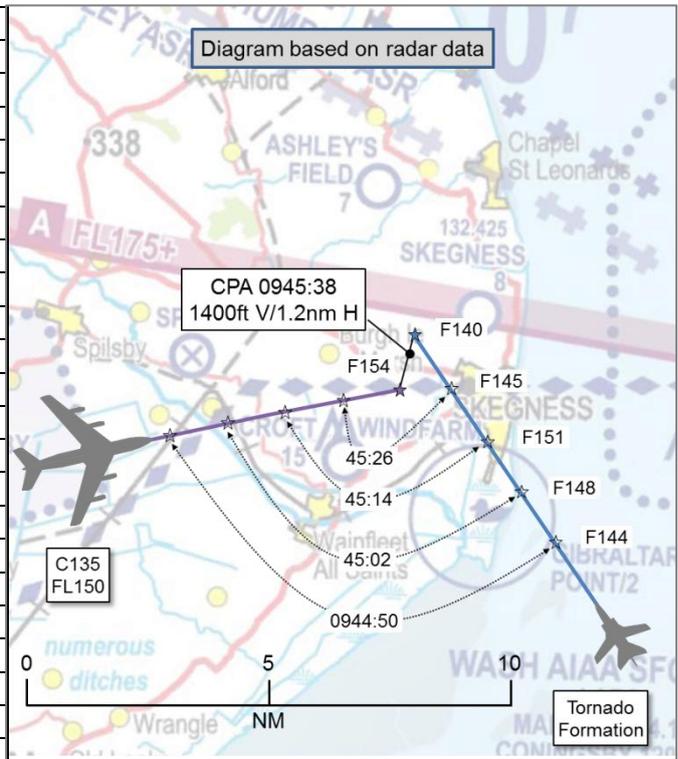


AIRPROX REPORT No 2015050

Date: 20 Apr 2015 Time: 0946Z Position: 5310N 00017W Location: 2nm NW Skegness

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

| Recorded | Aircraft 1 | Aircraft 2 |
|-------------|-------------------|----------------|
| Aircraft | Tornado | C135 |
| Operator | HQ Air (Ops) | Foreign Mil |
| Airspace | London FIR | London FIR |
| Class | G | G |
| Rules | VFR | IFR |
| Service | Traffic | Traffic |
| Provider | Swanwick Mil | Swanwick Mil |
| Altitude/FL | FL140 | FL154 |
| Transponder | A, C, S | A, C, S |
| Reported | | |
| Colours | Grey | NK |
| Lighting | Nav, HISLs | NK |
| Conditions | VMC | VMC |
| Visibility | 50km | NK |
| Altitude/FL | FL150 | FL140 |
| Heading | 325° | 360° |
| Speed | 300kt | 275kt |
| ACAS/TAS | TCAS II (TA only) | TCAS II |
| Alert | TA | RA |
| Separation | | |
| Reported | 1000ft V/<0.5nm H | 0ft V/ 0.5nm H |
| Recorded | 1400ft V/1.2nm H | |



THE TORNADO PILOT reports leading a flight of 2 GR4s, climbing out of Marham. The lead aircraft was equipped with TCAS and was flying with it selected to TA only at the time of the incident¹. Both aircraft were co-level and within 0.3nm. As the formation was climbing through FL142, Swanwick Mil advised that they were approaching controlled airspace and asked if both aircraft were co-level and within one mile to which the lead replied "Affirm". Just after this, as the aircraft were passing FL145, TCAS gave a Traffic Alert and, immediately after this, Swanwick Mil called, "Traffic, left, 10 o'clock, range 10 miles, crossing left-to-right, slightly ahead, indicating FL150". The rear-seat crewman of the lead Tornado focused on TCAS at this point and gave relative height calls from TCAS to the pilot whilst the pilot attempted to gain visual contact with the traffic. The formation number 2 called visual with the traffic, and initially assessed it as heading in the same direction as the formation. The lead pilot then gained visual contact and re-assessed it as being co-level with the formation at FL150 and on a collision course. An immediate descent was initiated to FL140 and the traffic was seen to pass less than 0.5nm behind the formation and 1000ft above.

He assessed the risk of collision as 'Medium'.

THE C135 PILOT reports 'on ATC vectors' under a Deconfliction Service, climbing through FL140 to FL150 when a pair of Tornados flew across their nose from right to left. The crew was first alerted by a TCAS RA 'Descend', immediately visually acquired the Tornados, which were descending through their altitude, and elected to continue climbing. The TCAS RA 'Descend' then switched to an RA 'Climb'.

He assessed the risk of collision as 'Medium'.

¹ In accordance with Standard Operating Procedures at the time.

THE SWANWICK MIL CONTROLLER reports his narrative was filed a few days after the event as the Airprox was not notified on frequency at the time or immediately after landing. He was the East 'Tac Left' controller during a busy phase with a Planner and 'Tac Right' controller in place. There was a busy radar picture in the background to his traffic, with some of his formations under a reduced service due to high traffic density. He recalled he had 9 speaking units on frequency at the time: 3 x F15s conducting general handling under separate squawks near Cottesmore; 2 x F15s conducting general handling in the Norwich area; 2 x F15s which had just free-called north of D207 for radar pick up for individual service and were identified just before the Airprox Tornado formation called; a C510 out of Norwich for CAS join under a Deconfliction Service; and a C340 transiting across the Norfolk coast, southeast bound for CAS join. The Tornado formation had been prenoted from Marham, climbing to FL190, and the controller called a conflictor to them that was west of their position by about 10 miles, indicating FL150. He recalled thinking that their rate of climb would take them above this level before it would become a factor. Shortly afterwards the crew informed him they were visual and were electing to descend to FL140 to go beneath it, a decision taken and communicated to the controller before the traffic had got within 3 miles. The controller did not believe there was anything else to note prior to sector transfer.

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

THE SWANWICK MIL 'OVERLOAD 2' CONTROLLER was not made aware that an Airprox had been filed and did not file a report.

THE SUPERVISOR reports that the incident occurred nearly 1 month prior to the request to complete a report and that he had no recollection of the events.

Factual Background

The weather at Coningsby was recorded as follows:

METAR EGXC 200950Z 07007KT 9999 FEW025 BKN250 11/04 Q1031 BLU NOSIG

A transcript of the Swanwick Mil Tac Left RTF was provided as follows:

| From | To | Speech Transcription | Time |
|-----------|-----------|--|----------|
| Tornado | S'wick TL | Swanwick Mil [Tornado C/S] flight on handover | 09:43:17 |
| S'wick TL | Tornado | [Tornado C/S] flight Swanwick Mil identified climbing flight level one nine zero, Traffic Service | 09:43:20 |
| Tornado | S'wick TL | Traffic Service in the climb flight level one nine zero for [Tornado C/S] | 09:43:26 |
| S'wick TL | C510 | [C510 C/S] Radar Control climb flight level two six zero | 09:43:30 |
| C510 | S'wick TL | Radar Control climb flight level two six zero [C510 C/S] | 09:43:33 |
| S'wick TL | C510 | [C510 C/S] squawk five four one four | 09:43:46 |
| C510 | S'wick TL | five four one four [C510 C/S] | 09:43:49 |
| S'wick TL | F15 | [F15 C/S] confirm you intend to work with [Other F15 C/S]? | 09:44:01 |
| F15 | S'wick TL | [F15 C/S] ah, in approximately two zero mikes we'll be working [Other F15 C/S] | 09:44:05 |
| S'wick TL | F15 | [F15 C/S] roger reduced Traffic Information from all around whilst you work western edge of East Anglia er, due to high traffic density | 09:44:09 |
| F15 | S'wick TL | [F15 C/S] copies we'll be working in our present position request flight level five zero, two four zero | 09:44:18 |
| S'wick TL | F15 | [F15 C/S] flight manoeuvre as required flight level five zero, flight level two hundred, and I'm just working on that separate squawk for your wingman | 09:44:24 |
| F15 | S'wick TL | [F15 C/S] copies all working five zero to flight level two hundred, standing by for separate squawk for [F15 No2 C/S] | 09:44:31 |

| From | To | Speech Transcription | Time |
|-----------|-----------|---|----------|
| S'wick TL | Tornado | [Tornado C/S] flight as you approach controlled airspace confirm both aircraft are within one nautical mile at the same level in the climb? | 09:44:43 |
| Tornado | S'wick TL | Affirm [Tornado C/S] | 09:44:50 |
| S'wick TL | Tornado | [Tornado C/S] traffic left 10 o'clock, one zero miles, crossing left to right er, slightly ahead indicating flight level one five zero | 09:44:52 |
| ? | ? | [Short burst of static] | 09:45:02 |
| S'wick TL | C510 | [C510 C/S] continue with Scottish one three three decimal eight | 09:45:04 |
| C510 | S'wick TL | One three three decimal eight [C510 C/S] | 09:45:08 |
| S'wick TL | F15 | [F15 C/S] squawk six zero six seven | 09:45:10 |
| F15 | S'wick TL | six zero six seven [F15 C/S] | 09:45:12 |
| ? | ? | TCAS contact | 09:45:17 |
| Tornado | S'wick TL | [Tornado C/S] we're descending flight level one four zero, we are visual with that traffic?? flight level one five zero | 09:45:19 |
| S'wick TL | Tornado | [Tornado C/S] acknowledged | 09:45:25 |
| F15 | S'wick TL | Swanwick confirm you'd like [F15 No2 C/S] to squawk six zero six seven? | 09:45:31 |
| S'wick TL | F15 No2 | [F15 No2 C/S] affirm squawk six zero six seven, [F15 C/S] maintain your squawk of six zero seven five | 09:45:35 |
| F15 | S'wick TL | [F15 C/S], [F15 No2 C/S] copies. | 09:45:41 |
| S'wick TL | F15 No2 | [F15 No2 C/S] identified er, confirm squawking with charlie? | 09:46:14 |
| F15 No2 | S'wick TL | [F15 No2 C/S] affirm | 09:46:20 |
| S'wick TL | F15 No2 | [F15 No2 C/S] squawk charlie | 09:46:33 |
| F15 No2 | S'wick TL | [F15 No2 C/S] recycling | 09:46:37 |
| S'wick TL | F15 No2 | [F15 No2 C/S] er identified Traffic Service, verify level | 09:46:39 |
| F15 No2 | S'wick TL | [F15 No2 C/S] traffic, level one five zero | 09:46:44 |
| Other F15 | S'wick TL | Swanwick say again for [Other F15 C/S] | 09:46:47 |
| S'wick TL | Other F15 | [Other F15 C/S] flight that call is not for you | 09:46:51 |
| Other F15 | S'wick TL | Copied thanks | 09:46:54 |
| S'wick TL | Tornado | [Tornado C/S] flight Radar Control as you enter controlled airspace. | 09:46:57 |
| Tornado | S'wick TL | [Tornado C/S] approaching level one nine zero request further climb to two three zero | 09:47:05 |
| S'wick TL | Tornado | [Tornado C/S] flight climb flight level two three zero | 09:47:14 |
| Tornado | S'wick TL | Flight level two three zero for [Tornado C/S] flight | 09:47:17 |
| S'wick TL | Tornado | [Tornado C/S] flight squawk six zero five one | 09:47:20 |
| Tornado | S'wick TL | Six zero five one for [Tornado C/S] flight | 09:47:23 |
| S'wick TL | Tornado | [Tornado C/S] Traffic Service as you leave controlled airspace | 09:47:51 |
| Tornado | S'wick TL | Traffic Service [Tornado C/S] flight | 09:47:55 |
| S'wick TL | Tornado | [Tornado C/S] flight contact Swanwick Mil two seven five decimal five zero | 09:48:28 |
| Tornado | S'wick TL | two seven five decimal five zero [Tornado C/S] flight push | 09:48:34 |

A transcript of the Swanwick Mil 'Overload 2' console RTF was provided as follows:

| From | To | Speech Transcription | Time |
|-----------|-----------|---|----------|
| C135 | S'wick O2 | Control [C135 C/S] with you level one five zero | 09:37:57 |
| S'wick O2 | C135 | [C135 C/S] Swanwick Mil identified flight level one five zero, Traffic Service, confirm your intentions | 09:38:02 |
| C135 | S'wick O2 | Er, one five zero for [C135 C/S] we're level and er, continue flight planned route for [C135 C/S] | 09:38:11 |
| S'wick O2 | C135 | [C135 C/S] roger confirm you're joining at ENITO | 09:38:18 |
| C135 | S'wick O2 | [C135 C/S] is er direct er Charlie Golf er Yankee at the moment | 09:38:24 |

| From | To | Speech Transcription | Time |
|-----------|-----------|---|----------|
| S'wick O2 | C135 | [C135 C/S] roger Holbeach Range is active remain outside | 09:38:32 |
| C135 | S'wick O2 | Er [C135 C/S] er confirm er???? remain outside | 09:38:37 |
| S'wick O2 | C135 | [C135 C/S] er Delta two zero seven currently erm north of you by three miles | 09:38:42 |
| C135 | S'wick O2 | [C135 C/S] er... | 09:38:50 |
| S'wick O2 | C135 | [C135 C/S] suggest turn left heading two seven zero degrees | 09:38:54 |
| C135 | S'wick O2 | Two seven zero [C135 C/S] | 09:38:57 |
| C135 | S'wick O2 | [C135 C/S] is er clear of the airspace request direct er charlie golf yankee when able | 09:39:56 |
| S'wick O2 | C135 | [C135 C/S] roger own navigation to charlie golf yankee | 09:40:01 |
| C135 | S'wick O2 | Resuming navigation charlie golf yankee [C135 C/S] | 09:40:05 |
| S'wick O2 | C135 | [C135 C/S] what level do you require for your cruise? | 09:44:00 |
| C135 | S'wick O2 | Er [C135 C/S] would like to remain at one five zero until we are A R complete | 09:44:06 |
| S'wick O2 | C135 | [C135 C/S] er roger confirm you are routing to ENITO this time | 09:44:13 |
| C135 | S'wick O2 | Er say again for [C135 C/S] we'll be er refuelling with er tanker | 09:44:21 |
| S'wick O2 | C135 | [C135 C/S] roger that's copied erm are you going to the tanker now | 09:44:27 |
| C135 | S'wick O2 | Er Affirmative [C135 C/S] it's er???? | 09:44:32 |
| S'wick O2 | C135 | [C135 C/S] roger, traffic right one o'clock eight miles, crossing right left, it's two Tornados, flight level one four zero, climbing | 09:44.38 |
| C135 | S'wick O2 | [C135 C/S] copies, searching | 09:44.47 |
| C135 | S'wick O2 | ????? control we're manoeuvring to avoid some Tornados | 09:45.33 |
| S'wick O2 | C135 | [C135 C/S] confirm you er staying level one five zero? | 09:45.43 |
| C135 | S'wick O2 | Errr [C135 C/S] had to climb, that's for an RA alert for some Tornados | 09:45.48 |
| S'wick O2 | C135 | [C135 C/S] roger that's copied | 09:45.55 |
| C135 | S'wick O2 | ??? returning to??? | 09:45.58 |

Analysis and Investigation

Military ATM

The incident occurred on 20 Apr 15 at 0945, north of the Wash. The Airprox occurred between a Tornado GR4 and a USAF C135, both under a Traffic Service with Swanwick (Mil) but with different controllers. The radar replay was based on the London QNH 1028 hPa.

At 0943:20, Swanwick Tac Left controller confirmed, "[Tornado C/S] *flight Swanwick Mil identified climbing FL190 Traffic Service*". At 0944:38, Swanwick Overload 2 controller transmitted, "[C135 C/S] *roger. Traffic right, 1 o'clock, 8 miles crossing right left. It's two Tornados. Flight level 1-4-0 climbing.*" The aircrew replied that they were searching.

At 09:44:38, Swanwick Overload 2 called traffic to the C135 pilot as, "[C135 C/S] *traffic right 1 o'clock eight miles, crossing right to left, it's 2 Tornados, FL140, climbing.*" This call was acknowledged at 09:44:47, "[C135 C/S] *copies, searching.*"

At 09:44:52 (Figure 1), Swanwick Tac Left called traffic to the Tornado formation as, "[Tornado C/S] *traffic left 10 o'clock one zero miles crossing left to right er, slightly ahead indicating FL150.*"

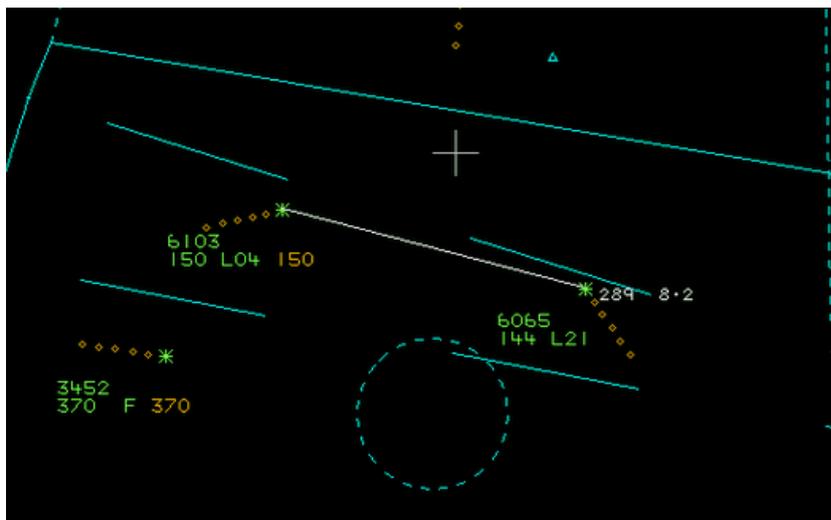


Figure 1: Traffic Information at 0944:52 (Tornado 6065; C135 6103)

At 09:45:19 (Figure 2), the Tornado lead confirmed, “[Tornado C/S] *we’re descending FL140 we are visual with that traffic at FL150.*”

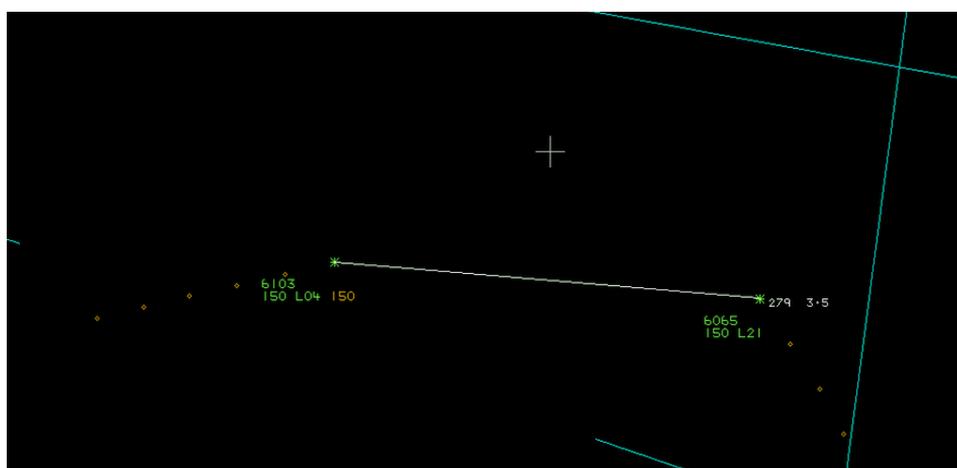


Figure 2: Tornado descending at 0945:18

At 0945:33, the C135 pilot commented, “*control we’re manoeuvring to avoid some Tornados.*” The CPA was at 0945:38 with 1400ft vertical and 1.2nm horizontal separation. Swanwick Overload 2 asked if they were staying at FL150 and the C135 pilot replied at 0945:48 with, “*Errr [C135 C/S] had to climb. That’s for an RA alert for some Tornados.*”

As per the provision of a Traffic Service (CAP774), the Swanwick Tac Left controller provided Traffic Information at 10nm and the Swanwick Overload 2 controller at 8nm. From the RT, Tac Left was busy and was constantly passing traffic and control instructions to the aircraft under a service. Due to a delay in reporting the Airprox to the Overload 2 controller, limited information was available; RAF(U) Swanwick confirmed that controller was on the overload console and that the East console had a planner, 2 Tacs and the Overload controller. It is assumed that the Overload controller and the unit had a high workload at the time of the incident. The Tornado lead element used a combination of Traffic Information, TCAS information and a visual sighting by the wingman to visually acquire the C135. The crews were trained and briefed on TCAS but had limited live experience of the equipment. The C135 crew had received accurate Traffic Information and had also received a TCAS RA to descend; however, the crew had visually acquired the descending Tornados and decided to climb. Subsequently, the TCAS RA changed to a ‘climb’ instruction. The C135 pilot had reported being under a Deconfliction Service but the transcript confirmed that the controller had applied a Traffic Service.

In this instance, numerous barriers worked to help paint a picture for the Tornado crew and they confirmed descending at 3.5nm horizontal separation with a CPA of 1.2nm and 1400ft. The type of service was appropriate and provided guidance at 10nm. The controller of the C135 had provided information at 8nm and had added details on the conflicting traffic. The Tornado crew used TCAS to get height information on the other track, and the post-incident investigation made further recommendations on TCAS operation for the Tornado Force. Eventually, lookout also worked as a barrier and enabled the crews to see and avoid.

UKAB Secretariat

The Tornado and C135 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard². The incident geometry was converging and the C135 pilot was required to give way to the Tornado formation³.

Occurrence Investigation

The Tornado Unit Occurrence Investigation identified that a combination of Air Traffic Control, lookout and Collision Warning System [alert] ensured that flight paths did not cross.

Comments

HQ Air Command

As with all Airprox involving Marham-based Tornados, this incident prompted an investigation on the unit. Whilst the incident itself was reasonably benign, it did highlight the fact that TCAS on Tornado is in its infancy, not only in terms of fleet fitment but also in terms of aircrew experience, and that the current TCAS employment guidance available to Tornado crews will need reviewing and trimming as the experience levels grow. Furthermore, this incident also reminds us that a busy frequency means that the controllers are working hard, and all crews should be prepared to increase their vigilance in terms of traffic detection and avoidance when operating in Class G airspace, irrespective of the ATS provided. In this instance the controller's assessment of projected separation in the climb did not equate to what the Tornado pilot saw out of the window and so he took action to maintain adequate, though slightly reduced, separation.

Finally, it is disappointing that the Airprox was not declared on frequency, or at least a call made to Swanwick (Mil) after the mission, as the delay between submission of the DASOR and Swanwick being informed of the Airprox probably led to a loss of perishable evidence in the form of controller recollection.

Summary

An Airprox was reported when a Tornado formation and a C135 flew into proximity at 0946 on Monday 20th April 2015 in the Class G airspace of the London FIR. Both crews were operating in VMC, The Tornado formation under VFR and the C135 crew probably under IFR, both in receipt of a Traffic Service from Swanwick Mil.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from the pilots of both aircraft, transcripts of the relevant RT frequencies, radar photographs/video recordings, reports from the air traffic controllers involved and reports from the appropriate ATC and operating authorities.

Considering the pilots' actions first, the Board noted that both aircraft were in VMC, and that the pilots were in receipt of a Traffic Service from Swanwick (Mil), albeit from two different controllers.

² SERA.3205 Proximity.

³ SERA.3210 Right-of-way (c) (2) Converging.

Members noted that, whether operating VFR or IFR, under SERA⁴ the C135 pilot was required to give way to the Tornados in this situation. It was agreed that although the C135 pilot had ultimately taken avoiding action on the Tornados, this did not equate to giving way, especially since he had been given Traffic Information to assist him with this requirement at 8nm separation. The Board discussed whether the C135 pilot, not normally based in the UK, had been aware that he was under a Traffic Service (having reported 'under ATC vectors in receipt of a Deconfliction Service'), and also whether he was fully aware of the implications of such in Class G airspace. It was agreed that the suggested heading at 09:38:54 to remain clear of Holbeach range had probably amounted to 'ATC vectors' in the C135 pilot's mind, and the likelihood that he thought he was under 'ATC vectors', might go some way to explaining him not giving way. During this discussion, military and civilian ATC members presented further anecdotal evidence of lack of understanding of UK FIS by pilots, and the routine 'imposition' of unrequested services due to the need to avoid protracted RT conversations with those who were unfamiliar with UK FIS. It was agreed that UK FIS 'ATSOCAS' provision was commonly misunderstood, or not understood at all, by many pilots, and that this was notably prevalent amongst those from outside the UK. The Board recalled making a number of previous recommendations in this respect concerning 'ATSOCAS' provision and education, but that they had all been rejected⁵.

The Board also noted that the C135 pilot had reported being first alerted to the Tornados by a TCAS RA 'Descend' but that he had in fact received Traffic Information on the Tornados at a range of 8nm. The USAFE member commented that this may be due to a failure of recollection given that the C135 crew had not been contacted to make a report until sometime after the event due to their being based overseas. The Board commented that this re-emphasised the requirement to make an Airprox call on the RT at the time, in order to cue the controllers and other pilot to record appropriate important information and circumstances before it became lost to memory.

Members noted that after the C135 pilot had received a TCAS RA 'Descend' he visually acquired the Tornado formation, made the decision to climb (because he perceived the Tornados to be descending on a conflicting flight path), and subsequently received an RA 'Climb' whilst he was in the climb. Members agreed that the Board was poorly placed to analyse the time-critical decision process that the C135 pilot went through, but observed that civilian pilots are required to follow TCAS RA commands, irrespective of what they observe, in case the TCAS RA is being generated by an aircraft they have not seen. In this respect, it was further noted that TCAS was inherently subject to angle of arrival error, that the azimuth of a TA or RA may not have been related to that of the traffic observed outside, and hence that the pilot could easily have placed himself in a situation where he was manoeuvring visually against traffic which was not in fact the cause of the TCAS RA. It was reasoned therefore that the safest course of action for the C135 pilot would have been to follow the TCAS RA as indicated, including any subsequent RA reversal.

The Board also commented on the fact that, in this case, the lead Tornado had been equipped with TCAS but that the procedure at the time was to select TA-only when in formation; this had denied the Tornado pilot the benefit of a cooperative RA. Although there were sound reasons for selecting TA-only when conducting tactical manoeuvring with both aircraft in a formation squawking, the Board wondered whether the Tornado Force might wish to review their TCAS SOPs when aircraft were transiting as a single speaking unit with the No2 aircraft SSR normally set to 'standby'. The Board noted that the Tornado formation had been passed Traffic Information on the C135 at 10nm, and that the No2 pilot had become visual with the C135. Although he had initially mis-assessed the other aircraft's aspect, the lead pilot then saw the C135 and assessed that an immediate descent to FL140 was necessary.

Members agreed that, ultimately, both pilots had resolved a conflict in Class G airspace, and that timely and effective action had been taken to prevent a collision. However, this Airprox highlighted a number of concerns regarding TCAS operation in an environment for which it was not specifically designed. If one aircraft was manoeuvred visually whilst the other was manoeuvred in response to a TCAS RA, then a situation could occur where the TCAS RA demanded manoeuvre might reduce

⁴ Standardised European Rules of the Air

⁵ 2013145, 2013150 and 2014016.

separation and hence increased risk. Conversely, if a TCAS RA was not followed and the aircraft was manoeuvred with regard to what was assessed independently by the pilot as the conflicting traffic, potential mis-identification could again bring about loss of separation and hence increased risk. Notwithstanding operational considerations, members agreed that, in this case, at medium-level in Class G airspace, the safest course of action was to use TCAS as it was designed; in RA mode, and to follow any RAs which might be issued.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: A conflict in Class G resolved by both pilots.

Degree of Risk: C.