Defence
Safety Authority

Service Inquiry

JACKAL Roll Over Accident
Catterick Training Area

29 January 2019

Defence Safety Authority

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JACKAL SI

PART 1.1

Covering Note

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PART 1.1 – COVERING NOTE

DSA/SI/19/001/JACKAL ROLL CTA

24 Jul 20

DG DSA

SERVICE INQUIRY INVESTIGATION INTO THE JACKAL ROLL OVER ACCIDENT THAT OCCURRED AT CATTERICK TRAINING AREA ON 29 JANUARY 2019.

1. The Service Inquiry Panel formally convened at Abbey Wood, Bristol at 13:00 on Wednesday 13 February 2019 by order of the Director General Defence Safety Authority for the purpose of investigating an accident involving Staff Sergeant John McKelvie of the Scottish and Northern Irish Yeomanry on 29 January 2019 and to make recommendations in order to prevent reoccurrence. The Panel has concluded its inquiries and submits the finalised report for the Convening Authority's consideration.

2. The following inquiry papers are enclosed:

Part 1.1	Covering Note;
Part 1.2	Convening Orders, Terms of Reference (TORs) and Glossary;
Part 1.3	Narrative of Events;
Part 1.4	Analysis and Findings;
Part 1.5	Recommendations;
Part 1.6	Convening Authority Comments.

[redacted]
Wing Commander, Royal Air Force
President

[redacted]
Captain, REME
Engineering Member

[redacted]
Sergeant, RM
Operations Member

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JACKAL SI

PART 1.2

Convening Order

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Defence Safety Authority

Service Inquiry Convening Order

13 Feb 19

SI President	Hd DAIB
SI Members	DSA HQ Legad1

Copy to:

PS/SofS	MA/VCDS	MA/DCGS
PS/Min(AF)	Sec/CNS	MA/CFA
PS/Min(DPV)	MA/CGS	DSA DLSR TL
PS/Min(DP)	PSO/CAS	DDC Dir
PS/PUS	PSO/COMD JFC	DDC Head of News
DPSO/CDS	MA/CJO	APSG BAS

DSA DG/SI/01/19 – CONVENING ORDER FOR THE SERVICE INQUIRY INTO THE DEATH OF A SOLDIER OF THE SCOTTISH AND NORTHERN IRISH YEOMANRY DURING AN ACCIDENT INVOLVING A JACKAL VEHICLE ON CATTERICK TRAINING AREA ON 29 JAN 19

1. In accordance with Section 343 of Armed Forces Act 2006 and in accordance with JSP 832 – Guide to Service Inquiries (Issue 1.0 Oct 08), the Director General, Defence Safety Authority (DG DSA) has elected to convene a Service Inquiry (SI).

2. The purpose of this SI is to investigate the circumstances surrounding the incident and to make recommendations in order to prevent recurrence.

3. The SI Panel will formally convene at DSA, Juniper Building, Abbey Wood North at 1300 on Wednesday 13 February 2019.

4. The SI Panel comprises:

President:	**Wing Commander** [redacted]
Members:	**Captain** [redacted]
	Sergeant [redacted]

5. The legal advisor to the SI is **Wing Commander** [redacted] (DSA-HQ-LEGAD1) and technical investigation/inquiry support is to be provided by the Defence Accident Investigation Branch (Defence AIB).

6. The SI is to investigate and report on the facts relating to the matters specified in its Terms of Reference (TOR) and otherwise to comply with those TOR (at Annex A). It is to record all evidence and express opinions as directed in the TOR.

7. Attendance at the SI by advisors/observers is limited to the following:

Head Defence AIB – Unrestricted Attendance.
Defence AIB investigators in their capacity as advisors to the SI Panel – Unrestricted Attendance.
Human Factors Advisors from the Army Personnel Research Capability seconded to provide specialist advice to the Panel and DAIB – Attendance appropriate to the consultation service being afforded.

8. The SI Panel will work initially from the DAIB facilities at Andover. Permanent working accommodation, equipment and assistance suitable for the nature and duration of the SI will be requested by the SI President in due course.

9. Reasonable costs will be borne by DG DSA under UIN D0456A.

Original Signed

R F P Felton CBE
Lt Gen
DG DSA – Convening Authority

Annex:

A. Terms of Reference for the Service Inquiry into the death of a soldier of the Scottish and Northern Irish Yeomanry during an accident involving a JACKAL vehicle on Catterick Training Area on 29 Jan 19.

Annex A To
DSA DG/SI/01/19 Convening Order
Dated 13 Feb 19

TERMS OF REFERENCE FOR THE SERVICE INQUIRY INTO THE DEATH OF A SOLDIER OF THE SCOTTISH AND NORTHERN IRISH YEOMANRY DURING AN ACCIDENT INVOLVING A JACKAL VEHICLE ON CATTERICK TRAINING AREA ON 29 JAN 19

1. As the nominated Inquiry Panel for the subject SI, you are to:

a. Investigate and, if possible, determine the cause of the accident, together with any contributory, aggravating and other factors and observations.

b. Ascertain whether personnel involved were acting in the normal course of their duties and whether the issued Personal Protection Equipment that was worn by the vehicle crew was appropriate, sufficient and fit for purpose.

c. Examine safety procedures and processes for this JACKAL driving course and the training area involved, including orders, SOPs and instructions and any other relevant documents issued. Consider applicability, relevance and the level of compliance.

d. Determine the status of all relevant equipment and examine maintenance schedules for the equipment. Comment on whether these were appropriately maintained and report any defects or deficiencies identified.

e. Examine the Platform Safety Case for the JACKAL and determine whether equipment hazards have been correctly identified to enable informed Risk to Life assessment in operating the vehicle.

f. Establish the level of training, including familiarity with equipment and procedures, competencies, qualifications and currency of students and directing staff involved in the activity.

g. Review the levels of authority and supervision covering the task when the incident occurred. Determine whether risk assessments were appropriate and considered at the correct level within respective Chains of Command.

h. Identify if the levels of planning and preparation were commensurate with the activities' objectives.

i. Investigate and comment on relevant fatigue implications of individuals' activities prior to the matter under investigation and on any Human Factors that may have played a part in this incident.

j. Assess any Health and Safety at Work and Environmental Protection implications in line with JSP 375 and JSP 418.

k. Determine and comment on any broader organisational and/or resource factors.

l. Investigate whether there have been similar related incidents and comment on whether lessons identified from these previous incidents have been learned.

m. Consider whether the Defence Land Safety Regulator has the appropriate authority, regulations, processes and resources to conduct adequate assurance (including Safety Case reviews) and Certification of JACKAL and other land vehicles.

n. Report and make appropriate recommendations to DG DSA.

2. The investigation should not seek to attribute blame and you should use JSP 832 Guide to Service Inquiries and DSA 03.10 as guidance for the conduct of your inquiry. You are to report immediately to the DG DSA should you have cause to believe a criminal or Service Offence has occurred.

3. If at any stage the Panel discover something they perceive to be a continuing hazard presenting a risk to the safety of personnel or equipment, the President should alert DG DSA without delay to initiate remedial actions. Consideration should also be given to raising an Urgent Safety Advice note.

4. These Terms of Reference have been designed to be wide ranging in order to ensure that you have the freedom to investigate wherever the evidence leads.

PART 1.2 – GLOSSARY

Serial (a)	Abbreviation/Acronym (b)	Definition (c)
1	1 (UK) Div	1st (United Kingdom) Division
2	2IC	Second-in-Command
3	4 Inf Bde	4th Infantry Brigade
4	A2020	Army 2020
5	A&I	Assurance / Audit and Inspection
6	AAE	Annual Assurance Estimate
7	AAP	Annual Assurance Plan
8	[redacted]	[redacted]
9	ACSO	Army Command Standing Order
10	Adjt	Adjutant
11	AED	Automated External Defibrillator
12	AESPs	Army Equipment Support Publications
13	AF510	Army Form 510
14	AF510A	Army Form 510A
15	AFPAs	Army Force Protection Advisors
16	AFV	Armoured Fighting Vehicles
17	AH Cbt	Assistant Head Combat
18	AHQ	Army Headquarters
19	AINC	Army Incident Notification Cell
20	ALARP	As low as reasonably practicable
21	ALP	Army Lessons Process
22	AOR	Area of Responsibility
23	ARMCEN	Armour Centre
24	ARMS	Army Reporting Management System
25	ASC	Army Safety Committee
26	ASCen	Army Safety Centre
27	ASEMS	Acquisition Safety and Environmental Management System
28	ASIMS	Air Safety Information Management System
29	AStrat	Assessment Strategy
30	ATSB	Australian Transport Safety Bureau
31	ATUD	Authority To Use Document
32	AV	Armoured Vehicle
33	AVSOs	Armoured Vehicle Standing Orders
34	BAMS	Bidding and Allocation Management System
35	BCIP	BOWMAN Combat, Infrastructure and Platform
36	BRF	Brigade Reconnaissance Force
37	BS	British Standard
38	CADMID	Concept, Assessment, Demonstration, Manufacture, In-service and Disposal
39	CAE	Claims Argument Evidence
40	CARE	Capture, Analyse, Resolve, Exploit
41	CAss	Climate Assessment
42	CC	Commissioning Course

43	CD Cbt	Capability Director Combat
44	CDS	Chief of the Defence Staff
45	CDTA	Catterick Driver Training Area
46	CES	Complete Equipment Schedule
47	CESO(A)	Chief Environment and Safety Officer (Army)
48	CF	Course Folder
49	CFA	Commander Field Army
50	CGS	Chief of the General Staff
51	CLM	Command, Leadership and Management
52	CNO	Casualty Notification Officer
53	CO	Commanding Officer
54	COM(L)	Chief of Material (Land)
55	CONUSE	Concept of Use
56	CoT	Care of Trainee
57	COTE	Commanding Officer of a Training Establishment
58	CPD	Continuing Professional Development
59	CPR	Cardiopulmonary Resuscitation
60	CR1	Challenger 1
61	CRM	Crew Resource Management
62	CS(A)	Chief Safety (Army)
63	CT	Continuous Training
64	CTA	Catterick Training Area
65	CTA SOFT	Catterick Training Area Standing Orders For Training
66	CTATC	Catterick Training Area Training Conference
67	CTG	Collective Training Group
68	CVO	Casualty Visiting Officer
69	CVR(T)	Combat Vehicle Reconnaissance (Tracked)
70	D Basing and Infra	Director Basing and Infrastructure
71	D Cap	Director Capability
72	D LE	Director Land Equipment
73	D LW	Director Land Warfare
74	D Reserves	Director Reserves
75	D Sp	Director Support
76	D&M	Driving and Maintenance
77	DAIB	Defence Accident Investigation Branch
78	DCC	Dismounted Close Combat
79	DCGS	Deputy Chief of the General Staff
80	DCoP	Defence Codes of Practice
81	DCS(A)	Deputy Chief Safety (Army)
82	DCTS	Defence Centre for Training Support
83	DDH	Delivery Duty Holder
84	DE&S	Defence Equipment and Support
85	DEDs	Derogations, Exemptions and Disapplication's
86	Def Log Pol	Defence Logistics Policy
87	Def Stan	Defence Standard
88	DfT	Department for Transport
89	DG DSA	Director General Defence Safety Authority
90	DGSDCI	Defence General Service Driver Conversion Instructor

91	DH	Duty Holding
92	DIO	Defence Infrastructure Organisation
93	DIO AO	Defence Infrastructure Organisation Allocations Officer
94	DIT	Defence Instructional Techniques
95	DLE	Defence Learning Environment
96	DLIMS	Defence Lessons Identified Management System
97	DLoDs	Defence Lines of Development
98	DLSR	Defence Land Safety Regulator
99	DMI	Driving and Maintenance Instructor
100	DMR	Digital Mobile Radio
101	DoC	Duty of Care
102	DRAS	Divisional Risk Appetite Statement
103	DSA	Defence Safety Authority
104	DSAT	Defence Systems Approach to Training
105	DSOs	Driver Standing Orders
106	DST	Defence School of Transport
107	DT	Delivery Team
108	DTA	Driver Training Area
109	DTCF	Defence Trainer Competency Framework
110	DTE	Defence Training Estate
111	DTL	Delivery Team Leader
112	DTM	Defence Trainer Managers
113	DTRs	Driver Training Records
114	DTS	Defence Trainer Supervisors
115	DTTT	Defence Train the Trainer
116	DTTTv2	Defence Train the Trainer Version 2
117	EASPs	Exercise Action Safety Plans
118	ECAB	Executive Committee of the Army Board
119	ECM	Electronic Control Module
120	ENvE	Engineering Notification via Email
121	EOs	Enabling Objectives
122	ERM	Equipment Registration Mark
123	ERV	Emergency Rendezvous
124	ESMI	Equipment Safety Matrix Improved
125	ExVal	External Validation
126	FAIR	Flowchart Analysis of Investigation Results
127	Fd Army	Field Army
128	FEPA	Force and Environmental Protection Audit
129	FHPA	Force Health Protection Audit
130	FMT	Form Motor Transport
131	FP	Force Protection
132	FTRS	Full Time Reserve Service
133	FTS	Formal Training Statement
134	G1A	G1 Audit
135	GOC	General Officer Commanding
136	GPMG	General Purpose Machine Gun
137	GS	General Service

138	GVW	Gross Vehicle Weight
139	H&S	Health and Safety
140	Hd VST	Head Vehicle Support Team
141	HMTV	High Mobility Truck Variant
142	HoC Cbt	Head of Capability Combat
143	HoC GM	Head of Capability Ground Manoeuvre
144	HQ	Headquarters
145	HROs	High Reliability Organisations
146	HS&EP	Health, Safety and Environmental Protection
147	HSE	Health and Safety Executive
148	HVTC	Heavy Vehicle Training Circuit
149	IC	Internal Communications
150	IDEA	Individual Development Evaluation and Assessment
151	IED	Improvised Explosive Device
152	INCREP	Incident Report
153	INS	Incident Notification System
154	Inst 1	Instructor 1
155	Inst 2	Instructor 2
156	InVal	Internal Validation
157	IPCC	Intergovernmental Panel on Climate Change
158	IR	Infra-Red
159	ISA	Independent Safety Auditor
160	ISO	International Standards Organisation
161	ISpec	Instructor Specification
162	ITDU	Infantry Trials Development Unit
163	ITT	Initial Trade Training
164	JAMES	Joint Asset Management and Engineering Solutions
165	JNCO	Junior Non-Commissioned Officer
166	JOTAC	Junior Officer Tactics Awareness Course
167	JSCS(L)	Junior Command and Staff Course (Land)
168	JSPs	Joint Service Publications
169	KLPs	Key Learning Points
170	KURs	Key User Requirements
171	KSRs	Key System Requirements
172	LAD	Light Aid Detachment
173	LCR	Legislative Compliance Review
174	LD	Light Dragoons
175	LE	Land Equipment
176	LEA	Land Equipment Audit
177	LEES	Land Equipment Engineering Standards
178	LEOC	Land Equipment Operating Centre
179	LFSOs	Land Forces Standing Orders
180	LoN	Land of Nod
181	LSAF	Logistic Support Assurance Framework
182	LSpecs	Learning Specifications
183	LSSR	Land Systems Safety Regulator
184	Lt Col	Lieutenant Colonel
185	LVTC	Light Vehicle Training Circuit

186	LWC	Land Warfare Centre
187	M&T	Movement and Transport
188	MATTs	Military Annual Training Tests
189	MCC	Mounted Close Combat
190	MJPs	Military Judgement Panels
191	Mk	Mark
192	MOD	Ministry of Defence
193	MRW	MASTIFF, RIDGEBACK, WOLFHOUND
194	MS	Military Secretary
195	MT	Motor Transport
196	MTS	Management of Training System
197	MTSO	Motor Transport Standing Orders
198	MTSR	Movement and Transport Safety Regulator
199	[redacted]	[redacted]
200	NAS	Naval Air Squadron
201	NATO	North Atlantic Treaty Organization
202	NOK	Next of Kin
203	NOTICAS	Notification of Casualty
204	NSN	NATO Stock Numbers
205	NTEP	National Training Estate Prime
206	NVG	Night Vision Goggles
207	NY Police	North Yorkshire Police
208	ODH	Operating Duty Holder
209	OME	Ordnance, Munitions or Explosives
210	OOB	Out of Bounds
211	PAM 1	Pamphlet 1
212	PAM 21	Pamphlet 21
213	PDA	Physical Development Audit
214	PDT	Pre-Deployment Training
215	PIDAT	Post-Incident Drugs and Alcohol Testing
216	PM	Post Mortem
217	PMV	Protected Mobility Vehicle
218	PMVP	Protected Mobility Vehicle Programme
219	PNCO	Potential Non-Commissioned Officer
220	POL	Petroleum, Oils and Lubricants
221	PPE	Personal Protective Equipment
222	PRVTC	Public Road Vehicle Training Circuit
223	PSA	Protective Security Audit
224	PSEPs	Platform Safety and Environmental Panels
225	PSI	Permanent Staff Instructor
226	QCC	Quality Control Cell
227	QM	Quartermaster
228	QMS	Quality Management Standard
229	QOY	Queen's Own Yeomanry
230	RA	Risk Assessment
231	RAC	Royal Armoured Corps
232	RASPs	Range Action Safety Plans
233	RBT	Roller Brake Test

234	RD	Regimental Duty
235	Recce	Reconnaissance
236	RECs	Record of Experience Charts
237	REME	Royal Electrical and Mechanical Engineers
238	RHQ	Regimental Headquarters
239	RMAS	Royal Military Academy Sandhurst
240	ROPS	Roll Over Protection System
241	ROSO	Regimental Operations Support Officer
242	ROSWO	Regimental Operations Support Warrant Officer
243	RPS	Role Performance Statement
244	RSDs	Reserve Service Days
245	RSM	Regimental Sergeant Major
246	RSOI	Reception, Staging and Onward Integration
247	RTCs	Road Traffic Collisions
248	RTGS	Residual Training Gap Statement
249	RTI	Road Traffic Incident
250	RtL	Risk to Life
251	RWMIK	Revised Weapons Mounted Installation Kit
252	S&EP	Safety and Environmental Protection
253	SC	Safety Case
254	SCBC	Section Commanders' Battle Course
255	SDH	Senior Duty Holder
256	SDSR	Strategic Defence and Security Review
257	SECR	Safety and Environmental Case Report
258	SEMC	Safety and Environmental Management Committee
259	SEMP	Safety and Environmental Management Plan
260	SEMS	Safety and Environmental Management System
261	SHEF	Safety and Health, Environmental and Fire
262	SI	Service Inquiry
263	SJAR	Service Person's Joint Appraisal Report
264	SMEs	Subject Matter Experts
265	SNCO	Senior Non-Commissioned Officer
266	SNIY	Scottish and Northern Irish Yeomanry
267	SOPs	Standard Operating Procedures
268	SPA	Senior Point of Authority
269	SQEP	Suitably Qualified and Experienced Personnel
270	SQMS	Squadron Quartermaster Sergeant
271	Sqn	Squadron
272	SRD	System Requirement Document
273	SRM	Single Radio Mount
274	SROs	Senior Responsible Owners
275	SRs	System Requirements
276	SSgt	Staff Sergeant
277	SST	Subsequent Trade Training
278	SSW/T	Safe System of Work/Training
279	SZF	Skill Zone Fitter
280	TAF	Total Armed Force
281	TAT	Training Advisory Team

282	TCO	Training Control Office
283	TDA	Training Delivery Authority
284	TDD	Training Delivery Deficiency
285	TDOL	Technical Documents On Line
286	TDT	Training Development Team
287	TECR08	Theatre Equipment Capability Review 2008
288	TLB	Top Level Budget
289	TLS	Through-Life Support
290	TNA	Training Needs Analysis
291	TNA WG	Training Needs Analysis Working Group
292	TNE	Training Needs Evaluation
293	TO	Training Objectives
294	TOA	Training Options Analysis
295	TORs	Terms of Reference
296	TPS	Training Performance Statement
297	TRA	Training Requirements Authority
298	TrAD	Training Authority Document
299	Trg WO	Training Warrant Officer
300	TSG	Training Standards Group
301	TSM	Training Safety Marshal
302	TSV	Tactical Support Vehicle
303	UBPS	Under Body Protection System
304	UGM	Universal Gun Mount
305	UOR	Urgent Operational Requirement
306	URD	User Requirement Document
307	VSI	Very Seriously Ill
308	VST	Vehicle Support Team
309	WO	Warrant Officer
310	Wrt	With regard to
311	WTS	Workplace Training Statement
312	XO	Executive Officer

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PART 1.3

Narrative of Events

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PART 1.3 – NARRATIVE OF EVENTS

All times local (GMT / ZULU).

Synopsis

1.3.1. Between 20 January 2019 and 1 February 2019, Army Reserve unit, The Queen's Own Yeomanry (QOY) was conducting JACKAL Driver Training. The course was delivered by C Squadron (Sqn) QOY and attendance included members of the wider QOY Regiment and a single member of the Scottish and Northern Irish Yeomanry (SNIY). The course was conducted between Fox Barracks, Chester and Catterick Driver Training Area (CDTA) and included elements of both classroom-based and practical teaching. On 29 January 2019 at approximately 12:00, Instructor 1 (Inst 1) and Staff Sergeant (SSgt) McKelvie commenced the cross-country driving element of the training in JACKAL, Equipment Registration Mark (ERM) [redacted]. This element of the JACKAL course was delivered at the Light Vehicle Training Circuit (LVTC) area of the CDTA. At approximately 12:25 whilst ascending a steep incline the JACKAL rolled multiple times down a hill in the Land of Nod (LoN) area of the LVTC. Both crew members were injured and were subsequently transferred to hospital where SSgt McKelvie later died.

Figure 1.3. 1 – JACKAL [redacted]

Background

The Queen's Own Yeomanry (QOY)

1.3.2. The QOY is an Army Reserve Regiment which was formed on 1 April 1971[1] and actively recruits from the Midlands, North of England and South West Scotland. As a result of the Army 2020[2] (A2020) Reorganisation, three squadrons transferred to the Scottish and North Irish Yeomanry whilst the QOY gained two squadrons from the Royal Mercian and Lancastrian Yeomanry. As a Reserve Light Cavalry unit, the QOY personnel are trained in reconnaissance. Their primary role is to operate well ahead of other forces, monitoring enemy troops and feeding intelligence back to commanders. The Reserves are trained in high-tech weaponry, thermal imaging equipment and digital battlefield communications systems. As a Light Reconnaissance Regiment, the QOY had been equipped with the Land Rover Revised Weapons Mounted Installation Kit (RWIMK) (see Figure 1.3.2). As part of A2020, and in order to better support its paired Regular Regiment, the Light Dragoons (LD), the QOY had commenced conversion training to JACKAL (see Figure 1.3.3).

Witness 10
Exhibit 304

Figure 1.3. 2 – Land Rover RWMIK

Permanent Staff Instructor (PSI)

1.3.3. A PSI is a Warrant Officer (WO) or Senior Non-Commissioned Officer (SNCO) from the Regular Army who has been selected to instruct Army Reserve soldiers. The PSI role is to provide professional experience from the Regular Army to the Army Reserve whilst ensuring that the training and operation of the unit

Exhibit 49
Exhibit 50

[1] https://www.army.mod.uk/who-we-are/corps-regiments-and-units/royal-armoured-corps/queens-own-yeomanry/

[2] Army 2020 is the transformation of the British Army for the 2020s and beyond, in response to the strategic challenges the British Army is likely to face in the future.

adheres to the Regular Army's standards. The PSI is typically responsible for much of the unit's administrative work, and usually takes a particular role in the training of Junior NCOs (JNCOs). Some PSIs are specialist instructors in specific areas such as communications, gunnery and driving and maintenance of vehicles.

Driving and Maintenance Instructor (DMI)

1.3.4. A DMI is responsible for the delivery of Armoured Vehicle (AV) training in accordance with the associated training syllabus. They are responsible for ensuring that their unit archives all course paperwork, maintains accurate records of attendance and that the training coordinator is informed of any training deficiencies incurred. A DMI is mandated to have completed the platform driver and commander course for the specific vehicle on which they are to teach prior to attending the DMI course and subsequent delivery of training.

Exhibit 15
Exhibit 50

High Mobility Truck Variant (HMTV) JACKAL 2

1.3.5. The HMTV JACKAL 2 (see Figure 1.3.3) is a Protected Mobility AV. Designed for a crew of four, the driver and commander occupy a semi-forward, open-architecture control cab, with all other crew carried in the rear body (known as the hamper). A flexible stowage system is designed to accommodate a wide range of role specific and general equipment. All HMTV vehicles carry a range of Complete Equipment Schedule (CES) items to enable them to be self-sufficient and provide the means for the crew to operate in the field for extended periods of time, unassisted by normal lines of support. [redacted] A Roll Over Protection System (ROPS) is fitted [redacted] and is designed to protect seated crew in the event of a vehicle rollover.

Exhibit 22
Exhibit 51

Figure 1.3. 3 – High Mobility Truck Variant JACKAL 2

1.3.6. JACKAL 2 is fitted with a Crew Protection Mount fitted on the cab providing a mounting position for a General Purpose Machine Gun (GPMG) and a weapon mount on the top of the vehicle which is compatible with a variety of weapons.

Exhibit 22
Exhibit 51

Catterick Driver Training Area (CDTA)

1.3.7. CDTA is located within the larger estate of Catterick Training Area (CTA) in the north of England. Consisting of two main areas, C1 and C2 (see Figure 1.3.4), the area provides challenging terrain to support driver training requirements. Area C1 is further divided into three areas (C1A, C1B and C1C) and is generally used for Light Vehicle Training, providing cross-country driving obstacles including water features, inclines and declines. The LoN is located within C1A and consists of a valley with three steep inclines on the southern slope known as the '3 Sisters' and a single, semi-circular track on the northern slope known as 'The Horseshoe' (see Figure 1.3.5). Area C2 is in the west of the CDTA and includes a Heavy Vehicle Training Circuit (HVTC). This area is predominantly semi-prepared tracks for the use of both light and heavy vehicles.

Exhibit 40

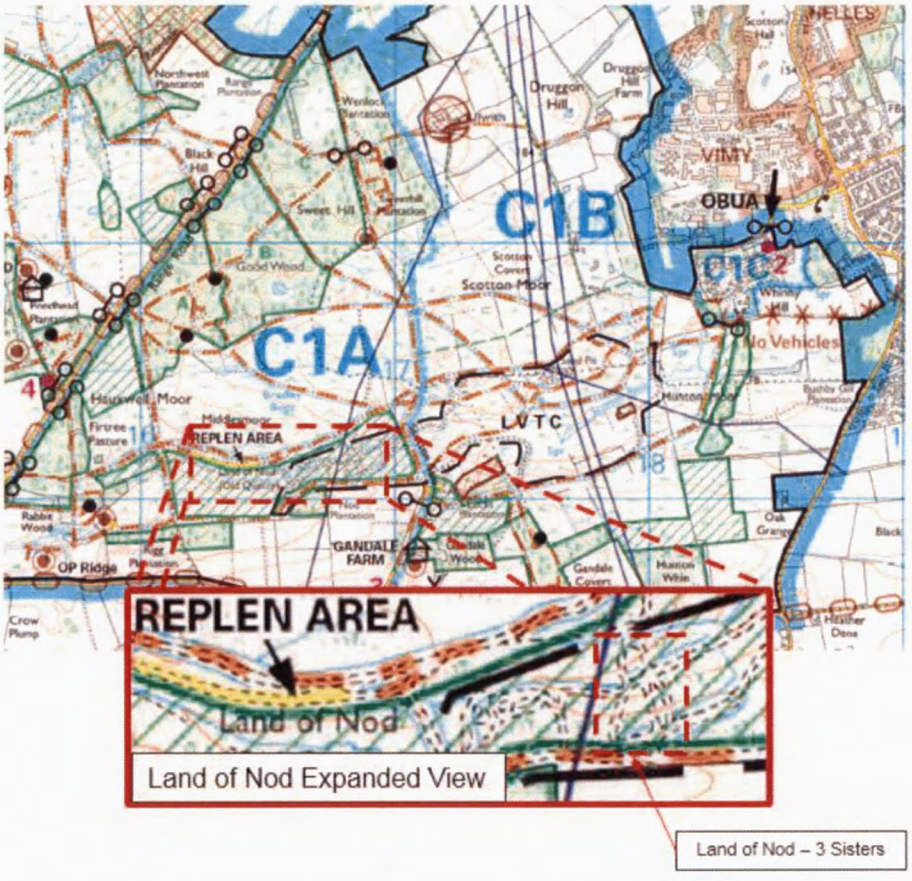

Figure 1.3. 4 – Map view of Catterick Driver Training Area (CDTA)

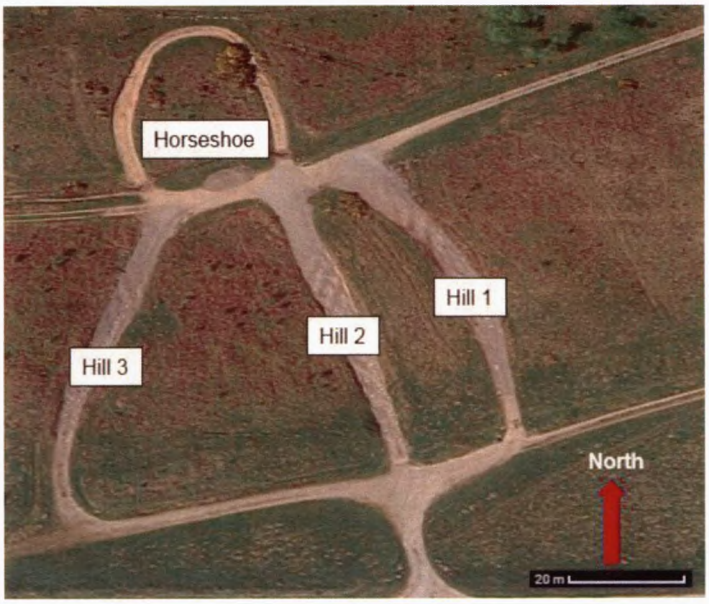

Figure 1.3. 5 – Land of Nod 3 Sisters

Pre-Accident Events

Course preparation and initial delivery

1.3.8. C Sqn, the QOY were tasked by Regimental Headquarters (RHQ) to provide a DMI to lead the January 2019 JACKAL Driver Course. C Sqn duly appointed Inst 1 as the lead instructor for the course and tasked him with the overall coordination of the training. Due to staff availability, course administration and preparation was supported by various members of the QOY, although Inst 1 remained the lead throughout. Completing the administrative and planning functions including convening the course through the Land Warfare Centre (LWC) Training Standards Group (TSG) Staff, Inst 1 ensured that all of the required elements were in place to correctly deliver the required training. Upon receipt of the prerequisite administration and a course timetable, TSG confirmed that the course was suitably convened and provided authority for the course to proceed, granting access to the relevant course folders and instructions.

Exhibit 3
Exhibit 24
Exhibit 52
Witness 1a

1.3.9. Whilst RHQ provided some support functions, Inst 1 was responsible for most of the organisational tasks, including the booking of accommodation and training areas at Catterick. Training Areas and supporting infrastructure, including accommodation bookings, were coordinated through the new Bidding and Allocation Management System (BAMS), an electronic system that replaced the traditional paper-based training area booking system. Throughout the planning process, Inst 1 liaised with the Regimental Training Warrant Officer (Trg WO) to provide updates on his progress.

Exhibit 2
Exhibit 3
Witness 1a
Witness 1b
Witness 12

1.3.10. Shortly before the course was due to start, the QOY received notification that one of the students was unable to attend the course. Due to the nature of the training involved and the complexity of the organisation, the QOY sought to fill the

Exhibit 31
Witness 1a
Witness 12

space with another student. Unable to find personnel from their own unit, the QOY opened the offer to other Yeomanry units in the area. The SNIY responded with a suitable candidate and the new student, SSgt McKelvie, was accordingly placed upon the course.

1.3.11. With all pre-course preparations complete, the JACKAL Driver Course met at Fox Barracks, Chester, on the evening of 20 January 2019[3]. Initial checks were completed to ensure all students met the correct entry standards prior to beginning the course the following day. Between 20 - 25 January 2019, the students conducted the details phase[4] of the course at Fox Barracks, covering theoretical and practical training on JACKAL operations and maintenance. Throughout the week the instructors assessed that all learning points had been covered to an acceptable standard and, due to good progress, the students were 'stood-down' for the weekend prior to the driving phase the following week.

Exhibit 31
Witness 1a
Witness 2

The day before the accident

1.3.12. Instructors and students were dispersed across the northern UK as most personnel had chosen to return home for the weekend. As a result of this, the instructors agreed to meet the students in different locations (Chester or Catterick) to minimise the travel required. On 28 January 2019, those meeting at Fox Barracks met at 07:00 to complete initial vehicle checks prior to their first road drive in the vehicle. With all checks completed to a satisfactory standard, Inst 1 and Student 5 completed the road driving element from Fox Barracks to the outskirts of Huddersfield where a student changeover was conducted. Student 4 then completed his road training from Huddersfield to Catterick. Students not partaking in driver training followed the JACKAL in Land Rovers. Due to their home town locations, Instructor 2 (Inst 2) and SSgt McKelvie travelled independently to Catterick.

Witness 1a
Witness 6
Witness 7

1.3.13. Upon arrival at Catterick, the entire course met at Gaza Barracks where Inst 2 and SSgt McKelvie had signed for the accommodation and a second vehicle which had been prepared by the LD, also based at Catterick. Students 4 and 5, who had completed their road driving training, remained at Gaza Barracks whilst the remaining students completed their road driving training within a 50-mile radius of Catterick. With all students successfully completing road driving training, the vehicles were returned to Gaza Barracks and the course finished for the day.

Witness 1a
Witness 2

1.3.14. The evening of 28 January 2019 was relaxed, with Inst 2 and the students meeting for dinner. After dinner, some members of the course visited Catterick Garrison whilst others remained within barracks. All course members returned to barracks by 22:30.

Witness 1a
Witness 5
Witness 7

[3] The JACKAL Driver Course consisted of two instructors and six students.

[4] Details phase covers the theory-based knowledge.

The morning of the accident

1.3.15. On the morning of 29 January 2019, all instructors and students met at approximately 08:00 before travelling to collect the two JACKAL vehicles to be used for the course. Upon collection it was noted that one of the vehicles was faulty with an unserviceable pneumatic component. This vehicle was rejected for the task and handed back to the LD. To enable the course to continue as planned and make most efficient use of the two instructors, Inst 1 sourced a further vehicle from the LD thus ensuring that the course had two vehicles for the cross-county phase. This issue delayed the course approximately two and a half hours after which they travelled to CDTA in a JACKAL and Land Rover convoy.

Exhibit 53
Witness 1a
Witness 2

1.3.16. Prior to entering the training area, Inst 1 notified Range Control of his plans by telephone. This conversation informed Range Control that the course would proceed onto the training area in accordance with the agreed plan sent to them via the BAMS tool.

Exhibit 1
Exhibit 2

1.3.17. Upon arrival at CDTA, the course parked at the hardstanding close to Gandale Farm (see Figure 1.3.6). The instructors then conducted an initial briefing before leaving with the first two students to conduct the cross-country driving phase in area C1B. The remaining students stayed with the Land Rovers parked at the hardstanding. The weather was typical for the time of year; cold and damp with a light drizzle.

Witness 1a
Witness 1b
Witness 1c
Witness 2

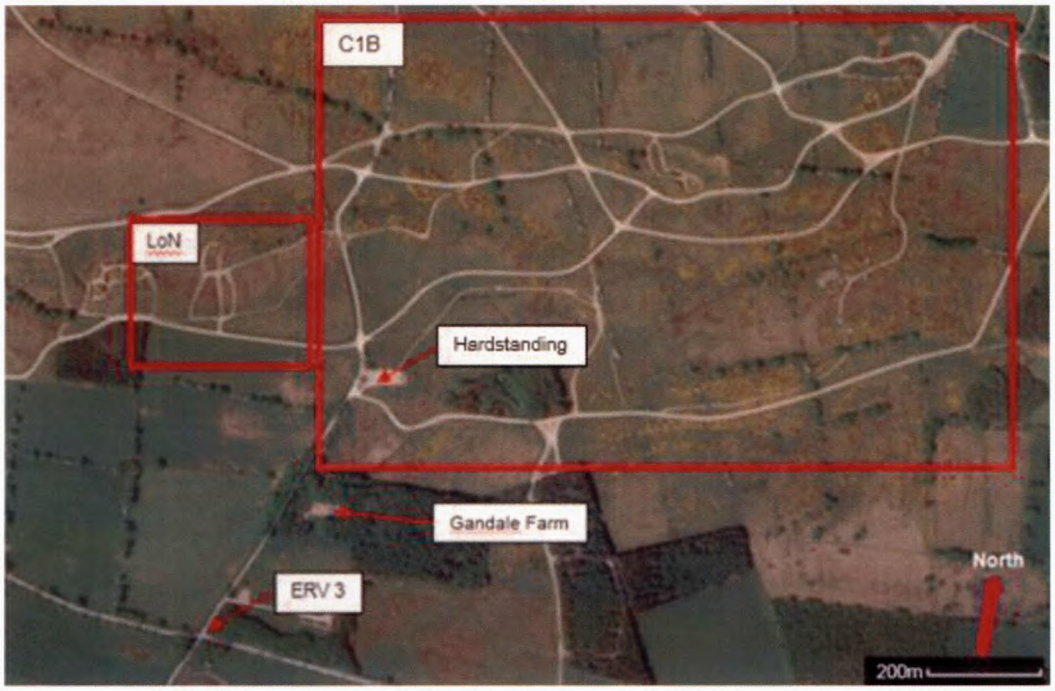

Figure 1.3. 6 – Light Vehicle Training Circuit C1B and Land of Nod

1.3.18. At approximately 11:00, Students 3 and 6 began the cross-country phase of driver training. Initially remaining within area C1B, Inst 1 led the two vehicles

Witness 1a
Witness 1b
Witness 1c

around the course, demonstrating the route to Inst 2. Throughout this phase the vehicles were driven by the students with the instructors occupying the commander's position. After completing a number of low-level obstacles and water features, the two vehicles moved onto the LoN area of C1A. The planned route at this stage (see Figure 1.3.7) was to ascend Hill 1 before descending Hill 2. After this descent, the route would then complete the Horseshoe loop on the opposite slope, ascend Hill 3 and then return to the hardstanding. After completing the first and second Hills, the lead vehicle attempted to negotiate the Horseshoe loop. After a number of unsuccessful attempts to negotiate the loop Inst 1 took the decision to return to the hardstanding to conduct a short debrief and student swap.

Witness 2
Witness 4
Witness 8

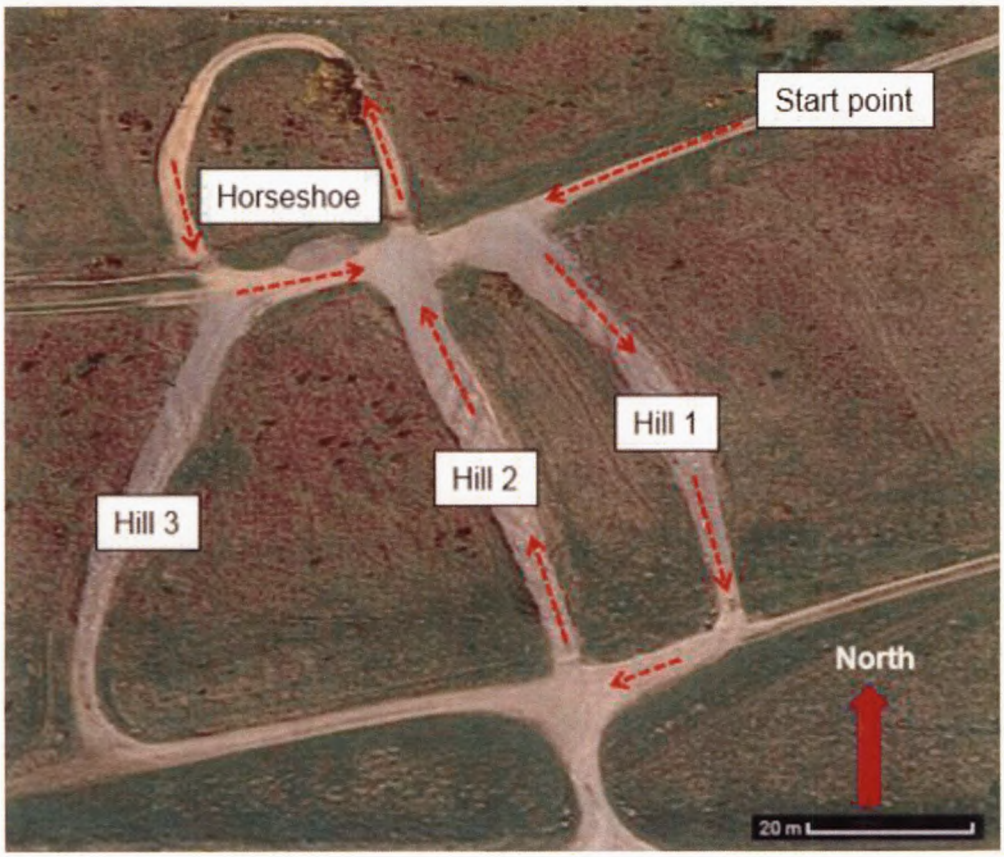

Figure 1.3. 7 – Driving route followed by Detail 1

The Accident

1.3.19. At approximately 12:00 the two JACKAL vehicles moved away from the hardstanding to conduct the second serial of cross-country training, Inst 1 teaching SSgt McKelvie whilst Inst 2 taught Student 2 . Following the same route as the previous serial, Inst 2 led the two vehicles onto the LVTC. Successfully completing the initial phase of obstacles, Inst 1 instructed SSgt McKelvie to move onto the LoN. Completing the first two Hills and successfully driving around the Horseshoe loop, Inst 1 instructed SSgt McKelvie to ascend Hill 3 (see Figure 1.3.8).

Witness 1a
Witness 1b
Witness 1c
Witness 2
Witness 5

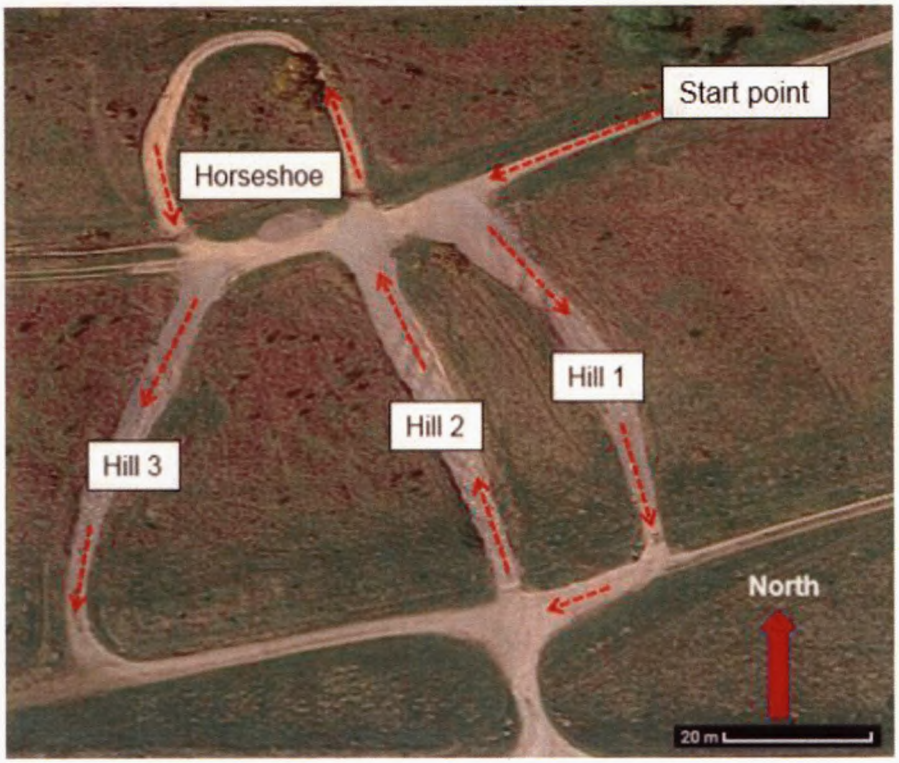

Figure 1.3. 8 – Driving route followed by Detail 2

1.3.20. At approximately 12:25, following four unsuccessful attempts to ascend Hill 3, Inst 1 and SSgt McKelvie decided to attempt the climb a fifth time. Approximately two-thirds of the way up the slope, the JACKAL lost traction and was unable to continue the climb. As the vehicle came to a stop, SSgt McKelvie exclaimed that the brakes were not working. Attempting to calm his student, Inst 1 offered reassurance before the vehicle began to move backwards down the slope. Very shortly after this backwards motion, the vehicle tipped and rolled-over multiple times before coming to rest at the bottom of Hill 3. During the initial phase of the roll, Inst 1, situated in the commander's position, fell out of the vehicle onto the slope of the hill. SSgt McKelvie remained strapped into the vehicle throughout the roll.

Witness 1a
Witness 1b
Witness 1c
Witness 2
Witness 5

1.3.21. As the vehicle continued to roll down the hillside, Inst 1 stood up and realised he had [redacted]. Quickly descending the slope, Inst 1 ran to the vehicle and tried to communicate with SSgt McKelvie to ascertain his injuries. At the same time, Inst 2 was attempting to ascend the Horseshoe loop. Alerted to the accident by the noise of the vehicle rolling down the hill, Inst 2 instructed Student 2 to stop his vehicle in a safe position prior to moving to the bottom of the valley to provide immediate assistance. Upon arrival of both Instructors and Student 2, it was clear that SSgt McKelvie had sustained significant injuries that required immediate first aid. SSgt McKelvie was unstrapped from the vehicle and laid close by to conduct an initial assessment and then cardiopulmonary resuscitation (CPR).

Witness 1a
Witness 1b
Witness 1c
Witness 2
Witness 5

Post-Accident Events

1.3.22. At approximately 12:31, CTA Range Control received a phone call from Inst 1 notifying them of the accident. Range Control advised the instructor that it was his responsibility to raise the Emergency Services and duly dispatched a Training Safety Marshal (TSM) to the accident location.

Exhibit 1
Witness 1a
Witness 2

1.3.23. After notifying Range Control of the accident, Inst 1 attempted to raise the Emergency Services. Unable to connect the call due to poor mobile phone reception, Inst 1 requested Inst 2 to attempt to call. Noting that they were situated in the base of the valley and the associated loss of mobile signal, Inst 2 moved to the hardstanding in the second JACKAL where he called the Emergency Services and directed the remaining students to provide assistance. Students 4 and 5 were dispatched to the accident location to assist with first aid whilst Students 3 and 6 assisted to locate and direct the Emergency Services. Due to confusion between the emergency call centre and the instructors, the exact location of the Emergency Rendezvous (ERV) Point was not fully understood by the Emergency Services. Range Control assisted by also calling the Emergency Services.

Witness 1a
Witness 1b
Witness 1c
Witness 2
Witness 4
Witness 7

1.3.24. At 12:51, the TSM arrived at the scene and began assisting with first aid whilst also calling for further assistance and equipment from Range Control. Shortly after, a land ambulance arrived at the scene and paramedics took over primary care of the casualties. North Yorkshire (NY) Police also arrived at the scene after hearing the call on the emergency channels. At 13:00, Range Control ordered 'Check Fire'[5] to enable an air ambulance to land at the accident location. SSgt McKelvie was evacuated via air ambulance whilst Inst 1 was evacuated via land ambulance, both to the same hospital. Table 1.3. 1 details the timings of key events.

Exhibit 54
Exhibit 55
Exhibit 57

Serial	Time	Activity
1	12:00	Crew mount [redacted] on hardstanding at C1B.
2	12:25	Accident occurs.
3	12:30	Inst 2 and Student 2 arrive at casualty and administer immediate first aid.
4	12:31	Inst 1 calls Range Control to notify them of the accident.
5	12:36	Inst 2 moves to hardstanding to raise emergency services and direct remaining students to assist.
6	12:51	TSM arrives on scene and assists with first aid. TSM calls for back up and additional equipment.
7	12:55	Land ambulance arrives.
8	13:04	Air ambulance arrives.
9	13:05	North Yorkshire Police arrive.
10	13:42	Primary casualty evacuated via air ambulance.

Exhibit 54
Exhibit 55
Exhibit 57

Table 1.3. 1 – Timetable of key events

[5] Command issued to all range users to temporarily halt live firing of weapon systems.

Injuries Sustained

1.3.25. **SSgt McKelvie.** Fatality. Arriving by air ambulance at 14:00 on 29 January 2019, SSgt McKelvie was treated for his injuries. Despite this treatment SSgt McKelvie subsequently died at 16:51 on the 4 Febuary 2019.

Exhibit 58
Exhibit 59
Witness 1a
Witness 2

1.3.26. **Instructor 1**. After initial assessment, Inst 1 required [redacted]. Inst 1 was discharged from the hospital on the [redacted]

Exhibit 59
Witness 1a

Post-Accident Management

1.3.27. An investigation team from the Defence Accident Investigation Branch (DAIB), consisting of one Operations Investigator and two Engineer Investigators were sent to conduct an initial Triage investigation. Arriving at CTA on the evening of 29 January 2019, the team conducted their preliminary investigation consisting of witness interviews and an inspection of the vehicle on 30 January 2019.

Exhibit 60

1.3.28. JACKAL ERM [redacted] was taken into custody by NY Police who recovered the vehicle by road to a secure compound in Darlington. Following initial investigations and an initial viewing by the Health and Safety Executive (HSE), JACKAL ERM [redacted] was released by NY Police to the Defence Safety Authority (DSA) Service Inquiry (SI) Panel on 28 March 2019. The vehicle was recovered to Dalton Barracks, Abingdon, Oxfordshire the same day. The vehicle was then subjected to a detailed examination by DAIB investigators and the SI Panel, assisted by 1710 Naval Air Squadron for specialist technical advice and testing.

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JACKAL SI

PART 1.4

Analysis and Findings

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TABLE OF CONTENTS – PART 1.4

LIST OF FIGURES

LIST OF TABLES

PART 1.4 – ANALYSIS AND FINDINGS

All times local (GMT / ZULU).

Overview

Witness 1a
Witness 2
Witness 11
Witness 12

1.4.1. Between 20 January and 1 February 2019, an Army Reserve unit, the Queen's Own Yeomanry (QOY) was conducting a JACKAL Driver Training Course. The course was run by C Squadron (Sqn) QOY and attended by five members of the wider QOY Regiment and one member of the Scottish and Northern Irish Yeomanry (SNIY) totalling six students. The course was conducted between Fox Barracks, Chester and Catterick Driver Training Area (CDTA). On 29 January 2019 at approximately 12:00, during the cross-country phase of the Driver Training Course, Instructor 1 (Inst 1) and Staff Sergeant (SSgt) McKelvie entered the cross-country driving circuit in JACKAL, Equipment Registration Mark (ERM) [redacted] At approximately 12:25, the JACKAL rolled multiple times down a hill in the Land of Nod (LoN) area of CDTA. Both crew members were injured and were subsequently transferred to hospital, where SSgt McKelvie later died.

1.4.2. The report will address the following areas:

a. Analysis of the accident;

b. Analysis of factors using the Safe System of Training structure;

c. Analysis of organisational factors.

1.4.3. The Panel has drawn conclusions and made recommendations throughout the report, but a summary of Accident Factors is included at the end of Part 1.4 and a summary of Recommendations is in Part 1.5.

Methodology

Accident factors

1.4.4. Once an accident factor had been determined to have been present it was then assigned to one the following categories:

a. **Causal factor/s.** Causal factors are those factors which, in isolation or in combination with other causal factors and contextual details, led directly to the accident. Therefore, if a causal factor was removed from the accident sequence, the accident would not have occurred.

b. **Contributory factor/s.** Contributory factors are those factors which made the accident more likely to happen. That is, they did not directly cause the accident. Therefore, if a contributory factor was removed from the accident sequence, the accident may still have occurred.

c. **Aggravating factor/s.** Aggravating factors are those factors which made the final outcome of the accident worse. However, aggravating factors do not cause or contribute to the accident. That is, in the absence of the aggravating

factor, the accident would still have occurred.

d. **Other factor/s.** Other factors are those factors which, whilst shown to have been present played no part in the accident in question, but are noteworthy in that they could contribute to or cause a future accident. Typically, other factors would provide the basis for additional recommendations or observations.

e. **Observations.** Observations are points or issues identified during the investigation that are worthy of note to improve working practices, but which do not relate to the accident being investigated and which could not contribute to or cause future accidents.

Probabilistic language

1.4.5. The probabilistic terminology detailed below clarifies the terms used in this report to communicate levels of uncertainty within the report. It is based on terms published by the Intergovernmental Panel on Climate Change (IPCC) in their Guidance Note for Consistent Treatment of Uncertainties[1] as well as the Australian Transport Safety Bureau (ATSB) in their paper on Analysis, Causality and Proof in Safety Investigations[2]. Figure 1.4. 1 shows a visual representation of the probabilistic language used.

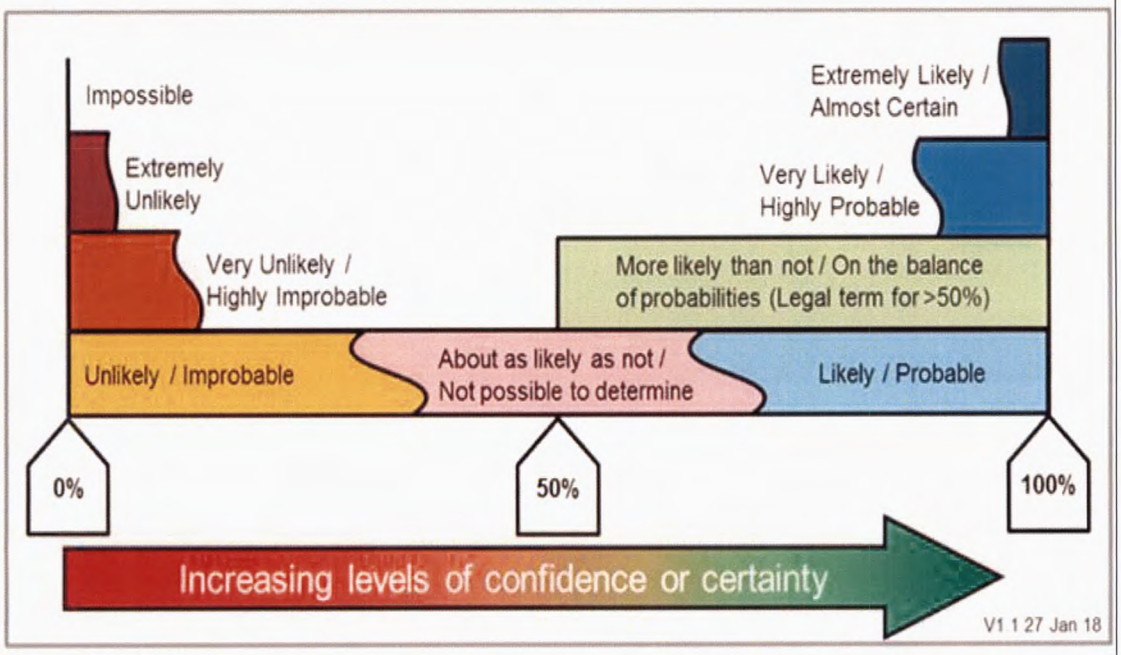

Figure 1.4. 1 – Probabilistic terminology

[1] https://pure.mpg.de/rest/items/item_2147184/component/file_2147185/content
[2] https://www.atsb.gov.au/media/27767/ar2007053.pdf

Definition of should

1.4.6. Throughout the report the Panel has made a series of recommendations. The Panel has used the term 'should' within the recommendations using the definition contained within DSA02.DLSR.LSSR: Exhibit 61

> "**Should.** Describes an activity that is considered to be good practice. If the activity is followed, then this will be considered sufficient to demonstrate compliance with the Regulation. However, alternative approaches may be utilised where this produces an outcome as good as required by the Regulation."

Analytical Methodology

1.4.7. The Panel used the Safe System of Training to analyse the findings of this Service Inquiry. The Safe System of Training is based upon four fundamental principles, that training is supported at all times by: Safe Equipment; Safe Practice; Safe Persons and Safe Place. By using this framework, the Service Inquiry Panel was able to assess the effectiveness of these four principles and the factors that led to the accident. In addition to the Safe System of Training, the Panel have added a fifth element to the analysis of this report, Organisation. The Panel used this fifth element to assess whether organisational behaviours influenced the outcome of this accident. Exhibit 74

The Accident

The day before the accident – road move to Catterick

1.4.8. Upon completion of theoretical training during the period 20 to 25 January 2019, the students were permitted to take the weekend off in order to rest prior to the practical driving phase of the course. Due to the dispersed nature of the QOY sub-units[3], students returned to their home locations across Northern England, whilst SSgt McKelvie returned to his home town in Scotland. Acknowledging the geographic split of personnel, it was decided that Inst 1 and five of the students would meet at Fox Barracks, Chester, at 07:00 on the 28 January 19 before driving two Land Rovers and a JACKAL to Catterick to meet with Instructor 2 (Inst 2) and SSgt McKelvie. Inst 2 and SSgt McKelvie planned to self-drive individually from their homes to Catterick and collect a second JACKAL from the Light Dragoons (LD) prior to meeting with the rest of the course. Witness 1a Witness 2 Witness 5

1.4.9. At approximately 06:30 on 28 January 2019, Inst 1 arrived at Fox Barracks to ensure that the students were conducting Before Use Checks[4] of the Exhibit 9 Witness 1a

[3] https://www.army.mod.uk/who-we-are/corps-regiments-and-Units/royal-armoured-corps/queens-own-yeomanry/

[4] Before Use Checks are maintenance tasks completed by the driver/operator prior to the use of a vehicle in accordance with the Maintenance Schedule (AESP 601).

vehicles whilst he produced the Authority To Use Document (ATUD)[5]. Upon completion of all checks and administrative tasks the vehicles left Fox Barracks at approximately 08:00. Witness 6 Witness 7

1.4.10. Inst 1 and Student 5 initially crewed JACKAL ERM [redacted] to conduct the practical elements of on-road driver training. Following a predominantly motorways-based route from Chester to Catterick, the vehicle convoy stopped midway to conduct a student change-over. At this point, Student 5 swapped positions with Student 4 enabling the latter to complete his on-road driver training with Inst 1. Witness 1a Witness 6 Witness 7

1.4.11. Although no formal faults were recorded with the vehicle during the initial drive from Chester to Catterick, Student 5 recalled noticing a tendency for the vehicle to lean to the right during turns as well as a slight knocking sound whilst driving. When questioned, neither Inst 1 nor Student 4 recalled anything abnormal with the operation of JACKAL ERM [redacted] during the road drive to Catterick. Acknowledging that this was the first time that the students had driven a JACKAL and also acknowledging the experience of Inst 1, in the opinion of the Panel it is likely that the JACKAL was operating normally throughout the initial road drive to Catterick and that the comments made by Student 5 were due to his inexperience driving the vehicle. Witness 6 Witness 7

1.4.12. The Panel finds that the road move to Catterick from Fox Barracks was **not a factor**.

The day before the accident – Catterick Garrison

1.4.13. Whilst the main body of the course conducted road driver training from Chester to Catterick, Inst 2 and SSgt McKelvie drove themselves from their home towns to Catterick. Upon arrival, the pair signed for the transit accommodation in Cambrai Lines, Catterick Garrison, before moving to Gaza Barracks to complete the takeover of a second JACKAL (ERM [redacted] provided by the LD. Exhibit 53 Witness 2

1.4.14. Upon arrival at Catterick Garrison, Inst 1 and the five students from Fox Barracks met with Inst 2 and SSgt McKelvie as planned. Inst 1, Inst 2 and those students who had still to complete the road drive prepared to mount the vehicles and complete the day's training whilst Students 4 and 5, having completed their on-road training, split from the rest of the course to conduct administration. Witness 1a Witness 2 Witness 4 Witness 5 Witness 8

1.4.15. Leaving Catterick, the two JACKALs travelled north towards Newcastle. Inst 1 and SSgt McKelvie formed the crew of JACKAL [redacted] whilst Inst 2 and Student 2 crewed JACKAL [redacted] Students 3 and 6 followed in the support Land Rover. Upon completion of the training requirements and remaining within a 50- Witness 1a Witness 2 Witness 4 Witness 5 Witness 8

[5] Authority to Use Document (ATUD). MOD drivers must ensure that an ATUD is produced to demonstrate journeys have been correctly and properly authorised and that journeys are recorded.

mile radius of Catterick due to roadside recovery constraints, SSgt McKelvie and Student 2 swapped places with the two other students allowing them to complete their training on the return leg to Catterick.

1.4.16. Arriving back at Catterick at approximately 16:00, the instructors and students returned the vehicles to Gaza Barracks and completed the mandatory 'After Use Checks'[6] reporting no vehicle faults. Upon completion of all checks and administrative duties, all personnel returned to the accommodation at Cambrai Lines. The Panel finds that the second phase of road driving training was **not a factor.**

Witness 1a
Witness 2
Witness 4
Witness 5
Witness 8

1.4.17. Once settled in the accommodation, the majority of the course met for dinner at approximately 17:00. After dinner, SSgt McKelvie, Student 2, Student 4 and Student 5 visited a local bar in Catterick Garrison, leaving the accommodation at approximately 19:30 and returning at 22:30. Inst 1 recalled seeing the four students return from the bar and noted that he did not suspect any of them as having consumed excessive alcohol. All students and instructors retired at approximately 23:00.

Witness 1a
Witness 5
Witness 6
Witness 7

1.4.18. Post-Incident Drugs and Alcohol Testing (PIDAT) did not take place after the accident due to the condition of the two crew members. As a result, the Panel was unable to conclusively assess whether the consumption of alcohol the night before contributed to the accident. Inst 1 stated that he had driven the students to the bar at approximately 19:30 and that they had returned on foot, arriving back at the accommodation at approximately 22:30. The Panel found that the bar was located 1.7 miles from the accommodation and that the total travel time was approximately 40 minutes. The Panel concluded that the students were in the bar for approximately 2 hours and 20 minutes. The Panel interviewed the students who visited the bar with SSgt McKelvie and found that it was likely that only 2 or 3 pints of beer were consumed during the evening.

Exhibit 28
Witness 1a
Witness 5
Witness 6
Witness 7

1.4.19. NHS guidance states that, on average, the body metabolises 1 unit of alcohol per hour. Assuming 2 units of alcohol per pint, SSgt McKelvie and the other students had sufficient time between returning to the accommodation and the accident to metabolise 14 units or 7 pints. Noting that the time in the bar was approximately 140 minutes, the Panel believes that it is unlikely that students consumed this quantity of alcohol. Furthermore, the Panel believes that had the students consumed the equivalent of 7 pints of beer, it is likely that Inst 1 would have noticed this through their behaviour upon their return to the accommodation. As a result, the Panel finds that the consumption of alcohol and rest taken prior to the accident were **not factors.**

Witness 1a
Witness 6
Witness 7
Exhibit 323

[6] After Use Checks are maintenance tasks completed by the driver/operator on completion of use of the vehicle in accordance with the Maintenance Schedule (AESP 601).

The morning of the accident

1.4.20. On the morning of 29 January 2019, the course met at the prearranged time of 08:00 although SSgt McKelvie was approximately 10 minutes late due to accidently oversleeping. Although a little late, Inst 1 did not suspect anything untoward or that SSgt McKelvie was suffering the effects of alcohol consumption from the previous evening, in his view, SSgt McKelvie appeared fit for duty. The Panel concluded that although SSgt McKelvie was late reporting for duty his demeanour appeared normal. The Panel finds, therefore, that SSgt McKelvie's fitness for duty on the 29 January 2019 was **not a factor.**

Witness 1a

1.4.21. Once assembled, the course left Cambrai Lines arriving at Gaza Barracks at approximately 08:30 in order to collect the vehicles. On arrival, the students conducted Before Use Checks on the two JACKALs under the direction of Inst 2 whilst Inst 1 contacted CTA Range Control via his mobile telephone to book onto the Training Area in accordance with his pre-arranged range booking (Bid Reference B12962).

Exhibit 1
Exhibit 2
Witness 1a
Witness 2
Witness 6

1.4.22. During the Before Use Checks, a technical fault was discovered on the suspension of JACKAL ERM [redacted] After a significant delay, a replacement vehicle, JACKAL ERM [redacted] was provided by the LD. Upon completion of all Before Use Checks and administrative tasks, the course departed Gaza Barracks at approximately 11:30 in the two JACKAL vehicles and two support Land Rovers. Inst 1 and Student 6 led in JACKAL ERM [redacted] whilst Inst 2 and Student 3 followed behind in JACKAL ERM [redacted] The remaining four Students used the two support Land Rovers to drive to CDTA.

Exhibit 53
Witness 1a
Witness 2
Witness 4
Witness 8

1.4.23. Upon arrival at CDTA the vehicles entered the area via Emergency Rendezvous (ERV) 3, close to Gandale Farm and travelled to a parking location on a hardstanding to the south of the Light Vehicle Training Circuit (LVTC). During the road move Inst 1 and Inst 2 briefed their respective students on the cross-country circuit and the training they were about to undertake. The LVTC and hardstanding are shown in Figure 1.4. 2. Typical for the time of year and location, the weather was inclement, with light drizzle and low temperatures.

Witness 1a
Witness 2
Witness 5

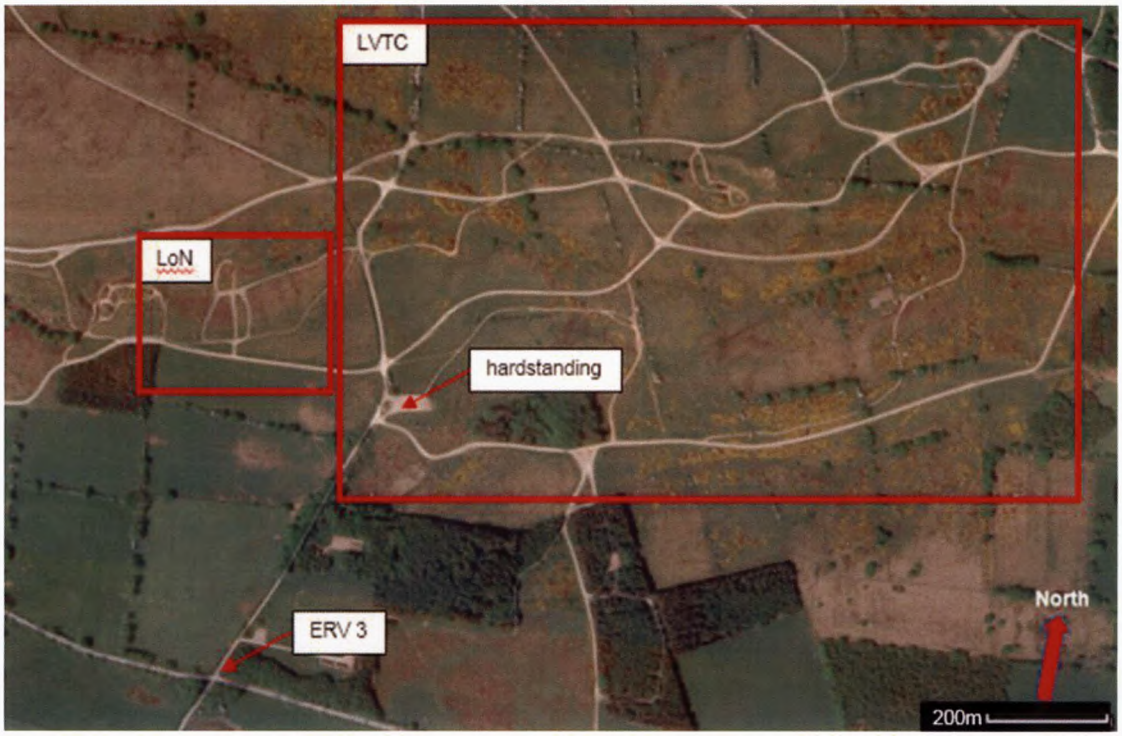

Figure 1.4. 2 – Light Vehicle Training Circuit

The cross-country circuit

1.4.24. Upon arrival at the hardstanding, Inst 1 briefed the four remaining students describing the cross-country phase and the day's planned activities. Following this briefing, the four students returned to the Land Rovers to keep warm and dry whilst organising themselves into pairs for the subsequent training serials.

Witness 1a
Witness 5

1.4.25. Returning to JACKAL ERM [redacted] Inst 1 reminded Student 6 of the transmission ratios and conducted a final confirmatory brief to ensure that his student was content with the planned activity. Following this short brief, Inst 1 and Student 6 started the cross-country driver training, moving away from the hardstanding and onto the LVTC, followed by the second JACKAL crewed by Inst 2 and Student 3.

Witness 1a
Witness 2
Witness 4
Witness 8

1.4.26. Although both instructors recalled discussing the use of the LoN area, and potential out of bounds areas, the instructors had not discussed the exact route that would be taken during the training activity. The Panel concluded that detailed collaborative planning did not take place between the two instructors. The Panel finds that the lack of collaborative planning prevented the opportunity for peer review of the overall plan and was a **Contributory Factor**.

Witness 1a
Witness 2
Witness 4
Witness 5

1.4.27. After completing a number of basic obstacles within the LVTC, the two vehicles moved into the LoN to conduct ascent and descent training. The LoN and proposed route is depicted in Figure 1.4. 3, and in greater detail in Figures 1.4. 4 and 1.4. 5.

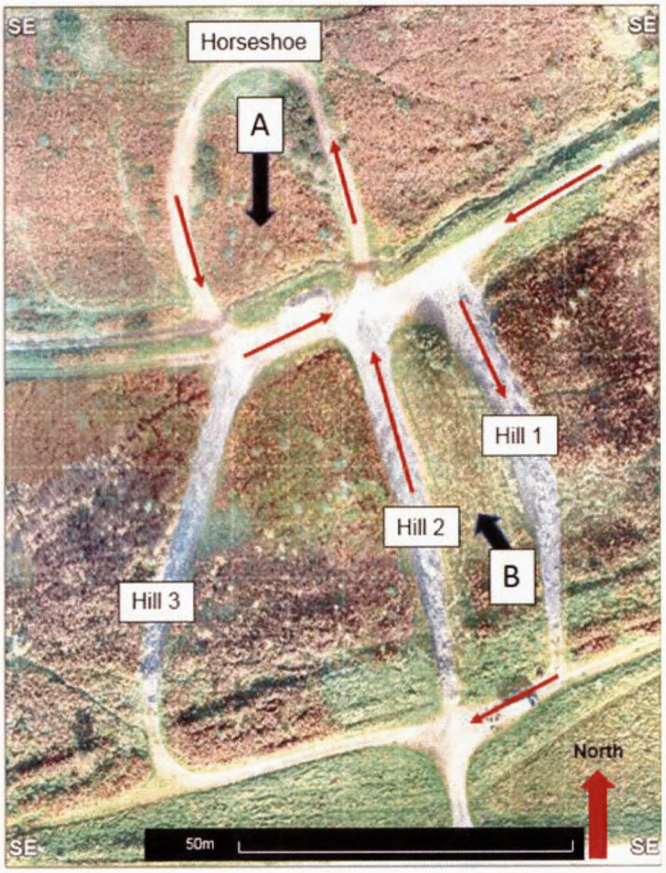

Figure 1.4. 3 – Land of Nod (Points A and B depict subsequent photo locations)

Figure 1.4. 4 – Land of Nod photo taken from point A

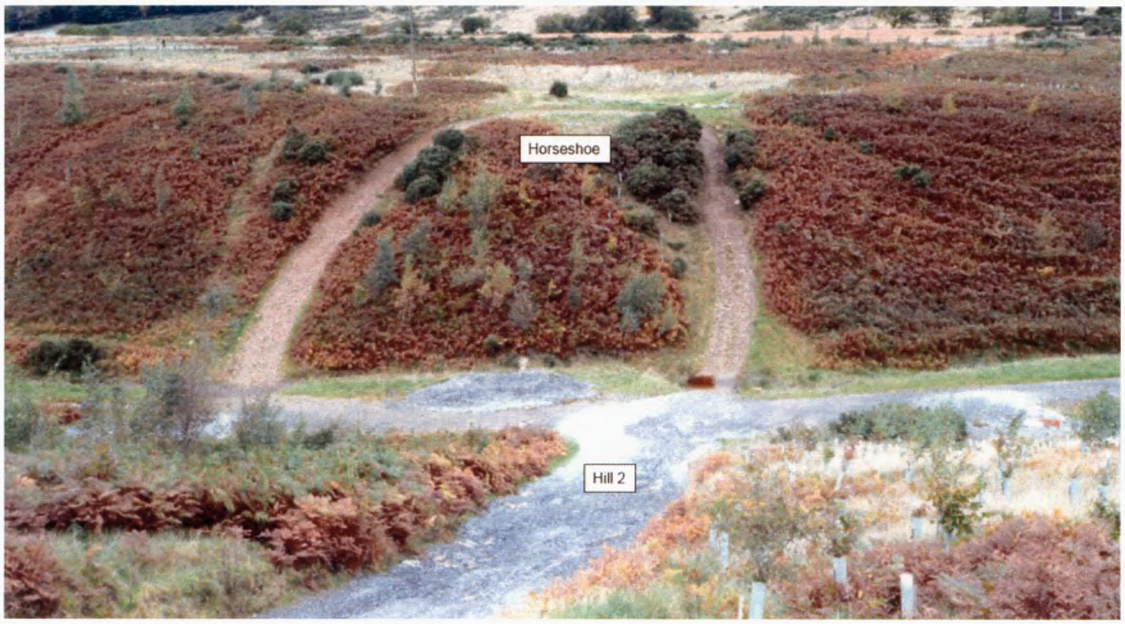

Figure 1.4. 5 – Land of Nod photo taken from point B

1.4.28. Upon arrival at the LoN, Inst 1's intent was to ascend Hill 1 turning right at the top of the incline to descend Hill 2. Following completion of the first climb and descent, Inst 1 planned to drive around the Horseshoe Loop before ascending Hill 3. Upon completion of the final ascent the vehicles would return to the hardstanding to conduct a student swap.

Witness 1b
Witness 1c

1.4.29. Arriving at the LoN in the lead vehicle, Inst 1 and Student 6 stopped at the base of Hill 1 to reiterate the driving techniques necessary to successfully negotiate the obstacles. Following this briefing, Student 6 successfully completed the ascent of Hill 1 stopping for a short period before conducting the descent of Hill 2. Despite being briefed on the correct techniques, Student 6 did not adequately control the vehicle during his initial descent of Hill 2 and so, after a short debrief, Inst 1 and Student 6 ascended Hill 1 again before conducting a second descent of Hill 2, this time to a satisfactory standard.

Witness 1a
Witness 8

1.4.30. After the successful completion of the first two hills, Inst 1 and Student 6 aligned the vehicle with the entrance to the Horseshoe Loop. Following another short pause, Student 6 attempted to ascend the initial part of the Horseshoe Loop. Unable to complete the ascent, Student 6 completed the Failed Ascent Drill[7] and reversed the vehicle to the base of the slope. Although attributing the unsuccessful ascent to poor driving technique, Inst 1 decided to attempt the Horseshoe Loop himself to ensure that the obstacle was achievable in the conditions. Successfully driving around the Loop and content that the obstacle was within the capabilities of

Witness 1a
Witness 1c
Witness 2
Witness 8

[7] The Failed Ascent Drill is a standard procedure used by military crews to safely descend an incline following a failed ascent. In the case of JACKAL, the vehicle is stopped using the footbrake before selecting reverse gear. The vehicle is then reversed down the slope in a controlled manner, under the guidance of the vehicle commander.

the vehicle and student, Inst 1 directed Student 6 to make a further attempt. Although Student 6 had observed Inst 1 complete the obstacle, he was again unable to negotiate the obstacle. Concerned that Student 6 was becoming frustrated, Inst 1 elected to end the exercise rather than increasing the pressure on his student. Offering reassurance and additional advice, Inst 1 directed Student 6 to return to the hardstanding where they completed a post-exercise debrief. Following the successful completion of Hills 1 and 2 and the Horseshoe Loop, the second JACKAL with Inst 2 and Student 3 returned to the hardstanding shortly after the first vehicle.

1.4.31. Shortly before 12:00, Inst 1 and SSgt McKelvie mounted JACKAL [redacted] whilst Inst 2 and Student 2 mounted JACKAL [redacted] After adjusting their seating positions and correctly fitting their harnesses, at approximately 12:00, JACKAL [redacted] with Inst 2 and Student 2 departed the hardstanding followed by Inst 1 and SSgt McKelvie. At this point Inst 1 noted a slight deterioration in weather conditions. Witness 1a Witness 2 Witness 5

1.4.32. Prior to the driver training, Inst 1 was aware that SSgt McKelvie was an experienced ex-Regular soldier with considerable previous driving experience. As a result, Inst 1 respected SSgt McKelvie and expected him to perform well during the course. Witness 1c

1.4.33. During the initial phase of cross-country driving SSgt McKelvie appeared to struggle with the techniques required to successfully negotiate the obstacles within the LVTC. This performance surprised Inst 1 who had expected SSgt McKelvie to easily convert his previous driving knowledge onto JACKAL. Following advice from Inst 1 regarding the techniques associated with JACKAL operations, SSgt McKelvie quickly progressed, and his driving ability improved dramatically. This rapid progression reaffirmed Inst 1's belief that SSgt McKelvie was a capable and experienced Armoured Vehicle (AV) operator. Witness 1a Witness 2 Witness 5

1.4.34. Despite leaving the hardstanding after Inst 2, Inst 1 and SSgt McKelvie completed the obstacles and arrived at the LoN first. Stopping the vehicle at the base of Hill 1, Inst 1 discussed the obstacle with SSgt McKelvie and reminded him of the correct transmission ratio. Successfully completing both Hill 1 and Hill 2, Inst 1 and SSgt McKelvie arrived at the base of the Horseshoe Loop where they paused to discuss the techniques required to negotiate the obstacle. Despite the advice offered by his instructor, SSgt McKelvie was initially unable to negotiate the Horseshoe Loop, resulting in a successfully completed Failed Ascent Drill. Revising his driving line, SSgt McKelvie made a second attempt at the Horseshoe Loop, this time successfully negotiating the obstacle. Witness 1a Witness 2

1.4.35. After the successful completion of the Horseshoe Loop and noting that the second JACKAL was conducting ascents and descents on Hills 1 and 2, Inst 1 decided to continue the exercise as planned and complete the ascent of Hill 3 (Figure 1.4. 6). Analysis conducted by the Panel established that Hill 3 is very similar to Hills 1 and 2 although it does ascend the incline at a slight angle across the slope. From a driver's viewpoint, the demands of Hill 3 are similar to those of Hills 1 and 2 although there is a section of more prominent boulders from approximately midway up the slope. During interviews Inst 1 stated that he did not perceive Hill 3 as being more demanding than Hills 1 or 2 and viewed the Horseshoe Loop as being the most demanding aspect of the course due to its high banks and heavily rutted surface. As a result, the Panel concluded that Inst 1 did not perceive any greater risk by attempting Hill 3.

Exhibit 62
Exhibit 335
Witness 1c

Figure 1.4. 6 – Hill 3

1.4.36. During his first attempt, SSgt McKelvie was unable to successfully negotiate Hill 3. It is likely that insufficient power was applied during the ascent which led to insufficient momentum to successfully negotiate Hill 3. As a result, it is likely that the vehicle lost the traction required to progress, causing the vehicle to slow down. Identifying that the attempt would be unsuccessful, SSgt McKelvie correctly stopped the vehicle before conducting a Failed Ascent Drill. Under the guidance of Inst 1, SSgt McKelvie successfully reversed the vehicle down the hill in a controlled manner and stopped the vehicle at the base of the climb.

Witness 1a
Witness 1b
Witness 1c

1.4.37. Following the unsuccessful ascent, Inst 1 confirmed that SSgt McKelvie was content to conduct further attempts. Both SSgt McKelvie and Inst 1 agreed that Hill 3 was achievable and collectively took the decision to attempt the climb again. During three further attempts, SSgt McKelvie was unable to achieve the summit of the hill; each attempt was followed by a successful Failed Ascent Drill. In the opinion of the Panel it is likely that the successful completion of multiple Failed Ascent Drills led the two personnel to perceive that there was no increased risk in conducting further attempts. During the third or fourth attempt, Inst 1 and SSgt

Witness 1a
Witness 1b
Witness 1c
Witness 2
Witness 5

McKelvie almost reached the summit, reaffirming their confidence that the ascent was achievable. Throughout these multiple attempts, Inst 2 and Student 2 in JACKAL ERM [redacted] were continuing to negotiate the Horseshoe Loop. This gap between the vehicles led Inst 1 to conclude that there was no time pressure to complete the exercise. The Panel finds that underestimating the risks associated with the ascent of Hill 3 when considering student performance and the environmental conditions was a **Causal Factor.**

1.4.38. **Recommendation. Director Land Warfare should include Dynamic Risk Assessment as a Training Objective in all Driving and Maintenance Instructor (DMI) courses in order to prepare DMIs to adequately assess all hazards associated with Armoured Vehicle instruction.**

1.4.39. Inst 1 recalled adjusting his harness during the Failed Ascent Drills and removing his shoulder harnesses. Inst 1 believed that his lap strap was secured at the time of the accident although it was possibly loosened significantly. Further analysis of the status of the harness will be covered within the Safe Equipment and Safe Practice elements of this report. Witness 1a Witness 1b Witness 1c

The accident

1.4.40. Following four unsuccessful attempts, Inst 1 and SSgt McKelvie decided to attempt the ascent for a fifth time. At approximately 12:25, SSgt McKelvie selected a route starting on the left-hand side of the track before moving to the right-hand side approximately midway up the climb. As the vehicle reached the bouldered section of the slope (see Figure 1.4. 7), SSgt McKelvie started to position the vehicle to the right-hand side of the slope, cutting across the track at approximately 45º and pointing towards the right-hand bank. Approximately 40m from the base of the hill, it is likely that the vehicle lost traction and stopped. Figure 1.4. 8 shows the approximate position of the vehicle when it stopped. Witness 1b

Figure 1.4. 7 – Hill 3 boulders

Figure 1.4. 8 – [redacted] loss of traction

Witness 1a
Witness 1b
Witness 1c

1.4.41. As the vehicle stopped, SSgt McKelvie exclaimed that he believed that the brakes were not working. Attempting to calm his student, Inst 1 recalled that at this point the vehicle began to move backwards. The observation that the brakes had failed made by SSgt McKelvie was likely due to the vehicle slipping on the boulders, inducing the sensation that the vehicle was rolling backwards. Despite SSgt McKelvie's statement that the brakes had failed, Inst 1 did not attempt to brake the vehicle by utilising the left foot brake[8]. The Panel concluded that due to the rapid onset of the accident, it is unlikely Inst 1 had sufficient time to process the statement made by SSgt McKelvie and react by utilising the secondary pedal. In the opinion of the Panel it was likely that the brakes had been correctly applied by SSgt McKelvie and that the brakes were serviceable at the time of the accident (brake serviceability will be examined later in the Equipment section of this report). As a result, the Panel finds that not using the left foot brake pedal was **not a Factor**.

1.4.42. The Panel found that instructors and commanders are not taught to cover the left foot brake during complex ascents and descents and the use of the left foot brake is not mentioned in any AV operating policy. In the event of a

[8] The left foot brake is a secondary pedal, connected to the main brake pedal, that is situated between the driver and the commander, allowing the commander to apply the brakes in case of emergency.

cognitive failure by the driver, it is possible that the pedal may not be correctly depressed when required and that vehicle control could be lost. The Panel finds that the lack of policy or guidance on the use of the left foot brake is an **Other Factor**.

1.4.43. **Recommendation. Director Capability should introduce policy, procedures and training for commanders and instructors on the use of the left foot brake in order to mitigate the risk of driver error and associated vehicle accidents.**

1.4.44. From the analysis of the ground signs and witness statements, the Panel was able to estimate the likely position where the vehicle lost traction (see Figure 1.4.9 position A). As the vehicle slid backwards it was coincident with an area of particularly large boulders creating multiple stepped drops (see Figure 1.4.9 position B). The Panel found that it is likely that the vehicle impacted the left-hand bank whilst the rear right-hand wheel was suspended above the ground due to the steps created by the large boulders. Analysis of the area indicates that the average slope was approximately 28° with areas of up to 43°. Exhibit 62 Witness 1a

1.4.45. The Panel concluded that the position of the vehicle when it lost traction, combined with wet, slippery boulders, caused the driver to lose control of the vehicle, leading it to slide into the left-hand bank. With the rear right-hand wheel suspended, the collision with the bank caused the vehicle to tip to the right and initiated the roll over. The Panel finds that the loss of traction combined with the position of the vehicle on the slope was a **Causal Factor.** Witness 1a Witness 1b Witness 2

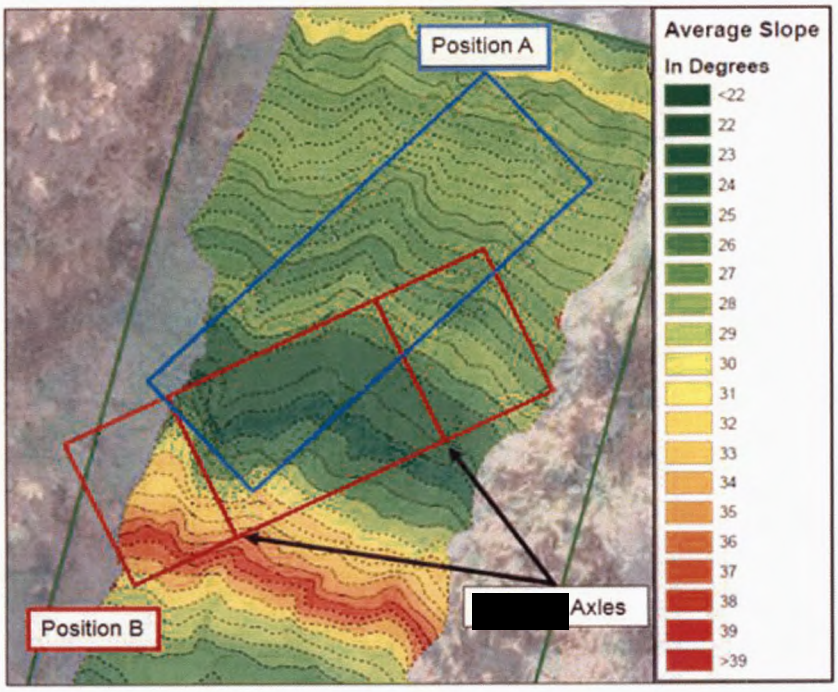

Figure 1.4. 9 – [redacted] positioning and gradient

1.4.46. As the vehicle rolled Inst 1 was ejected from the vehicle and deposited on the hillside, likely during the first rotation. Recalling his observations, Inst 1

stated that the vehicle completed approximately five or six rotations, with the JACKAL 'tumbling' down the hill with fore and aft pitching movements. Quickly standing, Inst 1 attempted to remove his helmet. [redacted], Inst 1 removed his helmet with his left hand before running down the hill behind the rolling JACKAL. Analysis of the damage sustained to the vehicle corroborates Inst 1's recollection and leads the Panel to conclude that [redacted] experienced a number of complex dynamic rolls, effectively tumbling down the hill.

1.4.47. During intial site visits the Panel observed that some large rocks had been displaced and displayed witness marks consistent with being struck by [redacted] (see Figure 1.4.10). Debris maps produced by North Yorkshire (NY) Police showed the position of debris found immediately after the accident (see Figures 1.4.11, 1.4.12 and Table 1.4.1) . Analysis of this evidence enabled the Panel to deduce the likely path that [redacted] took during the accident (see Figure 1.4.13). The Panel surveyed the site and concluded that the height, gradient and lack of obstacles to arrest the vehicle roll increased the severity of the outcome. Significantly, the shearing of the vehicle weapons mount, the damage to the rear Roll Over Protection System (ROPS) bar (see Figure 1.4.14) and the damage to the driver and rear crew member headrests (see Figures 1.4.15 & 1.4.16) suggests impacts of significant force in and around the crew space.

Exhibit 21
Exhibit 62
Exhibit 341

Figure 1.4. 10 – Significant boulders

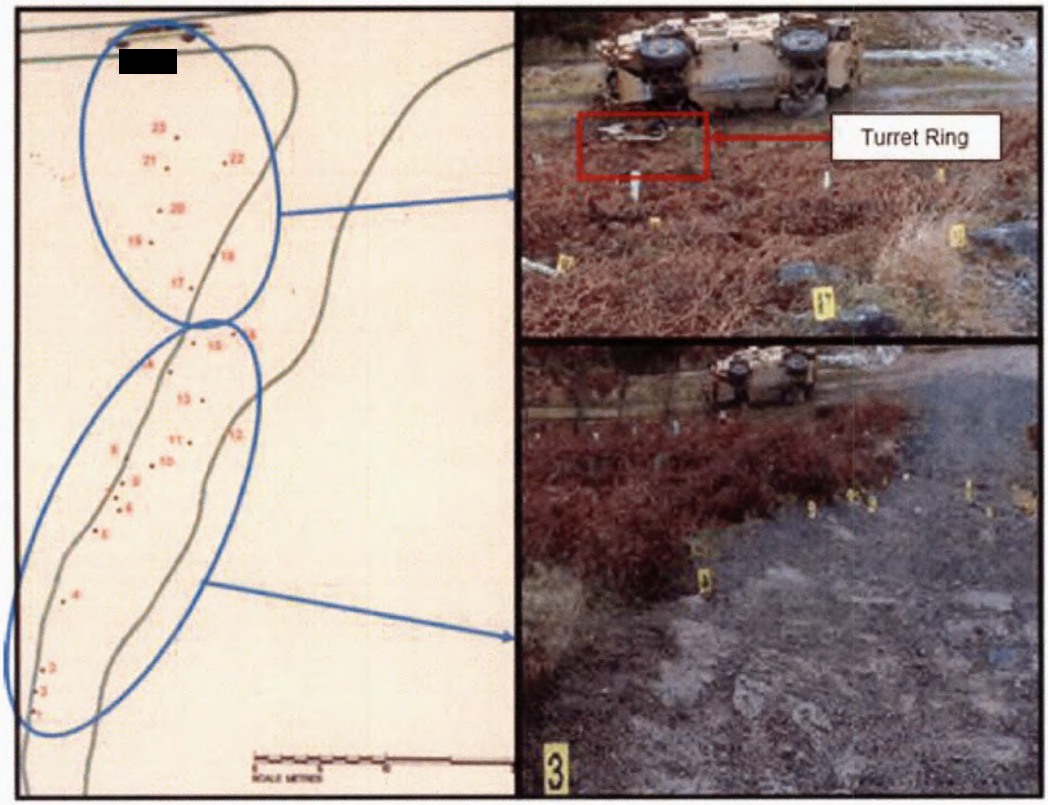

Figure 1.4. 11 – North Yorkshire Police ground sign map and debris photos

Serial	Police Description	SI Panel Description
1	Vertical tyre scuff across track	
2	Vertical tyre scuff across rock	
3	Rolling wheel scuffs in gravel	
4	Indentation in ground and scuffing	
5	Vertical tyre scuff across rock	
6	scrape mark on rock with beige paint	
7	Tyre scuff and paint - locked wheel	
8	Vertical tyre scuff across rock	
9	Vehicle debris on edge of track	Floor plate
10	Scrape containing beige coloured paint	
11	Vertical scratches across rock	
12	Debris from side of vehicle	Jerry Can Holder
13	Scrape across track	
14	Scuffing from track into bracken	
15	Nylon Strap from within vehicle	Recovery Strop
16	Indentation and vegetation on track	
17	Scrapes and scratches across rock	Large rocks, identified in Figure 1.4-11
18	Scrapes and scratches across rock	
19	indentation in moorland/bracken	Wing Mirror
20	indentation in moorland/bracken	
21	indentation in moorland/bracken	
22	indentation in moorland/bracken	
23	indentation in moorland/bracken	
24	Not identified	[redacted] Turret ring sheared off of vehicle – Identified in red box

Table 1.4. 1 – Police evidence log

Figure 1.4. 12 – Ground sign

Figure 1.4. 13 – Direction of roll

Figure 1.4. 14 – [redacted] rear Roll Over Protection System damage

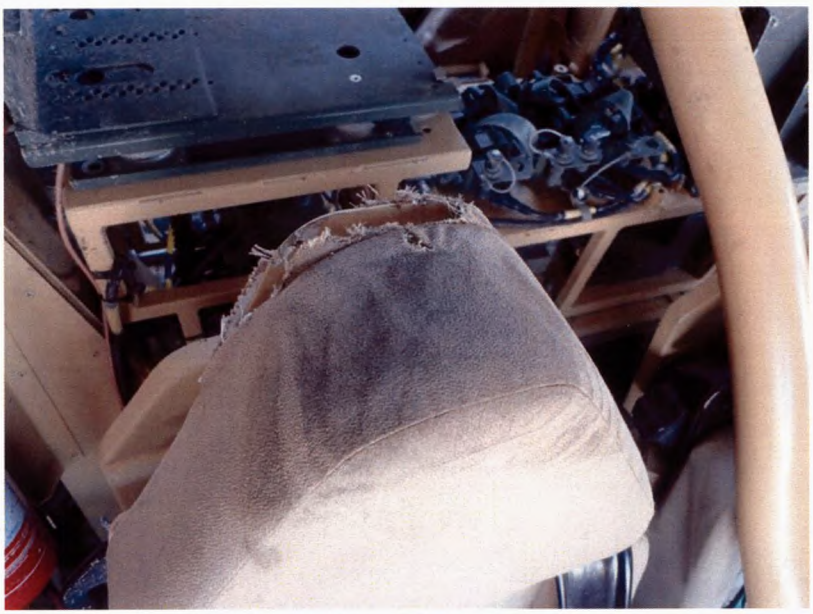

Figure 1.4. 15 – [redacted] driver's headrest

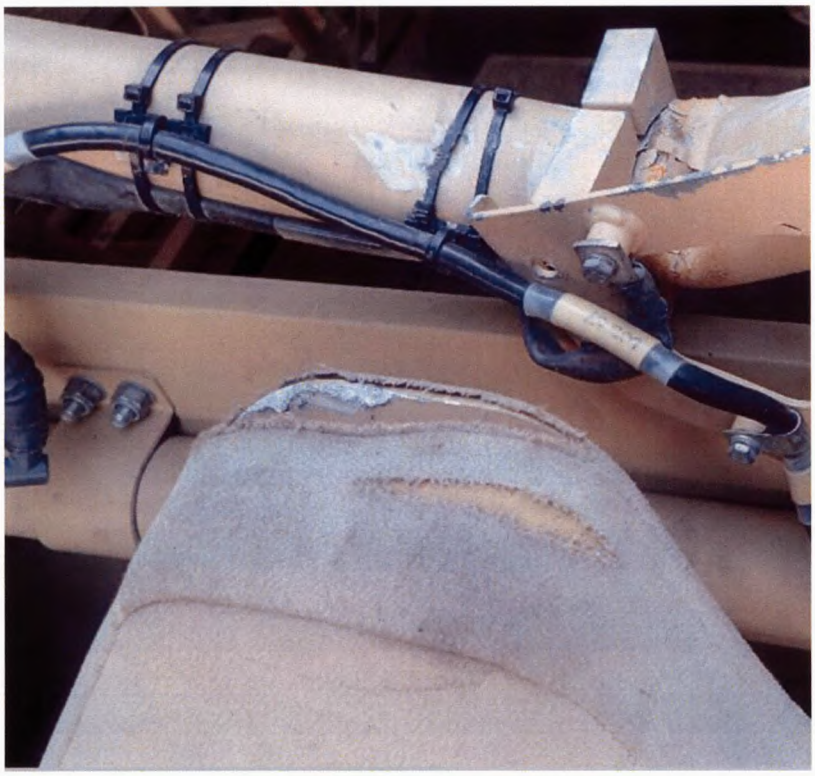

Figure 1.4. 16 – [redacted] rear crew headrest

1.4.48. The Panel assessed that the height and gradient of the hill combined with a lack of obstacles to prevent the continuation of the vehicle roll caused the roll over to become increasingly dynamic and violent. The presence of large boulders increased the likelihood of significant damage and likely caused a number of the significant areas of damage observed after the accident. The Panel finds that hill height and gradient combined with topography were **Aggravating Factors.**

Figure 1.4. 17 – [redacted] final position

Post-accident events

1.4.49. At time of the initial roll, Inst 2 and Student 2 were conducting Failed Ascent Drills on the right hand slope of the Horseshoe Loop. Nearing the bottom of the slope, Inst 2 recalled hearing a "deafening noise". Inst 2 ordered Student 2 to stop the vehicle whilst looking over his shoulder. Glancing towards Hill 3, Inst 2 observed [redacted] rolling down the hill with Inst 1 running after the vehicle [redacted]. Immediately, Inst 2 directed Student 2 to stop the vehicle and apply the handbrake. Inst 2 and Student 2 dismounted the vehicle and ran to provide assistance at the base of Hill 3.

Witness 1b
Witness 1c
Witness 2
Witness 5

1.4.50. Reaching the base of the hill, [redacted] came to rest on its right hand side (see Figure 1.4.17). Reaching the vehicle first, Inst 1 found SSgt McKelvie unresponsive and restrained within the driver's seat. Shortly after, Inst 2 and Student 2 arrived to provide assistance. Incapacitated by the extent of his injuries, Inst 1 handed control of the situation to the remaining two personnel whilst he attempted to contact Range Control for assistance.

Witness 1a
Witness 1b
Witness 1c
Witness 2
Witness 5

1.4.51. The initial assessment of SSgt McKelvie by Inst 2 and Student 2 indicated that he was unresponsive and had sustained significant injuries. Acknowledging the requirement to administer immediate life-saving first aid, Inst 2 and Student 2 elected to extract SSgt McKelvie from the vehicle. With Student 2 supporting SSgt McKelvie's head, Inst 2 attempted to unfasten the seat harness. Complicated by the position of SSgt McKelvie and the significant amount of clothing and Personal Protective Equipment (PPE) worn, release of the harness using the buckle was deemed too difficult. In an attempt to expedite the extraction, Inst 2 released the harness cutter located on the shoulder strap of the harness and attempted to cut through the harness straps. Recalling the efforts of Inst 2, during interview Student 2 stated that in his opinion the harness cutter was not capable of cutting the harness due to the strength and thickness of the webbing straps (see Figure 1.4.18). The effectiveness of the harness cutter will be further analysed within the Safe Equipment section of this report.

Witness 2
Witness 5

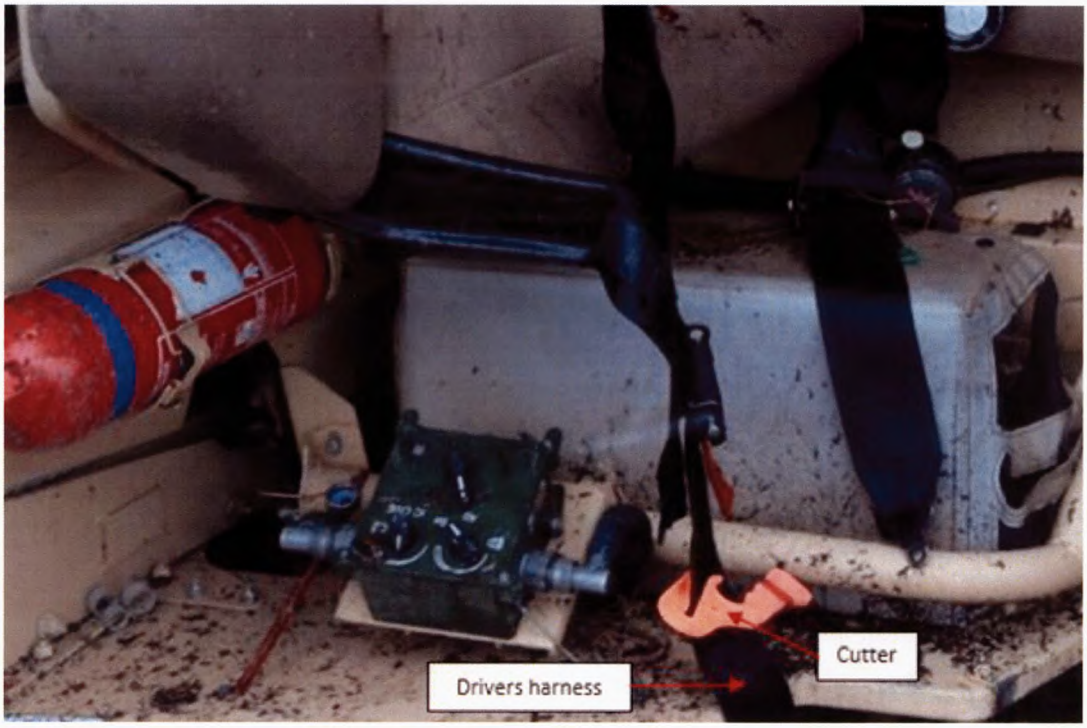

Figure 1.4. 18 – Failed harness cutter attempt

1.4.52. Realising the criticality of the situation and noting the ineffectiveness of the harness cutter, Inst 2 made another attempt to extract SSgt McKelvie by using the harness buckle. Managing to release the buckle, Inst 2 and Student 2 extracted SSgt McKelvie from the vehicle, laying him on his back next to the vehicle prior to Student 2, a previous Battlefield Casualty Drills Instructor, commencing first aid and subsequently cardiopulmonary resuscitation (CPR). Witness 2 Witness 5

1.4.53. Attempting to raise assistance through Range Control, Inst 1 was initially unable to establish a connected mobile phone call due to very poor signal. Whilst a connection was eventually achieved, the call lasted only 11 seconds and, because of the loss of signal, Inst 1 was unable to pass the message. Utilising JACKAL ERM [redacted] Inst 2 moved to the hardstanding to gain better mobile phone reception whilst also informing the remaining students of the accident and tasking them accordingly. Exhibit 1 Witness 1a Witness 2

1.4.54. Upon arrival at the hardstanding, Inst 2 dispatched Students 4 and 5 in a Land Rover to the scene of the accident to assist Student 2 with first aid whilst Inst 2 retrieved a mobile phone from Student 3 and contacted Range Control. Requesting immediate assistance and the Emergency Services, Range Control informed Inst 2 that he should contact the Emergency Services directly and that the operator should be aware of the ERV locations for CTA. Upon receiving the call, CTA staff dispatched a Training Safety Marshal (TSM) to provide support. Exhibit 57 Witness 2 Witness 4 Witness 6 Witness 7

1.4.55. After calling Range Control, Inst 2 returned the mobile phone to Student 3 who contacted the Emergency Services at 12:36. During this call, the Emergency Services Operator was not aware of the ERV locations although acknowledged an ambulance would be sent to CTA. At a similar time, Inst 1 also managed to achieve Exhibit 57 Witness 1a Witness 1b Witness 2 Witness 4 Witness 7

a connected call with the Emergency Services, passing the connected phone to Student 5 to confirm the grid reference details of the accident location. Due to the confusion regarding the location of ERV3, Students 3 and 6 were sent to locate the ambulance by Inst 2. The Panel noted that, during this period, there was a great deal of confusion regarding the communications plan and the contact made with both the Emergency Services and CTA Range Control. As a result, several witness statements contradicted each other as to exactly who made calls and the times at which they were made. The Panel believes that command and control on the ground at the time was impacted by the injuries sustained by Inst 1 and the lack of any formalised plan in the event of the primary instructor being incapacitated. Additionally, the lack of ERV knowledge by the Emergency Services Operator exacerbated the confusion on the ground at the time.

1.4.56. Analysis of an Administration Order containing course details produced by Inst 1 prior to the course highlighted the lack of any formal emergency plan beyond a list of local medical facilities in the event of an individual reporting unfit for duty. As a result, it is likely that no formal planning or discussion had taken place to confirm the actions in the event of an accident during the driving activity and it is likely that the Instructors had no formal emergency plans in place. This lack of planning resulted in confusion during the immediate aftermath of the accident which directly impacted the ability of the course members to effectively deal with the situation and to communicate with the support services. Due to the significance of the injuries sustained during the accident, it is unlikely that the confusion caused by the lack of emergency planning contributed to the final outcome and death of SSgt McKelvie. The Panel finds that the lack of an emergency or medical plan is an **Other Factor.** Additionally, the Panel finds that the lack of ERV awareness by the Emergency Services Operator is an **Other Factor.**

Exhibit 3
Exhibit 4
Witness 2
Witness 4

1.4.57. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should ensure that all UK Training Area Headquarters liaise with local Emergency Service Operations Centres annually in order to ensure that they are aware of all designated Emergency Rendezvous locations.**

1.4.58. Upon arrival at the scene, the TSM dispatched by Range Control found SSgt McKelvie on the ground next to the overturned vehicle being tended to by members of the course. Initially assessing the situation, the TSM contacted Range Control to request the provision of an Automated External Defibrillator (AED) whilst reiterating the severity of the situation. The Panel found that communications between the TSM and Range Control were initially hampered by poor radio performance. Following communication with Range Control the TSM relieved Student 2 from CPR.

Exhibit 54
Exhibit 57

1.4.59. An ambulance arrived at the scene at approximately 12:55. After an initial assessment of SSgt McKelvie's injuries, the Ambulance crew requested the support of the air ambulance to expedite his extraction to hospital. The air ambulance arrived at 13:04 and, following casualty preparation for flight, departed the scene at 13:42. The air ambulance landed at the hospital at 14:00.

Exhibit 55
Exhibit 57
Exhibit 58
Witness 2
Witness 4

1.4.60. The ambulance crew also assessed the injuries sustained by Inst 1 and diagnosed that he had [redacted]. Administering medical treatment, Inst 1 was transferred to hospital by road ambulance, departing the scene at approximately 14:30. During the transfer from CTA to hospital, Inst 1 initiated contact with the QOY Training Warrant Officer (Trg WO) to notify him of the accident. This call was made at 14:31. Exhibit 1 Witness 1a

1.4.61. NY Police received notification of the accident at 12:53 and arrived at the scene at 13:05. Taking control of the accident, NY Police cordoned the area and, with the assistance of a specialist Road Collision Team, commenced the prelimary analysis of the scene. NY Police also collected witness statements from the remaining students to ascertain the sequence of events. At 13:15 two Royal Military Police were tasked to attend the scene. Exhibit 21 Exhibit 55 Exhibit 56 Exhibit 60

1.4.62. Following notification of the accident by CTA Range Control at 14:34, the Defence Accident Investigation Branch (DAIB) deployed three investigators to the scene. Travelling from Bristol, the DAIB personnel arrived at Catterick Garrison at 23:30 and began an initial Triage Investigation the following morning, assisted by NY Police, CTA Staff and members of the course. Exhibit 60 Witness 28

1.4.63. Due to the significance of the injuries sustained by SSgt McKelvie, NY Police assumed control of the scene and accident vehicle. Following initial on-scene analysis, NY Police recovered the vehicle to a secure compound in Darlington via a civilian recovery company. The vehicle was removed from the accident scene at 23:05. Exhibit 55

Chain of Command initial response

1.4.64. Upon receiving notification of the accident at 14:31, the QOY Trg WO informed his Regimental Headquarters (RHQ) staff of the accident. This intiated the following response: Exhibit 59

a. The QOY Regimental Operations Support Officer (ROSO) and Regimental Operations Support Warrant Officer (ROSWO) were deployed to the hospital to support the casualties and their families;

b. At 16:20[9] the Executive Officer (XO) informed the DAIB of the accident;

c. At 16:30 the Adjutant (Adjt) and Regimental Sergeant Major (RSM) sent a Notification of Casualty (NOTICAS) for each casualty to 1st (UK) Division (1 (UK) Div) HQ in York;

d. Upon receipt of the NOTICAS and medical information from the hospital, SSgt McKelvie was listed as Very Seriously Ill (VSI) at 19:00. HQ 1 (UK) Div

[9] The DAIB had already been informed by CTA Range Control at 14:34.

tasked the Regional Duty Casualty Notification Officer (CNO) to inform SSgt McKelvie's Next of Kin (NOK). The CNO was escorted by the Casualty Visiting Officer (CVO) tasked by the SNIY;

e. An Incident report (INCREP) was submitted to HQ 1 (UK) Div in accordance with the Divisional Incident and Casualty Reporting procedures.

Medical treatment

1.4.65. **SSgt McKelvie.** Arriving by air ambulance at 14:00 on 29 January 2019, SSgt McKelvie was treated for his injuries. Despite this treatment SSgt McKelvie subsequently died at 16:51 on the 4 Febuary 2019. Exhibit 58

1.4.66. **Instructor 1.** After initial assessment, Inst 1 required [redacted]. Inst 1 was discharged from the hospital on the [redacted] Witness 1a Witness 1b

Post Mortem (PM) report

1.4.67. A PM was conducted on SSgt McKelvie by a consultant pathologist on behalf of HM Coroner. The PM report concluded that the cause of death was a [redacted] due to a vehicle roll over. Exhibit 58

1.4.68. Further analysis of the report by the Panel found that, in addition to the cause of death, the Pathologist made the following observations: Exhibit 58

a. The injuries sustained by SSgt Mckelvie were due to the extreme movement of the head in relation to his restrained torso;

b. The additional weight (1550g) of the helmet accentuated the head movement. The Pathologist was unable to determine whether the outcome would have been different without the helmet;

c. That a system which protects the head from the violent movements may have increased the chances of survival.

1.4.69. Although the Pathologist's report focussed heavily upon the movement of the head in relation to the torso and the potential effect of the weight of the helmet, it did not comment upon the potential for foreign objects to enter the crew space. Exhibit 58

1.4.70. Inspecting the vehicle post-accident, damage was evident to the driver's headrest, specifically deformation of the metal headrest backplate and the material covering the padding (see Figure 1.4.19). The Panel concluded that it is likely that some form of impact caused this damage during the roll. The Panel also noted from the Pathologist's report that SSgt McKelvie was 194 cm tall. The Panel hypothesised that the head of a soldier of this height could protrude outside the Exhibit 58

protected area provided by the vehicle ROPS. Using a soldier of similar height and wearing the same PPE to replicate the driving position of SSgt McKelvie (see Figure 1.4.20) the Panel demonstrated that it is highly likely that the helmet of SSgt McKelvie protruded above the headrest and likely the ROPS.

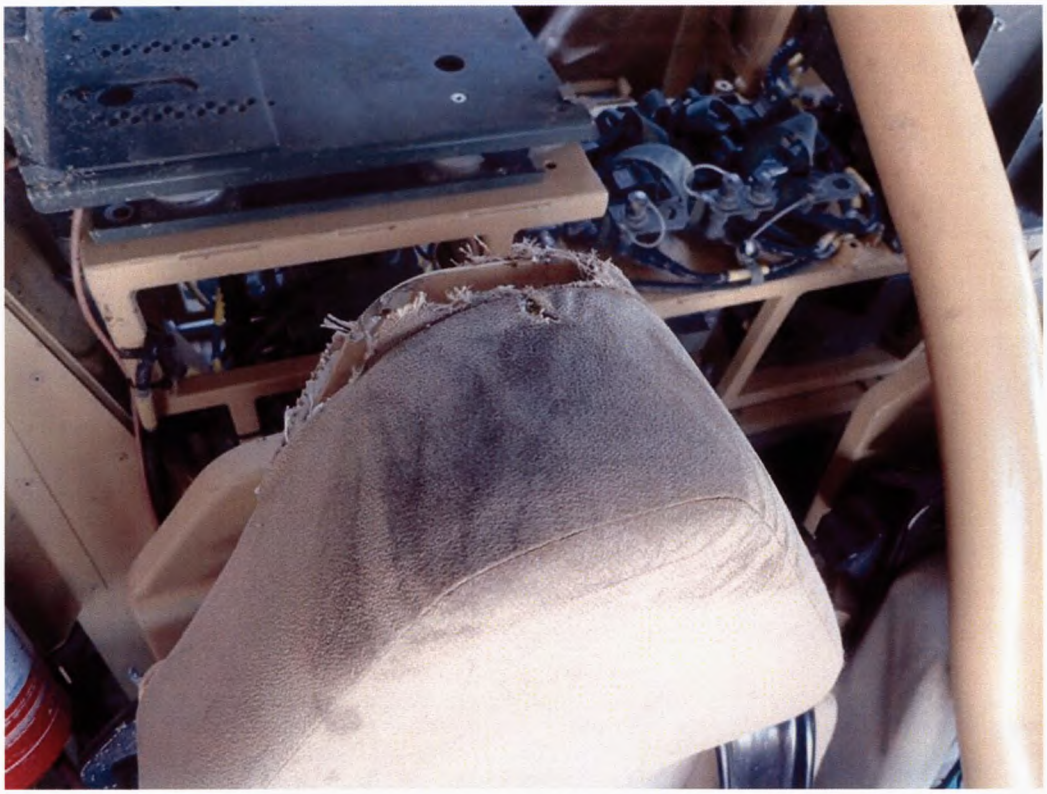

Figure 1.4. 19 – [redacted] driver's headrest

Figure 1.4. 20 – Soldier similar height to Staff Sergeant McKelvie

1.4.71. As a result of the damaged headrest and the height of SSgt McKelvie, the Panel believes that it is more likely than not that SSgt McKelvie's head contacted the ground or a foreign object during the roll. The Panel was unable to determine whether any contact with foreign objects either caused or exacerbated the injuries sustained by SSgt McKelvie. The Panel finds that the open-architecture vehicle design, helmet weight and lack of neck protection were **Aggravating Factors.**

1.4.72. **Recommendation. Director Capability should improve the protection offered to crew members in all High Mobility Truck Variant vehicles taking into account the likelihood of roll over events, neck protection, helmet design and vehicle design in order to ensure that adequate protection is provided to vehicle occupants.**

Army Safety Management

Health and Safety at Work etc. Act 1974

1.4.73. The primary piece of Health and Safety legislation in the UK is the Health and Safety at Work etc. Act 1974. The MOD is required to comply with all provisions of this piece of legislation unless a specific exemption is granted by the Secretary of State. The act broadly states that all workers have a right to work in places where risks to their health and safety are properly controlled. It also states that employees have a responsibility to take reasonable care of their own and other people's health and safety. Exhibit 63

1.4.74. The Health and Safety Executive (HSE) is the body responsible for regulating and enforcing Health and Safety. They provide advice and guidance on how to manage Health and Safety in the workplace. Current HSE guidance highlights the use of a Plan, Do, Check, Act cycle (see Figure 1.4.21). Exhibit 64

Exhibit 64
Exhibit 71

Figure 1.4. 21 – Plan, Do, Check, Act

Defence Safety Authority (DSA) policy

1.4.75. **DSA01.1.** The DSA is the Defence Authority for Health, Safety and Environmental Protection (HS&EP). DSA01.1 Defence Policy for HS&EP highlights Exhibit 65

the Secretary of State's Policy Statement for HS&EP and describes:

a. The HS&EP legislative framework that applies to Defence and how this is addressed by Defence policy;

b. The responsibilities for the management of HS&EP across Defence;

c. The requirements and arrangements for managing HS&EP risk in Defence;

d. The requirements for checking and reporting HS&EP performance;

e. The requirements for ensuring competence and providing information, training and instruction;

f. The arrangements for regulation, assurance and enforcement of HS&EP in Defence activities.

1.4.76. **DSA01.2.** Implementation of Defence Policy for HS&EP defines the specific legal and policy requirements, details acceptable means of compliance and offers further guidance material as appropriate. Exhibit 66

1.4.77. Further to the policy directed in DSA01.1 and DSA01.2, the Defence Land Safety Regulator (DLSR) is responsible for, amongst other activities, Land Systems Safety Regulation and Movement and Transport Regulation. DLSR communicates these regulations through 4 publications:

a. **DSA02.DLSR.LSSR** Land System Safety and Environmental Protection Directive; Exhibit 61

b. **DSA03.DLSR.LSSR** Land System Safety and Environmental Protection Defence Codes of Practice (DCoP); Exhibit 67

c. **DSA02.DLSR.MTSR** Movement and Transport Safety Regulations; Exhibit 68

d. **DSA03.DLSR.MTSR** Movement and Transport Safety Regulations – Defence Codes of Practice (DCoP). Exhibit 69

Joint Service Publications (JSPs)

1.4.78. **JSP 375.** The lead Departmental publication for Health and Safety is JSP 375. This is the corporate publication that provides rules and guidance to Defence in meeting its health and safety obligations. It comprises two parts: Part 1 is the directive that must be followed in accordance with Statute or Policy mandated by Defence for the management of health and safety. Part 2 provides guidance on specific areas of health and safety in accordance with the policy stated in Part 1. It provides policy-compliant business practices which should be considered best practice in the absence of any contradicting instruction. Exhibit 63

1.4.79. **JSP 418.** Aligned with JSP 375, JSP 418 is the corporate publication that provides guidance to Defence in meeting its Environmental Protection Policy Exhibit 70

and Regulatory obligations. JSP 418 consists of two parts and aligns with the structure of JSP 375.

1.4.80. The Panel reviewed the requirements of JSP 418 and the activities that were being conducted at the time of the accident. The Panel concluded that adherence to Environmental Protection was **not a factor**. Exhibit 70

Army policy

Army Command Standing Order (ACSO) 3216

1.4.81. ACSO 3216 sets out the Safety and Environmental Management System (SEMS)[10] for Safety and Environmental Protection (S&EP) in the Army Top Level Budget (TLB). Sponsored by Chief Safety (Army) and authorised by the Deputy Chief of the General Staff (DCGS), ACSO 3216 is the working level document detailing the Army's approach to safety. Based upon the HSE Plan, Do, Check, Act methodology, ACSO 3216 provides the Army TLB with clear orders on how to conduct activity and provides the guidance on all matters of safety and risk management, including the Safe System of Work/Training (SSW/T), Duty of Care and Duty Holding (DH) responsibilities within the Army. In addition to providing safety guidance and instructions, ACSO 3216 articulates the safety responsibilities of all those in the Army Chain of Command. At the time of the accident, ACSO 3216 was in its first edition, issued May 2018. In August 2019, mid-way through the SI, a first revision of ACSO 3216 was issued. This report will focus on the procedures and guidance detailed at the time of the accident but will refer to changes that have been made in the revision where appropriate. Exhibit 71

ACSO 1109

1.4.82. ACSO 1109 is the Army's overarching risk management policy for all types of risks. It directs how risk management is to be conducted within the Army. It provides a standardised risk management framework, which regulates the Army's risk language, governance, approach and processes. ACSO 1109 refers to ACSO 3216 as the primary Army Safety Risk document. Exhibit 249

Duty of Care (DoC)

1.4.83. For the majority of day-to-day activity, Army Health and Safety (H&S) management is based upon the principle of DoC. ACSO 3216 defines this as: Exhibit 71

'The Army has a legal and moral Duty of Care obligation for the health, safety and welfare of all its personnel and those who might be affected by its acts or

[10] A Safety and Environmental Management System (SEMS) is the organisational structure, processes, procedures and methodologies that enable the direction and control of the activities necessary to meet statutory requirements, MOD policy and Defence Regulations.

omissions. This obligation is universal (applied to all activities) and responsibility is vested in every individual from recruit to CGS. However, more is expected of commanders (from Lance Corporal upwards) who direct and supervise activity to manage the risks they create and/or are confronted by. This is done by understanding the risks, making a judgement on whether the risk (potential adverse outcome) is worth the potential benefit and putting controls in place to reduce the risks to ALARP[11]. The SSW/T is a useful framework and will, in most cases, reduce risk to ALARP and ensure Duty of Care obligations are being met'.

1.4.84. The DoC model places responsibility for H&S at every level but highlights the increased responsibility for those with management functions. DoC has been the primary model utilised by the Army for several years and is ingrained in its hierarchical structure.

1.4.85. ACSO 3216 defines key roles and responsibilities within the Chain of Command as follows: Exhibit 71

a. **Commanding Officers (COs).** COs have a personal responsibility for ensuring that activities are conducted in accordance with Service Instructions, Regulations, Defence Codes of Practise, Directives and Policy while taking due regard to any risks to personnel. In addition, the SSW/T must be applied to every activity and, where an activity cannot be controlled within the SSW/T, then 2* authority to continue must be granted and documented;

b. **1* Commanders.** 1* Commanders are responsible for providing oversight of the activities conducted by their subordinate commanders and should study submissions made by unit Commanders where activity cannot be controlled within the SSW/T. 1* Commanders should decide whether any such activity is critical and whether it can be offered further resource to remain within the SSW/T or whether it should be elevated to the 2* Commander for consideration;

c. **2* Commanders.** 2* Commanders should consider any submissions that are elevated from 1* Commanders and consider the necessity of the activity. Taking advice if required, the 2* must then consider whether the risks are tolerable to them and, if so, approve the activity, providing a documented audit trail with any additional controls that are to be in place and maintained by the unit Commander whilst undertaking the activity.

Duty Holding (DH)

1.4.86. In 2009, following the loss of a Nimrod aircraft in Afghanistan, Sir Charles Haddon-Cave QC released 'The Nimrod Review' investigating the broader Exhibit 72

[11] ALARP –"As Low As Reasonably Practicable" – Reasonably practicable involves weighing a risk against the trouble, time and money needed to control it. When these are judged to exceed any further control of the risk, then ALARP has been achieved" ACSO 3216.

issues surrounding the accident in 2006. The report focussed on organisational issues within the MOD and Industry highlighting concerns regarding the effectiveness of the Military Airworthiness System. Amongst a number of high-level recommendations, Haddon-Cave recommended the introduction of a 3-Tiered DH construct to clearly identify those with both the authority and legal responsibility with respect to the operation of military equipment within the Air domain.

1.4.87. Whilst this recommendation was directed at the Air domain, the then Permanent Secretary of the MOD, Sir Jonathon Thompson, directed that the DH model be applied to all military environments. In 2013, the Army Command Group directed that the DH model be aligned to the Chain of Command, with Chief of the General Staff (CGS)[12] as the Senior Duty Holder (SDH), 2* Commanders as Operating Duty Holders (ODH) and COs as Delivery Duty Holders (DDH). Exhibit 71

1.4.88. The DH construct was applied to all high-risk activities identified within the Army. Initially 136 activities were assessed as 'high risk' and managed under the DH construct. ACSO 3216 highlighted that this large number of activities required a disproportionate degree of management effort by Duty Holders in the Land Environment and limited the ability for DH to be a meaningful and effective safety management tool. Exhibit 71

1.4.89. To reduce the management burden and ensure focus was applied to the activities presenting the greatest risk, the Army revised the list of DH activities to the 8 most hazardous activities. This list was published in May 2018 in ACSO 3216 and included operating / driving military bespoke vehicles. Exhibit 71

1.4.90. Whilst DH operates in much the same way as Duty of Care, DH is designed to focus safety management on those activities that provide the greatest Risk to Life (RtL) and identify those key individuals who are accountable for holding that risk. The DH construct provides a clear definition of responsibilities for those who hold Duty Holding positions and provides a clear framework of risk elevation and acceptance activity. All those in DH roles are to hold a Letter of Delegation and are to manage their RtL to an ALARP and tolerable level.[13] Exhibit 71

1.4.91. The Panel noted that the approval to issue letters of delegation to the DDH level differed between the regulatory document DSA 01.2 and the single service SEMS ACSO 3216. DSA 01.2 chapter 3 states that all ODHs and DDHs should be appointed by the SDH through a letter of delegation. ACSO 3216 states that ODHs are to appoint DDHs through a letter of delegation. The Panel found that ACSO 3216 contravened the higher-level regulatory document and is an **Observation**. Exhibit 71 Exhibit 317

[12] CGS is the Professional Head of the British Army.

[13] RtL can be said to be reduced to a level that is ALARP when the cost of further risk reduction (mitigation) is 'grossly disproportionate' to the benefits of risk reduction. It is a balance of the gain versus the cost (in time, effort and financial terms). The balance must always be weighted in the favour of safety with greater consideration and proof required for RtL close to the intolerable boundary. – ACSO 3216 Ch 4.

1.4.92. Organisations that support Duty Holders by providing equipment or services are recognised as Duty Holder-facing organisations and hold responsibilities in line with the support they provide to the Duty Holder. The following Duty Holder-facing organisations will be discussed in this report: Exhibit 71 Exhibit 317

a. **Defence Equipment and Support (DE&S)** – responsible for the procurement and in-service support of equipment for the MOD;

b. **Defence Infrastructure Organisation (DIO)** – responsible for the provision of the Training Estate;

c. **Army Directorate of Capability (D Cap)** – responsible for Army Capability Development and Through-Life management of equipment Safety Cases (SCs). D Cap also provides advice on safe usage of equipment to the user;

d. **Army Directorate of Support (D Sp)** – Responsible for the Through-Life Support (TLS) of equipment.

Safe System of Work/Training (SSW/T)

1.4.93. The SSW/T sets the conditions under which military training is to be conducted, ensuring personnel are provided with the appropriate information, instruction and supervision. This enables the military to meet the training imperative set by the operational requirement whilst ensuring that personnel are provided with the best possible preparation for the roles they may undertake in times of conflict. The SSW/T enables Defence to maintain risks to an ALARP and tolerable state by ensuring that those who conduct the training are competent and that all associated risks have been considered and mitigated as far as reasonably practicable. Exhibit 71 Exhibit 73 Exhibit 74

1.4.94. The SSW/T is broken down into four key elements:

a. Safe Equipment;

b. Safe Persons;

c. Safe Place;

d. Safe Practice.

Safe Equipment

1.4.95. JSP 375 defines safe equipment as any equipment including explosives and ammunition, brought into service following the Defence process for the production of a SC, with appropriate documentation defining the safe operation and maintenance of the equipment under Service conditions. It is the unit Commander's responsibility to ensure that: Exhibit 74

a. Their subordinates have available, and make proper use of, the correct equipment to carry out an activity in accordance with the appropriate Service Equipment Support Publication or similar set of instructions;

b. Only Competent Persons or those under training who are being provided with the appropriate supervision are allowed to operate and service the equipment;

c. Complete training and maintenance records are kept.

Safe Persons

1.4.96. JSP 375 defines that safe persons are those who have received the appropriate information, instruction, training and supervision required to carry out a specific task correctly and safely. A competent person within the SSW/T is deemed competent by virtue of qualifications, currency, experience and maturity. It is essential that commanders ensure instructors and those supervising the training are competent and given an appropriate level of supervision to ensure that the delivery of training matches the ability of the trainees and complies in full with all the elements of the SSW/T. Exhibit 74

Safe Place

1.4.97. JSP 375 defines a safe place as one in which the controls, necessary to enable authorised training to be conducted safely, have been identified by a site-specific risk assessment and directed through appropriate Standing Orders such as Range Standing Orders. Commanders should ensure both Instructors and those under training are fully briefed on all necessary controls to be implemented in order to maintain the Safe Place. Exhibit 74

Safe Practice

1.4.98. JSP 375 defines safe practices as those conducted strictly in accordance with drills, procedures and instructions laid down by the Service authorities. These drills and procedures, taking into account the Training Imperative, are identified in the SC and developed in accordance with the Defence Systems Approach to Training (DSAT). Safe Practice includes following correct procedures, the provision of effective supervision and delivery of effective training, the briefing of all warnings, cautions and controls together with the use of appropriate PPE. Training is only to be delivered by a competent person to ensure that procedures are strictly adhered to and such instruction and training is closely supervised by the Chain of Command to ensure Safe Practice is implemented. Exhibit 74

Defence Capability Management

Exhibit 77

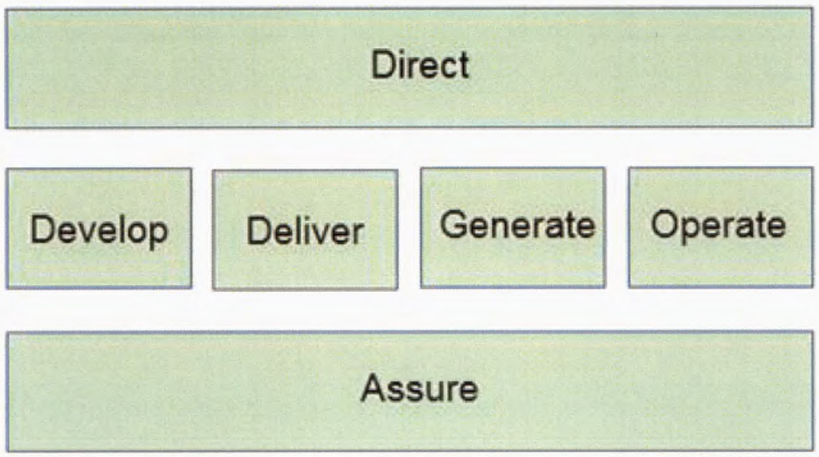

Figure 1.4. 22 – Capability management function

Exhibit 75
Exhibit 76
Exhibit 77
Exhibit 301

1.4.99. Capability Management is the means by which Defence Directs, Develops, Delivers, Generates and Operates military capabilities through-life in order to meet the strategic requirements. Capability Management (see Figure 1.4.22) is sub-divided into six Core functions:

a. **Direct** – The Direct function understands the strategic context, makes policy and strategy, produces the Command Plan and defines and resources the necessary military capability;

b. **Develop** – The Develop function plans the delivery of a timely, realistic, affordable and coherent capability aligned to strategy. The develop function plans the capability out to 30 years and prepares the future force in accordance with direction;

c. **Deliver** – The Deliver function enables Senior Responsible Owners (SROs) to drive the attainment of outcomes and delivery of benefits, in line with the intention of the change initiative as detailed in the Programme Mandate;

d. **Generate** – The Generate function produces the force elements needed to meet current operations and potential Military Tasks, realises the benefits of the Change Portfolio and contributes to developing the Future Force;

e. **Operate** –The Operate function in Commands is to operate and sustain force elements to execute Military Tasks and achieve military effects overseas and in the UK;

f. **Assure –** The Assure function provides all systematic actions necessary to provide confidence that the target (system, process, organisation, programme, project, outcome, benefit or output) is appropriate, strategically aligned and coherent, and that management information and business intelligence is reliable. This includes supporting CGS in the discharge of his role as Senior Duty Holder.

1.4.100. Military Capability is the combination of equipment, trained personnel and support that gives the Armed Forces the capacity to achieve the tasks they are given. There are several factors that the Commands must consider when making decisions on Military Capability. These factors combined are known as the Defence Lines of Development (DLoDs) and are used to ensure that an integrated, secure and comprehensive Military Capability is delivered. The eight DLoDs are:

a. Training;

b. Equipment;

c. Personnel;

d. Infrastructure:

e. Doctrine and Concepts;

f. Organisation;

g. Information;

h. Logistics and Security.

1.4.101. In addition to the eight DLoDs, interoperability is a key overarching principle that must be applied to ensure all military capabilities are able to operate effectively with other partners, nations and 3rd parties where required.

Army Organisation

1.4.102. The core purpose of the Army is to protect the UK, to defeat the UK's enemies, deal with disaster and to prevent future conflicts. This is achieved by generating an adaptable force that is prepared for current and future operations, maintaining a continual presence overseas to deter, protect and enhance prosperity whilst maintaining national security and assuring future resilience. Exhibit 76

1.4.103. Following changes announced in the 2010 Strategic Defence and Security Review (SDSR) with subsequent refinement in 2012, SDSR 2015 (SDSR15) concluded that the future Army required significant organisational restructuring. The key catalysts for change were: Exhibit 304

a. Withdrawal from enduring operations;

b. Tackling threats at source by developing the military capacity of partner nations rather than deploying on enduring operations;

c. The routine use of Reserves in an Integrated Army.

1.4.104. Following the SDSR15 announcements, CGS released plans for restructuring the Army known as Army 2020 Refine. The Army 2020 Refine paper identified how the Army would implement the SDSR15 and fully integrate both Regular and Reserve components to deliver effect in a more coherent manner.

1.4.105. Throughout the transformation, the Army has seen significant change. Army Headquarters (AHQ) was restructured to meet the demands of new roles, whilst Divisions and Brigades within the Field Army (Fd Army) were reconfigured to deliver the new force structure. The structure of the AHQ and Fd Army relationship at the time of the accident is captured within Figure 1.4.23, which highlights the Chain of Command from AHQ to the QOY.

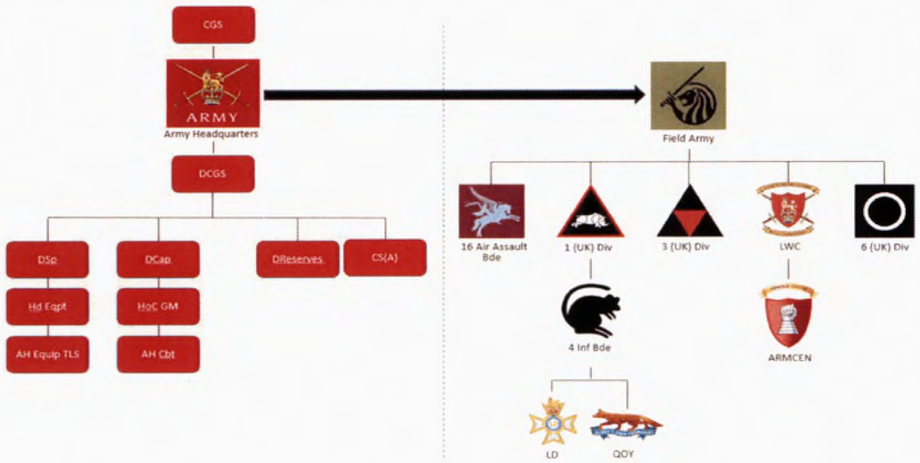

Figure 1.4. 23 – Army Headquarters and Field Army relationship (simplified)

Army Headquarters (AHQ)

1.4.106. AHQ is the 4* organisation that undertakes all activity concerned with the Direct, Develop and Deliver functions of the capability management model. The function of AHQ is to support CGS in all aspects of military capability and provide advice to Defence. It enables Land Forces to deliver on current operations whilst shaping the Army for future operations. AHQ interacts with the other single Services, Joint Organisations and MOD Contractors. The key functional areas within AHQ that are pertinent to this report are Support, Capability, Army Reserves and the Army Safety Centre (ASCen). Exhibit 76 Exhibit 78

Director Support (D Sp)

1.4.107. D Sp is the 2* Army Officer responsible for the delivery and through-life support of equipment, logistics and materiel to the Land Environment. Exhibit 76 Exhibit 78

1.4.108. D Sp sets and manages capability requirements with DE&S in the Command Acquisition Support Plan[14] in order to provide in-service capability management of equipment in support of the Army. D Sp is responsible for all Deliver elements of capability management although they are not accountable for equipment through-life safety management.

[14] The Command Acquisition Support Plan defines the objectives, related outputs and required outcomes expected of DE&S by AHQ.

Director Capability (D Cap)

1.4.109. D Cap is the 2* Army Officer responsible for Land Environment capability development. Exhibit 76 Exhibit 78

1.4.110. Along with capability development, D Cap is responsible for all Land Equipment through-life Safety Management, including the acceptance and signature of the Part 3 SC on behalf of the End User.

1.4.111. D Cap discharges the responsibilities of Capability Safety Management through five Heads of Capability. In the case of JACKAL this responsibility is bestowed upon Head of Capability Ground Manoeuvre.

Head of Capability Ground Manoeuvre (HoC GM)

1.4.112. HoC GM is the 1* Army HQ Officer responsible for capability development for all GM capability, including Mounted Close Combat (MCC)[15] and Dismounted Close Combat (DCC)[16] and combat support functions. Included in this role is the responsibility for coordinating all through-life equipment safety management. This role includes the coordination of attendance at safety meetings and sign off of the Part 3 SC. In accordance with ACSO 3216, HoC GM must ensure that support for safety activity takes priority over other activity. In addition, amongst other roles, HoC GM is to ensure that: Exhibit 71

a. Safety risks are identified and managed to ALARP and tolerable. These tasks are performed jointly with the Delivery Team Leader (DTL) within DE&S;

b. Risk controls and mitigations are implemented in a timely manner;

c. Periodic reviews of the standards and policy for the operation of equipment is conducted. This includes Hazard Log reviews and verification that controls and mitigations remain appropriate;

d. Appropriate user representatives attend DE&S Safety Panels and Safety Committees to provide effective communication of user feedback;

e. Annual safety assurance is provided to D Cap for all equipment within their Area of Responsibility (AOR).

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[15] Mounted Close Combat is the operating of Armoured Vehicles that combines reconnaissance, firepower, speed and momentum capabilities.

[16] Dismounted Close Combat is the capability of readily and rapidly deploying personnel to operate over all kinds of terrain in all weathers by foot providing flexibility.

Assistant Head Combat (AH Cbt)

1.4.113. AH Cbt is the Duty Holder facing Subject Matter Expert for combat platforms, including the High Mobility Truck Variant (HMTV) fleet. Working under HoC GM, AH Cbt is responsible for providing through-life safety oversight for around 50 different pieces of equipment, ranging from rifles to main battle tanks. Delegated responsibility as the co-signatory of the Part 3 SC, AH Cbt accepts equipment from DE&S and ensures that operating procedures and limitations are in place to enable the equipment to be 'safe to operate'. Witness 30

Director Reserves (D Reserves)

1.4.114. The 2* D Reserves is the Senior Army Reserve Officer responsible for monitoring, assisting and ensuring coherence and effectiveness of other Directorates' polices in recruiting, training, managing and deploying Reserves. D Reserves develops the Reserve Strategy and provides objective advice on the impact and implications of policy change on the Reserve component. D Reserves covers volunteer, full-time and sponsored Reserves. Exhibit 49

The Army Safety Centre (ASCen)

1.4.115. The ASCen is responsible for the management of Safety and Environmental Protection (S&EP) for the Army, providing safety policy and advice to all personnel. The ASCen's mission is to "Protect the Army's people – soldiers and civilians – and environment in order to meet operational outputs". Exhibit 71 Exhibit 79

1.4.116. **Chief Safety (Army) (CS(A)).** The CS(A) is an OF5 Staff Officer who works directly to the Deputy Chief of the General Staff (DCGS). CS(A) commands the ASCen and delivers the Army's organisation and arrangements for S&EP within the Army's Safety and Environmental Management System (SEMS) - Army Command Standing Order (ACSO) 3216. The CS(A) advises staff branches and the Chain of Command on S&EP issues. Exhibit 71 Witness 31

1.4.117. **Deputy Chief Safety (Army) (DCS(A)).** The DCS(A) is responsible for the management and direction of the Army Force Protection Advisors. Exhibit 71

1.4.118. **Chief Environment and Safety Officer (Army) (CESO(A)).** CESO(A) maintains the Army's organisation and arrangements for S&EP within ACSO 3216. CESO(A) conducts 2nd Line of Defence assurance in accordance with ACSO 9001[17] and ACSO 9016[18] and routinely monitors S&EP performance. CESO(A) is also mandated to produce an Annual Assurance Review on S&EP. Exhibit 71 Witness 35

1.4.119. **Army Force Protection Advisors (AFPAs).** AFPAs are S&EP trained individuals who are predominately contracted on a Full Time Reserve Service Exhibit 71

[17] Army Command Standing Order 9001 - Army Policy for Audit and Inspection.

[18] Army Command Standing Order 9016 - Army Force and Environmental Protection Audit Policy.

(FTRS) basis in order to provide advice and guidance to units. AFPAs are assigned to units on a risk-based approach, ensuring that those units deemed the highest risk are offered the most support. Although allocated at unit level, AFPAs also provide S&EP assurance to other units within the region.

Witness 35
Witness 47
Witness 48

Field Army (Fd Army)

1.4.120. The Fd Army (see Figure 1.4.24) is the 3* Army organisation that undertakes the majority of activity concerned with the 'Generate' and 'Operate' functions of capability management. Below the 3* HQ, the Fd Army is organised into:

Exhibit 80

a. Three 2* commanded Divisions with subordinate 1* Brigades;

b. The Land Warfare Centre;

c. 16 Air Assault Brigade.

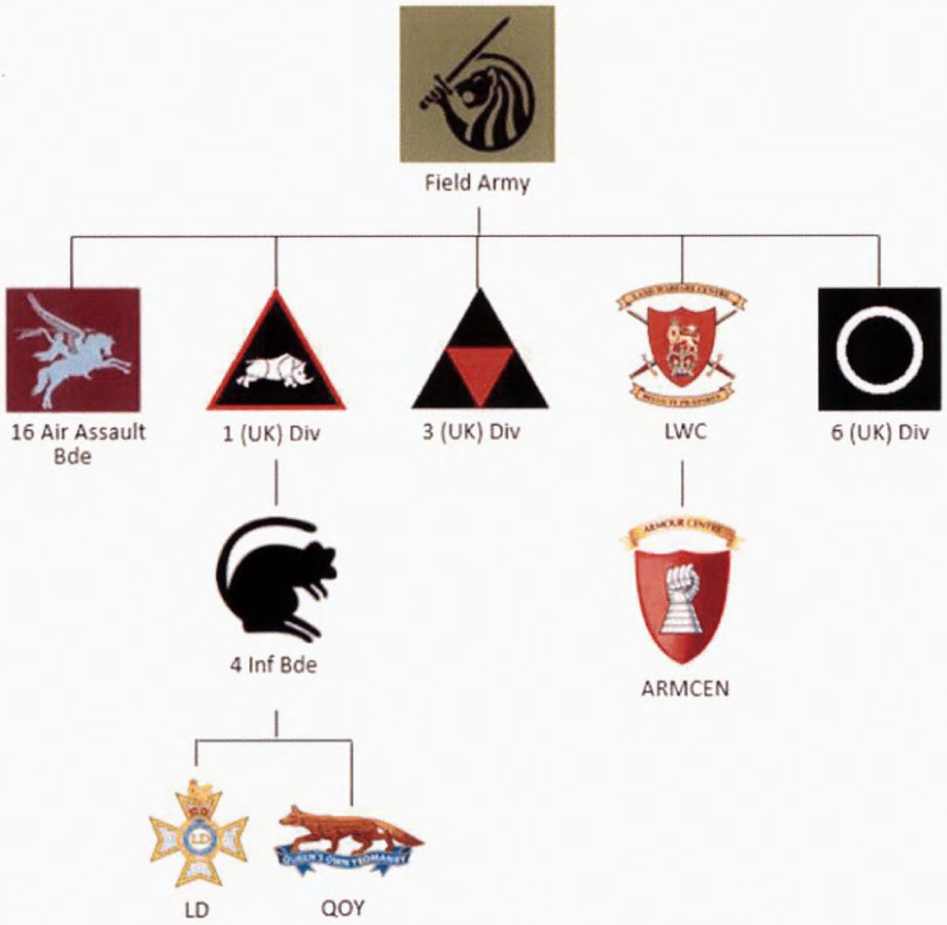


Figure 1.4. 24 – Field Army (simplified)

1.4.121. Fd Army output is delivered by specialised Regiments undertaking a variety of key roles, including infantry, cavalry, artillery and engineering functions. The Fd Army generates and deploys forces in accordance with the Army Readiness Order[19], continues to support and deliver the development of the modernised force and optimises the Field Force through Warfare Development.

1st (United Kingdom) Division (1 (UK) Div)

1.4.122. 1 (UK) Div consists of four Specialised Infantry Brigades, an Engineer Brigade, a Medical Brigade and Logistic Brigades. The Division's role is to prepare light force[20] elements at readiness for fixed and responsive tasks worldwide, focussing on the delivery of Joint Expeditionary Forces and Defence Engagement tasks. Exhibit 80

4th Infantry Brigade (4 Inf Bde)

1.4.123. 4 Inf Bde consists of four Regular and four Reserve units. The Bde prepares its units at readiness for UK and overseas operations. Exhibit 81

The Light Dragoons (LD)

1.4.124. The LD are a Regular Army Light Cavalry Regiment. As a mounted Regiment, the LD predominately deploy in JACKAL vehicles to provide forward reconnaissance support. Their primary role is to gather information on enemy activity and provide this to their deployable Headquarters (HQ) in order to shape the battle.

The Queen's Own Yeomanry (QOY)

1.4.125. The QOY are an Army Reserve Regiment paired with the LD. The role of the QOY is similar to the LD but by utilising Reserve Soldiers. As a Reserve unit, they may be deployed either as a formed unit or as individual augmentees. Until recently, the QOY had been equipped with the Land Rover based Reconnaissance Weapons Mounted Installation Kit (RWMIK). In 2018, the QOY were tasked to re-role onto JACKAL to enhance their integration with the LD. Witness 10

The Land Warfare Centre (LWC)

1.4.126. The LWC is a 2* commanded organisation that defines, delivers and manages the trade, collective and mission specific training requirements of the Fd Army in order to achieve readiness and ensure resilience. The LWC also develops the future training requirements of the Army, based on the output of the AHQ Exhibit 83

[19] Army Readiness Order – A Comprehensive document detailing how the Army will achieve levels of readiness.

[20] Specialised Infantry, configured to Train, Advise and Assist.

Develop function. The LWC is sub-divided into the Collective Training Group (CTG) and specialist Trade Training Schools.

The Armour Centre (ARMCEN)

1.4.127. The ARMCEN is a specialist Trade Training School that delivers Initial Trade Training (ITT) and Subsequent Trade Training (STT) to a broad variety of Fd Army and Defence users on tracked and wheeled Armoured Fighting Vehicles (AFV). The school delivers trained MCC and specialised DCC officers and soldiers to the Fd Army and Defence. Exhibit 82

Defence Equipment and Support (DE&S)

1.4.128. The role of DE&S is to equip and support the UK's Armed Forces for operations now and in the future. DE&S is responsible for the safe procurement and through-life support of a vast range of equipment – from warships, aircraft and missiles, to armoured vehicles, body armour and field kitchens. It also undertakes decommissioning and disposal when equipment reaches the end of its service life. Exhibit 305

1.4.129. DE&S is responsible for procuring equipment that is safe by design. With technical experts in engineering and equipment safety, DE&S provides the expertise to deliver safe equipment to Defence and communicate safe operating envelopes and equipment safety cautions and warnings. DE&S assures the delivery of equipment that is safe by design through the production of a Part 2 SC. DE&S works with D Cap as the Capability Sponsor and Through-Life SC manager to ensure that equipment remains safe by design and safe to operate.

1.4.130. DE&S is structured into four Domains (see Figure 1.4.25), each dealing with a different sector of Defence equipment requirement. The Land domain is the largest within DE&S with over 4,500 staff structured into three Operating Centres: Land Equipment, Weapons and Logistics Delivery. Exhibit 299

1.4.131. **Chief of Materiel (Land) COM(L).** COM(L) is the 3* appointment that leads the Land Domain and heads the Land Domain HQ.

1.4.132. **Director Land Equipment (D LE).** D LE is the 2* appointment responsible for delivering and supporting land equipment capabilities to UK Defence. The Land Equipment (LE) portfolio extends across a great range of equipment, from small arms to tracked vehicles and artillery. D LE commands the Land Equipment Operating Centre (LEOC).

1.4.133. **Head Vehicle Support Team (Hd VST).** The LEOC is further divided into a number of Delivery Teams (DTs) who manage smaller portfolios of equipment management and support. Responsible for HMTV, the Vehicle Support Team (VST) is led by the 1* Hd VST who holds responsibility for delivering and supporting a number of tracked and wheeled vehicles to the UK Armed Forces.

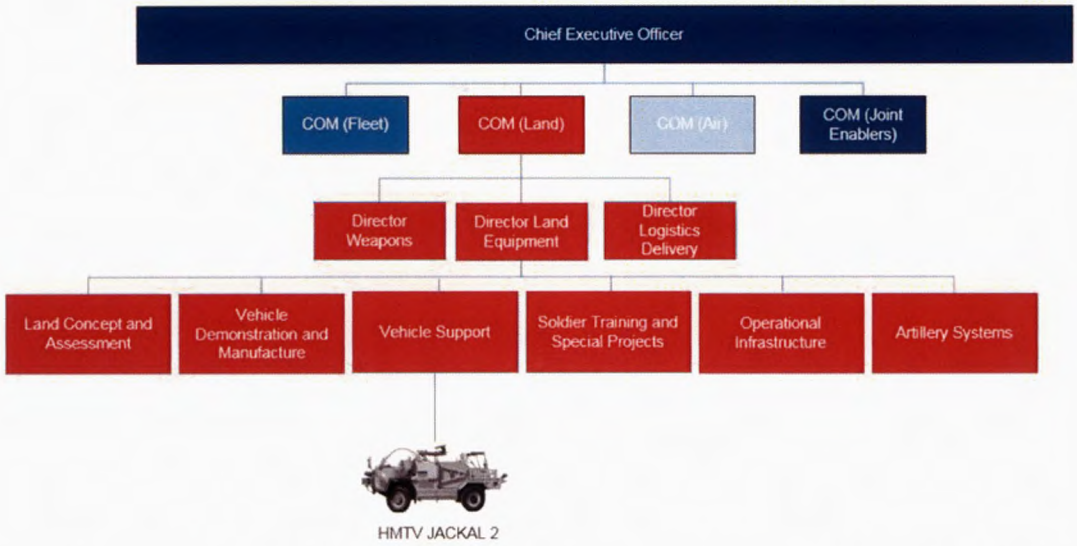


Figure 1.4. 25 – Defence Equipment and Support structure down to JACKAL 2

The Acquisition Safety and Environmental Management System (ASEMS)

1.4.134. To enable the standardisation of safety practices across the department, DE&S mandates the use of the ASEMS. By applying the policy, instructions and guidance described in ASEMS, projects are able to demonstrate the implementation of effective and efficient safety and environmental management processes which satisfy legislation and departmental policy. The aim is to ensure that all appropriate precautions are taken to prevent harm to personnel and to protect the environment, consistent with providing the operational capability required by the customer.

Exhibit 300
Exhibit 301

The Defence Infrastructure Organisation (DIO)

1.4.135. The DIO is responsible for building, servicing and maintaining Defence infrastructure including the Defence Training Estate (DTE). In this role it is required to maintain a safe, secure and sustainable training estate.

Exhibit 71
Witness 26
Witness 27

1.4.136. The training estate managed by the DIO is vast and its usage is varied. From heavily regulated live fire ranges to open fields, the DIO is expected to comply with MOD and civilian legislation and regulation. The Training Estate is managed within DIO by the 1* Head Overseas and Training Region.

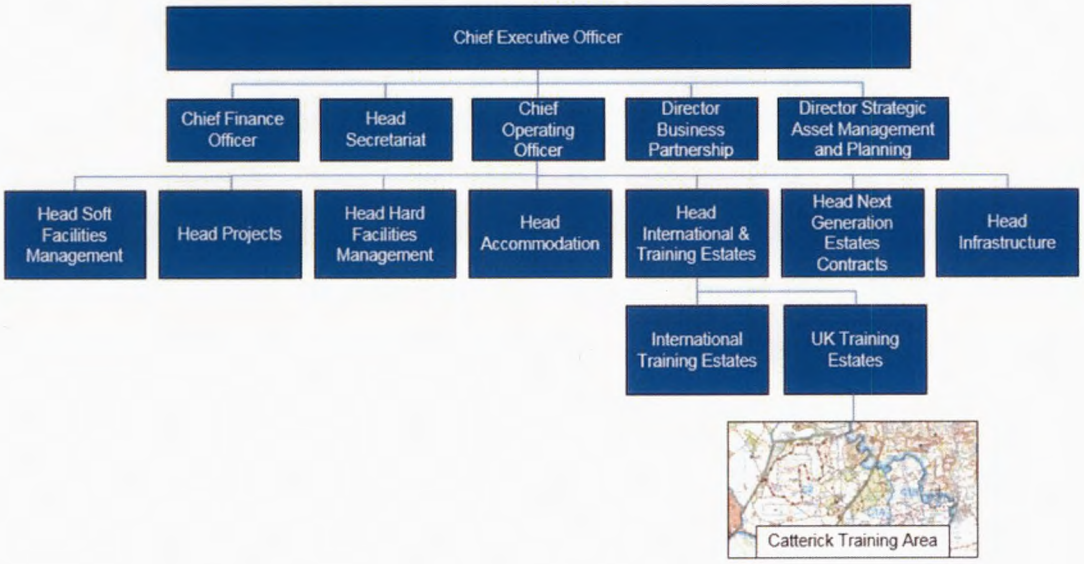


Figure 1.4. 26 – Defence Infrastructure Organisation Training Estates structure

Safe Equipment

Definition

1.4.137. JSP 375 defines safe equipment as any equipment including explosives and ammunition, brought into service following the Defence process for the production of a SC, with appropriate documentation defining the safe operation and maintenance of the equipment under Service conditions. It is the unit Commander's responsibility to ensure that: Exhibit 74

a. Their subordinates have available, and make proper use of, the correct equipment to carry out an activity in accordance with the appropriate Service Equipment Support Publication or similar set of instructions;

b. Only Competent Persons or those under training who are being provided with the appropriate supervision are allowed to operate and service the equipment;

c. Complete training and maintenance records are kept.

SUPACAT

1.4.138. Established in 1980 and based in Devon, SUPACAT[21] is an engineering company which specialises in the design and development of bespoke equipment operating in extreme conditions for the UK and worldwide Defence sectors. The

[21] https://supacat.com/

company also develops specialist vehicles and engineering solutions for the oil and gas, nuclear, marine and renewable sectors.

1.4.139. SUPACAT provides vehicle design and engineering solutions, prototype manufacture and testing, certification, platform manufacture and fleet support. The company is the manufacturer of JACKAL 2.

Equipment history

1.4.140. [redacted]. The driver and commander sit in a cab [redacted] whilst the gunner sits in the rear [redacted]. The vehicle carries a weapon ring [redacted] and can be fitted with a variety of in-service weapons as required. [redacted] Exhibit 22 Witness 19

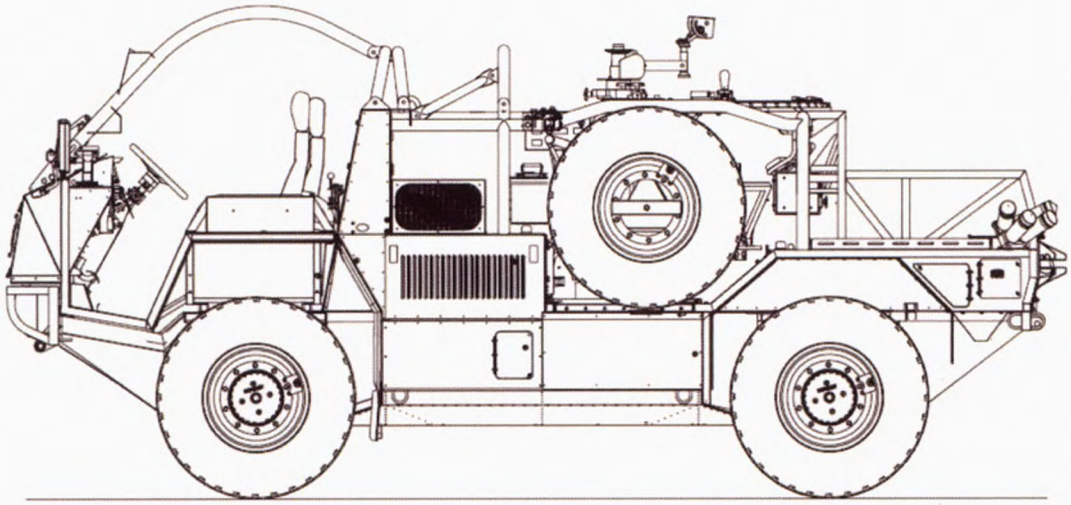


Figure 1.4. 27 – High Mobility Truck Variant [redacted]

1.4.141. The term HMTV denotes a family of vehicles. In this instance, the accident vehicle was a HMTV JACKAL 2. Throughout the development of the HMTV family of vehicles, tests have been conducted on different variants and the results have been read across to the entire fleet. This methodology saved time and money whilst providing evidence to support, or otherwise, the safety argument across the family of HMTV. There are seven platforms that fall within the HMTV family, the Panel discuss the following five throughout the report: Exhibit 22

a. [redacted]

b. JACKAL 1;

c. JACKAL 2;

d. JACKAL 2A[22];

e. COYOTE[23].

1.4.142. JACKAL 1 (see Figure 1.4. 28) was an Urgent Operational Requirement (UOR)[24] procured for Operation HERRICK in 2008. [redacted] Witness 19

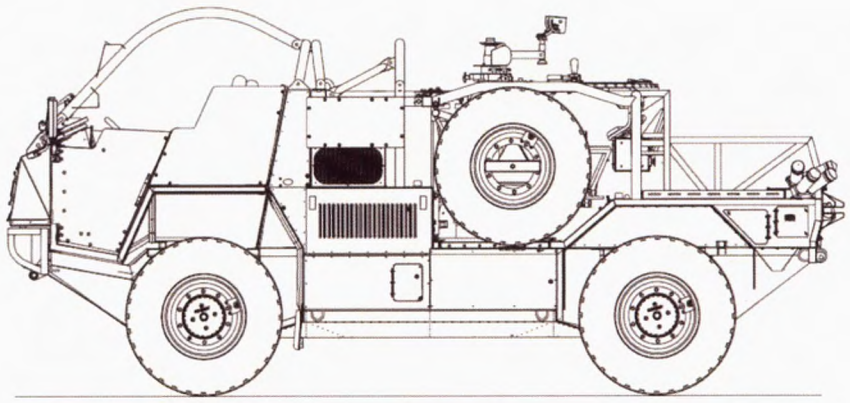


Figure 1.4. 28 – High Mobility Truck Variant JACKAL 1

1.4.143. Enhancing the capability further, JACKAL 2 (see Figure 1.4. 29) was an upgraded version of JACKAL 1 which entered service in 2009 as a UOR. Crew capacity was increased to four and the main armament gun ring was moved forward to give the gunner enhanced situational awareness. [redacted] Exhibit 22 Exhibit 84 Exhibit 85 Exhibit 86

[22] [redacted]

[23] COYOTE is a six-wheel variant of the HMTV with an extended rear loading bay.

[24] Urgent Operational Requirement – Further explanation in Para 1.4.144.

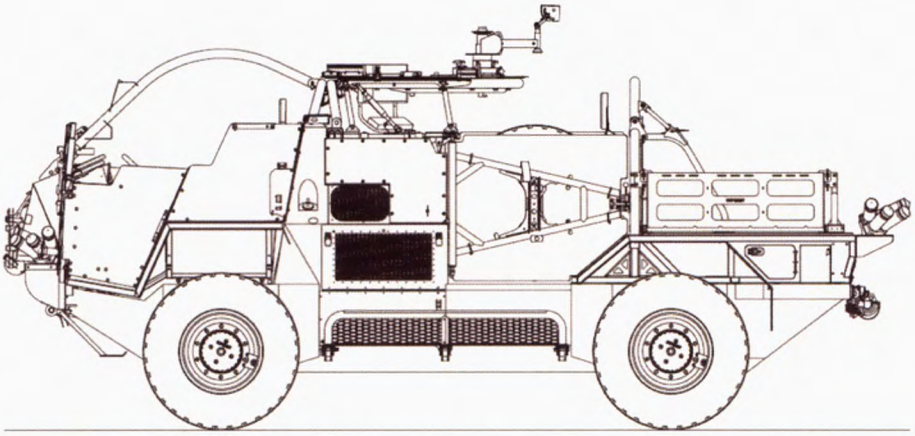


Figure 1.4. 29 – High Mobility Truck Variant JACKAL 2

Urgent Operational Requirement (UOR)

1.4.144. UORs address specific capability gaps that are identified during military operations. UORs provide the opportunity to rapidly procure new or additional equipment or fund essential modifications to existing equipment in order to support current or imminent military operations. It should be noted that UOR equipment is generally funded for the duration of the particular operational requirement and that, as a result, upon cessation of the operations for which it is procured, the equipment must either be disposed of or 'brought into core[25]' by finding additional funding to support the through-life costs of the platform. It is recognised that, because of the short timescales and pressures under which UORs are procured, it may not be practical to apply the full requirements of a Safety Management System prior to a UOR coming into service. As a result, safety assurance must be carried out in accordance with ASEMS should equipment transition from UOR to Core.

Exhibit 84
Exhibit 85
Exhibit 86
Exhibit 88
Exhibit 92

1.4.145. To assess the capability requirements for a specific operation, Defence conducts Theatre Equipment Capability Reviews. The Panel believes it is likely that JACKAL 2 was identified within the Operation HERRICK Theatre Equipment Capability Review 2008 (TECR08) as an improvement to the JACKAL 1, [redacted] whilst also adding a number of other minor improvements. Although the Panel was unable to access formal records of the TECR which supported the procurement of the vehicle, reference to TECR08 was found within the Infantry Trials Development Unit (ITDU) report referenced later in this section.

Exhibit 88
Exhibit 89
Exhibit 90
Exhibit 91

[25] The term 'Core' relates to equipment and capabilities that are procured through the standard capability management process and are funded and supported as an enduring programme with a defined out of service date.

1.4.146. The Panel has been unable to clarify exact in-service dates for each platform from formal records. However, DE&S has provided the following estimated dates:

Witness 19
Exhibit 92
Exhibit 90
Exhibit 92

a. JACKAL 1 entered service mid 2007/2008;

b. JACKAL 2 entered service May 2009 – January 2010;

c. COYOTE entered service June 2009 – February 2010;

d. JACKAL 2A entered service March 2010 – September 2010.

1.4.147. All JACKAL and COYOTE platforms were accepted as Core equipment in July 2013.

Exhibit 87

JACKAL [redacted] serviceability

Technical Reports

1.4.148. To assess whether any technical faults were present immediately prior to the accident, JACKAL 2 [redacted] was subjected to a number of physical inspections and detailed forensic analysis. Using expertise from across Defence and industry, the Panel received support from the following organisations:

a. 1710 Naval Air Squadron (NAS);

b. SUPACAT;

c. Defence Accident Investigation Branch (DAIB).

Description	Colour Code
Commander Seat	
Driver's Seat	
Gun Ring	
Roll-over Protection System (ROPS)	
Cutter Bar	
Jerry Can Holder	

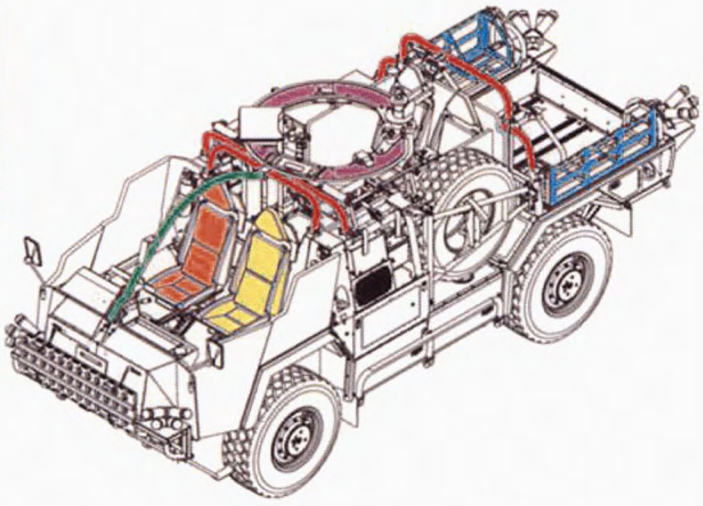


Figure 1.4. 30 – JACKAL key components

1.4.149. Figure 1.4.30 identifies the main elements of the JACKAL discussed within the equipment element of this report.

1.4.150. Due to the numerous technical reports presented to the Panel, this section will first detail the content of those reports and the findings of each independent specialist organisation. The Panel will then provide analysis of the reports as a whole and detail the findings regarding vehicle serviceability.

1710 NAS technical analysis

1.4.151. 1710 NAS[26] was requested to analyse components and Petroleum, Oils and Lubricants (POL) from [redacted] to ascertain whether any failure or contamination had occurred prior to the accident on the 29 January 2019 that may have impacted the vehicle's performance. Exhibit 5 Exhibit 6

1710 NAS mechanical analysis

1.4.152. Following the analysis of the physical damage witnessed on [redacted] 1710 NAS concluded that all damage found was caused as a direct result of the accident itself. Furthermore,1710 NAS stated that they were unable to find any evidence of any pre-existing fault with the vehicle that may have contributed to the accident Exhibit 5

1.4.153. Due to Inst 1 being ejected from the vehicle during the initial roll and the fact that he reported wearing his lap strap, the Panel requested 1710 NAS to analyse the status of both harnesses to determine whether an equipment failure caused Inst 1 to leave the vehicle. Examination of both harnesses found that both were in very similar conditions, with areas of wear in similar locations. Although 1710 NAS was unable to determine whether the commander's harness was fastened at the time of the accident they concluded that it was unlikely that sufficient force was generated during the roll to have caused the harness to fail. Exhibit 5 Witness 1a

1710 NAS Petroleum, Oils and Lubricants (POL) analysis

1.4.154. POL extracted from [redacted] was analysed to ascertain whether any contaminant was present at the time of the accident that may have affected the performance of the vehicle. Exhibit 6

1.4.155. During the analysis of the fuel, a layer of water was found within the Primary Fuel Filter. Despite this finding, 1710 NAS concluded that the overall fuel condition in all tanks was considered satisfactory with no evidence of contamination or degradation. Furthermore, the condition of the fuel in both the Primary and Secondary filters was considered satisfactory with no evidence of

[26] 1710 NAS is a Royal Navy Unit that, amongst other functions, assists with in-depth investigations into equipment failures and accidents.

significant *degradation* in the overall performance. 1710 NAS stated that the water layer found within the Primary Filter was not considered contributory to the accident.

Electronic Control Module (ECM) analysis

1.4.156. The following four ECMs[27] fitted to [redacted] at the time of the accident were interrogated to ascertain whether there was any form of premature equipment failure: Exhibit 8

a. [redacted]

b. [redacted]

c. [redacted];

d. [redacted]

1.4.157. The SUPACAT ECM report identified the state of the ECMs from [redacted] and commented on their functionality and the associated metadata.

1.4.158. [redacted] **ECM**. During interrogation of the [redacted] ECM, the manufacturer [redacted] found several historic fault codes referring to [redacted]. Further analysis of these codes highlighted that they had been triggered many [redacted] hours prior to the accident and that they were not present at the time of the accident. Furthermore, [redacted] could not see any evidence or active fault codes from the [redacted] ECM to suggest that the [redacted] was not performing correctly at the time of the accident.

1.4.159. [redacted] **ECM**. The [redacted] ECM does not provide long term storage of historic fault codes. As a result, no data from the accident could be retrieved as the vehicle had been switched on and off multiple times during the process of transferring it between storage locations.

1.4.160. [redacted] **ECM**. Although initial analysis conducted by the DAIB found an active fault code attributable to a badly damaged [redacted], the analysis undertaken by the manufacturer was unable to retrieve the code. As a result, the manufacturer stated that the [redacted] system was functioning correctly at the time of the accident.

[27] Electronic Control Module (ECM) – Embedded computer contained within a vehicle to control a sub-system, eg – brakes. Many vehicles have more than one ECM to control individual systems.

1.4.161. [redacted] **ECM**. The manufacturer of the [redacted] ECM confirmed that the system was unable to store fault codes, but that if a failure with the [redacted] system was evident then a warning light would have flashed continuously for a prolonged period alerting the crew to the fault.

Defence Accident Investigation Branch technical report

Exhibit 7

[redacted] The DAIB was requested to conduct a full technical inspection of [redacted] and provide independent analysis of the ECM reports. The summary of findings from the DAIB report are as follows:

a. *"The physical examination of the [redacted] and ECM data analysis revealed no indication of any condition that would provide reduced power output [redacted]. Similarly, the examination and analysis of the [redacted] did not indicate any fault condition present [redacted] in the lead-up to the accident. [redacted] were also examined, with all damage identified being commensurate with outcome of the accident";*

b. *"The [redacted] elements of the [redacted] system were examined and statically tested as far as feasibly possible, given the condition of the vehicle. Although a self-test of the [redacted] system revealed a fault with one of the [redacted], this was almost certainly caused by damage sustained in the accident. Therefore, no faults were identified within the system that could not be attributed to the effects of accident";*

c. *"The Investigating Officer therefore concludes that it is highly likely that there were no pre-existing faults or damage to the vehicle that would have caused the accident or made it more likely to occur".*

1.4.163. As highlighted in Para 1.4.153, 1710 NAS was unable to determine whether Inst 1 was wearing his harness at the time of the accident. To conduct further analysis the DAIB was requested by the Panel to inspect the integrity of the Commander's harness buckle. Following further analysis the DAIB report stated:

Exhibit 5
Exhibit 7

a. *"The Comd's [Commander's] harness was visually examined to confirm that there were no visible signs of internal damage or significant wear that would cause the buckle to fail in the accident."*

[redacted] serviceability analysis

1.4.164. To determine whether vehicle serviceability was a factor in the accident, the Panel conducted further analysis of the findings from the vehicle manufacturer, ECM manufacturers, 1710 NAS and the DAIB. The analysis was divided into the following areas:

a. [redacted] performance;

b. POL contamination;

c. Commander's harness;

d. [redacted] system;

e. [redacted] system;

f. [redacted] system;

g. Other systems.

1.4.165. [redacted] **performance.** Analysis of the [redacted] ECM demonstrated no signs of [redacted] failure or degraded performance. Furthermore, during interviews with Inst 1, no concerns regarding performance of the [redacted] were raised. The Panel concluded that it was very likely that the [redacted] was performing as expected at the time of the accident. The Panel finds that [redacted] performance was **not a factor**. Exhibit 7 Exhibit 8

1.4.166. **POL contamination.** Although water was found within the Primary Fuel Filter, technical documents stated that water capture is one of the functions of the Primary Fuel Filter. Army Equipment Support Publication (AESP) 2320-D-104-201 (Operator Manual) identifies that the JACKAL 2 Primary Fuel Filter includes a water trap function. The purpose of the water trap is to ensure that water is separated from the fuel prior to it being supplied to the [redacted] Although historic records of excessive water in fuel messages were found on the [redacted] ECM, the message was not present at the time of the accident, indicating that the fuel supplied to the [redacted] immediately prior to the roll was not contaminated beyond normal parameters. Furthermore, fuel found in the Secondary Fuel Filter, located between the Primary Fuel Filter and the [redacted] was found to be satisfactory. The Panel concluded that it was very likely that the fuel entering the [redacted] did not affect [redacted] performance. The Panel finds that POL contamination was **not a factor.** Exhibit 6 Exhibit 93

1.4.167. AESP 2320-D-104-601 (Maintenance Schedule) states that it is the operator's responsibility to examine the fuel / water separator as an element of the weekly maintenance regime. The Panel identified that there is no means of recording weekly maintenance checks on the Joint Asset Management and Engineering Solutions (JAMES)[28] system. As a result, it was impossible for the Panel to confirm whether the correct weekly maintenance had been carried out. The Panel finds that the lack of weekly maintenance records is an **Other Factor**. Exhibit 94 Exhibit 95

[28] JAMES is the engineering and asset management system across Defence for Land Equipment and enables control of capabilities to facilitate fleet management.

1.4.168. **Recommendation. Head Vehicle Support Team (VST) should mandate the recording of all vehicle maintenance on Joint Asset Management and Engineering Solutions, including weekly maintenance inspections in order to ensure an audit trail for all mandated maintenance activity.**

1.4.169. **Commander's harness.** Analysis carried out by both 1710 NAS and the DAIB found that the commander's harness displayed signs of wear and tear consistent with normal use and deemed it to be fully serviceable at the time of the accident. The Panel concluded that it is highly probable that the harness was functioning correctly at the time of the accident. The Panel finds that the commander's harness was **not a factor.** Exhibit 5 Exhibit 7

1.4.170. [redacted] **system.** During the initial DAIB technical inspection, [redacted] fault code was present within the [redacted] ECM. Further analysis by the Panel found that the code identified by the DAIB indicated a fault [redacted] that was likely to have been caused by the significant [redacted] damage sustained as the vehicle rolled down Hill 3. Exhibit 7 Exhibit 8 Exhibit 318 Witness 1a

1.4.171. The Panel also found that the fault code was indicative of a fault within the [redacted] and not the overall functionality of the [redacted] system. The role of this sensor is to ensure that the [redacted] and is designed to fail safe, enabling [redacted] irrespective of sensor serviceability. Further functional tests carried out by the DAIB and NY Police on the [redacted] components indicated that all [redacted] were functioning correctly at the time of the inspection. The Panel concluded that, although it is very likely that the fault code was caused by the damage sustained during the roll over, even if it had been present prior to the accident, it would not have prevented the [redacted] system from functioning correctly during the accident sequence. The Panel concluded that it was highly probable that the [redacted] were fully functional at the time of the accident. The Panel finds that [redacted] failure was **not a factor**. Exhibit 7 Exhibit 8 Exhibit 318 Witness 1a

1.4.172. [redacted] **system.** It was not possible to identify whether the [redacted] ECM contained fault messages at the time of the accident due to the absence of metadata. Based on interviews with Inst 1 and with no evidence to suggest [redacted] failure occurred, it is the opinion of the Panel that it was as likely as not that the [redacted] was functioning correctly at the time of the accident. The Panel finds that [redacted] failure was **not a factor**. Exhibit 8 Witness 1a

1.4.173. The Panel noted that critical vehicle information can be lost as a result of vehicle power cycles where ECMs are fitted with volatile[29] data storage solutions. This loss of data impacts the certainty with which post-accident investigations can assess the potential presence of system failures. Whilst the Exhibit 8

[29] Volatile data storage requires power to maintain the stored information.

Panel accepts that power cycles are inevitable post-accident, especially in emergency situations where vehicles must be shutdown to prevent further injuries, an alternative, non-volatile method of data storage could prevent the loss of important vehicle information and would assist future investigations. The Panel concluded that the lack of stored fault codes after vehicle power cycles is an **Observation**.

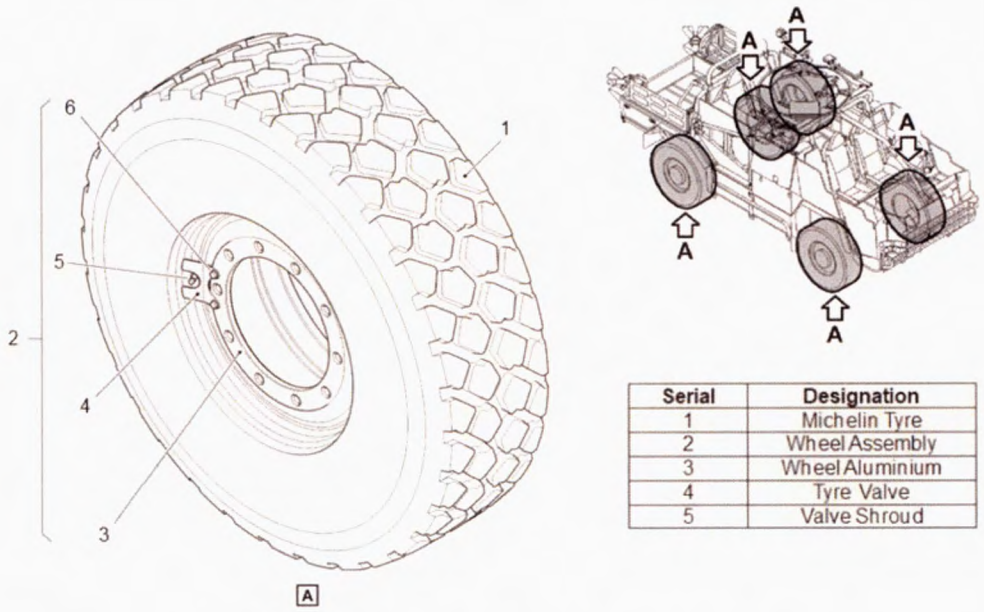
1.4.174. [redacted] **system.** The [redacted] ECM does not store fault codes and, as such, did not provide any information to the Panel. Physical examination of the [redacted] by the DAIB concluded that any system damage was commensurate with the accident. The Panel believes that it is likely that the [redacted] was functional at the time of the accident. The Panel finds that the system was **not a factor**. Exhibit 8

1.4.175. **Other systems.** In addition to those components above, the DAIB technical team also conducted an overall assessment of other systems including the [redacted] The DAIB report concluded that no other faults were found and that the vehicle was serviceable at the time of the accident. Exhibit 7

1.4.176. **Conclusion**. Based upon the technical evidence provided by 1710 NAS, the Equipment Manufacturers, NY Police and the DAIB, the Panel concluded that it is very likely that the vehicle was mechanically serviceable at the time of the accident and that the POL contained within the vehicle was not contaminated or degraded to a point that affected vehicle performance. The Panel finds that the serviceability of JACKAL ERM [redacted] was **not a factor.** Exhibit 5 Exhibit 6 Exhibit 7 Exhibit 8

Michelin 335/80R20 tyres

1.4.177. JACKAL 2 has four wheel stations each consisting of a one-piece aluminium wheel fitted with an All-Terrain 335/80R 20 tyre (see Figure 1.4.31). HMTV platforms also hold one or two spare wheels, dependent on the specific role of the vehicle. An air line, air line adapter, tyre inflator and tyre pressure gauge are all included as part of the Complete Equipment Schedule (CES) for the JACKAL allowing vehicle crews to check tyre pressures in accordance with the operator's handbook whilst also allowing the crew the ability to self-inflate their tyres via an auxiliary air cylinder. Exhibit 93 Exhibit 145 Exhibit 174 Exhibit 175



Serial	Designation
1	Michelin Tyre
2	Wheel Assembly
3	Wheel Aluminium
4	Tyre Valve
5	Valve Shroud

Figure 1.4. 31 – JACKAL tyre identification

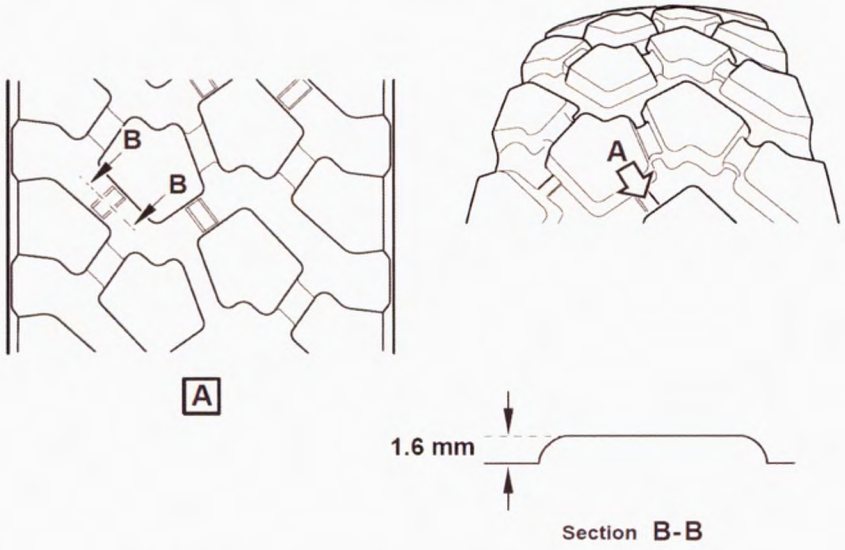


Figure 1.4. 32 – JACKAL tyre wear indicators

1.4.178. The JACKAL Operator's manual identifies that the remaining tyre tread must be no less than 1.6mm in depth on any part of the tyre in order to comply with UK legislation. The tread pattern of the tyres incorporates a wear indicator (see Figure 1.4.32), allowing crews to visually inspect the tyre prior to use. In addition to the requirement of 1.6mm tread depth, the DSA Land System Safety Regulator (LSSR) Standards and Inspection Manual 12 (SIM 12) mandates that tread depth must be a minimum of 3mm prior to undertaking off-road driving. Although it is likely that this requirement is managed during 6 monthly vehicle inspections undertaken by qualified Vehicle Mechanics, it is unlikely that operators are aware of this requirement due to a lack of knowledge of SIM 12. Furthermore, the Panel found that the 3mm off-road limit was not included within the Operator's manual

Exhibit 93
Exhibit 344

limitations and that vehicle crews were not provided with a tread depth gauge in order to measure tyre tread depth prior to off-road activities. During technical analysis, the tyres on JACKAL ERM [redacted] were found to be worn but compliant with both the 1.6mm and 3mm tread depth requirements. The Panel finds that the lack of 3mm tread requirement within the Operator's manual is an **Observation.**

1.4.179. Throughout the investigation, the Panel were made aware that users were concerned with the levels of grip offered by the JACKAL tyre, specifically during UK-based cross-country activities. During a visit to a JACKAL unit, the Panel witnessed that the vehicle readily lost traction on wet and slippery surfaces, such as wet grass and mud. Witness 44

1.4.180. The Panel reviewed the design of the current tyre and found that, despite being more robust than standard road car tyres, the tread depth was relatively shallow when compared to some off-road specific tyres. In contrast, many off-road wheeled vehicles, including those used in agriculture, have a much deeper and larger tyre tread, designed to enhance traction whilst cross-country.

1.4.181. The Panel could not find any evidence of tyre performance being reviewed in safety meetings, highlighting a potential lack of End User input into the meetings. The Panel concluded that it was unlikely that any formal analysis of tyre performance had been conducted by either DE&S or D Cap since the initial procurement to support operations in Afghanistan. Noting that it was likely that JACKAL [redacted] lost traction immediately prior to this accident, leading to the vehicle roll, the Panel finds that tyre performance was a **Causal Factor**.

1.4.182. **Recommendation. Head Vehicle Support Team should ensure that the tyres fitted to High Mobility Truck Variant vehicles provide adequate traction on all anticipated surfaces in order to ensure that the vehicle is safe by design.**

Tasking documentation

1.4.183. [redacted] was tasked and authorised by Inst 1 on the 28 January 2019 at 06:32. An Authority To Use Document (ATUD) was raised as follows: Exhibit 9 Witness 1a

a. ERM – [redacted]

b. Control Number - A2912D/201901/6518165;

c. Destination – Catterick;

d. Event Owner – QOY C Sqn;

e. Event Name - C/GF/01/07 JACKAL 2 DRIVERS COURSE;

f. Start Date/Time - 28 JANUARY 2019 at 06:32;

g. Authorising Officer – Inst 1.

1.4.184. The Panel reviewed the ATUD and noted that [redacted] was deemed Limited Role[30] due to the requirement to *'Replace [Single Radio Mount (SRM)] Power cable[31], [Universal Gun Mount (UGM)] Locking Segments[32] and Traverse Lock Exch[33]'*. This restriction did not affect the performance of the vehicle in relation to the training activity that was taking place at the time of the accident. The Panel finds that the Limited Role status of [redacted] was **not a factor.** Exhibit 9 Exhibit 96 Exhibit 97 Exhibit 98

Scheduled maintenance

1.4.185. [redacted] was in-date for all mandated Level 2[34] inspection and maintenance events in accordance with the AESPs. All Level 2 maintenance was logged on JAMES in accordance with the extant Equipment Support Policy. Exhibit 7 Exhibit 98

1.4.186. The current FMT 932[35] (Wheeled) Mandatory Equipment Roadworthiness Inspection and accompanying FMT 933 Role Inspection was conducted on 30 August 2018 by the LD Light Aid Detachment (LAD). The inspection sentenced [redacted] as automotively Fully Fit. Exhibit 10

1.4.187. As part of the inspection regime, [redacted] was subject to a Roller Brake Test (RBT). The RBT incorporates a computer system that calculates the brake efficiencies of the vehicle under test and prints out the results. The Department for Transport (DfT) provide a bespoke code allocated to each vehicle type which is then embedded within the RBT software database. The DfT code identifies the platform by type and reference data[36], reducing the risk of human error in manually inputting vast amounts of vehicle data. The code used to test [redacted] was 0935. Exhibit 10 Exhibit 99 Exhibit 100 Exhibit 101 Exhibit 102 Exhibit 103

1.4.188. At the time of the accident there were discrepancies within the maintenance documentation regarding the correct code to be used for JACKAL testing. As a result the wrong DfT code was used during the brake test. The Panel has confirmed that the correct code to be used was 0938 and not 0935.

1.4.189. This discrepancy was identified by the DE&S Delivery Team (DT) responsible for JACKAL 2 in 2017. Although the DT believed that the discrepency had been rectified through the issue of a formal Engineering Notification via Email (ENvE) in November 2017 and General Instruction in August 2017, the Panel Exhibit 104 Exhibit 105 Exhibit 106 Exhibit 107

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[30] Limited Role - Equipment has faults recorded against it that affect the role capability. The equipment is, however, still automotively roadworthy.

[31] Single Radio Mount Power Cable – Main power cable that supplies 24-volt power from the vehicle to the radio set.

[32] Universal Gun Mount Locking Segments – Areas on the gunner's weapon mount that allow the main gun to be locked within a specific traverse arc, in this instance the locking segments were distorted.

[33] Traverse Lock Exchange – The traverse lock that allows the gunner to lock the main gun into a specific segment.

[34] The level of equipment support is determined by the engineering content. Level 2 refers to maintenance tasks to be conducted by a competent and trained Royal Electrical and Mechanical Engineers (REME) personnel, or MOD Maintainer equivalent.

[35] FMT – Form Motor Transport; a series of forms used by Defence to support motor vehicle use and maintenance.

[36] Gross Vehicle Weight (GVW), Number of Axles, Independent Axle Weights.

found that this communication had not been released and therefore maintenance procedures were not updated.

1.4.190. Upon notification by the Panel during the SI, the DT subsequently released a revised ENvE and a corresponding General Instruction Number within the AESPs to instruct the Equipment Support community of the correct procedure and code for JACKAL 2.

1.4.191. Although the incorrect code (0935) was used in this event, DAIB technical analysis of the results for [redacted] indicated that the vehicle would also have also passed the RBT using the correct code. The Panel finds that although the testing was conducted against the wrong code this was **not a factor.** Exhibit 7

1.4.192. Whilst the Panel concluded that the brakes fitted to [redacted] operated to the required standards, the discrepancies within the maintenance procedures highlighted a lack of assurance in the process for releasing safety critical engineering information. The Panel finds that the lack of a robust mechanism for releasing and assuring compliance with revised engineering policies is an **Other Factor**.

1.4.193. **Recommendation. Director Land Equipment should improve the process for releasing and assuring compliance with all equipment notices in order to ensure that the dissemination and application of safety critical information across Defence is robust.**

1.4.194. On 10 January 2019 the Skill Zone Fitter[37] (SZF) from C Sqn the QOY conducted a receipt[38] inspection of two Land Training Fleet[39] vehicles, including [redacted] in accordance with maintenance policy. Although this inspection is not mandatory, it is seen as good practice. During these inspections, the SZF found a number of faults on one of the JACKAL vehicles and deemed it non-taskworthy. This vehicle was subsequently not used during the training activity in January 2019. Exhibit 11 Exhibit 95 Exhibit 99 Exhibit 243 Witness 1a Witness 15

1.4.195. As a result, Inst 1 was required to find another vehicle at short notice, which increased his workload shortly before the commencement of the course. Inst 1 successfully sourced a replacement vehicle through the LD in Catterick. The receipt inspection sentenced [redacted] as automotively Fully Fit.

1.4.196. Although the SZF had completed the JACKAL Maintainer course and held an FMT 936 (A2) Appointment of Examiner as authority to inspect equipment, this has not been signed by an Engineering Officer as mandated by Land Exhibit 102 Exhibit 292 Exhibit 293

[37] Skill Zone Fitter is a civilian employed by the MOD to carry out inspection, fault diagnosis, repair, forecasting, completion of maintenance and servicing, and modification of all vehicles and miscellaneous equipment held by or on loan to the unit as per standards set in AESPs, Unit Equipment Care Directive and other relevant technical and legislative documentation/regulation.

[38] A joint engineering and materiel accounting check of an equipment to establish that the equipment and documentation are correct.

[39] The Land Training Fleet is a pool of centrally managed equipment for use by units for training activities to supplement unit held equipment.

Equipment Engineering Standards (LEES). Consequently the SZF was not correctly authorised to conduct inspections. The Panel finds that the lack of correct authorisation of the SZF to conduct vehicle inspections is an **Other Factor** Exhibit 336

1.4.197. Additionally, the Panel could not be provided with any Record of Experience Charts (RECs) capturing the SZF's experience as mandated within LEES. As a result, the Panel was unable to gauge the level of competence of the SZF. The Panel finds that the lack of RECs for the SZF is an **Other Factor** Exhibit 102

1.4.198. **Recommendation. The Brigade Electrical and Mechanical Engineer in 4th Infantry Brigade should assure the proficiency of the Queen's Own Yeomanry Skill Zone Fitters in order to ensure that they are competent to carry out their duties.**

1.4.199. Before Use Checks were conducted on [redacted] on 28 January 2019 prior to the road move from Chester to Catterick and were recorded on the vehicle ATUD. Although no Before Use Checks were recorded on the ATUD on 29 January 2019, Before Use Checks were carried out on JACKAL ERM [redacted] which led to the discovery of the faulty air pipe. The Panel believes that it is likely that the two vehicles were checked at the same time, supervised by the two instructors. The Panel concluded therefore that it was likely that the Before Use Checks were carried out on [redacted] on the day of the accident and that the lack of record on the ATUD was an oversight, likely caused by the additional workload of finding another vehicle to replace [redacted] Witness 1a Witness 1b Exhibit 9

1.4.200. **Conclusion**. The Panel concluded that [redacted] was in-date for all major servicing and inspection tasks and had completed a receipt inspection, which was carried out by the QOY; these were documented accordingly on JAMES. Although Before Use Checks and Weekly Maintenance Checks, as discussed at Para 1.4.199, were not documented to cover 29 January 2019, it is likely that they were carried out correctly. The Panel finds that the maintenance, inspection and task worthiness of [redacted] was **not a factor.**

Personal Protective Equipment (PPE)

1.4.201. Armoured Vehicle Standing Orders (AVSOs) stipulate that it is the Armoured Vehicle crewman's responsibility to wear all PPE as prescribed in Figure 1.4.33 below. The PPE listed within the red border is the PPE that was required to be worn by both Inst 1 and SSgt McKelvie during the driver training activities. Exhibit 12

Equipment (All Eqpt is issued as per Defence Stores only)	AV Crewmen			Remarks
	AV Static Engine Running	AV Moving	"Head Out" Position	
Audio Gear	X	X	X	
Hearing Protection	X	X	X	Correct levels as per JSP 375
Crew Guard/Helmet		X	X	*Helmet to be of latest mk
Eye Protection		X	X	
Body Armour		X	X	Not required when the vehicle is being ground marshalled in barracks.
Wearing of Seat Belts	X	X	X	

Figure 1.4. 33 – Armoured Vehicle Standing Orders mandated Personal Protective Equipment

Audio gear/hearing protection

1.4.202. Live Internal Communications (IC) is designed to allow the AV crew to communicate easily above the engine and other ambient noises associated with the operation of the platform. The system comprises electronic intercom boxes fitted to the vehicle and removable headsets that are plugged in through a socket connection. As well as aiding communications, the headsets also provide a level of hearing protection. The wearing of audio gear and hearing protection is mandated at all stages of AV operation by AVSOs. Exhibit 12

1.4.203. Although Live IC was fitted and serviceable at the time of the accident, the instructors elected not to use it. When interviewed, Inst 1 stated that the Live IC was not used as it was common practice not to use it during training activity unless the gunner position was occupied. Despite Live IC not being used, Inst 1 was content that he could easily communicate with the driver throughout the cross-country driving activity. The Panel believes that the non-wearing of Live IC is commonplace across the JACKAL community. Whilst working with another JACKAL unit during the Inquiry, the Panel witnessed crews operating JACKAL whilst not wearing Live IC, providing further evidence that this is a commonplace violation. The Panel finds that not wearing the mandated audio gear and hearing protection by JACKAL crews is an **Other Factor.** Exhibit 10 Exhibit 11 Witness 1d

1.4.204. **Recommendation. Head of Capability Ground Manoeuvre should determine the requirement for audio protection and crew communications for all Armoured Vehicles in order to ensure appropriate hearing protection and internal communications.**

Helmet

1.4.205. The role of the service issued helmets is to provide a combination of non-ballistic and ballistic impact protection. At the time of the accident, several Exhibit 58 Exhibit 108 Exhibit 109

different helmet variants were available, including the older, Mark (Mk) 7 helmet as worn by SSgt McKelvie and the newer Virtus helmet which was worn by Inst 1. As a result of the injuries sustained by SSgt McKelvie and the findings of the Post Mortem detailed in Para 1.4.67, the Panel analysed the Mk 7 variant. It should be noted that some findings may be equally relevant to other versions of in-service helmets. Figure 1.4.34 shows a Mk 7 helmet which comprises the following components:

a. [redacted]

Figure 1.4. 34 – Mark 7 helmet

Mark 7 helmet analysis

1.4.206. DSA03 DLSR - Movement and Transport Safety Regulations (MTSR) states: Exhibit 108 Exhibit 110 Exhibit 111

> *"Use of open architecture vehicles - Those personnel controlling or operating open architecture vehicles shall ensure that appropriate safety clothing and equipment is made available and used.".*

1.4.207. The associated DCoP does not identify the type of helmet to be used other than for motorcyclists and riders of military quad bikes during training activities who are to wear British Standard Institution or equivalent EU standard motorcycle helmets.

1.4.208. Analysis of the DLSR regulations shows that there is no specific regulation that mandates the use of helmets in open architecture vehicles, only that appropriate safety clothing will be provided. The regulation is further complicated by the specific DCoP applying to quad bikes and motorcycles. The Panel was unable to find any evidence of analysis or definition of appropriate safety clothing for open architecture vehicles by DLSR, DE&S or D Cap. The Panel finds that the lack of analysis into appropriate safety clothing to be worn in open architecture vehicles is an **Other Factor**.

1.4.209. **Recommendation. The Defence Land Safety Regulator should establish regulation and guidance on the safety clothing to be worn when operating open architecture vehicles in order to ensure crews are adequately protected.**

1.4.210. Although it is not a regulatory requirement, AVSOs mandates the wearing of service helmets by crew members. The Panel was unable to find any audit trail to confirm why this requirement is mandated within AVSOs, although the Panel believes that it is likely due to one or more of the following reasons: Exhibit 12

a. **Operational risk**. In times of conflict and during live fire exercises, the helmet reduces the risk of injury from gunshots. The Army, along with the other military arms, adopts a 'train as you fight' rationale as much as possible. Given that helmets are an essential element of protection during combat, training to operate whilst wearing helmets and body armour is essential. Additionally, during live fire training, the helmet reduces the risk of injury in the event of poor weapon handling procedures;

b. **Operating risk**. Operating vehicles in the military environment, especially when driving cross-country, increases the risk of injury, particularly head strikes due to the movement of the vehicle over rough terrain. Whilst not the primary purpose of the helmet, the hard outer shell and inner cushioning does provide an element of protection against such injuries.

1.4.211. Due to its primary function, the Mk 7 helmet is not designed in accordance with road safety standards, such as BS6658, that govern the design of safety helmets manufactured to protect the wearer in the event of a vehicle Exhibit 109 Exhibit 173

accident. As a result, the in-service helmets have not been tested for crashworthiness.

1.4.212. Whilst the Mk 7 Helmet undoubtedly provides some level of impact protection, this has not been proven against any formal standard and, in the opinion of the Panel, should not be used as mitigation against vehicle hazards such as Road Traffic Collisions (RTCs). Furthermore, the post mortem highlighted the potential for the weight of the helmet to accentuate the movement of the head in the event of a vehicle roll, increasing the risk of serious injury. Due to the lack of testing or evidence to support the level of protection offered by the helmet in the event of an RTC and the potential adverse impact of additional weight being placed upon the head in the event of vehicle roll over, the Panel finds that the requirement to wear the service issue helmet whilst conducting driver training was an **Aggravating Factor**. Exhibit 58

1.4.213. **Recommendation. Head of Capability Ground Manoeuvre should improve the head and neck protection afforded to High Mobility Truck Variant Crews in order to reduce the risks associated with Road Traffic Collisions to as low as reasonably practicable and tolerable.**

Body armour and eye protection

1.4.214. During the JACKAL Driver Training Course, all personnel were wearing in-service body armour and eye protection in accordance with AVSOs. Based upon the injuries sustained by SSgt McKelvie the Panel concluded that it was very likely that the body armour and eye protection worn did not contribute to the injuries sustained by SSgt McKelvie. The Panel finds that the wearing of body armour and eye protection was **not a factor.** Exhibit 21 Exhibit 54 Exhibit 112

Seat harness

1.4.215. 1710 NAS and the DAIB technical reports stated that there were no identifiable faults with either seat harness. SSgt McKelvie remained strapped within the vehicle throughout the accident sequence whilst Inst 1 was ejected from the vehicle during the initial roll. Exhibit 5 Exhibit 7 Witness 1a Witness 1b

1.4.216. As there were no faults found with either harness, the Panel concluded that the harness worn by Inst 1 at the time of the accident was not fastened correctly. This will be discussed further in the Safe Practice element of this report. Exhibit 5 Exhibit 7

1.4.217. Whilst it could be argued that Inst 1 survived this accident due to the lack of a harness restraining him within the vehicle; the Panel firmly believes that in most circumstances, the wearing of the safety harness minimises the injuries sustained during a vehicle roll. This can be evidenced by the fact that there have been no other fatalities as a result of the 34 previously recorded JACKAL roll over accidents where it was more likely than not that most crew members would have been restrained at the time. Exhibit 17 Exhibit 113

1.4.218. The PM report stated that the injuries sustained by SSgt McKelvie were caused by the extreme head movements in relation to the fixed torso. The Exhibit 58

Pathologist further commented that the accident was potentially survivable had a system to prevent the violent movement of the head been in place.

1.4.219. Although the practicalities of wearing other safety equipment may impact the operational effectiveness of personnel whilst on operations and during some complex training activities, the Panel believes that the provision of some form of neck brace or increased headrest support may have increased the likelihood of survival in this case. The Panel also believes that, during initial driver training activities when there is an increased risk of vehicle mishandling, the provision of this additional safety equipment would decrease the risk of serious injury without significant impact to the output of the activity.

1.4.220. The Panel finds that the combination of the torso being restrained by the harness without measures to restrict the movement of the head directly contributed to the injuries sustained by SSgt McKelvie and was an **Aggravating Factor.**

The JACKAL Safety Case (SC)

1.4.221. A SC is developed to demonstrate that a system is acceptably safe to use; all risk has been reduced to a level that is ALARP and that the system complies with applicable legislation. The SC should be established to provide a structured argument, supported by a body of evidence that provides a compelling, comprehensible and valid case that a system is safe. Exhibit 114

1.4.222. The SC should consist of three parts:

a. Part 1 – Requirements;

b. Part 2 – Design;

c. Part 3 – Operation and Support.

1.4.223. Figure 1.4.35 shows the relationship between each part of a SC throughout the Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal (CADMID)[40] cycle.

[40] http://aof.uwh.diif.r.mil.uk/aofcontent/general/lifecycles/sg_cadmid.htm?zoom_highlight=cadmid

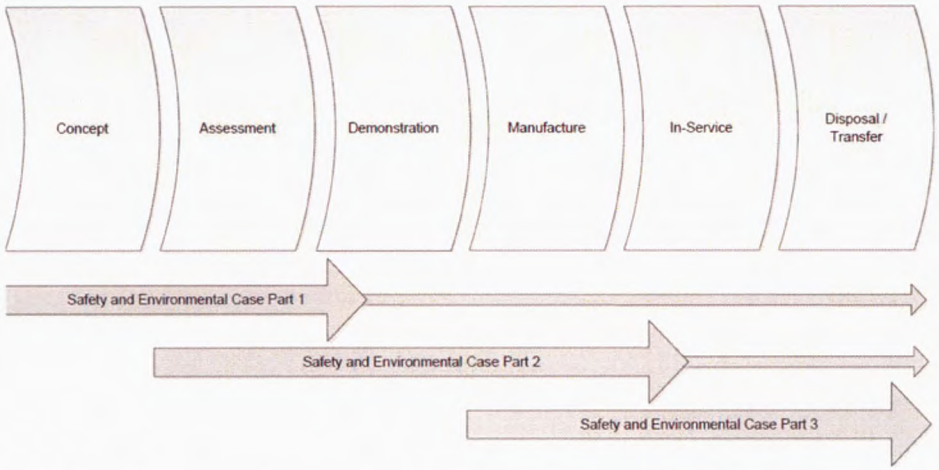

Figure 1.4. 35 – Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal (CADMID) cycle in relation to a Safety Case

1.4.224. **Part 1 – Requirements.** Part 1 of the SC should examine the User Requirement Document (URD) in order to refine and establish the safety requirements for the system, the likely risk that meeting the URD may present and the criteria against which safety performance will be measured. Exhibit 114

1.4.225. The requirements of the URD are further defined in the System Requirements Document (SRD). The Safety Requirements contained within the SRD form the Part 1 SC. As the platform matures in its development and the URD and SRD are refined, the SC should be updated and reviewed by the Safety and Environmental Management Committee (SEMC) for each system.

1.4.226. **Part 2 – Design.** The aim of the Part 2 SC should be to provide sufficient evidence and arguments that the platform can meet the safety requirements established in the SRD and, by definition, the Part 1 SC. It should provide the justification and evidence that a system design is acceptably safe. This evidence is used to support the In-Service ALARP statements within the Part 3 SC. Exhibit 114

1.4.227. Risk mitigation should be in place and residual risks should be identified. The Part 2 SC should also demonstrate compliance with applicable legislation and regulations and identify any non-compliances and the actions required to address them.

1.4.228. **Part 3 – Operation and Support.** The role of the Part 3 SC is to demonstrate that the residual risk is ALARP and tolerable. It should support platform acceptance and confirm that all safety requirements have been met, that risks have been reduced to ALARP and that all the necessary arrangements are in place, including limitations if necessary, to ensure the proper and acceptably safe operation of the system on its introduction into service and throughout the system's lifecycle. Exhibit 114

Part 1 Safety Case – Requirements

User Requirements Document (URD)

1.4.229. The URD is a structured and live capability definition of bounded need, recorded as user requirements. The URD is the primary mechanism for the Capability Sponsor to articulate the requirement of a particular capability during the concept phase of the CADMID cycle. The URD is spilt into five parts: Exhibit 301

a. **Part 1 – General Description.** Part 1 should contain the overall capability requirement and record the operational context;

b. **Part 2 – Key User Requirements.** The Key User Requirements (KURs) that are drawn from Part 3;

c. **Part 3 – Individual Capability Requirements and Constraints.** The complete structured set of individual user requirements;

d. **Part 4 – Context Documents.** Documents and supporting papers that back the URD;

e. **Part 5 – Definitions and Explanations.** Definitions and explanations for all terms that could cause confusion.

1.4.230. **URD Analysis.** Neither D Cap as the Capability Sponsor nor DE&S as the procurement organisation could provide the Panel with a formal JACKAL URD. In the opinion of the Panel, it is therefore probable that an endorsed URD was not produced during the development of the JACKAL requirement. This could be due to the UOR procurement process that was used to deliver the capability to operations in a shortened timescale. Whilst a formal URD could not be sourced, a draft DE&S Acceptance Report[41] was held by DE&S. Table 1.4.2 overleaf defines the KURs that were included on the draft Acceptance Report. Exhibit 115 Exhibit 116 Exhibit 117 Exhibit 340

[41] An Acceptance Report is used by DE&S to demonstrate compliance with the User and System Requirements. It often comprises an Excel spreadsheet displaying the requirements and detailing the evidence provided to support system acceptance along with a colour coded column to highlight non-compliances.

Ser	Key User Requirements
01	The User shall be provided with a vehicle with improved medium mobility.
02	The User shall be provided with a vehicle that accommodates a crew of 3 (commander, driver and gunner).
03	The User shall be provided with a vehicle that has the capability to carry enough material to support the crew for at least a [redacted] (threshold level).
04	The User shall be provided with a vehicle that is capable of mounting a GPMG on a forward mount, a GPMG, HMG or ALGL on a gunner's mount and [redacted]
05	[redacted]
06	The User shall be provided with a capability that allows [redacted]
07	The User shall be provided with a vehicle to [redacted] capabilities to allow operation in the relevant theatre.
08	The User shall be provided with a vehicle that is deployable by C130J (both operationally and strategically).
09	The User shall be provided with a vehicle that operates in the [redacted] climatic operating range.
10	The User shall be provided with a vehicle capable of completing 90% of battlefield missions without a mission failure.

Table 1.4. 2 – Defined Key User Requirements (excluding footnotes)

1.4.231. **URD Conclusion.** Notwithstanding the lack of a formalised URD, the draft Acceptance Report indicates that some analysis of user requirement took place during the development of JACKAL 2. It should be noted, however, that the draft Acceptance Report was dated after the platform had been delivered to units operating in Afghanistan and it is therefore likely that the formal Acceptance process occurred after intial platform delivery under UOR procedures. The Panel concluded that the lack of a formally recorded URD and lack of a signed acceptance report are **Observations**.

System Requirements Document (SRD)

Exhibit 301

1.4.232. The SRD is a structured and live definition of the optimal system requirements (including constraints). It further defines the capability requirement, providing a more detailed analysis of the user need. The SRD also defines the method by which system requirements will be validated and accepted and, if appropriate, traded against other requirements. The SRD considers all DLoDs to provide a solution focused response to the capability focused URD.

1.4.233. Like the URD, the SRD is split into five distinct parts:

a. **Part 1 – General Description.** Information that relates to the overall system definition written in an operational/systems context;

b. **Part 2 – Key System Requirements.** The Key System Requirements (KSRs) drawn from Part 3;

c. **Part 3 – Individual Systems Requirements and Constraints.** The complete, structured, set of individual system requirements and constraints;

d. **Part 4 – Context Documents.** Context documents and supporting papers;

e. **Part 5 – Glossary.** Definitions and explanations for all terms that could cause confusion.

1.4.234. **SRD Analysis.** Although the Panel could not source a formally endorsed SRD for the JACKAL, the Panel did find evidence that systems requirements were considered within a JACKAL 2 SRD Compliance Matrix[42]. Furthermore a list of mandated systems requirements were found in a draft DE&S Acceptance Report.

Exhibit 116
Exhibit 117
Exhibit 118

1.4.235. **SRD Conclusion.** Although a formally accepted SRD could not be found, the SRD Compliance Matrix confirmed that system requirements were identified by DE&S and it is therefore possible that some SRD development took place. The Panel concluded that the lack of a formally recorded SRD is an **Observation**.

1.4.236. **Part 1 SC Conclusion.** The Panel was unable to access a formal URD or SRD, although there is evidence to suggest an element of requirement analysis took place. The Panel concluded that the Part 1 SC was incomplete and failed to comply with both DSA regulations and the Acquisition Safety and Environmental Management System (ASEMS)[43] used by DE&S. Although this oversight may be attributable to the UOR procurement of JACKAL, the development of JACKAL into a Core project in 2013 should have initiated a full review of outstanding items against ASEMS. The UOR to Core work in 2013 was a missed opportunity to capture the lack of an auditable Part 1 SC. This omission undermined the safety management of JACKAL. The Panel finds that the lack of a Part 1 SC was a **Contributory Factor**.

Exhibit 87
Exhibit 114
Exhibit 300

1.4.237. **Recommendation. Director Capability should construct a Part 1 Safety Case for all High Mobility Truck Variant platforms in order to provide an auditable safety requirement against which the vehicles can be assessed.**

Part 2 Safety Case – Design

1.4.238. The aim of the Part 2 SC is to provide the evidence that a system design is acceptably safe in line with the Part 1 safety requirements, and that risks have been reduced so as far as reasonably practicable. It should show how risks have been mitigated and identify the residual risks which will require mitigation

Exhibit 114

[42] A SRD compliance matrix is used by DE&S to demonstrate SRD compliance to the customer. It includes all SRD elements and their status with links to supporting evidence.

[43] https://www.asems.mod.uk/

during operation and support of the system through the platform's life. It should also demonstrate compliance with applicable legislation and regulations and identify any non-compliances and the action required to address them. The evidence collated within the Part 2 SC will be used to support the in-service ALARP statements within the Part 3 SC.

1.4.239. Due to the lack of a formal Part 1 SC, the Panel used the SRD Compliance Matrix to identify JACKAL system safety requirements. To conduct the Part 2 SC analysis, the Panel requested access to the SC evidence on 14 February 2019. Although assistance was provided by the VST on behalf of DE&S, VST could not gain access to, or provide, the filing system containing the Part 2 evidence until 1 August 2019. It took a further month for the Panel to obtain the correct software and permissions to review the content. Upon successful access, the Panel found that the filing system used to organise the evidence was extremely poor, with no clear structure, significantly impacting the ability to retrieve evidence in support of the key SRD compliance matrix requirements. Exhibit 118 Exhibit 119 Exhibit 120 Exhibit 121

1.4.240. The 6 month delay in access to the Part 2 evidence suggests that it is likely that the Part 2 SC had not been reviewed for a number of years. Furthermore, due to the turnover of personnel within the DE&S team, it is likely that the Safety Manager had never completed a full review of the evidence held. The Panel finds that the poor management of Part 2 SC evidence is an **Other Factor.** Exhibit 118 Witness 21

1.4.241. **Recommendation. Head Vehicle Support Team should improve the process for storing and accessing Part 2 Safety Case evidence in order to ensure timely access is assured and filing systems are established to identify key evidence against the overall 3 Part Safety Case.**

1.4.242. In the following analysis of the Part 2 SC it should be noted that, whilst the Panel conducted a comprehensive search of the DE&S filing system, it is possible that some evidence may have been missed due to the issues raised in Para 1.4.239.

Part 2 Safety Case Analysis

1.4.243. During the analysis of the evidence held by DE&S, the Panel found a number of independent trials reports conducted by Millbrook[44], MIRA[45] and other agencies along with SUPACAT Acceptance Test Reports. Although the Panel was unable to determine the exact acceptance process used by DE&S and D Cap during the procurement of JACKAL due to the lack of an Integrated Test, Exhibit 118 Exhibit 123 Exhibit 128 Exhibit 129 Exhibit 130 Exhibit 300

[44] Millbrook provides vehicle test and validation services and systems to customers in the automotive, transport, tyre, petrochemical and defence industries. It is independent and impartial.

[45] MIRA are a civilian company who assist Defence with vehicle development, vehicle and system design, integration, testing and certification. https://www.horiba-mira.com/defence/

Evaluation and Acceptance Plan[46], the Panel believes that it is likely that the SUPACAT Acceptance Reports were used as the primary means of acceptance evidence during the UOR process.

1.4.244. The Panel analysed the five System Requirements (SRs) deemed to have been most pertinent to the accident. In doing so, the Panel reviewed the supporting evidence found to evaluate whether the Safety Arguments made within both the SUPACAT Acceptance Report and the Part 3 SC were evidentially sound. Table 1.4.3 details the SRs reviewed by the Panel. Exhibit 123 Exhibit 128 Exhibit 129 Exhibit 130

SR Reference Number	Requirement
SR131	The fully laden system shall be stable when tilted transversely to a minimum tilt table platform angle of [redacted] in either direction.
SR426	The system shall be able to conduct a controlled ascent and descent on a [redacted] slope.
SR378	The system brakes shall conform to the specified requirements.
SR329	The system shall protect the crew in the event of a lateral roll over.
SR161	The system shall provide a legally compliant safety belt and head rest for all crew members.

Exhibit 118

Table 1.4. 3 – System Requirements from Compliance Matrix

System Requirement 131 (SR131)

1.4.245. **SR131 The fully laden system shall be stable when tilted transversely to a minimum tilt table platform angle of [redacted] in either direction.** Exhibit 122

1.4.246. To validate SR131, DE&S instructed Millbrook to carry out tests to confirm the stability of JACKAL 2 by conducting a static tilt trial. A JACKAL of representative weight distribution was placed upon a static table that was progressively elevated on one side to induce a sideways tilt on the vehicle. Millbrook then measured the angle at which the JACKAL first lifted a wheel from the platform and the angle at which the vehicle became unstable, signifying the point at which the vehicle would roll in a static scenario. The test was conducted in both on-road and off-road suspension settings.

1.4.247. **SR131 Analysis**. The Millbrook Test Report stated the JACKAL failed the test criteria as the vehicle failed to achieve [redacted] when tilted to the right. The test results are shown in Figure 1.4.36 and the failed results highlighted in red. Exhibit 122

[46] An Integrated Test, Evaluation and Acceptance Plan is required by ASEMS to define how a system will demonstrate its ability to meet the requirements of the customer through testing and evaluation. The plan also defines the process by which the system will be accepted into service.

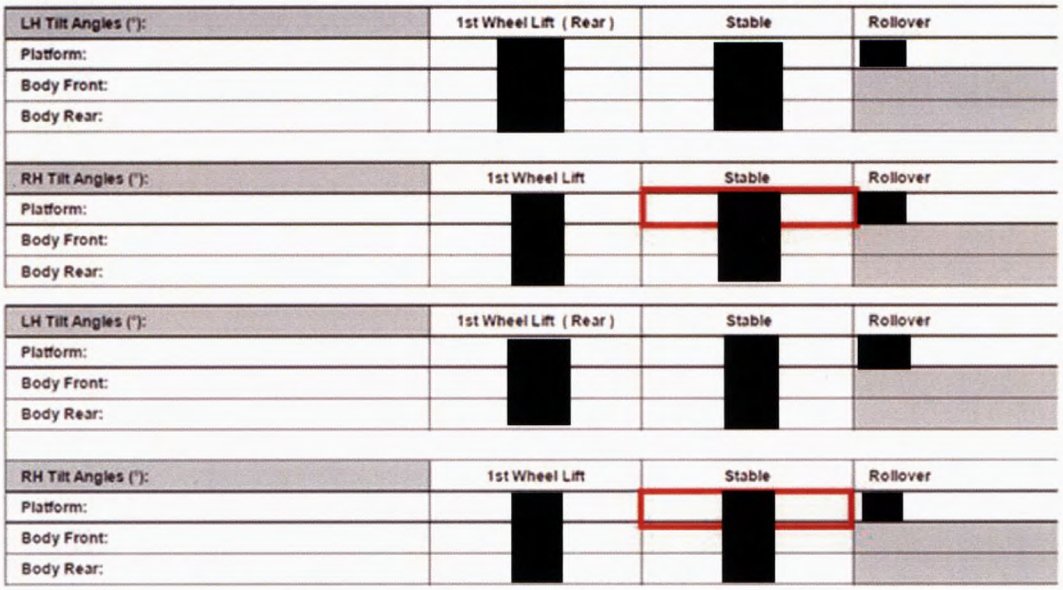

Figure 1.4. 36 – System Requirement 131 test results

1.4.248. In light of the results of the Millbrook testing, the SUPACAT Acceptance Report discounted the results of the Millbrook trial as pessimistic, stating that the loading of the vehicle was a worst case scenario that was unlikely to occur in real world usage. This loading decreased the angle at which it would begin to tip and therefore increased the liklihood of a failed test. Additonally, SUPACAT concluded that by averaging the angles achieved in off-road settings, the [redacted] pass criteria was achieved.

Exhibit 122
Exhibit 123

1.4.249. The Panel reviewed the SR, supporting evidence and the Compliance Matrix. The Panel noted that despite the failed Millbrook trial, the Compliance Matrix sentenced JACKAL as compliant with SR131. With no auditable justification supporting the claim the Panel concluded that it is likely that the argument within the SUPACAT report was accepted due to the marginal failure of the Millbrook test.

Exhibit 118
Exhibit 122
Exhibit 123

1.4.250. Despite the failed tilt trials and the SUPACAT report, the Panel found no evidence that these results had been used to determine the safe operating envelope of the vehicle and that no published vehicle tilt limitations were contained within the AESPs. Additionally, the Panel found that vehicle crews had no means by which to measure the tilt of the vehicle whilst driving or surveying the ground on foot. The Panel finds that the lack of tilt limitations and the lack of means by which to determine vehicle tilt were **Contributory Factors.**

1.4.251. **Recommendation. Head Vehicle Support Team should provide vehicle tilt limitations to crews in order to enable them to remain within the safe operating envelope of all vehicles within their portfolio.**

1.4.252. **Recommendation. Head Vehicle Support Team should provide vehicle crew a means by which to determine vehicle angle in order to ensure safe operating limitations are not exceeded.**

System Requirement 426 (SR426)

1.4.253. **SR426 – The system shall be able to conduct a controlled ascent and descent on a [redacted] slope.** Exhibit 125

1.4.254. Prior to analysis of SR426 it should be explained that the use of [redacted] slope has caused confusion within both DE&S and the user community. In the opinion of the Panel it is highly likely that the Compliance Matrix was incorrectly annotated and that the actual requirement was to conduct a controlled ascent and descent on a [redacted] slope; this is significantly shallower and a more realistic requirement for a medium sized, wheeled vehicle. The SRD Compliance Matrix states that the vehicle was assessed against a [redacted] criteria rather than the [redacted] requirement. For clarification, a [redacted] gradient is equivalent to approximately [redacted] (see Figure 1.4.37). Exhibit 118 Exhibit 125

[redacted]

1.4.255. Validation of SR426 was conducted by means of a Millbrook performance test. Due to the lack of a [redacted] incline at the test facility, Millbrook utlised a 25% gradient slope. To account for the lower gradient, the test JACKAL was connected to an additional tow load to simulate the [redacted] requirement. The calculations of additional load requirement were carried out by Millbrook and included within the final test report. Exhibit 125

1.4.256. Although JACKAL successfully completed a controlled descent under the test conditions, it failed to achieve the required climb performance. As such, Millbrook declared the test a failure. Figure 1.4.38 shows the maximum height the JACKAL achieved during the simulated [redacted] climb. Exhibit 125

Figure 1.4. 38 – Extent of System Requirement 426 ascent

1.4.257. Contrary to the Millbrook test, the SUPACAT Acceptance Report claimed acceptance based upon testing conducted on a COYOTE platform and providing read-across analysis. As COYOTE is a heavier vehicle than JACKAL but fitted with the same engine, the Panel concluded that the basis of this read across was sound. Despite the claim made by SUPACAT, the Panel was unable to source any corresponding evidence to prove compliance other than video footage of COYOTE ascending an unknown slope. The loading information and actual incline gradient were not recorded and, as such, does not prove compliance with SR426. It should also be noted that the SR does not specify the vehicle loading conditions to be used.

Exhibit 126
Exhibit 127
Exhibit 123
Exhibit 172

1.4.258. **SR426 Conclusion**. It is the opinion of the Panel that there is insufficient evidence to support the claim that JACKAL is compliant with SR426. The Millbrook test conducted on JACKAL was deemed a failure as a result of the failed ascent. The read across from the COYOTE trial onto the JACKAL has not been substantiated through the analysis of a full trials report and the video alone is unable to provide the required level of compliance evidence. The Panel finds that the performance of JACKAL during hill ascent trials is an **Other Factor.**

1.4.259. **Recommendation. Head Vehicle Support Team should conduct further vehicle trials in order to establish the maximum gradient limitations and determination of the safe operating envelope for High Mobility Truck Variant platforms.**

System Requirement 378 (SR378)

1.4.260. **SR378 – The system brakes shall conform to the specified requirements.**

1.4.261. The SI Panel could not find any evidence of any independent trial to support compliance with SR378 at the time the JACKAL entered service. Exhibit 123 Exhibit 128 Exhibit 129 Exhibit 130

1.4.262. A Millbrook Legislative Compliance Review (LCR) dated 5 January 2010 identified that although the braking system appeared to comply with the general legislative requirements, further testing would be required to prove compliance. The Panel found that in October 2012 SUPACAT was issued with a brake system compliance certificate of approval, likely as a result of further testing. Exhibit 250

1.4.263. Burgess Consulting Ltd conducted a further LCR on 22 March 2016. This subsequent report identified that the braking system embodied on the HMTV fleet was compliant with EU Directive 71/320/EEC[47]. Exhibit 132 Exhibit 246

1.4.264. **SR378 Conclusion.** The Panel could not identify whether any further analysis was conducted by the DT or whether the lack of evidence was accepted by D Cap prior to 2012. The Panel concluded that at the time of the accident, the braking system was compliant with UK legislation. Exhibit 132 Exhibit 133

System Requirement 329 (SR329)

1.4.265. **SR329 – The system shall protect the crew in the event of a lateral roll over.** Exhibit 134

1.4.266. The SRD Compliance Matrix requirement to protect the crew in the event of a lateral roll over lacked the necessary detail to adequately capture the magnitude of this requirement. With no definition of crew space or anticipated crew anthropolgy, the Panel was unable to clarify the exact pass / fail criteria for this requirement. Notwithstanding this lack of detail within the SRD Compliance Matrix, the Panel was able to retrieve several trials reports that comment on aspects of the design and performance of JACKAL in regard to this SR. Exhibit 118 Exhibit 134

1.4.267. To analyse the protection offered to JACKAL crews in the event of a lateral roll over, a number of trials were conducted at different stages of the equipment's life. These trials varied in complexity, from simple visual observations to full sled trials where the vehicle was subjected to a highly dynamic roll over event. The following paragraphs comment on the tests that have been conducted on the JACKAL Roll Over Protection System (ROPS).

[47] 71/320/EEC. European Union Council Directive relating to the braking devices of certain categories of motor vehicles and their trailers.

Taylor Woodrow trials

1.4.268. During the development of JACKAL, SUPACAT validated the ROPS design by using an internationally accepted standard. With no Defence Standards or regulations on which to baseline the design of open architecture military vehicles, International Standards Organisation (ISO) 8082:2003[48] was used. This ISO detailed the design requirements of ROPS for self-propelled forestry vehicles, which was assesed by SUPACAT as the closest standard applicable to the proposed usage of JACKAL at the time. Exhibit 136

1.4.269. As a result of the single roll-bar design used on [redacted] and JACKAL 1, initial tests were conducted on a single ROPS bar in August 2007. This initial trial provided evidence that the ROPS was sufficient in structure to meet the requirements of ISO 8082:2003 when considering 100% of the Gross Vehicle Weight (GVW) of the vehicle. These initial tests loaded the single ROPS bars in all three planes: longitudinal; lateral; and vertical (see Figure 1.4.39), progressively adding load to the bar and measuring any deformation in relation to the protected crew space. Exhibit 135 Exhibit 136

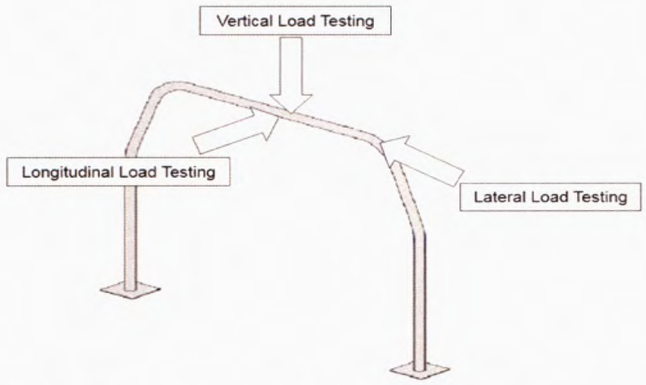

Figure 1.4. 39 – Longitudinal, vertical and lateral planes

1.4.270. The Taylor Woodrow Trials Report concluded that the single ROPS bar design met the requirement of ISO8082:2003 and therefore passed the test. In the JACKAL 2 design, this addressed the structural integrity of the front ROPS bar only. Exhibit 135 Exhibit 136

1.4.271. The development of JACKAL 2 and COYOTE introduced the requirement for a second, rear mounted, roll-bar to protect the crew members seated in the rear hamper. The JACKAL 2 ROPS bars are highlighted in red in Figure 1.4.40. The Cutter Bar, coloured green, will be discussed later in the report.

[48] ISO 8082:2003 establishes a consistent, reproducible means of evaluating the force-deflection characteristics of roll over protective structures on self-propelled forestry machines under static loading and prescribes performance requirements for a representative specimen under such loading.

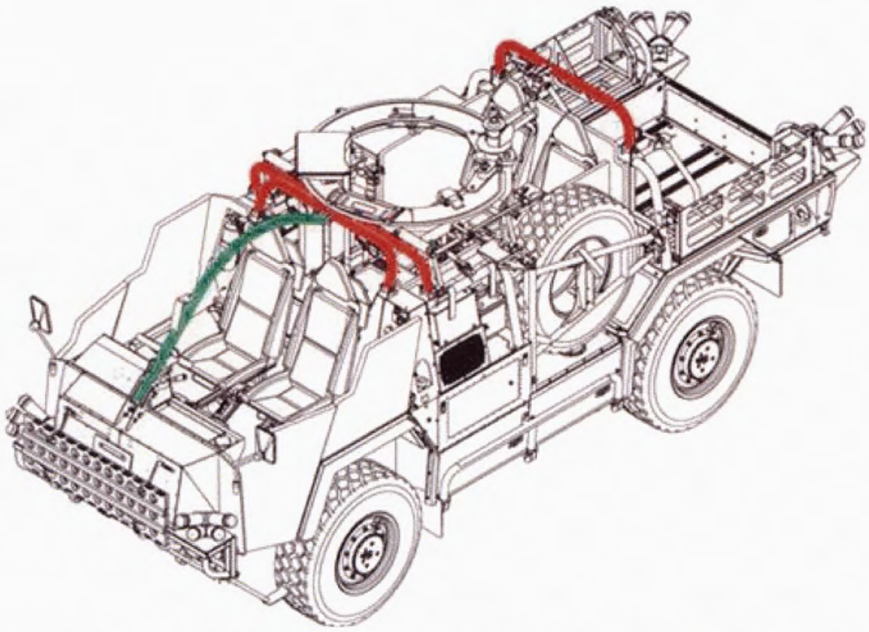

Figure 1.4. 40 – JACKAL 2 Roll Over Protection System and Cutter Bar design

1.4.272. With the introduction of the new ROPS design, a second trial was conducted by Taylor Woodrow in July 2009 to confirm the structural integrity of the ROPS as a whole. Prior to testing, SUPACAT made the following assessments of the likely accident scenarios: Exhibit 135 Exhibit 136

a. *"Following analysis of all possible roll over scenarios it is considered very unlikely that the rear ROPS structure would be required to withstand the entire weight of the fully laden vehicle, with the imposed force most likely shared by the front ROPS structure to some degree. In order to allow for a roll over where the impact is not equally shared, it was considered that each structure should be capable of sustaining at least 60% of the load and energy requirements of a single frame acting alone";*

b. *"The operation of the HMT vehicle negates the requirement (BS8082:2003) for longitudinal load testing of the rear of the ROP system. Unlike a forestry/construction site vehicle that may be constantly moving forwards and backwards during its day to day operation. SUPACAT engineering negate the need for this test as the vehicle is operated in its forward gears during its day to day operation. The longitudinal load test is therefore only required on the forward part of the system".*

1.4.273. As a result of the assumptions above, Taylor Woodrow conducted a trial which confirmed that the rear ROPS bar was capable of supporting 60% of the JACKAL gross vehicle weight in line with ISO8082:2003, although longitudinal testing was not conducted due to the analysis provided by the SUPACAT engineering team. Exhibit 135 Exhibit 136 Exhibit 137 Exhibit 138

Millbrook trial MBK10/0601

1.4.274. The roll over protection trial conducted by Millbrook in March 2010 was a simple observation of the platform design, providing a subjective view on how the ROPS may perform in the event of a lateral roll and the potential injuries that may result from such an event. Millbrook stated that the vehicle did not meet the SR requirements for the following reasons: Exhibit 134

a. *"In the event of a lateral roll the head and upper torso of the driver/commander may be exposed to crush injury. The risk is increased on soft or uneven ground, or in the event of deformation or folding of the roll bars";*

b. *"The front doors are each retained by spring catches and there are no positive latches fitted. During a lateral roll over it is probable that the front doors will open";*

c. *"The structural integrity of the roll over protection should be demonstrated, with particular reference to a lateral roll over of a vehicle with significant forward speed".*

1.4.275. Whilst the Millbrook trial was a subjective view and therefore open to counter argument, the Panel believes that the report highlights a number of credible deficiencies in the design of the JACKAL ROPS which will be discussed later. Exhibit 135 Exhibit 136 Exhibit 137

MIRA Cutter Bar trial

1.4.276. The purpose of the Cutter Bar is to support the wire cutting device in order to protect the crew from wires placed across the path of the vehicle. As a result of lessons and observations raised by personnel deployed on operations the Cutter Bar was redesigned. This new design elevated the position of the Cutter Bar above the ROPS bars and, as a result, the new design was tested to confirm that it would not deform into the crew space in the event of a roll over. Figure 1.4.41 & Figure 1.4.42 highlight the differences between the Cutter Bar designs. Exhibit 139

Figure 1.4. 41 – Original Cutter Bar design

Figure 1.4. 42 – New Cutter Bar design

1.4.277. To assess the suitability of the new Cutter Bar design, SUPACAT commissioned MIRA to conduct a dynamic roll over test to monitor the interaction of the Cutter Bar with the ground and assess the resulting Cutter Bar response. To conduct this trial, MIRA placed a previously damaged JACKAL 1 with the redesigned Cutter Bar onto a platform tilted laterally at 23°. The platform and vehicle were then accelerated along a road to 30.7 mph before being stopped abruptly to cause the unrestrained vehicle to roll from the platform and along the road, thus inducing a lateral roll over. Figure 1.4.43 shows the starting position for the MIRA trial.

Exhibit 139

Figure 1.4. 43 – MIRA new Cutter Bar trial equipment

1.4.278. During the test, the vehicle performed 2.25 revolutions before coming to a rest on its side. As a result of the speed to which the vehicle was accelerated, the subsequent roll did not follow a simple lateral roll profile. The high speed caused an element of fore-aft motion, inducing a tumble type rolling effect. This tumbling motion caused the vehicle to pitch sufficiently to clear the redesigned Cutter Bar and therefore no ground contact or deformation was observed. Figure 1.4.44 captures the motion of the vehicle in a selection of stills taken from the video footage. As a result, MIRA and SUPACAT concluded that the new Cutter Bar design would not encroach into the crew safe space and therefore the design was acceptable.

Exhibit 193

Figure 1.4. 44 – Video screenshot of MIRA Cutter Bar trial

SR329 Structural Integrity analysis

1.4.279. Analysis of the intial ROPS bar tests indicate that the single bar design incorporated on MV and JACKAL 1 was compliant with ISO 8082:2003. Whilst it could be argued that the was not suitable for JACKAL operations, in the absence of any other corresponding standards, it is the view of the Panel that ISO 8082:2003 was the most suitable test critria at the time. Exhibit 135 Exhibit 136

1.4.280. The twin ROPS bar design used on JACKAL 2 and COYOTE was subsequently tested using a modified interpretation of ISO 8082:2003 to take account of usage and failure assumptions made by SUPACAT. The Panel reviewed these assumptions and noted the following:

a. **Weight distribution in the event of a roll over.** As previously mentioned in Para 1.4.272 SUPACAT proposed that in the event of a roll over, the two ROPS bars would share the weight of the vehicle equally, thus the rear bar was only designed and tested to withstand [redacted] GVW (10% above the assumed requirement). Whilst the Panel believe that this assumption was reasonable for low speed roll overs on planar surfaces, it did not take into account the environment in which JACKAL routinely operates. Operations in the cross-country environment add a multitude of obstacles and foreign objects that could impact a single ROPS bar without contacting the other. In the opinion of the Panel, the rear ROPS bar should have been designed to withstand at least 100% GVW. To substantiate this claim, analysis of the damage sustained by [redacted] demonstrates significant deformation to the rear ROPS bar (see Figure 1.4.45). Whilst it is acknowledged by the Panel Exhibit 135 Exhibit 136

that the damage is likely to have occurred as a result of a point impact rather than a compressive load along the entirety of the ROPS bars (for which ISO 8082 tests), it does highlight the significant risk of injury to rear passengers in the event of a dynamic roll over. It is the opinion of the Panel that, had there been rear seated passengers within the vehicle at the time of the accident, the number of significant injuries or fatalities would have increased. The Panel finds that the inability of the rear ROPS bar to withstand at least 100% of the GVW is an **Other Factor**;

Figure 1.4. 45 – [redacted] rear seats and Roll Over Protection System deformation

b. **Longitudinal loading requirement of Rear ROPS.** As previously stated, SUPACAT analysis of JACKAL operations concluded that longitudinal testing of the rear ROPS bar was not required as the majority of JACKAL movements were conducted in the forward direction rather than the constant forward and aft travel of forestry vehicles for which the ISO applied. The Panel disputes this assumption. When attempting to negotiate harsh terrain, there is an increased likelihood of needing to reverse. In the case of hill ascents, this would require the vehicle to be reversed down a slope to conduct Failed Ascent Drills. Given that this reversing drill would be conducted on a significant slope, the likelihood of vehicle roll over increases, thus increasing the risk of a longitudinal force being applied to the Rear ROPS bar. The Panel found evidence of other accidents where Failed Ascent Drills had led to vehicle roll over accidents and at least one other significant event where the vehicle rolled multiple times. The Panel concluded that there are credible scenarios where a longitudinal force could be applied to the rear ROPS and, therefore, it should be designed and tested to the same standards as the front ROPS bar.

Exhibit 135
Exhibit 136
Exhibit 183

Exhibit 135
Exhibit 136

1.4.281. **SR329 ROPS design analysis.** Analysis of the ROPS design conducted by the Panel reinforced the views articulated within the Millbrook report. Whilst the ROPS is likely to protect crews in the event of a simple lateral roll over on a planar surface, any foreign objects placed in the path of a rolling vehicle would not be prevented from entering the crew space. Additionally, any roll over that included a tumbling or pitching motion could leave the front occupants exposed to the ground due to the height of the forward ROPS bar and forward bulkhead. Initial analysis conducted by the Panel demonstrated that a straight line between the forward ROPS and forward bulkhead exposes the front crew member to a risk of ground contact (see Figure 1.4.46). The damage sustained by [redacted] indicated that foreign objects did encroach into the crew space as evidenced by the significant damage sustained to the Cutter Bar which was depressed below the level of the forward ROPS bar (see Figure 1.4.47) and the damage sustained to the driver's headrest as depicted in Figure 1.4.48.

Figure 1.4. 46 – Roll Over Protection System to bulkhead analysis

Figure 1.4. 47 – JACKAL [redacted] Cutter Bar post-accident

Figure 1.4. 48 – [redacted] driver's headrest

1.4.282. In addition to the concerns raised regarding ROPS design, there are no anthropometric limitations placed upon JACKAL crew members. Although concerns regarding crew height and ROPS protection were raised within a 2009 Infantry Trials and Development Unit (ITDU) report, there is no evidence to capture any resulting risk analysis. As a result, personnel of all heights are permitted to operate the platform. Whilst the design criteria for JACKAL took account of personnel up to

Exhibit 14
Exhibit 58
Exhibit 89
Exhibit 90
Exhibit 91
Exhibit 298

the 95th percentile[49], there is no documented limitation to enforce this. The Panel noted that SSgt McKelvie was 194cm and therefore exceeded the 95th percentile.

1.4.283. Armoured Vehicle Standing Orders (AVSOs) advises the unit Chain of Command to make a judgement upon crew heights and the vehicles in which they are operating. It should be noted that limitations are imposed upon some Armoured Vehicles, including MASTIFF, RIDGEBACK, WOLFHOUND (MRW) and HUSKY. Due to the height of the JACKAL ROPS, any person who exceeds the 95th percentile seated height is at increased risk of injury or death in the event of a roll over. Figure 1.4.49 shows a male soldier who exceeds the 95th percentile[50] and his helmet position relative to the forward ROPS bar.

Figure 1.4. 49 – Taller than 95th percentile male soldier in driver's position

1.4.284. The Millbrook assessment also commented on the performance of the door latches, highlighting the likelihood of failure and corresponding risk of injury. Analysis of [redacted] damage identified that the driver's door had sheared as a result of the accident. In the opinion of the Panel it is highly likely that the force on the door during successive rolls led to the door opening which led to the damage. Further witness statements have also suggested that doors often open whilst driving cross-country due to the poor locking mechanism. The Panel concluded that the Millbrook assessment of door latches was substantiated by the damage sustained by [redacted]

Exhibit 21
Exhibit 134
Witness 8

1.4.285. **SR329 Cutter Bar analysis.** Whilst the Cutter Bar trial conducted by MIRA provided a satisfactory result, further analysis of other roll over accidents established that the Cutter Bar is likely to contact the ground when the vehicle rolls over and that the associated deformation forces the bar into the crew space, contrary to the MIRA test results. Figure 1.4.47 shows the damaged Cutter Bar fitted to [redacted] as a result of the roll over accident. Despite finding that this type of deformation had been identified by DE&S through accident and damage

Exhibit 113
Exhibit 139

[49] 95th Percentile in accordance with ISO 3411:2007 Earth-moving machinery – Physical dimensions of operators and minimum operator space envelope.

[50] 95th percentile - Standing 1905mm, seated 976mm from seat to top of head. Any additional 50mm is added to each measurement for helmets.

analysis, no further evidence of risk analysis could be found by the Panel. The Panel concluded that, despite real-life data contradicting the MIRA test result, the hazards associated with the redesigned Cutter Bar design had not been reconsidered by DE&S or D Cap personnel.

1.4.286. **Commander's seat failure.** During the MIRA roll over testing, the commander's seat mounting failed resulting in the seat moving to the end of its upwards travel. This failure caused the commander dummy's head to impact the ground as captured in Figure 1.4.50. Exhibit 139

Figure 1.4. 50 – Screenshot of dummy commander striking the ground

1.4.287. As a result of the seat failure, DE&S conducted a review to ascertain the cause. Both SUPACAT and the seat manufacturer, JANKEL, provided input into the subsequent investigation.

1.4.288. [redacted]. SUPACAT concluded that the seat design should be reviewed by JANKEL. Exhibit 140

1.4.289. There are no reasons recorded by JANKEL to explain the reason for the failure. [redacted] Exhibit 141

1.4.290. Following the SUPACAT and JANKEL reports into the seat failure, no further analysis was conducted by DE&S. The Panel believes that DE&S may have attributed the failure to the previous blast damage sustained by the vehicle; this decision, however, is not documented. The Panel concluded that the lack of full analysis to explain the commander's seat failure during the MIRA test is an **Observation**. Exhibit 139

1.4.291. **SR329 Conclusion.** SR329 directed that JACKAL would protect the crew in the event of a lateral roll. This requirement was poorly defined in the Exhibit 134 Exhibit 136 Exhibit 139

context of the operating environment and crew stature and this lack of definition was compounded by a lack of appropriate Defence Standards or Regulations. As a result, an ISO was applied by SUPACAT to varying degrees in an attempt to demonstrate compliance with the requirement. The Panel believes that it is likely that the application of ISO8082:2003 was not to meet only the UK requirement, but also those of the international market which SUPACAT also supplies. Despite numerous independent trials being commissioned by DE&S, the Panel believes that insufficient analysis of the results was conducted and thus failed tests were not correctly identified or interrogated. This lack of analysis is evidenced by the failed tilt tests and ROPS trials.

1.4.292. Despite passing the revised Cutter Bar design trials, subsequent accidents have proven the encroachment of the Cutter Bar into the crew space during roll over accidents. Although this was noted by DE&S, the Panel was unable to access any evidence to demonstrate further analysis of the associated hazards presented. Furthermore, trials and real-life experience have demonstrated that the door latches are prone to failure, releasing the door during normal operations and accidents, increasing the likelihood of injury to crew members. Exhibit 113

1.4.293. The Panel concluded that there was insufficient evidence to support the assessment that JACKAL protects crew members in the event of a lateral roll over accident within the context of the environment in which the vehicle operates. The Panel finds that the lack of adequate roll over protection afforded by JACKAL was an **Aggravating Factor**.

1.4.294. **Recommendation. Head Vehicle Support Team should assure the effectiveness of the Roll Over Protection System in all approved operating environments in order to ensure that the Roll Over Protection System is fit for purpose.**

1.4.295. **Recommendation. Head Vehicle Support Team should improve the door latches on all High Mobility Truck Variant vehicles in order to ensure crew members are protected during vehicle operations.**

1.4.296. **Recommendation. Head Vehicle Support Team should improve the Cutter Bar design in order to reduce the risk of crew injury in the event of a roll over.**

System Requirement 161 (SR161)

1.4.297. **SR161 – The system shall provide a legally compliant safety belt and head rest for all crew members**. Exhibit 142

1.4.298. JACKAL is fitted with a 4-point harness rather than a conventional 3-point car seatbelt. The harness comprises two shoulder straps secured by brackets mounted to the rear armour panel, two lap straps secured to the sides of the seat and a quick release fastener (see Figure 1.4.51). The commander's harness has an inertial reel fitted to each shoulder strap to enable an adjustable firing position on the weapon systems attached to the commander's weapon mount. The driver's and rear seat harnesses are fixed with no inertial reel. To demonstrate compliance Exhibit 142 Exhibit 143

with UK legislation, SUPACAT tasked Millbrook to carry out a harness trial in 2010. Further legislative compliance reviews have been conducted through the life of JACKAL, with the most recent conducted by Burgess Consulting Ltd in 2016.

Figure 1.4. 51 – 4-point harness

1.4.299. **SR161 Analysis.** In January 2010, Millbrook conducted analysis of the seat harness, concluding that the harness did not meet the requirements of SR161 stating that: Exhibit 142

a. *"The system provides a legally compliant safety belt and head rest for all crew members. The safety belts are not retractable. Therefore the system does not meet the threshold requirement"*

1.4.300. The Panel believes that the above statement is confusing, initially describing the system as legally compliant but then highlighting an element that does not meet the standards set within the SR. The Panel believes that the meaning of the statement is that the physical straps and headrests are compliant with the material specifications, however, as the harness straps are not retractable, the design does not meet the required legislative standard.

1.4.301. In March 2016, the Burgess Consulting Ltd LCR concluded that the harness was not compliant with EC Directive 77/541/EEC due to the orientation and colour of the harness release buckle. As required by DLSR Regulations, DE&S applied for an exemption to this legislative requirement. This exemption was granted by DLSR by authority of the Secretary of State. Exhibit 133 Exhibit 246

1.4.302. The Panel noted that there was a discrepancy between the Millbrook and Burgess Reports as Burgess made no reference to the requirement for the belts to be retractable. Further analysis of the legislative requirements demonstrated that retractable belts were not a legal requirement and thus the

Burgess LCR accurately captured the non-compliant elements of the JACKAL harness.

Harness cutter

1.4.303. In addition to the analysis of SR161, the Panel identified a potential shortfall in the design of the harness cutter as a result of it failing to cut the harness webbing during the extraction of SSgt McKelvie. As a result, the Panel conducted further analysis of the harness cutter design, acceptance into service and maintenance procedures. Exhibit 142

1.4.304. Each crew member has a cutter attached to their harness to assist in the evacuation of crew members during an emergency. The harness cutter comprises a metal blade enclosed within a plastic handle grip. The harness cutter is stored in a fabric sheath located on the left-hand harness shoulder strap. In an emergency, the cutter is removed from the sheath and used to cut the seat harness (see Figure 1.4.52). Exhibit 143

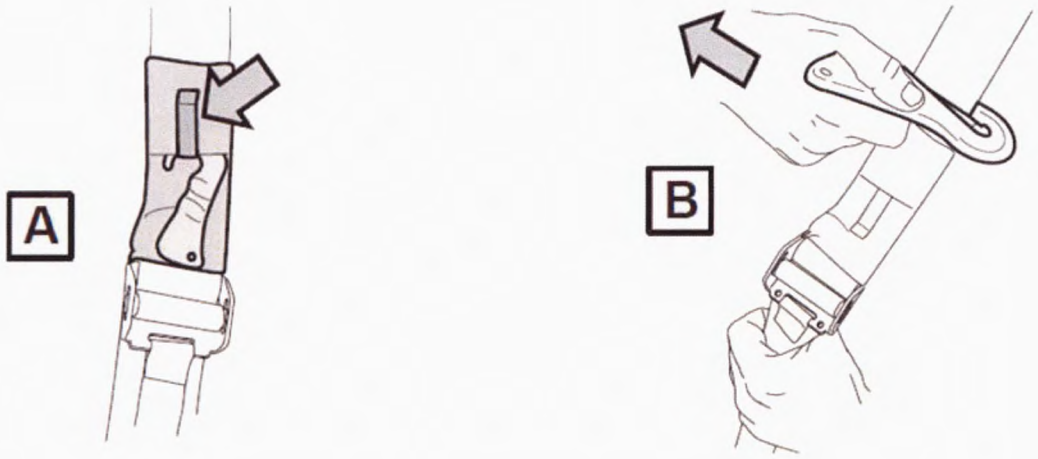

Figure 1.4. 52 – Harness cutter and sheath

1.4.305. **Harness cutter analysis.** Defence Standard (Def Stan) 25-009 (Design Guidelines for a restraint System – Land Equipment) issue 2 dated 29 March 2011 Para 14 identifies the requirement for rapid emergency egress. Para 14.3 states that: Exhibit 144

> *"A secondary mechanism for releasing the common restraint, such as a readily available tool, must be provided with each restraint to allow evacuation of the occupant should the restraint harnesses not release, and for the ease of releasing an injured occupant."*

1.4.306. The Def Stan identifies the following NATO Stock Numbers (NSN) of the preferred harness cutters and ancillaries: Exhibit 144

a. Kit, Cutter and Pouch – NSN 5110-99-490-4802;

b. Harness cutter – NSN 5110-99-667-6266.

1.4.307. The purpose of NSNs are to enable the individual identification of specific parts and ancilliaries across Defence. It is important that NSNs are correctly labelled and identified within platform documentation to ensure that the correct parts are fitted to the correct equipment and to assure configuration control. Analysis of the harness cutter NSN across two platforms, JACKAL and CHALLENGER 2, has shown that the same part is fitted to both vehicles, although the NSNs and descriptions used within the corresponding AESPs differ. The NSN within the AESPs also differs from those used within the Def Stan. Exhibit 145 Exhibit 146

1.4.308. Although the NSNs contained within the AESPs differ to those within the Def Stan, the Panel believes that it is likely that the NSNs have been updated but that this revision has not been included within the Def Stan. Despite this discrepancy, the Panel assessed that the correct harness cutter was fitted to JACKAL [redacted] at the time of the accident. Exhibit 144

1.4.309. During interviews the Panel noted that the original harness cutter fitted to the JACKAL was changed. The original cutter was produced by Gerber and was an attractive item for personnel to remove for personal use. As a result of the original cutters being removed from the vehicle, the decision was made to replace them with a less attractive, orange plastic version. The Panel was unable to find any formal documentation to address the removal of the original cutters Witness 49 Witness 50

1.4.310. The current harness cutter is managed by the Combat Tracks department within the VST in line with DE&S safety processes on behalf of all other users of the device. Due to the poor performance of the harness cutter at the time of the accident, the Panel investigated the acceptance criteria and trials evidence to support the current design. VST had limited evidence to support acceptance, however, an email from the equipment manufacturer provided evidence that some testing had been conducted. As the cutter is universal in design and used beyond Defence, the manufacturer had tested the cutter against commonly used seatbelts and an industrial webbing strap. The force required to completely cut through the strap was measured to assess cutter performance. The following results were passed to the Panel: Exhibit 147

a. Seatbelt 1 – Ford (1.28mm thickness), cut applied of 2 Kg causing the belt to be separated. The trial blade conducted 150 cuts of the seatbelt;

b. Seatbelt 2 – Peugeot (1.38mm), cut applied of 3 Kg causing the belt to be separated. The trial blade conducted 150 cuts of the seatbelt;

c. Industrial Webbing (4mm x 51mm), a 6 Kg force is required to cut the industrial webbing four times and 12 Kg of force to achieve the fifth cut.

1.4.311. The results above demonstrate testing by the manufacturer but the Panel could not find evidence that there had been any independent performance testing by DE&S against the harnesses fitted to JACKAL or other AVs.

1.4.312. In addition to performance testing, the Panel could not find any evidence of environmental testing. Whilst the pouch fitted to the harness strap is designed to provide some protection of the cutter blade, its effectiveness in a wet environment, such as that found in an open architecture vehicle, has not been assessed. During post-accident visual analysis of the harness cutter fitted to [redacted] the Panel found that the metal blade had suffered significant corrosion that was likely to have adversely affected the cutting performance (see Figures 1.4.53 and 1.4.54). As a result of a lack of testing and the condition of the cutter blade, the Panel was unable to conclude whether the issues relating to the extraction of SSgt McKelvie from the vehicle were due to harness cutter design or condition.

Witness 2
Witness 5

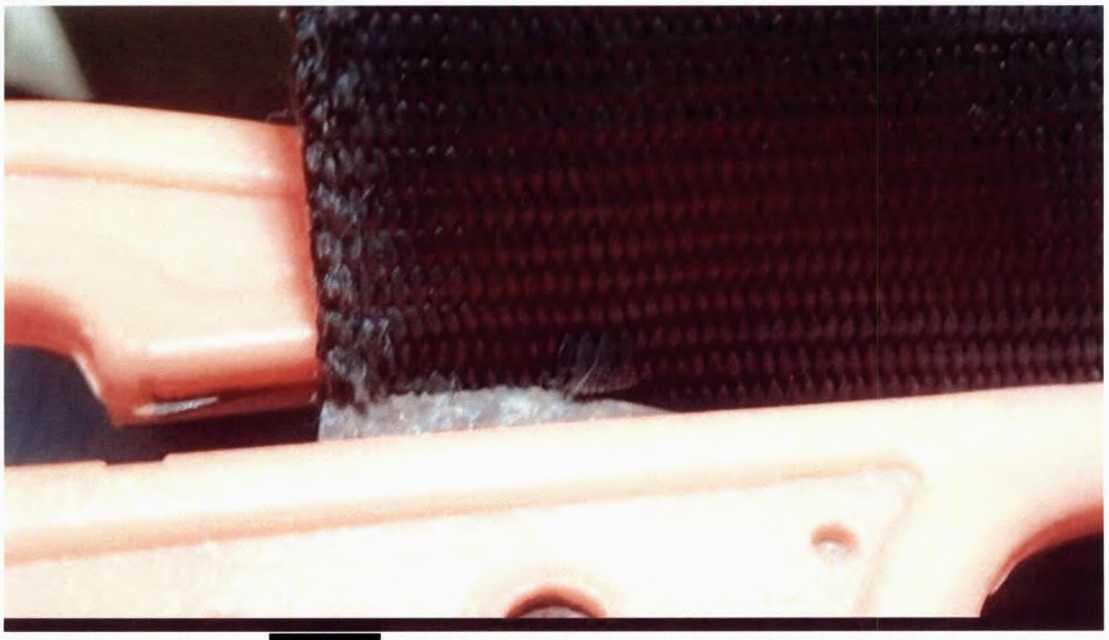

Figure 1.4. 53 – [redacted] driver's seat harness attempted cut post-accident

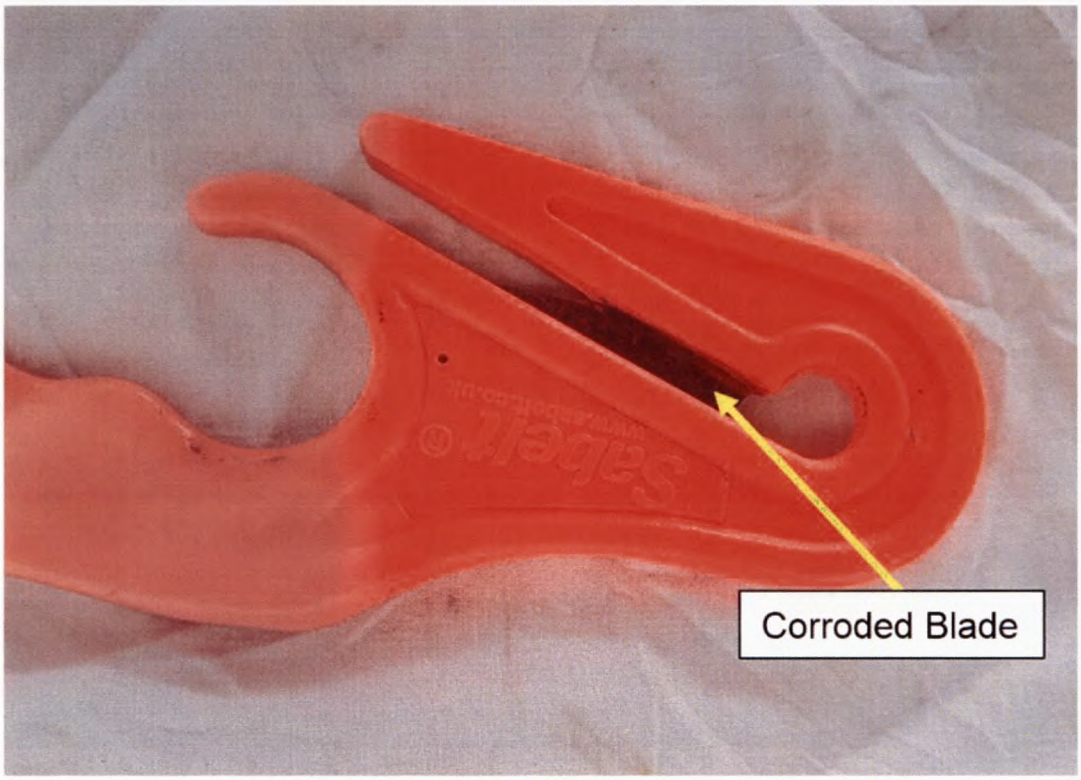

Figure 1.4. 54 – [redacted] corroded harness cutter blade

1.4.313. **SR161 Conclusion.** The seat harnesses fitted to JACKAL are not legislatively compliant, however a DLSR issued exemption is in place. On the day of the accident, it is likely that the harnesses operated as expected. The Panel finds that the seat harness fitted to JACKAL was **not a factor.**

Exhibit 133
Exhibit 147
Witness 2
Witness 5

1.4.314. The harness cutter failed to perform its function correctly. The Panel was unable to confirm whether the poor performance of the blade on the day of the accident was due to the design or the corrosion found on the blade. The Panel finds that the design and maintenance regime of the harness cutter was an **Other Factor**.

Witness 2
Witness 5

1.4.315. **Recommendation. Head Vehicle Support Team should conduct harness cutter trials in order to ensure that the design is fit for purpose.**

1.4.316. **Recommendation. Head Vehicle Support Team should introduce a harness cutter maintenance and inspection regime in order to assure that cutter blade condition remains appropriate through-life.**

1.4.317. **Recommendation. Head Vehicle Support Team should rectify the disparity between Harness Cutter NATO Stock Numbers within the Land Environment in order to ensure that the correct equipment is fitted to all Armoured Vehicles.**

Additional trials evidence

1.4.318. During the search for evidence to support the JACKAL SC, the Panel accessed several sources of data and reviewed numerous reports relevant to JACKAL. In addition to the detailed analysis of the five System Requirements conducted above, the Panel found the following noteworthy trial reports.

1.4.319. **Tactical Support Vehicle (TSV) Trials Report**. Off-road handling trials were conducted by Millbrook in August 2008 on five UOR vehicles including JACKAL. The trials reports noted concerns regarding JACKAL body roll, with test drivers stating that excessive body roll was evident. During the requirement to conduct a 25° side slope test, the driver declined to conduct the trial due to concerns over vehicle stability. Exhibit 148

1.4.320. **JACKAL 2 Handling Trials**. Further JACKAL handling trials were conducted by Millbrook in March 2010. These industry standard trials were conducted as compliance tests to assess on-road handling charateristics, including assessments of double-lane changes, steady state cornering and braking in a turn. Due to the weather on the day of the trials, the track conditions were damp. Noting a high degree of body roll and the tendency to slip due to worn tyres and the surface conditions, Millbrook test drivers commented that new tyres on a dry surface could increase the body roll further as the tendancy to slip was reduced. The report recommended further testing in dry conditions with new tyres fitted. The Panel was unable to find any evidence of repeated tests. Exhibit 149

1.4.321. The Panel concluded that the two trials above highlighted excessive body roll as a characteristic of the JACKAL platform. Despite the recommendation to conduct further dry testing, the Panel was unable to find any evidence that this was carried out. Exhibit 148 Exhibit 149

1.4.322. Throughout the inquiry, the Panel received comments from users indicating a propensity to roll and a feeling that the vehicle was top heavy. The Panel also received comments stating that the platform is very capable. From these comments, it is the opinion of the Panel that, whilst the platform is capable, driver competence is essential if the vehicle is to be operated safely. The Panel finds that the handling characteristics of the JACKAL is an **Other factor.**

1.4.323. **Recommendation. Head Vehicle Support Team should conduct further High Mobility Truck Variant handling trials in dry conditions in order to establish whether the JACKAL handling characteristics are suitable for its intended use.**

Part 2 Safety Case conclusion

1.4.324. The aim of the Part 2 SC is to provide the justification and evidence that a system design is acceptably safe and that risk has been reduced so as far as reasonably practicable. Exhibit 114

1.4.325. The Panel found several trials reports that did not support the safety argument and therefore the Panel concludes that the HMTV Part 2 SC did not fulfil Exhibit 119 Exhibit 120

its aim. Throughout the inquiry, DE&S was unable to provide immediate access to safety critical evidence highlighting shortfalls in the filing system and document handling thus undermining the through-life management of the SC.

1.4.326. The SR Compliance Matrix remained in draft despite the vehicle being in service for over a decade and the acceptance statements appeared to disregard the contradictory evidence and trials reports highlighted within this section. As a result, much of the evidence reviewed did not support the acceptance statements within the Compliance Matrix. The Panel finds that the lack of supporting evidence in the Part 2 SC was a **Contributory Factor**. Exhibit 118

1.4.327. **Recommendation. On completion of the recommendation at Para 1.4.237 (Part 1 Safety Case revision) Head Vehicle Support Team should re-evaluate the evidence held within the High Mobility Truck Variant Part 2 Safety Case, in order to demonstrate compliance with the revised Part 1 Safety Case.**

Part 3 Safety Case – operation and support

1.4.328. DSA03.DLSR.LSSR states that the aim of the Part 3 SC is to demonstrate that residual risk is ALARP. The Part 3 SC should support system acceptance and confirm that all safety requirements have been met. Exhibit 114

1.4.329. The Part 3 SC should demonstrate that:

a. The Maintenance Policy and arrangements meet the requirements of the system(s);

b. The Training Policy and arrangements meet any requirements stipulated by the system(s);

c. Operating documentation is available that identifies any requirements for the acceptably safe operation of the system;

d. Limitations of use are identified and any safety related restrictions have been imposed on the operation of the system, i.e. safe operating envelope;

e. Emergency and Contingency arrangements are identified and in place;

f. Arrangements are in place for monitoring safety performance and maintaining the SC;

g. Resources are in place to maintain the acceptably safe operation of the system through-life and these are identified in the Safety and Environmental Management Plan.

1.4.330. The Part 3 SC is managed on behalf of the Army by the Directorate of Capability (D Cap) within Army HQ and by DE&S. The resulting Safety and Environmental Case Report (SECR) is co-signed by D Cap and DE&S representatives to confirm both are content that the equipment is safe by design and safe to operate. Exhibit 160

1.4.331. The SECR should provide a summary of the safety arguments and supporting evidences. It is a 'snapshot' of the safety and environmental processes and results at the date of signing. It considers the risks identified within the Hazard Log and reflects upon the practices and limitations contained within the AESPs and other supporting documents to substantiate the top-level safety claim. In analysis of the totality of the Part 3 SC, the Panel concluded that the following three elements provided the basis to support the safe equipment claim: Exhibit 114

a. Hazard Log;

b. AESPs;

c. SECR.

Hazard Log

1.4.332. Prior to analysis of the Hazard Log, it is important to understand the differences between Hazards, Risks and Accidents. DSA02.DLSR.LSSR provides the following definitions: Exhibit 61

a. **Hazard.** The potential to cause harm, eg a physical situation or state of a system, often following from some initiating event that may lead to an accident;

b. **Risk.** The combination of the likelihood of harm and the severity of that harm;

c. **Accident.** An event or sequence of events, that causes unintended harm.

1.4.333. Hazard Logs capture and record possible hazards which could lead to an accident causing harm to an individual(s). They provide the means of establishing progress on resolving risks associated with identified hazards throughout the life of a project. The Hazard Log is an auditable trail of the hazard management process and demonstrates how safety issues are being dealt with and resolved. Exhibit 114

1.4.334. The Hazard Log details the 'hazard-accident-harm' pathway and records an assessment of risk based on likelihood of occurrence and severity of the outcome. Following assessment of the risk, it describes the control measures implemented to reduce the risk to levels that are ALARP. Use of a Hazard Log provides evidence that all credible hazards have been considered and those most likely to lead to an accident causing harm, particularly severe injury or death, have appropriate controls in place.

1.4.335. DSA03.DLSR.LSSR stipulates that the Hazard Log should contain as a minimum: Exhibit 114

a. Hazards;

b. Controls/Mitigations;

c. Causes;

d. Accidents;

e. Risk Assessments;

f. ALARP Justifications;

g. References to standards, design documents, competent personnel at hazard identification and assessment meetings, test results, SEMC dates and decisions.

1.4.336. The mandated[51] Hazard Log Tool for DE&S and its industry partners is Cassandra[52]. The Cassandra Suite is further divided into two versions: Exhibit 301 Exhibit 319

a. Cassandra;

b. eCassandra – Web based version of Cassandra.

1.4.337. The Cassandra suite provides the following functions:

a. Recording of hazards, causes of hazards, accidents, perceived safety risks and related control actions;

b. Classification of hazards and accidents according to a selected standard, Def Stan 00-056/2 or Military Standard 882D or customer specified;

c. Reviewing (and controlled editing) of existing records;

d. Reporting of hazards, causes and accidents and associated control actions;

e. An audit trail relating to Hazard Log entries.

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[51] https://www.gov.uk/guidance/knowledge-in-defence-kid

[52] Cassandra is a safety risk management tool designated to hazards, accidents, and any environmental health and safety risks.

HMTV Hazard Log analysis

1.4.338. The HMTV eCassandra Hazard Log contained 19 potential accident scenarios, 34 hazards, 98 control records and 54 reference records. Exhibit 150

1.4.339. Although a Hazard Log had been maintained, analysis of historic evidence contained on the DE&S filing system failed to demonstrate that any formal Hazard Identification process had been undertaken such as Risk Workshops or Hazard Identification meetings. This was contrary to the guidance issued within the Project Oriented Safety Management System contained within ASEMS.

1.4.340. During interviews D Cap and DE&S staff stated that platform hazards were reviewed during the annual Platform Safety and Environmental Panels (PSEPs). PSEPs will be discussed later in this section. Witness 21 Witness 33 Witness 36

1.4.341. The Panel found no evidence that a formal Hazard Identification process was conducted during the procurement of JACKAL and that periodic meetings, other than the PSEPs, had not been conducted. As a result, the basis of the Hazard Log contents could not be traced. Moreover, there was no evidence to show End Users were consulted when constructing and reviewing the Hazard Log. In the opinion of the Panel, the lack of End User input into the Hazard Log undermined the ability to accurately capture all day-to-day operating risks associated with JACKAL.

1.4.342. As a result of the findings above, the Panel conducted a review of the hazards contained within the Hazard Log and found that hazards such as terrain, environmental factors and tyre traction were not listed despite them being raised as concerns during informal discussions between members of the user community and the Panel. The Panel believes that the lack of periodic Hazard Identification meetings attended by End Users has detrimentally affected the identification of hazards within the Hazard Log. The Panel finds that the lack of Hazard Working Groups is a **Contributory Factor**. Exhibit 150 Exhibit 151 Witness 21

1.4.343. **Recommendation. Director Capability should establish routine Hazard Identification meetings to include End User attendance for all Armoured Vehicles in order to understand and review the safety concerns of those who routinely operate Armoured Vehicles.**

1.4.344. The Panel conducted a review of Hazard Log Accident reference A17 – Road Traffic Incident (RTI) Roll over. The Panel found that the Hazard Log identified nine hazards that could potentially lead to a vehicle roll over accident. The Accident-Hazard-Control sequence is depicted at Figure 1.4.55. In order to further refine the analysis of the Hazard Log, the Panel reviewed the hazard H4 Driver Skill Level and its associated controls. The HMTV Hazard Log description of this hazard is: Exhibit 150

> *"Driver confidence and skill fades over a period of time, especially using NVG [Night Vision Goggles] / IR [Infra-Red] Lights. Knowledge and experience are a perishable skill for driving bespoke platforms and will be lost if not periodically*

refreshed or continued driving is maintained. Driver skill level also encompasses inexperienced drivers/commanders and drivers undergoing training."

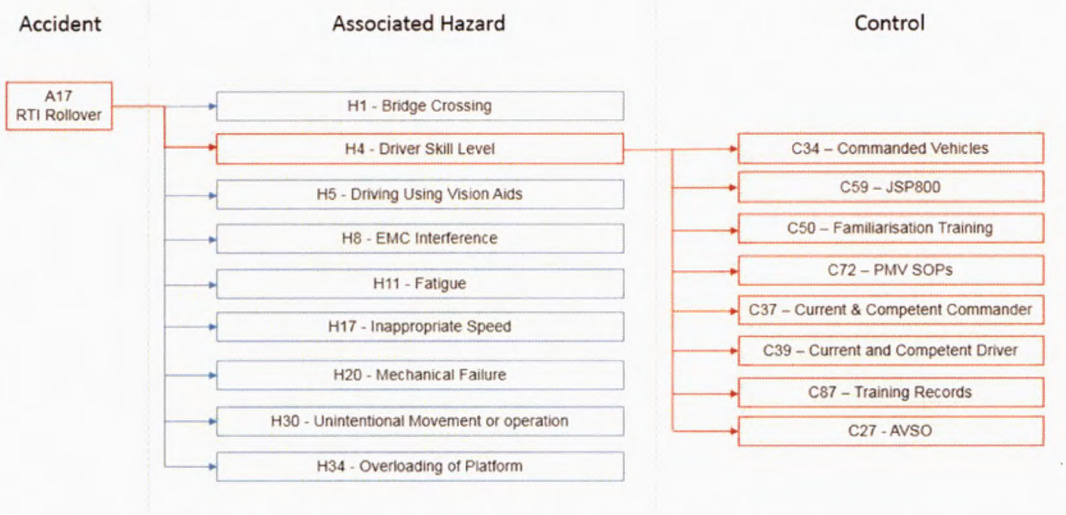

Figure 1.4. 55 – Graphical representation of vehicle roll over accident and associated hazards and controls

1.4.345. In the opinion of the Panel, the Hazard Log identified an accident and a hazard. It correctly articulated that skill level would deteriorate over time if not periodically practised and that skill was developed with greater exposure and experience. Exhibit 150

1.4.346. Despite capturing the elements of driver skill level correctly, the Panel believes that Driver Skill Level is not a hazard but rather a control against other hazards. The definition of hazard refers to a physical situation or state, neither of which is a description of Driver Skill Level. In this instance, the Panel believes that the primary hazard was 'Loss of control of the vehicle' and that 'Driver Skill Level' was one of the controls that failed, leading to the accident. The Panel concluded that the identification of Driver Skill Level as a hazard is an **Observation.** Exhibit 150

1.4.347. Notwithstanding the Panel's view regarding the allocation of Driver Skill Level as a hazard, the Panel reviewed the controls identified to mitigate the hazard. The HMTV Hazard Log detailed eight associated controls with the hazard, one of which was a historic control that was no longer in use, PMV SOPs[53]. Table 1.4.4 details the seven active controls and corresponding statements and references. Exhibit 150

[53] Protected Mobility Vehicle Standard Operating Procedures are no longer in circulation.

Control No	Control Name	Description	References
C34	Commanded Vehicles	The vehicle commander will ensure the driver does not drive the vehicle in an inappropriate manner that could cause injury to crew, occupants and third parties.	Nil
C59	JSP 800	Stipulations and guidelines from JSP 800 including volumes 3, 5 and 7.	Nil
C50	Familiarisation Training	Driver refamiliarization training every 6 months.	Nil
C37	Current and competent Commander	Competent meaning that they have completed all necessary training required, have gained all relevant experience to perform any tasks required and are current. Commander training course to be included.	Nil
C39	Current and competent Driver	Competent meaning that they have completed all necessary training required, have gained all relevant experience to perform any tasks required and are current. Driver training course including NVG element conducted by DMIs. Driver training course to be included.	Nil
C87	Training Records	Training records are held within Unit.	Nil
C27	AVSOs	Armoured Vehicle Standing Orders – Currency.	Nil

Table 1.4. 4 – Active controls for driver skill level hazard

1.4.348. Although detailed analysis of JSP 800, AVSOs, Currency and Competency will be covered later in the report, the Panel noted the following regarding the Control effectiveness.

1.4.349. **Analysis of C34 and C37 – Commanded vehicles and Commander currency and competency.** AVSO Para 1-07 identifies the responsibilities of a commander as *"responsible for the operation of the vehicle, the safety of its crew (Including associated dismounts), its equipment and all other passengers by the operation of the AV".* Exhibit 12

1.4.350. The Panel believe that the provision of a vehicle commander reduces the risks associated with low driver skill level when appropriate training, competency, currency and supervision are in place. The Panel found that the commander training course included limited training in vehicle safe operating envelopes, terrain and route selection and practical driving. Furthermore, commanders were not provided with any training regarding dynamic risk assessments or human factors. Exhibit 152

1.4.351. Upon qualification, commanders do not undertake any periodic practical assessment of their competency in role although they are mandated to conduct annual continuation training in line with AVSOs.

1.4.352. The Panel concluded that the level of training and currency requirements did not provide commanders with the knowledge or skills to appropriately supervise drivers or intervene where required. As a result of the training provided, the Panel found that the controls C34 and C37 were weak at the time of the accident.

1.4.353. **Analysis of C59 – JSP 800[54].** JSP 800 is a comprehensive set of transport guidelines providing Defence policy on Movement and Transport; as such JSP 800 does not comment on platform specific driving standards. Exhibit 153

1.4.354. JSP 800 is a significant suite of documents, Volume 5, as an example, is over 1000 pages. Whilst the Panel found some references to driver training and licencing requirements the extent to which they mitigated a failure in Driver Skill Level was viewed as limited. The Panel therefore believes that JSP 800 as a control measure for H4 is weak. JSP 800 will be covered in more detail during the 'Safe Practice' element of this report.

1.4.355. **Analysis of C50 – Familiarisation Training.** The Panel was unable to find any policies or orders that mandated 6 monthly familiarisation training as detailed within the Hazard Log. Exhibit 12

1.4.356. AVSOs contained two policies regarding periodic training. The first related to those who had not operated the vehicle for 12 months, detailing the requirement for return-to-role training. The second policy mandated a 12 monthly annual assessment for all AV crew members. Exhibit 16

1.4.357. Further analysis of the Annual Assessment requirement highlighted that no practical driving assessment was required and that the basis of the checks was primarily related to maintenance activities. The Panel concluded that no 6-monthly Familiarisation Training was mandated and therefore the control was not in place. Exhibit 16

1.4.358. **Analysis of C39 – Current and Competent Driver.** The currency and competency of the driver directly impacts driver skill level. The control, however, does not link to any reference material that stipulates how competency is gained or assessed. A review of policy conducted by the Panel demonstrated that, beyond initial qualification, there is no further check of competence. The only currency policy found by the Panel was the requirement to conduct return-to-role training if away from the platform for more than 12 months, essentially describing a once per year driving requirement. The Panel believes that operating the vehicle once per year would not be adequate to maintain the skillset required to operate the vehicle in challenging terrain. Moreover, there is no requirement to maintain any form of cross-country driving currency. The Panel found that the control C39 was not in place. Exhibit 12

[54] Joint Service Publication (JSP) – An authoritative policy or guideline published for pan Defence compliance.

1.4.359. **Analysis of C87 – Training Records.** Training records do not affect driver skill level. Instead they provide the auditable evidence trail to provide assurance against controls C37, C39 and C50. The Panel concluded that Training Records are not a control measure but, instead, a linked reference to the other controls. Exhibit 155

1.4.360. **Analysis of C27 – AVSOs.** Similar to C87, the Panel believes that the currency requirements stipulated within AVSOs support the controls C37, C39 and C50. The Panel found AVSOs should therefore be linked evidence to support those controls rather than a control in its own right. Exhibit 156

1.4.361. **Conclusion of Active Controls against H4.** In summary, the Panel concluded that the controls stated within the Hazard Log in mitigation of H4 lacked detail and were weak in most cases. As a result of the inaccuracies found by the Panel and the broad nature of many of the controls, it is the Panel's opinion that the intent of each is not understood by those who are responsible for the management and oversight of the Hazard Log. The Panel finds that the controls in place to mitigate and reduce the risk posed by Driver Skill Level and the associated accident RTI Roll Over were a **Contributory Factor**.

1.4.362. Whilst the Panel concentrated their analysis on one Hazard-Control branch, it is likely that similar issues existed throughout the HMTV Hazard Log. Additionally, the Panel discovered that the personnel charged with the management of the HMTV Hazard Log are also responsible for other platforms within the land environment. The Panel concluded, therefore, that this issue could be transposed across multiple platforms.

Hazard Log Conclusion

1.4.363. The Panel concluded that the HMTV Hazard Log did not support the Platform SC. Due to a lack of evidence to support a robust hazard identification process, the Panel found that it was likely that not all hazards had been identified and that several of those listed were incorrectly identified. Exhibit 150

1.4.364. It is likely that little or no formal Hazard Identification took place during the initial procurement of JACKAL and likely that End User involvement in hazard identification has been minimal throughout the lifecycle of the platform. This is evidenced by the poor quality controls listed within the hazard log and the absence of some hazards altogether. During the Inquiry, the Panel conducted its own hazard analysis of the accident sequence using the Bow Tie methodology described within DSA03.DLSR.LSSR to assess the effectiveness of the controls in place at the time of the accident and those that could have been implemented. The Bow Tie produced by the Panel is at Annex A. The Panel found that the Bow Tie provided a useful method to identify hazards and controls and to communicate the overall risk profile through an easy to understand diagram. Exhibit 67 Exhibit 150

1.4.365. The Panel also noted that although eCassandra provides adequate functionality for capturing and managing risks, its facility to communicate hazards, controls and the associated overall risk held by a platform is poor. This was Witness 42 Witness 43

evidenced during interviews at unit level, where COs and other End Users were not aware of the Hazard Log or its contents. Noting the dispersal of platforms across multiple units, this deficiency undermined the ability of End Users to understand the risks and controls associated with the platform and therefore, reduced the overall effectiveness of the Hazard Log as a risk management tool. The Panel finds that poor communication of the hazards and associated controls to unit supervisory personnel was a **Contributory Factor**.

1.4.366. **Recommendation. The Director Land Equipment should improve the process for communicating risks and associated controls in order to ensure risks and hazards are clearly understood by those responsible for managing and owning equipment operating risk.**

1.4.367. As a result of the observations above, the Panel concluded that the HMTV Hazard Log does not support the overall SC. The Panel finds that the contents, management and distribution of the HMTV Hazard Log was a **Contributory Factor**.

1.4.368. **Recommendation. Head Vehicle Support Team should conduct a full High Mobility Truck Variant Hazard Log Review in order to ensure that it accurately captures all credible hazards, applies appropriate controls and identifies residual risk.**

1.4.369. The Panel did not review all AV platform Hazard Logs, however, it noted that a number of UOR to Core platforms are managed by the same personnel as HMTV and are therefore likely to exhibit similar traits. The Panel concluded that the potential read across of findings to other UOR to Core platform Hazard Logs is an **Observation**.

Army Equipment Support Publications (AESP)

1.4.370. AESPs are a suite of platform specific publications that communicate technical information to the End User. Used by HQ staff, equipment operators and maintenance personnel, AESPs detail operating and maintenance procedures, platform limitations, cautions and warnings along with additional technical and parts details. Exhibit 157

1.4.371. In relation to a SC, the AESPs provide some of the mitigations against the residual risks identified within the Part 2 SC. They provide the practices and limitations under which the safe operation of the platform is bound. To enable ease of access and assure configuration control, AESPs are available on-line via the Technical Documents On Line (TDOL) webpage from where they can be printed in hard copy if required. Authority for the HMTV AESP is held by DE&S. Exhibit 158

1.4.372. In relation to this accident, the Panel reviewed the HMTV Operator's Manual section of the AESPs to confirm the practices and limitations that were available to the instructors and students immediately prior to the accident. Whilst the AESP does not detail specific driving advice, the document contains operating limitations, warnings and cautions that are pertinent to this accident. Exhibit 158

Army Equipment Support Publication (AESP) analysis

1.4.373. **Vehicle Limitations.** Chapter 1 of the Operator's Manual identifies the technical data for each of the HMTV platforms. Specific limitations are listed as seen in Figure 1.4.56.

Exhibit 22

Serial	Criteria	[redacted]	[redacted]	JACKAL	JACKAL 2	COYOTE	MSV
Physical data							
1	Length:						
2	Width:						
3	Height: Min Max						
4	Weight: Unladen Gross Vehicle Axle 1 Axle 2 Axle 3 Gross Train Weight (GTW)						
5	Wheels: Rim size Tyre Tyre pressure						
6	Rear load bed: Width Length						
Performance data							
7	Payload						
8	Fuel consumption						
9	Range						
10	Top Speed						
11	Fording depth						
12	Turning circle (kerb to kerb)						
13	Approach angle						
14	Departure angle						
15	Gradient						
16	Ground Clearance: Air out (Bump stops) On Road Off Road Max (Rebound stops, load dependent)						

Figure 1.4. 56 – High Mobility Truck Variant limitations table

1.4.374. Analysis of Figure 1.4.56 found that the Limitations Table did not include traversing or tilt angle limitations for any HMTV platform. Whilst maximum gradients and approach and departure angles (highlighted in the red box) were

Exhibit 22
Witness 1a
Witness 1b

published, the full spectrum of limitations was not available to the operator. Furthermore, the use of degrees and gradient percentages was not consistent and led to confusion. During interviews the Panel discovered that JACKAL operators did not commit these limitations to memory. Witness 2

1.4.375. **Vehicle Warnings and Cautions.** Further analysis of the AESPs found 150 Warnings and 64 Cautions relating to the safe use of HMTV JACKAL. The Panel found four warnings and one caution relevant to this accident. Exhibit 22

1.4.376. The AESP references the 'safety envelope' in two of the warnings reviewed by the Panel (see Figures 1.4.57 and 1.4.58). Upon further analysis, the Panel was unable to find any description of the 'safety envelope' contained within the AESPs. As a result, the Panel found that operators had no means to identify whether they were correctly applying the contents of these warnings. The Panel finds that the lack of safety envelope definition was an **Other Factor.**

Figure 1.4. 57 – Roll Over Protection System commander's safety envelope warning

Figure 1.4. 58 – Roll Over Protection System rear crew seats safety envelope warning

1.4.377. The AESP clearly identified the requirement to wear the seat harness at all times (see Figure 1.4.59). This was further supported by descriptions of the harness components and information on its operation later in the document, including how to adjust the straps, release the buckle and the importance of safety harness quick release checks prior to a mission. The Panel finds that information regarding seat harness use was **not a factor**. Exhibit 22

Figure 1.4. 59 – Harness warning

1.4.378. The ROPS bars on JACKAL are foldable to enable air transportation. The warning at Figure 1.4.60 was placed within the AESP to highlight the potential hazard posed by failing to raise the ROPS prior to operating the vehicle. Chapter 3 of AESP 201 clearly identified the lowering and raising procedure for the ROPS. At the time of the accident, the Panel found that the ROPS bars were fitted correctly and finds that this was **not a factor**. Exhibit 22

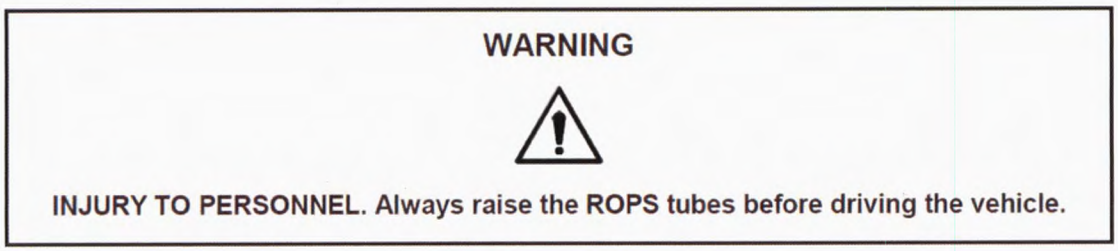

Figure 1.4. 60 – Raise Roll Over Protection System warning

1.4.379. The AESP also includes a caution that relates to the preservation of the platform after a roll-over accident and communicates the dangers associated with an overturned engine (see Figure 1.4.61). The AESP does not cover roll over drills for occupants. Personal roll over drills will be discussed in the Safe Practice section of this report. Exhibit 22

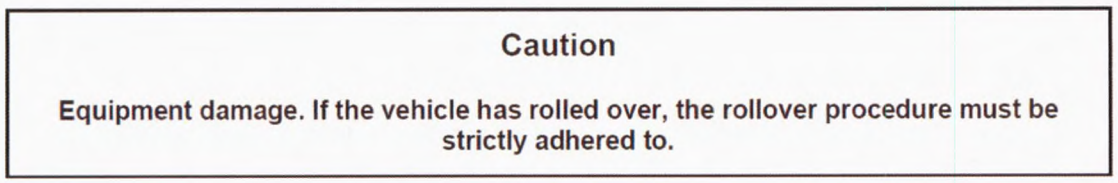

Figure 1.4. 61 – Equipment roll over caution

1.4.380. Throughout the inquiry, the Panel discussed the hazards associated with operating vehicles cross-country and, in particular, the increased dangers associated with open architecture vehicles due to foreign object penetration into the crew space. A full review of the AESP warnings and cautions found that this hazard was not captured within the AESPs. The Panel finds that the lack of warnings or cautions relating to the unique hazards associated with operating an open architecture vehicle in the cross-country environment is an **Other Factor**. Exhibit 22 Exhibit 150

1.4.381. **Conclusion.** AESPs are the definitive reference source of vehicle information for platform operators, supervisors and the maintainers and should support the SC by providing a definitive safe operating envelope and limitations where required. The Panel found that the AESPs supporting HMTV operations Exhibit 157

were relatively well written and correctly structured. However, in the opinion of the Panel, the AESPs failed to communicate some of the hazards presented by the operation of the HMTV fleet, particularly those presented by open-architecture vehicles in the cross-country environment. The AESPs also failed to communicate important safety information, such as the crew safety envelope and vehicle operating limitations. The AESPs also contributed to End User confusion due to the non-standardised use of units of measure. The Panel finds that the contents and more importantly the omissions found within the HMTV AESPs were a **Contributory Factor**.

1.4.382. **Recommendation. Head Vehicle Support Team should revise the High Mobility Truck Variant Army Equipment Support Publications in order to ensure all hazards, operating limitations and safety envelopes are communicated to the End User.**

Safety and Environmental Case Report (SECR) analysis

1.4.383. At the time of the accident, the HMTV fleet was supported by an independently produced Part 3 SECR dated June 2017.

Exhibit 159
Exhibit 160

1.4.384. The SECR was commissioned by DE&S and supported by the Platform Safety and Environmental Panel held in 2016 and the platform Hazard Log. The HMTV SECR at the time of the accident was signed by the following personnel:

Exhibit 159
Exhibit 160

a. Protected Mobility Vehicle Programme (PMVP) Safety Manager;

b. PMVP Service Delivery Manager;

c. PMVP Delivery Team Leader;

d. Front Line Command Capability Sponsor – Assistant Head Combat (AH Cbt) on behalf of Head of Capability Combat (HoC Cbt).

Safety and Environmental Case Report management

1.4.385. The SECR is managed by SC Managers on behalf of D Cap using the Equipment Safety Matrix Improved (ESMI) spreadsheet to track SECR activity across the Land Domain. The SC Managers ensure that SECRs are reviewed periodically and that current versions are annotated on the ESMI. The Panel found that SC Managers are not responsible for the contents of the SECR itself and do not provide any assurance that the SECR supports the safety argument for the equipment.

Exhibit 159
Exhibit 160
Exhibit 161
Exhibit 162
Witness 33
Witness 36

1.4.386. The Panel reviewed the ESMI and found that the HMTV SECR version annotated on the spreadsheet was out of date. As a result, the ESMI did not capture the 2017 version of the SECR. The Panel was unable to determine the exact reason for this error. The Panel finds that the out of date information captured on the ESMI was an **Other Factor**.

Exhibit 162
Witness 33
Witness 36

1.4.387. **Recommendation. Director Capability should conduct an assurance review of the Equipment Safety Matrix Improved to ensure that it is accurate in order to ensure Safety Cases are appropriately managed.**

Safety and Environmental Case Report 2017

1.4.388. The 2017 version of the HMTV SECR uses the Claims Argument Evidence (CAE) Network methodology to demonstrate that the platform is 'Safe by Design' and 'Safe to Operate'. CAE is an industry standard notation system that follows the conventions illustrated in Figure 1.4.62. Exhibit 159

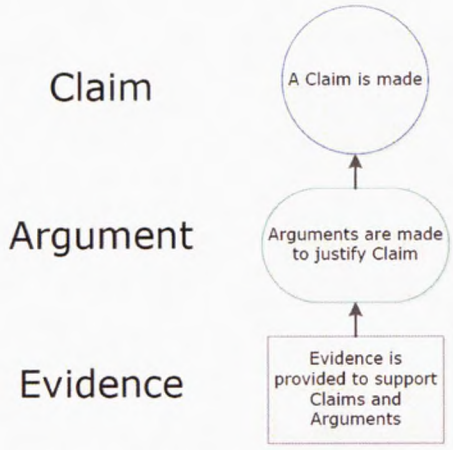

Figure 1.4. 62 – Claims Argument Evidence methodology

1.4.389. In simple terms, the SECR makes a top-level safety claim. The report then articulates structured arguments to support the safety claim. These arguments are in turn supported through the use of evidence. Exhibit 159

1.4.390. The HMTV top-level safety claim states:

a. *"HMTV Fleet is, and will continue to be, acceptably safe throughout its operational life";*

To support this claim, the SECR makes two further sub claims:

b. *"The design of the HMTV Fleet satisfies the defined safety requirements";*

c. *"Measures are in place to ensure that the HMTV Fleet remain* (sic) *acceptably safe and that all residual risks associated with the HMTV Fleet are ALARP".*

1.4.391. The Panel discovered significant gaps within the evidence to support the SECR, some of which has been highlighted earlier within this section. These concerns were raised through the Director General Defence Safety Authority (DG DSA) as Urgent Safety Advice (Annex B) and, as a result, DE&S tasked an internal review of the HMTV SC.

1.4.392. Due to the nature of the DE&S review, the Panel was not required to conduct a full analysis of the HMTV SECR. However, as evidence of the Panel's concerns, the following statement was found within the Executive Summary of the extant SECR: Exhibit 159

> *"The evidence collated for HMTV in support of the safety argument and sub claims is incomplete, and therefore at this time does not substantiate the top-level claim that the HMTV Fleet is and will continue to be acceptably safe throughout its operational life".*

1.4.393. The Panel was unable to find any further analysis that had been conducted to rectify the concerns raised within the SECR regarding availability of evidence and concludes, therefore, that the Top-Level Claim remains unsupported. In the opinion of the Panel, the consequences of the Top-Level Claim being unsubstantiated is not fully understood by DE&S or D Cap, who are ultimately responsible for the provision of Safe Equipment. Witness 23 Witness 25 Witness 33 Witness 36

1.4.394. Although the SECR identifies a lack of evidence within the Executive Summary and the body of the report, the Panel found that the overall quality of the SECR was poor and failed to correctly identify the areas where evidence was missing. Throughout the SECR, the use of colour coding is used to highlight where claims and arguments are supported by evidence. The introduction of the SECR describes the colour coding that will be used (see Table 1.4.5). Exhibit 159

Colour Code	Status
Red	There is a low level of confidence in the claim, or argument or the evidence is not currently in place.
Amber	There is a moderate level of confidence in the claim or argument or the evidence is partially in place or is awaiting completion of testing or analysis
Green	There is a high level of confidence in the claim or argument or the evidence is currently in place

Table 1.4. 5 – Safety and Environmental Case Report colour coding matrix

1.4.395. Reviewing the top-level safety claim, that the HMTV Fleet is, and will continue to be, acceptably safe throughout its operational life, the SECR concluded that only a medium level of confidence could be supported due to the level of evidence available to support the claim. Despite this analysis, the SECR contained a Claim, Argument flow diagram colour-coded green, indicating a high level of confidence (see Figure 1.4.63). Exhibit 159

Exhibit 159

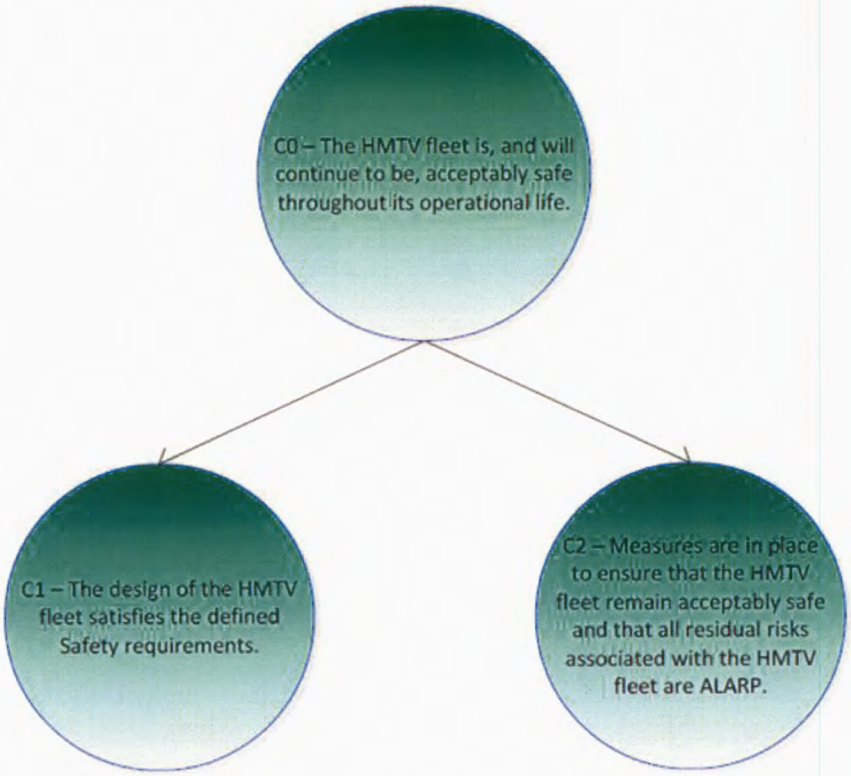

Figure 1.4. 63 – Safety claim diagram

Exhibit 159

1.4.396. The Panel reviewed the entire SECR and found similar anomalies throughout the document. In the opinion of the Panel, the incorrect application of colour-coding throughout the document misleads the reader, failing to correctly articulate the level of evidence supporting the safety claims. The Panel also believes that had the SECR been scrutinised correctly by both DE&S and D Cap staff, then the colour-coding concerns would have been identified and the document corrected. The Panel finds that the misapplication of colour-coding throughout the SECR led to incorrect conclusions being made over the safety of the vehicle and is a **Contributory Factor**.

1.4.397. **Recommendation. Head Vehicle Support Team should rewrite the High Mobility Truck Variant Safety and Environmental Case Report applying the correct colour-coding to the safety Claims and Arguments commensurate with the evidence available in order to clearly identify the level of evidence that has been reviewed to substantiate the claim and articulate the overall Safety Case confidence.**

Safety and Environmental Case Report assurance

Exhibit 159
Exhibit 160
Exhibit 320
Witness 21
Witness 25
Witness 33
Witness 36

1.4.398. SECRs produced by DE&S are not assured by D Cap on behalf of the Army. D Cap SC Managers confirm that SECRs are routinely updated and assessed through the PSEPs; they are not responsible for providing any analysis of SECR contents. The Panel found that D Cap platform Desk Officers are responsible for conducting SECR reviews, however, the Panel also believes that it

is very likely that these individuals do not have access to the evidence to conduct a full review. It is likely that, in the case of the HMTV SECR, the colour-coding was used to conduct a high-level review and that the Desk Officer and signatory did not appreciate the significance of the comments regarding a lack of evidence.

1.4.399. The lack of formal assurance activity by D Cap removes the ability for the Army to hold DE&S to account and check that the safe by design claim is underpinned with evidence. The Panel finds that the lack of SC Assurance activity by D Cap was a **Contributory Factor**.

1.4.400. **Recommendation. Director Capability should conduct formal Safety and Environmental Case Report reviews with Defence Equipment and Support in order to ensure all safety claims are underpinned by appropriate levels of evidence.**

Safety and Environmental Case Report conclusion

1.4.401. The Panel concludes that the 2017 HMTV SECR does not substantiate the top-level safety claim due to a lack of evidence to support the safety arguments. Although the document was signed by all relevant parties, it is the opinion of the Panel that the lack of supporting evidence from the Part 2 SC was not fully understood by either DE&S or D Cap. Although a lack of supporting evidence was highlighted within the Executive Summary of the SECR, the colour-coding has misled the reader into a false sense of security. Exhibit 159 Exhibit 160

1.4.402. The lack of D Cap SECR assurance undermined the ability to correctly identify the shortfalls in the HMTV SC and rectify them through detailed analysis of the evidence available. In the opinion of the Panel, the SECR failed to identify the shortfalls in the Part 1 and Part 2 SCs and therefore failed to articulate the overall status of the HMTV safety argument.

Part 3 Safety Case conclusion

1.4.403. The Panel concluded that the Part 3 SC did not support the claim that JACKAL was safe to operate. The Hazard Log was incomplete, difficult to understand and failed to communicate important hazards and controls to the End User and supervisory staff. Exhibit 150

1.4.404. The AESPs did not provide the End User with important safety envelopes or limitations. Warnings and Cautions were numerous, but not all hazards and risks were articulated. Exhibit 150 Exhibit 158

1.4.405. The SECR correctly identified a lack of supporting evidence in the Executive Summary and subsequent body of the document. However, due to the misapplication of colour-coding, the reader was likely misled, believing a high level of supporting evidence existed. The lack of SECR assurance by D Cap limited the ability of the Army to ensure equipment was safe by design and that all associated hazards had been captured. Exhibit 159

1.4.406. The overall contribution of the Part 3 SC was compromised by errors and omissions in the three primary supporting documents, (the Hazard Log, AESPs & SECR). The Panel concluded that the Part 3 SC did not support the overall safety claim for the vehicle. The Panel finds that the Part 3 SC was a **Contributory Factor**. Exhibit 159

JACKAL Safety Case conclusion

1.4.407. In the opinion of the Panel, the HMTV SC failed to support the safety argument. The Panel could not find either a URD or SRD as evidence of a Part 1 SC. Using a draft SRD Compliance Matrix, the Panel discovered that a number of safety requirements were not achieved during the trials conducted both during development and later in the platform's life. Exhibit 118 Exhibit 119 Exhibit 150 Exhibit 151

1.4.408. The Part 2 SC took months to access and, when finally available, it was almost impossible to navigate due to the lack of an organised filing system. In many cases, the documents and files that the Panel managed to access provided evidence of failed compliance tests rather than supporting the safety requirements of the Part 1 SC. Of particular note was the evidence pertaining to vehicle stability, ROPS functionality and tilt limitations. Exhibit 120 Exhibit 121 Exhibit 122 Exhibit 134 Exhibit 159

1.4.409. Due to the Part 2 SC findings, the overall safety claim could not be substantiated. As a result, the Part 3 SC was compromised by a lack of supporting evidence. The Hazard Log failed to adequately assess and control all of the hazards whilst the AESPs did not contain a number of hazards associated with JACKAL operations. Finally, the SECR correctly identified the lack of supporting evidence but failed to communicate this concern appropriately through the misapplication of colour-coding within the document. Exhibit 121 Exhibit 122 Exhibit 150 Exhibit 158 Exhibit 159

1.4.410. The Panel believes that the UOR procurement route almost certainly contributed to the deficiencies in the Part 1 SC and the lack of evidence within the Part 2 SC. However, the Panel also believes that the opportunity to rectify these issues was missed when HMTV was brought in to Core. The SECR 2017 highlighted evidential deficiencies in the Executive Summary but this was not analysed further by DE&S or D Cap, again missing an opportunity to fully reassess the HMTV safety argument. Exhibit 113 Exhibit 183 Witness 21 Witness 25 Witness 33 Witness 36

1.4.411. In the opinion of the Panel it is likely that the historic lack of fatalities or serious injuries associated with JACKAL operations contributed to DE&S and D Cap staff assuming that the platform was safe, despite contradictory evidence. The Panel also believes that it is likely that the Part 2 evidence had not been reviewed for many years and so the totality of the trials reports was not understood. The organisational culture which may have led to this behaviour will be reviewed within the final section of this report. Witness 21 Witness 25 Witness 33 Witness 36

1.4.412. The Panel finds that the poor quality of the HMTV SC was a **Contributory Factor**.

The Defence Equipment and Support Safety and Environmental Management System (SEMS)

1.4.413. The Land Equipment Operating Centre (LEOC) SEMS was the overarching document endorsed by Director Land Equipment (D LE). The LEOC SEMS provided the essential framework for every department within the LEOC and set the relevant policies, procedures and processes to be followed. The Protected Mobility Vehicle Programme (PMVP)[55] SEMS was subordinate to the LEOC SEMS and, as such, the PMVP SEMS should have interpreted the policy, procedures and processes within the LEOC SEMS and detailed how the PMVP would apply the higher-level policy.

Exhibit 166
Exhibit 167
Exhibit 166
Exhibit 167

1.4.414. At the time of the accident, the LEOC SEMS dated June 2018 and the PMVP SEMS dated December 2016 were extant. Following the transition of PMVP to VST no subsequent SEMS had been published prior to the accident in January 2019.

Exhibit 165

1.4.415. The PMVP SEMS was published in December 2016 prior to the LEOC SEMS and was based on the requirements within the Operational Support Programme SEMS Issue 5 dated March 2016.

1.4.416. Due to the then recent departmental changes within the LEOC, Platform and Operating Centre SEMS had not been aligned. An example of this was the lack of a current VST SEMS which managed the HMTV Fleet. Whilst it could be argued that the recency of the changes in the department caused the misalignment of the SEMS (VST only formed in October 2018) it is the opinion of the Panel that the risks associated with the changes and impact on safety management had not been well managed. As a result, the Panel found several discrepancies between the documents. The planned introduction of a new Acquisition Safety Project[56] further exacerbated these discrepancies as teams awaited new guidelines as to how to manage the allocation of safety responsibilities across DE&S.

Exhibit 165
Exhibit 166
Exhibit 167
Witness 20
Witness 23

1.4.417. Whilst the Panel understood the need for change, the rate and amount of changes experienced by the team delivering JACKAL led to a lack of both understanding and coherence. An example of this was found during initial interviews when JACKAL Delivery Team (DT) members were unable to categorically state who was responsible for JACKAL safety at the time of the accident. The Panel finds that the lack of coherent and aligned SEMS within the LEOC is an **Other Factor**.

Witness 21
Witness 23
Witness 24
Witness 25

[55] PMVP transitioned to VST in October 2018 as DE&S team responsible for HMTV support.

[56] The Acquisition Safety Project is the framework used by DE&S to ensure delivery of services and equipment that are safe to operate. It offered a greater opportunity for training and career progression throughout the organisation.

1.4.418. **Recommendation. Director Land Equipment should issue a single Safety and Environmental Management System which is applicable across the Operating Centre in order to ensure coherence. Subordinate Safety and Equipment Management Systems should be incorporated into the Land Equipment Operating Centre Safety and Environmental Management System.**

Safety and Environmental Management Committee (SEMC)

1.4.419. The SEMC is the programme level body that determines policy, sets the safety and environmental strategy and is responsible for the effective safety and environmental management of all projects, equipment and systems within that programme. The committee is responsible for monitoring and controlling the management activities undertaken for all systems operating under its Safety and Environmental Management Plan (SEMP) and co-ordinating the efforts of the individual Safety and Environmental Panels within a given platform portfolio. For JACKAL, the SEMC was chaired by Hd VST and provided oversight of all VST platforms.

Exhibit 166
Exhibit 168

1.4.420. Due to the departmental changes highlighted in Para 1.4.416, there were a number of documents that referred to the SEMC. As a result of the changes and the lag in the production of up to date safety governance documentation, the Panel found that many contained contradictory information. As a result, the Panel was unable to confidently ascertain the exact membership and the Chair of the meeting. However, consistent throughout the different documents was the requirement for the committee to be attended by Suitably Qualified and Experienced Personnel (SQEP) and for the Chair to hold a letter of delegation.

Exhibit 165
Exhibit 166
Exhibit 167

1.4.421. A review of SEMC minutes indicated that, on several occasions, key members had not been present and that the Chair had not held the correct delegation. As a result, and in accordance with extant policy, the committee meetings should have been downgraded to Working Groups; the Panel found that this had not occurred. The Panel finds that the lack of SEMC adherence to LEOC policy is an **Observation**.

Exhibit 169
Exhibit 170
Exhibit 273
Exhibit 274

Safety and Environmental Management Plan (SEMP)

1.4.422. A SEMP should be produced to document how the SEMS is to be applied to the platform. It should be used to set out and record the Safety and Environmental Management arrangements for the platform and the actions and processes to be followed to ensure continued safe operation and support of the platform.

1.4.423. The current HMTV SEMP is dated 5 May 2017. The HMTV SEMP identifies the organisational structure of the DT and explains how the management of the HMTV SC will be conducted. Although out of date in some areas, specifically the organisational structure and the high-level reference policy documents, the HMTV SEMP does stipulate the requirement for Platform Safety and Environmental Panels (PSEP) and the requirement for the SECR. As detailed

Exhibit 150
Exhibit 159
Exhibit 160
Exhibit 168

within the SEMP, it is the PSEP meeting that conducts the ongoing annual assurance that the platform risks remain ALARP and tolerable and reviews the Hazard Log to confirm applicability of hazards and associated controls.

1.4.424. In relation to safety management, the PSEP was critical as it provided the opportunity for Subject Matter Experts (SMEs) and stakeholders to review the Hazard Log, review safety performance and comment on accidents and incidents. The HMTV SEMP clearly defined the role of the PSEP and the membership required to ensure safety was managed to an appropriate level. If attendance did not meet the requirements within the SEMP, the SEMP mandated that the PSEP should be downgraded to a Working Group the impact of which would have been that the acceptance of the ALARP and tolerable statement could not have been approved. Exhibit 150 Exhibit 168

HMTV Platform Safety and Environmental Panel (PSEP).

1.4.425. As the formal meeting that manages and assures all elements of platform safety, the Panel opined that the PSEP should be coordinated and managed by the individual responsible for the overall management of equipment safety across all DLoDs. As detailed within ACSO 3216, D Cap is the individual responsible for the through-life management of land equipment safety and has responsibility for ensuring that all DLoDs support the safe operation of a platform. The Panel concluded that D Cap or a formally delegated individual should Chair the PSEP, manage attendance and endorse the ALARP and tolerable statement. Exhibit 168 Exhibit 171

1.4.426. The Panel reviewed the minutes of all PSEPs that were held on record and identified that the PSEP was routinely chaired by a DE&S platform manager rather than the D Cap representative. The Panel also identified that a number of meetings did not meet the attendance requirements of the SEMP. These meetings should have been downgraded to Working Groups. Furthermore, ALARP statements were approved at the end of these meetings. The Panel finds that the ownership of the PSEP was a **Contributory Factor.** Exhibit 159 Exhibit 150 Exhibit 171

1.4.427. **Recommendation. Director Capability should formally appoint a responsible person through a letter of delegation to manage and Chair all Platform Safety and Environmental Panels in order to ensure that equipment safety is appropriately managed across all Defence Lines of Development and that the as low as reasonably practicable and tolerable statement is endorsed on behalf of the Front Line Commands.**

1.4.428. The Panel reviewed the competence and experience of those attendees representing the End User. In the opinion of the Panel, many of the user representatives lacked the detailed knowledge of operating the platform in the current operational environment. Many of those listed in attendance were no longer qualified on the vehicle and their previous experience was limited. The Panel believes that the ability of these individuals to adequately sentence hazards and the effectiveness of associated mitigations was limited and that this lack of SQEP was reflected in the quality of the Hazard Log. The Panel finds that the lack of SQEP attendance at the PSEPs by End Users was a **Contributory Factor**. Exhibit 150 Exhibit 164 Witness 33

1.4.429. **Recommendation. Director Capability should define the membership and attendance of Platform Safety and Environmental Panels in order to ensure appropriately qualified and competent individuals are empowered to comment on platform safety.**

1.4.430. The annual review of the Hazard Log is an important element of the PSEP as it reaffirms the key assumptions made within the Part 3 SC. As previously mentioned, the HMTV Hazard Log is managed on the eCassandra application. Hosted on-line, one of the main benefits of eCassandra is the ability to access the log remotely, therefore enabling users to review hazards and controls prior to the meeting. A review of eCassandra account holders and interviews highlighted that not a single D Cap or D Sp HMTV PSEP attendee held an account. The Panel believe that it is likely that no Hazard Log reviews are carried out by user representatives prior to the PSEPs. The Panel finds that the lack of adequate Hazard Log analysis by End Users prior to PSEPs is a **Contributory Factor**. Exhibit 150 Exhibit 161 Exhibit 171 Witness 33

1.4.431. **Recommendation. Director Capability is to ensure all Army Platform Safety and Environmental Panel attendees obtain eCassandra accounts in order to enable a full Hazard Log review prior to all meetings of the Panel.**

Safety Management assurance

1.4.432. In order to ensure safety activities are conducted in line with legislation and policy, robust assurance mechanisms are defined within the DLSR regulations. In line with HSE policy, three Levels of assurance are provided. Exhibit 67 Exhibit 300

a. **1st Party (Internal) Assurance.** This is assurance activity undertaken within the department or unit conducting the activity. It is a self-assessment of adherence to policy and legislation;

b. **2nd Party (External) Assurance.** This level of assurance is conducted by one part of an organisation on another, for example by a functional area, eg the Army Inspector;

c. **3rd Party (External) Assurance.** This level of assurance is conducted by an organisation independent to the Auditees, eg the Land Systems Safety Regulator.

1.4.433. Whilst DE&S mandates assurance activity to take place, personnel constraints have limited the ability to routinely conduct assurance activity. Due to this constraint, DE&S conducts assurance activity on a 'Risk Based Approach' meaning that only platforms that are deemed high risk receive regular visits. HMTV had not received any form of external assurance activity since the SECR production in 2017. Exhibit 300 Exhibit 306 Witness 21

Independent Safety Auditor (ISA)

1.4.434. To maintain safety integrity across large and / or high-risk projects, it was advised that an ISA is appointed to provide independent assurance that safety Exhibit 67

requirements were met. The ISA should be acceptable to both contractor and the MOD, be independent of both organisations and have a good understanding of safety issues for systems of that type eg Land Systems, Air Systems, etc. For Level 1 and 2 SCs, the DLSR mandated the appointment of an ISA. In accordance with the DLSR regulations HMTV required a Level 2 SC and therefore, by definition, should have had an ISA appointed.

1.4.435. The LSSR regulations state that the ISA must have a well-defined role that is clearly understood by all parties. This role should include providing assurance by auditing safety processes and undertaking independent safety assessments. The role may change at different points through the life-cycle, but the ISA's independence must not be compromised by involving them in activities such as setting safety requirements, tender assessment or providing specific advice on engineering changes.

1.4.436. Analysis of HMTV related safety material, including SCs and PSEP minutes, demonstrates that ISAs have been employed at various times during the life-cycle of the vehicle but not continuously. The 2017 SECR reviewed earlier in this report was produced by an independent body. Exhibit 159 Exhibit 171

1.4.437. Recent PSEPs had not been attended by an ISA and, at the time of the accident, there was no ISA employed for HMTV. As a result, the Panel found that, at the time of the accident, HMTV safety was not being managed in accordance with DLSR regulations. The Panel finds that the absence of an ISA supporting HMTV safety is an **Other Factor**. Exhibit 171

1.4.438. **Recommendation. Head Vehicle Support Team should appoint an Independent Safety Auditor to the High Mobility Truck Variant project in order to provide independent assurance that safety requirements are met.**

Safe Practice

Definition

1.4.439. JSP 375 defines safe practices as those conducted strictly in accordance with drills, procedures and instructions laid down by the Service authorities. These drills and procedures, taking into account the Training Imperative, are identified in the SC and developed in accordance with the Defence Systems Approach to Training (DSAT). Safe Practice includes following correct procedures, the provision of effective supervision and delivery of effective training, the briefing of all warnings, cautions and controls together with the use of appropriate PPE. Training is only to be delivered by a competent person to ensure that procedures are strictly adhered to and such instruction and training is closely supervised by the Chain of Command to ensure Safe Practice is implemented. Exhibit 74

1.4.440. This section will discuss the practices specific to JACKAL operations as defined within Defence policy and vehicle specific limitations. The policy governing JACKAL operations is spread across multiple documents; as such this section will provide analysis of:

a. Defence Transport Policy;

b. JACKAL Policy and Orders;

c. JACKAL training.

Defence Transport Policy

Movement and Transport Safety Regulator (MTSR)

1.4.441. The MTSR is the lead within the DSA for the regulation of Movement and Transport (M&T)[57]. Working for the Defence Land Safety Regulator (DLSR), the MSTR is responsible for the regulation of planning, management, supervision and execution of Defence M&T activity worldwide. Through publication of DSA.02.DLSR Movement and Transport Regulations, the MTSR provides the regulatory framework to be followed by all members of the Armed Forces, civilian employees and others, including contractors. It should be noted that the regulations do not replace legislative requirements within the UK or abroad. Exhibit 68 Witness 40

1.4.442. In total there are 14 DSA.02.DLSR Movement and Transport Regulations. Nine of those are pertinent to this SI: Exhibit 68

a. Regulation 1 – M&T Safety Management;

b. Regulation 2 – M&T Competence;

c. Regulation 3 – Establishment of Safe Ways of Working;

d. Regulation 4 – Monitoring and Reviewing M&T Performance;

e. Regulation 7 – M&T Reporting;

f. Regulation 10 – Load Safety and Load Restraint;

g. Regulation 12 – Management and use of MOD vehicles;

h. Regulation 13 – Use of Operational Military Vehicles;

i. Regulation 14 – Driver Management.

1.4.443. The MTSR is split into three pillars: Regulate; Assure; and Analysis and Plans. The focus of the MTSR is to ensure that the use of M&T is safe. In order to do this, the MTSR has various levels of user interaction. The MTSR holds 6- Witness 40 Witness 41

[57] M&T includes the movement of vehicles, freight and personnel by road, rail, air and water; the safe use and management of road transport and Road Safety.

monthly Stakeholder Working Groups supported by standalone Editorial Working Groups, Safety Centre data and trend analysis. The Stakeholder Working Group reports into the Land Safety Regulator Stakeholder Committee. The MTSR provides user consultation via the assurance process and highlights possible areas of non-compliance.

1.4.444. To support End User regulatory compliance, the MTSR publishes supporting Defence Codes of Practice (DCoPs) within DSA.03.DLSR MTSR to provide acceptable means of compliance. DCoPs provide the regulatory advice which, if followed, would be considered sufficient to demonstrate compliance with the regulations. Guidance material may also be included which, whilst not compulsory, may also be considered good practice to further support the Regulations and DCoPs. Exhibit 69

1.4.445. A DCoP is provided for each Defence Regulation in the following format: Exhibit 69

a. **Regulation.** The Defence Regulation is reiterated in the relevant DCoP to aid clarity and reinforce the relationship and precedence of the Regulation to the DCoP;

b. **Rationale.** The reason why the Defence Regulation is applied to the MOD;

c. **DCoP.** Provides practical advice on how to comply with the Defence Regulation;

d. **Guidance Material.** Whilst not compulsory may be considered 'good practice'.

1.4.446. As top-level regulatory policy, it is not anticipated that all users will have a working knowledge of either DSA.02 or DSA.03 documents. Instead it is envisaged that the document will be used by those within the Chain of Command to construct their own policy and orders pertinent to their specific activity sets. Exhibit 68 Exhibit 69 Witness 40

JSP 800 – Defence Movement & Transport Policy

1.4.447. Subordinate to the MTSR regulatory documents, JSP 800 is managed by Defence Logistics Policy (Def Log Pol) and sets the overarching policy for MOD Transportation (Transport and Movements). JSP 800 is a substantial document covering a wide range of activities and associated policy. The document is divided into five volumes: Exhibit 208

a. Volume 2 – Passenger Travel Policy.

b. Volume 3 – Movement of Material Regulations;

c. Volume 5 – Road Transport Policy;

d. Volume 6 – Containers Management Regulations;

e. Volume 7 – Load Safety Regulations & Tie Down Schemes.

1.4.448. JSP 800 Volume 5 is the Defence policy for the management, control and operation of all Defence Road Transport. JSP 800 Volume 5 is divided into two parts. Part 1 is the Directive, providing an oversight of Road Transport policy, whilst Part 2 provides the ways by which to comply with the Part 1 Directive through a number of DCoPs, Policy Leaflets and general guidance. Exhibit 208

1.4.449. Although JSP 800 is a relatively high level document, it is assumed that a basic knowledge of the relevant parts of the document are understood at End User level, specifically knowledge regarding fatigue management, accident procedures and licencing requirements. Whilst JSP 800 covers all Defence driving activity, the Panel believes that its relevance to AV driving is limited. Exhibit 153 Witness 40 Witness 41

1.4.450. Analysis of MTSR regulations and JSP 800 found that there was an element of incoherence between the two documents. Whilst it was evident that work was being conducted to align the two documents, clear delineation was required between the regulatory and policy roles. The Panel concluded that the incoherence of MTSR regulatory documents and JSP 800 was an **Observation**. Exhibit 68 Exhibit 153

1.4.451. A review of JSP 800 highlighted the following policy that was pertinent to the accident. Volume 5, Part 2, Group 2, Section 4, Policy Leaflet 55 states: Exhibit 155

> ***"Cross-Country Driving Instruction**. Cross-country driving is defined as "driving a vehicle with cross-country capability in a controlled manner, without assistance, over terrain other than metalled roads and tracks and which presents problems associated with gullies, steep slopes, water obstacles, rough and uneven ground etc". All personnel required to drive a vehicle cross-country shall complete formal training, delivered by a Defence GS [General Service] Driver Conversion Instructor (DGSDCI) in line with the Defence GS Driver Training Package. Before undergoing cross-country driving instruction the driver shall hold the appropriate full licence category for the vehicle being driven."*

1.4.452. During the initial delivery of the JACKAL UOR capability, the Defence School of Transport (DST) delivered all JACKAL training. Training delivery was moved to the Armour Centre (ARMCEN) in 2013 as part of the UOR to Core transition. Exhibit 209 Exhibit 222

1.4.453. ARMCEN policy does not require AV DMIs to be qualified DGSDCIs as required by JSP 800. Additionally, there is no requirement for JACKAL driver students to have completed a cross-country driving course with a DGSDCI prior to commencing JACKAL training. As a result, many JACKAL drivers will not have completed cross-country driver training with a DGSDCI and are therefore not compliant with JSP 800. Exhibit 37 Exhibit 155

1.4.454. During the transition of JACKAL training from the DST to the ARMCEN, the lack of GS Module 1 and 2 qualification[58] was noted within a letter from Capability Director Combat (CD Cbt)[59]. As a result, the Panel believes that it is likely that the training deficiency was acknowledged and understood by the Capability Sponsor. The Panel believes that it was within the authority of the CD Cbt, as the owner of through-life capability safety and as the Training Requirements Authority (TRA) at the time, to accept any risk associated with the change in training. However, there are no records to show that this risk was fully assessed or that any formal exemption was requested from JSP 800. The lack of evidence of an exemption from JSP 800 for JACKAL cross-country driver training is an **Observation.** Exhibit 155 Exhibit 209 Exhibit 222

The Queen's Own Yeomanry (QOY) Motor Transport Standing Orders (MTSOs)

1.4.455. Standing Orders are designed to bring the requirements contained within higher level policy, such as JSP 800, to the attention of those required to follow them at unit level. MTSOs are lawful orders detailing vehicle management, operation, care and servicing. Exhibit 225

1.4.456. The Panel reviewed QOY MTSOs dated May 2015. These Orders were endorsed by the former QOY Commanding Officer (CO) on 1 January 2017 and were current at the time of the accident. Although reviewed and re-signed in 2017, there were several inaccuracies which were indicative of poor housekeeping. These included: Exhibit 224 Exhibit 226 Exhibit 227

a. Incorrect references to AVSOs;

b. Legacy forms that were no longer in use;

c. Incorrect roles and responsibilities.

1.4.457. JSP 800 mandates that MTSOs should be reviewed annually. Analysis of the QOY MTSOs shows that the most recent amendment was May 2017, although it is not clear whether this was a full review of the document. The Panel could not find any evidence of a review being conducted in 2018. The Panel finds that the lack of an auditable annual review of the QOY MTSOs is an **Observation**. Exhibit 211 Exhibit 224

1.4.458. The QOY MTSOs also include Driver Standing Orders (DSOs). These orders are published in order to communicate the latest driving policy to personnel operating MOD vehicles. JSP 800 mandates that all personnel who use MOD vehicles are to sign DSOs annually and conduct a Driving Licence check. Exhibit 210 Exhibit 226

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[58] The General Service Module 1 and 2 are driving qualifications gained by attendance at a DST approved training course. These courses included practical training and assessment of cross-country driving skills.

[59] CD Cbt was the 1* Army HQ appointment responsible for all Combat Capability. This role is now undertaken by HoC GM.

1.4.459. Inst 1 stated that he had signed DSOs during the 12 months preceding the accident. The Panel checked the Driver Training Records for all personnel and found that no record of Inst 1 signing orders was available and that Inst 2 had not signed since 9 July 2017. All the students had signed DSOs within the previous 12 months. The Panel concluded that the non-compliance with JSP 800 in relation to DSOs was an **Observation**.

Exhibit 18
Exhibit 19
Exhibit 20
Exhibit 34
Exhibit 315
Witness 1d

JACKAL/COYOTE Policy & Orders

Army Equipment Support Publications (AESPs)

1.4.460. The purpose and content of AESPs was discussed in the Equipment section of this report. For the purpose of this section, analysis will focus on the specific element of AESPs that is utilised by the operators to determine safe practices; the HMTV Operator Manual known as the 201.

Exhibit 157
Exhibit 158

HMTV Operator Manual (201)

1.4.461. The 201 is the primary document used by drivers and commanders as a source of vehicle technical and safety information. The 201 provides the primary mechanism for D Cap, as the Capability Sponsor, to communicate safe operating procedures in line with the SC. The 201 is managed on behalf of D Cap by the DE&S VST and comprises the following sections:

Exhibit 157
Exhibit 158

a. General description;

b. Instruments and controls;

c. Operating information;

d. Failure diagnosis / fault finding;

e. User maintenance;

f. Complete Equipment Schedule items;

g. Preparation for special environments;

h. Preparation for transportation;

i. Towing and recovery;

j. Denial and destruction of equipment.

1.4.462. In addition to the AESP comments raised within the Equipment section of this report, the Panel reviewed two further aspects of the 201.

1.4.463. **Roll Over Protection System (ROPS) description.** The 201 describes the ROPS as being composed of a pair of large tubular [redacted] bars mounted to the chassis behind the cab, and a large tubular [redacted] bar (Cutter Bar) running over the cab centrally. Chapter 5 of the 201 identifies the key components (see

Exhibit 22
Exhibit 307

Figure 1.4.64) of the ROPS including the Cutter Bar. Further analysis of the vehicle design and discussions with VST and SUPACAT engineers highlighted that the central Cutter Bar is not part of the ROPS. The Cutter Bar is made of tubular [redacted] that is not designed to withstand the weight of the vehicle in the event of a roll over. It is highly likely that the incorrect description of the ROPS has caused the user community to believe that the Cutter Bar offers crew protection. This is likely to have affected the decision making of crews and supervisors. The Panel finds that the misidentification of ROPS components within the 201 was an **Other Factor**.

Exhibit 307

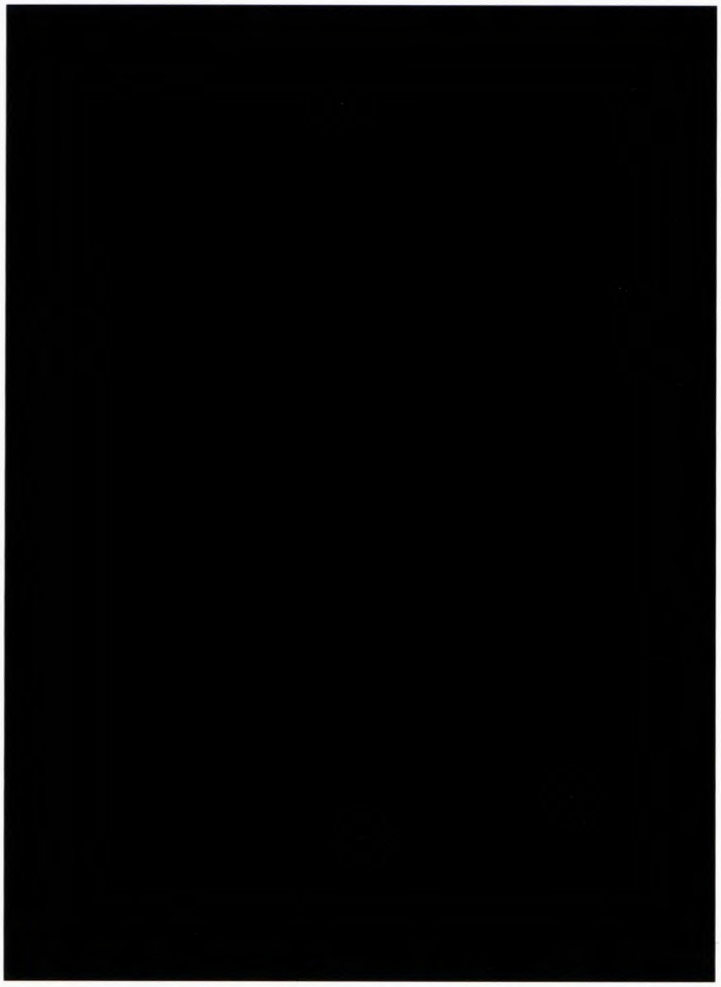

Figure 1.4. 64 – Army Equipment Support Publication (AESP) 201 Roll Over Protection System inspection diagram for JACKAL 2

1.4.464. **Recommendation. Head Vehicle Support Team should update the High Mobility Truck Variant Army Equipment Support Publication in order to ensure that the Roll Over Protection System is correctly identified and described.**

1.4.465. **Driving advice.** The AESP does not include any advice with regards to the handling characteristics of the vehicle or provide techniques to drive the vehicle. As a result, End Users have no reference guide as to how to operate the vehicle within the context of driving on roads and cross-country. In contrast, the Land Rover AESP contains a significant amount of driver advice regarding driver

Exhibit 158
Exhibit 223

techniques, particularly in the cross-country environment. The Panel finds that the lack of driving advice in the 201 was a **Contributory Factor.**

1.4.466. **Recommendation. Director Capability should direct the requirement for driving techniques to be included within Army Equipment Support Publications in order to communicate best practice and standardisation across the Armoured Vehicle fleet.**

Armoured Vehicle Standing Orders (AVSOs)

1.4.467. AVSOs are produced by Director Land Warfare (D LW) in his capacity as sponsor for Army Doctrine. AVSOs are used by all supervisors and crew members of Armoured Vehicles (AVs) and the contents constitute orders to direct best practice in operating and training on all AVs. As such, AVSOs support the SC through the articulation of safe operating practices. The following AVSO chapters were deemed relevant to this accident by the Panel: Exhibit 156

a. Chapter 1 – AV Role Definition;

b. Chapter 2 – AV Operation Warnings, Cautions and Hazards;

c. Chapter 3 – AV Operation;

d. Chapter 6 – AV Training Construct.

1.4.468. During the analysis of AVSOs, the Panel found several references that were out of date, such as reference to LFSOs (Land Forces Standing Orders) (now ACSOs) and incorrect JSP 800 versions. The Panel believe that AVSOs have not been fully reviewed since they were released in 2017. The Panel finds that the lack of regular reviews of AVSOs is an **Other Factor**. Exhibit 276

1.4.469. **Recommendation. Director Land Warfare should mandate an annual review of Armoured Vehicle Standing Orders in order to ensure that they remain coherent with other Defence policy.**

Chapter 1 – AV role definition

1.4.470. Chapter 1 defines the roles and responsibilities of AV crew members. The Panel reviewed the responsibilities held by the commander and driver. Exhibit 12

Commander

1.4.471. The commander is responsible for the operation of the vehicle and safety of the crew. As such the commander holds a number of key responsibilities including: Exhibit 12

a. Ensuring crew members correctly wear the fitted harnesses;

b. Compliance with AVSOs, AESPs and any authoritative documentation;

c. Ensuring crew members wear the correct PPE.

Driver

1.4.472. The driver is to comply with orders issued by the commander. In addition, they are to: Exhibit 12

a. Comply with AVSOs;

b. Use appropriate driving techniques to suit the conditions;

c. Notify the commander of any occurrence or likely occurrence that may affect vehicle performance or safety.

1.4.473. In the case of AV training, there are no specific additional duties detailed within AVSOs placed upon the DMI. The Panel believes that, in the case of a student in either the commander or driver position, as the single qualified person, the DMI must assume the responsibilities of both crew members. The Panel concluded that the lack of clear roles and responsibilities for the instructor and student whilst undertaking AV training is an **Other Factor**. Exhibit 12

1.4.474. **Recommendation. Director Land Warfare should define the Roles and Responsibilities of Driving and Maintenance Instructors within Armoured Vehicle Standing Orders in order to take account of the lack of qualification of the student(s) in the vehicle.**

Wearing of Seat Belts

1.4.475. SSgt McKelvie was wearing his harness at the time of the accident. This is evidenced by the fact that he remained within the vehicle throughout the event and had to be extracted from his harness by Inst 2 and Student 2. Exhibit 21 Witness 2 Witness 5

1.4.476. Analysis of the NY Police photos taken shortly after the accident showed that the commander's harness was completely unfastened and the lap straps extended at the time of the photos (see Figure 1.4.65). This, coupled with the fact that Inst 1 was ejected from the vehicle, indicates that Inst 1 was not wearing all elements of his harness. Exhibit 21 Witness 1a Witness 1b Witness 2

1.4.477. During interviews, Inst 1 confirmed that he was wearing his harness fully for most elements of the driver training and was positive that his lap straps were fastened, although possibly loosened for comfort, at the time of the roll over. Inst 1 was unable to recall the exact status of his shoulder harnesses; however, he concluded that it was very likely that they were not fitted across his shoulders and likely that they had been removed completely. Witness 1a Witness 1b

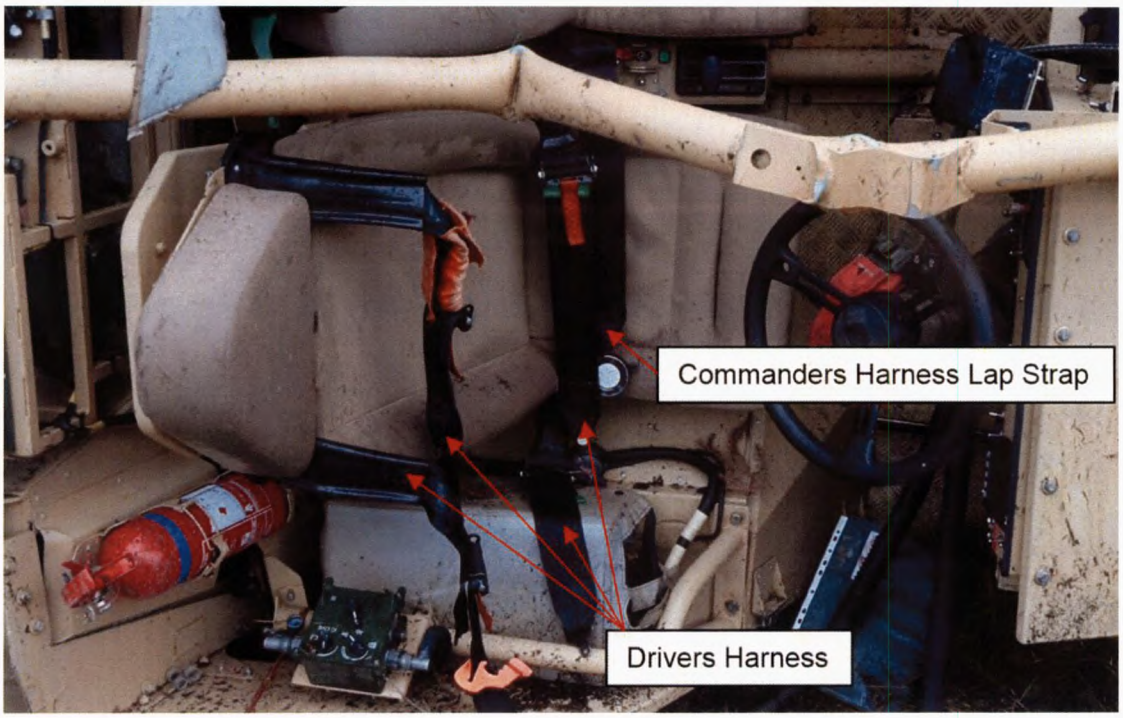

Figure 1.4. 65 – [redacted] post-accident - harnesses

Witness 2

1.4.478. Due to the lack of visibility afforded to the rear of the vehicle, commanders occasionally remove shoulder harnesses and, in some cases, the complete harness, in order to turn around within the seat to improve situational awareness during Failed Ascent Drills.

Witness 1b

1.4.479. During interviews, Inst 1 stated that due to his short stature, he often removed or loosened his shoulder harnesses in order to be able to turn sufficiently to view the rear of the vehicle. Due to the practice of removing the harness, it is as likely as not that Inst 1 unfastened the complete harness without cognitive thought. This could explain his belief that his lap straps remained fastened.

Witness 1a
Witness 1b

1.4.480. Alternatively, Inst 1 may have accidentally left the buckle released in attempting only to remove his shoulder straps. Considering the cold conditions and the multiple layers of clothing worn, it is feasible that Inst 1 did not notice the buckle failing to return to the locked position, leading to the straps disconnecting.

Exhibit 5
Exhibit 7
Exhibit 21

1.4.481. Following analysis of the police photos and the actions that took place immediately after the accident, the Panel was unable to identify any reason for any other person to have unfastened the commander's straps after the accident, particularly as the commander's seat was in an elevated position at the time. Analysis of the harness and buckle concluded there was no mechanical failure.

1.4.482. The Panel concluded that it was likely that Inst 1 unfastened his harness at some stage prior to the accident. On the balance of probabilities the Panel believes it was during one of the unsuccessful attempts to climb Hill 3. The Panel notes that this is a known practice during Failed Ascent Drills to improve commander visibility and that it was not Inst 1's intention to remove the entire harness. Exhibit 12

1.4.483. Due to the nature of the injuries sustained by both crew members during the accident, the Panel was unable to determine whether Inst 1 survived the accident because of his seat harness not being correctly fitted. Whilst it could be argued that the exit from the vehicle during the initial roll sequence saved him from the dynamic conditions during the remaining rotations, it could also be argued that, given his relatively short stature, he would have been better protected by the ROPS and his PPE than his taller student. In the opinion of the Panel, in most cases, the injuries sustained in an accident would be greatly reduced by wearing a seat harness. The Panel finds that the practice of removing seat harnesses by AV crews is an **Other Factor**. Exhibit 156 Witness 1a Witness 1b Witness 2

Chapter 2 – AV Operation Warnings, Cautions and Hazards

1.4.484. Chapter 2 highlights a number of 'Do's and Don'ts' relating to AV operations, stating that additional warnings and cautions are contained within the AESPs. Exhibit 13 Exhibit 272

1.4.485. Pertinent to this accident and in relation to the roll over hazard posed by AVs, AVSOs acknowledges the importance of knowing the tilt angle limitations for specific platforms and ensuring that they are not exceeded. AVSOs do not detail specific platform limits nor do they offer advice as to how to avoid exceedance. Exhibit 13 Exhibit 272

1.4.486. In the opinion of the Panel, AVSOs Chapter 2 lacks detail and useful advice. The section provides an excellent basis to reinforce vehicle limitations and provide practical advice to improve safety. Unfortunately, this information is not contained within AVSOs and so the opportunity is missed. Furthermore, incorrectly stating that limitations are contained within AESPs suggests that the AVSO authors are not familiar with the detail contained in AESPs. The Panel finds that the lack of detail and accuracy of elements of AVSOs Chapter 2 is an **Other Factor.** Exhibit 13 Exhibit 272

1.4.487. **Recommendation. Director Land Warfare should enhance the contents of Armoured Vehicle Standing Orders Chapter 2 to include practical safety advice to Armoured Vehicle operators in order to improve understanding and standardisation across the Armoured Vehicle fleet.**

Chapter 3 – Armoured Vehicle operation

1.4.488. Chapter 3 details general and emergency procedures to be adopted when operating an AV. The following topics have been analysed: Exhibit 14

a. Height restrictions;

b. AV operation cross-country;

c. AV drop down, roll over and egress drills.

Height restrictions

1.4.489. AVSO Chapter 3 states that soldiers must be able to carry out their duties safely whilst in AVs and that 'Safe to Operate' is the guiding principle. Whilst anthropometric limitations were listed for some vehicles, JACKAL was not included within the list. In the opinion of the Panel the lack of height limitations placed upon JACKAL was due to a QinetiQ study conducted in 2013 analysing the impact of crew height and head strike injuries due to blast scenarios. Whilst the Panel was unable to retrieve a copy of the QinetiQ study, the Panel believes that JACKAL was not included in the study as its open architecture design was not susceptible to head strike injuries in the same way as an enclosed vehicle. Exhibit 14 Exhibit 37 Exhibit 219 Witness 49

1.4.490. AVSOs also state that, in the event of a crew member exceeding the vehicle design specification, they may still be deemed safe by the Chain of Command. The Panel could not identify any training offered to Commanding Officers of AV units or their personnel in how to determine the safe limitations in respect to anthropology. This advice within AVSOs potentially places personnel outside of the crew safe envelope and undermines the SC. Exhibit 14

1.4.491. The lack of anthropometric limits placed upon JACKAL by either AESPs or AVSOs left the decision on crew suitability to the Chain of Command. When combined with an ill-defined ROPS as highlighted in Para 1.4.463, and a lack of definition of the safety envelope as stated in Para 1.4.376, the potential to crew JACKAL with personnel who sit outside of the protection offered by the ROPS is increased. The Panel finds that the lack of anthropometric limitations for JACKAL crews is an **Aggravating Factor.** Exhibit 14 Exhibit 158

1.4.492. **Recommendation. Head Vehicle Support Team should set anthropometric limitations for the High Mobility Truck Variant fleet in order to ensure that crew members remain within the protected space offered by the Roll Over Protection System.**

1.4.493. **Recommendation. Director Capability should develop a policy for the management of personnel who sit outside of the anthropometric limitations of Armoured Vehicles in order to ensure the safety of crew members.**

Armoured Vehicle operation cross-country

1.4.494. AVSOs mandate that prior to conducting cross-country driving activities the commander is to carry out an assessment of the terrain to ensure that it is suitable for the vehicle and crew. AVSOs offer no practical advice of what to assess nor do they highlight potential hazards. As a result, whilst the advice is sound, without supporting guidance it lacks real benefit. Exhibit 14

1.4.495. Inst 1 did not survey or drive the route immediately prior to the training on 29 January 2019. He was familiar with the area from previous experience and in his opinion, he was content that the vehicle was capable of negotiating all of the obstacles present. The Panel believes that had AVSOs contained practical advice regarding not only terrain, but also climatic conditions, it is probable that Inst 1 would have considered the potential for the route to be slippery due to the damp and cold conditions and reconsidered his plan. The Panel finds that the lack of advice regarding the hazards associated with terrain and environmental conditions was **a Contributory Factor.** Witness 1a Witness 1b Witness 2

1.4.496. AVSOs state that correct driving techniques for cross-country driving are to be carried out at all times but do not provide reference to any driving manuals or guidance. The Panel has been unable to find any document that contains either generic or JACKAL specific cross-country driving techniques or guidance on the assessment of cross-country routes. The Panel finds that the lack of published driving techniques and route assessment guidance was a **Contributory Factor**. Exhibit 12 Exhibit 14

1.4.497. **Recommendation. Director Land Warfare should update Armoured Vehicle Standing Orders to include guidance material on specific hazards associated with cross-country driving in order to assist commanders and drivers in identifying relevant hazards and associated control measures.**

AV Drop Down, Roll Over and Egress training

1.4.498. AVSOs mandate that all personnel, prior to travelling within an AV, are to have conducted AV drop down, roll over and egress drills. In the case of the JACKAL driver course, this training is mandated during the classroom based element of the course prior to practical driver training. As such, it is very likely that all personnel had conducted this training prior to the accident. The Panel finds that AV drop down, roll over and egress training was **not a factor.** Exhibit 14 Exhibit 219 Witness 1a Witness 2

Chapter 6 – Armoured Vehicle training construct.

1.4.499. Chapter 6 details the AV training construct outlining training definitions and setting policy for AV Continuation Training (CT). CT policy has been designed so that the training can be completed during routine activities and it is envisaged that Regimental DMIs will act as assessors. Upon completion of the mandated CT, the Chain of Command are responsible for recording the completed training on an individual's training record. AVSOs outline the basic competency requirements and activities that are to be assessed during Annual Assessment, Return-to-Role[60] and Specified[61] AV Training. Exhibit 16

[60] Return-to-Role training refers to previously trained personnel who have not operated a specific platform within a 12 month period or conducted an annual assessment in line with AVSOs.

[61] Specified training refers to personnel who come in contact with AVs but do not operate them in an operational or tactical context eg Mechanic.

1.4.500. During the analysis of the AVSO mandated annual CT requirements the Panel noted that there was no requirement to conduct a practical on or off-road driving assessment[62]. As a result, there is no check of a driver's competence after they have passed their initial driver course. The Panel finds that the lack of annual driving assessments for AV drivers is an **Other Factor.** Exhibit 16

1.4.501. **Recommendation. Director Land Warfare should mandate an annual driving assessment for all Armoured Vehicle drivers as a component of Annual Continuation Training in order to assure driving skill levels are maintained to an appropriate standard.**

JACKAL/COYOTE Training

JSP 822 Defence Systems Approach to Training (DSAT)

1.4.502. JSP 822 is the authoritative policy that directs and guides Defence training and education. The Defence Systems Approach to Training (DSAT) is the system that must be used by those who are involved in the analysis, design, delivery, assurance, management and governance of Defence training and education. JSP 822 is divided into two parts; Part 1 details the mandated policy that must be followed whilst Part 2 contains the guidance material to assist in compliance with Part 1. Exhibit 277 Exhibit 278

1.4.503. JSP 822 states that DSAT is designed to generate a Training System that allows trainers to deliver appropriate, effective, efficient, accountable, safe and risk-focussed training to trainees. When new or modified equipment, technology, tactics, techniques or procedures are developed, or when new or amended policy or legislation is brought in, the requirement for new or modified training must be examined. Where training is required, DSAT provides a tool to deliver training that meets the needs of the Training Requirements Authority (TRA) as well as the DSAT Quality Management Standard (QMS) mandated by Defence. DSAT consists of four elements; Analysis, Design, Delivery and Assurance (see Figure 1.4.66). Exhibit 278

[62] Notwithstanding Back to Basics Battle Craft Syllabus mandates Regiment specific training serials some of which include driver training elements. https://akx.sps.ahe.r.mil.uk/sites/baebb/back-to-basics

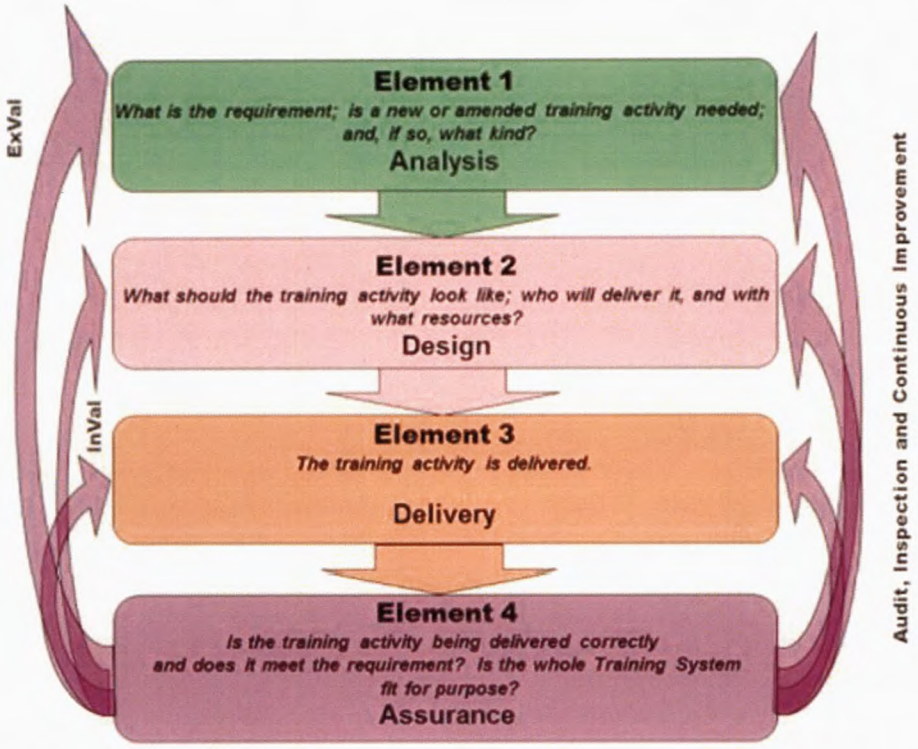

Figure 1.4. 66 – Defence Systems Approach to Training process

1.4.504. JSP 822 mandates that the DSAT process should be iterative and that the assurance activity should take place regularly and as part of all elements. Two key assurance activities are Internal Validation (InVal) and External Validation (ExVal). Other assurance activity that assures the whole of the Training System is also required. Exhibit 278

1.4.505. Integral to the four elements is the need to ensure that the Training System is properly governed and managed. The governance, management and assurance of training are collectively known as the Management of Training System (MTS). For the MTS to be effective, bodies such as boards and working groups must be established to ensure that the DSAT process remains on track and the Training System remains appropriate to the need. Exhibit 278

1.4.506. JSP 822 defines methods of training delivery as Collective Training and Individual Training. Collective Training is that training which is delivered to improve a team's ability and function as a cohesive entity. Individual Training is delivered to individuals to improve their knowledge, skills and attitudes. Driver training is classed as Individual Training. Exhibit 278

1.4.507. JSP 822 defines key roles and responsibilities within the DSAT process. The Panel concluded that three key roles were critical within the context of this accident: Exhibit 278

a. **Training Requirements Authority (TRA).** The TRA represents the End User and is the ultimate authority for the derivation and maintenance of the Role Performance Statement (RPS)[63]. The TRA is often a nominated 2* post but it is common practice for the responsibilities to be delegated, by letter, to an individual with more knowledge of the specific requirement. The nominated TRA for JACKAL in January 2019 was Director Land Warfare (D LW). When interviewed by the Panel SO2 MCC Training Development Team (TDT) stated that he was carrying out the duties associated with the TRA role. This was further supported by the fact that the Training Authority Document (TrAD) was signed by the then SO2 MCC TDT. The Panel could not find any formal Letter of Delegation from D LW to any member of MCC TDT delegating TRA responsibilities. The Panel finds that the lack of a formal Letter of Delegation from D LW to SO2 MCC TDT was an **Observation**; Exhibit 27 Exhibit 213 Witness 16

b. **Training Delivery Authority (TDA).** The TDA is the organisation responsible for training delivery. JSP 822 states that the TDA must be distinct from the TRA. The TDA for JACKAL in January 2019 was the ARMCEN; Exhibit 27

c. **Training Provider.** The Training Provider is the training school, college, organisation, establishment or group that conducts the training. In January 2019 the nominated Training Provider was the Armoured Fighting Vehicle Technical Training School. However, training was being conducted at unit level and, therefore, in the opinion of the Panel, the QOY should be considered the Training Provider for this course. Exhibit 27

1.4.508. To assess the suitability of the JACKAL training that was taking place during January 2019, the Panel assessed the JACKAL Driver Course in-line with the requirements set by JSP 822 under the following key components:

a. Analysis;

b. Design;

c. Delivery;

d. Assurance.

JACKAL Driver Course analysis

1.4.509. JSP 822 mandates the requirement for a Training Needs Analysis (TNA) to take place for all Defence Training. A TNA Working Group (TNA WG) should be established to govern and deliver the process and formally agree the Recommended Training Solution. The TNA should be a structured analysis of Exhibit 279

[63] The RPS is a detailed statement of the tasks / sub-tasks required to be undertaken by an individual to achieve the desired performance in the Role. It articulates the performance, conditions and standards expected within the Role.

training need that is conducted in three stages:

a. Stage 1 – Scoping exercise;

b. Stage 2 – Analysis;

c. Stage 3 – Evaluation.

1.4.510. The Panel obtained a copy of the 2009 JACKAL TNA that was conducted by SUPACAT during the UOR procurement process. Whilst the 2009 version was designed to analyse the differences between the existing JACKAL 1 requirements and those for the JACKAL 2, the 2009 TNA effectively covered both vehicles in a single document. Therefore, the Panel reviewed the JACKAL 2 TNA not as a gap analysis, but as a complete TNA. Exhibit 214

1.4.511. **Stage 1 – Scoping exercise.** JSP 822 mandates that, as a minimum, Stage 1 of the training analysis process will deliver a Scoping Exercise Report that includes the Training Audience Description and a Risk Register. The 2009 TNA states that SUPACAT were not provided with any form of Scoping Exercise Report and the Panel has not been able to find a copy elsewhere. As a result, the Panel believes it is unlikely that a scoping exercise was conducted. Due to its procurement as an UOR project, it is probable that the lack of a scoping exercise was as a result of the timescales involved in the delivery of the capability to theatre. However, this was never formally captured as a risk nor was it corrected during the UOR to Core work. Exhibit 214 Exhibit 279

1.4.512. **Stage 2 – Analysis.** JSP 822 mandates the requirement to conduct Role Analysis, Training Gap Analysis, drafting of Training Objectives (TO), Training Options Analysis (TOA) and production of a Training Needs Report. The object is to understand the roles that need to be trained, including all supporting duties and tasks and to identify any anticipated training gaps. Based upon the Role Analysis, a RPS and draft TOs are produced to deliver the key outputs. The TOA then reviews each task from the Role Analysis to assess the best option for training delivery, eg classroom, practical etc. Finally, the Training Needs Report will assess the costs against the merits of each training option to confirm a TNA endorsed training solution. Exhibit 279

1.4.513. The JACKAL TNA includes a comprehensive analysis of the role and includes most, if not all, the tasks associated with JACKAL operations. As a result, the initial element of Training Analysis appears to have been conducted to a high standard. However, the Panel has been unable to access many of the other elements including TNA WG minutes or other documents that might indicate that any Training Gap or Training Option Analysis took place. Similarly, the Panel has not been able to find any form of formal Training Needs Report or Cost Benefit Analysis. Although unable to access any formal records, during interviews the Panel was informed that monthly training meetings took place during the UOR stages of JACKAL in order to adapt training based upon lessons identified during operations. Exhibit 214 Witness 49

1.4.514. **Stage 3 – Evaluation.** The final stage of the TNA is the Training Needs Evaluation (TNE). The TNE is conducted in two parts; the first is an evaluation of the effectiveness of the TNA process and the second is an evaluation of the training solution. The key output is an assessment of how well the TNA outputs contributed to the provision of a training solution that meets the requirement. The Panel could not find any form of TNE. Exhibit 279

1.4.515. **TNA Conclusion.** The Panel was provided with the JACKAL 2 TNA dated 30 June 2009 based upon the training requirements to deliver the UOR capability. The Panel was not aware of any TNA taking place as part of the UOR to Core work in 2013. The Panel has concluded that the document provides a comprehensive analysis of role requirements and, as such, is more akin to the RPS for JACKAL than a full account of the Training Needs Analysis. Although it is likely that TNA meetings took place between operators, designers and DE&S, there is no formal mention of a TNA WG being established. The lack of TNA WG minutes or a scoping study highlights the absence of an audit trail to provide evidence that the correct TNA process was followed. Exhibit 214 Exhibit 220

1.4.516. JSP 822 mandates that a TNA should take place whenever there is a change in equipment, technology, tactics, techniques or procedures and, as such, the Panel believes that a revised TNA should have been conducted when the platform was moved from UOR to Core. With no evidence to support that this activity took place, the Panel concludes that it is likely that no TNA was conducted as part of the UOR to Core transition. The Panel finds that the lack of a complete and current JACKAL TNA is an **Other Factor.** Exhibit 209 Exhibit 222 Exhibit 280

1.4.517. **Recommendation. Director Land Warfare should review all JACKAL training in order to ensure that JACKAL training needs analysis, design, delivery and assurance is compliant with Joint Service training policy (JSP 822) and associated single Service training policy.**

JACKAL Driver Course - design

1.4.518. JSP 822 mandates a number of key outputs to facilitate the design of training activity. These outputs include: Exhibit 279

a. **Training Objectives (TOs).** These are based upon the RPS and draft TOs delivered as part of the Analysis stage. TOs are supported in delivery by associated Enabling Objectives (EOs) and Key Learning Points (KLPs);

b. **Formal Training Statement (FTS).** The FTS details the totality of training that must be achieved to meet the requirements of the RPS. The FTS includes:

(1) **Training Performance Statement (TPS).** The TPS states the training that will be delivered by the TDA;

(2) **Workplace Training Statement (WTS).** The WTS states the training that will be delivered by the employing unit after the trainee has been assigned to role. This is essentially post-qualification training;

(3) **Residual Training Gap Statement (RTGS).** The RTGS details any elements of the RPS that have not been allocated to any training activity and, therefore, represents the gap between the requirements of the RPS and the TOs delivered by either the FTS or WTS.

c. **Assessment Strategy (AStrat).** The AStrat articulates how and when training is assessed and by which method, summative (progressive assessment throughout a course) or formative (eg an end of course exam);

d. **Selection of Methods and Media.** The activity ensures the most effective and efficient methods of training delivery are utilised;

e. **Learning Scalar and Learning Specifications (LSpecs).** TOs, EOs and KLPs are compiled into a structured Learning Scalar. The LSpecs are a product of the Learning Scalar that enable the delivery of lessons for use by the Training Provider.

1.4.519. The Panel reviewed the JACKAL Driver Course Folder (CF) to confirm all elements were contained within it. The Panel concluded that the course design for JACKAL was in accordance with JSP 822 and noted that there was only one TO highlighted in the RTGS which was 'conduct firefighting procedures'. All other TOs were completed by means of the TPS with no WTS requirements. Exhibit 219

1.4.520. Noting the RTGS, the Panel reviewed the Hazard Log to confirm what controls were in place for vehicle fire or explosion. The Hazard Log listed Current and Competent Crew as a control measure. The Panel was not aware of any vehicle firefighting procedures specific to JACKAL being taught and noted that the control measure in place on the Hazard Log did not provide any reference to the training activity. The Panel finds that the lack of firefighting procedures training and its use as a control within the JACKAL Hazard Log is an **Other Factor.** Exhibit 150

1.4.521. **Recommendation. Director Land Warfare should introduce vehicle specific firefighting training for JACKAL crews in order to ensure that the risks posed by vehicle fires are reduced to as low as reasonably practicable and Tolerable.**

1.4.522. **Recommendation. Director Capability should amend the High Mobility Truck Variant Hazard Log with regard to firefighting on the vehicle in order to ensure that appropriate controls are in place against the hazard.**

1.4.523. Although all elements of course design were evident within the CF, the Panel noted that some LSpecs contained procedures or limitations that could not be substantiated from official vehicle publications such as the AESPs. Exhibit 22 Exhibit 23 Exhibit 219

1.4.524. **LSpec - Drive JACKAL/COYOTE Cross-country.** This LSpec details the requirement to teach cross-country driving to JACKAL driver students. In doing so, the LSpec states *"MAX tilt angle is* [redacted] *this MUST NOT be exceeded".* Exhibit 22

1.4.525. As previously highlighted, the vehicle AESPs do not provide any tilt or traverse limitation and as such the Panel was unable to determine the provenance behind the [redacted] LSPEC limitation. The Panel concluded that it was likely that a training limitation had been introduced during the early development of JACKAL training and that this had been carried forward to the current training documents. Exhibit 22 Exhibit 23

1.4.526. Additionally, the Panel found that there was no associated TO, EO or KLP to teach DMIs or students how to practically assess slope angles. The Panel concluded that despite the limitation being in place, DMIs had no means by which to ensure training was delivered in line with the LSpec requirements. The Panel finds that the provenance of the [redacted] training limitation and lack of an associated TO, EO or KLP to teach slope angle assessment is an **Other Factor.** Exhibit 23

1.4.527. **Recommendation. Director Land Warfare should determine the provenance of the [redacted] training limitation in order to ensure that it is within the safe operating envelope of the vehicle.**

1.4.528. **Recommendation. Director Land Warfare should introduce the requirement for students to be taught methods to assess the suitability of terrain, including the approximation of slope angles in order to ensure vehicles can be operated within the defined safe operating envelope.**

1.4.529. The LSpec also included instruction to load the training vehicle with simulated ammunition and filled jerry cans. Although no formal reason for this requirement exists, the Panel believes that it is to simulate a vehicle at representative operational weight during the driver training exercises. Exhibit 22 Exhibit 23

1.4.530. Analysis of the vehicle and the debris left behind after the vehicle rolled highlighted that [redacted] was not loaded in accordance with the LSpec on the day of the accident. The Panel assessed the likely impact of the loading of [redacted] on the day of the accident and concluded that the reduced overall mass and lower centre of gravity made it more [redacted] to negotiate the climb and less likely to tip. The Panel finds that the loading of KR94AB was **not a factor.** Exhibit 21 Exhibit 22 Exhibit 23 Exhibit 150

1.4.531. **LSpec – Vehicle Exterior Fittings.** This lesson details that the maximum gradient limitations for JACKAL are:

a. Vehicle moving – in excess of [redacted] ([redacted]

b. Stop and start - [redacted] ([redacted]

1.4.532. These limitations are different to those contained within the AESPs, which state a maximum gradient of [redacted] and approach and departure angles of [redacted] The AESPs do not detail any stop and start gradient limitations. The Panel was not able to confirm from where the LSpec limitations were derived or why they had not been checked against the AESP. The Panel finds that the reference to unvalidated vehicle limitations is an **Other Factor**. Exhibit 22 Exhibit 23

1.4.533. **Design Conclusion.** The Panel concluded that the design of the JACKAL Driver Course was completed in accordance with JSP 822. The anomalies within the LSpecs highlight a lack of coherence between the authoritative vehicle publications and the training material used by instructors; this is indicative of a lack of periodic review against the master documents. The firefighting procedures training gap has not been highlighted within the Hazard Log as a potential escalatory hazard in the event of a vehicle fire; instead training is used as a defensive barrier. This highlights a lack of user and training SQEP attendance at PSEPs as mentioned within the Equipment section. The Panel finds that the lack of coherence between the training publications, vehicle publications and hazard log is an **Other Factor.** Exhibit 279

1.4.534. **Recommendation. Director Land Warfare should assure all High Mobility Truck Variant training documents in order to ensure coherence with the authoritative vehicle documentation.**

JACKAL Driver Course – delivery

1.4.535. JSP 822 mandates that trainers are to comply with the Defence Trainer Competency Framework (DTCF). This framework details the qualifications that must be held by trainers and instructors at the differing levels of delivery within Defence. Additionally, JSP 822 mandates that training delivery should be properly programmed, planned and that training deficiencies should be managed appropriately. Exhibit 281 Exhibit 282

1.4.536. Within Defence, training can be conducted either centrally at a dedicated training unit or establishment or via a distributed system often at unit level. In the case of JACKAL, training is split between the two systems. Exhibit 282

1.4.537. Regular Royal Armoured Corps (RAC) personnel and all DMIs receive centralised training delivered at the ARMCEN. The delivery of centralised training has a number of benefits, including ease of standardisation and the ability to provide enhanced supervision by training Subject Matter Experts. Exhibit 209

1.4.538. Other units, such as Reserve Yeomanry and Armoured Light Infantry units, deliver driver and commander training under the distributed system, utilising centrally trained DMIs to deliver training under the supervision of the unit Chain of Command. This system enables training to be delivered at a much higher rate, increasing training output. It also enables greater flexibility in training programming, which is particularly useful for Reserve Units where availability of personnel can be limited. Exhibit 209

1.4.539. The Panel concluded that both methods of training delivery have advantages and drawbacks and that as long as suitable training and supervision is provided for instructors and the supervisory Chain of Command, the DSAT QMS should be maintained. JSP 822 covers the provision of instructor and supervisory competence through the DTCF. Exhibit 282

Defence Trainer Competency Framework (DTCF)

1.4.540. To remain within the DTCF, JACKAL DMIs must pass not only the DMI course at ARMCEN but also hold a Defence Train the Trainer (DTTT) qualification. The DTTT qualification is delivered at two levels, the higher level being DTTT (Phase 1 and 2) for trainers delivering training to Phase 1 or 2 students and the lower level being DTTT (Phase 3) for those trainers delivering training to Phase 3 students. Exhibit 282

1.4.541. JSP 822 defines the three training phases as: Exhibit 282

a. **Phase 1.** All new individual entry training delivered to Phase 1 recruits to provide basic military skills

b. **Phase 2.** Initial individual specialisation, sub-specialisation and technical training following Phase 1 training, delivered to Phase 2 trainees, prior to joining the Trained Strength;

c. **Phase 3.** Individual training undertaken at any stage in a Service Person's career after Phase 2.

1.4.542. Within the Regular Army, JACKAL driver training is split between Phase 2 and Phase 3 environments. The principal user of JACKAL, the RAC, conducts JACKAL driver training as part of their Initial Trade Training (ITT). This training is delivered centrally at the ARMCEN under Phase 2 guidelines. In addition to the initial operator courses, RAC personnel are also taught advanced techniques and tactics associated with JACKAL operations. As such, Regular RAC personnel received enhanced training within the Phase 2 environment prior to release to their units. Exhibit 82

1.4.543. The remaining Regular users, including the Light Mechanised Infantry, receive JACKAL training after the completion of their ITT and therefore it is delivered in a distributed manner in the Phase 3 environment. These personnel do not receive the enhanced training provided for RAC personnel. Exhibit 82

1.4.544. It should also be noted that any change of vehicle type beyond ITT is considered Phase 3 training. Therefore, all personnel (including those within the RAC) who re-role from one vehicle to another, conduct the training at their unit (ie distributed) delivered by Phase 3 instructors.

1.4.545. The Panel reviewed the requirements of JSP 822 and the DTCF and concluded that the boundaries between Phase 2 and Phase 3 were not clear when considering initial JACKAL Driver training in the context of the Army Reserve and in particular the Yeomanry as RAC units. Despite their alignment with Regular RAC units, Yeomanry JACKAL training is delivered after ITT and is considered Phase 3 training. As a result, Yeomanry JACKAL training is delivered in a distributed manner by DTTT (Phase 3) instructors. The Yeomanry do not complete the advanced training in line with their Regular counterparts. Exhibit 260 Exhibit 281 Exhibit 282

1.4.546. The Panel was unable to determine the reason for the difference in Regular and Reserve RAC training but believe that it is likely because of the

timescales involved and the availability of Reserve personnel to attend courses of prolonged duration. The Panel concluded that the differing standards of training for JACKAL crews across the Army is an **Observation**.

1.4.547. The Panel reviewed the qualifications held by both instructors and found that they held legacy instructional qualifications but not the mandated DTTT version 2 (DTTTv2) (Phase 3) qualification. Acknowledging the impact of changing the instructional qualifications regime, JSP 822 recognised the large number of personnel who held legacy instructional qualifications and provided a relatively easy mechanism for transferring existing skills to the new DTTTv2 construct. This policy was further defined within Army Training Policy and enabled those with legacy qualifications to automatically upgrade to DTTTv2 (Phase 3) by conducting on-line training courses. Despite this mechanism, neither instructor undertook the required training and therefore did not qualify for DTTTv2 (Phase 3) status. The Panel concluded that the lack of the DTTTv2 (Phase 3) qualification held by each instructor is an **Observation.** Exhibit 25 Exhibit 281 Exhibit 282

1.4.548. Considering that this may be a wider issue, the Panel reviewed the qualifications held by a Regular unit and found that almost all instructors held legacy qualifications but had not updated them to DTTTv2 (Phase 3) status. The Panel believes that the communication of new instructional standards was not robust and that it was likely that the non-compliance of legacy instructors was prevalent across the Army. The Panel concluded that the lack of DTTTv2 compliance is an **Observation**. Exhibit 231 Exhibit 232 Exhibit 281

1.4.549. Army Pamphlet 1 (PAM 1) details the start standards required for the ARMCEN delivered DMI course. The Panel found that PAM 1 stated that Defence Instructional Techniques (DIT) or DTTT were acceptable start standards for the DMI course, contravening the JSP 822 requirement. When asked, the ARMCEN confirmed that PAM 1 was out of date and that ARMCEN staff ensured all new instructors held the relevant DTTTv2 qualification. The ARMCEN also confirmed that, after initial qualification, the supervision of DMI qualifications was the responsibility of the unit Chain of Command. The Panel concluded that the out of date content within PAM 1 is an **Observation**. Exhibit 36 Exhibit 221 Exhibit 281

1.4.550. To assure adequate training supervision, JSP 822 mandates that Defence Trainer Supervisors (DTS) and Defence Trainer Managers (DTM) are assigned within Training units. DTSs are responsible for the development of their respective Defence Trainers. They are to hold the corresponding DTTT qualification and have training delivery experience. In addition, the DTS is to have completed DTS training up to Foundation Level. Exhibit 281

1.4.551. DTMs are to be SMEs in their professional area but may not have instructional experience. They are responsible for advising the Chain of Command of training implementation and policies. They are to attend the DSAT (Managers) Course. In small units where no individual suitable to act as a DTM exists, Service Commands may nominate other SQEP outside that unit to undertake the role. Exhibit 281

1.4.552. The Panel reviewed the QOY Chain of Command and concluded that the most appropriate positions for DTS and DTM were the Training Warrant Officer (Trg WO) and Executive Officer (XO) respectively. Analysis of their individual role descriptions highlighted that neither were formally assigned these roles. When questioned in interview, neither had any knowledge of DSAT or DSAT principles. Exhibit 215 Exhibit 216

1.4.553. Due to the lack of formal appointment and their lack of DSAT awareness, neither had the qualifications required for either the DTS or the DTM role. As a result, the management and development of instructors and the training within the QOY was not compliant with JSP 822. It is likely that the lack of formally qualified DTS and DTM undermined the ability of the QOY to properly supervise training and instructors. It is likely that Inst 1 received no instructional development opportunities after attending his DMI course at the ARMCEN. The Panel finds that the lack of training management and instructor supervision and development at the QOY was a **Contributory Factor.** Witness 1b Witness 11 Witness 12 Exhibit 281

1.4.554. Further analysis of individual suitability and recommendations relating to training supervision will be made in the Safe Person section of this report.

Programming and preparation

1.4.555. The JACKAL Driver CF offers a comprehensive course programme which instructors are to follow. If, for any reason, instructors wish to deviate from the published programme, they must first seek approval from the Training Standards Group (TSG) at the Land Warfare Centre (LWC). This process ensures that JACKAL courses follow a standardised structure that is approved by the TRA (D LW). Exhibit 29 Exhibit 219

1.4.556. In preparation for a course, the DMI must complete a Course Convening Order that includes a provisional training plan, student nominal roll and instructor details. The Course Convening Order is sent to the TSG who cross-check instructor qualifications and currency along with student start standards. By following this process, TSG conducts assurance that the course will be correctly structured and delivered. Once complete, TSG authorises the course and sends the current CF to the instructor to ensure that they deliver the most up to date training material. The Convening Order should be sent to the TSG no later than 10 working days in advance of the course start date in accordance with the TSG SOPs. Exhibit 29 Exhibit 219

1.4.557. The QOY staff completed the Course Convening Order in accordance with TSG SOPs prior to the course although it was not sent until 10 calendar days prior to the start date. Despite the late submission, TSG authorised the course on the same day. Although the TSG is required to check all student start states against the course requirement, the Panel found that four students did not meet Exhibit 24 Exhibit 29 Exhibit 30

the start states due to the incorrect BCIP[64] qualifications held. This will be further discussed in the Safe Person section of this report. The Panel finds that the lack of a full check of student start standards is an **Observation.**

1.4.558. As the course was being convened for a Reserve unit, a revised training programme was submitted to compress the standard 20 training day course into 12 days. The Panel noted that there was no TSG approved Reserve JACKAL course at the time and so Reserve units adjusted the standard programme to fit the time available on an ad hoc basis. Exhibit 31

1.4.559. Although the course programme submitted by the QOY compressed the training by 8 days, both Inst 1 and the TSG authoriser confirmed that no TOs had been missed and that the end of course standard was compliant with the Training Authorisation Document (TrAD). The Panel found that the compressed programme as planned would have exceeded the drivers' hours as mandated by JSP 800 due to the course planning to work 12 days consecutively with no single day off. The Panel finds that the lack of a comprehensive check of the course programme against all Defence policy is an **Observation.** Exhibit 27 Exhibit 28 Exhibit 31

1.4.560. The Panel concluded that the lack of an approved JACKAL Reserve Driver Course increased the likelihood of errors and omissions when constructing ad-hoc course programmes. The Panel finds that the lack of a JACKAL Reserve Driver Course is an **Other Factor.**

1.4.561. **Recommendation. Director Land Warfare should ensure that the training delivery of all distributed JACKAL driver training meets mandated course objectives and safety requirements and can be delivered within the time constraints of all units, including those within the Army Reserve in order to ensure that JACKAL training is standardised, assured and achievable.**

1.4.562. Although the QOY submitted a 12-day programme Inst 1 elected to change the course structure due to the good progress made by the students and also to comply with JSP 800 driver's hours limitations. Exhibit 29 Exhibit 32 Witness 1a Witness 1b

1.4.563. The TSG SOPs state that any changes from the approved course structure should be notified to TSG as soon as possible. The Panel found that TSG was not informed of the change and thus any assurance activity that had been undertaken by the TSG was negated. Exhibit 29

1.4.564. As part of the DMI Course, the TSG is required to provide a briefing outlining their role and the procedures to be followed when convening and running AV courses. When interviewed, the TSG authoriser stated that this was often missed due to a breakdown in communications between the ARMCEN and the TSG. As a result, many of the DMIs across the Land environment had not received Exhibit 35 Witness 18

[64] BCIP - BOWMAN Combat, Infrastructure and Platform which refers to the communications system fitted to JACKAL and other AVs.

this formal brief. When interviewed, Inst 1 stated that he had not received the TSG brief during his DMI course. The Panel concluded that the lack of TSG briefs to the ARMCEN DMI courses is an **Other Factor.**

1.4.565. **Recommendation. Director Land Warfare should ensure that all Armour Centre approved instructors receive the course convening briefing by the Training Standards Group in order to ensure that they have the knowledge required to conduct their duties.**

1.4.566. **Recommendation. Director Land Warfare should consider catch up training for those qualified instructors who have not received the Training Standards Group briefing in order to ensure that all instructors are aware of the roles and responsibilities of the Training Standards Group.**

1.4.567. In the past, DMIs were supported by the Training Advisory Team (TAT). The purpose of the TAT was to provide a base of experienced JACKAL operators to support the transition from UOR to Core, acknowledging the breadth of experience across the Army at the time and the change in role of the platform. The TAT provided training advice to DMIs and supervisors, helping them to achieve the training requirements. This support included assistance with training area selection, Risk Assessments and course programming. The TAT also provided engineering advice to unit maintenance personnel, highlighting common faults and spares issues. Witness 49

1.4.568. The TAT was disbanded in 2017 and no other provision for formal training support was put in place. The Panel believes that the removal of a formalised TAT had a detrimental effect upon distributed training delivery, in particular the availability of personnel to support new instructors with the safe delivery of training. The Panel concluded that the lack of SME training support for JACKAL DMIs is an **Observation.** Witness 49

JACKAL Driver Course assurance

1.4.569. JSP 822 mandates that assurance activity is conducted for all training activity. Mandated assurance comprises of: Exhibit 278 Exhibit 279

a. An Evaluation Strategy including Internal and External Validation;

b. 1st Party Audit and Inspection;

c. 2nd Party Audit and Inspection;

d. 3rd Party Audit and Inspection (Phase 1 and 2 only).

Evaluation Strategy

1.4.570. An Evaluation Strategy is broken into two distinct requirements: Exhibit 278 Exhibit 279

a. **Internal Validation (InVal).** This is undertaken by the Training Provider after a course has finished. It requires students to comment on the training delivery and content and provides feedback as to whether the TOs are being achieved.

b. **External Validation (ExVal).** This is undertaken by the TRA using both qualitative and quantitative data to determine the degree to which the training prepares the individual / team for the specified role and whether the role remains valid. Findings from periodic ExVals help to provide the evidence that the RPS remains valid or that changes are required to meet the operational need. Fundamentally, ExVals ensure that the training output remains fit for purpose.

Internal Validation (InVal)

1.4.571. The ARMCEN direction and guidance for InVal highlights the requirement for InVal in order to centrally manage TO achievement and to provide trend analysis to support recommendations for change. To enable the InVal process, the ARMCEN Quality Control Cell (QCC) conducts a number of independent activities. The QCC collects InVal data via questionnaires, post-course discussions, assessment data and discussions with instructors and supervisors. In the opinion of the Panel, the ARMCEN InVal process complied with the intent of JSP 822, enabling the ARMCEN to validate and amend its training delivery where required. The ARMCEN QCC InVal process covers all ARMCEN centrally delivered AV courses. The Panel finds that the InVal of centrally delivered AV courses was **not a factor**. Exhibit 254

1.4.572. Distributed training is also required to conduct InVal in accordance with JSP 822. To do so, individual units conduct their own InVal processes and forward the results to TSG. For the QOY this involved the collection of InVal questionnaires completed by students at the end of the course. Upon completion, the student questionnaires were sent to the TSG for analysis and data collection. Exhibit 29 Exhibit 254

1.4.573. The Panel was not provided with any evidence to identify analysis being undertaken on InVals for distributed training. Furthermore, TSG staff confirmed that although they receive the InVal feedback, no further analysis is conducted. Although it is likely that some unit level Inval is being conducted, the Panel believes that it is unlikely that the feedback received from students is used to modify training objectives or delivery. The Panel finds that the lack of analysis of distributed training InVals is an **Observation.** Witness 16 Witness 18

External Validation (ExVal)

1.4.574. The ARMCEN Evaluation strategy highlights a number of ExVal processes in line with JSP 822 policy, including responsive and planned validation activities. Exhibit 252 Exhibit 253

1.4.575. Despite this policy and anecdotal evidence that an ExVal had reviewed the JACKAL training policy, no formal records could be found. The Panel believes that it is unlikely that a formal ExVal has taken place since initial introduction of JACKAL capability. The Panel finds that the lack of formal ExVal evidence to support JACKAL training is an **Observation.** Exhibit 251

Assurance and Inspection (A&I)

1.4.576. As mandated by JSP 822, all Phase 3 training activity should be subject to 1st and 2nd Party A&I. Exhibit 283

a. **1st Party A&I.** 1st Party A&I activities are conducted for internal purposes to assure the CO that the training activities being conducted are being undertaken in accordance with the DSAT QMS elements of JSP 822 and that any improvements identified are implemented;

b. **2nd Party A&I.** 2nd Party A&I is conducted by an external body but still within Defence. 2nd Party A&I provides higher level assurance to stakeholders that Training Providers are complying with the DSAT QMS elements of JSP 822.

1.4.577. The Panel found no evidence from the QOY or the LWC to show that any JACKAL training A&I activity had taken place. When interviewed, the XO confirmed that he had not undertaken any form of Training Assurance of the JACKAL driver courses as he did not feel suitably qualified or experienced to do so. As a result, the Panel has concluded that it is almost certain that no formal A&I activity has taken place on the QOY delivered driver or commander training activities. In the opinion of the Panel the lack of A&I activity undermined the Chain of Command's ability to identify shortfalls or additional hazards posed by the training activity delivered in January 2019. The Panel finds that the lack of the QOY vehicle training A&I was a **Contributory Factor.** Exhibit 217 Witness 11

1.4.578. **Recommendation. The Commanding Officer of the Queen's Own Yeomanry should conduct 1st Party Assurance and Inspection of all the Queen's Own Yeomanry delivered training in order to ensure that training is being conducted in line with Defence policy.**

1.4.579. The TSG SOPs directed assurance activity through the provision of unit Inspections. These inspections should have been carried out via three methods: Advisory Visits, Formal Visits or unit Self-Assessments. In order to balance workload and the requirement for A&I activity, Formal Visits are conducted every 24 months interspaced with unit Self Assessments every 12 months. Advisory Visits can be requested by units if deemed appropriate and will always be followed by a Formal Visit 6 months later. Exhibit 29

1.4.580. The aim of these visits is to inspect:

a. Course files / folders;

b. Instructor records;

c. The Training Delivery Deficiency (TDD) register;

d. Continuation training;

e. Training and teaching areas;

f. The unit Inspection Archive;

g. Training wing manning.

1.4.581. Although these visits do not formally comply with the requirements of 2nd Party A&I, as they do not cover the JSP 822 requirement to audit the full 'Learning Experience', they offer a level of assurance that training activity is being conducted correctly by qualified staff and that record keeping is to an acceptable standard. Exhibit 29 Exhibit 284

1.4.582. When interviewed, the TSG Authoriser stated that although Formal Visits are mandated periodically, personnel constraints within the TSG have led to the routine visits being temporarily paused. As a result, unit Visits are risk based, with only high-risk units receiving Formal Visits. The Panel was unable to ascertain how unit risk levels were assessed to determine which units were to be visited. The Panel finds that the reduction in Formal Visits conducted by the TSG due to personnel constraints is an **Other Factor**. Witness 16 Witness 18

1.4.583. **Recommendation. Director Land Warfare should address the workforce requirement of the Training Standards Group in order to ensure that 2nd Party Assurance and Inspection activity is conducted.**

1.4.584. Analysis of TSG assurance of the QOY highlighted that there was no history of either Self-Assessments or Formal Visits. As a result, the Panel concluded that it was likely that the QOY had not been subjected to any 2nd Party training assurance activity as mandated by JSP 822. In the opinion of the Panel the lack of A&I activity undermined the LWC's ability to identify shortfalls or additional hazards posed by training delivered by the QOY. The Panel finds that the lack of QOY training assurance visits by the TSG was a **Contributory Factor**. Exhibit 217 Exhibit 279

1.4.585. **Recommendation. Director Land Warfare should ensure that 2nd Party Assurance of the Queen's Own Yeomanry training activity takes place as soon as practicable in order to provide assurance to the General Officer Commanding 1st (UK) Division that the Queen's Own Yeomanry training is being delivered in line with Land Warfare Centre direction.**

1.4.586. The Panel concluded that the assurance of JACKAL training was not compliant with JSP 822.

Risk Assessment (RA)

1.4.587. A RA is described within JSP 375 as the quantifying or qualifying of the probability of loss, ill-health or injury, whether resulting from acts, omissions, equipment failures or accident. All activities undertaken on the Defence Estate or elsewhere by Defence personnel should be risk assessed. Exhibit 218

1.4.588. RA policy relevant to safety is laid down in JSP 375 – Management of Health and Safety in Defence and within ACSO 3216 – The Organization and Arrangements for the Management of Safety and Environmental Protection in the Army. Exhibit 71 Exhibit 218

1.4.589. The XO of the QOY provided the Panel with a generic RA for the general use of Motor Transport (MT) vehicles. The RA was completed on the endorsed Form 5010 utilising the five step process. The RA contained a total of eight hazards: Exhibit 33

a. General vehicle use;

b. Lone driving;

c. Vehicle manoeuvring;

d. Vehicle operation in inclement weather conditions;

e. Workshops / MT hangars (vehicle access and egress);

f. Driving on tarmac and tracks;

g. Driving on natural features / worn tracks;

h. Cross-country driving.

1.4.590. The Panel reviewed the cross-country driving hazard in detail to assess the quality of the controls in place and also the measure of risk. In total, the cross-country driving hazard had 17 controls, all of which were active at the time. The controls listed provided effective barriers against the realisation of the risk although the Panel noted some potential controls were missing, in particular, the adherence to AVSOs and AESPs. The risk associated with cross-country driving was assessed by the QOY as being high and therefore additional controls were put in place. Although additional measures were identified by the QOY, the overall assessment of the risk remained high. The Panel was unable to determine whether the assessor had reassessed the risk after adding the additional controls or whether the risk remained high. The Panel also noted that the RA was not signed by the Assessor, Manager or CO. Exhibit 33

1.4.591. The Panel noted that the QOY RA was heavily based upon a similarly titled RA contained within ACSO 3216. The Panel believes that it was likely that the QOY RA had been copied from ACSO 3216 and that, as a result, limited independent analysis had been conducted to assess the hazards associated with the activity. The use of example RAs based upon known Defence activities within Exhibit 33 Exhibit 71

authoritative safety publications provides the potential for users to copy from these examples rather than conducting full and independent assessments of the activity they are to undertake. The Panel finds that the use of the example cross-country driving RA contained in ASCO 3216 is an **Other Factor**.

1.4.592. **Recommendation. Chief Safety (Army) should replace the example Risk Assessment in Army Command Standing Order 3216 with a non-Army related example in order to ensure that units produce their own Risk Assessments.**

1.4.593. The Panel also noted that the RA carried out by the QOY did not contain any assessment of the additional hazards presented by the training activity, nor did it contain a site-specific assessment regarding the use of Catterick Driver Training Area. The Panel concluded that the RA provided by the QOY was not reassessed prior to the JACKAL Driver Training Course and thus did not capture all the associated risks. Exhibit 33

1.4.594. The Panel found that a RA had been conducted for cross-country driving by the QOY although the analysis of hazards and controls was poor. Furthermore, the RA did not identify the need for a site-specific RA and did not highlight any analysis of the hazards associated with training. The Panel finds that the poor quality of the RA conducted by the QOY in support of the JACKAL driver training activity on 29 January 2019 was a **Contributory Factor.** Exhibit 33

1.4.595. **Recommendation. The Commanding Officer of the Queen's Own Yeomanry should revise all unit Risk Assessments in order to ensure that they are completed correctly and adequately control the associated risks.**

1.4.596. When interviewed, Inst 1 stated that he was not aware of the RA. As a result, the Panel believes that several controls contained within the RA would not have been in place. Specifically, the RA requires that "commanders are to assess ground conditions, any obstacles to be negotiated, the type and performance of the vehicle being used and the experience of the Driver" and that "Training Area Control Staff are to be contacted regarding any restrictions on use of areas/obstacles by specific vehicles". The Panel finds that the lack of RA awareness by Inst 1 was a **Contributory Factor.** Exhibit 33 Witness 1b

1.4.597. Similarly the Trg WO had no knowledge of a RA being produced for the course. The LWC approved JACKAL Driver Course Folder mandates that the Course Warrant Officer is responsible for ensuring that a RA is produced. Although a RA was in place, the Panel believes that it is highly likely that the Trg WO did not review it prior to the training activity taking place. The Panel finds that the lack of supervision of training activity RAs by the Trg WO was a **Contributory Factor.** Exhibit 219 Witness 12

1.4.598. **Recommendation. The Commanding Officer of the Queen's Own Yeomanry should ensure that all unit Risk Assessments are available for review by all personnel and are reviewed by those with supervisory responsibilities prior to each activity in order to ensure that personnel are aware of the levels of risks and control measures to be put in place.**

1.4.599. Whilst the Panel found that the effectiveness of the RA was poor, there is also no evidence of any Dynamic RA being carried out on the day. The Panel believes that it is unlikely that either instructor considered the impact of the weather conditions and the potential adverse effect upon the performance of the vehicles. As a result, the Panel concluded that opportunities were missed by both individuals to reconsider the planned route in light of the slippery conditions and to modify the plan by moving to a less demanding training area. The Panel finds that the lack of a Dynamic RA on the day of the accident was a **Contributory Factor**. Exhibit 33 Witness 1a Witness 1b Witness 2

1.4.600. **Recommendation. The Commanding Officer of the Queen's Own Yeomanry should ensure that Dynamic Risk Assessments are conducted by all supervisory personnel prior to activities taking place in order to ensure new hazards are assessed and associated controls are put in place to reduce risks to as low as reasonably practicable.**

Safe Persons

Definition

1.4.601. JSP 375 defines that safe persons are those who have received the appropriate information, instruction, training and supervision required to carry out a specific task correctly and safely. A competent person within the SSW/T is deemed competent by virtue of qualifications, currency, experience and maturity. It is essential that commanders ensure instructors and those supervising the training are competent and given an appropriate level of supervision to ensure that the delivery of training matches the ability of the trainees and complies in full with all the elements of the SSW/T. Exhibit 74

JACKAL training history

1.4.602. Prior to the transition of JACKAL into a Core capability, all training was delivered by the Defence School of Transport (DST). The training focused on the specific requirements of the operating environment and roles undertaken by those deployed on operations in Afghanistan. Exhibit 209 Exhibit 222

1.4.603. Upon cessation of large-scale operations in Afghanistan, JACKAL was developed into a Core capability. To account for the increased capability requirement and noting the change to the Concept of Use (CONUSE)[65], the TDA was transferred from the DST to the ARMCEN on the 30 August 2013. This transition was formally endorsed and funded on 30 November 2013. To support the new capabilities, the TRA also transitioned from HQ Infantry to the Capability Directorate Combat (CD Cbt). Following a subsequent restructuring of Army training, the TRA function moved to the Fd Army Training Branch in 2017 before being subsumed into the Land Warfare Centre (LWC) in 2018 under Project Exhibit 209 Exhibit 212 Exhibit 222 Exhibit 234

[65] A CONUSE describes the way in which a specified capability is to be employed in a range of activities, operations or scenarios. It remains in existence through the life of the capability.

BROADWAY. At the time of the accident, the TRA was Director Land Warfare (D LW) and the TDA was the ARMCEN.

1.4.604. Due to the changes in JACKAL requirements during the transition from UOR to Core, the TRA at the time (CD Cbt) identified a training gap between those who had completed the legacy DST courses and those newly trained by the ARMCEN. Whilst this gap was undesirable, Defence needed to maintain an enduring JACKAL capability. To do so, Army HQ (AHQ) devised an interim solution to allow those with legacy JACKAL experience to continue to operate the vehicle. This solution enabled those with the DST driver and commander qualifications to continue to operate the vehicle until the ARMCEN had delivered enough instructors to retrain all personnel. This interim period was initially restricted until 31 March 2015 but was later extended by 1 year due to a slower than anticipated delivery of instructors to the distributed training units. As of 31 March 2016, those who had not completed an ARMCEN approved driver or commander course were no longer permitted to operate JACKAL and their qualification was formally removed. Exhibit 209 Exhibit 222

ARMCEN training

1.4.605. Technical Authors within the ARMCEN in conjunction with the LWC Mounted Close Combat (MCC) Training Development Team (TDT) are responsible for producing and maintaining AV Course Folders (CFs). The CF is a selection of training documents that outlines course administrative requirements, start standards, lesson plans, training objectives and assessment strategies. CFs exist for each ARMCEN authorised AV course to ensure standardisation of course content and teaching methodology. These CFs cover both centralised and distributed training courses and are used by both instructors and those in the supervisory chain to assure the training output. CFs are regularly updated with revised practices and standards in line with AESP and CONUSE changes. Instructors and supervisors are directed to use the most up-to-date version when convening AV training courses. Exhibit 35 Exhibit 152 Exhibit 158 Exhibit 212 Exhibit 219

1.4.606. The All Arms[66] JACKAL/COYOTE DMI CF provides information for the following courses: Exhibit 35

a. **858A All Arms JACKAL/COYOTE DMI.** This is the standard DMI Course delivered centrally at the ARMCEN. The duration of the course is 20 training days and requires the student to deliver ten practice lessons. These lessons are assessed and graded by ARMCEN instructors to ensure that new DMIs meet the required standards;

b. **858R Reserve JACKAL/COYOTE DMI.** This course was specifically designed for Reserve DMIs. Delivered centrally at the ARMCEN, the duration of the course was 15 training days and required the student to deliver ten Exhibit 221

[66] All Arms refers to use by All Army Arms and Services and is inclusive of all Regiments/units in the Army.

teaching practices. Although this course was designed for Reserve use, following a pilot course, the ARMCEN withdrew the course favouring the standard 858A course detailed above. As a result, all DMIs now attend the full 20-day course;

c. **8581R-N Reserve JACKAL/COYOTE Re-Role DMI.** This centrally delivered course was a temporary measure specifically designed for Army Reserve DMIs who already held an ARMCEN Instructor qualification on another platform. Considering the previous experience of the student, the course was 9 training days in duration and required five teaching practices. The reduced course enabled the swift transition of Yeomanry units from RWMIK to JACKAL. Originally planned for three courses, the course was only delivered twice, qualifying a total of six DMIs, including Inst 2.

Exhibit 221
Exhibit 228

Driving and Maintenance Instructor (DMI)

1.4.607. A DMI is responsible for the delivery of distributed AV driver and commander training in accordance with the relevant CF. Before attending the JACKAL DMI course, personnel must meet the following start standards:

Exhibit 35
Exhibit 36

a. Qualified and current driver and commander on JACKAL;

b. Must hold a full Category B and C Driving Licence;

c. Must hold a valid FMT 600[67];

d. Must hold a current BCIP qualification;

e. Minimum rank of Junior Non-Commissioned Officer (Lance Corporal or equivalent);

f. Minimum age of 21;

g. Must have passed the Defence Instructional Techniques (DIT) or current Defence Train the Trainer (DTTT) Phase 3 course.

Although DIT is listed above and within PAM 1, as discussed in the Safe Practice section, the qualification is no longer accepted as a result of changes to JSP 822.

Exhibit 36
Exhibit 281

[67] FMT600 - Form Motor Transport Number 600 - an additional military driving licence capturing those platforms that the holder is authorised to drive/operate post receiving the appropriate training.

1.4.608. DMIs are deemed qualified and competent by means of: Exhibit 16

a. **Qualification**. The successful completion of the appropriate Instructors Course and formal award of its qualification;

b. **Experience.** Commanding Officers are to assure themselves that the Instructor has the appropriate experience before authorising them to conduct training activity;

c. **Currency.** The currency for instruction is valid for a maximum period of 12 months from the end date of the course on which they last instructed. If an instructor has not taught for more than 12 months, they are required to conduct a revalidation of their qualification.

Instructor 1 (Inst 1)

Service history

1.4.609. Inst 1 joined the Army in March 2008 as a Regular soldier in the Light Dragoons (LD). At the time, as a RAC Light Armoured Cavalry Reconnaissance Regiment, the LD predominately operated the Combat Vehicle Reconnaissance (Tracked) (CVR(T)), a small, tracked Armoured Fighting Vehicle (AFV) with multiple variants and roles. Upon joining the LD, Inst 1 immediately completed Pre-Deployment Training before deploying on Operation HERRICK as a CVR(T) Driver. After a successful deployment, Inst 1 was selected to serve with the Brigade Reconnaissance Force (BRF). Regarded as a highly demanding role, selection for BRF duties was seen as an accolade, demonstrating that Inst 1 was highly regarded by his Chain of Command. Witness 1c

1.4.610. Completing the DST JACKAL driver course in 2011, Inst 1 deployed on Operation HERRICK as part of the Troop Sergeants' crew on COYOTE. Finding himself predominantly in the gunner role, Inst 1 gained limited driving experience during this deployment. Upon return from operations in 2012, Inst 1 was promoted to Lance Corporal and returned to the LD; he was promoted to Corporal a year later in 2013. In 2014 Inst 1 attended and successfully passed the Section Commanders' Battle Course (SCBC) to a high standard. Aimed predominantly at Infantry soldiers, completion of the SCBC was unusual for a Light Cavalry soldier but highlighted Inst 1's desire to exceed expectations. Witness 1c

1.4.611. Following the SCBC, Inst 1 completed the ARMCEN JACKAL Crew Commander Course and, in 2015, he attended the Light Cavalry Non-Commissioned Officer Commanders' Course, designed to enhance tactical awareness and mission specific RAC skills. Witness 1c

1.4.612. In 2016 the LD were relocated from Swanton Morley to Catterick as part of the Army 2020[68] restructure. The following year, the LD deployed to Poland in support of Op CABRIT. During the deployment, Inst 1 was tasked as Squadron Quartermaster Sergeant (SQMS). Witness 1c

1.4.613. In 2018, upon return from Op CABRIT, Inst 1 took the opportunity to serve as a Permanent Staff Instructor (PSI) and DMI with the LD's paired Reserve unit, the QOY. This presented an opportunity for promotion along with a break from deployments, providing stability for his young family. Completing the required ARMCEN JACKAL Crew Driver and DMI courses, Inst 1 was promoted to Sergeant and assigned to C Squadron the QOY located in Fox Barracks, Chester. Witness 1c

1.4.614. During his time with the QOY, Inst 1 was viewed as a trustworthy and capable individual who could be relied upon to deliver high quality training with minimal supervision. As one of only a handful of Regular soldiers, Inst 1 was respected amongst his peer group and was heavily involved in the day-to-day running of C Sqn. As such, Inst 1 held a number of responsibilities beyond those of his counterparts in a Regular unit. Witness 10 Witness 11

Analysis of Instructor 1 (Inst 1)

1.4.615. **Qualification.** A review of Inst 1's driver training records and JPA competencies show that although he held a current DMI qualification and the requisite driver and commander qualifications for the vehicle, Inst 1 was not fully qualified in the instructional role as he had not upgraded his legacy DIT qualification to the approved DTTTv2 Phase 3 qualification. When questioned about his instructor qualifications, Inst 1 stated that he was aware of the requirement to upgrade his DIT qualification to a DTTTv2 Phase 3 qualification but that he had forgotten to complete the on-line training. The Panel believe that it is likely that the QOY Chain of Command was unaware of the change in JSP 822 requirements and therefore did not confirm that Inst 1 had updated his qualification in line with the new policy. Exhibit 19 Exhibit 25 Exhibit 281 Witness 1d

1.4.616. The Panel reviewed the training that was required to update a legacy instructional qualification to DTTTv2. During this review, the Panel found that the additional on-line training provided guidance on the importance of considering external factors, such as the environment, prior to training delivery. Although the training did not formally discuss Dynamic Risk Assessments, the Panel concluded that the advice contained within the enhanced training may have influenced Inst 1's decision to conduct the cross-country training on the day of the accident. Although the Panel concluded that the training provided a useful enhancement to existing qualifications, the Panel found that the course was not assessed and therefore it was possible that a student could complete the course without demonstrating an Exhibit 201

[68] Army 2020 is the transformation of the British Army for the 2020s and beyond, in response to the strategic challenges the British Army is likely to face in the future.

understanding of the principles taught. The Panel finds that the incorrect instructor qualification held by Inst 1 was **an Other Factor.**

1.4.617. Due to his lack of driving between 2012 and 2018, Inst 1 was required to conduct the ARMCEN derived JACKAL driver course prior to becoming a DMI. During interviews, the Panel discovered that during his ARMCEN Driver course delivered by the LD in January 2018, no practical driving exercises were conducted and, therefore, he did not complete all elements of the course in accordance with the Training Objectives. Despite these omissions, a training deficiency was not raised and Inst 1 was deemed to have passed the course. Whilst the Panel believes it is likely that this omission was due to a misguided appreciation of his previous experience, the lack of adherence to the approved course undermined the driver qualification held by Inst 1. As a result, the Panel concluded that Inst 1's driver qualification was incorrectly awarded. The Panel finds that the incorrectly awarded driver qualification held by Inst 1 is an **Observation.**

Exhibit 219
Exhibit 286
Witness 1c

1.4.618. The Panel reviewed the FMT 600 held by Inst 1 at the time of the accident and noted that it was issued by the LD rather than by his current unit, as required by JSP 800. There is no record of Inst 1 reading or signing for the QOY MT Standing Orders, an annual requirement stipulated in JSP 800. The Panel finds that the non-compliance of Inst 1's records with JSP 800 is an **Observation.**

Exhibit 19
Exhibit 20
Exhibit 34

1.4.619. **Experience.** Since his initial JACKAL qualification in 2011, Inst 1 had gained extensive experience of operating JACKAL and COYOTE in a variety of crew positions. A vehicle commander since 2014, Inst 1 had over 4 years of command experience, underpinning his awareness of the capabilities of the platform. Notwithstanding his experience, Inst 1 had a significant gap in his role as a driver between 2012 and 2018. As a result, Inst 1's competency in the driver role would have suffered significant skill fade immediately prior to his JACKAL DMI course. This was compounded by the lack of practical driving training and assessment during his course in 2018 as highlighted in Para 1.4.617. The Panel finds that Inst 1's lack of recent JACKAL driver experience was a **Contributory Factor.**

Exhibit 19
Exhibit 286
Witness 1a
Witness 1b
Witness 1c

1.4.620. Whilst Inst 1 had significant JACKAL operator experience, his exposure as an instructor was limited. With less than a year in the DMI role, Inst 1 was an inexperienced Instructor who, in the opinion of the Panel, required additional supervisory support. The Panel finds that Inst 1's lack of instructional experience was a **Contributory Factor.**

Exhibit 19
Witness 1c

1.4.621. In his role as C Sqn PSI located in Chester, Inst 1 had limited immediate supervision due to his dislocation from the Regimental HQ in Newcastle. As a result, Inst 1 was used to working independently and gained confidence in doing so. Although the QOY Trg WO made regular telephone contact with Inst 1, the Panel believes that it was unlikely that the XO or Trg WO could provide an adequate level of supervision from a remote location. This is evidenced by the lack of FMT 600 compliance and the errors made during the convening of the course on which the accident occurred.

Exhibit 19
Exhibit 24
Witness 1c

1.4.622. **Currency.** Inst 1 passed the All Arms JACKAL/COYOTE DMI course on 2 March 2018. Inst 1 had also instructed during two other JACKAL driver and commander courses within the 12-month period prior to the course in January 2019. As a result, Inst 1 was current in-line with the AVSO currency requirements for DMIs. The Panel finds that the instructional currency of Inst 1 was **not a factor.**

Exhibit 16
Exhibit 19
Exhibit 25
Exhibit 229
Exhibit 334

1.4.623. In addition to instructional currency requirements, AVSOs also stipulate specific currency requirements for all AV crew members. In the case of JACKAL, crew members are required to complete annual currency requirements in line with the AV Platforms Continuation Training (CT) and Assessment Matrix. This comprehensive list of CT requirements should be managed through unit supervisory checks and be recorded within an individual's Driver Training Record.

Exhibit 16

1.4.624. The Panel reviewed Inst 1's Driver Training Record. No history of CT could be found. Whilst it is likely that almost all elements of the mandated continuation training were completed during his driver course immediately prior to his DMI training, historic evidence to support his time as a commander does not exist. The Panel finds that the lack of CT records is an **Other Factor**.

Exhibit 16
Exhibit 19

Instructor 2 (Inst 2)

Service history

Exhibit 230

1.4.625. Inst 2 joined the Territorial Army[69] on 10 January 1987 and served with 103 Air Defence Regiment Royal Artillery until 9 August 1988 when he joined the Regular Army. On completion of Basic Training, Inst 2 joined 29 Commando Regiment Royal Artillery attending and passing the All Arms Commando Course in 1989. Completing 22 years of Regular service, Inst 2 undertook multiple operational tours including Northern Ireland, Kosovo, Cyprus, Iraq and Afghanistan. Inst 2 left the Regular Army on 19 September 2010 joining the Defence School of Transport (DST) on a Full Time Reserve Service (FTRS) contract in November 2010. Inst 2 was employed by the Specialist Training Division as a JACKAL instructor until 12 April 2013 when he left DST and joined the Army Careers Office in York as a FTRS Army Reserve Liaison Officer. In April 2017 Inst 2 joined the QOY.

[69] Since 2014 the Territorial Army has been named the Army Reserve.

Analysis of Instructor 2 (Inst 2)

1.4.626. **Qualification.** Inst 2 was not a qualified JACKAL operator during his time in the Regular Army. Upon joining the Reserves, under FTRS terms, Inst 2 was employed as a JACKAL instructor at the DST. To qualify, Inst 2 passed successive JACKAL 1 and 2 driver courses and a JACKAL to COYOTE conversion. In total, Inst 2 took less than 3 weeks to complete all JACKAL courses and qualify as an instructor. Inst 2 had no operational experience on the vehicle. Exhibit 18 Exhibit 25 Exhibit 230

1.4.627. Upon joining the QOY, Inst 2's JACKAL qualifications had expired under the transition from DST to ARMCEN training. At this time the QOY were operating the RWMIK and, making best use of his previous instructional experience, Inst 2 quickly qualified as an ARMCEN RWMIK DMI. Due to the Reserve re-role onto JACKAL, Inst 2 renewed his JACKAL qualifications by undertaking the JACKAL driver course in April 2018 and the commander course in May 2018; both courses were conducted by the LD. Although it is likely that all training objectives were achieved during these courses, the Panel has discovered that the instructor to student ratios exceeded the ARMCEN endorsed courseware. ARMCEN courses dictated an Instructor to Student ratio of 1:3 whereas the Panel has discovered that the actual ratio during these two courses was 1:5 during the driver course and 1:7.5 during the commander course. The Panel finds that the supervision and assurance of JACKAL training delivered to both instructors by the LDs was an **Observation**. Exhibit 18 Exhibit 209 Exhibit 287 Exhibit 288

1.4.628. Following successful completion of his JACKAL driver and commander courses, Inst 2 completed the JACKAL/COYOTE DMI 8581R-N Re-Role Reserve course. This course was the shortened version of the Reserve DMI course to convert previously qualified ARMCEN RWMIK Instructors to JACKAL. As a current RWMIK DMI, Inst 2 was qualified to undertake this course. The Panel finds the JACKAL qualifications held by Inst 2 were **not factors.** Exhibit 18 Exhibit 221 Exhibit 222 Exhibit 289 Exhibit 290

1.4.629. As with Inst 1, Inst 2 did not hold the current DTTTv2 Phase 3 instructor qualification but did hold legacy DIT and DTTT version 1 qualifications. The Panel finds that the lack of Inst 2's DTTTv2 (Phase 3) qualification was an **Other Factor.** Exhibit 25

1.4.630. **Experience.** Although Inst 2 had extensive experience as a JACKAL instructor from his time at the DST, he had no operational experience of driving or commanding the vehicle. As a result, it is likely that Inst 2's experience of driving the JACKAL away from specified driver training areas was relatively limited. Exhibit 18 Exhibit 230

1.4.631. Upon leaving the DST, Inst 2 experienced a 5-year gap where he did not operate JACKAL. It is likely that time away from the vehicle induced an element of skill fade. Although he re-qualified under the ARMCEN regime during his time with the QOY, his driver, commander and DMI courses were compressed into a very short period, leaving very little time for consolidation of the skills he had re-acquired. The Panel finds that the combination of rapid requalification of Inst 2 onto JACKAL, the 5 year gap in experience and the lack of operational experience on the type was an **Other Factor.** Exhibit 230 Exhibit 233

1.4.632. **Currency.** Inst 2 passed all of his JACKAL courses during the 12 months prior to the accident. The Panel requested a copy of Inst 2's Driver Training Record and found it to be deficient of an Individual Training Record Card. Whilst the Panel has concluded that the Record Card would not have included any records of CT due to the recency of his JACKAL course, its absence highlights a lack of supervisory oversight of CT compliance. Nevertheless, the Panel finds that Inst 2's currency was **not a factor**. Exhibit 18 Exhibit 233

1.4.633. **Recommendation. The Commanding Officer of the Queen's Own Yeomanry should ensure that all instructors have completed all mandatory training prior to undertaking instructional duties in order to ensure that training delivery is compliant with all applicable Defence policy.**

Instructor selection

1.4.634. JSP 822 mandates that instructors should be selected based upon an assessment of ability. To do so, commanders must have an appreciation of the professional ability of the personnel they command. Exhibit 281

1.4.635. AVSOs detail the annual CT requirements for all AV operators. Although the list of requirements is extensive, there is no requirement to conduct a practical driving exercise or assessment aside from a '*driving in extremis*' exercise. As a result, there is no formal process for assessing an individual's driving ability on which to base an instructional recommendation. Although the Service Person's Joint Appraisal Report (SJAR)[70] provides a facility to comment upon instructional suitability, the Panel views this as a generic assessment of character traits with regard to the demands of instructional duties rather than an assessment of practical ability. In the case of Inst 1, although he held recommendations for generic instructional duties within his SJAR, the Panel was unable to find any evidence to support that his selection as a DMI was based upon his driving ability. The Panel believes it is likely that he was selected for DMI training as a result of him volunteering for the QOY PSI position which necessitated him gaining a DMI qualification. Exhibit 16 Exhibit 235

1.4.636. Although the Panel believes that both instructors had displayed high levels of professional ability prior to their selection as DMIs, the lack of any documented assessment, in accordance with JSP 822, undermines their selection as DMIs. The Panel finds that the lack of a formalised and documented DMI selection process is an **Other Factor.**

[70] SJARs are to be used for all other ranks from OR9 (Warrant Officer Class 1) and below. The purpose of SJARs are to ensure the individual understands their role and responsibilities, to act as a management tool to improve performance address potential areas of improvement, to explain to the individual formally how they have performed during the reporting period and inform and explore career development.

1.4.637. **Recommendation. Director Land Warfare should mandate that the selection of individuals for Driving and Maintenance Instructor courses is to be auditable in order to demonstrate compliance with Joint Service Publication 822 and provide assurance of instructor competence.**

Through-life development of instructors

1.4.638. In accordance with JSP 822, the development of instructors is to be monitored by the Chain of Command. In doing so, instructors should be offered the opportunity to develop their instructional skills through access to Continuing Professional Development (CPD) opportunities. Exhibit 281

1.4.639. The Panel found that centrally-based ARMCEN instructors are being monitored and receiving CPD in line with JSP 822. This is very likely due to their location within a fully developed training establishment with access to training specialists with a comprehensive working knowledge of DSAT methodology. In contrast, the Panel found that away from Centralised Training Establishments, knowledge of DSAT was weak. As a result, it is very likely that the requirement for CPD is not understood and that some instructors are not afforded development opportunities through CPD. Exhibit 281 Witness 11 Witness 12

1.4.640. In the case of DMIs, this is evidenced through the lack of any formalised DMI CPD. As a result, beyond the DMI course, DMIs have no opportunities to improve their instructional techniques other than through their own private study. Any improvement is, therefore, wholly based upon the professional attitude of the individual as opposed to a formalised development programme. The Panel finds that the lack of DMI CPD is an **Other Factor**. Exhibit 16 Exhibit 281

1.4.641. **Recommendation. Director Land Warfare should introduce a formal Driving and Maintenance Instructor Continuing Professional Development programme for all Driving and Maintenance Instructors in order to ensure that instructors continue to develop their instructional skills.**

1.4.642. External assurance of distributed DMI activity should be provided by the LWC's TSG. Although the TSG conducts checks on course preparations, its ability to provide adequate assurance activity is undermined by a lack of personnel as highlighted in Para 1.4.582. Exhibit 29 Exhibit 217 Witness 18

1.4.643. As a result, external checks of practice on distributed training units are rare and therefore standardisation of training across the DMI cadre cannot be assured. The Panel finds that the lack of DMI standardisation checks is an **Other Factor.**

1.4.644. **Recommendation. Director Land Warfare should implement an annual Driving and Maintenance Instructor standardisation check in order to assure ongoing instructor competence and adherence to training policy.**

Students

1.4.645. An Armoured Vehicle (AV) driver is a Service Person who has received the appropriate AV system training specific to the platform for their role. An AV driver is responsible for driving the AV under the control and supervision of a qualified AV commander, marshal or controller. They are to be trained and hold the relevant Licence for the platform type they are driving. Specifically, for JACKAL this is the All Arms JACKAL/COYOTE Crew Driver. Exhibit 12 Exhibit 219

1.4.646. In order to conduct the All Arms JACKAL/COYOTE Crew Driver course individuals must have achieved the following pre-requisites: Exhibit 37 Exhibit 219

a. Must hold a full Category C driving Licence or pass certificate;

b. Must hold a valid FMT 600 and in-date UK matrix test;

c. Must hold a current BCIP qualification.

Start standards

1.4.647. All students held the required driving licences and FMT 600 records in accordance with the mandated course start requirements. Of the six students, only two held the correct BCIP qualifications; the remaining four held legacy qualifications as detailed below: Exhibit 30 Exhibit 34 Exhibit 38 Exhibit 39 Exhibit 41

a. Two students held a legacy BCIP 5.4 qualification;

b. One student held a legacy BCIP 4F qualification;

c. The final student held a legacy Clansman course qualification.

1.4.648. As a result, only two of the six students were correctly qualified to start the course. The Panel was unable to ascertain why the students were permitted to continue the course despite not meeting the required standards and why the anomaly was not detected by either instructor or the TSG check. As BOWMAN radios were not fitted to the accident vehicle, the lack of BCIP qualifications did not influence this accident. However, had the course completed as planned, the Panel believes that it is likely that all students would have been awarded a JACKAL driver qualification, despite not holding the appropriate supporting qualifications. The Panel finds that the lack of BCIP qualifications is an **Observation**. Exhibit 30 Exhibit 37 Exhibit 38 Exhibit 236 Witness 1b Witness 18

1.4.649. In accordance with the Crew Driver Assessment Strategy, students are to conduct an open book AVSO theory test. To pass, students must achieve a score of 80%. In case of failure, students are permitted to re-sit the test up to three times. Students must pass this test before operating any AV. If any student fails to pass the AVSO test they are to be returned to unit. The Panel found that all students passed the AVSO test at the beginning of the course. The Panel finds that the AVSO testing was **not a factor**. Exhibit 37 Exhibit 236

Experience

1.4.650. Due to the demographic of Reserve units, Army Reserve soldiers tend to possess greater life experience than those within Regular units. With a cross section of the population, Reserve units have a significant spread of military experience, from those with no military background to individuals who have already served a full career with the Regular Army. The experience of the driver course in January 2019 mirrored this profile, comprising students with no AV experience to those who had vast amounts of operational experience on AVs. During interviews both Inst 1 and Inst 2 stated that they deemed the students on the course as more experienced due to their age and maturity levels and it is the Panel's opinion that, as a result of this perception, the attitude of the instructors towards the students facilitated a more relaxed training environment with a reduced crew gradient[71].

Exhibit 202
Witness 1a
Witness 2

1.4.651. Whilst this reduced gradient facilitated a more relaxed learning environment, the effect of this is likely to have led to poor decision making and a blurring of command responsibilities. This will be discussed further in the Human Factors element of this report. The Panel finds that the perceived level of student experience was a **Contributory Factor.**

Exhibit 244
Witness 1a
Witness 1b
Witness 2
Witness 5

Staff Sergeant McKelvie

1.4.652. SSgt John McKelvie was a member of the Territorial Army from February 1986 to January 1988. He joined the Regular Army on 14 January 1988 and served with the Royal Scots Dragoon Guards until he left the Regular Army on 25 August 2010. During his career as a Regular soldier he was trained on various AFV platforms including Chieftain[72], Challenger 1[73] (CR1) and CVR(T). As an experienced soldier, SSgt McKelvie was qualified as a DMI on CVR(T) and CR1 and had served on operations around the world. Upon completion of a full Regular career, SSgt McKelvie joined the Reserves in October 2015, joining A Squadron, the Scottish and North Irish Yeomanry (SNIY). Whilst serving with the SNIY, SSgt McKelvie completed the RWMIK+[74] driver course in May 2016 and the All Arms JACKAL/COYOTE commander course in November 2018. The Panel finds that the experience and qualifications held by SSgt McKelvie were **not a factor.**

Exhibit 25
Exhibit 233
Exhibit 291

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[71] Crew gradient is a widely used term in aviation to describe the relative experience gradient between flight crews. Whilst significant gradients can lead to damaging autocratic leadership styles, equally a lack of gradient can lead to poor decision making.

[72] Chieftain was the Main Battle Tank of the British Armed Forces during the 1960's, 1970's and up to 1983.

[73] Challenger 1 (CR1) was the main battle tank used by the British Armed Forces from 1983 to the mid 1990's, when it was superseded by the Challenger 2 (CR2) which is currently still in service.

[74] RWMIK+ is an upgraded RWMIK including larger engine, automatic gearbox, [redacted] among other upgrades from the RWMIK.

Supervision of training personnel

1.4.653. The SSW/T states: Exhibit 237

> *'It is essential that Commanders ensure their instructors are competent and given the appropriate level of supervision to ensure that the delivery of training matches the ability of the trainee and complies in full with the Safe System of Training.'*

1.4.654. Supervision of training activities can be broken down into two distinct elements: Health, Safety and Environmental Protection (HS&EP); and Training Supervision. ACSO 3216 states: Exhibit 71

> *'Commanders have a personal responsibility for ensuring that activities are conducted in accordance with Service Instructions, Regulations, Defence Codes of Practice, Directives and Policy while taking due regard to any risks to personnel. If this is not rigorously enforced the Safe System of Training is removed and not fit for purpose.'* Exhibit 71

1.4.655. In addition to the application of the SSW/T, the risks associated with the JACKAL driver course are also managed by the application of the Army Duty Holding (DH) construct as detailed in Para 1.4.86.

1.4.656. In accordance with ACSO 3216, the CO of the QOY was the nominated Delivery Duty Holder (DDH) and was formally accountable for the DH activities undertaken by his unit. To enable him to perform his DH responsibilities, the CO was reliant upon his subordinate Chain of Command understanding the DH construct and providing the appropriate supervision of all personnel. He was also reliant upon SMEs within his unit providing specific feedback on hazard and risk analysis. Exhibit 71 Exhibit 295

1.4.657. Training Supervision provides the method by which Defence training is governed and assured. It provides the framework to ensure that training is carried out by appropriately supervised and competent personnel using the correct techniques and lesson formats. JSP 822, the Defence Systems Approach to Training (DSAT), details that COs are responsible for ensuring appropriate supervision and support is in place. To do so, the CO should appoint the following training supervisory positions: Exhibit 281

a. **Defence Trainer Supervisor (DTS).** The DTS should be an individual with previous instructional experience. For Phase 3 Training units, the DTS should hold DTTT Phase 3 and DTS training to foundation level. The role of the DTS is to assess and support the development of their Training Staff;

b. **Defence Trainer Manager (DTM).** The DTM should be a SME in their professional area although they may not have previous instructional experience. DTMs are responsible for advising their Chain of Command regarding Training Policy and act as functional managers for the DTSs. DTM oversee the development of the instructional staff and are responsible for the continuous improvement of training within their unit. DTMs are to have attended the DSAT Managers Course although there is no requirement for them to hold DTTT or other instructional qualifications.

1.4.658. A review of the QOY's training team found that no DTS or DTM had been appointed and that no continuous development or assessment of training staff had been undertaken. As a result, the CO's ability to assure training activity was likely to have been poor. This is evidenced by the lack of supervision afforded to Inst 1 during the convening of this course and the incorrect qualifications held by both instructors. The following paragraphs will analyse the key supervisory personnel during the planning and conduct of the JACKAL Driver Course. It should be noted that immediately prior to the course being delivered, command of the QOY was handed over and therefore both COs will be discussed due to their roles in the supervision of the training planning and delivery of this course.

Exhibit 25
Exhibit 71
Exhibit 215
Exhibit 216
Witness 11
Witness 12

The former Commanding Officer (CO)

1.4.659. The former CO of the QOY was a Regular RAC Officer who held the position of CO from September 2016 to 18 January 2019. He was first introduced to JACKAL whilst serving on Operation HERRICK alongside the BRF although he was not qualified in any role on the platform. Between 2016 and 2017, prior to the integration of JACKAL into the Reserve Light Cavalry, he attended several Integration Working Groups to plan for the transition from RWMIK to JACKAL. These integration meetings focussed on the support aspects of JACKAL operations and did not discuss safety matters. As a result, it is likely that the former CO was unaware of any safety related matters associated with JACKAL.

Witness 10

1.4.660. During interview, the former CO stated that, at times, he felt vulnerable, mainly due to personnel constraints and the nature of a Reserve Regiment. However, in his opinion he felt that he was coping with the demands due to the performance of the Regiment reported by assurance inspections. Although he was aware of his DH responsibilities, he did not receive a formal Letter of Delegation from General Officer Commanding (GOC) 1st (UK) Division[75] (1 (UK) Div) until August 2018, almost 2 years into his tenure as CO.

Exhibit 295
Witness 10

1.4.661. To maintain command and control of his Regiment and communicate his intent, the former CO held monthly meetings with the Command Team at Regimental Headquarters (RHQ). These meetings were attended by Inst 1, giving the former CO the opportunity to discuss matters with him face-to-face. In addition

Witness 1b
Witness 10

[75] GOC 1st (UK) Division is the 2* appointment who commands several 1* Brigades. Each Brigade consists of numerous Regiments/units.

to their interactions within the QOY, the former CO had previously worked with Inst 1 during a Short-Term Training Team task in Tunisia and with the BRF on Operation HERRICK. The former CO thought highly of Inst 1 and stated that he had arrived at the QOY with a good reputation from his previous unit. The Panel concluded that it is likely that Inst 1's good reputation led to him being afforded less supervision and oversight by the former CO than his peers within the QOY.

The Commanding Officer (CO)

Witness 9

1.4.662. The CO of the QOY at the time of the accident assumed command of the Regiment on the 18 January 2019. Although the handover was originally planned for March 2019, an operational deployment of the former CO necessitated an early handover. Completing the Commanding Officer's Designate Course in September 2018 and the on-line Army DH course, the CO received his DH Letter of Delegation in March 2019, 2 months after his appointment and after the accident occurred on 29 January 2019. Due to the delay in the issue of a Letter of Delegation by GOC 1 (UK) Div, at the time of the accident there was no formal appointment of a DDH within the QOY. The Panel finds that the lack of a formally appointed DDH at the time of the accident is an **Other Factor.**

1.4.663. **Recommendation. The Chief of the General Staff should ensure that all Duty Holders have signed and accepted their Duty Holder Letter of Delegation prior to assuming their Duty Holder role in order to provide assured and auditable ownership of Duty Holder responsibilities.**

Witness 9
Witness 11

1.4.664. As a Reserve Army Officer, the CO QOY committed 2 days a week to undertake his duties as CO and the remaining 3 days to his civilian employment. His weekends were split between CO duties and his personal life. Although the CO was not 'in office' 5 days a week as a Regular CO might be, the CO stated that he was contactable via telephone should he have been required. In the absence of the CO, the Executive Officer (XO), as the appointed Senior Regular Officer, would oversee the Regiment on the CO's behalf.

Witness 9

1.4.665. Due to the deployment of the former CO, it is likely that the handover of QOY command was compressed, concentrating on the administrative tasks associated with regimental command rather than a handover of hazards and risks. During interviews, the CO QOY stated that he had not been made aware of any previous JACKAL roll over accidents or the failed stability tests that had come to light in the weeks after the accident. In his view, the lack of safety information had undermined his ability to supervise the activity effectively. The Panel finds that the abbreviated handover and lack of safety information available to the CO was a **Contributory Factor.**

1.4.666. **Recommendation. The Chief of the General Staff should ensure that there is effective transfer of Duty Holder owned risks in order to maintain appropriate levels of Duty Holding assurance at all times.**

Exhibit 3
Exhibit 24
Witness 9

1.4.667. The JACKAL driver course commenced on 20 January 2019, 2 days after the appointment of the new CO. It is likely that the CO QOY would have assumed that all of the correct procedures had been followed with regard to the

preparation of the course and that the formal authorisation had been granted by the former CO. In addition, with no formal delegation of DH responsibilities, the CO QOY was not formally empowered to authorise the Driver Training activity. The Panel finds that the lack of DDH authority to conduct the Driver Training was an **Other Factor.**

1.4.668. **Recommendation. The Chief of the General Staff should assure that all Duty Holding activities are appropriately assessed and authorised in advance by Duty Holders in order to ensure that all associated risks to life are correctly scrutinised.**

1.4.669. In accordance with JSP 822, the QOY is a nominated Training Establishment as the unit conducts a number of Phase 3 training activities, including JACKAL training. As the CO of a Training Establishment (COTE), the CO QOY is required to attend the COTE course delivered by the Defence Centre for Training Support (DCTS). Despite this requirement, the Panel found that attendance at the course was not mandated within either the CO's Assignment Order or JPA Job Specification. Exhibit 281

1.4.670. The Panel found that the CO QOY had not attended the COTE course and was not fully aware of the contents of JSP 822. Due to the lack of training provided to the CO QOY, it is unlikely that he was aware of any of the requirements of JSP 822 with regard to DCTF or training assurance. The Panel finds that the lack of DSAT training undertaken by the CO QOY was a **Contributory Factor.** Exhibit 238 Exhibit 261 Exhibit 262

1.4.671. **Recommendation. Director Personnel should ensure that all Joint Personnel Administration Job Specifications and Assignment Orders for unit training supervisory personnel contain the correct list of mandated professional courses in order to ensure that all personnel are appropriately trained prior to taking up new roles.**

1.4.672. Whilst reviewing ACSO 3228 (The Army Trainer Capability) dated December 2018, the Panel found that the requirements contained within it did not align with JSP 822, requiring the CO to conduct only the lower level Care of Trainee (CoT) course rather than the COTE course. The Panel finds that the discrepancy between ACSO 3228 and JSP 822 is an **Other Factor**. Exhibit 262 Exhibit 263 Exhibit 281

1.4.673. **Recommendation. Director Personnel should update Army Command Standing Order 3228 in order to ensure that it is consistent with Joint Service Publication 822.**

The Executive Officer (XO)

1.4.674. The Executive Officer (XO) is a Regular RAC Officer who completed Phase 2 training in 2010 before commencing Regimental Duties (RD). In 2011, the XO deployed to Afghanistan in support of Operation HERRICK as a Reconnaissance Troop Leader of four JACKAL vehicles and associated crews. Following this deployment, the XO transitioned into intelligence and linguistic roles within the Army. The XO served away from RD until November 2017 when he joined the QOY as the Adjutant. In February 2018, due to a gap in the XO role, the Witness 10 Witness 11

XO was offered acting promotion to Acting Major and assigned into the XO position. As the Adjutant position remained gapped until April 2018, the XO undertook both roles for 3 months.

Exhibit 215

1.4.675. The QOY XO holds the following responsibilities:

a. Directly responsible to the CO for overall training policy, including the Regimental Training Directive and conduct of individual, trade and continuation training;

b. Deliver Regimental Training in line with the CO's policy, including Crew Commander Study, Troop Tests, Regimentally Sponsored Squadron training and Annual Camp;

c. Arrange and supervise all internal Regimental training, in particular, Royal Armoured Corps and other career courses required for pay and promotion;

d. Oversee the selection and preparation of QOY personnel attending external courses;

e. Responsible for ensuring that all Squadron Training Wing facilities and equipment are up to date, and that Squadron Training is correctly resourced;

f. Advise the CO, Permanent Staff Instructors (PSIs) and all training staff on all aspects of training within the Regiment;

g. Produce the Forecast of Events twice yearly;

h. Complete the reporting and management requirements for the Regimental Sergeant Major and all PSIs;

i. He is the principal G3[76] Organisation & Deployment staff officer in all non-personnel matters;

j. Conduct the duties of the Regimental Security Officer.

1.4.676. When the CO appointment is held by a Reserve officer, the XO holds the senior Regular appointment and acts as the defacto CO when the CO is away from the unit. Due to the demanding nature of the XO position, particularly when a Reserve CO is in place, the XO position should be assigned to a high calibre officer. In the opinion of the Panel this should be an experienced Major who has commanded a sub-unit and undergone intermediate staff training. The Panel also concluded that XOs should understand risk management and, in particular, the roles and responsibilities within the Duty of Care and Duty Holding constructs.

Exhibit 201
Exhibit 215
Witness 11

[76] G3 - Responsible for operations, including staff duties, exercise planning, training, operational requirements, combat development and tactical doctrine.

1.4.677. As the officer responsible for Regimental training activities the XO, by default, is also the unit Training Officer and should have an understanding of DSAT and training management. Despite the significant responsibilities held by the XO, the Panel could not find a list of prerequisite competencies required to be selected for the role. Exhibit 215 Witness 11

1.4.678. A review of the XO's service history highlighted that, despite several operational tours, the XO had spent a significant time away from RD. Whilst the Panel believes that the XO was a competent and intelligent Acting Major[77] at the time of the accident, it is highly likely that his lack of experience at RD restricted his opportunities to develop as a junior RAC Officer. Witness 11

1.4.679. When interviewed by the Panel, the XO stated that he was aware of Risk to Life (RtL) and the DH construct and that he had conducted RtL assessments for previous exercises. Despite his role as XO and the associated responsibilities, the XO was not required to conduct any formal DH training. As a result, the XO's understanding of DH roles and responsibilities was not supported with any formal training and, as such, the Panel viewed his knowledge of the DH construct as limited. For example, the XO was not aware of the requirement for DDHs to authorise DH activities. The Panel finds that the XO's lack of DH training was a **Contributory Factor.** Witness 11

1.4.680. **Recommendation. Chief Safety (Army) should mandate Duty Holding awareness training for all Regimental supervisory staff including Second-in-Command, Sub-unit Commanders, Executive Officers, Training Officers and Training Warrant Officers in order to assure the correct level of supervision of Risk to Life activities.**

1.4.681. When assessing the primary roles of the XO, the Panel noted the responsibilities with regard to training supervision. The Panel also noted that, in line with standard Reserve unit structures, no formal Training Officer position was appointed. As a result, the XO position fulfilled the roles and responsibilities of a Regular unit Training Officer and was, therefore, the most suitable person to fulfil the Defence Training Manager (DTM) position in accordance with JSP 822. Exhibit 215 Exhibit 281

1.4.682. During interviews, the XO stated that he was unable to adequately assure driving training activities due to a lack of DMI training specialisation. When questioned about his understanding of training management and any associated Defence policy, the XO stated he had not heard of JSP 822 or DSAT. Due to his lack of formal DSAT training, it is more likely than not that the XO was not equipped with the knowledge to understand and supervise the distributed JACKAL driver training activity undertaken by the QOY, despite being formally tasked to do so within his Job Specification. Witness 11

[77] Acting Major is a substantive Captain wearing the rank of Major prior to selection for promotion.

1.4.683. The Panel believes that, had the XO been formally tasked as the DTM, he would have conducted the required DSAT Manager training and, as a result, he would have had a much better understanding of training delivery and supervision. The Panel finds that not appointing the XO as the DTM was a **Contributory Factor.** Exhibit 215 Witness 11

1.4.684. **Recommendation. Director Personnel should ensure that all Reserve unit Executive Officers are nominated as the Defence Training Managers and undertake the required training in accordance with Joint Service Publication 822 in order to ensure that adequate levels of training assurance are provided for Reserve units.**

1.4.685. Although the XO initially benefitted from a Regular CO, the Panel does not believe that he received sufficient mentoring to compensate for his lack of Regimental experience. The Panel also noted that there are no training packages or courses for personnel assigned to XO roles. As a result of this lack of training and pre-requisite command and staff experience in rank, the effectiveness of an XO's supervisory role in both Training and Risk Management is likely to be limited. In this case, the Panel believes that it is likely that the XO did not possess the required experience or knowledge to conduct these supervisory duties appropriately. The Panel finds that the lack of experience and knowledge of the XO in the management of risk and training was **a Contributory Factor.** Witness 10 Witness 11

1.4.686. **Recommendation. Director Personnel should direct that officers selected for Reserve Regiment Executive Officer duties are post sub-unit command in order to ensure that adequate levels of experience are provided at all Reserve units.**

The Training Warrant Officer

1.4.687. The Training Warrant Officer (Trg WO) was a Regular Army RAC Warrant Officer Class 2. He enlisted into the Regular Army in April 1997 and had completed 7 operational tours. During his career he predominately served with his Regiment (The Royal Scots Dragoon Guards) although he had also seen short detachments from RD to the Army Training Regiment, Winchester, as an Instructor and to Kenya in support of UK exercises as Safety Staff. The Trg WO joined the QOY in November 2016 after completing a Regimental Quartermaster Technical position at RD. Throughout his career, the Trg WO had specialised in Armoured Fighting Vehicle (AFV) Gunnery and AFV live fire training. Witness 12 Exhibit 275

1.4.688. The Trg WO responsibilities within the QOY are as follows: Exhibit 216

a. Assist the XO in the production of the Regimental Training Directive and ensuring that it is carried out;

b. Advise Squadron PSIs to ensure all required Individual and Collective Training is completed;

c. Input planned Regimental activity onto CHURCHILL[78];

d. Assist the XO in planning for external courses for Regimental personnel and any pre-course training and selection that is required;

e. Responsible for booking training areas for Regimental Individual and Collective Training;

f. Liaise with Combat and Armoured Fighting Vehicle Training Schools on all related matters;

g. Assist the XO in the production of the Regimental Forecast of Events;

h. Any other task as directed by the CO and XO.

1.4.689. In the opinion of the Panel, the Trg WO position, based upon his responsibilities, should be filled by an individual with significant previous instructional experience; preferably across multiple disciplines. As such, the Panel believes that the Trg WO is the most suitable position to fulfil the role of Defence Trainer Supervisor (DTS), providing direct supervision of all unit instructors. As such, the Trg WO should be both DTTT Phase 3 and DTS Foundation Level qualified. Exhibit 281

1.4.690. Analysis of the Trg WO's TORs found that he was not formally appointed as the DTS and that several key responsibilities associated with the DTS role were missing, such as instructor assessment and development responsibilities. As a result, the Trg WO had not undertaken the required DTS training and was not DTTT Phase 3 qualified. Like the XO, it is likely the Trg WO was not appointed as the DTS due to a general lack of knowledge about DSAT by the QOY Chain of Command. The Panel finds that not appointing the Trg WO as the DTS was a **Contributory Factor**. Exhibit 216

1.4.691. **Recommendation. Director Personnel should ensure Reserve unit Training Warrant Officers are nominated as Defence Training Supervisors and should mandate the required Pre-Employment Training on associated Job Specifications and Assignment Orders in order to ensure that Reserve unit instructors are able to fulfil the role effectively.**

1.4.692. In the opinion of the Panel it is vital that a Trg WO has a sound understanding of all training activity taking place within the unit. This would require the Trg WO to be multi-skilled across several disciplines.

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[78] CHURCHILL is an activity capturing database. Units are required to input proposed training activity and resource requirement; this data allows higher formations to plan and manage future inventory and resource allocations.

1.4.693. When interviewed, the Trg WO stated that he was unable to supervise DMI activity, including Risk Assessments, due to his lack of Driving and Maintenance (D&M) experience. It is likely that the lack of D&M knowledge held by the QOY Trg WO undermined his ability to properly supervise the DMIs. This lack of training activity assurance coupled with his and the XO's lack of DSAT understanding compromised the SSW/T. The Panel finds that the lack of DMI supervision provided by the Trg WO was a **Contributory Factor**. Witness 11 Witness 12

1.4.694. **Recommendation. Director Personnel should direct that personnel selected for Reserve unit Training Warrant Officer positions are qualified and have experience in training delivery relevant to the unit's primary role in order to comply with Joint Service Publication 822.**

1.4.695. In accordance with JSP 822, the primary role of the DTS is the assessment and development of the instructors under their supervision. The Panel could not find any DMI Workplace Training Statement from either the ARMCEN or the QOY to enable this development. The lack of a formal instructor development plan, coupled with a lack of D&M specialisation within the QOY Chain of Command, compromised the development opportunities for new instructors. Exhibit 281

1.4.696. The Panel believes that this situation is not unique to the QOY and is likely to be apparent across many of the Army Reserve units. The effect of remote supervision associated with Reserve units is exacerbated when new instructors arrive with no, or limited, previous instructional experience. The Panel finds that supervision and development of Reserve unit DMIs is an **Other Factor.**

1.4.697. **Recommendation. Director Personnel should define the selection criteria for Reserve unit Permanent Staff Instructors in order to ensure that they are capable of operating safely and independently in the instructional role with limited supervision from the Chain of Command.**

The Queen's Own Yeomanry (QOY) Supervision

1.4.698. The Panel concluded that the level of supervision within the QOY at the time of the accident was poor, particularly the supervision of Risk Assessments and training. This is evidenced by the multitude of missed opportunities to identify the shortfalls during the convening of the training activity and the lack of adherence to Defence policy.

1.4.699. The Panel concluded that the lack of supervision should not be attributed to individuals but is likely symptomatic of organisational weaknesses. Whilst wider organisational considerations will be examined later in this report, the following two observations were made by the Panel relating directly to this accident:

a. **Training.** The Panel found that many key appointments do not have mandated pre-employment training requirements captured within the relevant assignment orders. For example, the Panel believes that had the CO, XO and Trg WO received the training stipulated by JSP 822, their ability to properly supervise the delivery of training in the QOY would have been vastly Exhibit 281 Witness 9 Witness 11 Witness 12

improved. Likewise, the Panel believes that DH awareness training should be mandated for all Regimental Supervisory Staff to enable them to properly support the CO;

b. **Experience.** In the opinion of the Panel the experience held by key QOY staff at the time was insufficient to provide assured levels of supervision. The CO was extremely new in post and, as a Reservist, had limited experience in command when compared to his Regular counterparts. The XO, as the senior appointed Regular Officer, was an Acting Major who had no sub-unit command experience and limited RD experience. Finally the Trg WO had no D&M experience and thus his ability to supervise the DMIs was greatly reduced at an important time when the unit was reconfiguring from one vehicle type to another. Witness 9 Witness 11 Witness 12

1.4.700. As a result of the observations above, the Panel finds that the sub-optimal level of supervision afforded to the JACKAL driver course delivered in January 2019 was a **Contributory Factor**.

Army Health and Safety training

1.4.701. In order to deliver progressive and relevant training to all personnel, the Army has developed a series of mandated Command, Leadership and Management (CLM) training courses. These courses are designed to introduce knowledge and skills at appropriate points in an individual's career, aligned with promotion through the rank structure. For non-commissioned personnel, the CLM package is delivered in four stages and must be passed in order to be eligible for promotion to the associated rank. The four levels are as follows: Exhibit 239

a. Potential Non-Commissioned Officer (PNCO). Delivered to personnel progressing from the first stage of their career (Private/Trooper etc) to Lance Corporal (LCpl);

b. Junior Non-Commissioned Officer (JNCO). Delivered to personnel progressing from LCpl to Corporal;

c. Senior Non-Commissioned Officer (SNCO). Delivered to personnel as they progress from Corporal to Sergeant;

d. Warrant Officer (WO). Attended by personnel progressing from Sergeant to WO.

1.4.702. Although the CLM courses contain a number of different topics, the Panel reviewed only those elements that were directly involved in the management of Health and Safety. Figure 1.4.67 shows the relevant training objectives for each course.

PNCO CLM	JNCO CLM	SNCO CLM	WO CLM
TO 3 Manage Activities EO 3.2 Implement SHEF Procedures 3.2.1.1Identify individual responsibilities within SHEF policy. 3.2.1.2 Take account of Duty of Care. 3.2.1.3 Discuss the Safe System of Training. 3.2.1.4 Use Risk Assessment Matrix. 3.2.2.1Identify local fire policy. 3.2.2.2 Identify individual responsibilities.	TO 3 Manage activities EO 3.2 Implement SHEF procedures 3.2.1.1 Identify the Commander's SHEF duties and responsibilities. 3.2.1.2 Understand what is meant by Accident and Incident Notification. 3.2.1.3 Understand the principle functions of the Land Accident Prevention and Investigation Team. 3.2.1.4 Damage Control (DAMCON) 3.2.1.5 Training Overseas 3.2.1.6 SHEF on Operations. 3.2.1.7 Understand the dangers of sleep loss. 3.2.1.8 Recognise elements written within JSP 375, Volume 2. 3.2.2.1 Identify local fire policy.	TO 3 Manage Activities EO 3.2 Maintain SHEF 3.2.1.1 Identify legislation which covers the responsibilities of managers with regards to SHEF issues. 2. 3.2.1.2 Identify strategies for ensuring compliance with SHEF in the workplace.	TO 3 Manage Activities EO 3.4 Maintain SHEF 3.4.1.1 Identify command responsibilities within SHEF policy. 2. 3.4.2.1 Define the role of the WO in supporting unit SHEF managers.

Figure 1.4. 67 – Relevant risk training during Command, Leadership and Management courses

1.4.703. The Panel reviewed the Training Objectives (TOs) and the associated courseware to determine the level of Health and Safety (H&S) training delivered at each stage of CLM delivery. The Panel noted that most of the TOs and associated EOs were high level and lacked detail. Exhibit 255 Exhibit 256 Exhibit 257 Exhibit 258

1.4.704. Analysis of the Instructor Specification (ISpec) used to deliver the courses found that, although initial training delivered during the PNCO appeared to contain a reasonable level of detail and prepared those selected for JNCO roles with adequate H&S awareness, as the courses progressed to the SNCO ranks the training appeared to diminish. Indicative of this was the time allocated to H&S training and the method of delivery. Exhibit 255 Exhibit 256 Exhibit 257

1.4.705. The Panel found that during the 8-day PNCO course, two 40 minute sessions were dedicated to H&S training. These sessions contained a good level of detail and were led by an appropriately trained instructor. However, the H&S training provided during the 13-day WO CLM course was less robust with only one 40 minute session comprising of a classroom discussion about H&S rather than any formal H&S presentations. Exhibit 255 Exhibit 258 Exhibit 259

1.4.706. The Panel noted that, over a total of 51 days of CLM training from PNCO to WO, a total of only 4 hours was dedicated to H&S. The Panel concluded that it was extremely unlikely that 4 hours of training was sufficient to instil the importance of H&S activity and the methods and tools for its management in Army personnel over a career that could span 24 years. The Panel finds that the level and quantity of H&S training provided for Non-Commissioned Army personnel is an **Other Factor**. Exhibit 255 Exhibit 256 Exhibit 257 Exhibit 258 Exhibit 259

1.4.707. **Recommendation. Director Personnel should improve Health and Safety training for all Non-Commissioned Officers during their career in order to ensure that an appropriate understanding of the importance of Health and Safety management and the processes and procedures in place within the Army.**

Exhibit 240
Exhibit 241
Exhibit 242

1.4.708. Similarly, Commissioned Officers are mandated to attend educational courses to develop their leadership throughout their career. This programme of training begins at the Royal Military Academy Sandhurst (RMAS), during the Commissioning Course (CC) and continues progressively as an individual progresses through the ranks. Due to the multitude of different courses offered to Army Officers, dependent upon role, the Panel reviewed only those initial courses delivered during the early years of their service, up to and including those holding the rank of Captain. The three courses reviewed by the Panel were the:

a. Commissioning Course (CC);

b. Junior Officer Tactics Awareness Course (JOTAC);

c. Junior Command and Staff Course (Land) (JCSC(L)).

1.4.709. The Panel reviewed the H&S element of the mandated courses. A list of the associated TOs and EOs can be found in Figure 1.4.68.

Commissioning Course (CC)	Junior Officer Tactics Awareness Course (JOTAC)	Junior Command and Staff Course (Land) (JCSC(L))
TO 4.1 Apply Management Principles. EO 4.1.6 Examine the principles of Risk Management. 4.1.6.1 Identify the definition of Risk, Risk types and Risk Management. 4.1.6.2 Identify the benefits of Risk Management. 4.1.6.3 Identify Army Risk Policy. 4.1.6.4 Identify Army Risk principles.	TO 6.1 Conduct Sub-Unit Operational Staff Work (OSW) enabling activities. EO 6.1.4 Employ Risk Management considerations. 6.1.4.1 Identify Risk within a given Operation. 6.1.4.2 Assess Risk within a given Operation. 6.1.4.3 Analyse Risk within a given Operation. 6.1.4.4 Mitigate against Risk within a given Operation.	TO 7.1 Conduct OSW enabling activities. EO 7.1.8 Apply Risk Analysis activities. 7.1.8.1 Apply Risk and Action Owners responsibilities. 7.1.8.2 Apply the generic Risk Management process. 7.1.8.3 Examine the Army's policy on Risk Governance.
TO 4.6 Comply with Workplace Legislation. EO 4.6.1 Employ Environmental and Workplace Health & Safety regulations and precautions. 4.6.3 Conduct a formal Risk Assessment (in support of the Safe System of Training/Safe System of Work).	TO 6.4 Identify the requirements of Force Preparation activities at Sub-Unit level. EO 6.4.2 Identify the individual training requirement. 6.4.2.4 Explain the process of Risk Management when planning training. EO 6.4.3 Explain the requirements when planning individual training. 6.4.3.1 Identify the planning requirements for a Sub-Unit exercise/range package. 6.4.3.2 Produce an exercise instruction. 6.4.3.3 Produce an EASP. 6.4.3.4 Conduct an exercise Risk Assessment.	TO 7.2 Identify the requirement for contemporary staff skills in support of operations. EO 7.2.3 Identify the principles of Risk Management. 7.2.3.1 State the importance of Risk Management. 7.2.3.2 Describe the Risk Management process. 7.2.3.3 List the theories and techniques of estimating project costs and time. 7.2.3.4 Explain what is meant by quantitative Risk Analysis. 7.2.3.5 Explain the application of three-point estimating as the MOD standard approach. 7.2.3.6 Apply a four-step process for managing Risk. 7.2.3.7 Recall the five techniques to identify Risk. 7.2.3.8 List the three essential elements required for Risk description. 7.2.3.9 Describe the four methods for mitigating Risk.
		TO 7.3 Apply OSW procedures. EO 7.3.12 Produce a Risk Impact Register. 7.3.12.1 Identify the critical content of a Risk Impact Register.

Figure 1.4. 68 – Relevant risk training during Career Stage 1

1.4.710. The Panel noted that, although most important topics were covered, no Duty Holding (DH) training was provided during these courses. Reviewing other courses developed for Army Officers, the Panel found that only the Commanding Officers' Designate Course and the on-line Defence Learning Environment (DLE) Army DH Course contained DH training. As the DLE package is not mandated for those not holding DH or DH-facing responsibilities, it is likely that a large percentage of Army Junior Officers have not conducted any DH training. The lack of DH training provided for Army Officers is an **Observation.** Exhibit 241 Exhibit 242 Exhibit 338

1.4.711. Despite the lack of DH training for Junior Officers, the Panel believes that the H&S training provided throughout an Army Officer's career is appropriate for the majority of roles and responsibilities undertaken. The Panel reviewed the training provided during the early years of an officer's development and found that most of the training was conducted during wider planning exercises over extended periods, enabling students to practice risk analysis and control in realistic scenarios. Whilst it is evident that some roles may require specific courses to be developed, such as Army Reserve unit XOs and those undertaking Training Officer roles, in the majority of cases personnel are provided with sufficient training to safely conduct their duties. The Panel finds that the H&S training provided for Junior Officers was **not a factor.** Exhibit 241 Exhibit 242 Exhibit 327 Exhibit 328

Human Factors

1.4.712. Inst 1 was a viewed as a highly capable SNCO who held a range of professional qualifications. Held in high regard by all within his supervisory chain, he was trusted to work alone with minimal supervision. His role as a Permanent Staff Instructor (PSI) afforded him the opportunity to manage his own workload. As a result, Inst 1 took on a multitude of additional responsibilities, contributing heavily to the success of his unit. Although commendable, as a result of high workload, the Panel found that it is likely that his proactive and enthusiastic demeanour resulted in him working at or beyond his capacity, without realising the implications. Exhibit 235 Exhibit 244 Witness 1c Witness 10 Witness 11

1.4.713. As a result of his high workload, the Panel concluded that it was likely that Inst 1 became distracted, resulting in reduced situational awareness and missed opportunities to identify a number of errors within his planning. These included a lack of familiarity with CTA standing orders and JSP 800. The Panel finds that the workload of Instructor 1 prior to the accident was a **Contributory Factor.** Exhibit 2 Exhibit 40 Exhibit 244 Witness 1a Witness 1c

1.4.714. Reviewing the relationship between instructor and student, it is clear that Inst 1 held SSgt McKelvie in high regard. As an older and more experienced soldier, SSgt McKelvie was also senior in rank to Inst 1. Although Inst 1 felt that there was mutual respect between the two and that SSgt McKelvie respected him as an instructor, the Panel believes that this mutual respect led to a relatively flat crew gradient between Inst 1 and SSgt McKelvie on the day of the accident. Exhibit 244 Witness 1a Witness 1c

1.4.715. The Panel believes that it is likely that the lack of crew gradient between the two individuals increased the likelihood of neither making a firm decision. This is evidenced when reviewing the decision-making process related to the multiple attempts of the Hill 3 ascent. When compared to the robust decision made by Inst Exhibit 244 Witness 1a Witness 1b Witness 1c Witness 8

1 after the two unsuccessful attempts by Student 6 to complete the Horseshoe Loop during the first training serial, the decision to continue to attempt Hill 3 five times with SSgt McKelvie was mutually agreed between the two crew members.

1.4.716. In the opinion of the Panel, the mutual agreement to attempt the climb multiple times was a result of the relationship between the two crew members. The Panel believes that, had a similar succession of failures been evidenced with a more junior student, Inst 1 would have stopped the activity earlier. The Panel finds that the lack of crew gradient between Inst 1 and SSgt McKelvie was a **Contributory Factor.** Exhibit 244

1.4.717. The Panel reviewed the training provided to vehicle crews and instructors and found that no Human Factors training was provided. As a result, it is highly likely that concepts such as Crew Resource Management (CRM) and crew gradients are not understood by the majority of vehicle operators. Whilst a predominantly aviation based concept, CRM is also used by the shipping industry and in medical operating rooms. CRM provides training to reduce human error and improve safety by developing improved leadership, communication and decision making skill. The Panel finds that the lack of Human Factors and CRM training for vehicle crews was a **Contributory Factor**.

1.4.718. **Recommendation. Director Land Warfare should introduce Human Factors and Crew Resource Management training for all vehicle crews in order to improve crew co-operation and raise awareness of the factors that contribute to accidents and near-misses.**

Safe Place

Definition

1.4.719. JSP 375 defines a safe place as one in which the controls, necessary to enable authorised training to be conducted safely, have been identified by a site-specific risk assessment and directed through appropriate Standing Orders such as Range Standing Orders. Commanders should ensure both Instructors and those under training are fully briefed on all necessary controls to be implemented in order to maintain the Safe Place. Exhibit 74

UK Training Area management

1.4.720. The UK Training Estate is managed by the Defence Infrastructure Organisation (DIO) on behalf of the MOD. Estate management is established by Regional Offices. Catterick Training Area is managed through the DIO North Regional Office, which is commanded by a Full Time Reserve Service (FTRS) Lieutenant Colonel (Lt Col). Supporting the DIO, Landmarc Support Services provide accommodation, catering, ranges, training services and infrastructure maintenance support through the National Training Estate Prime (NTEP) Contract. Exhibit 176

Catterick Training Area

1.4.721. Catterick Training Area (CTA) is situated adjacent to Catterick Garrison in North Yorkshire (see Figure 1.4.69). CTA consists of approximately 21,000 acres Exhibit 177

on the east side of the Yorkshire Dales. The landform is mostly high open heather moorland with limestone outcrops and mixed woodland. Due to its location in the North of England, the climate is notoriously variable and generally cool to mild with frequent cloud and rain.

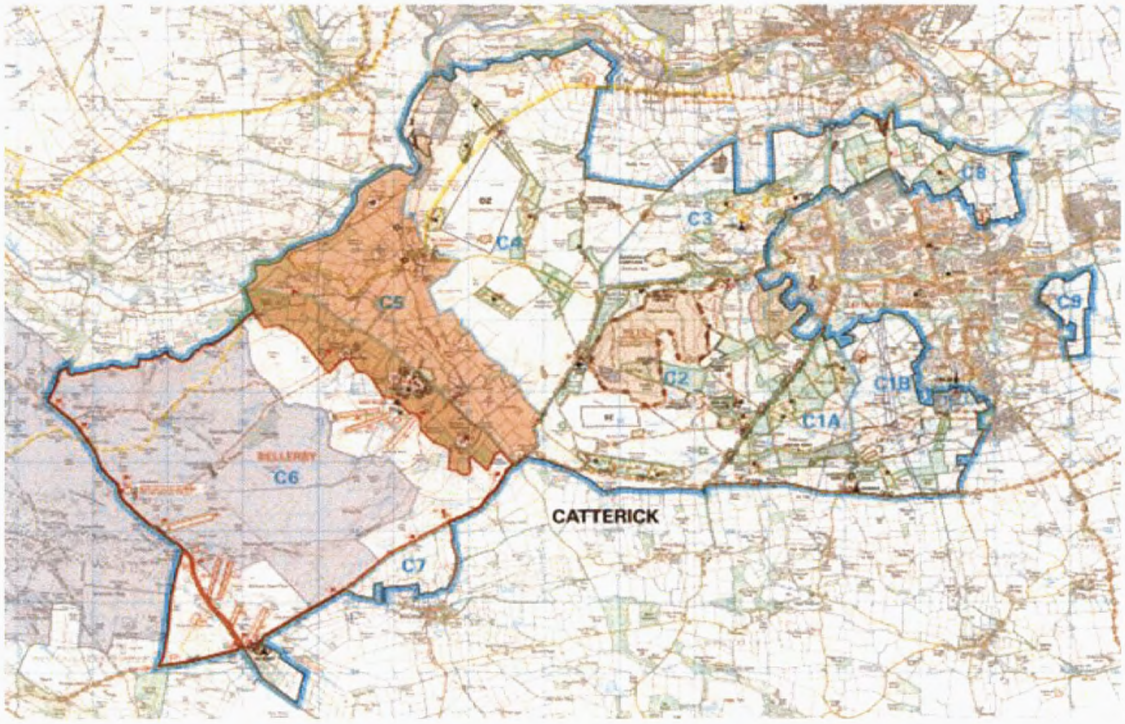

Figure 1.4. 69 – Catterick Training Area

Catterick Driver Training Area (CDTA)

1.4.722. To ease allocation and control, CTA is sub-divided into several areas. Specific areas are designated to support driver training, comprising a mixture of metalled roads, semi-prepared tracks and cross-country driving areas. CDTA is situated in sub-areas C1 and C2 and is further divided into the Light Vehicle Training Circuit (LVTC), the Heavy Vehicle Training Circuit (HVTC) and the Public Road Vehicle Training Circuit (PRVTC) (see Figure 1.4.70). The HVTC is situated in area C2 whilst the LVTC is situated in area C1 and is further sub-divided into areas C1A and C1B.

Exhibit 40

Figure 1.4. 70 – Catterick Driver Training Area

Light Vehicle Training Circuit (LVTC) and the Land of Nod (LoN)

Exhibit 40
Exhibit 62

1.4.723. The LVTC is contained within areas C1A and C1B (see Figure 1.4.71) and comprises a number of tracks and cross-country obstacles designed for driver training. The east of the LVTC, area C1B, is generally regarded as a more benign area, with small slopes and a number of low-level obstacles. The western side of the LVTC, area C1A, contains more demanding routes, including the area known as the LoN. The LoN is based in a steep sided valley with several tracks ascending both slopes. From the highest side of the southern hill, the valley drops approximately 20m vertically (see Figure 1.4.72).

Figure 1.4. 71 – C1A and C1B Light Vehicle Training Circuit

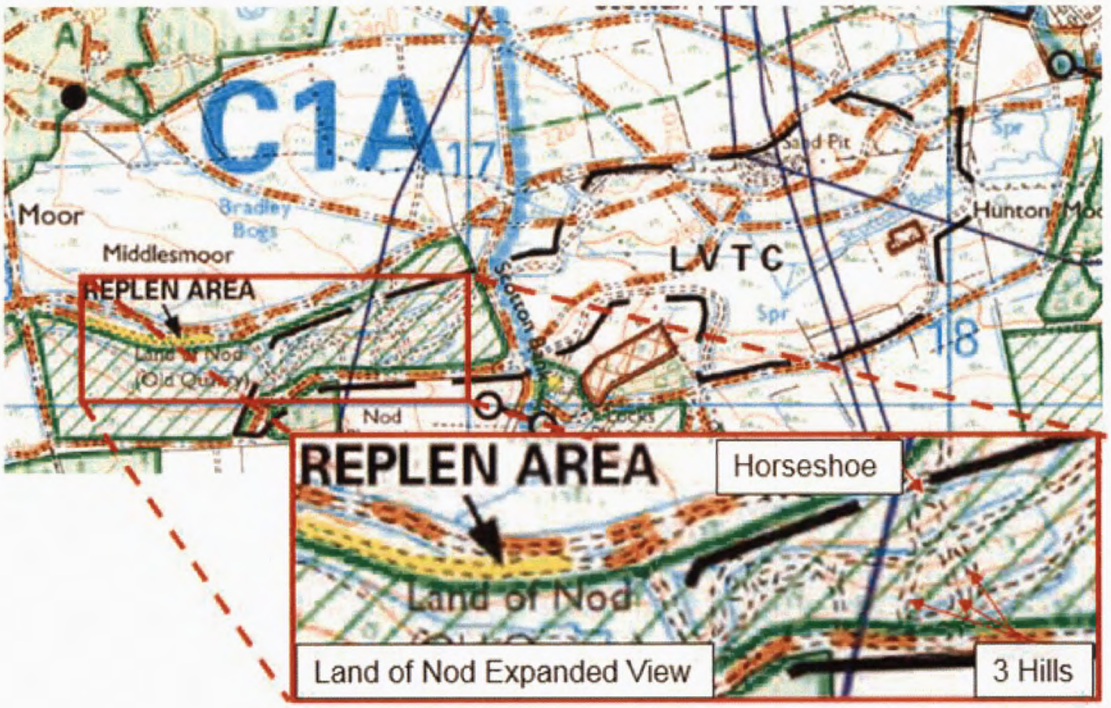

Figure 1.4. 72 – Land of Nod

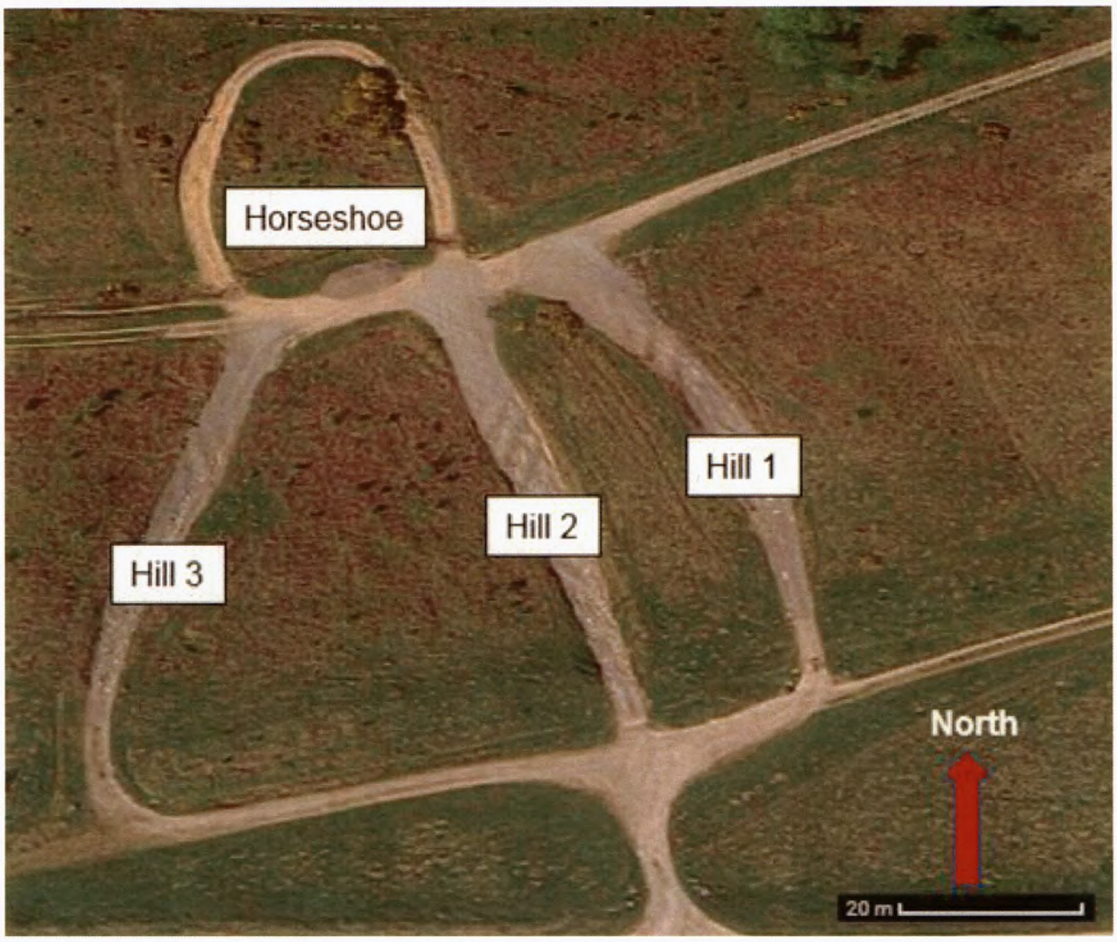

Figure 1.4. 73 – Land of Nod 3 Sisters and Horseshoe

1.4.724. The southern side of the LoN comprises of three steep tracks known as the '3 Sisters' (see Figures 1.4.73 and 1.4.74). The tracks are relatively even in gradient, with slopes between 20° and 30°. Large boulders are evident on all slopes; however, Hill 3 includes a more pronounced area of boulders from approximately halfway up the slope. These boulders increase the complexity of the terrain and create small areas of significant gradient and step-like drop offs between 30° and 90°.

Exhibit 62
Exhibit 40

1.4.725. The northern side comprises a heavily rutted, narrow, 'Horseshoe' shaped track enclosed by steep sided banks of heather (see Figure 1.4.75). With gradients of mostly 20-25°, and maximum gradients of 30°, the northern slopes are generally shallower than those found to the south. Despite the reduced gradient, the rutted surface and high banks makes this area a significant challenge for cross-country driving.

Exhibit 62
Exhibit 40

Figure 1.4. 74 – The 3 Sisters (facing south)

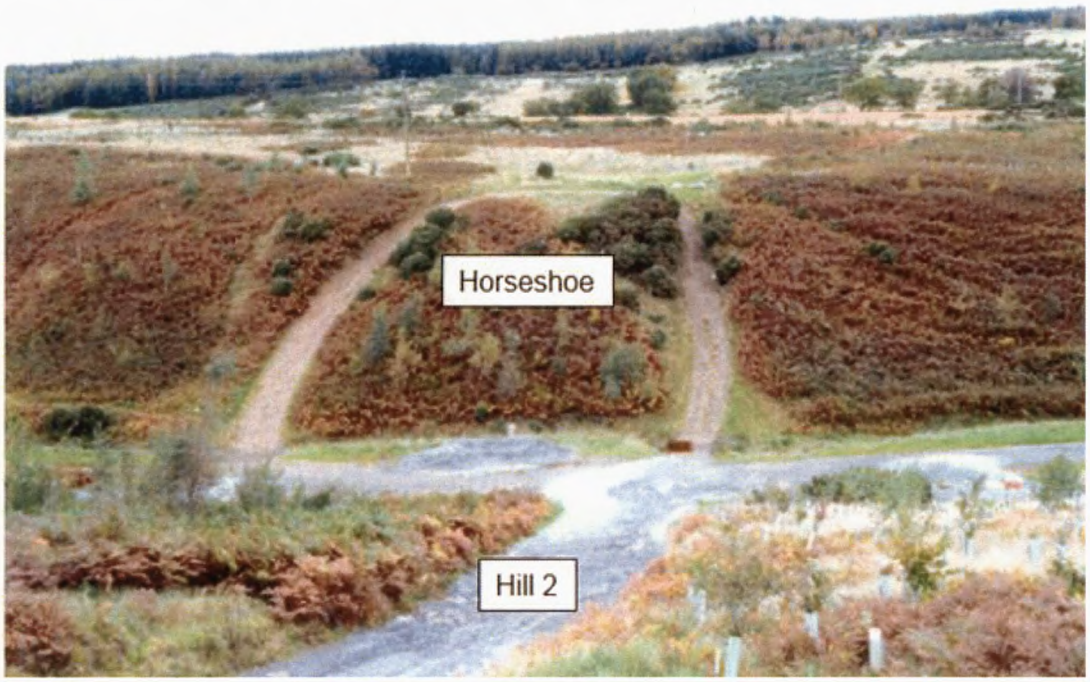

Figure 1.4. 75 – Horseshoe Loop (facing north)

Catterick Training Area Standing Orders For Training (CTA SOFT)

1.4.726. CTA, along with all other UK Training Areas, is managed through the application of site-specific Standing Orders. In the case of CTA, these orders are titled CTA SOFT and they were last issued in February 2018. The following orders and policies are relevant to this investigation.

Exhibit 178

Unit Risk Assessments

1.4.727. CTA Staff have completed generic site risk assessments for the area. CTA SOFT states that there are three uncontrolled risks that commanders are required to control and mitigate. These uncontrolled risks are: excessive speed, the terrain and distance from medical assistance. Exhibit 42 Witness 27

1.4.728. Although the QOY had completed generic driver training Risk Assessments, as detailed in Para 1.4.589, these did not include site specific risks or detail the challenging terrain associated with CDTA, specifically the LoN. Additionally, the Panel found no evidence that a Dynamic Risk Assessment was carried out on the day of the training to account for the poor weather conditions and the potential adverse effect on traction due to the slippery nature of the heavily bouldered areas. Had a more robust Risk Assessment been conducted it is possible that the risks associated with the terrain within the LoN would have been identified and training activity stopped or moved to another less demanding area. The Panel finds that the lack of a site specific risk assessment was a **Contributory Factor.** Exhibit 33 Exhibit 62 Witness 1b

1.4.729. **Recommendation – The Deputy Chief of the General Staff should assure that all units conduct robust site-specific Risk Assessments for all training activity in order to ensure that training is conducted safely.**

Range Action Safety Plans (RASPs) and Exercise Action Safety Plans (EASPs)

1.4.730. RASPs and EASPs are detailed within Army Pamphlet 21 (PAM 21) and provide a template for personnel to detail safety procedures during the planning phase of training activity. Although PAM 21 refers to AFV training, the basis of the rules contained within the document are live fire focussed. The Panel found no reference to driver or commander training. Furthermore, PAM 21 only mandates the completion of an EASP when Ordnance, Munitions or Explosives (OME) are used. Exhibit 44

1.4.731. CTA SOFT mandates that all units are to submit completed RASPs and EASPs relevant to their training activity. The Panel reviewed the two documents and concluded that the CTA SOFT requirement for RASPs and EASPs was based upon the PAM 21 requirement and, therefore, an EASP was not required for driver training activity. This was subsequently confirmed by CTA staff. As a result, neither PAM 21 nor CTA SOFT mandated any requirement for the QOY to produce or submit a safety plan prior to conducting their training activity. The Panel finds that the lack of a formal requirement to produce a safety plan is an **Other Factor**. Exhibit 3 Exhibit 43 Exhibit 44 Witness 28

1.4.732. The Panel reviewed the current RASP and EASP templates on the Army Battle Box on-line repository. The Panel found that due to the primary role of the forms, the templates were largely aimed towards live and blank firing activities and not particularly relevant to driver training. Notwithstanding this observation, the EASP template did contain elements that could have contributed to the prevention of this accident. Notably, the EASP contained a section titled Safe Place which Exhibit 44

required the Planning Officer to sign as having read Range Standing Orders and as being entirely familiar with the training area and facilities.

1.4.733. The Panel concluded that although the current RASP and EASP templates were not designed for driver training and other similar activities, a similar template could be designed that captured key safety planning requirements. The Panel finds that the lack of a formal safety planning template for non-firing activities is an **Other Factor**.

1.4.734. **Recommendation. Director Capability should provide and mandate the use of a revised planning template for all training activities in order to ensure training activity is correctly planned and that appropriate risk mitigations are in place and correctly authorised.**

Briefing

1.4.735. CTA SOFT highlights the significant safety benefits of all personnel receiving a site-specific briefing. CTA SOFT mandates all units to 'check-in' with HQ CTA prior to entering the Training Area in order to receive a briefing from CTA Training Staff. The briefing is conducted in order to: Exhibit 45

a. Ensure that the CTA Training Control Office (TCO) has situational awareness of all training activities taking place on the estate;

b. Allow units to confirm and update the TCO on anticipated training activities to be conducted;

c. Enable the TCO to update the user units to enhance user situational awareness;

d. Maintain an accurate log of units and personnel deployed on CTA;

e. Assure a Safe Place on CTA.

1.4.736. CTA SOFT mandates that all personnel in charge of training activities will attend the briefing in person and produce the following documentation: Exhibit 45

a. A copy of their allocation letter;

b. An EASP/RASP as appropriate;

c. A current CTA Map;

d. Any other associated documents as appropriate.

1.4.737. During the check-in process, CTA Trg Staff update the unit by briefing the following items: Exhibit 45

a. Updated allocation summary as appropriate;

b. Map updates;

c. Out of Bounds (OOB) Areas;

d. Meteorological data, including weather restrictions;

e. Fire Risk and attendant restrictions;

f. General update of information on CTA;

g. Issue a CTA Clearance Certificate;

h. Issue a CTA User Experience Survey.

1.4.738. Inst 1 did not check-in with CTA HQ in person but did so by telephone. Although this was contrary to the CTA SOFT, CTA HQ Staff did not prevent the activity from continuing despite the lack of face-to-face contact. The Panel found that CTA HQ staff generally deemed it acceptable for units to check-in to the training areas by telephone despite the requirements set-down in CTA SOFT. The telephone call to CTA HQ by Inst 1 lasted only 58 seconds. In the opinion of the Panel, this was insufficient to enable all of the required elements of the brief to be completed. The omission of a full briefing removed the opportunity for CTA Staff to confirm the instructor's intentions and highlight OOB areas. It is likely that a formal briefing would have prevented the activity taking place in the LoN Area and prevented the accident. The Panel finds that the lack of a formal check-in briefing was a **Contributory Factor.** Exhibit 1 Exhibit 45 Witness 28

1.4.739. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should ensure pre-training briefings are conducted in accordance with Training Area Standing Orders in order to ensure that training activities are conducted in line with the pre-arranged authorisations and that any changes are briefed to the appropriate staff.**

CTA Training Conference (CTATC)

1.4.740. The role of the CTATC is to review and confirm the training allocations for the following 2 months, remind units of training and safety restrictions and issue essential planning information. The conference is primarily aimed at unit Executive Training Staff, preferably the Training Officer, who understands the training plan and is empowered to make decisions. Attendance at the CTATC is mandated within CTA SOFT. Exhibit 179

1.4.741. The QOY did not attend the CTATC prior to the driver training conducted in January 2019 as the training was a late notice allocation. Whilst the CTATC provides updates on training and safety restrictions, it is unlikely that task specific Exhibit 179 Witness 1c

advice would have been issued as adherence to CTA SOFT would have been expected. The Panel finds that the non-attendance by the QOY at the CTATC was **not a factor.**

Training planning and preparation

1.4.742. Section 5 of CTA SOFT provides a useful guide to planning training activity, highlighting the availability of site-specific briefings and reconnaissance (recce) visits. Section 5 also provides a useful Exercise Planning Checklist for unit use. Exhibit 46

1.4.743. Inst 1 did not attend a briefing or conduct a recce visit prior to the training activity in January 2019. It is likely that this activity was omitted for the following reasons: Witness 1b Witness 1c

a. Inst 1 was familiar with CTA as his previous unit had been located in the local area;

b. Inst 1 had conducted driver training on the area during the previous 12 months;

c. Due to the unsuitable terrain the activity was amended at short notice from Swynnerton Training Area to CTA.

1.4.744. Inst 1 originally planned to conduct the driver course at Swynnerton Training Area. After reviewing the terrain offered by this area, Inst 1 concluded that he would be unable to complete all training requirements and decided to change his planning to CTA. This short-notice change restricted the opportunity for Inst 1 to conduct a CTA recce visit. Furthermore, it is likely that Inst 1's familiarity with CTA led him to conclude that a visit was not necessary as he was aware of the area he was planning to use and had used it for a similar activity within the previous 12 months.

1.4.745. Whilst Inst 1 was familiar with CTA, the Panel believes that his knowledge of CTA SOFT was incomplete. A briefing and recce with CTA HQ staff would have almost certainly highlighted the OOB areas. This, in turn, would have resulted in the activity being conducted on a different area. The Panel finds that the lack of a site briefing and recce visit was an **Other Factor.**

Driving training specific orders

1.4.746. The CTA SOFT Order Number 803 details specific rules and regulations pertaining to Driver Training activities conducted on CTA. Exhibit 40

1.4.747. **Vehicle Weight Classifications.** Order 803 categorises wheeled vehicles by weight. Within the CTA classification table (see Figure 1.4.76), JACKAL is incorrectly described as weighing [redacted] when unladen; the actual unladen JACKAL 2 weight is approximately [redacted] This error incorrectly places JACKAL into the Light Wheeled category rather than the Medium Wheeled category. The table also remarks that the laden weight of a JACKAL is [redacted] and states *'Not Land of* Exhibit 22 Exhibit 40

Nod'. The Panel believes that this remark within the table is ambiguous and open to misinterpretation.

4. **CTA Vehicle Weight Classifications**. For the purposes of training on CTA vehicle weights are categorised as shown in the table below.

Ser	Veh	Tracks/ Wheels	Unladen Weight (tonnes)	CTA Class	Remarks
(a)	(b)	(c)	(d)	(e)	(f)
1	CVR (T)	T	[redacted]	LT	
2	432/430	T		MT	
3	Viking	T		MT	
4	Bulldog	T		MT	
5	MLRS	T		MT	24.7 tonne Laden
6	Warrior	T		HT	
7	CR2	T		HT	
8	AS90	T		HT	
9	Titan	T		HT	
10	Trojan	T		HT	
11	Terrier	T		HT	
12	CRARRV	T		HT	
13	Landover GS Variants	W		LW	
14	4 Bedford/TM	W		MW	Not on LON
15	Mans 6/9/15	W		HW	Not on LON. Restricted on HVXCC
16	Panther	W		MW	Not on LON
17	Foxhound	W		MW	
18	Cougar	W		HW	
19	Husky	W		MW	
20	Wolfhound	W		HW	
21	Land Rover WMIK	W		MW	Permitted on LON
22	Mastiff	W		HW	
23	Ridgeback	W		HW	
24	Jackal	W		LW	7 tonne Laden. Not Land of Nod
25	DROPS all variants	W		HW	Not Land of Nod
26	Hosh Cosh	W		HW	Unladen
27	UBRE	W		MW	
28	Pinzgauer	W		LW	
29	Foden Rec Veh	W		HW	
30	Motor Cycles, Quads etc	W		LW	

LW = Light Wheele[redacted]
MW = Med Wheels
HW = Heavy Whee
LT = Light Tracks
MT = Medium Trac
HT = Heavy Tracke

Figure 1.4. 76 – Catterick Training Area Standing Orders For Training Part 1 Section 8 Order 803 – Vehicle Weight Classifications

1.4.748. **Order 803 Annex D.** Annex D to Order 803 describes the Light Vehicle Training Circuit including the LoN. The order states those vehicles that are deemed light vehicles. In contradiction to the Classification table, JACKAL is not listed as a Light Wheeled Vehicle. The following safety instructions are included within Annex D and pertinent to this inquiry:

Exhibit 22
Exhibit 40

a. ***"Driver Training is to be supervised by a qualified and current Service GS Driver Instructor or civilian equivalent".***

The Panel believes that this is incorrectly worded as all AV training is conducted by qualified Driving and Maintenance Instructors (DMIs). DMIs are not necessarily qualified as Service GS Driver Instructors. The Panel believes that this is because of historic qualifications from training activity conducted at the DST and highlights the lack of Driver Instructor SQEP within CTA HQ. The incorrect use of GS Driver Instructional qualifications is an **Observation;**

b. ***"Prior to using the facility, the instructor is to confirm that the student can safely use it by driving it himself".***

The route was not driven by either instructor prior to commencement of driver training. The Panel reviewed the current ARMCEN crew driver course and found that the requirement to pre-drive training routes is not taught to DMIs and, therefore, whilst the instructors were in contravention of CTA SOFT, they were conducting their duties in line with the ARMCEN endorsed practices.

Exhibit 23
Exhibit 35
Witness 1a
Witness 2

1.4.749. Notwithstanding the ARMCEN policy, the Panel believes that the practice of pre-driving the chosen route prior to instructional activity is beneficial and enhances safety. By conducting a familiarisation drive, the instructor is able to experience the challenges of the chosen route and check whether there are any areas of concern. Additionally, by doing so immediately prior to the activity, any environmental factors can also be assessed. The Panel finds that the lack of an instructor familiarisation drive was a **Contributory Factor.**

Exhibit 23
Exhibit 35

1.4.750. **Recommendation. Director Land Warfare should amend the Driving and Maintenance Instructors course and introduce the requirement for instructors to drive their chosen cross-country route on the day of the activity prior to conducting training in order to improve the safety of training delivery through Safe Place assurance.**

1.4.751. **Order 803 Annex D Appendix 1.** Appendix 1 details specific routes within the LVTC that are In and OOB for JACKAL driving activities. A map contained within Appendix 1 details a specific JACKAL route through the LoN, showing that the 3 Sisters (Hills 1-3) and the Horseshoe Loop are OOB. As a result of this order, the QOY were conducting Driver Training in an area that was OOB for JACKAL (see Figure 1.4.77).

Exhibit 40

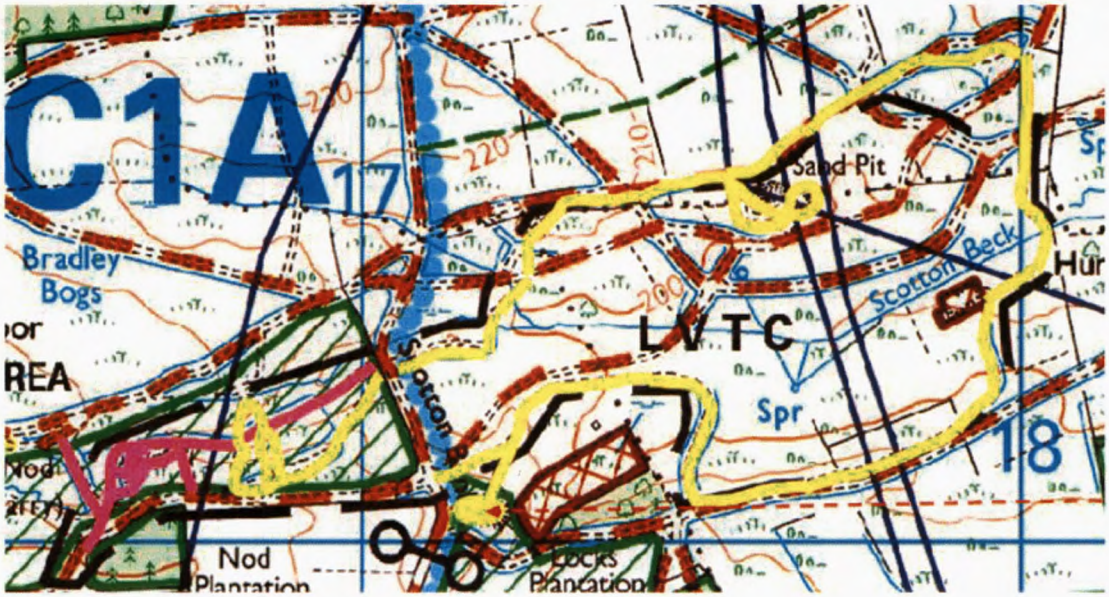

Figure 1.4. 77 – Light Vehicle Training Circuit Out of Bounds map

1.4.752. The Panel was unable to positively determine the reason for the LoN being placed OOB for JACKAL operations. During consultation with HQ CTA staff, the Panel found that it was likely due to land management concerns rather than an assessment of safety. Although there was no documentary audit trail to support this, CTA HQ staff highlighted the damage caused to the LoN by heavy vehicles and the impact on other training users. The Panel also noted the lack of AV driver experience held by the CTA staff, concluding that there was insufficient knowledge held by the team to have made a safety decision based upon vehicle characteristics and associated hazards. Witness 27 Witness 28

1.4.753. The Panel also reviewed the map contained within Order 803 Annex D Appendix 1 and found that, although the OOB route was marked on the map, the clarity and scale of the map and overlaid routing made it difficult to determine exactly what was OOB at the time. Exhibit 40

1.4.754. **Conclusion**. The Panel reviewed the CTA SOFT and determined that the contradictory guidance referring to JACKAL made it confusing, noting that the map detailing the permitted JACKAL routing through the LoN was of poor quality. Noting the professional attitude of Inst 1 and the confusing advice within CTA SOFT, the Panel believes that a poor working knowledge of CTA SOFT combined with the confusing contents caused the instructor to genuinely believe that he was permitted to use the LoN area. The Panel finds that the contradictory and confusing information contained within CTA SOFT was a **Contributory Factor**. Exhibit 178 Exhibit 321

1.4.755. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should revise Catterick Training Area Standing Orders For Training in order to ensure all vehicle related information is accurate and that the Out of Bounds areas are clearly defined.**

Emergency procedures

1.4.756. The CTA SOFT Part 2 details the procedures to be adopted in the case of an emergency. The overarching principal is that the first to discover an emergency is responsible for reporting it to the Emergency Services and CTA HQ. Exhibit 180

1.4.757. The CTA SOFT mandates that all units should carry an adequate number of mobile phones for use, in the event of an emergency, to contact the Emergency Services. CTA SOFT Part 2 Sect 1 Annex E states the locations and names of all Emergency Rendezvous locations (ERVs). The document also states that all ERV locations are known to the Emergency Services. Exhibit 245

1.4.758. On the day of the accident, most of the personnel on the course were carrying personal mobile phones. In the immediate aftermath of the accident, Inst 1 made numerous attempts to contact the Emergency Services and CTA HQ to request assistance. Due to poor mobile telephone signal in the area, the calls were only partially successful. To ensure correct communications had been passed, Inst 2 travelled to an elevated position on the hardstanding to inform the remaining students and gain a better line of communications with the Emergency Services. Witness 1a Witness 1b Witness 1c Exhibit 54 Exhibit 57

1.4.759. The Panel discovered that a poor mobile phone signal was a known issue on CTA. Despite this, CTA SOFT did not mandate the use of radios to enhance communications in the event of an accident.

1.4.760. The Panel also reviewed the radios provided to CTA Staff and the coverage offered by the associated network at the time of the accident. During discussions, the Panel discovered that a previous contract for 'Airwave' radios had recently ended, leaving the staff with less capable radios with reduced coverage. The Panel believes that the reduced coverage offered by the new radio network adversely impacted the TSM's ability to quickly raise additional support. The Panel finds that the lack of appropriate methods of communication is an **Other Factor**.

1.4.761. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should implement an assured communications capability within the Training Estate in order to provide an assured method of communication with Range Control and inform the User where there are significant dead spots and communications are poor.**

1.4.762. Upon receiving the initial call, CTA HQ tasked a Training Safety Marshal (TSM) to attend the scene and offer assistance. Using a Land Rover to travel to the scene, the TSM did not have comprehensive first aid equipment including an Exhibit 54

Automatic Emergency Defibrillator (AED) within the vehicle. Upon arrival at the scene, the TSM assessed the situation and attempted to raise further assistance and the provision of an AED using his issued Digital Mobile Radio (DMR)[79]. Again, due to poor signal the TSM struggled to communicate and had to leave the immediate vicinity of the accident to raise support.

1.4.763. The Panel discussed the provision of first aid equipment and issued radios with CTA staff and found that carriage of AEDs within TSM vehicles was not required by CTA policy. Although the Panel believes that it is unlikely that an AED would have changed the outcome of this accident due to the injuries sustained, the Panel believes that in other circumstances, timely access to an AED could save lives. The Panel finds that the lack of carriage of AEDs by all Training Area Safety staff whilst on the Training Area is an **Other Factor**.

Exhibit 54
Exhibit 58
Witness 28

1.4.764. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should provide all Training Area Safety vehicles with appropriate and sufficient First Aid equipment including Automatic Emergency Defibrillators whilst deployed on the Training Areas in order to provide a more comprehensive first response capability.**

Catterick Training Area (CTA) Risk Assessments (RAs)

1.4.765. CTA SOFT contains several site-specific RAs, including an assessment for the LVTC dated 22 January 2018. Although this assessment was beyond its 12-month review period, the following observations were made:

Exhibit 42

a. The RA correctly identified the potential for vehicle accidents including the potential for roll over due to the poor terrain;

b. The RA identified that there were no mandated safety standards for driver training circuits and there was no formal inspection regime;

c. The controls in place were:

(1) Qualification of vehicle commanders and instructors;

(2) De-confliction between units through the planning conferences;

(3) Circuit regularly patrolled by TSMs;

(4) Instructors briefed on dangerous areas to be avoided.

[79] A DMR Radio is an 'off the shelf' digital radio, the radios (Vehicle mounted or man portable) can be locally purchased however do not meet the same specifications as BOWMAN.

1.4.766. **Application of Controls.**

Exhibit 42

a. **Qualification.** CTA Staff rely on the unit Chain of Command to ensure drivers, commanders and instructors are suitably qualified. Although in this accident, both instructors did not hold the appropriate DTTT qualifications, they were qualified as DMIs. The Panel finds that, despite the DTTT discrepancy, generally this control was actively managed by units to a satisfactory standard and was **not a factor**;

Exhibit 45

b. **Deconfliction.** Not all units attend the CTATC. However, CTA HQ does ensure that activities are de-conflicted and monitors this process through the check-in regime. The Panel found that this is managed by CTA HQ to a satisfactory standard although 100% attendance at the CTATC by appropriate personnel would strengthen this control. The Panel finds that training deconfliction was **not a factor**;

c. **TSM Patrols.** CTA is covered by three TSMs. Given the large area of the Training Estate it is impossible for each area to have a dedicated TSM. As a result, TSM monitoring of training activity cannot be assured effectively. TSMs have awareness of the Training Estate usage and concentrate their patrols on areas of higher risk. In the opinion of the Panel, this control is managed by CTA HQ but is a weak barrier due to the lack of TSMs given the large area of Training Estate. The small number of TSMs employed by CTA is an **Observation**;

Exhibit 42
Witness 1a
Witness 1b
Witness 2
Witness 11
Witness 12

d. **Instructor Briefings.** The Panel found that the check-in process was not robust and not all personnel received a full brief from the CTA Training Staff. This control should have been co-managed by the unit and CTA HQ. In the opinion of the Panel this control was inadequate. The Panel finds that the lack of face-to-face pre-training briefings was a **Contributory Factor**.

1.4.767. **Unit Chain of Command Awareness of CTA RAs.** Due to the lack of adherence to key elements of CTA SOFT and the controls placed within the CTA RAs, the Panel concluded that it was unlikely that the QOY supervisory and instructional staff were aware of the existence of CTA RAs. As a result, it is very likely that the site-specific RAs were not reviewed by the QOY Training Staff, including the instructors, prior to this driver training course.

Exhibit 178
Witness 1b
Witness 11
Witness 12

1.4.768. From the analysis of the actions undertaken by the instructors, the Panel believes that knowledge of CTA SOFT was incomplete. It is as likely as not that neither of the instructors reviewed the Standing Orders prior to undertaking the training activity in January 2019. The Panel finds that the lack of knowledge of CTA SOFT by the instructors was a **Contributory Factor.**

1.4.769. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should ensure that those responsible for training activities have read and understood Training Area Orders and Risk Assessments prior to conducting activities on the Training Estate in order to assure a Safe Place.**

Bidding and Allocation Management System (BAMS)

Procurement

1.4.770. In 2014, Landmarc Support Services Ltd was awarded the National Training Estate Prime (NTEP) contract to provide support services to the DIO to support the delivery of the UK Training Estate. As part of the contract, a new BAMS was commissioned to replace the unsupported legacy booking system that relied heavily on paper and email-based activities. Exhibit 47

1.4.771. The requirements for BAMS were defined by the DIO within the NTEP contract and further refined by the production of supporting documents. In addition to the delivery of the new system, Landmarc was also contracted to provide on-line training to support final capability delivery. The training requirement specified under this element of the contract contained no direction on content or Training Needs Analysis. Exhibit 47

System design

1.4.772. BAMS was developed to provide an end-to-end management tool to allocate training facilities to users based upon training bids and to support the processes contained within JSP 907 - Use of the Defence Training and Evaluation Estate. The system was designed as two separate applications to be available to two distinct user groups as follows: Exhibit 47

a. **BAMS On-line.** This application is available to any MOD sponsored individual or unit who is required to submit a bid for the use of the Training Estate. This group is defined in BAMS as the End User;

b. **BAMS Management.** This application is designed for DIO Training Staff who allocate training facilities based upon the bids they receive. The application is also available to Landmarc, as the NTEP Contractor, to assign support facilities (accommodation, stores etc) once the allocation has been approved by DIO Training Staff. This group is defined in BAMS as the Management User.

1.4.773. System design and development was overseen by a DIO-led BAMS Working Group made up of BAMS Management Users. User acceptance testing was conducted over a number of weeks and phases and included representatives from both the future End User and Management User communities, drawn from all Front Line Commands, including Reserve Forces and Cadet organisations. Exhibit 47

System implementation

1.4.774. To de-risk the introduction of BAMS, the system was introduced to a single geographic area as a trial region. The purpose of this trial was to test system suitability in a real-life environment prior to wider distribution. Exhibit 47

1.4.775. Whilst the system worked, the trials concluded that both user communities experienced slow running speeds, specifically on the MOD DII Exhibit 47

network computers. This issue, along with other problems and an update to the MOD network from DII to MODNet, necessitated a pause in the further implementation of BAMS across the estate whilst modifications were made to the software.

1.4.776. The subsequent software and network modifications improved system performance to an acceptable level and the system passed a DIO-led Operational Readiness Review. To further de-risk any impact on training activity, the national roll-out was phased over a period of several months, with a BAMS Implementation Team spending approximately 1 month in any single regional area. Throughout this process, the Implementation Team identified ongoing issues and improvements. Those issues that were deemed to offer immediate benefit with little effort were implemented through progressive software upgrades. Those that required more effort were captured for consideration for future change requests. Whilst the NTEP contract provides a low level of through-life support, major upgrades or improvements are deemed additional work and require additional funding. Exhibit 47

1.4.777. BAMS was implemented in Defence Training Estate North (DTE North), including CTA in November 2018. Although the BAMS Working Group continues to monitor system performance and delivery the Panel noted that no system risk analysis has been conducted to understand the potential hazards associated with the introduction of BAMS. The Panel finds that the lack of risk analysis conducted on the changes made to the Training Estate allocation process is an **Other Factor.** Exhibit 47

1.4.778. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should hold Risk Workshops to identify the risks associated with the Bidding and Allocation Management System in order that measures can be put in place to ensure the delivery of a Safe Place for training activities.**

BAMS training

1.4.779. As stated above, there was no TNA or detailed training requirements provided to Landmarc by DIO. To support training design, Landmarc conducted an independent TNA for review by the BAMS Working Group. This review agreed the following training regime: Exhibit 47 Exhibit 339

a. An instructor-led training package for BAMS Management Users;

b. An e-learning package for BAMS End Users;

c. Production of electronic User Guides for both Management and End Users.

1.4.780. There was no requirement from the DIO for BAMS training to be compliant with JSP 822 Defence Systems Approach to Training. The lack of adherence to Defence Training policy by the DIO is an **Observation.** Exhibit 47

Training delivery – Management Users

1.4.781. BAMS training packages were primarily focussed at the Management User community. All Management Users undertook mandatory, instructor-led training that was tailored to their role. This training took between 2 and 5 days to complete and was delivered in purpose-built training pods that included training computer terminals to allow students to interface with a training network version of BAMS for practical training in their own areas of operation. There was no formal end-of-course assessment or check of understanding. Witness 28 Witness 47

1.4.782. Landmarc concluded that the training had been delivered to a high standard. However feedback from individuals interviewed during the Inquiry indicated that, although training fulfilled the basic requirement, students felt the course lacked detail and structure. Exhibit 47 Witness 28

Training delivery – End Users

1.4.783. As part of the implementation package, Landmarc delivered a number of instructor-led BAMS awareness sessions for End Users in each region. This training was not mandated and uptake was poor, with only 60% of the available spaces taken by students. It should be noted that the training was not intended to capture the entire End User population. Exhibit 47 Witness 1a Witness 1b

1.4.784. In addition to the BAMS awareness sessions, Landmarc produced a number of e-learning clips for publication on the on-line Defence Learning Environment (DLE). Whilst a number of video clips are available, completion of the training is not a mandatory requirement prior to the use of BAMS by End Users. Additionally, neither the awareness sessions nor the DLE courses include any form of assessment of understanding. Exhibit 47

1.4.785. Although Landmarc recorded the names of those who attended the awareness sessions, there is no facility to capture those who have completed the DLE training. As a result, there is no auditable method of ensuring End Users have conducted any form of BAMS training. The lack of training audit trail for BAMS End Users is an **Other Factor.** Exhibit 47 Exhibit 255

1.4.786. **Recommendation. Defence Infrastructure Organisation Assistant Head Safety should introduce an auditable record of those personnel who have completed the Bidding and Allocation Management System training in order to ensure users are competent to use the system.**

The Queen's Own Yeomanry (QOY) JACKAL training bid B12962

1.4.787. Bid Reference B12962 was the bid for training facilities submitted on BAMS for the QOY JACKAL driver course conducted in January 2019. Exhibit 2 Exhibit 47 Exhibit 337

1.4.788. B12962 was created by Inst 1, as the Bid Lead, at 01:28 on 6 January 2019 and submitted 11 minutes later at 01:39. Analysis of the bid found that use of the following Training Areas was requested:

a. TRG AREA SUB DIV C1A – LVTC LAND OF NOD;

b. TRG AREA SUB DIV C2 – HEAVY VEHICLE TRAINING CIRCUIT;

c. TRG AREA SUB DIV C2 – DRVR TRG TRACKED RD ROUTE;

d. TRG AREA SUB DIV C2 – HEAVY VEHICLE XCTRY CIRCUIT.

1.4.789. B12962 was locked for edit and placed under review by the DIO Allocations Officer (DIO AO) for DTE North at 11:52 on 9 January 2019. At 11:54, the DIO AO removed TRG AREA SUB DIV C1A – LVTC LAND OF NOD from the bid. The Panel believes that this change was made by the DIO AO as he noted that the LoN was OOB for JACKAL and, therefore, removed the area to prevent the instructor from contravening CTA SOFT. The bid was then provisionally accepted and authorised at 11:56 on 9 January 2019 by the DIO AO. Witness 28

1.4.790. Analysis by Landmarc determined that Inst 1 accessed BAMS on 6, 15, 17 and 18 January 2019. It was also established that Inst 1 accessed Bid B12962 on 17 January 2019. This session lasted 12 minutes and 19 seconds, although the exact elements of the bid that were reviewed during this session could not be established. Exhibit 47

1.4.791. Landmarc records showed that Inst 1 had not attended the BAMS End User awareness session and this was confirmed by Inst 1 who stated that he had not received any BAMS training although he felt that the system was relatively simple to use. Exhibit 47 Witness 1b

1.4.792. The DIO AO had attended the formal Management User training delivered by Landmarc and, although all topics were covered, the individual felt only 70% confident with how to operate the system. Witness 28

Bidding and Allocation Management System (BAMS) analysis

1.4.793. As a relatively new IT system, both Management Users and End Users had a limited understanding of the system. This lack of knowledge was exacerbated in the case of End Users who had no mandated formal training on how to use the system and analyse the bids after they had been accepted and authorised by DIO Training Staff. Whilst a User Manual existed, the document was relatively large, at 115 pages, and did not detail how bids may be amended by Management Users or how to identify any changes. The Panel finds that the lack of mandated End User training is an **Other Factor.** Exhibit 2 Witness 28 Witness 1a Witness 1b Witness 1c

1.4.794. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should ensure that all Bidding and Allocation Management System End Users conduct training in order to ensure that they fully understand the system prior to its use.**

1.4.795. Once an End User has submitted a bid for authorisation to the Training Area Staff, any changes made by the End User are highlighted as new versions of the bid (ie B12962 version 1, B12962 version 2, etc). However, if changes are made to the bid by Management Users, this change is not highlighted by a version Exhibit 2 Exhibit 47 Exhibit 271

change. Instead, to the End User, the bid version will remain the same and the bid will appear as authorised.

1.4.796. The only method of viewing Management User changes is through the history menu where the change will appear as a 'red pen' change, where the particular element of the bid will be scored through to indicate its removal. For those not fully conversant with the system, it is likely that this menu would not be accessed and, therefore, the End User would not be aware of the changes made. The Panel finds that the design of the Bid Home Page and lack of version change as a result of Management User changes was a **Contributory Factor.**

Exhibit 47
Exhibit 271
Witness 1b
Witness 28

1.4.797. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should issue a change request to improve the Bidding and Allocation Management System User Interface in order to enhance the awareness of End Users when Management User changes are applied to bids.**

1.4.798. To ensure End Users are made aware of changes implemented by Training Area Staff, Landmarc included an additional requirement for the Management User to communicate all changes to the End User via either the messaging facility on BAMS, normal email channels or via a phone call. In the event of the change being communicated via BAMS Message, this would be recorded on the BAMS bid. In all other circumstances the communication is not auditable (other than emails retained by staff).

1.4.799. Bid B12962 was modified by the DIO AO at 11:54 on 9 January 2019 when TRG AREA SUB DIV C1A – LVTC LAND OF NOD was removed from the bid. Reviewing the bid history, no BAMS message was sent to Inst 1 to communicate this change. When interviewed, neither the DIO AO nor Inst 1 could recall another form of communication highlighting the Management User change. It should be noted that the DIO AO handles a significant number of BAMS bids and it is, therefore, not surprising that he could not recall this particular bid in detail. As neither the Management User nor the End User could recall any form of communication regarding the changes made to B12962, it is more likely than not that the change was not communicated to Inst 1.

Exhibit 47
Witness 1b
Witness 28

1.4.800. As a result of the BAMS design and a lack of mandated BAMS End User training, despite reviewing Bid B12962 on 17 January 2019, Inst 1 was not aware of the change and therefore believed that he was authorised to use the LoN Area. The Panel finds that the lack of awareness by Inst 1 that Bid B12962 had not been authorised to use the LoN area was a **Contributory Factor.**

Exhibit 2
Witness 1b

1.4.801. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should mandate Management Users to use the Bidding and Allocation Management System Messaging tool to communicate changes in order to provide an auditable trail of changes and communications between Management User and End User.**

Driver Training Area (DTA) regulation

1.4.802. Unlike live firing ranges, there is no regulation or policy that stipulates the design and safety requirements for DTAs. As a result, many DTAs contain historic tracks, with some metalled and semi-prepared tracks added to extend the training facilities.

Witness 26
Witness 27

1.4.803. Although some DTAs such as those found at the ARMCEN at Bovington and the DST at Leconfield have been designed and built to support specific driver training needs, these areas are not bound by specific regulations or design criteria. As such, the design of the obstacles is likely based upon SME input by driving instructors to construct suitable obstacles for the training they deliver.

Exhibit 248
Exhibit 247

1.4.804. Away from those areas specifically supporting centralised driver training, the majority of the driving training areas, such as those found at Catterick and Salisbury Plain, make best use of the natural terrain available but are not specifically designed or controlled to ensure that risks are managed appropriately or that the obstacles meet the needs of the driver training to be conducted. The Panel believes that the ability to provide an assured Safe Place is significantly compromised by the lack of regulations guiding the design and use of specific DTAs.

Witness 27

1.4.805. Whilst it would be impossible to analyse every area of the Training Estate to ensure vehicle safety, it is the opinion of the Panel that it would be possible to regulate training areas that are specifically designed for initial and continuation driver training. By applying specific regulations and design policy to DTAs, such as maximum gradients, signage and safety barriers, Defence would be able to demonstrate that the hazards associated with the environment in which driver training takes place are understood and managed. The Panel finds that the lack of DTA regulation was a **Contributory Factor.**

Exhibit 62
Exhibit 248
Exhibit 247
Witness 26
Witness 27

1.4.806. **Recommendation. The Defence Land Safety Regulator should introduce regulations and supporting policy regarding the design and management of Driver Training Areas in order to assure Defence that Driver Training is conducted in an adequately controlled environment.**

Organisational analysis

1.4.807. ACSO 3216 states that Director Basing and Infrastructure[80] (D Basing and Infra) is responsible for the delivery of a safe place to live, work and train. The role is supported by DIO who provide the Training Estate and conduct some safety assurance activities.

Exhibit 71

[80] D Basing and Infra is the Army HQ 2* Officer responsible for the provision of all Army infrastructure and basing requirements.

1.4.808. As discussed at Para 1.4.752 DIO staff are not employed as platform SMEs and do not possess the experience or knowledge required to assure the safe place for all activities, especially driving activities. As a result, the DIO and D Basing and Infra are reliant upon current and competent operators deciding the suitability of areas for their respective training activities based upon system knowledge and recce visits. DIO staff believe that all users conduct robust Risk Assessments, including analysis of the training areas in use, to assure risks are managed appropriately and are understood by the supervisory chain. Witness 27 Witness 28

1.4.809. In contrast, the lack of platform specific SQEP within the DIO is not well understood by those within the Army Chain of Command. Interviews conducted by the Panel indicate a perception by those in supervisory roles that the training areas provided are assessed and assured for safety for all activities permitted on them. There is a firm belief that, if the activity is permitted within a given area, then it can be assumed to be safe to conduct the activity with no further Risk Assessment required. Witness 1c Witness 11 Witness 12 Witness 44

1.4.810. As a result of the disconnect in understanding between the DIO and unit staff, the Panel believes that Risk Assessments are not correctly identifying the potential risks associated with the training areas to be used. As a result, COs are not aware of the risks to which their personnel are exposed, and the supervision of safe training is undermined. This, coupled with a lack of training area regulation as highlighted in Para 1.4.802, undermines the provision of a safe place and, ultimately, the SSW/T. The Panel finds that the lack of understanding between the DIO and unit supervisory staff regarding the provision of a safe place was a **Contributory Factor**.

1.4.811. **Recommendation. The Defence Infrastructure Organisation Assistant Head Safety should ensure that Training Estate users are made aware of the extent to which the DIO are assuring the Safe Place prior to each training activity in order to ensure that users are aware of the boundaries of risk ownership and safety provision.**

1.4.812. **Recommendation. The Assistant Chief of the General Staff should ensure that Unit Commanders are aware of and understand the roles of all Duty Holder-facing organisations in order to ensure that Commanding Officers are aware of the boundaries of risk ownership and safety provision.**

Organisational Influences

Organisational challenges to the Army SEMS

1.4.813. It is essential that responsible and accountable individuals are aware of the hazards and risks to which their personnel are exposed. In areas of complex activity, such as operating bespoke military vehicles, the ability to clearly understand all hazards and risks is reliant upon a clear and well understood mechanism of risk transfer.

1.4.814. Under the Army Duty of Care and Duty Holding constructs, the CO is responsible for the majority of operating risks associated with the activities Exhibit 71

undertaken by their unit. As a result, the CO is expected to understand and analyse the hazards and risks posed by an array of equipment, activities and environments and manage them to an ALARP and tolerable level. In many cases, the CO is unlikely to be qualified on all of the equipment used by their unit and as a result they are reliant upon the expertise of the SMEs within the unit and the assurance of DH-facing organisations to assure the SSW/T.

1.4.815. The Panel investigated how risk was managed by several units and how it was assured through the SSW/T. The following observations were made:

a. **Safe Equipment.** Whilst the CO has the ability to access the Safety Case and discuss platform safety with DE&S, the reality is that the CO relies upon D Cap to assure that equipment is safe to use within the bounds of the AESPs and other Orders and policy. The CO does not attend PSEPs and therefore the ability for unit level safety concerns to be raised at the PSEP is dependent upon the analysis of any safety reports raised by the unit or their interactions with D Cap personnel; Exhibit 171 Witness 9 Witness 43 Witness 44

b. **Safe Person.** Although the CO is best placed to understand the personalities, strengths and weaknesses of the personnel assigned to their unit they are reliant upon the training system supplying them with qualified and competent staff. The CO is also reliant upon external expertise to define currency and competency standards by which personnel are governed. This is equally applicable to the training provided for those holding supervisory roles within the unit; Witness 44

c. **Safe Place.** The CO may not have a detailed awareness of the operating areas to be utilised by their personnel or the specific limitations of the equipment being used. The CO is reliant upon their personnel to correctly judge the capabilities of the equipment and the environment in which they are placed. The user must, therefore, understand the Safe Operating Envelopes of their equipment and be able to gauge the environment against that envelope. In the training environment, the CO expects training areas to have been assessed for suitability by an appropriately qualified and experienced individual; Witness 44

d. **Safe Practice.** All equipment and activities must be supported by procedures and instructions to enable the activity to be undertaken safely. These procedures and instructions are often governed by equipment support publications, operating procedures and policies. As the CO is unlikely to fully understand the specific limitations associated with a piece of equipment or specified activity, the CO relies upon SMEs within the equipment and training communities to correctly identify and disseminate these procedures to the user community. Exhibit 22

1.4.816. The Panel concluded that, to assure the SSW/T, the CO was reliant upon a number of organisations and personnel conducting their business appropriately and scrutinising the elements of the SSW/T they delivered. Exhibit 71 Exhibit 73

1.4.817. The Panel has analysed each of the four elements of the SSW/T, detailing areas where, in the opinion of the Panel, there are opportunities for improvement. Although correcting these areas individually would improve safety, the Panel believes that wider, organisational change should be embraced if the Army is to improve its overall safety performance. The final element of this report will analyse the organisational elements which, in the opinion of the Panel, played a part in this accident. Exhibit 71 Exhibit 73

Army Audit and Inspection (A&I)

1.4.818. To provide Army top-level assurance that COs and their units are complying with the policies and procedures directed by the higher Chain of Command, the Army conducts a series of Assurance Inspections. Exhibit 264 Exhibit 265

1.4.819. The Army's A&I regime ensures that the requirements of Defence are delivered whilst maintaining an appropriate level of assurance and compliance with the appropriate regulations. ACSO 9001 provides the overarching direction and guidance for the Army's regime of A&I control measures as part of the Army's Corporate Governance Assurance Operating Model. The A&I process contains Business as Usual assurance activity such as routine management checks, self-assessments and advisory visits and provides guidance on the ten mandated external compliance inspections. These are: Exhibit 264 Exhibit 265

a. The Land Equipment Audit (LEA);

b. The Logistic Support Assurance Framework (LSAF);

c. The G1 Audit (G1A);

d. The Force and Environmental Protection Audit (FEPA);

e. The Force Health Protection Audit (FHPA);

f. The Physical Development Audit (PDA);

g. The Protective Security Audit (PSA);

h. The Individual Development Evaluation and Assessment (IDEA);

i. The Climate Assessment (CAss);

j. The Military Secretary (MS) Audit.

Annual Assurance Process

1.4.820. Each unit within the Fd Army, at the direction of its 1* HQ, is required to conduct an Annual Assurance Estimate (AAE) and submit an Annual Assurance Plan (AAP) to its Brigade HQ for consideration.

1.4.821. Figure 1.4.78 shows a simplified model of the Army's AAE and Planning process. The Panel identified 1st (UK) Div, 4 Inf Bde and the QOY to demonstrate the assurance bidding process.

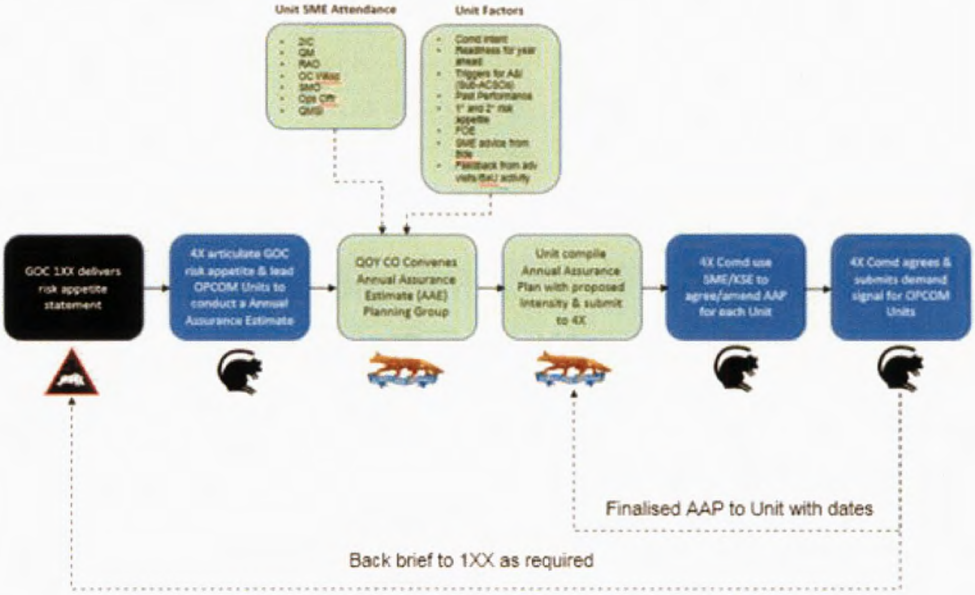

Figure 1.4. 78 – Army Command Standing Order 9001 Annual Assurance Estimate (simplified)

1.4.822. General Officer Commanding (GOC) 1 (UK) Div delivers the Divisional Risk Appetite Statement (DRAS), detailing priorities and risk appetite through the Divisional Annual Directive. On receipt of the directive, each Brigade HQ will interpret the risk appetite and instruct their units to conduct an AAE. In this example, HQ 4 Inf Bde will interpret the GOC 1 (UK) Div risk appetite and request an AAE from all subordinate units including, in this case, the QOY. Exhibit 80 Exhibit 81 Exhibit 264 Exhibit 265 Exhibit 308

1.4.823. To facilitate this request, the CO QOY will convene an AAE Planning Group with key Regimental stakeholders in attendance. The CO, in conjunction with their Command Team, will consider what level of assurance inspection they would prefer based on several factors, including the unit's commitments. After conducting this analysis, the Regiment will submit an Annual Assurance Plan (AAP) into HQ 4 Inf Bde, detailing the preferred inspection intensity and availability dates based on their planned activities for the year. Exhibit 264 Exhibit 265

1.4.824. SMEs within HQ 4 Inf Bde review each AAP and consider the request based on previous unit performance during inspections, advisory visit reports, etc. Based upon the advice from SMEs and considering the policy set by AHQ and the GOC's DRAS, Commander 4 Inf Bde decides the assurance intensity level that each unit will receive across all mandated external compliance inspections. The unit is subsequently informed of this decision and prepares appropriately for the assigned inspection regime. HQ 4 Bde passes the finalised Brigade AAP to the Audit and Inspections Coordinating Authority, who populate an A&I Dashboard and Exhibit 264 Exhibit 265 Exhibit 303

allocate Regional Command assurance teams to each unit inspection, where appropriate.

1.4.825. After inspections have been carried out, regardless of intensity level, the corresponding Inspection Reports are uploaded onto the Army Reporting Management System (ARMS).

Intensity levels

1.4.826. Inspection intensity levels provide units with the ability to balance the requirements of assurance with the workload required to conduct them. As a result, the multi-level Inspection regime comprises of 'must'[81] and 'should'[82] elements:

Exhibit 264
Exhibit 265

a. **Self-Assessment.** All units are to conduct self-assessment where the A&I regime permits self-assessment as a minimum;

b. **Light.** (Non-discretionary elements only). This is likely to be the 'must' elements of the standards;

c. **Medium.** All elements covered by the Light audit and selected elements directed by Defence and/or Army policy;

d. **Full.** Includes Light and Medium audit and any other additional requirements;

e. **Not applicable.** Units should only select 'Not Applicable' on the Demand Signal when the A&I regime in question does not apply to their unit.

1.4.827. For the purpose of the Inquiry, the Panel has focussed on the Force Protection (FP) and Logistic Support Assurance Framework (LSAF) assurance inspections of the QOY as they are the most relevant to the activity that was taking place at the time.

The Queens Own Yeomanry assurance – Force Protection (FP)

1.4.828. The QOY was scheduled to have a 'Light' FP audit in November 2018. However due to manpower constraints, the changeover of CO and Regimental Quartermaster and the absence of an Army Force Protection Advisor (AFPA) the Regiment requested that the assurance inspection be postponed until February / March 2019. HQ 4 Bde approved the A&I change request but mandated an advisory visit be conducted on the 24 November 2018.

Exhibit 28
Exhibit 268
Exhibit 269
Exhibit 270

[81] Must - An activity that is mandated.

[82] Should - An activity that is considered good practice.

1.4.829. The advisory visit general comments summary identified the following:

a. Force Protection and Environmental Protection documents had not been reviewed or updated;

b. The performance and training matrix had not been maintained or monitored to give a true picture of performance against inspections or training.

Exhibit 269
Exhibit 270

1.4.830. After the accident, the QOY was subjected to a 'Light' FP Inspection, conducted by a 4 Inf Bde FP Staff Officer in March 2019. The Panel noted the following statement made within the Executive Summary of the Inspection Report:

"During the advisory it was identified the SHEF Management System had not been reviewed for several months and communication from QOY Headquarters had all but ceased wrt [with regard to] FP H&S and EP. The Unit holds monthly meetings with Sqns, with SHEF [Safety and Health, Environmental and Fire] as an item on the agenda, however due the workload of the QM [Quartermaster] and absence of the AFPA, no direction or tasks were set for the Sqns during Oct 17 and Jan 19. The Unit had an Action Plan, which had not been monitored during the period, and therefore the Sqns, had been left to manage SHEF at Sqn level."

1.4.831. Although the March 2019 Inspection Report commented that SHEF management had been lacking for over a year and that this had been identified during the Advisory Visit in November 2018, this is not clearly articulated in the November 2018 report. The Panel was unable to determine how this finding was communicated to the QOY HQ staff after the Advisory Visit. Furthermore, despite the finding in November 2018, the Panel found no evidence of Brigade-level intervention to correct this behaviour in the period between the Advisory Visit and the Formal Inspection.

The Queens Own Yeomanry assurance – Logistic Support Assurance Framework (LSAF)

1.4.832. Prior to the accident, the last recorded LSAF inspection held on ARMS was conducted on 7 June 2017. The Regiment received one Non-compliance[83] and one Non-conformance[84] in areas that the Panel has also analysed during the investigation:

Exhibit 266

a. Non-conformance for the management of Driver Training Records (DTRs);

[83] Non-Compliance - Breach of Defence policy.

[84] Non-Conformance - Breach of legislation / contravention of a safety critical policy.

b. Non-compliance for the effective management of Driver/Operator training, maintenance and retention of course records/competency certificates.

1.4.833. During the analysis of the QOY's records, the Panel found that both of the issues raised in the LSAF inspection were still evident. The Panel therefore believes that recommendations from the LSAF Inspection in June 2017 had not been actioned by QOY. Exhibit 266

1.4.834. The Panel concluded the closure of recommendations and observations is not robust and, therefore, the assurance activity is not improving behaviours. Exhibit 266 Exhibit 268 Exhibit 269

1.4.835. Whilst the Panel did not review similar reports for other units across 4 Inf Bde, the Panel concluded that the lack of improvement displayed by the QOY was likely the result of poor closure mechanisms in the assurance process across the Brigade. The Panel finds that the lack of corrective action by either the QOY or 4 Inf Bde to the findings of the assurance process was a **Contributory Factor**.

1.4.836. **Recommendation. The Commander 4th Infantry Brigade should improve the follow-on procedures for all assurance activity in order to ensure findings are actioned in an appropriate and timely manner.**

Army Reserves

1.4.837. The White Paper, 'Reserves in the Future Force 2020: Valuable and Valued', was presented to Parliament in July 2013 by the Secretary of State for Defence. Following several years of declining numbers and in response to the Future Force 2020 requirements laid down in the Strategic Defence and Security Review (SDSR) in 2010, the MOD recognised the requirement to grow the then named Territorial Army from a shrinking force of around 20,000 personnel to the required force strength of 30,000 by 2020. To do so, the MOD proposed several significant changes to the terms of service and the way in which the newly named Army Reserve would be trained and employed. Exhibit 200

1.4.838. Acknowledging the important role Reserve personnel played in the delivery of UK Defence, the White Paper detailed that Army Reserve personnel would have access to enhanced training opportunities whilst being paired with Regular units to enhance the integration of the Total Armed Force (TAF)[85]. Following publication of the White Paper and further refinements as a result of the SDSR in 2015, the Executive Committee of the Army Board (ECAB) published The Army Reserve Sub Strategy in March 2017 detailing the vision and tasks for the Army Reserve and the strategy by which it would be delivered. To aid commanders, 'The Army Reserve: A Commander's Guide' was published by Director Reserves as the senior Reservist within the Army. This publication Exhibit 49 Exhibit 200 Exhibit 201

[85] Total Armed Force comprises full-time trained Regular personnel, trained members of the Army Reserve, the Sponsored Reserve, the call-out element of the Regular Reserve and the Military Provost Guard Service. – 'The Army Reserve : A Commander's Guide – Ch 2, Para 02.02'.

provides useful advice to all commanders involved with Army Reserve Personnel. It details the vision, roles and benefits of the Army Reserve whilst also highlighting some of the issues associated with the complications of Reserve service. The following statement is particularly pertinent to this Inquiry:

> *"The realities of Reserve service, particularly the constraints on time, limit what standard of training can be achieved by a Reservist. There will always be a training gap between the Regular and Reserve soldiers of similar rank and trade".*

Exhibit 203

1.4.839. Although the 2013 White paper detailed that Army Reserve training would require approximately 40 days per year and the Commander's Guide provides an indicative figure of 38 days, the minimum commitment expected from the majority of Army Reserve personnel is 27 Reserve Service Days (RSDs). Included within the 27 RSD requirement is a mandated 2-week training camp where Reserve personnel are provided with the opportunity to expand the capabilities of the unit whilst enabling a consolidated period of training exercises. Within the allocated RSDs, Army Reserve personnel are required to undertake all Military Annual Training Tests (MATTs) to the same standard as the Regular Army. For personnel with trade specific roles, such as vehicle driver or commander, Reserve personnel are to undertake the minimum level of CT as described within the Safe Practice section of this report. Despite there being a difference of 13 days between the respective requirements, the Panel reviewed the MATTs and trade specific training requirements for SSgt McKelvie and concluded that all training could have been completed well inside the mandated 27 RSDs. The Panel finds that the ability of SSgt McKelvie to complete all mandated training within the RSD allocation was **not a factor**.

Exhibit 16
Exhibit 200
Exhibit 201
Exhibit 203
Exhibit 204
Exhibit 294

1.4.840. The Panel concluded that it was possible for Reserve personnel to complete the level of training required within the 27 RSDs expectation. The Panel noted that this was a minimum training requirement to achieve currency and did not equate to the level of training and exposure to which a Regular soldier of a similar unit would be afforded. As a result, the Reserve soldier is likely to have significantly less experience than their Regular counterpart and the levels of competency between the two are likely to be significantly different.

Exhibit 203

1.4.841. A Reservist's ability and eagerness to commit time to the Army Reserve will vary from each individual and will be influenced by external pressures such as home life and civilian employment. It is assumed that the majority should be able to commit to the minimum prescribed RSDs, with the average Reservist committing to 40 RSDs annually. Some Reservists will be able to commit to more, up to 207 RSDs, provided the unit has sufficient funding and a valid requirement.

Exhibit 202

1.4.842. To contribute to the TAF, Army Reserves are employed across a wide range of roles. To enhance training and integration, Reserve units are paired with Regular units responsible for delivering the same role. In this case, the QOY was paired with its Regular unit, the Light Dragoons (LD).

Exhibit 203

1.4.843. Due to the nature of Reserve service, the Panel noted that it was more likely than not that Reserve personnel activated for operational tours would do so

as augmentees to Regular units, either individually or as small teams. The frequency of complete Reserve units deploying independent of their paired unit was considered to be low. Prior to deployment, it is extremely likely that any Reserve soldier would undertake a significant period of concentrated training[86] to bring them up to the standards of their Regular counterparts. This additional training, whilst not fully compensating for the differing levels of experience, would provide a significant mitigation against the lack of exposure and training afforded to the Reserve soldier. Similarly, were a Reserve unit to deploy, it is almost certain that they would be afforded a significant period of training to equip them properly for the upcoming deployment.

Witness 11
Witness 42

1.4.844. Whilst this enhanced Pre-Deployment Training offers a significant risk mitigation prior to operational deployments, the same cannot be said for training exercises, particularly those undertaken in the UK. Reserve units often deploy as full units during these training exercises, either as part of a larger group or as an individual unit. During unit level exercises, the Panel noted a self-induced pressure for Reserves to operate at a level that was likely to be beyond their competence and experience. In the opinion of the Panel this pressure was induced by a view that Reserves needed to operate at a level comparable to the Regular units and due to the Reserve soldier's desire to undertake higher level training rather than building from the basics. The Panel concluded that this was more likely to be a significant concern during high level, multi-unit exercises where Senior Commanders may lack the awareness of the differences in experience between Reserve and Regular units.

1.4.845. Paired with the LD, the QOY are a Light Cavalry Yeomanry unit which, up until 2018, operated the Land Rover based RWMIK[87] vehicle. Due to a re-role of the RWMIK to 16 Air Assault Brigade and the desire to integrate Reserve units with their paired Regular counterparts, the QOY, along with two other Light Cavalry units, the SNIY and the Royal Yeomanry, were tasked to re-role onto JACKAL. Acknowledging that this re-role would take significant effort and several years to achieve, the QOY began JACKAL training in April 2018. Despite the significant differences in platform capabilities and technical complexity, the Panel was unable to find any Organisational Safety Assessment to understand the impact that these changes may have contributed to the overall safety within Yeomanry units. The Panel concluded that it was more likely than not that no safety assessment was conducted prior to the re-role of Yeomanry units to JACKAL and, as a result, key risks associated with training and currency requirements were not captured. The Panel finds that the lack of a formal Organisational Safety Assessment to support the re-role of the Army Reserve Light Cavalry Regiments onto JACKAL was a **Contributory Factor.**

Exhibit 185
Witness 9
Witness 10
Witness 11

[86] To include Pre-Deployment Training (PDT) and Reception, Staging and Onward Integration (RSOI) on arrival in an operational theatre.

[87] RWMIK - Revised Weapons Mounted Installation Kit, is a light armoured, highly mobile fire support and force protection Land Rover,

1.4.846. **Recommendation. The Assistant Chief of the General Staff should ensure that a suitable and sufficient Organisational Safety Assessment is completed for all units that are re-rolling, and ensure this requirement is stated on the warning and implementation orders issued in order to ensure that all risks associated with re-rolling are understood and managed to as low as reasonably practicable.**

Reserve unit command structure

1.4.847. Reserve units often comprise of several dislocated sub-units commanded by a central Regimental HQ. In this case, the QOY was spread across four locations in northern England, with the Regimental HQ located in Newcastle and outlying Squadrons in Chester, York and Wigan. This geographical spread, coupled with the roles played by both Regular and Reserve personnel, requires a subtly different command structure to that of a Regular unit. Like other Reserve units, the Command Structure of QOY was organised as shown in Figure 1.4.79.

Exhibit 201
Witness 10
Witness 11

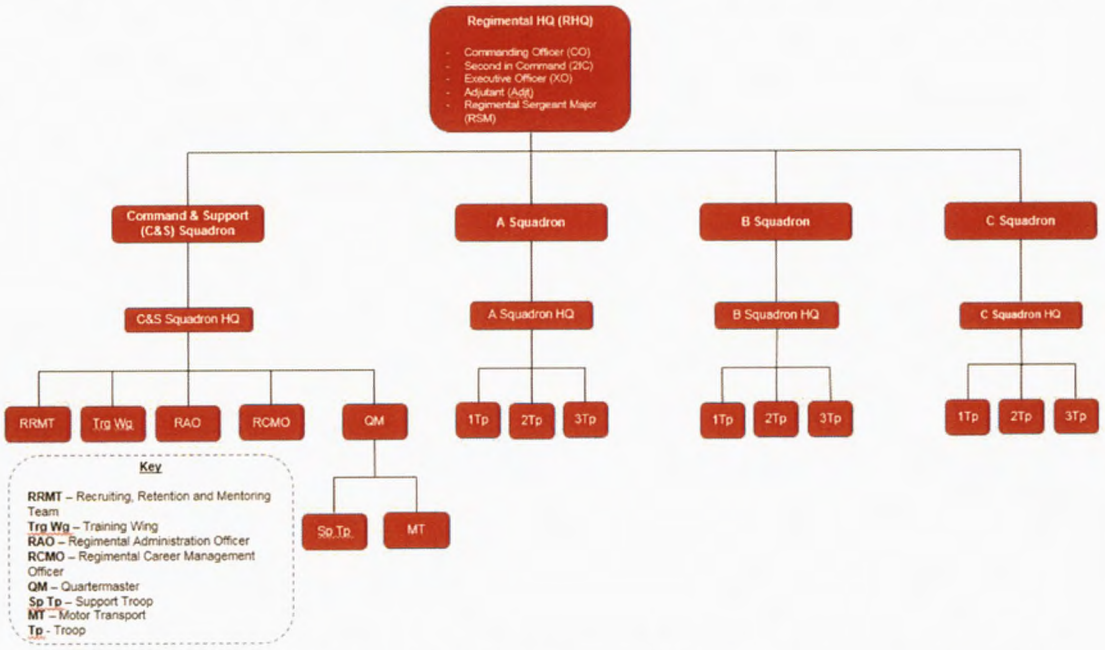

Figure 1.4. 79 – The Queen's Own Yeomanry Regimental command structure

1.4.848. COs of Army Reserve units can be either Regular or Reserve personnel although the long-standing principle is that where a suitably qualified Reservist is available, they should be appointed ahead of a Regular member of the Army. This principle enables the Army Reserve to remain attractive to personnel above the rank of Major.

Exhibit 201
Witness 9
Witness 10

1.4.849. The Panel noted that those Army Reserve officers afforded command opportunities were expected to allocate 120 RSDs to the role. The Panel concluded that, given the totality of command responsibilities, including Duty of Care and Duty Holding bestowed upon the CO, it was unlikely that 120 RSDs would be sufficient to conduct these duties to an acceptable standard. The Panel also noted that due to the dislocated nature of many Reserve units, the ability of

Exhibit 71
Exhibit 201
Witness 10

the CO to assure sub-unit activity was more challenging than that of a standard Regular unit located in a smaller geographic area.

1.4.850. Those Reserve officers appointed to Regimental Command are likely to have considerably less experience than their Regular counterparts. This difference in experience requires careful management if the Reserve unit is to be afforded the same level of supervisory oversight as Regular units. As a result, the Reserve CO is heavily reliant upon the experience and expertise of his command team, especially those appointed from the Regular Army. Exhibit 201

1.4.851. By reviewing the Command structure of multiple Reserve units, the Panel concluded that the XO was usually the senior Regular Officer appointment within the unit. The XO role is unique to Reserve units and is a position of great responsibility. Whilst a formal Second-in-Command (2IC) position exists, more often than not this is held by a Reserve Officer. As a result, in the absence of the CO and 2IC, the XO is responsible for the oversight and supervision of the unit for prolonged periods. The Panel concluded that the appointment of the XO is critical to assuring the correct level of supervision is undertaken throughout the command structure. Exhibit 201

Safety Culture

Accident Theory and High Reliability Organisations (HROs)

1.4.852. The Nimrod Review by Sir Charles Haddon-Cave QC describes the two main accident theories: Normal Accident Theory and High Reliability Theory and highlights that *'the importance of investigating and understanding the organisational causes of accidents cannot be overstated.'*[88] Reviewing the two theories, it is clear that whilst they share the same goal, they are very different in their opinion of the ability to avoid errors, incidents and accidents: Exhibit 206

a. Normal Accident Theory is the pessimistic view of accidents; that as technologies become more complex and 'tightly coupled', accidents become inevitable; Exhibit 206

b. High Reliability Theory is more optimistic, arguing that organisations can successfully compensate for inevitable human shortcomings. Proper design, management and training are important requisites for being a highly reliable organisation. Exhibit 206

1.4.853. Throughout the SI, many of those interviewed stated that they believed that the Army was a high risk job and an acceptance therefore that accidents were likely to occur. Although the vast majority also stated that they actively worked to reduce risk, in the opinion of the Panel the majority held a slightly pessimistic view of risk reduction.

[88] Haddon-Cave, The Nimrod Review 2009.

1.4.854. In 2011, the Health and Safety Laboratory (on behalf of the HSE) reviewed the literature relating to HROs[89] and the numerous studies into the benefits and drawbacks of adopting this methodology. Reviewing 37 documents, the study concluded that those organisations that successfully displayed the behaviours associated with HROs tended to be associated with 'exotic' businesses, namely military and service-oriented organisations (eg Air traffic Control). The HSE report concluded that the effectiveness of adopting HRO practices within other types of business may not deliver meaningful benefits. Exhibit 189

1.4.855. It is the opinion of the Panel that the behaviours displayed by traditional HROs provide an excellent benchmark by which to analyse the current maturity of safety practices within the Army, given its alignment with the types of organisation often referred to as HROs. To capture the findings, the HRO study provided a summary Mind Map, highlighting the common themes found within HROs from the various reports (see Figure 1.4.80). Exhibit 189

Figure 1.4. 80 – Health and Safety Executive High Reliability Organisations Mind Map

1.4.856. **Problem Anticipation.** HROs anticipate problems by engaging with staff at all levels to understand the bigger picture. They are attentive to all signals, irrespective of how trivial or minor they may be, as potential indicators of system health. This preoccupation with failure systematically collects and analyses all warning signals to avoid making assumptions about the causes of failures, using Exhibit 189

[89] Dr Lekka - High reliability organisations – A review of the literature 2011

effective accident investigations to identify potential systemic failures that contribute to incidents, rather than simplifying causal factors.

1.4.857. **Containment of Unexpected Events.** To contain the effects of incidents and accidents, HROs have back-up systems in the event of failures and conduct cross-checking of important decisions. Whilst a hierarchical system is implemented for day-to-day operations and defines those who are responsible for critical roles, in the event of emergencies, decision-making is deferred to those with expertise, irrespective of rank. Technical competence is assured through constant training, with well-defined procedures to cover all eventualities. Exhibit 189

1.4.858. **Learning Orientation.** HROs are reliant on open communications and root cause analysis of accidents and incidents to learn the mistakes of the past and communicate them effectively across the business to prevent reoccurrence. Following accident analysis, lessons identified are learnt through continuous technical training, incorporating important safety lessons and the updating of procedures to capture new elements in order to increase organisational knowledge and understanding. Exhibit 189

1.4.859. **Just Culture.** Organisations with a Just Culture are characterised by open reporting by all staff without the fear of punishment. They also empower staff to abandon work on safety grounds and foster a personal responsibility for safety across the entire work force. Exhibit 189

1.4.860. **Mindful Leadership.** Leadership is the key to HROs. Mindful leadership is characterised by proactive identification of problems by the commissioning of audits and interactions with the workforce. Personnel at all levels are encouraged to report 'bad news, bottom-up' and the mindful leaders encourage this through regular site visits. Exhibit 189

Safety Culture

1.4.861. Within The Nimrod Review, Haddon-Cave described several latent weaknesses within the management and organisational structure of military aviation and recommended the move towards the creation of an 'engaged safety culture'[90]. Exhibit 207

1.4.862. Using analysis of the characteristics found within HROs and developed from James Reason's 4 principles[91] of a Safety Culture, Haddon-Cave's Engaged Organisation and Safety Culture model added a fifth element, a Questioning Culture (see Figure 1.4.81): Exhibit 207

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[90] Haddon-Cave, Charles. *The Nimrod Review, Chapter 27 – A New Safety Culture*, p569-576.

[91] *Managing the Risks of Organizational Accidents*, James Reason, December 1997.

a. **Reporting Culture.** A Reporting Culture is *"an organisational climate where problems, errors and near-misses are reported"*[92];

b. **Just Culture.** A Just Culture is *"an atmosphere of trust where people are encouraged, and even rewarded, for providing safety-related information, and it is clear to everyone what is acceptable and unacceptable behaviour"*[93];

c. **Flexible Culture.** A Flexible Culture is *"a culture that can adapt to changing circumstances and demands while maintaining its focus on safety"*[94];

d. **Learning Culture.** A Learning Culture is *"the willingness and competence to draw the right conclusions from its safety information and the will to implement major safety reforms"*[95];

e. **Questioning Culture.** A Questioning Culture is one that understands *"it is vital to ask, "What if?" and "Why?" questions. Questions are the antidote to assumptions, which so often incubate mistakes"*[96].

Figure 1.4. 81 – Haddon-Cave's Five Element Safety Culture

[92] Haddon-Cave, Charles. *The Nimrod Review, Chapter 27 – A New Safety Culture*, p569-576.

[93] Haddon-Cave. Op Cit.

[94] Haddon-Cave. Op Cit.

[95] Haddon-Cave. Op Cit.

[96] Haddon-Cave. Op Cit.

Leadership and Safety Culture

1.4.863. Haddon-Cave highlighted the importance of leadership to effect real cultural change within any organisation. He added that it was the thought, word and deed of leaders that most influenced the attitudes, behaviours and priorities of employees. Exhibit 207

1.4.864. The senior leadership of the Army has clearly identified a need to improve its safety culture. In April 2017 CGS stated the requirement to develop the right culture during the inaugural Army Safety Committee and the topic has been discussed at every meeting since. Exhibit 192

1.4.865. The Army has a number of challenges in developing the correct Safety Culture whilst also maintaining a war-winning fighting force. As recently as July 2019, CS(A) stated that safety is seen by many as a blocker to necessary activity. It is this view that permeates to the junior ranks, causing them to take unjustified safety risks without contemplating the potential outcomes. Couple this with judgement impairing fatigue and a 'get it done' mindset, it is easy to see why there are so many injuries sustained by the Army during training activities (15.5 injuries per 1000 personnel per year)[97]. Exhibit 199 Witness 31

1.4.866. A change in culture must be supported from the very highest levels of an organisation. In 2017 CGS clearly articulated his desire for change when he chaired the first Army Safety Committee (ASC). As the top-level S&EP meeting attended by the senior executives of the Army Board, the role of the ASC is to consider all S&EP risks held by CGS and the 3* and 2* Commanders. It reviews annual safety performance, considers Duty Holding arrangements, sets priorities for the following year and refines S&EP policy. Supporting the ASC are two subordinate meetings, the Army Sub-Safety Committee chaired by DCGS (the Army Safety Champion) and the Army Safety and Environmental Working Group chaired by Chief Safety (Army) (CS(A)). Each reports upwards any issues that require elevation. Exhibit 71 Exhibit 192 Exhibit 342 Exhibit 343

1.4.867. Following the inaugural ASC in 2017, circumstance dictated that DCGS represented CGS at the 2018 and 2019 ASC meetings with CGS returning to chair the ASC in 2020. Given the importance of positive messaging from the senior leadership to the contribution of a positive safety culture, the panel **observes** the lack of attendance by CGS at the ASC may have been seen by those in subordinate roles as a lack of commitment to safety improvement. Exhibit 71 Exhibit 195 Exhibit 199

1.4.868. Safety Culture maturity was briefed to the ASC in 2019 by both CS(A) and Commander Field Army (CFA). Both individuals highlighted concerns regarding the current level of cultural maturity, with CS(A) highlighting the view that many in the Army still believe safety measures are a barrier to necessary activity.

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[97] 15.5 Serious and Specified Training injuries per 1000 personnel per year in FY18/19 – Army Safety Committee slides 3 July 2019.

CFA went on to highlight the lack of challenge to unsafe practices and an inability to demonstrate an audit trail of Dynamic Risk Assessments or other safety-based decisions.

1.4.869. Reviewing the importance of mindful leadership, as described in the analysis of HROs, it is important to highlight that Army Safety Audits are hindered by a lack of resource to carry out 2nd and 3rd Party Audits effectively. Whilst in-barracks activity is well understood and audits are relatively well-defined, out of barracks activities such as driver training are poorly understood. A lack of any DMI assurance regime is evidence of this lack of standardisation or safety assurance. Exhibit 199

Exhibit 189

1.4.870. From Panel interviews it is clear that many within the Chain of Command understand the importance of HS&EP. However, there remains a cohort who are concerned about the constraints placed upon them when trying to deliver realistic training. Moreover, safety training is still limited to small modules within career courses. In-depth HS&EP training is limited to those within key safety roles, such as Army Force Protection Advisors (AFPAs) and Quartermasters. Witness 9 Witness 10 Witness 42 Witness 43 Witness 44

1.4.871. Indicative of poor HS&EP understanding is the lack of policy knowledge held by those in positions of seniority, particularly unit COs. Throughout the Inquiry, the Panel noted a lack of knowledge of, and adherence to, key documents such as ACSO 3216. This lack of understanding undermines the communication link from a top down perspective. Whilst ACSO 3216 clearly defines roles and responsibilities and outlines the top-level Army SEMS, those expected to deliver it are not aware of the policy document or its contents. The Panel finds that the lack of safety training provided for Army personnel was a **Contributory Factor**. Exhibit 71 Witness 9 Witness 10 Witness 35

1.4.872. **Recommendation. The Deputy Chief of the General Staff should enhance safety training for all Army personnel in order to ensure safety policy and practices are understood at an appropriate level.**

Haddon-Cave's Engaged Safety Culture and the British Army

Reporting Culture

1.4.873. Haddon-Cave highlighted the importance of a positive reporting culture to help mitigate error by capturing hazards and safety concerns, enabling proper trend analysis to highlight areas of risk. Exhibit 207

1.4.874. To enable reliable reporting in both quantity and quality, Haddon-Cave introduced five elements he saw as critical to delivering a positive reporting culture: Exhibit 207

a. Reporters should be protected against disciplinary action where appropriate;

b. Reports should be confidential and anonymous where necessary;

c. There should be separation between those responsible for collecting and

analysing safety reports and those with the authority to discipline;

d. Analysis should provide rapid, useful, accessible and intelligible feedback to the reporting community;

e. Reporting should be easy.

1.4.875. **Protection against disciplinary actions where appropriate.** Whilst deliberate transgressions will require an element of discipline, honest mistakes should not attract disciplinary action. Further analysis of this will be covered within Just Culture. Exhibit 207

1.4.876. **Confidential and anonymous reporting.** Where appropriate, reports should be kept confidential and anonymous to promote reporting from all of those within the Chain of Command. Where there is a perceived problem with the establishment of a Just Culture, this element is increasingly important to ensure that reports are submitted, particularly from the lower ranks. Additionally, in many cases there is no requirement for others to know the exact details of events to gain safety benefits. For example, names and exact locations in many cases are superfluous and may detract from the lessons being identified and learnt. Exhibit 207

1.4.877. The Army safety occurrence reporting system does not have a confidential or anonymous reporting mechanism. All reports are submitted through the Army Form 510 (AF510) which requires personal data as a mandatory field. The Panel finds that the lack of confidential and anonymous reporting is an **Other Factor**. Exhibit 191

1.4.878. **Recommendation. Chief Safety (Army) should provide the Army with a mechanism to submit safety reports confidentially and anonymously in order to improve the Army reporting culture and encourage personnel to submit reports.**

1.4.879. **Separation between the safety reporting chain and the disciplinary Chains of Command.** It is human nature to apportion blame. The apportionment of blame often seeks to simplify the factors that contributed to the final event in order to come to an early conclusion, often resulting in disciplinary action. This serves to undermine reporting in two ways: Exhibit 207

a. The simplification of causal factors fails to correctly identify vital lessons, thereby missing the opportunity to learn those lessons and improve safety;

b. Attributing blame to individuals dissuades others from reporting similar incidents and accidents in the future.

1.4.880. Whilst the Army's formal incident and accident reporting chain is separate to the disciplinary chain, feedback from reporting leads directly into the unit Chain of Command to conduct further investigations and produce Learning Exhibit 71 Exhibit 191 Exhibit 205

Accounts. This process provides an opportunity for those within the Chain of Command to attribute blame to those under their supervision rather than reviewing the entirety of the occurrence including potential weaknesses or flaws in their own systems or performance.

1.4.881. Whilst the Panel acknowledges that complete separation between safety reporting and disciplinary Chains of Command is likely to be unachievable, it is important that a robust and documented Just Culture model is used. Just Culture will be analysed later in this section.

1.4.882. **Rapid, Beneficial Feedback.** The end product of any safety report should feedback to those submitting the report and the wider user community to provide detailed analysis of the lessons identified and the changes to procedures and practices that need to be made to manage the associated hazards and risks. A system that fails to feedback to the user community lacks value and quickly becomes a burden rather than a tool.

Exhibit 205

1.4.883. The feedback process of the current Army reporting system is complicated, lengthy and lacks independent analysis in many areas. Often feedback is not shared across the Army or to other organisations that have safety related roles. Dissemination of safety related lessons to junior ranks is reliant upon publications such as 'KiT! Magazine'[98] (which tends to be equipment focussed) and Safety Bulletins. The reliability of these methods of communication is poor, as they are reliant upon individuals finding and reading the documents. Further analysis of the feedback process will be conducted in the Learning Culture section.

Exhibit 191
Exhibit 205
Exhibit 310

1.4.884. **Easy Reporting.** Reporting arrangements should be simple and easily accessible to all. The Army Reporting system is primarily based on the AF510, which is available via several links on the MOD network, including the Army Knowledge Exchange. Although available to all, access for Junior Ranks can be constrained by a lack of computer terminals at unit level. As a result, it is likely that reports are centrally captured through a single point of contact at unit level who coordinates and submits safety reports.

Exhibit 207
Witness 31
Witness 37

1.4.885. The current AF510 is a Microsoft Excel spreadsheet form that is not directly linked into the reporting database. As a result, reports are manually generated, requiring completed forms to be emailed to the Army Incident Notification Cell (AINC). In many cases, the forms received by the AINC are not completed to acceptable standards and follow-up action is required to accurately capture the details of the occurrence. Upon completion, reports are manually

Exhibit 191
Witness 37

[98] KiT! Magazine is published quarterly on behalf of D LE. It updates the user community on safety related issues, good practice and any relevant information.

transferred from emails onto the Incident Notification System (INS) by AINC staff, increasing the risk of human error during the transfer of data. The current manual AF510 submission process is an **Observation.**

1.4.886. In addition to the AF510 process, the Panel believes that it is likely that many occurrences may be reported through the Chain of Command but never materialise into formal AF510 submissions. This is particularly likely for those incidents that are classed as near-miss and do not result in injury or equipment damage. As a result of informal reporting, the Panel believes that it is highly likely that not all safety occurrences are reported on AF510s and captured by the AINC. Exhibit 191 Witness 25 Witness 37

1.4.887. In contrast, a fully integrated reporting and management system exists within Defence where reports can be generated and submitted by the reporter on-line and automatically uploaded onto an Information Management System that can then be managed by safety staff and accessed by other users as appropriate. The military aviation-based Air Safety Information Management System (ASIMS) has been used since 2009 and enables all personnel with MOD computer access to submit reports. Where MOD computers are unavailable, ASIMS reporting templates are available on the Worldwide Web in PDF format, which can then be manually emailed to the ASIMS web team. ASIMS automation does not allow partial reports to be submitted, ensuring all pertinent data is captured on the first submission, thereby minimising follow up action. Reporters are able to track the progress of their reports through the various stages of analysis and observe any recommendations and actions that have been taken as a result of the report. Supervisors and other interested parties are able to access reports, both current and historic, to understand potential safety risks and gain an understanding of their own areas of responsibility. Exhibit 311

1.4.888. The Panel finds that the current Army Safety Occurrence Reporting System is an **Other Factor.**

1.4.889. **Recommendation. Chief Safety (Army) should improve the Army Safety Occurrence Reporting System in order to make it easy to use for all involved.**

1.4.890. In the opinion of the Panel, the reporting culture within the Army is poor. The Panel found that this was understood at the highest levels of the Army and had been briefed during the ASC. The Panel concluded that the area requiring significant improvement was in the reporting of near-miss occurrences. This was also reported by CS(A) at the 2018 and 2019 ASCs and by the Army Inspector within the 2018 Annual Assurance Report. A review of 2018 reporting held by AINC highlighted that only 243 near misses were reported across the entire Army in contrast to 8228 incidents and accidents; this ratio contradicts the widely held opinion that near-misses occur significantly more often than accidents. Based on this evidence, the Panel concluded that it is likely that most personnel see the reporting mechanism as a means of recording injuries rather than the promotion of safety. Exhibit 194 Exhibit 195 Exhibit 199 Exhibit 186

1.4.891. The exact reason for the poor reporting culture in the Army could not be established by the Panel, but it is likely due to a combination of the five factors

above. The Panel finds that the poor reporting culture within the Army is an **Other Factor**.

1.4.892. **Recommendation. Chief Safety (Army) should develop a reporting culture improvement plan in order to improve the reporting culture within the Army taking into account the five Haddon-Cave reporting culture principles.**

Just Culture

1.4.893. A Just Culture is the key enabling factor to promoting a mature Safety Culture. Described by a previous Chief of the Defence Staff (CDS), Air Chief Marshal Sir Jock Stirrup, as *"a culture that encourages open and honest reporting, that allows for structured investigation of errors which lead [sic] to an incident, and that takes 'just' action which is fair and measured"*. A Just Culture is critical to promote the trust of an organisation into its own reporting and disciplinary system. A Just Culture strikes the balance between 'blame' and 'blame-free' cultures; importantly these boundaries are communicated and well understood by all those involved through a set of principles of what is, and what is not, acceptable. Exhibit 207

1.4.894. Models such as the FAIR[99] Model, provide useful tools to understand Just Culture boundaries. However, there is a potential that such models can be detrimental to reporting when the individual involved believes that they are likely to face disciplinary action as a result of their reporting. Exhibit 71

1.4.895. Whilst the Army strives to adopt a Just Culture, the ingrained ethos of discipline and punishment undermines the ability to fully embrace it. Throughout the Inquiry, several personnel were overheard dismissing the timescales involved in producing an in-depth investigation, preferring instead to blame the instructor due to the location of the accident being in an Out-of-Bounds area. It is this approach that the Army must strive to discourage.

1.4.896. At the time of the accident, ACSO 3216 contained a useful chapter on Safety Culture, providing details of the FAIR model. Although the model was included within ACSO 3216, the Panel found few within the Chain of Command were aware of its use. Furthermore, in a subsequent version of ACSO 3216 released during the Service Inquiry, the Safety Culture section was removed along with the FAIR model diagram. The Panel was unable to establish the reason for its removal. Exhibit 71 Exhibit 78 Exhibit 184

1.4.897. The Panel was unable to conduct a full review of the Army Just Culture due to the significant nature of any such analysis. The Panel also assessed that the success of a Just Culture is also extremely difficult to quantify; much is based on a subjective and often personal opinion. Therefore, the Panel believes that it is extremely important for the Army to formally publish a policy on Safety Culture, including a robust and transparent Just Culture model that is effectively Exhibit 194

[99] Flowchart Analysis of Investigation Results (FAIR).

communicated to all personnel and demonstrably proven through the fair treatment of personnel irrespective of the significance of the accident or the rank of the individual. The Panel finds that the lack of a well communicated Just Culture model is an **Other Factor**.

1.4.898. **Recommendation. Chief Safety (Army) should update Army Command Standing Order 3216 to include a chapter on Safety Culture including the publication of an Army wide Just Culture model in order to promote an improved Safety Culture and establish a recognised Just Culture model across the entire Army.**

1.4.899. **Recommendation. Chief Safety (Army) should include Just Culture training in all Command, Leadership and Management safety packages, including Safety Risk Management training in order to promote the use of a Just Culture to all Army personnel.**

Flexible Culture

1.4.900. A flexible organisation is not bound by complex, rigid procedures or ill-defined chains of command. Flexible organisations are guided by core principles and are more likely to deal with changing circumstances and hazards. Exhibit 207

1.4.901. A flexible culture encourages all personnel, irrespective of rank, to question procedures, behaviours and their seniors in order to promote safety by stopping or interrupting unsafe practices prior to an incident or accident occurring. The benefits of this behaviour are evident in HROs, when those in leadership positions encourage the reporting of 'bad news' to help them understand the 'big picture'. Exhibit 207

1.4.902. Ultimately the Army is extremely flexible and must cope with a multitude of changes to the business due to financial constraints and operational requirements. It manages to do so through a solid foundation of leadership and communication of Orders and policies. Exhibit 207

1.4.903. However, the Panel believes that it is due to this strong leadership and constant change that safety is occasionally compromised as it takes a second place to ensuring operational capability. The strong leadership styles prevalent throughout the military are less likely to attract 'bad-news' from the shop floor, due to a reluctance from the junior ranks to voice concerns and the view that the leadership would not welcome them. Exhibit 207

1.4.904. In relation to this accident, the changing role of the Army Reserves acts to verify this point. Due to the changes made to the roles of the Army Reserve as part of the wider Army 2020 reorganisation, it was vital that the Army Reserves operated the same equipment as their paired units in the Regular Army. Whilst on the face of it, this makes perfect sense, there are safety implications which, in the view of the Panel, were not fully considered by those in senior Army positions. Exhibit 304

1.4.905. For example, previously, Army Reserve Light Cavalry units operated the Land Rover based RWMIK. Whilst a complex piece of equipment in its own right, Witness 10

the RWMIK is much simpler than JACKAL with its complex air suspension and much larger size. Despite this significant change to both the Person and Equipment elements of SSW/T, the Panel was unable to find any Organisational Safety Assessment to articulate the additional hazards that this change of equipment may have caused.

1.4.906. For the Regular Army, competence was maintained through ensuring personnel had regular access to their vehicles and opportunities to maintain and improve driving standards. By contrast, Reserve soldiers had minimal access to vehicles on which to train and thus limited opportunities to improve their competence. Despite this, Reserve units were expected to operate at the same level and over the same terrain as their Regular counterparts. This key difference was one of many that increased the risks associated with JACKAL operations in the Army Reserve. The Panel has found that this change was not discussed or formally recorded at any Safety Panel.

Learning Culture

1.4.907. An organisation promoting a strong Learning Culture is one that is willing to adapt and change, based on safety indicators and hazards. By learning through experience from historic internal and external accidents whilst also capturing safety data through audits and assessments, these organisations promote training and policy changes in response to safety analysis. Exhibit 205

1.4.908. The Army Lessons Process (ALP) policy is dictated by ACSO 1118 which highlights the NATO doctrinal view that: Exhibit 205

> *"A lesson learning capability provides a commander with the structure, process and tools necessary to capture, analyse and take remedial action on any issue and to communicate and share results to achieve improvements."*

1.4.909. ACSO 1118 utilises the NATO Capture, Analyse, Resolve, Exploit (CARE) lessons framework to identify key elements necessary to enable a learning culture (see Figure 1.4.82). Exhibit 205

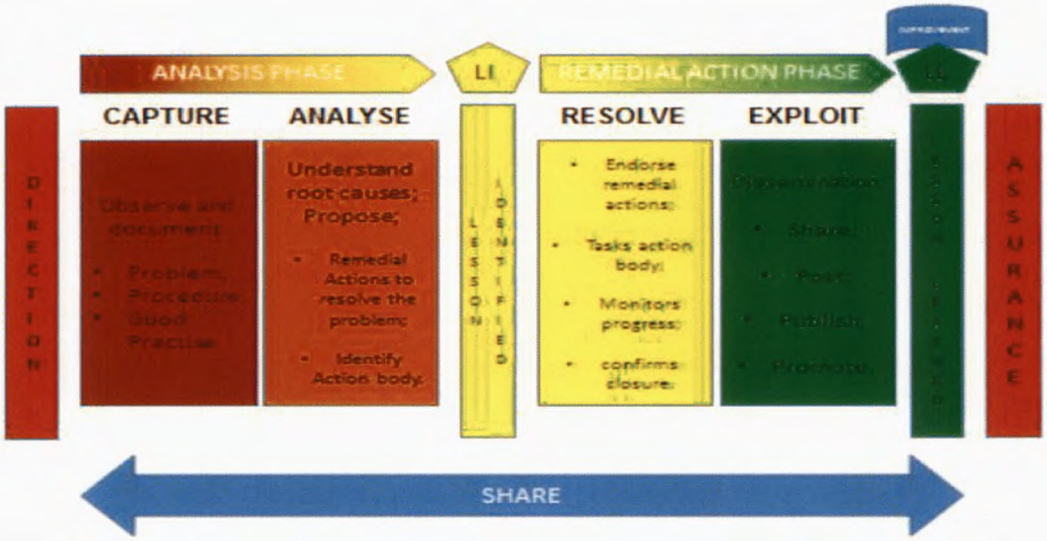

Figure 1.4. 82 – NATO Capture, Analyse, Resolve and Exploit framework

1.4.910. Whilst the ALP has been developed to learn from experience and improve all elements of Army output, with Force Generation and Operations being the main effort, this report will focus on the current ALP processes and outputs from a safety perspective and make observations and recommendations for potential benefits. The report will deal with each element of the CARE model in isolation and make recommendations as appropriate. Exhibit 205

Capture

1.4.911. Capturing safety occurrences is the purpose of AF510 as described in Para 1.4.877. Once an occurrence has been reported, if it involves a Serious or Specified Injury in accordance with Army Safety Centre (ASCen) procedures, the AINC will request further details of the accident by way of a unit Investigation, using the Army Form 510A (AF510A)[100]. The AF510A is a supplementary unit Investigation Report form that enables the AINC to capture a more detailed review of the safety occurrence. The AF510A captures the following details: Exhibit 71 Exhibit 187 Exhibit 191 Witness 45 Exhibit 188

a. Occurrence overview;

b. Background;

c. What happened;

[100] The AF510A was introduced in the first revision of ACSO 3216 in April 2019 as an improvement to Unit Safety Investigations. Although the AF510A was not in place at the time of the accident, the SI Panel have reviewed the process as evidence of the ongoing enhancements made by the Army to improve the Safety Lessons process.

d. First Aid/medical arrangements;

e. Why it happened;

f. Initial issues identified;

g. Good practices identified;

h. Immediate action taken to prevent reoccurrence;

i. Personnel involved.

1.4.912. AF510As are partially completed by the AINC using the information from the original AF510. The completed AF510A should be re-submitted by the unit to the AINC within 5 working days. Units are encouraged to seek advice from an AFPA.

Exhibit 71
Exhibit 187
Exhibit 191

1.4.913. If the accident is of significant importance, the unit will be requested to submit a Learning Account to analyse the accident further and to provide the lessons identified from the occurrence. Whilst Learning Accounts feature many of the requirements of the AF510A, they also detail formal Lessons Identified and recommendations for improvement. Learning Accounts are not formally part of the safety occurrence reporting system; however, as part of the wider Army Lessons process, safety related Learning Accounts are sent to the AINC to be processed alongside the AF510 and AF510A process. Learning Accounts are commonly sent by the reporting unit to their Brigade Level HQ for information and wider distribution if required.

Exhibit 71
Exhibit 188
Exhibit 191
Witness 45

1.4.914. The Panel concluded that the Army system for capturing safety occurrences is robust as long as initial AF510 occurrence reports are submitted. The requirement for supplementary reports is not transparent and units are not aware of the formal Army definitions of 'Serious or Specified Injury' or those that are deemed 'of significant importance'. This means that unit staff are unable to pre-empt a request for an AF510A or Learning Account. The Panel also found that the process was disjointed with different Army organisations managing the Learning Accounts and AF510A processes. The Panel believes that the ASCen should issue guidance on which occurrences will require supplementary reports so that units can prepare for the additional workload and request AFPA support where required. The lack of transparency in the Army AF510A and Learning Accounts process is an **Observation.**

Exhibit 191
Witness 45

1.4.915. In addition to the formal Army process, the DSA supports the capture process by attending serious accidents, deploying the Defence Accident Investigation Branch (DAIB) to conduct an initial assessment. Following the submission of an initial Triage Report by the DAIB, the DG DSA decides whether further investigation is required in the form of a Service Inquiry or a Non-Statutory Inquiry or that there is no need for a DSA level investigation, in which case the DAIB issues a Deployment Record to both the DSA and the relevant stakeholders in the TLB. Although the requirements of reporting accidents to the DAIB is captured within ACSO 3216, the use of resulting Deployment Records is not

Exhibit 60
Exhibit 71

formally documented as part of the Army Learning Process. The lack of coherence between internal and external means of capturing safety occurrences observations and lessons is an **Observation.**

Analyse

1.4.916. The analysis of safety occurrences is dependent upon the level of significance of the report generated for the occurrence and whether there are any trends to suggest a wider issue. The Panel reviewed the three primary processes: the AF510A; Learning Accounts; and Military Judgement Panels (MJPs).

1.4.917. **AF510As.** Following submission of an AF510A, the AINC enters the report onto the Army's Incident Notification System (INS). According to ACSO 3216, the AF510A forms part of the SSW/T as well as an important element of the mandatory investigation process for serious and certain specified incidents. Furthermore, the AF510A facilitates trend analysis into the root causes of accidents and incidents.

Exhibit 71
Exhibit 188
Exhibit 191

1.4.918. Reviewing previous JACKAL roll over occurrences on the Army's INS, the Panel identified that the corresponding AF510/AF510As failed to capture a number of the mandated fields and, where information was provided, detail was sparse. When interviewing key AINC staff, they highlighted the lack of ability to provide any in-depth analysis of causal factors, stating that the system was used more to provide low-level occurrence trend analysis. The Panel concluded that the AF510A process enabled the ASCen to capture numbers of events and analyse occurrence trends but did not provide the fidelity to accurately capture associated root causes, as stated within ASCO 3216.

Exhibit 191
Witness 37
Witness 45

1.4.919. **Learning Accounts.** Learning Accounts are requested for occurrences of significant importance. The role of the Learning Account is to provide a much more detailed analysis of causes, capturing lessons and providing recommendations to prevent reoccurrence. Learning Accounts are also used to support Military Judgement Panels to inform organisational learning. The Panel noted that, of the 34 occurrences of JACKAL roll over accidents between 2008 and 2018, only 10 were supported by Learning Accounts. A review of the Learning Accounts held on the Army's INS indicated that, whilst there was some spread of quality in the reports, overall, they were well-produced documents capturing a reasonable level of detail and accurately capturing some of the causal factors. Whilst the scope of these individual Learning Accounts is narrow, some high-level observations and recommendations were captured, including improved training and potential improvements to equipment.

Exhibit 113
Exhibit 183
Exhibit 188
Exhibit 205

1.4.920. As with AF510As, finalised safety occurrence Learning Accounts are archived on the Army's INS for future reference. Detailed analysis of individual Learning Accounts is not conducted by the ASCen.

Exhibit 113
Exhibit 188
Exhibit 191

1.4.921. **Military Judgement Panels (MJPs).** When a significant trend of events has occurred or following a SI or significant safety event, CS(A) can mandate a MJP to be held to assess reports, recommendations and distribute them across the Army. The role of the MJP is to identify lessons, observations and good practices and then to assign them to a Senior Point of Authority (SPA) to deliver. The output of the MJPs are identified lessons that are captured on the Defence Lessons Identified Management System (DLIMS) which is then monitored to ensure lessons are managed and learnt across the Army.

Exhibit 188
Exhibit 205

1.4.922. Despite 34 reported roll over occurrences involving JACKAL between 2008 and 2018 and the resulting injuries to approximately 30 personnel, including multiple fractured limbs and neck injuries, only one MJP had been held to consider vehicle roll overs prior to the accident in January 2019. In 2010, a MJP was held to consider a roll over accident at Driffield Training Area resulting. The MJP raised a number of lessons, including the lack of provision of vehicle tilt limitations to End Users and the lack of a method by which to determine vehicle tilt; both lessons identified by the Panel in relation to this accident. The MJP recorded these lessons on the DLIMS and mandated that the limitations should be included in the AESPs and that an inclinometer should be procured. Despite the findings from the 2010 MJP, the Panel discovered that the two recommendations were not delivered due to DE&S concerns regarding the applicability of tilt limitations and a SEMC judgement that the inclinometer was too complex to deliver. The Panel was unable to find any formal minutes for the 2011 SEMC in order to establish the exact reason for non-delivery of the inclinometer, however, the Panel noted that the rationale was likely due to the low number of previous roll overs; at this stage only two occurrences had been reported. The lessons were subsequently closed on the DLIMS.

Exhibit 113
Exhibit 183
Exhibit 322
Exhibit 329
Exhibit 330
Exhibit 331
Exhibit 332

1.4.923. The Land Equipment – Operating MJP was held on 27 March 2019 and reviewed topics such as cross-country driving and training requirements. Whilst the exact reason for calling the meeting was not recorded, the Panel believes that it was likely called due to a number of vehicle operating occurrences over a short period of time prior to the meeting. Whilst several observations, lessons and recommendations were discussed, the Panel noted that no formal minutes recorded the exact details of the accident reports reviewed. Whilst Records of Decisions were published, the Panel found that no formal assignment of SPAs was recorded. It should be noted that, although this meeting was held almost 2 months after the JACKAL accident on 29 January 2019, there was no record of any discussion regarding the lessons captured within the QOY's Learning Account or DSA issued Urgent Safety Advice (Annex C) that had been circulated prior to the meeting. This was likely due to the ongoing DSA Service Inquiry.

Exhibit 59
Exhibit 60
Exhibit 183
Exhibit 186
Exhibit 196

1.4.924. **Conclusion.** The Panel believes that the level of analysis of safety occurrences by the Army is poor. Whilst Learning Accounts provide a great amount of detail into individual occurrences, learning from multiple events is hindered by an inadequate INS and a lack of manpower within the ASCen. As a result, the Army's INS becomes a repository for occurrence statistics rather than a tool to track and analyse occurrences, observations, lessons and recommendations. Whilst the MJP process is designed to bring this data together and provide deeper analysis of trends and factors, the RoDs of MJPs analysed by the Panel displayed

a lack of an audit trail and a lack of analysis into occurrences stored on the Army's INS. Furthermore, the Panel found that similar lessons identified in 2010 had not been taken forward and subsequently contributed to this accident. The Panel finds that the inadequate level of analysis of safety occurrences by the Army is a **Contributory Factor.**

1.4.925. **Recommendation. Chief Safety (Army) should improve the Army's Safety Occurrence Analysis process in order to ensure that lessons are identified and learnt from all safety occurrences.**

1.4.926. During the Inquiry it became apparent that the Army has limited means of conducting internal formal investigations into accidents beyond unit level investigations due to a lack of formally qualified accident and safety investigators. As a result, the Army is largely reliant upon the DAIB to provide detailed analysis of serious events. The Panel finds that the lack of a robust internal Army accident investigation capability is an **Other Factor.** Exhibit 194

1.4.927. **Recommendation. The Chief of the General Staff should establish an internal Army accident investigation capability in order to ensure that Army-wide lessons are learned from those accidents not investigated by the Defence Safety Authority.**

1.4.928. **External Analysis.** Although not part of the formal Army Learning Process, the Panel reviewed the analysis of accidents undertaken by DE&S. As a DH-facing organisation, with responsibility for Safe Equipment, DE&S is provided with some accident reporting data. The Panel noted that the passage of accident information to DE&S was sporadic, with staff commenting that no formal process existed for routine accidents and that information tended to be based upon DE&S pull rather than an Army / ASCen push of information. With no access to the Army's INS, DE&S is not able to view the occurrences recorded on the system. Witness 21 Witness 25

1.4.929. Accident reports are an agenda item during the annual Platform Safety and Environmental Panels (PSEP), where equipment is annually reviewed for safety performance. The Panel reviewed all JACKAL PSEP minutes since 2015 and noted that, although accidents were discussed, the level of analysis into the causal factors was limited, often blaming accidents purely on driver error or driving at night on night vision devices with no follow-up actions. Exhibit 171

1.4.930. The Panel believes that accident reports are not properly reviewed prior to PSEPs by those attending and suspects that some are not reviewed at all. As a result, important safety recommendations are not discussed at the only platform specific safety meeting. An example to highlight this lack of analysis is from a JACKAL roll over Triage Report that was produced by the DAIB in October 2018 which highlighted the lack of traversing limitations in the AESPs and mentioned the failed tilt trials. Despite these observations and an action upon DE&S to consider undertaking a SC review, the PSEP held 1 month later made no comment on the observations. The Panel finds that the lack of accident analysis conducted by the PSEP was a **Contributory Factor**. Exhibit 113

1.4.931. **Recommendation. Chief Safety (Army) should ensure that all accident reports including Army Form 510s, Army Form 510As and Learning Accounts are available to Defence Equipment and Support in order to improve the analysis of causal factors and enhance the Safety Case.**

1.4.932. **Recommendation. Head Vehicle Support Team should ensure all High Mobility Truck Variant Safety Occurrence Reports are reviewed as a matter of urgency in order to ensure that the platform safety argument remains valid.**

1.4.933. **Recommendation. Director Capability should ensure that all Safety Occurrence Reports are adequately reviewed and lessons identified as part of the Annual Safety Case review during the Platform Safety and Environmental Panels in order to ensure that lessons are identified and learnt from all accidents.**

Resolve

1.4.934. As highlighted in the Analyse section, Learning Accounts provide the unit level analysis of accidents, highlighting causal factors, lessons identified and recommendations. Whilst these are captured on the Army's INS, the closure of such recommendations is not tracked by the ASCen and, therefore, an auditable record of recommendation resolution is not available. Whilst unable to track unit level resolution, the Panel concluded it is likely that in most cases individual units learn from their own mistakes and implement the recommendations from Learning Accounts. The Panel finds that the lack of Learning Account resolution tracking by the ASCen is an **Observation**. Exhibit 205

1.4.935. When an accident or activity is raised to an MJP, lessons identified are captured on the DLIMS to ensure corrective activity is progressed. Although the DLIMS is capable of recording and tracking resolution activity, reports released by the Army Inspector highlight that the system is not used by all across the Army and many believe it to be "clunky" and "not-user friendly". The DSA do not use the DLIMs at all, instead using a stand-alone recommendation tracker to track the closure of SI recommendations. The Panel finds that the lack of widespread use of the DLIMS by the Army and the reported poor user interface is an **Other Factor**. Exhibit 187 Exhibit 194 Exhibit 205 Exhibit 322

1.4.936. The Panel reviewed the DLIMS to confirm whether the lessons identified within the Land Equipment – Operating MJP had been loaded onto the system. The Panel found that although the lessons had been added to the DLIMS, no further action had been taken to resolve the lessons and that no SPAs had been allocated despite the lessons being over 12 months old. A further review found that of the five recent ASCen MJPs, only two had been correctly loaded onto the DLIMS, both as a result of formal Service Inquiry recommendations. The Panel finds that the lack of safety lessons resolution is a **Contributory Factor.** Exhibit 196 Exhibit 325

1.4.937. **Recommendation. Chief Safety (Army) should analyse the suitability of the Defence Lessons Identified Management System and report the findings to the Deputy Chief of the General Staff in order to determine whether the system is fit for purpose.**

Exploit

1.4.938. Learning Accounts are not held on an accessible database for other units to view and lessons and recommendations are not routinely distributed across the Army. Where equipment failures occur and are notified to DE&S, the Army has a relatively robust process to distribute safety information through engineering notifications. However, across other Defence Lines of Development, such as Training and Doctrine, safety lessons are less likely to be communicated if identified within Learning Account. Exhibit 205

1.4.939. As a result of poor information distribution, it is likely that safety observations and recommendations are not articulated to the D Cap area, undermining their ability to monitor the mitigations and barriers contained within the Hazard Log of the associated equipment. In the analysis of the 34 previous JACKAL roll overs, the Panel identified several observations and recommendations that had been articulated within Learning Accounts and DAIB reports that were, as the Panel has concluded, factors contributing to this accident. These included: Exhibit 113 Exhibit 183

a. Lack of a safe operating envelope within the Army Equipment Support Publications (AESPs);

b. Terrain and route selection;

c. Lack of Training Area safety assessment;

d. Roll Over Protection System (ROPS) performance.

1.4.940. The lack of Learning Account distribution denies the opportunity for organisational learning across the Army Chain of Command. Units operating the same equipment are unlikely to receive formal notification of accidents and corresponding Learning Accounts from other units and, as a result, the supervisory chain is unable to learn from the mistakes of others. Whilst it is evident that higher HQ do pass information across multiple units when able, this is sporadic and unreliable. In this case, the CO QOY was unaware of any of the observations mentioned above in relation to operating JACKAL and had no idea of the history of roll over accidents, undermining his ability to effectively supervise his personnel. Exhibit 113 Exhibit 310 Witness 9 Witness 10 Witness 42 Witness 43

1.4.941. Whilst some lessons are communicated by Army media, such as 'KiT! Magazine', 'Army Safety Matters' and the Army Knowledge Exchange, in the opinion of the Panel this tends to be either equipment maintenance focussed or on high level widespread issues such as hearing protection or climatic injury awareness. The ability for users to access a database of accidents and corresponding analysis for specific equipment and roles does not exist. The Panel finds that the lack of distribution of safety occurrence information, including lessons identified, across the Army is a **Contributory Factor**.

1.4.942. **Recommendation. Chief Safety (Army) should establish a mechanism to distribute all safety lessons across the Army in order to improve the Learning Culture of the Army.**

1.4.943. The Panel strongly believes that the Learning Culture of the Army was undermined by a poor Information Management System and a lack of ASCen resource to support a robust ASCen Lessons process. When interviewed, several of those within ASCen articulated that the lack of staff impacted their ability to deliver safety across the Army. Witness 31 Witness 37

1.4.944. The Army's INS is antiquated and manpower intensive, with reports manually processed by AINC staff. This compounds the lack of manpower and denies the opportunity to analyse and improve. Currently the Army's INS provides little more than a report filing system. The system is further undermined by a lack of safety reporting and, in particular, a lack of near-miss reporting, thus making it difficult to identify underlying trends before they manifest into an accident. The combination of poor INS and lack of reporting contributes to an overall poor Learning Culture. Exhibit 183

1.4.945. Beyond Capture and Analyse, the Army does not track the outputs from the majority of investigations other than those directed by the DSA. Furthermore, the inability to communicate lessons and recommendations across the TLB undermines the Army's ability to learn at an organisational level. Whilst ACSO 3216 and ACSO 1118 detail a robust learning process, the reality is that the process does not work as well as it should. Exhibit 71 Exhibit 205

1.4.946. In contrast, military aviation is well supported by the Air Safety Information Management System (ASIMS). Providing an on-line means of reporting, managing, analysing the distributing safety data, ASIMS is used by all personnel involved in aviation activities including aircrew, engineers, air traffic controllers and ground support personnel, including DE&S staff. After submission of a safety report online, the data is progressed through a team of localised safety staff to identify lessons and determine next steps. These staff are often located at both unit and 2* HQ level, providing layers of assurance as well as Subject Matter Expertise. Supporting the system, the aviation community has the ability to coordinate either internal or external investigations using personnel from both unit and HQ level. For minor incidents, unit personnel are used to conduct low level investigations whilst major occurrences are supported by significant expertise from the DAIB. Exhibit 311

1.4.947. The Panel concluded that the Army Learning Culture was undermined by a lack of safety reporting, in particular near-miss reporting coupled with poor analysis, resolution and distribution of those reports that were submitted. Due to the important contribution to the overall safety culture that learning has, the Panel believes that an improved Learning Culture would highlight the importance of reporting whilst also demonstrating fair analysis of causes, identifying lessons from which all could learn, thus having a marked positive impact on the other four elements of the Engaged Safety Culture. The Panel finds that a poor Army Learning Culture was a **Contributory Factor.**

1.4.948. **Recommendation. The Chief of the General Staff should establish a new Safety Information Management System in order to support Army safety learning.**

Questioning Culture

1.4.949. In addition to the traditional four pillars originally introduced by James Reason, Haddon-Cave identified the necessity of a questioning culture to promote safety thinking. His theory concluded that if all in the safety chain asked questions such as 'what if?', 'why?', 'can you explain?', 'can you prove it?' then assumptions which, in his view incubated mistakes, would be tested and either proven or disproven. Ultimately, by turning assumptions into facts, a better understanding of organisational and system safety would be realised. Exhibit 72

Army Questioning Culture

1.4.950. During the Inquiry the Panel spoke with Army personnel across a range of ranks and roles. A common theme from interviews and discussions was the assumption that safety measures were in place at the time of the accident. This can be broken down into all four elements of the SSW/T.

1.4.951. **Safe Equipment.** At the End User level, all of those interviewed across the QOY and other units assumed that the equipment was safe to use. Nobody within the Regimental, Brigade or Divisional Chains of Command had any reason to suspect that the equipment was not safe nor had they considered questioning the supporting safety argument. Witness 9 Witness 11 Witness 30 Witness 33 Witness 42 Witness 44

1.4.952. Equally, Army HQ and D Cap assumed that DE&S had followed the correct procedures and safety management systems in their procurement and ongoing support of the HMTV fleet. Despite the declaration within the Safety and Environmental Case Review (SECR) that the SC was not supported by a full suite of evidence, the impact that this had on the safety argument was not questioned. Additionally, as D Cap has no process for scrutinising the content of the 3 Part SC, the Army was unable to hold DE&S to account. With no Part 1 SC and only elements of a Part 2 SC held by DE&S, had Army HQ asked DE&S to prove the safety argument they would have quickly uncovered the lack of evidence. Exhibit 159 Witness 33 Witness 36

1.4.953. The turnover of staff at DE&S led to a lack of corporate knowledge and, therefore, assumptions were made about safety arguments that had been made in the past. As team members changed, there were opportunities to revisit the SC and question its integrity. In 2016, the Core PSEP provided an excellent opportunity to do just that. However, despite this opportunity, the old assumptions were accepted and the historic safety of the JACKAL fleet was used to justify its ongoing safety argument. A further opportunity was missed in 2017 with the production of the latest SECR. However, by this point, the Panel believes that those in position at the time were so comfortable with the safety of JACKAL that the report was probably not scrutinised appropriately. Exhibit 71 Exhibit 159 Witness 23 Witness 25

1.4.954. **Safe Persons.** As a Chain of Command responsibility, the Panel found that the level of supervision provided by the Chain of Command undermined the opportunity to stop the accident. The assumption that the instructors were experienced and had conducted all of the relevant planning activity undermined their ability to supervise effectively. That assumption was further exacerbated by a lack of experience within the Chain of Command. With no DMI experience within Witness 1b Witness 9 Witness 11 Witness 12

the Chain of Command above Inst 1 and a lack of Training Management awareness by both the Trg WO and XO, these individuals were not equipped to correctly supervise the activity.

1.4.955. Had a questioning culture been in place, it is plausible that the CO, XO or someone within the Chain of Command would have questioned the experience held at RHQ and whether they were able to provide the correct level of supervision. Equally, the assurance of the activity may have been improved had those in supervisory positions actively engaged with the instructor to confirm his intent. This level of assurance may have highlighted the relative lack of instructional experience held by Inst 1. Exhibit 25 Witness 1c

1.4.956. **Safe Practice.** The safe operation of the vehicle was based upon several documents highlighting procedures and rules for its use. These procedures and rules were based predominantly upon the AESPs and AVSOs that should have provided a comprehensive set of safe operating envelopes and techniques. Exhibit 156 Exhibit 157

1.4.957. In reviewing these documents, the Panel found several deficiencies including a lack of traversing limitations, a lack of crew safe space definition and no reference to cross-country driving techniques for JACKAL. The lack of these important elements highlights that the documents are either not read or that nobody has considered the impact of their absence. In either case, had the user or those responsible for the safe operation of the vehicle questioned these omissions then it is likely that they would have been rectified. Exhibit 156 Exhibit 158

1.4.958. Whilst the Panel acknowledges that document sets often require amendments throughout the equipment life-cycle, the Panel concluded that a number of opportunities were missed to correct these omissions. Prior to this accident, JACKAL had experienced at least 34 reported roll over events, with a report on each being held by the ASCen on the Army's INS. Exhibit 171 Exhibit 183

1.4.959. The analysis of PSEP minutes found that, although many of these accidents were discussed, the analysis of causes and potential lessons was not conducted appropriately. Whilst the Army reporting system may have contributed to this lack of analysis, the Panel believes that the PSEP had the opportunity to interrogate the wider issues associated with the multitude of vehicle roll over accidents. Exhibit 171

1.4.960. **Safe Place.** During the Inquiry, the Panel interviewed personnel who firmly believed that Driver Training Areas were managed to ensure safety. A number of senior personnel believed that the Out of Bounds (OOB) restriction placed upon the LoN for JACKAL was due to the area being unsafe for such activity. Exhibit 40 Witness 33 Witness 44

1.4.961. Interviews with DIO and Training Area staff revealed that, beyond live firing ranges, Training Area safety is not regulated and, therefore, Training Area staff provide generic risk assessments to highlight hazardous areas but ultimately rely upon the Chain of Command to conduct full, site specific, risk assessments. Witness 26 Witness 27 Witness 28

1.4.962. A review of the LoN OOB area established that it was likely placed OOB due to land management rather than safety concerns. Furthermore, during the Inquiry it became apparent that DIO staff did not have suitable qualifications or experience to deem whether an area was safe for driving activity or not. Notwithstanding this lack of SQEP, the Training Area staff spoken to by the Panel were found to be knowledgeable of their specific sites and were able to offer excellent advice to the user. The Panel concluded that it is the responsibility of the user to engage with the Training Area staff to benefit from their advice. Witness 27 Witness 28

1.4.963. Due to the belief that Training Area safety was managed by the Training Area staff, the Chain of Command assumed that the safe place element of the SSW/T was assured. Accepting that this accident occurred on an OOB part of the Training Area, it would be easy to place the blame upon the instructors at the time. However, analysis of other in-bounds areas of Catterick Driver Training Area highlighted that there were equally demanding and potentially steeper inclines that could be used within the Standing Orders. Furthermore, a similar accident had occurred in 2016 on a similar area of CTA which remained in-bounds at the time of writing this report. Exhibit 26 Exhibit 113 Exhibit 313 Exhibit 314

1.4.964. Had the Chain of Command questioned the instructor about his choice of routing, they may have determined that it was OOB and stopped it. However, this might then have moved the training to an equally demanding area and the same outcome may have occurred given the terrain and environmental conditions on the day.

1.4.965. However, had the Chain of Command questioned the provision of a safe place, they would have determined that the DIO was not responsible for assuring Driver Training Areas and that no regulations existed to manage the design and upkeep of such areas. As a result, the Chain of Command would have had a better understanding of their responsibilities and may have managed the risk more appropriately. Witness 26 Witness 27

1.4.966. The Panel concluded that the Army has a poor questioning culture; with many examples of personnel at all levels making assumptions that activity is being managed appropriately across Defence. The Panel believes that, had the Chain of Command asked pertinent questions to gain assurance that safety measures were in place, it is likely that several of the factors that were associated with this accident would have been identified and the risks of them occurring would have been reduced. The Panel finds that the poor questioning culture within the Army was a **Contributory Factor.**

1.4.967. **Recommendation. The Chief of the General Staff should establish and champion an appropriate Questioning Culture in the Army in order to ensure that safety related decisions are based upon facts rather than assumptions.**

Army Safety Culture Conclusion

1.4.968. Whilst it is evident that the Army is striving to improve its Safety Culture, based upon the findings above there is much to do. The Panel believes that this Exhibit 192 Exhibit 195 Exhibit 199

must be a top-down approach, led by CGS. The Panel believes that the two most important areas to improve are the Learning and Questioning elements of the 'Engaged Safety Culture'. In the opinion of the Panel, an improved Learning Culture would highlight to all personnel the benefits of an improved Safety Culture by providing tangible and demonstrable benefits across the Army operating space, improving Force Generation and efficiency by minimising injuries and equipment damage. These improvements should, in turn, lead to a better Reporting Culture. Witness 31 Witness 35

1.4.969. Equally, an improved Questioning Culture would enable the Army to understand areas of weakness and hold those responsible for safety to account. In doing so, not only would areas of weakness be identified and improved, but also an awareness of the ability to make honest mistakes would be realised across the Chain of Command. This, if managed correctly, should demonstrate that it is acceptable to make honest mistakes without fear of punishment and would demonstrate a Just Culture.

1.4.970. During the Inquiry, the Panel interviewed a number of personnel responsible for the delivery of safety at all levels, from Army HQ to Regimental sub-units. Whilst those interviewed understood the importance of safety and Safety Culture, the Panel noted a number of trends across the TLB:

a. **Lack of resources**. Almost all those interviewed highlighted a lack of personnel to deliver key safety roles. From the extremely small team in the AINC to individual Army Force Protection Advisors covering large elements of the Army, it is clear more resource is required; Witness 31 Witness 35 Witness 44

b. **Lack of training**. Whilst promotion courses do include elements of safety training, the benefits of that training are questionable. This is highlighted by a lack of knowledge of key principles such as Risk Assessments and Duty Holding;

c. **Single points of failure**. Across the Chain of Command, Safety critical roles are often 'one deep'. From Divisional HQ Safety roles to Regimental Quartermasters, it is apparent that single individuals are responsible for the day-to-day management of Health and Safety. When these roles are gapped, due to workforce constraints, illness, etc, there is often nobody suitably qualified to take over the role, leaving a significant gap in safety management. Witness 44

Regulation

1.4.971. Safety and Environmental Protection Regulation of the Land domain is undertaken by the Defence Land Safety Regulator (DLSR). The DLSR was an Army OF5 position responsible for the oversight and regulation of four regulatory areas: Adventurous Training; Fuel and Gas; Land Systems; and Movement and Transport. For the purpose of this report, the following analysis will focus on the Land Systems and Movement and Transport functions of the DLSR. Witness 38

1.4.972. The mission of the DLSR *"is to Regulate and Assure Safety and Environmental Protection in the Land Domain in order to enhance operational capability".*

Land Systems Safety Regulator (LSSR)

1.4.973. The LSSR is appointed by the DLSR to provide independent regulation of safety and environmental protection across all Defence activities involving the acquisition and use of land systems in accordance with DSA02.DLSR.LSSR. To do so, the LSSR conducts the following activity: Exhibit 61 Exhibit 316 Exhibit 326

a. Conducting audits of TLBs against the Safety and Environmental requirements of DSA02.DLSR.LSSR;

b. Monitoring the performance of equipment through review of safety procedures and accident, defect and deficiency data received from the authorities responsible for operating the system;

c. Holding Memoranda of Understanding with the Department for Transport for the Inspection and Certification of Vehicles for the Carriage of Dangerous Goods and the Conduct of Leak Proof Testing of Bulk Fuel Carrying Vehicles.

1.4.974. Within DSA02.DLSR.LSSR, a land system is defined as "any system designed to be operated and maintained in the land environment, where the output and the activity does not primarily impact on Air or Sea worthiness. Exhibit 61

a. This includes:

(1) Vehicles, integrated weapons, communications systems, information systems, support equipment;

(2) People as an element of the land system function;

(3) Rail systems.

b. This excludes:

(1) Permanent infrastructure owned and maintained by the DIO;

(2) Adventurous Training".

1.4.975. **Regulation**. The LSSR enforces 15 Regulations upon the Land Environment. Defence regulation is primarily based upon UK legislation, ensuring that Land Equipment meets the requirements laid down in various elements of UK Law. For military vehicles, applying UK legislation to design requirements ensures that the Land Domain fulfils its legal roadworthiness responsibilities in accordance with The Road Vehicles (Construction and Use) Regulations 1986. Whilst this process ensures that military vehicles are 'Road Legal' it does not cover applications beyond that of normal road use. In certain circumstances, it is acknowledged that military vehicles are not able to comply with UK legislation due to the unique capabilities for which they were procured. In these circumstances Exhibit 61 Exhibit 133

DLSR is authorised by the Secretary of State for Defence to apply Derogations, Exemptions and Disapplication's (DEDs) to enable military capability.

1.4.976. Beyond the application of UK legislation, DSA02.DLSR.LSSR does not contain any specific regulations regarding military vehicle design or use. The regulations state only that the equipment must be supported by a Safety Management System (Regulation 2) and corresponding SC (Regulation 4) and that any residual risk posed by a Land System is reduced to ALARP (Regulation 7). Exhibit 61

1.4.977. In the case of JACKAL, the lack of applicable legislation or Defence regulations meant that, in constructing the Part 1 SC, both D Cap and DE&S were provided with minimal guidance as to the standards that were deemed acceptable. As an open-architecture vehicle operated in a complex tactical environment, the Panel was unable to find any applicable British Standards (BS) that covered the type of design and usage. It is not surprising, therefore, that SUPACAT and DE&S considered the forestry and agricultural standards as appropriate when designing the vehicle. Exhibit 136

1.4.978. The Panel believes that, had applicable standards been in place that covered vehicle design safety standards and considering the military environment, DE&S would likely have applied them to the design of JACKAL. Moreover, had the design been unable to meet the regulations due to the operational capability requirement, then a DED would have been applied for and the risk associated with JACKAL would have been better understood and mitigated.

1.4.979. The Panel finds that the lack of military vehicle safety standards was a **Contributory Factor**.

1.4.980. **Recommendation. The Defence Land Safety Regulator should introduce regulations that cover the safety standards applicable to military bespoke vehicles, particularly those operated cross-country and with limited crew protection in order to provide Defence Equipment and Support and Director Capability with a benchmark safety standard.**

1.4.981. **Certification.** The LSSR does not certify all Land Equipment. Whilst it holds certification responsibility for certain aspects of Land Equipment compliance (such as Dangerous Goods vehicles), it has no mechanism to provide certification of bespoke military vehicles. As a result, those responsible for procuring bespoke military vehicles, including Army HQ and DE&S have no basis of safety acceptance to achieve prior to delivery to the End User beyond the requirement that equipment must have a SC and be managed by a Safety Management System. The lack of certification of vehicles by LSSR means that there is no Defence-led, independent assurance of vehicle design safety prior to delivery to the user. Witness 38

1.4.982. In the case of JACKAL, had a certification regime been in place, it would likely have captured the lack of evidence supporting the vehicle stability requirements and ROPS efficacy. This may have led to the vehicle being redesigned or its use constrained. The Panel finds that the lack of bespoke military vehicle certification by the LSSR was a **Contributory Factor.**

1.4.983. **Recommendation. The Land Systems Safety Regulator should establish a certification process for new Land Environment Vehicles in order to ensure that vehicles introduced into military service meet defined safety standards.**

1.4.984. **Audits.** Although the LSSR has a role to undertake audits of TLBs and HLBs, the most recent end-to-end audit of any equipment found by the Panel was in 2017 when the LSSR conducted an audit of the Warrior Vehicle. Since 2017, although there is evidence of audit planning, the Panel was unable to find supporting evidence to demonstrate that these audits had taken place. In interviews with key personnel in both the DLSR and DE&S, it was evident that audits had not been conducted in recent years. Witness 38 Witness 39 Exhibit 297

1.4.985. The lack of recent audits significantly impacts the DLSR's ability to provide assurance to the DG DSA that activities related to his/her AOR are being conducted in a safe manner. The Panel finds that the lack of recent safety audits by the LSSR is an **Other Factor.**

1.4.986. **Recommendation. The Defence Land Safety Regulator should establish a robust programme of safety audits for all areas under his/her jurisdiction in order to provide assurance to the Director General Defence Safety Authority that vehicle equipment management is being conducted safely.**

1.4.987. **Workforce**. Interviews conducted with senior DLSR staff highlighted a lack of personnel within the department, with a high number of posts gapped. In September 2019, the LSSR team consisted of 28 posts of which 6 were permanently gapped and 8 were vacant awaiting recruitment. Whilst it is clear that the high number of gapped posts is having a significant impact upon output, it is the belief of those interviewed and the Panel that a significant increase in personnel is required above the funded 28 positions if the LSSR is to undertake the regulatory roles placed upon it, including the ability to regulate, certify and audit land equipment. The Panel finds that the workforce requirements of the LSSR team is an **Observation**. Exhibit 190 Witness 38

Summary of Findings

1.4.988. The Panel identified a significant number of accident factors during the investigation. The factors throughout the report have been collated and grouped against the Accident, Safe System of Work/Training and Organisational influences.

Cause or causal factors

1.4.989. The following were assessed to have been Causal Factors, in that they were events which, in isolation or in combination with other causal factors and contextual details, led directly to the accident:

1.4.990. **The Accident:**

a. Underestimating the risks associated with the ascent of Hill 3 when considering student performance and the environmental conditions; 1.4.37

b. The loss of traction combined with the position of the vehicle.	1.4.45
1.4.991. **Safe Equipment:**	
a. Tyre performance.	1.4.181
Contributory factors	
1.4.992. The following were assessed to have been Contributory Factors, in that they made the accident more likely to occur:	
1.4.993. **The Accident:**	
a. The lack of collaborative planning prevented the opportunity for review of the overall plan.	1.4.26
1.4.994. **Safe Equipment:**	
a. The lack of a Part 1 Safety Case;	1.4.236
b. The lack of tilt limitations and the lack of means by which to determine vehicle tilt;	1.4.250
c. The lack of supporting evidence in the Part 2 Safety Case;	1.4.326
d. The lack of Hazard Working Groups;	1.4.342
e. The controls in place to mitigate and reduce the risk posed by Driver Skill Level and the associated accident Road Traffic Incident Roll Over;	1.4.361
f. The poor communication of the hazards and associated controls to unit supervisory personnel;	1.4.365
g. The contents, management and distribution of the High Mobility Truck Variant Hazard Log;	1.4.367
h. The contents and more importantly the omissions found within the High Mobility Truck Variant Army Equipment Support Publications;	1.4.381
i. The misapplication of colour-coding throughout the Safety and Environmental Case Report, which led to incorrect conclusions being made over the safety of the vehicle;	1.4.396
j. The lack of Safety Case Assurance activity by Director Capability;	1.4.399
k. The Part 3 Safety Case does not support the overall safety claim for the vehicle;	1.4.406
l. The poor quality of the High Mobility Truck Variant Safety Case;	1.4.412
m. The ownership of the Platform Safety and Environmental Panels;	1.4.426
n. The lack of suitably, qualified and experienced personnel in attendance at the Platform Safety and Environmental Panels by End Users;	1.4.428

o. The lack of adequate Hazard Log analysis by End Users prior to Platform Safety and Environmental Panels.	1.4.430
1.4.995. **Safe Practice:**	
a. The lack of driving advice in the Army Equipment Support Publication 201;	1.4.465
b. The lack of advice regarding the hazards associated with terrain and environmental conditions;	1.4.495
c. The lack of published driving techniques and route assessment guidance;	1.4.496
d. The lack of Training Management and Instructor supervision and development at the Queen's Own Yeomanry;	1.4.553
e. The lack of the Queen's Own Yeomanry training assurance and inspection;	1.4.577
f. The lack of the Queen's Own Yeomanry training assurance visits by the Training Standards Group;	1.4.584
g. The poor quality Risk Assessment conducted by the Queen's Own Yeomanry;	1.4.594
h. The lack of Risk Assessment awareness by Instructor 1;	1.4.596
i. The lack of supervision of training activity Risk Assessments by the Training Warrant Officer;	1.4.597
j. The lack of a Dynamic Risk Assessment on the day of the accident.	1.4.599
1.4.996. **Safe Persons:**	
a. Instructors 1's lack of recent JACKAL Driver Experience;	1.4.619
b. The lack of instructional experience by Instructor 1;	1.4.620
c. The perceived level of Student experience;	1.4.651
d. The handover and lack of safety information available to the Commanding Officer;	1.4.665
e. The lack of training undertaken by the Commanding Officer of the Queen's Own Yeomanry with regard to Defence System Approach to Training;	1.4.670
f. The lack of Duty Holding training undertaken by the Executive Officer;	1.4.679
g. Not appointing the Executive Officer as Defence Trainer Manager;	1.4.683
h. The lack of experience and knowledge of the Executive Officer in the management of risk and training;	1.4.685
i. Not appointing the Training Warrant Officer as the Defence Trainer Supervisor;	1.4.690
j. The lack of Driving and Maintenance Instructor supervision provided by the Training Warrant Officer;	1.4.693

k. The level of supervision afforded to the JACKAL Driver Training Course delivered in January 2019;	1.4.700
l. The workload of Instructor 1 prior to the accident;	1.4.713
m. The lack of crew gradient between Instructor 1 and Staff Sergeant McKelvie;	1.4.716
n. The lack of Human Factors and Crew Resource Management training for vehicle crews.	1.4.717

1.4.997. **Safe Place:**

a. The lack of an area specific Risk Assessment;	1.4.728
b. The lack of a formal Check-in briefing;	1.4.738
c. The lack of an instructor familiarisation drive;	1.4.749
d. The contradictory and confusing information contained within Catterick Training Area Standing Orders For Training;	1.4.754
e. The lack of face to face pre training briefings;	1.4.766.d
f. The lack of knowledge of Catterick Training Area Standing Orders For Training by the Instructors;	1.4.768
g. The design of the Bid Home Page and lack of version change as a result of Management User changes;	1.4.796
h. The lack of awareness by Instructor 1 that Bid B12962 had not been authorised to use the Land of Nod area;	1.4.800
i. The lack of Driver Training Area regulation;	1.4.805
j. The lack of understanding between the Defence Infrastructure Organisation and unit Supervisory staff regarding the provision of a Safe Place.	1.4.810

1.4.998. **Organisational Influences:**

a. The lack of corrective action by either the Queen's Own Yeomanry or 4th Infantry Brigade to the findings of the assurance process;	1.4.835
b. The lack of a formal Organisational Safety Assessment to support the re-role of the Army Reserve Light Cavalry Regiments onto JACKAL;	1.4.845
c. The lack of safety training provided for Army personnel;	1.4.871
d. The inadequate level of analysis of safety occurrences by the Army;	1.4.924
e. The lack of accident analysis conducted by the Platform Safety and Environmental Panel;	1.4.930
f. The lack of safety lessons resolution;	1.4.936

g. The lack of distribution of safety occurrence information, including lessons identified, across the Army;	1.4.941
h. The poor Army Learning Culture;	1.4.947
i. The poor Questioning Culture within the Army;	1.4.966
j. The lack of military vehicle safety standards;	1.4.979
k. The lack of bespoke military vehicle certification by the Land System Safety Regulator.	1.4.982

Aggravating factors

1.4.999. The following were assessed to have been an Aggravating Factor, in that it made the final outcome of the accident worse:

1.4.1000. **The Accident:**

a. The hill height and gradient combined with topography;	1.4.48
b. The combination of open-architecture design, helmet weight and lack of neck protection.	1.4.71

1.4.1001. **Safe Equipment:**

a. The requirement to wear the service issue helmet whilst conducting driver training;	1.4.212
b. The combination of the torso being restrained by the harness without measures to restrict the movement of the head;	1.4.220
c. The lack of adequate Roll Over Protection afforded by JACKAL.	1.4.293

1.4.1002. **Safe Practice:**

a. The lack of anthropometric limitations for JACKAL crews.	1.4.491

Other factors

1.4.1003. The following were assessed to have been Other Factors, in that they were shown to have been present but played no part in the accident, but were noteworthy in that they may cause or contribute to future accidents:

1.4.1004. **The Accident:**

a. The lack of policy or guidance on the use of the left foot brake pedal;	1.4.42
b. The lack of an emergency or medical plan;	1.4.56
c. The lack of Emergency Rendezvous awareness by the Emergency Services.	1.4.56

1.4.1005. **Safe Equipment:**	
a. The lack of weekly maintenance records;	1.4.167
b. The lack of a robust mechanism for releasing and assuring compliance with revised engineering policies;	1.4.192
c. The lack of correct authorisation of the Skill Zone Fitter to conduct vehicle inspections;	1.4.196
d. The lack or Record of Experience Charts for the Skill Zone Fitter;	1.4.197
e. Not wearing mandated audio gear and hearing protection;	1.4.203
f. The lack of analysis into the appropriate safety clothing to be worn in an open architecture vehicles;	1.4.208
g. The poor management of the Part 2 Safety Case evidence;	1.4.240
h. The performance of JACKAL during hill ascent trials;	1.4.258
i. The inability of the rear Roll Over Protection System bar to withstand 100% of the Gross Vehicle Weight;	1.4.280.a
j. The design and maintenance regime of the harness cutter;	1.4.314
k. The handling characteristics of the JACKAL;	1.4.322
l. The lack of safety envelope definition;	1.4.376
m. The lack of warnings or cautions relating to the unique hazards associated with operating an open architecture vehicle in the cross-country environment;	1.4.380
n. The out of date information captured on the Equipment Safety Matrix Improved;	1.4.386
o. The lack of coherent and aligned Land Equipment Operating Centre Safety and Environmental Management System;	1.4.417
p. The absence of an Independent Safety Auditor supporting High Mobility Truck Variant safety.	1.4.437
1.4.1006. **Safe Practice:**	
a. The misidentification of Roll Over Protection System components within the Army Equipment Support Publication 201;	1.4.463
b. The lack of regular reviews of Armoured Vehicle Standing Orders;	1.4.468
c. The lack of clear roles and responsibilities for the instructor and student whilst undertaking Armoured Vehicle training;	1.4.473
d. The practice of removing seat harnesses by Armoured Vehicle crews;	1.4.483
e. The lack of detail and accuracy of elements of Armoured Vehicle Standing Orders Chapter 2;	1.4.486

f. The lack of annual driving assessments for Armoured Vehicle drivers;	1.4.500
g. The lack of a complete and current Training Needs Analysis;	1.4.516
h. The lack of firefighting procedures training and its use as a control within the JACKAL Hazard Log;	1.4.520
i. The [redacted] limitation and lack of an associated Training Objective, Enabling Objective or Key Learning Point to teach slope angle assessment;	1.4.526
j. The reference to unvalidated vehicle limitations;	1.4.532
k. The lack of coherence between the training publications, vehicle publications and hazard log;	1.4.533
l. The lack of a JACKAL Reserve Driver Course;	1.4.560
m. The lack of Training Standards Group brief;	1.4.564
n. The reduction in Formal Visits conducted by the Training Standards Group due to personnel constraints;	1.4.582
o. The use of the example cross-country driving Risk Assessment contained in Army Command Standing Orders 3216.	1.4.591

1.4.1007. **Safe Persons:**

a. The incorrect instructor qualification held by Instructor 1;	1.4.616
b. The lack of continuation training records;	1.4.624
c. The lack of Instructor 2 Defence Train the Trainer Version 2 (Phase 3) qualification;	1.4.629
d. The combination of rapid requalification of Instructor 2 onto JACKAL, the 5 year gap in experience and the lack of operational experience on the type;	1.4.631
e. The lack of a formalised and documented Driving and Maintenance Instructor selection process;	1.4.636
f. The lack of Driving and Maintenance Instructor Continuing Professional Development;	1.4.640
g. The lack of Driving and Maintenance Instructor standardisation checks;	1.4.643
h. The lack of an appointed Delivery Duty Holder at the time of the accident;	1.4.662
i. The lack of Delivery Duty Holder authority to conduct Driver Training;	1.4.667
j. The discrepancy between Army Command Standing Order 3228 with Joint Service Publication 822;	1.4.672
k. The supervision and development of Reserve unit Driving and Maintenance Instructors;	1.4.696

l. The level and quantity of health and Safety training provided for Non-Commissioned Army personnel. 1.4.706

1.4.1008. **Safe Place:**

a. The lack of formal requirement to produce a safety plan; 1.4.731

b. The lack of a formal safety planning template for non-firing activities; 1.4.733

c. The lack of site briefing and recce visit; 1.4.745

d. The lack of appropriate methods of communication; 1.4.760

e. The lack of carriage of Automatic Emergency Defibrillators by all Training Area Safety staff whilst on the Training Area; 1.4.763

f. The lack of risk analysis conducted on the changes made to the training estate allocation process; 1.4.777

g. The lack of Bidding and Allocation Management System training audit trial for End Users; 1.4.785

h. The lack of mandated Bidding and Allocation Management System End User training. 1.4.793

1.4.1009. **Organisational Influences:**

a. The lack of confidential and anonymous reporting; 1.4.877

b. The current Army Safety Occurrence Reporting System; 1.4.888

c. The poor reporting culture within the Army; 1.4.891

d. The lack of a well communicated Just Culture model; 1.4.897

e. The lack of a robust internal Army accident investigation capability; 1.4.926

f. The lack of widespread use of Defence Lessons Identified Management System by the Army and the reported poor user interface; 1.4.935

g. The lack of recent safety audits by the Land Systems Safety Regulator. 1.4.985

Observations

1.4.1010. The following were assessed to have been Observations, in that they were issues that were not relevant to the accident but worthy of consideration to promote better working practices:

1.4.1011. **Army Safety Management:**

a. Army Command Standing Order 3216 contravened the higher-level regulatory document. 1.4.91

1.4.1012. **Safe Equipment:**

a. The lack of stored fault codes after vehicle power cycles; 1.4.173

b. The lack of 3mm tread requirement within the Operator's manual;	1.4.178
c. The lack of a formally recorded User Requirement Document and lack of a signed acceptance report;	1.4.231
d. The lack of a formally recorded System Requirements Document;	1.4.235
e. The lack of full analysis to explain the commanders seat failure during the MIRA test;	1.4.290
f. The identification of Driver Skill Level as a hazard;	1.4.346
g. The potential read across of findings to other Urgent Operational Requirements to Core platform Hazard Logs;	1.4.369
h. The lack of Safety and Environmental Management Committee adherence to Land Equipment Operating Centre policy.	1.4.421

1.4.1013. **Safe Practice:**

a. The incoherence of Movement and Transport Safety Regulator regulatory documents and Joint Service Publication 800;	1.4.450
b. The lack of evidence of an exemption from Joint Service Publication 800 for JACKAL cross-country driver training;	1.4.454
c. The lack of auditable annual review of the Queen's Own Yeomanry Motor Transport Standing Orders;	1.4.457
d. The non-compliance with Joint Service Publication 800 in relation to Driver Standing Orders;	1.4.459
e. The lack of a formal Letter of Delegation from Director Land Warfare to SO2 Mounted Close Combat Training Development Team;	1.4.507.a
f. The differing standards of training for JACKAL crews across the Army;	1.4.546
g. The lack of Defence Train the Trainer (Phase 3) Version 2 qualification held by either Instructors;	1.4.547
h. The lack of Defence Train the Trainer Version 2 compliance;	1.4.548
i. The out of date content within Army Pamphlet 1;	1.4.549
j. The lack of a full check of student start standards;	1.4.557
k. The lack of a comprehensive check of the course programme against all Defence policy;	1.4.559
l. The lack of a Subject Matter Expert training support for JACKAL Driving and Maintenance Instructors;	1.4.568
m. The lack of analysis of Distributed Training Internal Validations;	1.4.573
n. The lack of formal External Validation evidence to support JACKAL training.	1.4.575

1.4.1014. **Safe Persons:**	
a. The incorrectly awarded qualification held by Instructor 1;	1.4.617
b. The non-compliance of Instructor 1's records with Joint Service Publication 800;	1.4.618
c. The supervision and assurance of JACKAL training delivered to Instructor 2 by the Light Dragoons;	1.4.627
d. The lack of Bowman, Combat, Infrastructure and Platform qualifications;	1.4.648
e. The lack of Duty Holding training provided for Army Officers.	1.4.710
1.4.1015. **Safe Place:**	
a. The incorrect use of General Service Driver Instructional qualifications;	1.4.748.a
b. The small number of Training Safety Marshals employed by Catterick Training Area;	1.4.766.c
c. The lack of adherence to Defence Training policy by Defence Infrastructure Organisation.	1.4.780
1.4.1016. **Organisational Influences:**	
a. The lack of attendance by the Chief of the General Staff at the Army Safety Committees;	1.4.867
b. The current manual Army Form 510 submission process;	1.4.885
c. The lack of transparency in the Army Form 510A and Learning Accounts process;	1.4.914
d. The lack of coherence between internal and external means of capturing safety occurrences, observations and lessons;	1.4.915
e. The lack of Learning Account Resolution tracking by the Army Safety Centre;	1.4.934
f. The workforce requirements of the Land Safety System Regulator team.	1.4.987

PART 1.5

Recommendations

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PART 1.5 – RECOMMENDATIONS

1.5.1. **Introduction**. The following recommendations are made to reflect the findings at the point in time of the accident in order to enhance safety, noting that progress may have been made in resolving these findings in the period between the accident and the publication of this report:

1.5.2. **The Chief of General Staff (CGS) should:**

a. Ensure that all Duty Holders have signed and accepted their Duty Holder Letter of Delegation prior to assuming their Duty Holder role in order to provide assured and auditable ownership of Duty Holder responsibilities; 1.4.663

b. Ensure that there is effective transfer of Duty Holder owned risks in order to maintain appropriate levels of Duty Holding assurance at all times; 1.4.666

c. Assure that all Duty Holding activities are appropriately assessed and authorised in advance by Duty Holders in order to ensure that all associated risks to life are correctly scrutinised; 1.4.668

d. Establish an internal Army accident investigation capability in order to ensure that Army-wide lessons are learned from those accidents not investigated by the Defence Safety Authority; 1.4.927

e. Establish a new Safety Information Management System in order to support Army safety learning; 1.4.948

f. Establish and champion an appropriate Questioning Culture in the Army in order to ensure that safety related decisions are based upon facts rather than assumptions. 1.4.967

1.5.3. **The Assistant Chief of the General Staff (ACGS) should:**

a. Ensure that Unit Commanders are aware of and understand the roles of all Duty Holder-facing organisations in order to ensure that Commanding Officers are aware of the boundaries of risk ownership and safety provision; 1.4.812

b. Ensure that a suitable and sufficient Organisational Safety Assessment is completed for all units that are re-roling, and ensure this requirement is stated on the warning and implementation orders issued in order to ensure that all risks associated with re-rolling are understood and managed to as low as reasonably practicable. 1.4.846

1.5.4. **The Deputy Chief of the General Staff (DCGS) should:**

a. Assure that all units conduct robust site-specific Risk Assessments for all training activity in order to ensure that training is conducted safely; 1.4.729

b. Enhance safety training for all Army personnel in order to ensure safety policy and practices are understood at an appropriate level. 1.4.872

1.5.5. **Director Capability (D Cap) should:**

a. Introduce policy, procedures and training for commanders and instructors on the use of the left foot brake in order to mitigate the risk of driver error and associated vehicle accidents;	1.4.43
b. Improve the protection offered to crew members in all High Mobility Truck Variant vehicles taking into account the likelihood of roll over events, neck protection, helmet design and vehicle design in order to ensure that adequate protection is provided to vehicle occupants;	1.4.72
c. Construct a Part 1 Safety Case for all High Mobility Truck Variant platforms in order to provide an auditable safety requirement against which the vehicles can be assessed;	1.4.237
d. Establish routine Hazard Identification meetings to include End User attendance for all Armoured Vehicles in order to understand and review the safety concerns of those who routinely operate Armoured Vehicles;	1.4.343
e. Conduct an assurance review of the Equipment Safety Matrix Improved to ensure that it is accurate in order to ensure Safety Cases are appropriately managed;	1.4.387
f. Conduct formal Safety and Environmental Case Report reviews with Defence Equipment and Support in order to ensure all safety claims are underpinned by appropriate levels of evidence;	1.4.400
g. Formally appoint a responsible person through a letter of delegation to manage and Chair all Platform Safety and Environmental Panels in order to ensure that equipment safety is appropriately managed across all Defence Lines of Development and that the as low as reasonably practicable and tolerable statement is endorsed on behalf of the Front Line Commands;	1.4.427
h. Define the membership and attendance of Platform Safety and Environmental Panels in order to ensure appropriately qualified and competent individuals are empowered to comment on platform safety;	1.4.429
i. Ensure all Army Platform Safety and Environmental Panel attendees obtain eCassandra accounts in order to enable a full Hazard Log review prior to all meetings of the Panel;	1.4.431
j. Direct the requirement for driving techniques to be included within Army Equipment Support Publications in order to communicate best practice and standardisation across the Armoured Vehicle fleet;	1.4.466
k. Develop a policy for the management of personnel who sit outside of the anthropometric limitations of Armoured Vehicles in order to ensure the safety of crew members;	1.4.493
l. Amend the High Mobility Truck Variant Hazard Log with regard to firefighting on the vehicle in order to ensure that appropriate controls are in place against the hazard;	1.4.522

m. Provide and mandate the use of a revised planning template for all training activities in order to ensure training activity is correctly planned and that appropriate risk mitigations are in place and correctly authorised;	1.4.734
n. Ensure that all Safety Occurrence Reports are adequately reviewed and lessons identified as part of the Annual Safety Case review during the Platform Safety and Environmental Panels in order to ensure that lessons are identified and learnt from all accidents.	1.4.933

1.5.6. **Head of Capability Ground Manoeuvre should:**

a. Determine the requirement for audio protection and crew communications for all Armoured Vehicles in order to ensure appropriate hearing protection and internal communications;	1.4.204
b. Improve the head and neck protection afforded to High Mobility Truck Variant Crews in order to reduce the risks associated with Road Traffic Collisions to as low as reasonably practicable and tolerable.	1.4.213

1.5.7. **Director Personnel (D Pers) should:**

a. Ensure that all Joint Personnel Administration Job Specifications and Assignment Orders for unit training supervisory personnel contain the correct list of mandated professional courses in order to ensure that all personnel are appropriately trained prior to taking up new roles;	1.4.671
b. Update Army Command Standing Order 3228 in order to ensure that it is consistent with Joint Service Publication 822;	1.4.673
c. Ensure that all Reserve unit Executive Officers are nominated as the Defence Training Managers and undertake the required training in accordance with Joint Service Publication 822 in order to ensure that adequate levels of training assurance are provided for Reserve units;	1.4.684
d. Direct that officers selected for Reserve Regiment Executive Officer duties are post sub-unit command in order to ensure that adequate levels of experience are provided at all Reserve units;	1.4.686
e. Ensure Reserve unit Training Warrant Officers are nominated as Defence Training Supervisors and should mandate the required Pre-Employment Training on associated Job Specifications and Assignment Orders in order to ensure that Reserve unit instructors are able to fulfil the role effectively;	1.4.691
f. Direct that personnel selected for Reserve unit Training Warrant Officer positions are qualified and have experience in training delivery relevant to the unit's primary role in order to comply with Joint Service Publication 822;	1.4.694
g. Define the selection criteria for Reserve unit Permanent Staff Instructors in order to ensure that they are capable of operating safely and independently in the instructional role with limited supervision from the Chain of Command;	1.4.697

h. Improve Health and Safety training for all Non-Commissioned Officers during their career in order to ensure that an appropriate understanding of the importance of Health and Safety management and the processes and procedures in place within the Army. 1.4.707

1.5.8. **Director Land Warfare (D LW) should:**

a. Include Dynamic Risk Assessment as a Training Objective in all Driving and Maintenance Instructor (DMI) courses in order to prepare DMIs to adequately assess all hazards associated with Armoured Vehicle instruction; 1.4.38

b. Mandate an annual review of Armoured Vehicle Standing Orders in order to ensure that they remain coherent with other Defence policy; 1.4.469

c. Define the Roles and Responsibilities of Driving and Maintenance Instructors within Armoured Vehicle Standing Orders in order to take account of the lack of qualification of the student(s) in the vehicle; 1.4.474

d. Enhance the contents of Armoured Vehicle Standing Orders Chapter 2 to include practical safety advice to Armoured Vehicle operators in order to improve understanding and standardisation across the Armoured Vehicle fleet; 1.4.487

e. Update Armoured Vehicle Standing Orders to include guidance material on specific hazards associated with cross-country driving in order to assist commanders and drivers in identifying relevant hazards and associated control measures; 1.4.497

f. Mandate an annual driving assessment for all Armoured Vehicle drivers as a component of Annual Continuation Training in order to assure driving skill levels are maintained to an appropriate standard; 1.4.501

g. Review all JACKAL training in order to ensure that JACKAL training needs analysis, design, delivery and assurance is compliant with Joint Service training policy (JSP 822) and associated single Service training policy; 1.4.517

h. Introduce vehicle specific firefighting training for JACKAL crews in order to ensure that the risks posed by vehicle fires are reduced to as low as reasonably practicable and Tolerable; 1.4.521

i. Determine the provenance of the [redacted] training limitation in order to ensure that it is within the safe operating envelope of the vehicle; 1.4.527

j. Introduce the requirement for students to be taught methods to assess the suitability of terrain, including the approximation of slope angles in order to ensure vehicles can be operated within the defined safe operating envelope; 1.4.528

k. Assure all High Mobility Truck Variant training documents in order to ensure coherence with the authoritative vehicle documentation; 1.4.534

l. Ensure that the training delivery of all distributed JACKAL driver training meets mandated course objectives and safety requirements and can be delivered within the time constraints of all units, including those within the Army Reserve in order to ensure that JACKAL training is standardised, assured and achievable;	1.4.561
m. Ensure that all Armour Centre approved instructors receive the course convening briefing by the Training Standards Group in order to ensure that they have the knowledge required to conduct their duties;	1.4.565
n. Consider catch up training for those qualified instructors who have not received the Training Standards Group briefing in order to ensure that all instructors are aware of the roles and responsibilities of the Training Standards Group;	1.4.566
o. Address the workforce requirement of the Training Standards Group in order to ensure that 2nd Party Assurance and Inspection activity is conducted;	1.4.583
p. Ensure that 2nd Party Assurance of the Queen's Own Yeomanry training activity takes place as soon as practicable in order to provide assurance to the General Officer Commanding 1st (UK) Division that the Queen's Own Yeomanry training is being delivered in line with Land Warfare Centre direction;	1.4.585
q. Mandate that the selection of individuals for Driving and Maintenance Instructor courses is to be auditable in order to demonstrate compliance with Joint Service Publication 822 and provide assurance of instructor competence;	1.4.637
r. Introduce a formal Driving and Maintenance Instructor Continuing Professional Development programme for all Driving and Maintenance Instructors in order to ensure that instructors continue to develop their instructional skills;	1.4.641
s. Implement an annual Driving and Maintenance Instructor standardisation check in order to assure ongoing instructor competence and adherence to training policy;	1.4.644
t. Introduce Human Factors and Crew Resource Management training for all vehicle crews in order to improve crew co-operation and raise awareness of the factors that contribute to accidents and near-misses;	1.4.718
u. Amend the Driving and Maintenance Instructors course and introduce the requirement for instructors to drive their chosen cross-country route on the day of the activity prior to conducting training in order to improve the safety of training delivery through Safe Place assurance.	1.4.750

1.5.9. **Director Land Equipment (D LE) should:**

a. Improve the process for releasing and assuring compliance with all equipment notices in order to ensure that the dissemination and application of safety critical information across Defence is robust; 1.4.193

b. Improve the process for communicating risks and associated controls in order to ensure risks and hazards are clearly understood by those responsible for managing and owning equipment operating risk; 1.4.366

c. Issue a single Safety and Environmental Management System which is applicable across the Operating Centre in order to ensure coherence. Subordinate Safety and Equipment Management Systems should be incorporated into the Land Equipment Operating Centre Safety and Environmental Management System. 1.4.418

1.5.10. **Head Vehicle Support Team (Hd VST) should:**

a. Mandate the recording of all vehicle maintenance on Joint Asset Management and Engineering Solutions, including weekly maintenance inspections in order to ensure an audit trail for all mandated maintenance activity; 1.4.168

b. Ensure that the tyres fitted to High Mobility Truck Variant vehicles provide adequate traction on all anticipated surfaces in order to ensure that the vehicle is safe by design; 1.4.182

c. Improve the process for storing and accessing Part 2 Safety Case evidence in order to ensure timely access is assured and filing systems are established to identify key evidence against the overall 3 Part Safety Case; 1.4.241

d. Provide vehicle tilt limitations to crews in order to enable them to remain within the safe operating envelope of all vehicles within their portfolio; 1.4.251

e. Provide vehicle crew a means by which to determine vehicle angle in order to ensure safe operating limitations are not exceeded; 1.4.252

f. Conduct further vehicle trials in order to establish the maximum gradient limitations and determination of the safe operating envelope for High Mobility Truck Variant platforms; 1.4.259

g. Assure the effectiveness of the Roll Over Protection System in all approved operating environments in order to ensure that the Roll Over Protection System is fit for purpose; 1.4.294

h. Improve the door latches on all High Mobility Truck Variant vehicles in order to ensure crew members are protected during vehicle operations; 1.4.295

i. Improve the Cutter Bar design in order to reduce the risk of crew injury in the event of a roll over; 1.4.296

j. Conduct harness cutter trials in order to ensure that the design is fit for purpose; 1.4.315

k. Introduce a harness cutter maintenance and inspection regime in order to assure that cutter blade condition remains appropriate through-life;	1.4.316
l. Rectify the disparity between Harness Cutter NATO Stock Numbers within the Land Environment in order to ensure that the correct equipment is fitted to all Armoured Vehicles;	1.4.317
m. Conduct further High Mobility Truck Variant handling trials in dry conditions in order to establish whether the JACKAL handling characteristics are suitable for its intended use;	1.4.323
n. Re-evaluate the evidence held within the High Mobility Truck Variant Part 2 Safety Case, in order to demonstrate compliance with the revised Part 1 Safety Case;	1.4.327
o. Conduct a full High Mobility Truck Variant Hazard Log Review in order to ensure that it accurately captures all credible hazards, applies appropriate controls and identifies residual risk;	1.4.368
p. Revise the High Mobility Truck Variant Army Equipment Support Publications in order to ensure all hazards, operating limitations and safety envelopes are communicated to the End User;	1.4.382
q. Rewrite the High Mobility Truck Variant Safety and Environmental Case Report applying the correct colour-coding to the safety Claims and Arguments commensurate with the evidence available in order to clearly identify the level of evidence that has been reviewed to substantiate the claim and articulate the overall Safety Case confidence;	1.4.397
r. Appoint an Independent Safety Auditor to the High Mobility Truck Variant project in order to provide independent assurance that safety requirements are met;	1.4.438
s. Update the High Mobility Truck Variant Army Equipment Support Publication in order to ensure that the Roll Over Protection System is correctly identified and described;	1.4.464
t. Set anthropometric limitations for the High Mobility Truck Variant fleet in order to ensure that crew members remain within the protected space offered by the Roll Over Protection System;	1.4.492
u. Ensure all High Mobility Truck Variant Safety Occurrence Reports are reviewed as a matter of urgency in order to ensure that the platform safety argument remains valid.	1.4.934

1.5.11. **The Defence Land Safety Regulator (DLSR) should:**

a. Establish regulation and guidance on the safety clothing to be worn when operating open architecture vehicles in order to ensure crews are adequately protected; 1.4.209

b. Introduce regulations and supporting policy regarding the design and management of Driver Training Areas in order to assure Defence that Driver Training is conducted in an adequately controlled environment; 1.4.806

c. Introduce regulations that cover the safety standards applicable to military bespoke vehicles, particularly those operated cross-country and with limited crew protection in order to provide Defence Equipment and Support and Director Capability with a benchmark safety standard; 1.4.980

d. Establish a robust programme of safety audits for all areas under his/her jurisdiction in order to provide assurance to the Director General Defence Safety Authority that vehicle equipment management is being conducted safely. 1.4.986

1.5.12. **The Land Systems Safety Regulator (LSSR) should:**

a. Establish a certification process for new Land Environment Vehicles in order to ensure that vehicles introduced into military service meet defined safety standards. 1.4.983

1.5.13. **The Defence Infrastructure Organisation (DIO) Assistant Head Safety should:**

a. Ensure that all UK Training Area Headquarters liaise with local Emergency Service Operations Centres annually in order to ensure that they are aware of all designated Emergency Rendezvous locations; 1.4.57

b. Ensure pre-training briefings are conducted in accordance with Training Area Standing Orders in order to ensure that training activities are conducted in line with the pre-arranged authorisations and that any changes are briefed to the appropriate staff; 1.4.739

c. Revise Catterick Training Area Standing Orders For Training in order to ensure all vehicle related information is accurate and that the Out of Bounds areas are clearly defined; 1.4.755

d. Implement an assured communications capability within the Training Estate in order to provide an assured method of communication with Range Control and inform the User where there are significant dead spots and communications are poor; 1.4.761

e. Provide all Training Area Safety vehicles with appropriate and sufficient First Aid equipment including Automatic Emergency Defibrillators whilst deployed on the Training Areas in order to provide a more comprehensive first response capability; 1.4.764

f. Ensure that those responsible for training activities have read and understood Training Area Orders and Risk Assessments prior to conducting activities on the Training Estate in order to assure a Safe Place;	1.4.769
g. Hold Risk Workshops to identify the risks associated with the Bidding and Allocation Management System in order that measures can be put in place to ensure the delivery of a Safe Place for training activities;	1.4.778
h. Introduce an auditable record of those personnel who have completed the Bidding and Allocation Management System training in order to ensure users are competent to use the system;	1.4.786
i. Ensure that all Bidding and Allocation Management System End Users conduct training in order to ensure that they fully understand the system prior to its use;	1.4.794
j. Issue a change request to improve the Bidding and Allocation Management System User Interface in order to enhance the awareness of End Users when Management User changes are applied to bids;	1.4.797
k. Mandate Management Users to use the Bidding and Allocation Management System Messaging tool to communicate changes in order to provide an auditable trail of changes and communications between Management User and End User;	1.4.801
l. Ensure that Training Estate users are made aware of the extent to which the Defence Infrastructure Organisation are assuring the Safe Place prior to each training activity in order to ensure that users are aware of the boundaries of risk ownership and safety provision.	1.4.811

1.5.14. **Chief Safety (Army) (CS(A)) should:**

a. Replace the example Risk Assessment in Army Command Standing Order 3216 with a non-Army related example in order to ensure that units produce their own Risk Assessments;	1.4.592
b. Mandate Duty Holding awareness training for all Regimental supervisory staff including Second-in-Command, Sub-unit Commanders, Executive Officers, Training Officers and Training Warrant Officers in order to assure the correct level of supervision of Risk to Life activities;	1.4.680
c. Provide the Army with a mechanism to submit safety reports confidentially and anonymously in order to improve the Army reporting culture and encourage personnel to submit reports;	1.4.878
d. Improve the Army Safety Occurrence Reporting System in order to make it easy to use for all involved;	1.4.889
e. Develop a reporting culture improvement plan in order to improve the reporting culture within the Army taking into account the five Haddon-Cave reporting culture principles;	1.4.892

f. Update Army Command Standing Order 3216 to include a chapter on Safety Culture including the publication of an Army wide Just Culture model in order to promote an improved Safety Culture and establish a recognised Just Culture model across the entire Army; 1.4.898

g. Include Just Culture training in all Command, Leadership and Management safety packages, including Safety Risk Management training in order to promote the use of a Just Culture to all Army personnel; 1.4.899

h. Improve the Army's Safety Occurrence Analysis process in order to ensure that lessons are identified and learnt from all safety occurrences; 1.4.925

i. Ensure that all accident reports including Army Form 510s, Army Form 510As and Learning Accounts are available to Defence Equipment and Support in order to improve the analysis of causal factors and enhance the Safety Case; 1.4.931

j. Analyse the suitability of the Defence Lessons Identified Management System and report the findings to the Deputy Chief of the General Staff in order to determine whether the system is fit for purpose; 1.4.937

k. Establish a mechanism to distribute all safety lessons across the Army in order to improve the Learning Culture of the Army. 1.4.942

1.5.15. **The Commander 4th Infantry Brigade (4X) should:**

a. Improve the follow-on procedures for all assurance activity in order to ensure findings are actioned in an appropriate and timely manner. 1.4.836

1.5.16. **The Commanding Officer of the Queens Own Yeomanry (CO QOY) should:**

a. Conduct 1st Party Assurance and Inspection of all the Queen's Own Yeomanry delivered training in order to ensure that training is being conducted in line with Defence policy; 1.4.578

b. Revise all unit Risk Assessments in order to ensure that they are completed correctly and adequately control the associated risks; 1.4.595

c. Ensure that all unit Risk Assessments are available for review by all personnel and are reviewed by those with supervisory responsibilities prior to each activity in order to ensure that personnel are aware of the levels of risks and control measures to be put in place; 1.4.598

d. Ensure that Dynamic Risk Assessments are conducted by all supervisory personnel prior to activities taking place in order to ensure new hazards are assessed and associated controls are put in place to reduce risks to as low as reasonably practicable; 1.4.600

e. Ensure that all instructors have completed all mandatory training prior to undertaking instructional duties in order to ensure that training delivery is compliant with all applicable Defence policy. 1.4.633

1.5.17. **The Brigade Electrical and Mechanical Engineer (BEME) in 4th Infantry Brigade should:**

a. Assure the proficiency of the Queen's Own Yeomanry Skill Zone Fitters in order to ensure that they are competent to carry out their duties. 1.4.198

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PART 1.6

Convening Authority Comments

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PART 1.6 – CONVENING AUTHORITY COMMENTS

Introduction

1.6.1 This Service Inquiry (SI) was convened by my predecessor on 13 February 2019 to investigate the tragic death of Staff Sergeant (SSgt) John McKelvie whilst undertaking JACKAL Driver Training on Catterick Training Area (CTA). He died on 4 February 2019 as a result of injuries sustained when the JACKAL he was operating overturned and rolled down a slope situated in the Driver Training Area at CTA. SSgt McKelvie was an experienced ex-Regular soldier serving with the Scottish and Northern Irish Yeomanry (SNIY). The JACKAL Driver training was being delivered by the Queen's Own Yeomanry (QOY), an Army Reserve Regiment based across Northern England.

1.6.2 The SI Panel have submitted their report to me following 15 months of detailed evidence gathering, interviews and analysis. I have reviewed the report and offer the following key observations, using the key elements of the Safe System of Work/Training.

Equipment

1.6.3 It is clear that the JACKAL vehicle is an important capability for the UK Armed Forces. Although it was originally procured as a Urgent Operational Requirement (UOR) in support of operations in Afghanistan, it is clear that this versatile vehicle will continue to support our personnel on operations into the future.

1.6.4 Notwithstanding its procurement and performance to date, this report has highlighted a number of deficiencies within the evidence that supports the safety case. Opportunities to address these shortfalls were missed during the subsequent transition of the capability from UOR to Core and these should now be rectified as a matter of urgency. Defence should also note that a number of pieces of equipment are currently in routine service following initial UOR procurement and that similar deficiencies in safety evidence may be prevalent across other platforms.

Practice

1.6.5 This report has highlighted the significant quantity of publications and orders that are managed across Defence. The hierarchical structure of documents from regulatory requirements down to local orders should enable a simple transfer of responsibilities through the Chain of Command to the end-user. However, in some cases, it is clear that the quantity of different documents may cause misalignment of policy and practices and that contradictory advice may be found between publications.

1.6.6 To assure safe practices are followed, correct and thorough training is essential. Although some specific areas require improvement, it is pleasing to see that the training provided to JACKAL operators is largely compliant with Defence policy and meets the needs of the student.

1.6.7 To assure safe practice, it is essential that correctly staffed Risk Assessments are carried out. In this case it is disappointing to note that this was not the case and that the resulting risk assessment was poor. However, recent changes to training policy and career training implemented by the Army should address this shortfall and I am pleased to see improvements have already been made in advance of the publication of this report.

Persons

1.6.8 Correctly trained and motivated personnel are Defence's most important asset. In this case, it is clear that both of the personnel involved in the accident were conscientious and professional individuals who were acting within the best interests of the service at the time of the accident.

1.6.9 Although errors in planning and judgement were made, there are a number of reasons for this:

a. **Supervision.** The Instructor was newly qualified and as a result he should have been afforded enhanced levels of supervision. Despite this, and likely due to his good reputation, the Chain of Command did not assure his planning to the level required. Furthermore, the assurance of distributed training activity by training SMEs did not take place to an acceptable level.

b. **Human Factors.** The Instructor had received no Human Factors training and was unlikely, therefore, to have identified the potential issues of operating a multi-crew vehicle with varying crew gradients. Additionally, the high workload environment under which he was operating also increased the chances of errors being made.

c. **Chain of Command.** In this case the Commanding Officer had only recently taken command of the Unit and was unlikely to have had sufficient time to scrutinise the training activity. The Executive Officer, responsible for training delivery, was not correctly qualified to do so and had limited Regimental Duties experience. This combination of relative inexperience permitted an environment where the decisions made by the Instructor were not questioned or challenged.

1.6.10 Defence must consider the implications of allowing complex and potentially dangerous training activity to be delivered in the distributed environment where levels of supervision and standardisation of delivery are difficult to manage. Where appropriate, Defence must ensure that those Units responsible for distributed training assurance are correctly resourced to do so.

Place

1.6.11 The Training Estate is extremely large and utilised for a wide range of activities. Whilst the estate is maintained by DIO, it is crucial that the user is engaged with the safety management of the activities taking place. Correct procedures and policy must be enforced to ensure the estate is used as it is intended and in a safe manner.

1.6.12 The implementation of new systems, such as Bidding and Allocation Management System (BAMS) must be fully embraced by all staff and safety risks must be identified. In this case, the introduction of this new system introduced a new hazard which was not robustly controlled and inadvertently undermined the safe management of the training estate. Future changes must fully embrace all user communities to understand the potential hazards associated with new systems and robust hazard identification meetings should be held.

Organisation

1.6.13 Whilst significant improvements in safety management have been seen across Defence, this incident highlights the fact there remains room for improvement at all levels. Personnel must not assume that all safety processes are in place and must challenge all unsafe activities. Vital to this is the role of the supervisory Chain of Command who must embrace a robust safety culture in all that they do. It is encouraging to see that much work has been ongoing during the period of this Service Inquiry in an attempt to address organisational safety shortfalls.

1.6.14 When organisational changes are implemented, it is vital that Organisational Safety Assessments are carried out to address the hazards posed by new working practices or force structures. With constant pressure upon our forces to deliver with less, the importance of these assessments could not be more important.

1.6.15 Finally, the boundaries of risk ownership and responsibility must be understood by all. This incident has highlighted that in a number of areas, Commanders did not understand the ownership of safety responsibilities and what safety management controls were in place.

Conclusion

1.6.16 Having reviewed the report in its entirety, I am content that this tragic incident has been investigated, analysed and reported on thoroughly, accurately and rigorously. I am assured that the recommendations contained within it have been or will be implemented where feasibly possible in order to reduce the likelihood of a similar accident in the future.

1.6.17 Throughout the duration of the SI, the Panel have actively engaged with key stakeholders to help drive improvements forward. I am therefore pleased to see that many of the recommendation owners have already started important resolution activity.

1.6.18 On behalf of the Defence Safety Authority, I offer my sincere condolences to SSgt McKelvie's family, friends and loved ones.

DG DSA