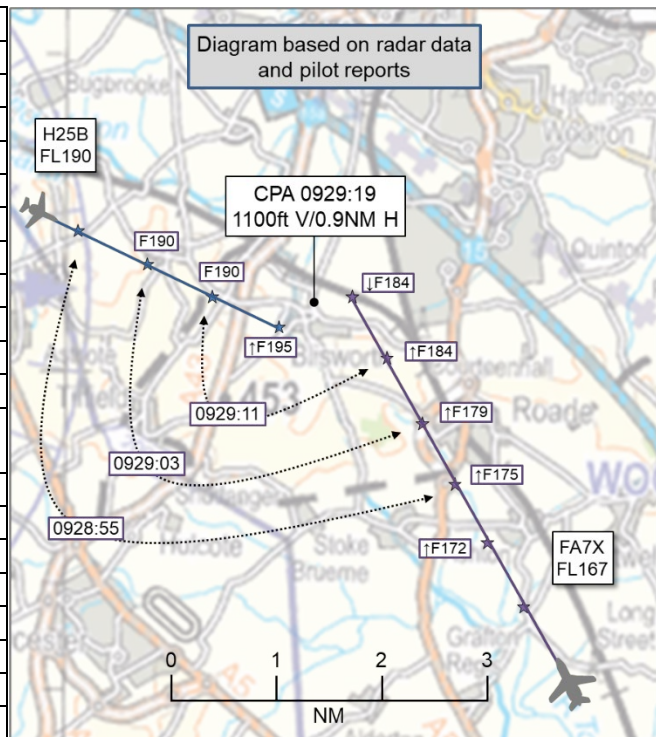


AIRPROX REPORT No 2023105

Date: 18 May 2023 Time: 0929Z Position: 5210N 00057W Location: 7NM E of Daventry VOR/DME

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Hawker H25B	Dassault FA7X
Operator	Civ Comm	Civ Comm
Airspace	Daventry CTA	Daventry CTA
Class	A	A
Rules	IFR	IFR
Service	Radar Control	Radar Control
Provider	Swanwick centre	Swanwick centre
Altitude/FL	FL195	FL184
Transponder	A, C, S+	A, C, S+
Reported		
Colours	NR	White
Lighting	NR	Nav, Strobe, Beacon
Conditions	NR	VMC
Visibility	NR	>10km
Altitude/FL	NR	FL180
Altimeter	NR	1013hPa
Heading	NR	NK
Speed	NR	300kt
ACAS/TAS	NR	TCAS II
Alert	NR	RA
Separation at CPA		
Reported	NR	>1000ft V/2.5NM H
Recorded	1100ft V/0.9NM H	



THE NATS CONTROLLER reports that the FA7X had been a London Terminal Manoeuvring Area outbound aircraft heading north. The H25B had been inbound to [destination airfield] via COWLY/WELIN/DAGGA. Both aircraft were on headings. The H25B had been at FL190; the FA7X had been climbed to FL180 underneath. As the FA7X passed approximately FL173 the white STCA alert went off and the controller warned the pilot to maintain FL180 on reaching as there had been traffic 1000ft above their cleared level; no response had been received. Shortly afterwards the controller warned the pilot again and they responded by saying 'TCAS RA'. The controller acknowledged that call.

The controller assumed that the TCAS RA would cause the FA7X to turn away from the H25B but it continued to climb past FL180 and did not look like it had been turning so they issued avoiding action to both aircraft. They turned the FA7X right onto a heading of 025° and the H25B right onto a heading of 185°. Shortly afterwards, [the pilots of] both aircraft reported that they were clear of conflict.

THE H25B PILOT - Despite significant efforts by UKAB Secretariat and wider contacts, it has not been possible to establish contact with the H25B pilot.

THE FA7X PILOT reports that the TCAS advised them to level off. To do so, the green range of the TCAS advisory in the PFD showed initially approximately -10° pitch-down. As the aircraft had been in a 3° to 4° pitch-up attitude, they were surprised when looking at the PFD, because of the big difference between aircraft [pitch] and requested pitch. Normally during training sessions in a simulator they only have to perform small adjustments, so the picture looked very strange to them. They followed a controller instruction to turn immediately to the right with a bank of 43°.

The pilot assessed the risk of collision as 'Medium'.

Factual Background

The weather at Birmingham was recorded as follows:

METAR EGBB 180920Z VRB03KT CAVOK 17/06 Q1028=

Analysis and Investigation

UKAB Secretariat

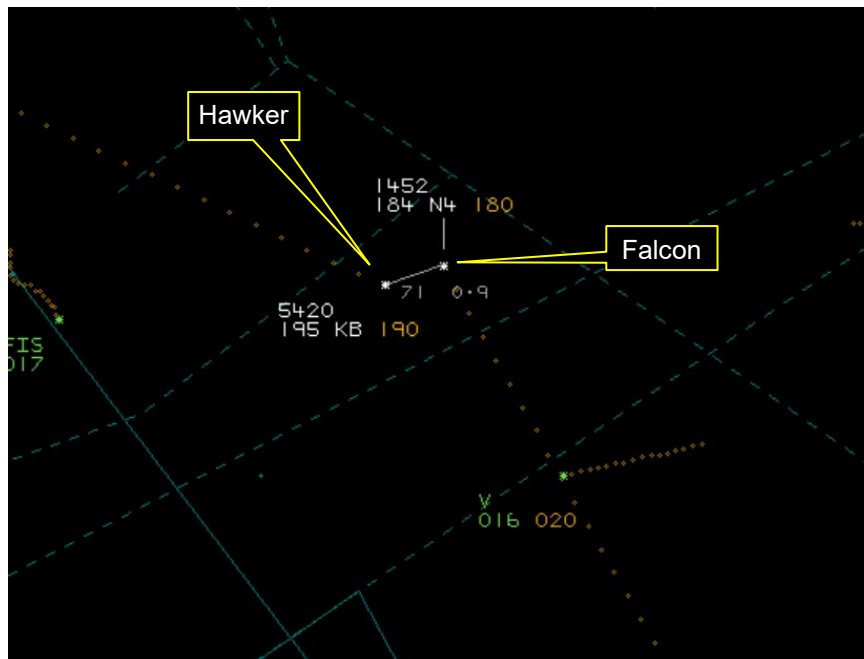


Figure 1 CPA (in absolute terms) 900ft V/0.9NM H (slant range of ~5578ft) at 0929:19

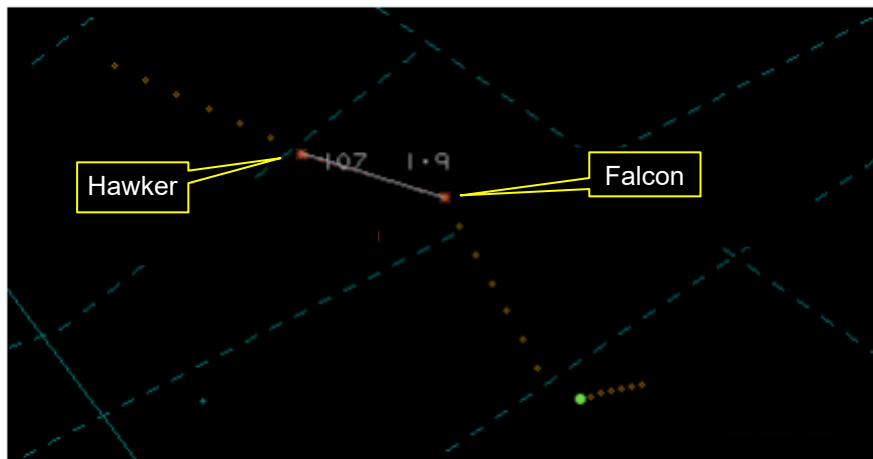


Figure 2 CPA (in vertical proximity terms) 500ft V/1.9NM H (slant range of ~11,555ft) at 0929:09

Radar interpretation had been carried out both by UKAB Secretariat and NATS; Figure 1 above shows the CPA in its most immediate sense – the closest 3-plane position that these two aircraft came together in this event – 0.9NM and 900ft. Figure 2 shows NATS’ calculation of the closest these two aircraft came in the vertical plane – 500ft at 1.9NM, 10sec earlier.

The H25B and FA7X pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard.¹ If the incident geometry is considered as head-on or nearly so then both pilots were required to turn to the right.² If the incident geometry is considered as converging then the H25B pilot was required to give way to the FA7X.³

Occurrence Investigation

NATS

Summary of the event:

The pilot of the FA7X, from [departure airfield] to [destination airfield], reported onto the TC WELIN frequency at 0925:40 in the climb to FL120 heading 335°. The TC WELIN controller cleared the FA7X to climb to FL180. The H25B, from [departure airfield] to [destination airfield], had been maintaining FL190, heading 135°. The pilot reported onto the TC WELIN frequency at 0925:53. The pilot was subsequently instructed by the TC WELIN controller to turn left heading 120°.

At 0927:51, the pilot of the H25B had been instructed to turn further left heading 110°. A low-level Short Term Conflict Alert (STCA) activated between the FA7X and the H25B at 0928:27 as the FA7X had been passing FL161, with a rate of climb of 2800ft/min. At 0928:36, as the FA7X passed FL165, with a rate of climb of 2900ft/min, the TC WELIN controller instructed the pilot, "Maintain Flight Level One Eight Zero on reaching, there's traffic a thousand feet above your cleared level." There had been no response to this initial instruction and, at 0928:48, the TC WELIN controller repeated the instruction. At the commencement of this transmission, the FA7X had been passing FL173 in the climb, indicating a rate of climb of 3800ft/min. The pilot responded, "We have traffic, traffic RA, TCAS RA." A TCAS 'Climb' command could be heard in the background of this transmission. The controller responded, "Roger". The next transmission, at 0929:01 had been from the pilot of the H25B, reporting, "we have climbing".

Coincident with separation minima being eroded, at 0929:05 the TC WELIN controller instructed the pilot of the FA7X, "Avoiding Action, turn right immediately heading zero two five." This had been read back by the pilot of the FA7X.

At 0929:13, the controller instructed the pilot of the H25B, "Avoiding Action, turn right immediately heading one eight zero degrees". The pilot read back this instruction, and in the background a TCAS 'Level Off' instruction had been audible. The FA7X climbed to a maximum of an indicated FL186 at 0929:13. At this time, the H25B indicated FL193 with a rate of climb of 3000ft/min. On the subsequent radar update, at 0929:17, the FA7X indicated FL184, now in the descent, with the H25B indicating FL197 with an associated rate of climb of 5000ft/min. As such, separation minima were restored at this time. The H25B reached a maximum of FL206 in the climb. Following the event, the pilot of the H25B had been transferred to the next frequency. [...]. Upon reflection of the event and the potential severity, the TC WELIN controller 'upgraded' their initial report to an Airprox and the UK Airprox Board (UKAB) had been informed.

Investigation:

Climb profiles – The FA7X initially climbed towards FL180 with a rate of climb averaging around 3000ft/min. Passing FL165, the aircraft indicated a rate of climb of 2900ft/min.

The UK AIP, ENR 1.1, 3.2.2.3 stated that '*It is considered that, with about 1500ft to go to a cleared level, vertical speed should be reduced to a maximum of 1500ft/min and ideally to between 1000ft/min and 500ft/min.*'

¹ (UK) SERA.3205 Proximity..

² (UK) SERA.3210 Right-of-way (c)(1) Approaching head-on.

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

Although it had been recognised that this vertical speed reduction is not mandated, NATS Safety Investigations contacted [the operator] of the FA7X, regarding the climb rate.

The response received had been that, *'our SOPs state, that a callout should be done 2000ft prior to reaching the cleared flight level. This is the reminder for the PF to change from CLIMB mode to V/S mode (if they haven't done that before) and – same as written in the UK AIP – includes a reduction to a vertical speed of 1500ft/min. As the Falcon 7X is a very powerful aircraft, especially with only a small amount of fuel on board, in several cases at this 2000ft point the autopilot had already changed into ASEL (Altitude Select) mode. Once this change has occurred automatically it [is] quite impossible to change back to V/S mode and reduce the rate. That's the reason, why we are discussing about a change of this "reminder call" to 3000ft prior [to] reaching the cleared level. Even with high climb rates, the earlier call would make it possible to change to V/S mode and reduce the rate to 1500ft/min.'*

The rate of climb increased to 3300ft/min passing FL170, then 3800ft/min passing FL173. An initial reduction in the rate of climb had been observed passing FL177 as the rate of climb reduced to 1800ft/min, at 0928:57; this had been after the pilot of the FA7X reported a TCAS RA. However, the aircraft proceeded to then increase the rate of climb again and passed through the cleared FL180, indicating 3800ft/min at FL185. The pilot of the H25B reported a TCAS RA when in level flight at FL190, the aircraft had then been observed to climb rapidly, indicating a rate of climb of 5000ft/min passing FL197, and reaching a maximum of 5300ft/min passing FL200.

FA7X actions: Upon receipt of the corrective 'Limit Climb' instruction, radar data indicated that the FA7X did initially commence to level off at FL177, however then acted contrary to TCAS and increased the rate of climb. Safety Investigations requested information from the airline relating to this action. [The operator of the FA7X] should be commended for the open nature and [comprehensive] detail they provided in several discussions with NATS Safety Investigations, including downlink of the Flight Data Monitoring system from the aircraft.

[Reference to FA7X Safety report below].

H25B actions: Following receipt of a TCAS climb, the H25B pilot increased the rate of climb significantly, reaching 5300ft/min. This rate of climb mitigated the scenario and resolved the confliction quickly. Following the event, the pilot reported that they had a TCAS RA and that, "all passengers are a little bit scared." As a result, the pilot requested a short cut to land as soon as possible.

NATS Safety Investigations was unable to contact the pilot of the H25B for further information relating to this event.

Controller perceptions and actions: An interview had been conducted by NATS Safety Investigations with the controller related to this event who had validated on the sector nine months previously. The controller stated that the H25B had been following the standard route towards [destination airfield], and the FA7X had been climbed to FL180 beneath the H25B. No headings were available to take the FA7X away from the H25B due to other traffic within the sector at the time of the event. The Mode S Selected Flight Level indicated FL180 throughout. In response to the activation of the STCA, the controller reminded the pilot of the FA7X to stop climb at the previously cleared FL180. There had been no response and the controller recalled observing a high rate of climb approaching FL180. A further reminder had been issued, together with Traffic Information, to which the pilot of the FA7X reported a TCAS RA.

The controller recalled acknowledging the TCAS RA, and then perceived that, "everything seemed to have happened really quickly." The recollection of the controller had been that the aircraft were "not going to hit each other " but, observing the trajectories, especially that of the FA7X, recognised that "something [had not been] right." The controller assessed that TCAS had not been resolving the situation and decided to take positive action and issued lateral avoiding action. They explained that they were "very aware of the guidance" that controllers should not interject with TCAS manoeuvres, however, they applied their judgement and could see that the situation had not been

resolving itself. Following receipt of the TCAS reports from the pilots, the controller issued avoiding action in the lateral plane to both pilots.

MATS Part 1, Section 1, Chapter 1 referred to the Standardised European Rules of the Air (SERA) and states:

5.2	When a pilot reports a TCAS RA, controllers shall not attempt to modify the aircraft's flight path or reiterate previously issued instructions, until the pilot reports "Clear of Conflict". (SERA.11014(c))
5.3	Once an aircraft departs from an ATC clearance in compliance with an RA, or a pilot reports an RA, the controller ceases to be responsible for providing separation between that aircraft and any other aircraft affected as a direct consequence of the manoeuvre induced by the RA. The controller shall resume responsibility for providing separation for all the aircraft affected when: <ol style="list-style-type: none"> (1) The controller acknowledges a report from the flight crew that the aircraft has resumed the current clearance; or (2) The controller acknowledges a report from the flight crew that the aircraft is resuming the current clearance and issues an alternative clearance which is acknowledged by the flight crew. (SERA.11014(d))

However, MATS Part 1, Section 1, Chapter 1 also states:

1.1	Air Traffic Services within the UK are provided in accordance with the Air Navigation Order, Rules of the Air Regulations and Standardised European Rules of the Air. Generally, these are in line with the Standards and Recommended Practices of the International Civil Aviation Organisation.
1.2	The Manual of Air Traffic Services contains instructions and guidance for controllers providing Air Traffic Services to cater for both routine and many emergency situations. However, nothing in this manual prevents controllers from using their own discretion and initiative in response to unusual circumstances, which may not be covered by the procedures herein.

The controller reported at interview that upon recognising that TCAS had not been resolving the situation, they decided that turning the aircraft in the lateral plane had been "the right way to solve it." Safety Investigations ascertained that some other controllers would have taken the same action, whilst others would not have intervened. The [MOR form] submitted by the controller stated, 'I assumed that the TCAS RA would cause the FA7X pilot to turn away from the H25B, but it continued to climb past FL180 and did not look like it had been turning'. A conversation with watch management indicated that the controller had been aware of the correct TCAS actions and that action had only been generated in the vertical plane, however, 'in the heat of the moment' when writing the report the controller wrote incorrect information. Watch questions the following day indicated a correct understanding of the activation of TCAS, and this had been backed up at interview where they demonstrated good knowledge of how TCAS works and how the data is displayed to flight crews.

During training, the controller noted that the activation of TCAS and how to deal with a TCAS event had been spoken about many times, and videos had been viewed on safety days. They noted that as a controller they had never seen a live TCAS event and it had also been noted that they had never seen a TCAS event simulated during training. As such, at the time of the interview the controller noted that they were unsure whether or not they had over-reacted to the scenario.

Causal factors:

The FA7X climbed in excess of the recommended 1500ft/min with 1500ft to go, as defined in the UK AIP.

A TCAS RA had been generated for the pilots of the FA7X and the H25B.

The pilot of the FA7X acted contrary to the TCAS instruction and climbed further into conflict with the H25B, through the cleared FL180.

The controller recognised that TCAS had not been resolving the conflict as expected and issued avoiding action to the pilots in the lateral plane.

The H25B climbed at a high rate in response to TCAS, which resolved the conflict expeditiously.

FA7X OPERATOR

The Safety Management Team used information given by the crew and by analysis of the available Flight Data Monitoring program. The crew used CLIMB mode, which is the normal mode according to the AFM of Falcon 7X. They missed the change of this mode to V/S mode at the point 2000ft prior to the cleared level. As the climb rate had been nearly 3800ft/min the autopilot initiated the level-off by "itself". For this – according to the logic of the autoflight system – the mode changed to ASEL (Altitude Select) 1500ft prior to reaching the pre-selected flight level. Consequently, the V/S had been reduced firmly by the autopilot. When passing FL174 the TCAS RA occurred. At this time the V/S had still been 2500ft/min with a decreasing tendency (without any influence of the crew, the aircraft would have levelled off at FL180). As a TCAS RA requires immediate action by the crew, the autopilot had been disengaged by the Pilot Flying.

The TCAS advised the crew to level-off. To do so, the green range of the TCAS advisory in the PFD showed initially approximately -10° pitch down. As the aircraft had been in a 3°-4° pitch up attitude, the PF had been startled when looking at the PFD, because of the big difference between aircraft and requested pitch. Normally during training sessions in a simulator [this scenario requires] only small adjustments, so the picture looked very strange to the PF. For a reason the pilot could not explain, this caused them to [briefly] pull the sidestick instead of pushing it. This [brief] pull resulted in an increased climb rate to 3500ft/min again and the climb continued up to FL185. In parallel, the pilot asked the PNF for a visual check of the other aircraft. Due to this command, the PNF focused on looking outside, instead of checking instruments and the PFD.

[Additional circumstances to consider]: A review of the timeline of the day, the crew had been in a slightly uncomfortable position as the day had started with a minor technical problem at the aircraft's homebase, causing a delay of around 20 minutes. At [the departure airfield for this flight] the departure had been delayed by 81 minutes due to an ATC slot. With a passenger "requesting" an on time arrival at [destination airfield], the crew used a higher climb speed of 300 KIAS instead of 260 KIAS. The crew was focusing on saving time.

Recommendations:

Pay more attention on flying the aircraft instead of thinking about surrounding circumstances.

Especially during climb (and descent) the flight modes should be checked more often.

A change from CLIMB mode to V/S mode should be performed at the latest around 3000ft prior to reaching the cleared level.

Consequences and mitigations:

Flight operations – The OM-B [currently] describes a call-out of '2000ft to go' prior to reaching the assigned level; this should be changed to '3000ft to go' to give earlier reaction during high climb/descent rates.

Contact the manufacturer to clarify Aircraft Flight Manual and EASA SIB 92013-11R1 differences.

Training – Contact simulator training provider to establish training scenarios that are more realistic than those used to date [...].

Safety Management – Publish this occurrence in the internal safety bulletin 'Share the experience' to inform all cockpit crew about this case.

Summary

An Airprox was reported when a H25B and a FA7X flew into proximity 7NM east of DTY VOR/DME at 0929Z on Thursday 18th May 2023. Both pilots were operating under IFR in VMC and in receipt of a Radar Control Service from Swanwick.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from the FA7X pilot, radar photographs/video recordings, reports from the air traffic controller involved and reports from the appropriate operating authorities. Relevant contributory factors mentioned during the Board's discussions are highlighted within the text in bold, with the numbers referring to the Contributory Factors table displayed in Part C.

The Board firstly discussed the actions of the H25B pilot. Although it had not been possible to draw additional information from the pilot or the aircraft operator, the members noted that the pilot had followed their air traffic instructions correctly up to the point of the TCAS RA alert received (**CF7**), and the late instruction from the Radar controller to turn for avoidance action as well as the TCAS instruction itself. Members felt that the H25B pilot had done all they had been required to do in the situation.

Members then considered the actions of the FA7X pilot, noting their apparent lack of familiarity with this type of scenario in their previous simulator work. They considered the pilot's concern regarding the significant and unusual direction from the TCAS (**CF7**), triggered in part by the climb performance of the aircraft in this case, and agreed that the pilot's potential to challenge that instruction had led to a lack of conflict assimilation by the pilot (**CF6**) and misinterpretation of the warning given (**CF8**). Members noted that, although the pilot had inadvertently applied correction momentarily in the wrong sense and could have performed other actions to control the situation, their view had been that the pilot should have followed the TCAS instruction as directed by (UK) SERA.11014(b) and their company policy (**CF3**, **CF4**, **CF5**).

Board members then discussed the actions of the Radar controller, noting the apparent lack of familiarisation with live and simulated TCAS events having led to a sub-optimal opportunity for learned behaviour. They noted the STCA alert received (**CF2**) and opined that, in this case, the controller had made the best judgement (in accordance with MATS Pt 1, Chapter 1, paragraph 1.2) in the circumstances they faced and the call to both aircraft to introduce lateral separation (in contravention of MATS Pt 1, Section 1, Chapter 1, paragraph 5.2) had not materially reduced the separation between the two aircraft (**CF1**). Members did note the controller had twice reminded the FA7X pilot to level-off at the instructed altitude.

Members noted the subsequent corrective action initiated by the FA7X operator for all of its crews as a result of this incident and that, in recognition of this event and the contributions made by the Radar controller, were heartened to hear that this scenario will be used to brief all NATS controllers at their next safety training day.

When assessing the risk, members considered the reports from the FA7X pilot, Radar controller, the radar replays available and the NATS investigation report. They noted that the separation between the two aircraft had been reduced and that safety had been degraded but that the circumstances, actions and information available had been sufficient to prevent the aircraft from coming into close proximity and that, therefore, no risk of collision had remained. Accordingly, the Board assigned a Risk Category C to this Airprox.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK**Contributory Factors:**

2023105				
CF	Factor	Description	ECCAIRS Amplification	UKAB Amplification
Ground Elements				
• Regulations, Processes, Procedures and Compliance				
1	Human Factors	• ATM Regulatory Deviation	An event involving a deviation from an Air Traffic Management Regulation.	Regulations and/or procedures not fully complied with
• Electronic Warning System Operation and Compliance				
2	Technical	• STCA Warning	An event involving the triggering of a Short Term Conflict Alert (STCA) Warning	
Flight Elements				
• Regulations, Processes, Procedures and Compliance				
3	Human Factors	• Use of policy/Procedures	Events involving the use of the relevant policy or procedures by flight crew	Regulations and/or procedures not complied with
• Tactical Planning and Execution				
4	Human Factors	• Action Performed Incorrectly	Events involving flight crew performing the selected action incorrectly	Incorrect or ineffective execution
5	Human Factors	• Insufficient Decision/Plan	Events involving flight crew not making a sufficiently detailed decision or plan to meet the needs of the situation	Inadequate plan adaption
• Situational Awareness of the Conflicting Aircraft and Action				
6	Human Factors	• Understanding/Comprehension	Events involving flight crew that did not understand or comprehend a situation or instruction	Pilot did not assimilate conflict information
• Electronic Warning System Operation and Compliance				
7	Contextual	• ACAS/TCAS RA	An event involving a genuine airborne collision avoidance system/traffic alert and collision avoidance system resolution advisory warning triggered	
8	Human Factors	• Response to Warning System	An event involving the incorrect response of flight crew following the operation of an aircraft warning system	CWS misinterpreted, not optimally actioned or CWS alert expected but none reported

Degree of Risk: C

Safety Barrier Assessment⁴

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

Ground Elements:

Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because the Radar controller passed lateral avoidance instructions to both pilots in receipt of TCAS RA instructions.

Flight Elements:

Regulations, Processes, Procedures and Compliance were assessed as **ineffective** because the FA7X pilot did not correctly follow their TCAS RA procedures.

⁴ The UK Airprox Board scheme for assessing the Availability, Functionality and Effectiveness of safety barriers can be found on the [UKAB Website](#).

Tactical Planning and Execution was assessed as **ineffective** because the FA7X pilot had missed the mode change from A/S to V/S and did not reduce their rate of climb when approaching their cleared level.

Situational Awareness of the Conflicting Aircraft and Action were assessed as **ineffective** because the FA7X pilot did not assimilate the confliction information available to them and did not reduce their rate of climb when approaching their cleared level (with traffic above them).

Electronic Warning System Operation and Compliance were assessed as **ineffective** because both aircraft were in receipt of a TCAS RA, and the FA7X pilot did not respond to the TCAS RA in the required manner.

See and Avoid were assessed as **not used** because both aircraft were operating under Radar Control and neither pilot reported achieving visual contact with the other aircraft.

Airprox Barrier Assessment: 2023105		Within Controlled Airspace						
Barrier		Provision	Application	Effectiveness				
				Barrier Weighting				
				0%	5%	10%	15%	20%
Ground Element	Regulations, Processes, Procedures and Compliance	✓	⚠	[Yellow bar: 20%]				
	Manning & Equipment	✓	✓	[Green bar: 15%]				
	Situational Awareness of the Confliction & Action	✓	✓	[Green bar: 15%]				
	Electronic Warning System Operation and Compliance	✓	✓	[Green bar: 10%]				
Flight Element	Regulations, Processes, Procedures and Compliance	✓	✗	[Red bar: 5%]				
	Tactical Planning and Execution	✓	✗	[Red bar: 5%]				
	Situational Awareness of the Conflicting Aircraft & Action	✓	✗	[Red bar: 10%]				
	Electronic Warning System Operation and Compliance	✓	✗	[Red bar: 15%]				
	See & Avoid	✗	○	[Red box: 0%]				
Key:		<u>Full</u>	<u>Partial</u>	<u>None</u>	<u>Not Present/Not Assessable</u>	<u>Not Used</u>		
Provision	✓	⚠	✗	●				
Application	✓	⚠	✗	●	○			
Effectiveness	■	■	■	■	□			