

46G/56000/8/2/P1

Headquarters 46 Group

Upavon 351, Ext 320

31 October 1974

ERRATUM TO PROCEEDINGS OF BOARD OF INQUIRY HELD AT  
BOOSTEDT, WEST GERMANY ON 13 SEPTEMBER 1974

1. Reference is made to the above Board of Inquiry which was convened to investigate incidents during Exercise BOLD GUARD on 11 September 1974.
2. The following amendment is to be made to the original and typed copies of the Proceedings of the Board of Inquiry:

FINDINGS OF BOARD OF INQUIRY  
SUMMARY

Paragraph 27, sub-para a, line 2,  
delete "of 359 yards," .



Group Captain  
President of Board of Inquiry

/2 Nov 74

ERRATA TO PROCEEDINGS OF BOARD OF INQUIRY ASSEMBLED AT BOOSTEDT, GERMANY  
ON 13 SEP 74

The following amendments are to be made to the original and all copies of the findings of the Board of Inquiry investigating the circumstances of the second parachute assault of Exercise BOLD GUARD on the night of 11 Sep 74.

- a. Page 103, para 36, line 17:  
Amend 908 yards to read 860 yards
- b. Page 110, para 63, line 33:  
Amend 813 yards to read 860 yards.



Gp Capt  
President of the Board

JCF/270

~~STAFF IN CONFIDENCE~~  
~~CONFIDENTIAL/SECRET~~

RAF FORM 412  
 (Revised June, 69)

**ROYAL AIR FORCE/ARMY  
 PROCEEDINGS OF A BOARD OF INQUIRY OR  
 UNIT INQUIRY INTO AN AIRCRAFT ACCIDENT**

(To be completed in accordance with AP3207, Chapter 5, Annexes 'E' and 'F')

Assembled on 13TH SEPTEMBER 1974 at BOOSTEDT, WEST GERMANY  
 (Date) (Place)  
 By order of AIR MARSHAL NEIL CAMERON CB CBE DSO DFC  
 Commanding 46 Group/Command/Brigade/Corps  
 incident of the Second Assault of  
 To Inquire into the ~~accident involving aircraft~~ Exercise BOLD GUARD on 11 SEP 74  
 (Type and Number) (Date)

**1. Composition of Board**

Duty	Rank, Initials, Name, Decorations, Number	Branch	Unit
President	GROUP CAPTAIN [REDACTED]	GD/P	HQ 46 GP
Members	WING COMMANDER [REDACTED]	GD/P	46 GP [REDACTED]
	LIEUTENANT COLONEL [REDACTED]	27) PARA	[REDACTED] UKJATFOR HQ46GP
	SQUADRON LEADER [REDACTED]	GD/N	RAF LYNEHAM
	SQUADRON LEADER [REDACTED]	PHYS ED	RAF ABINGDON
*In Attendance (see QR1261)			

**2. Full Terms of Reference**


(AP3207, chapter 5, paragraph 21 refers)

- A. To investigate the circumstances of the second parachute assault of Exercise BOLD GUARD in which part of the aircraft loads landed outside the DZ.
- B. To establish the reason why some of the loads fell outside the DZ.
- C. To determine whether the applicable operations orders, operating procedures and regulations were adequate and were adhered to.
- D. To determine the extent of loss of life and to ascertain the cause or causes and time and place of the deaths.
- E. To ascertain if Service personnel involved were on duty.
- F. To determine the extent of loss and damage to Service equipment.
- G. To examine the state of serviceability of all equipment relevant to loss of life.
- H. To examine the adequacy of the prescribed safety precautions.
- J. To determine whether there was negligence on the part of any person or persons which caused or contributed to:
- (1) The loads falling outside the DZs and;
  - (2) The resultant loss of life and loss of, or damage to Service equipment, and, if so, in each case to determine whether such negligence was culpable.
- K. To establish the extent of damage to civilian property.
- L. To make appropriate recommendations.

~~SECRET/CONFIDENTIAL~~

~~STAFF IN CONFIDENCE~~

NARRATIVE OF EVENTS

1. In January 1974, staff officers of HQ 46 Group and 16 Para Bde visited Schleswig-Holstein to select dropping zones (DZs) for the parachute assaults to be carried out during Exercise BOLD GUARD, a major NATO Exercise due to take place in September 1974. The area selected for the second assault was a stretch of ground 2,406 yards long, bounded on the north by the Kiel Canal and on the south by the Eider Canal, with a full length personnel DZ and a shorter stores DZ parallel to it along its eastern edge. A wood lay between the stores DZ and the Kiel Canal, beneath the run-in track of the dropping aircraft. These DZs were known collectively as the OSTERRADE DZ.
2. The OSTERRADE DZ was checked and approved by HQ 46 Group as suitable for the parallel dropping of stores and personnel by night from 1,000 feet, with a maximum stick length of 31 personnel. The recommended run-in was from the north. The DZ reconnaissance report noted that safety boats would be required on the Kiel and Eider Canals, and that parachutists would need to wear lifejackets. A later attempt to have shipping on the Kiel Canal stopped for the period of the assault was unsuccessful,  

3. After the ground reconnaissance of the DZ, the CO of the Guards Independent Parachute Company (1 (Gds) Indep Coy PARA), which was to be responsible for marking the DZs, wrote to HQ 46 Gp pointing out that the acquisition marker for the stores DZ would be in the middle of the wood to the north if placed in the normal position. This problem was not resolved during the later stages of exercise planning.
4. On the evening of 11 September, a few hours before the second assault, a pathfinder troop of 1 (Gds) Indep Coy PARA laid out the DZ markings at Osterrade. The positions of the DZ markings were accepted by the two RAF DZ Safety Officers (DZSOs) who were on the Osterrade DZ before and during the second assault.
5. P Hour for the second assault was 2000Z on 11 September, two hours after sunset. The planned stream formation consisted of 5 waves of 6 Hercules and one wave of 5, preceded by the Stream Commander's aircraft, which flew 10 minutes ahead of the first wave and dropped its parachutists at 1950Z. The Stream Commander's aircraft and the first 2 waves, a total of 13 aircraft, carried personnel. The last 4 waves, 23 aircraft, carried stores, which consisted mainly of medium stressed platforms (MSPs) carrying vehicles and trailers. Over the DZ, waves were separated by 2 minutes, with 10 second intervals between aircraft in waves.
6. All participating aircrew attended a comprehensive briefing before the assault. Drop height was initially briefed as 750 ft, but was later changed to 1,000 feet to conform to the normal height for night descents by Territorial Army parachutists.

A drop height of 1,000 feet was confirmed by HQUKJATFOR before the stream took off from Lyncham. Some doubt about the visibility to aircrew of the acquisition marker of the stores DZ was expressed at the briefing.

7. The flight was conducted according to standard JATFOR stream procedures with no irregularities. The DZ markings were clearly visible from the air, and the drop was made from calculated air release points (CARPs) determined from the wind that was broadcast by the Stream Commander, modified in some cases by successive Wave Leaders from their own measured winds at drop height. There was little difference in the air release point of the aircraft which dropped personnel, which was to the left and abeam the personnel DZ code identifier (ALPHA). The CARPs for the stores aircraft were between 350 and 400 yards short of the stores DZ code identifier (JULIETT), and many of the aircrew judged their release points from the stores DZ acquisition marker, which had been placed well to the north of its correct position.

8. The personnel drop was well concentrated with little spread along the length of the DZ of the first parachutists from all 13 aircraft. The mean point of landing for personnel was 355 yards short of the Alpha. Thirty five parachutists landed within 120 yards of the Kiel Canal. A further 15 parachutists landed in the Canal, of whom 6 were drowned.

9. During the stores drop, some MSPs landed on the personnel DZ causing the DZSO to stop the drop by firing red flares. Only 18 of the 23 stores aircraft completed the drop. The majority of the MSPs landed short of the DZ. The mean point of impact of the first MSPs released from all aircraft was 832 yards short of the Juliett.

10. German Army safety boats positioned on the Kiel Canal rescued 5 men from the water and picked up one drowned parachutist. During the rescue operations, ships passed through the Canal across the end of the DZ and 3 MSPs landed in the Canal. The parachutists who drowned failed to remain on the surface for long enough for the safety boats to rescue them alive. On the day after the drop, the Canal was swept for the missing men. Four more bodies were recovered during this sweep. The sixth body was retrieved from the water by a passing vessel when it floated to the surface 8 days after the drop. None of the life jackets of the men who were drowned were inflated.

11. After the drop, the 11 aircraft in Waves 5 and 6 landed at HOHN, some 12 miles from the DZ. These aircraft reported strong southerly winds down to 300 feet on the final approach to the runway.

FINDINGS

THE CIRCUMSTANCES OF THE SECOND ASSAULT OF  
EXERCISE BOLD GUARD ON 11 SEPTEMBER 1974

1. Exercise BOLD GUARD was a major NATO Exercise held in Schleswig-Holstein in September 1974. The Exercise Operation Order tasked UKJATFOR to carry out 2 parachute assaults. During the planning period, [REDACTED] who was at the time [REDACTED] the RAF Detachment at 16 Para Bde, was ordered to search for dropping zones (DZs) in the exercise area suitable for day and night parachute assaults. He could find no DZ suitable for a night assault within the Exercise area. He was instructed to extend his area of search to the north of the Exercise area, where, after some difficulty, he found acceptable terrain between the Kiel and Eider Canals near Osterrade. He wrote a DZ reconnaissance report recording the suitability of the Osterrade DZ for a JATFOR stream parachute assault. This report was accepted and endorsed by HQ 46 Group.

Twenty-Seventh Witness
2. The Operation Order required the second assault to be made at Osterrade at 0400Z on 11 Sep 74. The assault was postponed to 2000Z on that day because of unsuitable weather at 0400Z.

Twenty-Eighth Witness
3. On 5 Sep 74 a briefing was held at RAF Lyneham for aircraft wave leaders and their crews at which [REDACTED] of 1 (Gds) Indep Coy PARA described the DZ markings to be used for both assaults, and at which comprehensive briefing folders were issued to wave leaders. A further briefing of all participating aircrew was conducted on the day of the assault by [REDACTED] the Stream Commander and [REDACTED] his navigator. Also on 11 Sep 74, [REDACTED] of 15 Para (V) Bn, gave out his operational orders at Hullavington, including a warning of the water hazards of the Kiel and Eider Canals and a reminder of parachutists' into water drills.

Thirty-Third Witness  
Sixty-Fourth Witness

Thirty-Third Witness  
Sixth Witness
4. For the assault the aircraft stream consisted of the Stream Commander's aircraft flying 10 minutes ahead of 6 waves. The first 5 waves consisted of 6 Hercules each, and the last wave of 5. The first 13 aircraft carried parachutists, and the remaining 23 carried stores. The flight from Lyneham to Osterrade was flown in accordance with HQ 46 Cp SOPs Vol 4. Over the DZ, aircraft were separated by 10 seconds within waves and by 2 minutes between wave leaders. The Stream Commander dropped his personnel at 1950Z, 10 minutes ahead of the first wave.

Fifty-Ninth Witness

Thirty-Third Witness

STAFF IN CONFIDENCE

5. On the ground at Osterrade were [REDACTED] DZSO for the personnel DZ, [REDACTED] DZSO for the stores DZ, and [REDACTED] with his pathfinder troop of 1 (Gds) Indep Coy PARA, who had laid the DZ markings. The positions of the DZ code identifiers did not correspond with the positions given in the Operation Order, nor did the DZ layout correspond with HQ 46 Gp SOPs.

Twenty-First Witness  
Twenty-Second Witness  
Twenty-Eighth Witness

6. The forecast weather conditions for the assault were good, with a ridge of high pressure giving light surface winds and good visibility. The expected surface wind was 180/05 kts, and the estimated mean effective drop wind (MEDW) was 180/10 kts. The pressure setting used for the drop was 1024 mbs, and there was no significant cloud.

Twenty-Third Witness

Thirty-Third Witness

Thirty-Seventh Witness

7. A German meteorological van was positioned on the western side of the DZ. The observers in this van reported a surface wind of 130/05 kts at 2000Z, which was not significantly different from the winds they had found during the preceding 3 hours. However, the surface wind passed to the Stream Commander was 090/05 kts, as measured by [REDACTED] the Alpha and was confirmed by [REDACTED] measured the wind speed with a hand-held anemometer and estimated its direction by taking a compass bearing. The Stream Commander's Navigator calculated a MEDW of 120/15 kts from his own Doppler wind at 1,000 ft and the surface wind reported from the Alpha. He broadcast this MEDW to all wave leaders. With some minor adjustments, the aircrews used this wind for their CARPs.

Sixty-Second Witness

Twenty-Eighth Witness

Twenty-Eighth Witness

Thirty-Fifth Witness

Fortieth Witness

Forty-First Witness

8. The operating navigator in the Stream Commander's aircraft had calculated a MEDW from his own wind at drop height and his own estimate of 120/12 kts as the likely surface wind. He received the broadcast surface wind too late to calculate a revised CARP. He took some account of the reported surface wind, modified his CARP slightly, and released his parachutists at an estimated 300 yards to the left and 100 yards past the Alpha. The fourth parachutist to leave the port door of the Stream Commander's aircraft landed close to the Alpha, indicating an under-shoot of about 180 yards for the first men to leave the aircraft.

Thirty-Eighth Witness

Thirty-Eighth Witness

Twenty-First Witness

9. The lead navigator of the first wave elected to use the MEDW broadcast by the Stream Commander, and ordered all aircraft in the first wave to follow the same track over the DZ using a CARP of 300 yards left of and exactly abeam the alpha. The lead navigator in the second wave also used the broadcast MEDW but noticed that his drift was less than 5° as he approached the DZ. He therefore ordered the aircraft in the second wave to take up offset formation to avoid slipstream. The aircraft in the second wave dropped from a mean CARP of 70 yards left and exactly abeam the Alpha.
- Forty-First Witness  
Forty-Second Witness  
Forty-Second Witness  
Seventy-Third Witness
10. Aircrows in the first 2 waves reported that the DZ markings on the personnel DZ were excellent. Subsequent waves reported that all markings on the stores DZ were clearly visible, although some navigators thought the stores DZ acquisition marker seemed a long way from the Juliet.
- Forty-Seventh Witness  
Forty-Fifth Witness  
Fifty-Seventh Witness
11. The stores aircraft in waves 3, 4, and 5 also used the broadcast MEDW, with some minor adjustments to CARP made by some aircraft navigators using their own Doppler readings of drift and ground speed. During the stores drop, some MSPs landed on the personnel DZ causing the DZSO to stop the drop by firing red flares. The sixth wave did not drop its stores.
- Forty-Third Witness  
Forty-Fourth Witness  
Forty-Fifth Witness  
Twenty-First Witness  
Forty-Sixth Witness
12. The mean result of the personnel drop was an undershoot of between 338 and 360 yards, and of the stores drop, an undershoot of 813 yds. Fifteen parachutists landed in the Kiel Canal, and a further 35 landed within 120 yards of the southern bank of the Canal. Five men were rescued by safety boats, 4 more made their way to the bank, and 6 men were drowned. During the rescue operation, shipping was moving through the Canal across the northern end of the DZ. Three MSPs landed in the Canal; one landed on the northern bank, and most of the rest landed in or close to a wood which bordered the DZ on the north.
- Twenty-Third Witness  
Seventh Witness  
Tenth Witness  
Eleventh Witness  
Twelfth Witness  
Fourteenth Witness  
Eighth Witness  
Ninth Witness  
Sixteenth Witness  
Seventeenth Witness  
Eighteenth Witness  
Twenty-Third Witness  
Twenty-Fifth Witness
13. Soon after the drop, 11 aircraft from waves 5 and 6 landed at HOHN, an airfield 12 miles from the DZ. These aircraft experienced persistently strong southerly winds from 1,000 feet down to 300 feet on the final approach. The surface wind at HOHN during the landing period was reported as calm.
- Sixty-Fifth Witness  
Thirty-Fourth Witness



THE REASONS WHY PART OF THE LOADS FELL  
OUTSIDE THE DZs

14. The errors in the drop result are highly consistent and show that the loads dropped by all aircraft were affected by similar factors. There are several factors which may be assumed constant for all aircraft during a formation drop. An error in one of these factors, or in a combination of them, could have induced the gross undershoot of both men and stores during the second assault.

Seventy-Third Witness

THE WIND FACTOR

15. The MEDW broadcast by the Stream Commander was calculated using the reported surface wind measured at the Alpha of 090/05 kts. The German meteorological observers on the DZ measured a surface wind of 130/05 kts at P-Hour. Although the difference in direction between these two winds was within normal variation of light winds, the method of calculating the MEDW by modifying the wind at drop height by one third of its difference from the surface wind, allowed the reported surface wind to have an unduly strong influence on the broadcast MEDW. The mean of the winds at drop height measured by all aircraft in the stream was 150/20 kts, which, with a surface wind of 130/05 kts, would give a MEDW of 145/15 kts, 25° more southerly than the broadcast MEDW.

Thirty-Fifth Witness

Sixty-Second Witness

Sixty-Fifth Witness

16. However, from the evidence of aircraft landing at HOHN within 30 minutes of P-Hour, and from information the Beard have since obtained from German Air Force meteorological officers at HOHN, and the meteorological staff at HQ RAF Germany, there is evidence of a considerably stronger wind than 15 knots blowing between the surface and 1,000 feet at the time of the drop.

Sixty-Fifth Witness

17. The weather situation on the night of the second assault was particularly favourable for the formation of strong low-level winds over Schleswig-Holstein. There was a marked temperature inversion near the surface, and, with such an inversion, the wind strength in the layer between the surface and 1,000 feet may well be higher than the wind at 1,000 feet. Under these conditions, the wind strength will increase towards the top of the inversion, at which point the strongest wind will be found. At 2000Z on 11 Sep 74, the top of the inversion over the Osterrade DZ was estimated to be 700 feet. Expert evidence suggests that the wind strength at the top of the inversion could have been as high as 25 kts. This wind could not have

Sixty-Fifth Witness

been forecast from the 0600Z chart from which the drop forecast was prepared. Nor could the strength of the wind blowing at the top of the inversion be measured by aircraft at 1,000 feet.

Sixty-Second Witness

18. The mean wind which affected the drop is estimated to have been 149 degrees at 20 knots. The extent of the early error caused by this wind is estimated in expert evidence to be between 227 and 265 yards for personnel and 153 yards for stores.

Seventy-Third Witness

AIRCREW ERROR

19. The most recent data accumulated by JATE for parachute drops from 800 and 1,000 feet gives a mean early release error of 63 yards for parachutists and 113 yards for HSPs, where the air release point is normally farther away from the impact point. In considering the possible aircrew aiming error in the second assault, the Board notes that the release point for personnel was exactly abeam the Alpha; a position where it is least likely for the aimer to make a large along track error. Similarly, for the stores drop, most navigators were judging their release points from a position close to the stores DZ acquisition marker and were able to judge their release point from an abeam position. Aircrew aiming errors in the second assault were estimated in expert evidence to have been 85 yards early for both personnel and stores.

Seventy-Third Witness

Forty-First Witness  
Forty-Second Witness  
Fifty-Second Witness  
Fifty-First Witness  
Forty-Fourth Witness  
Forty-Fifth Witness  
Seventy-Third Witness

THE EFFECT OF STREAM FORMATION PROCEDURES

20. In stream formation drops some aircraft may be forced up above the briefed drop height to avoid slipstream and to ensure that they do not fly through parachutists dropped from aircraft ahead. Errors in height become progressively greater towards the rear of each aircraft wave. On the second assault, the fifth and sixth aircraft of the first wave, Chalks 6 and 7, were approximately 200 feet above the briefed drop height, which would contribute to the mean early error of Wave 1, which was 38 yards greater than that for Wave 2.

Forty-Ninth Witness  
Forty-Seventh Witness

Forty-Eighth Witness  
Forty-Ninth Witness

Seventy-Third Witness

21. HQ 46 Gp SOPs, Sect 2A, Page 13, notes that, because aircraft in stream are seldom independent, there is a tendency for a high proportion of failure to achieve calculated probabilities by all aircraft in stream in specially adverse conditions. The need for aircraft to avoid slipstream by flying

Thirty-Ninth Witness

offset formation instead of line astern also contributes to greater scatter than is normal for single aircraft drops.

PLATFORM DRIFT

22. The parachute constant tables for MSPs for heights above 750 feet were produced from only a small quantity of data. The results provided by the second assault, together with a re-examination of early kinetheodolite readings, indicate that the parachute drift of the MSPs dropped in the second assault may have been as high as 22 yards per knot of wind instead of the 17 yards per knot shown in the CARP tables. The Board find that the apparent increased drift of MSPs could have contributed to the stores drop error to the extent of 100 yards along the MBEW vector.

Seventy-Third Witness

DZ MARKING

23. Personnel DZ. The Alpha was positioned 65 yards to the north and 120 yards to the east of the grid reference given in the Operational Order. The acquisition marker was 280 yards north of the Alpha instead of the standard 400 yards. As the release point for personnel was exactly abeam the Alpha, the displacement of the acquisition marker had a negligible effect on the drop result. The northerly error in the position of the Alpha increased the distance between the mean point of impact and the planned point of impact by 65 yards. The lateral displacement of the Alpha caused some personnel to land on the stores DZ.

Seventy-Third Witness  
Twenty-Third Witness

24. Stores DZ. The Juliet was positioned 110 yards west and 22 yards south of the grid reference given in the Operation Order. This lateral error influenced the drop result and caused some platforms to land on the personnel DZ. As there was only 280 yards between the Juliet and the wood to the north of the DZ, the acquisition marker was placed on the bank of the Canal, 360 yards to the north and offset by 55 yards to the east of the planned impact point. As most navigators used this acquisition marker to judge their air release point, its displacement contributed 460 yards to the early error in the drop result. The easterly displacement of the marker also influenced the track of the aircraft over the DZ and probably caused an additional lateral error in the stores drop result.

Seventy-Third Witness  
Twenty-Third Witness

Thirty-First Witness

Twenty-third Witness

Seventy-Third Witness

25. The Placing of the DZ Markings. Planned points of impact for stores and personnel were given in the Operation Order in 6-figure grid references. Their positions on the ground were determined by the pathfinder troop of the Guards Company from features identified by six figure grid references. The errors

Twenty-Eighth Witness

in the positions of the code identifiers were no greater than might have been expected from the method of location used. The lateral errors were additive and reduced the planned separation between the personnel and stores DZs from 660 to 430 yards.

Twenty - Seventh Witness

26. The Planning of the DZ Markings. The calculations by JATE on DZ dimensions are based on a 96% probability of all loads landing within the DZ. In fact, the minimum probability required by paragraph 1, Page 9 of Section 2A of the SOPs is only 85%. The Board find that the planned position of the personnel impact point met the requirement for an 85% probability and did not, therefore, contribute to the error in the personnel drop. The planned position of the point of impact for the stores DZ was, by its grid reference, only 110 yards from the leading edge of the DZ, instead of the required 225 yards for 85% probability. This planning error played some part in the early error of the stores drop, but only for those few aircraft navigators who judged their air release point from the Juliet, rather than its acquisition marker. Even if the point of impact had been planned to give the minimum required clearance of 225 yards, and the Juliet had been accurately positioned, it would still have been only 350 yards from the wood, and it is likely that the Guards Company would still have laid the acquisition marker on the north side of the wood.

Seventy-Third Witness

Twenty-Third Witness

Twenty-Ninth Witness

#### SUMMARY

27. Accepting the determination by JATE of the most likely MEDW, the errors in the drop result may be summarized as follows:

Seventy-Third Witness

a. Personnel Drop. The total mean early error of 359 yards, relative to the Alpha, was caused by:

- (1) A mean early error of 246 yards attributable to strong low-level winds.
- (2) An early error of 95 yards attributable to aircrew aiming error.
- (3) 18 yards early error which is unattributable.

An additional 65 yards early and 120 yards lateral error relative to the planned point of impact was caused by the displacement of the Alpha from its planned position.

SUMMARY continued

27. b. Stores Drop. The total mean early error of 813 yards was caused by:
- (1) A mean early error of 153 yards relative to the Juliet attributable to strong low-level winds.
  - (2) 93 yards longitudinal error attributable to errors in the CARP tables.
  - (3) An early error of 460 yards attributable to the incorrect position of the stores DZ acquisition marker.
  - (4) An early error of 85 yards relative to the Juliet attributable to aircrew aiming error.
  - (5) An error of 22 yards relative to the planned point of impact caused by the displacement of the Juliet from its planned position.
28. The Board recognise that the accuracy of the figures in Paragraph 27 depend wholly upon the accuracy of the JATE determination of a wind of 149/20 kts as the wind most likely to have affected the drop result. A change of one knot in the strength of this wind would vary the figures for wind error, and consequently aircrew aiming error, by 21 yards.

THE ADEQUACY OF AND ADHERENCE TO OPERATION ORDERS, REGULATIONS AND OPERATING PROCEDURES

OPERATION ORDERS

29. Operation Orders were issued by HQUKJATFOR, RAF Lyneham and 1 (Gds) Indep Coy PARA. The Board finds that the grid reference of the stores DZ impact point was incorrect in all 3 of these orders. The orders were adequate in all other respects. The orders were correctly adhered to by all personnel involved in the operation, except for the application of certain regulations contained in HQ 46 Gp SOPs.

REGULATIONS FOR DZ RECONNAISSANCE

30. The regulations for DZ reconnaissance are contained in HQ 46 Gp SOP Vol 1, Sect 2A, Pages 4 - 8. These regulations were complied with as written. The Board finds that the regulations are not adequate in that they do not require the officer conducting the reconnaissance to investigate and confirm that standard DZ markings can be laid. As the largest scale map normally available is 1:50,000, the point

Twenty-Seventh  
Witness

of impact is normally described by 6-figure grid reference, and cannot therefore be defined with sufficient accuracy to ensure that the ground party can lay this marker in the planned position.

REGULATIONS FOR DZ DIMENSIONS

31. These regulations are contained in HQ 46 Gp SOPs Vol 1, Sect 2A. The SOP gives 2 methods of calculating DZ dimensions which is incorrect and confusing. The simplified method described in Paragraph 6 of Page 13 uses the drop factor for the middle of a stick of personnel or stores to produce a rectangular DZ. This method is incorrect both for DZ width and the position of the point of impact; its use results in too great an allowance for undershoot and too little length and width in the overshoot area. The Board, therefore, reject as unusable the JATE calculations for the size and impact point of rectangular DZs. The alternative, and more correct, way of calculating DZ dimensions gives an expanding DZ, which allows a leading edge width and undershoot based on the drop factor for the first load of a stick, and a far end width and overshoot based on the drop factor for the last load of a stick.

Sixty-Eighth Witness

Seventy-Third Witness

32. The correct criteria for calculating the dimensions of the DZ used for the second assault were for an expanding DZ large enough to achieve an 85% overall probability of all loads landing within the DZ, and a 96% overall probability of all loads landing clear of major hazards. The Board accept Case 5 and Case 7 of Annex C of the JATE appreciation (EXHIBIT RR) as closest to the correct criteria, but note that both of these cases are based on a 96% overall probability rather than 85%, which is the minimum permitted by regulations. The Board find, therefore, that the overall DZ dimensions satisfied the correct criteria. Moreover, the comment at Paragraph 11a of Annex C of the JATE appreciation, relating to parallel DZs is not accepted as the evidence that the 96% probability area around the standard DZ was treated correctly as a major hazard to personnel, as required in Section 2A.

Seventy-Third Witness

Sixty-Eighth Witness

33. The planned point of impact for the personnel DZ correctly allowed an 85% probability of all parachutists landing within the DZ and a 96% probability of clearance from major hazards, including the Kiel Canal. The required clearances were 210 yards from the leading edge of the DZ and 270 yards from both the Canal and the wood. The planned clearances were 220 yards from the leading edge of the DZ, 420 yards from the Canal and 355 yards from the

wood. The planned point of impact for the stores DZ did not meet the 85% probability requirement. The planned position of the impact point was only 110 yards from the leading edge of the DZ, when the minimum distance to give an 85% probability of success was 225 yards.

REGULATIONS FOR DZ LAYOUT

34. These regulations are contained in HQ 46 Gp SOPs, Vol 1 Sect 20, Pages 7 - 9. All markers described in the SOP were laid, but were not at the correct distances from the code identifiers. The Board notes that, apart from Note 1 on Page 9, there is no emphasis in the regulations on the need to lay markers at precise distances so that aircrew may use them to assess ground ranges. Nor is the warning at Note 2 on Page 9 that the ground markers should be omitted if they cannot be laid at the correct distance expressed clearly enough.

Twenty-Third Witness

35. From the evidence it is apparent that, in the mutual training and liaison between aircrews and the Guards Company before the Exercise, little emphasis was placed on the need for aircrew to use the markers for judging their range from the point of impact. The Guards Company was left with the impression that the primary consideration was that the markers should be laid so that they would be clearly visible to the aircrew.

Thirty-Second Witness

Sixty-Fourth Witness

36. There appear to be 3 different popular names for the acquisition marker, which is also called the early marker, and the approach marker. Recent attention to the development of acquisition lights lends support to the name acquisition marker, but this name tends to obscure the importance of this marker to aircrew as an aid to judging distance. In fact, for the second assault of Exercise BOLD GUARD, this misconception led to the Tactical Acquisition Light for the personnel DZ completely replacing the standard acquisition marker, instead of supplementing it, as had been the intention. On the stores DZ, the emphasis on acquisition was also foremost in the minds of the pathfinder troop of the Guards Company, who saw nothing wrong in laying the stores DZ acquisition marker 903 yards from the Juliet.

Thirty-Third Witness

Twenty-Eighth Witness

Sixty-Third Witness

Thirty-First Witness

Twenty-Eighth Witness

REGULATIONS FOR THE DZ SAFETY OFFICER

37. These regulations are contained in HQ 46 Gp SOP, Vol 1, Sect 2B, Pages 1 - 5. The regulations attempt to cover all possible parachute operations with particular emphasis on training. As written, the regulations are not appropriate for JAFFOR exercises or operations, where many of the specific responsibilities of the DZSO are allocated by the directive of Comd 16 Para Bde to the Army party marking the DZ. Other of these responsibilities are undertaken by the air staff planners. Nevertheless, responsibility for the overall safety of the DZ for the second assault remained with the RAF DZSOs. In particular they were required to ensure that the DZ markings were laid according to SOPs. Because [REDACTED] and [REDACTED] both accepted a non-standard position for the stores DZ acquisition marker at Osterrade DZ, they failed to comply with the regulations describing the responsibilities of DZSOs.

MEASUREMENT OF THE CALCULATED AIR RELEASE POINT

38. The air release points for the second assault were calculated from tables in HQ 46 Gp SOP, Vol 4. These tables were used correctly by aircraft navigators. The accuracy of the parachute drift figures for parachutists is not in doubt, but, from the results of the stores drop, it has been deduced that the figures given for reefed-mains extracted MSPs are not accurate.

Seventy-Third Witness

EXTENT OF LOSS OF LIFE AND CAUSE,  
TIME AND PLACE OF DEATH

39. Six Territorial Army Volunteer officers and men lost their lives through accident following a night parachute descent on the second assault of Exercise BOLD GUARD. They landed in the deep water of the Kiel Canal to the north of the OSTERRADE DZ shortly after 2000Z on 11 Sep 74 and were drowned. The men drowned were:

Fifth Witness

Seventy-Fourth Witness

4911816	Captain G MUIR	15 Para (V) Bn
24249254	Officer Cadet J COOPER	Edinburgh University OTC
24246022	Sergeant R C LEASK	15 Para (V) Bn
23695710	Sergeant R TOMKINS	15 Para (V) Bn
24282017	Lance Corporal B BETT	15 Para (V) Bn
24321630	Private E BEACH	4 Para (V) Bn



40. Capt Muir was the first man to jump from the starboard side of the second aircraft in the second wave. His body was recovered from the Canal on 12 Sep 74 together with his equipment. The parachute lift webs were forward over the body, and the rigging lines were normal. The lifejacket was still on the body and although the operating knob had been pulled, the jacket had not inflated. Inspection of the parachute revealed no evidence of canopy damage or malfunction. Inspection of the lifejacket revealed that the screw thread of the gas cylinder was damaged and it could not be screwed fully into the operating head. This has prevented the plunger piercing the gas bottle and inflating the lifejacket. The position of Capt MUIR's equipment indicates that he had partially completed his into water drills.

Sixty-Fifth Witness  
Twenty-Seventh Witness

41. Officer Cadet Cooper was the second man to jump from the starboard side of the second aircraft in the first wave. His body was recovered from the Canal on 12 Sep 74 together with his main parachute, and harness; both harness leg straps were found to be undone. His reserve parachute, helmet and equipment were missing. There was no evidence of parachute malfunction. The life jacket had not been operated, but the gas bottle had not been fully screwed in to the operating head. The position of Officer Cadet COOPER's equipment shows that he had almost completed his into water drills.

Sixty-Fifth Witness  
Twenty-Seventh Witness

42. Sgt LEASK was the first man to jump from the starboard side of the last aircraft in the first wave. His body was recovered from the Canal by a German safety boat on the night of the 11 Sep 74. His parachute harness was still in position but his reserve parachute was missing. The lifejacket had not been operated, but the gas cylinder had not been screwed fully home and the grub screw was loose. The position of Sgt LEASK's equipment indicates that he had almost completed his into water drills.

Sixty-Fifth Witness  
Twenty-Seventh Witness

43. Sgt TONKINS was the first man to jump from the port side of the last aircraft in the first wave. His body was recovered from the Canal on 12 Sep 74. There was no evidence of parachute malfunction. The life jacket was undamaged but had not been operated. Since Sgt TONKINS body and equipment could not be inspected for some time after recovery because of German police restrictions, the extent to which he had completed into water drills cannot be ascertained.

Sixty-Fifth Witness  
Twenty-Seventh Witness

44. L/Cpl BATES was the first man to jump from the port side of the second aircraft in the first wave. His parachute and equipment were recovered on 12 Sep 74 but his body was not found until 19 Sep 74. There was no evidence of parachute malfunction. The life-jacket had been operated but the gas bottle was not

Sixty-Fifth Witness  
Twenty-Seventh Witness

fully screwed into the operating head and the plunger had not pierced the bottle. As L/Cpl BETT had released himself from all his equipment, he had clearly completed his into water drills.

45. Pte BEECH was the second man to jump from the starboard side of the fifth aircraft in the first wave. His body and equipment were recovered on 12 Sep 74. There was no evidence of parachute malfunction. Both of Pte BEECH's arms were wrapped in the rigging lines up to the elbows. The lifejacket operating knob had been pulled but the lifejacket had not inflated because the gas cylinder was not screwed into the operating head. The position of Pte BEECH's equipment shows that he had probably just started his into water drills.

Sixty-Fifth Witness

Twenty-Seventh Witness

46. Although the drowned men may have had little or no warning of landing in water, L/Cpl BETT appears to have fully completed the drills to free himself of his harness and weapons container and inflate his lifejacket. Pte BEECH had taken no action to release his harness or weapons container but had pulled the operating knob of his lifejacket. The others had all completed some part of the necessary actions for landing in water. Sgt LEASK, Sgt TOMKINS and Officer Cadet COOPER appear not to have attempted to inflate their lifejackets. Capt MUIR, L/Cpl BETT and Pte BEECH all appear to have attempted to inflate their lifejackets but, in all these 3 cases, the gas cylinder was found not to have been screwed fully home, with the result that no gas had been released into their lifejackets. Certain items of personal kit were found stowed in the neck stoles of the lifejackets of Sgt LEASK and Officer Cadet COOPER.

Twenty-Seventh  
Witness

47. The Board conclude that all 6 men were drowned because they landed in water with insufficient time to prepare themselves properly for a water landing, and they were unable to remain on the surface long enough to be rescued by the safety boats. In the cases of L/Cpl BETT and Pte BEECH, the lifejackets were serviceable and would have inflated if the gas cylinders had been screwed fully home; a responsibility which devolves upon the parachutist himself. Only in the case of Capt MUIR did the unserviceability of his lifejacket contribute to his death. The gas cylinder of Capt MUIR's lifejacket appeared to be screwed tightly into the operating head, but the screw threads were found to be damaged and had prevented the cylinder from being screwed fully home.

Sixty-Ninth Witness

Twenty-Seventh  
Witness

~~STAFF IN CONFIDENCE~~

STATE OF SERVICABILITY OF EQUIPMENT  
RELEVANT TO LOSS OF LIFE

48. The Board find no evidence of parachute malfunction. The lifejacket worn by Capt BURR was unserviceable. All other equipment relevant to loss of life was serviceable.

49. An inspection carried out by [REDACTED] the request of the Board revealed that the lifejackets used by the parachutists on the second assault were generally of 1950s manufacture and were in a poor state of serviceability. Many had check ties broken or missing, some had frayed operating cables and, on others, the nut securing the operating head to the lifejacket was loose. Of the 50 tested, 4 failed to inflate and 4 inflated only partially. The lifejackets used by the parachutists on the first assault were found to be of more recent manufacture and in a better state of serviceability, although, of the 50 tested, 2 failed to inflate and 2 inflated only partially.

Twenty-Seventh Witness

50. The Board investigated the checking, storage and issue of lifejackets, and found that lifejackets and bottles were properly checked at the Central Ordnance Depot and were serviceable when issued to user units. There was no intentional discrimination between issues to regular and to volunteer battalions. Each life-jacket has a period of one year between specialist checks and each bottle has 6 months. However, during this period, lifejackets and bottles may be issued several times to parachutists to wear during flights and parachute descents. After use, they are returned to sub-unit stores and may be re-issued without specialist check, provided the period between checks has not expired. The Board find a weakness in this system which can result in the issue of unserviceable lifejackets to parachutists.

Sixty-Ninth Witness

Seventieth Witness

LOSS AND DAMAGE TO SERVICE  
EQUIPMENT

51. The Board has called for details from HQs 16 and 44 Para Bdes and PSU RAF Hullavington for loss and damage to service equipment incurred during the second assault. Detailed reports are awaited from HQs 16 and 44 Para Bdes. The report from PSU RAF Hullavington shows a write-off of parachute equipment to be £87,316.55 and for the cost of repair of damaged equipment to be £1071.50. The Board considers that some items such as the loss of green transit bags and the damage to both 66ft supply dropping and P X 4 parachute assemblies could be expected in any major parachute assault but may not be attributable to the inaccurate drop results on the second parachute assault of Exercise BOLD GUARD.

~~STAFF IN CONFIDENCE~~

DETERMINATION OF WHETHER OR NOT SERVICE  
PERSONNEL INVOLVED WERE ON DUTY

52. 15 Para (V) Bn was included in the task organisation for Exercise BOLD GUARD listed in the UKJATFOR exercise operation order. The browned parachutists were all Territorial and Army Volunteer Reserve personnel of 15 Para (V) Bn. Officer Cadet Cooper of Edinburgh University OTC and Pte Beach of A Para (V) Bn were attached to 15 Para (V) Bn for their annual training commitment. All parachutists were under military orders and were on duty at the time of the second assault.

Fifth Witness

53. All RAF personnel participating in the second assault on the ground and in the air were regular serving members of the RAF carrying out their service duty in accordance with the exercise operation order, and were on duty at the time of the second assault.

THE ADEQUACY OF SAFETY PRECAUTIONS

54. In accepting the Osterrade DZ as suitable for the second assault, planning staffs recognized the hazards on and around the personnel DZ. They took the following precautions:

a. The point of impact was selected to give at least a planned 90% overall probability that all parachutists would land clear of the Kiel and Eider Canals.

Sixty-Eighth Witness

b. Safety boats were positioned on both Canals.

Sixty-Seventh Witness

c. Medical, LZ Cicamex and Malfunction Patics were distributed over the area of the DZ to cover all areas where accidents might occur.

First Witness

d. All parachutists were reminded of into water drills during briefings at Hullavington and later by RAF Loadmasters before emplanment.

Sixth Witness  
Ninth Witness  
Eleventh Witness  
Twelfth Witness

[REDACTED]

Sixty-Seventh Witness

55. The DZSO on the personnel LZ was correctly equipped with red vorey signals with which to stop the drop in emergency. He identified the parachutist from the Stream Commander's aircraft who landed close to the Alpha as the fourth man in his stick and concluded that the first man in the stick was likely to be 180 yards north of the Alpha and clear of the Canal.

Twenty-First Witness

From this information he saw no reason to stop the drop by the main stream. He did subsequently stop the drop when HSFs landed on the personnel DZ.

56. In view of the safety measures taken, the hazard of the Kiel Canal was deemed to be adequately covered, as it was supposed that the small number of parachutists who might be expected to land in the water would inflate their lifejackets and could readily be rescued by the safety boats.

Sixth Witness

57. The Board find that the safety precautions were all that were required in planning the exercise, and should have been adequate. In the event, because of the unusual wind structure at the time of the assault, more parachutists landed in the Kiel Canal than could have been foreseen. Two ships passed through and 3 HSPs landed in the Canal during the rescue operations, but there is no real evidence that these events interfered significantly with the work of the safety boats. The Board note that those parachutists whose lifejackets were inflated were rescued.

Twenty-Fifth Witness

Twenty-Fourth Witness

THE PERSONS WHO CONTRIBUTED TO LOADS FALLING OUTSIDE THE DZs

THE PERSONNEL DROP

58. The Board has established that the major part of the error in the result of the personnel drop was caused by an unexpectedly strong wind blowing between the surface and 1,000 feet. Aircrew aiming error and the displacement of the Alpha from its planned position contributed smaller elements to the drop error.

Seventy-Third Witness

59. The Board find that the aircrew errors in height and aiming were within normal limits of accuracy as determined by analysis of past results and find no negligence on the part of the aircrews.

60. The impact point for the personnel DZ was correctly planned. In laying the Alpha, the pathfinder troop of 1 (Gds) Indep Coy PARA, under [redacted] displaced it by 65 yards north and 120 yards east from its planned position. Nevertheless, this location still achieved more than the minimum clearance from the Kiel Canal needed to achieve the required 96% overall probability of all parachutists landing on safe ground. The 120 yards easterly displacement contributed to some parachutists landing on the stores DZ. The displacement of the Alpha was within the limits of accuracy expected from the use of compass bearings from landmarks identified on a 1:50,000 scale map. The Board find no negligence on the part of [redacted]

Twenty-Third Witness

Twenty-Seventh Witness

THE STORES DROP

61. Wind and aircrew aiming error also affected the stores drop. Additional factors which contributed to stores landing outside the DZ were the incorrect selection of the impact point, the displacement of both the Juliet and its acquisition marker from their correct positions, and an error in the CARP tables.

Seventy-Third Witness

62. The aircrew aiming error was within normal limits of accuracy as determined by analysis of past results. The Board find no negligence on the part of the aircrews. The CARP tables for reefed-mains extraction MSPs have been prepared from minimum data, and the suspected underestimation of parachute drift shown in these tables may not be attributed to negligence.

Seventy-Third Witness

63. In his DZ reconnaissance report, [REDACTED] quoted a slightly inaccurate grid reference for the impact point of the stores DZ. [REDACTED] whose duty it was to clear the dimensions of the Osterrade DZ, approved the proposed position of the impact point although it was less than the distance from the leading edge of the DZ required to achieve an 85% probability that all MSPs would land within the DZ. Furthermore, this impact point was only 240 yards south of the wood, a distance that was not only less than the 295 yards clearance required from a major hazard, but which also prevented the laying of the acquisition marker in the standard position. The problem of laying the acquisition marker was noticed by [REDACTED] who included it in a report, on his own reconnaissance, to HQ 40 Gp. Although other parts of [REDACTED] letter received attention the problem of the stores DZ acquisition marker remained unsolved. It was not taken up by [REDACTED] who was responsible for detailed air staff planning, nor was it raised again by [REDACTED].

Twenty-Seventh Witness

Sixty-Eighth Witness

Seventy-Second Witness

Sixty-Third Witness

Seventy-First Witness

Sixty-Fourth Witness

[REDACTED] Orders for [REDACTED] pathfinder troop were included in an Air Instruction issued by 1 (Gd) Indep Coy PARA dated 6 Sep 74, which quoted the planned position of the stores DZ impact point. The grid reference of this point had remained unchanged from the original reconnaissance report. The pathfinder troop laid the Juliett at the given grid reference within normal limits of error, but it was, in fact, displaced by 110 yards to the west of the planned point. The acquisition marker could not be laid at the standard distance of 400 yards because of the wood, and it was located on the bank of the Canal 213 yards north of the Juliet. [REDACTED]

Twenty-Third Witness

Twenty-Ninth Witness

Twenty-Second Witness

[REDACTED] who was directly responsible for safety on the stores DZ, and his superior officer, [REDACTED] who had overall responsibility for DZ safety at Osterrade, agreed to the location of the Juliet and its acquisition marker. [REDACTED] believed the acquisition marker to be 600 yards from the Juliet, whilst [REDACTED] appears to have considered the distance from the Juliet as unimportant because he thought the acquisition marker would not be seen among

Twenty-First Witness

Thirty-First Witness

the electric lights along the Canal bank from the aircraft.

64. [REDACTED] for ensuring that the DZ markings at Osterrade were laid in accordance with HQ 46 Gp SOPs [REDACTED]

Twenty-First Witness

[REDACTED] was negligent in that:

a. [REDACTED] the acquisition marker for the stores DZ could be laid in a non-standard position, contrary to SOPs.

b. [REDACTED] the irregularity of the DZ markings.

65. [REDACTED]  
[REDACTED]  
[REDACTED] negligence to be culpable.

66. [REDACTED] was faced with the problem of positioning the stores DZ acquisition marker just prior to the assault. The problem had been recognized some months before and could have been resolved by staff action. [REDACTED]

Moreover, even if this marker had been located in the right position, the combination of wind and aircrew aiming error would still have caused many of the ISPs to fall in the wood. The Board recognizes in mitigation of [REDACTED] negligence that a situation had been created by planning and development [REDACTED]

67. [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

Twenty-Second Witness

68. [REDACTED]  
to ensure the safety of the stores DZ. He accepted the position at which the Juliet was laid in good faith because as the Juliet had been laid 110 yards east of its planned position, it was 320 yards from the nearest point of the wood and appeared to allow safe clearance from the wood. The Board therefore find that his negligence concerning the position of the point of impact was excusable.

[REDACTED] his negligence was culpable, [REDACTED]

69. The Board consider that the same mitigating circumstances apply to [REDACTED]

70. [REDACTED]

Sixty-Eighth Witness

71. [REDACTED]

The Board finds his negligence excusable.

72. The mistake made by [REDACTED] affected only those MSPs dropped from aircraft whose navigators judged their release point from the Juliet. In mitigation, the Board recognize that [REDACTED] checked all other dimensions of the Osterrade DZ correctly, and knew that the stores impact point had to be located as far to the north as possible to avoid conflict between the southern ends of the stores and personnel DZs. Moreover, he had some justification for assuming that the DZSO would ensure the required safe distance between the Juliet and the southern edge of the wood.



73.

Seventy-First Witness

[REDACTED]

[REDACTED]

Seventy-Second Witness

The Board find that [REDACTED] misunderstood an aspect of his responsibilities but was not negligent.

PERSONS WHO CAUSED OR CONTRIBUTED TO LOSS OF LIFE

74. The Board find that no person or persons contributed by negligence to the accidental deaths of the six parachutists.

PERSONS WHO CAUSED OR CONTRIBUTED TO THE LOSS OR DAMAGE OF SERVICE EQUIPMENT

75. The Board find that no single act of any individual person negligently caused loss or damage of service equipment, but that the negligence of [REDACTED] and [REDACTED] contributed to loss and damage. The Board, however, conclude that, without the negligence of these [REDACTED] officers, the cumulative effect of the drop errors caused by wind conditions, aircrew aiming and the CARP tables would, in all likelihood, have resulted in similar loss and damage to service equipment.

Seventy-Third Witness

THE EXTENT OF DAMAGE TO CIVILIAN PROPERTY

76. The extent of damage to civilian property caused by loads falling outside the Osterrade DZ during the second assault has not yet been precisely determined. The Board have requested that details be forwarded by

Seventy-Fourth Witness

the Claims Commission when accurate figures are available to them. From provisional information given to the Board in COMLANDJUT Signal 5160-25/G-4/BF of 040940Z Oct, field damage costs are estimated at DM 110,000 and canal administration costs are estimated at DM 20,000.

RECOMMENDATIONS

77. The Board recommend that:

a. ~~\_\_\_\_\_~~

b.

78. The Board also recommend that sections of HQ 46 Gp SOPs be rewritten in the following respects:

a. Duties of DZSOs. The responsibilities of DZSOs described in Section 2B are too broad, attempting to cover all types of parachuting operations. The duties of RAF DZSOs should be defined more clearly for exercises and operations when Army pathfinder elements are employed to lay DZ markings.

b. Duties of Army Pathfinders. The responsibilities of Army pathfinder elements should be jointly agreed between Army and RAF staffs, and described in Section 2B and appropriate Army orders.

c. DZ Markings. The warnings in Section 2C that acquisition and side markers must be placed at the fixed distances from the code identifier or must be omitted are poorly expressed. This Section should describe the importance of the markers to aircrew as guides to ground distances, and should include a requirement for any irregularity in DZ markings to be notified to the aircrew before the drop.

d. The Acquisition Marker. This term should be dropped. It encourages too much emphasis on the use of the marker for DZ acquisition and too little on its use by aircrew for alignment and judgment of distance. Of the several common terms for this marker, "early marker" is most frequently used and is least confusing. The term "early marker" should be adopted as standard.

e. DZ Reconnaissance Reports. Precise orders should be written for officers conducting DZ reconnaissances. They should include the need to confirm map accuracy for later use by ground parties, the need to report any features which might affect the layout of standard markings, and a requirement to quote compass bearings and distances from ground features as well as grid references to fix impact points.

f. DZ Dimensions. Section 2A should be rewritten to remove the ambiguity arising from the two methods of calculation of DZ dimensions. The calculations relating to rectangular DZs should be deleted.

79. The Board further recommends that:

a. Staff Planning. The division of planning responsibilities for DZ layout and marking between air and army staffs should be clearly defined.

b. Mean Effective Drop Wind. For stream assault exercises some precaution should be taken against unusual wind conditions. The Stream Commander's drop result should be passed to him so that his broadcast MEDW can be amended if necessary before being used by the main elements of the stream.

c. Setter Factor. The Joint Air Transport Establishment should be tasked to investigate the effects of stream formation drop techniques on load scatter.

d. Early Release. Emphasis should be given in transport support training to the measured tendency for navigators to make early release errors, and efforts should be made to eliminate this tendency.

e. DZ Wind Finding. The use of balloon ascents to measure the MEDW should be considered as a measure to improve the accuracy of major stream parachuting exercises.

f. Safety Equipment. Parachutists' lifejackets should be checked by qualified safety equipment workers before each parachute descent, and should be issued to each parachutist with his parachute.

OBSERVATIONS

80. The Board record their appreciation of the co-operation and help given to them by the officers of HQLANDJUT and German Territorial Command Schleswig-Holstein, which greatly facilitated their investigations

81. The Board observe that there is a lack of data on the results of major stream parachute assaults and note that a large amount of valuable information could be gleaned from analysis of future JATFOR exercises.

Signature of  
President

\_\_\_\_\_

Members



\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date *17 Oct 1954*

27. Remarks of Group Commander/Convening Officer (Army)

File Ref No. ....

The Board is to be commended for the despatch and thoroughness with which they have conducted their extensive enquiries into this lamentable affair. The Board has complied fully with its TOR with the exception of precise statements of damage to civil property, details of which are awaited from the Claims Commission.

From the evidence adduced, the Board have correctly established the sequence of events which led to both the fatalities and damage to equipment and property. But of greater importance, the cause of both has been precisely established. In addition, the Board make a number of recommendations, with which I agree in general, on certain measures which need to be taken to reduce the probability of similar errors being made again. However, in the course of this process errors of omission and commission on the part of certain individuals have been identified and blame attached.

The Board find that three individuals have been negligent. In the case of two, their negligence has been held to be culpable whilst the negligence of the third has been judged to be excusable. The distinctions between these degrees are in my judgement of the circumstances surrounding the accident, difficult to define with precision and justice. However, the Board have, in reaching their findings on this issue, been heavily and rightly influenced by the guidance set out in AP3265 but acknowledge mitigating circumstances to reduce the degree of culpability.

Exercise Bold Guard was a large and complex exercise involving many thousands of participants of several different nationalities, but despite the fatalities and damage, the participation of the UKJAFOR in it was highly successful. Indeed, the proceedings of the Board vindicate and validate both the concept, the tactics and our operational procedures. It is regrettable therefore that in seeking to establish the cause of the accident, the proceedings give the impression that much more went wrong than was actually the case. The Summary set out in the findings at Paras 27 and 28 derived, of course, from sworn evidence, makes it clear that by far the largest element of error in the early drop of personnel was caused by a totally unpredicted and unforeseeable variation between the calculated and actual mean effective wind at low-level used for the drop. Nobody can be blamed for this but as a result of it 15 men landed in the Kiel Canal. The same wind also affected the stores drop but here the error was compounded by the confusion over the placing of the early marker; but men did not die as a result of this and this needs to be weighed in the balance when making the judgement on the culpability of the three men held by the Board to have been negligent. Culpability is not of course affected by whether or not fatalities are involved but it needs to be clearly understood that even if both DZs had been accurately marked, such was the unforeseen strength of wind affecting the personnel drop, that men would still have landed in the water.

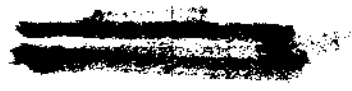
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Commanding .....



Certified True Copy



BOARD OF INQUIRY RE-OPENED ON 12 NOV 74

INTO CIRCUMSTANCES OF SECOND PARACHUTE

ASSAULT OF EXERCISE BOLD GUARD ON 11 SEP 74

LIST OF FURTHER EXHIBITS

- NW Extract of 44 Para (V) Bde Air Standing Orders
- XX Parachuting Records of 15 Para (V) Bn
- YY Summary of Experience of Personnel who landed in the Kiel Canal during the second parachute assault of Exercise BOLD GUARD.



RECONSIDERATION OF FINDINGS

THE CIRCUMSTANCES OF THE SECOND ASSAULT OF  
EXERCISE BOLD GUARD ON 11 SEPTEMBER 1974

1. State of Training of TA & VR Personnel.

15 Para (V) Bn provided the bulk of the personnel dropped on the second assault. The experience level of the troops who landed in the canal is broadly representative of the experience level of the whole battalion. The training records of these troops show that many had considerable experience, some had completed at least one descent during 1974 and some had completed as many as 3 descents. A large amount of air effort was allocated to 15 Para Bn during 1974 for parachuting and in the 3 years preceding Exercise BOLD GUARD the battalion had completed an average of 2,200 descents each year. The Board consider that the state of training of 15 Para (V) Bn was good.

Sixth Witness

2. The Forecasting of Wind Conditions.

Although the evidence of German Meteorological Officers indicates that inversions and the stronger low level winds associated with them occur often in the Schleswig area in Autumn (EXHIBIT CC) they were probably unaware of the special significance of the phenomenon in respect of parachuting operations, nor would it appear to be sufficiently extraordinary to require mention during discussions that were held during the planning stage of the exercise. The forecasting of wind profiles in shallow inversions is inexact and would be of little value because, due to the time that elapses between preparation of DZ forecasts and drop times, the parachuting winds must be calculated on winds measured at the time and

Sixty-Second  
Witness

Page 195

place of the drop. In the circumstances of the second assault, even if the drop forecast had indicated a possibility of strong low level winds associated with a shallow inversion the aircrew were in no position to allow for the existence of such a wind which at best would be based on suppositions graded many hours before the drop and not subject to precise measurement at the time of drop.

THE REASONS WHY PART OF THE LOADS FELL OUTSIDE  
THE DZ

3. Planned Drop Height. The Board finds no confliction between the evidence of the Twenty-Seventh and Sixty-Eighth Witnesses concerning the height at which the drop was planned. The normal practice in planning DZs for the JATFOR use is to assume the criteria applicable to the

Twenty-Seventh  
Witness

Sixty-Eighth  
Witness

Regular Army Parachute Brigade. If, at a later stage of planning it is known that TA & VR personnel are to be dropped, DZ dimensions are re-checked for any appropriate change in drop height. Moreover, in ratifying the DZ reconnaissance reports HQ 46 Group approve the DZ for the highest drop height that can be accommodated by the DZ dimensions. The Osterrade DZ, although initially reconnoitred for suitability for a drop from 750 feet was ratified by Tac Ops Mov HQ 46 Group for use from 1000 feet and its suitability for 1000 feet was rechecked immediately before the second assault, when the drop height was finally resolved.

COMPLIANCE WITH REGULATIONS

Page 196

4. Qualifications for Parachuting. The Board have studied the regulations governing the qualifications required by TA & VR personnel to participate in exercise parachute descents (EXHIBIT WW). There is some ambiguity in the regulations relating to night parachute descents with equipment which might be interpreted to require a parachutist to have previously completed a descent with equipment by day from the same type of aircraft. The practice of permitting parachutists to carry out their first equipment descent at night on an exercise, under unit supervision is approved by HQ 44 Bd. The Board finds that the regulations as interpreted by the controlling formation were complied with.


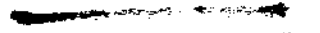
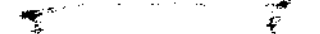


Sixth Witness

Seventy-Fifth Witness

5. Regulations Concerning the Use of Lifejackets. The Military Parachutists Manual includes regulations requiring the stole of the lifejacket to be partially inflated orally before any descent planned to enter into water. There is no such regulation applying to descents planned onto a land DZ in the vicinity of water where entry into water would constitute an emergency for which there are appropriate emergency rules.

Twenty-Seventh Witness

Signatures:

, President  
  
  
  
 } Members

~~STAFF IN CONFIDENCE~~

FURTHER REMARKS BY GROUP COMMANDER

1. The reconvened Board of Inquiry, less certain members whose recall was impractical, has completed its investigation of particular questions posed by HQSTC in further clarification of the circumstances of the second parachute assault on Exercise BOLD GUARD. From this additional evidence, the Board has reached additional findings to the original proceedings and I agree with the conclusions reached. In particular, I most strongly endorse the views expressed on the forecasting of wind conditions. Even if all concerned had been expressly and precisely warned beforehand of a risk of shallow inversions, due to the time lapse between compilation of a forecast and 'P' Hour, the mean effective dropping wind used by the Stream would still have been an interpolation of measured surface wind and the wind found by crews at dropping height. Furthermore, until some tactically sound method, at acceptable cost, can be developed to measure actual wind speed and direction between ground level and dropping height, the mean effective wind used to establish a correct CARP will remain a calculation rather than a measured observation.
2. Nothing in these additional findings invalidates or changes the sense of my remarks on the original proceedings.



N E HOAD  
Air Vice Marshal  
Air Officer Commanding 46 Group

14th November 1974

~~STAFF IN CONFIDENCE~~

~~STAFF IN CONFIDENCE~~  
~~\*CONFIDENTIAL/SECRET~~

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File Ref No. ....

28. Forwarding Remarks of Commander-in-Chief/Higher Formation Commander

Signature.....

Command

Date.....

~~\*SECRET/CONFIDENTIAL~~

~~STAFF IN CONFIDENCE~~

FORWARDING REMARKS BY THE AIR OFFICER COMMANDING IN CHIEF

1. Military parachuting is an acknowledged high risk occupation. To minimise the risks involved the Royal Air Force has laid down carefully compiled parameters (46 Gp SOP Vol 1 Section 24) which are followed in the planning, mounting and execution of airborne assault exercises. Both the personnel and stores Dropping Zones (DZ) for the second assault of Exercise BOLD GUARD had been decided upon only after the most exhaustive search for a suitable site within the exercise area. Those chosen were the best available; they met the planning criteria and were the only ones which could have accepted the planned numbers of personnel and stores required for a Battalion assault. The alternative would have been to reduce the size of the dropping force or to have withdrawn the second assault from this major NATO exercise and thus to have denied ourselves the rare opportunity of practising a Priority 1 Contingency Plan.

2. Due to the involvement of the regular parachute Battalion in Northern Ireland the personnel involved in this second assault included a high percentage of T & AVR. Their state of training in particular, and the minimum standards of training laid down by the Army, have been investigated. The Board found this to have been good for 15 Para (V) Bn and stated that the regulations as interpreted by the controlling authority were complied with. However, I consider that the Army Department should be invited to comment upon the standards of safety equipment maintenance and usage.

3. DZ criteria require that the dimensions of exercise DZs are such that the probability of all men and stores landing on the DZ proper is not less than 85% overall with a 90% overall probability of all men and stores landing within an area containing no major hazard. Implicit in this is the statistical expectation that some 15% of personnel and loads will land outside the DZ boundaries. Of this figure 4% can be expected to land amongst major hazards such as woods, roads, and water obstacles which might border upon the DZ. This 4% overall probability figure translates to a 2% linear probability which in this case meant that 2% could have been expected to encounter a hazard either short of or beyond the DZ. With the Kiel and Eider Canals situated as they were in the immediate undershoot and overshoot areas respectively of the selected DZ, major hazards were present into which it was highly probable that some troops were going to descend. Of the 550 men dropped 40/51 should have anticipated encountering these hazards, whereas in fact 35 did.

4. The factors which contributed to the cumulative inaccuracies of the drop are:

- a. The inability of the DZ party to lay the markers exactly in accordance with the requirements of the Operations Order. No allowance is made for such inaccuracies when calculating the DZ size. JAGM will be tasked to investigate this aspect of DZ marking and to determine what allowance, if any, is acceptable.
- b. The failure to warn airmen that the acquisition marker for the stores DZ was laid at a non-standard distance. Consequently navigators who made use of this marker to measure distances made gross aiming errors.
- c.

c. Aiming inaccuracies by aircrew. On analysis by JATE these are concluded to have been within normal and acceptable limits.

d. The presence of a low level jet stream associated with an inversion. The Mean Equivalent Drop Wind (MEDW) on which Computed Air Release Point (CARP) aiming calculations are based is derived from knowledge of the surface W/V (passed by the DZ party) and the Drop Height wind (obtained from the aircraft's Doppler). Application of an accepted formula gave a correctly calculated MEDW of 120<sup>0</sup>/15 kts. Subsequent calculations by JATE based on meteorological observations and the estimated low level wind profile gave a MEDW of 149<sup>0</sup>/20 kts. The overall effect of this difference in both direction and speed would be to aggravate any errors in the direction of the Kiel Canal. The Board rightly concludes that this wind effect was the largest contributory factor to the drop inaccuracy, but state that its existence and effect could not have been more accurately forecast, and in these circumstances the aircrews could not have made any allowance for it.

e. Inadequacies in the drop data for the Medium Stressed Platforms (MSFs). The Reefed Main system for MSFs has been developed as a low level technique (750' AGL) compared with the Extractor Retarder System which has a drop height of 1200' AGL. As the paratroops involved on this assault were T & AVR personnel they had to be dropped from 1000' AGL and so, therefore, did the platforms. Measured results on which the dropping data for 1000' is based are sparse; such data is now considered by JATE to be inaccurate and it is being reviewed.

5. In summary, there was a number of minor errors and omissions on the part of individuals none of which can be said to have been solely responsible for the tragedy. The troops involved were trained to the required standards and with some minor and uncritical exceptions the rules were followed and all required safety precautions were observed.

it is believed there is scope for possible improvement in our practice and staff action will be taken to ensure that these are re-examined immediately and the Army Department may wish to comment on the safety equipment aspects.

6. The Board found that  and  were culpably negligent. It cannot be emphasised too strongly however, that their negligence contributed in no way to the unfortunate deaths of the paratroopers; the culpable failings of these two officers were solely in relation to the markings of the Stores DZ and had nothing to do with the errors in the personnel drop. I agree with the  remarks about the degree of pressure which these officers have undergone already and I therefore consider that formal disciplinary action would be inappropriate.

DONALD SCALING  
Air Chief Marshal  
Air Officer Commanding in Chief

2314 November 1974