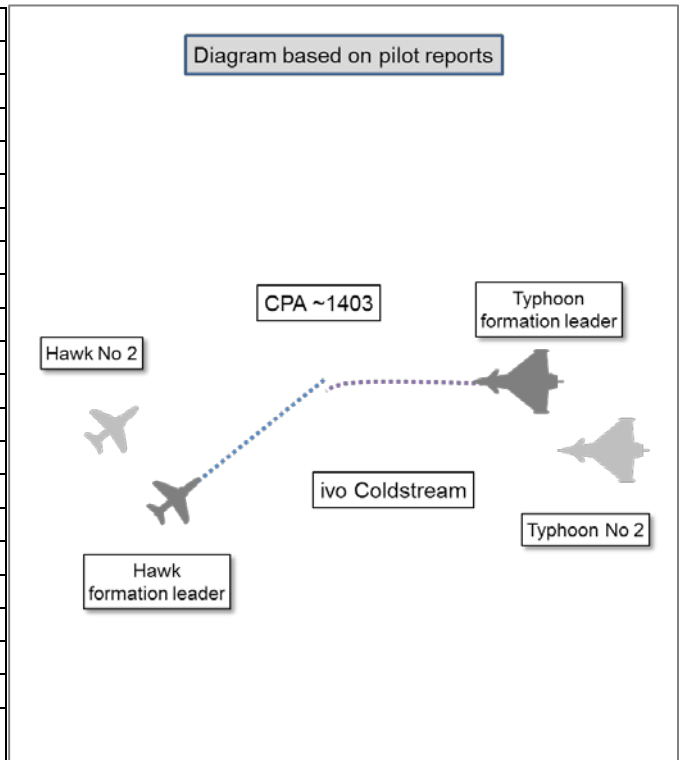


AIRPROX REPORT No 2018061

Date: 25 Apr 2018 Time: 1405Z Position: 5540N 00220W Location: Coldstream

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Hawk leader	Typhoon leader
Operator	HQ Air (Ops)	HQ Air (Ops)
Airspace	Scottish FIR	Scottish FIR
Class	G	G
Rules	VFR	VFR
Service	Listening Out	Listening Out
Provider	LL Common	LL Common
Altitude/FL	250ft MSD	250ft MSD
Transponder	A, C, S	A, C (S off)
Reported		
Colours	Black	Grey
Lighting	Nav, Nose, HISL	Nav, HISL
Conditions	VMC	VMC
Visibility	20km	20km
Altitude/FL	450ft	500ft
Altimeter	RPS (997hPa)	RPS (997hPa)
Heading	050°	270°
Speed	400kt	420kt
ACAS/TAS	Not fitted	Not fitted
Separation		
Reported	'1050ft' on No 2 Typhoon	NK
Recorded	NK	



THE HAWK PILOT reports leading a pair at low-level, conducting evasion training against a third Hawk, when he saw two Typhoon aircraft in his periphery just before they passed down his right hand side. At the time there was no perceived risk of collision but, after closer examination of information from the data-pod post sortie, it became evident that the Typhoons had passed nearly co-altitude and with only 1000ft lateral separation. Of note, there was no data-pod information available to assess the separation between the Hawk formation leader and one of the Typhoons. CADS had been checked immediately before the sortie (at 1255Z) and it showed no conflicts or any other factor-aircraft in the low-flying areas they were planning to use. During the sortie, numerous calls were made on the 'LL Common frequency' by both the lead and No3 of the Hawk formation with no replies heard. The No3 also checked in on the Operational Training Area Echo (OTA E) frequency with no response from other aircraft heard. One broken and unreadable message on LL common by a Typhoon callsign was the only R/T heard by any of the Hawk crews before the incident. The only discernible R/T from the Typhoons was a reply to a call made by the No3 Hawk after the incident.

He assessed the risk of collision as 'Medium'.

THE TYPHOON PILOT reports leading a formation of 2 Typhoons, conducting their second sortie of the day. Both sorties were initially planned to perform Close Air Support (CAS) on Salisbury Plain but, due to cloud cover on the first sortie, the decision was taken to relocate to the OTA E area for the second sortie; the pilot of the lead aircraft required low-level currency for an imminent deployment. The Typhoon Squadron Ops were requested to submit a low-level booking while the formation refuelled. Prior to taxi, Ops passed the low-level booking number and confirmed that CADS had indicated no conflicts on the desired routing. Following the medium-level portion of the sortie, the formation descended to low-level approximately 5nm to the southwest of Holy Island. Their position and intentions were passed on the LL-common frequency at 1401Z and no replies were heard. The formation subsequently crossed into another low-flying area, turning west towards Coldstream, and began to

become aware of traffic indicated on radar ahead. Having visually observed one of the Hawks, the formation initiated a turn away to the southwest and in the process passed another Hawk down the right hand side. At 1405Z, having separated to the southwest, R/T contact was established with the Hawk formation on the LL-common frequency. The formation members spoke on the telephone after landing and it became apparent that both formations believed there to be no traffic conflicts indicated on CADS. Furthermore, the Hawk squadron reported that the data-pod indicated that there had been very little separation between one of the Hawks and one of the Typhoons. Of note, the lead Typhoon was not equipped with a data-pod, but the wingman was. At the time at which the lead Typhoon initiated the turn away to the southwest the wingman was approximately 1500 feet behind and slightly to the right of the lead.

He assessed the risk of collision as 'Low'.

Factual Background

The weather at Newcastle and Edinburgh was recorded as follows:

METAR EGNT 251420Z 26019KT 220V280 9999 FEW027 11/04 Q1004=
 METAR EGNT 251350Z 26015KT 9999 FEW030 11/05 Q1004=

METAR EGPB 251420Z 27015G26KT 9999 -SHRA SCT034TCU 08/04 Q1003=
 METAR EGPB 251350Z 25014KT 9999 FEW014CB SCT030 10/05 Q1003=

Analysis and Investigation

UKAB Secretariat

The Hawk 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 hazard¹. If the incident geometry is considered as head-on or nearly so, then both pilots were required to turn to the right unless to do so would force a crossing of flight paths².

RAF Occurrence Safety Investigation

The RAF Occurrence Safety Investigation found that the final outcome was a loss of separation resulting in an Airprox between the Hawk and the Typhoon pair caused by the flight paths of the aircraft inadvertently bringing them into conflict. Additional outcomes were identified as:

- The lead Typhoon pilot did not identify the potential conflict on his radar display.
- The lead Typhoon pilot did not receive a response to his LL-Common R/T call.
- The Typhoon pair were unaware that the Hawk formation were operating in LFA 16.
- The Hawk formation were unaware the Typhoon pair were operating in LFA 16.

Background

The Typhoon pair planned to complete 2 CAS sorties over Salisbury Plain, during which they would practice targeting-pod work as part of the work-up before deploying on Operations. On completion of the first sortie, they planned to return to RAF Coningsby for a hot-pit turn-round, during which both pilots would stay strapped into their aircraft [whilst refuelling], then return to the Salisbury Plain area to carry out more pod work. The Hawk formation planned to complete a Post Graduate 2v1 evasion pairs-lead work-up sortie in OTA E and LFAs 12 and 16. The Hawk pair planned to fly a low-level route including a Simulated Attack Profile (SAP) whilst the singleton Hawk carried out a series of simulated attacks against them at various points along the route.

¹ MAA RA 2307 – Rules of the Air, paragraphs 1 and 2, Avoidance of Collisions.

² MAA RA 2307 – Rules of the Air, paragraph 13, Air Systems Approaching Head-On.

Sequence of Events (All times Z).

10:50 Singleton Hawk pilot input the planned route onto the CADS to book LFA 12 and 16 from 1340 to 1500.

11:09 Singleton Hawk pilot checked and acknowledged the CADS booking confirmation for LFA 12 and 16.

12:15 Typhoon pair landed at RAF Coningsby to commence a hot-pit turnaround. The Squadron Duty Ops Officer informed the lead pilot by radio that other Typhoon pilots had reported much improved weather to the north, so the Typhoon pair elected to go north for the second sortie because cloud cover in the Salisbury Plain area had precluded any training value from the pod work. In addition, the lead Typhoon pilot also required low-level currency so, once the pod work was complete, the plan was to descend to low-level in LFA 12 and 16 for about 10 minutes before returning to Coningsby. The lead Typhoon pilot contacted the Squadron Flight Operations Assistant (FOA) #1 by radio and requested that he book LFA 12 and 16.

12:52 FOA #1 amended the CADS route for the second planned sortie (to Salisbury Plain) and made a booking request for LFA 12 and 16 from 1315 to 1430.

12:55 Before completing the outbrief, the singleton Hawk pilot completed a final check of the CADS and was satisfied that there was still no conflicting traffic displayed.

12:58 FOA #1 had gone to a dental appointment, so FOA #2 reviewed the booking confirmation return on CADS for LFA 12 and 16 and checked for any conflicts before acknowledging the booking and noting the booking number. At the time he acknowledged the booking, FOA #2 believed that there were no conflicts displayed.

13:00 FOA #2 passed the LFA booking number to the lead Typhoon pilot via radio and briefed him that CADS was not displaying any conflicting traffic in either LFA 12 or 16.

13:15 The Typhoon pair departed Coningsby to the north to commence medium-level pod-work before descending to low-level in LFA 12 and 16.

13:25 The Hawk singleton departed RAF Leeming to route to LFA 12 and 16.

13:30 The Hawk pair departed RAF Leeming to route to LFA 12 and 16.

14:01 The Typhoon pair started a descent into LFA 12 on a northerly heading and selected the LL-Common (LLC) frequency.

14:01:30 Passing altitude 11000ft, the lead Typhoon pilot transmitted on LLC, "LLC, [callsign] flight of 2 Typhoons about to enter LFA 12 and 16 just at the south of Holy Island routing north." No reply was received to the transmission. The Hawk formation were approximately 30nm to the west of the Typhoon pair, the Hawk pair heading south at altitude 1400ft before turning left onto a north-easterly heading to start a SAP. The singleton Hawk pilot was briefed not to engage the Hawk pair during the SAP, so climbed to 3500ft and broke away on a westerly heading.

14:02:15 The Typhoon pair observed a rain shower to the north and so elected to turn left onto a westerly heading, still descending and passing about altitude 4200ft. The Hawk pair were heading south and the Hawk singleton west.

14:03:50 The Hawk pair were on a north-easterly heading, altitude about 900ft. The Hawk singleton turned onto an easterly heading at altitude 3500ft to the north of the Hawk pair and was visual with them, waiting for the SAP to be completed. The Typhoon pair were heading west at about altitude 1000ft and 12nm to the east of the Hawk pair. The No 2 Typhoon pilot transmitted to the lead pilot,

“Got some contacts low level on the nose.”. The lead Typhoon pilot replied, “Yeah, it’s just ground clutter. You saying about the radar, yeah?”. No 2 Typhoon pilot replied, “Affirm.”.

14:04:38 No 2 Typhoon pilot transmitted to lead, “Contact, one on the nose, low level Hawk.” and the lead replied, “Seen, coming left.”. No 2 Typhoon was about 1500ft behind and to the right of the lead Typhoon.

14:04:50 Lead Typhoon pilot transmitted, “One Hawk down on the right, half a mile.”. The lead pilot of the Hawk pair became visual with the Typhoon pair in his peripheral vision, just before they passed abeam on his right. The No 2 Hawk pilot became visual with the Typhoon pair as the lead Typhoon passed abeam the lead Hawk. None of the Hawk crews were able to assess the proximity of the Typhoon pair to the lead Hawk.

15:00 Following the Hawk sortie de-brief, the Hawk pilots examined the data-pod replay and found that the No2 Typhoon and lead Hawk had passed with 1000ft of lateral separation and near the same altitude. The lead Typhoon was not data-pod equipped and as such was not displayed on the replay.

The OSI identified a number of causal factors:

- The lead Typhoon pilot believed the radar contacts called by No2 Typhoon pilot were due to clutter caused by wind turbines in the area.
- The lead Typhoon pilot believed that due to the infrequent practice of flying at low-level in Typhoon, he may have subconsciously reverted to the habit pattern of his previous aircraft type, during which much of his flying experience was at low-level with no radar manipulation to consider.
- The Hawk singleton pilot received a broken and mostly unreadable message on the LLC frequency which he believed to be a Coningsby callsign operating in LFA 7 and consequently was satisfied that there was no specific threat of confliction.
- Both FOA #1 and #2 had particularly high work-loads due to the absence of another FOA and the additional workload presented by the concurrent Exercise Joint Warrior. This may have distracted them and led them to believe that there were no conflictions displayed on CADS when the booking for LFA 12 and LFA 16 was submitted.
- The sortie timings were such that the Hawk crews had walked to their aircraft prior to the CADS bookings being acknowledged for the Typhoon aircrew.

The OSI made 3 recommendations, of which the following 2 were accepted:

- Low-Level entry checks to include radar settings.
- SEMSCo is to publicise through RAF Safety Centre the importance of CADS as part of the MAC-mitigation process and encourage the use of this occurrence as a training aid for all CADS users.

The OSI Chairman commented that this was a thorough and comprehensive report. The delay [in concluding the OSI] was unfortunate and exacerbated by manning constraints, availability of key personnel from RAF Coningsby and RAF Leeming and the availability of the OSI member. The first review had also returned the DASOR to investigation due to new information regarding additional witness statements, Radar Analysis Cell replay and Typhoon radar replay not being available at the first sitting.

Barriers considered in this case were:

- CADS, to aid awareness of other aircraft, failed in this case due to human error addressed locally immediately and by Recommendation 2.

- Use of R/T before entering an LFA to aid SA to all users in the Low Flying System, failed in this case due to unknown circumstances.
- Use of aircraft radar to aid SA for that operator, partially failed but addressed by Recommendation 1.
- Lookout by all aircrew to aid SA, failed in respect of the Hawk aircrew but was successful by the No 2 Typhoon pilot, who relayed this sighting to his leader.
- CWS to aid SA to crews, was not present in this case.

The data-pod replay used by the Hawk formation in the sortie debrief lead to this incident being raised to an Airprox. Unfortunately, due to aircraft fit, whilst the distance between the Hawk and No 2 Typhoon was established, the distance between the Hawk and the (non-data-pod fitted) lead Typhoon could not positively be calculated. The lead Typhoon was 'sandwiched' between the Hawk and his No 2, who was the first to identify the Hawk visually. 12 seconds elapsed between the No2 Typhoon pilot sighting and the Hawk aircrew's glimpse of the Typhoon passing abeam. Two recommendations were supported and one rejected. The rejected recommendation was due to impossible implementation in insisting aircrew respond to R/T low-level entry calls into an LFA by another crew. During the investigation, the board noted that neither aircraft was fitted with a CWS. However, the Typhoon is to be fitted with Enhanced Collision Awareness System (ECAS) and Hawk funding has been approved for a yet to be determined CWS; date for introduction/completion of CWS systems into respective fleets was not available.

Comments

HQ Air Command

This incident demonstrates that no barrier to MAC is infallible. It appears that both missions were entered onto CADS in time for the conflict to be recognised by the Typhoon operations staff, yet this did not happen. There may have been a technical issue with CADS at the time but it may also be due to entirely justifiable human factors; the person(s) tasked with inputting the Typhoons' low level route to CADS were extremely busy at the time. It is acknowledged that it is not always possible for crews to check CADS themselves (such as in this case) but, where the opportunity exists, maximum use must be made of this tool to minimise the chances of unexpected encounters with other CADS users, especially at low-level when lookout is naturally compromised by the terrain.

Other barriers that were either unavailable or failed to resolve the conflict were communications by radio, the Typhoon radar and on-board collision warning systems. This is a salutary lesson that radios, even when line of sight is most probably assured, are subject to performance issues that may negate their use as a deconfliction aid. Similarly, the settings on the Typhoon radar likely led to the Typhoon crews suggesting that radar contact on the Hawks was in fact ground clutter; a recommendation has been made to address this latter point. Funding has been made available for the installation of a CWS on Hawk aircraft and Typhoon will be fitted with ECAS (Enhanced Collision Awareness System) in the next 12 months. This should assist in MAC mitigation but will not, of course, provide awareness of all aircraft that may be in the vicinity.

Once again, the final barrier of lookout proved key to preventing this incident being potentially much worse, and demonstrates that the more time spent with eyes out of the cockpit gives the crew the best chance of seeing and avoiding another aircraft, particularly at low level in Class G airspace.

Summary

An Airprox was reported when a Hawk and Typhoon formations flew into proximity at low-level at about 1405hrs on 25th April 2018. Both pilots were operating under VFR in VMC, listening out on the LL-Common frequency.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from both pilots, radar photographs/video recordings and reports from the appropriate ATC and operating authorities.

Members first discussed the circumstances leading up to the Airprox and agreed that on this occasion a number of barriers had not functioned as intended. Noting that the lead Typhoon pilot had dismissed the initial radar contacts as clutter, the Board felt that the CADS-conflict not being assimilated, was key. Had the CADS conflict information been available to the Typhoon formation, it was felt likely that the lead pilot would have reacted differently to what he had perceived as radar clutter. The Board went on to discuss the mechanisation of the CADS data input and display. Members noted that the route entry by the Hawk singleton pilot had been completed by 1109, and that the Typhoon FOA route input had been completed by about 1252. As such, members agreed that the conflict should have been displayed on CADS to both the Typhoon FOAs. To that end, the Board agreed that the fact that the FOAs did not assimilate the CADS conflict was contributory, as was the lead Typhoon pilot discounting the Hawk radar-returns as clutter.

Members discussed potential causes as to why the FOAs did not assimilate the conflict and, from the available information regarding the concurrent exercise, dental appointment and missing third FOA, surmised that the remaining 2 FOAs had been overloaded. The Typhoon Squadron Duty Authoriser would presumably be in a position to monitor the FOAs activities, and some members wondered whether they had had sufficient oversight to detect and mitigate such overload, and whether the impending operational deployment (and associated need to achieve currencies) had led to a degree of pressure to achieve the flying task.

Turning to the event itself, members discussed the geometry and separation of the aircraft, noting that by being between the 2 aircraft with data-pods, the lead Typhoon would be much closer to the lead Hawk than the 1050ft measured between it and the No2 Typhoon. The Board also noted that the No 2 Typhoon pilot had called a warning to the lead pilot about 12 secs before CPA, and that the Typhoon pair had commenced a left turn as a result. Noting his adept radar interpretation and acute lookout skills in sighting the Hawks in time to warn his leader, the Board commended the No2 Typhoon pilot for his instrumental actions in preventing what could easily have resulted in far graver circumstances.

Turning to the cause and risk, members with fast-jet experience commented that 12 secs represented considerable separation at the closing speeds involved, and they wondered whether the Typhoon lead-pilot should have initiated much earlier and more positive avoiding action as a result of his No2's warning. They also noted that the lead-Typhoon pilot reported only seeing one of the Hawks at this point; it was only during the process of initiating his turn away that he had unexpectedly passed the other Hawk on his right-hand side. Although this second Hawk had therefore been avoided largely by providence, after much discussion the Board agreed that the risk of collision had nevertheless been resolved by the Typhoons' turn after the No2 had seen the Hawks. As a result, the Board agreed that the event was probably best described as a conflict in Class G resolved by the Typhoon pilots, albeit at a late stage. Turning to the risk, members agreed that the separation at CPA had been much less than the half mile estimated by the Typhoon lead pilot. Notwithstanding, some members felt that the sighting, warning and action had been at sufficient range that there had been no risk of collision (Category C). Others disagreed and opined that the closing speed of the aircraft, the fact that neither the Hawk pilot nor the Typhoon lead-pilot saw each other until they passed, and the consequent lack of time to take appropriate action had resulted in an incident where safety had been much reduced below the norm. Following considerable debate, the latter view prevailed and the risk was assessed as Category B.

Members were heartened to hear that funding for a Hawk T1 TAS has been established, and that an Enhanced Collision Awareness System was scheduled for fitment to Typhoon in the next 12 months.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: A conflict in Class G resolved by the Typhoon pilots.

Contributory Factors: 1. The FOAs did not assimilate the Hawk/Typhoon conflict on CADS.
2. The lead Typhoon pilot discounted the Hawk radar-returns as clutter.

Degree of Risk: B.

Safety Barrier Assessment³

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

ANSP⁴:

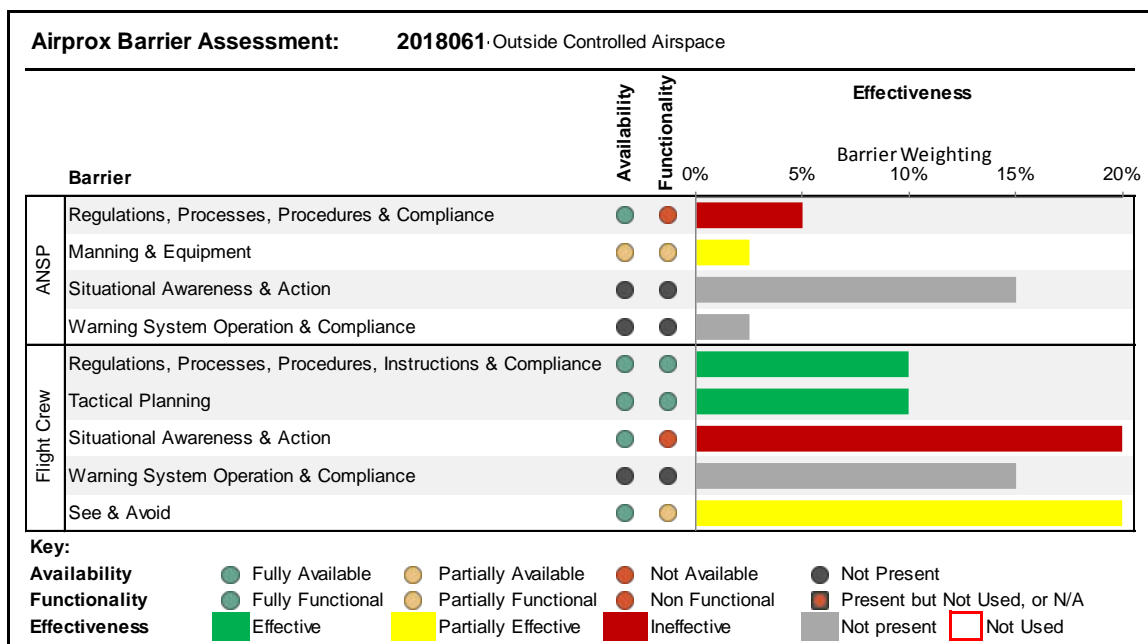
Regulations, Processes, Procedures and Compliance were assessed as **ineffective** because the CADS conflict was not detected.

Manning and Equipment were assessed as **partially effective** because the Coningsby FOAs were overloaded by coincident tasks and reduced manning.

Flight Crew:

Situational Awareness and Action were assessed as **ineffective** because none of the crews assimilated the presence of the other aircraft until very shortly before CPA; Typhoon-radar indicated returns that were likely the Hawks were discounted as ground-clutter.

See and Avoid were assessed as **partially effective** because the No 2 Typhoon was able to warn the lead Typhoon pilot of the approaching Hawks, albeit the Typhoon lead-pilot did not see the conflicting Hawk until they passed, and neither did the Hawk pilot see the Typhoon.



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

⁴ Although an ANSP was not involved, the ANSP label has been used to denote the 'ground segment' part of the context of the Airprox.