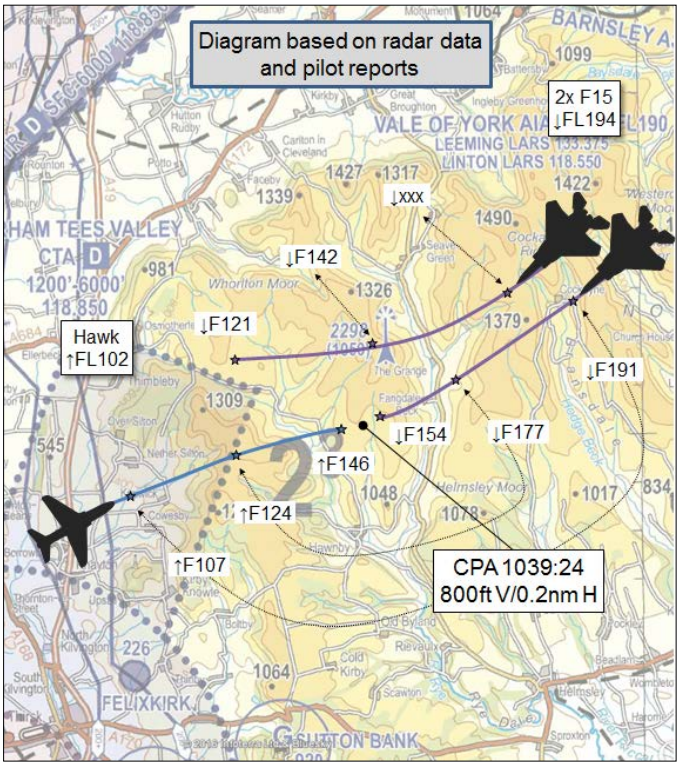
AIRPROX REPORT No 2016238

Date: 14 Nov 2016 Time: 1038Z Position: 5420N 00109W Location: 18nm E RAF Leeming

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Hawk	F15
Operator	HQ Air (Ops)	Foreign Mil
Airspace	Vale of York AIAA	Vale of York AIAA
Class	G	G
Rules	VFR	VFR
Service	Traffic	Traffic
Provider	Leeming	Swanwick Mil
Altitude/FL	FL146	FL154
Transponder	A,C,S	A,C,S
Reported		
Colours	Black	Dark Grey
Lighting	Strobes, Nav and landing	
Conditions	VMC	VMC
Visibility	20km	
Altitude/FL	15000ft	
Altimeter	RPS (1019hPa)	NK
Heading	090°	270°
Speed	300kt	494kt
ACAS/TAS	Not fitted	Not fitted
Separation		
Reported	2-300ft V/>1nm H	1000ft V/0.4nm H
Recorded	800ft V/0.2nm H	



THE HAWK PILOT reports that he was climbing in the Vale of York on a Traffic Service with Leeming Zone, having been handed over by Leeming Approach. Prior to take-off, a single F15 had been seen in the Leeming overhead at 4-5000ft. Once handed to Zone, he requested an update on the F15 and was told that it had departed the area. As they climbed through 15000ft, ATC called traffic to their left (north) indicating 2000ft below on a reciprocal heading. Both crew looked left, and the rear seat non-handling pilot (NHP) saw a single F15 and told the handling pilot. As he was looking left to see it, the NHP looked forward and instantly saw an F15 head-on and inside 1nm. He shouted 'bunt' twice and started to push the stick forward as the front seat pilot reacted to the call. They bunted and rolled left. Very shortly after this the F15 passed on the right-hand side on a reciprocal heading 2-300ft above. Shortly after it had passed, ATC called a further contact east 1nm indicating the same height, which the pilot believed to be the F15 they had just passed. They told Leeming Zone that they would be filing an Airprox.

He assessed the risk of collision as 'High'.

THE F15 PILOT reports that he was general handling and receiving a Traffic Service from Swanwick Mil. They received good Traffic Information from Swanwick Mil and picked up traffic on the nose at 2nm. They stopped descent to allow the traffic to pass below them and estimated it passed about 1000ft below.

He assessed the risk of collision as 'None'.

THE LEEMING CONTROLLER reports that he was the OJTI[1], with a controller under training (UT) in the Zone position. There were a number of Swanwick squawks general handling in the Vale of York. They were controlling a pair of aircraft manoeuvring in a block of airspace 7000-15000ft. They had received Traffic Information from Swanwick about a pair of F15s manoeuvring FL50-240, 10-15nm away from the aircraft already on frequency, but were not informed of any other traffic (including the subsequent Airprox F15s). Ordinarily, if Swanwick had traffic to affect, Leeming would hand over any general handling tracks to Swanwick, but at the time were trialling keeping traffic in the range FL100-190 to reduce Swanwick controller workload. Leeming App called to hand over a Hawk, who was climbing not above 19000ft QFE and, during the handover, they heard the App Controller call traffic general handling to the NE of the Hawk at FL185 and FL195 (Swanwick traffic). When the Hawk came on frequency he prompted the UT to call the traffic again, the previous radar sweep had shown it at FL185, but it was now head on at FL155 so was obviously descending rapidly. The Hawk was indicting 7000ft below and climbing. The UT called one of the tracks, but not the other, and after the Traffic Information was acknowledged by the Hawk pilot he called the second contact as 'east, 1nm, 500ft above'. At the time, Leeming was SSR only, so because of the SSR radar update speed, there was a possibility that the aircraft were closer than they were calling them. The Hawk pilot advised that he would be reporting an Airprox and they passed the message on to Swanwick.

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

THE LEEMING SUPERVISOR reports that although he didn't witness the incident, he was in the ACR monitoring the Director position at the time and was aware of the Hawk getting airborne and being handed over from App to Zone for general handling; he heard the Traffic Information being called. The Watchman radar was u/s for the second consecutive day, so Leeming was SSR only. The slower update rate of the SSR possibly meant that it was more difficult to assess the direction of travel of manoeuvring aircraft.

THE SWANWICK CONTROLLER reports that he was the TAC left controller on the NE sector. There were 3 pairs of F15s on frequency, spread over a large geographical area. Due to the high traffic density, there was a planner and a TAC right controller in position. At approximately 1040, the Airprox F15s, who had been 30nm east of Leeming, were seen tracking west in 2nm stream formation in a steady descent from FL190. At the same time a radar track squawking 0406 was observed departing Leeming on an easterly heading. Another pilot then made an RT transmission, and during this the controller realised that the F15s and the Leeming traffic were going to conflict. As soon as the frequency was clear he gave Traffic Information to the F15s as '5nm opposite direction at FL120 believed to be a Hawk. The lead pilot acknowledged the call, didn't call visual or systems contact, but was observed to turn slightly right of the contact. The controller didn't deem that there was any further confliction [with this aircraft], and he estimated that the closest they appeared on the radar was 1nm and 700ft. The second F15 was slightly above in the descent directly behind the lead aircraft, so, due to the quick closing speed, he made another Traffic Information call, this time aimed at the No2 in the formation, using his callsign he advised 'previously called traffic now 1nm west climbing through FL140'. The second F15 overflew the 0406 squawk with a Mode C indication of 1000ft separation. He did not report visual.

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

Factual Background

The weather at Leeming was recorded as follows:

```
METAR EGXE 140950Z 25017G29KT 9999 FEW020 BKN160 14/09 Q1023 BLU NOSIG=
```

[1] On-the-job training instructor

Portions of the tape transcript between the Leeming Zone Controller and the Hawk are below:

To	From	Speech Transcription	Time	Remarks
Zone	Swanwick	Swanwick Mil North East Planner	10:34:20	
Swanwick	Zone	Leeming Zone just checking that the F Fifteens are returning back.	10:34:22	
Zone	Swanwick	Erm, standby, er, yes they are.	10:34:27	
Swanwick	Zone	Roger Leeming ground, Leeming Zone.	10:34:30	
Zone	Swanwick	Thank you Swanwick.	10:34:32	
Aggressor	Zone	Aggressor the F Fifteens are now clear of the Vale of York airspace.	10:34:36	
Zone	Aggressor	Copied Aggressor Thank you.	10:34:39	
Zone	Hawk	Leeming Zone, {Hawk C/S}, airborne passing a thousand foot Traffic Service.	10:36:13	Incorrectly calling Zone on climb out.
Hawk	Zone	{Hawk C/S} Leeming Zone freecall Approach Stud three.	10:36:21	Screen steps in.
Zone	Hawk	Copied Stud three Hawk	10:36:25	
Approach	Zone	Ground err, Zone	10:37:48	
Zone	Approach	Approach	10:37:49	
Approach	Zone	Err, Zone	10:37:50	
Zone	Approach	Approach, Handover {Hawk C/S}	10:37:51	
Approach	Zone	Go ahead.	10:37:52	
Zone	Approach	Leeming East Seven miles manoeuvring squawking Zero Four Zero Five.	10:37:53	
Approach	Zone	Contact.	10:37:58	
Zone	Approach	Climbing Nineteen Thousand feet on our QFE looking to work in the block between Five and Nineteen Thousand feet on the Barnsley, Traffic Service reduced	10:37:59	
Approach	Zone	Identified Stud four	10:38:06	
Zone	Approach	Stud four roger Approach	10:38:07	
Approach	Zone	Zone	10:38:08	
Zone	Hawk	Leeming Zone {Hawk C/S} handover	10:38:27	
Hawk	Zone	{Hawk C/S} Leeming Zone identified Traffic Service reduced SSR alone, report ready for manoeuvring.	10:38:30	
Zone	Hawk	Hawk wilco.	10:38:37	
Hawk	Zone	Hawk that previously called traffic now North East Five miles tracking South West indicating Five Hundred feet above descending.	10:38:54	
Zone	Hawk	Hawk looking	10:39:02	
Hawk	Zone	Hawk further traffic East One mile tracking South West, er indicating One thousand feet above.	10:39:15	
Zone	Hawk	Hawk visual with that traffic a pair of F Fifteens obviously coming back for more.	10:39:21	
Hawk	Zone	Hawk roger.	10:39:26	
Zone	Hawk	And Hawk I am going to declare an Airprox on that second F Fifteen. We got rather close head to head	10:39:37	
Hawk	Zone	Hawk roger	10:39:45	

Portions of the transcript between the Swanwick NE Tac Controller and the F15s are below:

From	To	Speech Transcription	Time
SWK NE TAC	F15s	{F15 c/s}, traffic south west, 5 miles, opposite direction indicating FL120 believed.	10:38:48
F15	SWK NE TAC	{F15 flight c/s} searching.	10:38:52
SWK NE TAC	F15 (No2)	{F15 No2 c/s}, the traffic is your west 1 mile, tracking east at FL140 climbing.	10:39:16
F15 (No2)	SWK NE TAC	{F15 No2 c/s}, copies Sir, we're heading uh, we'll be over Leeming	10:39:26
SWK NE TAC	F15s	{F15 c/s} roger	10:39:32
SWK NE PLN	LEE Zone	Swanwick Mil NE Planner.	10:40:03
LEE Zone	SWK NE PLN	Leeming zone, request traffic information, uh Leeming east 7…correction 8 miles squawking 6055 and 6056.	10:40:04
SWK NE PLN	LEE Zone	They are a pair of F15's in the block FL50 to FL200	10:40:14
LEE Zone	SWK NE PLN	FL50 to 200	10:40:17
SWK NE PLN	LEE Zone	Affirm.	10:40:19
LEE Zone	SWK NE PLN	Roger, traffic information from us, Leeming 080, 15 miles, squawking 0405.	10:40:21
SWK NE PLN	LEE Zone	Contact.	10:40:27
LEE Zone	SWK NE PLN	Single Hawk, working 5000 to 19000 feet.	10:40:28
SWK NE PLN	LEE Zone	19000, is that on the Barnsley?	10:40:31
LEE Zone	SWK NE PLN	Affirm, he's gonna put in an Airprox on the uh, most easterly of the F15's 6056.	10:40:33
SWK NE PLN	LEE Zone	On the 6056?	10:40:41
LEE Zone	SWK NE PLN	Yeah.	10:40:44
SWK NE PLN	LEE Zone	Ok, that's no problem, Swanwick Mil.	10:40:45

Analysis and Investigation

Military ATM

Figures 1-6 depict the relative positions and separation between the Hawk and F15s at pertinent points in the lead up to the Airprox. The replay provided by the RAC does not necessarily reflect the picture seen by either controller involved. In particular, Leeming Zone was operating SSR-alone.

At 10:38:06 (Figure 1), the Hawk had just been handed over from Leeming Approach to Leeming Zone. The traffic operating 16nm NE was not mentioned during the radar handover but Traffic Information was passed by Leeming Approach prior to transferring the aircraft to Leeming Zone.

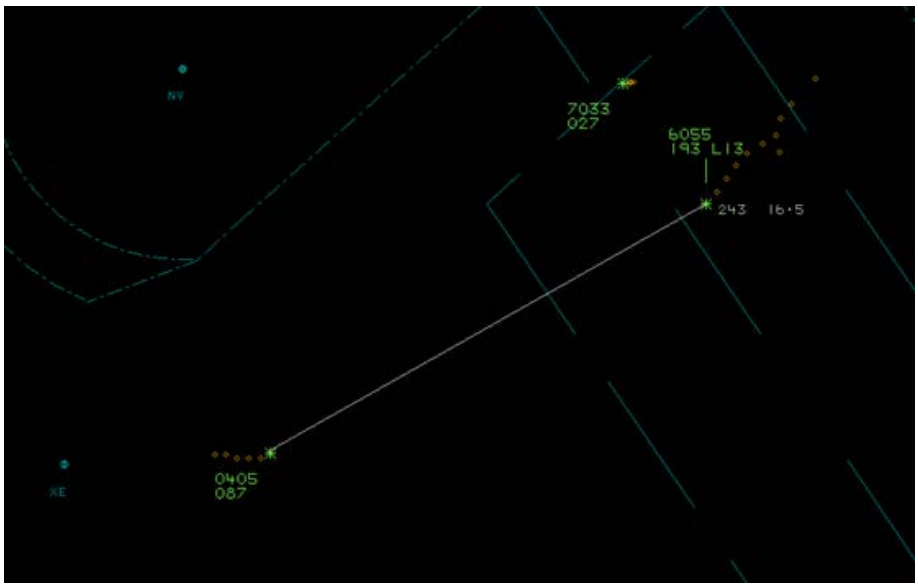


Figure 1: Geometry at 10:38:06 (Hawk SSR 0405; F15 SSR 6055/6)

At 10:38:30 (Figure 2), the Hawk checked in on frequency with Leeming Zone and Traffic Service was agreed. No Traffic Information was passed at this time, though Leeming Approach had passed Traffic Information on a pair of F15s prior to handing over the Hawk to Leeming Zone.

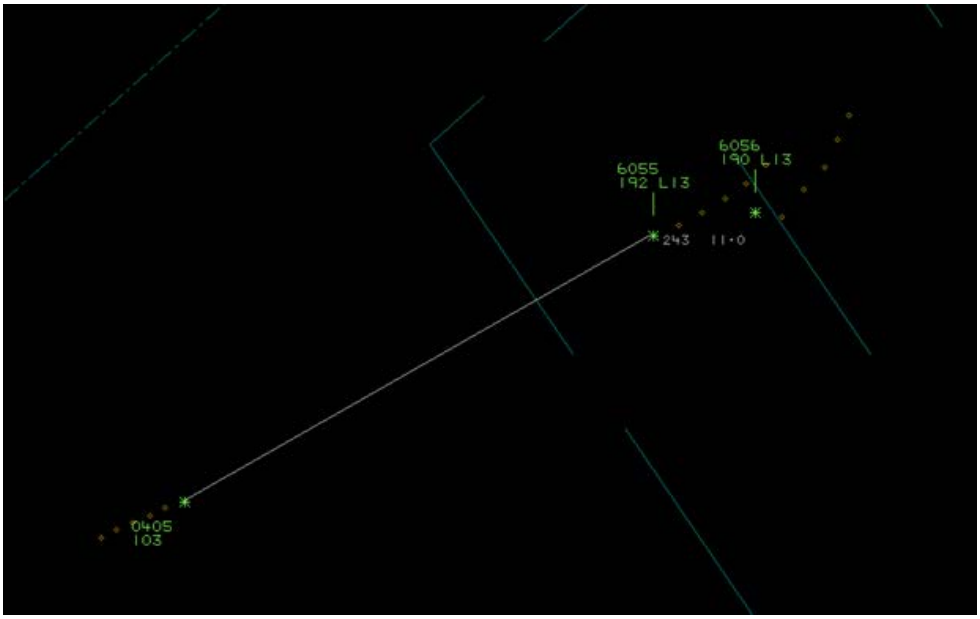


Figure 2: Geometry at 10:38:30 (Hawk SSR 0405; F15 SSR 6055/6)

At 10:38:54 (Figure 3), the Leeming Zone controller passed Traffic Information on the 'previously called traffic', described as NE, 5nm, tracking SW, indicating 500ft above, descending. There was no statement about the conflicting traffic being a pair. The Hawk pilot replied that he was looking but did not call visual. At the same time, the Swanwick NE Tac controller passed Traffic Information on the Hawk to the F15s as SW, 5nm, opposite direction, indicating FL120. The lead F15 replied that he was searching but did not call visual or systems contact.

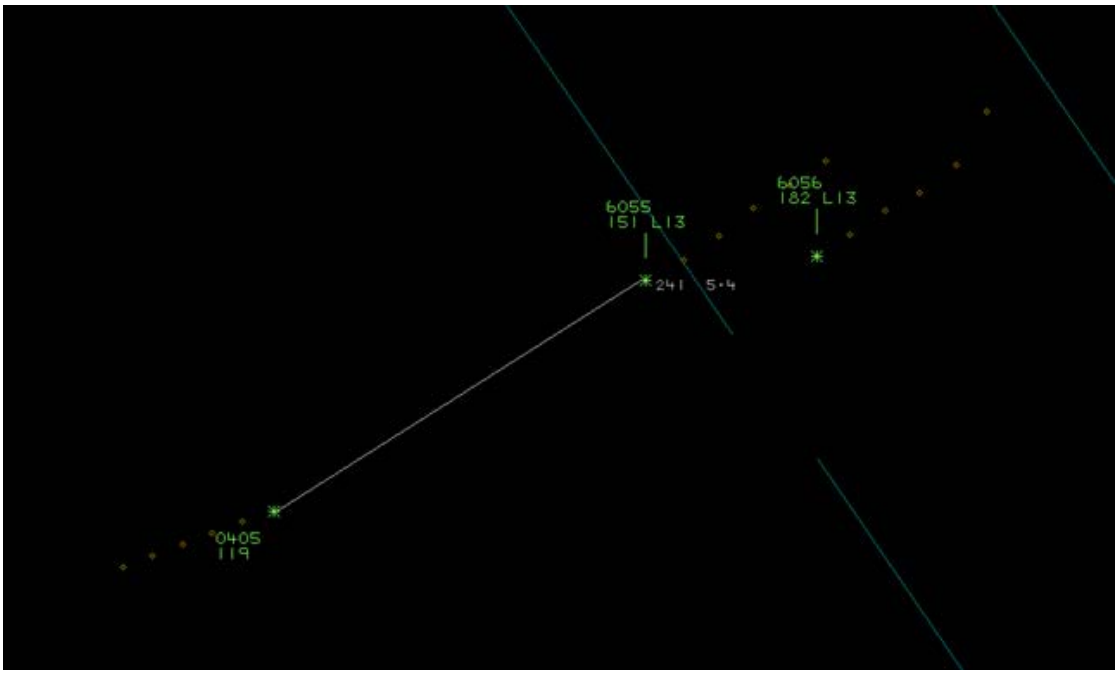


Figure 3: Geometry at 10:38:54 (Hawk SSR 0405; F15 SSR 6055/6)

At 10:39:15 (Figure 4), the Leeming Zone controller passed updated Traffic Information on 'further traffic', meaning the second aircraft in the pair of F15s. It was described as E, 1nm, tracking SW, indicating 1000ft above. Simultaneously, the Swanwick NE Tac controller provided updated Traffic Information to the second F15 as W, 1nm, tracking E at FL140 climbing. The pilot responded but still did not call visual.

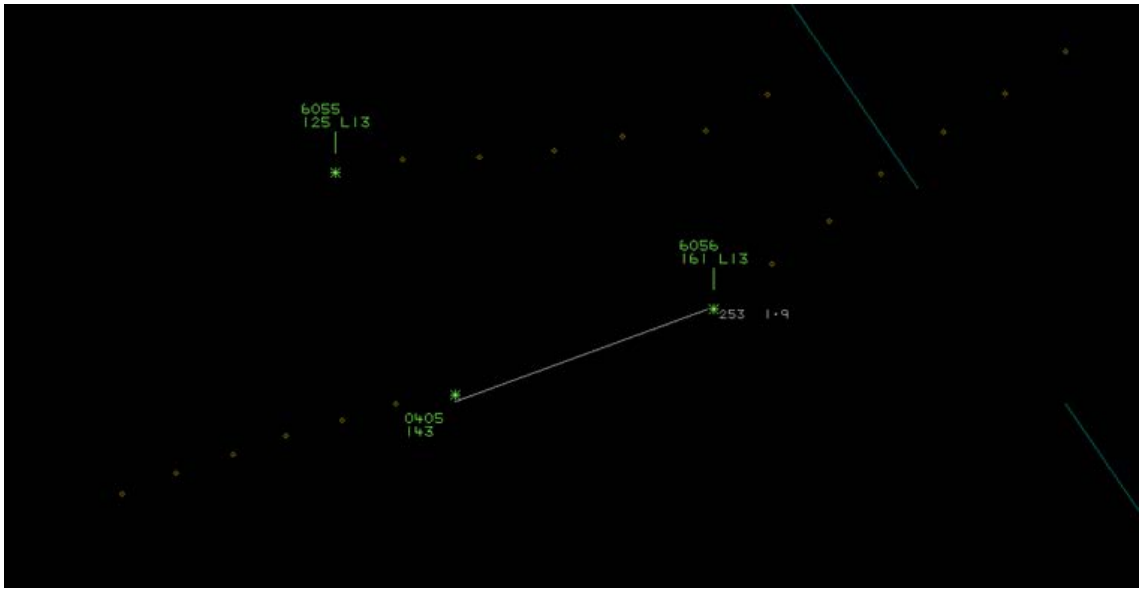


Figure 4: Geometry at 10:39:15 (Hawk SSR 0405; F15 SSR 6056)

At 10:39:21 (Figure 5), the Hawk pilot reported visual with the pair of F15s, followed by a declaration of Airprox with the second aircraft in the pair.

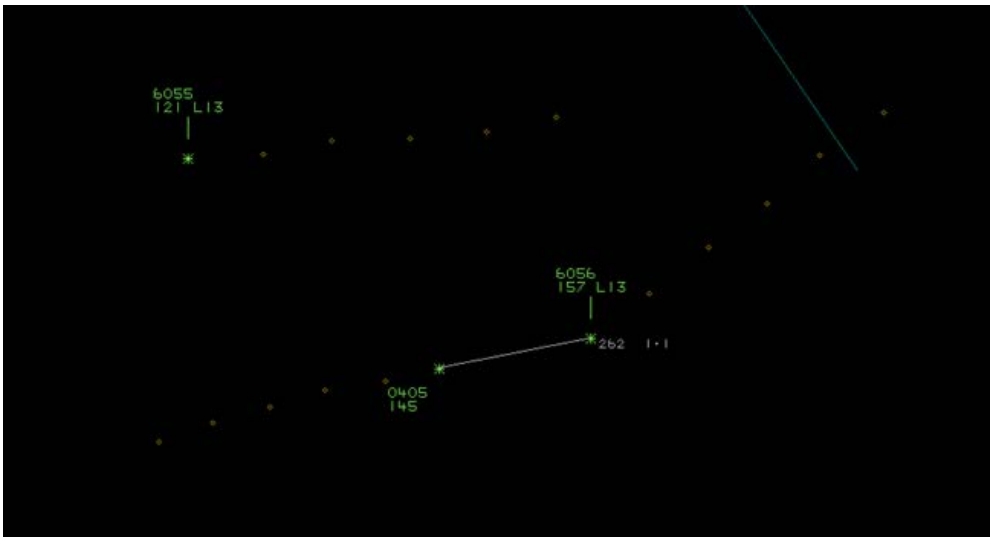


Figure 5: Geometry at 10:39:21 (Hawk SSR 0405; F15 SSR 6056)

At 10:39:24 (Figure 6), the 2 aircraft were at their CPA (crossing tracks) with an indicated vertical separation of 800ft.

Figure 6: Geometry at 10:39:24 (Hawk SSR 0405; F15 SSR 6056)

An Occurrence Safety Investigation (OSI) was convened at RAF Leeming on 21 Nov 16 in order to investigate the circumstances that led to this Airprox. The OSI determined that there was a loss of safe separation between the Hawk and the F15 because the late visual acquisition of the trail F15 by the Hawk pilots prevented timely avoiding action from being taken. Contributory factors included communication between ATC and aircrew, the use of secondary radar to provide surveillance and the lack of a collision warning system (CWS) on the Hawk.

Whilst climbing out and in receipt of Traffic Service from Leeming Approach, the Hawk was advised that a pair of F15s that had been operating in the vicinity of Leeming had vacated the area and that another pair of Hawks was operating approx. 25nm SE. At the end of the radar handover, the Leeming Approach controller passed Traffic Information to the Hawk on traffic manoeuvring 15nm ENE at FL185 and FL195. This information did not explicitly include that the conflicting traffic was a pair and, due to the range, the Hawk pilot used it to build SA rather than as a cue to gain visual acquisition.

Leeming ATC was operating SSR-alone, therefore their radar picture had a slower update rate and they were unable to see non-transponding aircraft. In some cases, a general handling pair will remain in formation and operate with only the lead aircraft squawking, which would have led to an inability to see the second aircraft had any lateral split occurred; however, in this case, both conflicting F15s had discrete squawks that were displayed on the Leeming Zone controller's radar screen and identified them as under control of Swanwick NE.

The UT Leeming Zone controller heard the Leeming Approach controller pass Traffic Information to the Hawk at the end of the handover. Once the Hawk had checked in on frequency, the UT and instructor had a brief discussion about when would be an appropriate time to update the information. The instructor prompted the UT to call the traffic as it approached a range of 5nm from the Hawk, however, the information did not include the fact that it was a pair. The instructor stated afterwards that, had there not been a UT in position, it is likely that the Traffic Information would have been timelier.

Due to high traffic intensity, the Swanwick NE bank was operating with a Tac Left, Tac Right and Planner, who was supporting both Tac Controllers. The NE Tac was controlling 3 pairs of general handling F15s, one of which was operating approx. 30nm E of Leeming. He observed an aircraft climbing out of Leeming, at which stage the closest F15s turned onto a W track, split into 2nm trail and began a steady descent from FL190. The controller's attention was turned to a different pair of F15s, who had transmitted their intentions; however, he also became aware of the conflict emerging between the Hawk and F15s E of Leeming. Once the frequency was clear, he passed Traffic Information to the F15s as 'SW, 5nm, opposite direction, indicating FL120, believed to be a Hawk[2]'. The lead F15 acknowledged the Traffic Information but did not call visual, though was observed to manoeuvre to the right, deconflicting from the traffic. Further Traffic Information was immediately passed to the trail F15 as 'W, 1nm, tracking E at FL140 climbing'. The pilot responded but did not call visual, crossing path with the Hawk with 1000ft separation.

The F15s had intermittent weapons system contact with the Hawk and, after the Traffic Information from the Swanwick NE Tac, the lead F15 became visual and called the traffic to the trail F15. The pilot of the second F15 became visual with the Hawk at a late stage but was content with the separation and took no avoiding action.

On receiving the 5nm Traffic Information from Leeming Zone, the Hawk pilots became visual with a single F15 displaced to the left and below. Neither pilot was aware of a second F15 in trail therefore no attempt was made to visually acquire the second aircraft. When the rear seat pilot looked forward, he saw another F15 in the 12 o'clock, within 1nm, and called for an avoiding action 'bunt' manoeuvre. The pilots assessed that, without the avoiding action, there would have been high likelihood of collision.

Both the Leeming Zone controller and the Swanwick NE Tac controller had Situation Awareness of the conflict building; however, the information was not passed to the pilots involved in a manner that would allow them to visually acquire each other in good time to effect see and avoid, taking into account closing speed. The NE Tac's traffic load (frequency blocked by another aircraft) meant that he was unable to pass Traffic Information to the F15s in a timelier manner. The combination of the Leeming Zone controller being a UT and operating SSR-alone led to their Traffic Information being both on the limits of that recommended in CAP 774 and, more crucially, inaccurate.

[2] The transcript finishes at the word 'believed' but the OSI clarifies the rest of the sentence.

UKAB Secretariat

The Hawk and F15 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard[3]. If the incident geometry is considered as head-on or nearly so then both pilots were required to turn to the right[4].

Comments

HQ Air Command

This incident was subject to a detailed safety investigation and serves as a stark reminder of the fact that Traffic Information (TI) is, at best, historic; it is simply a matter of 'how historic' the information actually is. In this instance, the Leeming controller was operating with SSR only, where the data update rate is slower than that of the primary radar and so distances displayed on the radar screen will have shown the aircraft to be further apart than they were in reality. This is exacerbated when the aircraft are head-on and closing at a rate of approximately 700kts. It is also unfortunate that this incident occurred during a trial to ease the burden on Swanwick (Mil) controllers, whereby terminal units are being encouraged to work their home-based traffic where possible. It is a shame that the Leeming controller did not consider handing the aircraft over to Swanwick(Mil) – assuming that Swanwick(Mil) had the capacity – in order to deliver a Traffic Service that was not reduced due to equipment limitations at Leeming.

The electronic conspicuity barrier was unavailable as neither aircraft involved in this Airprox was equipped with a CWS – whilst this is currently being addressed for the Hawk T1 (though will take a considerable amount of time to deliver, as has been noted in previous Airprox) it is unknown if there are any plans to equip F-15 aircraft with CWS.

The final barrier to MAC that was available was see-and-avoid. This proved to be effective for the F-15 pilot (who was comfortable with the separation) but less so for the Hawk crew. It appears that the TI delivered to the Hawk crew lacked one vital piece of information – that there was a pair of F-15s. The Hawk crew's eyes were drawn to the traffic that was first called (the lead aircraft) and, without the 'early' knowledge that there was a second F-15 following reasonably closely behind then vital seconds were lost in searching for that aircraft – it is a combination of good airmanship and a degree of good fortune that the trail F-15 was acquired visually and in time to react before the separation became further reduced (acknowledging that TI was passed on the second F-15 but received after the aircraft had crossed – probably due to the slower update rate of the SSR).

USAFE

There is little to add to the last paragraph of the Military ATM input. That said, given that the subject aircraft were not manoeuvring, it difficult to understand why all the traffic information was passed using cardinal points rather than the clock code which is easier to assimilate, more precise and, in a nose–to-nose situation, has greater immediacy.

Summary

An Airprox was reported when a Hawk and a pair of F15s flew into proximity at 1038 on Monday 14th November 2016. Both pilots were operating under VFR in VMC, the Hawk pilot in receipt of a Traffic Service from Leeming Zone and the F15 pilots in receipt of a Traffic Service from Swanwick Mil.

[3] SERA.3205 Proximity.
[4] SERA.3210 Right-of-way (c)(1) Approaching head-on.

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.

The Board first looked at the actions of the Hawk crew. They had requested a Traffic Service whilst climbing, and understandably expected to be given Traffic Information by ATC on all contacts that were relevant. The Hawk pilot recalled receiving earlier information about F15s operating in the Vale of York, and was provided with Traffic Information from the App controller prior to hand-over to Zone on a pair operating 16nm NE. Unfortunately, once handed over to Leeming zone, this Traffic Information was not updated until the F15s were only 5nm away. Having then been given Traffic Information on a potentially conflicting F15, the crew understandably concentrated their lookout in this direction without knowing it was one of a pair. It was fortuitous that the rear seat pilot looked forward and saw the F15, and that both crew were able to react in time to effect appropriate avoiding action. Although some members wondered whether they should have expected the F15s to come as a pair, particularly because the App controller had given earlier information to that effect, in the main the Board thought that there was very little more the crew could have done given the late and incomplete information they were supplied. A valuable lesson was to ensure that within a crew environment lookout is not focused in the same area, and it was probably only by good fortune that the rear-crew member had turned his attention to the front once the first F15 had been sighted. The Board were informed by military members that although the Leeming based Hawks are not fitted with a CWS at the moment, there is an on-going programme in place to fit one, albeit not until 2019; members welcomed this news.

For their part, the F15s were also receiving a Traffic Service. They had been operating in the area for some time and Swanwick (Mil) were providing Traffic Information as appropriate. Unfortunately, another pilot's transmissions blocked the frequency at the critical point and so the controller could not call the Hawk to the F15s until it was 5nm away. The lead F15 pilot saw the Hawk and manoeuvred away, but even with updated Traffic Information, the No2 pilot thought that the separation was adequate and was content to maintain his heading. The Board were somewhat perplexed by this and wondered why the F15 pilot didn't just manoeuvre to follow his lead to ensure a decent amount of separation. In particular, members with fast-jet experience wondered why a pilot would chose to fly head-on directly over the top of another climbing fast-jet aircraft without knowing the intentions of its pilot. The F15s reported seeing the Hawk at 2nm, and although the closing speed was fast, there was certainly still time to manoeuvre laterally. The Board noted that the F15s were also not fitted with any CWS, although they are equipped with a radar. Neither F15 pilot mentioned in his report whether the Hawk was seen on radar before it was visually acquired by them.

The Board then looked at the role that ATC had to play. The Leeming Zone Controller was under training, with an instructor overseeing from behind. The trainee controller gave Traffic Information on the F15 at 5nm away, and, although the information was accurate in its range assessment, the Board felt that 5nm away on fast-moving traffic in a head-on situation was late. More importantly, the omission of the fact that it was a pair on the first call, with the No2 aircraft being the one that was head-on and most likely to affect, was most unfortunate. The controller did give the extra Traffic Information on the No2 when the F15 was 1nm away, but this was co-incident with the Hawk pilot seeing it and taking action himself. Turning to the Swanwick(Mil) controller, the Board noted that it could be considered that he too passed late Traffic Information given the speed that the aircraft were travelling; however, noting that he couldn't get onto the frequency any earlier due to another pilot's transmissions, the Board recognised that there was little that he could do until the frequency was clear, and by updating the No2 F15 pilot individually, he probably did as much as he could under the circumstances. Some members noted that both controllers used cardinal headings for the Traffic Information, standard practise when aircraft are manoeuvring, but that both aircraft were on steady headings for some time before the incident (the Hawk had yet to start his general handling). It was mooted that calling the traffic using the clock code, and therefore reiterating that it was head-on, might have alerted all the pilots more readily to the impending danger. Although it was a matter of circumstance at the time, the Board thought it regrettable that the on-going trial for Leeming to keep

traffic that would normally go to Swanwick(Mil) was continued in spite of their Primary radar failure over the 2-day period; given the seeming complexity of the airspace at the time, it was galling that Swanwick(Mil) seemingly had capacity to spare and could have taken on the Hawk had they been informed that Leeming were operating SSR-only.

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

- **ATC Conflict Detection and Resolution** was only **partially effective** because, for different reasons, Traffic Information was passed late to both pilots and was not complete as far as the Hawk pilot was concerned.

- **Flight Crew Situational Awareness** was assessed as **ineffective** because the Hawk pilot was not told about the No2 F15 until it was too late, and the No2 F15 pilot did not assimilate that the vertical separation between the 2 aircraft was eroding rapidly as the Hawk climbed and he descended.

- **On Board Warning/ Collision Avoidance System** was assessed as **inapplicable** because neither aircraft was fitted with one.

- **See and Avoid** was assessed as **partially effective** because although the No2 F15 pilot saw the Hawk he did not avoid it sufficiently, and the Hawk pilot did not see the No2 F15 until the last minute.

Finally the Board debated the cause of the Airprox. It was quickly agreed that, unlike the Hawk crew, the No2 F15 pilot had sufficient information to alter the course of events at an earlier stage but had evidently been content to continue into a situation of potential conflict. Members commented that this was a clear case for not assuming that others will be as content with the apparent separation and associated risk as perceived by oneself. Some members opined that the No2 F15 pilot had effectively flown into conflict with the Hawk, but others commented that it was not as clear cut as that and, although probably flawed, his judgement had been that sufficient separation existed not to require a manoeuvre. As a result, the cause was determined to be that the No2 F15 pilot had flown close enough to the Hawk to cause its crew concern, with a contributory factor of inaction by the No2 F15 pilot on receipt of the Traffic Information. Notwithstanding, it was also agreed that ATC had a part to play in the Airprox; however, given that the aircraft were operating in Class G see-and-avoid airspace, the Board agreed that ATC's lack of timely and accurate Traffic Information had been only contributory rather than causal. Turning to the risk, members noted the discrepancy between the assessment of the separation from the two pilots. The Board thought it likely that the Hawk pilot was startled by the sudden appearance of the F15, perhaps causing him to assess it as closer than it was. Nevertheless, although the radar separation indicated 800ft (probably mainly due to the Hawk pilot slowing his rate of climb significantly during the bunt), the Board thought it possible that the aircraft had got much closer than this between radar sweeps. Certainly the avoiding action 'bunt' preformed by the Hawk did not show on the radar until after the F15 had passed (the NATS radars have between 4 and 8 secs update rate). Notwithstanding, some members thought that because the F15 pilot was visual with the Hawk at all times there had been no risk of collision. However, the vast majority felt that the separation and closing speeds were such that this incident represented a situation where safety had been much reduced below the norm. Had the Hawk pilot manoeuvred unexpectedly, there was little the F15 pilot could have done about it and, even given that this had not happened, the Hawk pilot's bunt had probably been the one action that had prevented this from being a much more serious outcome. Therefore the risk was assessed as Category B, safety much reduced below the norm.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The No2 F15 pilot flew close enough to the Hawk to cause its crew concern.

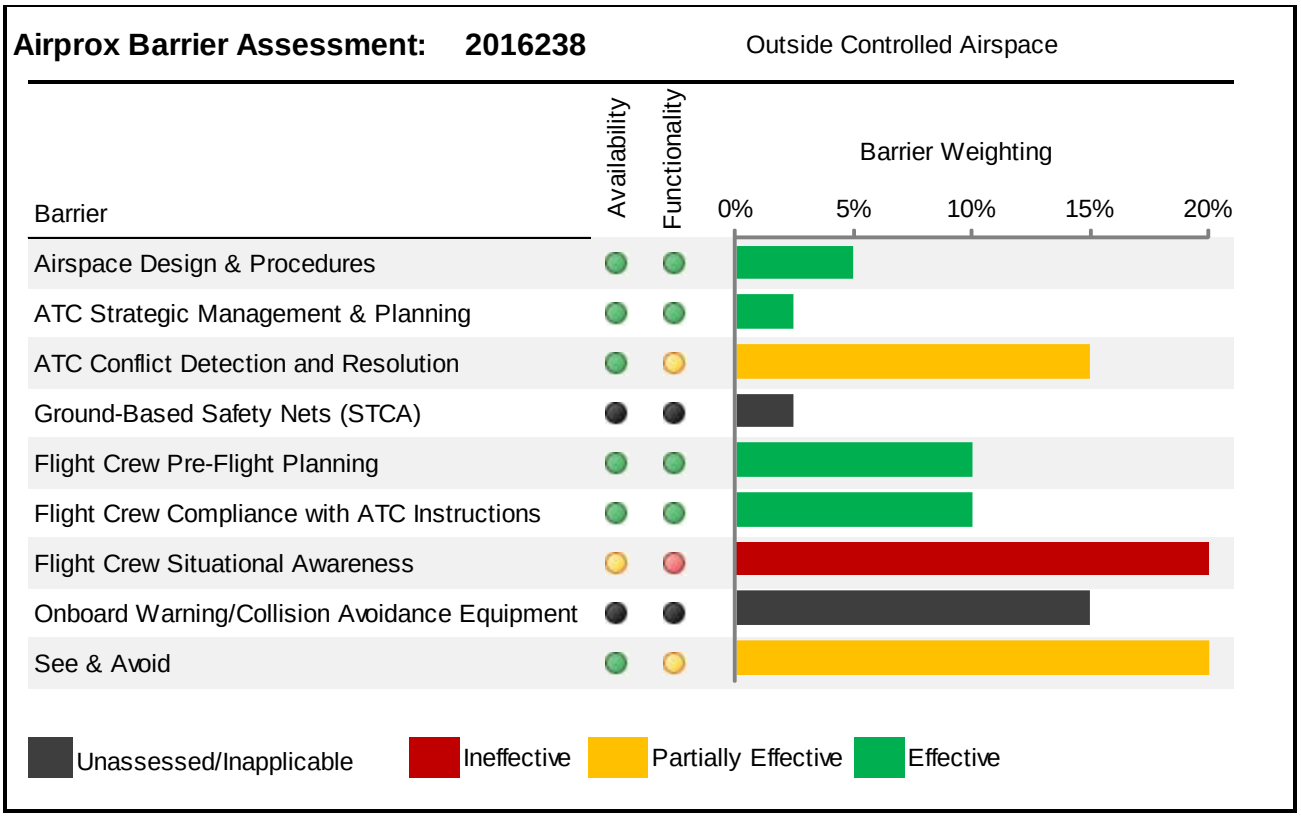
Contributory Factors: 1. Lack of timely and accurate Traffic Information.

2. Inaction by the No2 F15 pilot on receipt of Traffic Information.

Degree of Risk: B.

Barrier Assessment[5]:

Modern safety management processes employ the concept of safety barriers that prevent contributory factors or human errors from developing into accidents. Based on work by EASA, CAA, MAA and UKAB, the following table depicts the barriers associated with preventing mid-air-collisions. The length of each bar represents the barrier's weighting or importance (out of a total of 100%) for the type of airspace in which the Airprox occurred (i.e. Controlled Airspace or Uncontrolled Airspace).[6] The colour of each bar represents the Board's assessment of the effectiveness of the associated barrier in this incident (either Fully Effective, Partially Effective, Ineffective, or Unassessable/Absent). The chart thus illustrates which barriers were effective and how important they were in contributing to collision avoidance in this incident.



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

[6] Barrier weighting is subjective and is based on the judgement of a subject matter expert panel of aviators and air traffic controllers who conducted a workshop for the UKAB and CAA on barrier weighting in each designation of airspace.