1.4.118. The MxC, who in this instance was not a qualified H450 pilot (and did not have to be), was not involved in the planning process apart from preparing the tactical communications (J-CHAT) and obtaining airspace clearances. He was present during the back brief to the AO as part of the flight authorisation process. Two recent NSI's and the RAF CAM HF report concluded that the MxC role required extensive updating to reflect a more supervisory function: Witness 9, 10, 11. Exhibit 16, 100, 101

> *"Although the ZK518 NSI went on to recommend that improvements could be made to on-task supervision by increasing the supervisory responsibilities of the Mission Commander, this must only be implemented with clear lines of responsibility and clear piloting experience pre-requisites for the Mission Commander role (not all Mission Commanders were previous IPs). Many accidents have occurred due to the 'I thought it was ok as he never said anything' assumption scenario; a scenario driven by confused lines of authority."* Exhibit 16

The Panel concurs with previous recommendations that the MxC's role requires a fundamental re-evaluation and understand this process has been initiated. Without being a qualified UAS-p or UAS-c, the Panel believes the MxC's contribution and responsibilities into the overall mission do not warrant the rank of Sgt when the UAS-c, who has ultimate responsibility for the safe flight of the UA, has the rank of Bdr. Witness 34

1.4.119. The SO's involvement in this sortie was in a supervisory capacity, to oversee ZK515's crew's GTOLS procedures were correct as part of the 1 Arty Bde **(S26)** . He was not involved in the mission planning cycle carried out by the pilots, nor was he present for the mission back-brief or sortie authorisation. The SO conducted no planning or preparation for his supervisory function and was only expecting to be present within the GCS for the duration of the actual GTOLS procedures. Witness 12

**Work In Progress – H450 Planning**

1.4.120. The evolution of Bastion Airfield is such that it has almost continually been subject to construction work. As a precursor to remedial work on the main runway, Papa taxiway required repairs adjacent to Charlie Ramp. Witness 24

1.4.121. During interview, Bastion Airfield SATCO admitted that the UAS community were not considered when the contractor approached them regarding the proposed WIP at the southern part of P01. The WIP required personnel, machinery and equipment, including a tracked long-arm digger and cutting discs, to be sited on the taxiway adjacent to Charlie Ramp just south of the ATC tower (see Figure 13 below). A WIP NOTAM[68] was released by ATC on 28 Sept 11, but it was scant in detail and, whilst the general detail was sufficient to alert fixed and rotary wing operators to the works, the NOTAM would not necessarily have alerted the UAS Bty personnel to the exact location, or consequences, of the planned work. The WIP was scheduled to start on 29 Sep 11 and last for 17 days, however the BC did not find out about the WIP until the day the NOTAM was released; the day before work was due to start. Witness 24, 17 Exhibit 102 Exhibit 103 Witness 17

[68] Notice to Airmen.

**(S26)**

**Figure 13 – Camp Bastion map showing H450 'Papa' runway, WIP location and eventual crash site**

1.4.122. The BC immediately recognised that the WIP would affect H450 operations[69] so, in company with the SATCO, carried out a safety analysis, although this was an informal process and the decision was not formally | Witness 24, 17

[69] Work would be taking place directly on top of the GPS Waypoint used for a GTOLS launch from Papa 01 and approximately 200 meters from the last of 3 arrestor cables.

recorded. The BC informed the DDH of the situation via routine VTC report, but the risk analysis was dealt with at a local level. Rather than following a set risk assessment procedure, the WIP risk analysis was a subjective judgement based upon no more than the experience of the BC, having watched a significant number of H450 take-offs and landings, and the opinion of the SATCO and an H450 EP. No H450 performance calculations were carried out to establish if the WIP obstacles presented a problem for H450 operations.[70] H450 performance characteristics are laid down within the Technical Manual for H450 Operations; however, it became apparent to the Panel during interview that few Bty personnel knew about the existence of this data or how to use it. A risk to equipment was highlighted but there was no perceived risk to life as all contractors would be instructed to vacate the taxiway before any aircraft movements took place. The risk to equipment was considered acceptable because the portion of taxiway being repaired had not existed until a few months earlier. The BC and SATCO agreed that if required, the majority of vehicles and personnel could instantly move clear of the taxiway, leaving the cutting blades (which were bolted to the ground) and the barriers in place. The contractors would require 30 minutes to remove these items if required. The Bty also liaised directly with the ATC Tower to discuss launch and recovery times so that the contractor could manage the work in around them to minimise disruption. The photograph below was taken the day after the accident, but the Panel was informed it is a fair representation of the scene on the day.

Witness 17, 24

Witness 17

Exhibit 104

Witness 17, 13, 14

Witness 2, 17

Exhibit 103

Witness 7

**(S26)**

**Figure 14 – WIP Photo taken on 3 Oct 11**

1.4.123. As no formal record of the WIP risk assessment between the BC and SATCO was made, limited information was passed onto the Bty and ATC staff. On the morning of the accident, the ATC Aerodrome Controller (ADC) believed the Bty was content to conduct operations with the machinery in place, but only

Witness 17, 24

Witness 2

[70] For example stopway required in the event of a cable skip landing on P19, take-off obstacle clearance over the vehicles and JCB on a P19 departure, or obstacle clearance for a P01 landing over the vehicles and JCB.

once the personnel were moved out of the way. However, during ZK515's recovery a number of communications were made between Bty personnel and the ATC DSC. There were conflicting messages from different personnel within the Bty to ATC regarding whether the WIP was indeed a problem, what equipment was required to be moved and exactly how long it would take to move. Frustrated by the conflicting messages, ATC asked the Bty for a definitive answer and the DSC was told the equipment could remain in place for ZK515's recovery. However, the communications were made by phone from the GCS to the VCP, and by VHF radio to the ADC's assistant, but unfortunately neither means of communication were recorded. As there were no recordings, the Panel could not positively determine from interviews who gave this direction from the Bty to ATC.

Witness 3

Witness 2, 3, 9, 10, 13, 14, 17, 24

Witness 3

1.4.124. The crew of ZK515 did not carry out any pre-sortie planning with regard to the impact of the WIP on the GTOLS take-off, other than the UAS-c seeking an assurance from the FSR and EP that the vehicles did not pose an obstruction to their operation. From misunderstanding the 'HOT POOP' instruction (No GTOLS Take-Off P01), the crew of ZK515 believed there could be no GTOLS take-off or landing carried out on P01; they took-off on P19 using GTOLS, which may have further reinforced this belief and help to explain why their first approach with the overheating engine was a GTOLS approach to P19.

Witness 10

Witness 9,10

Exhibit 7

1.4.125. There are a number of human factors to be considered with regard to the full implications of the WIP on H450 operations:

Witness 9, 10, 12, 13
Exhibit 7

a. The Bty's general confusion regarding the risk assesment and agreed procedures for take-off and landing during the WIP.

b. ZK515 crew's misunderstanding of the 'HOT POOP' instruction.

c. ZK515 crew's and SO's lack of GTOLS knowledge.[71]

d. The limited airmanship, experience and captaincy skills of the crew and SO.

Considered in isolation, each factor above could potentially be of limited significance, but when considered together a picture emerges of a UAS Bty that is capable of conducting routine operations when the daily task remains the same, but exhibits weaknesses when events that are unusual or out of the ordinary occur.

1.4.126. For example, the close proximity of the WIP to the arrestor cables was not considered an issue, even though cable skips were a recognised DDH risk.[72] Dialogue between the UAS-c and GTOLS Observer highlights a lack of appreciation as the Observer considered it safe to recover the UA on P19 as the WIP was "*more than 20 meters from the last cable*".[73] The AO was also aware of the WIP, but did not fully appreciate the implications. He sought advice from the FSR and REME who said that the obstructions were too far away to be a problem, hence the AO made no calculations of his own; he accepted others' opinion at face value. The Panel were shown the distance from the final (third) arrestor cable to the point at which a H450 came to rest following a cable skip.

Exhibit 15
Exhibit 44
Witness 10

Witness 13

[71] The SO, AO, UAS-c and UAS-p did not fully appreciate how the WIP affected the GTOLS Take Off WP on P01.
[72] H450/1ARTYX/E035 – H450 Arrestor Skipping.
[73] Had the UA skipped the cable landing on P19 the stopway required is approximately 800m, thus the UA would have impacted the WIP vehicles. Cable skip is a recognised risk and has happened on a number of occasions at Bastion Airfield.

This distance was estimated by the Panel to be 800 meters, considerably beyond the WIP and vehicles in question. Moreover, neither the UASS-c, AO, SO, nor crew considered the risk the WIP vehicles posed from a discrepancy between the UA's two laser altimeters in the final stages of a GTOLS approach to P01. A laser altimeter discrepancy caused from over flight of one of the larger vehicles in the undershoot portion of the runway may have initiated a GTOLS self-abort. The H450 crews are trained to consider the implications of a laser altimeter discrepancy during a GTOLS approach, as the Panel witnessed during their visit to Israel, but no consideration was given by ZK515's crew in this case.

Witness 13, 12, 17

Exhibit 6

1.4.127. The BC and SATCO conducted a risk assessment with regard to the WIP at local level, but unfortunately the process and decisions made were not backed up with any auditable evidence. The Battle Space Management (BSM) Safety Management Plan[74] offers guidance on Safety Risk Management, Assessment and Recording for when a change to an operating procedure takes place and the Technical Manual H450 Operations holds aircraft performance operating data. Although the performance data in the Operating Manual may not have been particularly useful in this case, the data should still have been checked. Whilst the WIP was published as a NOTAM, displayed on the HOT POOP board and mentioned during the daily prayers meeting in the Bty, it is clear that neither its impact, nor temporary agreed procedure for operating with the WIP was fully understood by all parties.

Witness 17, 24

Exhibit 105

Exhibit 104

Witness 17

Witness 9, 10

[74] RAF Battlespace Management Safety Management Plan Edition 2 Dated 18 Apr 11.

## TOR H – FATIGUE

***Investigate and comment on relevant fatigue implications of individuals' activities prior to the matter under investigation.***

1.4.128. The REME engineers work a 24-hour shift pattern. During interviews it was clear that there are sufficient rest facilities provided to ensure the crews remain rested throughout their shift and all personnel are happy with this working arrangement. Should operational tempo dictate a requirement for continuous engineering activity throughout the 24-hour shift, then the Artificer will split the shift into 2 teams, again to ensure all personnel receive some rest during the shift. A recent paper by JHF(A)[75] details that the risk with this system is well known; an alternative shift system is likely to require an uplift of manpower. The paper explains that the fundamental requirement of such a shift pattern is to ensure active monitoring of working excessive hours. The Panel found that a good system of monitoring and supervision of fatigue is in place for the 57 Bty REME and found no evidence of fatigue of any engineering personnel. However, this system relies on relief engineering personnel temporarily deploying from the UK during the Rest & Recuperation (R&R) period which the Panel noted was also an effective system of introducing the next Bty's engineering team to the Bastion Airfield workplace.

Witness 19, 21, 22

Witness 19

Exhibit 46

Witness 19

1.4.129. The H450 Aircrew have a well defined fatigue management system in place and is detailed within the 1 Arty Bde FOB, Order 345, which defines the minimum crew rest periods and the maximum allowable time on duty. The AO, Ops O and BC were well aware of the order and actively ensured it was adhered to. The relatively repetitive 24-hour tasking cycle of H450 facilitated a straightforward crew rostering system which allowed the crews to rotate through early and late shifts; it was rare for crews to require a flying hour extension. The BC indicated that he was confident he would be supported by his tasking chain should he need to restrict operational tasking due to fatigue.

Exhibit 47

Witness 13, 14, 17

Witness 14

Witness 17

1.4.130. 1 Arty Bde FOB, Order 345 'Fatigue Management' is relevant to

> *"all UAS operators flying UAS platforms"* which is further defined as *"those individuals which form part of the GCS crew and are intimately involved with the flying of the UAS, ie UAS-c, UAS-p, UAS-op and EP."*

Exhibit 47

No mention is made of a requirement for instructional personnel or persons carrying out a supervisory function to adhere to the Crew Rest Periods (CRP) and on-duty hours. There is evidence to suggest the 57 Bty SO may have been fatigued by the time he was supervising the GTOLS approach of ZK515:

a. During the week prior to the accident the SO had not achieved much time away from the Bty, as the SO he was the only person able to oversee the **(S26)** . He averaged approximately 3-4 hours rest away from the Bty between each supervision event and achieved roughly 6-7 hours total sleep in any 24 hour period. The night before the accident he had approximately 5 hours sleep, waking at 0200L to return to the Bty. However, from the evidence given during an interview with the HF advisor, it appears he may have had less rest than this. The SO did not think he was tired whilst supervising ZK515's crew. However, from an HF

Witness 12

Exhibit 7
Witness 12

[75] Sep 2010.

perspective, even though he might not have felt tired during the incident itself, he could still have been suffering from cumulative fatigue from the previous week's schedule and broken rest patterns.

Exhibit 7

1.4.131. The Panel has observed that the SO, in his supervisory capacity as part of the operating crew, was not required to come under the fatigue management regulations. As such, he was likely to have been suffering from fatigue whilst supervising the crew of ZK515 due to an unrelenting work schedule during the previous week which did not allow adequate rest periods. The Panel has found that SO fatigue was a **contributory factor** in the accident.

**TOR I – INJURY SUSTAINED**

***Investigate the level of injury sustained and whether such injury will be the exciting cause of later disability; as established from expert testimony***

1.4.132. There were no injuries or fatalities as a result of this accident.

## TOR J – EQUIPMENT DEFICIENCIES

***Determine any relevant equipment deficiencies***

1.4.133. The ATC Visual Control Room (VCR) has a hard wired phone at the back of the room managed by the DSC. This line is not recorded, yet is a main means of communication to and from outstations. The Panel believes several important phone calls were made from the Bty to ATC using the phone during the events leading to ZK515's accident. It would have been extremely beneficial to the Panel to have had a recording of these conversations. Witness 26

1.4.134. The VHF radio controlled by the ADC's assistant is used to manage vehicular movements around the airfield. It is also utilised by the EP and the Lydian FSR as primary communications to and from ATC. This radio is not recorded and again the Panel believes there would have been great benefit to the SI had the communications been recorded. Witness 26

1.4.135. Primary communications between the GCS and ATC is via external radio and all domestic liaison calls are via phone between the GCS and ATC. These calls are not recorded and there did not appear to be a standard procedure for use of the GCS phone. The ability to make phone calls from the GCS to ATC and others appeared to confuse communications during the accident events and the Panel was not able to accurately determine what information was passed by phone from the GCS. Witness 3,9,10

1.4.136. The GCS is not fitted with a Cockpit Voice Recorder (CVR). It would have been extremely helpful to the Panel, when trying to piece together the events of 2 Oct 11, if a CVR had been fitted to the GCS. Instead the Panel has had to rely on the evidence of the witnesses whose accounts sometimes varied in what they could remember of communications during the accident sequence. Witness 3,9,10

1.4.137. The GCS client server clock time differed from the UA time by approximately 7 minutes. The client clock in the GCS is normally set by the technician from his watch because the GCS GPS system antenna is shielded from the sky by a tent, in order to assist keeping the GCS temperature regulated during the summer months. The time difference caused confusion when investigating the incident as the time stamps on the GCS log files and the UA FDR data did not match. Exhibit 73

## TOR K – POST-INCIDENT MANAGEMENT

***Confirm that the Post-Incident Management procedures were carried out correctly and that they were adequate***

1.4.138. The findings of the Panel are that the PCM was carried out well, particularly the **(S26)** procedures instigated by the UAS Bty in theatre. The professional nature of the post incident management by the Bty was commended by other agencies and the attention to detail whilst evidence gathering is worth particular note. The importance placed on the accuracy of statements and recording of information made it much easier for the Panel to conduct the investigation. Exhibit 66,67 Witness 24 Witness 16 Witness 19

1.4.139. The Bty SO's logbook was not quarantined as part of the **(S26)** procedure. The SO was acting in a supervisory capacity within the GCS, but his logbook and pilot record folder were not quarantined. The Panel believes this was because, at the time, the Bty did not consider the SO to be part of the operating crew, despite his supervisory function. Instead, the SO's logbook and pilot record folder were sealed in an ISO container to be transported back to the UK. This action hampered the inquiry as the items were not available to be examined as evidence until very late in the SI process. Exhibit 66 Witness 12

1.4.140. The FDR data was downloaded from the UA at the crash site by the Battery Fitter Section Artificer. The data was then passed to the Lydian contractors who transmitted it to the Original Equipment Manufacturer, Elbit, in **(S26)** and was carried out with authority from 1 Arty Bde. The downloading and distribution of the FDR data was carried out in accordance with the **(S26)** procedures; however the Panel believe that once FDR data has been removed from the UA, it should be quarantined along with the MOD Form 700 to be released by Hd MilAAIB or the SI President. Exhibit 68 Witness 19,8

1.4.141. The UAS Bty Artificer moved the propeller by a few degrees to visually confirm positive drive to the oil cooling fan to confirm that the bearing had not failed.[76] The Artificer wished to ascertain whether a fleet wide check would be urgently required; authority for this activity was not sought and it was not independently supervised. The Panel understands the rationale for carrying out this activity, but any movement of the propeller could potentially have disturbed evidence vital to the investigation. Witness 19

1.4.142. Currently the Post Incident Drug and Alcohol Testing (PIDAT) regime only covers incidents occurring on the UK mainland and in home waters. The Panel does not believe drugs or alcohol was an issue in this case, but without PIDAT cannot categorically rule out this issue as a contributory factor. Exhibit 65

1.4.143. No post accident assessment or counselling was carried out other than informal conversations between friends and colleagues. Some members of ZK515's crew indicated that they were not fully aware of the PCM process and were concerned about the repercussions of the incident. The Panel has observed there currently appears to be a lack of policy regarding professional counselling and assessment of an individual's mental state following an accident, particularly when determining if the individual is fit to resume flying operations. The MilAAIB have advised that the Tri Service Trauma Risk Witness 10,11,17 Exhibit 64

[76] There had been some issues with this fan across the fleet since its recent modification.

Management (TRiM) policy should be included in the PCM procedures, but this action has not yet taken place.

1.4.144. There was some initial confusion between the ambulance and an ATC vehicle regarding the correct grid reference of the crash location. The ambulance drivers were not familiar with the airfield and their crash maps were out of date. This error was identified quickly and has now been rectified. Importantly, the fire crew's response was not affected by the confusion. Witness 6

## TOR L – ORGANISATIONAL FACTORS

***Determine and comment on any broader contributory organisational and/or resource factors or causes***

### H450 Pilot Selection

1.4.145. The suitability of RA personnel for H450 training is established during Phase 1 training using the General Trainability Index (GTI) score.[77] There are two GTI scores applied to the RA: 38 for Strike and Artillery Logistics; and 46 for Command Systems, Surveillance Target Acquisition (STA) and UAS trades. The GTI assessment score is a legacy policy and the Panel can find no evidence that it was reviewed to ensure it was a suitable criteria for an H450 pilot; a score of 46 is not a specific requirement for a UAS pilot, but for any role within a UAS Regt. Once an individual is part of a UAS Bty, selection to undergo a H450 pilot course is made at sub-unit level based on the soldier's performance during UAS career courses. There are currently no aptitude tests, verbal or numerical reasoning tests conducted to determine an individual's suitability for H450 pilot training.

Exhibit 70

Exhibit 71

Exhibit 70

1.4.146. When H450 was introduced as a UOR in 2007, the input standard for flying training was a Phoenix UAV Level 3 soldier with live flying experience. These operators had a significant amount of operational experience with UAS. The nature of air operations from Bastion Airfield was also relatively benign in comparison to operations today. As the UOR endured due to Watchkeeper delays, to maintain the required throughput an increasing amount of young ab initio students were being trained. As the pool of experienced Phoenix operators dwindled, consequently the failure rate on the H450 courses started to increase. To compensate for the lower input standard, which was noticeable to Lydian, the length of the flying training was doubled in order to achieve the required pass rate.

Exhibit 73,72

Exhibit 74

1.4.147. There is limited evidence that preliminary research into UAS aircrew aptitude tests was conducted in 2007/08 between 32 Regt and the Officer and Aircrew Selection Centre at RAF Cranwell (OASC). However, the results of this screening process were not fully pursued by 32 Regt RA, due to the growing demand for H450 pilots at the time. Consequently, in 2007/08, a selection process that was likely to have reduced the numbers of soldiers available for the H450 pilot training pipeline was not conducive to expanding the operational capability.

Witness 32

1.4.148. As part of the UAS Pilot Soldier Transfer Scheme, there is a selection procedure for soldiers wishing to transfer from another section of the Army to become UAS operators in the RA. The selection procedure contains basic arithmetic and English language assessments in conjunction with verbal briefing skills and post flight report writing. Such assessments are encouraging to note, but currently only cater for those soldiers transferring from another arm or trade[78] and do not include the majority of H450 student pilots who are ab initio RA soldiers.

Witness 32

Exhibit 75

1.4.149. In sum, there are currently no specific selection criteria for the vast

[77] The General Trainability Index is a score derived from the Army entrance test results. The score level is initially requested by Arms & Service Directors. Agreement on the level requested is considered by the Directorate of Manning (Army).
[78] Approximately 10% of the total requirement for H450 pilots.

majority of H450 pilots, such as a unique GTI score or aptitude tests, and there have never been any specific criteria determined.

1.4.150. For comparison, the Panel has looked at other states' Tactical UAS selection criteria, namely the United States Army and the **(S26)** . To add context, the Army Air Corps (AAC) GTI score was also researched.

1.4.151. **(S27)**

Exhibit 76

1.4.152. **(S27)**

1.4.153. **AAC.** The AAC pilot selection process can not be compared directly to a UAS requirement, however, the basic requirement to join the AAC as a soldier for any trade is a GTI score of 48. A GTI score alone is not an accurate measure of the soldiers capacity to be a pilot, but it is the only system the British Army currently have to identify potential UAS pilots. With this in mind a score of 46 for a UAS pilot would seem to be low in comparison to the score of 48 to join the AAC as a soldier.

Exhibit 77

Exhibit 71

1.4.154. **Summary.** There are currently no specific selection criteria or aptitude tests for the UAS pilot role. In mitigation, this appears to be a consequence of the enduring UOR situation, but needs to change. The GTI is a psychometric test designed to determine how disposed an individual is to receiving information, but it does not determine a soldiers' aptitude to work as a UAS pilot in a GCS on operations. The Panel has seen evidence of some very capable individuals within the UAS Bty, but equally there is evidence of some poor decision making when under pressure.

Witness 32

Witness 8, 10, 19, 22

Witness 32

**Operational Duty Holder and Delivery Duty Holder Governance**

1.4.155. The external assurance provided by Joint Helicopter Command (JHC) as the Operational Duty Holder (ODH) for H450 is carried out In accordance with the JHC Air Safety Management System.[80] The JHC Air Safety

Exhibit 78

[79] Only open source information was used for this research.

[80] JHC ASMS V2 dated 13 Sep 11.

Assurance Team are required to visit all JHC units on a rolling 18 month cycle and audits of both Army UAS Regts and 1 Arty Bde are carried out. The ODH relies on SO3 UAS AAvn Standards as the Subject Matter Expert (SME) to provide air safety assurance.[81] From a recent MAA audit, the Panel noted that 1 Arty Bde, as the DDH Organisation, appears to understand its roles and responsibilities and has embraced the Aviation Duty Holder Governance construct.

Exhibit 80

Exhibit 156

1.4.156. The ODH/DDH governance structure for JHC and 1 Arty Bde is such that the Comd 1 Arty Bde is DDH, UAS Aircraft Operating Authority (AOA) and SO for UAS to Commander JHC. There are no UAS SMEs within JHC as there are few experts outside the relatively small RA UAS community. Therefore, all UAS SME advice to Comd JHC comes from Comd 1 Arty Bde. The ODH does not have the knowledge or expertise to advise the DDH on UAS operations, although he is capable of advising on safe flying operations generally. The ODH relationship with the DDH largely revolves around ensuring the appropriate risk management processes are in place and that the identified risks are being managed. Effectively, there is very little specialised scrutiny by any external party to the DDH organisation, largely by virtue of Comd 1 Arty Bde holding the triumvirate responsibilities of DDH, AOA and SO for UAS.

Witness 32

Exhibit 146

1.4.157. **External Assurance flying.** In accordance with the 1 Arty Bde FOB, external assurance for flying should be provided by HQ AAvn Standards as the Competent Army Authority and Inspectorate (CAA&I) for Army aviation. SO3 UAS AAvn Standards is responsible for this function; however, the current incumbent, since June 11, is not qualified on H450 owing to his involvement with Watchkeeper implementation. In such circumstances, the 1 Arty Bde FOB allows external assurance to be delegated to RA Gunnery Training Team (GTT). However, GTT have a lack of qualified persons to carry out this task, so they in turn delegate the authority to the RSA. Thus, the task designed to provide external scrutiny for flying is being delegated back within the RA owing to the lack of suitably qualified and experienced personnel at HQ AAvn. The situation is aggravated by a shortage of UAS SMEs and the limited number of posts available. The Panel believes that the task of external assurance of H450 flying must be conducted by an external and independent body.

Witness 33

Exhibit 147
Witness 34

Exhibit 147
Witness 32, 34

Witness 32, 33, 34

1.4.158. **External Assurance engineering.** As part of the ODH/DDH relationship, JHC Assistant Director (AD) Operations Support has delegated Engineering Authorisation (EA) Level K for H450 to the Senior Air Engineering Officer (AEO) in the BARO. The subsequent EAs are then disseminated through SO1 AEO BARO to the Bty Fitter Section (BFS) Artificer of the Theatre UAS Battery after a 'viva' to assure the SO1 AEO BARO of the BFS Artificer's engineering competence. This 'viva' process was instigated in late July 2011. The BFS Artificer at the time of the accident was not subject to this viva, and his engineering competence was assured to the SO1 AEO by the OC Workshop.[82]

Witness 33

Exhibit 81

1.4.159. The Principal Aircraft Engineer (PAE) in Theatre has also been delegated authority level K for H450 to be exercised in consultation with SO1 AEO BARO. The PAE is responsible for providing assurance to the UAS battery using the Internal Quality Audit (IQA) system and JHC also conducts Aircraft Condition Surveys (ACS) as part of the yearly External Quality Audit (EQA) process. The BFS Artificer carries out his own IQA as part of 32 Regiment RA Workshops Engineering management systems in accordance with the theatre

Exhibit 79

Witness 19
Witness 33

Exhibit 48

[81] The primary purpose of the audit is to conduct assurance on each Unit's Air Safety Management System & Plan.
[82] In accordance with MAP-01 chap 4.3 Engineering Authorisations paragraph 3.1.1.

deployed AESOs. The system appears to work very well but for some slight overlap regarding the delineation of responsibilities between the PAE in theatre and the SO1 AEO BARO. The PAE has been given level K for the H450 and, according to the JHC Command Instruction (CI), responsibility for ensuring that engineering governance is maintained for Tactical UAS and Mini UAS in theatre.

Witness 19
Exhibit 79
Witness 33

1.4.160. **H450 GTOLS Re-implementation. (S26)**

. The DDH issued a comprehensive set of instructions to be carried out by 57 Bty before they could **(S26)** in Sept 11. The final instruction to the BC 57 Bty, was to:

Exhibit 36
Exhibit 82
Witness 17

*"Ensure 32 Regt RA Operating Standards Cell (OSC) provide the DDH with assurance that the procedures are carried out correctly."*

Exhibit 82

This instruction was later superseded by a command from the DDH removing the explicit requirement for external assurance of the safe use of GTOLS:

Witness 32, 33, 34

*"Principle is that TH IUAS Bty is fully qualified and competent to commence GTOLS launch and recovery without external assistance; recognised they are not current. However Comd wants assurance that no 'novel' issues or incorrect practices have arisen with the enforced EP role in predominantly a GTOLS process; this is the specific role of the OSC. Hence 57 Bty need to complete all preparation prior to OSC arrival, and <u>can</u> hold until OSC attendance if such issues/practices have arisen, or <u>continue</u> and demonstrate correct confidence and competence to OSC. Th IUAS Bty dry drills and work up should flush this out well before."*

Exhibit 82

Despite a **(S26)** , 57 Bty were still technically current in GTOLS and there was an impetus to get the GTOLS procedures running again. Both 1 Arty Bde staff and the DDH's SO acknowledge that they applied pressure to 57 Bty to **(S26)** because 57 Bty needed to be current in GTOLS in order to qualify 10 Bty during the forthcoming ThQ process. Once the Panel arrived in theatre, it quickly became apparent that errors had been made with the GTOLS approach. Therefore, immediate safety advice was issued to the DDH to reinstate the requirement for the OSC to oversee the **(S26)** .

Witness 32, 33, 34
Exhibit 148

1.4.161. **NSI Recommendations.** Recommendations from previous NSIs and a BOI were captured by 1 Arty Bde through the Issues and Risk Register. More recently, a Post Aircraft Accident Follow Up (PAAFU) spreadsheet has been created to manage these recommendations. There is evidence to suggest that previous NSI recommendations have been recorded and actioned, but the Panel discovered there were occasions where a recommendation would reappear again as part of another inquiry, suggesting a lack of action.

Exhibit 83
Witness 32, 33, 34