TRAINING, RELEVANT COMPETENCY AND QUALIFICATIONS OF THE CREW

32. **Overview**. The Panel reviewed the flying logbooks, training records and F5200s of the operating crew and the sortie authorisation. They found the crew were current, qualified and trained and that the sortie was correctly authorised.

33. **Display Night Vision Goggles**. Some NVDs have a combined instrument feed to the device, known as Display Night Vision Goggles (DNVG). This allows flight information to be superimposed onto the field of view, akin to a head-up display. A variety of information can be selected for display, including ac attitude and Radalt indications. The Panel noted that the crew were not equipped with DNVG and that the HP and NHP were not DNVG trained. While the Panel could not state that the lack of DNVG was a factor in the accident, the use of DNVG may have reduced cockpit workload during the task. Witnesses 1 & 2

34. **The Captain and HP**. An experienced Chinook operator, at the time of the accident, the HP had amassed a total of 2215 flying hours, with 1961 hours on the Chinook. This was his 5th detachment on Op HERRICK, his 4th as ac captain and first as OC 1310 Flt. His Desert Environmental Qualification (EQ) was renewed during Ex Desert Vortex in Jordan on 13 May 10 and he completed his Theatre Qualification (TQ) on 11 Jun 10, before commencing flying in Afghanistan as an ac captain. His TQ training sortie was assessed as above-average with the training report stating that he executed dust landing and USL drop-off profiles to a high standard. Exhibit 71 & 76

35. **The NHP**. As a newly converted Chinook pilot, the NHP had a total of 1028 flying hours as of 30 Apr 10, with 115 amassed on the Chinook. This was his first detachment on Op HERRICK, during which he had flown with the Flt's training staff as an LCR co-pilot, allowing him to safely gain experience. He achieved his Desert EQ on 24 May 10 during Ex Desert Vortex in Jordan; no reference was made to his performance as a NHP during this exercise. The NHP completed his Afghanistan TQ on 11 Jul 10, with the training report stating that he provided a good NHP service and was very thorough in all matters. Exhibit 71 & 76

36. **The No 1 Crewman**. As an exchange crewman from a foreign Service and an experienced helicopter operator, the No 1 crewman came to the UK with 712 flying hours and subsequently had accrued a total of 580 hours on the Chinook. This was his 2nd tour of Afghanistan on the Chinook. He completed his Desert EQ on 19 May 10 during Ex Desert Vortex and his Afghanistan TQ on 16 Jun 10. His TQ training report stated that he executed USL drop-offs in accordance with the SOP; however, he tended to underestimate height units, bringing the ac into close proximity to the ground troops when they were attaching the USL. Exhibit 71 & 76

37. **The No 2 Crewman**. The No 2 crewman was approximately two thirds of the way to completing his first tour on the Chinook, yet had volunteered several times to support other flts and was consequently on his 6th tour of Afghanistan. He completed his Desert EQ on 22 Jun 08 and revalidated it in Theatre on 25 Jul 10, when he also completed his Afghanistan TQ. His TQ training report stated that he had carried out the dropping of a USL iaw the SOP. Exhibit 71 & 76

38. **The Authorising Officer**. The authorising officer was on his 5th detachment to Op HERRICK. He was a CR Chinook Captain and Training Captain (day only) with a total of 1265 hours of flying, 1004 of which were on Exhibit 76 Witness 14

the Chinook. He completed the Flight Authoriser's Course on 3 Jun 09, renewed his Desert EQ on 11 May 10 during Ex Desert Vortex in Jordan and completed his Afghanistan TQ on 15 Jun 10. The Authorising Officer had been granted his powers of authorisation by the Chinook Force Commander and these powers were specified on the RAF Odiham F1575C and had been duly transferred to the JHF(A) Authorisers Matrix. Exhibits 50 & 51

39. **Sortie Authorisation**. The Authorising Officer attended both the JMB at 1630 and conditions check at 0230 on the morning of the sortie before outbriefing the operating crew using the 1310 Flt standard outbrief format. His powers of authorisation had been granted by CO JHF(A) in accordance with the JAG Flying Order Book and a JHF(A) standard authorisation was used for the sortie, which was detailed in full on the authorisation sheet. The authoriser stated that the crew had been afforded the mandated 8 hours period available for rest before the sortie, but commented that the HP looked tired, which he felt was not an unusual sight amongst 1310 Flt personnel as they approached the end of their detachment. He stated that he was content with the plan, the crew composition and their ability to carry out the mission safely. The authorisation sheet was prepared using the 'STARS' software used by many JHC units. The Panel found 2 minor faults on the authorisation sheet, both due to the fact that STARS is primarily configured for use in the UK. The automatic inclusion of a booking to low fly in UK Low Flying Area 1 had not been removed; similarly the departure airfield was indicating as RAF Odiham. Neither of these errors had any bearing on the Crew's understanding of the sortie authorisation. The Authorising Officer initially stayed in the JHF(A) Ops room to ensure that the sortie departed without incident before retiring to his accommodation, remaining contactable through a hand-held radio. Witness 14 Exhibit 25 Exhibit 51 Exhibit 24 Witness 14

40. **The Panel concluded that the crew and the officer authorising the sortie were current, qualified and trained to perform and authorise the assigned mission respectively, but noted the lack of DNVG qualification for the HP and NHP. The Panel also found that, while the authorising officer could have scrutinised the crew to a greater extent for fatigue, the sortie, bar minor administrative issues, was correctly authorised.**

MEDICAL FACTORS INCLUDING POST-INCIDENT DRUG AND ALCOHOL TESTING

41. **Aircrew Medical Fitness**. There was no evidence that crew incapacitation was a factor in the accident. Documentation confirms that all crew members had current aircrew medical categories at the time of the accident. See paras 17-19 for the Panel's findings on fatigue. Exhibit 13

42. **PIDAT**. PIDAT was invoked by Commander Joint Aviation Group (COMJAG) following the accident. In the event, the Camp Bastion medical staff elected not to carry out PIDAT due to a lack of arrangements for the storage or handling of specimens. However, Afghanistan is an alcohol-free detachment for all UK service personnel and the SI Panel found no evidence to suggest that alcohol or drugs were a factor in this accident. Exhibit 71 Witness 22

43. **The Panel concluded that medical fitness, alcohol and drugs were not factors in this accident. Due to a lack of PIDAT, this could not be proved conclusively.**

THE ADEQUACY OF PLANNING, PREPARATION AND BRIEFING UNDERTAKEN IN ORDER TO COMPLETE THE MISSION

44. **Planning and Preparation**. The NHP used **(S27)** software to plan the sortie and was the most experienced member of 1310 Flt with that software, having previously used it extensively while on the Puma. A route devised using **(S27)** can be displayed overlaid on satellite imagery, as well as a variety of maps. This allowed the crew to visualise the approach to a HLS with greater ease than if the route is simply plotted on a map. It also served to highlight the incorrect grid reference for PB Bahadur LP in the JHF(A) HLS Directory. The NHP planned his route, initially to PB Nahidullah and PB Bahadur, in close consultation with the JHF(A) J2 personnel. When the NHP was informed that FOB Khar Nikah was to be resupplied instead of PB Bahadur, the **(S27)** software allowed him to quickly adjust his route and calculate an accurate ETA. As he had saved his original plan to fly to PB Nahidullah and PB Bahadur, the last-minute reversion following the conditions check posed no problems. **The Panel concluded that adequate preparation occurred prior to the sortie.**

Witness 2
Exhibit 4 & 6
Exhibit 5
Witness 2
Exhibit 7

45. **Sortie Weather**. The Panel found that the weather for the sortie was acceptable for the task and that the conditions were similar to those the crew had experienced throughout much of their detachment. The Panel noted that the lack of wind would have exacerbated the effects of dust on a HLS, as a strong wind can serve to make approaches to dusty HLSs easier by blowing the dust away from the ac cockpit, allowing the HP to maintain his visual references for a longer period of time. **The Panel found the weather was not a factor to the accident.**

Exhibit 8
Exhibit 3

46. **Sortie Brief**. The sortie was briefed at 1630 on 9 Aug 10, using the JHF(A) JMB format, with all crewmembers of both ac, the JHF(A) Duty J2 Officer and the authorising officer in attendance. The crews, authoriser and JHF(A) J2 personnel reconvened at 0230 on 10 Aug 10 for a conditions check. Here the latest meteorological and intelligence conditions were briefed before the HP and the AH Captain made the decision for the sortie to be launched. **The Panel concluded that a comprehensive briefing was carried out prior to the sortie.**

Witness 1-6
Exhibit 66
Witness 14
Exhibit 8

OPERATIONAL PRESSURE

47. **Risk Management**. The Panel found that COMJAG and CO JHF(A) had made considerable efforts to put in place an effective risk management strategy and noted that the JAG Flying Order Book had a specific section on operational planning risk management. This section detailed risk ownership and operational imperative among many factors and covered all types of tasking undertaken by JHF(A). There was a useful 'launch or abort' conditions check risk matrix that allowed aircrew to make informed risk assessments based on set criteria. The normal threats were listed, including the weather, insurgent threat, command and control, rules of engagement, firepower, operational tempo, force protection etc. However, the Panel found that with regard to selected HLSs to be used, while there was understandable consideration of the 'insurgent threat', the risks associated with the size, shape, dust conditions and nature of obstructions at the HLS were not raised, despite a recent dust-related accident in theatre. The Panel considered that because aircrew regularly take on that risk by operating to HLSs that are below standard, a subconscious perception that the risk is somehow minimised may have become established. The HFP reported aircrew perception of some HLSs as '*tight*' or '*sporty*', yet by constant use there became an assumption, or perception, of safety. While there

Exhibit 23

was evidence that the crew had considered the size of the HLS – in particular by electing to use a 3-metre extension strop on the load, the Panel considered that the JHF(A) risk matrix did not clearly allow the aircrew to make a complete assessment prior to their mission.

Annex F

Witnesses 1 & 3

48. **Mission Focus**. The Panel reviewed JAG FOB, order 380.100.1, entitled 'Operational Risk Management (ORM) and Flight Safety (FS)' which included the following:

Exhibit 23

> *'ORM is a key element of FS. Operations in Afghanistan will always be complex, multi-faceted and need a careful weighing of risks, FS and others to determine the preferred course of action. Therefore, when considering FS issues, aircrew are to ensure that they focus on the mission in hand, the imperative for that mission and the risks ranged against it. When appropriate mitigation has been applied, the residual risk will be known and the commander (ground, air and joint) can make a military judgement based on the preferred course of action.'*

The Panel considered that this kind of mission focus may be the key to tactical success, but it also may have been construed by some to mean that the assessment of risk is perhaps imbalanced towards mission success, whatever the residual risk from routine hazards to aviation. The Panel took the view that the order could have been construed as removing the right of the ac captain IAW JSP 550 to veto a mission on grounds of flight safety alone.

Exhibit 60

49. **Threat Interpretation**. As part of the enhanced 'clear, hold and build' strategy, the number of HLSs in the Helmand AO increased from circa 20 to circa 100 in the space of one year. At the tactical level, this dispersed the increased number of ground forces, making vehicle resupply from secure routes more difficult and consequently increasing the potential for IED attacks. Many locations were therefore assessed as being best resupplied by air, but this posture also increased the risk to aviation as it supplied fixed bases among the populous. To reduce the risks from attack, the Panel understandably found that crews would wish to minimise exposure and, for many HLSs, would wish to avoid the potential requirement to make a second approach. The Panel found that the dust encountered at HLSs in Afghanistan often had 'talcum' like properties, resulting in an aircraft having to hold airborne for some time while the dust clears before making a second approach, during which insurgents may have time to prepare an attack. For the accident sortie, the crew where supporting an I-ASR, indicating an urgency of the need to resupply, and with a threat from the north briefed during the transit. The Panel consider that this threat may have led to an acceptance of a greater risk in the profile flown. **The Panel concluded that the crew's threat interpretation led to a need for a successful first approach was a major contributory factor to the accident.**

Exhibit 5

Exhibits 11, 12 & 14

Witness 1

Exhibit 78

HLS IDENTIFICATION

50. **Late identification of HLS due to the lack of use of (S26)**. The crew of ZA708 had adjusted their approach to PB Bahadur to cater for a potential threat and were anticipating the use of **(S26)** by the ground forces to identify the HLS. Without this additional location aide, the crew located the HLS late and were forced to change their approach profile, rather than adopting the lower risk profile they had planned. **The Panel concluded that the late identification of the HLS due to the lack of use of a (S26) was a contributory factor to the accident.**

Witnesses 1-4

SOP 21 – DUST OPERATIONS

51. **Performance Brief**. SOP 21 states that a review of ac performance should be carried out. As the planned weight of the ac was within the limits which 1310 Flt had routinely operated to during this detachment, no member of the crew completed this calculation. The Panel analysed the performance data and found that when the ac arrived at PB Bahadur, it would have had **(S26)** Exhibit 3

. This would Exhibit 18 & 19
have allowed an acceptable safety margin during the approach, giving the HP the option of safely overshooting at any stage, without having to jettison the USL. **The Panel concluded that ac performance was not a factor in the accident.**

52. **SH STANEVAL Assessment**. SH STANEVAL were invited to review the available CVFDR data and other evidence to provide an opinion as to the suitability of the profile flown, with particular reference to SOPs. The main conclusions were as follows:

a. **Suitability for task**. SH STANEVAL stated that the original concept behind the USL dust technique was to allow crews to drop USLs into relatively unrestricted areas where the risk of collision with obstacles was low. They detailed that while an element of drift should never be considered acceptable during a dusty USL drop-off, the manoeuvre was a very demanding and difficult profile to fly and that some drift in the latter stages may be inevitable. STANEVAL stated that this procedure was never envisaged to be used in an area as confined as PB Bahadur. Exhibit 3 Annex G

b. **Approach profile flown**. STANEVAL detailed that SOP 21 states that '*All dust landings start with a good approach. …….Once the gate parameters have been achieved the aircraft should be trimmed and the NHP's Radalt bug set to* **(S26)**, amplifying this further by stating that the HP should '*Ensure the aircraft is accurately trimmed, especially laterally to ensure no drift.*' In contrast, they noted that this approach began with a very tight right turn to remain close to the PB (Fig 1-15b). The profile flown required significant amounts of roll, pitch and yaw inputs, with the aircraft not achieving a stable condition for the HP to then trim the aircraft and commence the approach; SOP 'gates' at **(S26)** , with the aircraft correctly trimmed, were not achieved. Additionally, upon rolling out on final approach, the aircraft appeared to maintain a degree of bank and pitch, a configuration that continued all the way to the drop point. STANEVAL highlighted that a stable hover was never achieved and the aircraft maintained a bank angle of around 10 degrees left side low, therefore setting up an increasing amount of drift in the dust cloud that would ultimately result in the impact. The Panel are of the opinion that the unstable nature of the approach profile flown significantly eroded the mental capacity of the HP to establish a hover attitude over the HLS, prior to vertically descending to place the load on the ground. **The Panel concluded that the conduct of a rapid approach profile that did not stabilise the aircraft on final approach or allow the pilot the mental capacity to adopt the hover attitude over the HLS was a major contributory factor in the accident.** Exhibit 3 Exhibit 16 Exhibit 16

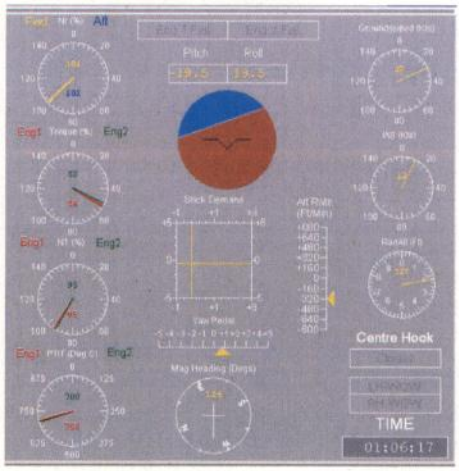

Fig 1-15a (CVFDR data) midway through finals turn.

Fig 1-15b – RN FSAIC data - Approximate path flown.

(S26)

Witnesses 8-11

c. **NHP and Crewman actions**. STANEVAL noted that the NHP did not confirm that the aircraft was 'in the gate' during the setup and consequently was not prompted to reset the Radalt audio to the **(S26)** above the 'load clear of ground' height. The Radalt audio bug remained at **(S26)** load clearance, and therefore could not provide any clearance warning to the crew in the latter stages of the approach. Further, they noted that the crewman talkdown was not fully in accordance with SOP 21. The Panel noted that the expeditious nature of the profile flown by the HP – taking circa 30 seconds from being abeam the HLS at 280 ft to descending to drop the load – significantly limited the ability of the NHP and crewman to give the full service detailed in SOP 21. Indeed, the Panel felt their curtailing and adjustment was probably necessary in the limited time available as they prioritised the information given to the HP. Finally, the Panel noted that while the No 2 crewman had asked the NHP to maintain a lookout on the PB wall, the position of the seat armour made it impractical for him to observe obstructions further back than the 10 o'clock position. **The Panel concluded that the deviation from SOP 21 with respect to Radalt settings and crewman talkdown, while potentially understandable given the rapid approach, was nevertheless a contributory factor to the accident.**

Exhibit 3

Witnesses 1 & 2

Exhibit 16

Witness 4

ACTS

FACTORS CONSIDERED AND DISCOUNTED AS CONTRIBUTING TO THE ACCIDENT

53. **Bird Strike**. There Panel found no evidence of bird strike on the ac and no crewmembers reported an actual or suspected bird strike. Witnesses 1-4

54. **FOD**. Aside from the damage caused to ZA708 by the collision with the compound wall and the subsequent rotor-strike, the Panel found no evidence of FOD found on the ac and no reports of FOD were made by the crew. ZA708 was fitted with engine air particle separators (EAPS), which filter foreign objects from the air ingested by the engines, preventing damage that may be caused by sand and dust. There is no evidence to suggest that the EAPS were not functioning correctly. Due to the fact that ZA708's engines were removed and denied to the insurgents at the emergency landing site, the Panel were unable to positively confirm that the engines were free of damage; however, CVFDR data analysis has shown that the engines were performing correctly. Witnesses 1-4 Annex C Exhibit 67 Annex A

55. **Enemy Action**. The Panel found no evidence of enemy action on ZA708 and none of the Chinook or AH crew reported being aware of any enemy action. There were no reports from witnesses on the ground that there was any enemy activity of a relevant nature that could have been a factor to the accident. Witness 1-6

56. **Deliberate Disregard of Regulations**. The Panel considered whether ZA708 might have been deliberately flown into the PB Bahadur compound wall and found no evidence of deliberate disregard of regulations. The Panel also found that the crew were acting in the course of their duties.

57. **Obstacle-Induced Recirculation**. AP3456 explains the phenomenon of obstacle-induced recirculation. The presence of an obstacle in close proximity to the rotor discs of the Chinook, such as the compound wall at PB Bahadur, can lead to a corresponding loss of lift on that side of the disk. This leads to the ac rolling toward the obstacle and subsequently drifting toward it. The Panel were unable to adequately assess the effect of this form of recirculation on ZA708; however, the CVFDR data did not show any obvious un-demanded roll to the left that may have been induced. **The Panel concluded that while obstacle-induced recirculation could not be discounted, it was unlikely to have been a factor to the accident.** Exhibit 15 Annex A

FACTORS CONTRIBUTING TO THE ACCIDENT

58. **Omission to Follow Crewman's Overshoot Direction**. The Panel noted that during the manoeuvre of the aircraft at the first PB on this mission, the aircraft had drifted over an area of the camp in recirculating dust. The crewman had given the executive order to '*overshoot*', which should prompt an immediate response from the HP; while in this case the order was given due to dust, it could have been given for any reason, including an insurgent threat, and therefore should have been responded to. The HP did not respond to this order and quickly regained references with the use of the landing lamp, but the incident may have affected the crewman's willingness to again call for an overshoot at PB Bahadur. During his interview with the HFP, the No 2 crewman stated that, at the point where he lost all visual references in severe recirculating dust at PB Bahadur, he considered calling 'overshoot' as he had done during the previous approach to Nahidullah. He reported being concerned about this order's interpretation by the HP and NHP and this, coupled with his Witness 4 Exhibit 16 Witness 1 Witness 4 Annex F

awareness of the high cockpit workload during the final stages of the approach to Bahadur, led to the No 2 crewman's decision to remain silent. The HFP reported that this episode of events contributed to the crewman's later comment regarding the final accident sequence in that he **(S41)** . **The Panel concluded that the omission of the HP to follow the crewman's 'overshoot' direction earlier in the sortie was a contributory factor to the accident.** Annex F

59. **Omission to adopt hover attitude over the LS**. During an approach to drop a USL in dusty conditions, a pilot encountering the onset of brown-out conditions will initially attempt to identify visual references close to the ac, which can be seen through the dust cloud. If he is unsuccessful, he will turn his attention to finding visual references outside the dust cloud. These references may be some distance from the HLS, but will allow him to maintain zero forward and lateral drift as he descends to place the load on the ground. The pilot also uses the visible horizon to judge the ac's attitude using visual flying techniques. As a very experienced Chinook pilot, the HP should be able to select the Chinook's hover attitude and maintain zero drift with sole reference to what he sees outside the cockpit. During this phase, and in accordance with Chinook SOP 21, the NHP should monitor the hover meter and the Radalt during the latter stages of the dust USL approach in order to confirm that the ac is not drifting and is at the correct height. However, on this occasion the NHP was also asked to report clearance from the compound wall on his left, which the Panel consider would have diverted him from the SOP 21 tasks. With neither the HP or the NHP wearing the DNVG that may have given them additional information during this phase, the Panel determined that the rapid approach profile, including a correction to the left as the aircraft decelerated over the HLS, resulted in the aircraft not establishing the hover attitude at the HLS. Instead the ac held an attitude of circa 10° nose-up and 10° left-wing low, with associated rear and left drift. CVFDR data detailed the following regarding the control inputs during the approach: Exhibit 71 Exhibit 3 Exhibit 16 Annex A

a. **Cyclic Roll Input**. The CVFDR data shows that the cyclic left input for the final turn to the left was initiated approximately 21.5 seconds before the collision with the compound wall. The angle of bank peaked at approximately 11.5° to the left, approximately 1.5 seconds before the collision. There was no evidence of any positive corrective cyclic input to the right prior to the impact, which would have been required to level the ac and stop the turn developing into lateral drift as the ac approached the hover. When combined with the IR video camera footage the data confirms that the ac entered the dust cloud over the HLS in a left wing low attitude from which it did not recover. Annex A (Fig 1) Exhibit 1

b. **Cyclic Pitch Input**. The CVFDR data shows that for approximately the final 25 seconds before the collision, the cyclic was held predominately aft of the neutral position. This ensured that the ac maintained a nose-up attitude as it decelerated, heading toward the overhead of the HLS. A positive forward cyclic movement was made at approximately 12 seconds before the impact, possibly indicating that HP had assessed that he was no longer moving forward and wished to maintain his position. However, a gradually increasing rearward movement of the cyclic follows over the next 5 seconds, with the ac attitude peaking at approximately 13.5° nose up at the point of impact with the compound wall. Annex A (Fig 2)

c. **Yaw Pedal Input**. The yaw pedals remain in an approximately Annex A (Fig 6)

neutral position for the final 10 seconds before the impact.

d. **Collective Input**. There is no collective control position input for the Chinook's CVFDR; however, the almost instantaneous reaction of the engines to any collective input allows for a good approximation of the HP's collective inputs. Analysis of the data shows that the HP initially arrested the descent with a positive increase in the collective at approximately 12.5 seconds before the first impact. The collective position is then reduced in order to prevent the ac from climbing and held relatively steady in this position for approximately 3.5 seconds. Radalt data shows that the ac maintained a relatively steady height for this period. At approximately 6.5 seconds before impact, the HP reduced the collective to continue the descent, before raising it again, probably in order to maintain a steady rate of descent. Approximately 3 seconds before the impact, the HP positively reduced the collective to initiate the vertical descent part of the SOP profile, with the ac at approximately **(S26)**, as indicated by the Radalt. Following the HP's interviews and analysis of the data, the Panel assessed that, at this point, the HP was of the belief that he was not drifting and that he was overhead the USL drop point. It is probable that the load was already on the ground at this time. Approximately 2 seconds later, the No 2 crewman calls for the overshoot. Within half a second of the overshoot call, the HP rapidly applies maximum power with the collective, but the impact occurs approximately half a second later.

Annex A (Fig 3)
Exhibit 3
Witness 1
Exhibit 16

The Panel concluded that the omission to establish a hover attitude over the HLS was a major contributory factor to the accident.

60. **Omission to overshoot when unable to maintain references**. SOP 21 states that if at any time references cannot be maintained, the HP should himself initiate an overshoot. At PB Bahadur, the HP reported catching fleeting glimpses of limited references through the recirculating dust cloud during what he believed to be the vertical descent to place the load on the ground. He elected to continue with the load drop-off procedure, after the No 1 crewman's call indicating 10 ft below the load, in anticipation of references becoming sufficiently defined so as to be able to hover, but the references did not improve. The Panel viewed that the HP's actions were at variance with SOP 21 in that he omitted to immediately overshoot upon being unable to maintain references. However, the HP reports that the point at which he lost references coincided with the point at which he positively lowered the collective to initiate the vertical descent. Analysis of the merged video and CVFDR data shows that this was 2 seconds before the overshoot call from the No 2 crewman. In contrast, the NHP lost references at the commencement of the 'brown out' and never acquired the compound wall he was looking for, even upon hitting it and rolling toward it; the No 2 crewman only saw the drift when he saw a **(S26)** marker moving rapidly into the ac's 2 o'clock. The NHP's and No 2 crewman's testimony, combined with the merged CVFDR data shows that they lost their references 4-5 seconds before the overshoot call. After careful consideration of the evidence and with particular reference to the dust cloud that engulfed the cockpit area, the Panel assessed that the HP's period without references was actually circa 4 seconds. The Panel flew the profile in the simulator, incurring drift inside the HLS and, combined with the HFP report, were of the view that at this stage the HP was in a state of overloaded mental capacity. Given that the margins for error were so small at the PB Bahadur HLS, **the Panel concluded that the omission to overshoot when the HP was unable to maintain references was a major contributory factor to the accident.**

Exhibit 3
Witness 1
Witness 1
Exhibit 16
Witness 2
Witness 4
Annex F

61. **Omission to follow correct overshoot procedure**. The No 2 crewman detected drift over the HLS and directed the aircraft to overshoot, direction that occurred at approximately the same time the No 1 crewman stated that the load was on the ground. CVFDR data indicates that maximum power was applied by the HP within half a second of the overshoot call, though this was in turn only half a second before the impact. CVFDR data indicated that the cyclic was not adjusted to correct the nose-up and left wing low attitude during the attempted overshoot; there was no right cyclic applied until after the collision/roll left and the first forward cyclic movement occurred 2 seconds after the impact. The Panel consider that this omission occurred because the HP believed he was already in a wings level hover attitude, although it is clear in the SOP that the pilot must first transfer to instruments, which may have rapidly drawn his attention to the ac attitude. Consequently, the drift to the left, in place as a result of the left-wing low attitude of the aircraft would have continued during the attempted overshoot. While the time between this manoeuvre and the impact was very small, **the Panel concluded that the omission to execute the correct overshoot procedure was a major contributory factor to the accident.**

Witnesses 3 & 4

Annex A (Fig 3)

Annex A (Figs 1 & 2)

Witness 1
Exhibit 3
Annex G

62. **Breach of MSC**. The compound wall on the left of the aircraft during the approach was approximately 3 metres high and was the structure that ZA708 initially collided with during the accident. The Panel has found that the rear of the ac was only 8.1 metres from this obstruction as it released the USL and that the rotors would have been overlapping the obstruction (Fig 1-16); an earlier impact with the rotor blades was therefore avoided by the use of the 3 metre strop. However, the Panel found that the ac drifted in heavy dust over the HLS, was unable to maintain MSC and struck the wall. **The Panel concluded that the causal factor of the accident was the breach of MSC within the HLS, with uncorrected drift leading to a collision with the PB wall.**

Annex C

Exhibit 21

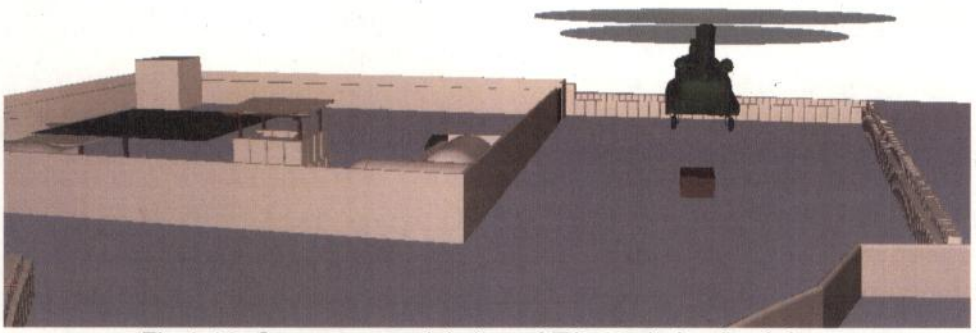

Fig 1-16 Computer model view of ZA708 during load drop

63. **Post-Crash Management (PCM)**. PCM was initiated by the JHF(A) Watchkeeper at the time of the accident and all the appropriate logs were kept, documents quarantined, and actions taken. The JHF(A) COS and the PAE both arrived in good time and took over from the Duty personnel in the Ops room. The JHF(A) PCM plan was followed and aircrew and ac were recovered, save those items destroyed or denied to the insurgents. **The Panel found that JHF(A) had conducted the appropriate PCM, considering the threat at the ac recovery site. PCM was therefore assessed as robust.**

Exhibit 2 & 27

Witness 12 & 25

SUMMARY OF CAUSE AND CONTRIBUTORY FACTORS (FIG 9)

64. **Cause**. The causal factor of the accident was the breach of MSC within the HLS, with uncorrected drift leading to a collision with the PB wall. Para 62

65. **Major Contributory Factors**. The Panel concluded that the following factors significantly contributed to the accident:

a. The lack of robust HLS management. Para 8

b. The omission to notify JHF(A) of the FP measures that reduced the HLS size. Para 12

c. The omission to notify JHF(A) and mitigate against unsuppressed and excessive dust as a result of the FP work on the HLS. Para 13

d. The crew's interpretation of the threat instilling a need for a successful first approach. Para 49

e. The conduct of a rapid approach profile that did not stabilise the aircraft on final approach. Para 52

f. The omission to establish a hover attitude over the HLS. Para 52

g. The omission to overshoot when the HP was unable to maintain references. Para 60

h. The omission to execute the correct overshoot procedure. Para 61

66. **Contributory Factors**.

a. The demanding environmental nature of Afghan operations. Para 7

b. The lack of Service support to 1310 Flt. Para 10

c. The over-reliance of the crew on the ability of the HP. Para 16

d. The lack of robust fatigue management and supervision of 1310 Flt. Para 17

e. The lack of robust supervision of OC 1310 Flt – the HP – in theatre. Para 19

f. The inaccuracy of the Radalt by approximately 10 ft. Para 29

g. The late identification of the HLS due to the lack of use of a **(S26)**. Para 50

h. The deviation from SOP 21 with respect to Radalt settings and crewman talkdown, while potentially understandable given the rapid approach. Para 52

i. The omission of the HP to follow the crewman's 'overshoot' direction earlier in the sortie. Para 58

67. **Aggravating Factor**. The use of an 'adobe'-type of structure, adjacent to the HLS, for sleep during a helicopter insert was an aggravating factor in the accident. Para 21

OBSERVATIONS

68. **HLS Management**.

a. The JHF(A) MAOT were unable to support both deliberate operations and the routine management of the JHF(A) HLS Directory.

b. There was little or no audit trail maintained during the production and amendment of JHF(A) HLS Directory entries.

c. Although ATP49(E) states that, through negotiation, the size of a landing site can be reduced below that specified, there was a lack of clarity as to what was the minimum size of a Chinook HLS, particularly for night operations, and the Panel was unable to find any evidence of negotiation taking place There appeared to be a creeping reduction in the acceptable size of a HLS.

69. **Training and Supervision**.

a. The use of Jordan for environmental training before deployment to Op HERRICK was generally regarded as unsuitable due to a lack of dust representative of that found in Afghanistan.

b. The pilots were not qualified in the use of DNVG, despite its availability in Theatre and its potential benefits for mission success.

c. There is no PIDAT facility in Op HERRICK to enable supervisors to unequivocally discount alcohol and drugs as factors in an accident.

70. **Equipment**.

a. Chinook Hot Poop 09/09 is extant and states that the USL emergency manual release should only be used in the event of an emergency and that following its use, it should be considered unserviceable until technical advice is sought. This is to ensure that there has been no damage to the hook or the release cable and that the hook is reset within the required tolerances.

b. **(S26)**.

c. **(S26)**.

d. There are no crashworthy crew seats in the cabin of the Chinook for use by the crewman in the event of a forced landing. Due to their lack of adequate restraint, it is likely the Crewmen would have been injured if it were not for the relatively gentle forced landing carried out in this instance.

e. **(S26)**.

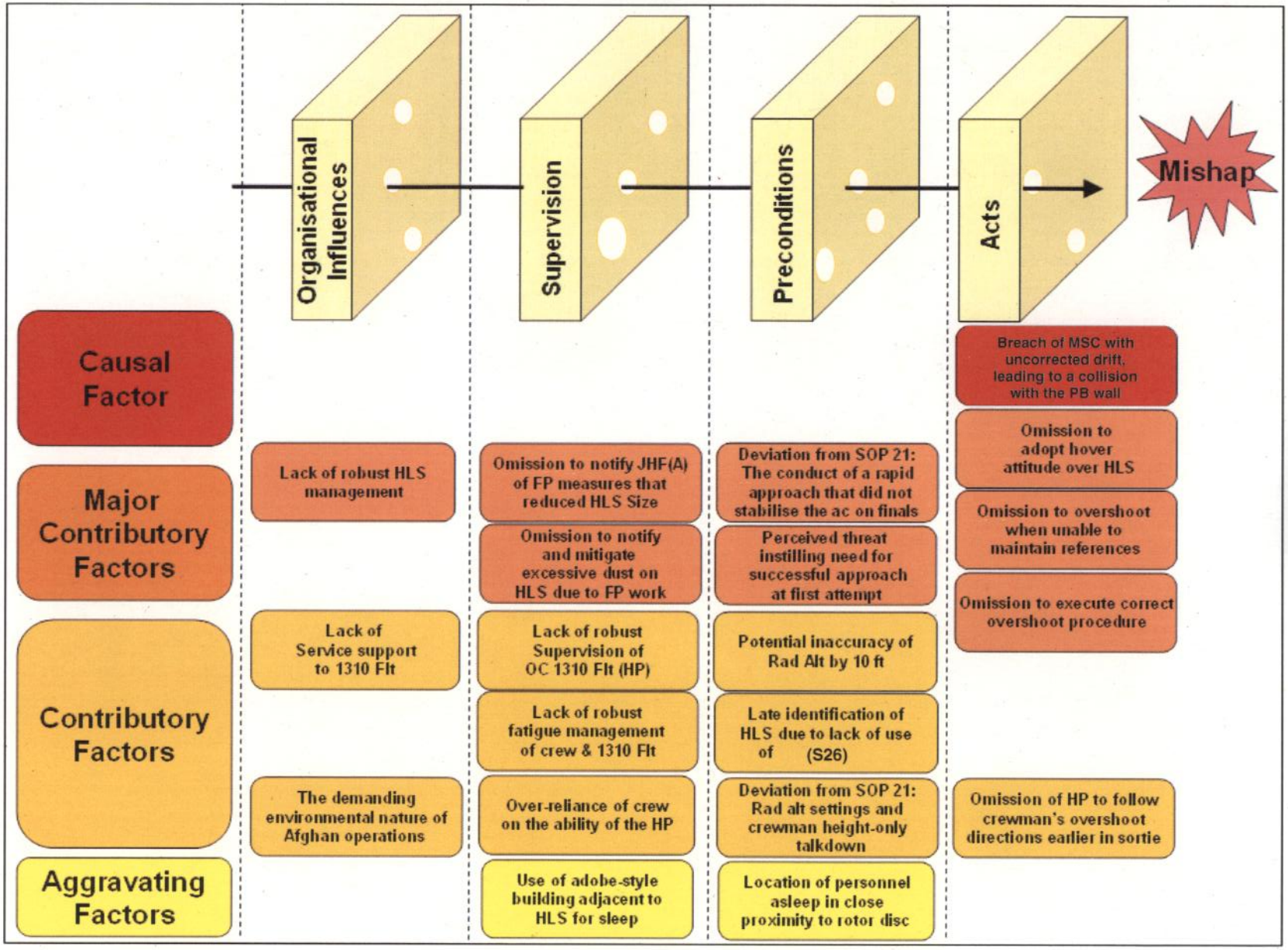

Fig 1-17 Summary of factors detailed under Reason's Model