

## PART 1.5 – RECOMMENDATIONS

## TOR C – POLICIES, ORDERS AND INSTRUCTIONS

No.	Recommendation	Findings Reference
1.5.1	Comd JHC should assure that the Royal Artillery (RA) Battery Senior Operator is trained, qualified, competent and current in all roles that he or she is required to perform, including instructional or supervisory activities.	1.4.15 1.4.75
1.5.2	Comd 83 EAG should incorporate procedures for Bastion Airfield-specific H450 GPS Take Off and Landing System (GTOLS) and No-Comms routes into the Bastion Airfield Flying Order Book.	1.4.16 1.4.45

## TOR D – AIRCRAFT SERVICEABILITY AND RELEVANT EQUIPMENT

1.5.3	The UAS PTL should conduct a feasibility study to determine and implement a suitable method of using the oil consumption data recorded within the MOD Form 700 for trend monitoring the health of the R802 Wankel Rotary Engine.	1.4.21
1.5.4	The UAS PTL should immediately implement regular inspections of the H450 (S43) oil supply pipe, oil system reducer and oil feed pipe, to mitigate any risk of engine oil congealing in these locations.	1.4.23 to 1.4.32
1.5.5	The UAS PTL should, as soon as practicable, replace the H450 (S43) supply pipe with a pipe made from material that will not interact with, or change the properties of, the engine oil.	1.4.23 to 1.4.32
1.5.6	The UAS PTL should modify the method for replenishing the H450 with oil to incorporate the use of a more appropriate filling device that eliminates ingress of environmental debris.	1.4.34

## TOR E – COMPETENCY, QUALIFICATIONS, TRAINING AND CURRENCY

1.5.7	Comd 1 Arty Bde should ensure that all training, qualifications and competencies of UAS Regiment personnel are accurately recorded.	1.4.96
1.5.8	LAND CD CS should improve the RA Training Development Team (TDT) information management processes to	1.4.96



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	accurately record and store Courseware, Inval and Exval information, thereby providing auditable data.	
<b>1.5.9</b>	<p>LAND CD CS, in close consultation with Comd JHC, should commission a redesign of the Royal School of Artillery (RSA) UAS Level 3 course, which should include:</p> <ul style="list-style-type: none"><li>a. A Defence Systems Approach to Training (DSAT) compliant Job Analysis and suitable courseware formulated by RA TDT.</li><li>b. Specialist aviation lessons covering airmanship, air traffic control (ATC) procedures, radio telephony (RT) procedures, and principles of flight taught by subject matter experts.</li><li>c. RSA Sergeant Major Instructor Gunners (SMIGs) attending the 2 week RAF Cranwell UAS ground school package as a pre-requisite to teaching on the UAS Level 3 course. The SMIGs should also be experienced practitioners in the subjects they are required to teach.</li><li>d. Enhancement of the ATC RT Phraseology and Emergency Procedures lessons that should include practical training to a defined standard and not specific to Bastion Airfield.</li><li>e. Situational awareness training for H450 student pilots. This training should be developed in a practical environment similar to the Ground Control Station (GCS) in which they will be required to work.</li><li>f. An expansion of the Human Factors (HF) training, to incorporate contextualised training specifically for H450 operations.</li></ul>	1.4.39 to 1.4.40
<b>1.5.10</b>	Comd JHC should ensure that H450 pilots receive enhanced technical ground-school training in order to enable greater emphasis to be placed on the application of knowledge as part of problem diagnosis during training.	1.4.41 to 1.4.47
<b>1.5.11</b>	Comd JHC should ensure that H450 pilots, authorising officers and UAS system commanders have a thorough working knowledge and understanding of the H450 Technical Manual Appendix A – Performance Data.	1.4.122
<b>1.5.12</b>	Comd JHC should ensure that the practical training undertaken in <b>(S27)</b> is representative of H450 operations, particularly ATC procedures, to aid development of students' situational awareness.	1.4.44
<b>1.5.13</b>	The UAS PTL should provide a minimum of 3, dual earpiece, headsets in every GCS in order to enable the UAS-p, UAS-c and MxC, or instructional staff in a supervisory or training role, to have a headset each.	1.4.51



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1.5.14	<p>Comd JHC should ensure that all H450 pilots complete a focussed continuation training work-up package as a crew, within the GCS simulator. This should follow pilot training in <b>(S27)</b> and be prior to Technical Confirmation Training and subsequent deployment on operations. The training should include:</p> <ul style="list-style-type: none"> <li>a. Detailed simulator training objectives (TOs), formulated by RA TDT, incorporating airmanship, captaincy, GTOLS procedures, emergency handling procedures and ATC procedures.</li> <li>b. Improved communications fidelity within the GCS simulator in order to assist crews when practising the management of the complex communications network and enable more realistic interaction with ATC.</li> <li>c. The development and practice of a standard operating procedure for the use of the telephone within the GCS.</li> </ul>	1.4.57 to 1.4.58
1.5.15	Comd JHC should conduct a full analysis of live and simulated H450 flying currency requirements, in order to determine whether the current requirements are adequate to maintain H450 pilot skills between operational tours and prevent skill fade.	1.4.55 to 1.4.58
1.5.16	Comd 1 Arty Bde should introduce a robust governance structure to ensure H450 pilot currency, both live and simulated, is accurately conducted, recorded, tracked and maintained. This must include H450 operators between operational tours in addition to those preparing for a deployment.	1.4.56
1.5.17	Comd JHC should ensure that all GTOLS failures and emergencies are included in continuation training and the GTOLS event periodicity requirement should be reduced significantly to ameliorate the risk of skill fade.	1.4.47
1.5.18	Comd JHC should review any No-Comms procedures that have a way-point associated 'critical altitude', in order to ensure continued air safety in the event of an H450 engine failure.	1.4.47
1.5.19	Comd JHC should remove the 'critical altitude' restriction of <b>(S26)</b> at the GTOLS No-Comms route Way-Point 6. (Recommendation first made by SI President on 11 Oct 11 as immediate safety advice).	1.4.47
1.5.20	Comd 1 Arty Bde should review all Bastion Airfield GTOLS routes and No-Comms routes periodically to ensure they do not directly overfly ground infrastructure as Bastion Airfield develops and expands.	1.4.46 to 1.4.47
1.5.21	AOC 1 Gp should review tour lengths for Air Traffic Controllers at Bastion Airfield to ensure the productive output is sufficient whilst minimising the training burden.	1.4.87



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<b>1.5.22</b>	Comd 1 Arty Bde should align and standardise theatre UAS Battery RT phraseology with Bastion Airfield ATC phraseology.	1.4.88
<b>1.5.23</b>	Comd 1 Arty Bde should ensure that differences in training between Theatre specific procedures and those taught during H450 training in <b>(S27)</b> are included in the H450 Theatre Qualification process.	1.4.46
<b>1.5.24</b>	Comd 1 Arty Bde should implement a requirement for in-Theatre H450 training, either live flying or using simulation, to be conducted during the operational tour to mitigate against skill fade.	1.4.57
<b>1.5.25</b>	Comd 1 Arty Bde should ensure that Regimental Instructors and members of the Operating Standards Cell who are required to instruct and check on H450 are trained, qualified, current and competent.	1.4.78
<b>1.5.26</b>	LAND CD CS should commission urgently a Job Analysis for the Mission Commander (MxC) role.	1.4.171
<b>1.5.27</b>	LAND CD CS should ensure that F700 documentation training on the Level 3 UAS Course should be delivered by a REME Staff Sergeant, preferably an Artificer. Sufficient notice of the training requirement must be provided by the RSA.	1.4.94

**TOR E - AIRMANSHIP AND CAPTAINCY**

<b>1.5.28</b>	<p>Comd JHC should instil an holistic approach to airmanship that encompasses the teaching and development of airmanship skills throughout pilot training and beyond. This should specifically include:</p> <ul style="list-style-type: none"> <li>a. Actively developing the foundations of airmanship identified in the RSA airmanship introduction lesson.</li> <li>b. Introducing a method of assessing the mental capacity of the students and formulating a training package to develop and practise mental capacity skills.</li> <li>c. Situational Awareness training that includes specific content on distributed team situational awareness and effective management of the multi-faceted H450 communications network.</li> <li>d. Specific training that covers effective decision making skills in high pressure/high workload situations.</li> <li>e. Development of airmanship skills formally introduced into the UK simulator currency package. Every simulator session should include specific airmanship objectives.</li> </ul>	<p>1.4.62 to 1.4.64</p>
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1.5.29	Comd 1 Arty Bde, in conjunction with JHC Flt Safety, should introduce a formal system where airmanship experiences and important lessons from real events are passed between H450 pilots, AOs and System Commanders, within an environment conducive to collective improvement and air safety.	1.4.64
1.5.30	Comd JHC should mandate a pre-requisite amount of experience as a UAS-p before becoming eligible to become a UAS-c; one operational tour or 6 months flying H450 on operations is recommended.	1.4.68 to 1.4.72
1.5.31	<p>Comd JHC should introduce specific captaincy training, to include:</p> <ul style="list-style-type: none"> <li>a. The roles, responsibilities and duties of a UAS-c.</li> <li>b. Workload management, prioritisation of tasks and effective decision making under pressure.</li> <li>c. Crew monitoring skills and maintenance of situational awareness.</li> <li>d. The responsibility as captain to ensure 2-man checks are carried out, particularly during emergency situations.</li> <li>e. How to handle complex emergency scenarios and use of all available resources to assist the situation, including the MxC.</li> <li>f. A set format for the take-off and landing briefs with reinforcement training of their critical importance given the distributed team and collective situational awareness.</li> <li>g. A requirement for the UAS-c to conduct a high proportion of simulator currency training in the GCS simulator working as a crew, rather than in the single console trainer.</li> </ul>	1.4.66 to 1.4.72
1.5.32	Comd JHC should ensure pilots are formally assessed in the role of UAS-c following specific captaincy training. The assumption that a Bdr is capable of H450 captaincy by virtue of rank should be withdrawn.	1.4.69
1.5.33	Comd JHC should implement a system where the decision to award captaincy is made by a panel, to include as a minimum the Battery Commander, the Bty SO and a member of the OSC who is a TQC2 H450 UAS-c. The decision of the panel should be formally recorded.	1.4.70
1.5.34	Comd JHC should ensure that the annual Certificate of Competence check includes a specific captaincy assessment for the UAS-c.	1.4.69



## TOR F – AUTHORISATION

1.5.35	Comd 1 Arty Bde should amend the 1 Arty Bde Flying Order Book to add a requirement for training or supervisory crew members to be included on the flight authorisation sheets and at the mission back-brief.	1.4.98
1.5.36	Comd JHC should implement a prerequisite experience requirement for H450 Authorising Officers (AOs); either previous aviation experience or operational experience as TQC2 on H450 is recommended.	1.4.101
1.5.37	LAND CD CS, in close consultation with Comd JHC, should conduct an urgent Job Analysis of the UAS AO to enable a re-design of the RSA AO course, which should include training on how to identify potential hazards and risks to H450 operations and provide guidance on how to evaluate and mitigate such problems.	1.4.100 to 1.4.102
1.5.38	Comd JHC should mandate that H450 AO attend the MAA Flying Authorisers Course in addition to specific H450 Authorising Officer training.	1.4.101
1.5.39	Comd 1 Arty Bde should ensure that, during operational tours, AOs direct and manage simulated H450 emergency procedures during each sortie and ensure progress is recorded post-flight.	1.4.103
1.5.40	Comd 1 Arty Bde should amend the 1 Arty Bde Flying Order Book to direct the establishment of a formal post-flight 'in-brief' system in accordance with MAA Regulatory Article 2305.	1.4.103

## TOR F – SUPERVISION

1.5.41	Comd JHC should implement a prerequisite experience requirement for UAS System Commanders (UASS-c); previous military aviation experience either within the RA or from another military aviation background is recommended. To facilitate this, a UAS career employment group for RA officers and soldiers should be established.	1.4.107
1.5.42	Comd JHC should mandate that UASS-c attend a course specific to the roles and responsibilities of a flying supervisor, such as the MAA Flying Supervisors Course.	1.4.107 to 1.4.109
1.5.43	Comd 1 Arty Bde, in consultation with Comd JHC, should provide the UASS-c with an approved hazard-risk decision matrix with objective predefined rules, to reduce the risk of decision error.	1.4.108
1.5.44	Comd 1 Arty Bde, in consultation with Comd JHC, should provide clear guidance to all UASS-c and AOs regarding	1.4.111



	whether the recovery to Bastion of an H450 outside the Release To Service weather limits is considered an acceptable practice under any circumstances.	to 1.4.112
1.5.45	Comd 1 Arty Bde should ensure that the ability of Bty SOs is independently checked by the RA Operating Standards Cell.	1.4.113

#### **TOR G – PLANNING AND PREPARATION**

1.5.46	Comd 83 EAG should ensure all airfield operators are consulted at the planning stage of infrastructure works and must also conduct a full safety analysis of the impact of work-in-progress, in accordance with the Battlespace Management Safety Management Plan.	1.4.121 to 1.4.122
1.5.47	Comd 1 Arty Bde should provide guidance for UAS operators regarding the hazard presented to UAS operations by temporary obstructions.	1.4.122
1.5.48	The UAS PTL should include data in the H450 Operations Technical Manual for H450 stopping distance required in the event of a cable skip on landing. This stopway safety distance should be adhered to and remain clear whilst H450 operations are being conducted on the Papa Taxiway at Bastion Airfield.	1.4.122
1.5.49	Comd 1 Arty Bde should direct that a formal entry is made in the Theatre UAS Bty 'Pilots To See' folder if, following a safety assessment by the UASS-c, an occurrence presents a hazard to H450 operations. This should include details of the hazard, constraints on H450 operations, revised operating criteria, other mitigations and the residual risk.	1.4.124 to 1.4.127

#### **TOR H – FATIGUE**

1.5.50	Comd 1 Arty Bde should amend 1 Arty Bde Order 345 to include all H450 personnel acting in a training or supervisory role.	1.4.131
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#### **TOR I – INJURY SUSTAINED**

Nil



## **TOR J – EQUIPMENT DEFICIENCIES**

<b>1.5.51</b>	Comd 83 EAG should provide a recording system for the Bastion ATC Duty Safety Controller's telephone and the VHF radio used by the ATC Local Controller's assistant.	1.4.133 to 1.4.134
<b>1.5.52</b>	The UAS PTL should fit the H450 GCS with a cockpit voice recorder.	1.4.135

## **TOR K – POST-INCIDENT MANAGEMENT**

<b>1.5.53</b>	Comd 1 Arty Bde should amend the 1 Arty Bde Flying Order Book to direct that the H450 Flight Data Recorder contents are quarantined following an accident to assist any subsequent investigation.	1.4.140
<b>1.5.54</b>	Hd MilAAIB should conduct a review of Post Incident Drug and Alcohol Testing (PIDAT) policy in order to consider the merits of including overseas accidents in the policy.	1.4.142
<b>1.5.55</b>	MAA D Ops should introduce a policy covering post-incident counselling for personnel involved in an accident to determine whether individuals are mentally fit to resume operations. This policy should not purely be restricted to aircrew.	1.4.143

## **TOR L – ORGANISATIONAL FACTORS**

<b>1.5.56</b>	LAND CD CS, in close consultation with Comd JHC, should introduce an appropriate UAS pilot selection process.	1.4.145 to 1.4.149
<b>1.5.57</b>	Comd JHC should establish an independent UAS Senior Operator to ensure advice provided to the ODH is independent of the DDH.	1.4.156
<b>1.5.58</b>	Comd JHC should ensure external assurance of H450 flying is conducted by an organisation independent of the Royal Artillery, such as a Central Flying School agent within Army Aviation Standards.	1.4.157
<b>1.5.59</b>	Comd 1 Arty Bde should remove from the 1 Arty Bde Flying Order Book the authority to delegate external assurance of H450 flying within the RA.	1.4.157



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<b>1.5.60</b>	Comd JHC should clarify the division of in-theatre engineering responsibility between the 1 Arty Bde Aviation Role Office and the JHF(A) Principal Aircraft Engineer.	1.4.158
<b>1.5.61</b>	Comd 1 Arty Bde should implement external oversight of UAS crews' use of GTOLS by the 32 Regt RA Operating Standards Cell, before further unrestricted use of GTOLS is authorised at Bastion Airfield. (Recommendation first made on 11 Oct 11 as part of the Initial SI report).	1.4.160
<b>1.5.62</b>	Comd 1 Arty Bde should ensure that the H450 Human Factors advice and guidance contained within the "RAF CAM Human Factors Investigation of Hermes 450 Operations in Camp Bastion, Afghanistan" report dated 1 Jun 11 is incorporated into H450 operations and training.	1.4.162 to 1.4.164
<b>1.5.63</b>	LAND CD CS should direct that the RA Training Requirements Agency implement an effective governance structure for H450 training courses.	1.4.167
<b>1.5.64</b>	Comd 1 Arty Bde should direct that the Operating Standards Cell report to the DDH, through his Senior Operator, in order to provide independent standardisation and assurance functions.	1.4.172
<b>1.5.65</b>	LAND Comd FDT, in close consultation with Comd JHC, should commission an independent study to establish the optimal organisational structure of the future UAS Regiment and flying training establishment.	1.4.169 to 1.4.170
<b>1.5.66</b>	Comd JHC should facilitate greater interaction with other Tactical UAS communities, for example the US Army, to share ideas, best practice and the evolution of the air safety culture.	1.4.174
<b>1.5.67</b>	Comd JHC should commission an independent study to map the risks and findings identified by this SI against Watchkeeper.	1.4.176

**TOR M – SECURITY OF PERSONNEL, EQUIPMENT OR INFORMATION.**

Nil

**TOR N – LOSS/DAMAGE TO SERVICE AND/OR CIVILIAN PROPERTY.**

Nil



TOR O – SAFETY, HEALTH AND ENVIRONMENTAL PROTECTION IMPLICATIONS.

1.5.68	Comd 1 Arty Bde should amend the theatre UAS Battery (S26) lithium emergency battery following an H450 accident.	Orders to include the potential fire risk from the	1.4.182
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