BOARD OF INQUIRY

INTO AN

AIRCRAFT ACCIDENT

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ARMY

ARMY FLIGHT SAFETY & STANDARDS INSPECTORATE
Headquarters Army Air Corps
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Reference: AACHQ.06.008

See Distribution Date: 1 Nov 09

BOARD OF INQUIRY (BOI) REPORT– SQUIRREL ZJ 247 – 29 MAY 08
AMENDMENT ONE

Reference:

A. AAC Form 8 – ZJ 247 – 29 May 08.

1. Amendment one to Reference A is required in light of correspondence between Rule 11 witnesses and the President of the BOI. The following amendments and addendums are to be made:

a. Part 4. Diagnosis of the Causes. Replace page 4-6 with new page enclosed. Discard blank second page.

b. Part 13 – Index of Witness Evidence. Replace page 13-0-4 with new page enclosed.

c. Part 13 – Witness Statements. At rear of current statements add 2 clear punched pockets and place in them copies of the enclosed letters as follows:

(1) Letter from Maj **[15]** dated 15 Oct 09 (4 pages) and reply from Lt Col **[2]** dated 19 Oct 09 (4 pages).

(2) Letter from Maj **[16]** dated 20 Oct 09 (2 pages) and reply from Lt Col **[2]** dated 27 Oct 09 (2 pages).

2. Inclusion of Amendment one is to be recorded on page (ii) of Reference A.

[Signed on DII(F)]

[14]
Lt Col
for DAAvn

Enclosure(s):

1. Page 4-6 Amdt 1.
2. Page 13-0-4 Amdt 1.
3. Letter from Maj **[15]** dated 15 Oct 09.
4. Letter from Lt Col **[2]** dated 19 Oct 09.
5. Letter from Maj **[16]** dated 20 Oct 09.
6. Letter from Lt Col **[2]** dated 27 Oct 09.

Distribution:

JHCHQ – SO2 J7 Flight Safety*
AACen – CO 7 (Trg) Regt AAC*

Copy to:

JHCHQ – SO1 J7 Safety*
AACen – Comdt*
HQ AAC – AFFSI SO2 Flight Safety*
HQ AAC – Ch Clk*

AMENDMENT LIST

Amendment No (a)	Date of Amendment (b)	Amended By (c)	Signature (d)
One	1 Nov 09	**[14]**	**[14]**

The lowest classification of this form is '**RESTRICTED**' when it includes the proceedings of a Board of Inquiry or Regimental Inquiry.

RECORD OF PROCEEDINGS

of two [1]Boards of Inquiry

firstly assembled at Middle Wallop, Hampshire

on the 30th May 2008

by order of[2] Colonel **[1]** late AAC (Board 1)
Commandant School of Army Aviation

secondly assembled at Wilton, Wiltshire

on the 28th July 2008

by order of Rear Admiral CA Johnstone-Burt OBE MA (Board 2)
Commander Joint Helicopter Command

for the purpose of[3] Investigating the sequence of events, circumstances and causes of the accident involving
Squirrel HT Mk 2 ZJ 247 on 29th May 2008.

Board 1:

PRESIDENT Lieutenant Colonel **[2]** AAC

MEMBERS Major **[3]** AAC
Captain **[4]** REME
Mr **[5]** FBH

Board 1 was dissolved with effect 25 July 2008.

Board 2:

Board 2 was convened with effect 28 July 2008.

PRESIDENT Lieutenant Colonel **[2]** AAC

MEMBERS Lieutenant Commander **[3]** RN
Captain **[4]** REME

The following persons ~~(was)~~ were in attendance throughout ~~(the whole)~~ (part) of the proceedings in accordance with (Rule) (Regulation) 11 of the (Board of Inquiry (Army) Rules, 1956) ~~(Regimental Inquiry Regulations, 1956)~~:-

Major **[16]** AAC
Captain **[15]** AAC
Captain **[17]** AAC
Staff Sergeant **[18]** AAC

~~*(He was) (They were) (unrepresented.) (represented by).~~

The Board of Inquiry, having assembled pursuant to the Convening order attached at Annex B to (record evidence (on oath) beginning at part 13.) (hear evidence (on oath)[4] in accordance with the transcript attached hereto.) (or as the case may be)

The findings *(~~and opinion~~) of the Board are attached at page 5-1 onwards

- *Strike out where not applicable*

[1] Although primarily intended for boards of inquiry and regimental inquiries convened under A.A., 1955 ss, 135 and 137 respectively, this form may be used for committees, etc., and this space may be filled in accordingly.
[2] Insert here the authority, or the rank, name and appointment of the officer convening the board of inquiry or as the case may be.
[3] Here set out the terms of reference as set out in the order convening the board of inquiry or regimental inquiry.
[4] This may only be struck out where a regimental inquiry has not been instructed to examine witness on oath.

TERMS OF REFERENCE

1. The Inquiry is to investigate fully all the circumstances surrounding the accident and is to record all evidence relevant to the Inquiry.

2. Evidence is to be taken on oath in accordance with Boards of Inquiry (Army) Rules 1956, Rule 13, and any documentary evidence is to be produced on oath by a witness suitably qualified; such documentary evidence is to be attached as an annex to the Record of Proceedings.

3. Evidence is to be heard and recorded in accordance with Board of Inquiry (Army) Rules 1956. All relevant sections of AAC Form 8 are to be completed in accordance with the pamphlet notes on Boards of Inquiry into Army Air Systems Aircraft (Issue 8 Apr 08).

4. Should it become apparent during the inquiry that any person whose character or professional reputation is likely to be affected by the findings, the President shall give that person the opportunity of being present or represented in accordance with the provisions of the Army Act 1955, Section 135(4) and Board of Inquiry (Army) Rules 1956, Rule 11.

5. The Board is to investigate, report and to express an opinion, where appropriate, on the following matters:

   a. The circumstances leading up to the accident and circumstances of the accident.

   b. The cause or causes of the accident.

   c. The cause and degree of injury suffered by persons both Service and civilian.

   d. Whether Service personnel involved were on duty.

   e. Whether all relevant orders and instructions were complied with.

   f. The extent of damage to the aircraft.

   g. The extent of damage to aircraft removable role equipment and associated items.

   h. The extent of damage to Service and civilian property.

   i. All relevant crash survival aspects.

6. Any other points relevant to the Inquiry.

7. The Board may make any recommendations it considers relevant in respect of the events leading up to the accident and in particular make recommendations to prevent a recurrence. The Board is not to attribute blame or negligence to any individual.

8. The Inquiry is to express an opinion with regard to any material conflict in the evidence that may arise and give reasons for reaching that opinion.

9. If it appears to the Board at any time during the Inquiry that any person may have committed an offence against Military Law, including a civil offence contrary to Section 70 of the Army Act 1955, the President is to adjourn the Inquiry and report to the Convening Officer.

The Board is to order the attendance of any witnesses whose evidence it considers may be relevant to the Inquiry.

10. The attention of the President is drawn to:

a. Queen's Regulations for the Army 1975, Chapter 5.

b. Manual of Military Law, Board of Inquiry (Army) Rules 1956 and Sections 135 and 137 of the Army Act 1955.

c. JSP 551 Volume 1, Section 205, Annex B.

d. Notes on Boards of Inquiry into Army Air Systems Aircraft (Issue 8 Apr 08).

11. The proceedings are to be recorded on an AAC Form 8 and are to be staffed as laid down in JSP 551.

12. The President is to submit an interim report within 96 hours of assembling the Board.

13. The Board is to verbally brief the Comd JHC on the findings once the Board of Inquiry is complete.

14. The support costs for all personnel directly forming the BOI team will fall to JHC. On the basis that all arrangements are directed from JHC HQ, the support costs of personnel from outside the JHC, but directly involved in the BOI, will be borne by the HQ budget within Comd Troops BLB. Where costs are common to a mixed-unit Team e.g. hire car, then the cost will be charged to Comd Troops.

BOARD OF INQUIRY CONVENING ORDER

BY

COLONEL [1]

COMMANDANT SCHOOL OF ARMY AVIATION

1. A Board of Inquiry, composed as under, is to assemble at HQ SAAvn on Fri 30 May 08 at 0900 hours to investigate the sequence of events, circumstances and causes of the accident involving Squirrel HT2, ZJ247, of 670 Sqn AAC on 29 May 08 at SS 541181 2 miles East South East of Great Torrington.

- Board members:

President:	Lt Col **[2]** AAC
Aircrew Member:	Maj **[3]** AAC
Military Engineering Member:	Capt **[4]** REME
Specialist Engineering Member:	Mr **[5]** FBH

- In Attendance:

AIEFSO:	Maj **[6]** REME
AIEFSWO:	WO1 (ASM) **[7]** REME
Human Factors Advisor:	Mr **[8]**
SAAvn SAM:	Lt Col **[9]** RAMC
SAM 3 Regt AAC:	Maj **[10]** RAMC (under instruction)
Clerk:	Sgt **[11]** AGC

2. The Inquiry is to investigate fully all the circumstances surrounding the accident and is to record all evidence relevant to the Inquiry.

3. Evidence is to be taken on oath in accordance with Boards of Inquiry (Army) Rules 1956, Rule 13, and any documentary evidence is to be produced on oath by a witness suitably qualified; such documentary evidence is to be attached as an annex to the Record of Proceedings.

4. Evidence is to be heard and recorded in accordance with Board of Inquiry (Army) Rules 1956. All relevant sections of AAC Form 8 are to be completed in accordance with the pamphlet notes on Boards of Inquiry into Army Aircraft Accidents (Revised Apr 08).

5. Should it become apparent during the Inquiry that any person whose character or professional reputation is likely to be affected by the findings, the President shall give that person the opportunity of being present or represented in accordance with the provisions of the Army Act 1955, Section 135(4) and Board of Inquiry (Army) Rules 1956, Rule 11.

6. The Board is to investigate, report and to express an opinion, where appropriate, on the following matters:

a. The circumstances leading up to the accident and circumstances of the accident.

b. The cause or causes of the accident.

c. The cause and degree of injury suffered by persons both Service and civilian.

d. Whether Service personnel involved were on duty.

e. Whether all relevant orders and instructions were complied with.

f. The extent of damage to the aircraft.

g. The extent of damage to aircraft removable role equipment and associated items.

h. The extent of damage to Service and civilian property.

i. All relevant crash survival aspects.

j. Any other points relevant to the Inquiry.

7. The Board may make any recommendations it considers relevant in respect of the events leading up to the accident and in particular make recommendations to prevent a recurrence. The Board is not to attribute blame or negligence to any individual.

8. The Inquiry is to express an opinion with regard to any material conflict in the evidence that may arise and give reasons for reaching that opinion.

9. If it appears to the Board at any time during the Inquiry that any person may have committed an offence against Military Law, including a civil offence contrary to Section 70 of the Army Act 1955, the President is to adjourn the Inquiry and report to the Convening Officer.

10. The Board is to order the attendance of any witnesses whose evidence it considers may be relevant to the Inquiry.

11. The attention of the President is drawn to:

a. Queen's Regulations for the Army 1975, Chapter 5.

b. Manual of Military Law, Board of Inquiry (Army) Rules 1956 and Sections 135 and 137 of the Army Act 1955.

c. JSP 551 Volume 1, Section 205, Annex B.

d. Notes on Boards of Inquiry into Army Aircraft Accidents (Revised Apr 08).

12. The proceedings are to be recorded on an AAC Form 8 and are to be staffed as laid down in JSP 551. Distribution is to be:

HQ SAAvn	-	1 copy
ACAS RTSA RW	-	2 copies

HQ JHC - 2 copies.
HQ AAC (AFSSI) - 4 copies, including the original.

13. The President is to submit an interim report by 3 Jun 08.

14. The Board is to verbally brief the Commandant SAAvn on the findings once the Board of Inquiry is complete.

Col **[1]**
Commandant 29 May 08

Distribution:

HQ AAC
HQ JHC
HQ ARTD
ACAS RTSA RW
145 (S) Bde
President of the Board

BOARD OF INQUIRY CONVENING ORDER

BY

REAR ADMIRAL C A JOHNSTONE-BURT OBE MA

COMMANDER JOINT HELICOPTER COMMAND

1. A Board of Inquiry, composed as under, is to assemble at JHCHQ on 28 Jul 08 at 1100 hours to investigate the sequence of events, circumstances and causes of the accident involving Squirrel HT2, ZJ247, of 670 Sqn AAC on 29 May 08 at SS 541181 2 miles East South East of Great Torrington. This inquiry is being convened by the JHCHQ following the closure of the SAAvn Board of Inquiry as ordered by Commandant SAAvn.

Board members:

President:	Lt Col **[2]** AAC
Aircrew Member:	Lt Cdr **[12]** RN
Engineering Member:	Capt **[4]** REME

In Attendance:

AIEFSO:	Maj **[6]** REME
AIEFSWO:	WO1 (ASM) **[7]** REME
Engineering Advisor:	Mr **[5]** FBH
Human Factors Advisor:	Mr **[8]**
SAAvn SAM:	Lt Col **[9]** RAMC
SAM 3 Regt AAC:	Maj **[10]** RAMC (under instruction)
Clerk:	Sgt **[11]** AGC

2. The Inquiry is to investigate fully all the circumstances surrounding the accident and is to record all evidence relevant to the Inquiry.

3. Evidence is to be taken on oath in accordance with Boards of Inquiry (Army) Rules 1956, Rule 13, and any documentary evidence is to be produced on oath by a witness suitably qualified; such documentary evidence is to be attached as an annex to the Record of Proceedings.

4. Evidence is to be heard and recorded in accordance with Board of Inquiry (Army) Rules 1956. All relevant sections of AAC Form 8 are to be completed in accordance with the pamphlet notes on Boards of Inquiry into Army Air Systems Aircraft (Issue 8 Apr 08).

5. Should it become apparent during the inquiry that any person whose character or professional reputation is likely to be affected by the findings, the President shall give that person the opportunity of being present or represented in accordance with the provisions of the Army Act 1955, Section 135(4) and Board of Inquiry (Army) Rules 1956, Rule 11.

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c. The cause and degree of injury suffered by persons both Service and civilian.

d. Whether Service personnel involved were on duty.

e. Whether all relevant orders and instructions were complied with.

f. The extent of damage to the aircraft.

g. The extent of damage to aircraft removable role equipment and associated items.

h. The extent of damage to Service and civilian property.

i. All relevant crash survival aspects.

j. Any other points relevant to the Inquiry.

7. The Board may make any recommendations it considers relevant in respect of the events leading up to the accident and in particular make recommendations to prevent a recurrence. The Board is not to attribute blame or negligence to any individual.

8. The Inquiry is to express an opinion with regard to any material conflict in the evidence that may arise and give reasons for reaching that opinion.

9. If it appears to the Board at any time during the Inquiry that any person may have committed an offence against Military Law, including a civil offence contrary to Section 70 of the Army Act 1955, the President is to adjourn the Inquiry and report to the Convening Officer.

11. The Board is to order the attendance of any witnesses whose evidence it considers may be relevant to the Inquiry.

12. The attention of the President is drawn to:

a. Queen's Regulations for the Army 1975, Chapter 5.

b. Manual of Military Law, Board of Inquiry (Army) Rules 1956 and Sections 135 and 137 of the Army Act 1955.

c. JSP 551 Volume 1, Section 205, Annex B.

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13. The proceedings are to be recorded on an AAC Form 8 and are to be staffed as laid down in JSP 551. Distribution is to be:

HQ SAAvn	-	One copy.
HQ JHC	-	2 copies.
HQ AAC (AFSSI)	-	4 copies, including the original.

13. The President is to submit an interim report within 96 hours of assembling the Board.

14. The Board is to verbally brief the Comd JHC on the findings once the Board of Inquiry is complete.

15. The support costs for all personnel directly forming the BOI team will fall to JHC. On the basis that all arrangements are directed from JHC HQ, the support costs of personnel from outside the JHC, but directly involved in the BOI, will be borne by the HQ budget within Comd Trps BLB. Where costs are common to a mixed-unit Team e.g. hire car, then the cost will be charged to Comd Trps.

C A JOHNSTONE-BURT
R Adm
Comd

28 Jul 08

PART 1

SUMMARY OF ACCIDENT

THE ACCIDENT

1. At approximately 1538 hours (hrs)[1] on Thu 29 May 08, Squirrel helicopter HT2 ZJ 247 operated by 670 Squadron Army Air Corps (670 Sqn AAC)[2], operating as one of a pair of aircraft, struck a set of 3 x 33 kilovolt (kV) wires strung across the Kingscott Valley, Devon (approximately 5 nautical miles (nm) east-south-east of Great Torrington). The aircraft was seen by the crew of the other Squirrel and one eye-witness on the ground to depart controlled flight and fall through the tree canopy. The aircraft impacted the ground at Grid Reference (Grid) SS 541173 (50°23'N 004° 04.62'E). The accident resulted in fatal injuries to both members of the crew, a Qualified Helicopter Instructor (QHI) and Student, and the loss of the aircraft.

2. Having struck the wires, the aircraft came to rest in a steep sided wooded valley containing a small stream running through the centre. The wreckage lay on the eastern slope of the valley, lying inverted, leaning port side down, with the nose pointing down-slope. There was a strong smell of fuel in the immediate vicinity of the wreckage and smoke was seen to be emanating from the engine exhaust. A small road ran along the valley just below the crash site. The crash site was approximately 145 metres (m) from the line of the severed power lines. Tree branches in the immediate area of the wreckage were broken and were either on the ground or dangling loosely from trees overhead. There was no other significant damage to civilian property, but there was a power outage as a result of the wires being severed.

3. The first witness on the scene, the Aircraft Commander (Ac Comd) from the other aircraft in the pair, reports that the QHI was found in the wreckage, sitting in the left hand seat **[Section 44]**. The Student Pilot was found out of his seat lying on the ground approximately 3-4 m in front of the aircraft. **[S44].**

4. The Search And Rescue (SAR) helicopter, "Rescue 169", having been alerted by a MAYDAY call from the other aircraft in the patrol, arrived overhead the crash site at 1554 hrs and dropped off a winchman and paramedic who provided medical treatment. A stretcher was winched down to the crash site at 1604 hrs. "Rescue 169" then remained in the overhead and provided video and commentary of the subsequent rescue effort. **[Section 44]**. Civil Police arrived on site at around 1610 hrs and offered immediate assistance, closing off the road and establishing a cordon. The Devon Air Ambulance arrived and landed in a nearby field at 1611 hrs. The Air Ambulance medics arrived at the crash site at 1616 hrs, coincident with the arrival of the Somerset & Devon Fire and Rescue Service and Devon Ambulance Service. The additional personnel then turned their attention to extracting the other casualty from the wreckage **[Section 44]**.

5. "Rescue 169" departed for North Devon Hospital Barnstaple at 1636 hrs with the Student, arriving there at 1642 hrs. The QHI was pronounced dead at the scene, the Student was pronounced dead at North Devon Hospital Barnstaple.

6. The crew was correctly constituted, current and the flight was authorised. The QHI, Warrant Officer Class 2 (WO2) VP Hussell AAC was the authorised Ac Comd, and the Student was Lieutenant (Lt) MM Reynolds AAC. In light of exercise play, WO2 Hussell was acting as the Handling Pilot (HP) (sitting in the left-hand seat), with Lt Reynolds acting as the Non Handling Pilot (NHP) Ac Comd (sitting in the right-hand seat). The crew had prepared and briefed for the

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[1] All timings are local, i.e. Zulu/UTC plus 1 hour. Swanwick Radar trace shows a loss of contact at 1538:42 hrs. Western Power Distribution report a power outage at 1538:54 hrs. "MAYDAY" call received by 22 Sqn RAF (Chivenor) at 1540 hrs.

[2] 670 Sqn is a sub unit of Flying Wing School of Army Aviation. Flying Wing is now re-titled 7 (Training) Regiment AAC (7 (Trg) Regt AAC).

sortie in accordance with extant practices. The planned sortie formed part of the course syllabus and fell within the capabilities of the crew. There was nothing to suggest that the aircraft was not serviceable up to the point of impact (subsequently confirmed by the Technical Investigation).

BACKGROUND

7. 670 Sqn AAC deployed a detachment of 26 people, 5 Squirrel and 1 Gazelle aircraft on Exercise (Ex) WOODLARK from 27 – 30 May inclusive. Ex WOODLARK, which has since been superseded by Ex COBRA STRIKE, was a constituent part of the Operational Training Phase (OTP) of the Army Pilots Course (APC). It constituted the penultimate phase of training before the award of the Army Flying Badge or "Wings". Ex WOODLARK was intended as a confirmatory assessment exercise designed to "practise operating tactically, as a single aircraft and as part of an Aviation Recce Patrol (ARP) in an unfamiliar area in order to teach and assess the Student's airborne fieldcraft, handling and captaincy in a tactical environment".

8. Ex WOODLARK was based at Fremington Camp on the north Devon coast, close to Barnstaple. Fremington Camp provided accommodation, food, aircraft parking and car parking with ad hoc administrative requests dealt with by Camp HQ. In other respects the exercise was self-sustaining with all real time aviation planning and exercise play organised via the exercise chain of command and operations room. FBH[3] staff detached from Middle Wallop provided servicing and support of the aircraft. Exercise flying, less the deployment and recovery phases, was conducted within Low Flying Area (LFA) 2. The exercise area was predominantly rolling open countryside with two large valley features and heavily wooded areas dominated by the high ground of Dartmoor to the south and Exmoor in the north-east.

9. Power lines, owned and operated by Western Power Distribution, ran parallel to, and across, the Kingscott Valley. Each set of wires was marked on the 1:50 000 Ordnance Survey maps that the crew were using and which were recovered by the Board. These wires were not specifically highlighted by the crew during the planning process. The planned routes, drawn on the respective maps, indicated that one aircraft intended to cross the wires over the mid-point of the valley, the other intended to cross them over the western valley shoulder. The lines that ran across the valley were a set of 3 x 33kV power lines mounted horizontally on two pylons, one each on the high ground to either side of the valley, some 360 m apart. This set of three power lines was severed. Western Power Distribution personnel estimated that the cables were severed 148m from the eastern pylon and that the wires were at a height of some 130 – 150 feet (ft) above ground level (agl) in the centre of the valley. The trees in the valley floor were assessed as being around 30 ft tall, thus the aircraft was at around 100 – 120 ft above the trees. The severed wires dropped into the valley and shorted out an 11kV power cable running underneath. The severed wires were heavily oxidised and the pylons, particularly the one on the eastern shoulder, were obscured from the approaching aircraft's view in trees. Without detailed scrutiny, the western pylon, when visible, could be misconstrued as belonging to the set of wires that ran along the valley shoulder and parallel to the planned aircraft track. The map is clear, but there is potential for a visual illusion on the ground.

THE INQUIRY

10. A Board of Inquiry (BOI) was convened by the Aircraft Operating Authority (AOA), Commandant School of Army Aviation (Comdt SAAvn), at 0900 hrs on Fri 30 May 08. The primary Board comprised:

President	- Lieutenant Colonel **[2]** AAC (SO1 FSS, HQ AAC[4])
Aircrew Member	- Major **[3]** AAC (FW Trg Offr (AH)[5])
Engineering Member	- Captain **[4]** REME[6] (JHC, then AH IPT[7])

[3] FRA Bristow Helisevices Ltd who enable the Defence Helicopter Flying School (DHFS) service under contract.
[4] Staff Officer Grade 1 Flight Safety & Standards Headquarters Army Air Corps.
[5] SAAvn Flying Wing Training Officer (Attack Helicopter).

FBH/Squirrel Rep - Mr **[5]** (FBH Squirrel Technician)

11. Documentary and physical evidence was impounded and personal effects gathered and recorded.

12. The Board was dissolved by Comdt SAAvn on 25 Jul 08. A new BOI was then convened by Commander Joint Helicopter Command (Comd JHC) at 1100 hrs on Mon 28 Jul 08. This second BOI comprised:

President	- Lieutenant Colonel **[2]** AAC (SO1 FSS, HQ AAC)
Aircrew Member	- Lieutenant Commander **[12]** RN (Sixty Sqn RAF, DHFS)
Engineering Member	- Captain **[4]** REME (AH IPT)

13. A number of new lines of inquiry were then pursued in order to determine relevance to the cause of the accident and in order to make meaningful recommendations to prevent recurrence.

14. A formal briefing was delivered to Comd JHC on 05 Sep 08. Having considered and incorporated the Medical Report and Human Factors Report, the BOI then paused awaiting completion of the full Technical Investigation.

RECOMMENDATIONS

15. The Board made a total of 39 Recommendations, ranging from the fitting of specific equipment, through a review and introduction of enhanced aircrew training, to a review and amendment of management process and supervisory practices.

[6] Royal Electrical & Mechanical Engineers.
[7] Joint Helicopter Command then Attack Helicopter Integrated Project Team.

PART 2

NARRATIVE OF EVENTS

	SUPPORTING DOCUMENTATION
AIRCRAFT	
1. Squirrel HT 2 ZJ 247 was employed on flying training duties by 670 Sqn AAC, Flying Wing, at SAAvn, Middle Wallop, Hampshire. Squirrel ZJ 247 was operated on the military register but civil owned (by FBH). The aircraft was a component part of the fleet that serviced the DHFS contract at RAF Shawbury and Middle Wallop. At the time of the accident the aircraft had accumulated 6034:52 flying hours.	Exhibit A.
BACKGROUND CIRCUMSTANCES	
2. 670 Sqn AAC delivers the final stage, the OTP, of the APC. Ex WOODLARK was a constituent part of the OTP. It was the penultimate phase of training before the award of the Army Flying Badge or "Wings". Ex WOODLARK was a confirmatory assessment exercise designed to "practise operating tactically, as a single aircraft and as part of an ARP in an unfamiliar area in order to teach and assess the student's fieldcraft, handling and captaincy in a tactical environment". Subsidiary aims of the exercise were Staff Continuation Training (SCT) and Familiarisation training as required.	Exhibit B. Witness: 6,18,26.
3. 670 Sqn AAC deployed a detachment of 26 people, 5 Squirrel and 1 Gazelle aircraft on Ex WOODLARK from 27 – 30 May inclusive. On this occasion the exercise was conducted over a period of four days, instead of the normal five, because of the Bank Holiday that occurred on Mon 26 May 08. Ex WOODLARK was based at Fremington Camp on the north Devon coast, close to Barnstaple. Fremington Camp provided accommodation, food, aircraft parking and car parking with ad hoc administrative requests dealt with by Camp HQ.	Witness: 1,6.
4. In other respects the exercise was self-sustaining with all real time aviation planning and exercise play organised via the exercise chain of command and operations room. An appropriate level of IT and communication facilities allowed the exercise to operate without any dilution of aviation or training related information. FBH staff detached from Middle Wallop provided servicing and support of the aircraft.	Witness: 1,6.
5. B Flight Commander (B Flt Comd), Captain (Capt) R **[15]** AAC, was the Officer in Command of the exercise and the exercise author on this occasion. WO2 VP Hussell AAC was the Flight Sergeant Major (FSM). All of the QHIs on the Exercise held powers of self-authorisation for Course Training Programme (CTP) serials.	Witness: 6.
6. Exercise flying, less the deployment and recovery phases, was conducted within Low Flying Area (LFA) 2. The exercise area was predominantly rolling open countryside with two large valley features and heavily wooded areas dominated by the high ground of Dartmoor to the south and Exmoor in the north-east.	Exhibit B.
DEPLOYMENT	
7. Exercise personnel received their deployment orders and an Airspace Control Order (ACO) at an Orders group at Command and	Exhibit B.

Ground Training Wing (CGTW) on Fri 23 May 08 at 0900 hrs. Personnel deployed by road or air on Tue 27 May 08. The road party departed at 0730 hrs and the air party at 0900 hrs. Deployment occurred without any significant delays or technical issues. All personnel were established at Fremington Camp by mid-day.

8. The remainder of the Tue was spent conducting Tactical Exercise (TACEX) 2. This sortie was a simulated liaison sortie flown as single aircraft around the local area. The sortie's key purpose was to provide an area familiarisation. The final phase of this sortie consisted of a wires awareness demonstration. Each QHI has his own variation on the theme, but it results in every student being taken up the valley from the "Blue Duck" (Grid: SS 554 123) until they come across the wires between Grids: SS 532 139 – 533 143 which are clearly marked on the map. Most students fail to identify the threat and rarely see the actual wires until they are pointed out. The dangers are then emphasised and the QHIs provide a personal, non-standardised, brief as to how to minimise the risk posed by wires suspended across valleys; this clearly varies from one QHI to another. During this demonstration no correlation is made between how wires are marked on the map and what that marking physically translates to on the ground. Pylons marked on the map are only a representation of the type and height of the pylon and not the actual geographical position of them or the height of the wires. There is no way of establishing from the maps used whether or not a particular set of wires is suspended across a valley or contours down and up each side, although a dogleg in the pylon on the map would be an indication of actual pylon position. Witness: 1,3,6,12,19,20.

EXERCISE ROUTINE

9. Each day's activities was co-ordinated and promulgated (but not made readily available to the students) by way of a daily flying programme (flypro) written by the FSM. Students were rostered by way of a notional "next to fly" regime. Dependent upon weather, performance, achievement, each day consisted of around 3 – 4 waves; each wave generally consisting of 2 x Squirrel pairs (total 4 aircraft, plus the Gazelle (if available)). The system worked well and enabled the FBH personnel to plan accordingly for servicing, refuels and for re-bulking the aviation fuel bowser at Chivenor. Witness: 1,6,7,9.

10. Prior to each sortie, students would receive a set of orders from a CGTW representative approximately 2 hrs prior to take off. The students would then be left to conduct their own planning, orders preparation and map marking. By local convention, the Student Mission Commander (Msn Comd) would concentrate on preparing and writing orders, the No2 would focus on the map recce and map marking to reflect the Msn Comd's plan. Of relevance, the No2 would take ownership of planning the ingress and egress routes, usually flown in a Standard Army Aviation Flight Route (SAAFR). The B Flt Standard Operating Procedure (SOP) for flying along a SAAFR is "100 knots (kts) at not below 100 ft"; for exercise play the co-ordination level[1] was set at not above 250 ft agl. The radar altimeter (RADALT) warning "bug" was set at 100 ft to warn of low height. Standard authorised minima for Ex WOODLARK was "Not Below 100 ft agl and 50 ft MSC (Minimum Separation Criteria – a term specifically used for low flying helicopters, which may be above the agl limit, but operating alongside trees, buildings etc. For example, in the Witness: 1,6,10. Witness: 4,5,13.

[1] The co-ordination level provides deconfliction from other airspace users, such as fast jets.

SAR role when conducting a cliff rescue)" for Ex 18 (Low Flying) and Ex 40 (Pilot Map Reading, Navigation).

11. At a predetermined time, but usually 1hr before planned take-off, the Msn Comd would deliver orders to the rest of the ARP. Orders would be attended by both students and their respective QHIs. Routinely, this would be the first time that the QHIs would have had detail of their student's intentions. During orders, which were lead by the Msn Comd, it was standard practice for the No2 to brief the ingress and egress routes, including any assessed significant and pertinent hazard information. Witness: 1,3,6,12,19,20.

12. On completion of orders, there might be a minor debrief but more usually the QHIs did not probe any conflictions or discrepancies in the students' plan. As the exercise had a confirmatory, assessment role to it and any failures could be debriefed later, QHIs preferred to give students an opportunity to learn from their mistakes. The QHIs would then get together alone to discuss and determine their own 'exercise' play. Instructions would be then given to the "Magic" callsign (played by the Gazelle and manned by CGTW), either verbally or in a written format, on intended code words and exercise play. Witness: 3,10,12,19,20,24.

13. Once complete, the QHIs would sign for their aircraft and carry out their respective self-authorisations. The crews would then walk to the Helicopter Landing Site (HLS) to wait for a "running change" (where the crew change over whilst the aircraft engine and rotors are still turning) or commence a full aircraft start, as appropriate. In either event, there was rarely much, if any, spare time. Witness: 3,10,12,19,20,24.

14. Wed 28 May became a non-flying day, due to persistent bad weather. As a result, the students were given a range of topics from which to prepare lesson plans for subsequent delivery to the rest of the team. On this occasion, Lt **[19]** prepared and delivered a short lesson on wires awareness and relevant map marking symbology. Witness: 6.

15. Having already lost a day to the Bank Holiday, the loss of Wed reduced the time available to conduct the exercise. The decision was taken to postpone TACEX 3, which could be conducted upon return to Middle Wallop. The focus, therefore, became the completion of TACEX 4 and TACEX 5. A flypro for Thu 29 May 08 was then written accordingly. This programme, written by the FSM, called for 4 waves, each of 2 pairs of Squirrels, supported, as available, by the Gazelle. The accident occurred during the second pair of the fourth wave. This pair was tasked as "Humber" patrol. Witness: 6.

PATROL PLANNING AND PREPARATION

16. "Humber" patrol comprised; "Humber 1", crewed by Staff Sergeant (SSgt) **[18]** as the QHI/Ac Comd and Lt **[20]** as the student and "Humber 2", crewed by WO2 Hussell as the QHI/Ac Comd and Lt Reynolds as the student. The students of "Humber" patrol received orders from Capt **[21]** AAC (CGTW), at approximately 1330 hrs on Thu 29 May 08. Planned take off time was 1530 hrs. Exhibit C. Witness: 10,13.

17. Lt **[20]** (as Msn Comd) concentrated on the part of the mission from the Holding Area (HA) forward and focused on writing his orders. The planning of the ingress and egress was conducted by Lt Reynolds (as No2). Lt Reynolds also conducted a map recce of the mission area and Witness: 13.

marked possible observation positions on the map. In line with standard practice, Lt Reynolds was also assisted by any spare students, in this case Lt **[22]**. Witness: 5,13.

18. Lt **[20]**, as the patrol commander, exerted influence over the planning and reassigned locations of critical tactical points initially selected by Lt Reynolds. Lt **[20]** recalls that a dotted line, depicting their respective pilotage routes along the SAAFR, was drawn about 2-3 mins ahead of orders being delivered. This route indicated that "Humber 2" (in the lead down the SAAFR) would route along the valley feature, but over the west side of the Kingscott Valley. The dotted line for "Humber 1" indicated that they would fly along the valley feature and through the Kingscott Valley. In the event, "Humber 2" flew through the Kingscott valley and "Humber 1" routed to the west side. This deviation is not uncommon, as pilotage lines are not strictly adhered to, but are used to assist with drawing the eye to the proposed route on the map. Witness: 5,13. Witness: 13, 19,20. Exhibit D. Exhibit E. Witness: 12,13,14,15.

19. At approximately 1430 hrs Lt **[20]** delivered a full set of orders to the rest of the patrol. This was the first time that either SSgt **[18]** or WO2 Hussell became engaged with this sortie. The orders were considered to be "pretty good" and to a "high average" standard. As was normal practice the No2 briefed the ingress and the egress, in by SAAFR DRAGON and out via SAAFR DEEP. Heights and speed to fly in the SAAFR were briefed as 100 kts groundspeed and not below 100 ft agl, not above 250 ft agl (the height of the exercise co-ordination level). There was no intervention by the QHIs post the orders to suggest that the brief had been anything other than entirely normal. Witness: 12,13.

20. Following orders the 2 QHIs formulated their exercise play and passed a note to the "Magic" callsign with their information and requests. The 2 QHIs then signed for their aircraft and self-authorised for the sortie. There is no evidence of them conducting any further sortie planning or map recce. The crews then made their way to the HLS to await the aircraft, which they were due to take on a running change. Witness: 12,14. Exhibit C.

21. The aircraft taken on a running change were Squirrel ZJ 246 ("Humber 1" – **[18]**/**[20]**) and Squirrel ZJ 247 ("Humber 2" - Hussell/Reynolds). This sortie was the second pair of the fourth wave. Following a successful running change the aircraft lifted at approximately 1530 hrs. Witness: 3,8,12,13.

THE AIRCRAFT IN DETAIL

22. Squirrel ZJ 247 flew 4:15 hours on Tue 27 May 08, it did not fly on the Wed due to bad weather. ZJ 247 had flown 4:35 hours in the previous flights on the day of the accident. No faults on the aircraft had been reported in this period. SSgt **[23]**, who handed the aircraft over to WO2 Hussell, stated that the aircraft was fully serviceable. He had experienced minor difficulties with the tactical (Tac) radio, but put this down to his low operating altitude. Exhibit A. Witness: 3.

23. The aircraft had been flight serviced on the morning of Thu 29 May and this flight servicing remained valid; no faults were found and no oils required. After the flight servicing the windscreens on all the aircraft were cleaned. The next hourly and calendar servicing due were at 6038:40 and 20 Jun 08 respectively. Taking into account the hours flown on 29 May 08, ZJ 247 was 5:38 hours from the next hourly based servicing, Exhibit A. Witness: 7,8. Exhibit A.

therefore the aircraft had ample hours clear for the planned flight.

THE ACCIDENT

24. "Humber" patrol lifted and followed the standard departure profile from Fremington Camp. The aircraft descended to low level en route to SAAFR DRAGON, which they would use for their ingress. The Swanwick radar trace confirms their routing down SAAFR DRAGON; with "Humber 2" leading and "Humber 1" in trail. Whilst in trail, "Humber 1" periodically moved from trail left to trail right at a distance of between 200-600 metres. At a point beyond where the SAAFR doglegs to the SSW "Humber 1" moved into trail right. With both aircraft tracking roughly SSW they headed towards a small deep valley feature to the east of the village of Kingscott, following their planned route. Witness: 12,13. Exhibit F.

25. "Humber" patrol was seen approaching the area by Mr **[24]**, a local farmer and landowner, who was herding his cows for milking. He first saw them approaching, at some distance, from his quad bike that he was riding in **[S40]**, just north of the valley entrance. He took no particular notice, as he was used to seeing helicopters in the area. He was also intent on herding his cows. He next recalls seeing them when he reached a sharp corner (Grid: SS 543 178), where he recalls very vividly considering that they were so low and slow that he could shoot them with his shotgun. The Board considers that the aircraft appeared "low and slow" because he was in an elevated position and the aircraft followed a circular track around him. Other witness statements and the Swanwick radar trace indicate that the aircraft were travelling at around 100 kts and around 100 – 150 ft agl. Mr **[24]** places the aircraft overhead the stream routing south at low level. He then continued along the road towards Kingscott. He first became aware of something "unusual", when he heard a strange popping/plinking sound when he was near the bridge (Grid: SS 541 178). Witness: 15.

26. A further witness, Mr **[25]**, noticed "Humber" patrol when he took a break from his GCSE revision. He was sitting in the conservatory of **[S40]** and had a clear view across to the valley, some 500m to the south-east of his position. He observed the aircraft approaching and one of them descending into the valley. He also remarked that he had never seen helicopters flying so low in that area before. Witness: 14.

27. Approaching the valley, Lt **[20]** (in the trail aircraft) recalls having a clear view of ZJ 247 heading into the valley. He specifically remembers seeing both white strobe lights and the diffusion from the exhaust. He would have been happy to follow them into the valley but, in the event, his aircraft routed to pass to the west of the valley. Witness: 13.

28. Mr **[25]** recalls seeing one aircraft fly into the valley, the other aircraft flew towards the west side of the valley towards the high ground. The first aircraft was momentarily lost from view. When it re-appeared it was in a severe nose up attitude and falling back towards the trees. He knew immediately that something was wrong. Witness: 14.

29. "Humber 1" was alerted to a white flash some 200m in front, whereupon Lt **[20]** looked across the cockpit, just in front of the port forward spar, where he saw "Humber 2" in an accentuated nose up attitude. Following an expletive by Lt **[20]**, SSgt **[18]** also looked to his left (having to lean slightly forward to look around the door pillar) and Witness: 12,13.

noticed ZJ 247 semi-inverted, falling through the tree canopy. A MAYDAY call was broadcast by "Humber 1" and received by 22 Sqn RAF (Chivenor SAR) at 1540 hrs. Exhibit G.

30. The Swanwick radar trace shows a loss of contact with "Humber 2" at 1538:42 hrs. Western Power Distribution reported a power outage at 1538:54 hrs. It was evident that ZJ 247 had struck wires, subsequently determined to be a set of 3 x 33 kV power lines anchored to two pylons, one each on the high ground to either side of the valley. This set of three power lines was severed. The severed power cables dropped into the valley and shorted out an 11 kV power cable running underneath. Exhibit F.

31. Mr **[24]** remembers thinking that the strange noise that he had heard might be associated with the power cables, but does not know why. He moved to a gate approximately 75m west of the bridge, where he looked for the wires; he could not see them. He heard a very sharp loud noise, which he could not identify, nor its source. The noise was sufficient to scare his cattle, which ran off. He then moved a further 150m, or so, west towards Kingscott. He climbed onto a bench and again looked for the wires. By now, he was certain that the cables had been damaged, so he phoned Western Power Distribution to report it. At this stage, he was still not certain whether the aircraft had actually been involved with the downing of the power cables. Witness: 15.

32. Initially, timing elements of Mr **[24]** evidence appeared inconsistent with that from other sources. However, the Board believes that the wirestrike occurred approximately 7-8 seconds after Mr **[24]** saw the aircraft "low and slow" relative to his position. The strange popping/plinking noise that he heard was probably 'blade slap' from "Humber 1", who was orbiting the accident site. The loud crack was probably the second power outage that occurred at 1541:53 hrs, when the system tried to re-connect automatically.

POST ACCIDENT

33. "Humber 1" circled the crash site and provided information to 22 Sqn RAF. They made a visual identification of the crash site, which was in a dense mature deciduous wood on the steep east side of the valley, just to the east of a single-track minor metalled road. The other patrol, "Crusader", that was airborne at the time heard the MAYDAY call and flew to provide any necessary assistance. Witness: 12,13. Exhibit F. Witness: 1,2.

34. SSgt **[18]** elected to land his aircraft (ZJ 246) on high ground to the east of the crash site (at 1543 hrs) and attend the site to render assistance. Having seized the fire extinguisher from his own aircraft, SSgt **[18]** made his way on foot to the accident site. At approximately 1544 hrs, whilst moving to the crash site, SSgt **[18]** made a telephone call to Capt **[15]** to inform him of the accident. Lt **[20]** was left in ZJ 246, at ground idle, to continue to provide communication as appropriate to the incoming SAR aircraft. Witness: 12,13.

35. SSgt **[18]** ran down the hill, calling out the names of the aircrew trying to elicit some signs of life and location. On arrival at the crash scene SSgt **[18]** was faced with a badly damaged aircraft that had impacted heavily, in an uncontrolled manner on a steep slope. The aircraft was lying inverted, leaning port side down, with the nose pointing down slope. There was a strong smell of fuel in the immediate vicinity of Witness: 12.

the aircraft. Smoke was emanating from the engine exhaust, so he discharged his fire extinguisher into it, to cool it down. A small road ran along the valley just below the crash site. The crash site was approximately 145m from the line of the severed power lines. Tree branches in the immediate area of the wreckage were broken and were either on the ground or dangling from trees overhead. Due to the extensive damage to the cockpit area SSgt **[18]** was unable to locate the emergency fuel cut off lever or disconnect the aircraft battery.

36. On closer inspection of the cabin area he saw that WO2 Hussell was sitting in the left hand seat **[Section 44]**. SSgt **[18]** found Lt Reynolds out of his seat lying on the ground approximately 3-4m in front of the aircraft. **[S44]** Shortly afterwards a farmer arrived on the scene and SSgt **[18]** asked him to inform the emergency services of the accident. Witness: 12.

37. At Fremington Camp, Capt **[15]** assumed the responsibility of Post Crash Management Officer and co-ordinated and implemented the Post Crash Management Plan. Mobile phones were confiscated and the appropriate agencies informed. Documentation and possible evidence was also quarantined for subsequent use by any Inquiry. Witness: 6.

38. The SAR helicopter, "Rescue 169", lifted from Chivenor at 1546 hrs, arriving overhead the crash site at 1554 hrs. Having identified the crash site, "Rescue 169" elected to land near to ZJ 246 and drop off a winchman and a paramedic. Having made their way to the crash site on foot, they assessed the casualties and provided medical treatment. **S44 and S40**. A stretcher was winched down to the crash site at 1604 hrs. "Rescue 169" then remained in the overhead and provided video and commentary of the subsequent rescue effort. Exhibit H. Exhibit G.

39. Civil Police arrived on site at around 1610 hrs and offered immediate assistance, closing off the road and establishing a cordon. The Devon Air Ambulance arrived and landed adjacent to ZJ 246 at 1611 hrs. The Air Ambulance medics arrived at the crash site at 1616 hrs, coincident with the arrival of the Somerset & Devon Fire and Rescue Service and Devon Ambulance Service. The additional personnel then turned their attention to extracting WO2 Hussell from the wreckage and **[Section 44]**. Witness: 12. Exhibit H.

40. Lt Reynolds was winched from the crash site at 1634 hrs and secured within the SAR helicopter by 1636 hrs. "Rescue 169" departed for North Devon Hospital Barnstaple, arriving there at 1642 hrs. Medical staff **[Section 44]** pronounced him dead at the accident scene. WO2 Hussell was pronounced dead at the accident scene by a road ambulance paramedic at approximately 1634 hrs. Exhibit H. Annex F.

41. Concurrent with all of the rescue activity, WO2 **[26]** ("Crusader") had flown to Fremington Camp to collect another QHI (Capt **[17]** RM) to recover ZJ 246 and Lt **[20]**. On completion of this task, having returned to Fremington, WO2 **[26]** made his way to the crash site by road with two Air Troopers to assist with guarding the site. Mr **[27]** and Mr **[28]** (both from the FBH detachment) also drove to the crash site in a separate vehicle in order to take oil and fuel samples and disconnect the battery; the only way of isolating the electrics. Witness: 1,13. Witness: 1. Witness: 7,9.

SUMMARY OF TIMINGS OF KEY EVENTS

27 May 08

0730 Ex WOODLARK road party deploys from SAAvn
0900 Ex WOODLARK air party deploys from SAAvn

28 May 08

Non flying day due to bad weather

29 May 08

1330 "Humber" patrol receive Orders
1430 "Humber" patrol deliver Orders
1530 "Humber" patrol lift from Fremington
1540 SSgt **[18]** transmits MAYDAY call
1543 SSgt **[18]** lands and proceeds to crash site on foot
1546 SAR lifts from Chivenor
1554 SAR overhead at crash site
1557 SAR lands and drops off winchman and paramedic
1604 SAR winches stretcher to crash site
1610 Air ambulance overhead at crash site
1610 Police car at crash site
1611 Air ambulance lands
1616 Fire engine and land ambulance at the scene
1616 Air ambulance medics at the crash site
1622 Firemen at the crash site
1634 WO2 Hussell pronounced dead at the scene
1634 Lt Reynolds winched out of the crash site
1636 SAR departs for Barnstaple
1642 SAR arrives at hospital
1650 Lt Reynolds pronounced dead at North Devon Hospital
1900 AIEFSO and AIEFSWO[2] arrive at the crash site

30 May 08

0900 BOI convened at Middle Wallop
1345 BOI arrives at the area of the crash site

[2] Accident Investigation & Engineering Flight Safety Officer and Warrant Officer

PART 3

MATERIAL FACTS FOUND AT SCENE

SUPPORTING DOCUMENTATION

GENERAL

1. Maj [**6**] REME (AIEFSO) and WO1(ASM[1]) [**7**] REME (AIEFSWO) arrived at the crash site at 1900 hrs on Thu 29 May 08. The BOI members arrived in the area of the crash site at 1345 on 30 May 08. Prior to viewing the crash site the BOI members were briefed by AIEFSO on his preliminary findings. He then escorted the BOI members around the site.

2. The aircraft wreckage lay in a steep sided wooded valley containing a small stream running through the centre. Power lines ran parallel to, and across the valley. The lines that ran across the valley were a set of 3 x 33 kV power lines mounted horizontally on two pylons, one each on the high ground to either side of the valley, some 360 m apart. This set of three power lines was severed in the accident. AIEFSO, in co-operation with Western Power Distribution personnel estimated that the cables were severed 148 m from the eastern pylon. The severed wires had dropped into the valley and shorted out an 11 kV power cable running underneath. The two pylons supporting the cables were also damaged. Initial eyewitness statements indicated that the aircraft had been in contact with the 3 x 33 kV power lines prior to crashing into the ground.

AIRCRAFT WRECKAGE

3. The main wreckage site consisted of the Main Fuselage, Tailboom, all major assemblies and the Main Rotor and Tail Rotor Blades; extensive damage to the front of the aircraft was evident. The aircraft was lying inverted, leaning port side down on the steep slope on the east side of the Kingscott Valley, with the nose pointing down the slope. There was a strong smell of fuel in the immediate vicinity of the aircraft. A small road ran along the valley just below the crash site. The crash site was approximately 145 m from the line of the severed power lines. Tree branches in the immediate area of the wreckage were broken and were either on the ground or dangling from trees overhead. — Annex E

4. A debris trail consisting of the Nose Cone, Starboard Cabin Door, Rear Seat Cushions and broken pieces of Windscreen Perspex, led back to the centre of the valley toward the area of the severed power lines. The concentration of wreckage was consistent with impact damage only and did not indicate a major break-up in the air.

AIRCREW

5. Both aircrew had been removed from the crash site prior to the BOI members arriving. However, the first witness on the scene reports that the QHI/Ac Comd was found in the wreckage, sitting in the left hand seat with [**Section 44**]. The Student Pilot was found out of his seat lying on the ground approximately 3-4 m in front of the aircraft. [**Section 44**]. — Part 2

[1] Artificer Sergeant-Major.

WIRE HEIGHT

6. The Board considered it necessary to determine actual wire height above ground, in order to validate witness evidence and to determine the aircraft height above ground. Therefore, on 3 Jun 08, the Board hovered alongside the replacement wires in a Squirrel to obtain a RADALT reading. Unfortunately, this did not prove conclusive, as the RADALT fluctuated rapidly between 80 -100 ft. The tree foliage in the valley beneath the aircraft was particularly thick; thus it is likely that the RADALT return was from the tree canopy rather than the ground. The foliage moving in the down wash created by the hovering aircraft probably caused the fluctuation in the RADALT reading. If one accepts the mean point of fluctuation as the height above trees, then the wires are estimated as being around 90 ft above the trees. The trees in the area, when compared to the 30 ft high pylons, are estimated to be between 30 - 40 ft. This implies that the replacement wires are 120 - 130 ft above the valley floor.

7. As the wire height still remained a matter of conjecture, the Board asked Western Power Distribution to survey the valley to determine the height of the original 3 x 33 kV power cables at the time of the accident. Western Power Distribution undertook a detailed Global Positioning System (GPS) survey of the valley profile underneath the line of the power cables. Western Power Distribution then calculated an upper and lower band for the height of the cables above the ground, taking into account cable specification and temperature (upper band at 0 degree C, lower band at 50 degrees C). These bands and the valley profile were then plotted on a chart, which was supplied to the Board. Using the estimate of the point at which the cables were severed (148 m from the eastern pylon); the height of this point above ground was read off from the chart. This gave a lower and upper band height for the original cables as 130 ft and 150 ft respectively above ground, at the point at which the cables were severed. Exhibit I.

8. The Board accepted that the accurate wire height will never be determined, but considers that they were in the region of 130 ft above the valley floor at time of impact.

PART 4

DIAGNOSIS OF THE CAUSES

SUPPORTING DOCUMENTATION

INTRODUCTION

1. The Board has examined potential causes and contributory factors, using JSP 551 as a guide. The Board sought not to attribute blame or negligence.

2. The aircraft did not contain a Cockpit Voice Recorder/Flight Data Recorder (CVR/FDR). The Board therefore had limited evidence as to what occurred in the aircraft during the sortie and in particular in the time leading up to the aircraft striking the wires.

3. The Board has also made itself aware of the study into Wire Strike Protection Systems (WSPS) being conducted by the Directorate of Aviation Regulation & Safety (DARS). The Board has also referred to the Australian Transport Safety Bureau (ATSB) Safety Investigation Report into "Wire-strike Accidents in General Aviation: Data Analysis 1994 to 2004", published in Sep 06. The ATSB is an Australian Government organisation.

POSSIBLE CAUSES

4. The Board considered each of the following cause groups (as defined within the Master Glossary of JSP 551 Vol 1) and considered how they may have contributed to the cause of the accident:

- Human Factors (Aircrew)
- Human Factors (Non Aircrew)
- Human Factors (Medical)
- Technical Fault
- Natural and Operating Risks
- Unsatisfactory Equipment
- Organisational Issues
- Non-Service Control
- Not Positively Determined

TECHNICAL

6. **Technical Fault.** A full technical investigation can be found at Annex E. Early indications, which were confirmed by the formal Technical Investigation, suggested that there was no reason to suspect a technical fault. — Annex E.

7. **Equipment.** There was no evidence to suggest that equipment contributed to this accident. This option was, therefore, formally discounted by the Board. — Annex E.

8. **Harnesses.** Comment on the harnesses can be found in the Medical Report (Annex F). — Annex F.

9. **Wire Strike Protection Systems (WSPS).** The Board looked into the WSPS modification that is available for the Squirrel helicopter and

considered whether it would have affected the outcome of this accident. The Squirrel WSPS is referred to as the 'Cable Cutter Installation', which is intended to reduce the risk of aircraft crash. In outline, it consists of an upper cable cutter, with canopy reinforcement to deflect the cable into the cutter; there is also a lower cable cutter, with reinforcement to the cabin floor to deflect the cable into the cutter. There is no reinforcement to the nose structure. In this accident, the wires appear to have struck on the nose between the 2 areas of possible reinforcement, and the speed of the aircraft at impact (approximately 100 kts) is significantly greater than that at which this modification has been tested (40 kts). The Board are, therefore, of the opinion that embodiment of this modification would not have affected the outcome of this accident. Exhibit AD. Annex E.

HUMAN FACTORS (HF)

10. **HF (Non Aircrew) (HF(NA))**. There was no evidence to suggest that HF(NA) contributed to this accident. ZJ 247 was serviced, handled, refuelled etc in exactly the same way as the other aircraft, none of which experienced any problems. Part 2

11. **HF (Medical) (HF(M))**. A full medical investigation report can be found at Annex F. Early indications, subsequently confirmed by the full Medical Report, indicated that there was no reason to suggest that there were any medical issues affecting the crew which may have caused or contributed to the incident. Fatigue is also discussed within the Medical Report and there is no evidence to suggest that the crew were unduly fatigued. Annex F.

12. **Opinion**: The Board considered evidence that WO2 Hussell was completing a lengthy weekly commute. The chain of command was aware of this and the Chief Flying Instructor (CFI) raised a concern to WO2 Hussell about his commute (having done so himself for 2 years) and discussed it with him. WO2 Hussell assured him that the situation was under control and that he was managing it. The Board could, therefore, find no evidence of any concern as to the commute affecting WO2 Hussell's ability to conduct his job and no evidence of a link to the accident.

13. **HF Report**. The Board obtained a HF report (Annex G), provided by Director Army Personnel Services (Science) (DAPS(Sci)). This report was compiled from DAPS(Sci) psychologists who attended the interviews conducted by the main Board, with access to all evidence obtained by the Board and from discussions with Board Members. The report, therefore, is the considered opinions of the psychologists who conducted the research. In parallel, the Board has also explored a range of aircrew HF issues, which they thought might have had a bearing on the accident; the Board has used Annex G to assist in the exploration of certain issues. Annex G.

14. **HF (Aircrew) (HF(A))**. The Board considered the currency and experience of both WO2 Hussell, the QHI/Ac Comd (HP) and Lt Reynolds, the Student Pilot (Acting Ac Comd).

15. **WO2 Hussell.** WO2 Hussell completed the APC in May 99 as a "High Average" student and his QHI course in Jan 08 as an "Average" student. His most recent flying assessment, on 7 Apr 08, graded him as "High Average". WO2 Hussell had a total of 2274:10 flying hours with Exhibit J. Exhibit K.

367:38 hours on Squirrel and a total of 376:55 in command (of which 108:59 on Squirrel). He had flown 1:40/4:50/26:10 hours in the preceding 24 hours/7 days/28 days respectively. WO2 Hussell was in current flying practice in all respects, except that he had not completed a monthly check by an A2 QHI[1] (as mandated in the SAAvn Flying Order Book (FOB) at A360.101.3 SCT) since 11 Apr 08, although he did complete his Night Vision Device (NVD) Competence to Instruct (CtoI) with an Army Flight Safety Standards Inspectorate (AFSSI) Standards Officer on 29 Apr 08. There is no evidence of a formal A2 Check in May. Exhibit L.

16. **Opinion**: The A2 check serves a two-fold purpose: firstly, a supervisory check to ensure that B2 probationary instructors are teaching correctly; secondly to provide guidance and development as he is learning his craft.

17. This was WO2 Hussell's second time on Ex WOODLARK. The evidence confirms that he had completed a TACEX 4 serial before and that he would have flown this particular exercise SAAFR previously. The accident occurred whilst he was flying down the SAAFR on TACEX 4. Exhibit K.

18. WO2 Hussell was a recently promoted WO2. He had recent operational experience on OP HERRICK. The Board noted that he was a relatively inexperienced Ac Comd, remarked upon by the Officer Commanding (OC) 670 Sqn upon his arrival, despite becoming an Ac Comd in Feb 02. It is also worth noting that his 376:55 captaincy hours were not achieved in a consolidated block. Between Feb 02 and Dec 03, he progressed from 24.6 to 147:42 captain hours. From Jan 04 to May 08 he progressed from 147:42 hours to his total of 376:55 hours, of which 82:57 hours were achieved in his 6 months and twelve days at Middle Wallop. Witness: 18. Exhibit K.

19. WO2 Hussell had aspired to be a QHI for some years. Indeed he was advised in 2003, on an AAC Form 3 by his then CO, to accumulate more captaincy hours before applying (he had 156 in 2003). Applying again in 2006 with a further 56 hours he obtained an AFSSI recommendation but was not selected. It is instructive to observe that the relevant AAC Form 3 had not been commented upon by any of his chain of command. Having re-applied in 2007 he was selected for QHI training. AAC QHI Selection Policy stipulates a minimum flying hours requirement of 500 hours, but makes no specific reference to whether this relates to total or captaincy hours. Exhibit J. Exhibit K.

20. **Opinion**: Command/captaincy hours are significant, as it is the Ac Captain/Commander who takes overall responsibility, makes decisions and manages the sortie/mission. The Board considered WO2 Hussell's relatively low captaincy hours to be significant, as it indicates that 22% of his low total of captaincy hours was achieved whilst he was also trying to develop as a newly qualified QHI. He was a B2 (probationary) QHI who had arrived from his QHI course and had been employed with B Flt since his arrival at SAAvn. He had accrued 72:32 instructional hours during his 6 months and twelve days at Middle Wallop. It is instructive to note that he had accrued some 27:38 less instructional hours than his QHI course contemporary (SSgt **[23]**) which suggests that he may have had less opportunity to develop as a QHI.

[1] QHI progression is from B2 to B1 then A2 to A1.

21. In addition to his primary duties WO2 Hussell had a number of additional responsibilities, as is normal within the military. As a result WO2 Hussell had specifically requested of the Flt Comd, that he only be allocated one student (rather than 2), as he was concerned at his ability to cope with these additional responsibilities. Additional responsibilities were: Witness 6 (addendum).

a. **President of the Mess Committee (PMC).** WO2 Hussell had been nominated to be the PMC of the Warrant Officers & Sergeants Mess (WO's & Sgts Mess), without the knowledge of the Sqn OC and CFI. Witness: 6.

b. **Flight Sergeant Major (FSM).** WO2 Hussell was appointed as the B Flt FSM, as he was the only WO2 in the Flt. Whilst not a particularly onerous task, it took him away from his core requirement to develop from a probationary B2 QHI and establish himself as a B1 QHI. Witness: 6,18.

22. **Opinion**: The Board consider that as a probable consequence of additional duties placed on WO2 Hussell he achieved around 27 hours less instructional flying than his QHI course contemporary.

23. **Opinion**: With regard to his secondary duty as PMC, the Board consider that this is a significant task and one which his principal supervisors should have been able to exert influence over his selection for. There is some inconsistency in the evidence as to who was actually aware that he had been nominated as PMC, but it was clear to the Board that the Flt Comd was managing this. The Board considered it unfortunate that those better able to exert influence over his nomination had not been consulted prior to his selection, as this task impacted upon his ability to develop his skills as a probationary QHI. Witness: 1,6. Witness: 26.

24. **Opinion**: The Board considered that this situation was unsatisfactory, however it could find no evidence that his secondary duties and overall workload directly contributed to this accident.

25. WO2 Hussell's Training Record indicates that he had not received the ground training brief for "Deployments – Orders, Admin and Briefings" from the OTP Administration Phase[2], but was expected, by the B Flt Comd, to deliver this very subject to students in the run-up to Ex WOODLARK. In the event, evidence suggests that the students did not receive this brief. Exhibit Q.

26. **Opinion**: The Board noted that WO2 Hussell had not completed all of the pre-requisite SAAvn QHI Induction Training serials before teaching on Ex WOODLARK. The Board considered this to be unsatisfactory. WO2 Hussell's incomplete induction to flying and administrative duties in B Flt, and there being no formal TOR for the role of FSM, may have caused this departure from what should have been a standardised activity. The Board felt that this task was within WO2 Hussell's core capabilities and qualifications. Exhibit Q.

27. **Lt Reynolds.** Lt Reynolds attended the Royal Military Academy Sandhurst from 11 Sep 05 and was commissioned on 11 Aug 06. Lt

[2] Part of SAAvn QHI Induction Training.

Reynolds was attending APC 103/104[3] (due to finish 13 Jun 08) having been back-coursed from APC 101/102, in order to give him further opportunity to consolidate. It is clear from his last Fortnightly Report, dated 13 May 08, that he was making solid progress. Lt Reynolds had a total of 257:45 flying hours with 202:55 hours on Squirrel and 12:40 in command (10:05 on Squirrel). He had flown 1:40/4:50/14:30 hours in the preceding 24 hours/7 days/28 days respectively. Lt Reynolds was in current flying practice as a student pilot. Witness: 3,6. Exhibit N.

28. **Opinion**: The Board consider that Lt Reynolds was competent and current to undertake the sortie as part of Ex WOODLARK under the instruction of WO2 Hussell.

ORGANISATIONAL ISSUES

29. **Ex WOODLARK**. Ex WOODLARK has been running since 1991. A number of witnesses confirm that the format of the Exercise has not changed markedly for at least the last 10 iterations. Ex WOODLARK is a constituent part of the OTP. It is the penultimate phase of training before the award of the Army Flying Badge or "Wings". Ex WOODLARK is a confirmatory assessment exercise designed to "practise operating tactically, as a single aircraft and as part of an ARP in an unfamiliar area in order to teach and assess the student's fieldcraft, handling and captaincy in a tactical environment". Subsidiary aims of the exercise are SCT and Familiarisation training as required. The staff are required to acknowledge that earlier ARPs conducted at Middle Wallop were largely instructional, whereas the Ex WOODLARK serials were more 'confirmation assessment' – hence a far greater reliance was placed on the student. A further issue being that both instructors and students were operating 'out of area' away from the more familiar area of Middle Wallop, thus working harder, due to a lack of familiarity. Witness: 6. Witness: 1,7,12,24.

30. **Staffing – Roles and Responsibilities**. Ex WOODLARK was co-ordinated and managed by B Flt Comd, by virtue of his appointment, under direction from OC 670 Sqn. The Board was unable to determine any specific Directive or Mission Statement for the Exercise, other than an overarching comment contained within the Exercise Instruction. It was instructive to note that this Exercise Instruction contained numerous errors. Day to day responsibility for the conduct of the exercise devolved to B Flt Comd. He was assisted by the FSM and, on this occasion, by the Sqn Trg WO (WO2 **[26]**) who had also deployed on this exercise to bolster the supervisory element. Witness: 6,18. Exhibit B.

31. **Ex Instructions**. The Board found that Lt Reynolds' name did not feature on the Ex Instruction for this Ex WOODLARK, but was content that this was a minor staffing oversight. Exhibit B. Witness: 6.

32. **B Flt Staff Folder – List of Hazards and Avoids**. The Board was presented with a copy (1 of only 2) of the B Flt Ex WOODLARK Staff Folder. The folder contained a range of information, from guidance to the staff, Exercise information (scenario, narrative, enemy ORBAT (Order of Battle)), daily flying programmes, Communications & Electronic Instructions and Artillery Control Point (ACP) grids. A list titled "Permanent Avoids" (x17) and "Potentially Dangerous Wires" (x5), is contained within the folder. The Kingscott Valley wires, struck in the Exhibit U. Witness: 6,35,36,37.

[3] APC students join with another course to form a joint OTP when at Middle Wallop to make best use of resources.

accident, were the second set of wires on this list. The Board heard that the list was locally generated and originated from 1998. It was last updated as at Oct 07 by the then B Flt Comd Capt **[29]**, though it has the signature block of the FSM of the time, WO2 **[30]**.

33. The Board found evidence that the students were given parts of the information contained in the folder, which indicates that the folder was being used. Capt **[15]** believed that the list of "Permanent Avoids" and "Potentially Dangerous Wires" was issued to the students by the FSM. However, the Board found evidence that this list had not been distributed to the students on this course. Witness: 30,31,32,33,34.

34. The Board then elicited the views of numerous key members of staff as to the ownership, management and use of the B Flt Staff Folder. In particular, OC 670 Sqn, B Flt Comd (past and present), previous B Flt FSMs and SSgt **[18]**.

a. **OC 670 Sqn**. OC Sqn was not familiar with this folder but believed that it was a live, in-use document. His expectation was that the folder contained information pertinent to the administration and conduct of Ex WOODLARK. He expected the folder to be used and that information within it would be current, valid and there for a purpose. Any outdated or irrelevant information should not be contained within the folder and should have been discarded. He believed that the B Flt hierarchy (Flt Comd/FSM) should own the folder. Witness: 38.

b. **B Flt Comd**. The Flt Comd was aware of the folder and its contents. In his view, the folder was used by the FSM to administer Ex WOODLARK and was available to all staff for the same purpose. He was aware of the existence of the list of "Permanent Avoids" and "Potentially Dangerous Wires", but felt that due to a long ago change in the Flt's modus operandi, namely stepping up in that area, many of the specified hazards had become less of an issue. As such, he believed that he had inherited a situation whereby these hazards were no longer considered as such and were, therefore, not highlighted on maps (albeit marked on the obstruction overlay). Whilst he believed the list to be out of date, he explained that it had not been removed from the folder as the Flt had been too busy to do so. The previous B Flt Comd (Capt **[29]**) and previous B Flt FSMs (WO2 **[31]** and WO2 **[30]**) all stated that the list was in use during their respective tenures of the post. Witness: 27, Witness: 37,35,36.

c. **SSgt [18]**. SSgt **[18]**, who told the Board that this was his 10th Ex WOODLARK, said that he was aware of the existence of the Staff Folder, generally aware of its contents and what it was used for. In his view, the folder was used by the Flt Comd and FSM to administer Ex WOODLARK and was available to all staff for the same purpose. He stated that, due to his familiarity with the exercise he had no need to refer to the folder and he had not done so for several iterations. As such, he was unable to comment authoritatively upon its contents. He also stated that he was not aware how it had been used prior to or during this Exercise. Witness: 28.

35. **Opinion**: The Board was content that the Staff Folder was available to all staff and that it was used by some as a reference document. However due to the inconsistent views and apparent

confusion of key Sqn personnel, the Board was unable to satisfy itself of ownership, content value and management of the folder. The Board considered it significant that the list of potential hazards, which had clearly been in use previously, was not promulgated to the students on APC 103/104. The Board considered this to be highly unsatisfactory.

36. **Hand Over/Take Over**. The Board felt it necessary to refer back to the previous Flt Comd and FSMs in order to examine previous procedures and the handover processes between them. The Board, therefore, conducted interviews with Capt **[29]**, WO2 **[30]** and WO2 **[31]** in order to draw a comparison between previous and extant management processes.

Witnesses: 18,27, 35, 36, 37. Annex G (para 74 – 78)

37. **Opinion**: The Board concluded that, whilst there had been a formal handover, the process was not robust resulting in some of the previous administrative and supervisory practices falling into disuse. These included briefings to students, promulgation of the B Flt Staff Folder list and formal map checking. The Board believes that a formal set of written directives would minimise potential for issues to be overlooked in the future. There are no TOR or written Directives, but the OC gave verbal directives to the Flt Comds, monitored their working practices, flying hours, working day length and was mindful of any domestic issues. The OC employed what he coined was a 'Mission Command' style of leadership and did not interfere or get involved in the day to day running of the Flt. Capt **[15]** stated that he had no TOR for the role of B Flt Comd, Exercise Director for Ex WOODLARK or Detachment Commander for Ex WOODLARK. This lack of defined TOR for posts within 670 Sqn has led to reliance on handover/takeovers between incumbents in particular posts. Where handover/takeovers are deficient the new incumbent must then rely on the Sqn or Flt 'Old Guard' to fill in the gaps. The Army Operational Training Phase (AOTP) rewrite has addressed the conduct of the course syllabus however particular individual's administration tasks, roles and responsibilities are not currently documented. This has led to a migration of responsibilities over successive handover/takeovers and certain functions and responsibilities have been diluted or omitted altogether. The rotation of personnel through the Flt Comd appointment happened relatively infrequently, whereas the opposite seems to be the case for the FSM appointment. The **[29]/[15]** (Flt Comd) handover took place at a similar time as the **[30]/[31]** (FSM) handover. Though the Board ascertained there was a handover between the respective positions, they could not determine if there was much in the way of discussion between the new Flt Comd/FSM combination as to how the workload was to be shared.

38. **Students**. The Board felt it necessary to ask students how well prepared they felt for Ex WOODLARK. Students have stated that they had been 'pulling' for key information rather than it being 'pushed' at them. For example, on the last working day prior to deployment, the students were asking for the Exercise Administration Order as the issued Administration Order had gone missing, in order that they could ensure individual tasks were complete. A small number of students were making, amending and marking maps of the Ex WOODLARK area, production-line style. The student maps presented to the Board were not correctly prepared for the exercise; whilst containing much of the 'Exercise Play' information, much of the 'Real' information was missing. This included wires updated by published Chart Amendment Document (CHAD), Local Avoids and Potentially Dangerous Wires from the list

Witness: 30,31,32,33,34.

Exhibits D, E.

within the B Flt Ex WOODLARK Staff Folder. The Board found that staff had not checked the maps at any stage. The Board interviewed 5 students individually to ascertain what information they received prior to Ex WOODLARK and what guidance they received relating to hazards and map marking. Student evidence was unanimous and entirely consistent, thus the Board felt it unnecessary to interview the remainder of the students. Each interview followed a similar format, summarised as follows:

a. **What information were you given prior to Ex Woodlark?** Operation Order, Exercise Scenario and narrative, list of ACPs. — Witness: 30,31,32,33,34.

b. **What information were you given on hazards?** None.

c. **What guidance were you given on map marking?** None, although individual QHIs did suggest a few things.

d. **Have you ever seen this list of "Permanent Avoids" and "Potentially Dangerous Wires"?** No, never.

39. **Opinion:** It was clear to the Board from the inconsistencies in evidence and general confusion that there was a lack of clarity as to duties, tasks and responsibilities, which, on this occasion, resulted in a number of issues being overlooked and not attended to.

40. **Student Map Marking.** The student maps presented to the Board were not marked in accordance with the Student Study Guide. The maps reviewed by the Board showed that neither the Kingscott Valley wires nor the 200 ft pylons were highlighted on students' maps. — Exhibits D, E.

41. **Ex WOODLARK Master Map.** The master map held in the Fremington Camp Operations (Ops) Room did not have the local 'sensitive areas' information and dangerous wires marked on it in accordance with the list in the B Flt Ex WOODLARK Staff Folder. Further, some wires which were highlighted on the Ops Room map were not on the B Flt specified list. — Exhibit P. Exhibit T.

42. **Opinion:** The Board heard inconsistent views from Capt **[15]** and SSgt **[18]** as to what level of checking had taken place. Additionally, the Board heard that the hazard highlighting that they would have expected was different from that specified in the B Flt Staff folder list. The Board considers that these inconsistencies in the way in which maps were checked and highlighted are unsatisfactory. — Witness: 27,28. Exhibit U.

43. **Orders/Information Extraction.** Once planning had been completed, students then briefed a set of orders to all members of the patrol. Orders were normally delivered approximately 1 hr to 45 mins before planned take off. The "Humber" patrol Msn Comd (Lt **[20]**) delivered the orders, with the ingress/egress briefed by the No2 (Lt Reynolds). Potential hazards to flight were expected to be briefed. Evidence suggested that the major pylons and masts were covered but there was no recollection of the wires involved in the accident having been mentioned. Evidence, from staff and students alike, indicated that these wires were viewed as 'domestics' (domestic low-level wires) and posed no significant threat. — Witness: 3, 6,12,19, 20.

44. **QHI 'Involvement'.** The QHI played no part in the planning — Witness: 1,6,12.

processes. First full engagement came with the delivery of the student orders. On completion of orders, which is the first time that they know the students' intentions, the QHIs will then have a discrete meeting to establish their exercise play. Some QHIs indicated that they checked the students' planning but stated that they viewed the SAAFR as a 'given' and thus did not merit much consideration. SAAFR DRAGON has not been materially changed for at least the last 10 Ex WOODLARKs, thus has been used by many aircraft and crews.

45. **Opinion:** Orders is the first, and often only, opportunity that the QHIs have to extract the information that they require for the safe conduct of the sortie. The QHIs should have been making themselves aware of potential hazards during the sortie, as the QHI acts as the HP (non map reading). The Board considered that the lack of direct engagement by the QHIs in the planning process, which clearly varied from individual to individual, could lead to the situation where the QHI was more reliant upon the students' map recce and route plan. The Board considered that viewing the SAAFR as a given, and affording it little attention, is unsatisfactory.

46. **Opinion**: Evidence suggested that there seemed to be little conscious recognition amongst the QHIs that they were placing an increased and significant level of trust in their students who, by definition, remain unqualified at that stage of training. It was instructive to note that levels of trust varied from "70 – 80%" down to "30 – 40%". None of the Flt QHIs interviewed was able to then quantify how they mitigated against the lack of trust in their student's ability. The Board considered that there is potential for the QHI to be drawn into a false sense of security, particularly an inexperienced B2 QHI and limited experience Ac Comd, when conducting a confirmation assessment style sortie rather than pure instruction.

47. **Ex WOODLARK Sortie Standardisation.** The Board heard evidence from QHIs and students that raise issues regarding the lack of standardisation of the sorties. The Board found that there was a lack of standardisation in a number of areas. Witness: 1,6,10,12,19,20.

48. **Opinion**: Having reviewed the extant OTP Syllabus, the Board considered the guidance within it to be so general that it was open to individual interpretation. This is then handed on by word of mouth from QHI to QHI as the preferred way to conduct the sortie. There is no evidence of a robust management framework or structure to prevent this.

49. **Sortie Focus.** Evidence indicated that the main focus of each sortie was the mission phase, thus less attention was paid to the ingress/egress phases at the planning stage. The Board found that instructors and students viewed the ingress/egress as 'givens'. Witness: 6,12,13

50. **Opinion**: The Board considered that the ingress/egress being viewed as a 'given' resulted in a missed teaching/training opportunity. The belief was that the threat from wires etc was mitigated against by flying at 100 kts at not below 100 ft agl. All of the QHIs interviewed stated that the "standard" for operating within a SAAFR was 100 kts at not below 100 ft agl; most, however, stated that they operated around 150 ft agl. On this sortie SSgt **[50]** stated that, until the time of the accident, he saw nothing untoward and was comfortable with how the sortie was being flown.

51. **Sortie Influence**. Evidence suggested that students were permitted to progress their plan, dependent upon their ability and efficacy of their planning until a pre-arranged codeword from either of the QHIs. At this point, the QHIs, with assistance from 'MAGIC', would start to influence the sortie by way of re-tasking and changes in the battle picture. This detail had been discussed and arranged by the individual QHIs after orders and prior to launch. There was no prescribed script; it was left up to the QHI's imagination. This influence normally occurred a good way into the sortie and never as early as the ingress phase. The Board felt it significant that WO2 Hussell on a previous documented occasion, had introduced a particular tactical issue (namely the threat posed by 2S6[4] and hence the imperative to use low ground). This view is reinforced by written comment in Lt Reynolds' personal notebook where notes from TACEX 2 (flown with WO2 Hussell) indicate that he was briefed to use low ground. There is some evidence to suggest that low flying and threat avoidance were particular areas of interest for WO2 Hussell. The CFI commented during WO2 Hussell's Acceptance Check, that he "*must be encouraged to add his considerable operational experience to his instructional lexicon, putting instruction into context is very important especially on the OTP*". Witness: 1,6,10,24.

52. **Opinion**: Whilst the Board supported the need for QHIs to utilise and impart their previous operational experience, they felt that it should be managed to ensure standardisation of content and delivery.

53. **'Pace' Notes**. The Board has noted that there were no 'Pace' Notes in the documentation that existed at the time of the accident. The Board is aware that Pace Notes have been incorporated in the rewrite of the AOTP syllabus.

54. **Opinion**: Though there is no requirement for formal 'Pace' Notes for a syllabus, it is generally considered good practice to do so, as it provides instructors with a guide as to how to conduct a lesson.

55. **Internal Validation**. The Board could find no evidence of any internal validation of Ex WOODLARK and, specifically each sortie. As a result, sortie content and conduct appears to have been handed down from one generation of QHIs to another: In WO2 Hussell's case, he received one 40 minute familiarisation sortie on 17 Mar 08, the second of 4 sorties that he flew that day. On 20 May 08, WO2 Hussell then elected to fly a further 1hr solo SCT sortie in the Ex WOODLARK area. There is no evidence of any further training. There was no specific instruction, rehearsal or guidance on how the Ex WOODLARK sorties were to be conducted. The Post Exercise Review between Instructors, Flt Comd and Trg Offr that had previously existed, had not been conducted recently Exhibit K. Witness: 3,6,12,19,20.

56. **Opinion**: The Board noted the lack of recent internal validation and found it unsatisfactory.

57. **Opinion**: The Board found evidence of a lack of formalised sortie standardisation, or any mechanism to ensure such. The Board ascertained that there was a supervisory mechanism in place for Ex WOODLARK, however it should have been more robust. It was the

[4] A Russian made mobile anti-aircraft weapon system.

Board's opinion that supervision should have been better.

58. **Ex WOODLARK QHI Induction Familiarisation Sortie.** Evidence suggests that new QHIs would receive an area familiarisation sortie on their first deployment to Ex WOODLARK. This sortie consisted primarily of a geographic familiarisation, with a few pointers as to the identified major hazards, such as significant masts and the major (200 ft +) pylon lines. Particular attention was also drawn to the wires in the 'Blue Duck' valley and those that crossed the 'southern lake', as they were deemed to pose a particularly serious hazard. WO2 Hussell completed a 40 min area familiarisation with SSgt **[32]** on 17 Mar 08 during his first Ex WOODLARK; this was his 2nd of 4 sorties on that day. By way of evaluation, the Board calculated that it would take 30 min to fly direct to/from the south of the exercise area. WO2 Hussell then elected to complete a 1hr solo SCT sortie in the Ex WOODLARK area on 20 Mar 08. The 'Blue Duck' valley element of the familiarisation included how WO2 Hussell should deliver the 'Blue Duck' wires demonstration to students. A recurring theme was that the instructors all relied upon "local knowledge" and "familiarity" to conduct their task. Witness: 1,3,6,12,20.

59. **Opinion**: The Board considered that the familiarisation sortie was not long enough, nor did it cover sufficient detail.

60. **Authorisation.** All B Flt QHIs have powers of self-authorisation for OTP serials, including Ex WOODLARK. It is, therefore, routine for each QHI to self-authorise every instructional sortie. The B Flt Duty Instructor (DI) plays no part in the authorisation process and there is no external scrutiny of the ARP's planning. This ARP, on which the accident occurred, was authorised as follows: Exhibit AE. Exhibit C. Exhibit B.

a. **'Humber 1'**. SSgt **[18]** authorised himself and Lt **[20]** for TACEX 4 in accordance with APC Ser 58 (Lead) NAI 072 in Squirrel ZJ 246. Exhibit C.

b. **'Humber 2'**. WO2 Hussell authorised himself and Lt Reynolds for TACEX 5 in accordance with APC Ser 59 (Wing) NAI 072 in Squirrel ZJ 247. Exhibit C.

Standard authorised minima for APC Ser 58 & 59 are "Not Below 100 ft agl and 50 ft MSC" for Ex 18 (Low Flying) and Ex 40 (Pilot Map Reading, Navigation). Exhibit P.

61. **Opinion**: The Board considered that the lack of independent authorisation or, at the least the Msn Comd QHI taking full supervisory ownership, was a missed opportunity to introduce a further decision-making check. The SAAvn FOB suggests that an 'outbrief' should be given where a Duty Authoriser or Ops Staff are available; this was not being actioned either. Whilst not necessarily directly contributing to this accident, the Board felt that enhanced supervision and a more rigorous authorisation process might lessen the chances of a similar incident occurring in the future.

62. **Wires Awareness - 'Blue Duck' Familiarisation.** All students and new QHIs undertake the 'Blue Duck' familiarisation as part of TACEX 2 (the initial 'liaison' (area familiarisation) sortie). WO2 Hussell and Lt Reynolds both completed the TACEX 2 sortie, and the 'Blue Duck' Witness: 3,6,12,19,20. Exhibit T.

element on Tue 27 May 08. The Board found that each QHI had his own variation on the theme, but it resulted in every student being taken up the valley from the 'Blue Duck' (Grid: SS 554 123) until they came across the wires between Grids: SS 532 139 – 533 143) which are clearly marked on the map. Despite this, most students had not previously highlighted or identified these wires as a threat and rarely saw the wires until they were pointed out to them by the instructor. The dangers were then emphasised and the QHIs provided a personal, non-standard brief on how to minimise the risk posed by wires strung across valleys; this again varied from one QHI to another. The familiarisation is conducted in the low level **tactical** environment, ie less than 100 ft with a commensurate low speed. Witness: 1,3,6,12,19,20.

63. **'Down Day' Lesson**. Wed 28 May 08 became a 'Down Day' with no flying due to persistent bad weather. During the afternoon, the students were tasked with giving short lessons on a range of topics. One of the chosen lessons was wires and map marking. A lesson was delivered by Lt **[19]** on these topics and Lt **[22]** specifically recalls mention of map marking symbology and pylon/wire heights. The Board was unable to confirm it, but evidence suggested that both WO2 Hussell and Lt Reynolds would have received this lesson. Witness: 6,13,31.

64. **Opinion**: 'Wire awareness' is the airmanship skill to identify possible emerging wire hazards before they become a threat; large HT wires are not usually the main threat due to their conspicuity. 'Domestic' wires are generally at or about 40 ft above ground level (based on the height of the pylon/post, rather than the wires themselves). In this case the chart symbology did not depict whether the wires were suspended across or contoured down and up each side of the valley. However, there is Defence Geographic Centre (DGC) symbology that can be used to indicate a suspended cable obstruction. This relies on the potential hazard being identified and notified to the DGC for incorporation onto the chart. Further, the threat posed by wires can never be discounted on steeply contoured ground[5]. This potential hazard should be identified as early as possible. It may well emerge in the planning phase (particularly if already known about and promulgated on a master hazards map or list of potential dangers), but the threat should certainly be identified when flying. Once the potential hazard is identified a number of options exist: The area could be avoided completely, or the track flown adjusted accordingly. Depending on a number of variables (weather, depth of the valley, enemy threat etc), it is generally safer to adhere to the shoulder of the valley or high ground to give the best possible chance of avoiding any wires. If it proves necessary to enter the low ground, aircrew should fly at a commensurate height and speed such that, should wires be encountered, safe avoiding action can be taken. Defensive flying is the dynamic assessment of emerging hazards whilst airborne, in order to take early preventative, rather than curative, action. The Board considered that the general lack of true wires awareness was a major contributory factor.

65. **Opinion**: In the opinion of the Board, although the Instructors held the view that the 'Blue Duck demonstration' was of great value and well received, the students may not learn the complete lesson. Whilst this

[5] The Caution Note, printed as part of the Legend for GSGS 5215 Great Britain Low Flying Chart 1:50,000, and again at the bottom of the Ordnance Survey of Great Britain (OSGB) Map Sheet, specifically states: "The power line and obstruction overprint information has been compiled from the most reliable sources available. Completeness of detail heights and alignments cannot be guaranteed."

familiarisation may impart certain threat elements to the students, none of them had correlated the threat of domestic wires in the low level **transit** environment. In other words, students perceived that at 100 ft 100 kts 'domestics' did not pose a threat. Of the 5 Students who had recently completed Ex WOODLARK and interviewed subsequently by the Board, only one of them gave the staff answer as to the danger of wires in valleys; and that realisation was due directly to the accident. When questioned what he had learned from the Blue Duck demonstration and the accident, one student simply answered, "There are lots of wires in Devon". The Board concluded that wires awareness training was unsatisfactory and needed review.

66. **Continuation/Emphasis.** It is clear that all exercising personnel considered themselves wires aware. Furthermore, they suggested that they were aware of "wires everywhere". Despite this, it is also evident that students continued to plan to fly down valleys that the maps clearly showed had wires crossing them, with no evidence from the students' maps studied by the Board that wires were being routinely highlighted on students' maps.

Witness: 1,6,12,13,19,20.

Exhibit D, E.

67. **Opinion**: The Board considers it pertinent that the 'Blue Duck' wires attract a less significant map marking symbol than those struck in the accident. The Board believed this methodology to be correct as students were taught of the dangers posed by the smallest wires, however, there was no evidence from the student's maps that they had considered the threat posed by more significant wires. The map marking symbology states:

a. **'Blue Duck' Wires.** *Powerline on pylons between approximately 80 ft and GL[6] (11kV & below).*

Exhibit X.

b. **Accident Wires.** *Powerline on pylons between approximately 80 ft and GL (>11kV).*

BOI Note: measurements considered over level terrain.

68. **Route Selection**. The accident occurred approximately half way down the SAAFR around 30 km back from the planned Forward Line of Own Troops (FLOT). The Board attempted to determine why the aircraft was flown down this valley. Having specifically flown the route, to try and replicate the sortie profile and to corroborate witness evidence, the Board concluded that it was a deliberate act to fly through the valley. The significance of such is that the Board did not consider that the aircraft flew into the valley by chance. The Board considered the following factors:

Exhibits D, E.

a. **Weather**. The Board found no evidence to suggest that the weather affected route selection.

Witness: 1,12,13. Exhibit Y.

b. **Planned Route.** Having recovered the maps, it is clear that Lt Reynolds had intended to follow the line of the valley. However, the dotted route line on his map suggested that he planned to route up over the right (west) shoulder. Lt **[20]** map (in the other aircraft of the patrol), however, indicated a route straight through the valley. This is not uncommon, as pilotage lines are not strictly adhered to

Exhibits D, E.

[6] Ground Level.

but are used to assist with drawing the eye to the proposed route on the map.

c. **Tac Considerations/Use Low Ground**. As previously discussed, there is evidence to suggest that on previous occasions WO2 Hussel favoured the use of low ground. Exhibit V.

d. **Terrain/Topography**. The approach to the valley, indeed much of the route north of it, is predominantly over rolling, undulating hills. The valley itself tightens and the sides become much steeper in short order, both of which are masked by a small shoulder of ground several hundred metres in advance of the valley entrance. Topographical map marking of the area is good, clear and accurate. Exhibit Z.

e. **Masking/Visual Illusion.** The Board studied the ground in detail, both on foot and from the air. It was evident that identification of the pylons and wires was difficult. Firstly, trees obscured the pylons, especially the one on the east side. The pylon on the west side was more readily visible, but, at a quick glance, could be mistaken as being part of the set that ran along the valley shoulder (parallel to the valley). The map is clear, but there is potential for a visual illusion on the ground. Exhibit Z. Ground Recce. Exhibits D, E.

f. **Funnelled**. The Board found no evidence to suggest that WO2 Hussell was funnelled into this valley due to external factors. For completeness; initial interpretation of the Swanwick radar trace indicated that 'Humber 1' had accelerated past 'Humber 2' and, at the time of the accident, was actually in the lead – a detail contradicted by both SSgt **[18]** and Lt **[20]**. Having sought clarification from Swanwick, the Board determined that the radar information has a speed error of up to 10% and a location error (dependent upon proximity to the radar head) of +/- 100 m. The Board was, therefore, entirely satisfied to afford a lower significance to the picture painted by the radar trace (in both lateral and vertical axes) and endorse the witness evidence. Witness: 12,13. Exhibit F.

69. **Opinion**: The Board concluded that the route selection, whilst constrained by the boundaries of the SAAFR, was a deliberate act, as was the actual route flown. There is no evidence of any external influences that may have affected route selection and nothing to indicate anything untoward. The absence of a CVR/FDR means that the Board is unable to establish what precisely may have been being discussed by the crew at the time.

NATURAL AND OPERATING RISKS

70. The Board considered a number of issues that they felt fell into the Natural and Operating Risks category.

71. **Weather**. The weather at the time of the accident was overcast with around 6-7 km visibility in occasional light showers, which had led the crew of 'Humber 1' to use the single windscreen wipe feature periodically. None of the crews reported the weather as being problematic, nor did any of the witnesses. The crew would have been looking and flying into sun, but, at that time of the day, it was still sufficiently high that even if not obscured by cloud, they were not looking Exhibit Y. Witness: 12,13.

directly into sun. The Board, therefore, discounted the weather and visibility as causal or contributory factors.

72. **Power Line.** Western Power Distribution has indicated that this power line was first erected in the late 1950s – they have, therefore, been there for many years. Western Power Distribution has never received formal notification that these power cables represent a hazard. The power cables were last inspected on 24 Apr 08, with no faults found. Western Power Distribution was not aware of any fault associated with the power cable immediately before the accident. Exhibit AA. Exhibit U.

a. **Pylons.** The pylons from which the power cables were suspended were situated in, near or behind trees dependent upon direction of view. From the direction of travel, they would have been difficult to see, particularly those on the east side of the valley. The pylon on the west side could easily be visualised as belonging to the set of wires than ran parallel with the valley top (parallel to the route being flown). Exhibit Z. Ground recce.

b. **Wires.** The wires comprised a set of 3 cables, mounted horizontally. The conductor concerned was 0.1 square inch hard drawn copper, resulting in each of the 3 power cables being approximately 12mm in diameter. Notwithstanding the remarks pertaining to the pylons, the power cables would also have been very difficult to see. The copper cables were heavily oxidised thus presented a green image against a green background of trees and grass. The wires were not marked with any form of hazard warning, nor are they currently required to be. The wires were marked on the map overprint, but were not highlighted by the crew. Exhibit AA. Annex E. Exhibits D, E.

c. **Wire Height.** Both sets of wires (one set crossing, one set parallel to the valley) were marked on the map; the pylon line that crossed the valley (therefore the aircraft track) was marked as *"Powerline on pylons between approximately 80 ft and GL (>11kV)"*. Subsequent analysis by the Board, corroborated by a detailed GPS survey conducted by Western Power Distribution, indicate that the actual wire height at point of impact would have been around 130 ft agl. Exhibits D, E. Exhibit I.

73. **Opinion:** The Board considered that the lack of conspicuity of both pylons and wires was a contributory factor. It must be emphasised that current legislation does not require the wires to be marked with any form of hazard warning. The line of the power cables was, however, marked on the maps that the aircrew were issued with. Neither set of aircraft maps had been annotated by the students to highlight these wires as a particular hazard. The actual height of the wires crossing the valley is estimated as around 130 ft at point of impact. There is no guaranteed correlation between how wires are marked on the map and what that marking physically translates to on the ground. Pylons marked on the map are only a representation of the type and height of the pylon and not the actual geographical position of them or the height of the wires. The lack of accurate detail as to whether cables contoured down, or were suspended across the valley is considered to be a contributory factor.

74. **Remaining JSP551 Cause Groups.** After reviewing all of the evidence, the Board felt able to discount the following cause groups:

a. **Non-Service Control**. There is no evidence to suggest that any issues outside of Service control contributed to this accident. This option was formally discounted. | Part 2.

b. **Not Positively Determined**. The Board believed that they would be able to determine a cause, thus discounted this option. | Part 2.

OTHER RELEVANT MATTERS

75. **Low Flying**. Low flying, as being conducted on Ex WOODLARK, is a necessary military skill, which requires regular practise. This discipline is not practised as regularly as previously and, on Op HERRICK, is not routinely conducted by Apache aircrew (in the case of WO2 Hussell). The discipline of low flying is trained for and major potential hazards, such as wires, are covered during all phases of flying training. Risk mitigation strategies associated with low-level flying rely heavily on the level of situational awareness maintained by the pilot. Strategies used to establish and maintain adequate situational awareness include reading the physical structure indicators (ie orientation of insulators, presence of pylons and poles), self discipline, pre-flight briefing, pre-flight reconnaissance and observation, memory and awareness, appropriate flying techniques, maintenance of a good visual scan and consideration of weather factors. The ATSB Study determined that 63% of pilots had some knowledge of the wire before coming into contact with it. | Exhibit AB. Exhibit P. Witness: 26 Exhibit AC.

76. **Opinion**: The Board considered that Low Flying is not now practised as regularly as previously and is not routinely conducted on current operations by Apache aircrew. The Board believes that the corporate knowledge base and skill set has scope for improvement. Low Flying should not be considered a routine activity and should be addressed accordingly.

77. **Manning**. The Board heard evidence that the Sqn was not resourced to cope with the numbers of students on each course. Evidence suggested that there were gaps between the "Dynamic White Ticket" (a planning tool used to calculate manpower needs) establishment and the actual manpower liability. The Board also heard evidence that B Flt was running on minimum manpower. | Witness: 6,18,26,39.

78. **Course Schedules**. The Board heard evidence that course schedules were tight and therefore left little opportunity for re-evaluation, re-constitution or consolidation. The 670 Sqn course schedule had no gaps and relied on each course finishing on time as the next began immediately thereafter. | Witness: 6,20.

79. **Sqn Tasking**. Over the past 18 months 670 Sqn tasking has increased through the introduction of Air Awareness Training, Pre-QHI Course Training and Pre-Apache Course Refresher Training. Although this tasking was shared with HQ FW, there was an additional burden on the Sqn, particularly the Sqn Trg Office staff. | Witness: 6,18,26.

80. **Postings/Gaps**. The Board was advised of the postings turbulence and personnel turnover that has occurred and that continued within Flying Wing, which compounded the various experience related issues within 670 Sqn. It also exacerbated the internal training and | Annex G. Witness: 18.

supervisory burdens. Additionally, from interview with the Flt Comd, B Flt was operating at the minimum manpower level to complete their task. Postings resulted in an increased turnover of junior QHIs, which caused an increased burden on the Sqn Trg Office for Induction Training and mentoring. Witness: 6.

81. **Opinion**: The Board heard a variety of potentially inconsistent views, but which indicated overstretch and pressure within B Flt. The Board did not pursue this avenue as they did not consider it directly relevant to their TOR, but feel that it is worthy of study.

82. **AOTP Review**. The Board was made aware of a number of training pipeline management issues. At the time of the incident the Sqn, under direction from HQ FW, and with the blessing of Comdt SAAvn, was conducting a review of the AOTP syllabus and had embarked upon a re-write of a number of the serials and sorties. This was regarded as a significant and necessary piece of work by the CFI, which involved effort from every individual within 670 Sqn to some degree. The review was commenced in Oct 06 and had the express aim of relieving the time pressure created when courses began to run behind schedule. This review was completed and the necessary action taken. In particular, Night Flying Training and Instrument Flying Training which had been modular in format, were spread across the AOTP through A and B Flts. Subsequently an AOTP rewrite was ordered by the CFI in Nov 07 with an implementation date of Sep 08, certain discrete elements would be phased in earlier. This was in order to change the AOTP such that the training delivered reflected the flying carried out on current operations. Witness: 18,26,39.

83. **Opinion**: The Board noted that this was very valuable work, but observed that a number of witnesses commented upon the additional workload that this had created.

84. **Induction Training**. SAAvn QHI Induction Training is delivered in three phases; The Induction Phase, the OTP Tactical Familiarisation Phase and the OTP Administrative Duties Phase. The Induction Phase is managed by the Sqn Trg Offr and is conducted upon arrival, the Tactical Familiarisation Phase and OTP Administration Phase are managed by the relevant Flt. WO2 Hussell completed the Induction Phase, including the Acceptance Check with the CFI. He did not complete the OTP Familiarisation Phase and OTP Administration Phase. These latter phases should be delivered in stages by a military QHI. They do not all have to be completed before the Instructor can begin teaching, however each individual stage must be taught to the new instructor before he can go on to teach that relevant stage to students. Exhibit Q. Exhibit K.

85. **Opinion**: The Board reflected upon the coherence of training provided. The Board felt that QHI Induction Training should be reviewed. Junior QHI mentoring mechanisms, whilst adequate, could be improved to incorporate captaincy and awareness issues, rather than concentrating on pure flying instructional techniques.

CONCLUSION

86. After taking evidence, considering it in detail to identify and iron out inconsistencies, followed by significant deliberation and debate, the Board reached a number of conclusions. The Board found that:

a. The accident was caused by the aircraft striking the Kingscott Valley wires.

b. The wires were suspended approximately 130 ft above ground level at the point of impact.

c. These wires had previously been identified as a potential hazard and were specified on a list of "Permanent Avoids" and "Potentially Dangerous Wires" contained within the B Flt Staff Folder.

d. The list of "Permanent Avoids" and "Potentially Dangerous Wires" was not being used and had not been distributed to students attending Ex WOODLARK.

e. The Kingscott Valley wires were not highlighted on student maps.

f. The planned route took the patrol along the SAAFR and through the valley.

g. The sortie was being flown in accordance with the plan.

h. There was no evidence of any Technical reasons for the accident.

i. There was no evidence of any Medical reasons for the accident.

87. Formal Findings can be found at Part 5.

88. Recommendations can be found at Part 6. As the Board had no further Observations, there is no Part 7 and the Report is signed off at the end of Part 6.

PART 5

FINDINGS OF THE BOARD

SUPPORTING DOCUMENTATION

CAUSE

1. The accident was caused by the aircraft striking the Kingscott Valley wires. — Part 4

2. **Causal Factor.** The decision to fly through this valley was deemed to be a causal factor.

3. **Contributory Factors.** Notwithstanding the principal and supporting cause, the Board considered there to be a range of contributory factors as follows:

   a. The set of wires struck in the accident was contained in a list of "Potentially Dangerous Wires" contained in the B Flt Staff Folder, but not promulgated or highlighted on any maps (although they were marked on the obstruction overlay).

   b. A general lack of true wires awareness.

   c. A lack of formalised sortie standardisation, or any mechanism to ensure such.

   d. The lack of conspicuity of both pylons and wires.

   e. The lack of detail as to whether cables were suspended across or contoured down and up each side of the valley.

   f. Due to the training needs, the ARP required to operate at low level.

   g. A lack of clarity of duties, tasks and responsibilities.

   h. Induction training and mentoring elements of QHI training.

INJURY

4. The Ac Comd, 24885235 WO2 VP Hussell AAC, suffered fatal injuries consistent with exposure to the extremely high deceleration forces sustained by the aircraft during impact with the wires and subsequently the ground. Death was certified at 1634 hrs, on site, by **[33]** the land ambulance paramedic. — Annex F

5. The Student Pilot, 565352 Lt MM Reynolds AAC, suffered fatal injuries consistent with exposure to the extremely high deceleration forces sustained by the aircraft during impact with the wires and subsequently the ground. Death was certified at 1650 hrs, at North Devon Hospital, Barnstaple, by Dr **[34]** (A&E Doctor). — Annex F

DUTY

6. WO2 Hussell and Lt Reynolds were both on duty and correctly authorised to conduct the task. The Board found that Lt Reynolds' name did not feature on the Ex Instruction for this Ex WOODLARK, but was — Exhibit C.

content that this was a minor staffing oversight. Exhibit B.

ORDERS AND INSTRUCTIONS

7. The Board found that all orders and instructions had been complied with except that:

a. **Monthly A2 Check.** WO2 Hussell had not completed an A2 Check in May, which he was required to do in accordance with the SAAvn Flying Order Book at A360.101.3 SCT. Exhibit K. Exhibit L.

b. **Induction Training.** According to WO2 Hussell's SAAvn QHI Training Record, he had not completed all of the required tactical low flying and ARP pre-training as necessary for the Tactical Familiarisation Phase nor had he received the ground training brief for "Deployments – Orders, Admin and Briefings" from the OTP Administration Phase, Exhibit Q.

c. **Chart Amendment Document (CHAD) Implementation.** The Board found that individual 1:50 000 Maps used on Ex WOODLARK had not been amended in accordance with the extant CHAD. The CHAD is prepared and issued every two months by the Defence Geographic Centre (DGC) at the MOD; it is to be made available to all Pilots and Navigators for use in pre flight planning. The CHAD is held by the Middle Wallop Flight Planning Office, from where SAAvn students and instructors alike obtain their maps. However the latest CHAD, No 249 dated 1 Apr 08 was not available in the Flight planning Office; a previous CHAD No 247 dated 1 Dec 07 was in use. The para in CHAD No 247 that amended the relevant map used on Ex WOODLARK is identical to the paragraph in CHAD No 249. Therefore, although the most up to date CHAD was not available, the latest changes to the relevant map were accessible. The changes included a new set of wires that crossed the planned route of "Humber" patrol some 4 km north of the accident site. It should be noted that, although Ex WOODLARK individual maps were not amended in accordance with the CHAD, the master Ops Room map was correctly amended. Exhibit AF. Exhibits D, E. Exhibit T.

d. **RADALT Setting Policy.** The Board noted that the sorties were authorised for "Not Below 100 ft agl" in transit, yet the RADALT bug was set to 100 ft – this is not in accordance with the SAAvn FOB, which states the bug should be set at 10% below the minimum height. Exhibit L.

DAMAGE

8. The aircraft was damaged beyond repair (Category 5 (Scrap)). Annex E

DAMAGE TO ROLE EQUIPMENT AND ASSOCIATED ITEMS

9. The aircraft was in the standard Middle Wallop role fit, with no removable role equipment. Annex E

DAMAGE TO SERVICE AND CIVILIAN PROPERTY

10. The accident caused 3 x 33 kV power cables that traverse the Part 3.

valley span at the crash site, to be severed. All 3 x 33 kV power cables dropped into the valley and shorted out an 11 kV power cable running underneath. Three Western Power Distribution sub stations shut down automatically; these were at Great Torrington, Tinkerscross and Middle Barlington. In order to reinstate power to affected areas, 3 generators were run, one at each of the three sub stations for 2 days while repairs were made. The 3 x 33 kV power cables were replaced by Western Power Distribution. Two concrete 'H' poles supporting the cables, one on either side of the valley, were damaged and subsequently replaced with wooden poles.

11. The impact caused damage to a number of trees in the immediate area of the crash site. Some tree branches had been severed and some partially severed branches were dangling over the crash site. These branches were hazardous to personnel working at the crash site and were removed by a tree surgeon called out by the Institute of Naval Medicine (INM) Duty Crash Response Officer (DCRO). Exhibit AG.

12. There was a strong smell of fuel at the crash site. Calculations made, based on the estimated fuel on board at the time of the accident and fuel recovered from the fuel tank, indicated approx 100 litres of fuel was lost into the ground. The INM DCRO decided that the most practicable solution would be to let the fuel attenuate naturally. There was no evidence of other damage to civilian property. Exhibit AG.

CRASH SURVIVAL

13. The deceleration forces at impact with the wires and the ground far exceeded human tolerances; the crash was not survivable. Annex F

14. **Wire Strike Protection Systems (WSPS).** The Board looked into the WSPS modification that is available for the Squirrel helicopter and considered whether it would have affected the outcome of this accident. The Squirrel WSPS is referred to as the "Cable Cutter Installation", which is intended to reduce the risk of aircraft crash. In outline, it consists of an upper cable cutter, with canopy reinforcement to deflect the cable into the cutter; there is also a lower cable cutter, with reinforcement to the cabin floor to deflect the cable into the cutter. There is no reinforcement to the nose structure. In the accident the wires appear to have struck on the nose between the 2 areas of possible reinforcement, and the speed of the aircraft at impact (approx 100 kts) is significantly greater than that at which the WSPS modification has been tested (40 kts). The Board are, therefore, of the opinion that embodiment of the WSPS modification would not have affected the outcome of this accident. Exhibit AD.

POST CRASH ASPECTS

15. Post crash management of the site was initially conducted by SSgt [**18**] AAC. Civil Police and Fire and Rescue were swiftly on the scene, as were the Chivenor SAR helicopter and the Devon Air Ambulance. Part 2

16. The accident site was then managed by WO2 [**26**], until the arrival of the AIEFSO. Part 2

OTHER

17. **CVR/FDR.** The lack of any form of CVR/FDR restricted the Board's ability to determine what happened and hampered the Board's ability to identify why and how the accident occurred. | Part 4.

18. **Compilation of Obstruction Overlay.** The Board found a number of issues pertaining to the compilation process associated with the obstruction overlay: | Exhibit X.

a. Power companies provide information on cable voltage (11 kV, 33 kV, 132 kV) but do not give information on pylon or wire height.

b. Any heights relate to the height of the pylon, not the wires.

c. Pylon locations are not marked, merely a representation of their line.

d. In this case the chart symbology did not depict whether the wires were suspended across or contoured down and up each side of the valley. However, there is DGC symbology that can be used to indicate a suspended cable obstruction. This relies on the potential hazard being identified and notified to the DGC for incorporation the chart.

PART 6

RECOMMENDATIONS OF THE BOARD

1. The lack of any form of CVR/FDR restricted the Board's ability to determine what happened immediately prior to the accident and hampered the Board's ability to identify why and how the accident occurred.

Recommendation: The Release To Service Authority (RTSA), Helicopter Islander Combined Integrated Project Team (HIC IPT) and FBH should, as a matter of urgency, fit some form of CVR/FDR (as a minimum a basic CVR) to all platforms.

2. The Board investigated the WSPS modification that is available for the Squirrel helicopter and considered that it would not have affected the outcome of this accident. However, WSPS is a far broader topic than merely wire cutters (as fitted to the Squirrel).

Recommendation: MOD CAP (ALM)[1], RTSA(s) and IPT(s)[2] should investigate the efficacy of all forms of WSPS for every platform and incorporate them accordingly in order to reduce the chances of aircraft crash and loss of life or injury.

3. The accident was caused by the aircraft striking the Kingscott Valley wires. It became evident to the Board, after wide discussion, that units and individual aircrew were not as wires aware as they thought that they were.

Recommendation: HQ AAC Dev Trg[3], with 22 Trg Gp RAF[4], should ensure effective defensive flying training is introduced. Defensive flying training should include threat perception during planning and the dynamic assessment of emerging hazards whilst airborne, in order to take early preventative, rather than curative, action.

- This process should start in the Flying Training system when Low Flying (Rotary) is introduced in order that the defensive flying seed is planted early.
- This should be continued and nurtured through the Flying Training Pipeline by means of formal instruction and mentoring, both on the ground, during the planning stage, and whilst airborne.
- This is to include the robust use of standard hazard highlighting.

Recommendation: HQ AAC Dev Trg, with 22Trg Gp RAF should review wire awareness training. This should include ground based training to aid 3 dimensional visualisation of 2 dimensional maps with particular reference to wires across valleys and other hazards.

4. Wider Defensive Flying training. It became evident to the Board, after wide discussion, that units and individual aircrew were not as familiar with nor utilising defensive flying techniques as they thought that they were.

Recommendation: AOAs should give consideration to delivering retrospective defensive flying training to their respective communities. Defensive flying training should include threat perception during planning and the dynamic assessment of emerging hazards whilst airborne, in order to take early preventative, rather than curative, action.

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[1] Ministry of Defence Capability Air & Littoral Manoeuvre.
[2] For all (tri-Service) helicopters across Defence.
[3] HQ AAC Development Training branch
[4] 22 Training Group RAF.

Recommendation: AOAs should continue to impress upon aircrew the dangers posed by hazards in the low level environment; operating in this environment is not to be seen as *routine.*

Recommendation: AOAs ensure that aircrew using maps/charts are fully aware of both the obstruction display symbols used, as well as the cut-off heights.

Recommendation: AOAs remind all aircrew that "The Caution Note", printed as part of the Legend for GSGS 5215 Great Britain Low Flying Charts 1:50,000, specifically states: "*The powerline and obstruction overprint information has been compiled from the most reliable sources available. Completeness of detail, heights and alignments cannot be guaranteed.*" This warning also appears at the bottom of the OSBG map sheet. Dismissing the threat of wires ("they are only domestics") is clearly unwise and dangerous.

5. The set of wires struck in the accident was contained in a list of "Potentially Dangerous Wires" contained in the B Flt Staff Folder, but not promulgated or highlighted on any maps (although they were marked on the obstruction overlay).

Recommendation: HQ 7 (Trg) Regt AAC should review all of the information that is held within formal and informal "Staff Folders" (and the like), to ensure provenance, integrity, validity, relevance, authority and applicability.

Recommendation: HQ 7 (Trg) Regt AAC should provide policy direction on how "Staff Folders" (and the like) are managed, updated and used.

Recommendation: HQ 7 (Trg) Regt AAC should ensure that the extant list of Potential Hazards is widely available and is displayed in Middle Wallop Flight Planning.

- Hazards should also be plotted on a map in Flight Planning.
- The list is not to be considered exhaustive.
- Individuals are to be encouraged to forward obstructions and assessed hazards to Flight Planning for inclusion on this list.

6. Exercise Play – Simulated vs Real threats.

Recommendation: AOAs should ensure that real dangers associated with Low Flying are not overshadowed by exercise overlays and role play. This should fall under the banner of defensive flying which should be developed and nurtured at all times.

7. QHI workload.

Recommendation: HQ 7 (Trg) Regt AAC should ensure that B2, probationary, QHIs are not given external demanding secondary duties and are to be limited to no more than one internal additional responsibility. The B2 must be permitted and encouraged to develop his newly acquired and burgeoning skill-set.

8. Sortie standardisation

Recommendation: HQ AAC Dev Trg, HQ SAAvn and HQ 7 (Trg) Regt AAC should ensure that 670 Sqn (and its other sub units as appropriate) have documented instructional sortie profiles to follow, and that staff members, are subject to regular standardisation, especially probationary instructional staff.

9. Sortie planning.

Recommendation: The Board was aware that Ex WOODLARK would be replaced by Ex COBRA STRIKE. HQ 7 (Trg) Regt AAC should ensure that a full set of supervisory instructions are available to underpin sortie planning policy and guidance.

10. Lack of conspicuity of both pylons and wires.

Recommendation: DARS in concert with the power distribution companies should identify methods of making both pylons and wires conspicuous to aviators.

11. Lack of detail as to whether the wires were suspended across or contoured down and up each side of the valley.

Recommendation: AOAs should ensure aircrew are encouraged to report obstructions or assessed hazards to their respective Ops/Flight Planning departments in order that the units build a database of 'Potential Low Level Hazards'.

- Any list should not be viewed as exhaustive – there may still be hazards: Fly Defensively.
- Whilst individual units help to build this database they gain a better understanding of what constitutes a low flying hazard.

Recommendation: AOAs should insist that aircrew report obstructions or assessed hazards to the Defence Geographic Centre (DGC); Chart Amendment Low Flying (CALF) and Chart Amendment Document (CHAD) have details of how to do so. This will ensure that, where appropriate, they are included within the Digital Vertical Obstruction File (DVOF), then incorporated within subsequent CHADs and maps.

Recommendation: AOAs should ensure that all "near-miss obstruction occurrences" are widely reported, and certainly, to the DGC.

Recommendation: The DARS in concert with the DGC and power distribution companies investigate whether power lines and cables can be marked on aviation overlays in a manner that is more representative of the reality on the ground.

Recommendation: The DGC should review its policy for data gathering and considers ways of annotating accurately exactly how wires cross valleys (traverse/span or contour). Similarly DGC should make clear how obstacle height information is derived and displayed.

Recommendation: When AOAs deploy on UK exercises they should be encouraged to get a list a local area hazards from the central database for the exercise area.

Recommendation: AOAs should create and maintain a master exercise area hazards map. This master hazard map should be updated and briefed prior to each iteration of an exercise.

12. Low Level Flight.

Recommendation: AOAs should remind aircrew that flight at low level is never to be considered routine; methods should be developed to regularly reinforce this message.

13. Induction training and mentoring elements of QHI training.

Recommendation: HQ 7 (Trg) Regt AAC should create, use and adhere to a robust framework of course material:

- Instructor Guides

- Sortie Profile Notes (Pace Notes)
- Sortie Standardisation Notes
- Sortie Standardisation Briefs

Recommendation: HQ 7 (Trg) Regt AAC should ensure that QHI Operational Training Phase (OTP) TAC Familiarisation Phase training and OTP Duties are completed with 670 Sqn prior to teaching the TACEX syllabus.

Recommendation: HQ 7 (Trg) Regt AAC should implement the use of formal Individual Training Plans (ITP) to take a B2 instructor from post induction to B1 standard. The plan should be performance based and offer a mechanism to mitigate against any shortfall in the instructors ability and/or experience by use of targeted instructional sorties by experienced A2 QHIs, to be documented for ease of supervision, reference and management. In effect a more formalised and documented use of the monthly/bi monthly A2 check of B2 QHIs.

Recommendation: HQ 7 (Trg) Regt AAC should introduce a specific representative sortie of low level flight instructional sorties for B2 QHIs. This is to be a representative sortie where the student is the pseudo aircraft/mission commander Non Handling Pilot (NHP) and the QHI is the actual aircraft commander and Handling Pilot (HP). This sortie should highlight the differences between confirmation assessment and pure instruction in order to highlight the different QHI roles and provide a thorough understanding of the dynamics of this type of flight. A level of competence should be displayed commensurate with the CTP sortie profile and may take a few sorties to achieve. The sorties should be performance based and be considered instructional rather than familiarisation. They should include Crew Resource Management (CRM) issues, contentions and areas of ambiguity.

Recommendation: HQ 7 (Trg) Regt AAC should, within the recommendation above, consider giving QHIs the opportunity to observe (from the rear of the ac) a TACEX sortie prior to teaching the TACEX syllabus.

14. Administration, exercise and map preparation.

Recommendation: HQ 7 (Trg) Regt AAC should ensure that a Job Specification/Job Description exists for the role of Flt Comd and FSM in order to mitigate against various degrees of ability and experience.

Recommendation: HQ 7 (Trg) Regt AAC should review its update policy to ensure that all maps, charts and documents are amended in a timely efficient manner. The aim should be to establish a 'push' system, rather than 'pull'.

Recommendation: The Board was aware that Ex WOODLARK would be replaced by Ex COBRA STRIKE. HQ 7 (Trg) Regt AAC should ensure that a robust Mission Statement and full set of supervisory exercise policy and instructions are available to underpin any future exercise.

Recommendation: TOR should exist for CGTW personnel attending Ex COBRA STRIKE to provide a set definition of their involvement, participation and contribution to the Exercise.

15. Overstretch and pressure felt by Flying Wing.

Recommendation: HQ AAC and HQ SAAvn should review and adjust, where necessary:

- Course schedules
- Course loading (especially the OTP)

- Flying Wing establishment

to ensure that suitable opportunities exist to take stock, consolidate and conduct meaningful staff continuation/development training in line with Flying Wing's second mission: "To take B2 QHIs and train them to B1 standard and beyond for employment with the Field Army".

16. QHI selection and management policy.

Recommendation: HQ AAC reviews its QHI selection criteria to consider and address the issue of high total hours but low captaincy hours, particularly prevalent within the Apache Senior NCO aircrew community.

Recommendation: JHCHQ, HQ AAC and AFSSI reviews the policy guidance provided to units to provide enhanced opportunities for suitably qualified Ac Comds to actually earn meaningful captaincy/command experience.

17. Supervision and internal validation.

Recommendation: HQ 7 (Trg) Regt AAC, assisted where appropriate by HQ SAAvn, should review and improve the following processes:

- Authorisation – minimise the use of self-authorisation.
- Consider using a Duty or Formation Leader Authorisation when detached.
- Outbriefs – deliver outbriefs to the Duty Instructor (DI), if used, in accordance with the SAAvn FOB.
- Standardisation – implement a regime of strict pre-sortie standardisation.
- Internal Validation – actively review and validate policies and process.
- Feedback Loop – ensure that issues identified are actively fed back and managed accordingly.

18. The Board noted that the sorties were authorised for "Not Below 100 ft agl" in transit, yet the RADALT bug was set to 100 ft – this is not in accordance with the SAAvn FOB, which states the bug should be set at 10% below the minimum height.

Recommendation: AFSSI and HQ 7 (Trg) Regt AAC reviews the policy guidance for RADALT setting when low flying.

Signatures of Board Members: **Date: 30 Jul 09**

President: [2]

Member: [12]

Member: [4]

PART 7

OBSERVATIONS OF THE BOARD

As the Board had no further observations, there is no Part 7.

PART 8

AIRCRAFT OPERATING AUTHORITY'S COMMENTS

INTRODUCTION

1. Firstly, I am grateful to the BOI team for their work in completing the investigation into this tragic accident. However, I am disappointed that I am making comment on this accident some 14 months after I was presented with the Board of Inquiry findings by the President. The staffing process, particularly through DALS, has meant that there has been a lengthy delay and I will be addressing this issue outside of this Inquiry. Inevitably this has had a significant impact on the families of those who lost their lives. All investigations in future must aim to be completed within the timescale laid down in JSP 832

CAUSE AND CONTRIBUTORY FACTORS

2. Although the BOI team identified the causal factor as the decision to fly through the Kingscott valley, I believe that the cause of this accident was either a failure to visually acquire the wires or that they were sighted too late to allow the Handling Pilot to avoid them. I would put the decision to fly through the valley as a contributory factor rather than a causal factor. I fully agree with the other contributory factors identified by the Board and wish to expand on a few of them. The lack of true wires awareness was most certainly a contributory factor, and I think that the use of the SAAFRs to transit to and from the Holding Area (HA) Forward had become routine, and that the threat posed by the "domestic wires" to the crews in the undulating terrain was not as clearly identified as it should have been. The evidence presented by the Board shows that these wires were, and still are, extremely difficult to spot. The wires were on the map that the crew was using, although the crew had not highlighted them, but there is no indication of whether the wires are suspended or follow the contours of the ground, and I believe this contributed towards the accident. I strongly recommend that these particular wires are highlighted as suspended across the valley and that their physical conspicuity is enhanced.

3. It is clear from the evidence presented by the Board that organisational shortcomings at SAAvn also played a part in this accident. The limitations of Ex WOODLARK had been identified prior to the accident and work to remedy these issues was already taking place. The effort required to review this phase of the course may well have increased the workload of the QHIs, possibly to the detriment of the normal standardisation and supervision of the Operational Training Phase. Indicative of this was the apparent confusion over the ownership, amendment and use of the staff folder through all levels of 670 Sqn. The list of "potentially dangerous wires" that was contained in this folder should have highlighted the threat posed to crews operating in the Kingscott valley and the fact that it had not been promulgated to all Exercise aviators was a contributory factor.

4. The evidence gathered also indicated that B Flt was under significant pressure in terms of manpower numbers and the experience levels amongst the QHIs, with a high proportion of the QHIs operating as B2 instructors. There were no formalised and documented instructional sortie profiles for instructors to follow and therefore the guidance for the new B2 QHIs was limited. The lack of supervision by the QHIs of the planning process, and more crucially the checking of the routes prior to the sortie meant that they

were overly reliant on the student's map recce. The need for clarity of duties, tasks and responsibilities and a robust training and mentoring programme for the new QHIs should have been considered by the Command chain. The success of any training regime depends on the delivery of well structured and consistent instruction. The limited degree of standardization across the training programme meant that individual QHIs could deliver their own interpretation of the package rather than an endorsed course standard.

RECOMMENDATIONS

5. I welcome the wide-ranging recommendations that the BOI has made, and many of them echo the findings made in the DARS Study into Obstruction and Wirestrike Hazards[1]. As a short term measure I will ensure that the DARS paper is redistributed to all JHC Aviation Units to reinforce the recommendations made by the BOI and this will be followed by wide distribution of the BOI itself. With regard to the fitment of CVR/FDRs, these are a significant asset when investigating this type of incident and I support the fitting of such a system to all our aircraft. As with all resource-heavy modifications, this will have to be balanced against the cost of introducing such a system. However, it must be made clear that a FDR/CVR system could not have prevented this accident. Likewise, I note that whilst the Squirrel Wirestrike Protection System would probably not have made any difference to the outcome of this accident, it is clear that in some cases the fitment of such a system could increase the chances of surviving a wirestrike, and historically it is our smaller helicopters that are the most vulnerable. The development of a better "Wires Awareness" culture is strongly supported, and the recommendations of both this BOI and the DARS Wirestrike study need to be incorporated into our training pipelines to ensure that Defensive Flying Techniques are inculcated in our aircrew from the earliest stages of training. We must also ensure that this message is sent loud and clear to our frontline operators.

6. I would also like to comment on the recommendations made at Page 6-2, Para 6 with regard to Exercise Play – Simulated vs Real Threats. The JHC FOB is clear in the direction it gives to all JHC aviators regarding the rules and regulations for Low Flying. When planning exercises it is the responsibility of individual units to conform to these orders. In the ideal world we need to train as we fight, but in aviation, this must never compromise the safety of our aircraft and crews. The recommendations at Page 6-3, Para 11 regarding the lack of detail of wires annotated on maps are also worthy of further comment. The JHC FOB[2] orders aircrew to report new obstructions on a Master Wires obstruction map and these amendments are to be sent to DGC for amendment of the wires overlay. Likewise, advice is contained within the JHC FOB[3] directing units to seek information on obstruction and wires from the appropriate authority when they are to be operating outside their normal area. The redistribution of the DARS study and the recommendations of this BOI should reinforce the responsibilities that all aircrew have in ensuring they have the best possible obstruction and hazard information. I am reassured that 7(Trg) Regt AAC have implemented the recommendations of the BOI with the review of the Army Operational Training Phase (AOTP) of the Pilot's Course.

[1] DARS/3/1/6 dated 1 Dec 08.
[2] JHC FOB Order J317.110.1.d
[3] JHC FOB Order J330.130.1

SUMMARY

7. This tragic accident resulted in the untimely death of two aircrew and the loss of a valuable aircraft. Collision with wires remains one of the JHC's top aviation risks, and is inherent when conducting our essential Low Level training and on operations. Operating in the Low Level environment can never be considered routine, and crews must use every piece of information at their disposal to minimise the risk of having a wirestrike. We must develop a strong culture of wires awareness and encourage our crews to adopt defensive flying techniques to minimise the risk to our crews. The evidence of this BOI indicates that the level of awareness of the threat posed by wires needs to be raised significantly. We must learn the lessons from this accident and do our utmost to prevent it happening ever again.

C A JOHNSTONE-BURT
R Adm
Comd JHC

COMMENTS ON THE CONDUCT OF BOARD OF INQUIRY INTO THE DEATHS OF 24885235 WO2 HUSSELL AND 5653522 LT REYNOLDS 2 (TRG) REGT AAC ON 29 MAY 09

BIRD REFERENCE	CONVENING AUTHORITY	REVIEWING AUTHORITY
	JHC	HQ LF - DPS(A)

BRIEF DESCRIPTION OF THE OCCURRENCE

On Wed 29 May 08, a Squirrel helicopter struck a set of power lines near the village of Kingscott in Devon. It crashed killing the two occupants, WO2 Hussell (QHI/Aircraft Comd) and Lt Reynolds (Student). The helicopter was one of a pair that comprised a patrol participating in Ex WOODLARK, which was the final exercise of the Operational Training Phase (OTP) of the Army Pilot's Course (APC). B Flight, from 670 Sqn AAC, were responsible for the conduct of the exercise, which was scheduled to take place at Fremington Camp, Devon from Tue 27 to Fri 30 May 08. As a confirmatory, rather than training, stage of the APC the students gave orders for the sortie. After a standard departure from the camp the two helicopters descended to low level flight to enter the ingress route through the area of Kingscott valley. One helicopter flew along the edge of the valley, the other (crewed by WO2 Hussell and Lt Reynolds) flew through the valley. It was this second helicopter that struck a set of power lines that were anchored either side of the valley by pylons. After the MAYDAY was raised a comprehensive evacuation plan was implemented. WO2 Hussell was pronounced dead at the scene: Lt Reynolds was airlifted to hospital where he was also pronounced dead.

COMMENTS ON THE PROCEEDINGS OF THE BOARD

This Board of Inquiry (BoI) was originally convened on 30 May 08, but was dissolved on 25 Jul 08 due to legal advice. The BoI had been convened by the Commandant of the School of Army Aviation. To assure the independence of the BoI the responsibility was removed from the training chain of command and it was then convened by the Commander Joint Helicopter Command (Comd JHC) on 28 Jul 08.

Being an aviation BoI report, which was constructed during the transition to AFA 06 procedures, it has an unusual format. In addition to the typical Narrative and Findings in response to the Terms of Reference (TORs) there is also a large middle section entitled Diagnosis of Causes. This section is more commonly understood as a Flight Safety Air Accident Investigation (as detailed in JSP 551 Vol1). The inclusion of this section is a product of the crash investigation beginning originally instigated in this format; it was on legal advice received from ALS3 during spring 2009 that the BoI report was amended to respond closer to the requirements of JSP 832. The resultant format is awkward as it results in two completely different forms of Inquiry existing side by side within the same BoI report. As the two were not assimilated into one the opinions, findings and recommendations of the Board are distributed across the two reports.

The finalisation of the report depended on the completion of two technical reports including; a Human Factors Report (dated Sep 08) and an AIEFSO report (dated 30 Dec 08). The report was first drafted in spring 2009 and due to its unusual format required a significant degree of legal advice and re-writing to conform with JSP 832. The report was finalised in autumn 09. The BoI was submitted to DPS(A) on 8 Dec 09. The Inquest is to follow the release of the BoI.

COMMENTS ON THE FINDINGS OF THE BOARD

The findings of the BoI were:

- The causal factor of the accident was the decision to fly through the valley.
- The contributory factors were: that the location of the 'Potentially Dangerous Wires' were not promulgated, a lack of wire awareness, lack of sortie standardisation, the lack of conspicuity of both pylons and wires, the lack of detail as to the suspension of the wires, the requirement to fly at low level, a lack of clarity over duties, tasks and responsibilities and the induction training and mentoring of elements of QHI training.
- WO2 Hussell and Lt Reynolds suffered fatal injuries consistent with exposure to the extremely high deceleration forces sustained by the aircraft during impact with the wires and ground.
- WO2 Hussell and Lt Reynolds were on duty.
- WO2 Hussell had not completed his monthly QHI check.
- WO2 Hussell had not completed all the necessary induction training.
- The maps used had not been correctly amended.

- The RADALT was not set correctly.
- The aircraft was damaged beyond repair.
- The accident caused electrical cables to be severed, trees to be damaged and fuel to be released at the crash site.
- The crash was not survivable.
- The embodiment of WSPS would not have affected the outcome of the accident.
- Post crash management was conducted firstly by SSgt Williams, then the Civilian Police, Fire and Rescue, Chivenor SAR and the Devon Air Ambulance.
- The absence of CVR/FDR restricted the Board's ability to determine what had happened.
- The obstruction overlay did not contain accurate information of obstructions on the ground.

Additional key findings from the Diagnosis of Causes are:

- That low flying is not practised as regularly as previously had been the case.
- That there were signs of overstretch in B Flt.

The Reviewing Authority (RA) accepts that the absence of a CVR/FDR restricted the ability of any party to determine what had happened. The RA also notes that while the BoI found that the causal factor of the incident was the decision to fly through the valley, the Convening Authority (CA), which is the Aircraft Operating Authority, considered the causal factor to be either:

- A failure to visually acquire the wires, or,
- That they were sighted too late to allow the Handling Pilot to avoid them.

The RA notes that the CA considered the decision to fly through the valley was therefore a contributory, rather than a causal, factor and that the CA agreed with all the other contributory factors identified by the BoI.

COMMENTS ON THE RECOMMENDATIONS OF THE BOARD

The board made thirty eight recommendations relating to: hazard awareness, low flying, QHI training, Sqn management, the use of CVR, WSPS and the setting of the RADALT. Fifteen of the recommendations are now closed, and twenty three remain 'on-going', with review times annotated for either the 12 Feb or 30 Apr 10 in the majority of cases.

ADDITIONAL ACTION REQUIRED OF THE BOARD

Other than to monitor the implementation of the recommendations, no additional action is required.

SIGNED [35]
APPOINTMENT MT GRIFFITHS
Brig
DPS(A)
DATE 8 Feb 2010