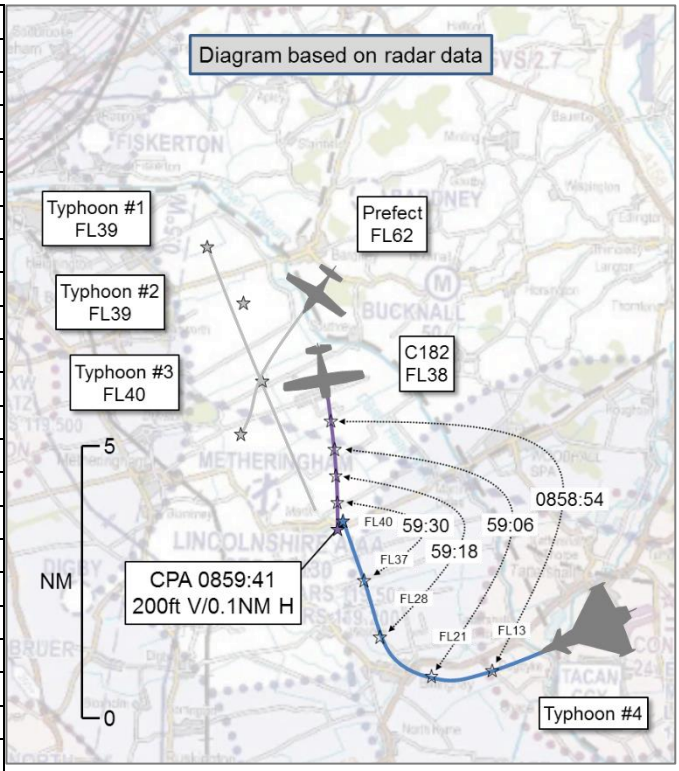
AIRPROX REPORT No 2020069

Date: 16 Jul 2020 Time: 0900Z Position: 5307N 00018W Location: 5NM NW Coningsby

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Typhoon No.4	C182
Operator	HQ Air (Ops)	Civ FW
Airspace	London FIR	London FIR
Class	G	G
Rules	IFR	VFR
Service	Traffic	Basic
Provider	Coningsby Dep	Coningsby LARS
Altitude/FL	FL40	FL38
Transponder	A, C. S off	A, C, S
Reported		
Colours	Grey	White, red, blue
Lighting	HISL, nav	NK
Conditions	VMC	VMC
Visibility	NK	10km
Altitude/FL	FL040	4000ft
Altimeter	SPS	QNH (NK hPa)
Heading	340°	NK
Speed	350kt	130kt
ACAS/TAS	Not fitted	TAS
Alert	N/A	TA
Separation		
Reported	300ft V/200ft H	NK
Recorded	200ft V/0.1NM H	



THE TYPHOON PILOT reports conducting a radar trail departure as number 4 of a 4 ship formation. The formation was initially cleared [RW25] Military Instrument Departure (MID) North[1] climbing to FL150. Prior to take-off clearance from Tower, the departure clearance was revised to "stop climb at FL040" which was acknowledged by the formation leader before switching to the Departures frequency. The formation departed using standard 20sec spacing between aircraft and under a Traffic Service. Before the formation leader had turned north on the MID, Departures called, "traffic north 10 miles tracking south indicating FL60." shortly followed by, "further traffic north 8 miles tracking south indicating FL38." An update was passed 30sec later as, "previously called traffic north 5 miles tracking south indicating similar level." At this point the leader achieved radar contact and perceiving a confliction if the MID was continued, altered heading to 350°, later refined to 340°, and the formation maintained standard radar trail. The traffic passed down the right hand side of formation members 1, 2 and 3. At 0859:15Z Coningsby Departures called, "[No4 C/S] traffic north 3 miles tracking south indicating similar level." At about this point No4's radar began to build the contact showing it at about 1.5NM. Not being visual, No4 called "unsighted", whilst levelling at FL040. The pilot then visually acquired the light aircraft, nearly head to head, with it maintaining about a 10° divergent heading and too late to take any avoiding action, and called "visual". The aircraft passed down the left side and the type, colour and registration were discernible. The pilot noted that the incident occurred shortly after departure, with the main focus being maintaining radar contact with the formation member ahead of him, whilst building traffic SA.

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

THE C182 PILOT reports that he was in transit and was passed on to Coningsby [LARS] from Humberside. It was not busy. He did not ask for a different ATS. Soon after being passed to Coningsby ATC, he was informed of 4 Typhoons climbing and passing him on the right, which they did. He saw the first Typhoon at a range of 5NM and they passed 2-3NM to the right and 100ft above, climbing. No

[1] Climb to FL150 . Maintain runway track to 1200ft QFE or CGY 2·5d, whichever later, then a right turn on to track 008°.

avoiding action was necessary, he could see the 4 Typhoons clearly, they did what ATC said they would do in passing him on the right. He felt comfortable that they could see him.

The pilot assessed the risk of collision as 'None'.

THE CONINGSBY U/T CONTROLLER reports that they were the U/T controller for Departures on Stud 3 at RAF Coningsby, with a screen controller. This was the third session in that seat. At the time of the incident, there were many formations departing and pre-notes from the ground controller. Before [the Typhoon formation] was released, the Radar Approach controller co-ordinated tracks with Cranwell traffic that was general handling northwest of Coningsby by 10NM. It was agreed that the Coningsby tracks would stop climb at FL40 against a Prefect not below 6000ft Barnsley [QNH]. [The Typhoon formation] were then released not above FL40 with Stud 3 on the runway. [At that time] there were no other aircraft within 10NM of Coningsby. After the release, the ATC Supervisor took a handover of a Basic Service LARS track in the vicinity of Wickenby, tracking south. Once [the Typhoon formation] were airborne and identified, the controller called the Prefect traffic to [the Typhoon lead]. Once he had acknowledged this, the controller called further traffic, the Basic Service track. Updated Traffic Information was then passed on the Basic Service track again. [The lead Typhoon pilot] then stated he had system contact and was maintaining heading 340° to deconflict. The screen instructor then instructed the controller to call the traffic to [Typhoon No.4]. At first, he said he was not visual then, two seconds later, stated he was visual.

THE CONINGSBY SCREEN CONTROLLER reports that he was the screen controller for Departures on Stud 3 at RAF Coningsby, with a U/T controller. Numerous formations were departing and being pre-noted. Before [the Typhoon formation] was released, the Radar Approach controller spoke to Cranwell about traffic operating northwest of Coningsby approximately 10NM on the intended route of [the Typhoon] formation and agreed that [the Typhoon formation] would stop climb at FL40 in order to separate from a Prefect operating not below 6000ft Barnsley [QNH]. [The Typhoon formation] were then released not above FL40 with Stud 3 on the runway approved and no other aircraft within 10NM of Coningsby. Prior to [the Typhoon formation] getting airborne the ATC Supervisor took a handover of a Basic Service LARS track in the vicinity of Wickenby, tracking south. As [Typhoon No.1] got airborne, the aircraft was identified, and the coordinated Prefect called. Straight after [Typhoon No.1] confirmed his cleared level and type of service. The Basic Service aircraft was called as north, 8nm tracking south indicating FL38. Traffic Information was then updated as north 5nm tracking south indicating a similar level. [Typhoon No.1] called systems contact and stated he was maintaining a heading of 350° to deconflict. Shortly afterwards, [Typhoon No.1] stated he was coming left to 340° to deconflict from the civilian traffic. At this point the screen controller prompted the U/T controller to call the traffic to [Typhoon No.4] and it was called as north 3NM tracking south, indicating similar level. [Typhoon No.4] said not visual, and then visual in quick succession. The civilian aircraft was visual with the 4 ship of Typhoons throughout.

THE CONINGSBY LARS CONTROLLER: A report was not received from the Coningsby LARS Controller.

THE CONINGSBY SUPERVISOR: A report was not received from the Coningsby Supervisor.

Factual Background

The weather at Coningsby was recorded as follows:

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METAR EGXC 160850Z 32009KT 9999 SCT019 BKN031 BKN036 17/12 Q1018 NOSIG RMK WHT WHT=
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Analysis and Investigation

Military ATM

An Airprox occurred on 16 Jul 20 at approximately 0859 UTC, near RAF Coningsby between a Typhoon and a C182. The Typhoon was the number 4 in a formation receiving a Traffic Service from RAF Coningsby Departures; the C182 was receiving a Basic Service from Coningsby LARS.

The 4-ship of Typhoons were on departure from Coningsby following a Military Instrument Departure (MID) North profile climbing to FL40 which was restricted from the normal level of FL150 due to conflicting traffic at FL60. The lead aircraft requested 'Stud 3' on the runway due to a thin layer of cloud to get earlier Traffic Information which was reported as normal for a 4 ship departure. Due to no further traffic within 10NM of Coningsby, radar release was given to the formation. It is unknown how much time elapsed between the release being approved and the formation getting airborne. The Formation Lead pilot reported that he felt a Traffic Service would be sufficient as they could see blue sky through the cloud. Between the release call and the formation getting airborne the Coningsby Supervisor took a handover of a Basic Service LARS track routing [southbound] from the Wickenby area. On initial departure the formation lead was passed Traffic Information on the coordinated track (not the C182), once this was acknowledged Traffic Information on the conflicting C182 was passed. After a second set of Traffic Information was passed on the C182 the formation lead reported 'system contact' and opted to turn to avoid the C182. A further 10-degree turn was initiated by the pilot and although a change in altitude was considered it was not taken due to other conflicting traffic above and the Waddington MATZ and a cloud layer below. The No.4 Typhoon in the formation reported airborne and had separate Traffic Information passed to them from the trainee Coningsby Departures controller regarding the conflicting C182 once prompted by the Coningsby Departures instructor. Initially the Typhoon was not visual with the C182 however, the pilot reported that their radar was beginning to show a contact. As the Typhoon levelled at FL40 they visually acquired the C182 although stated that it was too late to take avoiding action, reporting the separation to be visually judged at 300ft vertically and approximately 200ft laterally. The C182 was handed over to Coningsby in the Wickenby area transiting [southbound] and was in receipt of a Basic Service from Coningsby LARS. The C182 reported VMC and had been given Traffic Information on the Typhoon 4-ship departure. The C182 reported that they were visual with the Typhoons throughout and no avoiding action was initiated as the Typhoons did what ATC said they would do, and they felt comfortable that the Typhoons were visual with them.

Figures 1-7 show the positions of the Typhoons and the C182 at relevant times in the lead up to and during the Airprox. The screen shots are taken from a replay using the NATS Radars, which are not utilised by Coningsby, therefore may not be entirely representative of the picture available to the Coningsby controllers. Having identified the potential conflict, the Coningsby Departures controller passed Traffic Information to the lead Typhoon who was under a Traffic Service. The first set of Traffic Information indicated that separation from the C182 was 8NM, however, this was not captured by the radar replay. Further Traffic Information was passed to the Typhoon formation lead prior to No. 4 reporting airborne. Separation at this point was 5.4NM from the formation lead.

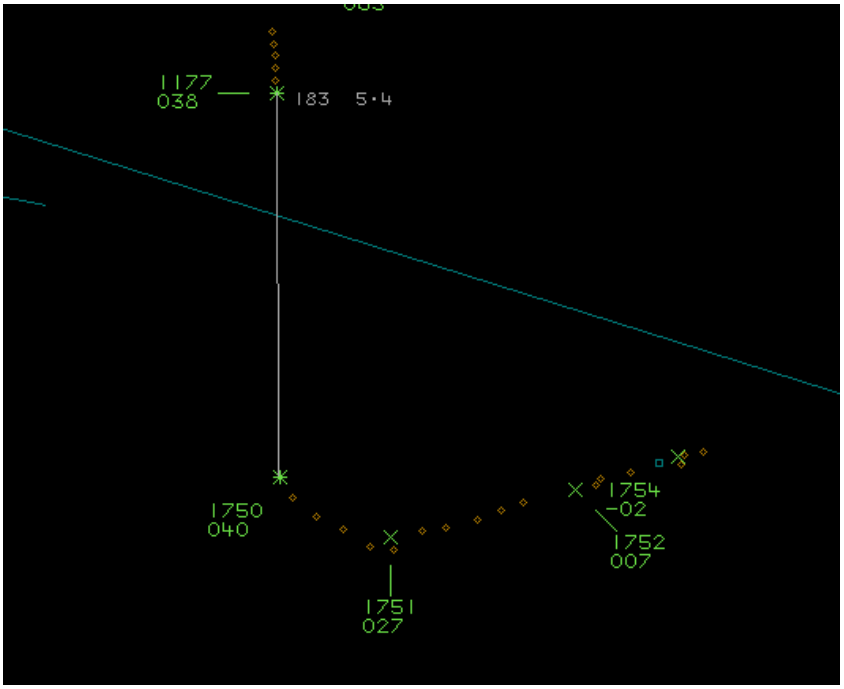


Figure 1: Traffic Information passed to the Formation Lead

Five seconds after No.4 reported airborne the formation lead reported system contact on the C182 and altered the formation heading left to 350°. This was 13sec after the Traffic Information was passed. Separation at this point was 3.8NM from the formation lead.

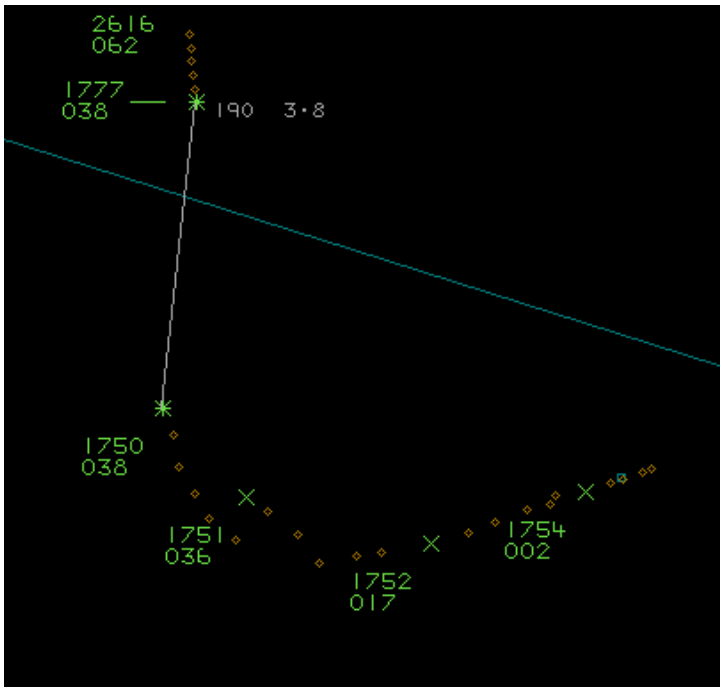


Figure 2: Formation Lead alters the formation heading to 350 degrees.

36 sec after the last Traffic Information was passed the formation lead altered the formation heading left to 340°. Separation at this point had decreased to 1.1NM from the Formation Lead.

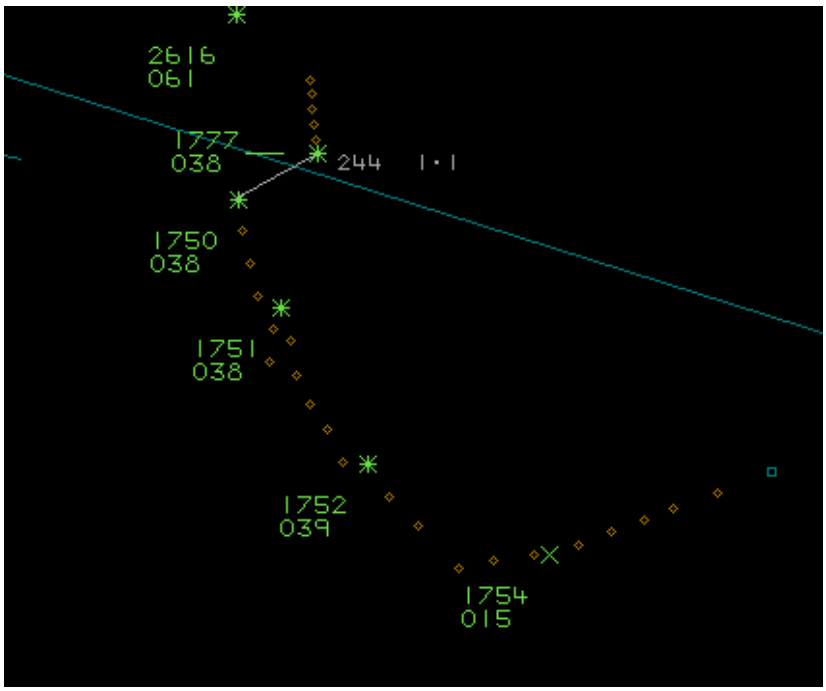


Figure 3: Formation Lead alters the formation heading to 340 degrees.

The Coningsby Departures screen controller prompted the trainee to pass Traffic information to the No.4 Typhoon. Traffic Information was passed and the separation between Typhoon No.4 and the C182 was 2.7NM and 600ft.

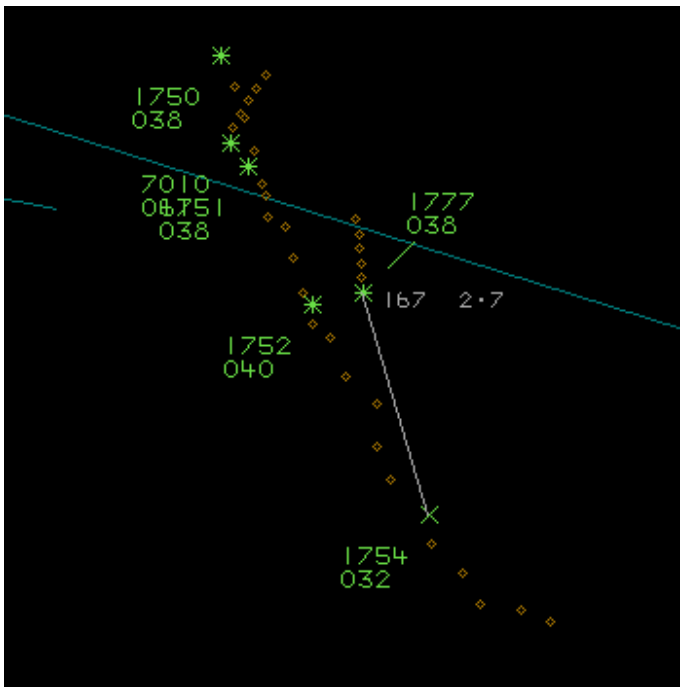


Figure 4: Traffic Information passed Typhoon No.4

Six seconds after the Traffic Information was passed, Typhoon No.4 reported not sighed however, he reported visual two seconds later. Separation at this point was 1.5NM and 100ft.

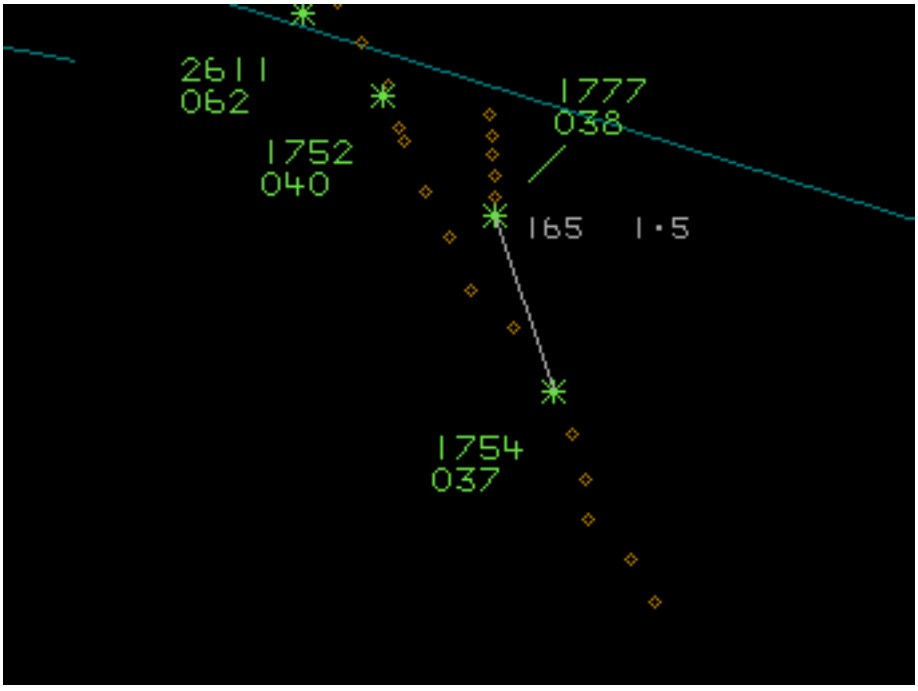


Figure 5: Typhoon No.4 reported visual

Nine seconds after the No.4 Typhoon reported visual separation had decreased to 0.4NM and 200ft. The Radar contacts did not merge, and it is likely that CPA happened between radar sweeps. After the aircraft passed, the separation had decreased to 0.2NM and 200ft.

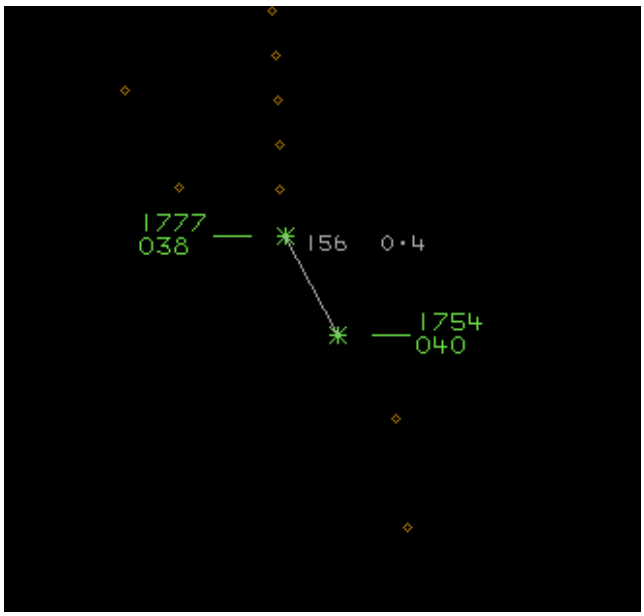


Figure 6: Separation prior to CPA.

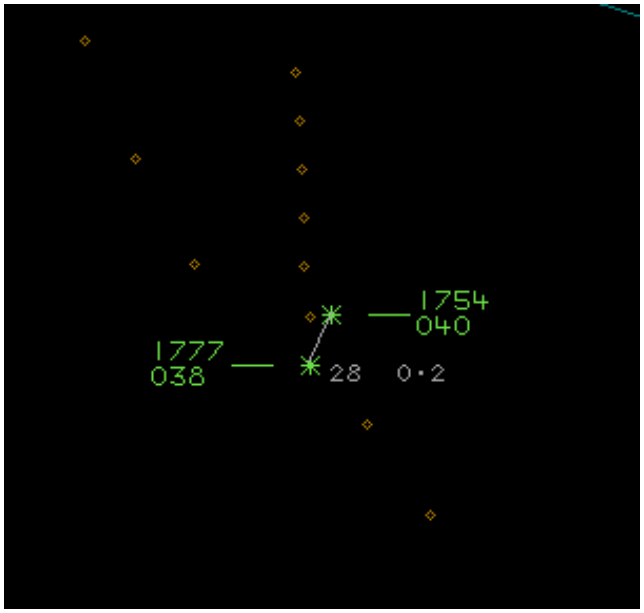


Figure 7: Separation after CPA.

The Typhoon formation departure was approved with no conflicting tracks within 10NM of Coningsby. It is unclear as to the length of time that had passed between the initial radar release and the Typhoon formation getting airborne and whether Traffic Information could have been passed prior to departure. The controller passed timely Traffic Information to the Typhoon formation lead on both conflicting tracks once airborne. That Traffic Information along with the onboard radar allowed the formation lead to alter the heading of the formation to avoid the C182. The restriction of FL40 and the proximity to Waddington caused issues for the Typhoon formation lead as they were effectively boxed-in with limited available options to avoid the C182. The Coningsby Departures instructor should be commended for prompting the trainee to pass Traffic Information to the No.4 Typhoon. The C182 pilot reported that they were visual with the departing Typhoons, assumed that they were visual with him, and therefore took no measures to increase separation. It is worth noting that a previous Airprox [2019017] had similar circumstances involving Coningsby-based aircraft.

UKAB Secretariat

The Typhoon and C182 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard.[2] If the incident geometry is considered as head-on or nearly so then both pilots were required to turn to the right.[3] The lateral separation at CPA was calculated by interpolating between radar sweeps.

MAA RA 3234 - Air System Formations, states as follows:

> Regulation:
> A controller shall consider a formation as a single unit for controlling purposes when the formation is operating within specified parameters.
>
> AMC:
> Formations should be considered as a single unit for separation purposes provided that:
>
> > a. The formation elements are contained within 1 nm laterally and longitudinally for military Air Systems or 0.5 nm laterally and longitudinally for civil Air Systems, and at the same level[4]
> >
> > .

[2] SERA.3205 Proximity. MAA RA 2307 paragraphs 1 and 2.
[3] SERA.3210 Right-of-way (c)(1) Approaching head-on. MAA RA 2307 paragraph 13.
[4] At the same level is defined as operating within 100 feet vertically of the lead air system.

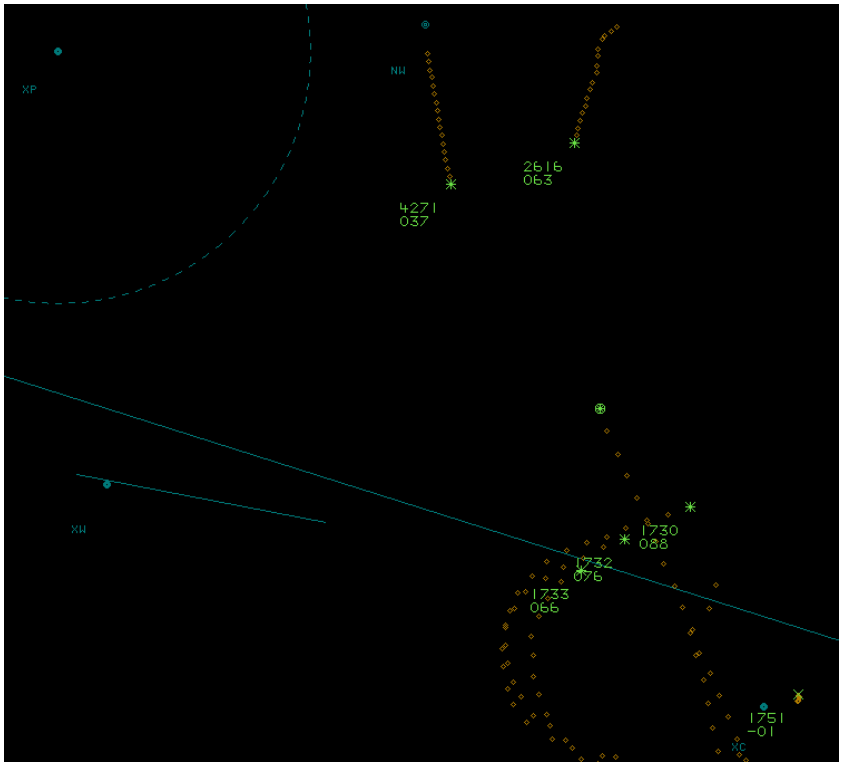
b. Where the formation contains a mix of military and civil Air Systems, the military distances (1 nm and at the same level) should be applied.

c. Where a civil formation is undertaking a military task, the formation should adopt the military formation distances (1 nm and at the same level).

d. Within Class G airspace only, at the controller's discretion, these limitations can be increased to 3 nm and/or up to 1000 ft vertically.

e. The formation, although operating outside the parameters given above, has been the subject of an Airspace Utilisation Section (AUS) Airspace Coordination Notification (ACN) or tactical negotiation between appropriate military supervisors and civilian watch managers.

NATS Ltd area radar picture at radar release for the Typhoon formation, 0856:22 UTC. Coningsby bottom right in the picture:



C182 squawk 4271 (Humberside Approach),coordinated Prefect squawk 2616 (RAF Cranwell). Squawks 1730, 1732 and 1733 Typhoon formation departing on MID East prior to the Airprox Typhoon formation.

RAF Coningsby Local Investigation

A full transcript of the Coningsby Departures frequency was provided to aid board members with their analysis of the events. The following captures the pertinent chronology in relation to the formation getting airborne and the Traffic Information passed:

08:56:22 Radar release was given for [Typhoon formation C/S]

08:57:37 [Typhoon #1 C/S] was identified by CGY Departures and cleared to FL 40. At this point Traffic Information was passed as follows: "Traffic North one zero miles tracking South indicating FL six zero."

08:57:53 Further Traffic Information was passed to the formation: [Typhoon formation C/S] further traffic North eight miles tracking South indicating FL three eight.

08:58:31 [Typhoon #4 C/S] called airborne.

There is currently no documentation that stipulates how long a Call for Release (CFR) is valid for, however ATC work on a 2min validity. This does not appear to be sufficient to enable a 4 ship of Typhoons to get airborne.

CAP 774 states that the automatically provided service from ATC is decided upon by the current weather state. On this occasion, the weather meant that the service provided as a default was a Traffic Service. With such congested airspace, this might not be the best service for a departing 4 ship of Typhoons into congested Lincolnshire airspace.

A 4 ship take-off requires anything between 1min 20sec and 2min 40sec (this was taken as a snapshot and timings can well be outside of this time frame); which could mean that a departing formation trail could be up to 15 miles long; this is outside what RA3234 classes as a formation[5].

Observations

The service to be automatically provided by ATC are dependent on the weather at the time. Traffic Service is only applied to the lead aircraft in a formation, not the individual aircraft.

MAC Barriers

The following barriers to MAC were considered:

Airspace Design & Structure.

In order to transit to the operating area, departures (VFR or IFR) must transit an AIAA within Class G airspace. The MID N cannot mitigate against LOSS. Barrier ineffective.

Regulation.

All regulation was complied with by both pilots and ATC but allowed the aircraft to be released into conflict. Barrier ineffective.

ATC Conflict Management.

All relevant information was provided by ATC to the pilots iaw the ATS. As the situation developed ATC provided more information than required under a duty of Care. Regardless, the Barrier proved ineffective.

Pilot Conflict Management.

Radar contact was too late to allow the conflict to be resolved. Barrier ineffective.
Visual sighting was too late to allow the conflict to be resolved. Barrier ineffective.

Technical Conflict Management.

Typhoon is not equipped with a Collision Avoidance System. Barrier ineffective.

Given that no barriers were effective, the resolution of the conflict relied on providence.

DDH Recommendations

Title. Review of Formation Departure Procedures

[5] Within 1NM laterally and longitudinally, or 3NM and/or 1000 ft - at the controllers discretion - only when operating in Class G airspace.

Text. A review is to be carried out, utilising both ATC and Ty StanEval resources, into the procedures for multi-ac formations departing RAF Coningsby. The review is to include, but is not limited to; the period of validity of CFR; the provision of ATS wrt weather conditions and intensity of ac operations in the Coningsby area and; the ability to maintain formation (as defined in RA3234) versus the relevance of stream (singleton) departures and stream (pairs) departures.

RAF Coningsby SO comment. This has been a thorough investigation and I thank the Station Safety Cell, and all of those involved in this incident, for their honesty and efforts to discover the facts. There does not appear to be a visible 'smoking gun' where process or procedure was not applied in this case and, disappointingly, the barriers to MAC have proven ineffective across the board. I agree with the recommendations from this LI and would like to see these reviewed as soon as possible; in particular, whether or not a 2-minute 'window of release' is deemed appropriate (and whether this should be formalised); whether we are adequately considering traffic density when selecting an ATS and; whether we should review our departure procedures to ensure we remain compliant with the definitions of a formation iaw RA3234.

RAF Coningsby DDH comment. I welcome this thorough investigation and agree it has illuminated the issues and provides a sound recommendation to address the ongoing concern. It is apparent that whilst extant procedures were followed, these did not provide a sufficiently robust barrier to prevent the Airprox. Therefore, whilst agreeing the recommendation for further work to develop a more effective procedural barrier, I would like the BM Force STANEVAL to be involved in the review group as they will undoubtedly be able to assist in suggesting and codifying any changes to the radar clearance procedure.

Comments

HQ Air Command

This Airprox was subject to a thorough Local Investigation. It is regrettable that so many barriers to reduce the risk of MAC were ineffective for what is a fairly common-place procedure. The third Typhoon in the trail also commented that this was the second very similar incident in which they had recently been involved. A recommendation has been made for both Typhoon Standards and Evaluation (STANEVAL) and Coningsby SATCO to investigate formation departure procedures to seek a solution that improves the MAC barriers and reduce the likelihood of a similar occurrence happening again.

A Radar Trail Departure is an efficient way to get a formation through cloud and to meet up above in VMC, by reducing communication and time required to get all elements airborne. Each aircraft adopts a 20 second spacing on the next rolling element; therefore, a 4-ship should only require 60 seconds from the lead rolling to number 4 rolling, with last Air System calling airborne once the after-take-off checks have been completed. Between the formation being cleared for take-off and getting airborne, the C182 came within 10NM of Coningsby, with the formation being told to level at FL40 due to coordinated traffic from Cranwell at FL60. This placed them very close to the level of the C182. Although the C182 was under a Basic Service, Traffic Information was passed to each aircraft and each reported being visual with the other, although the C182 was visual seemingly long before Typhoon 4 was. Being aware of the Typhoon formation’s intentions and visual from an early stage, the C182 pilot could have deviated from their course to give the 4-ship departure a wider berth and increase separation. For each aircraft to have passed within 0.2nm and 200ft of each other was avoidable.

Earlier this year, the Air Investment Approvals Committee granted approval for the Typhoon Enhanced Collision Awareness System (ECAS) Stage 1 Fix Package to be delivered for evaluation and assessment of its utility towards the end of 2021.

Summary

An Airprox was reported when a Typhoon and a C182 flew into proximity when 5NM northwest of RAF Coningsby at 0900Z on Thursday 16th July 2020. Both pilots were operating in VMC, the Typhoon pilot under IFR and in receipt of a Traffic Service from RAF Coningsby Departures and the C182 pilot under VFR and in receipt of a Basic Service from RAF Coningsby LARS.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from both pilots, radar photographs/video recordings, reports from the air traffic controllers involved and reports from the appropriate 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.

Board members first discussed the issue of coordination between the Typhoon formation and the Prefect. Members questioned why the Typhoon formation had been cleared to level at FL40 when the Prefect was at about FL60 and wondered why the Typhoon formation were not given FL50, thereby also remaining clear of the C182 (at about FL40) and achieving the correct semi-circular level. The Board was subsequently informed by a military controller member that the Typhoons' FL40 clearance had been issued because the Prefect had actually been cleared to descend to FL50. Members then questioned why the Typhoon formation had been coordinated to remain below the Prefect rather than the singleton Prefect being coordinated to remain clear of the 4-ship Typhoon formation. Furthermore, it was unclear as to why the Typhoon formation had been co-ordinated with the Prefect, general handling 10NM to the northwest, but had not been co-ordinated with the C182 which was also conflicting traffic (**CF4**). A military controller member opined that the C182 was probably not perceived by the U/T controller or screen as being a factor. After further discussion, members agreed that the Typhoon formation had been released into conflict with the C182 because the clearance to level at FL40 had been inappropriate (**CF3**). Members felt that this was not in accordance with ATC procedures (**CF1**) because it would be reasonable to expect factor traffic to be included in the departure plan. The procedure for calling Traffic Information to formations relative to the formation lead aircraft had also resulted in the Typhoon 4 pilot only receiving specific Traffic Information at a late stage (**CF7**), 23sec before CPA at the controller stated separation of 3NM but 8sec before the Typhoon 4 pilot called visual with the C182 at a reported distance of '1000ft ahead'. It was unclear at what point the C182 pilot was handed over to Coningsby and therefore members were not able to establish how the that traffic had been integrated into the Typhoon formation departure plan. Although all of the pilots were only in receipt of a FIS, members felt that the C182 handover could have presented itself as an opportunity for ATC to provide additional coordination. It was unfortunate that a summary of this coordination activity was not included in the RAF Coningsby Local Investigation (LI) because the Board felt this was a key factor in events leading up to the Airprox.

Members readily agreed that the C182 had been factor traffic and that its conflicting flight path had been detected at a later stage than was desirable (**CF2**). Members wondered whether the Typhoon formation could have upgraded their FIS to a Deconfliction Service but concluded that this would not have been possible with the aircraft separated by 6NM from front to back of the formation. This prompted a discussion concerning the suitability of an IFR clearance for a stream take-off. Members noted that the requirements of a 4-ship stream to depart under IFR, but to remain separated under MARSA in an extended trail formation and to join up under VFR at altitude, could be problematic when other traffic operating under a FIS was involved. Nevertheless, it was the responsibility of formation members not to fly into such proximity with other traffic as to create a risk of collision. Members wondered how subordinate formation members could achieve this when their primary focus was, necessarily, to maintain the integrity of the extended trail. Military members noted that it was also for the C182 pilot not to fly into such proximity as to create a danger of collision. However, others felt that in circumstances such as this it was unlikely that a recreational civilian pilot would be able to assimilate

Traffic Information in time to enable them to take avoiding action. Without a transcript of the LARS frequency, the Board were not able to establish whether the C182 pilot had been given enough information (or any information) to allow them to take such action. Additionally it would have been reasonable for them to assume that a departing formation, operating under the same FIS provider, would not close to a range where avoiding action would become necessary. The Board were, therefore pleased that RAF Coningsby were undertaking a review of formation departure procedures and noted that the results of such a review could well have applicability to all MoD formation departures..

Turning to the Typhoon 4 pilot, members agreed that they had not been able to avoid flying in to such proximity with the C182 as to create a risk of collision (**CF5**). Members surmised that either: Traffic Information, radar picture and building link picture had not been assimilated, or the pilot had simply levelled as per the clearance without recognising that the C182 was closing in the 12 o'clock at about the same level. In addition, at the time, their stated main focus was 'maintaining radar contact with the member of the formation ahead … whilst building traffic SA' leading to an element of distraction (**CF9**). The Typhoon formation leader had attempted to turn the formation away from the C182 and the Board commended this action but, the closing geometry and spread of the Typhoon formation was such that it proved inadequate for Typhoon 4 (**CF6**). Members questioned whether each formation member was required to follow the MID North profile or were permitted to cut the corner to catch up with the preceding formation member, in the latter case adding a degree of uncertainty for the formation leader as to the location of subordinate elements. Members noted that the time required for a 4-ship take-off was 3 times the individual spacing; a total of 1min *for* 20sec spacing and 2min *for* 40sec spacing. Given the stated 20sec separation, it would be expected that Typhoon 4 pilot would call airborne approximately 1min after the leader called 'rolling'. In this case Typhoon 4 pilot called airborne almost 2min after the leader called rolling, however, it was noted that the NATS Ltd area radar picture showed the formation to be separated by about 6NM from front to back, which was to be expected with 20sec separation and 350kt departure speed. By comparing ATC transcripts and the radar picture, it was evident that the airborne call was late. Additionally, it was possible to ascertain from the information available that the Typhoon formation had actually concluded its take-off within the ATC 2min 'window' for call for release. The concern shown in the RAF Coningsby LI relating to this particular aspect was therefore not germane, however, as previously stated, the Board welcomed the review of formation departure procedures.

Considering the risk, the Military ATM report stated that the Typhoon pilot had gained visual contact with the C182 at a range of 1.5NM and 100ft below the C182. However, the Typhoon 4 pilot's DASOR stated that the first sighting was 'RADAR at 1.5NM, Visually approx 1000ft ahead, passing 300ft underneath and about 200ft laterally' and that the avoiding action was 'Sharp raise of nose however that would have been likely too late if on an actual collision course'. Given this description, members thought that the degree of risk was higher than might be inferred from the Military ATM report. In the event, the Typhoon 4 pilot had seen the C182 very shortly before CPA and at a point that the Board considered to be effectively a non-sighting (**CF11**) because it was too late to increase separation at CPA.

The C182 pilot reported seeing the first Typhoon at 5NM and that the Typhoons had passed 2-3NM to the right (**CF12**) although the report of a TAS alert (**CF8**) indicated otherwise. However, although Typhoons 1 to 3 did pass 1NM, 0.8NM and 0.6NM to the right, respectively, Typhoon 4 actually passed 0.1NM to the left, and all passed within 200ft vertically of the C182. Considering the C182 pilot's report, some members wondered whether the C182 pilot had in fact seen Typhoon 4. Many members felt that the separation at CPA and closing speed of 480kt, in combination with the Typhoon 4 effective non-sighting, was such that providence alone had prevented a mid-air collision, Risk A. Others argued that Typhoon 4, cleared to FL40, was always going to level 200ft above the C182 at 4000ft, to which it was noted that Typhoon 4 had crossed through the C182's level at a range of about 1.3NM, or just over 9 seconds before CPA. Further robust discussion ensued until Director UKAB called for a vote, at which the Board members agreed by a margin of one vote that Risk B (safety much reduced) rather than Risk A (providence decided the outcome) best described the occurrence (**CF10**).

Members also discussed the RAF Coningsby LI and noted that, in their opinion, although thorough in the timeframes immediately leading up to the departure of the formation, it had not explicitly examined

the ATM co-ordination of the LARS handover. The Board hoped that their additional analysis might serve to provide supplementary information to complement the risk picture for the DDH.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK

Contributory Factors:

	2020069		
CF	**Factor**	**Description**	**Amplification**
	Ground Elements		
	• Regulations, Processes, Procedures and Compliance		
1	Organisational	• ATM Information Provision	Inadequate regulations or procedures
	• Situational Awareness and Action		
2	Human Factors	• Conflict Detection - Detected Late	
3	Human Factors	• Inappropriate Clearance	The ANS clearance contributed to the Airprox
4	Human Factors	• ATM Coordination	
	Flight Elements		
	• Regulations, Processes, Procedures and Compliance		
5	Human Factors	• Flight Operations Documentation and Publications	Regulations and/or procedures not complied with
	• Tactical Planning and Execution		
6	Human Factors	• Insufficient Decision/Plan	Inadequate plan adaption
	• Situational Awareness of the Conflicting Aircraft and Action		
7	Contextual	• Situational Awareness and Sensory Events	Pilot had no, late or only generic, Situational Awareness
	• Electronic Warning System Operation and Compliance		
8	Contextual	• ACAS/TCAS TA	
	• See and Avoid		
9	Human Factors	• Distraction - Job Related	Pilot looking elsewhere
10	Contextual	• Near Airborne Collision with Aircraft, Balloon, Dirigible or Other Piloted Air Vehicle	Piloted air vehicle
11	Human Factors	• Monitoring of Other Aircraft	Non-sighting or effectively a non-sighting by one or both pilots
12	Human Factors	• Perception of Visual Information	Pilot perceived there was no conflict

Degree of Risk: B.

Recommendation: Nil.

Safety Barrier Assessment[6]

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

Ground Elements:

Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because the Typhoon formation were coordinated against Cranwell traffic but in the process were cleared to about the same level as the nearby C182.

Situational Awareness of the Confliction and Action were assessed as **partially effective** because Traffic Information was passed to Typhoon No.4 at a late stage.

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

Flight Elements:

Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because the aircraft were flown into such proximity as to create a danger of collision; Typhoon No.4 pilot levelled at about the same level as the C182 and the C182 pilot did not turn right.

Tactical Planning and Execution was assessed as **ineffective** because the Typhoon formation leader's turn on to heading 340° did not resolve the confliction.

Situational Awareness of the Conflicting Aircraft and Action were assessed as **ineffective** because the Typhoon No.4 pilot was given information on the C182's position and level but still levelled at about the same altitude.

See and Avoid were assessed as **ineffective** because the Typhoon pilot saw the C182 too late to increase separation before CPA and the closure rate was such that the C182 pilot had little opportunity for avoiding action.