

## AIRPROX REPORT No 2012065

Date/Time: 14 May 2012 2135Z (Night)

Position: 5108N 00146W  
(1km WSW RW35 THLD  
Boscombe Down  
- elev 407ft)

Airspace: ATZ (Class: G)

Reporting Ac Reported Ac

Type: Apache AH1 Gazelle AH1

Operator: HQ AAC HQ AAC

Alt/FL: 250ft↑ 500ft  
QFE (1000hPa) NR

Weather: VMC NR VMC NR

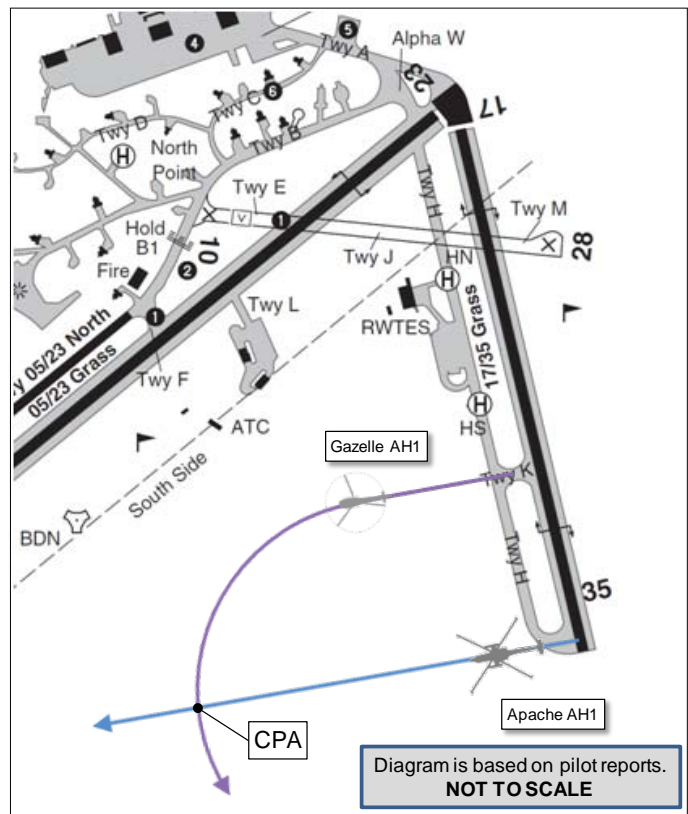
Visibility: 20km NR

Reported Separation:

100 - 200ft V/H 200ft V/0m H

Recorded Separation:

NR



## PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

**THE APACHE PILOT** reports flying a local night advanced training sortie using NVS and operating RW23 LHC 'South Side', with navigation and red anti-collision lights selected 'on'. The SSR transponder modes 3/A, C and S were selected on but TCAS was not fitted. In the hover over the RW35 threshold he conducted a lookout turn in order to obtain visual contact with a Gazelle helicopter he believed to be late DW or on L base; red lights were seen in that area. He completed the lookout turn, transitioned into forward flight into wind heading 260° and accelerated to 70kts. 'At circa [hgt] 250ft ...' [Boscombe Down QFE 1000hPa] the Gazelle appeared in his 5 o'clock position approximately 100-200ft above him and turning over the top. He stopped climbing and extended into wind to achieve greater separation. The Gazelle then moved to operate RHC to the N of RW23.

He observed that the Gazelle's anti-collision lights did not appear to be functioning, that its navigation lights blended into the clutter of other lights on the airfield, that it did not stand out from the backdrop of a very well lit up area around Boscombe Down and that operations on the South Side were being conducted 'negative R/T'.

He assessed the risk of collision as 'High'.

**THE GAZELLE PILOT** reports conducting a NVG currency check operating 'on South Side circuit' with red upper anti-collision light, lower IR anti-collision light, position lights and IR searchlight selected on. The SSR transponder modes 3/A, C and S were also selected 'on'. He was the handling pilot for the sortie and was seated in the R seat, with the non-handling pilot (NHP) seated in the L seat. At approximately 2015 he was advised by ATC that 'negative R/T' was being used. He commenced LHCs at hgt 500ft [QFE 1000hPa] from/to the intersection of Twy K and RW35 using a hdg of about 260°, while an Apache was 'working RW23'.

On commencement of his 2<sup>nd</sup> cct the Apache requested to work South Side from/to the approach end of RW35, heading approximately 260°. He continued LHC while deconflicting with the Apache. After conducting a clearing hover turn and verifying that the Apache was on the ground, he commenced a take-off for a LHC. At about hgt 450ft he called 'clear me left' to the NHP who visually cleared the area into the turn, saw nothing and called 'clear'. After approximately 20° of hdg change he called

'Apache' and commenced a gentle climb. Almost immediately both crew saw the Apache pass approximately 200ft below the ac from their L rear.

He assessed the risk of collision as 'Low'.

**THE BOSCOMBE DOWN TOWER** controller reports that an Apache pilot joined the cct and requested permission to conduct operations onto RW23. He authorised the pilot to join the light ac cct for RW23. The Apache pilot then landed and asked for takeoff clearance, which he gave. He noted that the Apache pilot was conducting LHCs instead of normal RH not above 500ft; however, he allowed the ac to continue because the cct was clear and he presumed the pilot's intention was to avoid overflying the sleeping quarters Northside. A Gazelle pilot, who had been working with Boscombe APP to the W of the A/D, then called for recovery to the South Side for a crew change so he held the Apache pilot when he had landed on RW23 and asked him to report ready for departure.

Following the crew change the Gazelle pilot requested take-off, remaining South Side, which he granted. The Apache pilot then called for departure from RW23. He informed him of the Gazelle remaining South Side and that 'from now on' he would be cleared RW23 RHCs in order to deconflict laterally from the Gazelle. The Apache pilot agreed and stated that he was visual with the Gazelle. The Apache then 'surprisingly' requested join South Side, reconfirming that he was visual with the Gazelle. He informed the Gazelle that the Apache had requested to join South Side and was visual with him and the Apache then stated that they would be operating by the RW35 threshold. The controller again asked the Apache pilot if he was visual with the Gazelle to which he replied 'affirm'. After 3 verbal confirmations that the Apache pilot was visual with the Gazelle, he permitted the ac to work autonomously South Side, in accordance with the Flying Order Book (FOB), Chap 6, Para 7m:

'When RWY 17/35 is not in use, helicopters may operate South-Side autonomously between ground level and 500ft QFE ...; when operating autonomously pilots are to maintain a listening watch on Stud 3 at all times, except when ATC approve otherwise.'

After a short period the Gazelle pilot requested to cross and re-cross the Main; the controller asked him if he was visual with the Apache to which the pilot replied affirm'.

Both ac were operating VFR in the visual cct. He had given ample opportunity for the Apache to deconflict with the Gazelle by instructing the pilot to operate North Side and then on 3 occasions ensuring that he was visual with the Gazelle. He also followed the SOP for South Side operations by allowing them to work autonomously. At no point did either pilot request a position report of the other ac, or ask to revert to positive R/T.

[UKAB Note(1): The Boscombe Down weather was reported as follows:  
METAR EGDM 142150Z 25007KT CAVOK 06/05 Q1014 BLU NOSIG].

**THE BOSCOMBE DOWN ATC SUPERVISOR** reports that he received a request, via the ATC Switchboard, that Middle Wallop was requesting to operate at Boscombe during their own night flying period; since a Gazelle from Boscombe was planned to carry out NVG Ops at the airfield this request was refused. Later that afternoon a further request came from Stn Ops that Middle Wallop was requesting that they operate an ac at Boscombe. Stn Ops called RWTES and it was agreed that they would de-conflict and that they were content to operate alongside the Apache. With all parties happy and Middle Wallop aware that a Gazelle would be conducting NVG operations, in order to be flexible he agreed to permit the Apache to operate during Boscombe night flying.

**BM SAFETY MANAGEMENT** reports that this incident was between a Gazelle and an Apache in the visual circuit at Boscombe Down airfield at night in VMC, with both ac conducting NVG training. The ac were operating 'negative R/T', in accordance with the Boscombe Down FOB.

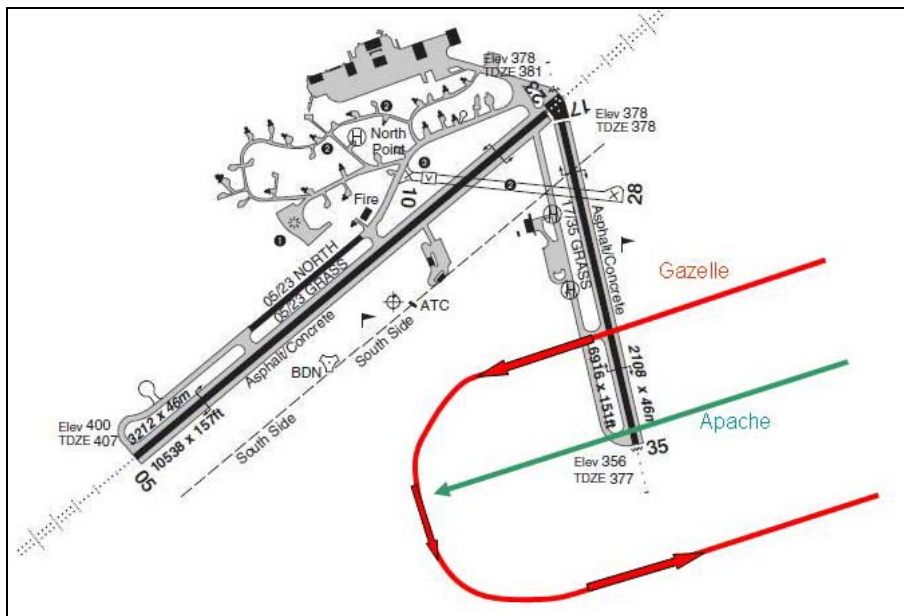
The ATC Supervisor rostered for the morning of the incident reported that he was contacted by the Apache unit seeking permission for their ac to operate at Boscombe Down that night, iaw FOB Order 20; however, Order 20 relates to the operation of Middle Wallop based Apaches at Boscombe Down

when ATC is closed. Since the Gazelle was planned to operate that night and would be operating under NVG, permission for the Apache to operate was denied. That afternoon, the ATC Supervisor received 2 further requests for the Apache to operate at Boscombe Down that night. The first request was made in accordance with Order 20 and was again refused for the same reason; the second request was made through Boscombe Ops. Boscombe Ops liaised with the Gazelle's unit and obtained their agreement for the Apache to operate at Boscombe and to 'de-conflict' with the Gazelle; on that basis, given that Order 20 no longer applied, the ATC Supervisor agreed to permit the Apache to operate at Boscombe Down that night.

The incident sequence commenced at 2121:59 as the Gazelle got airborne to conduct left-hand circuits, remaining South-side, from the intersection between Twy K and RW35 (see Figure 1). The Gazelle sought confirmation from the ADC that they could operate negative R/T, which was confirmed at 2123:30. The then extant Boscombe Down FOB, Order 6, Para 7 m (i), stated that '...helicopters may operate South-side autonomously between ground level and 500ft QFE...When operating autonomously pilots are to maintain a listening watch on [the TWR freq]'; the FOB did not differentiate between day or night in this order.

The Apache had been flying left-hand circuits to RW23 and, at 2125:18, was given clearance to take off and instructed to, "make this a 23 normal right-hand circuit with a Gazelle operating south-side"; the pilot replied "[c/s] visual, cleared for takeoff and right hand circuit". At 2125:39, the Apache pilot requested a, "change of intentions, request left-hand circuits, visual with the Gazelle, for a join south-side". The ADC instructed the Apache to, "join south-side, 1 Gazelle". At 2126:04, the ADC advised the Gazelle pilot that, "the Apache on the runway is about to get airborne and join south-side, visual with yourself" which he acknowledged.

At 2129:46, the Apache stated that they were, "established south-side to operate threshold runway 35" (see Figure 1). The ADC asked them to, "confirm visual with the Gazelle" to which the Apache replied, "[c/s] visual". The ADC acknowledged this visual call and informed the Apache that they were, "happy for you to work negative R-T south-side", which was read-back by the pilot.



**Figure 1: Boscombe Down with Operating Locations of Gazelle & Apache**

Based upon the reports of the pilots and the R/T transcript, the Airprox occurred at some point between 2130:05 and 2138:36 as the Gazelle climbed over the Apache, which had recently transitioned to forward flight and was climbing through 250ft.

[UKAB Note (2): The incident took place below the base of recorded radar cover].

The Apache crew reported that they believed they had visually acquired the Gazelle downwind/left-base; however, subsequently, they have reported that they mistook environmental lighting in the area around the airfield for the Gazelle lights. Moreover, they stated that they believed the Gazelle's anti-collision lights (strobes) were not operating.

From an ATM perspective, the Supervisor permitted the Apache to operate at Boscombe Down only having confirmed that the Gazelle's unit was happy for the Apache to operate. At the time the ADC authorised the Apache to operate negative R/T; this was done in accordance with extant unit orders. Moreover, the ADC ensured that both aircrews were aware of each other's ac and that the Apache pilot was visual with the Gazelle, prior to permitting the ac to operate negative R/T; consequently, ATM was neither a causal nor contributory factor in this Airprox. The environmental lighting around Boscombe Down caused the Apache crew to misidentify the Gazelle and, contributed to by their operating negative RT, fly into conflict with the other ac.

Boscombe Down has amended the FOB to state that negative R/T may not be utilised at night when more than one ac is operating south-side.

[UKAB Note (3): Boscombe Down conducted a flight safety investigation into this incident, which is reproduced below].

**THE BOSCOMBE DOWN FLIGHT SAFETY OFFICER** comments that on 14 May 2012 a Rotary Wing Test and Evaluation Squadron (RWTES) Gazelle (XX443), with 2 POB, was conducting an NVG currency sortie in the dedicated helicopter area (Southside) of the visual circuit at MOD Boscombe Down. Concurrently an Apache AH1 (XJ170), from 7 Regt AAC Middle Wallop with 2 POB, was also Southside and conducting a Night Vision System (NVS) refresher sortie. Both aircraft were operating autonomously up to 500ft iaw the MOD Boscombe Flying Order Book (FOB) and conducting LHC into wind (approx 260°) centred on a position to the N of Twy Kilo on RW35 (Gazelle) and the threshold of RW35 (Apache) respectively.

2. Immediately prior to the incident, the crew of the Gazelle conducted a visual lookout turn, whilst in the hover on runway 35 main, and positively identified the Apache, hovering, on the threshold of runway 35. The Gazelle then transitioned on an approximate heading of 260° accelerated to 90 kts IAS and planned to level at 500ft QFE. A short time later, the Apache crew also conducted a lookout turn whilst on the threshold of runway 35 main and, believing that the Gazelle was late downwind/base leg, identified red lights towards that position. No further hazards were detected visually, on the aircraft radar or NVS and the Apache transitioned on an approx heading of 260° accelerated to 70 kts and planned to level at 300ft QFE. As the Gazelle approached 450ft the handling pilot (HP-right seat) called for the non-handling pilot (NHP) to clear him left which he did. The HP commenced a left turn and after approximately 20° of turn he saw the Apache approaching from the left rear of his aircraft, called it and instinctively commenced a gentle climb levelling at 600ft QFE. Simultaneously, as the Apache crew approached 250ft QFE they saw the Gazelle appearing from, what they perceived to be, their 5 o'clock position turning over the top as the Apache pilot started to level off. Both crews estimated the distance between both aircraft was between 100-200ft with little time for effective avoiding action.

## NARRATIVE OF EVENTS

3. Gazelle Planning. A RWTES pilot instructor planned to fly 2 consecutive NVG currency sorties, transiting to and from Deptford Down landing strip in D124 within the Salisbury Plain Training Area, with an intermediate engine running crew change at MOD Boscombe Down. The Gazelle captain had been notified (via RWTES Ops staff) of, and raised no objections to, the Apache Practice Diversion (PD) to MOD Boscombe Down. Sortie planning was routine and the Apache sortie details were noted by the Gazelle crew on the Central Aviation Data System (CADS) during their planning and the sortie brief. Apart from a brief crossover period in the circuit, during the planned Gazelle intermediate crew change, there were no other conflicts with the Apache and no obvious requirement for further de- confliction with the Apache crew.

4. Gazelle Execution. The first Gazelle sortie departed to Deptford Down but, due to an administrative error, the crew found that no booking into Deptford Down had been made. They were able to negotiate a clearance and completed this sortie uneventfully prior to recovering to MOD Boscombe Down. During this period, the Apache had arrived into the MOD Boscombe Down circuit and was conducting circuits on runway 23 main with a left hand circuit to avoid domestic site disturbance. The Gazelle crew recovered to Southside and conducted an intermediate crew change whilst trying to secure a further slot at Deptford Down. This was unsuccessful and the captain replanned the sortie to remain Southside for approximately 20 mins on initial departure. Once airborne, the Gazelle captain requested negative RT iaw the MOD Boscombe Down FOB and this was approved by ATC. There was no direct discussion with the Apache crew following the decision to stay in the circuit rather than departing to Deptford Down. That said, both aircraft were visual with each other and on the same radio frequency whilst in the MOD Boscombe Down circuit. In addition, the ATC controller informed each aircraft of the other's presence and confirmed mutual visual contact on several occasions despite operating negative RT.

5. Although the Gazelle crew maintained visual separation on the Apache in the circuit, they were not fully aware of the Apache sortie profile or detailed circuit parameters. Immediately prior to the incident, the Gazelle crew had completed a lookout turn and identified the Apache on the 35 main threshold. They turned to the West and commenced a transition which placed the Apache below, behind and to the left of them in a much more difficult position to see.

6. Apache Planning. The Apache crew had initially intended to conduct this sortie at Keevil but were unable to secure a booking for the period required. The alternative plan of using MOD Boscombe Down was pursued as the planned Gazelle sorties, as displayed on CADS, showed the Gazelle departing to Deptford Down. Therefore, there was no obvious need for direct pre-flight discussion or deconfliction with the Gazelle crew.

7. Apache Execution. The Apache crew visually joined an empty MOD Boscombe Down circuit. They were initially offered a direct join Southside but elected to position for runway 23 main with a left hand circuit to avoid local disturbance and to conduct running takeoff and landings; they completed several approaches culminating in a practice emergency and landing on runway 23 main. During this period, and whilst the Apache was conducting a practice emergency, the Gazelle recovered Southside for crew change and then joined Southside having changed their plan at short notice. After landing on runway 23 main, the Apache crew requested take off and were instructed by ATC to complete a right hand circuit due to the presence of the Gazelle Southside. The Apache wished to conduct field circuits at 200-300ft and, as these could not be flown over the domestic site, called visual with the Gazelle and requested left hand circuits; there was no information exchange on circuit parameters between the Apache crew and the ATC controller. The ATC controller cleared the Apache to join Southside and informed the Gazelle captain that the Apache was about to enter Southside. The Apache crew transmitted, "[C/S] now established Southside to operate threshold runway 35". The ATC controller confirmed that the Apache captain was visual with the Gazelle and then transmitted, "[C/S] roger, happy for you to work negative RT Southside ...". The Apache pilot accepted and responded "*negative RT and 23 Southside*". The Apache commenced to fly left hand circuits from the 35 threshold into wind and up to 300 ft QFE.

8. Immediately prior to the incident the Apache crew completed a lookout turn whilst hovering on the runway 35 main threshold and were unable to distinguish the Gazelle's thermal signature as they looked from the 35 threshold north towards the hovering Gazelle. This angle placed the Gazelle against a backdrop of multiple domestic site heat sources; no strobes or aircraft lights were seen with the unaided eye either, against the backdrop of multiple lights sources within the domestic area. The Apache crew identified some red lights towards the downwind position, on their left, which they perceived to be the Gazelle, which reinforced an incorrect mental model of the Gazelle's position. The use of negative RT procedures denied the Apache pilots the opportunity to update their mental model prior to transition, on a heading of 260°, towards the Gazelle which was climbing ahead and to their right. Furthermore, the Apache aircraft radar was experiencing clutter and did not provide any useful update.

9. Letter of Agreement (LOA). An LOA exists between MOD Boscombe Down and AACEN Middle Wallop which allows 7 Regt AAC Apache helicopters to conduct training both in and out of hours at MOD Boscombe Down. The LOA details operations and booking procedures and relevant orders are contained within both the MOD Boscombe Down and Middle Wallop FOBs. For out-of-hours operations (Order 20 MOD Boscombe Down FOB), requests should be made to MOD Boscombe Down Main Operations and up to 2 Apache aircraft are permitted to operate in the circuit with a requirement to make blind joining, circuit position and leaving RT calls. Apache operations under Order 20 are not permitted if MOD Boscombe Down is conducting flying operations.

10. The LOA also stipulates that requests for Apache operations at MOD Boscombe Down, in-hours, should be made to MOD Boscombe Main Operations and that “approval is on a case by case basis depending on the requirements of the MOD Boscombe Down programme and the time constraints for OIC Fg to coordinate and promulgate”. This allows relevant deconfliction to be considered by ATC and supervisors. There is no mention of a PD booking process within the LOA as this would traditionally be made directly with ATC by visiting aircraft.

11. Booking-In Process. On the morning of 14 May, 7 Regt AAC operations staff made 2 out-of-hours (Order 20) night booking requests directly to MOD Boscombe Down ATC (contrary to the LOA). These requests were refused by 2 separate shift ATC supervisors as MOD Boscombe Down had planned night flying. That afternoon, a further request by 7 Regt AAC operations staff, for an Apache PD, was made to Main Operations at MOD Boscombe Down who then contacted RWTES operations and the ATC assistant seeking coordination and approval. PD timings were discussed. The RWTES Gazelle captain, who was planning to depart the circuit on both of his sorties, was informed of the PD by RWTES ops staff and raised no objections; the night ATC supervisor, aware of the previous Order 20 refusals, contacted MOD Boscombe Down operations to confirm that RWTES were content before agreeing to accept the PD. The MOD Boscombe Down Duty Flying Executive (DFE) was also informed of the Apache PD booking. MOD Boscombe Down operations staff passed a PPR number to 7 Regt AAC operations at Middle Wallop and emphasised that the PD would be subject to in-hour rules. Although convoluted, the process worked; however, the DSS/OIC Fg was not aware and there was potential confusion within ATC and RWTES about the nature of the Apache booking by the use of the term PD.

12. ATC. The ATC supervisor had accepted the Apache PD having confirmed, via operations, that RWTES were content. The ATC controller initially attempted to de-conflict both aircraft by directing the Apache pilot to fly right hand circuits. Furthermore, the Gazelle pilot requested negative RT Southside and the ATC controller authorised this. When the Apache requested left hand circuits, the ATC controller re-cleared the Apache Southside and also transmitted “happy for you to work negative RT Southside” which was accepted by the Apache pilot. This was, at the time, iaw with the extant MOD Boscombe Down FOB; ATC supervision was based on the same mindset and both crews accepted the operating condition. Despite operating with negative RT procedures, the ATC controller made several calls to both aircraft to confirm visual contact with each other. The ATC controller was unable to see the Apache on the 35 threshold or the Gazelle hovering to the north of Kilo as this view was obstructed by the RWTES hangar and local topography, a known ATC blind spot. Furthermore, the use of IR aircraft lighting made visual acquisition more difficult. Having authorised negative RT, the ATC controller continued to monitor both aircraft as best as he could despite the limitation described. His expectation was that both aircraft pilots would exercise visual separation iaw Southside SOPs.

13. Supervision. OC RWTES was the on-call Duty Flying Executive (DFE) with 2IC RWTES acting as both the Duty Squadron Supervisor (DSS) and OIC Flying: a normal supervisory routine for night flying. The DSS/OIC Flying was present on the Squadron, attended the sortie brief and authorised both Gazelle sorties based on the plan to mount from MOD Boscombe Down and conduct both sorties to and from Deptford Down. Although the DFE had been informed, and both ATC and the Gazelle captain were aware of the planned Middle Wallop Apache PD booking into MOD Boscombe Down, there was a lack of clarity on the Apache’s further intent following his PD; the DSS/OIC Fg remained unaware of the PD and could not recall this being mentioned prior to the incident.

14. The DSS/OIC Fg supervised both Gazelle sorties and was present in his office next to the RWTES Ops room monitoring the RWTES air to ground frequency. He was not immediately aware of the rapid change of plan for the second Gazelle sortie or the Apache joining Southside. That said, the operation of up to 4 aircraft Southside, at night, was allowed iaw the Boscombe Down FOB. Although internal RWTES Southside deconfliction was routine, on this occasion, there was no expectation that the RWTES Gazelle or another aircraft would be operating Southside simultaneously and consequently no airborne deconfliction was discussed. The Apache sortie was supervised, briefed and authorised iaw the Middle Wallop FOB and 7 Regt AAC orders. Again, there was no expectation by the Apache crew that a Gazelle would be operating Southside other than to depart and arrive from Deptford Down.

15. Orders. The orders relevant to the incident sortie aircraft are contained within References A to G. Apache aircraft may operate at MOD Boscombe Down either in-hours, subject to the MOD Boscombe Down FOB, or out-of-hours i.a.w. the LOA, which is cascaded to crews as Order 20 in the MOD Boscombe Down FOB and replicated in the Middle Wallop FOB.

a. Booking (In-Hours). There is some lack of clarity within the MOD Boscombe Down and Middle Wallop FOBs on booking procedures particularly for in-hours Apache operations, Southside, at night. PD bookings are usually made by other units directly to ATC. The MOD Boscombe Down ATC Order Book (100.100.9) gives guidance to ATC personnel on PD requests and approvals and specific guidance on the acceptance of Middle Wallop Apache helicopters Southside during normal working hours. This directs the ATC supervisor/ATCO IC "to consider the trials programme for Boscombe based aircraft". The LOA directs 7 Regt AAC to make requests to operate "alongside planned night flying" via MOD Boscombe Main Operations who should consider each case with an action on OIC Fg to coordinate and promulgate. Consolidation of relevant booking processes and requirements within the MOD Boscombe Down FOB, ATC Controllers Order book and the Middle Wallop FOB would ensure that all key stakeholders aid clarity and should be considered.

b. NVG Operations. The MOD Boscombe Down FOB Order 9 (5), Night Flying Procedures, states that "the mixing of NVG and non-NVG in the visual circuit is to be avoided" and states some restrictions if this is planned. However at 5(c) it states "No restrictions on helicopters operating Southside at or below 500ft". The Apache uses a FLIR NVS system that is unable to detect the lower IR strobes and spotlights, as displayed by the Gazelle, during this incident. Furthermore, there is a lack of detail on procedures for RW NVG operations Southside such as weather limitations, NVG/NVS compatibility, maximum number of aircraft allowed and deconfliction requirements for visiting aircraft. A review of these orders should be considered.

c. Negative RT. The then extant orders permitted RW aircraft to operate autonomously Southside with negative RT by day and night. Operating by day with negative RT is beneficial and reduces the workload of crews and ATC controllers safely. However, by night this represents a significant loss of update information for crews and ATC controllers. NVG/NVS systems are able to provide visual mitigation but equipment limitations are well known and can be critical. The use of negative RT during daylight is routine within RW operations and training; however, there are few examples of its use for non-operational night tasks. The use of positive RT, or at least blind calls, during this incident would have provided a significant situational enhancement to both crews and the ATC controller.

d. MOD Boscombe Down Orders. It was noted that some unit order books replicated, in full or part, information or orders from AWCASOs and the MOD Boscombe Down FOB. Furthermore, some information relevant to a wider audience (unit deconfliction responsibilities and booking procedures contained within the MOD Boscombe Down and Middle Wallop LOA) was not visible to all. A review of the MOD Boscombe Down FOB and unit orders, to eliminate repetition and check relevant content, should be considered.

16. Weather. The weather conditions during this incident were not a factor but the moon was below the horizon and light levels were low (2 Millilux).

17. Aircraft. Both aircraft were fully serviceable although it was noted that the Gazelle had been flown on continuous operations from day into night. A routine check of the lower IR strobe lights and spotlight, by ground crew, prior to the first night sortie was not completed; however, they were checked by the ac captain during his pre-flight walk-around and by ground crew post flight and found to be serviceable. Furthermore, although the Apache crew reported that they did not see lights on the Gazelle with the NVS or visually, the upper red light was noted as serviceable by the Gazelle crew during the intermediate crew change immediately prior to the incident sortie.

18. Deconfliction. At the initial Apache booking stage, 2 MOD Boscombe Down ATC supervisors had rejected both Apache (Order 20) requests based on the guidance in ATC orders. A further request for a PD through MOD Boscombe Down Main Operations was subsequently approved. Although booking deconfliction involved the Gazelle captain, the DFE and ATC personnel, it was conducted indirectly and the RWTES DSS/OIC Fg remained unaware. There were no planned simultaneous Gazelle/Apache NVG operations on Southside and pre-flight deconfliction was conducted by both crews using the CADS system which indicated that both aircraft would be in the MOD Boscombe Down circuit for a short period as the Gazelle returned from Deptford Down. Further airborne deconfliction was, therefore, not planned and ultimately limited to see and avoid when both aircraft entered Southside. A requirement for positive DSS/aircrew/ATC night deconfliction, prior to operating more than 1 RW aircraft on Southside, would provide mitigation.

19. Situational Awareness (SA). The visual limitations inherent in operating at night on NVG/NVS are well known. Both crews were relying on visual updates and had been given some initial updates by the ATC controller on their respective positions. The use of negative RT denied both crews further update opportunities and although the Gazelle crew had positively identified the Apache immediately prior to the incident, it is clear that the crew mental picture within both aircraft had deteriorated. An expectation that the Gazelle was downwind was re-enforced by a mis-identification of red lights, which the crew believed to be the Gazelle's position. The decision to transition towards the unseen Gazelle was based on an incomplete and erroneous mental air picture. The Gazelle crew had right of way and were not expecting the Apache to approach; despite the extant responsibility of all pilots to avoid mid-air collisions, the Gazelle pilot was poorly placed to gain a visual update as the Apache closed from below and behind. Equally difficult, the Apache crew were faced with the approach of the Gazelle from above and the 5 o'clock position.

20. Collision Warning. Neither the Gazelle nor the Apache is fitted with a collision warning system, which would have increased the chance of detecting each aircraft.

21. See and Avoid Limitations. Both crews were reliant upon the See and Avoid principle as their primary deconfliction process during this incident. There are several recent military mid-air accident reports citing the limitations of the human visual and information processing system which are present to various degrees in all pilots. Clearly both crews involved in this incident did not see each other in time to take effective avoidance. Fortunately, on this occasion, the aircraft were not on a collision course.

## DETERMINATION OF THE CAUSE

22. Cause. The cause of the incident between Apache [serial number] and Gazelle [serial number] was the controlled flight of both aircraft into the same geographical position, at the same time, as a result of both aircraft captains being unaware of the position and proximity of the of the other aircraft at the point of flight path convergence.

23. Contributory factors. The following contributory factors did not directly cause the incident but made it more likely to happen:



- a. Negative RT. The lack of positive RT or blind calls, at night, denied both pilots and the ATC controller the opportunity to regain situational awareness and was a contributory factor in the incident.
- b. Lack of additional deconfliction measures. The lack of positive, additional, airborne deconfliction measures for the Gazelle and visiting Apache, operating autonomously in Southside, was a contributory factor in the incident.
- c. See and Avoid. The sole reliance upon the See and Avoid principle, which is subject to fundamental human and equipment limitations, was a contributory factor in the incident.
- d. Incomplete Mental Air Picture (MAP). The pilots of the Apache and Gazelle were unaware of the actual position, proximity and track of each other, which led them to inadvertently fly flight paths that converged. The Gazelle pilot was initially aware of the position of the stationary Apache but the absence of further visual or radio cues led to a divergence of expectation and reality with respect to the position of the Apache following transition. The Apache pilot transitioned with an incorrect MAP and, in the absence of visual and radio cues, was unable to detect this error until he saw the Gazelle. An erroneous or incomplete MAP prevented both pilots from recognising that their separation was reducing and was a contributory factor in the incident.
- e. Collision Warning. The lack of in-cockpit aids to alert the pilots to the proximity of each other was a contributory factor in the incident.
- f. NVG Operations. The simultaneous operation of an NVG equipped Gazelle and an NVS equipped Apache (unable to detect the Gazelle lower IR strobe light and spotlight) in the RW Southside area of the MOD Boscombe Down circuit was a contributory factor in the incident.
- g. Orders. A lack of specific procedures or limitations for NVG/NVS autonomous operations in Southside allowed both aircraft to fly independent and, generally, uncoordinated sortie profiles in the same airspace using negative RT procedures and was a contributory factor in the incident.
- h. Communication. Although there were several opportunities for the DSS/OIC Fg to detect, or be informed, that an Apache PD had been accepted into MOD Boscombe Down, he remained unaware of this plan throughout and was, therefore, not in a position to consider or exercise any supervisory deconfliction between the Gazelle and Apache. The lack of communication, concerning the Apache PD, between the DSS/OIC Fg and other MOD Boscombe Down agencies (Ops, ATC, Gazelle crew, DFE) was a contributory factor in the incident.

## OBSERVATIONS

24. The following observations were made:

- a. Harmonisation of MOD Boscombe Down and Middle Wallop Flying Orders. It was noted that the booking process for Apache aircraft from Middle Wallop into MOD Boscombe Down was included in several documents (MOD Boscombe Down FOB, LOA, ATC Order Book and the Middle Wallop FOB) and contained some minor contradictory guidance and inconsistency.
- b. OIC Fg Orders. It was noted that Order 1 para 5b(e) of the MOD Boscombe Down FOB stipulates that the night OIC Fg is to attend the Main Operations Room for a formal handover from the day OIC Fg by 16:30, unless specifically negotiated through SLOps. This action was not completed on the 14 May and knowledge of this requirement may have generally faded over time.
- c. Aircraft Engineering. It was noted that a maintenance check of the Gazelle lower IR strobes lights and IR spotlight was not completed by ground crew when the aircraft operated from the day into night programme.

d. Southside. The MOD Boscombe Down FOB, Order 6 1 (a) defines Southside with reference to "within 1nm of the airfield boundary fence". The southern airfield boundary fence is an irregular shape and RW generally use the area down to the Andover – Salisbury railway line. A simpler definition stating an East and West boundary with the Southern limit as the railway line could be considered.

## CONCLUSION

25. The main causal factor of this incident is considered to be the controlled flight of both aircraft into the same geographical location at the same time, separated by an estimated 100-200ft, as a result of both captains being unaware of the position and proximity of the other aircraft. The use of negative RT at night was significant and denied both captains the opportunity to update their MAP. This incident involved home based and visiting NVG/NVS RW aircraft operating simultaneously, Southside at night and with negative RT. The inability of the Apache NVS to detect the lighting on the Gazelle and the lack of a mandated and flexible deconfliction process to cater for late notice/replanned sortie profiles added risk. On this occasion, it was fortunate that both aircraft flew a different circuit height otherwise the risk of collision would have increased.

## RECOMMENDATIONS

26. It is recommended that:

- a. All RW aircraft operating at night in the visual circuit at MOD Boscombe Down (Southside) are mandated to use positive RT with blind information calls by exception as a minimum.
- b. A positive deconfliction process involving the DSS/OIC Fg, Aircrew and the ATC supervisor is mandated for all RW night operations Southside at MOD Boscombe Down when more than 1 RW aircraft is present.
- c. A review of the relevant orders for RW Southside operations at MOD Boscombe Down is conducted to consider inclusion of weather limitations, maximum Southside capacity and NVG/NVS procedures and limitations.
- d. Consideration should be given to fitting a suitable collision avoidance system to Gazelle and Apache aircraft as a priority.
- e. A review of the process and orders applicable to Middle Wallop Apache bookings into MOD Boscombe Down is conducted to ensure consistency and clarity.
- f. Ground crew are reminded of the requirement to conduct RW aircraft light checks iaw the appropriate servicing schedules prior to night flying.
- g. All personnel conducting flying supervision at MOD Boscombe Down are reminded of their mandated responsibilities as promulgated in the MOD Boscombe Down FOB.
- h. The MOD Boscombe Down FOB, Order 6 1(a) is reviewed to consider removing the reference to the southern airfield boundary fence, instead defining Southside by reference to geographical features.
- i. A review of MOD Boscombe Down orders is conducted to check content for structure, relevance and currency and to remove repetitious or superfluous material.

## REMARKS OF GAZELLE SQUADRON COMMANDER

This is a comprehensive report and I wholeheartedly support the conclusions and recommendations.

The pre-flight deconfliction was not robust enough to cater for unforeseen changes of plan, which resulted in two aircraft operating Southside without a clear understanding of each other's intentions. This made the requirement for in-flight deconfliction more critical. Reliance on 'see and avoid', whilst entirely appropriate for day operations, was manifestly inadequate for night operations, particularly as it involved a mixture of home-based and visiting aircraft, and completely different types of electro-optical systems.

I support the requirement for clearer orders and more robust pre-flight deconfliction of night flying at Boscombe Down. However, the essential point is that when more than one aircraft is operating at the airfield at night, blind calls must be made as a minimum to provide shared situational awareness of position and intentions. Positive RT should be implemented when additional control is required.

#### REMARKS OF APACHE SQUADRON COMMANDER

Such a situation should not have occurred at an open airfield with ATC in operation. That said, there are a number of key points to be drawn out:

- At the time of the incident the Gazelle was conducting 500' circuits and the AH was conducting 300' circuits. It is therefore unlikely that there was a real risk of collision.
- Both aircraft commanders were surprised at each other's proximity. This resulted due to acceptance of negative RT and poor situational awareness / lookout.
- Whilst it was not possible or anticipated, thorough deconfliction should have taken place, led by ATC once it was clear both aircraft would be operating on the airfield.

I support CO RWTES' comment that blind calls are a minimum requirement when more than one aircraft is operating. Indeed, I would expect ATC to maintain positive control in these circumstances.

#### REMARKS OF STN CDR (Chief Test Pilot/Head of Flying)

Operating in the visual circuit at night with negative RT, coupled with the inherent limitations and certain incompatibilities of FLIR and NVG systems, led to a loss of situational awareness by both crews and the subsequent loss of separation. I am satisfied that all key factors have been identified and that the recommendations made address all of the issues. The following actions have been taken:

- All aircraft operating at night, in the visual circuit, are mandated to use positive RT with blind information calls by exception as a minimum.
- A positive deconfliction process involving flying supervisors, aircrew and ATC supervisors is mandated for night circuit operations.
- A review and clarification of the booking process to be used by Middle Wallop staff has been completed and made available to relevant personnel.
- A review of the relevant MOD Boscombe Down FOB orders has been completed.
- The simultaneous operation 2 or more aircraft fitted with mixed media (NVG/NVS) in the night visual circuit is prohibited.
- The procurement of a suitable monocular handheld NVG system, to aid ATC controllers to maintain visual contact with NVG/NVS aircraft, is being pursued.
- Furthermore, current other work is already underway to fit a collision avoidance system to priority MOD Boscombe Down aircraft including the Gazelle.

Immediately following this incident, I imposed mandatory positive RT at night and paused Apache night flying pending the outcome of the Flight Safety investigation. I am now satisfied that all key recommendations have been addressed and that Apache operations may resume at MOD Boscombe Down under FOB Order 20. This was an uncomfortably close loss of separation between 2 aircraft operating in a familiar and relatively benign environment. The combination of several factors, including a late change of plan, created an increased threat of a mid-air collision. Fortunately, on this occasion, the aircraft crossed paths with an estimated separation of about 150ft. It is vital that all relevant personnel learn from this incident and fully understand the required mitigations.

## **PART B: SUMMARY OF THE BOARD'S DISCUSSIONS**

Information available included reports from the pilots of both ac, transcripts of the relevant RT frequencies, reports from the air traffic controllers involved and reports from the appropriate ATC and operating authorities. Radar video recordings were also available but the subject incident occurred below the base of recorded radar contacts.

Board Members commented on the restrictive lookout afforded by NVGs, pointing out that this incident highlighted their limitations and the danger of relying on them to maintain visual deconfliction during night-time operations. It was agreed that neither crew had sufficient SA, which was not assisted by the use of 'negative R/T'. The RN member stated that night operations at Merryfield were conducted 'negative R/T' if there was only one ac in the cct but that RT was used for position calls if there were more than one. FW Members questioned the use of 'negative R/T' in any circumstances and were informed by RW Members that RT calls could disrupt teaching objectives. However, RW members also stated that it would not be unusual for RW pilots to make unacknowledged position calls when in the cct area. Members agreed that there seemed to be a presumption that ac operating 'South Side' would operate 'negative R/T' and that the controller had allowed the ac to operate iaw the FOB, as it stood at that time. He also did all he could reasonably be expected to do to ensure the ac were visual with each other before allowing them to operate 'negative R/T'.

Board Members also commented on the chronology of events, particularly the change of plan of the Gazelle pilot, which then impacted on presumptions made during the Apache booking-in process. Whilst the flexibility shown by Boscombe in accommodating the Apache pilot's request to operate there is to be lauded, there was a subsequent breakdown in appreciation of the ramifications when the Gazelle pilot's plan changed. Both ac were now operating simultaneously in the visual cct at night using 'negative R/T'; a situation that was permitted by the relevant Boscombe Down FOB orders at that time and which lay outwith the controller's training or experience.

The Board also discussed at length the degree of responsibility of the crews, both of whom performed clearing turns before translating to forward flight. It was felt that the Gazelle crew's lookout was effective and that they had identified the Apache on the THLD of RW35. In contrast, the ambient and cultural lighting clutter experienced during the Apache crew's lookout resulted in confirmation of where the Apache crew believed the Gazelle to be, not its actual position; this was a classic instance of confirmation bias. The Board opined that had the Apache crew seen the Gazelle at Twy K the outcome would have been different. However, Members pointed out that whatever their respective responsibilities, the ac passed within 200ft of each other, without either crew being aware until the last moment.

It was also noted that a previous Board recommended that a helicopter ACAS be fitted following an Airprox involving a Chinook and an Apache [Airprox 2011/006 dated 24<sup>th</sup> January 2011]. The fitment of an ACAS would have probably increased crew SA in this incident such that the risk would have been substantially reduced.

[UKAB Post-meeting Note: Further Boscombe Down review of this incident has ascertained that the Gazelle lighting configuration is such that if **either** the upper **or** lower **IR** anti-col beacon is selected on then **both** upper **and** lower **visible** anti-col beacons are inhibited. The subject Gazelle's lighting system was tested and found to behave as stated. As the Gazelle pilot had selected the lower IR anti-col beacon on, both the upper and lower visible anti-col beacons were inhibited. The Apache pilot had 'observed that the Gazelle's anti-collision lights did not appear to be functioning' in his report. This was an unintended consequence of the deliberate selection of the lower IR anti-col beacon by the Gazelle pilot. Also, the Apache NVS EM spectrum coverage does not include that part of the spectrum within which the Gazelle IR anti-col beacons emit. Consequently the Apache crew could not detect the Gazelle IR anti-col beacon. This denied the Apache crew an additional source of SA as to the position of the Gazelle.]

### **PART C: ASSESSMENT OF CAUSE AND RISK**

Cause: The Apache crew did not have SA on the position of the Gazelle.

Degree of Risk: B.

Contributory Factor: Selection of the Gazelle's lower IR anti-collision beacon automatically inhibited both visible anti-collision beacons.