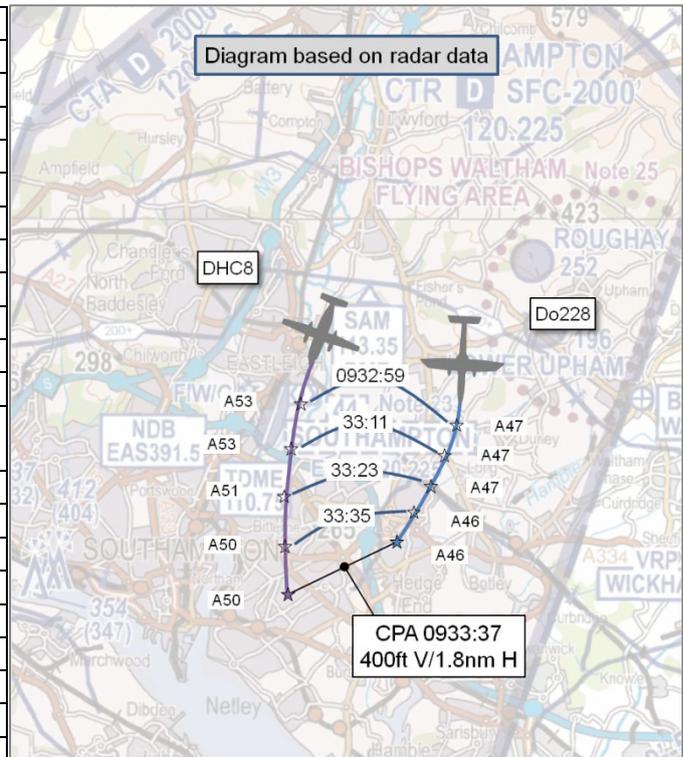


**AIRPROX REPORT No 2017032**

Date: 16 Feb 2017 Time: 0934Z Position: 5055N 00120W Location: SAM hold

**PART A: SUMMARY OF INFORMATION REPORTED TO UKAB**

Recorded	Aircraft 1	Aircraft 2
Aircraft	D228	DHC8
Operator	CAT	CAT
Airspace	Solent CTA	Solent CTA
Class	D	D
Rules	IFR	IFR
Service	Radar Control	Radar Control
Provider	Solent	Solent
Altitude/FL	4100ft	4500ft
Transponder	A,C,S	A,C,S
Reported		
Colours	Company	Company
Lighting	Strobes, beacon, nav	Nav, strobes
Conditions	VMC	VMC
Visibility	10km	>10km
Altitude/FL	4000ft	5000ft
Altimeter	QNH	QNH (1031hPa)
Heading	180°	190°
Speed	160kt	190kt
ACAS/TAS	TCAS	TCAS II
Alert	None	Information
Separation		
Reported	Not seen	400ft V/2nm H <sup>1</sup>
Recorded	400ft V/1.8nm H	



**THE DORNIER D228 PILOT** reports that after entering the hold they were initially given a radar heading, with a right-hand turn, on to 040° by Solent Radar. Shortly after commencing the turn they were then given avoiding action to turn left on to 110° and to continue descent. Once clear they were passed to Southampton Radar and continued to complete a normal approach and landing.

He assessed the risk of collision as ‘Low’.

**THE DHC8 PILOT** reports that whilst maintaining 5000ft, heading 190°, they noticed proximate TCAS traffic behind them to the left, which was maintaining 400ft below them. ATC then issued avoiding action to the pilot of this aircraft, followed by avoiding action to them. They were told ‘avoiding action turn right 360 degrees’. He disconnected the autopilot and flew a 30° banked turn to comply. The controller seemed to be dealing with some sort of emergency traffic ahead of both of them. He assessed the risk of collision as ‘none’ because they appeared to be well ahead of the other aircraft and it certainly was not catching them up on TCAS. However, he thought it was an ATR but it turned out to be a Dornier, so actually it would have been closer visually than he thought because the Dornier is smaller than an ATR, but even so the risk was ‘zero’.

He assessed the risk of collision as ‘None’.

**THE SOLENT RADAR CONTROLLER** reports that they are unsure why they issued the descent instruction to the DHC8 pilot to 5000ft. They believed that they could have prematurely crossed out 5000ft on the D228 strip. They said that they were distracted during the event by a GA pilot who was still on the Southampton Radar frequency and by another pilot who was questioning their routing.

<sup>1</sup> Estimated from TCAS display.

## Factual Background

The weather at Southampton was recorded as follows:

EGHI 160920Z 24004KT 210V270 6000 BKN004 06/06 Q1031=

MATS Part 1<sup>2</sup> states:

'Horizontal separation based on ATS surveillance system information shall not be used between aircraft holding over the same holding point.'

Additionally<sup>3</sup>:

An aircraft may be instructed to climb or descend to a level previously occupied by another aircraft provided that:

- (1) vertical separation already exists;
- (2) the vacating aircraft is proceeding to a level that will maintain vertical separation; and
- (3) either:
  - (a) the controller observes that the vacating aircraft has left the level; or
  - (b) the pilot has reported vacating the level.

Controllers shall exercise caution when instructing an aircraft to climb or descend to a previously occupied level. Consideration shall be given to the fact that aircraft may climb or descend at markedly different rates and, if necessary, additional measures such as specifying a maximum or minimum climb or descent rate for each aircraft shall be applied to ensure that the required separation is maintained. This is particularly relevant when the aircraft concerned are established in the same holding pattern.

## Analysis and Investigation

### CAA ATSI

ATSI had access to reports from the pilots of the D228 and the DHC8, the area radar recordings and Solent Radar & R/T recordings. ATSI also received a report from the controller involved and a copy of the unit investigation report. An interview with the controller was also conducted. Screenshots in the report are taken from both the area radar and Solent Radar recordings. Note that the area radar shows levels as Flight Levels (FL). All times are UTC

The pilot of the D228, inbound from the south, made first contact with Solent Radar at 0919:20 and was cleared to route direct to the SAM VOR with descent given to FL50. The controller had previously been dealing with a BE36 pilot who had attempted an approach to a private landing site to the east of Southampton. Having been unable to complete that approach, the BE36 pilot had requested to divert to Southampton. At 0924:28 the Solent Radar controller instructed the D228 pilot to route to the hold, advising them of the diversion of the BE36 and their intention to allow that aircraft to make an approach ahead of the D228.

At 0925:49 the DHC8 pilot, inbound from the north, contacted Solent Radar and was instructed to route to the hold, being advised that they were Number 3 in the approach sequence.

The Solent Radar controller having previously requested a second radar position be opened, transferred the BE36 pilot to that controller, for its approach, at 0926:08.

At 0926:50 the D228 pilot was re-cleared to descend to altitude 5000ft (note FL50 was equivalent of 5486ft on the day). The D228 pilot acknowledged this, advising that they were reducing speed to try and avoid the requirement to enter the hold (due fuel). The controller acknowledged this,

<sup>2</sup> Section 1, Chapter 3, Paragraph 10.2.

<sup>3</sup> Section 1, Chapter 3, Paragraph 5B.

advising that the BE36 ahead of them was now 11nm from touchdown, and that due to some problems with the aircraft, (the pilot of the BE36 had advised having issues with their compass), they wanted to have that aircraft land first.

At 0927:10 the pilot of a third inbound aircraft contacted the controller and was instructed to route to the hold, but to anticipate no more than one hold.

At 0928:18, the controller cancelled the D228 pilot's hold and instructed them to fly a heading of 050°.

At 0929:25 the Solent Radar controller advised the D228 pilot that the BE36 pilot was having problems with the approach and instructed the D228 pilot to again route to the hold (Figure 1).

At 0930:00 the DHC8 pilot was instructed to descend to altitude 6000ft.

At 0930:18 the pilot of an outbound aircraft contacted the controller. They were instructed to fly a heading of 200° and to climb to 4000ft.

At 0930:40 the controller rang Swanwick ATC and requested that silent handovers be cancelled, and coordinated an extended routing and further climb for the outbound to keep it clear of the hold.

At 0931:35 the controller instructed the D228 pilot to descend to 4000ft (Figure 2). [He did not report vacating 5000ft.]

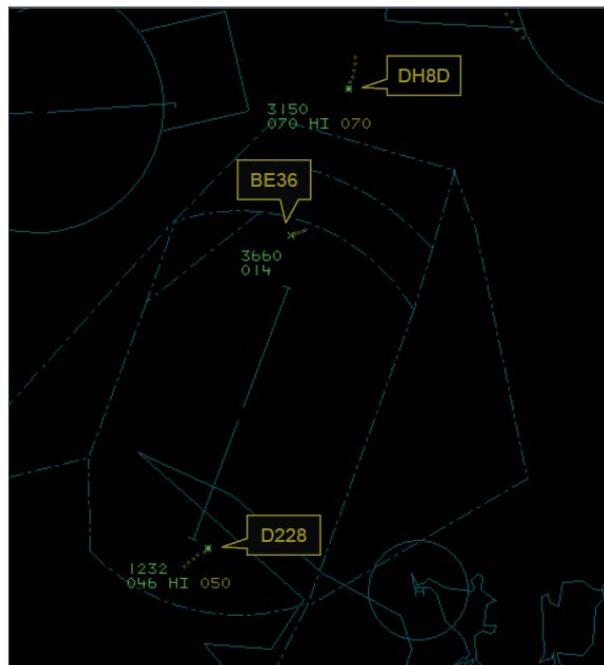


Figure 1 Swanwick MRT (levels are FL) – 0929:25.



Figure 2 Solent Radar – 0931:35.  
(callsigns obscured)



Figure 3 Solent Radar – 0931:47.

At 0931:47 the controller instructed the DHC8 pilot to descend to 5000ft (Figure 3).

At 0931:55 the third inbound aircraft's pilot was given descent, and the controller then went back to the outbound, instructing it to make a left turn on track to its next flight-planned point.

At 0932:32 standard separation between the D228 and the DHC8 was eroded, with the aircraft being 2nm apart laterally and separated by less than 1000ft, (3nm or 1000ft required) (Figure 4).

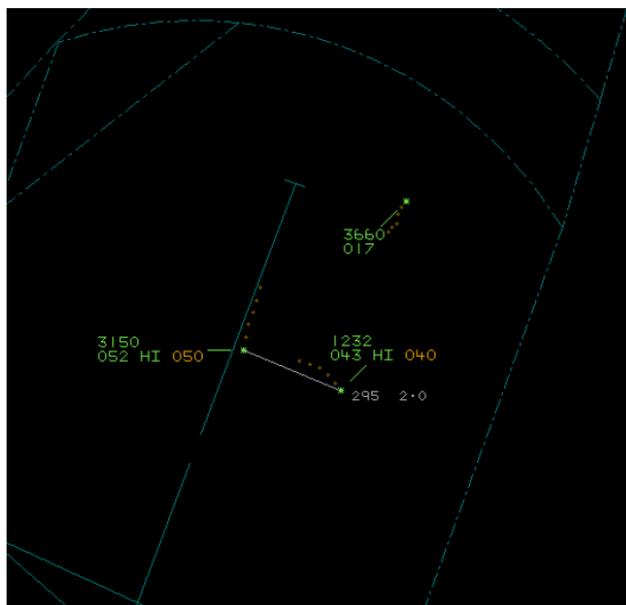


Figure 4 Swanwick MRT - 0932:32.

The controller then received a telephone call from Swanwick ATC advising them of their next two inbound aircraft, after which, at 0933:20, the controller instructed the outbound aircraft to contact the next sector.

At 0933:31 the controller cancelled the D228 pilot's hold again, instructing them to turn right onto a heading of 050° (Figures 5 & 6).



Figure 5 Solent Radar – 0933:31

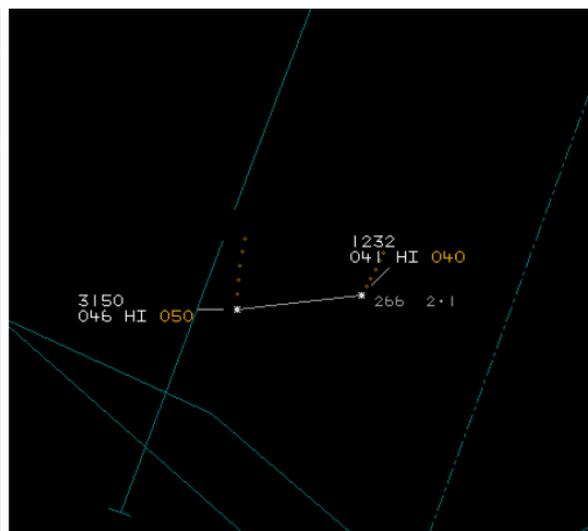


Figure 6 Swanwick MRT - 0933:31

At 0933:45 the Solent Radar display showed the controller re-orientating the labels of the D228 and DHC8 on their radar display, whilst at the same time they asked the DHC8 pilot to confirm that they were maintaining 5000ft. This coincided with CPA when the aircraft were separated by 1.8nm laterally and 400ft vertically (Figures 7 & 8).



Figure 7 Solent Radar – 0933:45.

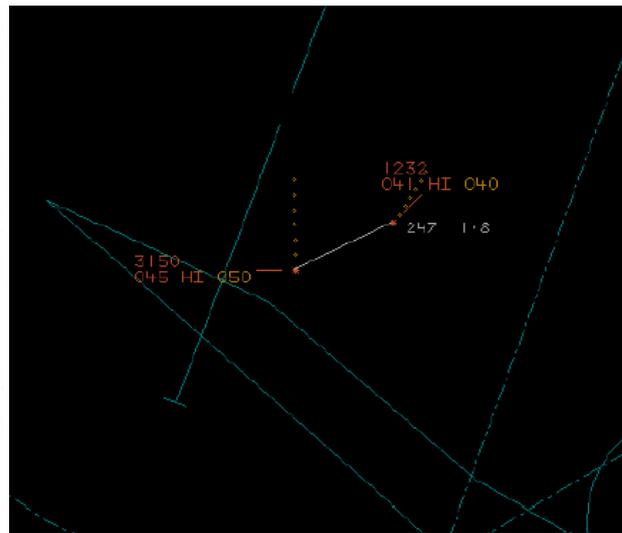


Figure 8 Swanwick MRT – 0933:45.

At 0933:50 the controller issued avoiding action to the D228 pilot followed-up by Traffic Information on the DHC8. The controller then immediately issued avoiding action to the DHC8 pilot also following this up with Traffic Information on the D228.

The Solent Radar controller had been dealing with a couple of unusual issues prior to this incident. An earlier inbound pilot had elected to return to his airfield of departure and the controller had spotted that the altitude readout was incorrect, which required extra communications with the pilot, and coordination with the next sector. The BE36 pilot, who had requested the Southampton weather, and had asked to be able to divert to Southampton, should they be unable to land at their original destination, required coordination with the Tower to arrange ground handling.

Having elected to divert to Southampton, and confirming that they could accept an IFR clearance, the pilot of the BE36 then announced that they had had problems with their compass. The controller confirmed with them that they would still be able to fly headings for an ILS.

Having transferred the BE36 pilot to their colleague, the controller then continued to monitor the progress of the BE36, in order to reduce to a minimum the delay for the subsequent inbounds. Having taken the D228 pilot out of the hold, and then following the abortive attempt by the BE36 pilot fly the ILS, the controller placed the D228 pilot back in the hold; workload could be considered to have increased significantly. The extended routing of the outbound due to the holding traffic, together with an increase in telephone calls due to the cancelling of the silent handover of aircraft, which gave the controller some measure of control for subsequent inbounds with aircraft now holding, ultimately contributed to this increase in workload. The distraction of the extended routing of the outbound further contributed to the delay in the controller recognising the loss of separation between the D228 and the DHC8.

The loss of separation occurred some 37 seconds after having cleared the DHC8 pilot to descend above the D228. At interview, the controller admitted that they still have no idea why descent instructions were issued to the DHC8 pilot before vertical separation had been assured against the D228. They thought that they might have crossed out the level being vacated by the D228 (5000ft) on their corresponding flight progress strip (uncorroborated), leading to the controller incorrectly believing that the level was now available for the DHC8. The controller did not refer to the radar screen to ascertain the levels, and it was noted that the label of the DHC8 was garbling with that of the BE36 at the time.

ATSI noted a disparity in the rates of descent of the D228 and the DHC8 (the DHC8 being much higher). The D228 pilot had only descended 400ft in the 2 minutes 10 seconds following the original descent clearance to 4000ft. The controller was asked if the display of the D228's level as an altitude and that of the DHC8's as a Flight Level had been a factor, but this was denied.

In general terms when aircraft that are being monitored on radar enter a hold, the radar blips and/or data-blocks start to merge/garble and, on occasions, the identity of the aircraft can be lost. Separation is then monitored and maintained procedurally by reference to the flight progress strips. The subsequent loss of standard separation at 0932:32 between the D228 and DHC8 went unnoticed by the controller until, at 0933:45, they re-orientated the SSR labels.

ATSI noted that on the Swanwick MRT their STCA was activated at 0933:30, changing to red [high] at 0933:38. The Swanwick STCA continued until it returned to white [low] at 0934:10 and then cancelled at 0934:19. A total period of 49 seconds. The Southampton STCA was not activated. In the unit investigation report, the lack of STCA was investigated, and the following response from the engineering department was obtained:

*'The STCA Loss of separation parameters are:*

*Distance = 2NM*

*Height = 700 feet. If both aircraft are within these parameter distances and NOT diverging then an alert is created.*

*The 'NOT diverging' parameter is usually on, but we can make it fixed so the alert always happens in this case, but the number of nuisance alerts goes up. If both aircraft are predicted to be within this distance in 45 seconds, a stage 1 (amber) alert is generated. If both aircraft are predicted to be within this distance in 30 seconds, a stage 2 (red) alert is generated.'*

The engineering explanation for why the STCA was not activated was:

*'>2NM. In this case both aircraft are on a diverging-parallel-shallow converging trajectory. When they are parallel at ~2.28NM separation the (DH8D) flight is in fact overtaking the slower (D228) flight.'*

*<2NM. At this point although we are now inside the parameters both distance and height the trail dots clearly show the (DH8D) is about a 1/3 faster than the other flight. So the tracks are in fact actually diverging.'*

ATSI are unsure as to how effective STCA can be considered to be at Southampton if standard separation is allowed to reduce by 1nm and/or 300ft before alerting the controller.

The pilot of the D228 did not report receiving a TCAS alert. The pilot of the DHC8 reported: "we noticed proximate TCAS traffic behind us and to the left and maintaining 400ft below us". They also assessed that; "we appeared to be well ahead of the other aircraft and he certainly was not catching us up on TCAS".

ATSI noted that the avoiding actions issued by the controller were both succinct and effective, and exactly in accordance with CAP413; furthermore, the response of the pilots appeared to be immediate and without question.

Although the vertical separation reduced to 400ft, the aircraft ran parallel at a lateral distance of 2.1nm for a sustained period of time. Lateral separation started to reduce further when the DHC8 pilot commenced the procedural turn to join the hold, but by this time was pulling ahead of the D228. (Note: the DHC8 pilot would ultimately have then made a right turn back towards the SAM VOR).

It is considered likely that the Solent Radar controller had become distracted by the number of unusual tasks being created as a result of the weather diversion into and ultimately out of Southampton by the BE36 pilot.

ATSI recommended that Southampton ATC undertakes a review of their STCA parameters.

## UKAB Secretariat

The D228 and DHC8 pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard<sup>4</sup>, notwithstanding that, in Class D airspace, ATC were required to separate the aircraft operating under IFR.

## Occurrence Investigation

The D228 pilot was cleared to descend to 4000ft at 0931:35. He vacated FL45 (5000ft altitude) at 0932:04. One minute later, at 0933:04, the aircraft was descending through FL42. At 0934:04 it was passing FL40.

The UK AIP<sup>5</sup> states:

'In order to ensure that controllers can accurately predict flight profiles to maintain standard vertical separation between aircraft, pilots of aircraft commencing a climb or descent in accordance with an ATC Clearance should inform the controller if they anticipate that their rate of climb or descent during the level change will be less than 500 ft per minute, or if at any time during such a climb or descent their vertical speed is, in fact, less than 500 ft per minute. This requirement applies to both the en-route phase of flight and to terminal holding **above Transition Altitude.**'

The D228 was holding below the Transition Altitude and so the requirement to notify a rate of descent less than 500fpm was not applicable.

## Summary

An Airprox was reported when a D228 and a DHC8 flew into proximity at 0934 on Thursday 16<sup>th</sup> February 2017. Both pilots were operating under IFR in VMC, in receipt of a Radar Control Service from Solent Radar. The Solent Radar controller cleared the DHC8 pilot to descend to 5000ft before the D228 had formally vacated the altitude. CPA was 400ft vertical and 1.8nm horizontal.

## **PART B: SUMMARY OF THE BOARD'S DISCUSSIONS**

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

The Board first noted that the Airprox occurred within Class D airspace of the Solent CTA and that both pilots were operating IFR flights under VMC in receipt of a Radar Control Service from Solent Radar. Both the D228 and the DHC8 were inbound to Southampton and were instructed to enter the hold at SAM. Initially, the D228 pilot had been issued with a radar heading to leave the hold but, subsequently, he had been placed back in the hold because there was a pilot of a BE36 ahead of him who was experiencing problems with carrying out the ILS procedure because of an unserviceability in the aircraft.

The D228 pilot was holding at 5000ft and the DHC8 pilot was cleared to descend to 6000ft. The D228 pilot was subsequently instructed to descend to 4000ft in the hold. However, the pilot did not report leaving 5000ft and the controller did not question whether he had left this altitude. Without receiving a vacating call by the D228 pilot, in accordance with the MATS Part 1, the only way that the controller could descend the DHC8 pilot and maintain separation was to wait until he had seen the D228's Mode C pass 4600ft in the descent (400ft below its vacating level). However, approximately 12 seconds after clearing the D228 pilot to descend the controller cleared the DHC8 pilot to descend to 5000ft, although it was still formally occupied by the D228. The Board was advised that the controller had incorrectly crossed through the 5000ft level on the D228's flight progress strip, indicating to him that the D228 had left 5000ft and that he could now use that altitude for the DHC8. It has not been possible to determine why he had made this error, although he did report that he may have been

<sup>4</sup> SERA.3205 Proximity.

<sup>5</sup> ENR1.1-14, Paragraph 3.2.2.4.1.

distracted by the problems concerning the BE36 and another pilot questioning his routing. He did not notice the situation until about 2 minutes after clearing the DHC8 pilot to descend to 5000ft. It was only after re-orienting the SSR labels of the two aircraft that he realised that separation was lost and he issued avoiding action and Traffic Information to both pilots at about the time of CPA.

The Board wondered why the Southampton STCA did not warn the controller of the loss of separation. The NATS advisor explained the parameters that are set up in the STCA, which he confirmed were the same for all NATS airports. He commented that there are two circumstances to trigger an alert. When two targets are predicted to come within 2nm/700ft within the parameter times (45sec or 30sec), or two aircraft are already within 2nm/700ft and their trajectories are not diverging. He added that the STCA is a conflict detection tool. The system is designed to alert when the aircraft separation is predicted to drop below the parameter, not when a loss of nominal separation occurs. On this occasion, as mentioned, STCA normally triggers well before the aircraft come inside 2nm/700ft, based on their trajectories and the predicted time before they reach 2nm/700ft apart. This would routinely be a stage 1 amber alarm 45sec prior to getting to 2nm/700ft apart, followed by a stage 2 red alert at 30sec. In his opinion there was clearly something unusual about the trajectories of the aircraft that meant that they avoided triggering the alert. The Board noted that ATSI had recommended that Southampton ATC undertake a review of their STCA parameters. The Board agreed that this should be undertaken, to hopefully provide information as to why the STCA did not trigger on this occasion. The fact that the STCA did not trigger was considered to be a contributory factor to the Airprox.

The Board noted that the D228 pilot descended at a shallow rate of descent, at about 200 fpm, which was less than might have been expected. Normally, pilots would descend at not less than 500fpm, but the UK AIP states that this is not a requirement when carrying out a terminal hold below the Transition Altitude. However, Board members opined that the fact that the D228 pilot descended at a much shallower than expected rate of descent without informing ATC, was another contributory factor. Airline members wondered why the D228 pilot had descended at such a low rate. He had previously stated that he had reduced speed to save fuel and possibly, they thought, this could explain why he was trying to stay as high as possible. In their opinion this would not have provided much fuel saving. Members also queried the D228 pilot's situational awareness; both pilots having been on the same frequency when the DHC8 pilot was cleared to descend to an altitude he had not yet vacated.

The Board then turned its attention to the cause and risk of the Airprox. It was quickly and unanimously agreed that the Airprox had occurred because the Solent Radar controller had cleared the DHC8 pilot to descend without confirming that the D228 pilot had left 5000ft. As to the risk, although it is not an ideal situation for pilots in controlled airspace to be given avoiding action turns, the Board decided that in view of the CPA of 400ft vertically and 1.8nm horizontally, and with the DHC8 pilot monitoring the position of the D228 on TCAS, there had been no risk of a collision. Accordingly, the Airprox was assessed as risk Category C.

### **PART C: ASSESSMENT OF CAUSE, RISK AND SAFETY BARRIERS**

<u>Cause:</u>	The Solent Radar controller cleared the DHC8 pilot to descend without confirming that the D228 pilot had left 5000ft.
<u>Contributory Factor:</u>	1) The D228 pilot descended at a much shallower than expected rate of descent without informing ATC. 2) The Southampton STCA did not trigger.
<u>Degree of Risk:</u>	C.

## Safety Barrier Assessment<sup>6</sup>

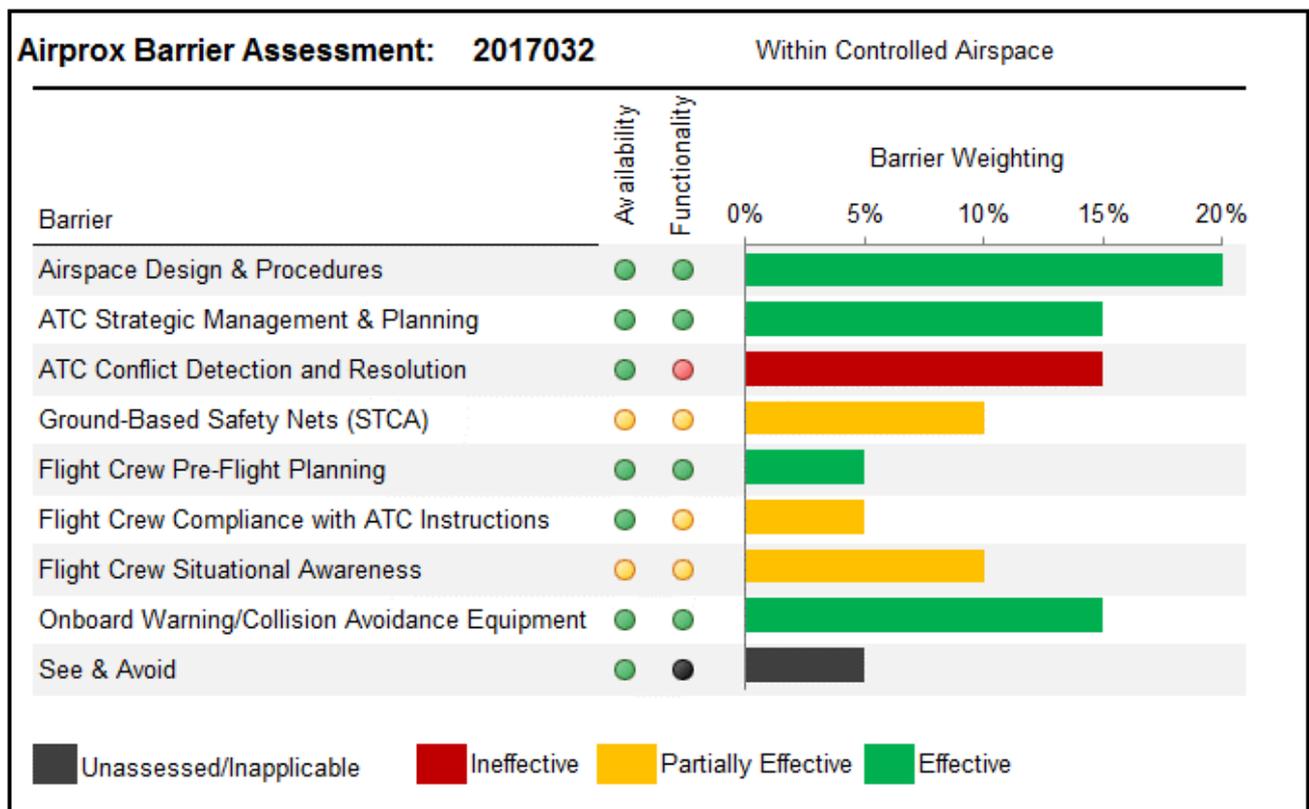
In assessing the effectiveness of the safety barriers associated with this incident, the Board concluded that the key factors had been that:

**ATC Conflict Detection and Resolution** was assessed as **ineffective** because the Solent controller believed incorrectly that the D228 pilot had vacated 5000ft on descent to his cleared altitude of 4000ft. He then cleared the DHC8 pilot to descend to 5000ft without realising that the altitude was still occupied.

**Ground-Based Safety Net (STCA)** was assessed as **partially available** and **partially effective**. Although STCA had functioned as intended, the parameters applied by Southampton resulted in it not showing the loss of separation.

**Flight crew compliance with ATC instructions** was assessed as **partially effective** because the D228 pilot selected an unusually low rate of descent when cleared to descend by ATC.

**Flight Crew Situational Awareness** was assessed as **partially effective** because only the DHC8 pilot was aware of the presence of the D228, having observed it on his TCAS display. Although both pilots were on the same frequency in the SAM holding pattern, the D228 pilot did not detect that the DHC8 pilot had been descended to his altitude.



<sup>6</sup> The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the [UKAB Website](#).