

AIRPROX REPORT No 2013007

Date/Time: 1 Feb 2013 1445Z

Position: 5331N 00402W
(47nm SSE RAF Valley)

Airspace: Valley AIAA (Class: G)

Reporting Ac Reported Ac

Type: Hawk T Mk2 Hawk T Mk1

Operator: HQ Air (Trg) HQ Air (Trg)

Alt/FL: 16000ft 16000ft
RPS (993hPa) RPS (1004hPa)

Weather: VMC CLAC VMC CLAC

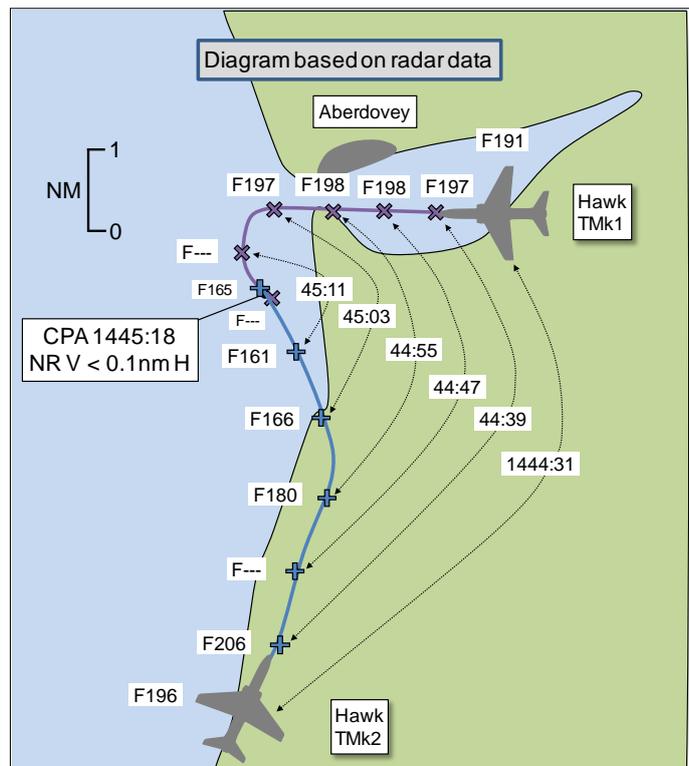
Visibility: 50km 50km

Reported Separation:

0ft V/0.5nm H 0ft V/0.5nm H

Recorded Separation:

NR V/<0.1nm H



PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

THE HAWK T MK2 PILOT reports conducting a general handling currency sortie after a 2-week weather lay-off. He was seated in the rear seat and was acting as Pilot Monitoring (PM), with the pilot student, PF, seated in the front. He was operating under VFR in VMC with a TS from LATCC(Mil) [280.350MHz]. The black ac had navigation, conspicuity and strobe lights selected on, as was the SSR transponder with Modes A, C and S. The ac was also fitted with TCAS II. Setting up for an Operational Training Manoeuvre (OTM) at an altitude of 19000ft. The crew observed a rapidly closing 'TCAS contact' in the 1 o'clock position, indicating 2000ft below at a range of approximately 8nm. 'London Mil' informed him 5sec later of traffic "North at 8nm tracking West 2000ft below". The transmission was 'clipped' by his TCAS TA audio warning of "traffic traffic". The PF initiated a climb in an attempt to deconflict vertically. However, the TCAS contact was observed to climb at a greater rate and soon indicated above, he thought. With the contact still closing, the ac was rolled inverted and a 25° nose down attitude selected. At the start of this manoeuvre the TCAS reverted to standby (as is usual during dynamic manoeuvring). Approaching 16000ft the ac was turned L through 60° and levelled at 15600ft, during which time the TCAS automatic resetting sequence had completed and it gave normal indications (clear of contacts) at 20nm scale. A gentle climb was initiated to set up for the next manoeuvre when the crew observed a further TCAS TA audio warning of "traffic traffic" and a TCAS contact inside 2nm in the 1 o'clock position indicating a descent from 2900ft above, closing rapidly towards a collision. The TCAS range scale was reduced to 6nm, at which point the contact appeared to be in the same position as his own ac. Despite the crew's attempts, visual contact with the conflicting traffic had not been attained up to this point and he asked London Mil "request where the traffic is now". As he finished this transmission he observed a Hawk T Mk1 in his R 5 o'clock, in a climbing L turn, co-altitude at a range of about 0.5nm, with 30° tail aspect. After enquiring with London Mil, he was informed that the conflicting traffic was also receiving a TS on the same frequency.

He assessed the risk of collision as 'Medium'.

THE HAWK T MK1 PILOT reports conducting a general handling refresher sortie. He was seated in the rear seat and was acting as Pilot Monitoring (PM), with the pilot student, PF, seated in the front. He was operating under VFR in VMC with a TS from LATCC(Mil) [280.350MHz]. The black ac had 'all lights' selected on, as was the SSR transponder with Modes A and C. The ac was not fitted with

a Mode S capable transponder or an ACAS. He had informed London Mil that he would be operating in the height block 5000ft to 20000ft and had been in the same area for more than 10min. Just before the incident London Mil passed TI on traffic 12nm S at 500ft above, transiting N. No indication was given that this ac would be changing height and he did not recall London Mil informing the other ac of his height block. There was an updated TI call of traffic 8nm S, and the crew entered a LH Maximum Rate Turn (MRT), descending from about 18000ft. After the second orbit of the MRT, with the crew focusing their lookout through the top of the canopy, they both saw a flash of black, R to L across the front of the ac. The ac was immediately recovered and the crew saw a Hawk T Mk 2 in a gentle climb N-bound at approx 15-16000ft and 0.5nm away. It was believed that this was the same ac that had been called by London Mil earlier. Before entering the MRT, the crew's SA led them to believe the conflicting Hawk was still a few miles away, transiting N but above them in height and maintaining level, so he elected to enter the MRT thinking this would increase vertical separation.

He assessed the risk of collision as 'Medium'.

[UKAB Note(1): The RAF Valley weather was reported as follows:

METAR EGOV 011450Z 33015KT 9999 FEW012 BKN015 BKN025 07/06 Q0996 WHT TEMPO FEW015 BLU]

THE LATCC(MIL) AREA CONTROLLER reports he had just begun his shift and was the only ATCO working in the band-boxed position with all 'West Bank' sectors open. [The 2 subject Hawks] were conducting general handling in similar altitude blocks in a similar area, with both under a TS. He had heard the previous controller calling TI to each about the other during their position handover so knew they were both aware of each other. Several minutes after handover he noticed both ac were flying on headings and at levels which would take them within 3nm and 3000ft of each other so he passed TI to both pilots, which was acknowledged by both. They continued to get closer and one of the Hawk pilots asked for further TI. He gave as accurate a picture as he could and recalled both ac being within 1nm, with no Mode C available on [the Hawk T Mk1]. [The Hawk T Mk2 pilot] then asked if the other Hawk was on frequency and he offered him the opportunity to talk directly, believing he wanted to negotiate with his colleague. [The Hawk T Mk1 pilot] transmitted that he was visual with the other Hawk. Both aircraft recovered to Valley soon after. The controller took no further action at the time as an Airprox was not declared by either pilot.

He assessed the risk of collision as 'Negligible'.

THE LATCC(MIL) SUPERVISOR reports that an Airprox was not declared on frequency at the time or brought to her attention soon after and that she had no recollection of the event.

THE UNIT SAFETY MANAGEMENT OFFICER reports that the incident occurred due to the flight profile of the two Hawks in West Wales. The W Tac controller was operating the 4 "West Bank" sectors (NW/Central and W/SW) and the SUP would have been monitoring SE for pre-notes; a routine scenario for traffic levels at the time. There was no planner in situ. No landline conversations took place during the time period of the RT transcript. The controller made appropriate TI calls to the Hawk pilots when he deemed it necessary and with the information available to him. The pilots gave the impression that they would attempt to deconflict laterally but this did not occur. The controller also updated the TI when he could; the RT transcript indicates that both pilots made a change in altitude following the TI, which took them into conflict with each other.

BM SAFETY POLICY AND ASSURANCE reports that this Airprox occurred on Fri 1 Feb 2013 at 1445:19, between a Hawk T Mk2 (Hawk T2) and a Hawk T Mk1 (Hawk T1). Both Hawks were manoeuvring individually in altitude blocks within the North Wales Military Training Area (NWMTA), in receipt of a TS from LATCC(Mil) W Tac.

All heights/altitudes quoted are based upon SSR Mode C from the radar replay unless otherwise stated.

Information

Both aircrews reported VMC with unlimited visibility, operating 6000ft above cloud. W Tac reported low workload and task complexity, operating 'band-boxed' with the W, SW, NW and Central sectors.

The 2 Hawk pilots had been operating within 15nm of each other, on the same freq, for at least 15min prior to the start of the incident sequence and were aware of each other's presence. W Tac controller stated in his DASOR that, while he was accepting a handover of the control position, he heard the off-going controller provide TI to the 2 Hawks on each other; this TI was passed between 1438:00 and 1438:27.

The incident sequence commenced at 1444:26 as W Tac provided TI to Hawk T2 pilot on Hawk T1 stating, "*traffic North, 8 miles, tracking West, indicating 2000 feet below, similar type*", which was acknowledged. At this point, Hawk T2 was 8.9nm SW of Hawk T1, tracking NNE'ly, indicating FL196; Hawk T1 was tracking W'ly, indicating a climb through FL178; Figure 1 depicts the incident geometry at this point.

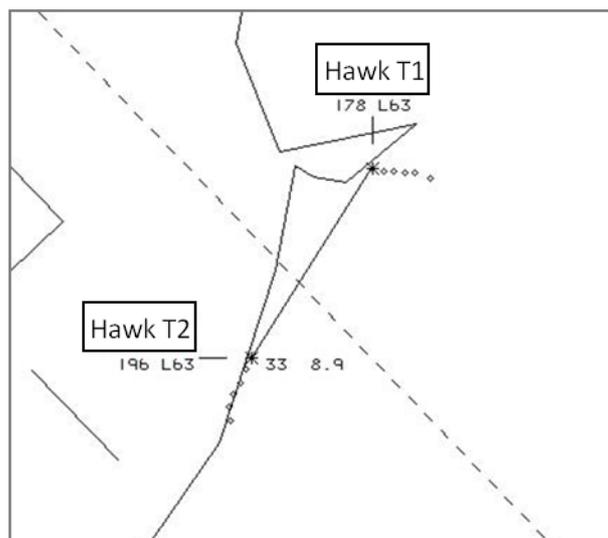


Figure 1: Incident Geometry at 1444:26

Based upon the report submitted by the pilot of Hawk T2, it was at approximately this point that they received a TCAS TA warning of the presence of Hawk T1 and initiated a climb 'in an attempt to deconflict vertically'.

Immediately after the pilot of Hawk T2 acknowledged the TI, at 1444:35, W Tac provided TI to Hawk T1 on Hawk T2 stating, "*traffic South, 6 miles, Northbound, similar type, now 500 feet above you*"; the pilot of Hawk T1 acknowledged this TI, advising W Tac that he was, "*looking*". At this point, Hawk T2 was 6.8nm SW of Hawk T1, tracking NNE'ly, indicating a climb through FL197; Hawk T1 was maintaining its W'ly track, indicating FL196. Comparison of the radar replay and R/T transcript timings demonstrated that, at the time that W Tac described Hawk T2's altitude as "*500 feet above*" Hawk T1, Hawk T2's SSR Mode C indicated FL201.

CAP 413 Chapter 5 Section 1.6.2 states that an ac's 'level should be described [as] indicating level (if known), unverified or 1000 feet above/below'; or, (when giving traffic information to an aircraft which is climbing or descending) '...1000 feet above/below cleared level.' However, when providing TI to ac conducting dynamic manoeuvring, on other ac conducting dynamic manoeuvring, describing the conflicting ac's altitude in relation to the ac under service's cleared altitude is impractical and would not improve pilot situational awareness. In these instances, accepted 'good practice' would be to advise the pilot of the conflicting ac's manoeuvring block and either describe the conflicting ac's level as a number of feet above and below the ac under service's level at that point, or to state the level or altitude that the ac is indicating. Furthermore, CAP 413 phraseology only paints a partial picture to

the pilot as it does not describe the trend of the altitude, in that it does not include the ability to describe an ac as climbing or descending, nor does it include the ability to describe whether an ac is manoeuvring within a block of airspace. Again, adding these descriptors is considered 'good practice' in military controlling to enhance aircrew situational awareness.

The pilot of Hawk T2 reported on his DASOR that he observed Hawk T1 on his TCAS display climbing at a faster rate than his own and indicated above them. Figure 2 provides the SSR Mode C information for Hawk T2 (in red) and Hawk T1 (in blue) and starts with the data point immediately after Hawk T2 initiated the climb indicated on the radar replay at 1444:35, co-incident with the T1 passed to Hawk T1.

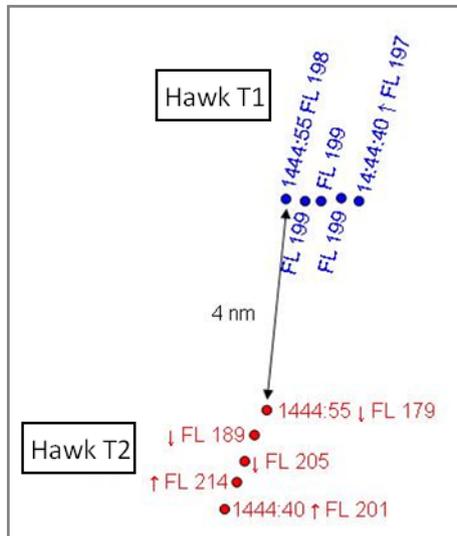
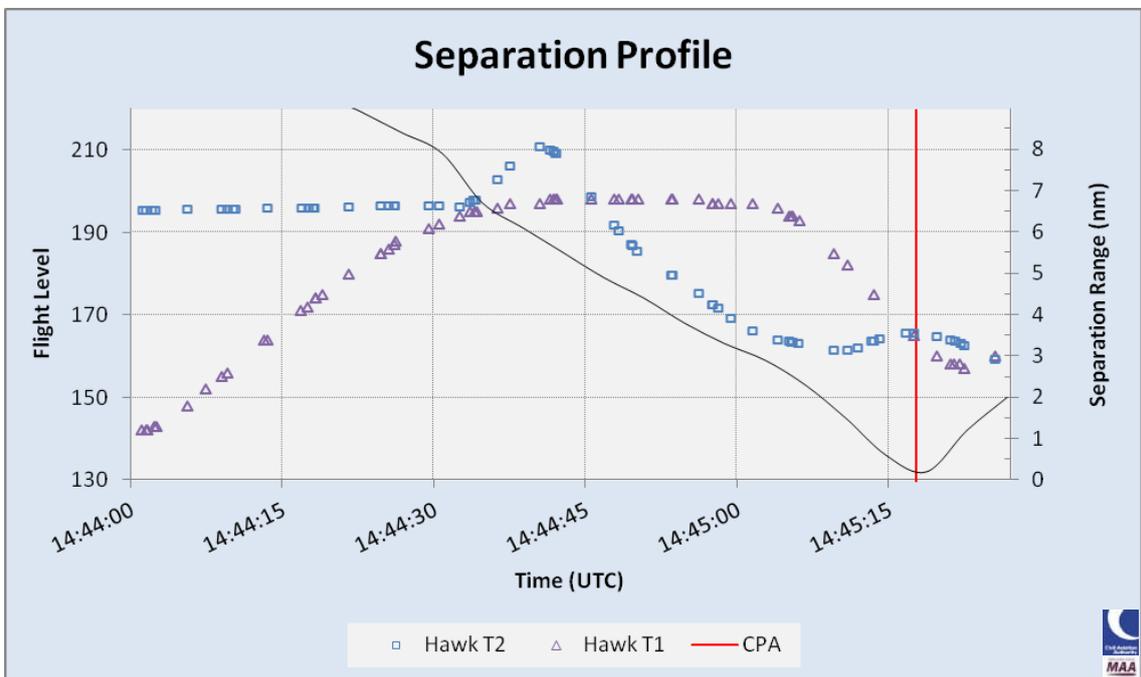


Figure 2: SSR Mode C Information for Hawk T2 and Hawk T1

At 1444:44, Hawk T2 reached the 'top of climb' and 'rolled inverted and a 25 deg nose down attitude [was] selected' to deconflict from Hawk T1.

[UKAB Note(2): The following graph shows the vertical profile of each ac on the LH scale (taken from unprocessed Mode C radar data from 5 radar heads with overlapping coverage), and separation range on the RH scale (taken from a radar recording of the St Annes radar head with 4sec update rate).



At 1445:04, Hawk T2, indicating descent through FL167, turned L and adopted a N'ly track; Hawk T1 was 3nm N of Hawk T2, indicating FL197. Given the range scales utilised at Area radar, the turn by Hawk T2 would have become evident at approximately 1445:12. At 1445:11, Hawk T2, indicating FL159, turned L and adopted a NW'ly track. Simultaneously, Hawk T1, 1.9nm NNW of Hawk T2, initiated a maximum rate descending turn to the L, indicating descent through FL190. At the next sweep of the radar at 1445:16, Hawk T1's SSR Mode C information 'dropped-out' from West Tac's surveillance display; at this point, Hawk T2 was 1.2nm SE of Hawk T1 indicating FL161. At the range scales utilised at Area radar, the turn by Hawk T1 had not yet become evident and the radar returns of Hawk T2 and Hawk T1 were merging.

CAP 774 Chapter 3 Para 5 states that TI on relevant traffic shall be updated 'if it continues to constitute a definite hazard, or if requested by the pilot'.

The CPA occurred at 1445:19 as Hawk T1 passed above and 0.1nm W of Hawk T2; vertical separation was not recorded due to the loss of Hawk T1's SSR Mode C information. Based upon the respective pilot's reports, it appears that the crew of Hawk T2 visually acquired Hawk T1 after the CPA; the crew of Hawk T1 acquired Hawk T2 at the CPA. Figure 3 depicts the incident geometry from 1444:32 to 1445:35.

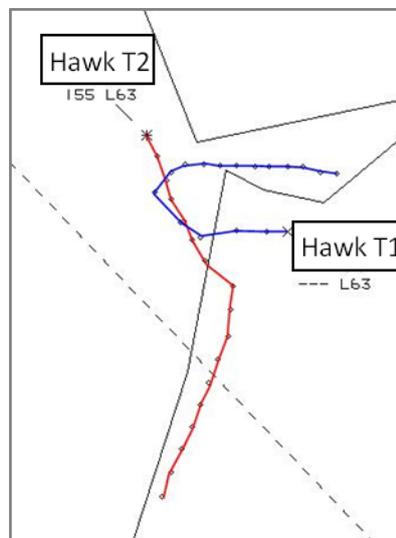


Figure 3: Incident Geometry from 1444:32 to 1445:35

Almost co-incident with the CPA, at 1445:20, the pilot of Hawk T2 requested "further traffic" from W Tac, who advised "Roger, on your 12 o'clock, in fact, he's over the top of you now, last indicating 3000 feet above, Westbound"

Analysis & Conclusion

Given the surveillance display range scales that would have been utilised by W Tac, the TI provided to both Hawk T2 and Hawk T1 pilots was timely and generally accurate. That said, the aircrew's SA would have been enhanced had W Tac included a description of the altitude trend of the respective Hawks. From W Tac's perspective, up until the point that Hawk T2 adopted a N'ly then a NW'ly track, which would have become visible to W Tac at approximately 1445:12, Hawk T2 was passing behind and below Hawk T1 and thus fell outside the CAP 774 bounds of 'relevant traffic'. Moreover, subsequent to completing their DASOR, W Tac has stated that he was conscious that the Hawk aircrews were aware of each other's presence and that he did not want to overly burden them with R/T. Given the rapidly developing situation from 1445:12 to the CPA, W Tac was not in a position to affect the incident outcome, which occurred following the max rate turn and descent into conflict by Hawk T1.

Recommendation

BM SPA has requested that MAA ATM Regs considers the inclusion of the TI phraseology issues highlighted within this report, in their ongoing work on TI phraseology with the Joint Phraseology Working Group.

HQ AIR (TRG) comments that there is an inconsistency in Hawk T1 pilot's narrative in that he reports seeing Hawk T2 'after the second orbit', whilst the radar replay shows the CPA occurring 100° or so into their first orbit; indeed it shows the completion of only a 180° turn. The crew have accepted that the incident may actually have occurred much earlier in the turn.

This incident highlights the limitations of both TCAS and ATS when dealing with manoeuvring traffic. Hawk T1 pilot's climb to above Hawk T2's level that was indicated on TCAS is not evident from the radar replay, which shows Hawk T1 climbing to, and then maintaining, around FL198 as Hawk T2 climbed to at least FL214. It is likely that the rate of climb on the host aircraft was beyond the capability of the TCAS to interpret; indeed it subsequently failed during the climb at 1444:38 having indicated a final differential of +200ft climbing, which is clearly at odds with the radar picture. Unfortunately, this erroneous information formed the basis of a decision to descend aggressively, at this stage with no TCAS information at all. This might still have been effective but for the subsequent turn to the W, which unfortunately brought the two ac back into conflict. A more appropriate avoiding action from Hawk T2 might have been a turn towards the E, given TI that Hawk T1 was tracking W although the crew's overriding impression from TCAS was that the contact was approaching rapidly from the 1 o'clock. For their part, Hawk T1's crew made a reasonable decision to descend, based upon their TI received just as Hawk T2 pilot briefly levelled above them. However, given that Hawk T2 pilot's intentions were unknown, without any positive coordination between the two crews this was never going to be entirely reliable and maintaining a concentrated lookout and requesting updates to the TI might have been more effective. It was also apparent from Hawk T2 pilot's comments immediately following the CPA that the crew were unaware that Hawk T1 had been receiving TI on them at the same time. Had W Tac referred to the other ac by its callsign rather than just as 'traffic', SA in both cockpits may have been improved and the crews may have been more likely to take positive deconfliction action themselves. It appears that W Tac had a misplaced confidence in the awareness that the two crews had of each other and updated TI to Hawk T1 following Hawk T2 pilot's manoeuvre might also have alerted him to the renewed conflict potential.

The balance between the inflexibility of rigidly sectorised airspace and the risk of collisions is a delicate one for the Hawks' Duty Holder. BM SPA's recommendations on phraseology are supported as are any RAF Valley-specific methods that might improve internal coordination. The crews commented that before being mandated to utilise a TS they would all have operated on a common frequency and deconflicted geographically. A TS combined with use of TCAS can still be effective but requires crews to strictly limit their manoeuvring to allow TCAS to function, and, if required, to avoid laterally based on TI to avoid unsighted, manoeuvring, traffic. This incident will need to be considered when assessing the effectiveness of the current deconfliction processes.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

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

A military pilot Member noted that the 2 crews seemed to be making decisions based on historical information, which was compounded by the TCAS indications received by the Hawk T2 crew. There is a discrepancy between the ac vertical profiles on recorded radar and Hawk T2 pilot's report of the TCAS indications. It seemed likely that this was a result of the ac conducting dynamic manoeuvring above the limits for reliable surveillance radar tracking and/or that TCAS is not designed to be used

in a dynamically manoeuvring environment. Military pilot Members agreed and noted that the Hawk T2 TCAS is designed to enter a 'standby' mode once past a set threshold of manoeuvre intensity. It was also noted that the Hawk crews were mandated by local flying orders to use a TS, whereas previously crews could have deconflicted by reference to geographical locations on a common frequency. This arrangement highlighted the difficult balance required for deconfliction between RAF Valley based ac and between Valley-based ac and other airspace users. The BM SPA Advisor noted that the Hawk T2 pilot had earlier stated he would operate in a different location in order to facilitate deconfliction. It was not known why he had then subsequently changed location.

Members next discussed how the ATS was utilised. Some were of the opinion that the LATCC(Mil) controller could have provided better SA if he had included information on the 'vertical tendency' of the ac (eg '2000ft below, climbing') although it was accepted that this option was not provided in CAP413. The BM SPA Advisor noted that his recommendations for phraseology change had been accepted and would appear in CAP413 shortly. Members agreed that both pilots would have been better placed had they requested updated TI before starting their dynamic manoeuvres and all were agreed that the controller could not have done much more within his provision of a TS; it was the pilots' responsibility to request a DS if that was required. It was also noted that after the Airprox the Hawk T2 crew did not seem to be aware that they were on the same frequency and being controlled by the same controller as the Hawk T1. Members opined that the T2 crew took aggressive action when a better option may have been to use the ATS and TCAS information available to them in order to assess the situation and make a deconfliction plan that was effective. The T2 crew knew there was traffic N of them heading W from the TI but they turned L in addition to descending based on their TCAS information. Similarly, the T1 crew knew there was traffic S of them and they would have been better placed by asking for updated TI before entering their MRT to their L towards that traffic, albeit their SA placed the T2 above them and remaining above.

The Hawk T2 crew did not gain visual contact with the other ac until after the CPA and the Board assessed that the Hawk T1 crew gained visual contact at, or very shortly before, CPA. In any case, neither crew saw the other ac in time to take any avoiding action; the cause was, effectively, non-sightings by both crew. It was apparent from radar recordings that the ac had passed in close proximity and the Board were persuaded by the Hawk T1 pilot's statement that he had seen "a flash of black, R to L across the front of the ac" that separation was reduced to the minimum and that the ac had avoided collision by providence.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: Effectively non-sightings by the crews of both ac.

Degree of Risk: A.