

AIRPROX REPORT No 2012079

Date/Time: 14 Jun 2012 0844Z

Position: 5301N 00035W (3.6nm W of Cranwell - elev 231ft)

Airspace: Cranwell CMATZ (Class: G)

Reporting Ac Reported Ac

Type: Beech Shadow Grob Tutor

Operator: HQ Air (Ops) HQ Air (Trg)

Alt/FL: 1500ft↓ 1300ft
 QFE (1010hPa) QFE (1010hPa)

Weather: VMC VMC

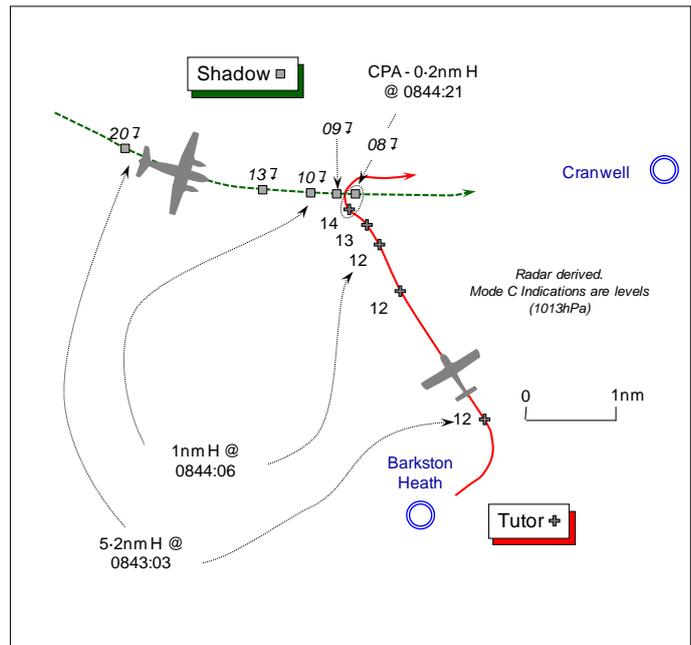
Visibility: 40km 30km

Reported Separation:

200ft V/0.5nm H 300ft V

Recorded Separation:

0.2nm H



PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

THE BEECH SHADOW R1 (SUPER KING AIR 350 ER) PILOT reports he was conducting a dual NDB/DME training approach at Cranwell (CWL), in VMC between layers of cloud and in receipt of a TS from CWL DIRECTOR (DIR). The assigned squawk was selected with Modes C and S on: TCAS is fitted. The ac has a grey colour-scheme but the HISLs, recognition lights and anti-collision beacons were on in addition to the landing and taxi lights.

Descending in accordance with the procedure through 1500ft QFE (1010hPa), wings level on the approach to RW08RHC and 'within the safety lane' between 6-5nm Finals heading 100° at 150kt, TCAS enunciated a TA on a contact 3nm away. They saw the Tutor, which was in the 1:30 position about 2nm away flying directly towards them. A TCAS RA was enunciated commanding them to MAINTAIN VERTICAL SPEED in the descent, which the PF complied with initially. However, after deciding to increase the separation between the ac visually, a slightly higher ROD was flown by the PF. Minimum vertical separation was 200ft and the Tutor passed about 0.5nm away to starboard with a 'medium' Risk of collision. When 'clear of conflict' was enunciated, the instrument approach was continued and ATC were informed of the RA. He subsequently reported the Airprox to ATC by landline.

He commented that there were a very high number of ac operating VFR in the CWL area. When the Airprox occurred his ac was in the late stages of an instrument approach and thus was in a low and slow configuration, with flap and gear down, resulting in reduced ability to manoeuvre.

THE GROB TUTOR T Mk1 PILOT, a QFI, reports that on completion of a navigation training sortie, the student PF was instructed to execute a PD to Barkston Heath (BKH), from which he was tasked to recover to CWL via the TOWER-to-TOWER (TWR-to-TWR) procedure. As the student had not flown this procedure before, the QFI directed him during the TWR-to-TWR transit. In receipt of a BS from CWL TOWER on UHF, they had been cleared to join for RW08RHC via initials. Flying level at 1300ft CWL QFE in VMC, as they approached the A/D he became aware from the standard instrument traffic broadcasts by TOWER of the Shadow - on an instrument approach. At a position about 3nm from touchdown he did not feel 'threatened' by the instrument traffic, which would be passing below his ac so he was content to cross the RW08 centerline whilst looking for the conflicting ac. As their Tutor approached the centre-line, heading 20° at 100kt, both he and his

student sighted the Shadow about 1nm away, but there was a slight delay in informing TOWER of the sighting due to the busy RT frequency. He estimated that the Shadow passed from L – R 300ft beneath his Tutor with a 'low' Risk of collision. No avoiding action was taken as his flightpath was keeping them clear of the Shadow on approach, whereas a turn would have extended the time his Tutor would have spent in the close vicinity of the Shadow. Furthermore he was following the TWR-to-TWR procedure, which is flown at 1300ft QFE.

He states that his cockpit workload was relatively high, coupled with a busy RT frequency. His Tutor is coloured white; the white HISLs were on and he was squawking the assigned code with Mode C and S on; TAS (TCAS I) is fitted.

THE CRANWELL AERODROME CONTROLLER (ADC) reports that nothing was reported to him on the frequency about the Airprox between the Shadow and the Tutor. Completing his report over a week after the incident, he has no recollection of anything unusual during this period on TOWER and only became aware of the Airprox 4 days after the occurrence.

CRANWELL DIRECTOR (DIR) reports that he was mentor to a trainee; the workload was light with weather state colour code BLU. The Shadow was under TS at about 4nm final to RW08RHC indicating about 1200-1300ft Mode C (1013hPa). A contact [the Tutor] was seen in the Shadow's R 2 o'clock at a range of 3nm crossing R – L, squawking A2612 and indicating 1200ft Mode C (1013hPa). This contact was called to the Shadow crew and then called again at a range of 1nm; the Shadow crew acknowledged both calls. The conflicting Tutor ac was seen to turn L and climb to go behind the Shadow and at this point the Shadow crew asked for the C/S of the conflicting Tutor ac, which was subsequently identified recovering from BKH to CWL via the TWR-to-TWR procedure.

THE CRANWELL ATC SUPERVISOR (SUP) reports he was in the VCR discussing a point with the duty flying supervisor at the time of the occurrence and did not witness the Airprox. On arrival back in the ACR the DIR mentor informed him that a Tutor on a visual join had flown quite close to the inbound Shadow. No mention was made of any Airprox until the Shadow PIC telephoned some 1½hr after the occurrence.

BM SAFETY MANAGEMENT reports that the Shadow crew, conducting an NDB/DME approach, was in receipt of a TS from DIR and the Tutor crew was following the TWR-to-TWR procedure for a visual recovery to CWL from BKH and in communication with CWL TWR [under a BS].

The Shadow pilot reported VMC with 40km visibility in nil weather and SCT cloud at 1500ft. The Tutor pilot reported VMC with 30km visibility, nil weather.

Although the Shadow pilot reported filing a VFR flight plan, they were conducting an instrument approach at the time so it is reasonable to suggest that they were operating IFR.

DIR was manned by a trainee and a mentor; whilst the trainee was a highly experienced multi-tourist controller he was relatively inexperienced at CWL. DIR described the workload as 'low' with only the Shadow on frequency with 'routine' task complexity. The ADC could recall little of the incident as nothing untoward had been reported to him at the time or on the RT.

The diagram at Figure 1, extracted from the CWL FOB, depicts the ground track for ac conducting a TWR-to-TWR transit from BKH to CWL. The FOB states that the procedure should be flown in VMC, clear of cloud and in sight of the surface, with a minimum visibility of 1500m, at 1300ft QFE; furthermore, 'ac joining the CWL visual circuit are to cross the radar centre-line within 2nm of the airfield'. The FOB does not stipulate whether this is determined through the use of DME, or 2nm from the RW threshold or from the A/D Reference Point (ARP). In the case of RW08, the DME reads 0.73d at the threshold and the distance between the ARP and the threshold is approximately 0.9nm. The Missed Approach Point (MAPt) for the RW08 NDB-DME approach is 1.5d, approximately 0.8nm from the RW08 threshold.

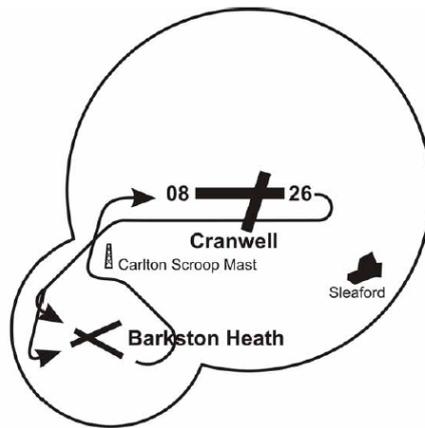


Figure 1: CWL – BKH TWR-to-TWR Procedure

Carlton Scroop mast is approximately 3.3nm SW of the RW08 threshold and 4.4nm SW of the ARP. The CWL FOB also states that airfield joins are:

‘normally to be through the Initial Point (IP) unless ATC clearance is obtained for another type of join’.

The IP is situated 2nm from the threshold of RW08, 100m from the centre-line on the deadside.

The BKH ADC pre-noted CWL APP with the details of the Tutor crew’s TWR-to-TWR transit at 0840:00 and the Tutor crew left BKH TOWER’s frequency at 0842:31. The Tutor crew had conducted a practice diversion into BKH and retained the SSR code of A2612 previously assigned by CWL DEPARTURES throughout the remainder of the incident sequence. The CWL FOB states that:

‘all aircraft intending to enter, or are established within, the CWL visual circuit are to squawk Mode 3/A 7010C on changing to the TWR frequency’.

The incident sequence commenced at 0843:00 when the Tutor crew requested to join the CWL cct for a, “..visual run-in and break with Bravo.” [ATIS BRAVO: BLU; Sfc Wind 130/10; 20km visibility nil weather; Cloud, FEW 1300, SCT 8800, TEMPO SCT 015 WHT, QFE 1010hPa.] In reply, the ADC instructed the Tutor crew to, “join runway 0-8 right hand, Q-F-E 1-0-1-0, join not above height 1 thousand 5 hundred feet, one in, radar traffic 4 and a ½ miles”, which was acknowledged. The radar traffic referred to by the ADC was the Shadow on the NDB-DME approach. The unit has stated that it is likely that the instruction to, “join not above height 1 thousand 5 hundred feet” was as a result of the activation of Waddington’s Radar Training Circuit (RTC). [At 0843:02, the Shadow was 5.2nm NW of the Tutor, tracking SE’ly, indicating descent through 2000ft Mode C (1013hPa); the Tutor was tracking NNW’ly, indicating 1200ft Mode C (1013hPa).] The Tutor pilot reported that the student had not flown the BKH-CWL TWR-to-TWR procedure before; consequently, he ‘directed the TWR-to-TWR transit.’

The NDB-DME RW08 procedure advises the following heights/ranges: 5d, 1300ft QFE; 4d, 1000ft QFE; 3d, 700ft QFE. The Shadow pilot has reported that the ac was ‘descending in accordance with the procedure’ and the SSR Mode C displayed on the radar replay supports this statement.

At 0843:47, DIR passed TI to the Shadow crew about the Tutor, “..traffic right 2 o’clock, 3 miles [radar replay shows 2.5nm], crossing right-left, same height”, which was acknowledged. At that point, the Tutor was 3.3nm SW of the CWL ARP and 2.5nm SW of the threshold to RW08RHC, tracking NW’ly, indicating 1200ft. The unit has confirmed that DIR had been advised by APP that the Tutor was conducting a TWR-to-TWR transit.

CAP774 Chapter 3 Para 5 guidance material states that:

'controllers shall aim to pass information on relevant traffic before the conflicting aircraft is within 5NM, in order to give the pilot sufficient time to meet his collision avoidance responsibilities and to allow for an update in traffic information if considered necessary.'

However, the Regulation also states that:

'high controller workload and RTF loading may reduce the ability of the controller to pass traffic information, and the timeliness of such information'.

On the RT transcript there is a period of 55sec, prior to DIR passing the TI message at 0843:47, where no transmissions or off-freq conversations were recorded. Subsequent to completing his report, the DIR mentor recalled that they liaised with APP over the identity of the Tutor and were advised by APP that the Tutor was conducting a TWR-to-TWR transit, although the audio tape does not confirm it. Moreover, the DIR trainee recalled considering breaking-off the Shadow from the NDB-DME approach due to the presence of the Tutor and what their options might have been to effect that, but could not remember whether he discussed this with his mentor, or whether it was a course of action that they were considering. Whilst DIR could not recall when the liaison or the discussion/consideration to breaking the Shadow off occurred, BM SM suggests that this occurred during the 55sec immediately prior to DIR passing TI at 0843:47.

The Shadow pilot reported that they received a TCAS TA between 5-6nm on the approach before visually acquiring the Tutor, perceiving the aircraft to be flying directly at them. Given the ranges involved, it is reasonable to suggest that the TI provided by DIR coincided with the generation of the TCAS TA. Moreover, given that the Shadow would be descending through approximately 1300ft QFE at 5d and that the Tutor was at 1300ft QFE, this suggests that the Shadow visually acquired the Tutor at approximately 5d (4.3nm from RW08 threshold); equating to approximately 1.9nm lateral separation between the ac. This is in accord with the Shadow PIC's assessment of 2nm lateral separation existing on first sighting of the Tutor. The Shadow crew then received a TCAS RA directing them to MAINTAIN VERTICAL SPEED.

At 0844:02, DIR updated the TI to the Shadow on the Tutor, "*that traffic now right 2 o'clock, 1 mile, crossing right-left, same height*", which was acknowledged. The Shadow crew did not inform DIR that they were complying with a TCAS RA, nor that they had sighted the Tutor. (At 0844:06, the Tutor was 3.4nm WSW of CWL ARP and 2.5nm WSW of RW08 threshold, tracking NW'ly, indicating 1200ft Mode C.) The Tutor pilot reported that 'they were content to cross the centreline' at what 'he perceived to be 3nm from touchdown' and 'did not feel threatened by the instrument traffic which would be passing below.' Based upon the Tutor pilot's report, they sighted the Shadow as they approached the centreline at a range of approximately 1nm; however, their call to acknowledge sighting the Shadow was delayed by the busy RT frequency. Based upon analysis of the radar replay, transcripts and pilot's report, the Tutor pilot's sighting of the Shadow coincided with DIR's updated TI.

At 0844:11, utilising the Hi-Brite ATM, the ADC passed TI to the Tutor crew on the Shadow stating, "*traffic believed to be you has traffic just passing 12 o'clock, similar height*"; the Tutor pilot replied that they were, "*visual with that traffic.*" At that point, the Tutor was maintaining a NW'ly track indicating 1200ft about 0.9nm SE of the Shadow, as the former crossed through the extended centreline. The Shadow was indicating descent through 1000ft Mode C ½nm N of the RW08RHC centreline, due to the final approach track (FAT) of the NDB-DME approach being offset 14° L (N) the RW08RHC centreline.

Although not mentioned in the Tutor pilot's report, the radar replay shows that at 0844:16 as the aeroplane passes 0.4nm SE of the Shadow, the Tutor crew commence a L turn to track WNW'ly and climb slightly. This concurs with the DIR's report, stating that they saw 'the conflicting aircraft [the Tutor]...turn left and climb to go behind [the Shadow]'. [The CPA occurs at 0844:20 as the Tutor indicating 1400ft - a height of about 1310ft CWL QFE (1010hPa) - passes 0.2nm SSW of the Shadow that is descending through 800ft - about 710ft CWL QFE.] The CPA occurred 3.6nm W of

the CWL ARP and thus about 2.7nm W of the RW08 threshold. The Shadow crew did not report the Airprox on the RT to the ADC, but made a report by telephone about 1½ hours after the event.

The lack of a defined datum point for the range at which the extended centreline should be crossed, permits interpretation of the TWR-to-TWR procedure. Notwithstanding the relatively low performance characteristics of the Tutor, the requirement to route outside Carlton Scroop mast, cross the extended centreline within 2nm of the airfield and route through the IP would seem to be difficult to achieve. If the procedure were to be interpreted as crossing the centreline at 2nm from the threshold (2.73d), then in excess of 600ft vertical separation should exist between ac conducting the TWR-to-TWR transit and an IFR ac conducting an NDB-DME approach.

When considering the interaction of IFR ac with a VFR traffic conducting the BKH-CWL TWR-to-TWR procedure, as the IFR ac could abandon the approach at any point, there does not appear to be any procedural deconfliction between the 2 procedures. The sole safety barriers are the prior imposition of a climb out restriction on the IFR ac by ATC, active control by ATC at the point the approach is abandoned together with 'see and avoid'. Discussion with CWL ATC revealed that they were not cognisant of a requirement to impose a climb-out restriction on the IFR ac and perceived that a MAP would only be carried out from the MAPt; consequently VFR ac conducting the TWR-to-TWR procedure at 1300ft QFE would be above any IFR ac executing a MAP. Whilst this is understandable, it does not cater for the worst credible scenario. Positive control by ATC, at the point of abandonment of the procedure, is heavily reliant on timing and the reaction of the controller, making it an imperfect barrier. As evinced by previous Airprox, the sole remaining safety barrier of 'see and avoid' is also an imperfect barrier.

The Tutor pilot states that he crossed the extended centreline at what he 'perceived' to be 3nm from touchdown; the radar replay shows the Tutor crossing the centreline at 2.7nm - approximately 3.4d - reducing the procedural vertical separation between the Tutor and the Shadow to between 300-600ft. However, the Tutor pilot was cognisant of the approaching IFR traffic and 'did not feel threatened' by that traffic, knowing that it would pass beneath them. It is reasonable to suggest that the Tutor crew would have been actively scanning to their L as they approached the RW08RHC centreline in order to visually acquire the Shadow. On that basis, an issue worthy of consideration is whether the Shadow crew was aware of the TWR-to-TWR procedure and whether an awareness of that would have moderated their concern over the event. This could not be ascertained at the time of this investigation. However, based upon both crews' accounts, they were able to discharge their responsibilities to 'see and avoid' each other, the Shadow crew aided by TCAS.

Albeit that the Tutor crew visually acquired the Shadow prior to receiving TI from the ADC, the ADC fulfilled his duty of care by providing a relatively timely warning to the Tutor crew of the confliction with the Shadow. Whilst the DIR's initial provision of TI to the Shadow crew was later than is required by the Regulation, it appears to have coincided with the Shadow's TCAS generating a TA and the crew correlating that information to visually acquire the Tutor. Consequently, BM SM contends that the timeliness of DIR's initial TI did not have a detrimental impact on the outcome of the incident. Moreover, whilst it has not been possible to determine conclusively why the TI was passed late, given the Shadow crew's training requirement to conduct the NDB-DME approach, BM SM contends that it is unlikely that earlier TI would have affected the outcome of the incident.

BM SM has requested that CWL review the CWL-BKH TWR-to-TWR transit procedure, specifically the datum used for '2nm from the airfield'.

HQ AIR (OPS) comments that this incident highlights the risk of aircraft getting close to one another when visual circuit traffic is required to integrate with an instrument approach pattern. Nevertheless, the Rules of the Air are quite specific; the Tutor was required to give way to the Shadow, who was on approach to land. It appears that the Tutor pilot, although visual with the Shadow, allowed the separation between himself and the Shadow to reduce to an extent that the Shadow pilot felt compelled to submit an Airprox. The message is clear - if in doubt give someone a wide berth! One final thing to note is that if the Airprox had been filed at the time of the incident, the actions of those involved in CWL ATC may have been more closely noted to aid the subsequent investigation.

Therefore, all aircrew involved in an Airprox should report the incident directly to the ATC Unit concerned ASAP, if circumstances allow.

HQ AIR (TRG) comments that the TWR-to-TWR procedure limitations are exposed by this incident, in that the Tutor pilot would never be able to achieve an 'initial point', which should be passed on runway heading, to the north of the centre-line at 2nm if he is unable to cross that centre-line outside 2nm. The review of the procedure requested by BM SM is supported and HQ 22Gp has been asked to monitor progress on addressing the issue. Options for TWR-to-TWR traffic to hold clear of the circuit when conflicting instrument traffic is reported should also be considered. In the event, the Tutor crew initially relied on a perceived procedural separation from the instrument traffic and were fortunate that it was not high on the approach or going around, that all involved were receiving TI, that TCAS was available, and that each acquired the other visually in good time, resulting in a very low risk of collision. The Shadow crew's selection of TCAS RA mode on an approach where visual joiners are very likely to be encountered is potentially contributory in that the RA increased their level of concern. The Tutor pilot's decision to cross behind the Shadow, rather than turn E remaining S of the centre-line is understandable, but in doing so he inadvertently increased the Shadow crew's concern. An early orbit by the Tutor would probably have removed any perceived conflict.

UKAB Note (1): The CWL Unit Safety Management Officer reports that having discussed the Airprox at the CWL Airspace User Group and then at the Station Flight Safety Meeting, the Station elected to amend the current FOB entry for the BKH/CWL TWR-to-TWR procedure when both are on Easterly runways. The TWR-to-TWR procedure will no longer be approved for this configuration when there is any radar traffic, thereby reducing any potential for a recurrence and mitigating the Risk as low as reasonably practicable.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from the pilots of both ac, transcripts of the relevant RT frequencies, radar video recordings, reports from the air traffic controllers involved and reports from the appropriate ATC and operating authorities.

This Airprox stemmed from the inevitable mix of instrument and visual traffic commonly encountered at this busy training A/D. The CWL TWR-to-TWR procedure for RW08 was aimed at affording some procedural separation between instrument traffic on final approach and traffic inbound for a visual join from Barkston Heath that had to cross the RW centre-line onto the deadside for RW08RHC. However, all ac joining visually through the IP (2nm from the threshold of RW08) are close to the FAT for the RW08 NDB/DME procedure, which is offset L of the RW centre-line.

DIR first passed the Shadow crew TI on the Tutor when the radar recording shows it was at a range of 2.5nm, crossing from R – L, crucially at the same height. This TI did not include any advice that it was VFR traffic inbound to join the visual cct and if the crew had been told that it might have been helpful. A Member suggested that as the Shadow crew was not CWL-based they would not be aware of the TWR-to-TWR procedure; however, a similar procedure is used between Waddington and CWL so they would probably have understood what the Tutor was doing. Nonetheless, simple amplification of the TI to highlight that it was traffic recovering visually might have allayed the crew's concerns. DIR conscientiously updated the TI at 1nm range, but by that stage the Shadow crew was responding to the TCAS RA having already acquired the Tutor visually at 2nm, which influenced the PF to fly a slightly higher ROD. It was noted that the Shadow crew did not advise DIR that they were responding to a TCAS RA, which Members realised should have been done when practicable and would have been helpful in maintaining the controller's SA.

The Tutor QFI, coaching his student through the TWR-to-TWR procedure, had been alerted to the presence of the Shadow on final by TOWER's broadcasts, but reports he did not spot the twin visually until it had closed to a range of 1nm. It was evident that the Tutor crew had crossed the RW centre-line at a greater distance from the A/D than specified in the FOB, and a Member suggested this was part of the Cause. However the Tutor was flying at the specified height and the BM SM

report had revealed significant shortcomings in the promulgated TWR-to-TWR procedure. Plainly there is scope for instrument traffic to execute a MAP at any stage, which may result in a conflict inside the FAF with VFR traffic crossing the FAT to the deadside – even more so with the NDB-DME approach FAT being offset 14° L of the RW08RHC centre-line. The Board's CAA Strategy and Standards Advisor opined that the procedure was inherently unsafe, and subsequent to this Airprox and the review proposed by BM SM, it is evident that the Unit has taken a hard look at the procedure and wisely elected to discontinue its use for RW08RHC. The Members agreed that it was the procedure itself that was fundamental to the Cause of this Airprox. However, when the conflict was recognised, both crews were aware of each other's ac and took appropriate action to forestall a close quarters situation: the Shadow crew followed their TCAS initially and then increased the vertical separation visually against the Tutor, with the latter's crew maintaining their own visual separation that included a L turn and slight climb to increase the vertical separation as the Shadow crossed ahead. A Member suggested that the Cause was that the Tutor pilot flew close enough to trigger a TCAS RA. However a CAT pilot Member pointed out that a TCAS RA was inevitable in this situation and the system was working 'as advertised'. [Generally, TCAS RAs are inhibited below a height of 1000ft (+/-100ft), descend RAs are inhibited at 1100ft and all aural TCAS enunciations are inhibited at 500ft.] The Shadow pilot perceived the minimum separation to be 200ft and the radar recording confirms that at a range of 1nm the Tutor was 200ft above the twin; however, the combination of the Shadow's increased ROD and the Tutor's climb resulted in about 500ft abeam, with the CPA shown at 0.2nm as the Tutor drew aft some 600ft above the still descending Shadow. The Board concluded, therefore, that the Cause of this Airprox was that the TWR-to-TWR procedure was incompatible with the instrument approach to RW08RHC resulting in a conflict between the Shadow and the Tutor, which was resolved by both crews. In the Board's view, both crews' visual sightings and their prompt reactions had effectively forestalled any Risk of a collision.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The TWR-to-TWR procedure flown by the Tutor, was incompatible with the instrument approach to RW08RHC resulting in a conflict between the Shadow R1 and the Tutor, which was resolved by both crews.

Degree of Risk: C