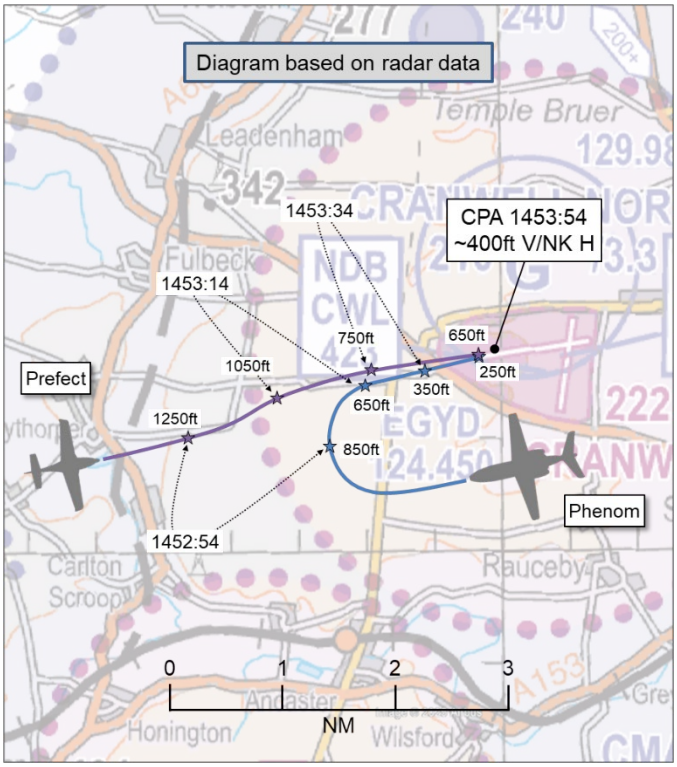
AIRPROX REPORT No 2024239

Date: 20 Sep 2024 Time: 1454Z Position: 5302N 00030W Location: Cranwell ATZ

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Phenom	Prefect(3)
Operator	HQ Air (Trg)	HQ Air (Trg)
Airspace	Cranwell ATZ	Cranwell ATZ
Class	G	G
Rules	VFR	VFR
Service	ACS	ACS
Provider	Cranwell Tower	Cranwell Tower
Altitude/FL	250ft	650ft
Transponder	A, C, S+	Standby[1]
Reported		
Colours	White	White
Lighting	NR	NR
Conditions	VMC	VMC
Visibility	NR	NR
Altitude/FL	200ft	500ft
Altimeter	QFE (1014hPa)	QFE
Heading	082°	NR
Speed	NR	180kt
ACAS/TAS	TCAS II	TAS, FLARM
Alert	None	None
Separation at CPA		
Reported	NR	"*unknown*"
Recorded	~400ft V/NK H	



THE PHENOM PILOT reports that they were conducting circuits at Cranwell on RW08RH when a formation of three Prefects joined for the break. During the final turn, the trainee in the left-hand seat [of the Phenom] was visual with the formation. As [the Phenom pilot] commenced their touch-and-go, they heard [Formation callsign-1] call that they were on the break. As [the Phenom] rotated and passed 100-200ft, they saw a Prefect to the left, slightly above and ahead of them, presumably at 500ft. They called for their trainee to level, which they did at about 200ft and, once they were both confident it was the third Prefect and they were clear, they continued the climb.

[The pilot of the Phenom commented that] it takes about 7sec for a Phenom to conduct a touch and go. There were three Prefects in the formation, conducting a break at 5sec intervals. They have raised this as an Airprox because they believed if they hadn't intervened, the distance between the aircraft would have been significantly closer. They also spoke with [Formation callsign-3] who, due to being number three in the formation, was aware that there was a Phenom in the circuit conducting a touch-and-go but, [reportedly], wasn't visual with it during their break.

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

THE PREFECT(3) PILOT reports that they were positioned in the right-hand seat (RHS) as the non-handling pilot during the Visual Run In And Break (VRIAB) Airprox. Approaching Initial in echelon left, they had good SA on the Phenom established downwind/turning final based on aircraft and ATC R/T. Given that the formation was positioned slightly on the live-side, converging toward the dead-side through Initial, they told the handling QFI that they were prioritising lookout and acquisition of the Phenom over their monitoring of their station keeping. They couldn't recall if they got visual with the Phenom but believed they did, either in their final turn or as they rolled out short-final. Given the correct

[1] The formation-lead Prefect was observed on the NATS radar replay to have operated an A,C,S transponder; it is an SOP for subordinate elements to squawk standby when in close formation.

positioning of the formation approaching the break, plus mental model of the position relative to the Phenom, they were content to return their focus back to the 'Give Back' (teach) element of the formation VRIAB. At that stage, the Phenom would have been hidden from sight under their aircraft's right wing. As per standard technique, both [crew] looked to the front (to maintain line and height) when [Prefect(2)] broke. Despite a clearing lookout right prior to breaking at the briefed 5sec spacing, they did not re-acquire visual contact with the Phenom. At no point during the execution of the break did they consider that separation margins would be eroded to unsafe levels.

THE PREFECT(1) PILOT (as a witness) reports that they were flying as lead element of three Prefects conducting a Visual Run-in And Break (VRIAB) on RW08 at Cranwell. On contacting Tower, they were informed of a single Phenom in the visual circuit and were able to maintain visual contact with this aircraft. They were aware that the Phenom pilot was conducting a touch-and-go landing. With apparently significant overtaking speed, they decided to break over the runway threshold, with the Phenom on short final, believing the No.2 would break after 5sec with the Phenom still on the runway, and the No.3 to achieve safe forward separation after another 5sec. They perceived the aircraft on the runway would not build sufficient speed to close on the No.3 during their touch-and-go. They were able to maintain visual contact with the Phenom until established on the break, which was executed at 500ft and 180kt, and were surprised to learn that the Phenom crew had taken evasive action on the No.3 aircraft who they had expected to be safely ahead. No TAS or [EC device] alerts were triggered in the lead aircraft, and were suppressed in Nos. 2 and 3. With other aircraft joining visually behind the formation, they believed a delayed break or reposition at initials was not required in this case.

[The pilot of the Prefect commented that the formation] crew were visually following the lead element and therefore unsighted on the Phenom. The formation leader had anticipated adequate lateral separation from their overtake to allow the break to be initiated. The Phenom accelerated sufficiently during a touch-and-go to generate apparent closure on the No.3 Prefect. The formation crews only became aware of the issue following a ground debrief.

[The pilot of the Prefect opined that] if the Phenom pilot was able to close on the No.3 aircraft despite having initiated the break with considerable overtake, they had underestimated the acceleration capability of [the Phenom] during a touch-and-go landing.

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

THE PREFECT(2) PILOT (as a witness) reports that they were in the RHS and had control running-in from initials to 'give' the VRIAB. They had seen the Phenom as they ran in from initials and were content that they would be ahead of them when they broke, although they didn't remember seeing them at the point at which they broke.

THE CRANWELL CONTROLLER reports they had one Phenom in the visual circuit [when] a formation of three Prefects called to join the circuit. When the formation called Initial, [the Cranwell controller] stated "*1 Phenom, short final, touch-and-go, remaining*". The formation leader responded "*visual*".

As the Phenom was on the runway conducting its touch-and-go, the formation called "[C/S], *on the break to land, order 1,2,3*". They acknowledged this with "*Roger*". The Phenom pilot completed a touch-and-go and the formation landed behind.

They were subsequently informed that the Phenom pilot declared an Airprox because they had to level-off before continuing their climb-out as the No.3 of the formation obstructed their path. This Airprox was not declared on frequency.

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

Factual Background

The weather at Cranwell was recorded as follows:

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METAR EGYD 201450Z 05014KT 9999 SCT023 19/13 Q1022 NOSIG RMK WHT WHT
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Analysis and Investigation

Military ATM

Utilising occurrence reports and information from the local investigations, outlined below are the key events that preceded the Airprox. Where available they are supported by screenshots to indicate the positions of the relevant aircraft at each stage. The screenshots are taken from Unit radar recordings and present the radar presentation of the Phenom and Prefect formation available to the Cranwell Tower controller on the Aerodrome Monitor. [Note that the radar screenshots are orientated south-up].

Sequence of Events: At 1451:48, the Prefect formation established approximately 5NM in the approach, requested to join the visual circuit on the Cranwell Tower frequency. The Cranwell Tower controller approved the join and provided initial circuit Traffic Information; "*Join, Runway 08 right hand, QFE 1014, 1 in*". The '1 in' referred to the Phenom which was the only other aircraft established within the visual circuit.

At 1452:05, the Phenom pilot reported downwind with an intention to touch-and-go.
At 1452:41, the Phenom pilot was cleared to touch-and-go, following a gear confirmation.

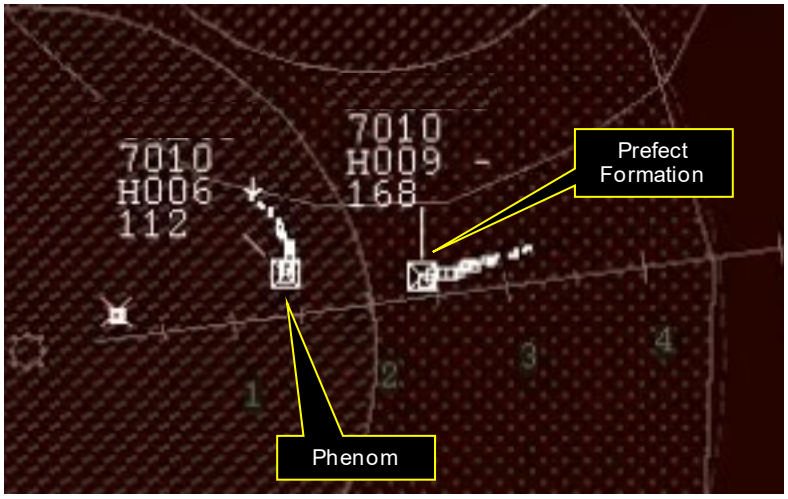

Figure 1 - 1453:00. Prefect formation reported at initial.

At 1453:00, the Prefect formation reported at initial. The Cranwell Tower controller acknowledged that and provided standard circuit Traffic Information: "*Phenom short finals, touch-and-go, remain, wind 050 12*". The Prefect formation had positioned for a low-level circuit, established at 500ft on Cranwell QFE.

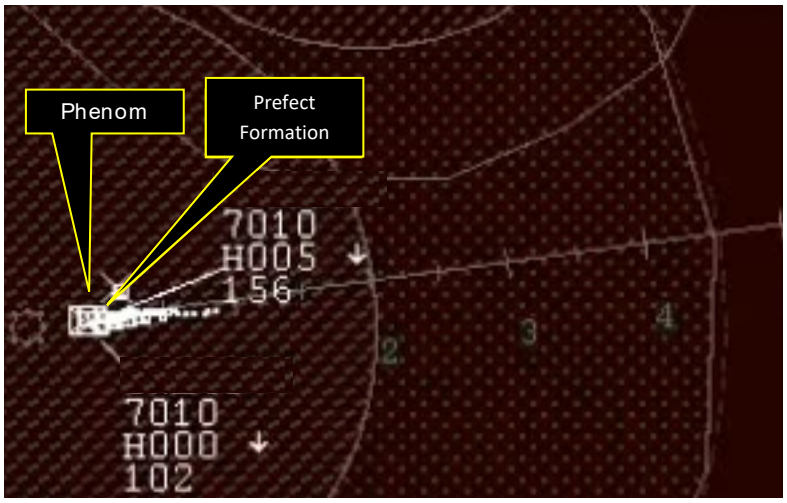

Figure 2 (1453:54). Prefect formation reported on the break.

At 1453:54, the Prefect formation reported on the break with an intention for a low circuit to land in the order 1, 2, 3. Breaking last, Prefect 3 turned right-to-left across and overhead the Phenom, causing the Phenom pilot to level-out from the climb following the touch-and-go.

CPA occurred at 1453:56 and was recorded as 0.0NM and 400ft separation.

Local BM Investigation: A local investigation was conducted by 3FTS following the event to identify the causal/aggravating factors. The outcome of the investigation was a perceived Loss of Safe Separation between two non-co-operating aircraft, however, no Air Traffic Service-related factors were identified. The investigation found that the Cranwell Tower controller provided relevant and timely Traffic Information within the visual circuit as per local procedures.

2 Gp BM Analysis: The actions of the Cranwell Tower controller were entirely in accordance with local procedures and standard military visual circuit operations. The process of position reports by pilots enables other pilots to gain situational awareness and, therefore, there was no requirement for the Cranwell Tower controller to provide the Phenom pilot with any additional information on the Prefect formation. Ultimately, integration into the visual circuit is the responsibility of the joining pilot, in this case the Prefect formation lead.

3FTS Investigation

[The] formation was recovering via a VRIAB whilst a Phenom was conducting touch-and-go circuits. The prior circuits were of a similar dimension (taken from radar replay) and, therefore, no significant difference in their conduct during this event. Although all formation crews were QFIs, they were assuming a ‘give back’ sortie profile due to this being a QFI upgrade training event and, therefore, the trainee break dimensions of 5sec between elements breaking was used instead of the QFI [standard] 2sec. Although the run-in from initials was a little non-standard (being slightly crossing from live side to deadside) the formation was appropriately situated for the break and this was not deemed a factor. The VRIAB for all three aircraft types based at Cranwell is a level VRIAB at 500ft QFE with normal circuit height for Prefect and Phenom being 1000ft and Tutor 800ft. All lead elements had sight of the Phenom on run-in, albeit fleetingly on its final turn, but the lead has greatest situational awareness of its location, and ordered a break approximately coincident with the Phenom touchdown. The formation lead had, in their experience, used this timing previously with no negative outcome. The break was actioned but, due to the Phenom's location, the wing of each Prefect obscured the crew from having sight of the Phenom as they ran parallel to the runway. The formation elements broke in turn and each captain felt that was conducted safely. Report of events from the Phenom pilot’s point of view is as per narrative, however, 7sec for a touch-and-go to be flown is an estimate and has not been definitively tested for accuracy as part of this investigation. It does however appear to be a viable rule of thumb.

UKAB Secretariat

An analysis of the NATS radar replay was undertaken and the Phenom could be positively identified from Mode S data. The formation-lead Prefect could be positively identified from Mode S data. The three Prefects in formation were not observed individually on the replay due to system processing resolving the radar returns into a single contact (Figure 3).

Both aircraft were depicted on the radar replay as flying at Flight Levels. A suitable correction was applied to calculate their altitudes. The diagram was constructed and the separation at CPA determined from the radar data.

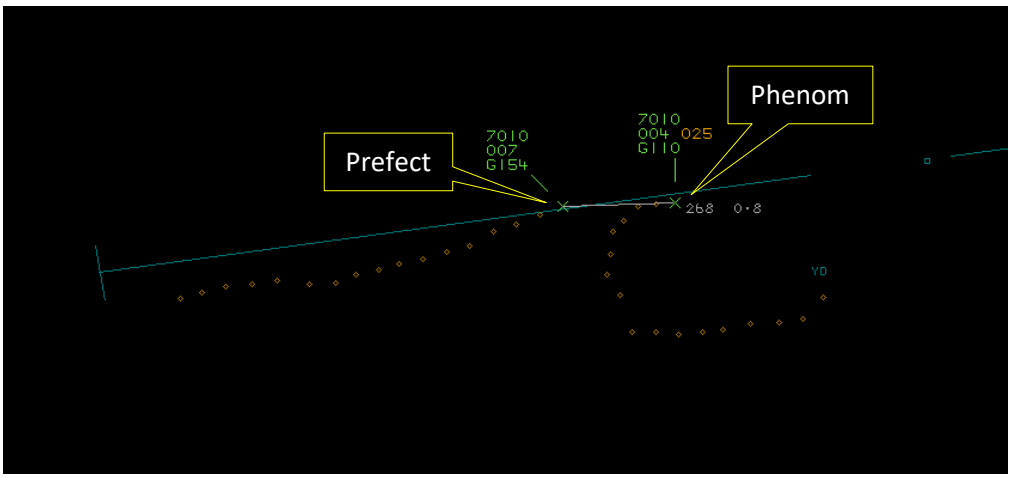

Figure 3 – Aircraft positions at 1453:18

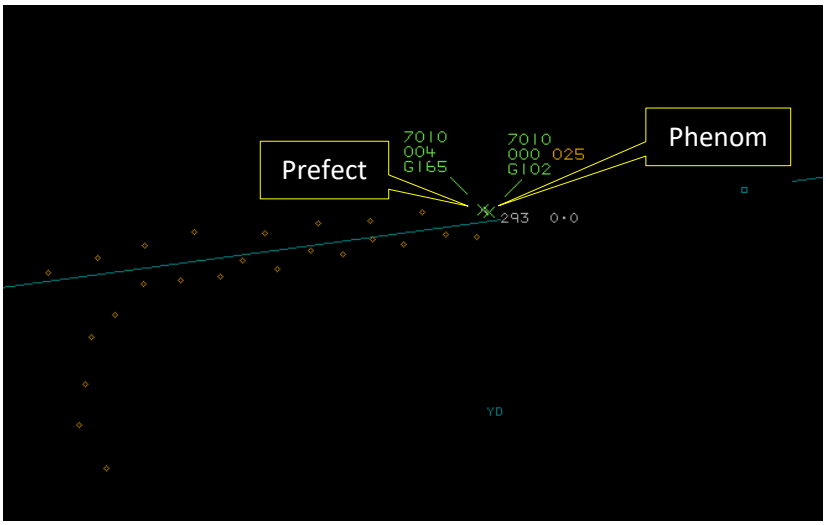

Figure 4 – CPA at 1453:54

The Phenom 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 hazard.[2] An aircraft operated on or in the vicinity of an aerodrome shall conform with or avoid the pattern of traffic formed by other aircraft in operation.[3]

Comments

HQ Air Command

A thorough investigation was carried out after this event, which revealed the lead Prefect pilot misjudged the space required between their formation break and the Phenom conducting a touch-and-go. After the lead Prefect [pilot] lost sight of the Phenom upon their own break into the circuit, the remaining Prefect [pilot]s stayed close to the Phenom, but without visual contact. Formation members assume responsibility for lookout once the aircraft ahead breaks but could not see the Phenom in this instance due to wing obscuration. The lead sets the spacing between other aircraft in the circuit when initiating the break. This is due to the other formation members concentrating on flying the formation references until the aircraft ahead breaks away. They cannot easily split their lookout to the circuit in these circumstances. Fortunately, the Phenom crew was visual with the conflicting Prefect and was able to take timely avoiding action. A review of the Prefect formation

[2] MAA RA 2307 paragraphs 1 and 2.
[3] MAA RA 2307 paragraph 17.

lead training and procedures has been conducted and this event has been a useful prompt for ongoing scrutiny.

Summary

An Airprox was reported when a Phenom and a Prefect flew into proximity in the Cranwell ATZ at 1454Z on Friday 20th September 2024. Both pilots were operating under VFR in VMC and in receipt of an ACS from Cranwell Tower.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from both pilots, radar photographs/video recordings, a report from the air traffic controller involved and a report from the appropriate operating authority. 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 first considered the actions of the pilot of the Phenom. Members noted that they had been conducting circuits to RW08RH when the lead pilot of the Prefect formation, Prefect(1), had called on the Cranwell Tower frequency to join for a VRIAB. The Cranwell Tower controller subsequently passed information on the Phenom to the pilot of Prefect(1). An advisor with particular knowledge of military ATC procedures confirmed that the pilot of the Phenom would not have expected to have been passed information regarding the inbound Prefect formation directly. Members surmised that the radio call to the pilot of the Prefect had been assimilated by the pilot of the Phenom as their narrative report had not indicated that the appearance of the Prefect formation had been a surprise. Additionally, members noted that the trainee in the left-hand seat of the Phenom had visually acquired the Prefect formation approaching from the west. As the touch-and-go had been conducted, the pilot of the Phenom had sighted Prefect(3), had been concerned by its proximity (**CF3**) and had assessed that the safest course of action had been to instruct their trainee to arrest their climb and to level the Phenom at 200ft.

In consideration of the aspect of EC interactions between the aircraft, members assessed that the TAS fitted to Prefect(3) had been capable of detecting the Phenom, and the TCAS fitted to the Phenom had been capable of detecting Prefect(1) (as that had been the only Prefect in the formation that had a transponder that had been operated). However, members agreed that, essentially, the safety barrier of EC interactions had been 'Not Used' due to the encounter having occurred in an environment where the pilots involved would not have been expected to have referred to their EC devices.

Members next turned their attention to the actions of the pilot of Prefect(1). A member with particular knowledge of military flight training operations explained that they, as formation lead, would have had overall responsibility for lookout. It was explained that, whilst the following pilots could have broken away from the formation if, in extremis, they had considered that it had been necessary, it would ordinarily have been expected that they 'follow the lead'. Members noted that the pilot of Prefect(3) believed that they had visually acquired the Phenom during their approach but could not recall precisely at which point during the event they may have done so.

Members pondered the timing of the procedure and noted that the pilot of the Phenom had considered that a touch-and-go would take 7sec and the Prefect pilots had conducted their successive breaks at 5sec intervals. Given that the pilot of the Phenom had instructed their trainee to level at 200ft due to the proximity of Prefect(3), it was clear to members that the timing of the break by the pilot of Prefect(1) had not been judged accurately. Members agreed that the pilot of Prefect(3) had not conformed with, nor had avoided, the pattern of traffic formed by the Phenom in the circuit (**CF2**).

Members turned their attention to the procedures pertaining to the VRIAB at Cranwell and noted that the prescribed height for the three aircraft types based at Cranwell is 500ft QFE with the normal circuit height for Prefect and Phenom being 1000ft and Tutor at 800ft. It occurred to members that, whilst it had been expected that the VRIAB would have been conducted at 500ft QFE, due to the potential for uncertainty of the performance of a different aircraft type, the VRIAB could be conducted at circuit height when mixed-types are in operation in the circuit. Members agreed that the procedure had, perhaps,

been inadequate to have ensured safe separation between aircraft of different types (**CF1**) and resolved to make a Recommendation that:

> "RAF Cranwell reviews the procedure for VRIAB with respect to the altitude at which a VRIAB is conducted when mixed aircraft types are in operation at the airfield. This should be coordinated through the MAA in case any findings are relevant to other Defence airfields where similar circumstances exist.".

Members next considered the actions of the Cranwell controller and noted that they had passed Traffic Information on the Phenom in the circuit to the pilot of Prefect(1). It was noted that reciprocal Traffic Information had not been passed to the pilot of the Phenom but recalled their thoughts from earlier in the discussion and agreed that there had been little else that the Cranwell controller could have done to have assisted matters.

Concluding their discussion, members agreed that the pilot of Prefect(1) had not appreciated the performance of the Phenom and had not judged the timing of the VRIAB correctly. Members acknowledged that the pilot of the Phenom had been concerned by the proximity of Prefect(3) but agreed that they had had sufficient time to have considered, and to have taken, the safest course of action. Members agreed that safety margins had been reduced but were satisfied that there had not been a risk of collision. The Board assigned Risk Category C to this event.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK

Contributory Factors:

	2024239			
CF	**Factor**	**Description**	**ECCAIRS Amplification**	**UKAB Amplification**
	Flight Elements			
	• Regulations, Processes, Procedures and Compliance			
1	Organisational	• Flight Operations Documentation and Publications	Flight Operations Documentation and Publications	Inadequate regulations or procedures
	• Tactical Planning and Execution			
2	Human Factors	• Monitoring of Environment	Events involving flight crew not to appropriately monitoring the environment	Did not avoid/conform with the pattern of traffic already formed
	• See and Avoid			
3	Human Factors	• Perception of Visual Information	~~Events involving flight crew incorrectly perceiving a situation visually and then taking the wrong course of action or path of movement~~	Pilot was concerned by the proximity of the other aircraft

Degree of Risk: C.

Recommendation: RAF Cranwell reviews the procedure for VRIAB with respect to the altitude at which a VRIAB is conducted when mixed aircraft types are in operation at the airfield. This should be coordinated through the MAA in case any findings are relevant to other Defence airfields where similar circumstances exist.

Safety Barrier Assessment[4]

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

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

Flight Elements:

Electronic Warning System Operation and Compliance were assessed as **not used** because the Phenom and Prefect pilots had conducted their respective operations without the aid of electronic conspicuity equipment.