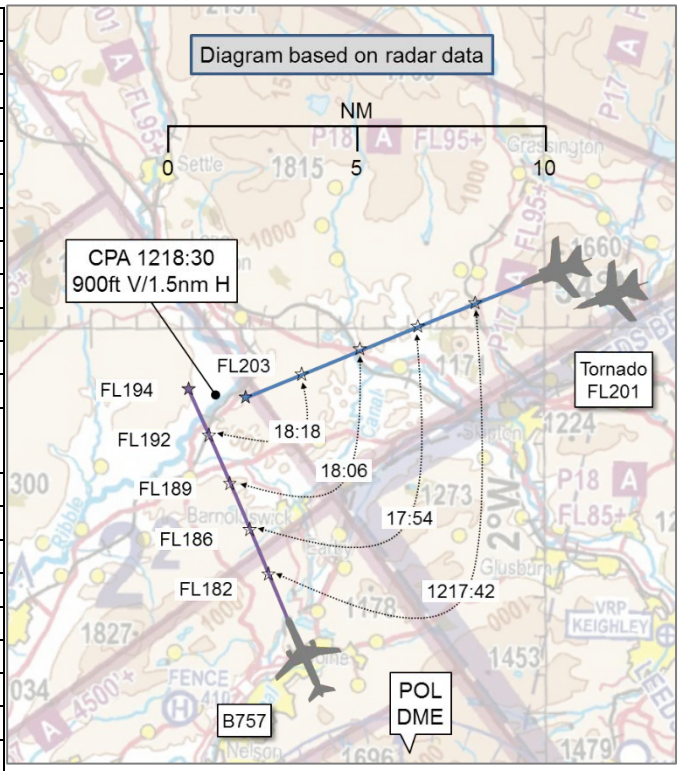
AIRPROX REPORT No 2018050

Date: 12 Apr 2018 Time: 1218Z Position: 5358N 00215W Location: 2nm SE RIBEL

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Tornado x 2	B757
Operator	HQ Air (Ops)	CAT
Airspace	London FIR	Airway
Class	C	A
Rules	IFR	IFR
Service	Radar Control	Radar Control
Provider	Warton	Scottish
Altitude/FL	FL203	FL194
Transponder	A,C,S	A,C,S
Reported		
Colours	Grey	Company
Lighting	NK	Nav, strobe, position
Conditions	NK	IMC
Visibility	10km	NK
Altitude/FL	FL200	FL188
Heading	250°	360°
Speed	400kt	290kt
ACAS/TAS	TCAS II	TCAS II
Alert	RA	RA
Separation		
Reported	NK	Not seen
Recorded	900ft V/1.5nm H	



THE TORNADO PILOT reports that a flight of two Tornado GR4 aircraft had a TCAS RA incident while in receipt of a Radar Control Service from Warton Approach in Controlled Airspace (CAS). The Tornado flight were transiting east-to-west on a heading of 250°at FL200. An airliner was spotted by the lead aircrew in their 10 o'clock position, heading north, moving left-to-right in relation to them. The aircraft initially registered 1000ft below on TCAS. While receiving climb-out instructions from Warton Radar, the Tornado's TCAS gave an RA based on the airliner beginning to climb while transiting northbound across the Tornado's nose from left-to-right. The Tornado pilot followed the RA instructions, noted no safety danger due to positive visual contact, and alerted Warton Radar of the incident. The second Tornado was in close formation throughout the incident and squawking standby. The sortie was continued without further incident.

He assessed the risk of collision as 'Low'.

THE BOEING 757 PILOT reports that prior to the event they were cleared by Scottish to climb to FL190. On heading 360° and climbing through FL188 (vertical speed 1000ft per min) the TCAS alert on the screen became yellow and the controller cleared them to climb to FL290 (the Commander turned the altitude selector to FL290). The controller asked them if they had the traffic in sight; the First Officer started looking, but did not read back the flight level assigned. When passing through FL192-193 the controller transmitted '[B757 C/S] confirm maintaining FL190 and turn heading 270°'. The Commander turned the heading bug to 270°, initiated the turn and selected FL190 on the Mode Control Panel (MCP). At that moment they received a TCAS RA. The Commander disconnected the autopilot and autothrottle and followed the command bar. The First Officer called the TCAS RA to ATC. After the RA had been followed they replied to ATC that they were returning to FL190. The manoeuvres were smooth and they never saw the other traffic except on TCAS. The highest Flight Level reached was FL194.

He assessed the risk of collision as 'Low'.

THE WARTON CONTROLLER reports that the Tornado formation was carrying out a routine transit of CAS to the north of Leeds at FL200. They were in receipt of a Radar Control Service having been handed over by Swanwick (Mil) as a pair in the vicinity of OTR at 1210. This was in preparation for a planned practice diversion to Warton with the handover being initiated early at his request. As the Tornados were approaching CAS to the south of Linton, the B757 was observed climbing northbound from Manchester and highlighted as a potential confliction. At 1216 he initiated coordination with the Prestwick Control North Sector Controller (SC) and agreed that the Tornados would maintain FL200 and the B757 would climb not above FL190. Having resolved this potential confliction and with the Tornados on track for the intermediate approach phase he began an R/T exchange to establish their exact requirements and intentions following their approach. During this exchange, at 1218, and as the B757 passed approximately 2.5nm ahead of the Tornados, the B757 was observed passing FL193 (Mode C) in the climb (the Mode S Selected FL (SFL) remained FL190). The Tornado pilots were given an avoiding action vector onto a southerly track and the conflicting traffic's position was reported. At this time the Tornado pilots reported a TCAS RA which was acknowledged. The B757 returned to FL190 and continued northbound. Once clear of confliction the Tornado's approach and departure continued without any further event.

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

THE PRESTWICK CENTRE (PC) NE SECTOR TRAINEE CONTROLLER reports that the NE Sector was bandboxed. He instructed the B757 pilot to climb to FL190; this was confirmed and selected in Mode S. Both he and his On the Job Training Instructor (OJTI) spotted a 3661 squawk tracking towards RIBEL at FL200; shortly after this Warton called for coordination. Coordination was agreed at FL190 for the B757 until the aircraft were clear. He also called Sector 29 to confirm the 3661 squawk coordination as this was in S29's airspace and to agree additional coordination once clear of the traffic. As the aircraft approached each other he told the B757 pilot to maintain FL190 and passed Traffic Information; 2 o'clock, 8nm right-to-left, 1000ft above. Almost immediately after this he observed the SFL change to FL290 and Mode C indicated a climb. He was about to query the pilot but he changed the transmission to give an avoiding action turn and passed additional Traffic Information. Because the aircraft was still climbing he then gave additional avoiding action in the descent. The SFL was observed to change back to FL190; however, at this point the B757 pilot reported a TCAS RA, and the aircraft descended back to FL190. Once the traffic was clear he climbed the B757 pilot to the agreed coordination of FL250. Prior to transferring the pilot he attempted to query the level bust; however, it was apparent that the pilot was confused and therefore he did not pursue the query.

THE PC NE SECTOR OJTI reports that the North and East Sectors were combined. The B757 pilot was climbed by the trainee to FL190. They both spotted a 3661 squawk to the east of the B757. At almost the same time Warton Radar called to coordinate this traffic. Coordination was agreed with the B757 climbing to not above FL190 and the 3661 squawk would maintain FL200. As the aircraft approached each other the B757 pilot was told to maintain FL190 and Traffic Information was passed. It was then observed that the SFL of the B757 changed to FL290. This was queried by the trainee who tried to confirm the cleared level of FL190, but in the same transmission this was amended to avoiding action and further Traffic Information. The B757 was seen to change SFL back to FL190, but the aircraft continued above FL190. Descent to FL190 was issued, at which point the aircraft reached FL194 and reported a TCAS RA. The B757 then returned to FL190.

Analysis and Investigation

CAA ATSI

ATSI had access to reports from the pilots of the Tornado formation and the B757. ATSI also had access to reports from all air traffic controllers involved. The local area radar and radio recordings were also reviewed. Screenshots produced in this report are provided using recordings of the Prestwick MRT Radar. Levels indicated are in Flight Levels (FL). All times UTC. The Tornado formation (code 3661) were an IFR flight flying in Class C airspace and were in receipt of a Radar Control Service from Warton Radar. The B757 (code 7326) was an IFR flight flying in Class A airspace and was in receipt of a Radar Control Service from the Scottish Control Centre (PC).

At 1208:58 the Tornado formation established communication with the Warton Radar controller at FL200. The aircraft were identified and a Traffic Service was agreed.

The B757 pilot established communication with the Scottish controller at 1211:25. The aircraft was identified and the Scottish controller issued an instruction to climb to FL110.

At 1213:44 the Scottish controller instructed the B757 pilot to: "*[B757 C/S] climb Flight Level one nine zero."*

The B757 pilot responded: "*Climb Flight Level one nine zero, [B757 C/S]."*

At 1214:57 the Tornado formation exited the TRA and a Radar Control Service was agreed with the Warton Radar controller.

The Warton Radar controller initiated coordination with the Scottish controller at 1215:53 (Figure 1). The coordination agreed was that the Tornado formation would maintain FL200 on the current track and the B757 would fly not above FL190.

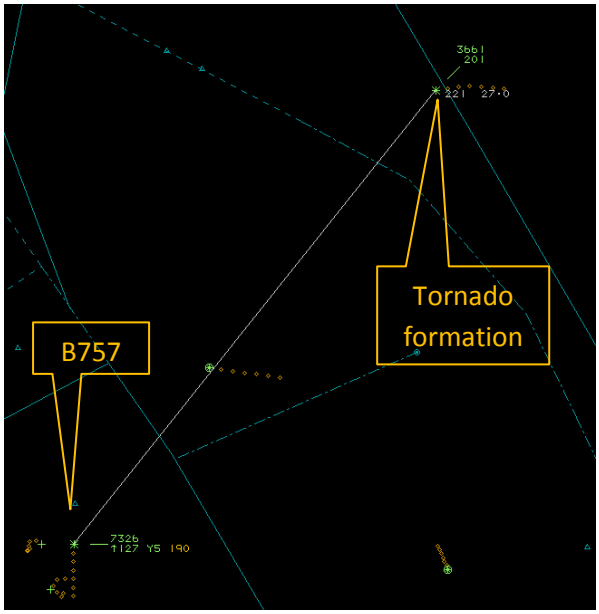


Figure 1 – 1215:53.

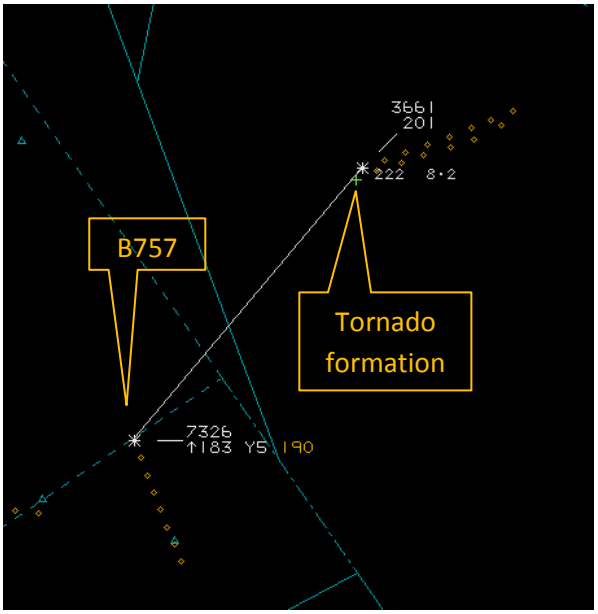


Figure 2 – 1217:46.

The Warton Radar controller asked the Tornado formation if they would like to carry out an SRA on the QNH or QFE at 1217:27. It was agreed that they would carry out an SRA on the QFE 1005hPa. The controller stated they would be vectoring for a left-hand pattern and then passed the standard administrative phraseology for the SRA, including the procedure minima. The procedure was read back correctly.

At 1217:46 (Figure 2) the Scottish controller instructed the B757 pilot: *"B757 [C/S] maintain Flight Level one nine zero on reaching, there is traffic currently in your two o'clock range of eight miles, right to left, it's a thousand feet above your clear level crossing."*

There was no response from the pilot.

The Selected Flight Level (SFL) of the B757 changed to FL257 at 1217:55 (Figure 3).

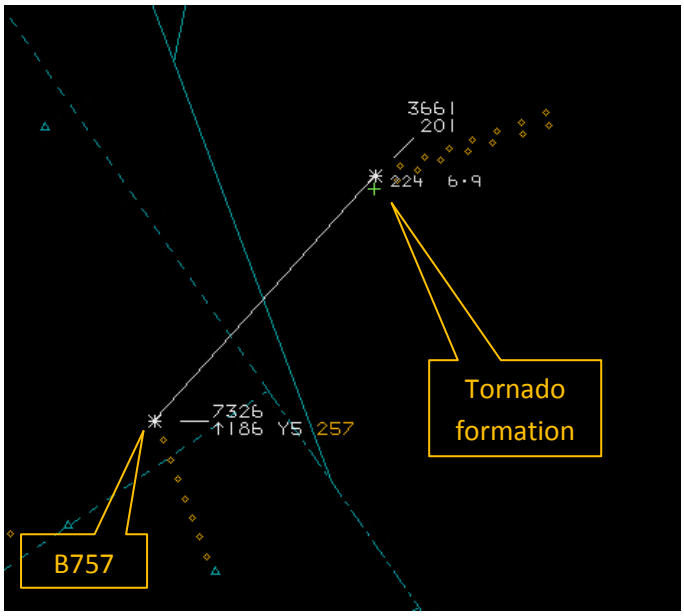


Figure 3 – 1217:55.

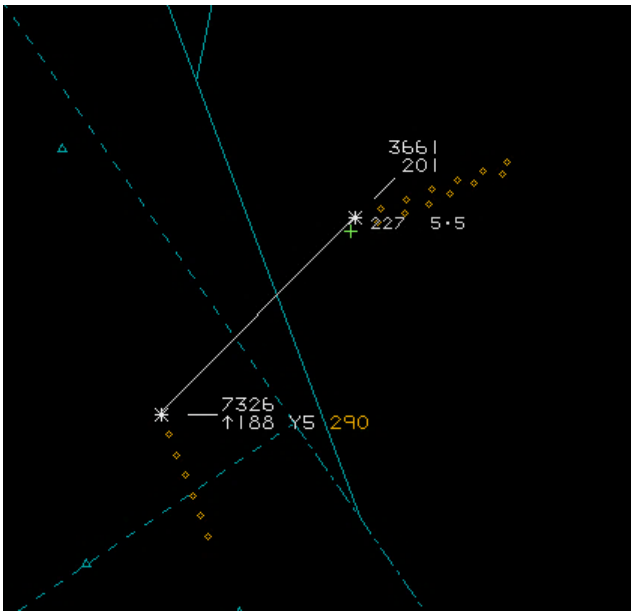


Figure 4 – 1218:03.

At 1217:58 the Scottish controller tried again to communicate with the B757 pilot: *"[B757 C/S] Scottish Control."* The pilot responded: *"[B757 C/S] say again."*

The Scottish controller then instructed the B757 pilot: *"[B757 C/S] maintain Flight Level one nine zero, in fact [B757 C/S] avoiding action turn left immediately heading two seven zero degrees."* The B757 pilot responded: *"Two seven zero on the heading and er one niner zero."*

At 1218:03 (Figure 4) the radar indicated that the SFL of the B757 had reached FL290. At the same time, the Warton Radar controller passed the climb-out instructions to the Tornado formation for after the completion of the SRA and stated that this would be a single frequency approach and departure. The pilot read back the climb out instructions and asked the controller to repeat the last part of the instruction.

The replay indicated that the SFL of the B757 had returned to FL190 at 1218:05 (Figure 5), but the radar indicated that the aircraft was still climbing.

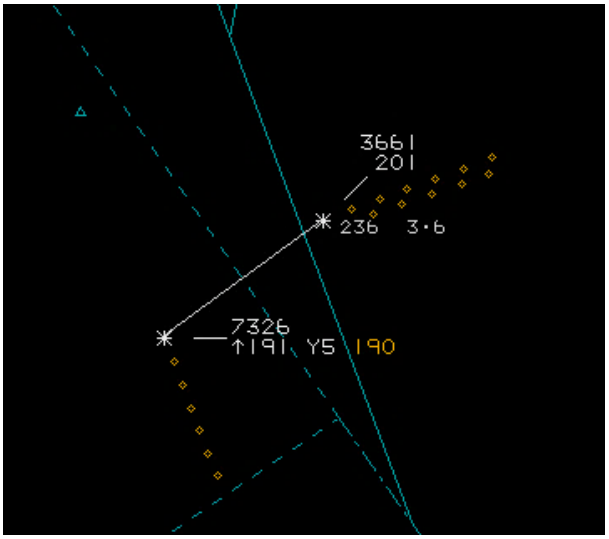


Figure 5 – 1218:05.

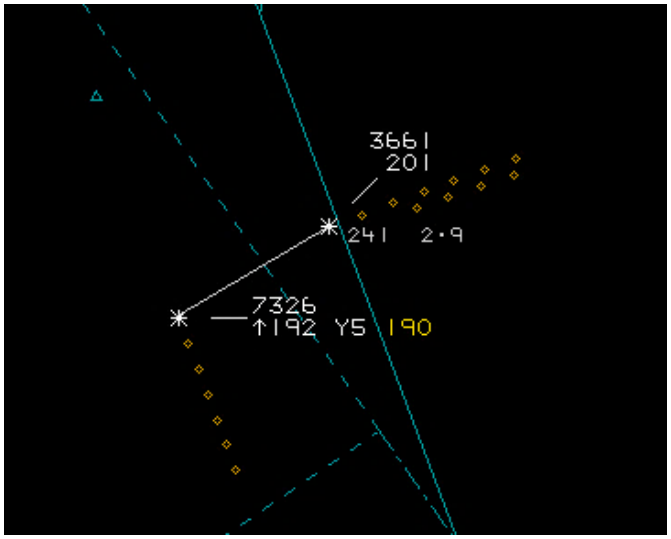


Figure 6 – 1218:19.

The radar indicated that the B757 was at FL192 and the aircraft was continuing to climb at 1218:19 (Figure 6).

At 1218:20 the Warton Radar controller re-states to the Tornado formation that this will be a single frequency approach and departure, there was no read back from the pilot.

At 1218:22 the Scottish controller passed the following Traffic Information and instruction to the B757 pilot: *"[B757 C/S] that traffic is currently in your three o'clock range four miles, indicating in fact coordinated at Flight, at a thousand feet above your level, [B757 C/S] descend immediately to Flight Level one nine zero, that traffic is now in your three O'clock range of two miles."*

The radar indicated that the B757 passed FL190 at 1218:23 (Figure 7). At this point the radar displayed the aircraft's level as FL194 and indicating that the aircraft was still climbing.

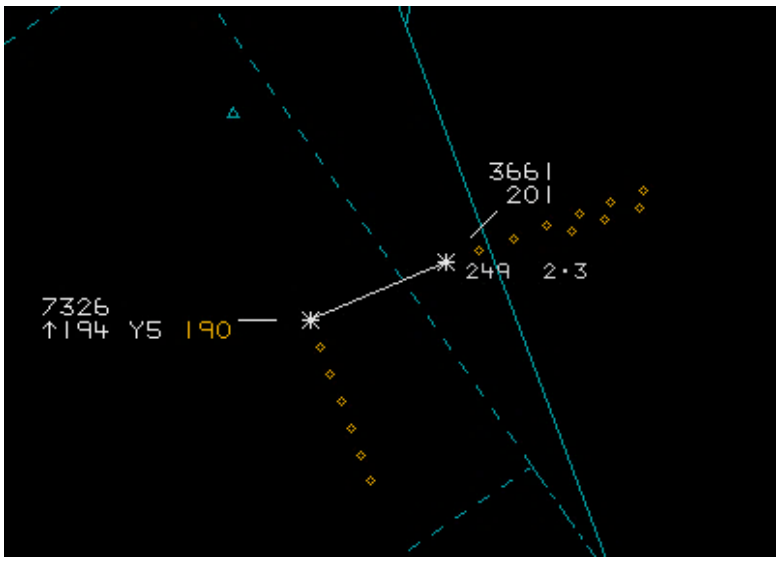


Figure 7 – 1218:23.

The Warton Radar controller issued avoiding action to the Tornado formation at 1218:28 (Figure 8): "[*Tornado C/S*] *avoiding action turn left heading one nine zero degrees, traffic was twelve o'clock in fact right two o'clock now range of three miles northbound er five hundred feet below."*

The Tornado formation stated they had received an RA which the controller acknowledged.

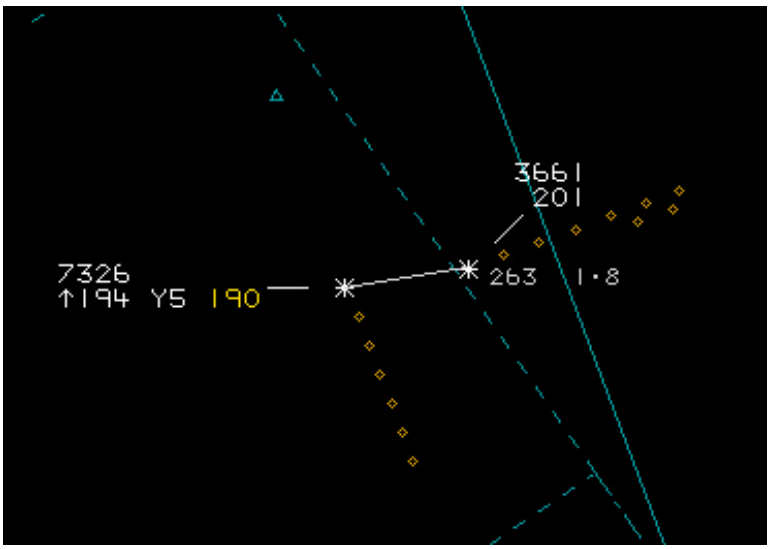


Figure 8 – 1218:28.

CPA occurred at 1218:31 (Figure 9) with an indicated separation of 1.5nm horizontally and 900ft vertically. At this point the radar indicated that the Tornado formation had started to climb.

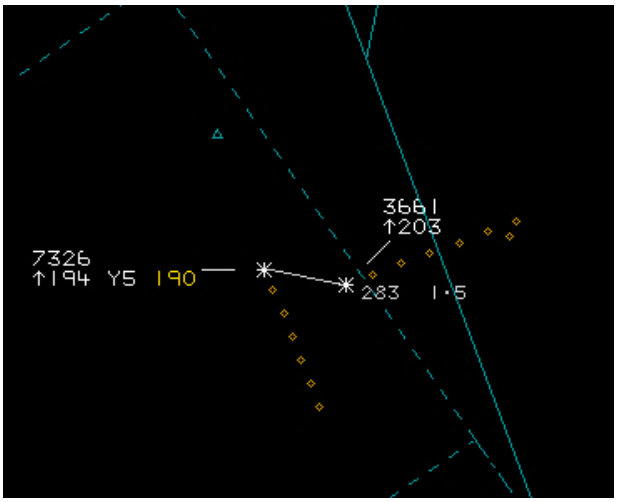


Figure 9 – 1218:31.

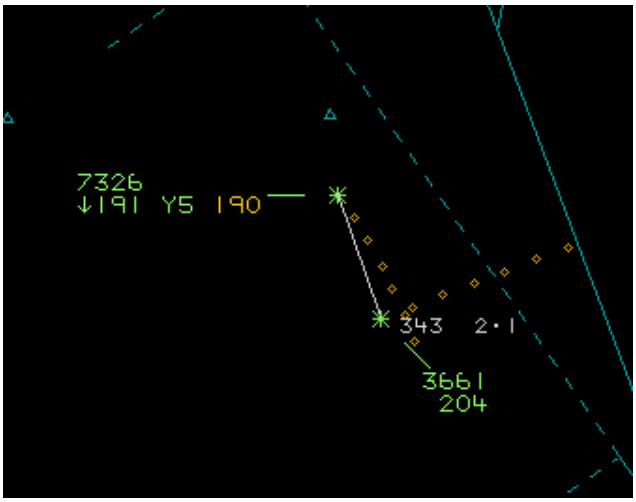


Figure 10 – 1218:43.

At 1218:43 (Figure 10) the B757 pilot reported level at FL190.

Both controllers were responsible for separation. The vertical separation requirement was 1000ft and the relevant sections of CAP 493, Section 1, Chapter 3 state:

'Standard vertical or horizontal separation shall be provided, between:

(1) all flights in Class A airspace;
(2) IFR flights in Class C, D and E airspace;

To ensure vertical separation using Mode C, CAP 493, Section 1, Chapter 6 states:

'When SSR is used to assess vertical separation the Mode C responses are to be continually monitored to ensure that the vertical distance is never less than the prescribed minimum.

Minimum vertical separation may be applied between verified Mode C transponding aircraft provided the intentions of both aircraft are known to a controller because either:
(1) they are under his control;
(2) they have been co-ordinated;

The following criteria apply when assessing the vertical position of a Mode C transponding aircraft:

An aircraft may be considered to be at an assigned level provided that the Mode C readout indicates 200 feet or less from that level;
An aircraft climbing or descending may be considered to have passed through a level when the Mode C readout indicates that the level has been passed by 400 feet or more and continuing in the required direction;
An aircraft may be considered to have reached an assigned level when three successive Mode C readouts indicate 200 feet or less from that level.'

CAP 493, Section 1, Chapter 6 also states;

'Selected Levels display intent-based information only and shall not be used for the purposes of separation.

Units equipped with Enhanced Mode S surveillance systems that enable Down-Linked Airborne Parameters (DAPs) should display Selected Levels on the situation display as a means of mitigating the risk of level busts. The checking of Selected Levels shall not be used as a substitute for RT read-back of level clearances. Where the Selected Level is seen to be at variance with an ATC clearance, controllers

shall not state on RT the incorrect level as observed on the situation display. However, taking into account the limitations of Selected Levels detailed above, controllers may query the discrepancy using the following phraseology: "(Callsign), check selected level. Cleared level is (correct cleared level)".'

The conflict was detected by both controllers and the co-ordination that was agreed was safe; the clearances issued by both controllers were in accordance with the agreed coordination which would have ensured separation.

The Scottish controller instructed the B757 pilot to maintain FL190, together with Traffic Information on the Tornado formation. However, the B757 pilot did not read back the clearance and reported that they heard an instruction to climb to FL290. The controller missed the opportunity to re-iterate the instruction to maintain FL190 and 9 seconds later the SFL on the B757 changed.

The Warton Radar controller was busy communicating the administrative R/T with the Tornado formation at the time of the Airprox, in the belief that the co-ordination had resolved the conflict. The avoiding action that the Warton Radar controller issued was appropriate and was issued 5 seconds after the radar first indicated that a level bust had occurred. By this time the pilot was already complying with a TCAS RA.

The Scottish controller issued avoiding action by adding it to the end of the transmission that contained a control instruction. They subsequently did not notice that the pilot did not read back the avoiding action and they did not re-issue it. The avoiding action to turn left heading 270° against traffic that was to the north east and tracking west could have prolonged the conflict.

Warton ATC

The Warton ATC unit report states that, at 1209, the Tornados were inbound to Warton Aerodrome, from the East Coast for a 2nm Surveillance Approach (SRA) to RW07; then to depart eastbound at medium level, under a Traffic Service outside CAS and a Radar Control Service inside CAS. In order to achieve the unit's stated requirements for controller currency, the controller took the decision to accept the Tornados, from Swanwick Mil, early whilst still in the vicinity of Ottringham (OTR). This would allow much needed time towards the monthly requirements in the TEST endorsement. The controller's intention was to perform an airways cross of P18, N601, N57 & L612 in a westerly direction at FL200 under the authority of Warton unit's area of autonomy. This authority allowed Warton TEST qualified ATCOs to enter CAS, within specified areas, and take 5nm or 5000ft on un-coordinated airways traffic, or 1000ft (2000ft within RVSM Airspace) on coordinated traffic.

Having received a radar handover from Swanwick Mil at FL200, the controller proceeded to vector the Tornado pilots towards Warton's area of autonomy, prior to setting a course towards Warton; taking the formation north of Leeds/Bradford in a westerly direction. Prior to entering CAS, the controller noticed the B757 climbing out of Manchester airport and proceeding in a northerly direction. The Mode S indications for this contact showed an SFL of FL190 with a UK exit designator of Y5. With a turn to cross CAS, the B757 was deemed to be a potential confliction to the Tornados and, therefore, coordination was initiated and achieved with the PC North and East Controller. The agreed coordination was for the B757 not to be above FL190 and for the Tornados to be not below FL200.

Having resolved the only observed confliction, the controller then proceeded to complete the administrative tasks with the Tornado pilots prior to the SRA and confirming their climb out requirements. Unfortunately, whilst involved in some lengthy phraseology, the SFL of the B757 was observed, after the event during the radar replay, changing from FL190 to FL290. At the time the B757 and the Tornados were on crossing courses with 6.5nm horizontal separation with the B757 still below FL190. At 12:18 the SFL of the B757 had changed back to FL190, however, the aircraft proceeded to climb above FL190, and was observed reaching a maximum level of FL194 within 1.4nm of the Tornados.

Having been alerted to the level bust by a colleague, the controller proceeded to pass avoiding action to the Tornado pilots, however, by this point, the B757 had passed through their 12 o'clock and they were already responding to a TCAS RA, having initiated a climb and passing FL204.

At the time when the B757's SFL changed from FL190 to FL290, the controller was involved in the lengthy phraseology for the SRA and subsequent climb-out. It is believed that this distraction resulted in the controller not observing and responding to the level bust at the earliest opportunity. The lack of a conflict alert tool did not alert the controller to the level bust and potential confliction.

During the course of this investigation it became clear that the controlling team at Warton had varying views on the immediacy of providing avoiding action on a coordinated aircraft who had yet to break coordination, but whose SFL was observed changing to a level beyond that coordinated. Having spoken with the PC Ops Supervisor and Swanwick Military Supervisor it is recommended that, should time permit, a landline call be made to query the change in SFL. If time does not permit, then avoiding action should be initiated.

UKAB Secretariat

The Tornado and B757 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard[1]. Because the incident geometry is considered as converging then the B757 pilot was required to give way to the Tornado formation.

MATS Part 1[2] states:

> *'Under some circumstances controllers may consider it prudent to inform a pilot of other traffic which is separated from his aircraft. In such cases, to prevent any possible confusion, no reference should be made to the actual level of the other aircraft. If necessary, the pilot should be informed that the other aircraft is "(number) thousand feet above/below".'*

The Radiotelephony Manual (CAP 413)[3] states:

> *'Clearances transmitted by ground personnel (usually Air Traffic Control) are to be strictly complied with and the clearance issued is to be read back verbatim. Information is provided to assist the safe conduct of the flight and should not be read back. If the information is not understood, a request to repeat the information is sufficient.'*

Comments

HQ Air Command

The aircraft involved in this Airprox were all in receipt of a Radar Control Service and the controllers involved had agreed coordination, thus the ATS barrier was fully functional. However, it appears that the pilot of the B757 misheard a clearance to climb to 10000ft above his coordinated level and thus the vertical coordination was eroded to the extent that it triggered TCAS RAs in both aircraft. Coincident to the RAs being issued in the aircraft, both controllers noticed the loss of vertical separation and issued avoiding action to their respective aircraft as the pilots took appropriate action in response to the RAs issued. This incident highlights the importance of a layered defence to loss of separation – the controllers could not have predicted that one of the aircraft involved would not adhere to the cleared level and this is one of the many reasons that we employ systems such as TCAS.

[1] SERA.3205 Proximity.
[2] Section 1, Chapter 6, Page 19, Paragraph 16.2.
[3] Chapter 2, Paragraph 2.1, Table 1.

Summary

An Airprox was reported when a Tornado and a B757 flew into proximity in controlled airspace at 1218hrs on Thursday 12th April 2018. Both pilots were operating under IFR and were in receipt of a Radar Control Service, the Tornado from Warton Radar and the B757 from Scottish Control.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from the pilots and controllers concerned, area radar and RTF recordings and reports from the appropriate ATC and operating authorities.

The Board noted that the B757 pilot, who was routing northbound from Manchester, was in receipt of a Radar Control Service from the Prestwick Centre NE Sector. After his initial call, the pilot had been cleared to climb to FL110, and subsequently FL190, which he read back correctly. Meanwhile, the Tornado formation had established contact with Warton Approach with the intention of carrying out a planned practice diversion to Warton. Once in Controlled Airspace they were provided with a Radar Control Service at FL200. ATC members noted that the Warton and Prestwick controllers were aware of the potential confliction between the aircraft and had agreed appropriate coordination for the Tornado formation to remain at FL200 and the B757 to be not above FL190.

Following the coordination agreement, the Board noted that the Prestwick controller informed the B757 pilot to *"maintain FL190 on reaching there is traffic currently in your two o'clock range of eight miles right to left it's a thousand feet above your clear level crossing"*. A Civil Area Controller member confirmed that this phraseology was in accordance with MATS Part 1 and was regularly used by controllers. In his experience, it was very unusual for this message to be misunderstood. He explained that there are two reasons for making this transmission: to reduce the possibility of a TCAS alert, because the pilot would probably start to reduce his rate of climb if he was soon expecting to level-off; and to inform the pilot that any expectation of further climb would not be possible until clear of the traffic.

The Board then discussed the actions of the B757 pilot after receiving this transmission. It was apparent that the pilot had misheard the message and believed, erroneously, that he had been cleared to climb to FL290 because he changed the SFL, initially to FL257 then FL290, and the aircraft started to climb. The B757 pilot's mishearing of the Prestwick controller's R/T transmission as a clearance to climb was considered to be a contributory factor to the Airprox. No response to the transmission was made by the pilot, and Civil Airline pilot members commented that, if the B757 pilot had thought he had received a clearance to climb further then he was mandated to read back the new clearance before doing so rather than initiate the climb first. This was precisely to avoid the situation that occurred if pilots mishear transmissions. The fact that the B757 pilot did not read back his perceived clearance was considered to be another contributory factor. Civil Airline pilot members also wondered if there had been a discussion in the cockpit regarding the controller's transmission and its meaning, and if that was why no response was received. However, if there had been any doubt, the Board considered that an enquiry to ATC should have been made before any climb took place.

Turning to the ATC aspects of the incident, the Board noted that the Prestwick controller had quickly noticed the change to the B757's SFL and its Mode C indicating a climb. He issued an avoiding left turn to the B757 pilot, which the Board considered was appropriate, together with Traffic Information and an instruction to descend to FL190. The B757 crew then received a TCAS RA and informed ATC accordingly. For his part, although he was busy discussing the Tornado formation's approach to Warton, the Warton controller also noticed that the Mode C of the B757 indicated that it had climbed above its coordinated level, and issued an avoiding action left turn, together with Traffic Information to the Tornado pilot who responded about having received a TCAS RA. The Board commended the actions of both controllers who had had to react quickly to an unexpected loss of separation between two aircraft that had previously been coordinated at safe levels.

Turning to the cause of the Airprox, it was quickly agreed that the incident had been caused by a level bust by the B757 pilot. The Board then turned its attention to the risk and noted that both pilots had been given avoiding action and Traffic Information by their respective controllers, which was

supplemented by them receiving TCAS RAs. At CPA they were 1.5nm apart, the Tornado formation had climbed to FL203, and the B757 pilot had stopped his climb at FL194. The Tornados subsequently passed 2.1nm behind the B757. Consequently, the Board assessed that although normal safety standards and procedures had not pertained, in view of the actual separation between the aircraft there had been no risk of a collision. They therefore assessed the risk as Category C.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: A level bust by the B757 pilot.

Contributory Factors: 1. The B757 pilot misheard the Prestwick controller's R/T transmission as a clearance to climb.

2. The B757 pilot did not read back his perceived clearance.

Degree of Risk: C.

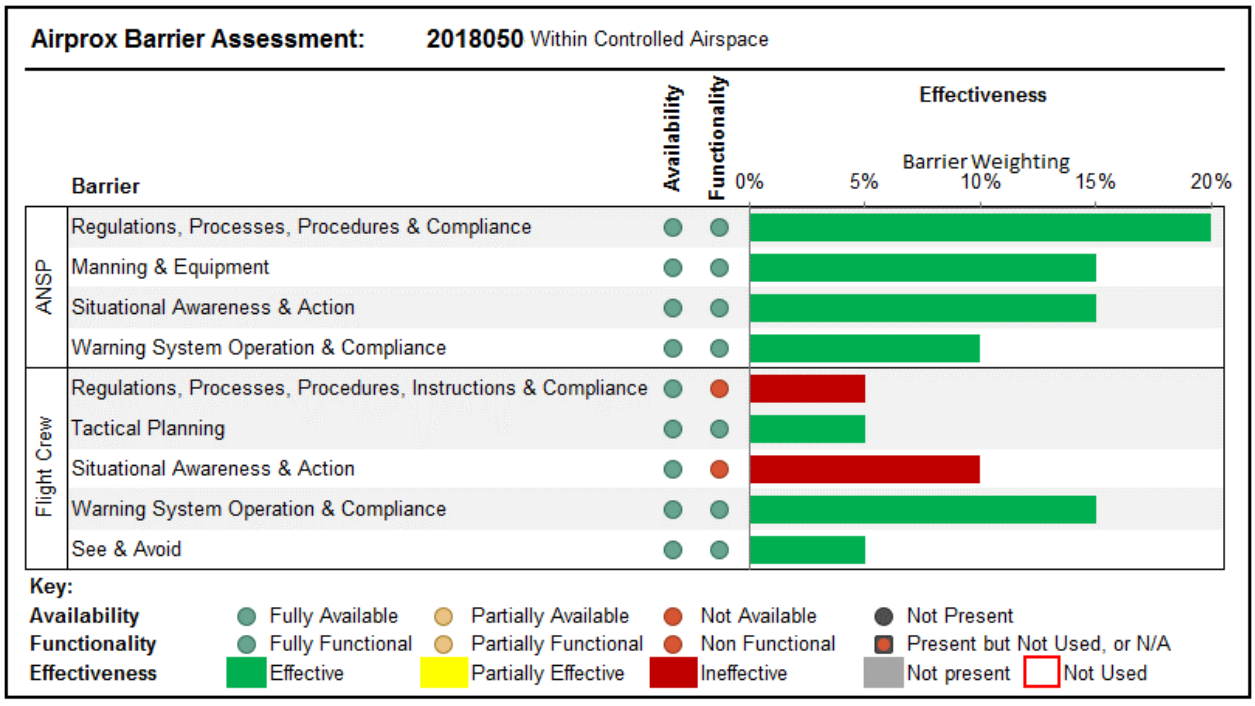
Safety Barrier Assessment[4]

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

Flight Crew:

Regulations, Processes, Procedures, Instructions and Compliance were assessed as **ineffective** because the B757 pilot climbed above his cleared level and did not read back what he believed was a climb clearance.

Situational Awareness and Action were assessed as **ineffective** because the B757 pilot did not use the information provided by ATC and/or TCAS about the Tornado formation and climbed above his cleared level.



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