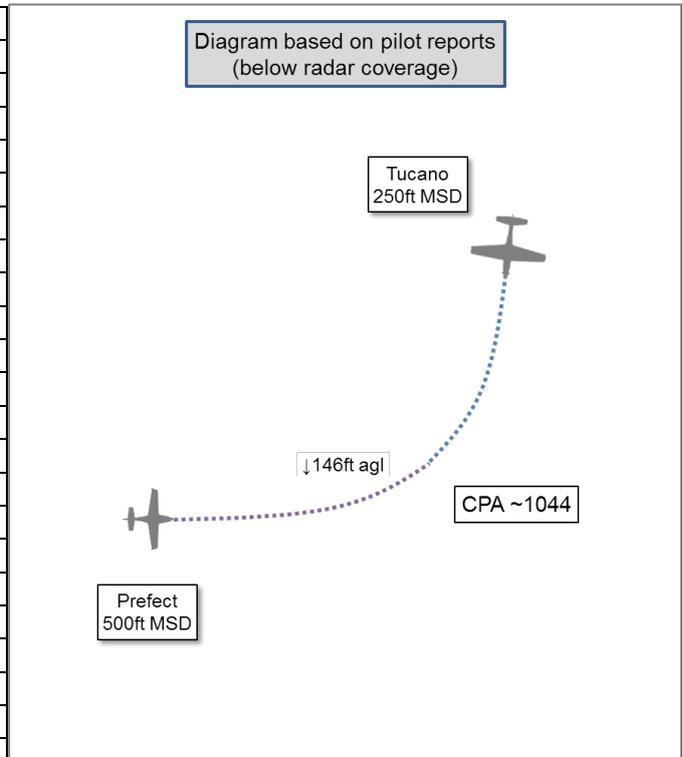


AIRPROX REPORT No 2019004

Date: 14 Jan 2019 Time: 1044Z Position: 5410N 00040W Location: 4nm ENE Malton

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Tucano	Prefect
Operator	HQ Air (Trg)	HQ Air (Trg)
Airspace	London FIR	London FIR
Class	G	G
Rules	VFR	VFR
Service	Listening Out	Listening Out
Provider	LL common	LL common
Altitude/FL	NK	NK
Transponder	A, C, S	A, C, S
Reported		
Colours	Black, yellow	White, blue
Lighting	HISL, nav, land	NK
Conditions	VMC	VMC
Visibility	>10km	>10km
Altitude/FL	250ft	500ft
Altimeter	msd	msd
Heading	190°	070°
Speed	240kt	180kt
ACAS/TAS	TCAS I	TAS
Alert	TA	RA
Separation		
Reported	0ft V/0m H (TCAS)	30ft V/0m H
Recorded	NK	



THE TUCANO INSTRUCTOR reports that during the pre-flight CADS check and out-brief it was noticed that there would be a Prefect routing in the opposite direction over the southernmost portion of their planned route; a deconfliction plan was briefed at length which involved both lateral and vertical separation and included the use of NATO LL-common as an aid to SA. Significantly, however, the deconfliction plan was focused on the information they had available at the time which led them to believe that a potential conflict was most likely to occur at the southern portion of the route and would involve the Prefect (operating at 500ft MSD) going high and themselves (operating at 250ft MSD) remaining at 250ft MSD. The formation took off on time; however, due to a weather delay once airborne, the formation split as planned but the Airprox Tucano entered low-level about 5 min after the planned low-level entry time. Approaching the entry point at Knapton Granary, the crew had several contacts displaying on TCAS with one of interest displaying at 4 miles range slightly below their level. They had already descended to 1000ft altitude due to low cloud when approaching the entry point. The instructor informed the student of the contact and brought the TCAS range down to 6 miles. Believing that the TCAS contact might have potential to develop into a possible conflict, he elected to take early control of the radio from the student (a foreign national for whom English was a second language) to ensure that their position and intentions were transmitted clearly, promptly and accurately over the NATO LL-common frequency. He did not receive a reply to the information call. At this time the TCAS contact did not appear to be on their intended route so he allowed the student to continue with his LL entry. Because the instructor had not heard a reply to his [UHF] information call, and whilst he could not rule out that the TCAS contact was a Prefect, his mental model was now erring towards the possibility that it might be a slow moving civilian light-aircraft and therefore he perceived that, at this stage it was unlikely to conflict with their track. As they ran into the LL entry-point the TCAS contact was displaying co-altitude although he noted that the student was flying a little above MSD. Passing over the LL entry-point, he noted that the TCAS contact was now rapidly closing on a constant relative bearing and still

displaying co-altitude. He took control from the student and directed him to focus solely on lookout whilst he reduced the TCAS range to 2 miles. At this point the instructor was mindful of the following:

1. The student had been flying a cautious 250ft MSD that in his visually judged opinion was probably closer to 500ft MSD.
2. He suspected that the TCAS contact was either a Prefect; in which case he assumed it would be operating at 500ft MSD, or a civilian aircraft, in which case he concluded that on balance it would be more likely to be operating above 500ft than below.
3. The cloudbase, whilst apparently within limits, was already quite low and any significant climb might bring with it a reduction in lateral visibility approaching cloudbase. Conversely, given neither crew member was visual with the TCAS contact, a descent might help skyline the conflict which would aid visual acquisition.

Based on the balance of information and confronted with the option of climbing or descending, he elected to descend. After initiating the descent, and with the TCAS contact now approaching zero range, still co-altitude and on a constant relative bearing with no visual contact, he adjusted heading 20°-30° to the right (as much out of desperation as anything else), which also kept them over the lowest terrain. He was mindful of the limitations of TCAS bearing information although until then the TCAS contact had been closing on a constant relative bearing; he felt that he was starting to run out of options. The TCAS range then increased, the contact disappeared from the display and they continued the sortie as planned. Although he considered the possibility that an Airprox had taken place at the time, given that he had not seen the other aircraft he felt that he couldn't say if separation had been reduced to an unsafe level. After landing he was phoned by the Prefect pilot and only after consultation with him, where it became apparent just how close they had come, did he submit an Airprox.

The instructor stated that, in his opinion, the barriers to loss of safe separation and aids to SA, (namely lookout, TCAS and CADS) had all failed and the only remaining barrier to a collision on his part was providence. Furthermore, and even with the benefit of hindsight, if faced with the same set of circumstances he would still make the same decisions which led to the Airprox. The instructor observed that:

1. The Prefect is, like the Tutor, a small and relatively inconspicuous aircraft and, [being faster than the Tutor], it has a greater potential to achieve high closure rates and operates further out into the Low-Flying system from home base than was previously routinely the case with the Tutor. Therefore, he was now more likely to encounter Prefects in the Linton local area than was previously the case with the Tutor.
2. Despite effective cuing from TCAS and a Traffic Advisory that alerted them to the presence of another aircraft, and even with both crew focusing on lookout, neither crew member was able to achieve visual contact with the Prefect.
3. Whilst the limitations of lookout are well documented, he believed this case highlighted that even with the assistance of TCAS to aid SA, lookout is still imperfect.
4. The use of CADS directed the focus of their pre-flight deconfliction planning in the wrong place and contributed to his incorrect mental model that the Prefect would be operating above them. He believed this incident highlighted that, when used for building SA, CADS is very sensitive to changes in timing and is not especially robust against the normal timing errors which occur. Furthermore, the way CADS displays information (the 'sausage' around the route turning bright red where the system believes a conflict exists) can insidiously lead to the conclusion that a conflict is likely to exist where one doesn't, or vice-versa, resulting in misdirected planning and briefing effort.
5. Anecdotally, and based on personal experience, it seemed common for Tucano staff and students alike to fly high on 250ft MSD, with no routine opportunity for 'recalibration' of the 250ft

MSD picture. 250ft visual run in and breaks used to be commonplace and provided a useful means of recalibrating the visual picture in the absence of a Tucano radar altimeter. However, these breaks were withdrawn a few years ago and, since then, the only opportunity to recalibrate the 250ft picture in normal flying training is on one sortie of the Basic Fast-Jet Training syllabus (Intro to Low-Level) where a single fly-through of the airfield at 250ft is performed. Speaking only for himself, it was 5 years since he had last flown a radar altimeter equipped aircraft at 250ft MSD and, on examining his logbook, it appeared that he had in fact never flown the 'Intro to Low-Level' sortie with a real student (notwithstanding he would have flown the sortie profile at some point during various check flights and QFI upgrades over the course of his tour, most likely last in early 2017). Therefore, he believed it was highly likely in this case at least that his interpretation of the 250ft MSD picture had started to err on the cautious (high) side. He believed this has potential ramifications for LL deconfliction where part of a deconfliction plan may be based on MSD separation.

He assessed the risk of collision as 'High'.

THE PREFECT PILOT reports that he was on a medium-to-low-level navigation exercise entering low-level (500ft MSD) east abeam Hull. The weather began to deteriorate north of Driffield; the handling pilot considered the weather to be unsuitable to the northeast of Driffield but suitable to proceed to the planned target in the Vale of York. The handling pilot was aware of numerous aircraft operating in the area, including Hawk and multiple Tucano and Prefect aircraft; all aircraft were pre-notified on CADS. As the Prefect cleared the high ground to the south of its target run, the cloud base and visibility improved. The pilot commenced a planned navigation turn onto the eastbound track of the target run and, whilst doing so, heard a Tucano on Low-Level-Common frequency transmit that it was entering low-level at Knapton Granary. The Prefect handling pilot did not respond immediately; the intention being to complete the turn onto the target run, identify the Tucano and provide a useful relative position to the descending Tucano. In retrospect this was an unhelpful decision and a low-level-common call indicating general position could have provided increased SA to the Tucano. No visual identification was made on the descending Tucano until a TAS alert, appearing at approximately 2 miles, drew the handling pilot's eyes into the 10 o'clock position. With the Tucano initially heading south (assumed 240kt) and the Prefect on an easterly track (180kt groundspeed), the Tucano entered a descending turn to the right (presumably a look out turn), creating a converging heading. The Prefect initiated a turn to the left to create lateral separation, with the perception that the Tucano would be tracking southbound, as per the published CADS profile. The Tucano continued its descending turn to the right further closing the separation, at which point the Prefect pilot rolled wings-level and descended below authorised MSD to avoid a collision. The accurate minimum height of the Prefect in this manoeuvre was unknown but was assumed to be approximately 250ft AGL. The Prefect passed directly under the Tucano with a separation estimate of considerably less than 100ft. After CPA the Tucano continued southbound, and the Prefect climbed back up above MSD and tracked eastbound. The Prefect handling pilot made the following observations:

1. A lack of an accurate Low Level Common call by the Prefect in response to the Tucano's low-level entry call did little to assist the Tucano operators with updating SA on potentially conflicting traffic.
2. A lack of any TAS contact information (until approximately 2 miles) did not provide the Prefect pilot with any prior indication of the Tucano traffic.
3. Poor weather, with low cloud base to the south of Knapton Granary, and rising ground may have demanded increased consideration for the Tucano operators, looking ahead at their routing to assess the suitability to continue.
4. After speaking to the Tucano crew post-sortie, it is believed that at no point did the Tucano gain visual with the Prefect, but did have the Prefect displayed on TAS and were aiming to generate vertical de-confliction by descending to 250ft MSD (visually judged).

He assessed the risk of collision as 'High'.

Factual Background

The weather at Linton was recorded as follows:

METAR EGXU 141050Z 34006KT 9999 FEW010 BKN025 BKN048 06/04 Q1020 BLU TEMPO BKN023 WHT=

Analysis and Investigation

UKAB Secretariat

The Tucano and Prefect pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard¹. If the incident geometry is considered as head-on or nearly so then both pilots were required to turn to the right². If the incident geometry is considered as converging then the Tucano pilot was required to give way to the Prefect³.

Linton Occurrence Investigation

An Investigation was convened to establish the circumstances surrounding a loss of safe separation between a Tucano and Prefect aircraft operating in Low Flying Area (LFA) 11 on the morning of 14 Jan 2019. The aircraft converged to a separation of about 30ft vertically and with no lateral separation. To avoid collision, the Prefect pilot descended from 500ft to 146ft agl. Following the incident both aircraft continued with their planned sortie profiles. An Airprox was submitted by the Tucano and Prefect pilots shortly after both aircraft had landed. The investigation centred upon DASOR information submitted by the instructors, interviews with the Tucano and Prefect aircrew, examination of the Tucano Training Manual (TTM) Guidance on Traffic Collision Avoidance System (TCAS) Employment, Tucano Aircrew Manual, UK Military Low Flying Handbook Centralised Aviation Data Service (CADS) SOPs, the International Aircraft Planning Mission System (IAMPS) and the Prefect dynamic simulator. OC Instructor Training Fit (Tucano), Tucano QFIs, Prefect aircrew and Tucano and Prefect simulator personnel were also consulted. Examination of the ATC radar trace was carried out. The investigation concluded that none of the aircrew reacted to electronic (TCAS/TAS) information regarding each other in an effective or timely manner. TAS did enable the Prefect pilot to gain visual with the Tucano, but he was not able to generate sufficient separation. The investigation focused on the reasons why the aircrew did not generate adequate separation.

The following outcomes and causal factors (CF) were identified:

1. Loss of safe separation resulting in an Airprox between the ac flown by Aircrew 1 (Tucano) and Aircrew 3 (Prefect). Separation between Aircrew 1 (Tucano) and Aircrew 3's (Prefect) ac was estimated by Aircrew 3 (Prefect) to have reduced to approx. 30ft vertical separation with no lateral separation.
2. Aircrew 1 (Tucano):
 - a. descended and turned right towards the Prefect, bringing the flight paths into conflict.
 - b. prioritised entering low level at Knapton Granary rather than reacting to TCAS information.
 - c. elected to generate vertical separation with the Prefect through use of differential MSDs.
 - d. assessed Aircrew 2 (Tucano) to be flying at 500 ft MSD so took control and descended the ac to a visually assessed 250 ft MSD in an attempt to generate vertical separation and skyline the Prefect.
 - e. turned the ac 20 to 30 degrees right during the descent, to try and keep the ac over lower ground, which reduced lateral separation with the Prefect.

¹ MAA RA 2307 paragraphs 1 and 2.

² MAA RA 2307 paragraph 13.

³ MAA RA 2307 paragraph 12.

- f. was of the belief that the TCAS should be used primarily to gain visual acquisition and manoeuvring on TCAS information alone is not advisable.
 - g. interpretation and understanding of the Tucano Training Manual (TTM) – Guidance on TCAS Employment Chapter 16 was incorrect and not in line with the Tucano force understanding.
 - h. was of the belief that climbing to generate vertical separation would make the situation worse as he thought visibility would be reduced toward the cloud base further inhibiting visual acquisition of the conflicting ac. In addition, any hard manoeuvring without visual acquisition may have caused a collision.
 - i. were unable to acquire the Prefect visually. Poor conspicuity of the Prefect due to its size and colour made visual identification hard for Aircrew 1 and 2 to achieve.
 - j. continued with the low level entry procedure with a conflicting TCAS contact and at some point an audio TA.
 - k. followed the plan to enter low level at Knapton Granary, rather than avoiding an area of known traffic confliction, or effecting a delayed entry.
3. Aircrew 3 (Prefect):
- a. descended below his authorised MSD of 500ft, during which the separation reduced to 146ft agl.
 - b. manoeuvred his ac on a descending flight path to avoid collision with the Tucano.
 - c. was initially unable to determine which way the Tucano was turning and was then unable to fly a suitable lateral de-conflicting flight path as he had little previous experience of assessing ac operating in a high speed dynamic environment; he therefore descended to achieve separation.
 - d. inadvertently manoeuvred his ac along a flight path which brought it into confliction with the Tucano.
 - e. chosen course of action, was not executed in sufficient time to effect safe separation.
 - f. did not use the LLC frequency to instruct the Tucano to stop descending, as he could not think of what to say in a timely manner.
 - g. stated that his TAS did not display the Tucano contact prior to the audio warning. Had it done so earlier this could have given him greater SA to react sooner and avoid the confliction area.
 - h. did not respond to Aircrew 1's (Tucano) position update made on the LLC frequency.
 - i. elected to wait until he could pass more useful positional information to the Tucano.
 - j. was distracted by the frustration of not knowing why the TAWS terrain avoidance voice warning had not deselected. TAWS audio warnings were present during Aircrew 1's LLC transmission.

The CFs attracted a number of recommendations.

1. The MAC risk is held at ODH level across MOD. It could be argued that following on from the level of risk ownership, Airprox OSIs and ORGs consequently should be convened at ODH level as a minimum. Any airprox that involves different units should be convened at above Stn level. A minimum of Gp level but potentially incorporating RAFSC input for cross Gp/Def or civilian events. An ORG at Gp level would ensure objectivity is sustained, supporting the generation of robust recommendations.
2. Generate through synthetic training, random visual threats which need to be assessed and reacted to appropriately with emergency breaks and suitable R/T.
3. Generate through synthetic training, random TAS threats which need to be assessed and reacted to appropriately with suitable R/T. This training should be incorporated in the EFT & QFI syllabuses at an appropriate juncture.
4. BTRs for all Prefect aircrew to demonstrate competency in the ability to generate avoidance criteria from TAS and visual threats.
5. Generate TAS SOPs utilising best practice from all TAS/TCAS equipped training ac.
6. Identify the operational employment of the TCAS II system currently fitted to Hawk T2 and establish the suitability and effectiveness of the system for Prefect and other 22GP advanced platforms operations.
7. Devise formal training for Prefect aircrew on the operation of CADS. To be included in QFI & EFT courses.
8. Investigate the reliability of Prefect TAS.
9. Review all documentation to ensure suitable provision of guidance on low level de-confliction planning, including but not ltd to appropriate generation of vertical separation.

10. Simulator training for all Tucano aircrew to generate TCAS conflicts with instruction on avoidance techniques and criteria.
11. BTRs for all Tucano aircrew to demonstrate competency in the ability to generate avoidance criteria from TCAS threats.
12. EKQs to include TCAS/TAS questions regarding separation criteria for pan-22 Gp TCAS/TAS equipped air systems.
13. All Tucano pilots are to be briefed on the revised guidance for response to TCAS contacts
14. Clarification of the TTM Guidance on TCAS employment wrt the provision of guidance on how best to use TCAS to generate avoidance criteria.
15. Investigate the possibility of improving Prefect conspicuity.
16. LFA specific key geographic features are identified through consultation with key LFA users and printed on the LFC. These then form the positional reference for all deconfliction radio transmissions within the LFS.
17. It is recommended that the outcome of this OSI is utilised to remind aircrews of the importance of checking system indications when operating equipment when completing the LL entry checklist.

Comments

HQ Air Command

This incident led to a detailed Occurrence Safety Investigation which identified a number of causal factors and made recommendations accordingly.

A number of barriers to MAC were breached before the final barrier (lookout) led to a collision being avoided. The plan-to-avoid barrier was not fully employed as the 2 crews did not have the opportunity to speak directly to each other; the primary plan of separating by using differing MSDs was fundamentally flawed in that there is no equipment fitted to the Tucano that can accurately measure height (i.e. there is no radar altimeter); the Tucano was not on its original timeline, thus the CADS display of conflicts would no longer have been valid; we have seen many, many times that a plan to deconflict at low-level through use of the radio is often unsuccessful (as it was in this case).

The electronic conspicuity barrier was available and functioned for both crews. However, by utilising the TCAS display to aid visual acquisition, rather than manoeuvring on the displayed information prior to gaining visual with the other aircraft, the Tucano pilot continued into proximity with the Prefect. For his part, the Prefect pilot received a TAS indication of the Tucano at approximately 2 miles and became visual with the Tucano almost immediately. Having turned to maintain lateral separation, this was eroded by the manoeuvring of the Tucano, ultimately leaving the Prefect pilot with no option but to keep descending to avoid a collision. Whilst the separation distance was minimal, the risk of collision was reasonably low as the Prefect pilot was visual with the Tucano throughout.

This incident highlights the need to utilise all the barriers to MAC to their full effect – plan to be in a different place to the other aircraft; react to information received (from ATC or onboard sensors) before your aircraft comes close to the other. Using the SA provided by CADS and/or TCAS/TAS to simply supplement lookout (ie ‘we’ll keep a good lookout here as we expect to see another aircraft’) simply places more reliance on the lookout barrier.

Summary

An Airprox was reported when a Tucano and a Prefect flew into proximity at about 1044 on Monday 14th January 2019. Both pilots were operating under VFR in VMC, both operating autonomously on the Low Level Common frequency.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from both pilots, radar photographs/video recordings (which did not show the aircraft at CPA) 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 commended the Linton Occurrence Investigation team for a particularly thorough and exhaustive investigation, which had established numerous causal factors. Following a review of these from the military member, the Board then discussed the chronology of events and noted that from the very start of their sorties both crews had been aware of the planned presence of the other aircraft from CADS information. Unfortunately, and as highlighted in the OSI and HQ Air Command comments, neither had then made a sufficiently robust plan for deconfliction (**CF2**).

Turning to the Tucano pilot's actions, members noted that he was ultimately relying on his MSD being lower than that of the Prefect, which the Board commented was always going to be flawed due to MSD in those aircraft being based on a visual assessment (with the potential for inherent error). More generally, MSD meant Minimum Separation Distance which, by definition meant that another pilot might choose to fly at a greater height than their MSD (especially over undulating terrain and near obstacles); therefore, relying on each other being at respective minimum heights for deconfliction was fundamentally flawed. Nevertheless, the Board commended the Tucano pilot for making an R/T transmission on the LL-Common frequency as he entered low-level, it was unfortunate that the Prefect pilot chose to delay his response such that the Tucano pilot was then denied valuable SA (**CF4, CF5**).

With the aircraft now closing, the Prefect pilot (heading east) turned left, based at least in part on his belief from CADS that the Tucano planned track was to the south. However, this did not take in to account the updated SA available from his TAS (**CF4, CF6, CF7**). Similarly, the Tucano pilot turned right towards lower ground, presumably to enhance his MSD deconfliction plan, but therefore into greater conflict with the Prefect despite having TCAS information indicating the growing threat (**CF4, CF6, CF7**).

Overall, it appeared to the Board that both pilots had become task focused on their individual sortie and student objectives to the extent that they had then prioritised these over the converging flight paths (constant bearing) that could be deduced from their TCAS/TAS displays (**CF3**). In this respect, members had a wide-ranging discussion on the use of TCAS/TAS, and commented that it seemed that the procedures for dealing with associated conflict scenarios were not robust (**CF1**); this, they opined, had likely contributed to both pilots' inadequate use of the information available to them on their CWS displays such that they had both consciously flown into an area of a known traffic threat. Given the increasing proliferation of CWS equipment in both civil and military aircraft, the Board were of the opinion that guidance on what to do when confronted with CWS threat information was not just a military issue but one that was equally applicable to the GA community. Therefore, in order that both communities did not develop conflicting guidance, the Board resolved to recommend that, 'CAA and MAA provide advice and guidance on the interpretation and use of electronic conspicuity equipment'.

As the aircraft closed, the Prefect pilot saw the Tucano at 2nm and members opined that earlier action to positively avoid it would have been appropriate at that point. As it was, on seeing the Tucano turn towards, it seemed to the Board that the Prefect would have been better served by turning away to the right (to increase the sight-line rate) rather than turning left (thereby decreasing the sight-line rate); however, without being privy to the circumstances presented in the cockpit at the time, it was not for the Board to second-guess the Prefect pilot's actions based on what he perceived the geometry to be. Now flying into the same airspace, the only option left to the Prefect pilot was to bunt underneath the Tucano with minimal vertical separation achieved. For their part, the Tucano crew did not see the Prefect at all (**CF8**) although they were aware that they were in a likely conflict situation.

Members then discussed the risk and agreed that, although the Prefect pilot had seen the Tucano and had likely materially increased separation at CPA, the separation had still reduced to the bare minimum

where a serious risk of collision had existed. Members discussed how this could have come about and agreed that barriers were not effective unless those using them applied them effectively (**CF9**).

PART C: ASSESSMENT OF CAUSE AND RISK

Contributory Factors:

CF	Factor	Description	Amplification
Flight Elements			
• Regulations, Processes, Procedures and Compliance			
1	Organisational	• Flight Operations Documentation and Publications	Inadequate regulations or procedures
• Tactical Planning and Execution			
2	Human Factors	• No Decision/Plan	Inadequate planning
3	Human Factors	• Insufficient Decision/Plan	Inadequate plan adaption
4	Human Factors	• Incorrect Decision/Plan	Incorrect or ineffective execution
5	Human Factors	• Accuracy of Communication	Ineffective communication of intentions
• Situational Awareness of the Conflicting Aircraft and Action			
6	Human Factors	• Lack of Action	Pilot flew into conflict despite Situational Awareness
• Electronic Warning System Operation and Compliance			
7	Human Factors	• Interpretation of Automation or Flight Deck Information	CWS misinterpreted or not optimally actioned
• See and Avoid			
8	Human Factors	• Monitoring of Other Aircraft	Non-sighting by one or both pilots
9	Human Factors	• Lack of Action	Pilot flew into conflict

Degree of Risk: A.

Recommendation: CAA and MAA provide advice and guidance on the interpretation and use of electronic conspicuity equipment.

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:

Flight Elements:

Regulations, Processes, Procedures and Compliance were assessed as **partially effective** because robust guidance and procedures for action in the event of TAS/TCAS alerts was lacking.

Tactical Planning and Execution was assessed as **ineffective** because the deconfliction plan based on differing MSDs was not sufficiently robust.

Situational Awareness of the Conflicting Aircraft and Action were assessed as **partially effective** because although both pilots could have done more with the TAS/TCAS information, the Prefect pilot did at least use the TAS information to visually acquire the Tucano.

Electronic Warning System Operation and Compliance were assessed as **partially effective** because although both pilots received TAS/TCAS information, the conflict was not fully resolved.

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

See and Avoid were assessed as **ineffective** because the Tucano crew did not see the Prefect and, although the Prefect pilot saw the Tucano at range, the aircraft still closed to close proximity.

Airprox Barrier Assessment: 2019004		Outside Controlled Airspace						
Barrier	Provision	Application	Effectiveness					
			Barrier Weighting					
			0%	5%	10%	15%	20%	
Ground Element	Regulations, Processes, Procedures and Compliance	●	●					
	Manning & Equipment	●	●					
	Situational Awareness of the Confliction & Action	●	●					
	Electronic Warning System Operation and Compliance	●	●					
Flight Element	Regulations, Processes, Procedures and Compliance	⚠	✓					
	Tactical Planning and Execution	✓	✗					
	Situational Awareness of the Conflicting Aircraft & Action	✓	⚠					
	Electronic Warning System Operation and Compliance	✓	⚠					
	See & Avoid	✓	✗					
Key:			Full	Partial	None	Not Present	Not Used	
Provision	✓	⚠	✗	●	○			
Application	✓	⚠	✗	●	○			
Effectiveness	■	■	■	■	■	■		