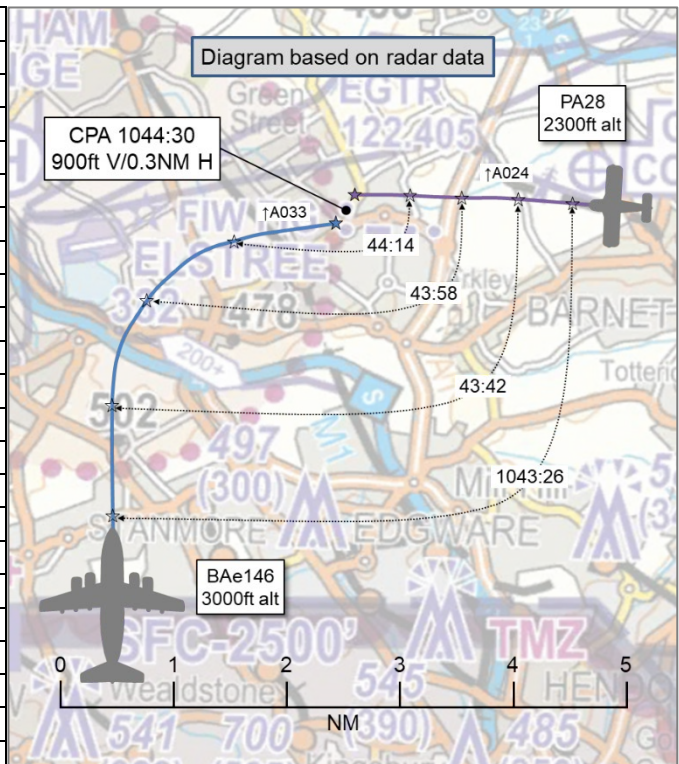


AIRPROX REPORT No 2021185

Date: 16 Sep 2021 Time: 1045Z Position: 5140N 00016W Location: Borehamwood

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	BAe146	PA28
Operator	HQ Air (Ops)	Civ FW
Airspace	London TMA	London FIR
Class	A	G
Rules	IFR	VFR
Service	Radar Control	Basic
Provider	Northolt Radar	F'borough LARS
Altitude/FL	3300ft	2400ft
Transponder	A, C, S	A, C, S
Reported		
Colours	NR	Blue, white
Lighting	NR	Beacon, anti-colls
Conditions	VMC	VMC
Visibility	>10km	>10km
Altitude/FL	3000ft	2400ft
Altimeter	QNH (1018hPa)	QNH (1018hPa)
Heading	090°	280°
Speed	NR	115kt
ACAS/TAS	TCAS II	Not fitted
Alert	RA	N/A
Separation at CPA		
Reported	<500ft V/NR H	1500ft V/1NM H
Recorded	900ft V/0.3NM H	



THE BAE146 PILOT reports that, whilst being vectored for the ILS to RW25 at RAF Northolt, the TCAS warned of "Traffic" and soon after issued the command to "Climb, Climb". Immediate actions in accordance with the checklist were carried out during which a small GA single-engine aircraft was seen passing down the left-hand side of the aircraft on a near reciprocal heading, not far below their altitude. Once clear of the conflict the BAe146 was descended back down to 3000ft and the approach was continued with no further anomalies.

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

THE PA28 PILOT reports that they took off from [their departure airfield] at approximately 1030 en-route to [their destination airfield], via Bovingdon, Oxford and then direct. The initial cruise altitude was 1300ft to remain below the Stansted CTA and then, once clear, they climbed to 2400ft. Once clear of [their departure airfield's] ATZ they contacted Farnborough LARS N and requested a Basic Service. They would have requested a Traffic Service but they know that Farnborough will not give this type of Service to aircraft at 1300ft. The Service was not upgraded on climbing to 2400ft due to in-flight visibility being excellent. They had just levelled at 2400ft in the Potters Bar area when they received Traffic Information from the Farnborough controller about a contact in their 12 o'clock with no height information. They received no information from the Farnborough controller regarding the BAe146, although they sighted it in their 10-11 o'clock at a range of about 1NM and well above them. They did not take any avoiding action as the bearing was changing and there was plenty of vertical separation.

The pilot assessed the risk of collision as 'None'.

THE NORTHOLT RADAR CONTROLLER reports that [the BAe146] was handed over from Heathrow Approach descending to 4000ft on the London QNH. They identified the aircraft and descended it to 3000ft on the Northolt QNH. A radar return was seen tracking west towards Elstree at 2300ft, outside controlled airspace, which they called to [the BAe146 pilot] using the phrase: "I will shortly be turning

you eastbound, traffic NE 6 miles tracking west at altitude 2300ft, you will be separated by classification of airspace", which the pilot acknowledged. They then turned [the BAe146] onto heading 090° and recalled the traffic as 12 o'clock, 2 miles opposite direction. The pilot called a TCAS RA and climbed to 3300ft and, once able, descended back to 3000ft. The rest of the approach was completed without further incident or comment from the pilots. The controller was not informed of an Airprox.

The controller perceived the severity of the incident as 'Negligible'.

THE FARNBOROUGH LARS NORTH CONTROLLER reports that, following a period of annual leave, on their return to the unit they were advised by the Airprox Board that an Airprox had been filed by [the BAe146 pilot] making an approach into Northolt inside CAS. They were the Farnborough LARS North ATCO at the time of the incident providing the other aircraft involved a Basic Service. They have no recollection of the event as nothing was mentioned on the RT or via telephone.

Factual Background

The weather at RAF Northolt was recorded as follows:

METAR EGWU 161050Z 27009KT 9999 FEW021 20/15 Q1018 NOSIG RMK BLU BLU=

Analysis and Investigation

NATS Farnborough

[The PA28] was displaying mode-A 5023 (Farnborough LARS North) and believed to be in receipt of a Basic Service. [The PA28] always remained outside controlled airspace. [The BAe146] was inside CAS and appeared to carrying out radar circuits at Northolt under the control of Northolt Radar, indicating 3000ft mode C.

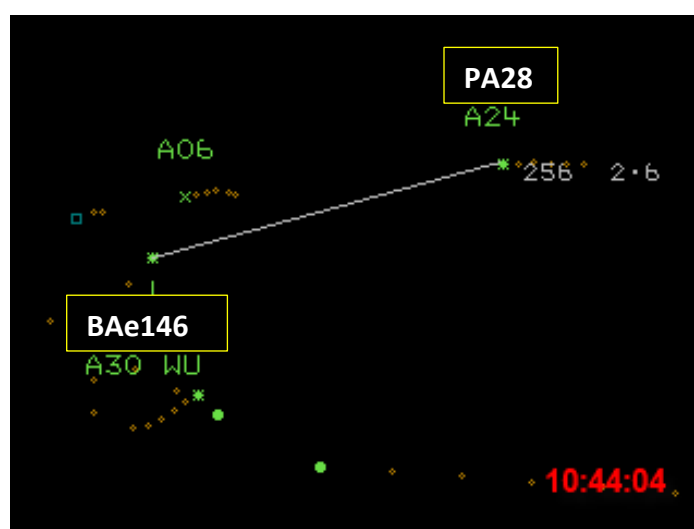


Figure 1

[The BAe146] was initially at 3000ft – the 5023 squawk (Mode S indicated this to be [the PA28]) at 2400ft. The base of the London TMA in this area is 2500ft. [The BAe146] was inside controlled airspace. [The PA28] was outside controlled airspace.

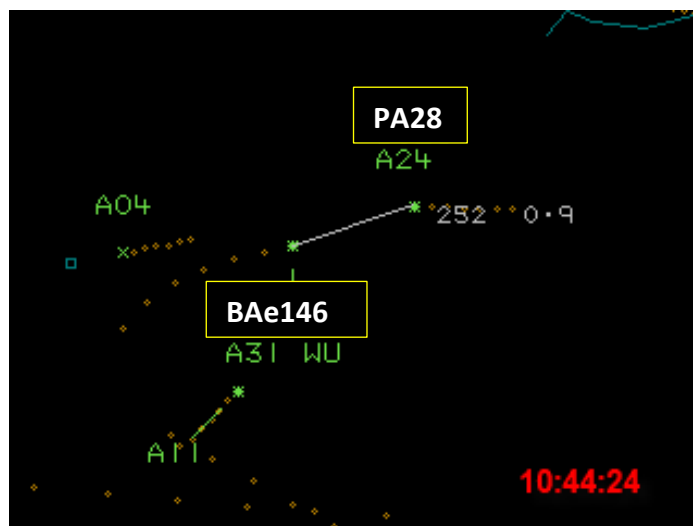


Figure 2

As the aircraft approached, [the BAe146] commenced climb.

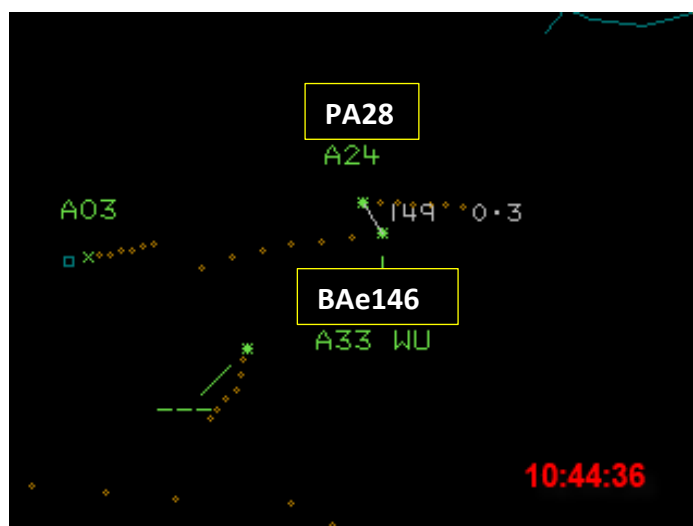


Figure 3

This investigation was based on notification from the UK Airprox Board, a retrospective report from both the reporter and the initial investigator. Due to data not being correctly impounded, no unit radar or RT evidence was available; however, given the respective aircraft geometries and airspace utilisation, it is highly probable the Farnborough controller would not have passed Traffic Information or had any material input or contribution to this event. Further radar information for this report was sought via NATS Safety Investigations.

The report from the controller, who submitted a retrospective report following a period of annual leave, stated '*I was the Farnborough LARS North ATCO at the time of the incident providing the other aircraft involved a Basic Service. I have no recollection of the event as nothing was mentioned on the RT or via telephone.*'

This event occurred owing to a conflict at the vertical limits of controlled airspace. The base of CAS in the position of the reported Airprox is 2500ft.

[The PA28 pilot] was receiving a Basic Service, potentially from Farnborough LARS North, and squawking 5023. [The PA28]'s mode C indicated 2400ft and remained outside controlled airspace at all times.

[The BAe146] was inside CAS under the control of Northolt Radar and indicated 3000ft mode C.

At the closest lateral point, the aircraft were 0.3NM/900ft apart. [The PA28] did not enter controlled airspace at any time.

Military ATM

The BAe146 pilot was on return to RAF Northolt and was being vectored for an ILS to RW25. They received a TCAS warning of 'Traffic' which was shortly followed with an instruction to climb. The BAe146 pilot became visual with the PA28 passing down their left-hand side on a near reciprocal heading. Once clear of the conflict, the approach resumed as normal. Separation was reported as not more than 500ft.

The Farnborough LARS North controller had no recollection of the event due to being notified of the Airprox on return from annual leave.

The Northolt Radar controller was positioning the BAe146 following a handover from Heathrow Approach. The BAe146 was descended to 3000ft Northolt QNH and the pilot was passed Traffic Information on the PA28 which was transiting at 2300ft, outside controlled airspace. The BAe146 pilot was advised that they would be separated by classification of airspace. Traffic Information was updated which was followed by the BAe146 pilot responding to a TCAS RA. Separation was noted by the controller as 600ft.

Figures 4 – 7 show the positions of the BAe146 and the PA28 at relevant times during the Airprox. The screenshots are taken from a replay using the NATS radars which are utilised by Northolt Radar and, therefore, are representative of the picture available to the Northolt Radar Controller.

The BAe146 pilot was advised that there was '*traffic north east by six miles, tracking west indicating 2300ft*' and the Northolt Radar controller stipulated that they would be separated by classification of airspace (Figure 4).

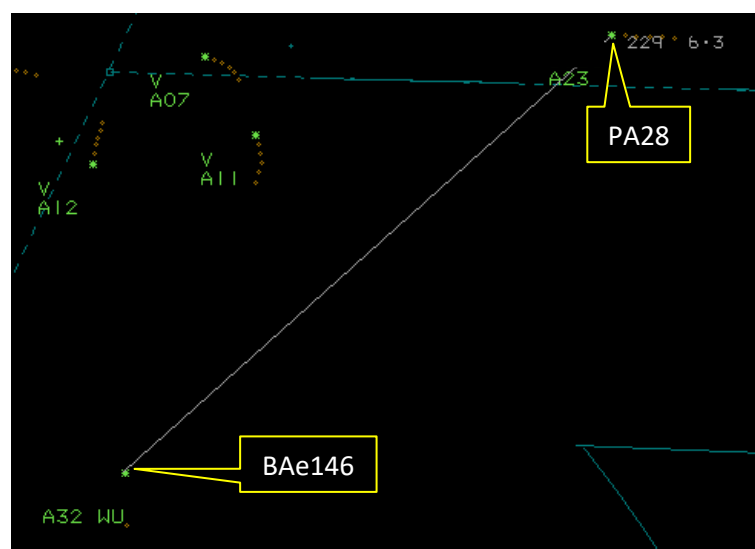


Figure 4

Information regarding the PA28 passed to the BAe146 pilot

The BAe146 pilot was given a right-hand turn to 090°, 29sec after the initial Traffic Information. 25sec later, the Northolt Radar controller provided an update on the location of the PA28. Separation had decreased to 2.3NM and 600ft (Figure 5). 6sec later, the BAe146 pilot reported responding to a TCAS RA. Separation had decreased to 1.6NM and 600ft (Figure 6).

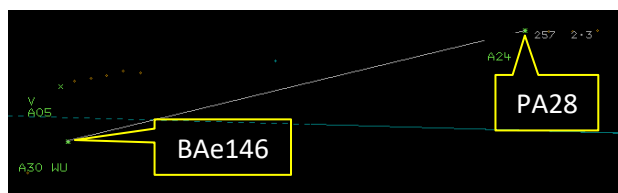


Figure 5

BAe146 pilot provided with an update on the PA28

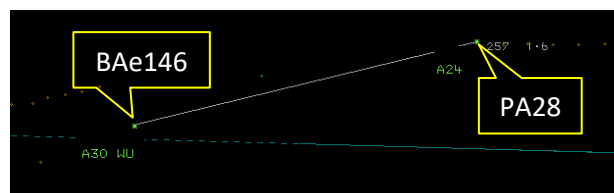


Figure 6

BAe146 pilot reported TCAS RA and climbing

Minimum vertical separation occurred between radar sweeps with separation of approximately 1NM and 600ft before the radar displayed the BAe146 climb in response to the TCAS RA (Figure 7).

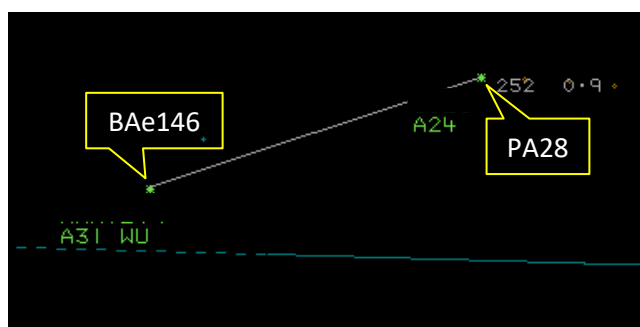


Figure 7

Minimum vertical separation

Traffic Information was passed and updated by the Northolt Radar controller to the BAe146 pilot regarding the PA28, which was outside controlled airspace and not likely to be considered a factor due to the classification of airspace separation. It is unfortunate that the BAe146 pilot received a TCAS RA, although not entirely unexpected due to the proximity and vertical separation between the two aircraft, noting the parameters for TCAS activation.

UKAB Secretariat

The BAe146 and PA28 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

RAF Northolt Occurrence Investigation

Reports were submitted by both the captain [of the BAe146] and the controller at the time. A tape transcript was provided by Northolt Radar. The airspace in the vicinity of Elstree is Class G (uncontrolled airspace) and aircraft can operate up to 2400ft amsl.³ Class A (controlled airspace) is positioned above it, with a base level of 2500ft amsl. [The BAe146] was at 3000ft amsl and under Radar Control. It is not known what service, if any, the conflicting aircraft was receiving at the time. The controller passed Traffic Information on the conflicting traffic which was acknowledged by the [BAe146 pilot]. The controller updated the Traffic Information 54sec later, at which point [the BAe146 pilot] responded with TCAS RA and reacted with the correct actions in accordance with the BAe146 FCOM Vol 3 Part 3 Abnormal and Emergency Checklist. The radar replay available to Northolt Radar displayed an indicated 600ft separation at the time of the TCAS RA.

¹ (UK) SERA.3205 Proximity. MAA RA 2307 paragraphs 1 and 2.

² (UK) SERA.3210 Right-of-way (c)(1) Approaching head-on. MAA RA 2307 paragraph 13.

³ UKAB Note: Aircraft in Class G airspace can operate up to the base of controlled airspace; in this case, 2500ft.

Comments

HQ Air Command

The BAe146 crew was given Traffic Information from ATC prior to the RA but there was little time between the escalation of 'Traffic Traffic' to 'Climb Climb' from the TCAS. The crew responded accordingly and correctly. Given the separation deduced by the UKAB investigation, the PA28 was at the outer limits of the TCAS RA activation zone; nonetheless, this was not known by the crew at the time and, coupled with seeing the PA28 on a near reciprocal heading after manoeuvre, was clearly uncomfortable for them. Whilst, after investigation, the threat of collision was low in this case, and each aircraft was separated by airspace classification, we have seen examples in the past of airspace infringements that have led to Airprox; nothing should be assumed. TCAS continues to provide protection from more severe incidents.

AOPA

In this case, the PA28 pilot was operating in accordance with the advice from both GASCo and the Airspace Infringement Working Group by remaining at least 200ft vertically from the base of controlled airspace, and was aware of the limitations on the type of ATS available from Farnborough at certain altitudes. They had the BAe146 in sight in controlled airspace following a warning from the Farnborough controller, even though they were receiving a Basic Service, and the Farnborough controller should be applauded for passing Traffic Information to the PA28 pilot on this occasion. Although the BAe146 pilot was unsure of the intentions of the PA28, the BAe146 was in controlled airspace and it can be assumed that the PA28 would remain outside controlled airspace.

This Airprox demonstrates how TCAS II works and has an increased separation requirement compared to the human interface when operating VFR in Class G airspace. There may be scope to modify ATC procedures to give greater separation from non-controlled airspace to prevent TCAS warnings being generated against aircraft legitimately operating outside controlled airspace.

Summary

An Airprox was reported when a BAe146 and a PA28 flew into proximity over Borehamwood at 1045Z on Thursday 16th September 2021. The BAe146 pilot was operating under IFR in VMC and in receipt of a Radar Control Service from Northolt Radar. The PA28 pilot was operating under VFR in VMC and in receipt of a Basic Service from Farnborough LARS North.

PART B: SUMMARY OF THE BOARD'S DELIBERATIONS

Information available consisted of reports from both pilots, radar photographs/video recordings, reports from the air traffic controllers 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 discussed this event and concluded that normal safety standards and parameters had pertained and that that had been no risk of collision. Accordingly, the Board assigned a Risk Category E to this Airprox. However, members agreed that the following factors (detailed in Part C) had contributed to this Airprox:

- CF1. The BAe146 pilot, on receipt of the TCAS RA, had been concerned by the proximity of the PA28.
- CF2. Although the aircraft were separated by classification of airspace, a TCAS RA was nonetheless generated on-board the BAe146.

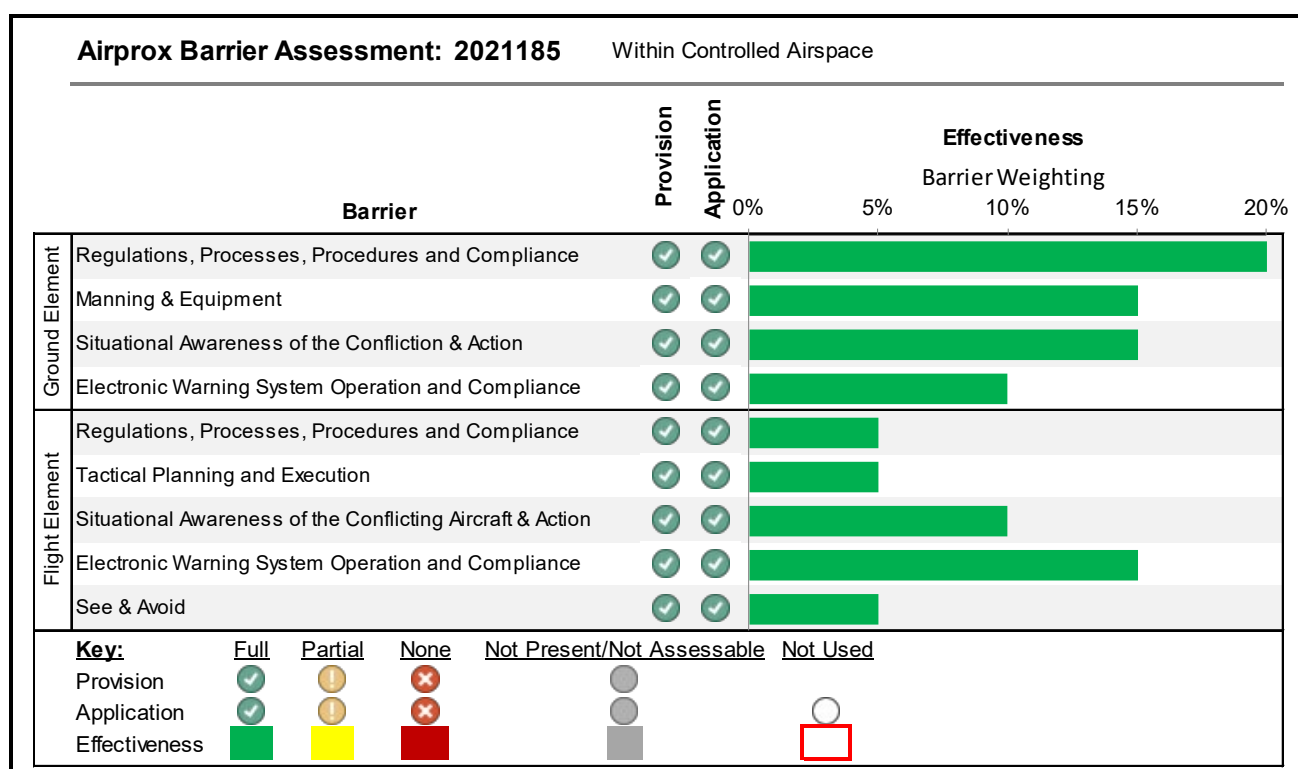
PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK**Contributory Factors:**

2021194				
CF	Factor	Description	ECCAIRS Amplification	UKAB Amplification
Flight Elements				
• Situational Awareness of the Conflicting Aircraft and Action				
1	Human Factors	• Unnecessary Action	Events involving flight crew performing an action that was not required	Pilot was concerned by the proximity of the other aircraft
• Electronic Warning System Operation and Compliance				
2	Contextual	• ACAS/TCAS RA	An event involving a genuine airborne collision avoidance system/traffic alert and collision avoidance system resolution advisory warning triggered	

Degree of Risk: E

Safety Barrier Assessment⁴

In assessing the effectiveness of the safety barriers associated with this incident, the Board concluded that, in this case, all the barriers to mid-air collision had performed as intended.



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