

REPORT OF THE BOARD OF INQUIRY INTO THE LOSS OF

HMS COVENTRY

25th MAY 1982

National archives DEFE 69/1336



HMS Coventry D118 website: www.hmscoventry.co.uk

HMS Coventry D118 group: facebook.com/groups/coventry.d118

HMS Coventry Association: facebook.com/groups/hmscoventryd118

Type 42 Association: www.facebook.com/groups/TYPE42A

South Atlantic Medal Association: sama82.org.uk

Combat Stress: combatstress.org.uk

SECRET*Minutes and Brief Details of Enclosures*M 1

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 VCNS
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 2-28
 1-81
 Minister(AF)

Clas.

Enc.
No.

This submission invites the Admiralty Board to take note of CINCFLEET's report and the Board of Inquiry proceedings on the loss of HMS COVENTRY on 25 May, placed opposite. The reports have separately been fed into the Lessons Learnt studies for the main analysis of Falklands experience, and this submission chiefly summarises main action in train.

Narrative

2. See Flags A-P. COVENTRY was generally well-prepared for war and a confident ship, though not well practised against low-level air attacks off land; training on passage was restricted by tight EMCON policy. On 1 May she entered the TEZ and was soon engaged controlling Sea Harriers against air attacks. From 6-9 May she engaged in bombardment near Port Stanley and interception of Argentinian aircraft, destroying a Puma with Sea Dart and possibly two other aircraft (collided avoiding Sea Dart). She established a close working relationship in a 'Type 42/22 combination' with BROADSWORD, the latter operating as 'goalkeeper'. After a period on air defence of the Carrier Group, on 22 May (the day after the San Carlos landing) she was ordered with BROADSWORD to mount AAW patrol off West Falkland, as an aggressive measure to intercept enemy aircraft in a 'missile trap' and (particularly from 24 May) to provide good AAW picture for San Carlos. On 24 May both ships controlled Sea Harriers with significant success and provided good AAW picture.

3. On 25 May, a clear day, COVENTRY was in good shape and well rested, having by experience found she was able to do most of her operations in Defence Watches, with a good routine for Red warnings. The patrol line, some 10 miles off Pebble Island, was a balance between weapon capability, CAP control, her communications task and expected enemy operations; risks were appreciated and accepted. About 1230Z she shot down one aircraft with Sea Dart, and another at 1530Z (possibly a third).

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4. At 1700Z intelligence reported a further raid, which was detected on radar at 1745Z at 160 miles. Because her position was probably compromised by the 1530Z incident, COVENTRY went to Action Stations about 1800Z, with control of 2 CAP aircraft. Two pairs of Skyhawk/Mirage, detected by BROADSWORD, came in very low over Pebble Island about 1820Z (sketch Red Tab 6). COVENTRY was fully ready, but firm 992 contact was not established until the first pair were clear of land. CAP was within 3 miles but was hauled off when Sea Dart was believed to have acquired; it had not, but the aircraft were engaged by gunfire and turned off towards BROADSWORD (hit by a bomb which passed through her without exploding). COVENTRY engaged the second pair 90 seconds later with Sea Dart, which had not locked on, and by gunfire. At this moment due to rapid manoeuvring, BROADSWORD was down-threat. COVENTRY was hit by cannon fire and by 3 bombs (Blue Tab 2). One of which did not explode. One exploded in conversion machinery room, which put all weapon, sensors and communication systems out of action. The other bomb exploded in the forward engine room, and there was large underwater damage. Photographs Blue Tabs 5 and 6.

5. Within 10-15 minutes there was rapid flooding, which could not have been controlled, and the ship began to heel over. Broadcast had been lost, but evacuation and abandon ship was obvious and spontaneous, well-controlled locally, and conducted with coolness and discipline and several instances of heroism. 19 men died, 2 of them on leaving the ship (one an officer who hit an obstruction, one a Chinese with a heart-pacer). There were difficulties with survival suits and (because of the list) in launching rafts. Rescue was swift by BROADSWORD and helicopters from RFA PORT AUSTIN, the men spending some 15 minutes in the water and rafts.

Board of Inquiry Proceedings

6. Main Conclusions Flag G, detailed conclusions and recommendations Flags H and J. COVENTRY was inadequately trained in inshore AAW and massive damage situations but better than most. She was properly employed at the time, at known risk. With hindsight there were errors in handling the final engagement, but it would have needed faultless handling to have materially affected the outcome. Q13 (Flag G) points to major issues to be resolved, related to low-level short range 'pop up' attack, improvement to Sea Dart, close range defence and ship construction.

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- b. Hardware and Software Modifications. CINCFLEET recommendations (Annex A para 3) are agreed. Although some of the changes are minor, overall implications warrant close study, bearing in mind that computer store capacity is already on the limits and that additional software may be expensive.
- c. Inshore Air Defence Training (CINCFLEET para 3)
- (1) Inshore air defence is clearly required in the NATO context. Training in this environment is therefore important and should be given more priority. However, shortcomings in our ships inshore were largely due to equipment limitations (eg. poor overland radar capability, over-long GWS 30 reaction time, slow and inaccurate visual Target Indication and lack of PDS in the Type 42). Work is in hand to overcome these limitations. Better training in the inshore environment may well ameliorate the situation; but until equipments are fitted which can operate effectively close inshore, the current vulnerability of our ships in such an environment will undoubtedly remain high.
- (2) It is doubtful that additional ship time could be made available purely for inshore air defence training, but the Naval Staff would wholeheartedly support an increase in overall weapon training time. Practice allowances are maximised as far as current LTCs allow; increases would necessitate a reduction elsewhere in the NTH. A requirement for a low level target has been identified in DNW's "AAW Threat Simulation and Target Facilities Policy Paper" which is shortly to be presented to the FRC. If such a target is procured, numbers will necessarily be limited and a balance will have to be struck between low level short range firings of benefit mainly to Weapon System crews, and higher level longer range firings of more benefit to the whole Command team. Provision of a range where firing towards or over land may be carried out will be difficult due to safety criteria - the land would almost certainly have to be uninhabited.
- /d.

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CINCPLEET's Report

7. CINCPLEET generally agrees the findings. He notes that this was COVENTRY's first direct attack, and agrees that only faultless handling would have made a difference. He points to the requirement for more ship-time and assets for inshore air defence; and to the vulnerability of Type 42 to surprise attack and need for PD missile system and guns. He refers to the need to balance strict EMCON policy against better effectiveness of weapon systems; and remarks that, given the damage, capsizing was predictable. He attaches specific advice on main follow-up action.

Advice of MOD Staffs

8. The Naval Staff advise that :

a. Vulnerability to Surprise Attack (CINCPLEET para 4)

(1) The slow reaction time of the GWS 30 system has been well known for some years, but the cancellation of GWS 31 and the STIR radar following Cd.8288 in 1981 effectively stopped any hopes of reducing this time. Action is being taken to give the Type 42s a new TI radar (Type 996(2)) with automatic track extraction, and possibly a height finding capability. It is hoped to introduce this radar from 1985, with a consequent improvement in GWS 30 reaction time.

(2) The late 'pop up' facility is being introduced, in the short term, under the heading of ADAWS 4 Edition 30.

(3) The need for the Type 42 to have a Point Defence System was identified in the mid 1970s, and a proposal to fit Seawolf at the expense of the 4.5" gun and the after 909 director was forwarded to the FRC in 1978 and 1979. This proposal was discarded as too demanding on dockyard resources and loss of operational time for the ships. An urgent study is now being undertaken on a possible CIWS fit: Vulcan Phalanx for Batches 1 and 2, Seaguard for Batch 3. The OCSG Phase III has already reported that it will be possible to fit Vulcan Phalanx in the Type 42 during a weapon update period.

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No.9. DG Ships advises that:

- a. The conclusions and recommendations of the proceedings are included in the Lessons Learned which are receiving attention within the Ship Department.
- b. The need for improved education and more readily assimilated information on stability has been identified by other Boards of Inquiry and by the DSAC Working Party. Ship Department will collaborate with Captain NBCD and others to effect improvements, via DNW's Navy Department NBCD Committee structure, which includes the Ship Defence Panel and the Damage Control Working Party.
- c. Action is being taken on Damage Control communications in the Type 23, and improvements for existing classes are under consideration. (CINCFLEET Annex A para 8).
- d. The provision of extra or alternative stowages for life rafts is under investigation but no simple solution is apparent. (CINCFLEET Annex A para 9).
- e. The implementation of A & A 175 to make all the 2 deck bulkheads in the Type 42s water and gas tight is being implemented at MRPs as a matter of urgency.

10. DGST(N) advises that:

- a. The design of the survival suit is being examined, and it seems feasible to incorporate drain valves in the feet. Design work is being initiated with a view to producing a new specification. (Proceedings para 156b).

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- d. Survival training will to some extent be facilitated by the use of the mobile survival classroom which is due in service shortly. A review of survival training and training aids is being undertaken. (Proceedings para 155).
- e. Those Damage Control aspects which have a bearing on the distribution of personnel (and thus the Quarter Bills) are being reviewed by DNW NBCD Committees. (Proceedings para 106 and Annex F para 10).

Recommendation

12. The Admiralty Board is invited to take note of CINCFLEET's report and the Board of Inquiry proceedings.

13. The question of a final submission will be considered in due course. Press enquiries are being handled on the same lines as for HMS SHEPPFIELD.

14. Advance copies of this minute go to Sec.VCNS, Sec.CPS, Sec.CofN, Sec.2 SL, Sec.1 SL and PS/Minister(AP). Copies also go to PS/SofS, PS/Minister(DP), PS/USofS(DP), PS/USofS(AP), PS/CER, AUS(NS), AUS(NP), AUS(PS) and AUS(Mat N).

15. In view of security and sensitivity this docket and all copies of the minute have access sheets: access must be limited to strict need-to-know, and papers must be passed under Exclusive cover.

16. Summary of Falklands awards for COVENTRY placed opposite.



T.M.P. STEVENS
Head of NLC
NA 218 7584MB.

22 October 1982

M2

Noted

3. 25/10

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MOD Form 1M

Minute Sheet No. 4

Reference D/NLC/1/9/80/1

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- b. Implementation of the Recommendation on the basic rig at Action Stations falls outside the DGST(N) area. It is known, however that Captain NBCD and DNW accept the principle that protection against flash and heat, and to some extent flame, can be improved by wearing layers of clothing, and undoubtedly this will be incorporated in the NBCD Manual, BR 2170 for future application. (Proceedings para 158a).
- c. The Personal Protection Panel of the NBCD Committee have accepted the recommendation that a coverall-type garment in flame-resistant material should be provided for wear in action, and that to ensure its good condition when so worn it should be broken-out of a sealed package only in war. To enable fires to be fought at other times flame-resistant coveralls and No 8 shirts and trousers are proposed. The full proposals are being formulated for submission to the Admiralty Board for approval. (Proceedings para 158b).

11. DGNMT advises that:

- a. He supports CINCFLEET's recommendations about training in damage control, ship stability and survival (CINCFLEET Annex paras 6,7 and 10).
- b. On operational performance standards for GWS 30, a review of OPS and TPS may indicate the need to upgrade the complement, with possible implications on ship accommodation and on rating structure. (Proceedings para 140a and b).
- c. The provision of onboard training equipment for both existing and future ships is being actively pursued by the NSTG. (Proceedings para 140c).

/d.

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CFS
2SL ← C9N.
1SL
Min(AF)

1. Noted. HMS COVENTRY's role on 25 May required acceptance of risk from low air attack and her equipment characteristics made detection of raids approaching from landward difficult. A combination of tactical decisions, understandable in the circumstances, and equipment failures led to the final raids not being engaged. The damage suffered was catastrophic and no damage control measures could have saved the ship. The ship's company behaved well.

2. Action on the recommendations made by the CinC Fleet is in hand. Modifications to improve GWS 30 reaction time are being considered for introduction post 1985. Both material improvements in close range AAW capability and training in their effective use, especially when operating inshore, are of high priority. The lessons of this engagement are applicable to operations in the NATO area.

4 Nov 82

Russ
VCNS

M4

Noted

17 Nov 82

JMK
CFS

M5

1. Noted

2. I confirm that the recommendations of the report, as they apply to the Ship & Weapons Departments, together with the recommendations of the Marine Technology Board are under active consideration.

LSB

24. XI. 82

HMS NELSON
Portsmouth
Hants

00520/5.X

The Commander-in-Chief Fleet
Northwood
Middlesex

9 August 1982

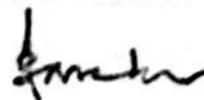
Sir,

REPORT INTO THE LOSS OF HMS COVENTRY

1. We have the honour to present our report on the loss of HMS COVENTRY on 25th May 1982.
2. The Board convened at HMS NELSON on Monday 28 June 1982. All the facilities and support we required were willingly and efficiently provided both by NELSON and all the many authorities who provided expert advice.
3. The witnesses were, to a man, open, frank and helpful in spite of the obvious strain of reliving painful memories. This applies particularly to Captain HART DYKE who was in attendance for most of the Inquiry. We were all struck by the difference between those who suffered shock and injury and those who did not, particularly the way in which this affected their ability to recall details of events on the day of the loss (and before).
4. The picture which emerged from our investigations was often confusing and in some areas our version of events is open to question on points of detail. However we are confident that sound conclusions can be drawn in all critical areas. Our recommendations include some which result from the distillations of fragments of evidence and impressions gained by the Board.
5. We are conscious that we have not answered all the questions posed in our directive. That is because some subjects did not loom as large in practice as one might have expected; other apparently trivial matters assumed considerable importance.
6. We have tried to catch the mood and feeling of Operation Corporate in our narrative in order to counter balance the clarity of hindsight. The fog of war was often present. Many situations were completely new to those concerned; systems were being used in situations for which they were not designed. Unconventional and untried methods were not uncommon. Expensive failures were to be expected.
7. At 1820 on 25th May a routine air raid suddenly developed into a three minute fight for survival. It was the first direct attack on COVENTRY. The speed of events, equipment and procedural failures and bad luck overcame them. The battle-hardened BROADSWORD fared little better. It was fortunate that so many men survived.

8. We see no need for any censures or disciplinary action; on the contrary we have endorsed the Commanding Officer's recommendations for meritorious service and added some of our own.

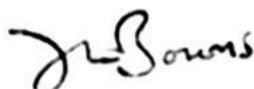
We have the honour to be,
Sir,
Your obedient Servants



A R BARNDEN
Captain Royal Navy



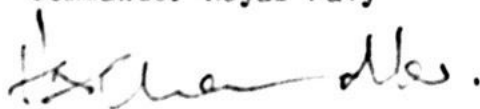
N R ESSENHIGH
Commander Royal Navy



J E BOWNS
Commander Royal Navy



J F J SIMPSON
Commander Royal Navy



H. A CHANDLER
Surgeon Commander Royal Navy

ANNEX C

REPORT OF THE BOARD OF INQUIRY INTO THE LOSS OF HMS COVENTRY - CONTENTS

<u>SECTION I</u>	<u>INTRODUCTION (SECRET)</u>
<u>SECTION II</u>	<u>PREPARATIONS FOR WAR (SECRET)</u> HMS COVENTRY, her history, her preparations for and initial involvement in Operation Corporate.
<u>SECTION III</u>	<u>INSHORE AIR DEFENCE OPERATIONS (SECRET)</u> Inshore air defence operations - up to 251600Z MAY.
<u>SECTION IV</u>	<u>THE FINAL ACTION (SECRET)</u> The tactical handling and weapon engagement in the final action.
<u>SECTION V</u>	<u>THE DAMAGE (SECRET)</u> An assessment of the damage sustained and the consequences.
<u>SECTION VI</u>	<u>THE ESCAPE AND RESCUE OPERATION (SECRET)</u> A description of the aftermath of the damage, the injuries sustained, the escape from the ship and subsequent rescue.
<u>SECTION VII</u>	<u>MAJOR CONCLUSIONS (SECRET)</u> Synopsis of answers to the major questions
<u>SECTION VIII</u>	<u>DETAILED CONCLUSIONS AND RECOMMENDATIONS (SECRET)</u>
<u>ANNEX A</u>	<u>SUPPORTING DIAGRAMS (SECRET)</u> Appendix 1: Operations South of Stanley 6-9 May 1982 2: Patrol Line 22 May 1982 3: Patrol Lines 24-25 May 1982 4: Sea Dart Engagement 1230Z 25 May 1982 5: Sea Dart Engagement 1530Z 25 May 1982 6: Final Engagement 1800-1830Z 25 May 1982 7: Final Engagement 25 May 1982
<u>ANNEX B</u>	<u>SIGNALS (SECRET)</u> Appendix 1: CTG 317.8 082321Z MAY 2: CTG 317.8 091040Z MAY 3: HMS COVENTRY 092025Z MAY 4: HMS BROADSWORD 101235Z MAY 5: HMS BROADSWORD 232218Z MAY 6: HMS BROADSWORD 220825Z MAY 7: HMS BROADSWORD 222040Z MAY 8: CTG 317.8 222234Z MAY 9: CTG 317.8 240003Z MAY 10: HMS COVENTRY 241745Z MAY 11: HMS BROADSWORD 242020Z MAY 12: HMS BROADSWORD 250538Z MAY 13: HMS BRILLIANT 122230Z MAY 14: HMS BROADSWORD 131040Z MAY 15: CINCFLEET 230453Z MAY

ANNEX C

TYPE 42/22 AAW TACTICS AND PROCEDURES (SECRET)

ANNEX D

WEAPON ENGINEERING (SECRET)

Appendix 1: The Final Attacks - WE Aspects -
An Analysis

2: ADAWS 4 Possible Hardware, Software
and Drill Improvements

3: Radar Type 909 - Possible Minor Hardware
Improvements

4: EMCON Policy, Dummy Loads and Performance
Testing

ANNEX E

MARINE ENGINEERING (CONFIDENTIAL)

ANNEX F

DAMAGE AND DAMAGE CONTROL (SECRET)

Appendix 1: Detailed Summary of Damage

2: Blast Route and Damage

3: Stability After Damage - Flooding to 2 Deck

4: Stability After Damage - Flooding to
deck edge

5: Photographs of Damaged Ship:

Plate 1 - Explosion

Plate 2 - Port Side Upright

Plate 3 - Port Side Heeled

Plate 4 - Bow View Heeled

6: Photographs of PHOENIX Type 42 model:

Plate 1 - Model Flooding to 2 deck

Plate 2 - Model Deck Edge Immersed

7: Photographs of Bulkheads in 2 Deck Passageway
HMS CARDIFF:

Plate 1 - Watertight bulkhead

Plate 2 - Non-watertight bulkhead

8: Damage Control - Lessons Learnt

ANNEX G

ESCAPE/SURVIVAL/RESCUE (RESTRICTED)

Appendix 1: Problems Abandoning Ship

2: Liferaft Launching Difficulties

ANNEX H

FIRST AID AND CASUALTIES (RESTRICTED)

Appendix 1: Deaths

2: Injuries

ANNEX J

CLOTHING AND BURNS (RESTRICTED)

ANNEX K

REFERENCES CONSULTED (RESTRICTED)

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REPORT OF THE BOARD OF INQUIRY INTO THE LOSS OF HMS COVENTRY

SECTION I - INTRODUCTION

1. A Board of Inquiry into the sinking of HMS COVENTRY was convened by the order of the Commander-in-Chief Fleet (1) and assembled in HMS NELSON at 0900 on 28 June. The Board was comprised of:

Captain (X) A R BARNDEN, Royal Navy
Commander (X) N R ESSENHIGH, Royal Navy
Commander (ME) J E BOWNS, Royal Navy
Commander (WE) J F J SIMPSON, Royal Navy
Surgeon Commander H A CHANDLER, Royal Navy

AIM OF THE BOARD

2. The aim of the Board was to investigate the circumstances leading to and attending the disablement and later sinking of HMS COVENTRY under the command of Captain D HART DYKE MVO Royal Navy between 23 and 26 May 1982.

FORM OF THE REPORT

3. The main body of the report is divided into 8 sections. The Introduction contains a synopsis of events on 25th May which is presented in a very general form and serves purely to set the scene. Detailed accounts of events leading up to, during and subsequent to the final action are contained in later sections and amplified in supporting annexes and appendices. The report thus begins with a short description on the scene of action on 25 May.

THE SCENE OF ACTION

4. On 25 May 1982, D+4, HMS COVENTRY was conducting inshore Anti-Air Warfare (AAW) operations in support of the Amphibious Operating Area (AOA) in close company with HMS BROADSWORD 10 miles north of Pebble Island, West Falkland. They were attacked by two pairs of Argentinian Skyhawk/Mirage aircraft with cannon and 1000 lb bombs. A plan of the action is at Annex A, Appendix 6.

5. It was a calm bright sunny day. The ships had worked together for prolonged periods without being directly attacked. COVENTRY had destroyed two, possibly three aircraft that afternoon with Sea Dart, one of which was acquired over Pebble Island.

6. Because of these successes, the likelihood of observation from the shore and COMINT, they thought their position may have been compromised. COVENTRY was always aware of their vulnerability close inshore. The final raid came as no surprise, COMINT and radar (965) gave early warning. BROADSWORD's Radar 967, with its doppler mode, tracked two pairs of hostile aircraft approaching to the southwest of Pebble Island on a heading of 080°.

7. The ships were at Action Stations, course 090° with COVENTRY leading and BROADSWORD about 3 cables fine on her starboard quarter. Instead of following the normal northerly track to the San Carlos AOA these aircraft swung low over Pebble Island and attacked in two pairs about 10 miles/1½ minutes apart.

(1) CINCFLEET's letter 00520/5.X dated 11 June 1982

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8. CAP aircraft were fast approaching Station 33, 25 miles to the east but were too late to engage the first pair of aircraft. Their movement was slightly hampered by the AOA missile zone. Quick reactions by COVENTRY's fighter controller got the CAP within 3 miles of their weapon release point on the second pair of aircraft but the CAP was hauled off when Sea Dart was believed to have acquired.
9. The first pair of aircraft were only engaged by COVENTRY's 4.5 gun and both ships' close range weapons. Neither Sea Dart nor Sea Wolf was fired. The gunfire appeared to divert the attacking aircraft towards BROADSWORD who was hit by a bomb bouncing up through the flight deck and the Lynx.
10. The second pair of aircraft attacked 1½ minutes later from a direction of about 175°. They were acquired by BROADSWORD's forward Sea Wolf system in low radar tracking mode. While waiting for them to close to engagement range BROADSWORD passed close astern of COVENTRY who was the formation guide.
11. COVENTRY had in fact altered course to starboard in two steps to about 190°. She fired a Sea Dart which does not appear to have been locked on to the attacking aircraft. The 4.5 gun engaged briefly. COVENTRY was struck on the port side by cannon fire and three 1000 lb bombs. One exploded in the Conversion Machinery compartment, another in the Forward Engine Room. The third is thought to have entered the Naval Stores (3H) without exploding. A cannon shell sliced through the ship's side just above the waterline in the Forward Auxiliary Machinery Room (FAMR) passing aft into the Forward Engine Room striking K air compressor. This was reported before the bombs exploded.
12. The Operations Room, HQ1 and the Machinery Control Room (MCR) were put out of action by peripheral blast and smoke logging. Their crews were shocked and burnt but all escaped. The CMR, Computer Room, Forward Engine Room and Junior Ratings Dining Hall were devastated, killing all 16 occupants. One rating in the Technical Office was also killed, probably as a result of taking cover with his head in an awkward position.
13. It quickly became apparent that massive flooding was taking place in five main compartments from 16 to 36½ stations; all internal and external communications, sensors and all but close range weapons were rendered useless. The centre of the ship at all deck levels was smoke logged, many ladders were damaged, doors and hatches were distorted, movement was difficult not least because the ship had developed an alarming list to port.
14. The ship was evacuated in an orderly fashion as it became obvious to all that capsize was imminent. The starboard liferafts were released with some difficulty and the ship abandoned. The water was cold (7°C-44.6°F), the sea state was mercifully low and the rescue by BROADSWORD and helicopters from the San Carlos area was quick and efficient.
15. A Chinese laundryman, fitted with a heart pacemaker, died in the water. Many others in difficulties were assisted into very overcrowded liferafts. 40 people in 25-man rafts was normal. The First Lieutenant hit a stabiliser as he slid down the ship's side and was lost.
16. It was difficult to get the overloaded liferafts clear of the ship. Two drifted round the bow and beneath the Sea Dart launcher and the 965 aerial. Towing these liferafts clear was difficult; one was punctured by a Sea Dart missile and subsequently sank. By about 1900 COVENTRY was lying on her port side, BROADSWORD's Gemini was paddling clear with the last of the survivors;

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a Wessex V was making a final search. The last survivors reached BROADSWORD at about 2000, some 1½ hours after entering the water.

17. COVENTRY subsequently sank although this was not seen by BROADSWORD, who left the upturned hull still afloat as darkness fell. The hull has since been relocated.

Service at Portsmouth in October 1972 and commissioned on 10 November 1972. Part IV trials lasted some 10 months and the ship became operational on 17 August 1973. After undergoing RMT at Portland between September and November 1973 and taking part in JMC 732 the ship returned to Portsmouth for Christmas leave and RPT.

The early history of HMS was spent in a series of trials, which were organized and supervised by the ship's command and the ship's design to the Middle and Far East with the ship's design to the Middle and Far East. The ship's design to the Middle and Far East was completed in 1973. The ship's design to the Middle and Far East was completed in 1973. The ship's design to the Middle and Far East was completed in 1973.

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SECTION II - PREPARATION FOR WAR

BUILD AND EARLY PROGRAMME

18. HMS COVENTRY, the fourth Type 42 destroyer, was laid down in 1973 and launched at the Birkenhead Yard of Cammell Laird on 21 June 1974. The ship was accepted into Service at Portsmouth in October 1978 and commissioned on 10 November 1978. Part IV trials lasted some 10 months and the ship became operational on 17 August 1979. After undergoing BOST at Portland between September and November 1979 and taking part in JMC 793 the ship returned to Portsmouth for Christmas leave and AMP.

1980 PROGRAMME

19. The early months of 1980 were spent in a series of trials, minor exercises and weapon training periods and the ship deployed to the Middle and Far East with Task Group 318.0 in mid-May 1980. After several exercises in the Indian Ocean and an AMP in Hong Kong in early August, COVENTRY visited Shanghai and then Tokyo in company with other ships of the Task Group. At the end of September, Operation ARMILLA began and COVENTRY operated for 4 weeks on patrol in the Gulf of Oman. She returned to the Group early in November for the homeward passage reaching Portsmouth on 9 December.

1981 PROGRAMME

20. Between January and April 1981 the ship underwent a DED/AMP at Portsmouth. A satisfactory standard was achieved, the major item of work having been repairs to the port Controllable Pitch Propeller (CPP) system. Command Team Training for one team was also completed and during this period some 6 officers and 139 ratings in complement billets were relieved.

21. A 2 week COST at Portland began on 5 May 1981 following post DED sea trials in late April. FOST reported that the ship arrived in a hurry and was ill-prepared for her work-up with many safety items and OPDEFs outstanding. However the performance of the warfare department in particular was reported to be most encouraging and a general enthusiasm and willingness to learn led to steady improvement being noted. Continuing defects with the 909 radars, IFF, 4.5 gun and UAA1 caused considerable frustration. On departure, COVENTRY had achieved a satisfactory standard but it was noted that much effort would be required to get the UAA1 and 909 radars fully operational. AAW remained a weak area with GSA1 not proved in AA or NGS and GWS 30 drills were still well below standard.

22. After several port visits, COVENTRY took part in a two week JMOTS sponsored exercise (ROEBUCK) which followed the pattern of a traditional JMC and then returned to Portsmouth for an AMP which began at the end of June 1981.

23. Captain D HART DYKE Royal Navy took command of COVENTRY on 30 June 1981. The ship remained in harbour for the combined leave and AMP period (6 weeks) and sailed for various trials and a shakedown before finally leaving for a planned 3½ months away from the base port. Exercise OCEAN VENTURE which followed provided many good training opportunities thereby preparing the ship for joining STANAVFORLANT on 1 September 1981 and launching immediately into exercise MAGIC SWORD NORTH. This exercise gave COVENTRY some valuable experience in offshore barrier operations near the coast of Norway when enemy patrol boats attacked carrier forces. Weather conditions encountered were similar to those the ship was to meet some 6 months later in the South Atlantic.

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24. The STANAVFORLANT deployment continued with participation in JMC 813 at the beginning of November. This proved to be a valuable, if testing opportunity for COVENTRY from which considerable air defence training value was extracted and again South Atlantic style weather conditions were encountered. The ship returned to Portsmouth on 8 December for leave and AMP.

1982 PROGRAMME

25. The year began for COVENTRY with a short 909 radar trials period in the Portsmouth areas and 3 weeks of syllabus training in the Portland areas (Lynx DLT and PWO(U) seatime). Concurrent with an SMP from 13 February to 5 March, a period of Command Team Training was also carried out for the team which had been block drafted to the ship during the Christmas leave period. This team was favourably reported on by SMOPS DRYAD who stated that they progressed well and achieved a most satisfactory standard. The team was well motivated and produced a clear, concise picture to enable the Command to fight the ship. The air team was shown to be particularly sound as were the weapon direction team and the Fighter Controller.

26. COVENTRY sailed from UK for the last time on 17 March 1982 to take part in exercise SPRINGTRAIN 82. Again air defence was high on the agenda and the Commanding Officer has described his steadily growing confidence in his operations team which was by now soundly trained and extensively practiced. However, high seas firings at the end of March were disappointing as 2 out of the 3 Sea Dart telemetry rounds fired appeared to be rogue. There were also continuing mechanical problems and a serious plumper block defect had to be rectified in Gibraltar during late March.

27. In general therefore the ship was well prepared for war. The Commanding Officer was well satisfied with his team and, with a few exceptions mainly on the mechanical side, believed his ship to be both materially sound and operationally ready. However attacks of the sort which proved fatal for COVENTRY on 25 May, that is low level air strikes coming off nearby land, had never been a high priority in the ship's operational training. The Portland inner areas GUNEX 20L had provided limited opportunity for visual engagements with close range weapons and with GSA1 in the emergency mode but the team had never exercised 909 acquisitions under the circumstances they were to meet to the north of the Falklands. The known weakness of 909 against targets masked by land clutter remained largely unexplored.

THE VOYAGE SOUTH

28. On 2 April 1982 after receiving the news of the invasion of the Falkland Islands, COVENTRY (in company with ANTRIM (FOF1), GLAMORGAN, SHEFFIELD, GLASGOW, ARROW, BRILLIANT, PLYMOUTH and OLMEDA) was ordered to proceed to Ascension Island. During this 9 day voyage preparations for war began in earnest. For the first 24 hours the southbound ships paired off with those who were homeward bound and topped-up with all possible items of stores and spares. COVENTRY was allocated AURORA, however, at the end of a lengthy series of transfers, there were still significant deficiencies (Sea Dart warshots, 4.5 ammunition for example) which did not become available until later.

29. During this early phase there was a full and intensive practice programme but without integral carrier support it was very difficult to exercise any realistic air defence drills. In particular, COVENTRY felt the lack of targets

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for GWS 30/GSA1 system checks but with SPRINGTRAIN and earlier exercise opportunities behind them, this situation did not unduly worry the Command. At this stage, heavy emphasis was placed on surface procedures as the surface threat from the Argentinian Exocet armed vessels was seen to be dominant. NBCD exercises were conducted regularly and long term securing-for-action measures were set in train. The ship's company also began to make the necessary mental adjustments, putting aside thoughts of the planned return home for Easter leave and coming to terms with the challenge that faced them. Individuals were affected in different ways and, in a general mood of expectancy, everyone kept a close watch on the news as diplomatic manoeuvring continued. Overall, COVENTRY was a confident ship; men were quietly confident in their own ability to fight and generally could not conceive that theirs' was to be a one-way voyage.

30. On arrival at Ascension on 11 April there began a further and intensive storing period; the ship was painted in her war colours; essential maintenance was carried out and further practices and exercises took place. Although it was COVENTRY's aim to complete storing before proceeding further south, this was in the event not possible. Orders were received on 15 April to proceed with despatch in company with BRILLIANT (CTU), SHEFFIELD, GLASGOW, ARROW and APPLELEAF southwest towards the Falkland Islands to enforce the Total Exclusion Zone (TEZ) which was to come into force on 1 May. COVENTRY therefore left Ascension still short of several important items of spares for weapons systems and once again was concerned to ensure that these were obtained before action was joined.

31. This second stage of the passage south took COVENTRY's Task Unit in a totally silent posture to a waiting position equidistant about 1000 NM from South Georgia, the Falklands and Buenos Aires where again the ships remained silent. Exercise opportunities in this phase were particularly limited and the absence of targets and the restrictive EMCON policy dictated that full overall systems checks were impossible to achieve. Additionally, preparations were hampered by a period of particularly adverse weather in the vicinity of 40° S. Emphasis was therefore placed on those practices which could be completed within the limitations of the situation; NGS was exercised; NBCD was exhaustively pursued and final steps were taken to secure the ships for action. COVENTRY's overriding requirement at that time was to rejoin the main Task Force which was in an overt posture and thus to gain the benefit of target tracking opportunities against Sea Harriers. In particular COVENTRY wanted to be free of the EMCON silence restrictions and to exercise co-ordinated air defence drills: it was now over 3 weeks since the High Seas Firings, the last opportunity to prove the ship's main armament. Within the constraints of what was possible in the prevailing operational circumstances, most practices followed established tactical procedures and, with minor exceptions no new or special drills were developed. The Type 42/22 combination which was to be so extensively used later was not specifically exercised at this stage. Ships remained in this holding position for several days until the main Task Force arrived when final preparations began for the entry into the TEZ on 1 May. COVENTRY in particular welcomed this change of status as the opportunity to radiate on sensors and complete outstanding weapons systems checks.

32. COVENTRY was therefore now ready to go to war. There is no doubt that the ship had, during the preceding 6 months, experienced a good programme for this purpose and, with the possible exception of lingering mechanical worries, was well prepared for what lay ahead.

SECTION III - INSHORE AIR DEFENCE OPERATIONSEARLY OPERATIONS

33. The war began in earnest for COVENTRY on 1 May when the Task Force entered the 200 mile TEZ and was strongly opposed by the Argentinian Air Force. Hostile aircraft were held at arms length by Sea Harriers and COVENTRY took a key and successful part in controlling these aircraft into position to attack Mirage and Skyhawk raids. At this stage, and in the subsequent few days, COVENTRY was stationed some 20 miles west of the carrier group which itself was about 80 miles east of Stanley.

34. During these early days many CAP engagements took place well to the west of the force, often over land on the Falklands: whilst enemy aircraft remained at high altitude, the land posed little problem to Task Force radars. However, the nature of Argentinian operations was such that many of their aircraft went low over the Islands and the resultant loss of radar contact served to heighten apprehension that air attack on the Task Force was imminent. Air launched Exocet was seen as a prime threat and COVENTRY has commented on the frequent and early use of chaff by most ships in this period.

35. Area Air Co-ordination was employed from the outset and appears to have given rise to few problems, although friendly aircraft safety remained a prime concern in COVENTRY. The absence of non-military air tracks served to clarify the air picture and the combination of IFF/SIF and identification manoeuvres seems to have met all requirements for air safety. In this phase COVENTRY had no opportunity to engage hostile targets with Sea Dart, but was content that area air defence was working well and was satisfied that the Type 42 was being employed fruitfully in a position that met the requirements of the main weapon system.

36. During the night of 2 May a surface contact was detected approximately 50 miles north of the force and COVENTRY's Lynx helicopter was despatched to investigate. In the subsequent action the contact was identified as a hostile patrol boat and was attacked and sunk by 2 Sea Skua missiles. This historic engagement marked the first firing of Sea Skua in anger and that in a highly successful operation. Later that week, on 4 May, HMS SHEFFIELD was crippled during an Exocet attack by Argentinian Super Etendard aircraft, however COVENTRY took no part in that action as she was patrolling a sector on the opposite side of the formation to SHEFFIELD.

INSHORE OPERATIONS 6-9 MAY

37. Task Force operations took a more hostile turn during early May when ships began night time bombardments of Argentinian positions in the vicinity of Stanley. COVENTRY's first turn at NGS came on 6 May when, in company with BROADSWORD who was to provide point air defence cover and ASW support, overnight bombardment took place on a gun line to the south of Cape Pembroke (Annex A Appendix 1). Navigational constraints, including the Argentinian declared minefield, and tactical considerations of air defence and vulnerability to attack from shore emplacements dictated that the ships stood off to seaward during intervals between bombardment runs. Difficulties were encountered with COVENTRY's 4.5 Mk 8 mounting during this first night inshore and this caused the action to be terminated prematurely.

38. COVENTRY was again in action with BROADSWORD for shore bombardment on the night of 8 May. Although the mechanical defect in the 4.5 mounting had been rectified on the previous day, there was a recurrence of the same problem

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during this night. However, on this occasion, the defect was fully cured. In addition to the overnight NGS operation COVENTRY and BROADSWORD had been ordered by CTG 317.8 to remain by day in the area to the South of Stanley (Annex B Appendix 1) and to attack Argentinian aircraft which were attempting to drop supplies to the beleaguered Stanley garrison. The aim was clearly expressed by CTG 317.8 (Annex B Appendix 2) when he instructed COVENTRY to act as a "missile trap" and not to "drive the enemy away with CAP" unless this became necessary. A Sea Dart line was therefore established (Annex A Appendix 1). The likely targets, believed to be Hercules with Skyhawk/Mirage escort, were known to be transitting from the west, crossing West Falkland and then letting down to approach Stanley. On this occasion COVENTRY held long range contact on a group of aircraft approaching from the west (120 miles on 965 radar). There were also voice communications intercepts which indicated a C130/Skyhawk mix. Two aircraft peeled off, presumably to create a diversion but the remaining 3 were successfully indicated to both 909s at some 60 miles range. The first missile was fired at 38 miles and was seen to pass through the 909 range gate but missed its target. The second was fired at 35 miles and the third when the previous shot was reported to have missed. These were long shots taken at the earliest opportunity for fear the targets might detect that they had been illuminated then turn away. JMIC assessed that Mirage aircraft had an I/Low J band warner. Although it appeared that all 3 missiles missed their targets it was later discovered from communications intercept that 2 of the escorting Skyhawks had collided and crashed whilst taking action to avoid an approaching Sea Dart missile. It is interesting to note that COVENTRY later received an unconfirmed intelligence SITREP which suggested that the target for this engagement may have been one or more Lear Jet aircraft possibly with Skyhawk/Mirage escort.

39. Later that day, again whilst operating on the Sea Dart line south of Stanley, BROADSWORD indicated (via the Link), a slow moving air track flying southwest overland in the vicinity of Port Harriet. COVENTRY's 909s could not acquire this as a Link indicated track but eventually acquired the contact firmly when it came clear of land near Port Fitzroy and a single Sea Dart missile was fired which hit the target. It was seen to explode in a spectacular manner and was subsequently identified as an Argentinian Puma helicopter. The moment of incidence was in the vicinity of Port Pleasant, probably over land.

40. The significance of these two engagements in consideration of later events is that both were markedly affected by the proximity of land. In the Hercules/Skyhawk case the moment of incidence may even have been over the land although target height was presumably sufficient to allow the 909s to acquire at long range. The cause of failure on this occasion (ignoring the fortuitous collision) is believed to have been connected with the proximity of the targets to the edge of the feasibility envelope and the subsequent effects of any evasive manoeuvres they may have made. There is also evidence to suggest that the 909s were searching between the targets which were closely formed and this may have affected the accuracy of the shots. The successful Puma engagement however masked the potential difficulty that would eventually be encountered operating a Type 42 in the air defence role so close to land. Here, COVENTRY had hit a low crossing target, albeit slow moving, at close range and whilst it was skirting along a rocky and prominent coast. The value of BROADSWORD's type 967 doppler radar for indicating low targets over land had been amply demonstrated. Investigation of COVENTRY's 992 radar MTI facility reveals that this comparatively recent innovation had nowhere near the performance of 967 and could not be relied upon to produce ab initio detections in heavy clutter conditions. Its value

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lay in correlation, particularly against Link received tracks. Despite this, the defensive capabilities of the Type 42/22 combination when operating close to land remained unproven as the ships had not been directly attacked. However the Puma incident was a good morale booster and a welcome confidence builder after a disappointing period of difficulties with the gun and worrying doubts about Sea Dart performance.

41. COVENTRY took no further part in NGS operations off Stanley and returned to her more usual air defence role in support of the carrier group still operating well to the east. The Commanding Officer has described his lingering concern at this stage that Sea Dart was not being given the opportunity to prove itself in anything like its designed role. Whilst operating to the east, no feasible targets presented themselves. Further west, the system had often been hamstrung by land. The fertile ground seemed to him to be to the west of West Falkland, on the enemy's over-sea flight path where most factors appeared to be in Sea Dart's favour. In this vein at the end of the day (9 May), COVENTRY suggested a plan to BROADSWORD (as CTU) by signal (Annex B Appendix 3) and this was subsequently taken up by BROADSWORD in his post action SITREP (Annex B Appendix 4) but was not reflected in CTG 317.8's immediate future plans.

AIR DEFENCE AFTER THE LANDINGS - 21 TO 24 MAY

42. The first landings took place at San Carlos on 21 May and BROADSWORD, who was responsible for air defence in the AOA on that day, soon became aware that the Type 22 operating in such confined waters could not provide effective cover. Sea Wolf was virtually useless in these circumstances with enemy aircraft using contour flying techniques with great effect to achieve maximum surprise. As a result of this and a similar experience in the AOA on 23 May, BROADSWORD recommended to CTG 317.8 (Annex B Appendix 5) that a more offensive anti-air posture should be adopted and that the Type 22/42 combination could be effectively employed by taking the fight to the enemy. This would involve intercepting attacks as they closed from the west rather than waiting for them to reach their target. Meanwhile on 22 May CTG 317.8 detached COVENTRY from the carrier group to join up with BROADSWORD to mount an AAW patrol to the north of West Falkland (Annex B Appendix 6). This was essentially an aggressive and offensive plan which appeared to suit better the needs of both GWS 25 and GWS 30. With BROADSWORD providing close air defence and Sea Harriers in support (albeit operating near the limits of their endurance), COVENTRY looked forward to better opportunities to harass incoming enemy air raids with Sea Dart.

43. It is worthwhile briefly considering the Type 42/22 tactics at this stage before continuing with the narrative. BROADSWORD had experienced only one period of 'goalkeeping' before the transit south with HERMES: during JMC 821 she protected RFA RESOURCE for a short period (1). As a pair, COVENTRY and BROADSWORD had gained valuable experience operating together south of Stanley in the second week of May and had developed stationing and manoeuvring drills equating broadly to the 'Goalkeeper' tactic described in ATP 31 and the Fighting Instructions. COVENTRY as guide navigated to patrol pre-determined tracks and BROADSWORD as CTU manoeuvred to maintain station up-threat in COVENTRY's stern quadrant between about 2 and 5 cables distant as she had previously practiced with HERMES. COVENTRY was free to alter course as necessary for navigation and to open arcs as raids developed. The Commanding Officer of COVENTRY has described how this drill developed and how the single letter SAT manoeuvring signals from FOTI were used by him to keep his consort informed of changes of course and speed. Initially COVENTRY always used maximum speed when under threat of air attack (circa 30 knots). But later BROADSWORD asked that slower speeds be used to enable her to maintain her

(1) Captain F2 letter to FOF2 205/1 dated 8 Apr 82

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critical close station when sudden alterations were made to counter developing raids. Vibration problems also adversely affected 967 radar. COVENTRY had Tyne 1c engines with a Tyne-max speed of some 22 knots and believing this to be fast enough in the circumstances, COVENTRY then negated his previous standing instruction to select Olympus drive when Air Raid Warning Red was broadcast. By 22 May therefore when the order to patrol northeast of Sedge Island was received, both Commanding Officers appeared satisfied with their terms of reference and had already established a good working relationship based on earlier experience and an understanding of each other's problems.

44. COVENTRY had been personally briefed by CTG 317.8 on a secure voice circuit before detaching for this new mission. COVENTRY had freely expressed his belief that Sea Dart must be given the opportunity to fire at suitable targets on its own terms but was appraised of the problems facing amphibious forces in the Falkland Sound and the need for a "missile trap" (CTG's phrase) to be established to the north of West Falkland to ensure the attrition of the more northerly raids, inbound and outbound. The term "missile trap" left COVENTRY in no doubt that the aim was to carry out aggressive AAW operations with Sea Dart as the prime offensive weapon system.

45. Whilst on passage to her new northerly patrol line COVENTRY detected and acquired what was believed to be an Argentinian 707 reconnaissance aircraft (possibly the Presidential aircraft in peacetime). A very good firing solution was achieved and the order to engage with a salvo was given but missile launch did not occur due to a flash door fault. By the time this was cleared the 707 had left the feasibility envelope having possibly detected 909 illumination. This was an understandably annoying frustration when such a prime target escaped unscathed.

46. COVENTRY and BROADSWORD patrolled a line 10 miles long running North/South about 10 miles northwest of Sedge Island (Annex A Appendix 2). Argentinian air raids continued to close from the west passing over the centre of West Falkland but all remained outside Sea Dart engagement range. Navigational difficulties in the vicinity of the north western archipelagos (Jason Islands/ Carcass Island) prevented COVENTRY from making ground to the south to close the range. COVENTRY and BROADSWORD therefore planned to bias their patrol further west on the night of 22 May (Annex B Appendix 7) but were stopped when COVENTRY was ordered to re-join the carrier group to the east as a major air launched Exocet offensive was thought possible the following day (Annex B Appendix 8). CAP control opportunities were limited at this stage as CAP stations were to the east of COVENTRY and prime targets were generally on the limit of CAP endurance.

47. COVENTRY was detached from the carrier group for the last time on 23 May having refuelled and ammunitioned. Again COVENTRY was personally briefed by CTG 317.8 on secure speech before departing and in response to his expression of concern about the choice of operating area was told to discuss his requirements with the CTU (BROADSWORD). CTG 317.8 made it clear to COVENTRY that although Sea Dart might be hampered by the close proximity of land there was a pressing need for a co-ordinated AAW picture to be compiled and told to the amphibious forces in San Carlos Water who were subject to repeated and heavy air attack. This verbal brief was followed up by outline signalled instructions from CTG 317.8 to BROADSWORD (Annex B Appendix 9).

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48. On meeting with BROADSWORD in the early hours of Wednesday 24 May COVENTRY discussed the question of positioning for the day's patrol, relaying the brief from CTG 317.8. BROADSWORD emphasised the need to tell a comprehensive air picture to shipping in the Sound and pointed out that the primary AAWC frequencies would have to be UHF due to the increasing level of enemy jamming of HF and possible attempts at spoofing on those frequencies. Selection of the patrol line was therefore dictated largely by UHF range considerations and it was decided that the area about 10-15 miles north of the north entrance to Falkland Sound would be best for the day's operations.

49. Events of 24 May were straightforward from COVENTRY's point of view. The day dawned clear, fine and cold and the enemy took advantage of the weather to press home repeated attacks on shipping and ground forces in the vicinity of San Carlos Water. It was very much a Harrier day with COVENTRY and BROADSWORD controlling CAP with significant success. No attempt was made to attack the ships on their patrol line and all potential Sea Dart targets were either downed or dispersed by a combination of CAP and fire from both shore and ships in the Sound. Air picture compilation worked well with COVENTRY once again commenting on the effectiveness of BROADSWORD's doppler TI radar in holding air tracks over land and passing these out on Link 10. Reports of the fearless, almost suicidal flying of the Argentinian pilots continued to surprise COVENTRY, however by the end of the day there was a general feeling that the air battle was being won. That afternoon the COVENTRY command team once again discussed the question of positioning and whether or not they would be better placed elsewhere. High on their agenda was the question of potential compromise of the ship's position as they had now spent all the daylight hours in clear weather conditions well within sight of the coast and had almost certainly been observed from the air by enemy fighters. On balance though, whilst they considered that from their position to the north of the Sound they had been achieving success with CAP control, they decided once again to press for a move into more open water and signalled CTG 317.8 with further advice on Type 42/22 positioning (Annex B Appendix 10).

50. Later, after consultation with COVENTRY, BROADSWORD signalled overnight intentions (Annex B Appendix 11) and the plan for air defence of the AOA on 25 May (Annex B Appendix 12). The agreed patrol line for the following day was established slightly further to the northwest to allow COVENTRY a clearer look over the sea towards any threat developing from the west. BROADSWORD retired to fuel during the night and COVENTRY conducted an ASW patrol in the northern approaches to the Sound. The ships then made a rendezvous at first light on Thursday 25 May and began the eventful day that led to COVENTRY's final demise.

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SECTION IV - THE FINAL ACTION

THE PATROL LINE

51. Dawn on Thursday 25 May was at about 1030 and the day was again cold and clear with very little cloud and light southwesterly winds. COVENTRY and BROADSWORD took up their new patrol line some 10 miles long east/west about 7½ miles north of Government Island (Annex A, Appendix 4). Stationing and manoeuvring were conducted as on the previous day; COVENTRY was guide and BROADSWORD manoeuvred to remain within 1000 yards up threat. The threat direction was assessed as being all round and air attack was considered highly probable particularly with the clear weather being very much in favour of Argentinian air operations.

52. COVENTRY was in good shape when she began her last day. Her fuel and ammunition state was high; there were no known serious defects with either sensors or weapon systems; the propulsion machinery was in good order and morale was assessed as high with the Ship's Company quite well rested and generally confident in their ability to deal with enemy attacks. Organisationally COVENTRY had settled down well into the routine of Defence Watch watchkeeping. The policy for closing up at Action Stations had evolved in the previous weeks from one of reacting to almost every Red warning in the early days to a more selective and less disruptive pattern based on analysis of all available information when assessing the degree of threat posed by a particular raid. COVENTRY's policy for changeover of key personnel when going from Defence to Action Stations was to minimise the number of moves involved and only to permit these in a few selected positions. For example in the case of the Fighter Controllers, the very much greater skill and experience of one over the other dictated that more would be lost by leaving the less effective man in the chair than would be gained by trying to maintain continuity.

53. Before discussing the day's events it is worth examining further the choice of patrol line for 25 May. As already described, the risk of compromise of the ship's position after the previous day's successful operations had influenced the move some 30 miles to the west. Although the positioning on 24th had allowed the use of UHF frequencies for air picture reporting it had to be acknowledged that the greater range from ships in the Sound would necessitate a switch to HF for the LAAWC net and acceptance of the known operating difficulties this would create. There was also the question of CAP control to be considered and on 25th COVENTRY found herself controlling Sea Harriers on stations that were 'down-threat' (Annex A, Appendix 6 - CAP Station 33). Although not necessarily a serious disadvantage this was nonetheless a factor to be taken into account.

54. Similarly, the distance of the patrol line off land was the subject of careful considerations and had to be a compromise between the needs of Sea Dart, Sea Wolf, CAP control, communications and, above all, an assessment of the enemy's most likely course of action. The indication was that the Argentinian air effort directed against San Carlos was generally routed along the north or south coastlines of West Falkland, but remaining over land. The resultant choice of a missile trap some 10 miles north of Pebble Island was therefore deemed best in the circumstances and the most likely to provide engagement opportunities for both GWS 25 and GWS 30. Indeed from COVENTRY's standpoint this new patrol line better met Sea Dart requirements than had the previous day's positioning as it provided a longer look for 909s both to the southwest and southeast over open water. With the exception of attacks from

due south, which at this stage had not been observed, the move to the west seemed to solve many of the problems of Sea Dart employment about which COVENTRY as already described had made several representations to BROADSWORD as CTU and to CTG 317.8. Furthermore the new position was likely to give an additional 30 miles warning from COVENTRY's 965 radar and thereby improve the air raid warning service for units in the Sound. Indeed an exchange of signals on 23/24 May between CTG 317.8 and CTG 317.0 indicated that the main requirements of units in the Sound was for the 42/22 air defence umbrella to be quite firmly spread in their vicinity and not operating as an interdictory force at longer range.

SEA DART ENGAGEMENT - 251230Z

55. During the forenoon the patrol was substantially without incident. HF voice communications with ships in the Sound were difficult and COVENTRY have described how they had to work a lot harder than on 24 May to tell their air picture; HMS PLYMOUTH became their main point of contact and she relayed the picture to other units involved. The first hint of action came at about 1230 when a report was received from BROADSWORD of 2 hostile air contacts being tracked over land by 967 Doppler radar. COVENTRY detected these targets also over land on 992 radar at about 52 miles bearing 130 (about Green 40 relative) (Annex A, Appendix 4). Contact was held intermittently as the range closed to about 45 miles. Slight problems with target indication were overcome by putting the forward 909 into a large spiral scan around the approximate position of the aircraft and acquisition was achieved after a few seconds of search. The after 909 soon acquired and the launcher was loaded with 2 Sea Dart missiles when the range of the target was about 30 miles. However at this stage the ship altered course to starboard and temporarily placed the missile homing eyes in the bow blind arcs. The target (now seemingly single on 992) had meanwhile crossed North Falkland Sound and was heading towards Pebble Island. COVENTRY assessed that the 2 aircraft were flying in close formation and, because of lingering doubt about Sea Dart performance after the Hercules/Skyhawk incident on 9 May (See paras 38-40), fired a salvo rather than a single shot as soon as the homing eyes came clear. This decision was influenced by consultation of CB 04988(2A) (Sea Dart Performance and Limitations) in the wake of the 9 May firing. The shot was 'round-the-corner', range at missile launch about 15 miles with the target crossing rapidly from left to right. The ship's head was by now approaching south, still turning to starboard with the launcher bearing to port. The engagement was successful and BROADSWORD reported having seen a parachute deployed from one of the aircraft. The fate of the other was uncertain and another report (from COVENTRY's GDP) may have correlated with one of the salvo of missiles hitting a rocky islet to the north of Pebble Island.

56. The turn to starboard during the time immediately before engaging these targets is a key feature of this action. At face value the ship's original course, 090, was quite satisfactory. Both 909s had acquired and, on a relative bearing of about Green 40, the targets with their right going movement could probably have been re-engaged if necessary without an alteration of course. The logic for the turn is therefore difficult to follow but appears to have centred on a combination of wanting to present a fine aspect to potential attacking aircraft coupled with a feeling that arcs would remain open for longer if the ship altered course to the West. This turn made it more difficult for BROADSWORD to get up threat.

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57. During this engagement COVENTRY made a COMINT detection either from a shore position or one of the attacking aircraft reporting the presence of "two British frigates" north of Pebble Island. It was therefore then clear that the ships' positions had most likely been compromised and this suspicion certainly coloured COVENTRY's later thinking.

SEA DART ENGAGEMENT 251530Z

58. Later in the afternoon, at about 1530, ships in the Sound reported enemy air activity in their vicinity. BROADSWORD soon detected this raid at some 44 miles range on Doppler radar (Annex A, Appendix 5). COVENTRY gained radar contact at about 36 miles with the target closing through a radar clear gap but still over land and then acquired with 909 at about 33 miles. Although 992 contact was lost as the target approached the coast and merged with radar returns from high ground on Pebble Island, 909 remained locked on and a single Sea Dart was fired just as the target neared the northern edge of land. The moment of incidence took place over the sea to the north of Pebble Island; as 909 contact was lost almost immediately after a flash was seen on radar and Doppler tracking ceased, the engagement was judged to be successful. During this engagement COVENTRY again altered course to the south from an easterly heading for reasons similar to those used in the earlier attack.

59. Near the end of the afternoon at about 1600 and influenced by the earlier suspicion that the position may have been compromised, COVENTRY closed up at Action Stations having fought the earlier engagements with the on-watch Defence Watch. This was occasioned by a report of multiple Mirage radar detected by HMS PLYMOUTH in the Sound. However this turned out to be the Blue Fox radars of an approaching Harrier CAP section and COVENTRY reverted to Defence Stations soon after. The afternoon had therefore been quite successful with COVENTRY undertaking two Sea Dart engagements and dealing effectively with problems created by the proximity of land. The significance of COVENTRY's alterations of course do not seem to have been registered in either ship.

THE FINAL ENGAGEMENT

60. At about 1700 COVENTRY received an intelligence report of a possible raid approaching the Falklands from the west. Although the ship had remained at Defence Stations for most of the afternoon it was decided because their position was probably compromised during earlier raids that it would be prudent to go to Action Stations for what was considered to be the final attack of that day. Accordingly the Captain forwarned COVENTRY of his intentions at about 1715 and settled down to monitor the developing situation. At 1740 COVENTRY gained an internal UHF COMINT detection which indicated that 3 or 4 Argentinian aircraft were active somewhere in the Falklands area. Soon after, at about 1745, aircraft were detected on 965 radar bearing about 270 range 160 miles (Annex A, Appendix 6). By their relative movement (very slow closing rate) it was assessed that those contacts were the incoming raid tanking before commencing their attack. Contact was held on 965 radar until about 1755 when, at some 90 miles range, it was assumed they had gone low for their transit across West Falkland. Air Raid Warning Red was promulgated at this stage and COVENTRY initiated a DR track on the lost 965 contact.

61. At 1800 exactly the ship went to Action Stations and was then approaching the eastern end of the planned patrol line, heading 090 at 8 knots with both Tyne engines selected. Also at this time COVENTRY had control of 2 CAP aircraft (Red Section from HMS HERMES) which were fresh on task and were joining from the east heading for their station (Station 33) (Annex A, Appendix 6). Meanwhile BROADSWORD detected the incoming raid on 967 Doppler radar as 2 pairs of aircraft some 10 miles apart tracking east over West Falkland and initiated link tracks which were indicated to COVENTRY. Although these tracks did not directly correlate with the stale DR from the lost 965

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contact, COVENTRY was satisfied with the warning provided and was fully ready for the raid. However, despite persistent searching, firm 992 contact was not established until the first pair of aircraft came clear of land flying in echelon port at about 10 miles range immediately to the north of Pebble Island. (Annex A, Appendix 7, Figure 1). 'Alarm Aircraft - Blind' was called in COVENTRY's Operations Room and both the Sea Dart and the MGD(B) repeatedly indicated the targets to the 909s but, at this stage, without success. Both radars reported clutter out to 10 miles but it is likely that inaccurate TI bearing was the problem.

62. Precise timings are difficult to establish but by this time (1820 approximately) the ship had reached the eastern extremity of its patrol line and the Officer of the Watch, in consultation with the Navigating Officer, had already decided to continue heading east as there was no immediate navigational danger and it was apparent from Command open line that action was imminent. Visual detection of the raid came when the aircraft were some 8 miles identified as Skyhawks flying in close formation, very low and, at the call 'Alarm Aircraft Visual', control of the 4.5" gun was given to the starboard LAS sight and the target was engaged in the secondary mode with a manually injected open fire range of 6000'. The Gun Controller progressively stepped down the range in 1000' steps to 3000' where it remained set for the remainder of the engagement. Some 18 rounds were fired in small groups however visual reports indicated that all fell well short of the target. By this time both 20mm and small arms fire had been brought to bear and the attacking aircraft had begun a series of evasive weaving manoeuvres. Although they had been flying directly at COVENTRY when they began their approach, when faced with a barrage of AA fire they turned to port and made for BROADSWORD eventually passing to starboard and astern of COVENTRY (Annex A, Appendix 7, Figure 3). This pair attacked BROADSWORD with 30mm cannon fire and struck the ship with one of 4 bombs dropped.

63. As this action developed, COVENTRY's fighter controller vectored his CAP section southwest towards the raid from Station 33 (Annex A, Appendix 6). The CAP had flown no more than 5-7 miles when it became apparent that they had too far to go for a successful interception without straying into BROADSWORD's missile engagement zone. They were therefore put into a port orbit some 10 miles northeast of Cape Tamar and held there pending development of further raids.

64. At about the time of the initial 992 radar detection when the attacking aircraft were some 10 miles to the south, the Captain ordered the Officer of the Watch to alter course to port believing that he would be better placed to fight the action if he made ground to seaward. However he was advised by the PWO that a turn to starboard would serve better to keep weapon arcs open and thus, before the port wheel had time to take effect the Captain gave the order "Come hard right 140" and ordered speed to be increased to 15 knots. Thus, by the time the first pair of enemy aircraft overflow BROADSWORD, their relative bearing from COVENTRY was about Green 150 although 4.5" fire was checked when they were on COVENTRY's starboard beam (Annex A, Appendix 7, Figure 4).

65. Both forward and after 909 did, eventually acquire the targets, but at short range. The after set locked on at some 4 $\frac{1}{2}$ -5 miles range when the aircraft flew through the range gate and acquisition was achieved. The forward set had a similar experience. The 909s both observed 4.5" shells flying along the bearing but apparently falling short of the target. Lock was broken at 1.4 miles. No attempt was made to switch the gun to primary control (ie following either 909) and at the range in question there was no chance of a Sea Dart engagement.

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66. The final moments of the last attack have proved very difficult to reconstruct in any accurate detail. There was, no doubt, some measure of confusion. The time interval between the 2 pairs of enemy aircraft was no more than 90 seconds and although the approach of the second pair had been detected on 992 radar at some positions in the Operations Room (Annex A Appendix 7, Figure 5) in other key areas their presence was not apparent until the visual sighting was made and broadcast by which time they were only 4-5 miles at the most from COVENTRY (Annex A Appendix 7, Figure 6). When detected on 992 they were over the north coast of Pebble Island crossing fast from right to left some 8-10 miles from the ships and as they turned towards attention was still directly largely at the retreating first pair. In COVENTRY, 3 more or less simultaneous attempts were made to engage the approaching raid and these are described separately in the following paragraphs although the exact sequence and overlap cannot be confirmed. Also at about this time the Captain gave a final order to alter course to starboard which the Officer of the Watch did using 35° of wheel. The Captain may have been reacting to the first pair of aircraft departing to the southwest. He also thought he saw another radar contact to the northwest. The Officer of the Watch initiated a change from Tyne to Olympus drive which was never completed. This did not affect the ship's manoeuvring.

67. Soon after 992 detection of the second pair and after brief consultation with the AWO, COVENTRY's Fighter Controller began to vector his CAP section towards the second raid in preparation for a 90-crossing interception. They had once again flown only a comparatively short distance when they were hauled off, this time on the Fighter Controller's own initiative when he heard the call 'Birds Affirm' over Command Open Line (Annex A Appendix 6). The CAP was then put into another orbit to await further instructions which were in the event overtaken by the failure of the impending Sea Dart and Sea Wolf engagements. At the stage they were diverted, the CAP section had only about 4-5 miles to fly to the interception point, itself on the very edge of BROADSWORD's MEZ. The lead pilot was very clear that, in the absence of a COVENTRY directive, he would have broken off the attack before penetrating the Sea Wolf danger zone.

68. Although it appears that the aircraft were painting on 992 from some 8-10 miles range the Target Indication Operators were not alerted to their presence quickly enough to enable 909 to make a timely acquisition; furthermore it is probable that the Aft 909 was placed in blind arcs at a crucial moment by the ship's turn to starboard. The 4.5 gun was therefore put to follow the port LAS which had acquired a target and both close range weapons and the 4.5 opened fire almost simultaneously. However the fire was checked after only 3 rounds when it was reported that the gun was in depression. At some stage the MGD ordered the gun to switch to the rifle mode and, in parallel, the Gun Controller tried by various means (including returning the gun to the Park position) to rectify what he took to be a misalignment. He was not successful probably because in the earlier firing the gun had tracked the target from a position on the starboard bow (during the turn to starboard) and was now trying to bear on the port bow having passed through the stern arc but was prevented from doing so by the system's angular turn limitations. The mounting eventually came to rest at about 5° elevation facing broad on the port bow, well away from its target and remained 'on the stops' when power was lost having taken no further part in the action (Annex A, Appendix 7, Figure 7).

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69. Finally as the incoming raid closed to less than 3 miles, possibly closer, the Sea Dart was fired but as is now evident from BROADSWORD's GWS25 video tape, the launch angle and bearing of the missile appeared to be very wide of the approaching target. The sequence of events in this firing is obscure although it is clear that feasibility override was employed to counter a number of firing holds that were present. In the frantic efforts to engage the enemy now at very short range it is possible that the 909 acquisition was on land or clutter and as a result nothing was achieved. Some 16 seconds later the ship was hit by 30mm cannon fire from the lead aircraft of the pair and almost immediately afterwards by 3 out of 4 bombs dropped at very low level by both aircraft (Annex A, Appendix 7, Figure 8).

70. The engagement from BROADSWORD's point of view was equally frustrating and confusing. She had a good air picture initially. The GWS 25 system auto alerted to the first pair of aircraft but then suffered a multiple target indication problem and the trackers developed an unexplained 'follow' fault. This frustration and a bomb hit aft did much to cloud the clear picture.

71. The Captain was not aware of COVENTRY's alteration of course to starboard although it had been signalled on Tactical (UHF). It was, in his view, an unnecessary alteration, because on a course of 090 targets from about 130° to 230° could be engaged by all systems in both ships which were disposed at right angles to the threat. Experience in the AOA had indicated that aircraft had more difficulty in judging the time of weapon release than with the line of attack. Being beam on to an attack reduced the range danger space. This experience does not appear to have been discussed with COVENTRY who favoured a fine aspect to attacks.

72. The OOW, in the absence of other instructions from the Operations Room, followed COVENTRY round to starboard in a wheel manoeuvre slightly inside the wake. This put BROADSWORD progressively down threat from the second pair of aircraft approaching from 175° - ie 20° to the left of the first pair (see Annex A Appendix 7).

73. On this occasion GWS 25 responded better to a Manual Target Indication and locked on to the leading aircraft of the second pair in Radar Low Angle. In this mode firing is initiated at 2.2 Km (as opposed to 5 Km in the TV mode). BROADSWORD crossed behind COVENTRY and GWS 25 was wooded.

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SECTION V - THE DAMAGE

THE ATTACK

74. Although the precise identities and arming/weapon loads of the 2 aircraft in the second wave of the final attack have not been established, it is clear that the first aircraft fired a burst of 30mm cannon fire and then dropped at least 2 bombs. The second aircraft may not have fired any cannon shells but certainly dropped bombs, probably 2.

75. Hits were achieved by 30mm cannon shells and by 3 out of the 4 bombs that were observed falling. The size and type of bombs dropped is not known but it is probable from the severity of the explosions that they were 1000 lb weapons. Damage occasioned by each of these means is described below.

DAMAGE

30MM AIRCRAFT CANNON FIRE

76. 30mm cannon fire hit the ship's port side just above the waterline in 3J, the Forward Auxiliary Machinery Room (FAMR) and in 3K slightly higher than the Forward Engine Room (FER). (Annex F, Appendix 5, Plate 2). The watchkeeper in the FAMR sighted a horizontal slot 5' x 8" wide behind the port air conditioning plant. The shell(s) then entered the FER between the ship's side and the diesel service tanks through 3J/K bulkhead. The entry was not sighted but was confirmed later when a bomb blast in the FER vented a small fireball and debris into the FAMR. The FAMR was safely evacuated with both diesel generators left running, however this compartment flooded from the sea and the FER when the ship heeled to Port as a result of further bomb damage.

77. An eye witness from the quarterdeck also saw holes on the waterline port side extending from P section right aft to the stern, he also saw the 182 Sonar winch situated aft on the quarterdeck (2R) marked and possibly dislodged from its deck mountings. Higher level cannon shell hits were also sighted in the port side of the hangar.

78. There is no evidence from eye witness accounts to suggest that either of the aircraft in the first pair which attacked BROADSWORD strafed the starboard side of COVENTRY, however a video taken by HMS BROADSWORD shows smoke emitting from a series of holes above the waterline on the starboard side prior to final capsizing. This attack may be further substantiated by an account of the air lock door in the starboard side of the hangar (1N) being found off its hinges by personnel evacuating to the hangar from the aft DC base.

FIRST BOMB

79. The first bomb pierced the hull leaving a hole 6' long x 2' wide at 3G Port (Computer Room) and is believed to have exploded after delayed-action in the Conversion Machinery Room 4G blowing up the deck of the Computer Room and rupturing the 4G/4H bulkhead and ship's side. The fireball and blast from this explosion swept up into the Operations Room 2G from the Computer Room hatch 2/3G port. The Computer Room became a blazing inferno trapping and killing 7 men. Although the fire in the Computer Room was observed to subside, the generation of dense black smoke did not, thus forcing a total evacuation of all Operations Room personnel. This bomb put all weapon, sensors and communication systems out of action.

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80. It is thought that the CMR (4G) and the Provision Room area (4H) were rapidly flooded. This flood spread upwards into the Computer Room (3G) and the Naval Stores (3H).

SECOND BOMB

81. The second bomb entered the ship in the port waist at 1H penetrating the passageway at 2H, falling into the Naval Store 3H and probably finally penetrating the Provision Rooms in 4H. The bomb did not explode in the Naval Store and either remained unexploded in 4H or exited the ship outboard to sea. There is no evidence of an underwater explosion occurring in the vicinity of H section. Annex F, Appendix 5, Plate 2 shows the bomb entry marked by a vertically blackened area just forward of the NILE Stowage. The scorched screen residual smoke are partially attributable to a fire resulting from the severed hydraulic ring main that runs outboard in 2 deck passageway.

THIRD BOMB

82. The third bomb entered the ship in OIK ie through the Port Olympus intake and exploded aft in the port side of the Forward Engine Room, the blast affected the whole of K section from 5 deck to 01 deck. The blast profile viewed from HMS BROADSWORD's bridge is shown in Annex F, Appendix 5, Plate 1 photograph where the white or silver strips blown to starboard are believed to be the louvres from the starboard Olympus intake assembly. It is obvious from this view that the main force of the blast vented through the Port side Olympus intake and photograph shows a section of displaced plating between the red based whip aerial and the foremast as a result of the outward blast.

83. The Junior Rates Dining Hall 2K amidships (above the Forward Engine Room) was completely devastated by the explosion below. A Petty Officer and 4 spare hands were closed up here and despite any take-cover position they may have adopted they would have experienced severe upward and sideways blast from the deck and engine room ductings. All 5 men were assessed as having been killed outright.

84. Photograph shows no apparent damage to K section hull plating on the Port side above the waterline except for two minor horizontal splits between 2 and 3 deck under the Cheverton davits. From the resulting heel to port immediately after this explosion, it is assumed that there was large scale underwater damage in K section, also with the port access hatch to the Engine Room blown out into 2 deck there was an irreversible loss of Watertight Integrity. In the Type 42 destroyer 2 deck passageway is subdivided into sections by doors for blast and smoke boundary protection, but there is no watertight integrity between sections due to the non-glanded passage of pipework outboard of the door frames. Examples of this problem can be seen at (Annex F Appendix 7 Plate 2).

85. The Forward Engine Room/After Engine Room bulkhead was ruptured on the Port side close the ship's side admitting a fireball and blast. The Tyne engines remained running but de-clutched from the gearbox and propulsion was totally lost at this point. The shock-damaged control console in the MCR would have put the propulsion system (ie propellor pitch and engine throttle) in this fortuitous 'fail safe' mode. There was however the chance that the ship might have continued being driven at 21 knots ahead whilst settling deeper in the water and capsizing. Alternatively the ship could well have stopped in the water and eventually rolled over with shafts still turning but at zero propellor pitch. In circumstances other than rapid heel of the ship and flooding of the After Engine Room from the Forward Engine Room the Tyne propulsion and control could have been recovered manually providing the hardware was intact. As a direct result of the Forward Engine Room explosion, key DC and MCR personnel were forced to evacuate because of shock and smoke ingress from 2 deck passageway.

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86. Within 10-15 minutes of the bombs exploding in the ship there was major flooding in G, H, J, K and L sections, the ship heeled to Port in the loll condition at about 15°. After 20-25 minutes the deck edge (heel now 25°) was immersed allowing the sea to enter 2 deck passageway from the second bomb hole in the Port waist at 1H and, at the same time, water was flooding 2 deck in K section from below via the blown hatch in the Forward Engine Room. The loll condition increased to 90° and the ship finally capsized and sank some time later.

FOURTH BOMB

87. A fourth bomb was observed to clear the ship diagonally from Port to Starboard over the Flight Deck landing astern of the ship but there are no reports of it landing nor any evidence that it exploded either on or near the ship.

DAMAGE CONTROL AND FIREFIGHTING

DAMAGE CONTROL

88. Due to the rapid development of heel caused by the flooding of 5 compartments from the Port side, no attempt to contain flooding or repair damage was made. It is also now clear that in the circumstances any attempts of this sort would have been futile and could have led to further loss of life when DC parties might have been trapped below as the ship rolled over.

FIREFIGHTING

89. In the immediate wake of the attack attempts were made to survey and then to contain outbreaks of fire, in particular those visible from the upper deck and that in the Operations Room. However these were short lived as the list rapidly developed and as with damage control attempts, were prudently abandoned when it became clear that the end was nigh.

SUMMARY

90. With 2 deck breached in 1H, 2H and 2K and with free flooding below in 5 sections of the ship it was inevitable that flood water would be transmitted along 2 deck at least between G and M sections and if 2E/G and 3M/N doors were left open the flooding would have extended throughout the ship. In this condition, a massive capsizing moment was established, the reaction being that the ship rolled on its beam ends. From this position without a watertight superstructure the ship steadily deepened and finally capsized in a state of uncontrollable loll. Eventually sinking was then purely a function of the rate of dispersal of residual buoyancy as air was forced out of the ship. It is sobering to note that this critical condition in a Type 42, which in this case was caused by massive bomb damage, could be encountered in peacetime in a serious collision and would lead to the same disastrous and inevitable end.

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SECTION VI - THE ESCAPE AND RESCUE OPERATION

GENERAL

91. This concluding section of the narrative covers, in outline, events that took place after the ship had been hit and was then abandoned. Full details can be found at Annex G.

EVACUATION

92. The speed with which COVENTRY capsized and the hopelessness of the damage control and firefighting situation led the ship's company very rapidly to the conclusion that evacuation was the only prudent course of action.

93. Once damage had been sustained, power was lost to the main broadcast and it was therefore not possible to control evacuation centrally nor to give a general order to Abandon Ship. The operation was therefore quite spontaneous with groups of men being directed to make for the upper deck by their immediate superiors and in many cases doing so without specific orders.

94. There were few serious problems with escape. Many different routes were followed and a wide variety of minor difficulties was encountered (bent/broken ladders, jammed doors, buckled hatches, failed lighting, smoke, list of the ship etc). No one perished as a result of evacuation problems.

LEAVING THE SHIP

95. Again there were few serious problems with leaving. As the ship steadily rolled over to port men found increasing difficulty in maintaining their footing on the upper deck. The first men to jump did so when the list was less than 10 degrees and were able to enter the water well clear of the ship's side. As the list developed it became progressively more risky with a real danger of hitting underwater obstructions (stabiliser fins and bilge keels). As these obstructions broke surface (at about 25-30° list) men were able to slide, eventually to walk down the ship's side and then to jump from the bilge.

96. Although several minor injuries were sustained during this phase, only one man perished, the First Lieutenant, who probably drowned as a result of striking a stabiliser fin when he jumped/slid into the water. However, it must be remembered that conditions for abandoning ship were reasonable (clear calm weather, daylight). Under other circumstances the risk of injury would have been much greater.

SURVIVAL

97. Of the 276 survivors who entered the water only 2 perished, the First Lieutenant and No 2 Chinese Laundryman who may have died from heart failure whilst swimming to a liferaft.

98. On average men spent about 15 minutes in the water which was cold (circa 7°C). Even those wearing survival suits suffered discomfort from cold although the duration of the rescue operation was such that this did not become a dominant factor.

99. Lifejackets worked well and only a handful of men encountered problems with flotation, mainly because they lost their personal lifejackets below decks and did not/could not avail themselves of spares before entering the water.

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Survival suits however posed different problems and attracted much adverse comment from survivors. Only 35% of the 276 survivors managed to don the suit correctly; even amongst these men, many suffered ingress of water and later found difficulty with rescue when the 'Michelin Man' effect complicated the problems both of entering liferafts and then climbing scrambling nets on reaching BROADSWORD. Over half either did not attempt to put on the suit or failed to do so properly before entering the water. Again there was a variety of reasons but list of the ship, loss of the suit below decks and reluctance to remove the lifejacket all figures prominently amongst these.

100. As with other phases of the abandon ship operation, no general order to slip the liferafts could be given. Launching of the rafts was therefore undertaken on the initiative of individual officers and senior ratings when the ship was already listing some 10° to port several minutes after the attack. No attempt was made to launch the port set of rafts due to the apparent danger of capsizing. All 8 starboard side rafts were slipped and all inflated correctly. Considerable difficulty was experienced in actually manhandling these rafts over the side out of their stowages as the list to port increased.

101. Men entered the rafts wherever they found them and, as a result, uneven loading took place. With only 8 rafts in the water some ended up seriously overcrowded with as many as 47 men counted in one raft (88% overload) and some men still outside in the water clinging to the grab ropes. There were considerable problems when attempts were made to propel laden liferafts away from the ship's side. Rafts from the after group eventually drifted astern and clear of the ship downwind. However some of the forward rafts drifted around the bow and back close under the port side, becoming entangled with obstructions as the ship steadily rolled over. One raft was eventually punctured by the antennae of an unfired Sea Dart missile still on the launcher and eventually sank causing the occupants to take to the water again.

RESCUE

102. Rescue was affected swiftly by means of BROADSWORD's boats (whaler, Cheverton and 2 Geminis) plus about 10 helicopters from RFA FORT AUSTIN. The majority of men were deposited in BROADSWORD but some of the worst injured were flown directly ashore to a field hospital. All men were recovered from the water by about 2000Z and the search was called off at dusk when it was clear that no more survivors could be found.

103. BROADSWORD transferred the fit survivors to other ships in San Carlos later that night and sent the remainder of the wounded to the hospital ship UGANDA.

SUMMARY

104. In general the evacuation of the ship and subsequent abandonment went well. The comparatively small number of deaths and injuries is to some extent a result of the speed and efficiency with which this was carried out. There was however a considerable degree of luck: the weather was clear and calm; darkness had not fallen; the enemy did not make another attack; BROADSWORD and numerous large helicopters were close at hand. It is not difficult to envisage other circumstances in a South Atlantic winter battle when luck might not have been so much in evidence and the consequences for all concerned would have been serious.

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105. The Board has noted and reported separately on a number of instances of heroism during this period following the attack. Several men totally disregarded their own safety to assist others who were in difficulty both onboard the ship and subsequently in the water. The general absence of panic and cool manner in which the ships company behaved are a credit to their underlying sound organisation and good discipline.

and water responsibilities.

4. The Board has properly noted to cope with situation at 25/02/02 Navy

4. The Board has noted the training for 25/02/02 Navy and the damage situation.

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SECTION VII - MAJOR CONCLUSIONS

106. In this section we draw the major conclusions of our investigations in the form of answers to those broad questions which must be uppermost in most people's minds. Section VIII examines these conclusions in more detail and makes recommendations.

Q1 Was COVENTRY properly trained to cope with situation at 251820Z MAY?

A No. She had inadequate training for inshore AAW and massive damage situations.

Q2 Was COVENTRY uniquely undertrained?

A No. On the contrary in many areas she was better trained than most.

Q3 Was COVENTRY in a satisfactory material state?

A Yes.

Q4 Was COVENTRY being properly employed?

A Yes. In the extreme circumstances prevailing at the time. The very high risks were well known at all levels.

Q5 Should BROADSWORD/COVENTRY have moved when their position was thought to have been compromised?

A Possibly to the east but this would not necessarily have affected the outcome because their movement would have been seen from shore.

Q6 Was the final engagement well handled?

A No - in hindsight one can point to errors of judgement by both COVENTRY and BROADSWORD.

BUT the situation developed very quickly and every aspect would have had to have been handled faultlessly to have materially affected the outcome.

Q7 Could COVENTRY have been saved?

A No. The massive damage to Watertight Integrity made excessive loll and final capsize inevitable.

Q8 Could any initial casualties have been avoided?

A No - using existing doctrine. The distribution of people within the ship can be improved.

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Q9 Was evacuation properly conducted?

A Yes but in a hasty and apprehensive manner as the ship's list rapidly increased.

Q10 Was survival equipment adequate?

- A
- a. Lifejackets - Yes.
 - b. Liferafts - Yes in spite of being heavily overloaded.
 - c. Once Only Suits - Yes when put on properly.

Q11 Did rescue operations go well?

A Yes.

Q12 Should anyone be censured?

A No.

Q13 What major issues need to be resolved?

- A
- a. Should a Type 42 be able to defend herself against the low level short range/pop-up attack by manned aircraft/missiles?
 - b. If yes - to what extent should SEA DART be improved and/or other CIWS be fitted?
 - c. What tactical development and training effort should be devoted to close range defence?
 - d. Decide what types of major damage a Type 42 should be able to survive. Then, if necessary, modify the ships and their training accordingly.

SECTION VIII - CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

107. For ease of reading the conclusions and recommendations have been divided into the following main sections:

- a. General Considerations.
- b. Operations.
- c. Weapons Engineering.
- d. Damage and Damage Control.
- e. Escape/Survival/Rescue.
- f. First Aid and Casualties.
- g. Clothing and Burns.

CONCLUSIONS

GENERAL CONSIDERATIONS

108. Preparations for War

a. COVENTRY's programme from August 1981 to April 1982 provided (paragraphs 25-27) an ideal preparation for Operation CORPORATE. The ship had been well reported on during Command Team Training in February 1982. By the end of April 1982 the ship was well prepared for war except that:

- (1) There were some outstanding ME defects.
- (2) Sea Dart remained unproven.
- (3) The ship had little experience of inshore AAW.

b. En route to the TEZ there were few opportunities to exercise (paragraphs 29-31) AAW procedures and weapons systems due to restrictive EMCON and lack of targets. Surface warfare, NGS and NBCD training were given priority. The ship's company adjusted themselves to the thought of war and were quietly confident of their abilities.

OPERATIONS

109. Early Operations

a. COVENTRY gained useful CAP control and Area Air coordination experience with the Carrier Group (TG 317.8) 1-5 May.

Para 33-35

b. Early NGS operations were not successful owing to gun defects. These were rectified and the gun gave no further problems.

Para 38

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- c. The first Sea Dart engagement (C130/Lear Jet) was not successful. The targets were at the limit of feasibility. Paras 38 and 40
- d. The successful Sea Dart engagement against the Puma helicopter whilst encouraging was not representative of the subsequent inshore problems. Para 40
- e. Radar Type 992 MTI was not very successful in heavy clutter conditions and was unpopular with operators particularly surface picture compilers. It proved useful in correlating Link received tracks from Radar Type 967. Para 40
Annex D,
Para 3d(2)
- f. After her inshore operations South of Port Stanley COVENTRY reported that she would be best employed west of West Falkland. Para 41
- g. Offensive AAW operations required a Type 42 to the North and West of West Falkland with a Type 22 in close support. The Type 22 was shown to be ill suited to AAW operations in the AOA and vulnerable to 967 radar problems when manoeuvring at high speed. Paras 42 and 43
- h. COVENTRY's policy for closing up at Action Stations involved the minimum changes of position. The ship was fought on the watch with additional back-up where needed. Para 52
110. 42/22 Combination
- a. The 42/22 combination showed initial promise inshore. Annex C, Para 4
- b. However the inherent dangers were amply demonstrated when GLASGOW was hit. Annex C, Para 70
- c. COVENTRY's manoeuvres during the successful Sea Dart engagement at 251230Z and 251530Z appeared to be motivated by considerations of evasion. They complicated BROADSWORD's up threat manoeuvring. Para 56
- d. The significance of COVENTRY's alterations of course do not seem to have been registered in either ship. Para 59
- e. The manoeuvring methods developed by COVENTRY/BROADSWORD failed (under great stress) because:
- (1) Lack of guidance on evasive manoeuvring. Annex C, Para 11
 - (2) Lack of anticipation of COVENTRY's evasive action. Annex C,
Para 15, Para 71
 - (3) The conning officer in BROADSWORD was not aware of the threat axis for the second attack. Annex C,
Para 16, Para 72
 - (4) The manoeuvring method in use was not positive enough. Annex C,
Para 14

111. Choice of Patrol Lines 22-25 May

- a. The Sedge Island patrol line put the ships in relatively clear water but out of range of the enemy aircraft flight paths. Para 46
- b. The patrol line north of the AOA (24 May) was good for CAP control and AAW coordination but did not provide any Sea Dart opportunities. Para 49
- c. The patrol line for the 25th May north of Pebble Island potentially offered better Sea Dart opportunities although less well placed for CAP control and AAW coordination. Para 50
- d. The patrol line on 25th placed the CAP down threat for incoming raids. AAWC HF was required. Para 53
- e. The distance offshore (10 miles) was a compromise between interdicting raids and self defence. GWS 30 was better placed than previously in all directions except due South. 965 warning was increased by 30 miles. Para 54
- f. To interdict enemy aircraft on low level approach routes the Type 42 must be within 15 miles of that route. Annex C, Paras 19-20
- g. The Type 42 must be at least ten miles offshore to have any chance of engaging a direct FGA attack. Annex C, Para 22
- h. 15 miles offshore gives a balance between interdiction and self protection but any material or drill error will prevent successful engagements. Annex C, Para 23
- j. CTG 317.0 wanted a 42/22 air defence umbrella in the vicinity of the AOA rather than one interdictory force at longer range. Para 54

112. The Final Action

- a. On 25 May COVENTRY was in a good material state, her ship's company was quite well rested and confident. Para 52
- b. GOVENTRY and BROADSWORD had early 965/COMINT warning of the final raid and went to Action Stations. Para 60-61
- c. Two good 967 Link tracks were formed on the raid as it closed over West Falkland. Para 61
- d. COVENTRY detected the first pair of aircraft on Radar 992 as they crossed the coast at 10 miles. Para 61
- e. The Fighter Controller very nearly completed a snap interception at very close range in confusing circumstances. He did well. Para 67
- f. A 10 mile initial detection on 992 gives insufficient time for reliable 909 acquisition. Para 68

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g. The AIO did not provide a clear picture to the Captain in the latter stages of the attack. They had only 90 seconds to do so.

Para 66

h. The turn to starboard (which put the final attack on the port bow) complicated 4.5" gun control, visual gun direction and fouled Sea Dart aros.

Para 68

j. Visual Gun Direction is difficult in Type 42s and targets should be kept on one side of the ship if possible.

Paras 35-36

NOTE: Detailed GWS 25 and GWS 30 conclusions are considered under Weapons Engineering at Annex D.

WEAPONS ENGINEERING

113. Lessons from Early Operations

a. The WE Department was in good material state on 25 May.

Annex D,
Para 1

b. The WE Department was fully manned to the approved Scheme of Complement.

Annex D,
Para 2

c. A prolonged transit in EMCON silence militates against routine servicing and testing of WE transmitting sensors.

Annex D,
Appendix 4

114. Early Operations

a. No direct evidence of target hits was available until the Puma engagement.

Annex D,
Para 3a(4)

b. A failure on the right lane upper flash door locking bolt prevented an engagement against the Boeing 707 recce aircraft 22 May.

Annex D,
Para 3a(5)
Annex D,
Appendix 2
Para 5

c. The 4.5 Mk 8 experienced a rash of problems during NGS firings: all were satisfactorily resolved by mid May. During the final engagements approx 24 rounds were fired without mechanical/RPC mishap.

Annex D,
Para 3b(3)
Annex D,
Appendix 1,
Paras 2 and 3

115. The Final Action

a. Sea Dart was successful in 2 engagements on 25 May, at 1230 and 1530. During the final engagements, a missile was fired but as an unaimed shot.

Annex D,
Para 3a(6)
Annex D,
Appendix 1,
Para 4,

b. The successful Sea Dart engagement at 251530Z demonstrated the ability of 909 to hold lock overland when 992 contact was lost. (This is to be expected with a narrow beam radar and a target at sufficient height).

Para 58

c. 909 range from both trackers was available from about 4 $\frac{1}{2}$ -5 miles during the first attack of the last engagement. It was not used.

Annex D,
Appendix 1,
Para 2

SECRET

- d. Neither the gun nor the Sea Dart was used effectively during the final engagement. The only rounds fired by the gun were in depression. Annex D, Appendix 1, Paras 5 and 6
- e. GWS 30 target indication problems rather than clutter appear to have hampered 909 acquisition. Annex D, Appendix 1, Para 2; Annex C, Para 22
- f. Pressure of events probably caused the Gun Controller to use incorrect drill in attempting to control his turret when it went into Red limits. Annex D, Appendix 1, Para 3
- g. Decisions left to the Gun Controller concerning 'Sectoring out' his turret are prone to error under action conditions. Annex D, Appendix 2, Para 6
116. Equipment
- a. A pair of binoculars was illegally strapped to the port LAS visual head to supplement a permanently filtered left eyepiece. The effect was to give a false angle of sight from the port LAS. Annex D, Appendix 1, Para 5
- b. The 909 scan patterns provided as possible counters to 'pop-up' targets search too much volume for the time available. Annex D, Appendix 2, Paras 1 and 2
- c. Upper Flash Door locking bolts of the design available in COVENTRY are inadequate and a system freeze following failure in unacceptable. Annex D, Appendix 2, Para 4
- d. There is a pressing need to include a lethality prediction mechanism into system software; the current information is not sufficient. Annex D, Appendix 2, Para 7
- e. A range of 4 minor hardware improvements to the Radar Type 909 operators' console seem sensible and should be incorporated. Annex D, Appendix 5
- f. Information on which to base EMCON policies is available in FOTI and ATP1B. The style of presentation could be improved. Annex D, Appendix 4, Para 4
- g. No guidance is available on the retention of SAT transmitter performance levels after long inactive periods. Annex D, Appendix 4, Para 5
- h. There is no listing available showing criticality of performance testing/servicing under action conditions. Annex D, Appendix 4, Para 5
- j. 'Leak proof' dummy loads should be provided where sensor testing is essential. Annex D, Appendix 4, Para 6

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DAMAGE AND DAMAGE CONTROL

117. Preparations

- a. Damage Control Parties were correctly closed up before the attacks began.
- b. 'Take Cover' drill was not exercised prior to being used operationally.

Annex F
Paras 1-5

Annex F
Paras 4-5

118. Damage

- a. The precise weapon load of each attacking aircraft is not known.

Para 70
Annex F,
Appendix 1

- b. COVENTRY was hit by 30mm cannon fire and 3 bombs (probably 1000lb). Two exploded.

Para 71
Annex F,
Appendix 1

- c. 30mm cannon fire split the ship's side (5'x8") allowing the Forward Auxiliary Machinery Room (3,4,5J) to flood as the ship heeled. The diesel generators were undamaged and continued to run.

Para 72
Annex F,
Appendix 1

- d. Two bombs, one of which exploded, flooded 3, 4G and 3, 4H.

Paras 75-77
Annex F,
Appendix 1

- e. One bomb flooded the Forward and After Engine Rooms.

Paras 77-81
Annex F,
Appendix 1

- f. The Computer Room (3H), Operations Room (2G), Senior Ratings Dining Hall (2K), HQ1/MCR 2L were devastated by blast.

Paras 75, 79 & 81
Annex F,
Appendix 1

- g. 2 deck passageway distributed water throughout the ship as she lolled to port and deepened. Capsize was then inevitable.

Paras 80-82, 86
Annex F,
Appendix 1

119. Recovery from the Attack. HQ1 and other DC teams evacuated the HQ1/MCR/Technical Office complex soon after damage and attempted to take control of DC operations from the Aft Section Base.

Annex F
Paras 8-10

120. Damage Appreciation

- a. No single out-station knew the total extent of damage.

Annex F
Paras 12-16

- b. All DC communications had failed.

Annex F
Paras 12-16

- c. The Forward Section Base did not know that HQ1 had been evacuated.

Annex F
Paras 12-16

121. The After DC Base

- | | |
|--|------------------------|
| a. The huge search and rescue potential of the After DC Base was never used either to establish contact forward or to check for survivors between the blast doors on 2 deck passageways. | Annex F
Paras 18-21 |
| b. The normal reaction and logic of the CPO i/c and other senior ratings were numbed by the shock of actually being hit and seeing casualties. | Annex F
Paras 18-21 |
| c. There was acute awareness of the heel and fear of being trapped between decks. | Annex F
Paras 18-21 |

122. <u>The Forward DC Base.</u> The Forward DC Party was distracted from its primary task when faced with a flood of injured and shocked men evacuating the Operations Room. The 2I/C switched role to first aider and took no further part in DC attempts.	Annex F Paras 23-28
--	------------------------

123. Stability After Damage

- | | |
|---|--------------------|
| a. COVENTRY heeled some 16° to Port when flooded to 2 deck in several sections of the ship. | Annex F
Para 34 |
| b. The angle of heel developed to 45° + as flooding gradually caused deck edge immersion. | Annex F
Para 35 |
| c. Final resistance to capsize was lost as heel approached 45°. | Annex F
Para 35 |

124. Watertight Integrity of 2 Deck Passageway

- | | |
|--|--------------------|
| a. Although 2 deck is subdivided from G to N Section only 3 bulkheads are fully watertight. | Annex F
Para 36 |
| b. Some bulkheads are fitted with watertight doors but are not watertight overall because of unsealed pipe penetrations. | Annex F
Para 36 |
| c. These bulkheads can be made watertight by A+A action but other modifications to ventilation arrangements then become necessary. | Annex F
Para 36 |

125. Stability Documentation

The information in the NBCD Class Book is inadequate.	Annex F Para 37
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ESCAPE/SURVIVAL/RESCUE

126. <u>Organisation and Training.</u> With the exception of 2 points (unpacking, checking and restowing each survival suit and briefing on dangerous areas for leaving the ship) all reasonable preparations had been made before entering the war zone.	Annex G Paras 2-4
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127. Evacuation of the Ship

a. Due to the loss of the main broadcast, there was no general order to abandon ship.

Annex G
Para 5

b. There were few serious problems with evacuation, although 28% of survivors had some degree of difficulty. (A detailed breakdown of problems is at Annex G, Appendix 1).

Annex G
Para 6

128. Assembly at Abandon Ship Stations. Assembly was orderly but actual positions were dictated by men's choice of escape route, what they had done on the way there and the difficulty in maintaining a foothold on the rapidly listing deck.

Annex G
Paras 7-8

129. Leaving the Ship

a. In the absence of main and upperdeck broadcasts no general order could be given to leave the ship.

Annex G
Para 9

b. Men became reluctant to leave the ship as underwater obstructions broke surface when the list reached 25-30 degrees.

Annex G
Para 9

c. Although a number of men sustained minor cuts and bruises whilst leaving the ship there was (with the exception of the First Lieutenant who struck a stabiliser fin) no serious injury.

Annex G

130. Personal Survival. Despite the cold weather conditions personal survival did not pose many serious problems.

Annex G
Para 12

131. Time in the Water

a. All survivors spent some time in the water (minimum 15 seconds, maximum 90 minutes, average 15 minutes).

Annex G
Para 13

b. Cold was a problem but its effects were mainly limited to discomfort. Some men displayed symptoms of exhaustion whilst attempting to reach liferafts.

Annex G
Para 13

132. Survival Suits

a. Only 35% of the survivors managed to dress correctly in the survival suit. Many subsequently suffered from the effects of ingress of water.

Annex G
Para 14

b. About 53% of survivors did not attempt to dress in the survival suit due to a variety of reasons (loss of the suit below decks; deliberate decision in belief that capsizing was imminent; various 'finger troubles').

Annex G
Para 15

133. Lifejackets. About 90% of survivors wore their lifejackets and few problems were encountered.

Annex G
Para 17

134. Liferafts

- a. No general order to launch rafts was given. Annex G
Para 18
- b. No attempt was made to launch port side rafts due to increasing list of the ship. These rafts did not appear on the surface when the ship capsized. Annex G
Para 19
- c. All 8 starboard side rafts were released but with increasing difficulty as the list to port increased. Annex G
Para 20
- d. Liferafts in the water were heavily overladen (up to 47 men in one raft). Annex G
Para 21
- e. Laden liferafts were difficult to propel from the ship's side. Some became trapped and one sank after being punctured. Annex G
Para 22

135. Rescue. Rescue was swiftly and effectively carried out by BROADSWORD's boats and 10 helicopters from RFA FORT AUSTIN.

FIRST AID AND CASUALTIES

136. Training

- a. It is doubtful whether every member of the ships had adequate knowledge of BR 25 (First Aid in the Royal Navy). Annex H
Para 3
- b. Although key First Aid personnel had received a good training this had not included work with real wounded. It is clear that familiarity with the problems of facing and dealing with wounded speeds up the response to the problem and promotes a calmer, more rational atmosphere. Annex H
Para 5
- c. The Forward DC party appears to have been made less effective by the flood of wounded from the Operations Room area, none of whom was seriously injured. Annex H
Para 22
- d. No cold water for the treatment of burns was stored in baths, basins or in any containers that could be pressed into use. Annex H
Para 22
- e. Only the MO was able to set up an intravenous saline infusion. This can be lifesaving in serious burns cases and must be considered as a First Aid measure. Annex H
Para 23
- f. Two men died, one indirectly, and one was quite seriously injured through adopting an incorrect posture at 'Take-Cover'. Annex H
Para 32a

CLOTHING AND BURNS

137. Protection Afforded by Clothing

- a. There is no evidence to prove a difference between the protective qualities of cotton and man made fibre clothing as supplied in the RN.

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- b. There is good evidence to suggest that more layers of clothing improve protection against flash fire.

RECOMMENDATIONS

OPERATIONS

138. The following recommendations arise from conclusions drawn from both the narrative and relevant Annexes.

139. General Considerations

- a. The requirement for GWS 30 fitted ships to be able to engage low level/pop-up targets at short range should be re-examined. We believe the requirement exists.
- b. The fitting of PDMS/CIWS in GWS 30 ships should be considered. The need (or otherwise) for the 42/22 combination should be established and appropriate SOP's developed. (N.B. Subsequent recommendations are subject to decisions taken on 3a above).

140. Training

- a. Operational Performance Standards (OPS) for the use of GWS 30 (or PDMS/CIWS to be fitted) against low level/pop-up targets should be developed.
- b. Training should be instituted at appropriate levels (career, PJT, CTT, QJT) to meet OPS in a. above. (This training may be beyond the capabilities of those now manning the system).
- c. A policy for the fitting and use of onboard continuation training equipment (particularly in the quick reaction situation) during prolonged operations or exercises needs to be developed.
- d. 42/22 SOP's (if developed) should be exercised at all levels.

141. Documentation

- a. In view of continuing Falklands involvement Intelligence and Recognition material should be updated (we are sure it is).
- b. CB 3189/Fighting Instructions/ATP 31 should include recommended evasive manoeuvres against low level lay down attacks.
- c. CB 04988(2A) - GWS 30 Performance and Limitations. Should be amended to include Probability of Success curves within the Feasibility envelope. Table 15.1 requires expansion and updating (printed 1977). This book should incorporate the lessons learned from paragraph 142.b below.

142. Systems - Expected Performance

- a. The need to carry out confidence checks of Weapon Systems when opportunity targets object to being illuminated should be established. Balloon runs?

b. Realistic expectations of system performance should be made from analysis of all available information/and widely disseminated in order to dispel optimism or pessimism.

143. Systems - Preparations. No recommendations. Systems were well prepared.

144. Systems - Support. The support was excellent; those concerned should be congratulated (no doubt they have).

145. Systems - Operational Use

a. The performance of GWS 30 in an inshore (AOA) environment should be evaluated having incorporated the hardware and software modifications resulting from Fleet Trial 114/80 and Task 1171.

b. GWS 25 software and standard drills should be developed to improve its performance against manned aircraft.

c. Greater emphasis should be placed on the use of GSA1 in all its AA modes.

d. Consideration should be given to providing communications for the MGD(V) on the port side of the Type 42's GDP.

WEAPONS ENGINEERING

146. EMCON/Dummy Loads/Performance Testing

a. Technical information on which to base EMCON policies should be presented in a single volume, using a format similar to that employed in CB 4986 (Confidential Addendum to BR 2924).

b. Sensors which need frequent testing of transmission to maintain confidence in their performance levels should validate these against ship launched targets at every opportunity.

c. Ships should be provided with a list of minimum maintenance and servicing items for use under action conditions.

d. Where dummy loads are provisioned, every design step should be taken to minimise radiation.

147. Radar Type 909

a. Search patterns for 'pop-up' targets should be researched and incorporated.

b. Target range and tracker relative bearing should be provided within the line of sight of the 909 I-Band operator. Blind arc audible indication should be added to the visual cue.

c. J-Band S/N indication should be provided for the J-Band operator.

148. Sea Dart Launching/Handling

- a. Upper Flash Door locking bolt arrangements should be redesigned, trialled and fitted as a matter of urgency.
- b. Procedures must be developed which allow use of the system, even in a degraded mode, if minor features of the engagement sequence fail.

149. GWS 30 System. A lethality prediction process should be included in the software.

150. GSA 1

- a. Software should be provided which controls gun sectoring.
- b. Ships should be reminded that binoculars are not to be lashed on to the LAS without proper authority.

DAMAGE AND DAMAGE CONTROL

151. Training

- a. Take Cover drill must be introduced to ships NBCD training.
- b. DC team training should impress the need for men to keep their station until directed otherwise by the leader.

152. Equipment. Typical heel angles at various levels of underwater damage should be displayed on Section Base state boards.

153. Construction

- a. Type 42s currently deployed should make the non-watertight bulkheads watertight by self help or with the assistance of support vessels.
- b. Similarly Type 42s in the UK should be modified and examined by their Admin Authority before re-deployment.

154. Documentation. An immediate update on Type 42 stability behaviour should be forwarded to ships and training establishments for insertion in the NBCD class book.

NOTE: A number of other minor recommendations are incorporated into 'Damage Control - Lessons Learnt' - Annex F Appendix 8.

ESCAPE/SURVIVAL/RESCUE

155. Training

- a. More emphasis should be placed on Sea Survival and Raftsmanship Courses for ships as run by HMS DAEDALUS.
- b. Periodic drills should be carried out to familiarise men with the technique for dressing in and wearing the survival suit.

156. Equipment Design and Provision

- a. Some system of distinctive deck edge or guardrail marking should be investigated which highlights those areas where underwater obstructions make abandon ship dangerous.

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- b. The design of the survival suit should be re-examined to determine whether drain plugs could be re-incorporated into the feet.
- c. Liferaft stowages should be modified to ensure that rafts can be released without lifting even when the ship is listing.
- d. The number of liferafts carried should be increased so that there is sufficient on each side of the ship for all of the ship's company.
- e. The design and equipment fit of the liferafts should be re-examined to establish whether better towing fixtures could be provided and whether the provision of some form of paddle is necessary.

FIRST AID AND CASUALTIES

157. Training

- a. Individual training should be re-examined to increase the emphasis on first aid, in particular familiarity with BR 25 (First Aid in the Royal Navy).
- b. Key members of both first aid and damage control teams should receive some training involving work with real wounded/injured.
- c. The importance of storing cold water for treatment of burns at Action Stations should be re-emphasised in ships' NBCD training.
- d. Training in intravenous saline infusion should be given to key members of first aid parties.
- e. The correct position for "Taking Cover" should be taught and enforced.

CLOTHING/BURNS

158. Equipment

- a. At Action Stations in addition to the basic rig of No 8's, underwear, wool socks, DMS Boots and Antiflash Gear, a HWJ should be added as an absolute minimum. As many layers as possible should be worn.
- b. Each officer and rating should be issued with "Battle Clothing". This would consist of an overall with attached hood and instep straps, bulky enough to cover other clothing, made of a modern man-made fire retardant cloth such as 'Nomex'. Two suits of this clothing would be issued but only used in real war and emergencies such as fires in ships etc. Exercises would be done using standard cotton overalls.
- c. All headsets should be entirely without flammable materials in exposed parts.

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ANNEX A TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

SUPPORTING DIAGRAMS

1. The diagrams at Appendices 1 to 7 support descriptions of various phases of the action referred to in the narrative and in Annexes to the Report.

Appendix:

1. Operations South of Stanley 6-9 May 1982
2. Patrol Line 22 May 1982
3. Patrol Lines 24-25 May 1982
4. Sea Dart Engagement 1230Z 25 May 1982
5. Sea Dart Engagement 1530Z 25 May 1982
6. Final Engagement 1800-1830Z 25 May 1982
7. Final Engagement 25 May 1982

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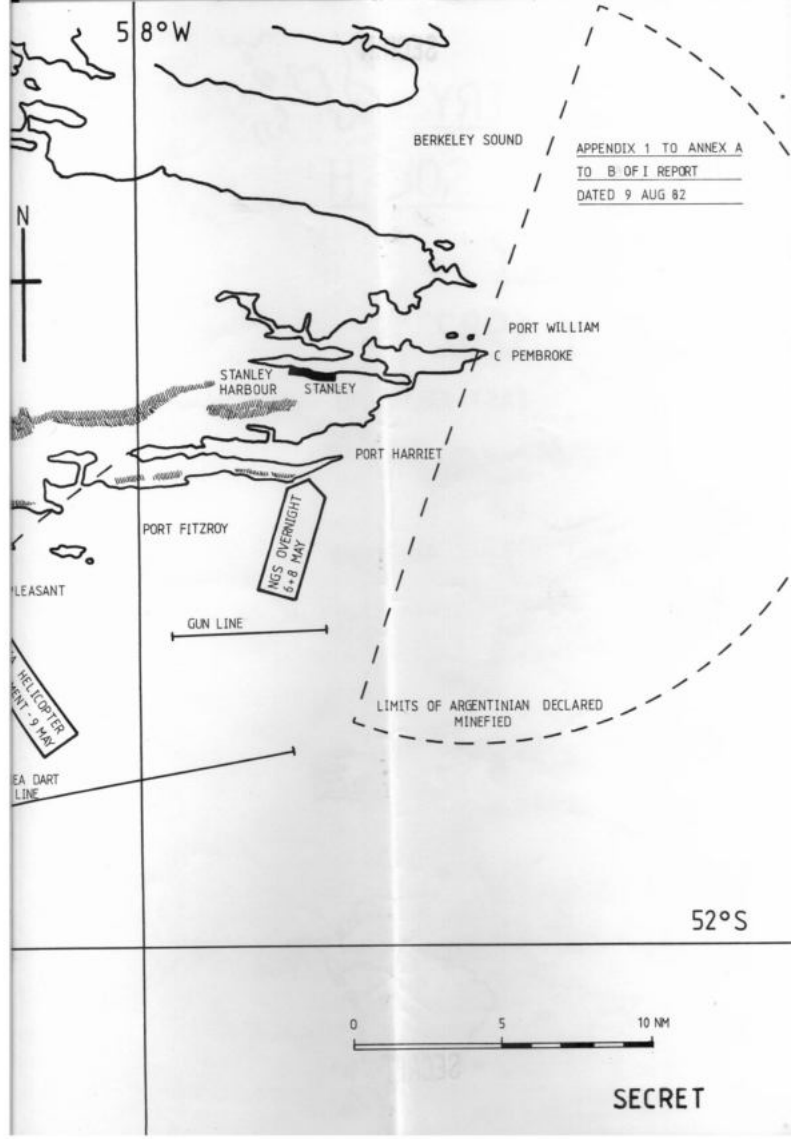
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HMS COVENTRY

OPERATIONS SOUTH

OF STANLEY

6-9 MAY 1982



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HMS COVENTRY PATROL LINE

22 MAY

App 2 to
Annex A to
B of I Report
Dated 9 Aug 82

51°N

JASON ISLANDS

4

N FUFUI UR

← Cov/B'Sword Patrol Line
For 22 May

SEGE ISLAND

Cov/B'Sword Planned Patrol
Line For 23 May
(Not Taken Up Due To New
Orders From (TG 317-8))

SOUTH JASON

Various Navigational Dangers
Kelp, Reefs etc

CARCASS ISLAND

SAUNDERS ISLAND

WEST
FALKLAND

Argentinian Air Traffic
Outside Viable Sea Dart Range
From Patrol Line 22 May

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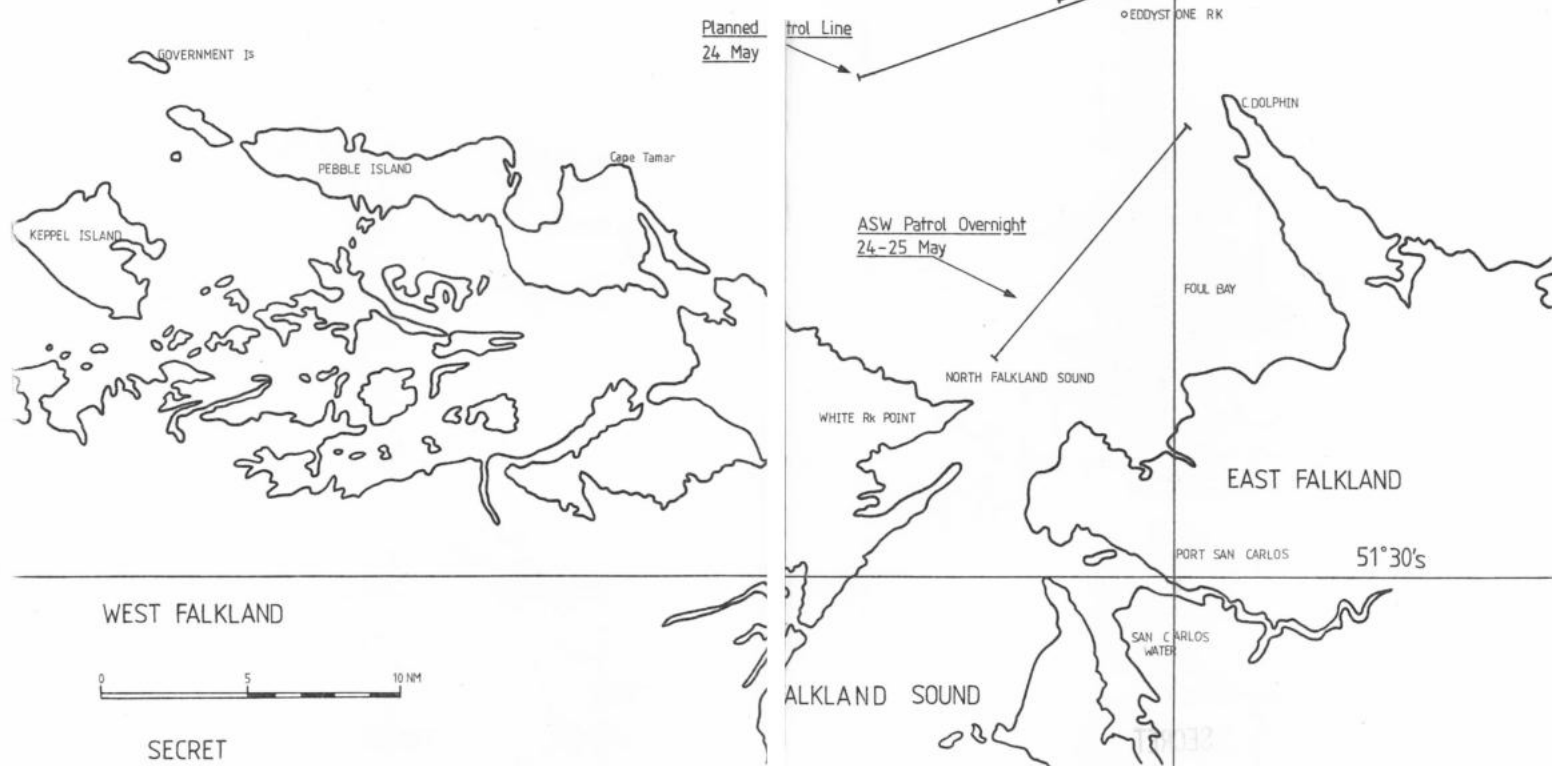
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T37032
5 9°W

HMS COVENTRY PATROL LINES

24-25 MAY

App 3 to
Annex A to
B of I Report
dated 9 Aug 82



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HMS COVENTRY SEA DART

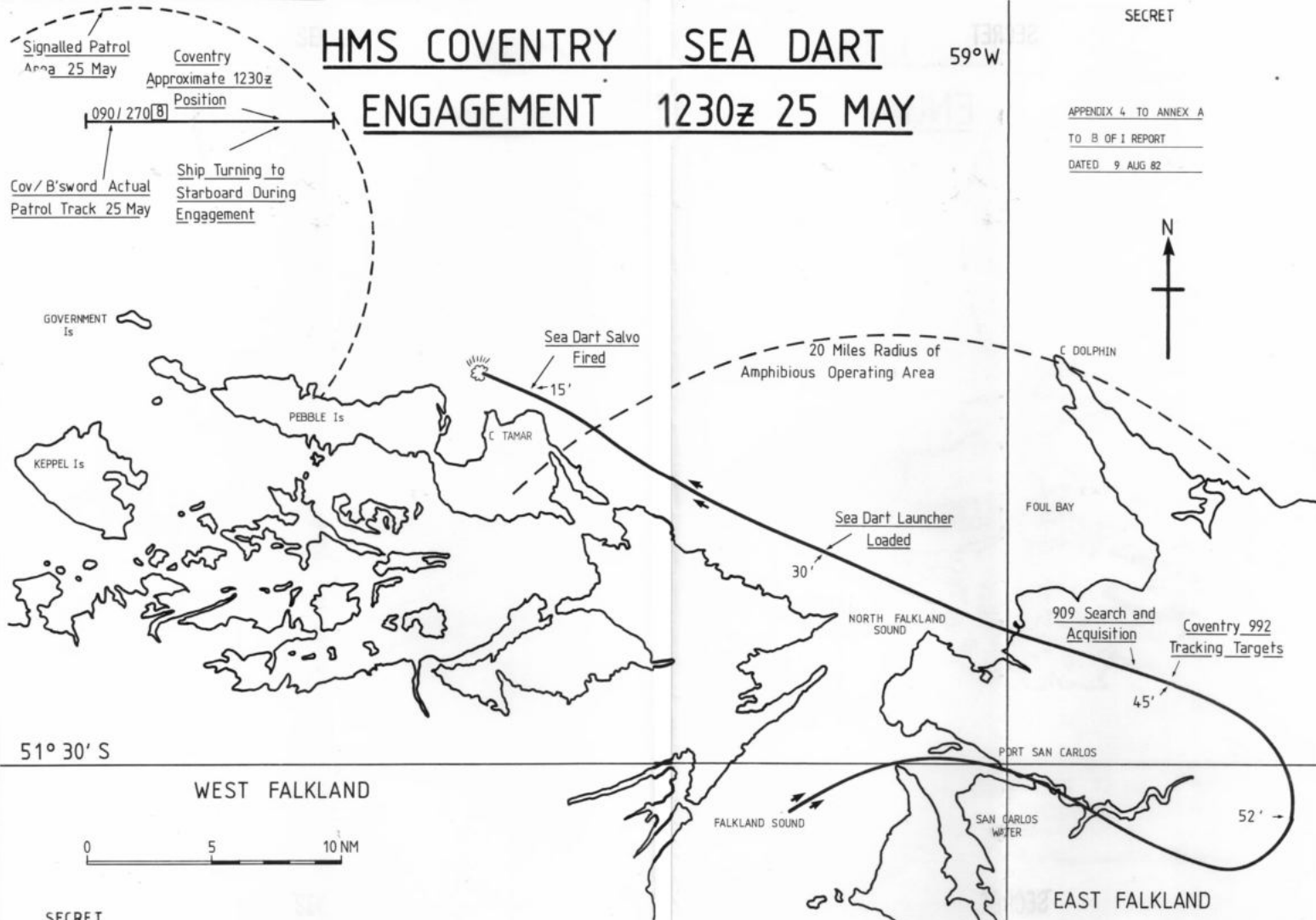
59°W

ENGAGEMENT 1230z 25 MAY

APPENDIX 4 TO ANNEX A

TO B OF I REPORT

DATED 9 AUG 82



Signalled Patrol
Area 25 May

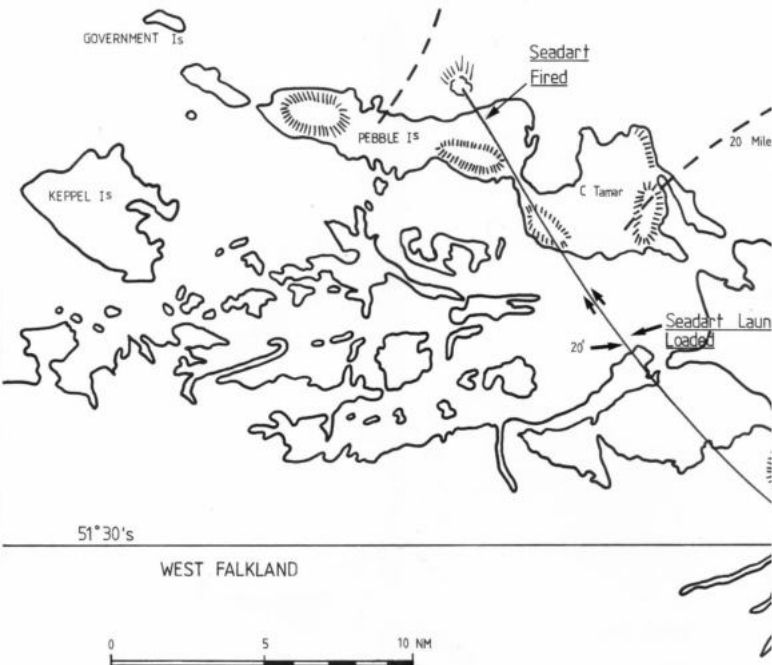
Coventry
Approximate 1530z
Position

090/270

Cov/B'Sword Actual
Patrol Track 25 May

Ship Turning To
Starboard During
Engagement

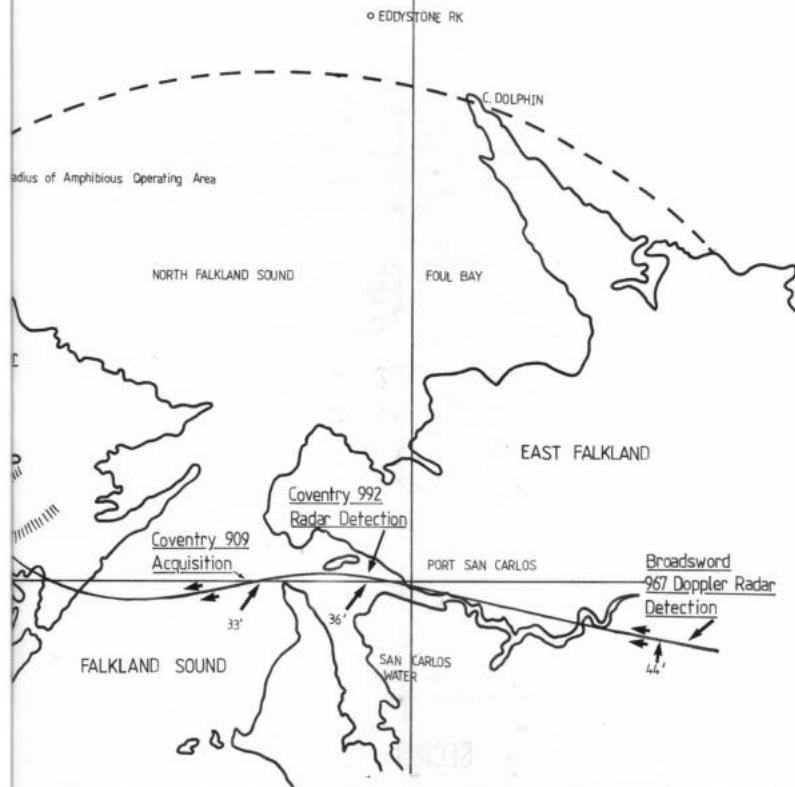
HMS COVENTRY / SEA DART ENGAGEMENT 1530 Z 25 MAY



59°

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APPENDIX 5 TO ANNEX A
TO B OF I REPORT
DATED 9 AUG 82



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HMS COVENTRY FINAL ENGAGEMENT

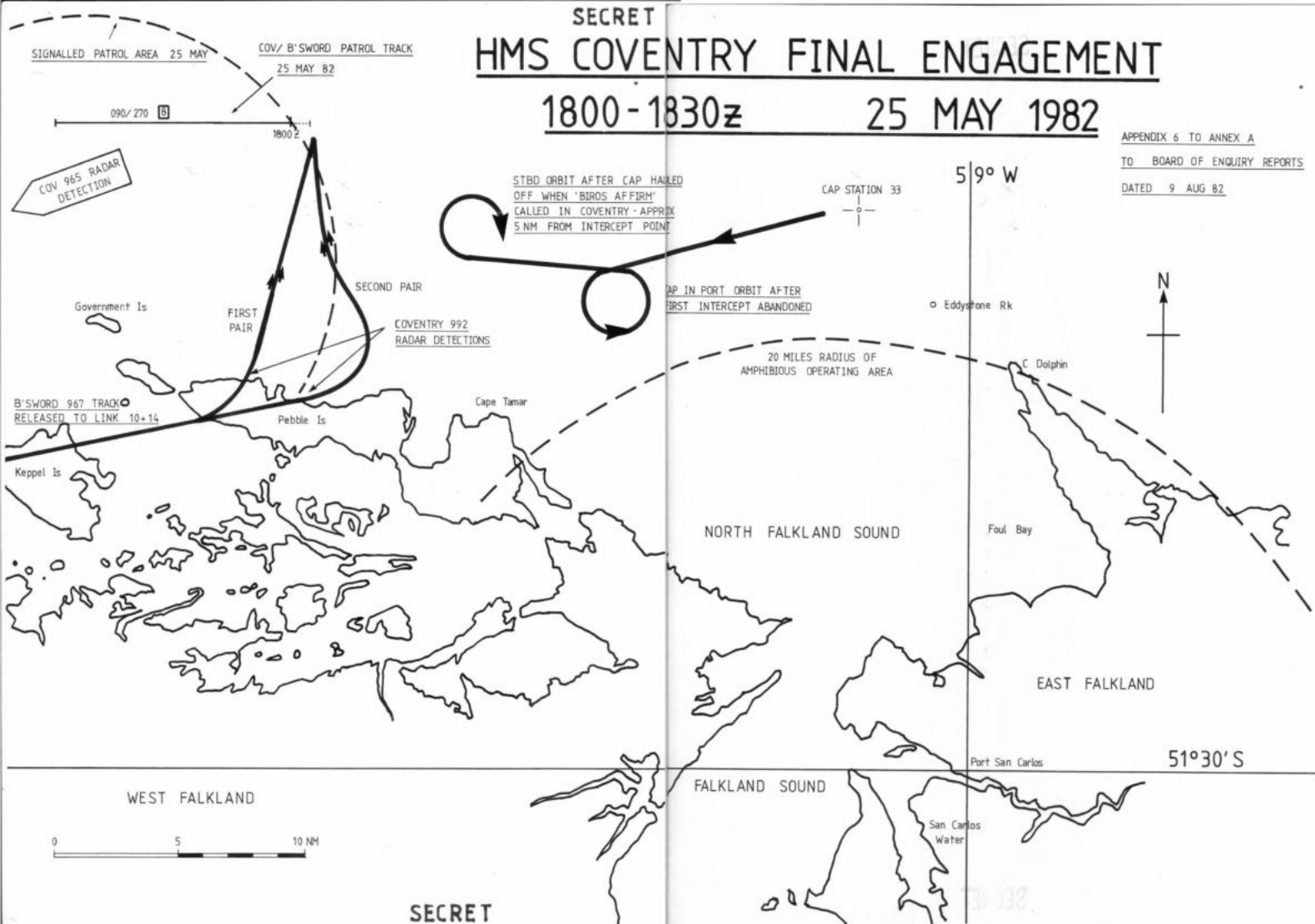
1800-1830z

25 MAY 1982

APPENDIX 6 TO ANNEX A

TO BOARD OF ENQUIRY REPORTS

DATED 9 AUG 82

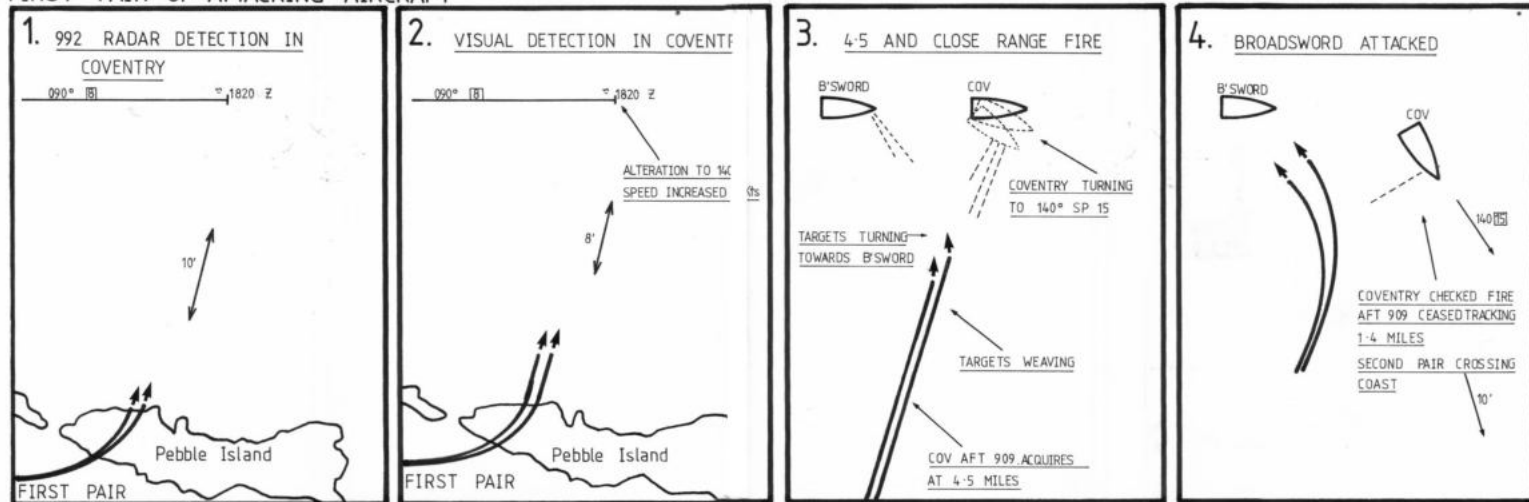


HMS COVENTRY - Final Engagement - 25 May 82

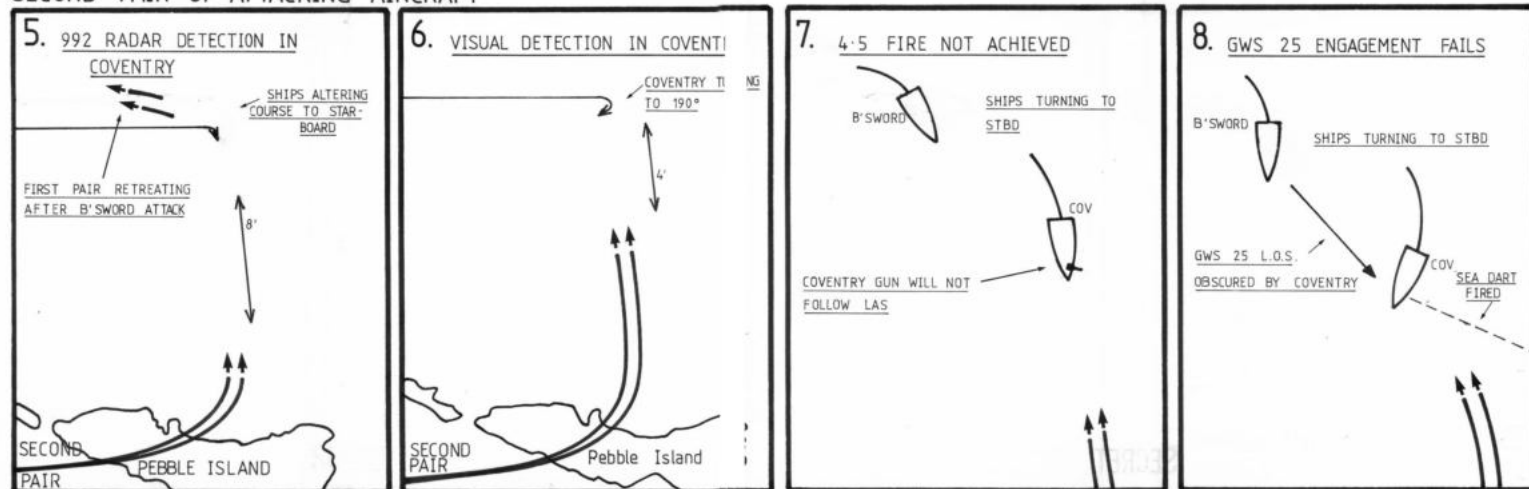
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APPENDIX 7 TO ANNEX A
TO B OF I REPORT
DATED 9 AUG 82

FIRST PAIR OF ATTACKING AIRCRAFT



SECOND PAIR OF ATTACKING AIRCRAFT



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SIGNALS

1. At Appendices 1 to 15 are transcripts of signals transmitted between 8 and 25 May 1982 which are relevant to the actions leading up to the loss of HMS COVENTRY.

1. Take COVENTRY under your orders and at 0900Z proceed inshore to a suitable position between the airfield and the coast South West of Pembroke Light.
2. Arrive before dawn in order to battle in good time.
3. Conduct AAM mission to intercept air traffic and Arg CAP to/From/Over Port Stanley. In spare time COVENTRY should target separately briefed.
4. Withdraw:
 - a. After sunset.
 - b. When reduced to fifty percent (50%) fuel.

Appendices:

1. CTG 317.8 082321Z MAY - Orders for inshore patrol on 9 May
2. CTG 317.8 091040Z MAY - Explanation of missile trap
3. HMS COVENTRY 092025Z MAY - Recommendation for employment of Type 22/42 combination
4. HMS BROADSWORD 101235Z MAY - Post Action SITREP 9 May
5. HMS BROADSWORD 232218Z MAY - Air Defence in AOA
6. HMS BROADSWORD 220825Z MAY - Intentions for Operations West of Falklands
7. HMS BROADSWORD 222040Z MAY - SITREP 22 May/Intentions 23 May
8. CTG 317.8 222342Z MAY - Instructions for COVENTRY to return to Carrier Group
9. CTG 317.8 240003Z MAY - Orders for missile trap 24 May
10. HMS COVENTRY 241745Z MAY - COVENTRY views on Type 42 positioning
11. HMS BROADSWORD 242020Z MAY - Intentions 24/25 May
12. HMS BROADSWORD 250538Z MAY - Air defence of AOA 25 May
13. HMS BRILLIANT 122230Z MAY - Type 42/22 Combination
14. HMS BROADSWORD 131040Z MAY - GWS25 Brief
15. CINCFLEET 230453Z MAY - HMS ARDENT Lessons Learnt

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APPENDIX 1 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

Z 0 082321Z MAY 82
FM CTG 317.8
TO HMS BROADSWORD
INFO HMS COVENTRY
CTG 317
HMS ALACRITY
HMS INVINCIBLE

SECRET

1. Take COVENTRY under your orders and at 0300Z proceed inshore to a suitable position between the minefield and the coast South West of Pembroke Light.
2. Arrive before dawn in order to settle in good time.
3. Conduct AAW mission to interdict air traffic and Arg CAP to/from/over Port Stanley. In spare time COVENTRY bombard targets separately briefed.
4. Withdraw:
 - a. After sunset.
 - b. When reduced to fifty percent SEAWOLF outfit.
 - c. When you have had enough for whatever reason.whichever is the earlier.
5. Comms iaw current organisation. Grateful for SITREPs on AAWC HF which will be the primary AAWC net for the period of the operation.
6. Be aware ALACRITY coming out from your slot leaving shore at about 0400Z.
7. SHAR CAPs will keep clear COVENTRY MEZ and may be given to COVENTRY for control by AAWC.

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SECRET

APPENDIX 2 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 091040Z MAY 82
FM CTG 317.8
TO HMS COVENTRY
INFO HMS INVINCIBLE
HMS BROADSWORD

CONFIDENTIAL

You are a missile trap. Try not to drive enemy away with CAP unless you have to.

SECRET

SECRET

APPENDIX 3 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 092025Z MAY 82
FM HMS COVENTRY
TO HMS BROADSWORD
INFO CTG 317.8
HMS INVINCIBLE

1. Arg air activity today clearly indicates supplies are being dropped frequently on West Coast of East Falklands as well as on Stanley. Also possibly on Western Island.
2. Highly recommend Type 22 and 42 combination for air interdiction. Consider two pairs operating independently to West and South West of Island would be ideal for intercepting Arg air traffic.

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SECRET

APPENDIX 4 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 101235Z MAY 82
FM HMS BROADSWORD
TO CTG 317.8
INFO HMS COVENTRY

CONFIDENTIAL

POST ACTION SITREP

1. Rejoining at 100700Z COVENTRY in company.
2. Estimate fuel remaining on arrival, 74 percent BROADSWORD
83 percent COVENTRY.
3. Ammunition expended. BROADSWORD nil. COVENTRY 4 Darts 14 Rounds HE.
4. Comments:

- a. Consider deterrent role largely successful but kill rate disappointing. NGS hampered by COVENTRY gun defect.
- b. Feel SSK threat increases as NGS area is used on a more regular basis.
- c. Would like to try setting up missile trap West of Falklands or off Falkland Sound which might be better interdiction point.
- d. Consider T22/42 combination has great potential.

B4 - 1 of 1

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SECRET

APPENDIX 5 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

Z O 232218Z MAY 82
FM HMS BROADSWORD
TO CTG 317.8
INFO CTG 317.0

SECRET

AIR DEFENCE IN AOA 23 MAY

1. Attacked by estimated total of 10 Mirage/Skyhawk during second half of afternoon. One splashed by CAP and two possibly three by Missile/gun fire.
2. ANTELOPE serious bomb damage, BROADSWORD missed by 25 yards.
3. I remain of the opinion that disposed as we are in the AOA we suffer almost every disadvantage including:
 - a. Little or no warning.
 - b. Poor ESM environment.
 - c. Lack of suitable air defence ship.
 - d. Weapon systems limited to secondary emergency mode of operation.
 - e. Lack of Link.
4. Although we are whittling away at the enemy's strength in the air it is expensive in ships, inefficient and hard to take with equanimity.
5. The enemy clearly has a high regard for the Harrier and with good reason but we are failing to exploit this because of para 3c and shortage of time on target. While your views on TDT are well understood I firmly believe and very strongly recommend we should vary out tactics and take the fight to the enemy by either:
 - a. Stationing Type 42/22 combo about 10 miles North of AOA to make better use of CAP, or
 - b. Setting up Type 42/22 missile trap West of Falklands to disrupt incoming raids.
6. I recognise that my attempt at objective thought is inevitably coloured by the unhappy experience to date of feeling a bit cornered. It is also relevant that despite frequent multiple raids BROADSWORD has so far only been able to fire 4 SEA WOLF missiles to date although 2 of these scored. 1 other taken by Bofors.
7. Finally there seems little coordination yet with Rapier batteries. Are we in their way?

SECRET

SECRET

APPENDIX 6 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 220825Z MAY 82
FM HMS BROADSWORD
TO HMS COVENTRY
INFO CTG 317.8
317.0

SECRET

INTENTIONS FOR OPERATION WEST OF FI

Ref CTG 317.8 19N/SAB 220008Z MAY 82 (AAWC Freqs)

1. Mission is to proceed to a patrol line (North/South) between Sedge Island and N Fur Island (Chart 2514) arriving at daybreak and remaining covert until arrival. Then to use surprise/CAP/DART/SEA WOLF to intercept anticipated waves of Arg air reducing thereby the AAW task of units in Falkland Sound.

2. Screen Kilo from 220800Z COVENTRY ZZ BROADSWORD Station W2 0036 ZZ Plan 15 S Courses and Speeds as ordered. Patrol line AA/BB is

51 08 S (4) 060 34 W (3) - AA

50 58 S (8) 060 34 W (3) - BB

On arrival COVENTRY patrol reporting courses and speeds by SAG single letters.

3. Comms X-Ray COMPLAN column Alfa in force with following exceptions:

a. ASW circuits are Yankee COMPLAN.

b. AAWC HF iaw ref.

4. X405A will be used for LAAWC. AAWC HF is for passing SITREFs to CTG 317.8/CTG 317.0.

5. Initial EMCON plan

C 60U 80X 88U 70U 181U
182X.

Relaxations will be made as the situation changes.

6. COVENTRY take duties 22 28 85 BROADSWORD all other duties.

7. If Link 10 deteriorates intention is to activate a local Link.

SECRET

SECRET

APPENDIX 7 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 222040Z MAY 82
FM HMS BROADSWORD
TO CTG 317.8
INFO CTG 317.0
HMS HERMES
HMS COVENTRY
HMS INVINCIBLE

SECRET

SITREP

1. Remaining same area until after dark.
2. Wind 340 - 28. Sea State 3. Vis 4M. Overcast.
3. Intend moving to new location South of Grand Jason under silent EMCON overnight.
4. Believe an unnecessary amount of information is being disclosed on AAWC HF. Far greater use could be made of CAP UHF relay.
5. C 130 and escort turned away well outside weapon range. CAP legs not long enough. Regret no engagement.
6. Hope for more trade tomorrow.

SECRET

SECRET

APPENDIX 8 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

Z 222234Z MAY 82
FM CTG 317.8
TO HMS BROADSWORD
INFO HMS COVENTRY
CTG 317.0
TU 317.8.4

SECRET

1. Return to AOA. Report PCS 2 hourly to me and CTG 317.0.
2. On reaching position 000 Pt Alpha 10 detach COVENTRY to rejoin me near 51 30S (9) 055 10W (1) via route Damson by 231100Z. COVENTRY to report 2 hourly PCS to me info TU 317.8.4.
3. Signal summarising other friendly movements follows.

B8 - 1 of 1

SECRET

SECRET

APPENDIX 9 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

Z 240003Z MAY 82
FM CTG 317.8
TO HMS BROADSWORD
INFO CTG 317.0
HMS ALACRITY

SECRET

1. COVENTRY join BROADSWORD at position Orchard at 240300Z.
2. BROADSWORD set up missile trap North of AOA as agreed, COVENTRY roughly as in ref para 5a.
3. Review at dusk tomorrow.
4. Ref para 7 suspect answer is yes.

5. Whilst with some risk consider only offensive positioning possible for Type 42 in amongst islands to far West with Type 23 for mutual support. Otherwise defence of HMS in open sea remains most effective role.

6. At 0415Z HMS ALACRITY was fired at enemy aircraft bearing 060 but 900 reduced by land clutter during engagement.

7. Kill so far reported by BROADSWORD as 1 Mirage splashed by SAM, 3 by Napalm and 2 by FIM-92. Total 5. One other heard on 0420Z but not in position 3' 37N 16' 00W as yet.

SECRET

SECRET

APPENDIX 10 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 241745Z MAY 82
FM HMS COVENTRY
TO CTG 317.8
INFO CTG 317.0
HMS BROADSWORD

SECRET

1. A Type 42 operating less than 25 miles from shore can only bring SEA DART to bear over 180 degree arc to seaward.
2. In present position 10 miles North of Sound COVENTRY is only giving moral support to BROADSWORD and assisting with CAP control. SEA DART is never in with a chance since enemy to date appears off land from South or from close along North Coast from West.
3. Albeit with some risk consider only offensive positioning possible for Type 42 is amongst islands to far West with Type 22 for mutual support. Otherwise defence of HVU in open sea remains most effective role.
4. At 1415Z one SEA DART was fired at enemy aircraft bearing 160 but 909 seduced by land clutter during engagement.
5. Kill so far assessed by COVENTRY as 3 Mirage splashed by CAP, 3 by Rapier and 2 by FEARLESS. Total 8. One other heard on Arg frequency ditched in position 51 37S(6) 60 50W(1) on way home.

SECRET

SECRET

APPENDIX 11 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O P 242020Z MAY 82
FM HMS BROADSWORD
TO HMS PLYMOUTH
HMS COVENTRY
HMS ARROW
HMS YARMOUTH
INFO CTG 317.0

INTENTIONS 24/25 MAY 82

1. ASW. 242100Z - 250900Z MAY. BROADSWORD Falkland Sound areas Delta-Golf. COVENTRY (unless recalled by CTG 317.8) carry out ASW patrol in North Falkland Sound between Cape Dolphin and White Rock Point. YARMOUTH and ARROW call BROADSWORD ASW(A) on rejoining.

2. AAW. From 250900Z MAY 82. Same as today.

SECRET

SECRET

APPENDIX 12 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

O 250538Z MAY 82
FM HMS BROADSWORD
TO CTG 317.0
HMS COVENTRY
INFO TU 317.8.2
TU 317.0.4
HMS BRILLIANT
HMS ANTRIM

CONFIDENTIAL

AIR DEFENCE OF AOA TODAY

1. 22/42 combo operating NE of Government Islet falling back towards North Falkland Sound during day.
2. Link 10/14 as for yesterday. Link 10 fitted ships tell Link RXD picture on UHF to other units.
3. Station 14 Mod (N Falkland Sound) and 15 Mod (Grantham Sound/Swan Island) to be filled. Stn 14 will be taken West to meet any developing threat.
4. PLYMOUTH report Link 14 state.

SECRET

SECRET

APPENDIX 13 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

P 122230Z MAY 82
FM HMS BRILLIANT
TO CTG 317.8
INFO HMS GLASGOW
HMS COVENTRY
HMS BROADSWORD

CONFIDENTIAL

TYPE 42/22 AAW COMBO

1. As a result of today's air attack action involving BRILLIANT and GLASGOW consider we have learned some more lessons worth recording.
 - a. First that the combination is a good one in which the strengths and weaknesses in ship systems offset each other. There are no serious interference problems.
 - b. Type 967 radar can and does perform well over land and Type 42 can acquire 22 link tracks. However 42 system prefers to be at least 20m offshore to ensure long range Sea Dart engagement which if we end up escorting heavies inshore this pairing arrangement might have to be re-thought.
 - c. 22 needs to follow 42 around in order to have gun and Sea Dart arcs. Attack line needs to be roughly at right angles to threat bearing if possible to allow both Sea Wolf launchers to engage.
 - d. At a pinch Type 22 can control CAP even overland (did today) although probably at not more than 50m.

SECRET

SECRET

APPENDIX 14 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

P 131040Z MAY 82

FM HMS BROADSWORD

TO CTG 317.8

INFO CTF 317

TO 317.8.4

FOF3

HMS BATTLEAXE

HMS ANDROMEDA

ASWE PORTSDOWN

SECRET

GWS 25 FOR BEGINNERS. GOALKEEPING LESSONS LEARNT

1. HVU. T22 within 5 cables (pref 3) up threat. Good liaison between HVU and Goalkeeper essential. Accurate threat direction required. HVU should use SAG single letter signals for alterations of course and speed.
2. T22/42 combo. T22 at standard distance on up threat quarter of T42. This may mean losing station during bombing raids but combo should try and stick together. Sea Darts will not be taken by Wolf at such close quarters.
3. To eliminate some misunderstandings for the uninitiated about the system sub paras below may help.
 - a. Radial velocity. System will automatically form track on any contact with relative radial velocity (Doppler) of plus or minus 85 knots. Not to be confused with.
 - b. Critical velocity. Setting on command panel from 100-650 knots. TGTS at less than critical velocity set will not be considered a threat.
 - c. Crossing distance. Altered in 500yd steps out to 9500yds. In auto mode ~~targets~~ crossing outside 1 mile will not be engaged.
4. Critical velocity and crossing distance are crucial to successful Goalkeeping especially in terms of the current threat. Note that the system will take all track categories except friendlies. All tracks are vetoed until air raid warning red when veto is lifted. On gunline/T22/T42 combo BROADSWORD does not apply veto at all when combo is clear of other units.
5. Depending on Goalkeeping role and threat, command settings and missile beacon codes are altered in BROADSWORD as follows.
 - a. Exocet
 - Critical velocity 300 kts
 - Crossing distance 1500 yds
 - Salvo inhibit Salvo
 - Fuse 3
 - Acquire time 15 secs
 - Overrides selected

SECRET

SECRET

b. A/C threat T22/42 combo

As for B above except critical velocity 150 kts (anti Pucara).
(B and C above missile codes fwd D/F aft B/C)

6. Blue on Blue. At 15 secs time acquired system will alert to a threat at about 5-7 miles. Returning CAP must reduce to below critical velocity setting to avoid becoming a threat. This is crucial during air raids when CAP and raid could be inbound at the same time and no vetoes are applied. The problem presented by helicopters is that rotor tips throw off high speed clutter tracks which can alert the system seducing it away from a slower but real threat. There is no danger to the helicopter and the system cannot acquire and thus fire against a clutter track.

7. Ref A describes the problems during BRILLIANT's second attack. Although the first attack was dealt with by auto alert and TV track clutter tracks fouled up the TEWA process in the second and with hindsight BRILLIANT believes an early manual TI (OTI) with subsequent TV track would have solved the problem all be it with little time to spare.

8. Recommendations:

a. Goalkeeper should station approx 3 cables towards threat.

b. Settings as in para 5 except individual ships beacon codes.

c. When under attack by a/c in close formation there must be an early decision on auto/manual alert and auto/TV tracking because of 967 range/bearing discrimination.

d. If many clutter tracks present PN NEG DBB track block or individual clutter tracks. Consider 968 auto track and manual TI if desperate but remember difficulty of 968 auto track in ground wave.

e. For GWS 25 ships joining:

(1) Check and calibrate beacon codes and alternatives as listed in FOD 1. Bearing in mind constraints listed in FOTI 0705.

(2) Practice all types of alerts against 4-6 aircraft in stream/close formation.

(3) Ensure you are on different 967 frequencies.

9. The attack produced no new experience and the root cause is the long complained of clutter track problem. Here the very nature of the system caused the upset when least expected, especially in view of the highly successful encounter a few minutes earlier. When clutter problems do occur it is very difficult to get the system back on to the target. Flying fingers on the keyboard are only part of the answer. Nonetheless we are all very confident in the system: at present no other system can claim 3 aircraft splashed (1 in fright) using 3 missiles.

10. One last thing the system was designed to look after number one as far as the 6 computers are concerned Goalkeeping is of secondary importance.

SECRET

APPENDIX 15 TO
ANNEX B TO
BOARD OF INQUIRY REPORT
DATED 9 AUG 82

P 230453Z MAY 82

FM CINCFLEET
INFO MODUK NAVY
FOF2
FOF3
FOST
EXCELLENT
SMOPS
CINCFLEET PORTSMOUTH
DEFIANCE

O 222320Z MAY 82

FM SMO CANBERRA
TO CTG 317.8
INFO CTF 317
CTG 317.0
TU 317.0.4
TG 317.8
TU 317.8.1
TU 317.8.8

SECRET

LESSONS LEARNT/RE LEARNT FROM CO ARDENT

1. Anti Flash. Many casualties averted because it was worn. In some cases Anti Flash almost completely burnt off but skin underneath undamaged.
2. Isolated fire main. This enabled fire fighting to continue despite severe damage.
3. Strict vertical sub division very effectively kept damage/fires/smoke isolated.
4. Crash Stop Ventilation. Recommended prior to attack, successfully kept smoke from spreading.
5. High speed into wind. Assess attacking pilots failed to make adequate allowance for ship movement. Several bombs fell aft.
6. Take Cover pipe. Bombs can clearly be seen leaving a/c. Pipe "Take Cover" at this instant saved many lives. It is essential weapons crews are briefed not to react to this pipe and in ARDENT they kept firing.
7. Weapons in air. Fire all weapons even if not directly on target. Several a/c turned away prior to commitment for attack when gun firing and Seacat in air. First attack in which Seacat did not fire was first with critical damage. Once Seacat destroyed all attacks were from stern sector.
8. Ship position. Frigates are extremely vulnerable I AWPNTRE of Sound. Best positioning is close in to steep sided shore where attacking a/c are forced up.
9. Further details specific to Type 21s follow.

SECRET

TYPE 42/22 AAW TACTICS AND PROCEDURESEXPECTED THREAT

1. On entering the TEZ COVENTRY and BROADSWORD were well aware of the FGA and air launched Exocet threat. They had received JMIC's assessment (JOSEA) at Ascension. It was updated by signal. No special mention was made of likely FGA attack methods. Nevertheless the ship's knowledge of approach manoeuvres and weapon release methods was sound; their general expectation however was that the threat could be dealt with at arm's length. Comprehensive visual recognition material was available with the exception of the PUCARA.

42/22 COMBINATION - GENESIS

2. The origins of the Type 42/22 combination are not entirely clear. We heard three versions. On 8 May CTG 317.8 wanted to take the fight to the enemy and to have a forward Air Defence Unit to the west of West Falkland with the following capabilities:

- a. Long range air warning (965, UAA1, COMINT).
- b. CAP control.
- c. Medium range missile trap - SEA DART.
- d. Strong self-protection - SEA WOLF.

3. BROADSWORD was invited to study the aggressive use of escorts and initially a two Type 42, two Type 22 unit was envisaged. In the event it was decided to try out the 42/22 combination of BROADSWORD and COVENTRY and GLASGOW and BRILLIANT in very different circumstances to the south of Port Stanley. This allowed CAP to be provided without moving the Carrier group to the west and CTG 317.8 to assess the vulnerability of the 42/22 combination close inshore before being committed to the main landing.

EXPERIENCE GAINED IN INSHORE AAW - 42/22 COMBINATION

4. By 24 May the only experience gained of direct attacks on 42/22 combination close inshore was that of GLASGOW/BRILLIANT.

5. BRILLIANT reported (Annex B Appendix 13):

- a. The (42/22 combination is a good one in which the strengths and weaknesses in ships systems offset each other. There are no serious interference problems.
- b. Type 967 Radar can and does perform well over land and Type 42 can acquire Type 22 link tracks. However 42 system prefers to be at least 20 miles offshore to ensure long range SEA DART engagement which can then be followed up by SEA WOLF against the survivors. However if we end up escorting heavies inshore this pairing arrangement might have to be rethought.

- c. 22 needs to follow 42 around in order to have Gun and SEA DART arcs, attack line (line of bearing between ships) needs to be roughly at right angles to threat bearing if possible to allow both SEA WOLF launchers to engage.
 - d. At a pinch Type 22 can control CAP overland (did today) although probably at not more than 50 miles.
6. BROADSWORD signalled (Annex B Appendix 14) a summary of GWS 25 considerations for the goalkeeping role. This included:
- a. GWS 25 command settings for FGA attacks.
 - b. CAP speeds to avoid becoming a threat particularly when no vetoes are applied.
 - c. Highlighted the clutter track problems.
 - d. A reminder that GWS 25 was designed to look after 'Number One'.
7. The key features of these attacks were:
- a. Approach. The first wave of four Skyhawks attacked at very low level in an echelon formation such that they were engaged sequentially. The second wave attacked in almost line abreast. There was 30 minutes between attacks which allowed the ships to move further offshore at high speed.
 - b. Weapon Load/Delivery. The normal weapon load for both Skyhawk and Mirage was cannon plus either 4 x 500 lb or 2 x 1000 lb bombs. Weapons were released at very low level, bombs often bouncing in front of their targets.
 - c. Results. 3 aircraft out of the first wave were destroyed by GWS 25 or in its avoidance. Owing to GWS 30/25 failures the second wave were not hit. GLASGOW was struck by one bomb.

EXPERIENCE GAINED FROM AAW OPERATIONS IN AOA

8. The following AAW experience gained from operations in the AOA was also relevant to 42/22 operations:
- a. Effectiveness of high speed upwind evasion (Annex B Appendix 15).
 - b. Use of CR weapons and small arms.
 - c. The difficulties of AAW coordination in confined waters. BROADSWORD's comments (Annex B Appendix 5) included:
 - (1) Little or no warning.
 - (2) Poor ESM environment.
 - (3) Lack of Air Defence Ship.
 - (4) Lack of Link.
 - (5) Enemy has high regard for Sea Harrier, with good reason, but we are failing to exploit this because of lack of Air Defence Ship.

SECRET

(6) We should vary our tactics and take the fight to the enemy by either stationing Type 42/22 combination about 10 miles north of AOA to make better use of CAP or setting Type 42/22 missile trap west of Falklands to disrupt incoming raids.

42/22 MANOEUVERING

9. The method of 42/22 manoeuvring was evolved from the experience of COVENTRY/BROADSWORD and GLASGOW/BRILLIANT. The Type 42 was guide and free to manoeuvre to maintain the agreed patrol line and deploy her SEA DART system. The 42 passed her courses, speeds and alterations by V/S or on Tactical UHF using single letter SAG signals. By 25 May COVENTRY was, with BROADSWORD's agreement, manoeuvring without necessarily signalling her intentions. The Type 22 maintained Station within 5 cables astern, usually on the upthrust quarter of the Type 42.

10. COVENTRY was by the 25th May normally operating on Tyne 1C engines because Olympus engines are smoky at low and very high speeds and the acceleration that they can provide caused Station-keeping problems. BROADSWORD operated on 1 Tyne and 1 Olympus and tried to avoid violent manoeuvres which caused vibration and 967 clutter tracks.

11. The conventional wisdom for manoeuvring when under FGA attack is contained in the Firing Manual (CB 3189). There is no advice in the Fighting Instructions or ATP 31. Ships are advised to keep weapon arcs open and to proceed up wind at full speed; should these actions conflict, weapon arcs should be given priority. No mention is made of the manoeuvring of units in close formation or of reactions to different types of bombing attacks.

12. A 'staff' solution for evasive manoeuvring against low level lay down bomb attacks has been gathered from the MTS and the Naval Air Weapons Analysis Centre. They recommend:

- a. Ships on a line of bearing at right angles to the threat with all weapon and radar arcs open. This is the primary consideration.
- b. Put threat on the bow.
- c. At high speed up wind consistent with:
 - (1) a and b
 - (2) Maintaining weapon effectiveness in face of ship movement, vibration, smoke and spray.

13. This advice should be validated and included in the Firing Manual (CB 3189), the Fighting Instructions and ATP 31 although the risk of damage spread when hit at fine angles of inclination must be borne in mind. Putting the target on the beam would minimise this.

14. It is necessary for the 42/22 combination to be able to anticipate each other's manoeuvres particularly in close range engagements and when using the control methods described above. Their broadly similar weapon/radar arcs are helpful. Alternatively it is necessary to use a more positive manoeuvring method similar to those employed in multi-ship, close formation surface actions or in close ASW Action Method 1A (Lock-on). When targets are detected within 10 miles the chances of SEA DART acquisition are minimal. It would therefore appear reasonable to manoeuvre the 42 to assist the 22's SEA WOLF engagement.

This could be achieved by the 22 giving positive manoeuvring signals (by whatever method) to the Type 42. The following sequence of events is envisaged:

<u>Raid Range</u>	<u>Manoeuvres</u>
> 10 miles	42 Guide - free to manoeuvre
< 10 miles	42 remains guide - 22 orders course and speed as required.

Such a system would work well with a single raid of one or more aircraft. It would be less effective with a stream attack in which SEA Dart might be engaging medium range targets at the same time as SEA WOLF is engaging close range targets. In such a case the Type 22's movements should be subordinated to those of the Type 42. A form of AAW manoeuvre (analogous to TCMs) should be considered which would clear each ship's line of sight and weapon arcs as quickly as possible while maintaining mutual support. This requires further study.

15. It would appear that the loose manoeuvring methods failed and BROADSWORD got exactly down threat of the guide, COVENTRY. With a threat developing on the beam BROADSWORD was concerned to keep both GWS 25 systems bearing. Her course of 085° was ideal. She did not expect COVENTRY to alter course. At 1820 COVENTRY signalled 'Guides course is 185°', on Tactical (UHF) when the first pair of aircraft were 8' south. BROADSWORD was having difficulty acquiring with GWS 25 and shortly after was hit by a bomb aft; she was busy to say the least.

16. The PWO(N) was conning the ship. The 'OOW' manned open line on a headset, the PWO(N) could hear open line on loudspeaker and reacted quickly to direction from the Command in the Operations Room. The PWO(N) was responsible for station keeping and saw his task as following COVENTRY. This he did, unaware that he was progressively getting down threat of COVENTRY as she altered to starboard from 090° to 185°. Unfortunately the Ops Room gave him no help.

POSITIONING OF COVENTRY/BROADSWORD

17. The positioning of COVENTRY/BROADSWORD on 25th May was inevitably a compromise between the following conflicting requirements:

- To provide early warning of raids from the west, and picture compilation via Data Link.
- To man LAAWC - preferably UHF for clarity and to avoid the jamming and spoofing experienced on HF.
- To engage raids en route to or returning from San Carlos AOA.
- To control CAP aircraft in Station 33 (Eddystone Rock).
- Enough sea room to use SEA DART and SEA WOLF for self-protection.

18. The principal difficulty was reconciling the need to engage passing raids while maintaining self defence.

SECRET

19. The radar horizon range against a 4 metre² target are shown below:

		RADAR	
		992	909
AIRCRAFT HEIGHT IN FEET	50	19	15.5
	100	23	19

20. The situation was complicated by enemy aircraft typically transitting at right angles to the likely engagement bearing and flying low over hilly terrain. The information (1) available to COVENTRY about the effectiveness of SEA DART in these circumstances was scanty and not directly relevant to the ultra low FGA attack. The propulsion performance boundary diagram (1) figure 9.1 indicates a maximum range of just under 19 miles for a 50' target. Therefore for both propulsion and radar horizon reasons the ship should be no more than 15 miles from the target track. At this range the crossing rate of an FGA aircraft does not significantly affect the overall effectiveness although poor J Band response could cause guidance problems.

21. Successful 909 acquisitions were made over land and targets held while no longer visible on 992. The height of these aircraft above the land is not known although it is thought that to avoid seduction an angular difference between land and aircraft of about 1° is necessary. That is a height difference of 1592 feet at 15 miles. In clear weather aircraft should have no difficulty in avoiding SEA DART overland provided that they are aware of the threat.

22. The success of SEA DART for self defence against low flying targets coming off the land depends on the time available and the accuracy of operation of the system including the operators, software and hardware.

a. Time. Trials in Cook Building HMS DRYAD have shown that a pop-up target at 50' and 450 knots, in ideal conditions with perfect picture compilation, can normally be engaged by two missiles at 10 miles and by three missiles at 15 miles.

b. Land Clutter. It is fruitless to attempt to acquire a target while there is land in the 909 range gate. The aircraft must be at least two miles clear of land.

c. Sea Clutter. Does not appear to have been a major problem in the prevailing Sea States below 10 miles; when the target appeared within the range gate at 4.5 miles lock on was immediate.

d. Indication Accuracy. The narrowness of the 909 beam and in this case the small search in conjunction with 992 indication inaccuracies make acquisition progressively more difficult as the range closes. It seems likely that this was the primary cause of COVENTRY's acquisition difficulties. Steps are already in hand to overcome this problem.

e. Weapon and Radar Arcs. Any weapon or radar arc problems encountered will reduce the time available to complete successful engagements. A Type 42 at 15 knots takes 1 minute 10 seconds to turn through 90° using 35° of wheel. In this time aircraft may

close 7 - 10 miles. At 25 knots the time is reduced to 43 seconds, the aircraft closing $4\frac{1}{2}$ - $7\frac{1}{2}$ miles.

23. A compromise position which gives a good chance of engaging low level crossing targets while giving a small degree of self protection is 15 miles off shore. Even at this range any drill or material error will prevent successful engagement.

GWS 25

24. GWS 25 had limited success in the goalkeeping role. The failures can only be partly explained by the use of the system in a way for which it was not designed. An analysis of the attacks on COVENTRY/BROADSWORD is at Annex D Appendix 1.

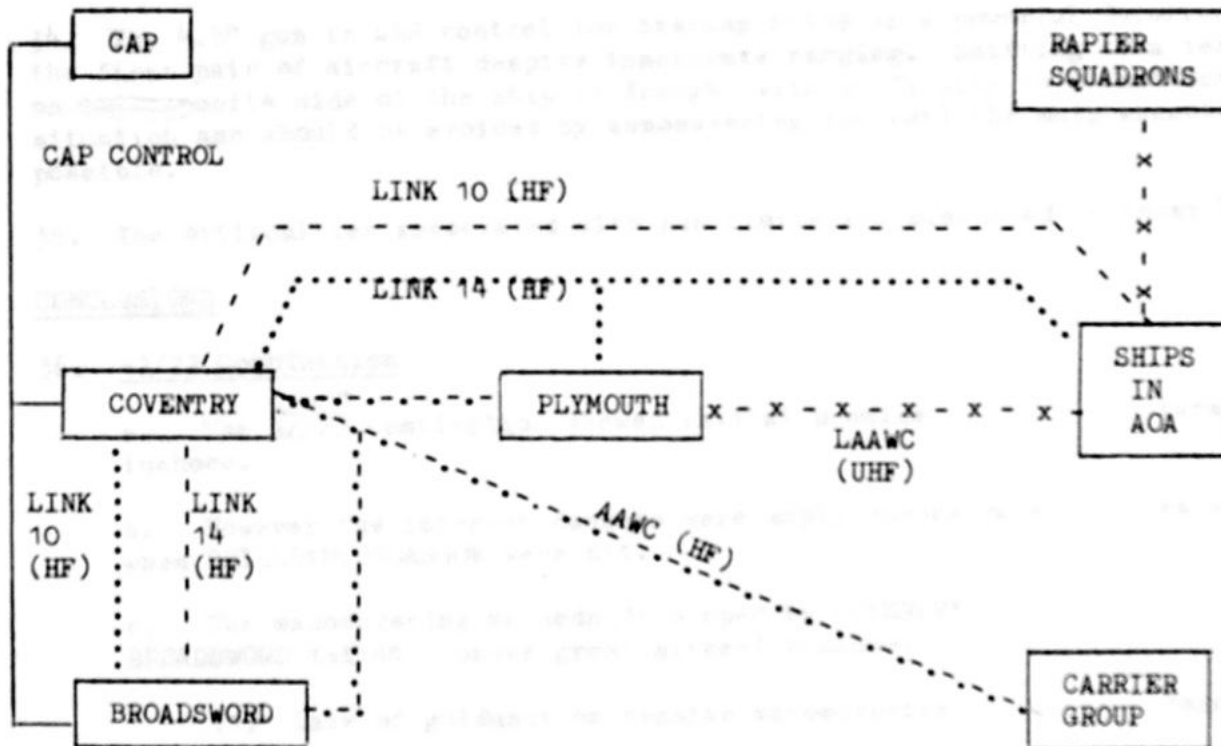
AAW COORDINATION - CAP CONTROL

25. Area AAW Coordination was used for CAP and ship missile systems throughout the inshore operations and it worked well. A 20 mile Rapier missile zone was established around the AOA and CAP aircraft were kept clear. CAPs operated in pairs at low level with height discretion to optimise their visual lookout.

26. COVENTRY apparently had no difficulty in tracking CAP aircraft except over land. BROADSWORD's 967 and associated Link tracks were a great help.

AAW PICTURE COMPILATION - COMMUNICATIONS

27. On 25th May the following picture compilation organisation was in force:



28. HF Voice frequencies were necessary because of the distances involved. They suffered from difficult propagation, some annoying jamming which could be worked through and some spoofing which may have been self inflicted as a result of call sign problems. Short term codes were in use.

29. Link 10 (HF)/Link 14 (HF) worked satisfactorily between COVENTRY and BROADSWORD and to the ships in the AOA. Link propagation to the Carrier Group was unsatisfactory and all information was exchanged on AAWC (HF).

30. Our witnesses hardly ever mentioned communications, or problems with them. We conclude that they did not adversely affect operations on 25th May 82.

EMCON

31. COVENTRY/BROADSWORD operated in a completely overt posture on 24/25th May. India Band navigational warning radars were silent to reduce interference with UAA1.

32. COVENTRY had little information about Argentinian aircraft's ESM capabilities. JOSEA stated that Mirage were fitted with an I/J Band warner and it was assumed that all aircraft had UHF/DF. The lack of reaction of aircraft when illuminated for prolonged periods may have been due to lack of ESM equipment or suicidal tendencies. The behaviour of Hercules and 707 aircraft indicated a much greater wariness of the missile threat.

VISUAL GUN DIRECTION

33. Visual gun direction is not easy in the Type 42 because of the difficulty of moving from one side of the GDP to the other and the lack of communications for the MDG(V) on the port side.

34. The 4.5" gun in LAS control for bearing acted as a powerful deterrent to the first pair of aircraft despite inaccurate ranging. Shifting to a target on the opposite side of the ship is fraught with difficulty in a fast moving situation and should be avoided by manoeuvring (or not) the ship whenever possible.

35. The difficulties associated with gun limits are discussed in Annex D.

CONCLUSIONS

36. 42/22 Combination

- a. The 42/22 combination showed initial promise inshore. Para 4
- b. However the inherent dangers were amply demonstrated when BRILLIANT/GLASGOW were hit. Para 7c
- c. The manoeuvring methods developed by COVENTRY/BROADSWORD failed (under great stress) because:
 - (1) Lack of guidance on evasive manoeuvring. Para 11
 - (2) Lack of anticipation of COVENTRY's evasive action. Para 15

- (3) The conning officer in BROADSWORD was not aware of the threat axis for the second attack. Para 16
- (4) The manoeuvring method in use was not positive enough. Para 14
- d. To interdict enemy aircraft on low level approach routes the Type 42 must be within 15 miles of that route. Para 19 - 20
- e. The Type 42 must be at least ten miles offshore to have any chance of engaging a direct FGA attack. Para 22
- f. 15 miles offshore gives a balance between interdiction and self protection but any material or drill error will prevent successful engagements. Para 23
37. AAW Coordination. Area coordination worked well. Para 27
38. Communications. No major problems were encountered except Link 10/14 (HF) to TG 317.8. Para 29 - 30
39. Visual Gun Direction. Is difficult in Type 42s and targets should be kept on one side of the ship if possible. Para 35 - 36
- (2) The RLF in BROADSWORD left great deal and several were fired on the forward 105 and no damage occurred. The last attempt was written off when BROADSWORD damaged the target after GUNFIRE's missile launch. Neither of the other 2 achieved their aim and the subsequent discovery of incorrect settings to the guidance and modulation depth of the forward launch (2 Sept) would have been the reason for failure. The failures were rectified as soon as possible. A policy of total safety on all matters was in force from leaving harbour until the RLF was fully joined, over 1 week later. Some 20% of all performance tests and planned maintenance require active participation. They could not be done. Although an exercise was being available to both units on 17 or 18 September, on 18 Sept they were not able to proceed as BROADSWORD was still at sea. The limitations were due to a total of 100 for 2 are separately detailed in appendix 4. Some time from transferring maintenance, a programme of performance checks, 2/12 Sept was initiated. Many weekly performance checks were also carried out because of their distinctive nature. The operational safety division that was conducting performance checks was very active. BROADSWORD's lack of time was a major, although some checks were undertaken more frequently.

WEAPON ENGINEERING

1. Material State. The overall material state of the WE Department was good on 25 May. Her outstanding OPDEFs had either been repaired completely, or a temporary fix installed while key parts were being supplied. There were no significant deficiencies in either equipment or stores support.
2. Manning State. HMS COVENTRY was not one of the Integrated Manning Scheme (IMS) Type 42 trials ships; she was thus fully complemented with no RMS, gapping or dilution and one key senior rate post had both the incoming and outgoing man available. There was no shortage of expertise, especially in the often troubled Radar Type 909 area, where a deeply experienced maintainer was available. Two ratings, one from compassionate leave and one from course, rejoined the ship via Ascension Island and HMS HERMES to complete a full scheme of complement.
3. System Effectiveness
 - a. (1) GWS30. Until the latter stages of SPRINGTRAIN 82, the GWS30 (Sea Dart) system had not been fired for some 18 months. Although a High Seas Firing (HSF) had been planned for JMC 3/81 in November 1981, this was aborted by target defects. The only other firing opportunity was during Exercise ROEBUCK in May/June 1981 when defects on both 909s ruled out an engagement. Her involvement with Fleet Trial 114/80 containing Task 1171, brought her up to (and beyond) the 'Sealed design state' for 909s, which added a very significant measure of reliability, but also introduced her 909 operators to the facility for detecting side-lobe acquisitions and passing these back into the main beam, without the need for re-indication. They also saw the effects on low target acquisition. Most of the tracking trials were over water; the set planned to be over land was not completed. On completion of these trials, most of the hardware and all the software was removed, the latter because it was not possible to run a full operational program while it was in the system.
 - (2) The HSF in SPRINGTRAIN left questions unanswered; 3 missiles were fired on the forward 909 and no successes recorded. The last attempt was written-off when SHEFFIELD destroyed the target after COVENTRY's missile launch. Neither of the other 2 achieved front lock and the subsequent discovery of incorrect settings to the phasing and modulation depth of the Command tones (J Band) might have been the reasons for failure. The defects were rectified en route Gibraltar - Ascension. A policy of total silence on all emitters was in force from leaving Gibraltar until the HERMES group joined, some 3 weeks later. Some 30% of all performance tests and planned maintenance require active emissions. They could not be done. Although no evidence was later available to cast doubts on 909 or 992 performance, no balloon runs were undertaken from pre-HSF in SPRINGTRAIN until 25 May. The limitations imposed by a total silence EMCON are separately debated in Appendix 4. Once freed from transmitting constraints, a programme of Performance Checks, SOC's et al was instituted. Many 'weekly' Performance/Servicing checks were discarded because of their disruptive nature. The operational pattern dictated that most servicing/performance checks were done at night; SOC's generally took place once a watch, although some checks were undertaken more frequently.

(3) The first live firing opportunity occurred on 9 May, when the ship was just south of Port Stanley, with a very long range engagement against a Hercules (C130) with escorts. Despite being at or just beyond the edge of the feasibility boundary, a total of 3 missiles were fired. Although the first was seen to pass through the range gate, the second and third were probably unsuccessful because of violent evasive manoeuvres by the targets. Later intelligence suggested that the C130 had seen the first missile pass very close; two escorts failed to return home and may have collided while evading. However, confidence immediately after the shoot was not particularly high, although the close pass to the C130 lent some credibility to the accuracy of the system.

(4) A second opportunity to fire occurred later that day; a link track from BROADSWORD was passed over and the 909s acquired a slow moving opening target when it appeared, briefly, in open water between islands. One missile was fired and a direct hit observed. In many senses this was a low, difficult target, with high crossing rates, against a land background. Confidence in the system returned.

(5) The next Sea Dart engagement opportunity came during the night 21/22 May when the reconnaissance Boeing 707 was tracked into an almost text-book firing position. The failure of the right lane upper flash door locking bolt to operate left the system in its 'load' position and unable to continue.

(6) The last GWS 30 engagements took place on 25 May. The first at 1230Z, when COVENTRY was to the north of Pebble Island started with 50 mile detections of the targets over E. Falkland and resulted in a salvo engagement at about 15 miles and one kill. The second at 1530Z was similar, but started at 40+ with a link track from BROADSWORD. 909 acquired at 30+ miles over land and a target was destroyed just to the north of Pebble Island.

(7) An analysis of the final engagements leading to COVENTRY's sinking is at Appendix 1.

b. (1) GSA1. Overall feelings about 4.5 Mk 8/GSA1 were predominantly gloomy. The system received this dubious reputation by a series of highly visible, frustrating failures when the ship was tasked for NGS, early in May; two night firings were aborted after only a handful of rounds had been fired on each occasion.

(2) There had been very little opportunity to exercise the Gunnery teams in 1981 and no successful SAT(G) had been recorded since mid year. After Christmas 81, when much work was done inter alia on turret alignment and fusing arrangements, the system did achieve fair results when fired at the beginning of SPRINGTRAIN 82. The passage to Ascension and on down to the T&Z did provide the opportunities for practicing secondary/emergency drills; these were fully exercised. The importance of visual control was realised and shortcomings that were discovered led to a redeployment of both LAS operators and the MDG(V), making the most capable team available as the Action Crew. However, compared with their Sea Dart colleagues, the gunnery team was considerably less practiced and there was no great Command confidence in their system.

(3) The failures which arose during NGS were in 2 main areas: firstly, a string of problems arose with the RPC, particularly in elevation. These became apparent only when a significant training

demand was input, at which the gun ran to maximum elevation: this was associated with the rupturing of thyristor fuses. Eventually, all 6 thyristors and their fuses were replaced, after which the defect did not recur. The second area was in mechanical malfunctions: incorrect setting-up of the hoist system led to a double stroke, with consequent damage to the upper round decelerators and fuse-setting gear. Another problem lay in low recuperator pressure, which gave slow gun run-out, a low energy breech drop and therefore a failure to activate the spent cartridge ejection mechanism; leaks in the mantlet weathering system allowed quantities of salt-water into the gunhouse and caused emulsification of grease in some areas. All these problems were cleared by about 14 May.

(4) These sets of defects were experienced serially and over a short period; the overview thus became one of expecting unreliability and a cynical surprise if the gun functioned properly. Despite this pessimism, a large number of Chaff Charlie shells were fired in the intervening days between NGS failures and final attacks on 25 May. No further gun defects were experienced.

c. ADAWS 4

(1) HMS COVENTRY was running the ADAWS 4 Edition 3 main operational program. She had a full outfit of test and training programs and had no deficiencies in hardware or software documentation. While running Edition 2, particularly during major exercises, a policy had been established of dropping the operational program once every 24 hours and re-running the master into the machines. This philosophy was continued once Edition 3 had been installed. The reason given for adoption of this procedure was to combat 'creeping corruption' with associated computer crashes, sometimes at inopportune moments. This re-run policy appeared to give a high probability of uninterrupted running for 24 hours, with the only penalty being a short time off-line while the program was input. The ADAWS project were said to be aware of the procedure.

d. RADARS

(1) 965. A major defect (OPDEF WE 40/82) reported on 4 May rendered the 965 radar inoperative. The culprit, an EHT inductance, had burnt out and the spare followed suit some 100 hours later. Pre-fitting checks had showed that the inductive value of the spare unit was far lower than the specification quoted in the documentation. When it was clear that a correctly valued replacement was going to be some time in coming, both coils were cannabilised for wire and a temporary replacement constructed on board. This functioned most satisfactorily until the ship was lost. Overall radar performances were good and, on the quite frequent days with anaprop, outstandingly good.

(2) 992. Radar Type 992 was fitted with MTI over the Christmas period 1981. While there were few problems with MTI, there were many with Outfit RSE which culminated in Camper and Nicholson, the RSE contractors, being called in. HATs and SATs were completed but the operators were never completely happy with the end product, not least because once switched into circuit, the resultant change in surface picture content caused much disquiet. In consequence, MTI was rarely used in the Falklands area apart from validating link tracks overland.

- (3) 1006. Radar Type 1006 was barely used from Gibraltar southwards into the TEZ. Apart from navigation close-in, where the ground wave of 992 was a disadvantage, there was little operational loss.
- (4) 1010/1011. Apart from a very small number of defects, IFF was used continuously and performed well. Overall, primary and secondary radars gave very good service throughout the operational period.
- (5) Electronic Warfare. ESM outfit UAA1 performed very well throughout the period, with only one PEC defect in the display. Band 4 notch filters to prevent SCOT breakthrough were supplied on 23 May but, in the event, ever fitted.
- (6) SATCOMs. SCOT was widely used early in the operation but after the SHEFFIELD loss, transmission was limited to night hours only. Traffic was cleared by HF to HERMES then gateway'd to UK by satellite.
- (7) Secure Speech. COVENTRY was fitted with KY8 and 'GROWLER'. Both proved reliable with the former in constant use.
- (8) Links. Both Link 10 and Link 14 were widely used, exclusively on HF, because Outfit 1203 was not universally available and thus link could not be shifted to UHF. No significant problems were experienced with Link 14 but Link 10 did not perform well beyond 60 miles. Since they rely solely on groundwave propagation, the higher data rate of Link 10 and the high HF frequencies used for low probability of intercept purposes produced performances approximating to its specification. It is not therefore surprising that the CVBG was beyond Link 10 range, nor that ships within the confines of Falkland Sound/San Carlos water, and much wooded by surrounding land, received very poor quality pictures.

4. WE CONCLUSIONS

- a. The WE Department was in good material state on 25 May (1).
- b. The WE Department was fully manned to the approved Scheme of Complement (2).
- c. A prolonged transit in EMCON silence militates against routine servicing and testing of WE transmitting sensors (3a(ii), Appendix 4).
- d. No direct evidence of target hits was available until the Puma engagement 9 May (3a(iv)).
- e. A failure on the right lane upper flash door locking bolt prevented an engagement against the Boeing 707 recce aircraft 22 May (3a(v), Appendix 2, Paragraph 5).
- f. Sea Dart was successful in 2 engagements on 25 May, at 1230 and 1530. During the final engagements, a missile was fired but as an unaimed shot (3a(vi), Appendix 1, Paragraph 4).
- g. The 4.5 Mk 8 experienced a rash of problems during NGS firings: all were satisfactorily resolved by mid May. During the final engagements approx 24 rounds were fired without mechanical/RPC mishap (3b(iii), Appendix 1, Paragraph 2, 3).

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- h. Pressure of events probably caused the Gun Controller to use incorrect drill in attempting to control his turret when it went into Red limits (Appendix 1, Paragraph 3).
- j. A pair of binoculars was illegally strapped to the port LAS visual head to supplement a permanently filtered left eyepiece. The effect was to give a false angle of sight from the port LAS (Appendix 1, Paragraph 5).
- k. 909 range from both trackers was available from about 4 $\frac{1}{2}$ -5 miles during the first attack of the last engagement. It was not used. (Appendix 1, Paragraph 2).
- l. Neither the gun nor the Sea Dart was used effectively during the final engagement. The only rounds fired by the gun were in depression (Appendix 1, Paragraphs 5 and 6).
- m. The scan patterns provided as possible counters to 'pop-up' targets search too much volume for the time available (Appendix 2, Paragraphs 1 and 2).
- n. Upper Flash Door locking bolts of the design available in COVENTRY are inadequate (Appendix 2, Paragraph 4).
- o. A system freeze following the failure of the Upper Flash Door Door locking bolt to operate is unacceptable (Appendix 2, Paragraph 5).
- p. Decisions left to the Gun Controller concerning 'Sectoring out' his turret are prone to error under action conditions (Appendix 2, Paragraph 6).
- q. There is a pressing need to include a lethality prediction mechanism into system software; the current information is not sufficient. (Appendix 2, Paragraph 7).
- r. A range of 4 minor hardware improvements to the Radar Type 909 operators console seem sensible and should be incorporated (Appendix 3).
- s. Information on which to base EMCON policies is available in FOTI and ATP1B. The style of presentation could be improved. (Appendix 4, Paragraph 4).
- t. No guidance is available on the retention of SAT transmitter performance levels after long inactive periods (Appendix 4, Paragraph 5).
- u. There is no listing available showing criticality of performance testing/servicing under action conditions (Appendix 4, Paragraph 5).
- v. 'Leak proof' dummy loads should be provided where sensor testing is essential (Appendix 4, Paragraph 6).
- w. Stale track problems arising from 967 discrimination prevented successful engagement of the first attack (Annex D, Appendix 1).
- x. Radar low angle tracking inhibits long range (5 Km) engagements (Annex D, Appendix 1).
- y. The successful Sea Dart engagement at 251530Z demonstrated the ability of 909 to hold lock overland when 992 contact was lost. (This is to be expected with a narrow beam radar and a target at sufficient height) (Paragraph 3a(6)).

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z. GWS 30 target indication problems rather than clutter appear to have hampered 909 acquisitions. (Appendix 1, Paragraph 2).

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THE FINAL ATTACKS - WE ASPECTS - AN ANALYSIS

1. The operational aspects, with which those of WE are inextricably intertwined, have been stated elsewhere. Final events took place against a background of confidence in GWS 30, engendered by a very successful afternoon's shooting against targets leaving the Sound Area. All sensors were operating well and the WEO had no doubts about his weapon systems.

2. The First Attack. The initial detections of the raid were passed from BROADSWORD's 967 by Link 10 to COVENTRY. In contrast to previous profiles flown, target aircraft stayed low and were not detected by 992 or acquired by 909s until they cleared land. Despite having a Link track, the geography and possibly bearing inaccuracies of the 967, conspired to keep the targets out of the 909 beams until the after set, engaged in sweeping its bearing line in range, saw a target appear in the range gate, followed by lock-on at about 5 miles. The forward set had a similar experience. Neither was used for GSA1 range at any stage, although both had this available for a significant length of time. No Sea Dart was fired during this first attack. The gun was used entirely in the visual mode (LAS/Computer/gun). After an 'Alarm aircraft, follow Starboard LAS' MGD(V) and the Gun Controller used the techniques developed as an anti-Exocet measure, of producing a water/shrapnel wall in front of the attack, using a starting range of 6000 yards. Both 909s witnessed the effect of this procedure, which used a mix of VT and Surface burst shells: it is possible that the barrier was too far in advance of the aircraft but, whether this deterred the pilots or not, the first pair swung away from COVENTRY and attacked BROADSWORD. The turret checked-fire at Green 90 and followed the aircraft round to approximately Green 140. Some 18/20 rounds had been fired during this engagement.

3. The Second Attack. Detection of the second raid was made very late by the GDP visual crew, fine on the port bow. The port LAS operator saw the targets and the Gun Controller made a manual injection to follow port LAS. The gun slewed from well inside Green blind arcs, through the bridge and out to Port. As soon as the gun came to rest, GC fired 3 rounds, checking fire only when told that the gun was in depression. He attempted to train and elevate and, on failing, injected an instruction to go to 'Park' - 000° and 5° elevation. It is possible that the gun elevated but would not train. He then ordered 'Rifle' mode in an effort to control the training motion, again without success. The bombs struck before the gun could take further part in the engagement.

4. Sea Dart was loaded but, with the very short range acquisition, had not been used against the first attack. There is evidence that the Sea Dart Controller allocated the launcher from Forward to Aft repeatedly during the unsuccessful 2nd attempts to acquire. SDC fired a missile, using Feasibility Override and Engage when the launcher was bearing on the port side. No aircraft target was acquired by either 909 and it must be concluded that an I-band track was established on sea or land clutter, enabling the missile to fire. The missile was not fired in local control from the Sea Dart Quarters position.

ANALYSIS

5. The Gun. Despite the fact that 909 range was available from about 5 miles, it was not used against the first pair of aircraft. However, since the aircraft turned away, they were either deterred or always intended to strike at BROADSWORD. The probable reason for the effects experienced during the second raid was a failure to appreciate the shortest way to the LAS bearing also put the gun into limits (LS1, 2 and 3). Had the gun been 'sectored out', it is highly unlikely that GC would have experienced the problems he did. A second feature, which had

gone unreported to the WE Department, was the placing of 7 x 50 binoculars on top of the sight head on the Port LAS. The reason for their presence was apparently to remedy a defective left eye piece in the LAS where the lightest polaroid filter was permanently in place. This defect had already been discussed between Senior WE and Ops ratings and agreed as tenable, until replacement LAS binoculars were available. At low elevations, the temporary binoculars would have given a false, depressed angle of sight to the Computer, thence to the gun. It is probable that this arrangement led to the turret being depression during the last attack on the port side. Support for the argument that the gun indeed went into limits comes from the evidence of WEMN TWYMAN, the 4.5" Mk 8 maintainer who, although unable to remember the exact relative bearing at which the gun stopped firing, clearly recalls sending his LWEM 'to wind the gun out of limits'. Final support lies in photographic evidence, where the gun is clearly at about Red 60 and elevated to about 5°. (Annex F, Appendix 5, Plate 3)

6. GWS 30. As is discussed earlier, the Sea Dart took no real part in the entire last set of engagements. Until the BROADSWORD video tape became available, there was very considerable doubt about both the firing elevation and training angle. Analysis of the VT shows it to be at about Red 75 and 50° Elevation. Target bearing was about Red 10° when the missile was fired. Evidence from the Sea Dart Controller clearly indicated that the missile had been launched for deterrence reasons, not as an aimed shot. The mechanism by which this launch could have taken place relies on the launcher being in clear arcs, an I-band lock established, J Band transmitting with 'Feasibility Override' and 'Permission to Engage' made. Since two very reliable Senior Ratings in the Sea Dart Quarters are positive that the system was not fired locally, it must be concluded that one or other of the 909s was locked onto a target; whether this was land or sea, both of which had caused acquisition problems, will probably never be known. Whether this lock was maintained is also unknown but is improbable, since the Sea Dart launcher was definitely in the 'Load' position, both during the evacuation over the foc'sle and in the photographs taken by BROADSWORD. While this 'Load' position was probably the result of a computer instruction while waiting for re-allocation to a new 909 acquisition it could have been the result of WEMN MORTON shutting down the system before evacuation. (Annex F, Appendix 5, Plate 3)

7. GWS 25. No Sea Wolf missiles were fired during either of the last 2 attacks in the final engagement. A video tape containing a record the second attack was made available by BROADSWORD and has allowed a limited analysis to be made by Project, the ship and the Board. This film was shot from the forward tracker, the after being in blind arcs. The sequence of events for the first attack probably was:

- a. Two separate 968 echoes seen clearing the land (at about 10-12 miles).
- b. 967 auto alerts to a single track at 6.5-7 miles. (Category PN).
- c. Both trackers acquired in 'Radar Low Angle' as indicated on TV screen cross wires.
- d. Before the Missile Controllers could demand control, a new pair of tracks were formed inside alarm range (Category PA).
- e. Both trackers were re-alerted, when the original track became non-feasible.
- f. Neither tracker acquired a target, probably because of the short range inaccuracy of the TI.

- g. It was correctly concluded that the problems may have arisen because the auto detection mode was used.
8. The sequence of events in the second attack was as follows:
- a. The after system was in blind arcs. The first aircraft of the second raid was manually indicated and acquired in 'Radar Low Target' mode by the forward tracker.
 - b. While waiting for the target to close to the first engagement range of 2.2 Km COVENTRY crossed the line of sight and broke tracker lock.
9. The normal drill of going to the TV tracking mode as soon as practicable was not followed on this occasion because of the excellent radar low tracking. Had TV tracking been selected it would have been possible to engage at 5 Km.
10. It should be appreciated at this stage that the fog and excitement of war were at work. The Command Team in the Ops Room were not aware of COVENTRY's or their own manoeuvres until COVENTRY appeared on the TV monitor. Initially they were therefore reasonably confident that on this occasion GWS25 was behaving well: a normal engagement was possible and they wished to do nothing which might upset this process.
11. The 'stale track' effect was already under investigation. During trials on 25 May, a new tracker fault was also discovered, which was later found to correlate closely with BROADSWORD's symptoms. No software solution was available, but a drill procedure was signalled (ASWE 19F/HCF 021045Z JUN 82).
12. ANALYSIS CONCLUSIONS
- a. 909 range was available for use against the first raid. It was not used.
 - b. The fitting of a pair of 7 x 50 binoculars on top of the port LAS probably gave a false angle of sight to the computer.
 - c. The Gun Controller probably failed to appreciate that his gun was in danger of approaching limits and should have been sectoried out.
 - d. The Sea Dart that was fired was not an aimed shot and was insufficiently close to the target threat bearing to cause any significant deterrence. This round was probably fired using either land or sea clutter as the I-Band target.
 - e. No Sea Wolf missile was fired during either attack in the final engagement.
13. ANALYSIS RECOMMENDATIONS
- a. Under close range, high speed attack, it is unreasonable to expect the Gun Controller to implement 'sectoring out' rules. A software solution, which avoids operator input, must be pursued.
 - b. The GWS 25 must be made more capable against multiple, manned and manoeuvring targets.

ADAWS 4 - POSSIBLE HARDWARE, SOFTWARE AND DRILL IMPROVEMENTSRADAR TYPE 909/LINK

1. Scan Pattern. The paper text alludes to a possible mismatch between Link 10 tracks and the scan pattern adopted by 909 to acquire this target. Where the source of the Link track is Radar Type 967, an accuracy of about 1° in bearing is likely in the bracket of 10-30 miles, although this probably worsens at shorter ranges. This sort of accuracy should be within the scope of the 909 search patterns as designed, so small errors in bearing, whether generated by the 967 radar or some other sensor are unlikely to affect the process. If larger bearing errors were to be experienced, a wider bearing search would be an obvious asset.
2. Although the angular and range matching of a link generated track to existing 909 search patterns may be satisfactory for medium/long range targets, for the 'pop-up' attack (high speed, low level and short range), a time problem exists. A mechanism does not appear to exist which both reduces the volume of sky to be searched and is very quickly available to the operator. MS(POS) injections do achieve the former but at the expense of the SDC having to make a manual injection. Clearly, a software solution should meet the time constraint and have the added attraction of easing the SDC's problem at crucial moments.
3. The Board is not qualified to pursue this issue much further; Project should investigate the feasibility of installing a software solution to the problem.
4. Launcher/Handling Gear. The Boeing 707 engagement was aborted due to the malfunction of the right lane Upper Flash Door (UFD) locking bolt. It is understood that this is not an unknown problem to the Project; indeed a trial version of the new bolt was at sea in HMS GLASGOW, herself in the Falklands. While she too suffered an aborted engagement with a sticking LEC flash door, the trial UFD locking bolt worked faultlessly. The Board considers that once proven, the new locking bolt assembly should be supplied and fitted as a matter of considerable priority.
5. Salvo Selected/UFD Locking Bolt Failure - System Freeze. A downstream effect of the UFD locking bolt malfunction was to leave the launcher locked in the load position, with two missiles on the beams, and no obvious, quick way out of the impasse - the system would not function until either the hydraulics were de-pressurised or (more dangerously) the offending bolt was struck sharply with a mallet/wedge. Neither procedure was particularly helpful in the closing seconds of an engagement. A last possibility was to tinker with relay contacts in an attempt to override the logic; Project has investigated this problem, since GLASGOW's LEC flash door defect had very similar effects. A method has been devised to use the system, despite partial deficiencies normally required to complete a firing solution. However, without an exhaustive trial, it is not yet clear that these procedures will be free from side effects on the software.
6. Sector-Out of Software. The probable reason for losing control of the 4.5 Mk 8 during the final engagement was failing to appreciate that the gun had gone into Red limits for training. While there are visual cues for indicating this state of affairs to the Gun Controller (GC), it is another set of decisions and actions, which in the heat of battle may prove too difficult.
7. The range of GSA1 software improvements has been discussed with DSWP(N); the following are endorsed by the Board:

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- a. An indication to the Gun Controllers tote page which shows when he has passed through the 180° position from the fore and aft line.
 - b. A software generated unwind from approaching limits, subject to GC veto.
 - c. A software generated unwind after an SP2(neg) injection.
 - d. A software generated rule which stops the turret unwinding at a new target bearing, if that bearing is between the current position and the unwound conditions.

8. Feasibility Boundaries. CB 04988(2A) Fig 9.1 offers a propulsion performance envelope. Chapter 15 discusses Lethality. While the former gives a useful reference, it is slightly incomplete eg the 19 mile limit at low angle may be propulsion dependent, but it is also radar horizon limited; in the written preamble (paragraph 1), the phrase of '92% probability speed is 1000 ft/s' is also misleading, since the speed of a target is irrelevant. Speed is highly relevant to a feasibility calculation and to target position in the CATE list. In Chapter 15, the stated range of lethality is of interest but excludes any vehicle similar to the wide range of targets experienced in the South Atlantic. Although accepting that these results were achieved from modelling, a lethality prediction would be of very great value in assessing the probable outcome of an engagement, using data available before illumination with fire control radar. The calculation could be performed off-line but should be built into the software. The Board considers that this facility has a high priority for addition to the system.

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RADAR TYPE 909 - POSSIBLE MINOR HARDWARE IMPROVEMENTS

1. Considerable off-the-record discussions took place when 909 maintainers were giving evidence. Four proposals emerged from these talks and have been further investigated by Board members with the Project and at HMS DRYAD. All seem eminently sensible and of a relatively minor nature to design for incorporation.

a. Target Range. The present numerical display is on top of the console, well of the normal sight-line of the operator. A simple digital readout, probably just above the level of his A displays, would be of advantage.

b. Tracker Relative Bearing. Bearing information can be gathered from G2B cabinet but this means leaving the operating position and looking to the right of the J Band operator. While it can be argued that relative bearing is of no importance to the operator, in real terms it is a valuable psychological aid to maintain a sensible set of directional co-ordinates.

c. Blind Arc Indication. Blind arcs are currently indicated by the illumination of lamps on the console. While of slightly different colour, the size of the indicators is identical to those on the flow-lines surrounding them. An audible warner (a buzzer?) to draw attention to the indication would be a sensible addition.

d. 'J' Band Signal/Noise Indication. Part of the Fleet Trial 114/80 Task 1171 hardware has been the incorporation of an I Band S/N indication for use in sidelobe detection capability. Clearly, the ability to measure S/N of J Band returns from the target would be a very useful addition to the classification process.

2. The Board sees much merit in the addition of the above 4 facilities to aid Radar Type 909 operation. It is recommended that they be given consideration by the Project for incorporation in Type 909 radar consoles.

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APPENDIX 4 TO
ANNEX D TO
BOARD OF INQUIRY REPORT
DATES 9 AUGUST 1982

EMCON POLICY, DUMMY LOADS AND PERFORMANCE TESTING

1. A decision was made to conduct the Gibraltar - Ascension - Holding Area transits in total silence. The merits of this decision are debatable but do conflict, in most current equipments/systems, with the need to maintain specified performance levels.
2. Operationally, the idea was to insert RN units into the Falklands area, covertly, before the overt arrival of the HERMES group. The rationale for silence was believed to centre on the detection ranges demonstrably possible against most transmitting sensors. Even where dummy loads are provided, sophisticated detection systems are reputed to be able to provide much intelligence on the 'leakage', at considerable ranges.
3. Maintainers and operators were thus denied maintenance and testing opportunities to a significant degree; had ships been involved in action immediately after this 3 week pause in transmitting on virtually all sensors, the result might have been very different. In the event, there was ample breathing space for overt testing to take place and there is no evidence to suggest any unit suffered because of the transmission embargo.
4. The Technical information on which to base a sensible EMCON decision is available to ships' officers in FOTI and ATP1B. It is for consideration that data be presented, possibly in the same form as for RADHAZ/EIED susceptibility, listing measured field strengths at varying distances from dummy loads, and an appreciation of detection thresholds in current threat systems. In this way, the Command can appreciate the likely probability and thus weigh it against possible system degradation.
5. From the WE viewpoint, no information is available on the probability of achieving SAT performance from sensors after a period of inactivity. Guidance on 'essential minimum' performance and planned maintained tests is not available, neither is the change to this list under silence conditions. Both issues should be addressed.
6. The provision of dummy loads for testing sensor transmitters depends on many factors, not least whether the gain from exercising the output stages, albeit at reduced power, outweighs the detection probability. Although the need for such devices is arguably decreasing, sufficient needy transmitting sensors will be in service for many years. It is essential that these sensors are either provided with 'leak-proof' dummy loads or highlighted as bring alive risks, where the EMCON policy dictates long periods of silence.
7. Once committed to an operational area, the policy of illuminating opportunity targets (eg own Sea Harriers or helicopters) becomes highly unpopular, especially where fire control radars are used which swamp Radar Warning Indicators. Therefore the only vehicles for final testing of radar system performance become either the enemy or balloons. Since the former may prove a costly confirmation of poor results, the latter is vastly to be preferred. Where no other method is available, frequent balloon-runs should be used until sufficient confidence exists in the sustainability of SAT performance.

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MARINE ENGINEERING1. Operational Readiness

a. During the six months prior to deploying for Operation CORPORATE, COVENTRY had been hard pressed to bring the ME department up to the average material standard of the Class but this had been achieved.

b. The MEO and Captain were happy with the overall material state and the ability of the department to cope with Operation CORPORATE requirements. However, deficiencies in standard class spares that should have been on board (for the main engines in particular) were a matter of concern.

2. OPDEFs outstanding at Ascension Island Significant to CORPORATE

a. ME 26-82. Starboard Olympus, 'Inoperable' due to suspect auxiliary gear drive deterioration (metal on magnetic chip detector). MEO continued to use this engine for Action Station manoeuvring. In peacetime the engine would not have been used except in emergency.

b. ME 27-82. Steering gear, degraded auxillary pumps awaiting spares.

c. ME 28-82. Port and Starboard Tynes degraded burners, due to bacterial contamination of fuel.

3. Departmental Activities

a. Extensive DC training combined with Machinery Breakdown Drills had been progressed during the passage from the Mediterranean via Ascension to the TEZ and the Command was happy with the depth and scope of training.

b. The department had worked extremely hard in their preparations for action in the TEZ but were not unduly fatigued or stale on arrival. The passage from Ascension to the Falklands was uneventful with respect to machinery breakdown.

4. Material State on Closing Up at Action Stations at 1800 on 25 May

a. The following machinery and systems were running the isolated as follows:

(1) Main Engine. Port and Starboard Tynes running, selected and in bridge control. Port and Starboard Olympus starts were initiated at the start of the attack. Engine TET overrides on.

(2) Diesel Generators. J1 supplying J1 and M1 Sections
 J1 " J0 and J2 "
 M1 " M0 and M2 "

(3) Fuel System. De-isolated. Port and Starboard boost pumps running.

(4) Air Condition Plant. J1 and J1 J2 M2 Circulating Pumps.

(5) Salt Water Service System. G, K, L, N pumps running. System isolated in K section aft of K fire pump riser on the port side and in L section forward of L pump riser on the starboard side. K and L were running on their alternative supplies.

(6) HP/LP/GS Air Systems. Isolated in accordance with the operating BR.

(7) Hydraulic System. Isolated at K section and depressurised FWD and AFT.

(8) Ventilation. Crashed stopped from the MCR about two minutes before the bombs exploded.

(9) Aux Boilers.)

(10) Flash Evaporators.) Shut down

(11) Fresh Water System.)

(12) Steering Gear. Both pumps running.

b. All weapon systems were running and available in both normal and alternative supplies.

5. Distribution of Marine Engineering Department Personnel at Action Stations

a. Teams closed up at action stations as per the Action Bill which is standard for the class. However, this practice to some extent defeats the original Type 42 design concept for centralised main machinery control.

b. The FER team were involved in defect work on a fuel filter arrangement prior to the action but were closed up primarily for the starting of the Olympus GTs. The control system however does give reliable remote starting of these engines.

c. The AER team were similarly closed up to take the power-pitch system into manual control if a control failure or action damage had been experienced.

d. Similarly, teams were closed up in the forward and after Auxiliary Machinery Rooms despite complete auxiliary machinery surveillance systems in the MCR.

e. COVENTRY's Mobile Action Repair Team (MART) was closed up in the Technical Office during Action Stations; led by the Chief MEM(M) they all escaped uninjured aft but were then never deployed in any subsequent DC evolution.

f. None of the main machinery spaces are manned continuously at sea or in harbour; stop/start, metering and surveillance are incorporated in the MCR console to satisfy staff requirements for NBCD manning. Machinery is not at risk if the compartments are unmanned.

g. The whole question of manning machinery spaces at Action needs reviewing in light of COVENTRY's experience:

(1) It is unlikely that men closed up in machinery spaces will be able to take immediate repair action or manual control if that space is hit, since they are most likely to be casualties themselves or at least shocked, and therefore in need of evacuation.

(2) A talent - strengthened MART would be better suited for recovery of post-action damage, especially if they are BA equipped and have their own personal lighting and communication aids.

6. Survival of Machinery after Action. Because of the immediate evacuation of manned machinery spaces and HQ1, it was not possible to assess from witnesses the state of the services remaining. However, the following machinery was running immediately after the attack:

- a. J1, J2 and M1 Diesel Generators (left running during abandon ship)
- b. Port and Starboard Gas Turbines (shut down prior to abandon ship)
- c. No 2 and No 4 Firepumps.

7. Services remaining after the attack. The essential services required in COVENTRY after action damage were lighting and firemain. There was an abundance of power generation; lighting circuits were largely intact and this gave added confidence to the DC teams and evacuees. The loss of firemain amidships did not hinder DC teams or prevent rescue and evacuation. However, the loss of firemain forward due to 440V distribution damage may have deterred the establishment of a conventional attack and support fire team.

8. The very short time between bomb explosions and loss of the ship has made a detailed appraisal of machinery/services endurance unnecessary.

9. Marine Engineering - Design/Equipment Performance and Shortcomings

a. Hull

- (1) Lack of watertight integrity of 2 deck passageway bulkheads.
- (2) Between deck ladders were not secured at their base and hung vertical when the ship heeled.
- (3) Wooden ladders fractured and splintered from upward shock and blast.
- (4) A blast-door once having suffered blast:
 - a. Cannot be opened by one man
 - b. Is no longer watertight.
- (5) A review is required for the re-introduction of manhole covers in hatches.
- (6) Escape hatches are too small for use by men wearing BA.
- (7) Door clip spindles should have some friction so that they prevented from hanging freely when the ship lists, thereby making one - man escape hazardous.

b. Main and Auxiliary Machinery

- (1) Main engines (Tynes) were brought to idle through a fortuitous 'fail-safe' control failure of the MCR console as a result of shock.
- (2) All three diesel generators and necessary auxiliary services remained running after the action.

c. Services

- (1) Firemain section pressure gauges not available at either DC base.

d. Electrical Generation and Distribution

(1) No information was available as to the final state of the forward and aft switchboard breakers after the shock of action damage.

(2) Abnormally high voltages were experienced through the ship on the 440V and 115V system since lights surviving the damage all burned very brightly. Loss of the AVR system is responsible for this.

(3) The supply 'available' lamp is between 2 phases; it can therefore give a false indication that a full 3 phase supply is available. No 1 firepump did not run despite the alternative available lamp being lit. The initial movement on attempting to start may have been caused by single phase action.

e. Main Machinery Broadcast

(1) Magnetic loop in machinery spaces is at single level, no communications are possible with men working at lower level or 'take-cover'.

f. DC Communications

(1) Forward and After DC bases cannot communicate without both RICE circuitry and linking keys being intact in HQ1 (HQ1 was lost during action damage).

(2) Dedicated DC communication lines between the forward and aft sections need to be run down both sides of the ship (2 deck) and be battery or sound powered, and independent of the main RICE system. VHF communications between section bases and the bridge should be investigated.

10. Conclusions. There is no evidence whatsoever to suggest that any shortcomings in the Marine Engineering department's material state, machinery operating procedures or personnel performance contributed to the ships positioning during the attack or to its failure to survive.

DAMAGE AND DAMAGE CONTROLPRELUDE TO THE ATTACK

1. The ship was closed up for Action Stations in less than 5 minutes with State 1 machinery and system isolation, including the switchboard line-up, completed to the check-off list just prior to Action Stations being sounded at 1800.
2. Personnel throughout the ship were well versed in closing the ship down and were familiar with their Action Stations. The DC organisation was standard for the class of ship.
3. The WEO in the Ops Room immediately established an open link with MEO in HQ1, who then relayed the build up of the air attack to the main machinery spaces by broadcast.
4. 'Take-cover' although ordered by MEO for hands in machinery spaces during this air attack was never rehearsed or discussed in DC training; the effectiveness of the posture and position adopted by various personnel is discussed later in this section.
5. 'Take-Cover' was not a familiar drill in the ship before or during Corporate deployment probably because the term is only associated with Nuclear attack or the safety of RAS teams on the upper deck. No similar pipe was made by the Ops Room or even to the rest of ship over the main broadcast.

THE ATTACK AND DAMAGE

6. Although the precise identities and arming/weapon loads of the 2 aircraft in the second wave of the final attack have not been established, it is clear that the first aircraft fired a burst of 30mm cannon fire and then dropped at least 2 bombs. The second aircraft may not have fired any cannon shells but certainly dropped bombs, probably 2.
7. Hits were achieved by 30mm cannon shells and by 3 out of the 4 bombs that were observed falling. The size and type of bombs dropped is not known but it is probable from the severity of the explosions that they were 1000lb weapons. Damage occasioned by each of these means is described in full detail in Appendix 1.

RECOVERY FROM THE ATTACK

8. Key DC personnel in HQ1, namely the MEO, DME0 and 1st Lieutenant were all affected by the shock and blast from the Forward Engine Room explosion and were forced to evacuate when smoke logging developed.
9. The Machinery Control Room watch led by the Chief Artificer were also forced into the Starboard passageway by smoke as was the Mobile Action Repair team which was closed up in the Technical Officer annex. A total of 27 men evacuated the HQ1/MCR/Technical Office complex and moved to the After Section Base.
10. HQ1 was out of action from this point and never re-used. In the light of COVENTRY's experience the doubtful policy of closing up many key DC personnel in one compartment needs re-appraisal. In particular it would seem prudent that the DME0 should be closed up on the bridge or the aft DC base at Action Stations in this class of ship.

11. The evacuation of the Ops Room and Engine Room casualties and non casualties and their passage through the ship has been covered in the detailed account of damage resulting from action (Appendix 1).

DAMAGE APPRECIATION

12. Before the detailed actions of the DC bases are described the scenario immediately after the action damage as seen from the various command posts should be outlined.

13. The Bridge

- a. OOW knew of explosion in vicinity of funnel
- b. Aware no steering, no propulsion
- c. Saw casualties coming on to the bridge from the Ops Room
- d. Saw CO was injured
- e. Was aware of rapidly developing heel.

14. The Forward DC Base

- a. Knew of Ops Room damage from injured men going forward
- b. Not aware of Forward Engine Room explosion
- c. Not aware of the abandonment of HQ1
- d. Had zero communications
- e. Aware of rapidly developing heel.

15. The After DC Base

- a. With MEO and DMEOW now at the Section Base knew of Forward Engine Room explosion and loss of HQ1.
- b. Knew nothing of Ops Room damage
- c. Had zero communications
- d. Aware of rapidly developing heel.

16. The Flight Deck

- a. Knew of midships explosion
- b. Saw injured men from HQ1 and aft machinery spaces
- c. Aware of rapidly developing heel.

17. Summary

- a. No one Command post knew of the total damage from the attack.
- b. All DC communications had failed.

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- c. The forward DC base did not know that HQ1 was abandoned.
- d. All posts were aware of the rapidly developing heel to port.

THE AFTER DC BASE

18. After the noise of forward explosions the CPO I/C the After Section Base organised searches in the after sections of his area. The area was well lit and from first reports there was no damage aft. After the arrival of the HQ1/MCR team including the MEO some preparations were made to transit the port passageway to the HQ1 access. A later independent search carried out by a PO and CPO was aborted.

19. It appears that the arrival from HQ1 of the '1st XI' at this DC base swamped the CPO I/C. He did a face by face check around the base to eliminate those men who might be still be closed up or trapped below in machinery spaces and convinced himself they were all accounted for, this after hearing a series of sitreps from shocked and distressed men. From this time there was no intention to send a patrol forward along the 2 deck passageway to check for stragglers from the machinery spaces or casualties from the forward extreme of his section ie non machinery spaces even though BA personnel and back-up were dressed and available.

20. By this time the MEO had decided that the rate of heel was serious and fearing a sudden capsizes he ordered the whole DC party and nearby first aid team to make for the upper deck. It should be pointed out here that the MEO had no idea of the extent of underwater damage but sensed from the ships motion that there was no chance of her righting and that there was imminent danger of DC parties and casualties being trapped between decks.

21. Despite the order to abandon the post, a CPO carried out a lone search of the Starboard passageway without BA and found a CPO slumped over the hatch coaming of the After Engine Room. However the lack of BA cover prevented him from completing his survey and he went no further forward after safely getting that man aft.

22. Summary

- a. The huge search and rescue potential of the aft DC base was never used either to establish contact forward or check for survivors between the blast doors on 2 deck passageways.
- b. The normal reactions and logic of the CPO I/C and other senior rates were numbed by the shock of actually being hit and seeing casualties.
- c. There was acute awareness of the heel and the fear of being trapped between decks.

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THE FORWARD DC BASE

23. Of the two DC teams, the forward was perhaps the most worked up and confident and they had thought carefully about how they would respond to action damage. As a result of damage to the Operations Room this team had a fire combined with a search and rescue problem on their doorstep, only one watertight door away from their base. However for a variety of reasons their subsequent handling of the situation was not to be in the Portland or Phoenix vein.

24. It was only when facially burnt ratings evacuating the Operations Room burst through the watertight door 2 E/G starboard that the CPO I/C and his men became aware that their section had been hit. The casualties were well received by the 2 I/C of the team (POMEM) and were taken into the forward bathrooms to have their burns doused in fresh water. Meanwhile the CPO I/C was organising the attack firefighters and BA team to go to the starboard access of the Operations Room. He also sent a messenger along 2 deck to establish contact aft.

25. A Leading Hand in BA, with a fearnought suitman (not wearing BA), following with first aid appliances, then approached the 2E/G door on their way to the Operations Room. They were met by men evacuating the Operations Room who told them to "get out as the ship was sinking". They hesitated but continued through the door to the Ops Room. At the access they were confronted with smoke and debris and could not see inside, so they both returned to the CPO at the Forward Base. Their sitrep to the CPO was garbled but having been re-equipped with lights, they were told to return and assess the situation.

26. These two ratings have admitted that they were frightened at the thought of entering a smoke filled compartment, not knowing the state of the deck. They were also more than a little disconcerted by seeing the injuries of evacuees, many of them Officers and Senior Rates.

27. Meanwhile, the CPO I/C checked firemain availability at a nearby hydrant. There was no pressure so a message was passed to the 2 I/C in D section who quickly found No 1 fire pump in C section stopped. This pump could not be re-started. The BA team returned to the base a second time still with no information as to the state of the Operations Room or the whereabouts of any trapped/injured personnel. By this time the CPO I/C was becoming very irate over their hesitant approach so they were instructed to return to the Operations Room for a third time and to hold the lantern in the doorway to guide any survivors out. This they did and three ratings were probably led to safety by their action.

28. On their final return to the Forward DC base the BA team took their gear off and told the CPO I/C they were going to leave the section and join the queue to escape via the foc'sle hatch. They were very frightened as the heel was now approaching 20° and they were surrounded by men, including some experienced Senior Ratings, whose obvious intention was to escape before the apparently imminent capsizes. The bewildered CPO I/C agreed that they should go for he was now aware of the steadily increasing heel.

29. Summary

a. The Forward DC Party was distracted from its primary task when faced with a flood of injured and shocked men evacuating the Operations Room. The 2 I/C switched role to first aider and took no further part in DC attempts.

- b. The CPO I/C did not appreciate the reluctance of the BA team to enter the burning Operations Room without a waterwall available and the standard back up personnel. He never left the DC Base control point to judge the conditions he was sending two young men into or considered leading them himself.

DIAGRAMMATIC REPRESENTATION OF ACTION DAMAGE AND BLAST ROUTES

30. The detailed damage described previously is illustrated on a diagram of the ships profile (Appendix 2). It was compiled from photographic evidence shown at Appendix 5, Plates 1 and 2, and eye witness accounts from HMS COVENTRY survivors. It does however assume that a compartment experiencing bomb blast near the ships side will rupture. All of the underwater damage shown on this diagram is assumed and was largely substantiated by simulation using a Type 42 floating model at HMS PHOENIX. It is acknowledged that variations in the actual hull damage compared with that assumed in 4G and 4H would give a similar overall results regardless of the source of flooding.

MODEL TESTING AT HMS PHOENIX

31. The Type 42 floating model was manufactured by Chatham Dockyard and delivered to HMS PHOENIX on 6 July 1982 - Constructor K HARPER of DG Ships PD212C and Lieutenant Commander A SEARS of HMS PHOENIX were co-opted by the Board of Enquiry with a remit to simulate HMS COVENTRY's action damage on the model and report their findings directly to the Board. Their trials were successful in producing hull behaviour that was later substantiated by photographs taken from BROADSWORD, of COVENTRY sinking. Reference to the model testing results is included under the title 'Stability after Damage'.

STABILITY AFTER DAMAGE

32. Introduction

- a. If a ship suffers underwater damage on the port side in a relatively calm sea, it will immediately heel to port.
- b. The hydro-dynamics of filling large non-longitudinally divided spaces maintains the developing heel to port, with the inevitable loll condition increasing this angle by a series of sudden jerking motions. As the ship deepens, the loll angle increases or decreases depending on the free-surface behaviour; a steep sea or strong wind could easily reverse the heel to starboard.
- c. HMS COVENTRY remained heeled over to port because of the moderate/calm sea state and the initial dynamics of flooding.
- d. An analysis of the sinking mode of merchant ships designed with no longitudinal bulkheads gave the following data:

95% capsized

4% 'plunged' (bow or stern first)

1% sank bodily (vertical)

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33. Flooding Diagrammatic Representation. The flooding pattern which followed Action Damage is described in two stages using separate diagrams of the ships profile.

34. Stability after Damage - Flooding to 2 Deck (Appendix 2)

a. This diagram shows the flooded sections and damage up to 2 deck and inset is a diagram of the heel experienced. This state corresponds to the photograph of HMS COVENTRY taken about 15 minutes after being hit (Appendix 5, Plate 3) where the heel was assessed as $15-20^{\circ}$ using photographic interpretation techniques. The PHOENIX model with the same damage simulated produced a heel of 16° (Appendix 6, Plate 1).

b. Water then flooded into 2 deck passageway through the open hatch in 2G (Ops Room to computer room), the bomb hole in 2H and the blown off hatch in 2K. Had the two doors at 2E/G (Port) and 2 M/N (Port) been left shut prior to abandoning ship then the flooding from below would have completely filled sections G and K and K to M due to the non watertight integrity of the intermediate bulkhead. (See Paragraph 36).

c. However evidence on this subject is not conclusive and it is doubtful that these doors were left closed. In this case, the flooding along 2 deck would have extended forward and aft of the passageway to fill undamaged compartments. This probable extent of flooding is shown as dotted blue hatching in Appendix 4.

35. Stability after Damage - Flooding to Deck Edge (Appendix 4)

a. This diagram shows the condition where the deck edge immersion corresponds to the level of water established in the port 2 deck passageway. At this point the bomb hole in the port waist at 1H assists further flooding of the ship via 2 deck.

b. The PHOENIX model with 2C to 2G port flooded produced a heel of 47° ; this angle would have been greater but for the buoyancy of the model's superstructure.

c. Due to loll and the massive capsizing moment set up by the collar of water wedged in the passageway the ship was very unstable. Later, capsize was inevitable.

d. Shortly after reaching 45° of heel the ship would have deepened still further and finally rolled on to her beam ends. Gradually upper deck compartments would then have flooded and the ship would have lost her final resistance to capsize.

e. After capsizing the underside of the hull was observed to be intact by BROADSWORD. Rudders and propellers were also intact. The ship sank later but was not observed.

36. Watertight Integrity of 2 deck passageway

a. In the Type 42, 2 deck passageway is subdivided from G section to N section but only 2E/G, 2J/K and 2 M/N are watertight bulkheads. Although fitted with watertight doors intermediate bulkheads at 2G/H, 2H/J, 2K/L and 2L/M are not watertight because of unsealed entries for chilled water, hydraulic and salt service pipes outboard of the doors.

b. Photographs taken in HMS CARDIFF shortly after her return from the Falklands show the watertight bulkhead at 2E/G and the non watertight bulkhead at 2L/M (Appendix 7, Plates 1 and 2).

c. The lower annular space around the pipework was packed and sealed with tape and, in CARDIFF, the upper 'double annulus' (with hand visible.) was apparently left clear. These spaces are clearly prone to smoke and flood communication and will by-pass blast. A real hazard was thus posed to the following Corporate ships: HMS SHEFFIELD, COVENTRY, CARDIFF, GLASGOW and BIRMINGHAM, but HMS EXETER was modified in that area during build.

d. This weakness in watertight integrity was voiced by DNE as early as 1975 and was outlined in several build acceptance reports of Type 42 destroyers. The annular passages described are a class design-feature and provide vent circulation between sections on 2 deck and are therefore necessary for the establishment of the gas-tight citadel. The class A&A 175 makes the non watertight bulkheads watertight to 6 feet and fully gas tight but despite its watertight integrity implication, it has always carried a Military Essentiality Code (MEC) of 100. Other A&A's associated with this problem provide an improved vent/citadel arrangement to overcome the air circulation difficulty which arises when the annular holes are blocked.

37. Stability - Documentation for the Type 42

a. The only information on Type 42 Stability available to ships is in Chapter 2 of CB 4538W (NECD Book Sheffield Class Type 42 Destroyers).

b. Chapter 2 gives seven examples of flooding in the major sections after action damage leading to the most severe case when the 4 main machinery compartments are flooded.

c. A diagram of the ship's profile in each case is shown with the new waterline but with the ship vertical in the water. There is no complementary athwartship diagram of the ship indicating the maximum heel that could be attained through loll.

d. MEOs at sea in Type 42s at the moment cannot advise their Captains what the maximum heel will be for any specific damage below the waterline. They do not therefore know whether or not the ship can be saved by means of Damage Control once heel angles of 20° plus are reached.

e. Additional information on the Type 42 flooding behaviour should be drawn up by DG Ships PD 212c and forwarded to ships for insertion in the NECD book. HMS PHOENIX has already incorporated the information revealed by model testing into its stability lectures to MEOs and CO Desigs.

CONCLUSIONS

38. Preparations

- a. Damage control parties were correctly closed up before the attacks began. Para 1-5
- b. 'Take Cover' drill was not exercised prior to being used operationally. Paras 4-5

39. Recovery from the Attack

- a. HQ1 and other DC teams evacuated the HQ1/MCR/Technical Office complex soon after damage and attempted to take control of DC operations from the Aft Section Base. Paras 8-10

40. Damage Appreciation

- a. No single out-station knew the total extent of damage. Paras 12-16
- b. All DC communications had failed. Paras 12-16
- c. The Forward Section Base did not know that HQ1 had been evacuated. Paras 12-16

41. The After DC Base

- a. The huge search and rescue potential of the After DC Base was never used either to establish contact forward or to check for survivors between the blast doors on 2 deck passageways. Paras 18-21
- b. The normal reaction and logic of the CPO I/C and other senior ratings were numbed by the shock of actually being hit and seeing casualties. Paras 18-21
- c. There was acute awareness of the heel and fear of being trapped between decks. Paras 18-21

42. The Forward DC Base

- a. The Forward DC Party was distracted from its primary task when faced with a flood of injured and shocked men evacuating the Operations Room. The 2 I/C switched role to first aider and took no further part in DC attempts. Paras 23-28

43. Stability After Damage

- a. COVENTRY heeled some 16° to Port when flooded to 2 deck in several sections of the ship. Para 34
- b. The angle of heel developed to 45° + as flooding gradually caused deck edge immersion. Para 35
- c. Final resistance to capsize was lost as heel approached 45°. Para 35

44. Watertight Integrity of 2 Deck Passageway

- a. Although 2 deck is subdivided from G to N Section only 3 bulkheads are fully watertight. Para 36

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b. Some bulkheads are fitted with watertight doors but are not watertight overall because of unsealed pipe penetrations. Para 36

c. These bulkheads can be made watertight by A+A action but other modifications to ventilation arrangements then become necessary. Para 36

45. Stability Documentation

a. The information in the NBCD Class Book is inadequate. Para 37

RECOMMENDATIONS

46. Take Cover drill must be introduced to ships NBCD training.

47. Typical heel angles at various levels of underwater damage should be displayed on Section Base state boards.

48. DC team training should impress the need for men to keep their station until directed otherwise by the leader.

49. Type 42s currently deployed should make the non-watertight bulkheads watertight by self help or with the assistance of support vessels.

50. Similarly Type 42s in the UK should be modified and examined by their Admin Authority before re-deployment.

51. An immediate update on Type 42 stability behaviour should be forwarded to ships and training establishments for insertion in the NBCD class book.

DETAILED SUMMARY OF DAMAGE

1. This appendix describes the detail and effects of the damage and attempts to control it under the following headings:

- a. Bomb/Shell entry pattern.
- b. Initial effects and Structural Damage.
- c. Personnel.
- d. System Loss.
- e. Watertight Integrity.
- f. Damage Control Action taken.
- g. Damage Control Repair potential.
- h. Contribution of damage to ship's sinking.

2. 30mm Aircraft Cannon

a. Shell Entry

- (1) Forward Auxiliary Machinery Room (FAMR) 3J port horizontal slot approx 5' long 8" wide shells entered compartment parallel to the ship's side just above the waterline under one liferaft stowage (Appendix 5 Plate 2) passing through the after bulkhead 3J/3K into the Forward Engine Room (FER).
- (2) Forward Engine Room (FER) 3K port (Appendix 5 Plate 2) shows horizontal markings for about 8' under the Cheverton davits.
- (3) 3Q port - eye witness saw holes above waterline.
- (4) 2R port - 182 Sonar winch 'marked' and probably dislodged from its mountings.
- (5) 1P port - Hangar sides (viewed from inside) were hit and equipment damaged.
- (6) 1N starboard - Hangar airlock door 'knocked-off' hinges!

b. Initial Effects and Structural Damage

- (1) FAMR 3J port open to sea about 18" above the waterline.
- (2) FER 'K' HPAC probably disabled - this plant is located aft, close to the port side.
- (3) Possible flooding from sea in 3Q Messdeck when ship heeled to port.

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c. Personnel - action taken/casualties/escape

- (1) Forward Auxiliary Machinery Room - watchkeepers sighted ships side slot, made report to the MCR and then safely evacuated when subsequent bomb explosion ('third' bomb) blew fireball into compartment from shell hole in aft bulkhead.
- (2) Forward Engine Room - watchkeepers reported K HPAC tripping - all killed by later bomb explosion.

d. System Loss

- (1) FAMR - Nil before flooding from slot in ships side. (Both diesel generators remained running after attack).
- (2) FER - 'K' HPAC tripped, integrity of HP air bottles not known.

e. Watertight Integrity

- (1) FAMR - Lost - free flooding due to ship's subsequent heel from other damage. Access hatches 2J port and starboard left secured fully clipped.
- (2) FER - Nil - Ships side assumed breached below the waterline (port side).
- (3) 3Q port - Lost - free flooding due to ship's subsequent heel from other damage.

f. Damage Control - Action taken

- (1) FAMR - Nil.
- (2) FER - Nil.
- (3) 3Q port - Nil.

g. Damage Control - Repair potential

- (1) FAMR - Nil due to rapid flood caused by ship's immediate list.
- (2) FER - Nil, compartment devastated by exploding bomb.
- (3) 3Q port - damage not seen by DC party.

h. Contribution to ship's sinking

- (1) FAMR - major flooding of whole compartment deepened the ship adding to the ship's heel: shell hole in bulkhead aft to FER communicated a rapid flood into the FER.

3. The First Bomb

- a. Bomb Entry. Through ship's side at 3G port (Computer Room) and assumed down into the Conversion Machinery Room (CMR) 4G probably exploding near the 4G/4H bulkhead after delayed action.

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b. Initial effects and structural damage. Bomb explosion in the CMR - blast damage rupturing deck of computer room, 4G/4H (Provision room) bulkhead, 3G/3H (Naval Store) bulkhead, the ship's side at 4G and probably that at 4H.

- (1) Conversion Machinery Room (4G) - unmanned, assumed devastated.
- (2) Computer Room (3G) - severe blast and fireball, devastation, inferno developed but appeared to subside before entry hole filled from sea.
- (3) Operations Room (2G) - fireball followed by blast from Computer Room access hatch (left open) and swept across the Ops Room. Blast vented through both Ops Room access doors and the vertical access to the cabin flat. Displays imploded/exploded, minor fires developed in consoles and on the deck, operators' chairs disintegrated, some were blown through starboard access door. The deck/cable runs/False deck sandwich apparently remained intact.
- (4) Provision Room (4H) - may have flooded by communication with 4G.
- (5) Naval Store (3H) - rapid flood either from 4H or 3G when ship deepened and heeled to port.

c. Personnel - action taken/casualties/escape

- (1) Computer Room (3G) - no survivors, but an officer tried to escape by ladder up to Operations Room without success.
- (2) Operations Room (2G) - all personnel closed up escaped, majority via the shattered wooden ladder to the cabin flat and the starboard access to 2 deck passageway. Two people forced a way out through the severely damaged port access to the passageway. Injuries were facial and hand flash burns or the result of burning clothes. Smoke logging was heavy but not incapacitating to the evacuees.
- (3) Provision Room - unmanned.
- (4) Naval Store - CPO(SA) and 2 normally closed up in the office but for this attack took cover in the Gyro room with the maintainer and two of the DC rounds party. All escaped injury after the explosion forward, and the simultaneous bomb penetration from 2H (described under 'second' bomb). Naval Store was viewed, proved athwartship racks still intact but deck under 3 feet of water and rapidly flooding. Soft door was blown into the flat outside. The Gyro compartment suffered no apparent structural damage. The aft switchboard door was blown off - breaker state not known. Hatch 2/3H (port) fully clipped after evacuation.

d. System Loss

- (1) Conversion Machinery Room - all services lost including steering gear control but the 140v gyro back up batteries appear to have survived, providing power to the gyro SFCs.

- (2) Computer Room - devastated by blast and fire.
- (3) Operations Room - all systems made u/s by blast and flash fires.
- (4) Gyro room - both gyros left running on battery back-up.

e. Watertight Integrity

Golf Section

- (1) Conversion Machinery Room (4G) - assumed open to sea across whole compartment (access door from pump space starboard is not watertight).
- (2) Computer Room (3G) flooded, when ship heeled immersing bomb entry hole.
- (3) Operations Room hatch 2/3G port open to flood water rising from Computer Room.

Hotel Section

- (1) Provision Room (4H) - possibly flooded from 4G.
- (2) Naval Store (3H) free flooding across whole of 3H section.
- (3) M.C.O. (2H) open to flooding from 'second' bomb hole 2/3H.

f. Damage Control - Action taken. No action in any compartment except closing of 2/3H starboard hatch.

g. Damage Control - Repair potential

G Section NIL hull damage below waterline
H Section NIL probable hull damage below waterline

h. Contribution to ship's sinking. Below the waterline flooding across whole of 4G and probably 4H and rapid flooding after initial list in 3G and 3H deepened the ship and added to the ship's heel to port.

4. The Second Bomb

a. Entry. In the port waist at 1H almost vertically through 2H into the Naval Store 3H with probable final penetration into 4H (Appendix 5 Plate 2) in line with 909 radome.

b. Initial Effects and Structural Damage. Bomb holed 1 deck and deck edge (2' wide by 3' long) striking 440v cables in deckhead, rupturing the hydraulic ring main outboard in 2 deck passageway causing a fire around the periphery of hole resulting in 2H deck. The bomb continued its path into 3H Naval Store and probably entered 4H, there is no evidence to suggest the bomb exploded in 4H but it may have exited out to sea.

c. Personnel - Action taken/casualties/escape

(1) 2H passageway - two ratings initially trapped in the CCR transmitting room after the blast from the bomb explosion under the computer room were hindered by the smoke logging and hole in the passageway. They were finally directed around the bomb hole in their escape forward to the MCO by a senior rating maintainer.

(2) 3H Naval Store - personnel who were sheltering in the Gyro room amidships were not aware of any bomb entry into 3H/4H.

d. System Loss. 2H port passageway - loss of hydraulic ring main and unspecified 440v supplies to forward weapons and auxiliary services, probable loss of chilled water and fire main service (situated below hydraulic ring main pipework).

e. Watertight Integrity. 2H - open via bomb hole to flooding from below by Naval Store 3H and to sea from above when 1 deck was submerged at later heel of 25°.

f. Damage Control - Action taken

(1) 1H (port waist) NIL

(2) 2H passageway NIL

(3) 3H Naval Store NIL

g. Damage Control - Repair potential

(1) 1H - NIL hole embraced deck edge and was submerged by rapidly developing heel.

(2) 2H - existence of bomb hole not known to forward DC Party. Shoring from 2 deck would have only been a possibility with more time available before abandoning ship.

h. Contribution to ship's sinking. The breach in 1 deck was responsible for the massive final flooding of 2 deck, which although sub-divided has no effective watertight integrity. With the 2 deck port passageway already flooded from below in G, H and K sections the influx of water from 1 deck breach would quickly flood the remaining fore and aft compartments of the ship besides giving the ship a substantial capsizing moment to port.

5. The Third Bomb

a. Entry. Bomb entered ship through OIL ie the Port Olympus intake and is believed to have travelled aft in the Forward Engine Room before exploding by delayed action outboard of the Port Olympus engine module.

b. Initial Effects and Structural Damage

(1) The explosion from this bomb affected the whole of K section from 5 to 01 decks and although the main force of the blast vented through the engine intakes there was a tremendous force on the deck

of the Junior Rates Dining Hall immediately above, which as a compartment was totally devastated. If the bomb had lodged between the Port Olympus module and the ship's side the outboard explosion would have certainly blown the hull plating out below the waterline, however from Appendix 5 Plate 2 the only above-waterline damage appeared to be just under 2 deck between the davits in the form of two horizontal slits. There was clear evidence that the port engine room access hatch 2K had been blown out and the ladder to 3K forced upwards into the passageway outside the EWER. The blast from the ruptured access hatch was largely withheld by 2K/L blast door, the final condition of which is somewhat vague except that the door clips were seen to be 'bent back'.

(2) Peripheral blast effects. Despite the doors in 2J/K and 2K/L peripheral effects were felt either side of the blast source along 2 deck port passageway. In 2J the galley server hatch was smashed into the galley. In 2L, HQ1 and the Technical Office were swept by blast after the 'soft' sliding door blew in, although most of the damage in HQ1 was from shock transmitted from the Forward Engine Room after bulkhead. The blast doors in 2 deck passageways of the Type 42 are in themselves substantial structures, however there is a substantial blow-by area outboard of the door frames. The 'blow-by' area is an air gap for passageway ventilation, by using annulli surrounding firemain and chilled water pipework. There is no total watertight or gas tight integrity of the sub-divisions in the 2 deck passageways.

(3) The Aft Engine Room (L section) was the main compartment affected by the peripheral blast; eye witness accounts describe a fireball and blast propagation from the port forward corner of the bulkhead. There was no clear report of where the bulkhead ruptured as smoke entering the compartment from the FER quickly masked its source. It was assumed however that any flooding in the Forward Engine Room would quickly pass through the hole(s) into the After Engine Room, especially with the ship heeling to port.

c. Personnel - action taken/casualties/escape

(1) Forward Engine Room: All five men closed up in the Forward Engine Room were presumed killed outright.

(2) Junior Rates Dining Hall: All 5 men closed up were presumed killed outright.

(3) Galley: All personnel closed up escaped serious injuries from the shower of dislodged shutter blades. Some blast and flash swept across the galley from the aft bulkhead, part of the Olympus intakes.

(4) After Engine Room: Three watchkeepers escaped with shock, the fourth was caught in the fireball and blast but managed to escape using the starboard access.

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(5) HQ1, Technical Office and MCR: Eighteen men escaped suffering from blast and shock from transmitted forces on the deck and adjacent bulkheads. One man (WEM HALL) was not recovered from HQ1; he was directly in line with the blast from the Technical Office door, having adopted an awkward take-cover posture. The escape route for all personnel was via the MCR access to the starboard passageway.

d. System Loss

(1) Forward Engine Room: Olympus gas turbine propulsion.

(2) After Engine Room: Extent of damage not known but blast from port forward bulkhead would have caused shrapnel damage to high level lub oil and CPP system pipeworks adjacent to the main gear-boxes. Subsequent flood damage would render unserviceable all propulsion and auxiliary systems that survived blast.

(3) HQ1: Loss of fire and flood alarm panels (Minerva). Loss of RICE communication system to fwd and aft DC bases.

(4) MCR: Loss of main propulsion control, auxiliary machinery, stop/start panels, diesel generator stop/start panel, communications to machinery spaces and bridge.

e. Watertight Integrity

(1) Forward Engine Room: NIL: port side assumed open to sea below waterline.

(2) Aft Engine Room: NIL: ruptured bulkhead at 3 or 4 deck level would allow rapid flooding from Forward Engine Room.

(3) Port 2 deck passageway: the whole passageway was open to internal flooding from the damaged Forward Engine Room access hatch (2K port).

f. Damage Control Action taken

(1) Forward Engine Room: NIL.

(2) After Engine Room : NIL but port access hatch was left fully clipped.

g. Damage Control Repair Potential

(1) Forward Engine Room: NIL - assumed major damage sustained below the waterline.

(2) After Engine Room: NIL - compartment smoke logged and bulkhead rupture would be in area of difficult access.

h. Contribution of damage to ship's sinking

(1) The rapid flood in the Forward Engine Room deepened the ship and added to the loss of buoyancy already developing in other spaces from free surface flooding. Internal flooding of 2 deck via the

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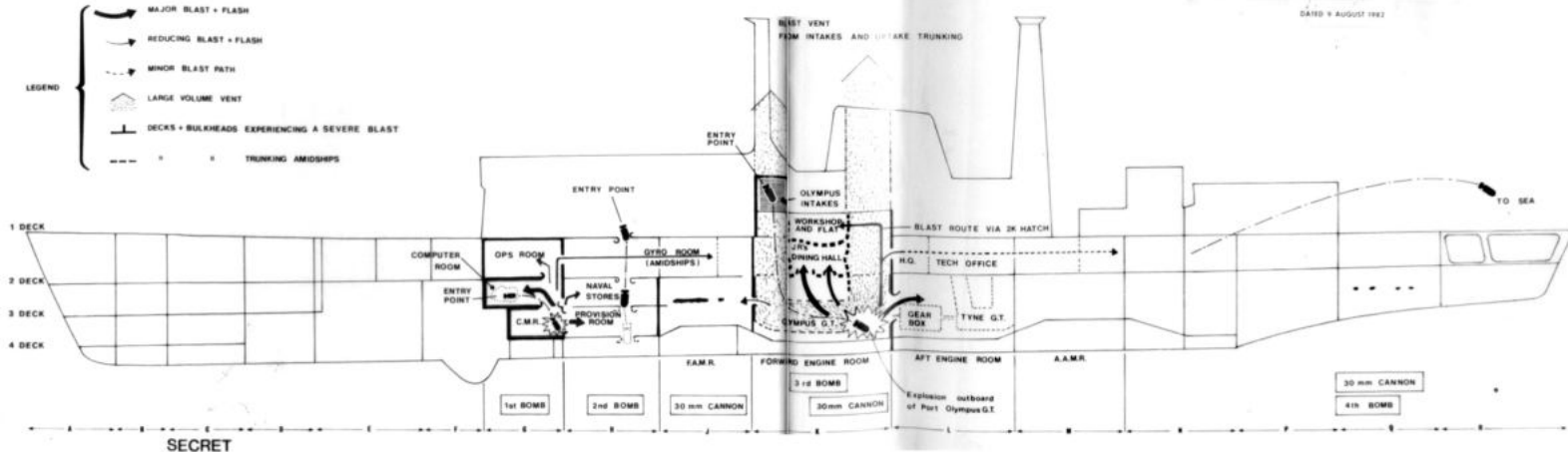
damaged access hatch would feed the whole of the ship, and with 2 deck passageway eventually 'water wedged' at 45-50° heel (in the loll condition) the capsizing moment would be near maximum.

(2) If the Olympus modules had been displaced to port by the explosion or subsequent list the increased rate of heel would have been considerable. The Forward Engine Room is the only machinery compartment where large surface areas (G.T. modules) are incident to any blast plane and are almost solely supported by shock mounts.

6. The Fourth Bomb. A fourth bomb was observed to clear the ship diagonally from Port to Starboard over the Flight Deck, landing astern of the ship but there are no reports of hitting the sea or exploding.

DIAGRAM No 1
BOMB* ENTRY AND BLAST ROUTE

APPENDIX TO ANNER 1 TO BOARD OF INQUIRY REPORT
DATED 9 August 1982



SECRET

STABILITY AFTER DAMAGE

FLOODING STATE AT 18° HEEL TO PORT

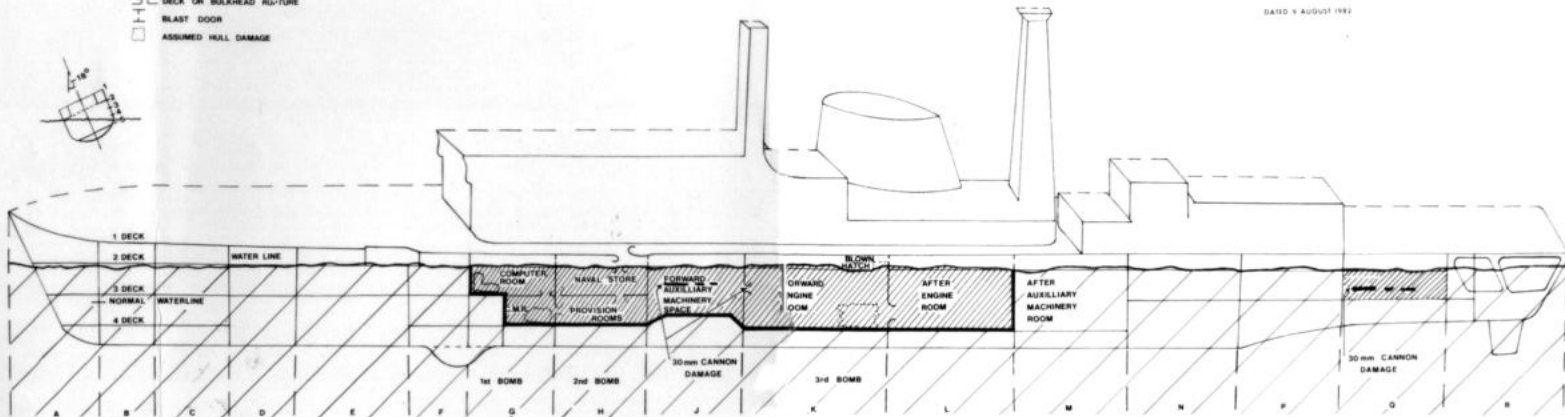
2 DECK ON THE WATERLINE - DIAGRAM NO. 1

LEGEND:

-  FULL FLOOD
-  DECK ON BULKHEAD RUPTURE
-  BLAST DOOR
-  ASSUMED HULL DAMAGE

APPENDIX TO ANNEX 1 TO BOARD OF INQUIRY REPORT

DATED 9 AUGUST 1982



SECRET

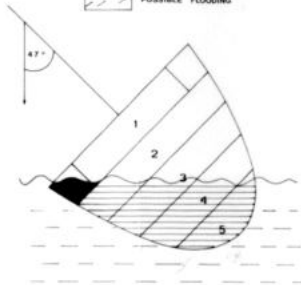
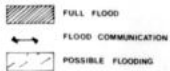
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STABILITY AFTER DAMAGE

DIAGRAM NO 1

FLOODING STATE AT 47° HEEL TO PORT
DECK EDGE IMMERSED - DIAGRAM No.

LEGEND:



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APPENDIX TO ANNEX F TO BOARD OF ENQUIRY REPORT

DATED 9 AUGUST 1982

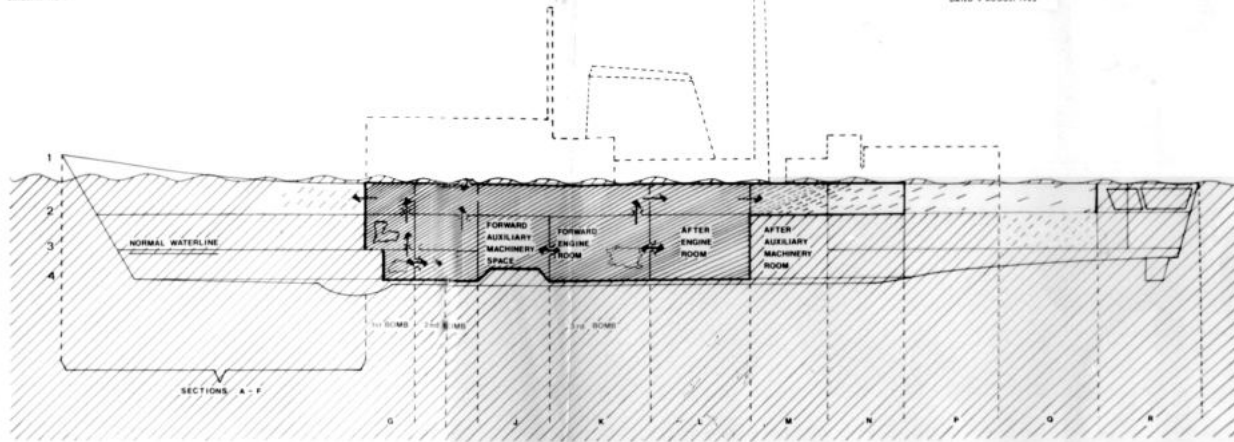


PLATE 1 - EXPLOSION



PLATE 2 - PORT SIDE UPRIGHT



PLATE 3 - PORT SIDE HEELED



PLATE 4 - BOW VIEW HEELED



PHOTOGRAPHS OF PHOENIX TYPE 42 MODEL

PLATE 1 - MODEL FLOODED TO 2 DECK

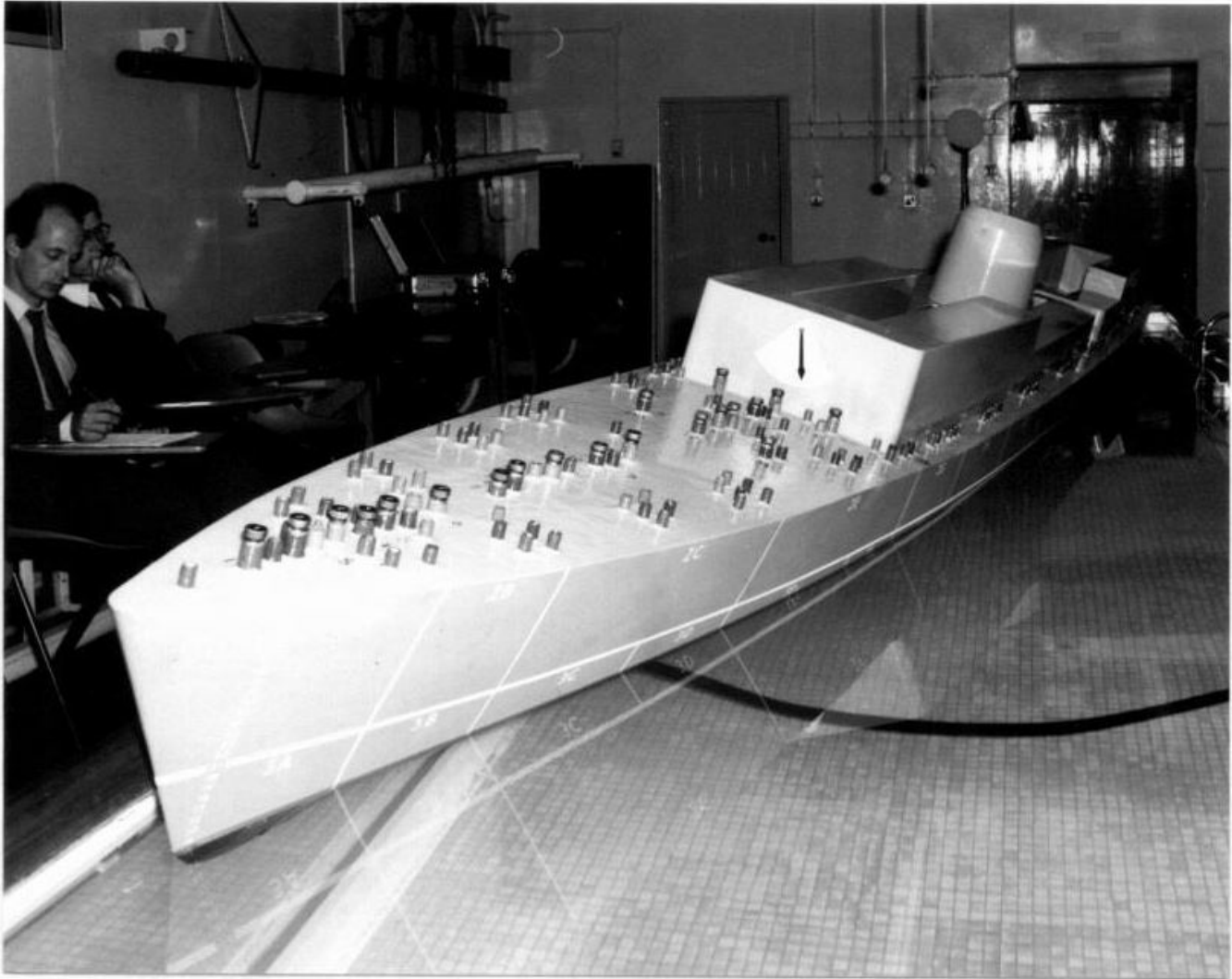
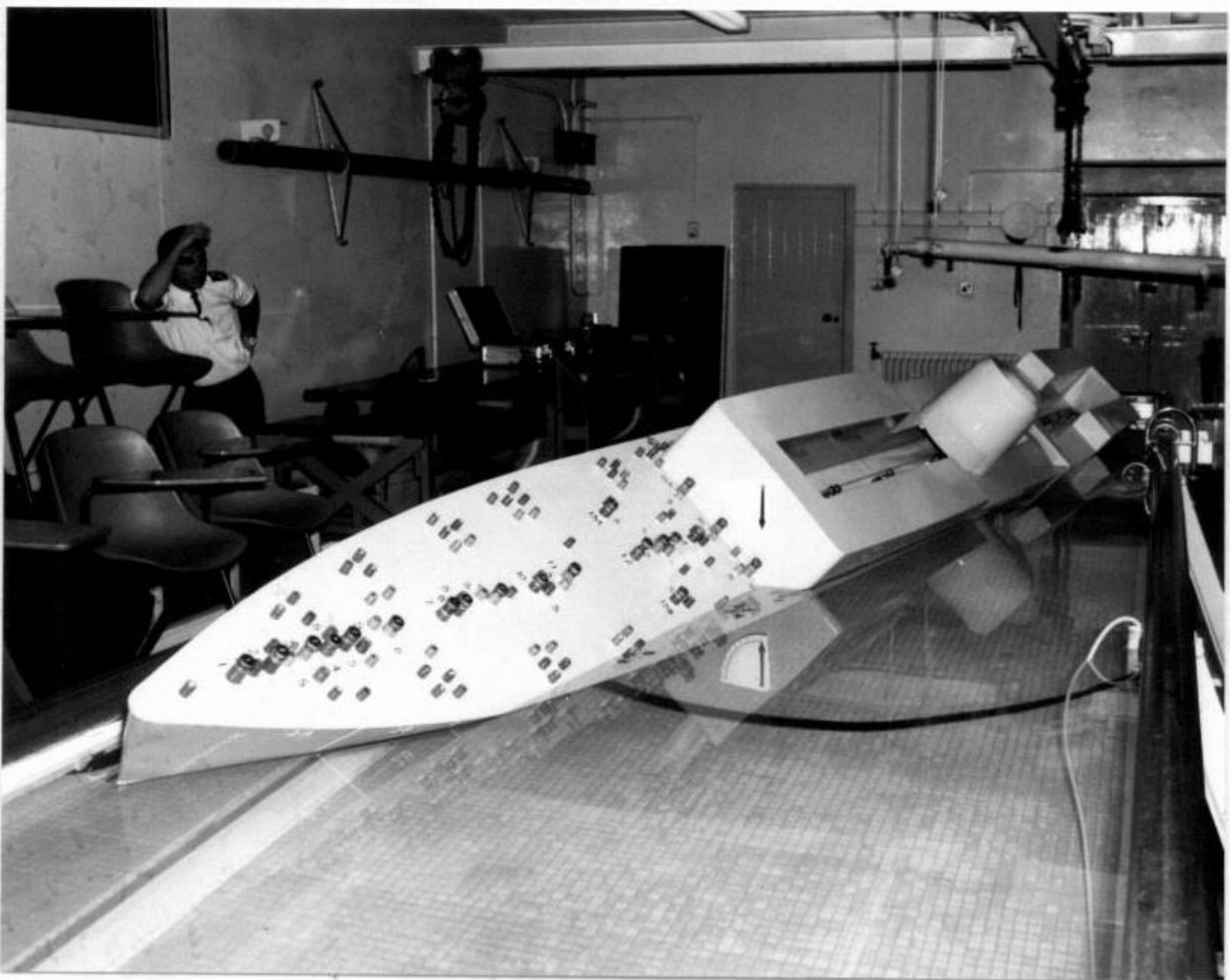


PLATE 2 - MODEL WITH DECK EDGE IMMERSED



PHOTOGRAPHS OF BULKHEADS IN 2 DECK
PASSAGEWAY (HMS CARDIFF)

APPENDIX 7 TO ANNEX F TO
 BOARD OF INQUIRY REPORT
 DATED 9 AUG 82

PLATE 1 - WATERTIGHT BULKHEAD

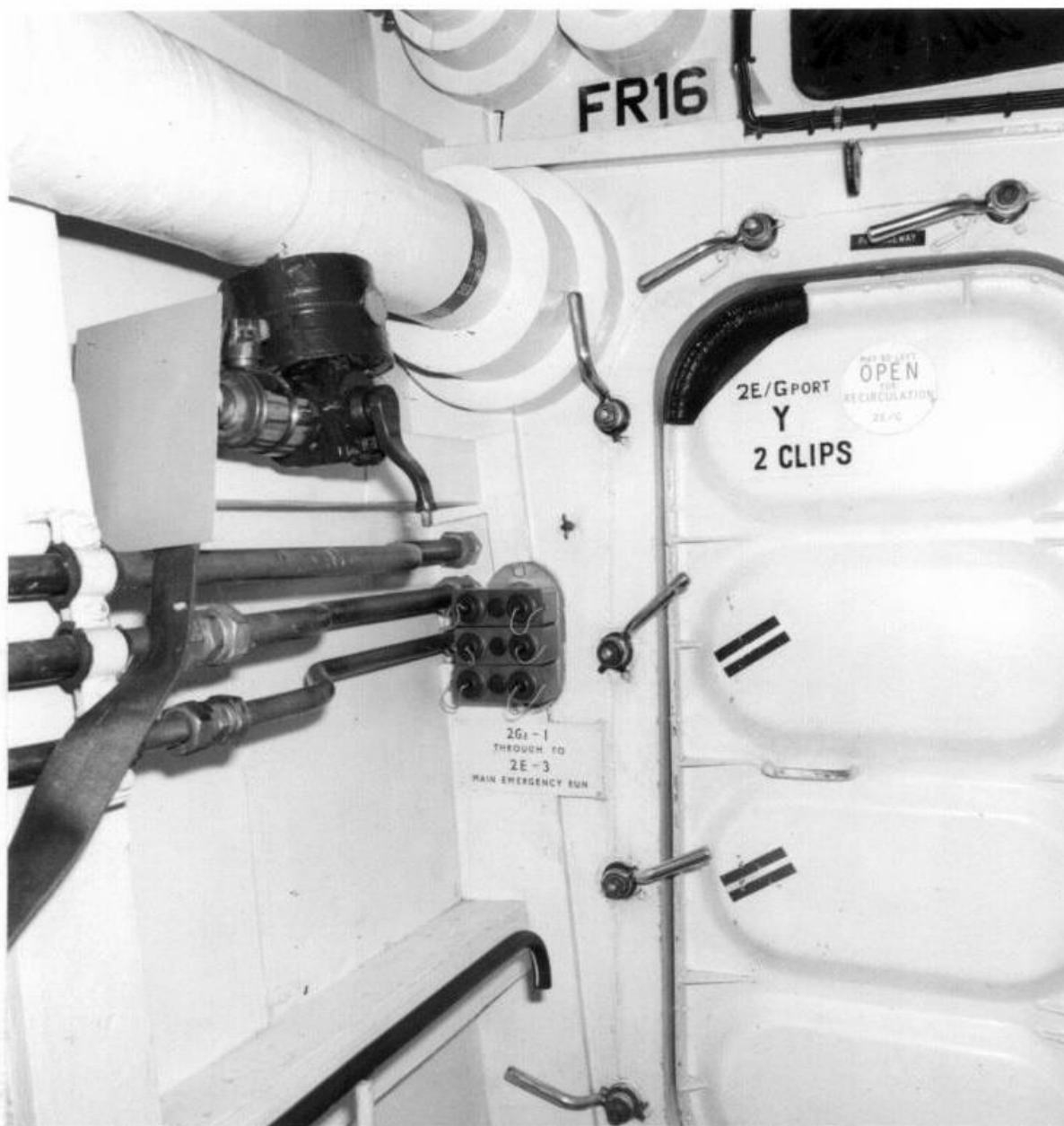
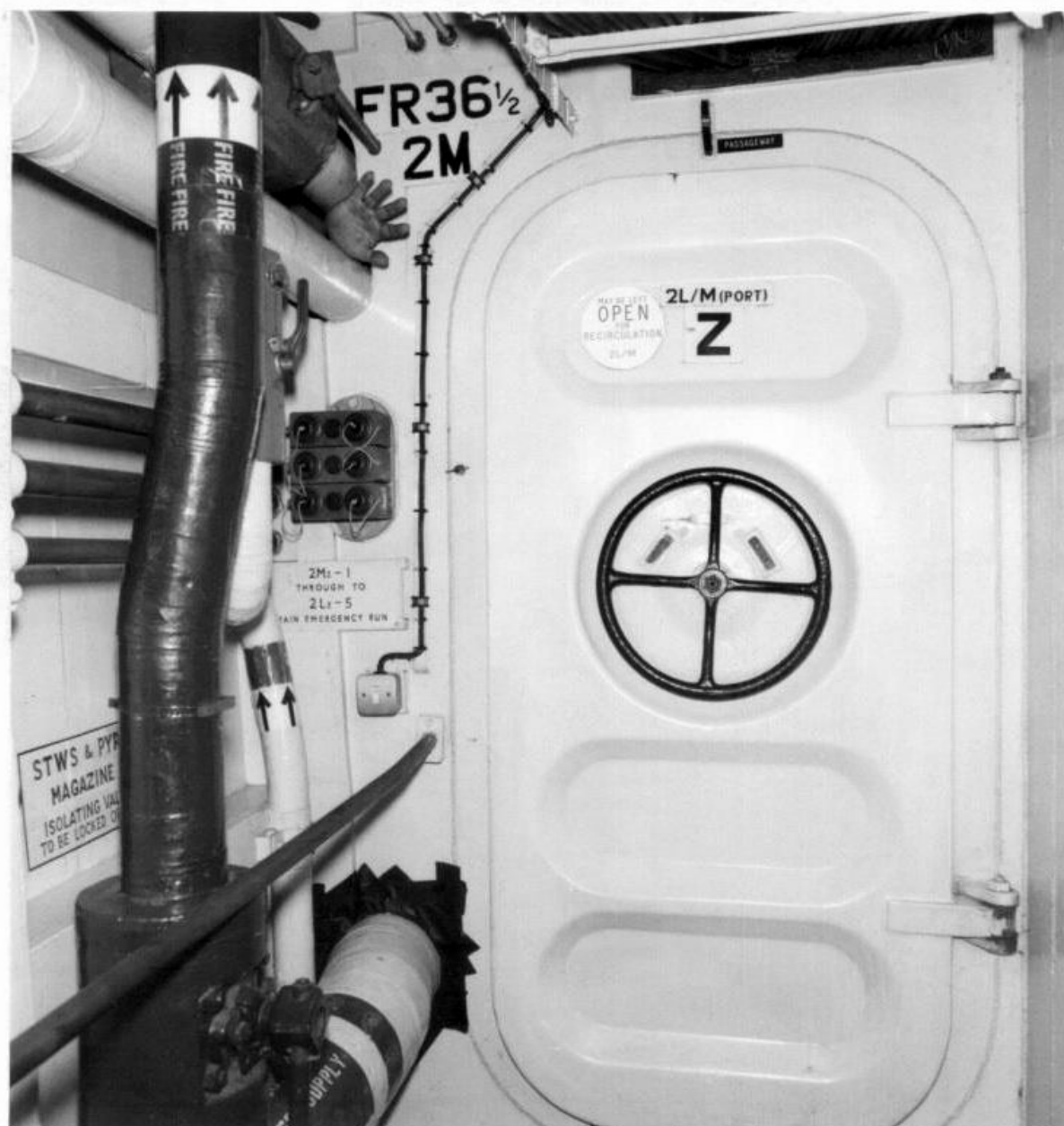


PLATE 2 - NON WATERTIGHT BULKHEAD



DAMAGE CONTROL - LESSONS LEARNT

1. The following miscellany of lessons learnt has been assembled from information gleaned both formally in evidence given to the Board and informally from discussions with survivors.

2. Structure and Training of DC Teams

a. It is clear from the performance of the forward DC party, albeit in an alarming situation, that the structure and training of DC teams needs to be reviewed.

b. The team needs to be manned, trained and equipped to:

(1) Assess accurately the physical state of compartments and report accordingly.

(2) Provide first aid, damage control and firefighting.

(3) Provide search and rescue services in the face of damage, fire, smoke and flood.

(4) Carry out long term damage repair.

c. The team needs to have a sensible balance of technical knowledge, leadership and resolution, and control at the scene of damage and at section bases/HQ1.

d. Long term success critically depends on those first at the scene and their assessment of the situation. Current doctrine provides a team consisting of those in Column 1 below. We would recommend an altogether stronger team as shown in Column 2. (Such a team would be the spearhead of a team sent to a Merchant Ship on fire.)

<u>COLUMN 1</u>		<u>COLUMN 2</u>
Senior Rating i/c	MEA/MEMN1 x 1	MEA/MEMN1 x 1*
Auxiliary Systems 'artificer'	-----	MEA/MEMN1 x 1
Pumping and Flood Control (Back up firefighters)	POMEM(M) x (1) MEM(M) x 2 MEM(L) x 1	POMEM(L) x (1) MEM(M) x 2 MEM(L) x 1
Breathing Apparatus	LMEM x 1 MEM(M) x 2	POMEM x 1* LMEM x 1 Reserve LMEM
Fearnought suit-men	MEM x 2	MEM1 x 2

Firefighters		LMEM	x 1	LMEM	x 1 (Reserve BA)
		MEM	x 2	MEM	x 3
		WEM	x 1	WEM	x 1
Electrical Repair Party	i/c	POMEM(L)	x 1	MEMN2(L)	x 1
		LMEM(L)	x 1	LMEM(L)	x 1
		WEM	x 1	WEM	x 2
Incident Board		WTR/WEM	x 1	WTR/STWD	x 1
Communications		WEM	x 1	STWD/WEM	x 1
			<hr/>		
			1 + 2 + 3 + 13	2 + 3 + 3 + 13	
			<hr/>		

*NBCDI qualified

e. This attack team must be trained and equipped to operate in the most adverse and arduous conditions - they need the qualities normally to be found among ships/clearance divers (and professional firemen). All require BA, headlamps and protective clothing which inspires confidence in working in dangerous situations.

f. The experience in COVENTRY was that those with the knowledge, experience and leadership potential were so remote from the scene of action as to be almost irrelevant while those close at hand were ill-equipped, undertrained and under confident.

3. Partition and Access Doors. Aluminium sliding access doors offer little or no protection against blast; even a relatively low pressure wave that has escaped from adjacent but damaged blast doors will either distort or blow them into a compartment. These doors are better left open or secured by hooked wire strops across their width.

4. Reduction of Flash Damage.

a. Removable canvas or fibre glass curtains should be located in passageways and in access routes to impede flash effects and smoke logging. They should be rigged before joining action.

b. Similar arrangements could be employed to mask the high risk power and control system cable runs, that are exposed on bulkheads or deckheads, from flash fire potential.

5. Stowage of Gear at Action Stations

a. Fixed and portable chairs in the Operations Room were swept by blast through open accesses thus impeding subsequent evacuation. Better securing arrangements may be possible.

- b. State boards lightly fixed to bulkheads in HQ1 and the MCR broke free when bulkheads sprung under shock. More robust fixings should be employed.
 - c. BRs, although lashed in book racks, became missiles when powered by blast. Their cardboard covers penetrated office furniture. Stowages must be better designed to withstand shock followed by blast.
 - d. The Technical Office microfilm viewer/printer left its mountings when affected by shock. It should be better secured.
6. Take Cover Drill. Take cover drill was not taught to the Ship's Company. As a result in HQ1 injuries were sustained by 3 men who had their necks propped against a partition bulkhead that reverberated with shock. Men must be fully rehearsed for the adoption of the correct body posture and their placing within a compartment.
7. DC Communications. Forward and Aft DC bases cannot communicate without both circuitry and RICE linking keys being intact in HQ1. (HQ1 was lost during action damage.) DC communication lines between the forward and aft sections should be run down both sides of the ship (2 deck) and should be both battery and sound powered. The use of VHF portables as a means of communicating between Forward and Aft DC Parties and the bridge should be investigated.
8. Main Machinery Broadcast. Magnetic loop in machinery spaces is single level, thus no communication is possible with men at lower levels or 'taking-cover'. Better loop cover is essential if men are to be stationed in machinery spaces at Action Stations.
9. Additional Personal Equipment. Every man should carry:
- a. A torch.
 - b. A whistle (separate from his lifejacket).
 - c. A knife for use in the water, in liferafts or cutting free flooded survival suits.
10. Action Preparations. No fresh water was stored in officers' cabin sinks nor in the officers' bathroom. Insufficient fresh water was in ratings' bathrooms or in the galley area. As a result there was some delay in the treatment of burns and unorthodox methods were adopted (beer, milk etc).
11. Escape Routes. These can be difficult to find in smoke or in emergency lighting. Markings should be illuminated by additional AEL's with much enhanced light intensity. Access to exits from compartments leading to passageways for escape could be indicated by a battery powered audio unit (bleeper).
12. DC Equipment at Bases
- a. The miners headset cannot be worn by BA men.
 - b. DC lanterns do not have sufficient intensity to be seen across a smoke filled compartment and are too heavy to pass quickly through hatches.
 - c. Shoring timber is sparse throughout the Type 42.

13. Anti-Flash Gear

- a. Loose fitting stretched anti-flash hoods were blown or sucked off by blast.
- b. Hoods must be tucked into collars of HWJ's or No 8 shirts to save injury from neck burns.
- c. Gloves cannot easily be worn by some Ops Room personnel because of their need to touch keyboards accurately. Gloves saved many hands against flash burns and enabled flames to be beaten out on the backs of ratings on fire.
- d. Names/titles must be marked on both the front and back of anti-flash hoods.

14. Use of the AGR for Smoke Protection

- a. The use of the AGR for limited periods to transit a smoke barrier was not well known to the ship's company. It gave added confidence and protection to the eyes of those men who successfully used it.
- b. AGRs that were not attached to people were blown away by blast. Operations Room personnel in particular found it difficult to wear the haversack and sit comfortably at their displays.

ESCAPE/SURVIVAL/RESCUEBACKGROUND

1. The speed with which COVENTRY capsized put to the test the Navy's policies for personal and collective survival at sea in a way virtually unknown since the disasters of the Second World War. In general terms the operation can be assessed as successful; there were 276 survivors from COVENTRY all of whom abandoned ship and lived to tell their stories. Of the 20 men who perished, only 2 died as a result of mishaps whilst leaving the ship and given the circumstances this must be judged a success. The following paragraphs highlight the main events in this phase of the incident and make recommendations for follow-up action where necessary.

ORGANISATION AND TRAINING

2. COVENTRY's Emergency Stations and Abandon Ship organisations were run along conventional lines. For Abandon Ship hands were detailed to muster at stations on the upper deck to await the order to leave following release of the liferafts by nominated teams. This evolution was exercised on several occasions during the passage south from Ascension Island and, as far as was possible, the ship was prepared for such an eventuality.

3. Also during this period refresher instruction was given on personal survival. The ship's company was warned of the problems of survival in the expected weather conditions and frequently reminded of the drills for use of liferafts, survival suits and personal lifejackets.

4. COVENTRY thought carefully about the problem of abandoning the ship, an evolution that is rarely rehearsed in peacetime damage control exercises. The form that training took was planned to produce an awareness of the problems involved without generating an unnecessarily pessimistic mood onboard. With the exception of two points (unpacking, checking and re-stowing each survival suit and briefing on dangerous areas for leaving the ship) all reasonable preparations had been made before entering the War Zone.

EVACUATION OF THE SHIP

5. Once damage had been sustained, power was lost to the Main Broadcast system and it was not possible to centrally control evacuation of the ship. However it quickly became apparent, even to those remote from the actual damage, that all was not well as the ship rapidly developed a list to port and showed no sign of steadying up; all indications were that capsize was imminent. Evacuation was more or less spontaneous with groups of men being directed to make for the upper deck by their immediate superiors and in many cases doing so without specific orders.

6. There were few problems with escape routes with 8 main hatches in G/H, M and N sections having been deliberately left open for this purpose. However, in the event many other hatches and doors were used including those on routes through the quarterdeck and both the Reel Store (2B) and half deck store (2½C). In answer to the questions, "How did you abandon ship? Did you follow a recognised escape route? What difficulties did you encounter?" some 28% of the survivors indicated some problem with escape (note that 13% were no answer/don't know!). However, analysis of their replies reveals a variety of problems with few common threads. An extract of difficulties encountered is at Appendix 1.

ASSEMBLY AT ABANDON SHIP STATIONS

7. Assembly at abandon ship stations was orderly but the actual positions in which men mustered were dictated by their choice of escape route, what they had done on the way there and most significantly by the difficulty in maintaining a foothold on the rapidly listing deck. The flight deck, forecastle and 1H cross-passage soon became untenable and men were forced to perch either on the uppermost deck edge or in the waists against the bulkheads.

8. It was not possible to carry out any sort of headcount in the time available during assembly. Both the diverse choice of escape routes and the deteriorating stability situation coupled with the confusion inspired by dazed and injured men in need of assistance prevented any formalised muster being carried out. This problem was further complicated later on when rescued survivors were deposited in a variety of ships and some injured were taken ashore. It is difficult to see how this could have been avoided; indeed in different circumstances there might have been no such problem yet in others it may have been much worse.

LEAVING THE SHIP

9. Because no general order to abandon ship could be given over the main broadcast it was left to officers and senior ratings at various points along the ship's side to judge the best moment for men in their vicinity to enter the water. Men did so progressively as they reached the upper deck and as the liferafts were launched. The first men to leave the ship went before the list to port was excessive (probably between 5 and 10 degrees) and were able to jump well clear of the bilge keels and stabilisers. However, as the list increased from about 15 to 20 degrees and the underwater obstructions could be seen from the upper deck, men became reluctant to jump and began sliding down the ship's side. Others, some dazed and shocked had to be prevented from jumping near obstructions. Before long at about 25-30 degrees of list the bilge keels, stabilisers and the starboard screw broke surface and at this angle many men were able to walk down the ship's side and jump when they reached the bilge.

10. Although a number of men sustained minor cuts and bruises whilst leaving the ship there were, with one exception, no serious injuries. The death of the First Lieutenant is attributable in part to an injury sustained when he struck a stabiliser fin whilst sliding down the ship's side. Although he was warned from the water that he was in danger he is known to have been dazed and paid no attention before sliding. It is clear that a number of other men might have suffered a similar fate had it not been for the alertness of others who warned them of the dangers they faced. In the dark or in severe weather conditions the risk of injury would have been much greater.

11. The question of where to abandon ship therefore warrants further attention. If it is assumed that under most circumstances, when this is likely the ship will have developed some degree of list as a result of damage (flooding or fire-fighting water) then underwater projections will be a hazard. It would therefore seem sensible that the dangerous areas should be clearly marked in such a way that men do not attempt to enter the water other than where it is safe to do so. Some form of distinctive deck edge or guardrail marking, not visible from outboard, may be the answer. Training should also cover this point but the circumstances in which men abandon ship will by definition be dire and pre-determined drill may be overtaken by expediency.

PERSONAL SURVIVAL

12. Despite the cold water conditions (circa 7°C) personal survival did not pose many very serious problems. The death of the First Lieutenant has already been discussed. The other 'survival' fatality, No 2 Chinese Laundryman, also has peculiarities as this man was suffering from a heart ailment and may have died from heart failure in the water rather than from drowning. Neither case however was truly representative of what the remainder of the ship's company experienced.

TIME IN THE WATER

13. Examination of survivors' questionnaires reveals that every man spent some time in the water although this ranged from a minimum of 15 seconds to a reported extreme of 90 minutes although the average time for the 276 survivors was about 15 minutes. Cold was a problem for nearly everyone whether wearing a survival suit or not although in most cases the effects were limited to discomfort often in the aftermath of rescue. In one or two cases men began to display symptoms of exhaustion whilst attempting to reach liferafts and there are some clear cases of heroism where men in difficulty were saved from imminent drowning by the actions of others who were less afflicted themselves. There appears to be no direct correlation between physical fitness/injuries sustained onboard and subsequent ability to survive in the water and it is likely that panic was the significant factor in most cases of difficulty. It is clear however that in other circumstances (dark, rough weather, delay in rescue) that cold and exposure, particularly in the cases of men who abandoned ship without survival suits, could well have resulted in considerable loss of life.

SURVIVAL SUITS

14. As has already been described, the ship's survival training programme during the passage south had covered the use of the survival suit but only through the medium of CCTV films and lectures. The ship's company were not ordered to unpack and check their suits because this was simply not considered necessary. In the event a number of problems stemmed from this. Some 35% of the survivors managed to don the survival suit before leaving the ship although many of those subsequently suffered from ingress of water which created a 'Michelin Man' effect in the legs and complicated boarding liferafts and subsequent rescue. Drain plugs in the feet of the suit would have helped. Some tore their suits as they slid down the ship's side and all who spent more than a few minutes in the water complained of discomfort due to cold even though they were correctly dressed. Those who had taken the precaution to wear extra layers of clothing suffered less in this respect.

15. Almost 53% stated that they either did not attempt to put on the suit or failed to do so correctly before entering the water. (Note that 12% were no answer/don't know!). The reasons for this high incidence of failure were fairly evenly distributed amongst:

- a. Loss of the suit before evacuating the ship - often because the owner found it too cumbersome to wear around his waist at his Action Station. (Some men did acquire suits from the emergency stowages on the upper deck).
- b. Deliberate decision not to wear the suit in the belief that there was insufficient time left before the ship capsized and associated reluctance to remove lifejacket.

- c. Inability to put on the suit due to the list of the ship, tightness of leg ties when undoing it from its container and various 'finger troubles' associated with shock/panic/cold hands.

16. It is clear that few survivors have much to say in favour of the suit but the opinion of the Board is that this owes much to a lack of previous indoctrination into its use. There is a case for better onboard training with possibly an exercise reserve of suits being held in ships and periodic drills carried out to familiarise men with the technique and problems of wearing the suit. The normal outfit (120%) should provide enough for training purposes. Better use could also be made of the Sea Survival and Raftsmanship courses run by HMS DAEDALUS which until recently have received comparatively little attention from ships.

LIFEJACKETS

17. There were comparatively few problems with lifejackets. Of the survivors who completed questionnaires (92% of the total) some 87% wore a lifejacket and were well satisfied with its performance. Some of these men evacuated the ship having left their personal lifejackets at their action station and thus had to avail themselves of the upper deck emergency stowages. The remainder encountered a variety of problems. Some left the ship with no lifejacket having lost it below decks; some did not secure their lifejackets properly before jumping and lost them entering the water; others either did not inflate the jacket at all or only part filled it with air and then for various reasons found difficulty completing the operation when in the water. However, none of these problems reflects badly on the design of the lifejacket itself which seems to have done its job well and produced numerous favourable comments from amongst survivors.

LIFERAFTS

LAUNCHING

18. As with other phases of the abandon ship operation, no general order to slip the liferafts could be given due to the early failure of the ship's main broadcast. Launching of the rafts was therefore undertaken on the initiative of individual officers and senior ratings forward and aft and began when the ship was already listing some 10° to port several minutes after the attack.

19. No attempt was made to launch any of the port side liferafts as men were generally deterred from moving in that direction due to the rapidly developing list to port; everyone believed that capsizing was imminent. There is no evidence to prove that the port side rafts were eventually freed by their hydrostatic release devices as the list increased or after the ship capsized. If this did take place, either the rafts were not sighted or they were trapped in the superstructure under the ship.

20. All 8 starboard side liferafts were released progressively although with considerable difficulty as the list to port developed. The height of the outboard lips of the wooden cradles was such that the rafts in their GRP containers had to be physically lifted out of their stowages and thrown clear, a difficult task with a heavy weight on a sinking ship. The last rafts were launched when the list was 20°+ and very nearly fell back inboard onto the waist between the rack and the top of the guardrails. Under other circumstances (dark, rough weather etc) it is possible that some of these rafts might never have come clear of the ship and would thereby have aggravated the overcrowding problem which was in any event quite severe with only half the ship's outfit being launched.

LOADING

21. Loading of liferafts was not a particularly serious problem in the calm weather conditions prevailing but could easily have become so. Most of the survivors (84%) managed to board a liferaft and even had they been evenly distributed amongst all 8 rafts would have been some 30 per raft (20% overload). However the practicalities of the situation were such that some rafts were very heavily overlaid with as many as 47 men counted in one (88% overload). In others there were 30+ inside with many more sitting on the outside and some men in the water clinging to the grab ropes. The risk of such overloading happening suggests that the number of liferafts carried on each side of the ship should be sufficient to cater for the whole ship's company in the event of only one set of rafts being released. If, for example, the Type 42 carried 12 rafts on each side as opposed to the present 8 this would provide capacity for 300 without overloading. There were considerable problems in these conditions trying to 'manage' affairs inside the rafts and had rescue not come quickly the situation could have deteriorated very rapidly with the risk of lives being lost as a result. Time spent in the liferafts ran from a minimum of about 5 minutes to a reported maximum of about 2½ hours with the average being just under 1 hour. However it should be noted that from BROADSWORD's accurate records no man could have spent more than 1½ hours in a raft.

PROPULSION

22. The next problem encountered was the difficulty in propelling the loaded rafts away from the ship which gave the appearance of imminently sinking. A variety of means were tried including paddling with hands, DMS Boots, debris etc., kedging with the sea anchor and men over the side in the water swimming. None were successful and the rafts stayed pressed against the starboard side of the ship. The after ones drifted clear astern but the forward ground all moved around the bow and then aft close to the port side becoming entangled with obstructions as they went. One spent some time poised unhappily under the 965 aerial and another sank having first been trapped under the 4.5 turret and then impaled on the unfired Sea Dart missile still on the launcher. The sharp antennae of this missile punctured the raft which deflated causing the occupants to take either to the water again or to scramble back onboard the ship as it slowly rolled over to port. It is also significant that both a helicopter and a Gemini attempted to tow this raft clear of the ship when it was by the gun but failed. The Gemini tried to take it in two with the rescue quoit/line but this soon parted and there appeared to be no strong point to which any other line could be attached. As a result of this and similar experiences with other rafts a great many of the survivors commented on the lack of paddles and said these should be provided. This whole question warrants further investigation as it could easily have been the cause of more fatalities and once again would have been seriously aggravated in poor weather.

RESCUE

23. Rescue was effected by means of HMS BROADSWORD's boats (whaler, Cheverton and 2 Geminis) plus about 10 helicopters from RFA FORT AUSTIN. Boats were all in the water within 20 minutes of COVENTRY being hit and with the exception of some Gemini engine problems there were few problems. As already described attempts to tow liferafts were frustrated by the absence of robust towlines or strong points and also by the proximity of some rafts to obstructions on the starboard side of the ship.

24. The first helicopter was on the scene within 40 minutes and others followed soon after. Men were lifted from liferafts, from boats and from the water and one aircraft is even reported to have landed on the side of COVENTRY's hull to effect the rescue of one man from the sunken forward liferaft.

25. For those who were ferried to BROADSWORD by boat their next hurdle was to reach the safety of the deck by means of a scrambling net. Cold and shock made this difficult for some and others reported difficulty due to the volume of water inside their survival suits. Some injured men were recovered from boats by means of BROADSWORD's swimmer booms and a helicopter stop.

26. Later that night the majority of the survivors were transferred to FORT AUSTIN by which time the remainder who were injured had been landed ashore or taken to the hospital ship UGANDA.

RECOMMENDATIONS

27. It is recommended that:

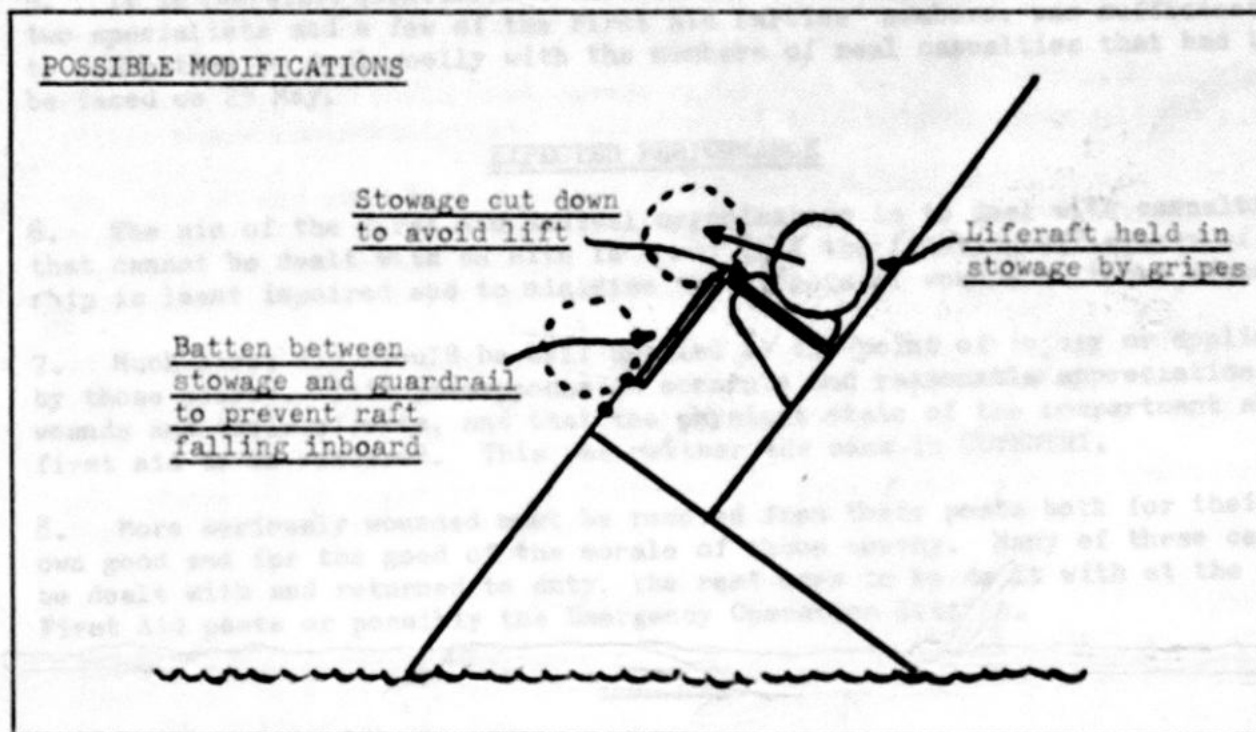
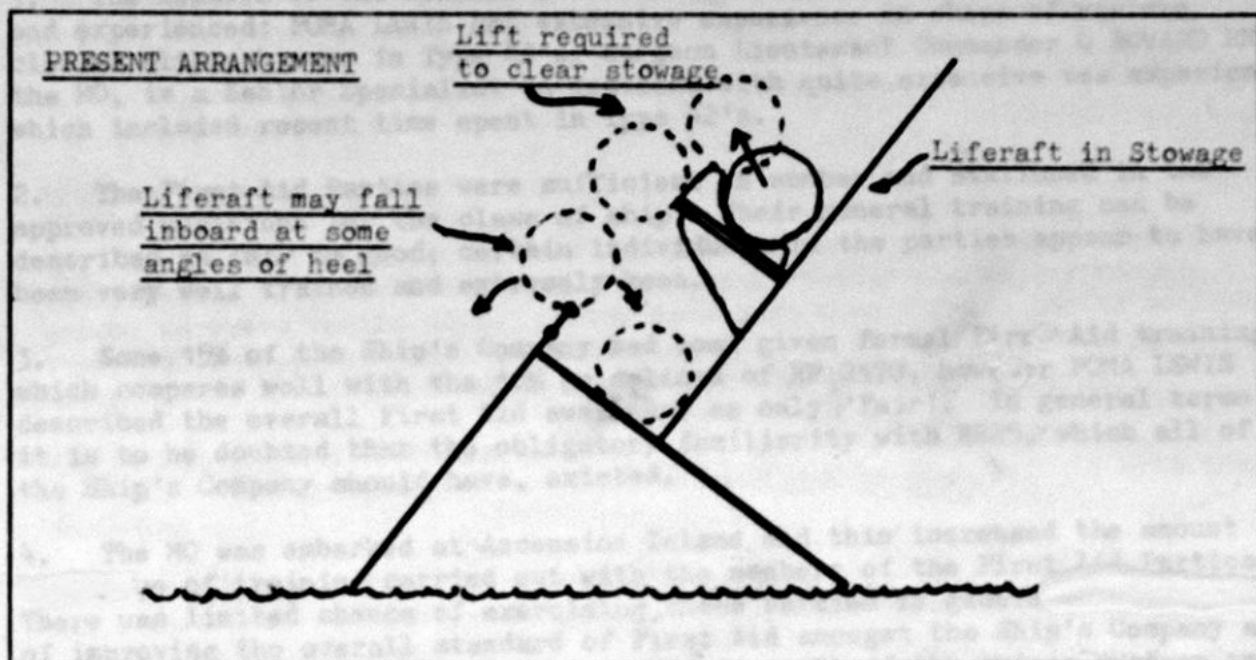
- a. Some system of distinctive deck edge or guardrail marking should be investigated. This should highlight those areas where underwater obstructions make abandon ship dangerous (Para 11).
- b. The design of the survival suit should be re-examined to determine whether drain plugs could be reincorporated into the feet (Para 14).
- c. Periodic drills should be carried out to familiarise men with the technique for dressing in and wearing the survival suit (Para 16).
- d. More emphasis should be placed on Sea Survival and Raftsmanship Courses for ships as run by HMS DAEDALUS (Para 16).
- e. Liferaft stowages should be modified to ensure that rafts can be released without lifting even when the ship is listing (Para 20).
- f. The number of liferafts carried should be increased so that there is sufficient on each side of the ship for all of the ship's company (Para 21).
- g. The design and equipment fit of the liferafts should be re-examined to establish whether better towing fixtures could be provided and whether the provision of some form of paddle is necessary (Para 22).

PROBLEMS ABANDONING SHIP

1. Going down ladders.
2. Hatches above Chiefs Mess buckled.
3. Hatch in Chiefs Mess buckled.
4. Chiefs Mess filled with smoke and toxic fumes.
5. Chiefs Mess main door jammed.
6. Ladder up to Routine Office swinging from N1-2 EDC and cross passage.
7. From 1N to stbd side, stbd side crowded.
8. Thick black smoke and bomb damage to port side passage coming from Tech Office.
9. List of ship, walking up deck, nothing to hold on to.
10. Equipment bulk.
11. Slippery conditions.
12. Trying to carry liferaft from Aircraft.
13. Stbd side behind bridge, no ladders.
14. From MCO stbd side going aft, ladder destroyed.
15. Lack of lighting.
16. N Section ladder swinging because of the list of the ship.
17. 2 deck fwd - escape hatch in fwd breakwater fell back on to head while going through.
18. Ladder missing O2 Deck down to O1 Deck.
19. Steel blast door from EMR/EWER to 1K flat jammed.
20. Route from Ops Room to cabin flat overcrowded.
21. Some aluminium ladders collapsed.
22. Bulk of clothing through emergency hatches slowed down escape.
23. Stores hatch near POs Dining Hall - no ladder.
24. Ladder missing on stbd funnel deck.
25. Launching of liferafts due to list.
26. No lighting in Wardroom.
27. Fwd from MCO to 2D section - several doors buckled/jammed.
28. Ladder from Chiefs Mess to O1 Wardroom flat pushed out and buckled.
29. Trying to avoid men already there when jumping into water.
30. Queuing up and waiting to get up ladders etc.
31. Pantry ladder buckled.

32. Hatch by 965 office jammed.
33. Stbd ladder in Ops Room missing runs and elevated.
34. Bottom of scramble net stbd side 10ft from sea due to list.
35. Caught Once Only Suit climbing down ship's side.
36. Disorientation because of thick smoke.
37. Doors at 2H flat jammed.
38. Smoke in fwd escape route to foc'sle hatch.
39. Hatch at 2G flat buckled.
40. Ops Room wooden ladder smashed.
41. Ops Room ladder to Captain's cabin burnt away.
42. Needed to be good at long jump to get clear of ship or slide down and possibly hit obstruction.
43. Difficult to see and breathing fumes.
44. Trapped in CPOs restroom.
45. MCR Door.
46. Smoke in 2D flat, lighting out.
47. Crowds at 2N ladder.
48. Ladder from GDP boat deck damaged.
49. 2J-1J ladder in MCO not there.
50. Flight deck netting prevented safe escape.
51. 1J ladder buckled.
52. Ladders had been raised by blast.
53. Airlock door from 1K flat blown off.
54. Ladder up to 02J buckled.
55. Only one route from EWER annex - ladders US.
56. Buckled hatches.
57. 2 escape B/H doors buckled.
58. 1M access ladder angled.
59. Swinging ladders throughout.
60. Dange of hitting bilge keel when jumping over side.
61. Difficulty opening doors and hatches.

LIFERAFT LAUNCHING DIFFICULTIES



FIRST AID AND CASUALTIES

TRAINING

1. The leaders of the Medical and First Aid system were both well trained and experienced: POMA LEWIS had extensive experience in ships of various classes although none in Type 42's; Surgeon Lieutenant Commander O HOWARD RN, the MO, is a Senior Specialist in medicine with quite extensive sea experience which included recent time spent in Type 42's.
2. The First Aid Parties were sufficient in number and stationed in the approved positions for the class of ship. Their general training can be described as fair to good; certain individuals in the parties appear to have been very well trained and extremely keen.
3. Some 15% of the Ship's Company had been given formal First Aid training which compares well with the 10% guidelines of BR 2170, however POMA LEWIS described the overall First Aid awareness as only 'Fair'. In general terms it is to be doubted that the obligatory familiarity with BR25, which all of the Ship's Company should have, existed.
4. The MO was embarked at Ascension Island and this increased the amount and scope of training carried out with the members of the First Aid Parties. There was limited chance of exercising these Parties in general and less chance of improving the overall standard of First Aid amongst the Ship's Company as there was an obvious preoccupation in bringing all of the ship's systems up to scratch and each section and department was engrossed in its own problems.
5. It is therefore questionable whether the training of anyone, short of the two specialists and a few of the First Aid Parties' members, was sufficient to equip them to deal coolly with the numbers of real casualties that had to be faced on 25 May.

EXPECTED PERFORMANCE

6. The aim of the First Aid/Medical organisation is to deal with casualties that cannot be dealt with on site in a way that the fighting efficiency of the ship is least impaired and to minimize the effects of wounds on those wounded.
7. Much First Aid should be self applied at the point of injury or applied by those nearby. This presupposes an accurate and reasonable appreciation of wounds and their effects, and that the physical state of the compartment allows first aid to be rendered. This was neither the case in COVENTRY.
8. More seriously wounded must be removed from their posts both for their own good and for the good of the morale of those nearby. Many of these can be dealt with and returned to duty, the rest have to be dealt with at the First Aid posts or possibly the Emergency Operation Station.

PREPARATIONS

EQUIPMENT STATE

9. The only deficiencies in standard equipment when the ship was at Gibraltar were many drugs that were going out of shelf life. A signal was sent with the intention of rectifying this on return to UK. However rectification was effected by a signal being received extending the shelf lives of the drugs in question.

10. The Medical Officer's Conversion Kit was already open before arrival at Ascension Island and all First Aid Boxes were fully equipped.
11. Further medical stores were embarked at Ascension Island giving sufficient Shell Dressings for at least one to be carried by each of the Ship's Company and for caches to be made in convenient places throughout the ship.
12. A lack of Anaesthetic noted by the MO on embarkation at Ascension Island was swiftly rectified.

EQUIPMENT DISPOSITION

13. Considerable quantities of First Aid equipment were distributed on entering the Total Exclusion Zone. The distribution was to any responsible person anywhere in the ship. Caches were also made in many places so that there was gear to be had practically anywhere in the ship. Every person also had at least one shell dressing in his AGR haversack.
14. The Emergency Operation Station was rigged in 2F Mess Deck on entering the TEZ. The hardware such as the Table and Lights were left in situ for the duration.
15. It is to be noted that no containers were provided or extemporized for the cold water required in the initial First Aid treatment of burns.
16. Morphia was widely distributed to responsible personnel and in caches throughout the ship for immediate use as necessary in accordance with BR 2170(2) Table 36.1.

PERSONNEL

17. The First Aid Posts were manned by trained personnel who were well equipped within their capabilities and trained as BR 2170 demands, some better.
18. The MO and POMA were together at Action Stations, both at the After First Aid Post/Sick Bay Area. Thus the Emergency Operation Station in 2F Mess Deck was not manned for immediate use and the personnel to man it were some distance away through a number of closed watertight doors.
19. Both the Forward and After First Aid Parties were in close contact with the nearby respective Damage Control Bases. The First Aid Teams and Damage Control Teams to a large extent are interdependant.
20. There is no suggestion of anything but high morale amongst the First Aid Parties, similar to that throughout the ship.

EXPERIENCE GAINED IN AREA

21. The only possible factor to be assimilated was the possibility that burns could well be a major First Aid/Casualty problem. This information, stemming from HMS SHEFFIELD, was not properly acted upon.

PERFORMANCE AFTER 251800Z

22. In the ten to fifteen minutes between the explosions and abandoning ship there was a steady flow of casualties mainly via the Forward and After DC Bases. All were walking wounded, some needing some support. Most wounds were burns, a few having lacerations and bruises and many being temporarily affected by smoke. All were shaken mentally although there was little panic. All of the

burns were flash burns, none greater in depth than partial thickness (1st Degree) and about a third were more extensive than hands and face. (See paragraph 31 for details of casualties). However, except for one of the forward bathrooms, no water had been stored for First Aid treatment and the cold water supplies had failed. (Cold beer was used to good effect in the CPO's Mess). Cold water is the initial First Aid treatment of choice for burns as it cleanses and acts as a coolant and carminative. Members of the Forward Damage Control Party became involved in treatment of the burnt and wounded and thus were not giving their full attention to the task of saving the ship.

23. Had any burns in the Forward part of the ship been serious, that is full thickness and greater than about 10%, there would have been a problem in starting an intravenous infusion of saline, an important lifesaving measure. The MO is the only person trained and it was impossible to traverse the ship.

24. In the time between being hit and abandoning ship there was no need or call for any First Aid Parties to move beyond their posts for casualty evacuation, both time and total communications failure precluded this. Luckily it appears that nobody was abandoned wounded. This was more by luck than judgement as there was no purposeful head counting and little checking of compartments before abandoning ship.

25. At abandoning ship there was little problem in getting the wounded to the upper deck; all save one or two were walking without too much problem and the rest simply needed support.

26. Most of the wounded were helped into Survival Suits whereas some of the First Aid Parties did not manage to get theirs on.

27. Sufficient morphia was being carried by First Aid /Medical Staff as well as others to ensure that any that needed it in the liferafts received it.

28. The treatment of wounded in the liferafts was difficult due to an average of 40 being in rafts intended for 25, causing mobility problems.

29. It is to be noted that many of the Ship's Company, especially those at Action Stations near the site of the explosions, were shocked and concussed by the blast. Whilst many were not obviously injured they were in fact not able to think clearly or constructively. Many from the Ops Room and MCR were officers and it should be noted that in no way can they be expected to take charge despite hopes to the contrary.

CASUALTIES

DEATHS

30. All immediate fatalities occurred in compartments that were directly affected by bomb blast (a summary of death is in Appendix 1):

a. Olympus Room Bomb

4 ratings died in the Olympus Room
5 ratings in the Junior Rates Dining Hall
1 rating died in the Tech Office.

b. Computer Room Devastation

1 Officer and 6 ratings died in the Computer Room.

c. In Abandoning Ship

1 Officer and the Chinese No 2 Laundryman.

INJURIES

31. Written evidence was provided to the Board to indicate that there were 44 of the Ship's Company injured during, immediately after the attack or during abandoning ship and rescue. A summary of injuries is in Appendix 2:

<u>Number</u>	<u>Injury</u>
32	Burns as all or part of injury
12	Bruising and lacerations
4	Smoke inhalation problems
2	Cold injury
2	Psychiatric sequelae (NP)
1	Near drowning.

COMMENTARY

32. Fatalities. All statements made on the death that occurred in the ship at or around 25 May 1800Z were confirmed in the Board of Inquiry transcript. None of the fatalities that happened at bomb impacts could have been prevented given the disposition of personnel at that time.

a. The death of Lieutenant Commander ROBINSON-MOLTKE RN occurred whilst he was abandoning ship. Lieutenant Commander ROBINSON-MOLTKE RN, the First Lieutenant, took cover at Action Stations in HQ1. Evidence was given that he took cover in the supine position with his head against a bulkhead. Nearby one man MEM(M) JONES P C, had quite serious head injuries taking cover in a similar position and posture and another, WEM(O)1 HALL I F, also died, again in a similar position and posture. The First Lieutenant was so severely shaken up that the MEO considered him dead but CMEM SMITH hauled him to his feet to find him alive if considerably confused. He followed CPO SMITH and others out of the HQ1 and via the starboard passage to the After DC Base. Although several people spoke to him and received replies he took no part in the organisation of any part of the activities going on at that time. At abandoning ship he was seen on the upper deck by WEM AKITT near the hangar being helped by an unidentified person into a survival suit and lifejacket. WEM AKITT also saw the First Lieutenant slide down the side and strike the stabiliser and whilst in the water close to him, he thought him dead. RO TREVARTHEM T M, also saw the First Lieutenant being helped into survival clothing and also over the ship's side. RO TREVARTHEM called a warning from a liferaft to the First Lieutenant about the stabiliser but the warning was not heeded. It is to be concluded that Lieutenant Commander ROBINSON-MOLTKE RN was severely concussed by the Olympus Room bomb as were several near him and at no time after was he seen to be acting in his 'normal' manner. On sliding down the ship's side he struck the stabiliser that was not spotted by his helper and that the stabiliser physically made his condition worse, possibly killing him and also ripping his lifejacket. He was seen to strike it with the back of his head and shoulder. WEM AKITT certainly considered him dead in the water and as he subsequently was not found afloat his lifejacket must have been punctured.

b. The Chinese No 2 Laundryman KYU BEN KWO had established severe hypertension cardiac failure and coronary arterial disease. Sudden entry into the sea at 7°C or so without a survival suit would be sufficient to cause his heart to fail due either to a sudden arrhythmia and/or coronary arterial spasm. He was later buried at San Carlos.

33. Injuries. All of the burns were caused by flash from the bombs and occurred in the near vicinity of their sites of explosion eg Ops Room, Aft Engine Room, Galley etc. All burns of whatever extent were only of partial thickness (1st Degree). The relationship of burns to clothing is discussed at Annex J. Four of the bruising and lacerations were caused at bomb impact, the rest during evacuation and abandoning ship, in fact two hurt their backs striking the Bilge Keel sliding down the ship's side. Many of the Ship's Company complained of smoke being a problem during evacuation of the ship; only four had overt symptoms, all of which had settled within four weeks. This problem is to be dealt with by Naval Medical Officer of Health (Fleet), The Medical Department RNH HASLAR and The Institute of Naval Medicine. Many of the Ship's Company complained of cold and some of a degree of exposure caused by their time in the water and in liferafts, which varied from 30 minutes to about 2 hours. Only two had sufficient problems to cause it to be entered in written medical records. Many complained of feeling cold for several days after and the MO himself suffered early frostbite from having his legs trapped for an hour and a half in a grossly overcrowded liferaft. It is surprising that no more cold injury was sustained given the sea temperature of 7°C, the time involved, the overcrowded liferafts and the small number who both put their survival suits on and put them on properly.

CONCLUSIONS

34. It is concluded that:

- a. It is doubtful whether every member of the Ship's Company had adequate knowledge of BR 25 (First Aid in the Royal Navy) (paragraph 3).
- b. Although key First Aid personnel had received a good training this should have included work with real wounded; it is clear that familiarity with the problems of facing and dealing with wounded speeds up the response to the problem and promotes a calmer more rational atmosphere (paragraph 5).
- c. The Forward DC Party appears to have been made less effective by the flood of wounded from the Ops Room area, none of whom was seriously injured (paragraph 22).
- d. No cold water for the treatment of burns was stored in all baths and basins or in any containers that could be pressed into use was not done (paragraph 22).
- e. Only the MO was able to set up an intravenous saline infusion. This can be lifesaving in serious burns cases and must be considered, in modern terms, a First Aid measure (paragraph 23).
- f. Two died, one indirectly, and one was quite seriously injured through adopting an incorrect posture at 'Take Cover' (paragraph 32a).

RECOMMENDATIONS

35. It is recommended that:

- a. Individual training should be re-examined to increase the emphasis on first aid, in particular familiarity with BR 25 (First Aid in the Royal Navy).
- b. Key members of both first aid and damage control teams should receive some training involving work with real wounded/injured.

- c. The importance of storing cold water for treatment of burns at Action Stations should be re-emphasised in ships' NBCD training.
- d. Training in intravenous saline infusion should be given to key members of first aid parties.
- e. The correct position for "Taking Cover" should be taught and enforced.

DEATHS

DEPARTMENT/ROOM	PIECE/ITEM (one piece/item number)	NAME	IDENTIFICATION NUMBER
COMPUTER ROOM	LT	HEATH R R	C025063S
	AWEA1	STRICKLAND D A	D138928M
	ACWEA	CADDY J D C	D075562M
	AWEMN1	OZBIRN D J A	D088253K
	WEA APP	WILLIAMS I R	D178859U
	AWEM(R)1	DOBSON J K	D183607L
	AWEA2	WHITE P F	D136510B
OLYMPUS ROOM	MEM(M)1	ARMES F C	D170136A
	MEM(M)2	TONKIN S	D192370P
	MEA(M)1	CALLUS P S	D145600D
	MEA2	STOCKWELL G L J	D136502Y
JR DINING HALL	APOCA	DAWSON S R	D155633A
	PO(S)	FOWLER M G	D098740D
	ACK	TURNBULL I E	D189147F
	LRO(W)	STILL B J	D185304T
	AAB(EW)	SUNDERLAND A D	D187550Y
TECH OFFICE	WEM(O)1	HALL I F	D170776Z
ABANDONING SHIP		Laundryman KYU BEN KWO	
		LT CDR G S ROBINSON-MOLTKE	C013330R

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INJURIES

<u>NAME</u>	<u>INJURY</u>	<u>ACTION STATION</u>
BRUTON R G POME D129129E	Burns to face	MCR
CROOK A T AB(R) D182308C	Burns to face, chest, back, about 3% 1st Degree	Ops Room
DANIELS M AB(S) D174527B	Burns to face	Ops Room
DAWES C J RC2(G) D190904E	Smoke Inhalation	Comms Office
FOSTER J PO(S) D108652Y	Burns to face	Ops Room
HAMILTON R W Lt Cdr C016404U	Burns to face	HQ1
INGLEBY S AB D182467J	Minor back strain going over side	Stbd 20mm
JOHNSON M W WEM(O)2 D185540M	Bruising right ear	4.5 mag
LUFF I D MEM(M) D179937Q	Groin strain	After DC Base
MABBOT C L/S D157019R	Bruises right arm and shoulder	APR'F'
NUNN D R CPO(OPS)R D082789K	Burns to face, bruised left leg	Ops Room
PIPER M D AB(S) D148560X	Bruised left shoulder	SCR
PLUMRIDGE P Sub Lt C027172T	Burns to face	HQ1
POTTER G AB(R) D170846W	Bruised back on ship's side	965 Monitor
ROWELL R J LWEM(R) D124697N	Bruised left upper arm and face	1006 Office
RUDD M D G RO2 D178126P	Burns to face	Ops Room
SMITH P D RO1(G) D185441K	Bilat-barotrauma otitis	Comms Office
STUART K LS(M) D157675R	Burns to face	Ops Room
SWORDS S B AB(R) D168772P	Burns to face and right hand and back of neck	Ops Room
TURNER J R LS(R) D148659V	Facial burns	Ops Room
WALTON D Lt C021080S	Burns to face, right hand and left loin	Ops Room
WELBURY W LMEM(M) D172440P	Minor burns left and right fingers	FD AMR
HEATH G LWEM(R) D133246M	Burns to face also NP	Ops Room

RESTRICTED
STAFF-IN-CONFIDENCE

WOODRUFF A LS(R) D163079N	Burns to face	Ops Room
STEPHENSON J LS(R) D159527H	17% burns to back and legs, perforated right ear drum	Ops Room
LANE G W Cdr CO19194E	Burns to face and right hand	Ops Room
MATTHEWS J CWEMN DO73473N	Burns to face	Ops Room
LEGGE P T T MEM(L) D169749H	Near drowning	Fwd DC Base
LANE R A Lt CO19757U	Burns to face	Ops Room
ESTCOURT A A MEA(P)1 DO91934E	Burns to face, right hand, left ankle	Aft Engine Room
KELLY R RO1(G) D162211V	NP	
WHITE P J LWEM(O) D165133D	Smoke and cold exposure	Fwd Section Base
BERRY S O AB(M) D152697L	Burns to face, left side of neck, left buttock	Cps Room
PRIESTLEY P W AB(EW) D172059E	Burns to face	Ops Room
MANSEY C LMEM(L) D149859C	Burns to face	HQ1
URBAN A CA D182292S	Burns to face	Galley
MARVIN P V AB D163327Y	Burns to face, back of right arm, right thigh, 9% total	Ops Room
CHURCH A POWTR D124443Y	Burns to face	Ops Room
WILSON M RO2 D186809P	Scalp lacer. (slight)	Comms Office
OVERALL S AB(R) D148483N	Burns to right hand, face and back - 13%	Ops Room
HOWE C A PO(EW) D134500V	Burns to arms, chest and back - 27%	Ops Room
ELLIS R D ACPO(CPS)M DO97539E	Burns to arms, face, back - 22%, smoke inhalation	Ops Room
JONES P C MEM(M) D188086V	Concussion, left facial N Palsy, left Parotid gland Fistula, Damage left Ext and Meatus	Tech Office
FISHER P R CPO(OPS) DO86341P	Burns to back, buttocks, arms and legs 23%, and cold	Ops Room

CLOTHING AND BURNSINTRODUCTION

1. In the informal questionnaire sent by the Board to all members of HMS COVENTRY's Ship's Company the following sub section was included where answers could be ticked:

What were you wearing
during the final attacks?

No 8's (Cotton)
No 8's (Man Made Fibres)
Overalls (Cotton)
Overalls (Man Made Fibres)
Socks (Wool)
Socks (Man Made Fibres)
Underwear (Cotton)
Underwear (Man Made Fibres)
Antiflash hood & Gloves (heavy)
Antiflash hood & Gloves (light)
HWJ (Woolley-Pully)
Other Jersey
Foul Weather Jacket
Foul Weather Trousers
DMS Boots
Other Footwear
Steel Helmet
Lifejacket - personal
Lifejacket - Flight Deck
List any other clothing

276 completed questionnaires were returned, everyone had this clothing sub-section completed.

2. 32 of the Ship's Company were burnt, for details see Annex H. All 32 had at least facial burns, 17 returned via SS UGANDA to RNH HASLAR; the rest, 15, travelled with the rest of COVENTRY's Ship's Company in RMS QUEEN ELIZABETH II. Of the 32 burned 10 had burns greater than the minimal facial burns of the visor shape allowed by the opening of antiflash headgear. Commander G W LANE RN had, in addition to 'visor' burns of his face, further head burns caused by his headset catching fire.

CLOTHING WORN AT ACTION STATIONS

3. Whole Ship's Company

47 wore Cotton No 8's
168 " Man Made No 8's
43 " Cotton Overalls
144 " HWJ
54 " Other Jersey
37 " No 8's and Overalls
106 " Extra Clothing

Of those burnt (32)

23 wore Man Made No 8's or Overalls
9 " Cotton " "

Of those with burns greater than visor burns (10)

8 wore Man Made No 8's or Overalls
2 " Cotton " "

Of those burnt (32)

22 wore HWJs
6 " extra clothing

Of those most seriously burnt

6 wore HWJs
0 (none) wore extra clothing

4. There is much anecdotal evidence that those wearing more than basic No 8's of any type fared better in the flash fire than those only wearing 8's. The Captain is a good example as his facial burns were at the extreme severity of those seen in the Ops Room and near to full thickness. He only received facial burns and no more and he was wearing several extra layers of clothing as well as No 8's and HWJ. Three of the four most extensively burned were only wearing No 8's, the fourth was wearing both cotton No 8's and cotton overalls.

CORRELATION

5. Using a 2 x 2 Contingency Table 'Chi-squared' analysis to compare the total number burnt divided by dress, man made or cotton, with the same division of the seriously burned, no significant difference is seen between the proportions of seriously burnt wearing either cotton or man made No 8's. This is despite the apparently worse performance of man made fibre clothing: 8 of 23 (35%) versus cotton 2 of 9 (22%); this may be due to the small numbers involved.

6. The small sample size also makes a similar analysis of extent of burns versus the amount worn to be non-profitable. Better information would be available if similar data was available from other ships that have had similar or worse fire problems e.g. HMS SHEFFIELD.

CONCLUSIONS

7. It is concluded that:

- a. There is no evidence to prove a difference between the protective qualities of cotton and man made fibre clothing as supplied in the RN.
- b. There is good evidence to suggest that more layers of clothing improve protection against flash fire.

RECOMMENDATIONS

8. It is recommended that:

- a. At Action Stations more clothing should be worn than just No 8's, underwear, wool socks, DMS Boots and Antiflash Gear. An HWJ should be worn as an absolute minimum.
- b. Each officer and rating should be issued with "Battle Clothing". This would consist of an overall with attached hood and instep straps, bulky enough to cover other clothing, made of a modern man-made fire retardant cloth such as 'Nomex'. Two suits of this clothing would be issued but only used in real war and emergencies such as fires in ships etc. Exercises would be done using standard overalls.
- c. All headsets should be entirely without flammable materials in exposed parts.

REFERENCES CONSULTED

REFERENCE	REASON
HMS COVENTRY Ship's Investigation dated 4 June 82.	Background information.
CB 3189. Firing Manual.	Chapters 4 and 5 - Tactics for use against low level bombing and other air attack.
SS CANBERRA I9F/IDA 222320Z MAY 82 "Lessons Learnt/Re-learnt from CO ARDENT"	Countermeasures for use against free-fall bombing attack.
S2040 Monthly Ship Activity Returns	Ship's Programme since Acceptance.
HMS COVENTRY - Report of Proceedings dated 24 April 1981, 30 June 1981, 19 October 1981, 18 December 1981, 30 June 1982.	Ship's Programme since January 1981.
FOST 3003/62.A dated 5 June 1982 (HMS COVENTRY COST Report)	Background on standards achieved in COST.
HMS COVENTRY longcast programmes dated 28 October 1981 and 10 March 1982.	Background information on ship's programme.
ATP 31 Art 1422e)
Fighting Instructions Vol I Page 7-18 Paras 4 and 9, Vol II)
Page 170 Paras 10-11) Background information on
JMC 821 Exercise Report Paras 18 and 68) 'Goalkeeper' tactics.
HMS BROADSWORD I9F 131040Z MAY 82)
DOAE Memo 7517 (October 75))
SMOPS DRYAD 722/9/27 dated 15 March 1982 - HMS COVENTRY CTT Report.	Background information on performance during CTT February/March 1982.
CB 04988 (2A) - GWS 30 Performance and Limitations.	Sea Dart system information.
CB 4538W - Type 42 NBCD Class Book	NBCD Information and deck plans.
BR 2170 (1) and (2) - Ship NBCD Manual	NBCD Information including first aid.
Human Response to Fire - Knapp, S.C. & Knox, F.S., US Army Aeromedical Research Laboratory.)
Agard Lecture Series No 123, Aircraft Fire Safety - June 82) Background on human response to fire plus clothing protection.
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