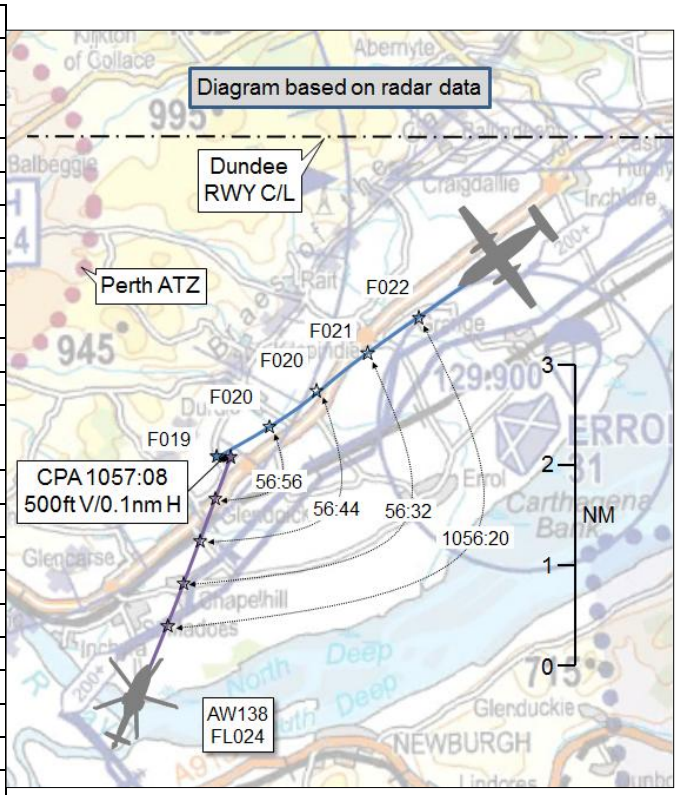
AIRPROX REPORT No 2016187

Date: 23 Aug 2016 Time: 1057Z Position: 5624N 00316W Location: 5nm W Dundee airport

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	DHC8	AW139
Operator	CAT	Civ Comm
Airspace	Scottish FIR	Scottish FIR
Class	G	G
Rules	IFR	VFR
Service	Procedural	Traffic
Provider	Dundee	Leuchars
Altitude/FL	FL19	FL24
Transponder	A,C,S	A,C,S
Reported		
Colours	Company	Multi
Lighting	Landing, HISL, nav	Strobes, nav
Conditions	VMC	VMC
Visibility	NK	8nm
Altitude/FL	2200ft	3000ft
Altimeter	QNH	RPS
Heading	NK	020°
Speed	180kt	135kt
ACAS/TAS	TCAS II	TCAS I
Alert	RA	TA
Separation		
Reported	400ft V/3-400ft H	600ft V/0.25nm H
Recorded	500ft V/0.1nm H	



THE DHC8 PILOT reports that he was proceeding outbound from the hold on a procedural arrival for a Localiser-only RW09 approach. The aircraft continued overhead the Dundee (DND) NDB and outbound with LNAV engaged. Indicated Airspeed (IAS) was 180kt clean, and a VS of 800fpm was selected to ensure the capture of a level plateau prior to manually managing the vertical profile of the approach. During the outbound leg of the procedure they were advised of transiting rotary traffic that they subsequently became visual with. A TCAS 'Traffic Traffic' annunciation occurred, followed shortly by a TCAS 'Monitor Vertical Speed' [RA] annunciation as they levelled at the plateau altitude of 2200ft. The AW139 helicopter transited above and across their track by approximately 3-400ft. Dundee ATC, he recalled, advised that the AW139 was at a transit altitude of 2600ft. Due to the proximity of the conflicting traffic and the fact that he was VMC with the ground, he elected to manually descend the aircraft down to 2000ft to provide an additional margin of safety until the 'Clear of Conflict' annunciation was made by TCAS. On receiving this during the base turn, the Auto Pilot was re-engaged and the plateau of 2200ft was re-established. The approach continued to an uneventful landing. There was no Radar coverage at DND and he was on a Procedural arrival to establish on a Non-Precision Approach. By being in VMC, he was able to judge the increasing threat from the rotary traffic and assess that against the MSA/Plateau altitude, and balance the risks more appropriately. Thankfully, they were VMC to take such an action. He commented that whilst this was an instrument approach outside CAS, the principle of other aircraft routinely flying through and in the proximity of an instrument procedural arrival does not rest well in his mind. He believed that the liaison between Dundee, Perth and Leuchars needed to be better to advise transit traffic that the instrument approach was active.

THE AGUSTA WESTLAND AW139 PILOT reports that he was in the cruise at 3000ft (RPS) receiving a Traffic Service from Leuchars Radar. He was routing from Edinburgh airport to a private site in Angus. Having left the Edinburgh CTR via Kelty, and then via the north side of Loch Leven to avoid any gliders at Portmoak, he was on a direct track to his destination. This track took him to the west of the 'disused' Errol[1]

[1] UK AIP ENR 5.5-3. Notified parachute jumping site.

airfield and outside Dundee's ATZ. Whilst receiving a Traffic Service from Leuchars, the crew were informed that there was an aircraft in the Dundee hold at 3000ft. This aircraft was not at a range to be visual at this stage and, because they were tracking to the west of Dundee, it did not appear to be a factor. The first time the crew saw the DHC8 was after they had passed west-abeam Errol airfield. It was in their 1-2 o'clock tracking towards them at about 2-3nm. It had also appeared on their TCAS between 2-3 o'clock descending (200ft below them and continuing down). At the same time as the crew sighted the conflicting aircraft, Leuchars also advised them of traffic. The crew thought that the DHC8 was descending outbound for either a visual or ILS approach to Dundee. Apart from turning sharply right, there was not a lot they could do, and the DHC8 was descending to go under them and slightly in front (TCAS gave the height difference as 600ft below when they passed). From when it was first sighted and they were informed of the traffic, the DHC8 was in view throughout and at no time did there appear to be any risk of a collision as the DHC8 was descending. The crew only recollect ever being told that there was an aircraft in the Dundee hold and at no time were they told that it had left the hold or was flying outbound in the procedure. They believed that they were only informed about the traffic at about the same time as they saw it.

He assessed the risk of collision as 'None'.

THE LEUCHARS APPROACH RADAR CONTROLLER reports that he controlled the DHC8 inbound to Dundee. The aircraft was identified, placed under a Deconfliction Service and descended initially to 5000ft on the Dundee QNH. Once the aircraft was south-west of Leuchars by approximately 5nm the pilot was given descent to 3000ft Dundee QNH. Traffic Information was given on other traffic believed to be in the Dundee visual circuit not above 1500ft. He confirmed that the DHC8 pilot was happy to continue against this traffic and then abeam Leuchars, with no other traffic to affect, the pilot was instructed to squawk 7374 and released to Dundee. Approximately 5 minutes later, he was contacted by a free-calling AW139 pilot. The aircraft was leaving the Scottish TMA north-east bound at 2500ft, the pilot requested a Traffic Service. The AW139 was identified, placed under a Traffic Service and given the Tyne RPS. Subsequently, the aircraft tracked west of Dundee. He called the DHC8 to the pilot of the AW139, who confirmed he had the aircraft on TCAS and then reported that he also had visual contact. The pilot of the AW139 confirmed that the DHC8 was 500ft below him and he then confirmed again that he still had visual contact with the aircraft. He also spoke to Dundee ATC on the landline to pass Traffic Information and to inform them that the AW139 pilot was visual with the DHC8, suggesting that they give DHC8 pilot Traffic Information. At no time did he consider safety to be compromised because the traffic he was controlling was in Class G airspace and visual at all times with the DHC8.

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

THE DUNDEE CONTROLLER did not submit a report.

Factual Background

The weather at Dundee was recorded as follows:

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EGPN 231050Z 09010KT 9999 FEW030 SCT046 15/13 Q1022=
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Analysis and Investigation

CAA ATSI

ATSI had access to reports from both pilots, the area radar recording, a copy of the Dundee radio transmissions and a Unit report from Dundee. Screenshots produced in the report are provided using the Prestwick MRT radar source, levels indicated are in reference to Flight Levels.

At 1050:52, the DHC8 pilot contacted Dundee Approach and requested an ILS approach to RW09 at Dundee. A Procedural Service was agreed, and the DHC8 pilot was cleared to the DND at 3000ft.

At 1051:06, the controller advised the DHC8 pilot that the glidepath was on maintenance and that either a Localiser-only approach was available or the glidepath could be returned to use in approximately 4 minutes. Following a slight pause, the DHC8 pilot chose to make a LOC/DME approach (Figure 1).

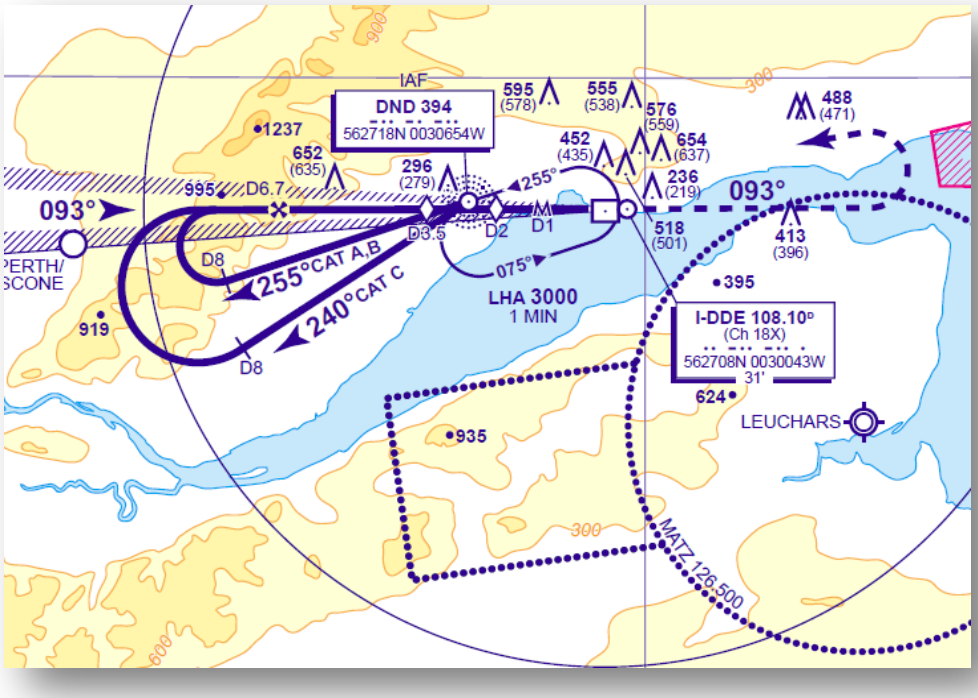


Figure 1 LOC/DME chart for RW09 at Dundee.

At 1051:38 (Figure 2), the controller instructed the DHC8 pilot to report beacon outbound on the approach.

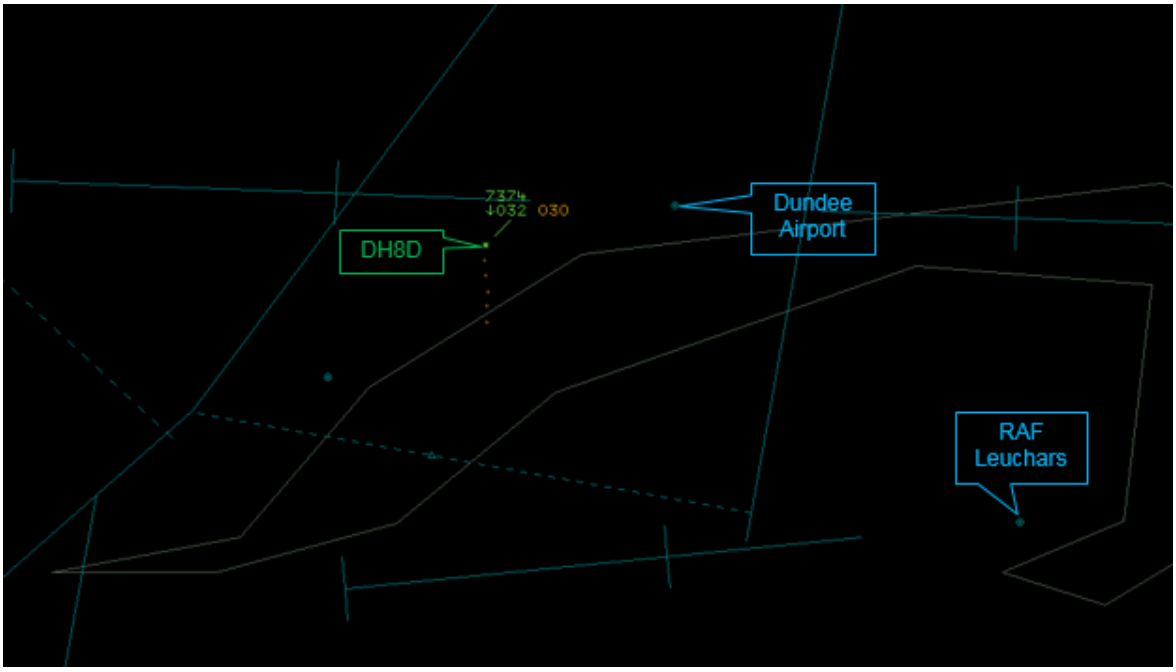


Figure 2 – Prestwick Radar at 1051:38.

At 1054:50 (Figure 3) the DHC8 pilot had made a reversal turn overhead Dundee and reported beacon outbound. The controller asked him to report established inbound on the localiser.

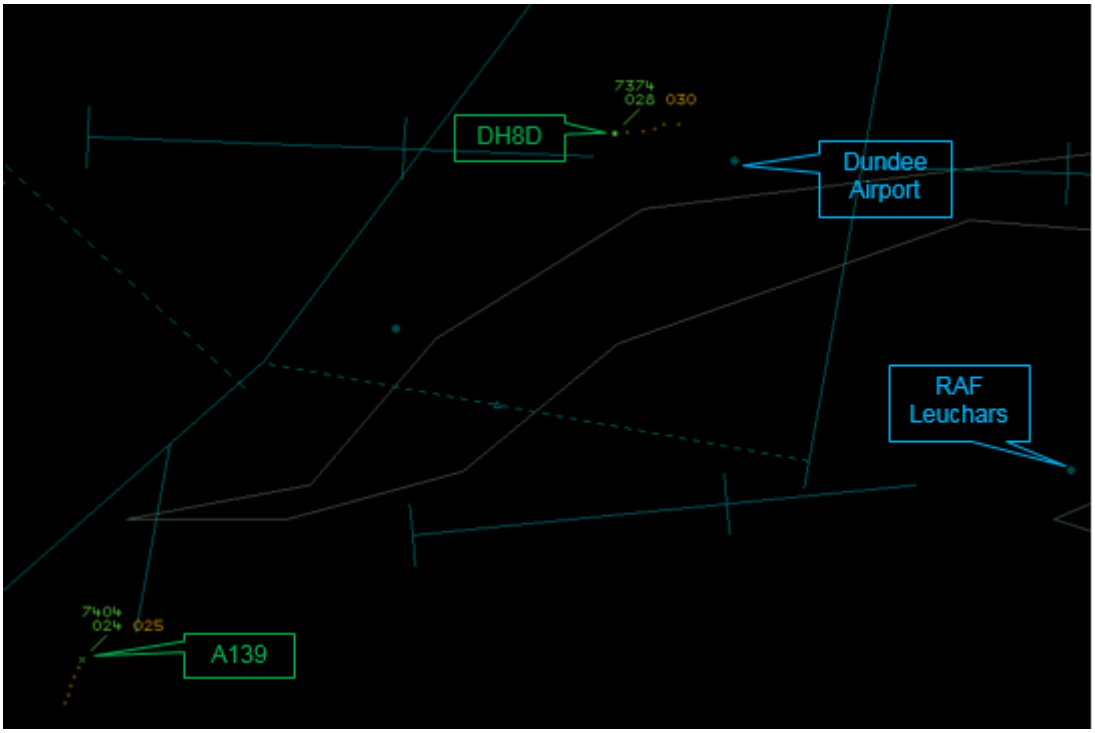


Figure 3 – Prestwick MRT at 1054:50.

At approximately 1056:30 Leuchars LARS telephoned Dundee and advised them that they were working an AW139 helicopter at 2500ft that was tracking northbound and had the DHC8 in sight. The controller passed this information to the DHC8 pilot at 1056:55.

CPA occurred at 1057:08 (Figure 4) when the DHC8 was indicating FL019 and the AW139 FL024 (CPA 500ft vertically and 0.1nm horizontally).

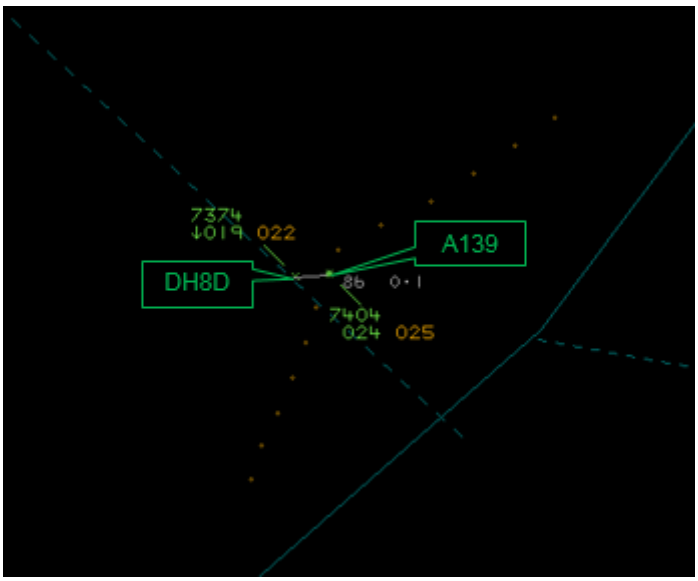


Figure 4 - Prestwick MRT at 1057:08.

The controller at Dundee was providing a Procedural Service without the use of surveillance equipment.

The pilot of the DHC8 had observed the presence of the AW139 on TCAS and, being visual with the ground as he stated in his report, had descended below the platform altitude for the approach of 2200ft to 2000ft. This is evidenced by the 'Mode C' height readout of FL019 (descending).

The telephone call between Leuchars LARS and Dundee was not recorded at Dundee but, given the pause in radio transmissions by the Dundee controller and other Traffic Information provided about circuit traffic, the information about the AW139 was likely passed after approximately 1056:30. [Recorded at Leuchars, see ATM Mil report.]

The Dundee controller made one other brief transmission to a pilot on the ground and then passed the Traffic Information to the DHC8 pilot. Although the controller stated in his report that the Traffic Information was passed whilst the DHC8 was in the base turn, it was in fact still proceeding on the outbound leg of the procedure.

Military ATM

Portions of the tape transcripts between the Leuchars Approach/Zone controller and the DHC8 and AW139 pilots are below:

To	From	Speech Transcription	Time
Tutor	Zone	[Tutor C/S] roger I've got traffic inbound to Dundee from the south shortly under deconfliction??	10:46.02
Zone	DHC8 C/S	Hello Leuchars [DHC8 C/S] squawking 7403 now and descending FL70 direct Dundee	10:47:05
Zone	Tutor	Yeah [Tutor C/S] I'm coming onto south to negotiate another sector as sector 3 is unworkable I think	10:47.12
Tutor	Zone	Roger	10:47.20
DHC8	Zone	[DHC8 C/S] Leuchars good morning identified DS set the Dundee QNH 1021	10:47.22
Zone	DHC8	DS Dundee QNH 1021 [DHC8 C/S]	10:47.31
DHC8	Zone	[DHC8 C/S descend initially altitude 5000 feet	10:47.36
Zone	DHC8	Descend initially 5000 feet 1021	10:47.41
DHC8	Zone	[DHC8 C/S] own navigation for the DND	10:47.45
Zone	DHC8	Roger routing DND [DHC8 C/S]	10:47.49
DHC8	Zone	[DHC8 C/S] descend altitude 3000 feet	10:48.09
Zone	DHC8	Descend altitude 3000 feet [DHC8 C/S]	10:48.12
DHC8	Zone	[DHC8 C/S] believed to be 2 aircraft in the vicinity of Dundee in their visual cct recovering not above 1500 feet you happy to continue inbound against these tracks	10:48.16
Zone	DHC8	Affirm [DHC8 C/S]	10:48.26
DHC8	Zone	Roger	10:48.27
Tutor	Zone	[Tutor C/S] now clear of that traffic inbound Dundee now manoeuvre as required	10:49.11
Zone	Tutor	That's copied I'm now going towards sector 4 and 5 , it'll have to be 5 to get a bit of height so we'll remain well clear	10:49.16
Tutor	Zone	No problem thanks	10:49.26
DHC8	Zone	[DHC8 C/S] squawk 7374	10:49.40
Zone	DHC8	Squawk 7374 [DHC8 C/S]	10:49.43
DHC8	Zone	[DHC8 C/S] traffic right 1 o'clock 4 miles crossing right left believed to be Dundee visual cct	10:50.03
Zone	DHC8	Roger looking [DHC8 C/S]	10:50.10
DHC8	Zone	[DHC8 C/S] Leuchars has no known further traffic to effect continue with Dundee 122.9 good day	10:50.17
Zone	DHC8	122.9 [DHC8 C/S] speak to you soon	10:50.22
Tutor	Zone	[Tutor C/S] traffic south west four, three miles northbound indicating 1500 feet below	10:50.48
Zone	Tutor	[Tutor C/S] has that traffic on TAS and looking	10:50.56
Tutor	Zone	Roger	10:51.00
Zone	AW139	Leuchars radar hello again [AW139 C/S]	10:51.26
AW139	Zone	[AW139 C/S] Leuchars good morning again pass message	10:51.35
Zone	AW139	[AW139 C/S] AW139 helicopter with a total of 4 on board just coming out of the Edinburgh zone at Kelty we're at level 2500 feet 1017 the Tyne routing to a private site [destination] requesting a TS	10:51.40
AW139	Zone	[AW139 C/S] roger squawk 7404	10:51.55
Zone	AW139	Roger sir 7404 on	10:52.03
AW139	Zone	[AW139 C/S] identified TS the Tyne pressure is 1017	10:52.13
Zone	AW139	TS 1017 is set thank you	10:52.17
AW139	Zone	And you're below the TSL responsible for your own terrain clearance	10:52.20
Zone	AW139	Copied sir thank you	10:52.23

To	From	Speech Transcription	Time
AW139	Zone	[AW139 C/S] traffic right 2 o'clock range 6 miles similar altitude in the Dundee hold shortly inbound to Dundee I'll keep you advised	10:55.45
Zone	AW139	Copied I have him on TCAS and our tracks going to take us to the North and West of Dundee	10:55.54
AW139	Zone	That's in the holding pattern I think it's just going to do a lazy right turn then intercept the DME on the inbound	10:56.01
Zone	AW139	We got him visual as well sir	10:56.08
AW139	Zone	Roger	10:56.09
Zone	DND App	Dundee approach	10:56.17
DND	Zone	Hi Dundee it's Leuchars I've got a Augusta 139 going northbound he's about 4 miles away from your dash 8 he is visual	10:56.18
Zone	DND	Right Ok what's his altitude	10:56.25
DND	Zone	2500 feet	10:56.27
Zone	DND	Ok my guys descends to 22 is he tracking south north	10:56.29
DND	Zone	He's going northbound but he's got him on TCAS and??	10:56.31
Zone	Tutor	?? sectors 1 and 2 initiating a visual recovery and we'll be routing via initials	10:56.34
Tutor	Zone	[Tutor C/S] roger information Charlie runway 08 QFE 1021 report aerodrome in sight	10:56.41
Zone	Tutor	Charlie 1021 wilco [Tutor C/S]	10:56.46
AW139	Zone	[AW139 C/S] are you still visual with that traffic	10:56.52
Zone	AW139	Sir he's just passing me 500 feet below	10:56.54
Zone	Tower	Tower	10:58.11
Tower	Zone	Approach [Tutor C/S] recovering from the north via initials	10:58.12
Zone	Tower	Roger and the guys are going to lunch now if you're happy	10:56.16
Tower	Zone	Yeah no problem	10:56.18
Zone	AW139	And Leuchars [AW139 C/S] just to confirm he's just turning inbound but we still have him visual but we should be clear of the centreline by the time he comes back past us	10:58.19
AW139	Zone	[AW139 C/S] thanks for that	10:58.33
Zone	AW139	Leuchars [AW139 C/S] can I check the Orkney setting sir	11.00.12
AW139	Zone	Roger the is Orkney is 1017	11:00.16
Zone	Tutor	[Tutor C/S] visual with the aerodrome	11:00.17
Zone	AW139	1017 ok thank you	11:00.20
Tutor	Zone	[Tutor C/S] roger continue with eh tower stud 2	11:00.23
Zone	Tutor	[Tutor C/S]	11:00.29
AW139	Zone	[AW139 C/S] I'm likely to lose you very shortly eh due to the high ground suggest 7401 the squawk and Scottish information on 119.875	11:00.53
Zone	AW139	Understand 7401 and 119.85 875 roger	11:01.04

At 10:55:45 (Figure 5), the DHC8 was tracking south-west under control of Dundee ATC and the AW139 was tracking north-east under control of Leuchars Approach. The Leuchars Approach controller passed Traffic Information to the AW139 pilot on traffic in his right, 2 o'clock, 6nm, similar altitude, in the Dundee hold but shortly inbound to Dundee and stated that he would keep the pilot advised. The pilot responded that he had the traffic on TCAS and would be routing to the west and north. At 10:56:08 the pilot reported visual with the traffic.

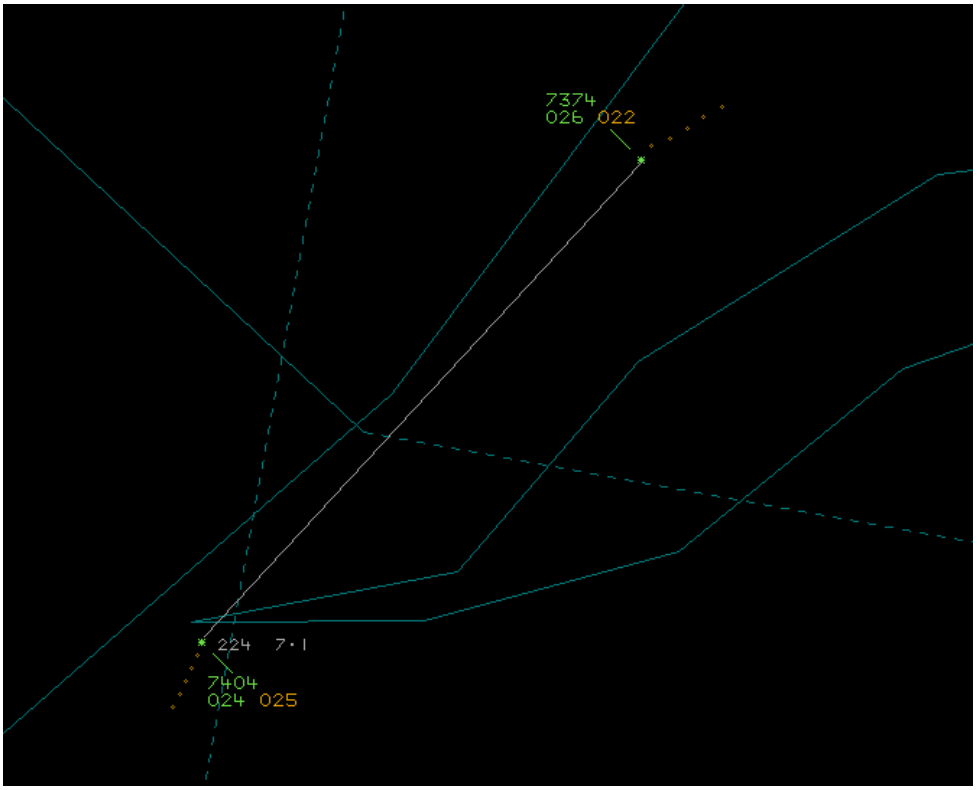


Figure 5: Geometry at 10:55:45 (DHC8 SSR 7374; AW139 SSR 7404).

At 10:56:18 (Figure 6), Leuchars Approach passed Traffic Information by landline to Dundee ATC, stating that the AW139 pilot was visual with the DHC8.

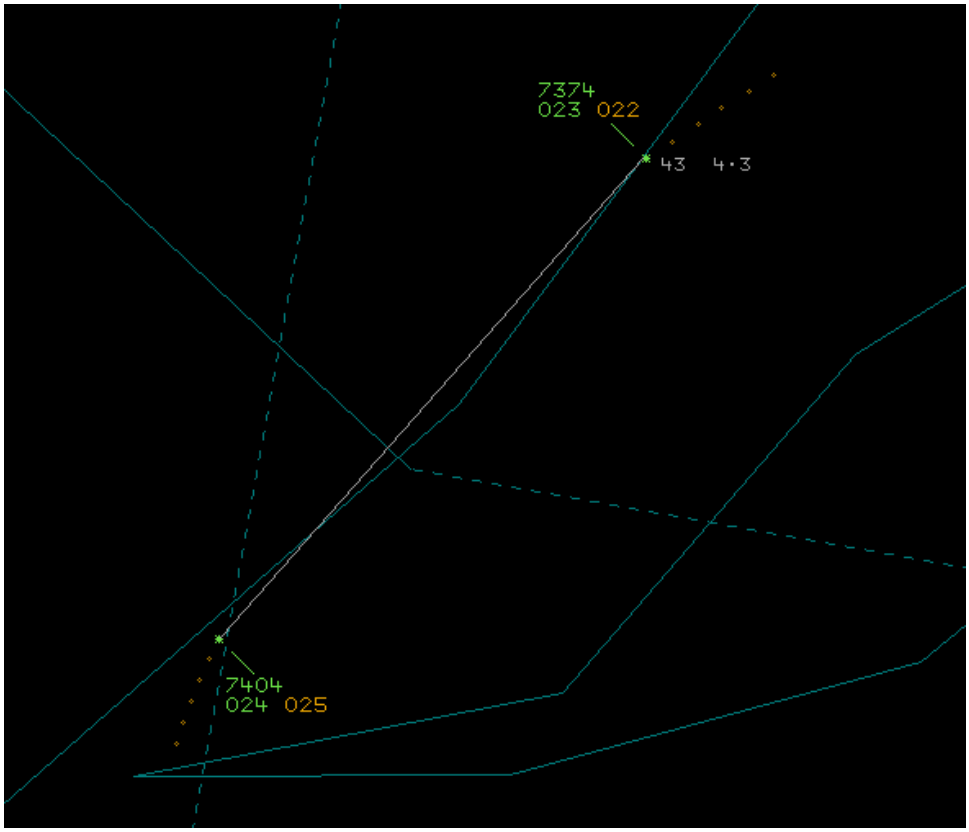


Figure 6: Geometry at 10:56:18 (DHC8 SSR 7374; AW139 SSR 7404).

At 10:56:52 (Figure 7), the Leuchars Approach controller asked the AW139 pilot if he was still visual with the conflicting DHC8. The pilot stated that the traffic was just passing 500ft below.

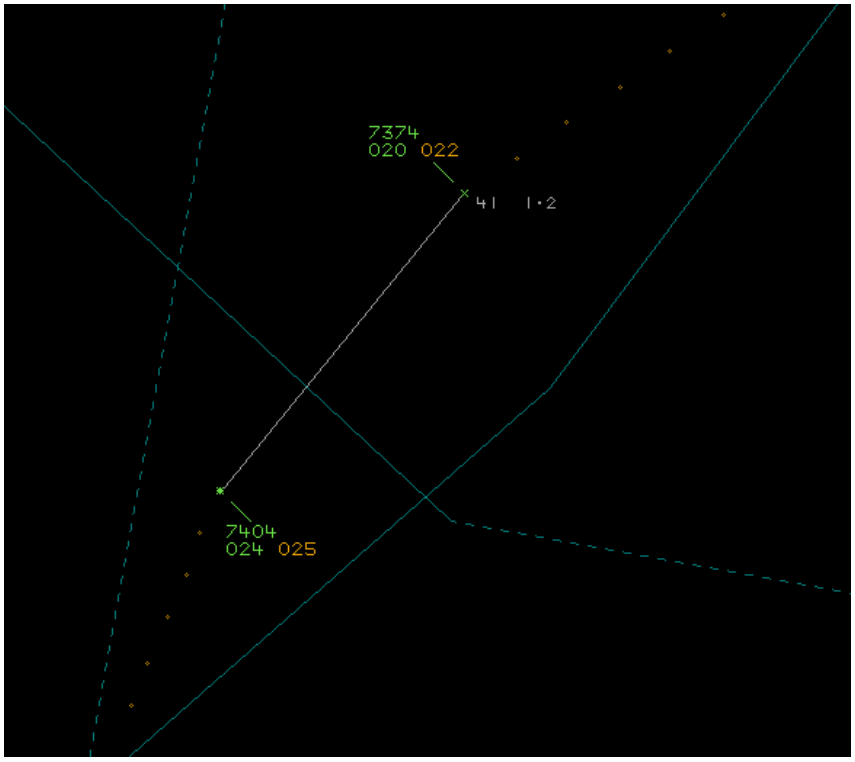


Figure 7: Geometry at 10:56:52 (DHC8 SSR 7374; AW139 SSR 7404)

At 10:58:19 (Figure 8), the AW139 pilot advised the Leuchars Approach controller that the DHC8 appeared to be turning inbound, that they were still visual, and anticipated being clear of the centreline by the time the DHC8 returned to that location.

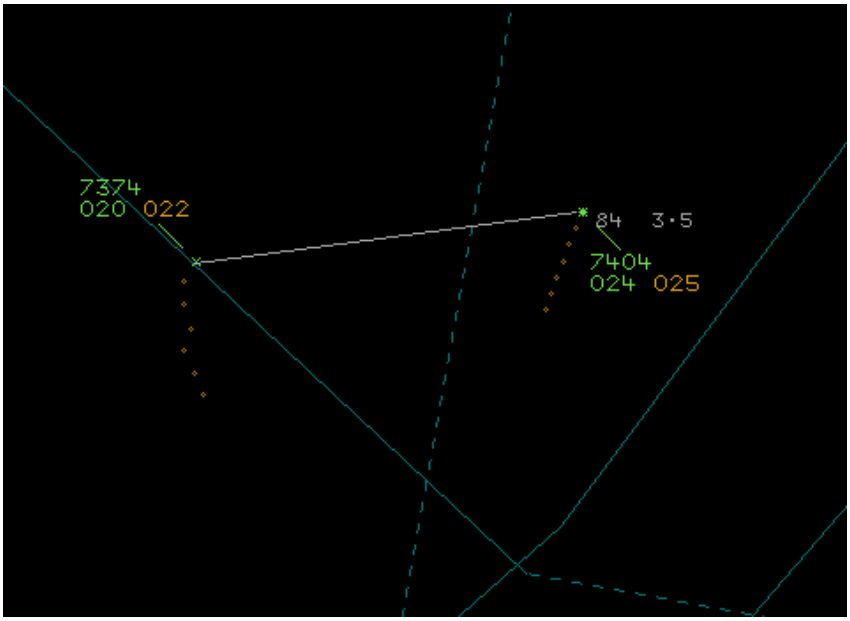


Figure 8: Geometry at 10:58:19 (DHC8 SSR 7374; AW139 SSR 7404).

The Leuchars controller was operating bandboxed as Approach and Zone. They reported identifying the DHC8 inbound Dundee, and giving an initial descent to 5000ft Dundee QNH under a Deconfliction Service, followed by further descent to 3000ft once 5nm south-west of Leuchars. The controller passed Traffic Information on Dundee circuit traffic, confirming that the DHC8 pilot was content to continue and then releasing the aircraft to Dundee ATC. Approximately 5 minutes later the AW139 pilot called up requesting a Traffic Service in transit north-east through the area at 2500ft Tyne RPS 1017hPa. The controller reported passing Traffic Information to the AW139 pilot on the DHC8 in the Dundee hold. The pilot stated that he had the aircraft on TCAS, then called visual with the traffic 500ft below. The Leuchars Zone controller passed Traffic Information on the AW139 to Dundee ATC and suggested that the Dundee controller inform the DHC8 pilot that the AW139 pilot was visual with him. The controller did not consider safety to be compromised as the AW139 pilot was visual with the DHC8 throughout.

The AW139 pilot reported receiving a Traffic Service from Leuchars ATC while in transit at 3000ft RPS. They stated that the Leuchars controller passed Traffic Information on an aircraft at 3000ft in the Dundee hold, and that, although they were not visual, they considered that their routing to the west of Dundee would mean the traffic would not be a factor. The conflicting DHC8 appeared on TCAS in the aircraft's 2-3 o'clock, 200ft below and descending, and was then sighted in the 1-2 o'clock, opposite direction at range 2-3nm. At this time, the pilot reported receiving Traffic Information from the Leuchars Approach controller and believed that the DHC8 was descending outbound for either a visual or ILS approach to Dundee. The AW139 crew remained visual with the DHC8 after first sighting and their TCAS reported 600ft vertical separation as the two aircraft passed. The crew stated that they believed there to be no risk of collision; however, their recollection was of only receiving Traffic Information on an aircraft in the Dundee hold, which was not updated until about the time they became visual.

Although the narrative provided by the AW139 pilot states that the DHC8 was not at a range to be visual during the first Traffic Information call (10:55:45), the pilot did call visual at 10:56:08, therefore the Leuchars Approach controller took the opportunity to pass Traffic Information to Dundee ATC, returning to check that the AW139 pilot was still visual with the DHC8 as the two aircraft reached 1nm separation, therefore fulfilling the requirements of the Traffic Service. CAP 774 states:

> *'The controller shall pass traffic information on relevant traffic, and shall update the traffic information if it continues to constitute a definite hazard, or if requested by the pilot'.*

In this case, the Traffic Information provided by the Leuchars Approach controller enabled the pilot of the AW139 to acquire the DHC8 on TCAS and then visually, therefore these three barriers were effective.

UKAB Secretariat

The DHC8 and AW139 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard[2]. If the incident geometry is considered as converging then the AW139 pilot was required to give way to the DHC8[3].

Summary

An Airprox was reported when a DHC8 and an AW139 flew into proximity at 1057 on Tuesday 23rd August 2016. The DHC8 pilot was operating under IFR in VMC, the AW139 pilot under VFR in VMC. The DHC8 pilot was inbound to Dundee in receipt of a Procedural Service and the AW139 pilot, who was transiting the area, was in receipt of a Traffic Service from Leuchars. The DHC8 pilot received a TCAS RA; the AW139 was visual with the DHC8. The CPA was recorded as 500ft vertically and 0.1nm horizontally.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from both pilots, the Leuchars controller, area radar and RTF recordings and reports from the appropriate ATC and operating authorities. The Board was disappointed that no report was received from the Dundee controller since this meant that they could not allow for his perception of what had occurred when coming to their conclusions.

Looking first at the actions of the DHC8 pilot, the Board noted that he had initially been provided with a Deconfliction Service outside CAS by Leuchars before being handed over to Dundee when clear of any known traffic. Dundee is not radar equipped, consequently no radar service was available and the DHC8 pilot was given a Procedural Service. Nevertheless, as a result of information passed from Leuchars radar, during the outbound leg of the procedure Dundee were able to give the DHC8 pilot Traffic Information that

[2] SERA.3205 Proximity.
[3] SERA.3210 Right-of-way (c)(2) Converging.

the AW139 was at 2500ft and tracking northbound with the DHC8 in sight. The DHC8 pilot reported that he subsequently gained visual contact with the AW139, received a TCAS Traffic alert, shortly followed by an RA to Monitor Vertical Speed. Being VMC and in contact with the ground, he decided to descend 200ft below the procedure's platform altitude of 2200ft to increase vertical separation between the two aircraft. A Civil Airline Pilot member stated that, in the circumstances, he considered that this was an acceptable manoeuvre. The Board commented favourably on the utility of TCAS as a significant barrier in preventing collisions when the other aircraft is transponding, but noted that the DHC8 pilot was visual with the AW139 anyway and so the principle barrier available to the DHC8 pilot was see-and-avoid. Finally, members noted the comments made by the DHC8 pilot about being concerned about aircraft routinely flying through an instrument arrival. Recognising that the airfield was situated in Class G airspace and without a radar to assist in deconfliction, the Board encouraged the DHC8 operator to review their risk assessment for their operation into Dundee in order to ensure that they were content that associated risks had been mitigated to their satisfaction.

For his part, the Board noted that the AW139 pilot was transiting VFR northbound to the west of Dundee, in receipt of a Traffic Service from Leuchars. He had been informed about the DHC8 in the Dundee hold at 3000ft. The pilot reported TCAS indications at that point but stated he only sighted the aircraft in his 1-2 o'clock tracking towards at about 2-3nm as the controller updated the Traffic Information. He did not recall that ATC had informed them that the DHC8 had left the hold or that it was flying outbound in the procedure. In fact, members noted from the radio transcript that the AW139 pilot had acknowledged the Leuchars controller's comment that "…I think it's just going to do a lazy right turn then intercept the DME on the inbound" and had stated that he was visual with the traffic at that point (at about 4-5nm). Having called visual with the traffic, this removed the onus on the controller to continue with any further Traffic Information, although the controller did seek to confirm that the AW139 pilot was still visual as they converged. The AW139 pilot continued his flight, keeping the DHC8 in sight, and the Board could understand why the pilot had not taken any visual avoiding action given that the DHC8 was already below them and was continuing to descend. Notwithstanding, members commented that, as a courtesy to the other pilot, the AW139 pilot could usefully have increased his altitude before they came into proximity in recognition that the DHC8 pilot would have to react to any TCAS alert generated by his aircraft's presence.

The Board then turned to the actions of the Leuchars Radar controller. He had agreed to provide a Traffic Service to the AW139 pilot and, subsequently, he issued him with Traffic Information about the DHC8 *"in the Dundee hold shortly inbound to Dundee"*. The pilot responded that he had him on TCAS. The controller then transmitted "*That's in the holding pattern I think it's just going to do a lazy right turn then intercept the DME on the inbound"*. A number of members, including military controllers, commented that, although indicative of what the DHC8 might be doing, this was not a clear message to the AW139 pilot that the DHC8 would be routeing outbound on an instrument approach away from the hold. Some members thought that if the AW139 pilot had been advised of the DHC8's precise routeing he might have taken action to proceed further away, but the majority thought this was a moot point in that the AW139 pilot had reported that he was visual at that point and therefore he had every opportunity to modify his own track if he wished. The Board commended the Leuchars controller for telephoning Dundee to pass them Traffic Information about the AW139, which they were then able to forward to the DHC8 pilot; however, they noted that when advising Dundee of the AW139's altitude, the Leuchars controller did not inform them that this referenced to the Tyne RPS, not the local QNH (albeit there was only 5hPa difference - equivalent of 135ft higher).

In looking at the safety barriers relevant to this incident, the Board considered that all barriers had functioned fully effectively apart from ATC Ground-Based Safety Nets (such as Short-Term Conflict Alert) which were absent as a result of Dundee not having a radar. As a result, the Dundee controllers were not positively cued by any system about the separation between the 2 aircraft. Somewhat in mitigation, Leuchars was able to provide such information and had positively passed details of their conflict detection to the Dundee controllers.

The Board then turned its attention to the cause and risk of the Airprox. The Board again noted the comments made by the DHC8 pilot about being concerned about aircraft routinely flying through an instrument arrival but noted that in this instance both aircraft were visual with each other and had traffic information in advance. Although the DHC8 pilot was clearly concerned by the presence of the AW139, he also knew from ATC that the AW139 was visual with him and so, even if he had not descended on the procedure's plateau, the AW139 would have passed clear above in accordance with VFR, see-and-avoid,

Class G requirements. Acknowledging that the separation may have been closer than the DHC8 pilot would have desired, the Board quickly agreed that the incident was best described as the DHC8 pilot being concerned by the proximity of the AW139. In the Board's view there was no danger of a collision: the AW139 pilot had the DHC8 (which was descending below him), in sight; and the DHC8 pilot received a TCAS RA, descended 200ft below the plateau altitude to increase vertical separation, and also had the AW139 in sight. The Board therefore concluded that normal safety standards and procedures in Class G airspace had pertained, and accordingly assessed the risk as Category E.

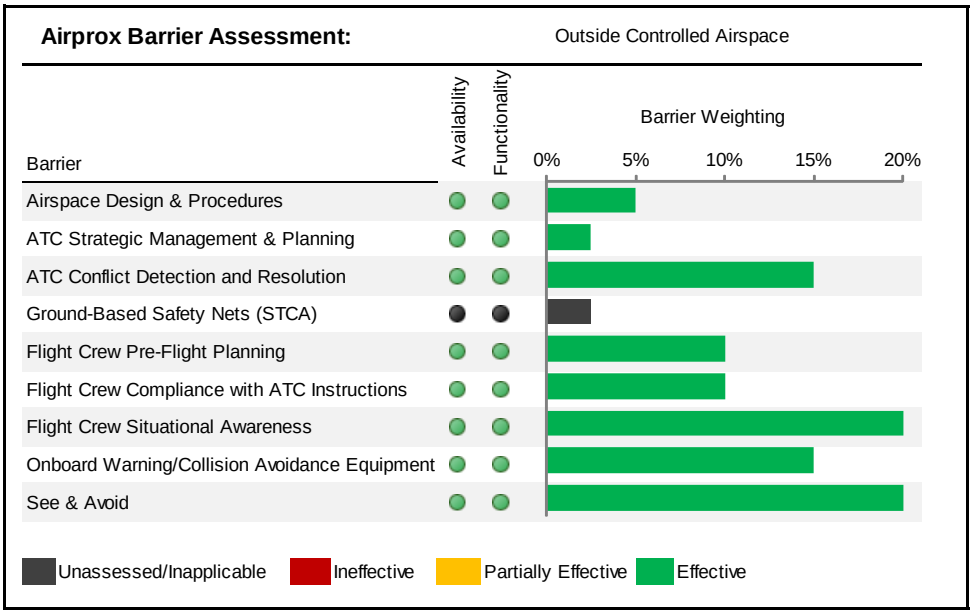
PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The DHC8 pilot was concerned by the proximity of the AW139.

Degree of Risk: E.

Barrier assessment:

Modern safety management processes employ the concept of safety barriers that prevent contributory factors or human errors from developing into accidents. Based on work by EASA, CAA, MAA and UKAB, the following table depicts the barriers associated with preventing mid-air-collisions. The length of each bar represents the barrier's weighting or importance (out of a total of 100%) for the type of airspace in which the Airprox occurred (i.e. Controlled Airspace or Uncontrolled Airspace).[4] The colour of each bar represents the Board's assessment of the effectiveness of the associated barrier in this incident (either Fully Effective, Partially Effective, Ineffective, or Unassessed/Inapplicable). The chart thus illustrates which barriers were effective and how important they were in contributing to collision avoidance in this incident.



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

Barrier Effectiveness		Consequence		
		Non-functional	Partially Functional	Functional
Availability		**1**	**2**	**3**
Completely Unavailable	**1**	1	2	3
Partially Available	**2**	2	4	6
Available	**3**	3	6	9

Key:

	Effective
	Partially Effective (If the system was partially available but fully functional score availability as 2.5)
	Ineffective
	Unassessed/Inapplicable

Barrier	Availability			Functionality			Unassessable / Absent
	Fully (3)	Partially (2)	Not Available (1)	Fully (3)	Partially (2)	Non Functional (1)	
Airspace Design and Procedures	Appropriate airspace design and/or procedures were available	Airspace design and/or procedures were lacking in some respects	Airspace design and/or procedures were not appropriate	Airspace design and procedures functioned as intended	Airspace design and/or procedures did not function as intended in some respects	Airspace design and/or procedures did not function as intended	The Board either did not have sufficient information to assess the barrier or the barrier did not apply; e.g. TCAS not fitted to either aircraft or ATC Service not utilised. Note: The Board may comment on the benefits of this barrier if it had been available
ATC Strategic Management and Planning	ATM were able to man and forward plan to fully anticipate the specific scenario	ATM were only able to man or forward plan on a generic basis	ATM were not realistically able to man for or anticipate the scenario	ATM planning and manning functioned as intended	ATM planning and manning resulted in a reduction in overall capacity (e.g. bandboxed sectors during peak times)	ATM planning and manning were not effective	
ATC Conflict Detection and Resolution	ATS had fully serviceable equipment to provide full capability	ATS had a reduction in serviceable equipment that resulted in a minor loss of capability	ATS had a reduction in serviceable equipment that resulted in a major loss of capability	The controller recognised and dealt with the confliction in a timely and effective manner	The controller recognised the conflict but only partially resolved the situation	The controller was not aware of the conflict or his actions did not resolve the situation	
Ground-Based Safety Nets (STCA)	Appropriate electronic warning systems were available	Electronic warning systems is not optimally configured (e.g. too few/many alerts)	No electronic warning systems were available	Electronic warning systems functioned as intended, including outside alerting parameters, and actions were appropriate	Electronic warning systems functioned as intended but actions were not optimal	Electronic warning systems did not function as intended or information was not acted upon	
Flight Crew Pre-Flight Planning	Appropriate pre-flight operational management and planning facilities were deemed available	Limited or rudimentary pre-flight operational management and planning facilities were deemed available	Pre-flight operational management and planning facilities were not deemed available	Pre-flight preparation and planning were deemed comprehensive and appropriate	Pre-flight preparation and/or planning were deemed lacking in some respects	Pre-flight preparation and/or planning were deemed either absent or inadequate	
Flight Crew Compliance with Instructions	Specific instructions and/or procedures pertinent to the scenario were fully available	Instructions and/or procedures pertinent to the scenario were only partially available or were generic only	Instructions and/or procedures pertinent to the scenario were not available	Flight crew complied fully with ATC instructions and procedures in a timely and effective manner	Flight crew complied later than desirable or partially with ATC instructions and/or procedures	Flight crew did not comply with ATC instructions and/or procedures	
Flight Crew Situational Awareness	Specific situational awareness from either external or onboard systems was available	Only generic situational awareness was available to the Flight Crew	No systems were present to provide the Flight Crew with situational awareness relevant to the scenario	Flight Crew had appropriate awareness of specific aircraft and/or airspace in their vicinity	Flight Crew had awareness of general aircraft and/or airspace in their vicinity	Flight Crew were unaware of aircraft and/or airspace in their vicinity	
Onboard Warning/Collision Avoidance Equipment	Both aircraft were equipped with ACAS/TAS systems that were selected and serviceable	One aircraft was equipped with ACAS/TAS that was selected and serviceable and able to detect the other aircraft	One aircraft was equipped with ACAS/TAS that was selected and serviceable but unable to detect the other aircraft (e.g. other aircraft not transponding)	Equipment functioned correctly and at least one Flight Crew acted appropriately in a timely and effective manner	ACAS/TAS alerted late/ambiguously or Flight Crew delayed acting until closer than desirable	ACAS/TAS did not alert as expected, or Flight Crew did not act appropriately or at all	
See and Avoid	Both pilots were able to see the other aircraft (e.g. both clear of cloud)	One pilots visibility was uninhibited, one pilots visibility was impaired (e.g. one in cloud one clear of cloud)	Both aircraft were unable to see the other aircraft (e.g. both in cloud)	At least one pilot takes timely action/inaction	Both pilots or one pilot sees the other late and one or both are only able to take emergency avoiding action	Neither pilot sees each other in time to take action that materially affects the outcome (i.e. the non-sighting scenario)	