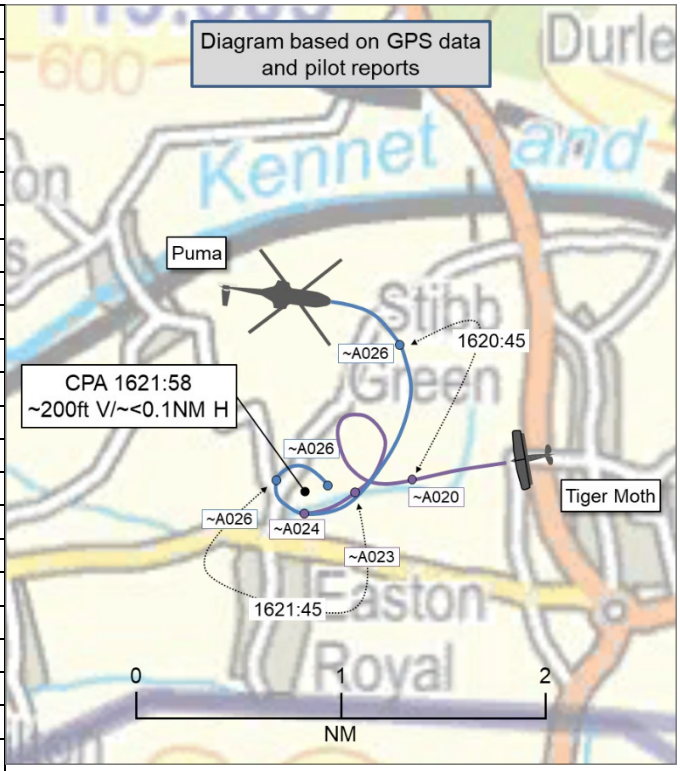
AIRPROX REPORT No 2022160

Date: 04 Aug 2022 Time: 1622Z Position: 5121N 00142W Location: 3.5NM S Marlborough

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	Puma HC2	DH82A Tiger Moth
Operator	HQ JHC	Civ FW
Airspace	London FIR	London FIR
Class	G	G
Rules	VFR	VFR
Service	Listening Out	None
Provider	Salisbury Ops	N/A
Altitude/FL	~2600ft	~2400ft
Transponder	A, C, S	Not fitted
Reported		
Colours	Green, grey, red	Green, silver
Lighting	NR	None
Conditions	VMC	VMC
Visibility	>10km	>10km
Altitude/FL	2200ft	2000ft
Altimeter	QNH (NR hPa)	QNH (NK hPa)
Heading	90°	260°
Speed	100kt	75kt
ACAS/TAS	TAS	Not fitted
Alert	None	N/A
Separation at CPA		
Reported	0ft V/150m H	200ft V/200m H
Recorded	~200ft V/~<0.1NM H	



THE PUMA PILOT reports that they were in transit, under VFR and at low level, to [destination] within D128 of the Salisbury Plain Training Area (SPTA) for confined area landings. On entering the Low Flying Area, they attempted to contact Middle Wallop but were unable to raise them. Instead, an information call was transmitted blind and they continued to the SPTA, gaining clearance from Salisbury Ops on UHF before entering the [destination area] to conduct training as planned. On completion, the Puma departed to the north to identify a suitable site in the vicinity of Burbage to conduct autorotations and PFLs. Due to the lack of communication with Middle Wallop, the crew informed Salisbury Ops that they would remain on frequency for a listening watch. On identifying a suitable field, HASELL checks were completed while climbing to 2200ft. The captain briefed that a 180° lookout turn would be flown before entering the PFL. During the lookout turn, the crewman identified an intruding aircraft in the 3 o'clock position at the same level and transiting in the opposite direction. No TAS alert was provided to the crew. The pilot visually acquired the aircraft (a vintage biplane type) at an estimated 1NM range, and the Puma pilot elected to continue to orbit to ensure safe separation prior to conducting the PFL.

As the Puma pilot continued the orbit to the right, the other aircraft turned towards them, reducing the separation distance. As the Puma continued into a second orbit, the other aircraft tightened its turn, positioning itself in the 4-5 o'clock position from the Puma, and pointing towards the Puma with decreasing range. As it got closer to the limit of the Puma crew's field of view, the Puma pilot tightened their turn in order to maintain visual contact and to attempt to force the chasing aircraft to discontinue its manoeuvre. On doing so, the chasing aircraft also tightened its turn, further reducing the separation. This continued for approximately 4 orbits [they recall], with the chasing aircraft adjusting its angle-of-bank to keep the Puma aircraft in its 12 o'clock position throughout. It was the shared opinion of the Puma crew that the other aircraft seemed to be attempting to 'tailchase' the Puma. At its closest, the other aircraft was an estimated 6-10 rotor spans (100-150m) and the captain was able to read the aircraft registration from the fuselage. As the Puma crew discussed the situation and their options, the

other aircraft eventually broke off its chase, turning left behind the Puma and departing the area. The Puma crew continued with their planned sortie.

An Airprox report was not submitted to Salisbury Ops on the radio as the crew had maintained visual contact throughout the event and were not sure at the time that an Airprox had occurred. After landing, and in-briefing with the sortie authoriser, the crew decided that an Airprox had occurred due to the close proximity between the two aircraft and that the Puma was effectively forced into undertaking prolonged avoiding action to maintain visual contact. It is the opinion of the Puma crew that separation was only maintained because of the actions of the Puma crew despite the actions of the other aircraft. They believe there was a high risk of mid-air-collision due to the deliberate reduction in separation and positioning at the limits of the crew's external view by the intruder aircraft.

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

THE TIGER MOTH PILOT reports that during a transit flight at 2000ft on a westerly heading they observed a military helicopter in their 10 o'clock position, approximately 3NM distant and 1000ft above, flying straight-and-level. It soon became clear that the helicopter was not on a collision course but crossing left-to-right ahead. It subsequently passed through their 12 o'clock position at about 0.5NM range and approximately 800ft above. Shortly after that, the helicopter entered a level right turn, passing down their right side. On passing the 4 o'clock position, they judged that, should it continue with the same rate of turn, it would pass into their 6 o'clock position with significant overtake, above and behind, and they would be largely unsighted. Not knowing the intentions of the other pilot and being aware of the downwash produced by heavy helicopters and their capacity for rapid descents, they became uncomfortable with this development. It was clearly not a navigational turn but likely a clearing turn prior to a handling exercise so they initiated a right turn to keep visual with the helicopter and be best positioned for avoiding action should the need arise. The Tiger Moth's turn was effectively an orbit with half the diameter and at half the speed of the helicopter in order to keep visual with it in the 2 o'clock position. Uncertain of the extent of the downwash, and unable to climb above it, after one complete orbit they resumed their westerly track by diving behind the helicopter well below where the downwash was judged to be. However, the helicopter continued to turn, presenting a repeat of the previous situation. By continuing the turn, the Tiger Moth pilot reasoned that [the Puma pilot] was not visual with them or they would have rolled out and cleared the area. For the same reasons as before, they flew a second orbit, tighter this time, to keep visual and to remain inside the curtain of rotor downwash potentially lethal to a wood-and-fabric biplane. During this second orbit they could see a crewman silhouetted through the open rear doors which confirmed that they were now aware of their presence. Unable to climb above its downwash they again elected to dive behind and well below its wake to resume a westerly track. This time, the helicopter rolled out on an easterly heading and soon entered a rapid descent into low level.

Based on their military experience flying air-combat, and 17 years of formation display flying, they estimate that they were no closer than 200m from the helicopter. Whilst the manoeuvres to deconflict with the helicopter and its downwash might have been as incomprehensible to the helicopter pilot as their manoeuvres were to them, there was at no time any risk to either aircraft and they were in full control throughout the mitigation process.

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

THE SALIBURY AIR OPERATIONS RANGE OPERATOR reports that the Airprox occurred outside the Danger Area (DA) and even though they would normally pass a caution if an aircraft had been on a listening watch, they did not for the following reasons [which they had subsequently confirmed from the pilot's report];

a) The Puma pilot was leaving the DA near Burbage to work in the Pewsey Vale area and although still on frequency, had already left the DA.

b) The Tiger Moth called requesting entry into the DA from the north, about 5NM west of Burbage,[1] [to destination airfield]. There was no indication that the aircraft was anywhere near the Pewsey Vale area and they did not have SSR which they could have used as an SA tool. Due to the perceived distance, no call was made by Air Ops to either aircraft.

c) The aircraft were on different frequencies.

Factual Background

The weather at Boscombe Down was recorded as follows:

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METAR EGDM 041550Z 31011KT CAVOK 21/08 Q1016 RMK BLU
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Analysis and Investigation

UKAB Secretariat

Analysis of the NATS radar replay and of the GPS flight logs kindly provided by both the Puma pilot and the Tiger Moth pilot was undertaken. The Puma appeared on the radar replay, albeit sporadically, but could be positively identified from Mode S data (see Figure 1). The flightpath of the Puma could not be fully reconstructed as the radar returns were too fragmented. The Tiger Moth was not observed on the radar replay. The timestamps within the GPS data for the Puma were assessed not to be accurate and construction of the diagram was based on the GPS data and an integration of the event narratives from each pilot. An estimation of the timing, and separation of the aircraft at CPA was determined from these separate data sources.

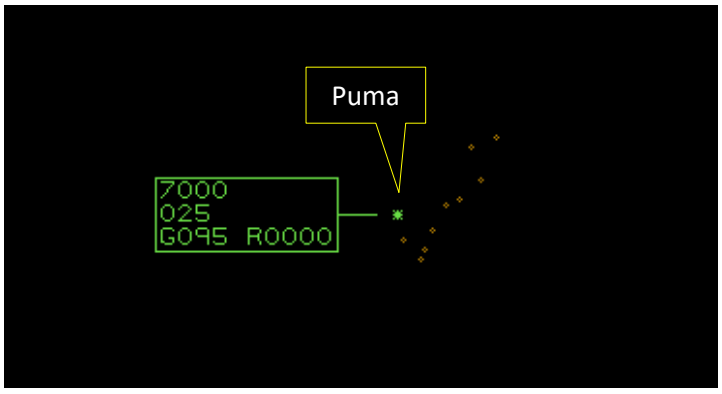

Figure 1 – CPA at 1621:58

The Puma and Tiger Moth 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] The aircraft that has the right-of-way shall maintain its heading and speed.[3] An aircraft that is obliged by the following rules to keep out of the way of another shall avoid passing over, under or in front of the other, unless it passes well clear and takes into account the effect of aircraft wake turbulence.[4] If the incident geometry is considered as converging, the aircraft that has the other on its right shall give way.[5] If the incident geometry is considered as overtaking then the aircraft that is being overtaken has the right-of-way and the overtaking aircraft, whether climbing, descending or in horizontal flight, shall keep out of the way of the other aircraft by altering its heading to the right, and no subsequent change in the relative positions of the two aircraft shall absolve the overtaking aircraft from this obligation until it is entirely past and clear.[6]

[1] The Tiger Moth entered the Danger Area approximately 4min after CPA.
[2] (UK) SERA.3205 Proximity. MAA RA 2307 paragraphs 1 and 2.
[3] (UK) SERA.3210 Right-of-way (a). MAA RA 2307 paragraph 6.
[4] (UK) SERA.3210 Right-of-way (c). MAA RA 2307 paragraph 5.
[5] (UK) SERA.3210 Right-of-way (c)(2) Converging. MAA RA 2307 paragraph 12.
[6] (UK) SERA.3210 Right-of-way (c)(3) Overtaking. MAA RA 2307 paragraph 14.

Comments

JHC

Prior to conducting PFLs, pilots are instructed to carry out HASELL checks. The lookout check worked correctly and spotted a potential confliction while carrying out an additional orbit to build in separation. During this orbit the Tiger Moth pilot decreased separation by turning towards the Puma and potentially compromising the safety of both Air Systems. At all times the Puma crew followed SOPs and the sortie objectives were not affected.

AOPA

When flying in Class G airspace without any form of radar service or EC, lookout is the only mitigation for MAC avoidance. If pilots are unsure of the other pilot's intentions, and feel uncomfortable about it, the best thing is to fly away from the situation in the most effective direction and at an appropriate altitude.

Summary

An Airprox was reported when a Puma and a Tiger Moth flew into proximity 3.5NM south of Marlborough at 1622Z on Thursday 4th August 2022. Both pilots were operating under VFR in VMC, the Puma pilot on a listening watch with Salisbury Air Ops and the Tiger Moth pilot not in receipt of an ATS.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available consisted of reports from both pilots, radar photographs/video recordings, GPS track data, 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 first considered the factual elements in the moments before the encounter. Members noted that neither pilot had been in receipt of an ATS and had not had any situational awareness of the other aircraft (**CF2**). The EC equipment fitted to the Puma would not have detected the presence of the Tiger Moth and the Tiger Moth had not been fitted with any EC equipment (**CF3**).

Members next turned their attention to the actions of the pilots, and one member with particular knowledge of Puma operations proffered that the Puma pilot, having spotted the confliction, had followed their SOPs correctly. Further, that the continued presence of the Tiger Moth indicated that the Tiger Moth pilot had in fact considered the risk to the integrity of the Tiger Moth's structure from the helicopter's downwash as negligible. The member continued, endorsing the view of the Puma pilot that the pilot of the Tiger Moth had been deliberately chasing the Puma. Whilst some members agreed that the actions of the pilot of the Tiger Moth had appeared to suggest that they had been chasing the Puma, other members remarked that the actions of both pilots appeared to suggest that neither had wanted to 'give way' to the other and that they had become locked into competing orbits. The Board was in agreement that neither pilot had adapted their dynamic plan sufficiently to resolve the unfolding encounter more expeditiously (**CF1**).

Turning their attention to the risk that this encounter had presented to each pilot, it was agreed that the pilot of the Tiger Moth, flying lower than the Puma throughout the encounter, would have faced the greatest risk in that they had prolonged their proximity to the helicopter's downwash. The discussion continued and a member with knowledge of the physics of rotor downwash, explained to the Board that the 'curtain of downwash' referred to by the pilot of the Tiger Moth would not have acted vertically downwards but would have radiated away from helicopter at an angle commensurate with the helicopter's angle of bank throughout its orbits. Members agreed that it was apparent that the pilot of the Tiger Moth had attempted to keep their orbits centred within those flown by the Puma pilot and that they had been waiting for the Puma pilot to leave the area first.

The Board concurred that the downwash from a helicopter, particularly a large helicopter such as the Puma, would have had a significant effect on a light-aircraft, especially on the relatively fragile structure of a vintage biplane. A majority view prevailed that the pilot of the Puma may not have fully appreciated the risk that their helicopter's downwash had presented to the Tiger Moth pilot (**CF5**).

Concluding their discussions, members agreed that each pilot had flown close enough to the other to have caused concern (**CF4**). There was broad agreement that the most prudent course of action would have been for each pilot to have vacated the area, vertically or laterally, in the most expeditious way possible and to not have continued to orbit around each other. In determination of overall risk, the Board agreed that safety had been degraded, but members were satisfied that there had been no risk of collision. Consequently, the Board assigned a Risk Category C to this event.

PART C: ASSESSMENT OF CONTRIBUTORY FACTORS AND RISK

Contributory Factors:

	2022160			
CF	**Factor**	**Description**	**ECCAIRS Amplification**	**UKAB Amplification**
	Flight Elements			
	• Tactical Planning and Execution			
1	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			
2	Contextual	• Situational Awareness and Sensory Events	Events involving a flight crew's awareness and perception of situations	Pilot had no, late, inaccurate or only generic, Situational Awareness
	• Electronic Warning System Operation and Compliance			
3	Technical	• ACAS/TCAS System Failure	An event involving the system which provides information to determine aircraft position and is primarily independent of ground installations	Incompatible CWS equipment
	• See and Avoid			
4	Human Factors	• Incorrect Action Selection	Events involving flight crew performing or choosing the wrong course of action	Pilot flew close enough to cause concern
5	Human Factors	• Lack of Individual Risk Perception	Events involving flight crew not fully appreciating the risk of a particular course of action	

Degree of Risk: C

Safety Barrier Assessment[7]

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

Flight Elements:

Tactical Planning and Execution was assessed as **partially effective** because neither pilot had adapted their dynamic plan sufficiently to resolve the unfolding encounter more expeditiously.

Situational Awareness of the Conflicting Aircraft and Action were assessed as **ineffective** because neither pilot had been aware of the presence of the other.

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

Electronic Warning System Operation and Compliance were assessed as **ineffective** because the EC equipment fitted to the Puma would not have been expected to have detected the presence of the Tiger Moth. The Tiger Moth was not fitted with EC equipment.

See and Avoid were assessed as **partially effective** because each pilot could have elected to discontinue their orbiting manoeuvres sooner. The pilot of the Puma may not have appreciated the effect that the helicopter downwash had presented to the Tiger Moth pilot.