

AIRPROX REPORT No 2010122

Date/Time: 5 Jul 2010 1000Z

Position: 5144N 00129W (4nm SSE of Brize Norton - elev:287ft)

Airspace: London FIR (Class: G)

Reporting Ac Reported Ac

Type: Tristar KC1 P180 II Avanti

Operator: HQ Air (Ops) Civ Comm

Alt/FL: 5000ft↓ 3000-5000ft
QFE (1011mb) QNH (1020mb)

Weather: IMC VMC IICL

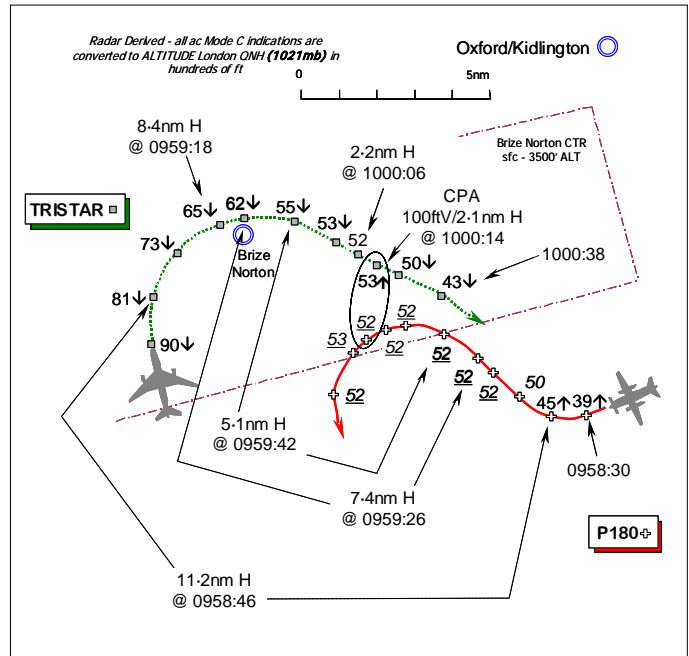
Visibility: 10km 10km+

Reported Separation:

Nil V/<2nm H NK

Recorded Separation:

100ft V/2.1nm H



PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

THE LOCKHEED TRISTAR KC1 PILOT reports he was inbound to RW26 at Brize Norton from Akrotiri under IFR and in receipt of a TS from Brize DIRECTOR (DIR) on 133.75MHz. The assigned squawk was selected; Mode S and TCAS are fitted.

About 10nm S of the aerodrome in the descent from FL160 to FL80 at 270kt, DIR vectored them onto a radar heading of 340° straight towards the aerodrome and instructed them to descend to 4000ft Brize QFE (1011mb). Their proximity to the aerodrome and their height necessitated the use of full speed brakes. Passing about 9000ft they were given further descent to 2500ft and, once through the RW centreline, they were turned onto a heading of 100°, positioning them S of the aerodrome. Shortly afterwards, DIR gave a further R turn onto a heading of 120° towards traffic displayed on TCAS level at 5000ft. DIR then requested they expedite their descent. At about 6000ft QFE he elected to begin a level off, to avoid both the other ac's height and also to avoid entering cloud with tops at 5300ft QFE. This was followed very shortly afterwards by a TCAS RA, initially demanding a descent at over 2000ft/min, which the crew followed whilst informing ATC of the RA. Almost immediately thereafter they entered cloud and received a further RA, commanding a climb at 1500ft/min, which the crew initiated. During the period of the RA, DIR attempted to give avoiding action but once again he informed the controller of the TCAS RA. Shortly after receiving the 1500ft/min CLIMB RA, TCAS enunciated MAINTAIN VERTICAL SPEED indicating a 600ft/min climb, 5sec later CLEAR OF CONFLICT was enunciated. They then began descending to 2500ft in compliance with DIR's instruction and completed an approach and landing without further incident.

The other ac was not seen - it might have been in cloud – but he estimated minimum separation was within 2nm at the same height with a 'high' Risk of a collision. The Airprox occurred while the crew were under a high workload during their descent in the airfield overhead utilising speed brakes and about to enter cloud.

THE PIAGGIO P180 II AVANTI PILOT, the PF, reports that they were outbound from Oxford/Kidlington under IFR to join CAS at COMPTON (CPT), flying at 200-250kt. The assigned squawk was selected; enhanced Mode S and TCAS I is fitted.

After take-off from RW01 they climbed to 2500ft QNH (1021mb) making a R turn onto a downwind and quickly contacted Brize RADAR for a DS. Cloud was FEW at 3800ft and Brize RADAR gave them further clearance to climb but he was unsure to what altitude [FL50 – ALT52]. They were given several radar headings with large turns between them (i.e. 90° to L and R). Several contacts were seen on TCAS and he assumed this was the reason for the turns, but none of these triggered a 'warning' from their TCAS I whilst flying in 'intermittent VMC' in and out of cloud. After approximately 5min they were given a clearance to climb and proceeded enroute. The other ac was not seen.

They were not aware that an incident had taken place and both he and his colleague were quite surprised to hear from the UKAB. Had they been aware at the time then an occurrence report would have been filed.

His ac has a white/orange livery and the HISLs were on.

BRIZE NORTON DIRECTOR (DIR) reports that he had a light workload and was working the Tristar inbound from airways on a radar-vectored ILS approach under a TS. He had taken the Tristar through the centre-line, overhead the aerodrome, in a descent to 2500ft QFE (1011mb) on a heading of 120°. At this point the Tristar was descending through FL61 [ALT63] when he noticed that there was traffic – the P180 - working LARS heading NW at FL50 [ALT52]. He asked LARS where they were taking the ac and the ATS, which was a DS. Traffic information was given to the Tristar crew who were told to expedite their descent. Updated TI was given again at 4nm range and then the Tristar crew called a TCAS RA. The P180 turned southbound and the Tristar then continued inbound under his radar vectors.

THE BRIZE NORTON LARS CONTROLLER (LARS) reports she was mentor to a trainee controller on LARS when the P180 departed Oxford and requested a DS. The ac was immediately in conflict with numerous contacts around the CPT area so she took over from her trainee and issued an avoiding action turn. She did step in during the session as it was one of the first times the trainee had experienced providing a DS and the trainee's initial avoiding action was ineffective. There was not time to let him rectify this, or discuss it. Although the workload was high for the trainee, she did not feel like she as mentor was working to capacity; indeed, she felt in control of the situation with both the trainee and the traffic. At no time did the P180 crew report an Airprox or a TCAS RA.

The main problem for the P180 was conflicting traffic in the CPT area, which required some liaison with the civil sector to get a higher joining level. She initiated this liaison, which was completed by the Supervisor. It was stressed that she did not feel pressured or unduly busy and felt the situation was under control and safe.

HQ 1GP BM SM reports that the Tristar was being vectored for an ILS approach to RW26 at Brize Norton and in receipt of a TS from DIR. The P180 was outbound from Oxford/Kidlington to join airways at CPT, whilst in receipt of a DS from LARS, which was manned by a trainee and mentor.

When identified and instructed by LARS to climb to FL50, the P180 crew requested a DS at 0957:25. LARS did not place the flight under the requested ATS at that point, although it is clear from LARS' actions that they applied a DS. Immediately, at 0957:39, LARS offered an avoiding action turn onto W against another ac that is not within recorded radar coverage [not the Tristar], “[C/S] *avoiding action turn right immediately heading 2-7-0 degrees traffic was south 5 miles tracking west indicating 2 thousand feet below.*” At this point, about 12nm horizontal separation existed between the P180 and the Tristar, which was descending through FL114, S of Brize Norton. At 0958:33, LARS issued a further avoiding action R turn instruction onto a heading of 310°, against the other contact that was now manoeuvring 3nm to the south, but “*..indicating 3000 feet below*” with the P180 in the climb to FL50.

Meanwhile, after establishing from the crew that a TS was required when the Tristar exited CAS, at 0957:37 DIR instructed them to, “*..set Brize Q-F-E 1-0-1-1 descend...height 2 thousand 5 hundred feet*”, followed later by a turn onto 100°. DIR turned the Tristar R onto a heading of 120° at 0958:44,

followed at 0959:22 by TI on the P180; “[C/S] *traffic south east 6 miles north west bound indicating flight level 5-0 expedite descent*”. Although DIR reports that he asked LARS ‘where they were taking the ac’ and ascertained that the P180 was under a DS, there is no evidence on the transcript of any liaison being conducted between DIR and LARS, nor does the LARS mentor mention it. It is possible that DIR’s instruction to the Tristar crew to “*expedite descent*” was in order to assist LARS, conscious that the heavy ac would be unable to level off quickly as, at the time, it was passing FL63 Mode C [about 8.4nm NW of the P180].

[UKAB Note (1): At 0959:44, DIR updated the TI on the P180 to the Tristar crew, “...*that previously called contact 12 o'clock 3 miles now opposite direction indicating flight level 5-0*” [ALT52], which was not acknowledged by the crew. This was followed by an instruction to turn L 20° onto a heading of 100°. At 1000:03, the Tristar crew advised DIR “*..just got TCAS R-A*”, to which DIR replied, “*confirm what heading*”. The Tristar crew repeated 5sec later “[C/S] *is 5 thousand feet TCAS R-A*”, whereupon DIR responded, “*roger that's copied turn left heading 1-0-0 degrees descend height 2 thousand 2 thousand 5 hundred feet*”. This instruction was read-back by the crew “*left heading 1 hundred and descend 2 thousand 5 hundred feet [C/S] currently I-M-C*”, which was acknowledged by the controller. Following a further L turn instruction from DIR onto 080°, the crew advised at 1000:34 that they were “*..now clear of conflict*”.]

Although the Tristar pilot reports that at about 6000ft they ‘elected to begin a level-off’ to avoid the P180’s level and also entering cloud, they did not mention the level-off on the RT. [UKAB Note (2): A reducing RoD is evident from the Tristar’s recorded Mode S Downlinked Ac Parameters (DAPs) as the ac steadies outbound from the Brize overhead, after 0959:42, from about 2500ft/min to 1100ft/min at 0959:50. Mode S then shows an increasing ROC up to ~900ft/min through to the CPA. However, this ROC is hardly reflected at all in the ac’s indicated Mode C, before the descent is resumed after 1000:14, increasing to over 3300ft/min.]

It is clear that LARS was aware of the P180’s proximity to the Tristar at 0959:23, when an instruction to turn L onto 180° was issued; however, it is not until 0959:42 that the turn begins to become evident on the radar recording [about 2 sweeps later], when LARS amended the instruction into avoiding action, “[C/S] *avoiding action turn left immediately heading 1-7-0 degrees traffic was north east [sic] 4 miles tracking east indicated at flight level 5-0*”. The transcript is not clear but the P180 crew may have become visual with the Tristar at this point stating, “*request traffic in sight and..turning left heading 1-7-0.*”

[UKAB Note (3): The P180 pilot reports the Tristar was not seen. When the avoiding action turn was transmitted the Tristar was actually 5.1nm NW of the P180, not NE as stated by LARS, indicating 5300ft (1013mb) and some 340ft above the P180 that was at 5200ft London QNH (1021mb) – (at the western edge of the displayed London QNH (1021mb) area). The CPA occurred at 1000:12 as the ac passed abeam, 2.1nm apart, with the Tristar indicating 100ft above the P180 on Mode C. A change of controller is noted on the transcript for the next transmission to the P180 crew at 1000:30, suggesting the mentor stepped-in at this point; “[C/S] *avoiding action turn right immediately heading 2-7-0 degrees traffic [not the Tristar] was south east 4 mile manoeuvring indicating 2 thousand 2 hundred feet below*”. This was read back by the crew, “*..right heading 2-7-0 again*”, before LARS [the mentor] added, “[C/S] *I am going to struggle to get you close to COMPTON under a Deconfliction Service as there is a lot of conflicting traffic in that area [are you] happy to accept a downgrade to Traffic Service for your controlled airspace join?*” This was declined by the P180 crew, “*..roger we prefer a Deconfliction Service*”. DIR then responded by modifying the previously transmitted avoiding action turn by 10° at 1000:56. A further avoiding action R turn was given onto E before the P180 crew was released own navigation for CPT, the CAS joining clearance issued and the flight switched to LACC.]

Although the Tristar crew state that, based on their interpretation of the TCAS display, DIR’s turn onto 120° vectored them into confliction, this is not the case. At the point that the turn was issued to the Tristar crew [at 0958:44] the P180 was SE of Brize Norton and no factor. Furthermore, even after the P180 was turned onto 310° [at 0958:33], the Tristar’s heading of 120° would still not be a conflicting heading within the terms of a TS, insofar as about 1nm of horizontal separation would

have been achieved. Moreover, whilst the Tristar crew highlight that DIR passed them avoiding action after ATC were advised of the TCAS RA, this is technically incorrect in that it was a re-statement of the heading of 100° previously issued. Having acknowledged the TCAS RA, DIR then continued to vector the Tristar inbound. JSP 552 245.120.3 states that:

‘controllers shall not attempt to modify the aircraft flight path until the pilot reports Clear of Conflict’.

Notwithstanding the potential cockpit workload during this phase of the flight, of further concern is the fact that the crew appeared to have decided to level-off without communicating this intention to DIR and that they did not advise DIR of the first TCAS RA.

From an ATC perspective, once LARS had given the P180 crew the avoiding action turn onto W against another ac at 0957:39, the trainee controller was faced with a challenging situation, given the airspace constrictions and his experience level. However, at no stage did LARS attempt to coordinate with the military ATSU that was working the traffic that caused them to take avoiding action. Nor did they reduce the ATS for the high traffic density, which may have afforded them greater flexibility to route towards CPT. Although the mentor took over from the trainee immediately after the avoiding action turn away from the Tristar, this Command contends that earlier intervention by the mentor could have prevented this Airprox. Notwithstanding DIR’s actions after being advised of the TCAS RA, DIR had attempted to provide the best level of ATS to the Tristar by requesting the expedite descent and turning them away from the P180.

Normally in this situation, the SUPERVISOR (SUP) would be expected to maintain oversight and liaise between the controllers involved, a presence that could have affected the outcome of this Airprox; however, in this instance, the SUP had been busy in the VCR [although LARS says the airways join was finalised by the SUP after he returned to the ACR]. RAF Terminal ATSUs have for some time operated with only one Supervisor in ATC whose remit extends to both the VCR and ACR, yet a number of incidents have occurred where the lack of a supervisory input has been a contributory factor. As the RAF begins to concentrate ac types at a reduced number of MOBs, it may be appropriate to re-consider the RN system of a dedicated VCR Supervisor – the Duty Air Traffic Control Officer (DATCO) – in addition to a Radar Supervisor in the ACR.

An aggravating factor in this occurrence was the slow response of the P180 to the avoiding action turns, possibly as a result of the crew’s use of the A/P to initiate the turn, rather than flying the ac manually. If this is the case, this issue has been highlighted before in Airprox investigations and warrants further investigation.

Recommendations made by BM SM

- i. HQ 1 Gp BM SM will shortly begin a regular newsletter to publicise the findings of occurrence investigations, which will cover the issues raised above.
- ii. RAF ATM FLC, in association with units, is requested to examine the utility and possibility of instituting dedicated ACR and VCR Supervisors.
- iii. The UKAB is requested to engage with the CAA about the use of A/P initiated avoiding action turns, rather than manual flying, when operating in un-controlled airspace.

HQ AIR (OPS) comments that the analysis by the HQ 1GP BM SM is supported and that HQ Air (Ops) has nothing further to add.

UKAB Note (4): Although not involved in this Airprox, NATS Ltd helpfully provided a TCAS review of this Airprox using the Eurocontrol Automatic Safety Monitoring Tool (ASMT) to analysis TCAS RA messages downlinked via Mode S (TAs are not downlinked) and the InCAS simulation tool. As TCAS interrogates once every second and the radar recordings used for the simulation give data updates rates of up to 8sec intervals, interpolation is necessary. Hence, there can be variations

between the InCAS simulation and what actually occurred in the cockpit. The InCAS simulation here used interpolated single source radar data from the Heathrow 10cm (4sec data update rate), the Airprox diagram is based on the Clee Hill Radar recording (8sec data update rate). The main elements of this simulation are summarised herein.

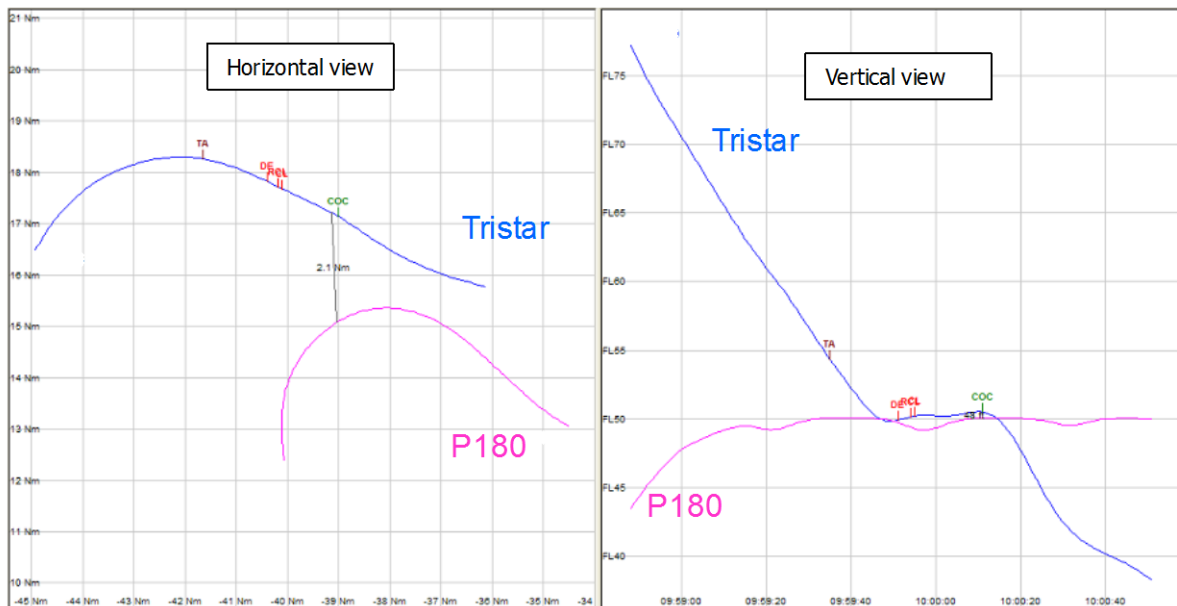
InCAS indicates that the Tristar crew first received a TA at FL54 at 0959:35, when the P180 was at a range of 5.88nm and 432ft below the Tristar. The ASMT recorded two TCAS RA messages downlinked via Mode S from the Tristar during this encounter. When the P180 had closed to a range of 3.57nm and 22ft below the Tristar, the latter's crew received a Descend RA within the 4 seconds prior to 0959:51. This RA changed to Maintain Vertical Speed within the 4 seconds prior to 0959:54. Analysis of the 'raw' downlinked messages indicates that this RA was specifically a Maintain Climb type of RA. (This RA is enunciated as "Maintain Vertical Speed, Maintain".) This would indicate that the sense of the RA must have reversed from a descending sense into a climb via an additional 'Reversal Climb' RA between the initial Descend RA message and the Maintain Climb RA message. The ASMT has not recorded this probable RA as no radars interrogated the ac during this brief period.

(Notably, the downlinked TCAS RA messages from the Tristar indicate that it treated the P180 as a Mode A/C aircraft and not as Mode S equipped. This is despite the ground radars identifying the aircraft as at least Mode S Elementary Surveillance capable.)

Thus the encounter geometry of the ac was such that the Tristar could have been in receipt of a Descend RA at 0959:51, followed within 4sec by a 'Reversal Climb' RA at 0959:54 as detailed above.

The simulation indicates that the Clear Of Conflict message would have been generated at 1000:11.

InCAS Simulation



Encounter Diagram Based on Heathrow 10 Single Source Radar Data

CODE	DESCRIPTION	CODE	DESCRIPTION
TA	Traffic Alert	DE	Descend
RA	Resolution Advisory	RCL	Reversal Climb
COC	Clear of Conflict	KVS	Maintain Vertical Speed

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from the pilots of both ac, transcripts of the relevant RT frequencies, radar video recordings, reports from the air traffic controllers involved and reports from the appropriate ATC and operating authorities together with a TCAS analysis.

The Board noted the comments in the HQ 1GP BM SM report relating to the perceived slow response by the P180 crew to the avoiding action instructions issued by LARS, possibly as a result of the crew's use of the A/P rather than hand flying the ac. The Board was briefed that the recorded radar data (only updated every 8sec) suggested that the P180 was turning at a rate of about 3°/sec (rate 1) with a radius of turn of about 2nm. This seemed reasonable and a CAT pilot Member explained that his company's policy had changed recently from disengaging the A/P when given an avoiding action instruction to now applying the turn with the A/P still engaged. However, it was unclear how the P180 crew had executed the avoiding action turns in this instance. The Board had discussed on several occasions the advantages of the rapid response when flying manually against the disadvantages of disengaging the A/P and adding to the crew's workload in a potentially difficult and intense situation. A GA Member familiar with the P180 opined that it is fitted with a good, responsive A/P and the consensus here was that faced with multiple instructions to avoid other ac, including the Tristar, under the DS and their preparations to join CAS, the P180 crew was probably complying with LARS's instructions as best they could and their speed of response had little impact on the eventual outcome of this Airprox. Nevertheless, in view of the concern expressed by HQ 1GO BM SM, the CAA ATS Policy and Standards Advisor agreed to clarify, outwith the meeting, the current 'best practice' advice relating to the use of the A/P when complying with ATC avoiding action instructions.

Military controller Members noted that although the Tristar pilot was in receipt of radar vectors there was no necessity to achieve any stipulated separation minima under the TS requested by the pilot. A Member was concerned at the use of TS for directing IFR recoveries in IMC; some military controller Members suggested this was the only suitable radar service in Class G airspace, given the density of traffic commonly encountered in this locale. The military fast-jet pilot Member agreed that it was the Tristar pilot's choice; a balance had to be struck between an expeditious approach under a TS, where the pilot was content to maintain his own separation against traffic that he could see, versus the significant delays occasioned by following avoiding action vectors under a DS to achieve the stipulated deconfliction minima. A military controller Member opined that DIR would have been taking other traffic into account when issuing vectoring instructions in the pattern and agreed with the Command that the Tristar was not vectored into conflict by DIR. However, other pilot and controller Members had different views. This Airprox illustrated the importance of an early all round and frequent scan for other traffic by radar controllers, which might affect ac under service. DIR reports that he had not noticed the P180 until the Tristar was descending through FL61 and Members recognised this was moments before he transmitted the first TI about it to the Tristar crew as the latter passed abeam Brize Norton. DIR was not busy, but it seemed to civilian controller Members that the controller had spotted the P180 at a late stage; with vectors into a LHD pattern S of the RW centreline, combined with the decent to 2500ft QFE, it was always going to be difficult to get the Tristar safely below the P180 and a Member thought that DIR had subsequently vectored the Tristar unnecessarily close to the P180. Hence the request to the Tristar crew to expedite their descent below the P180's level. In the absence of verbal co-ordination, not knowing what LARS might do with the P180, a military controller Member thought it would have been better to have vectored the Tristar into a RHD pattern downwind N of the RW centreline, but by the time DIR had seen the P180 and appreciated the situation it was all too late. At these ranges the potential for triggering a TCAS RA by vectoring the Tristar so close ahead of another ac in level flight whilst descending through its level should have been readily apparent and ultimately resulted in the three RAs being generated in close succession. The TCAS analysis indicates that the Tristar crew received a TA and three RAs over the space of 20sec: a Descend RA, a reversal into a Climb RA followed by Maintain Vertical Speed, before Clear of Conflict was achieved. In considering the Tristar pilot's response to the TCAS instructions, the Board noted that he had advised DIR 12secs into the RA sequence, which the Board viewed as entirely reasonable in the circumstances given the requirement is to notify ATC as soon as possible, but with the caveat 'as permitted by flight deck workload'. CAT pilot Members

rejected the Command's criticism of the Tristar crew for not communicating this and his intention to level out earlier. Moreover, pilot Members stressed that even if there is a conflict between an RA and an ATC instruction, pilots must comply with the TCAS RA that will, if followed promptly, ensure that they fly clear of the conflicting ac. Members agreed DIR should not have issued or reiterated any instructions to the Tristar crew once the RA had been declared. A civilian controller was concerned that this Airprox might illustrate a deficiency in military ATC training, but the HQ 1Gp BM SM Advisor reassured the Board, and the extract from JSP 552 confirmed, that the instructions for military controllers not to attempt to alter the ac's flightpath until advised that the ac was 'Clear of Conflict' were the same as that for their civilian colleagues.

Whilst endeavouring to descend the Tristar speedily below the P180 it seemed that DIR had attempted to liaise with LARS, but the Command had highlighted that no verbal co-ordination was evident from the transcripts. Irrespective of whether a TS or DS was being afforded, controller Members were adamant that co-ordination was warranted to ensure the safe deconfliction of these two ac. However, in the provision of a DS, controller Members opined that LARS had the primary responsibility to initiate verbal co-ordination to achieve the stipulated deconfliction minima. Neither controllers' workload was high, which should have allowed them to reach an accord that could have helped LARS significantly, prevented the eventual erosion of deconfliction minima and forestalled the TCAS RAs. The Board agreed that the lack of co-ordination between LARS and DIR was a Contributory Factor.

Especially in the early stages of training, Mentors must not allow the limited abilities of the trainees in their charge to adversely affect the ATS being provided. The LARS Mentor had reported her trainee's initial avoiding action was ineffective, but it seemed that she had not taken over control from the trainee until after the CPA had occurred. Judging exactly the most appropriate point to step-in and take-over is not always obvious or straightforward. Nevertheless, Members agreed that earlier intervention by the LARS mentor, who was entirely responsible for the actions of the controller under training, could have been beneficial here. Whether or not the CAS joining clearance affected LARS ability to co-ordinate or monitor the trainee, the Command's comment about the efficacy of retaining a Supervisor exclusively in the ACR had merit and might have led to earlier resolution of the developing conflict. When LARS elected to turn the P180 R onto 310° it might have taken the P180 away from the other ac, but it vectored the P180 closer towards the aerodrome radar pattern, which illustrated to some Members a lack of awareness of the overall traffic situation. This, coupled with the absence of any verbal co-ordination against an ac descending through the level of the P180 was indicative of a lack of team work within the ATSU, a civil controller Member opined. The HQ BM SM report shows that LARS did not attempt to resolve the conflict with the Tristar until the P180 was turned L onto 180°, when the Tristar was just over 7nm away and closing rapidly with horizontal deconfliction minima being eroded moments later. This signified that LARS was also caught unawares by the tanker descending into the ILS pattern, but which should have been readily apparent to them. After a wide ranging debate, the Members concluded that this Airprox had resulted because LARS vectored the P180 into conflict with the Tristar.

Turning to the inherent Risk, the P180 pilot reported that he did not see the Tristar, although his RT response to the avoiding-action turn and TI about the Tristar might feasibly have confused the controller into thinking that he had. Nevertheless, whilst flying in between cloud layers the proximity of the Tristar should have been apparent to the P180 crew from their TCAS I display. Similarly, while the Tristar crew were aware of the P180 from their TCAS display and warnings, they did not see it visually. Although the rapidly changing TCAS RAs had only enabled the Tristar crew to gain 100ft separation above the 'non co-operative' TCAS I equipped P180 at the CPA, the analysis demonstrates that TCAS was resolving the conflict in the vertical plane. Furthermore, the avoiding action L turn instruction issued to the P180 crew did eventually ensure that their ac was flown clear to the S of the Tristar with 2.1nm horizontal separation as the ac passed. This convinced the Board that no Risk of a collision had existed in these circumstances.

The Board noted the first two internal Recommendations made within the HQ Air BM SM report and awaited further advice about the use of A/P initiated avoiding action turns, versus manual flying, when operating in un-controlled airspace.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: LARS vectored the P180 into conflict with the Tristar.

Degree of Risk: C.

Contributory Factor: Lack of co-ordination between LARS and Director.