers for that altitude block, and cleared by Swanwick(Mil) to conduct AAR. He was established in an east-west circuit at FL320 with an operating block of FL300-FL330. Typhoon(C) joined and was in-tow conducting AAR on the right hose. The Typhoon(B) pilot then contacted Swanwick(Mil) with his position at FL290 and confirmed that he had radar contact on the tanker. Swanwick(Mil) informed him of the range, bearing and flight level of the tanker and then offered assistance for the join. The Typhoon(B) pilot confirmed this was not required and requested to change to the boom frequency, which was approved. The tanker crew reported that the joining level was clear, but no initial joining call was made to the pilot of Typhoon(B) due to the rapid switch-over to the boom frequency. The Typhoon(B) pilot was now on the boom frequency, called visual and requested join; the tanker crew cleared him to join on the boom frequency. During this process, the Typhoon(A) formation was with Swanwick(Mil) and reported radar contact on the tanker. Swanwick(Mil) informed the Typhoon(A) formation of the range, bearing and level of the tanker and asked if they required assistance for the join. The formation declined due to having radar contact and requested to switch to the boom frequency. Swanwick(Mil) cleared the Typhoon(A) formation to FL310 for the tanker and passed the boom frequency. At this point, the tanker crew discussed the current and expected air-picture; the PM confirmed with the PF that he had indeed cleared the Typhoon(B) pilot for the join and that the Typhoon(A) formation was now cleared to the joining level of FL310 by Swanwick(Mil). When the Typhoon(B) pilot called visual, he was climbing from FL290 and, at this point, at a range that was unknown to the tanker crew. The MIDS was not consulted due the current AAR operation with a receiver in-tow. The Typhoon(A) formation was now perceived to be closing fast from the south [the formation was, in fact, closing from the north] and perceived to be in a higher block than Typhoon(B). The tanker crew called Swanwick(Mil) and asked them to confirm who they were sending to the tanker first (due to the uncertainty with the levels) but received no reply. The Typhoon(A) formation was now in the process of switching to the boom frequency. The PM, working the Swanwick(Mil) frequency, informed the PF, working the boom frequency, that there was a confliction of levels and asked him to confirm with the Typhoon(A) formation their position, because they were in the process of switching to the boom frequency. The Typhoon(A) formation checked-in on the boom frequency, called visual and requested join. The PF immediately asked them for their position and if

they were visual with both receivers (Typhoon(B) joining and Typhoon(C) in-tow). The Typhoon(A) pilot reported that they were only visual with the aircraft in-tow. The Typhoon(B) pilot immediately reported (on the boom frequency) that he was visual with all aircraft and happy to re-fuel second after the Typhoon(A) formation. The tanker instructed the Typhoon(B) pilot to separate vertically by 1000ft (to FL300) and the Typhoon(A) formation to maintain FL310 as they were, in fact, closer in proximity to the tanker. All receivers complied and were subsequently cycled through AAR with no further incident.

The Voyager tanker pilot noted the following:

The receivers arrived in quick succession and with minimal assistance from Swanwick(Mil) due to the fact they had good radar SA on the tanker. This could have had a negative effect because, although this can be more efficient for receiver pairs on the tanker, it may be less so for other joining receivers being vectored from opposite sides and differing altitudes. Some SA was lost by the entire formation due to the lack of spatial SA on all players, compounded by radio frequency changes.

The lack of joining call for some of the receivers negated the use of the Air-to-Air TACAN. This was discussed with the receivers post flight and, due to the number of receivers in close proximity from both north and south, may only have given the tanker crew SA on a single pair at any one time.

MIDS is a useful tool but, at the time of this event, the tanker crew was concentrating on the delivery of fuel and the use of the cameras for the movement of the refuelling process with Typhoon(C).

The communications switch-overs were very efficient, but lacked the time to make the joining call from tanker to receivers. Proper joining calls may have avoided the initial level confliction, or at least highlighted the potential confliction.

The perceived picture from the tanker was that the Typhoon(B) pilot called visual from a good distance out and was cleared to join from a lower altitude (FL290). The Typhoon(A) formation was then cleared to move into the joining level (FL310) by Swanwick(Mil), which was above the level of Typhoon(B) and the formation was considerably closer at the time of the switch-over to the boom frequency. Hence, both the formation and Typhoon(B) were joining from differing levels but now competing for the same piece of airspace. This was identified and resolved late in the joining process due to the communications handovers and close range of the receivers.

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

THE SWANWICK(MIL) TAC L CONTROLLER reports that, at approximately 1230Z and about 50NM SW of AARA 4, a request was made by the receivers to tank at FL300 and above due to better weather conditions. The tanker agreed and requested an AAR block of FL300-330, which was updated by the North Supervisor at 1236Z. The first receiver [Typhoon(C)] began its transit at FL300 from the EG D809 complex while the tanker was still routing to AARA 4. Once the tanker was established and the pilot was visual, the receiver transferred to the tanker frequency. Typhoon(B), as the next receiver, began transit at FL290 from the EG D809 complex and, once visual, was transferred to the tanker frequency. The Typhoon(A) formation (a pair) were the final receivers and transited at FL280 from the west of Wick. While still transiting, FL300 and FL310 were reported vacated by the tanker. The Typhoon(A) formation was instructed to climb to FL310 and, once visual, transferred to the tanker frequency. The controller was informed post-sortie that Typhoon(B) may have still been occupying FL310, rather than it being vacated, as the Typhoon(A) formation was transferred to the tanker frequency.

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

THE SWANWICK(MIL) SUPERVISOR reports that a Tac Left, Planner and Tac Right were in-situ for aircraft conducting general handling and tanking. The Supervisor paid particular attention to the tanking once the levels changed to the upper air, FL300-FL330, due to a higher likelihood of civil traffic interaction and the change in type of airspace. However, during the event, they had no knowledge that an incident had occurred because procedures appeared to have been followed correctly. They noticed that the Typhoon(A) formation had been transferred from Tac Right to Tac Left at FL300. Without intervention, the Tac Left controller descended the Typhoon(A) formation to FL280, passed bearing,

range and altitude of the tanker and informed of two 'chicks in-tow'. Typhoon(C) and Typhoon(B), both singletons, had been transferred to the tanker frequency at FL300 and FL290 respectively. Due to these aircraft being on the tanker, the Tac L controller was not able to ascertain what level they were at; the controller correctly waited with the Typhoon(A) formation at FL280 until the tanker crew reported FL310 clear. The controller acknowledged this and, on the same frequency, issued an instruction to climb to FL310 to the Typhoon(A) formation. The Typhoon(A) pilot reported visual and requested to switch to the boom frequency, which the controller authorised.

Factual Background

The weather at Aberdeen was recorded as follows:

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METAR COR EGPD 051250Z AUTO 18014KT 9999 BKN014 OVC019 07/05 Q0998 NOSIG=
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Analysis and Investigation

Military ATM

The Voyager was established in AARA 4 and was scheduled to accept six aircraft for refuelling. Due to poor weather, the initial agreed tanking block (FL180-210) was amended to FL300-330, with refuelling taking place at FL320. In the run-up to this Airprox, a third Typhoon (Typhoon(C)) was already established on the tanker. Following identification, the Typhoon(B) pilot was cleared to FL290, confirmed that vectors were not required and told to report visual with the Voyager. Shortly afterwards, Typhoon(A) formation (a pair) was identified, also confirmed that vectors were not required and the pilot was cleared to FL280.

Once the Typhoon(B) pilot was visual with the Voyager, he was transferred to the boom frequency while still maintaining FL290. Shortly afterwards, the boom operator on the Voyager confirmed to Swanwick(Mil) that FL310 was clear; this resulted in the Swanwick(Mil) controller climbing the Typhoon(A) formation to FL310 for the join. At this point, Typhoon(B) was in the process of climbing from FL290 to FL310 on the boom frequency. The unit investigation which followed this Airprox identified that this call should have been made earlier (once Typhoon(C) was receiving fuel) and led the Swanwick(Mil) controller to believe that Typhoon(B) had vacated FL310 during the join.

Figures 1-6 show the positions of Typhoons(A) and (B) at relevant times in the lead-up to, and during, the Airprox. The screenshots are taken from a replay using the NATS radars, which are utilised by Swanwick(Mil) and are, therefore, representative of the picture available to the controller.

In preparation for the join with the tanker, Typhoon(B) was descended to FL290. At this point, the Typhoon(C) pilot had already been transferred to the boom frequency and was under the control of the tanker. Typhoon(A) formation was not yet on frequency.

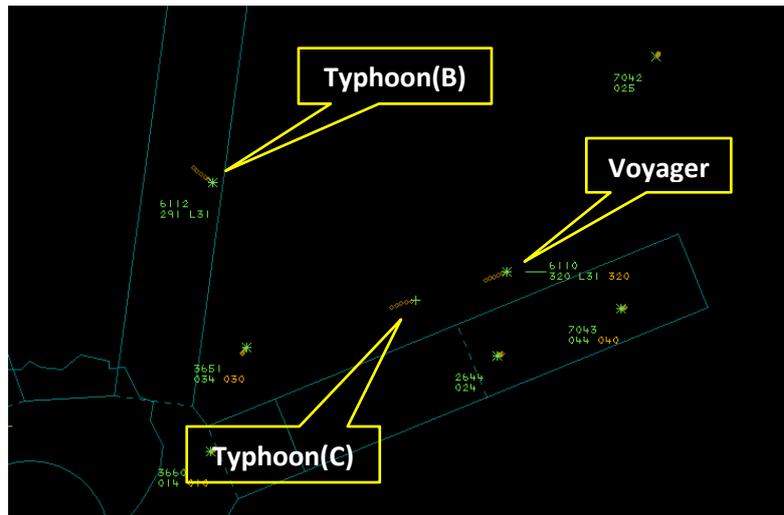


Figure 1 – Typhoon(B) at FL290

The Typhoon(A) pilot was handed over to Swanwick(Mil) at FL300, was passed the appropriate tanker joining instructions and was issued a descent to FL280 in order to build in separation with Typhoon(B).

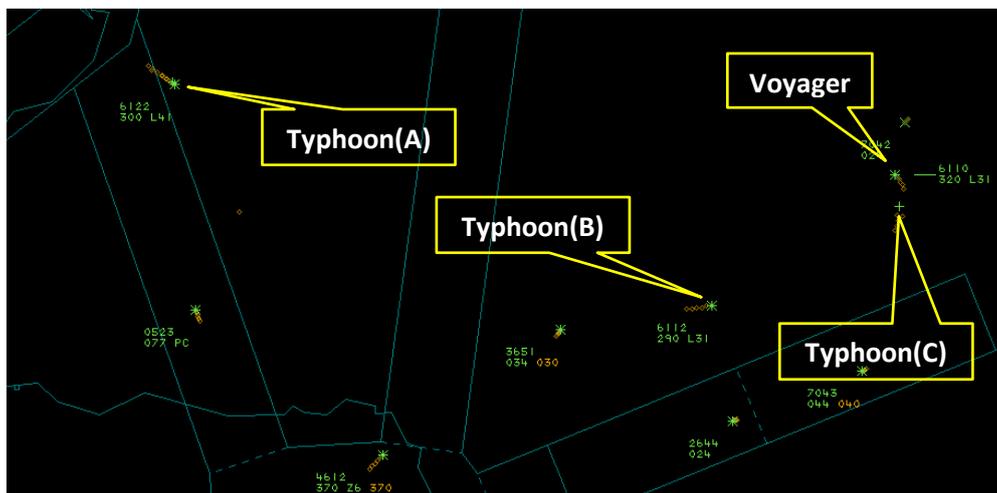


Figure 2 – Typhoon(A) formation on handover

Some 2min later, at 1243:25, the Typhoon(B) pilot requested a change to the boom frequency, which was approved by the Swanwick(Mil) controller. Typhoon(B) was still at FL290 and separation between the incident aircraft was in excess of 65NM.

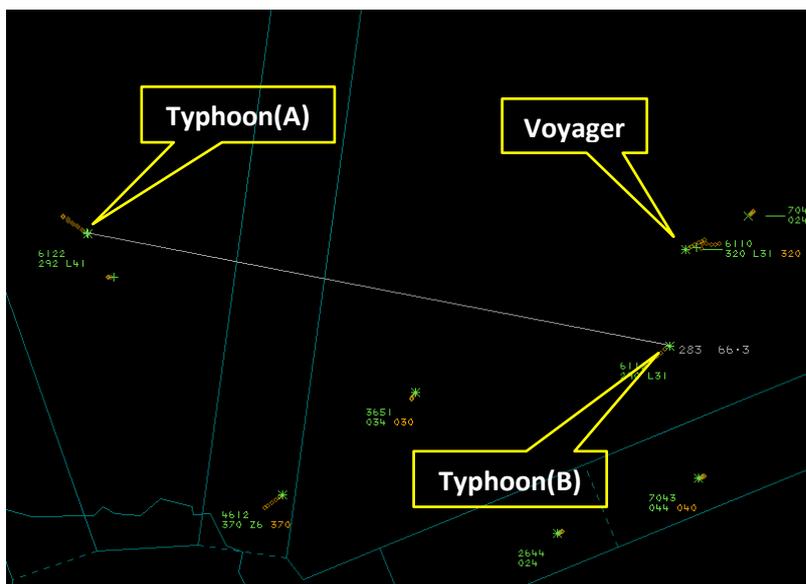


Figure 3 – Typhoon(B) pilot transferred to boom frequency

At 1246:03, the Voyager pilot reported to Swanwick(Mil) that FL310 was clear. This call came approximately 3min after the Typhoon(B) pilot was transferred to the boom frequency and the Swanwick(Mil) controller believed that Typhoon(B) had now climbed to FL320. The unit investigation found that this ‘flight level clear’ call from the tanker was late and related to Typhoon(C), which was now refuelling. Because aircraft are instructed to squawk standby as part of the refuelling process (to avoid TCAS alerts), there was no visual clue for the controller to alert them that Typhoon(B) had not climbed and, as a result, issued a clearance to Typhoon(A) to climb to FL310. Separation at this point had decreased to 32NM.

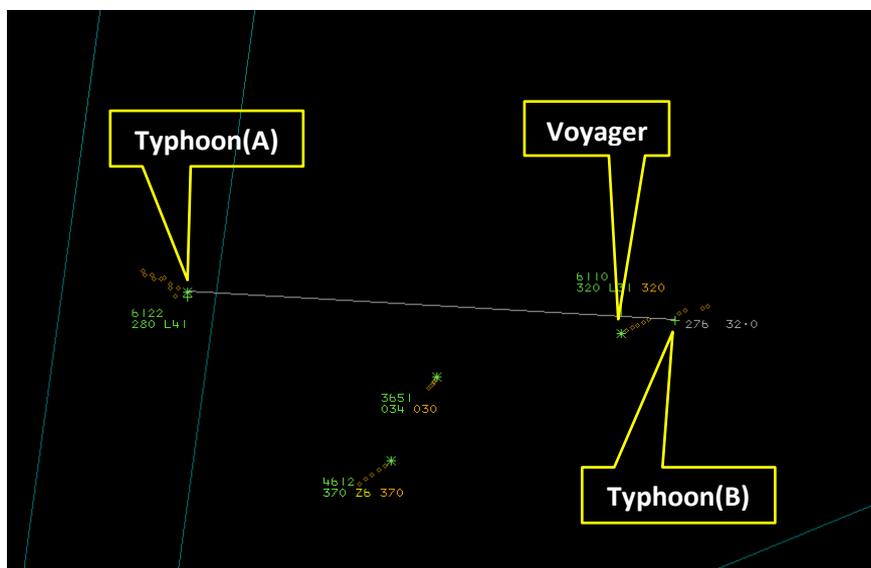


Figure 4 – FL310 reported clear

At 1247:28, the Typhoon(A) pilot reported visual with the tanker and was cleared to join by the Swanwick(Mil) controller, who still believed that the joining level of FL310 was clear. Separation at this point was 7.8NM.

Believing that there was no traffic ahead of them, the Typhoon(A) formation turned towards the tanker to effect the join and, in doing so, cut across the flightpath of Typhoon(B) which had not yet joined. For his part, the Typhoon(B) pilot realised that the Typhoon(A) formation was joining from ahead and to the right, and gained visual contact with the pair. The Typhoon(B) pilot selected idle

and initiated a weave to increase separation. CPA occurred at 1248:09 and was measured at 0.7NM.

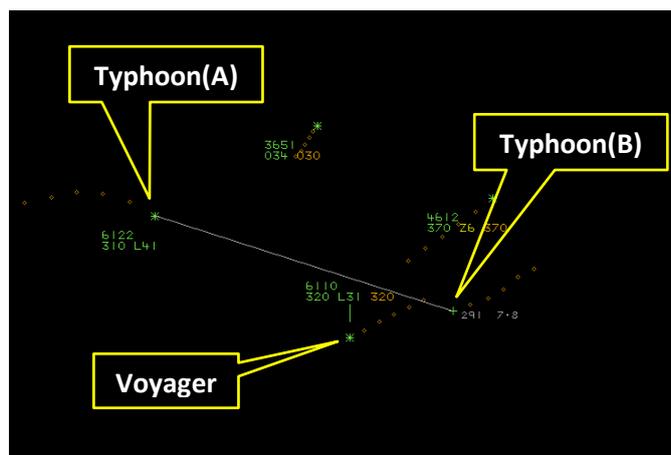


Figure 5

Typhoon(A) transferred to boom frequency at FL310

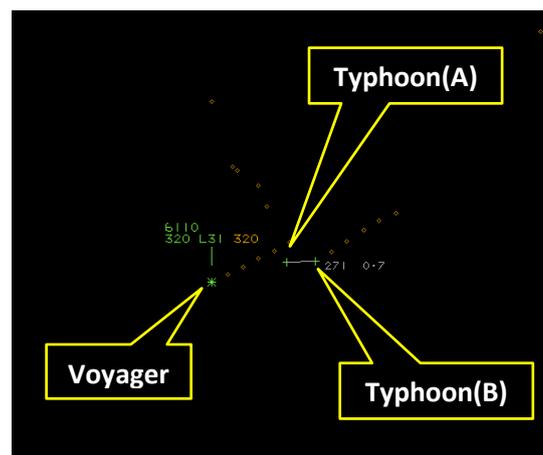


Figure 6 – CPA

This was a routine refuelling sortie for Swanwick(Mil) and, as the Typhoons did not require vectors, workload was low. Having received the 'FL310 is now clear' call from the tanker, the Swanwick(Mil) controller followed the procedure above and would not have seen anything amiss in doing so. Because aircraft squawk standby when joining a tanker, there was no visual clue on the radar that the level allocations conflicted. This meant that, once Typhoon(B) had transferred to the boom frequency, the only way the Swanwick(Mil) controller could get situational awareness on available joining levels was from the tanker. Given these circumstances, the Swanwick(Mil) controller acted appropriately.

UKAB Secretariat

Aircraft joining a tanker to conduct air-to-air refuelling do so in accordance with the NATO Standards Related Document National SRD – United Kingdom.⁴ The Voyager Force Flight Commander Air Safety provided the following extracts pertinent to this event:

- *Once the receiver is on the tanker control frequency, the tanker will make an RV Initial Call.*
 - Initial RV calls were not made to Typhoon(B) or the Typhoon(A) formation.
- *The use of a discrete boom frequency for AAR will prevent the Tanker Controller from hearing receivers joining the tanker and commencing AAR. In this case, the controller must be advised by the tanker captain that the joining level has been vacated before subsequent receivers can be cleared to that level.*
 - The tanker crew was late in stating 'Joining Level Clear' following the first receiver joining echelon-left.
- *If the tanker pilot has not taken control of the join, the Tanker Controller may only release the receiver to the tanker's boom frequency (if one is in use) or allow the receiver to reduce the vertical separation if the receiver has visually acquired the tanker, and the receiver is at the correct joining level.*
 - Neither the first receiver nor the pilot of Typhoon(B) had declared visual before being switched to the boom frequency.

⁴ Specifically, Annex C, Appendix C1

- *Normally, the tanker pilot will clear the receiver to join after visual contact has been declared. The tanker pilot may allow the receiver to complete a join from any level provided that SA is assured.*
 - The tanker crew was not assured of the SA for all players, so clarified with Swanwick(Mil) and then on the boom frequency to receivers. Once SA was assured, all receivers were cleared to join.

CPA was measured by Military ATM as occurring at 1248:09 with a lateral separation of 0.7NM. Using the same radar sources, the UKAB Secretariat measured CPA at 1248:22 with a lateral separation of 0.2NM. Due to the close proximity of all aircraft involved, and the distance from the radar head, the radar picture was unstable and suffered from significant jitter. Of note, the transponder of Typhoon(B) is seen to be set to standby at a range of 7.5NM from the tanker.

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.⁵ In the UK, separation between aircraft comprising a formation of military aircraft is the responsibility of the formation leader (MARSA).⁶

Comments

HQ Air Command

This Airprox was subject to a thorough local investigation, the conclusion of which deduced that the procedures that are already in place for AAR (Air to Air Refuelling NATO SRD – UK, Annex C, Appendix C1) are sufficient and thus no formal recommendations were made. This investigation has been forwarded to all UFSOs concerned and has been a subject at Air Safety briefing days to raise awareness to other crews.

There were many good intentions by all those involved to try and make the joins as expeditious and efficient as possible. However, this was to the detriment of everyone's SA and resulted in a lot of confusion. Omitting a few simple transmissions can quickly result in a degradation of critical safety barriers. The reports raised by the aircrew touch on the join being a period of high workload; it is for this very reason that procedures and SOPs should be followed, thus alleviating the potential for ambiguity, and would have resulted in a clearer air-picture for all concerned.

Summary

An Airprox was reported when two Typhoons flew into proximity in AARA 4 at 1248hrs on Thursday 5th December 2019. Both pilots were operating under IFR in VMC and both pilots were part of the Voyager tanker formation, which was under Radar Control from Swanwick(Mil).

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from the pilots of both aircraft, transcripts of the relevant RT frequencies, radar photographs/video recordings, reports from the air traffic controllers involved and reports from the appropriate ATC and operating authorities. Relevant contributory factors mentioned during the Board's discussions are highlighted within the text in bold, with the numbers referring to the Contributory Factors table displayed in Part C.

Due to the exceptional circumstances presented by the coronavirus pandemic, this incident was assessed as part of a 'virtual' UK Airprox Board meeting where members provided a combination of written contributions and dial-in/VTC comments. Although not all Board members were present for the entirety of the meeting and, as a result, the usual wide-ranging discussions involving all Board members

⁵ MAA RA 2307 paragraphs 1 and 2.

⁶ MAA RA 3234 paragraph 2.

were more limited, sufficient engagement was achieved to enable a formal assessment to be agreed along with the following associated comments.

The Board first considered the actions of the Typhoon pilots and heard from a military member that air-to-air refuelling is considered routine for the military and that all pilots and controllers are familiar with the processes. Members discussed the procedures in place for air-to-air refuelling and agreed that, with the intention of completing the join as expeditiously as possible, the joining procedures had not been completed in an appropriate manner (**CF3**). This had led to a breakdown in shared situational awareness for all concerned, such that none of the pilots or controllers involved had been able to develop an accurate air-picture (**CF1, CF7**). The Board noted that the Typhoon(A) pilot had been informed by the controller that there had been 2 aircraft behind the tanker but, as he joined, he had only been visual with one Typhoon taking fuel from the tanker and had not seen Typhoon(B) (**CF8, CF9**). This had led to the Typhoon(A) pilot rolling-out of his joining turn in front of Typhoon(B) (**CF4**). For his part, members felt that the Typhoon(B) pilot could have informed the tanker that his join had become protracted and perhaps updated the tanker crew on his range and altitude (**CF6**), notwithstanding he had not heard that the Typhoon(A) formation had been cleared to a level that he had not yet vacated. That said, on sighting the pair joining from his front-right quarter and clearly being concerned with his relative position (**CF10**), he had taken appropriate action to ensure separation.

The Board then considered the actions of the Voyager pilot and the Swanwick(Mil) controller, and wondered why there had been a 7min interval between Typhoon(C) vacating the joining level and the Swanwick(Mil) controller being informed that the level was clear. Because this information was passed approximately 3min after the Typhoon(B) pilot had been transferred to the boom frequency, the Board felt that this delay had most likely led the Swanwick(Mil) controller to believe that both Typhoons(C) and (B) had vacated the joining level and so the controller had, accordingly, cleared the Typhoon(A) formation to that level. An ATC member suggested that the controlling of refuelling by the tanker crew on the boom frequency is akin to a Procedural Service, and wondered what processes had been in use to track the positions and altitudes of all the aircraft involved. The Board discussed the timing of the instruction to the Typhoon(B) pilot to set his transponder to standby and some members felt that, although instructed to do so by the controller upon his own request to transfer to the boom frequency, in selecting his transponder to standby at a range of 7.5NM from the tanker (**CF5**) the Typhoon(B) pilot had inadvertently denied the controller an opportunity to detect the conflict in joining levels that followed (**CF1, CF2**). Members noted, however, that there are a number of checks prior to refuelling that a single-seat pilot has to perform and that the Typhoon pilots would have been keen to have completed their checks prior to arriving in close proximity to the tanker. The Board was heartened to hear from a military member that Typhoon pilots have been re-briefed on the importance of following the correct procedures and the potential pitfalls of missing elements of them.

Turning to the collision risk involved, members noted that the Typhoon(A) pilot had joined the tanker 'belly-up' to, and had been completely unsighted on, Typhoon(B) at the same level. It had been difficult to accurately measure the lateral separation on the NATS radar due to jitter and the Board was grateful for the post-mission analysis of the Typhoon mission recordings that found there had been a range of 1800ft (~0.3NM) between the aircraft. Members agreed that the Typhoon(B) pilot had been visual with Typhoon(A) during the latter half of his joining turn and had then taken appropriate action to ensure separation by retarding his throttles and conducting a weave. Therefore, although safety had been degraded, there had been no risk of collision; Risk Category C.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK**Contributory Factors:**

	2019329		
CF	Factor	Description	Amplification
Ground Elements			
• Situational Awareness and Action			
1	Contextual	• Situational Awareness and Sensory Events	Generic, late, no or incorrect Situational Awareness
2	Human Factors	• Conflict Detection - Not Detected	
Flight Elements			
• Regulations, Processes, Procedures and Compliance			
3	Human Factors	• Flight Crew ATM Procedure Deviation	Regulations/procedures not complied with
• Tactical Planning and Execution			
4	Human Factors	• Action Performed Incorrectly	Incorrect or ineffective execution
5	Human Factors	• Transponder Selection and Usage	
6	Human Factors	• Accuracy of Communication	Ineffective communication of intentions
• Situational Awareness of the Conflicting Aircraft and Action			
7	Contextual	• Situational Awareness and Sensory Events	Generic, late, no or incorrect Situational Awareness
8	Human Factors	• Understanding/Comprehension	Pilot did not assimilate conflict information
• See and Avoid			
9	Human Factors	• Monitoring of Other Aircraft	Non-sighting or effectively a non-sighting by one or both pilots
10	Human Factors	• Perception of Visual Information	Pilot was concerned by the proximity of the other aircraft

Degree of Risk: C

Safety Barrier Assessment⁷

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

Ground Elements:

Situational Awareness of the Confliction and Action were assessed as **ineffective** because the joining Typhoon pilots had set their transponders to standby while still at a significant range from the tanker, thus denying Mode C information to the controller and an opportunity to detect the conflicting levels of Typhoons(A) and (B).

Flight Elements:

Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because neither the tanker pilot nor the pilots of Typhoons(A) and (B) followed the standard AAR joining procedure, including the relevant radio calls.

Tactical Planning and Execution was assessed as **partially effective** because the Typhoon(A) and (B) pilots switched to the boom frequency and set their transponders to standby once visual

⁷ The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the [UKAB Website](#).

with the tanker which denied the opportunity for the tanker and receivers to follow the standard joining process, including radio calls.

Situational Awareness of the Conflicting Aircraft and Action were assessed as **partially effective** because the Typhoon(A) pilot believed that the joining level (FL310) was clear and the Voyager pilot was unaware of the level of Typhoon(B).

Airprox Barrier Assessment: 2019329		Within Controlled Airspace						
Barrier	Provision	Application	Effectiveness					
			Barrier Weighting					
			0%	5%	10%	15%	20%	
Ground Element	Regulations, Processes, Procedures and Compliance	✓	✓	[Green bar to 20%]				
	Manning & Equipment	✓	✓	[Green bar to 15%]				
	Situational Awareness of the Conflicting & Action	⚠	✗	[Red bar to 15%]				
	Electronic Warning System Operation and Compliance	○	○	[Grey bar to 10%]				
Flight Element	Regulations, Processes, Procedures and Compliance	✓	⚠	[Yellow bar to 5%]				
	Tactical Planning and Execution	✓	⚠	[Yellow bar to 5%]				
	Situational Awareness of the Conflicting Aircraft & Action	✓	⚠	[Yellow bar to 10%]				
	Electronic Warning System Operation and Compliance	○	○	[Grey bar to 15%]				
	See & Avoid	✓	✓	[Green bar to 5%]				
Key:								
	<u>Full</u>	<u>Partial</u>	<u>None</u>	<u>Not Present/Not Assessable</u>	<u>Not Used</u>			
Provision	✓	⚠	✗	○	○			
Application	✓	⚠	✗	○	○			
Effectiveness	■	■	■	■	□			