

SECRET

Copy No. 12

UK EYES B



REPORT TO  
COMMANDER-IN-CHIEF, FLEET  
OF THE BOARD OF INQUIRY  
INTO THE LOSS OF

**HMS SHEFFIELD**

IN MAY 1982

UK EYES B

SECRET

HMS NELSON  
Portsmouth

Commander-in-Chief Fleet  
Eastbury Park  
Northwood  
Middlesex  
HA6 3HP

22 July 1982

Sir

1. We have the honour to report that, in accordance with your instructions dated 28 May 82, we have conducted an investigation into the circumstances leading to and attending the disablement, and later sinking, of HMS SHEFFIELD under the command of Captain J F T G SALT, Royal Navy. Our report is attached. Our conclusions and recommendations are at Annexes A and B respectively. Summarised main conclusions and recommendations fall at the end of this covering letter. Our report is generally chronological but is also divided thematically, the principal sections covering Operations, Damage Control and Fire Fighting, Medical and Salvage.

2. A preliminary investigation was carried out by Ship's Officers. Although the Board does not agree with all the conclusions or the analysis leading to them, we found it most helpful.

3. The Board sat in HMS NELSON and was provided with all necessary facilities. Witnesses were called from HM Ships SHEFFIELD, GLASGOW and COVENTRY, together with expert witnesses on ship stability, ventilation, materials, GWS 30 drill and the EXOCET missile. CTG's views were signalled to us. Evidence was taken at Fleet Headquarters and RNH HASLAR.

#### Situation

4. On Saturday 1 May, the Task Group (TG) commenced operations in the Total Exclusion Zone (TEZ). On that first day SHEFFIELD went to Action Stations and State 1, Condition ZULU on numerous occasions at Air Warning YELLOW. However, because radar detection ranges on Argentinian aircraft of some 160 miles were being achieved, and because attacks were made only on the NGS Group inshore, the routine was subsequently modified and Action Stations were delayed until Air Warning RED. SHEFFIELD and others were dogged by what they considered to be ESM induced false alarms, believing that Mirage III radar was being wrongly identified as the AGAVE radar (nicknamed CONDOR) of the Argentinian SUPER ETENDARD (SUPER E). The 2 and 3 May were quiet and the ship settled into a Defence Watch routine. The Air Warning remained YELLOW throughout.

5. CTG and TG ships had been provided with a large amount of intelligence data. On the crucial question of whether Argentinian SUPER Es had Air-to-Air Refuelling and EXOCET (AM 39) capabilities, and hence whether ships were liable to AM 39 attack on 4 May, CTG and SHEFFIELD had much the same information, showing that such an attack was quite possible. However, SHEFFIELD rated the AM 39 danger lower, and the submarine threat higher, than did CTG.

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#### The Attack

6. At the time of the attack, on the afternoon of 4 May, SHEFFIELD was the southerly of three Type 42 destroyers disposed on an Air Defence Screen about 18 miles to the West, up threat, from the main body. The AAWC was in INVINCIBLE and Flag in HERMES. The weather was fair and cool with a calm sea and 2m swell. The ship was in Defence Watches and Damage Control State 2, Condition YANKEE. An overt policy was in force and SHEFFIELD was transmitting on radar, sonar, HF, UHF and SHF. Base course was 250, speed 12, two Tynes were in use. The Captain had visited the Ops Room at about 1245 and was in his cabin. The AAWO on watch, Lieutenant Commander BATHO, left the Ops Room at about 1340 to visit the Bridge.

7. The raid was first detected on UAA1 by GLASGOW who correctly identified SUPER E AGAVE radar in both search and lock-on modes and subsequently gained two 965 contacts at about 40 miles. GLASGOW reported the raid on AAWC HF and AAWC UHF, released it to LINK 10, reporting "ONEX", and called the racket as "CONDOR 245". GLASGOW went to Action Stations and fired Chaff D. Paints had been seen in INVINCIBLE at 50 and 30 miles which correlated with GLASGOW's CONDOR report. CAP were told to investigate but found nothing. The AAWC did not accept GLASGOW's classification of the raid and declared the contacts to be spurious. ZIPPO 4 was not called by the AAWC and Air Warning remained YELLOW.

8. At about 15 miles the two attacking SUPER Es swung to starboard away from GLASGOW and towards SHEFFIELD. In SHEFFIELD, UAA1 Band 4, which covers AGAVE radar and AM 39 head, was blanked by an own ship transmission on SCOT. The AAWO was still out of the Ops Room, as were two important members of the Air Team. AAWC HF was not being manned. Other than piping for the AAWO, the PWO, [redacted] did not react to the raid. Chaff was not fired. Attempted 909 acquisition was unsuccessful. The raid was not engaged. The ship remained at Defence Stations and in Damage Control State 2, Condition YANKEE. The Captain was not called. The AAWO returned to the Ops Room very shortly before impact and misidentified the raid as Mirage III. He was too late to influence events.

9. One missile struck the ship at 2 Deck starboard between the Galley and the Forward Auxiliary Machinery Room, (FAMR) and Forward Engine Room, (FER). A possible second missile missed and ditched close by. The Argentinian launch aircraft flew down ship's head, perhaps to observe the results of the attack. The AAWC remained unaware that SHEFFIELD had been hit, and continued denying the existence of the raid for some 12 minutes. Many in SHEFFIELD, including the PWO, still did not realise this had been an AM 39 attack.

#### Damage Control and Fire Fighting

10. The missile's impact left a 15 feet by 4 feet hole in the ship's side and caused widespread minor shock damage, typically the buckling of doors and collapse of ladders. Evidence indicates that the Warhead did not detonate. There are few reports of shrapnel. Large fires broke out

immediately in the FAMR/FER area. The overwhelming initial impression is of the very rapid spread of acrid black smoke through the centre section of the ship and upwards, as far as the Bridge. This smoke very quickly forced evacuation of the Machinery Control Room, Main Communications Office, HQ1 and the Bridge, followed after a few minutes by the Ops Room and later the complete Forward Section of the ship and the forward superstructure. Missile propellant and burning Dieso from the FAMR Service and Ready Use Tanks were the main sources of this smoke, which was responsible for the early and almost complete loss of the ship's fighting capability. Smoke clearance was unsuccessful forward and only partially successful aft.

11. The Firemain was breached at impact. Pressure was lost immediately and was never restored. Of the four fire pumps, C was probably damaged by shock, it would not start. K had been running, but stopped at impact and would not restart. L similarly stopped at impact, but was restarted. However, attempted isolations were unsuccessful and Firemain continued to discharge overboard through the hole until L Fire Pump subsequently failed. N was defective. The lack of Firemain pressure was crucial, as it removed any real chance of tackling the fires. Fire fighting was largely restricted to external boundary cooling, using portable pumps and buckets, and this had little or no effect on the fires raging within the ship.

12. The fires gained quickly, soon embracing most of H, J and K Sections from 4 to O2 Deck and subsequently spreading forward and aft. Re-entry attempts were made along the starboard 2 Deck passage, and later at 1H Starboard Cabin Flat and at 1J Starboard Access Hatch. These were well briefed, determined attacks by men wearing fearnought suits and BA, but all were beaten back by heat and smoke. Some critical deficiencies in Damage Control and Fire Fighting arrangements and equipment in Type 42 destroyers came to light. Rover Gas Turbine pumps performed outstandingly badly.

13. The control of fire fighting and other activity after impact lacked cohesion. No emergency HQ1 was established, it was not clear where Command of the Ship was located, the control of personnel was unco-ordinated and, in particular, inadequate checks were made on which Quarters had been abandoned and which were still closed up.

14. Much external assistance was provided. To port, ARROW did an excellent job of boundary cooling, supplying hoses and general support. Conditions for YARMOUTH, to starboard, were less easy. Both ships' efforts were bedevilled by frequent spurious submarine and torpedo alarms.

15. Twenty Officers and Ratings died. Some personnel, in the Galley area, were killed on impact. Others were asphyxiated, later, either attempting to escape, re-entering the ship or staying at their quarters to try and restore the ship's fighting capability. Twenty-six were injured, all of whom are making a satisfactory recovery.

Abandon Ship and Salvage Attempts

16. At 041750Z there was still no Firemain, the fires were spreading, the Sea Dart Magazine was thought to be at risk and the ship's fighting capability had been largely destroyed. With the tactical situation in mind, the Captain ordered hands to abandon ship. Most climbed over to ARROW, a few went to YARMOUTH by Gemini, some were flown to HERMES.

17. The fires burned fiercely for a further two days. However, SHEFFIELD remained afloat, upright and with an even trim and normal draught. Salvage was attempted, and SHEFFIELD was towed to the edge of the TEZ. Here, in deteriorating weather, she began to ship water through the missile entry hole, developed an increasing list to starboard and eventually, at about 100700Z May, rolled over and sank in position 52°11'S 53°50'W in 1000 fathoms. There was no Towing Crew onboard.

Conclusions

18. HMS SHEFFIELD was lost, together with 20 of her Company, as the result of a single AM 39 hit, starboard side, 2 Deck in J Section. A further 26 of the Ship's Company were injured, mostly suffering burns, shock or smoke inhalation.

19. SHEFFIELD was not fully prepared for the attack. Some vital members of the Ops Room Defence Watch, including the AAWO, were absent, an important air defence net was not manned and the UAA1 Band 4 was blanked by own ship SCOT transmissions. Chaff C and D were not fired. Neither aircraft nor missile were engaged. The ship did not go to Action Stations.

20. A significant portion of the ship filled, very soon after impact, with thick acrid smoke. This smoke critically hampered fire fighting attempts and control of ship propulsion. It was responsible for the early and virtually complete loss of the ship's fighting capability. Smoke clearance was unsuccessful forward and only partially successful aft.

21. Firemain pressure was lost immediately and was never restored. As a result, fire fighting was largely restricted to external boundary cooling, using portable electrically driven pumps (and buckets), and had little effect on the internal fires which rapidly gained hold of much of H, J and K Sections from 4 Deck up to O2 Deck and subsequently spread forward and aft. Several determined re-entry attempts were made but all were beaten back by heat and smoke.

22. There were some critical deficiencies in Damage Control and fire fighting arrangements and equipment. A number of Rover Gas Turbine Pumps failed. The ability of some equipment to resist shock damage is suspect.

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23. Despite the danger of further attack, protracted fire fighting assistance was provided by YARMOUTH and ARROW. The latter's efforts were particularly determined. Spurious submarine and torpedo alarms prejudiced this assistance.
24. After fighting the fire for nearly four hours, and with the situation deteriorating, and he being convinced that the ship's fighting capability was irremediably destroyed, the Captain ordered hands to abandon ship at about 041750Z. No further lives were lost or injuries incurred. We consider this decision necessary, brave and right.
25. Subsequent salvage attempts were unsuccessful. SHEFFIELD was taken in tow by YARMOUTH and reached the edge of the TEZ. However, at about 100700Z SHEFFIELD rolled over to starboard and sank in position 52°11'S 53°50'W in about 1000 fathoms. There is no serious possibility of compromise of classified material.
26. There were some shortcomings in the performance of key personnel of the Operations Department which contributed to the ship's failure adequately to counter the attack:
- the on-watch PWO, possibly partly through inexperience, but more importantly from inadequacy, failed to react in accordance with standard tactical doctrine and teaching, in particular, when he first heard of the CONDOR racket and also on receiving other indications of the developing raid. To this degree he demonstrated negligence.
  - Lieutenant Commander BATHO, the on-watch AAWO, spent far too long out of the Ops Room and did so without ensuring that anyone knew his precise movements. Arriving late, he made an incorrect judgement, based on his reading of the intelligence situation in assessing the raid as Mirage III. In the circumstances his lengthy absence from the Ops Room demonstrated negligence.
27. Captain SALT's background as a submariner, his lack of Air Defence and recent surface ship warfare experience, along with an appointment to SHEFFIELD after the ship had carried out CTT, BOST and major Fleet exercises meant that he was not well prepared and lacked experience for command of an Air Defence Unit facing a potent threat in a War situation.
28. Similarly, the First Lieutenant, Lieutenant Commander NORMAN, an ASW Helicopter Observer, lacked relevant in depth experience of surface ships. After impact, he was somewhat at a loss, albeit in extremely difficult and demanding circumstances, and he was not able to control manpower effectively or direct effort decisively.
29. There were many fine examples of individual bravery in the efforts to save SHEFFIELD. The Board have drawn those of which they are aware to the attention of the Captain. We consider the conduct of the WEO, Lieutenant Commander J S WOODHEAD, Royal Navy and the Computer Room Crew, and of POMEM BRIGGS (all deceased), are particularly praiseworthy.


Recommendations

30. General. Training and doctrine for defence against sea skimming missiles must highlight the supreme importance of vigilance, and of instant, full reactions on first indication of possible attack.

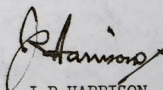
31. In relation to Type 42 Destroyers

- a. Improvements in self defensive capability against the sea skimmer are urgently required.
- b. Arrangements for maintenance or restoration of firemain pressure following extensive damage are essential.
- c. Methods of preserving the ability to control and fight the ship in dense smoke should be investigated.
- d. The further important deficiencies in Damage Control and Fire Fighting arrangements and equipment we have highlighted should be investigated and remedied.
- e. Smoke clearance arrangements require review.

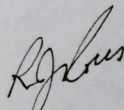
We have the honour to be,  
Sir,  
Your obedient Servants



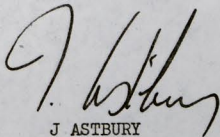
C W PILE  
Commander  
Royal Navy



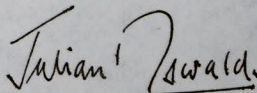
J R HARRISON  
Surgeon Commander  
Royal Navy



R J ROLLS  
Commander  
Royal Navy



J ASTBURY  
Commander  
Royal Navy



J J R OSWALD  
Captain  
Royal Navy

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CONCLUSIONS

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ANNEX

The principal conclusions of the Board are:-

1. HMS SHEFFIELD was lost, together with 20 members of her Ship's Company, following a single AM 39 EXOCET hit, on the starboard side, 2 Deck in J Section. Impact was at about 1403Z on 4 May. H, J, K, L,  
N, P, Q, R
2. Photographs and verbal evidence indicate that the AM 39 Warhead did not detonate as designed. L
3. Only one body was recovered. Careful enquiry indicates that the other 19 died on impact or, later, by asphyxiation. There is no possibility that any of these men survived. Q, R
4. A further 26 of the Ship's Company were injured, mostly suffering burns, shock or smoke inhalation. Only one is still in hospital. He is making a good recovery. The remainder have returned to duty. First aid was very well handled. Q, R
5. SHEFFIELD's assessment of the threat on 4 May acknowledged the possibility of SUPER E/EXOCET attack, and that such an attack could be at low level. However other types of attack, particularly from submarines, were considered more likely. G
6. The Commanding Officer was satisfied with the state of the Ship's Training. With the exception of some aspects of Ops Room Training and the GDP Crew, the Board consider the ship's efforts in this respect were commendable. D, E
7. Although the attitude on board was tense, and no evidence has suggested complacency, some were beginning to get bored and a little frustrated by inactivity. Stress, sea sickness and tiredness were not important factors. J, R
8. When the attack came, SHEFFIELD was not fully prepared for it. Some vital members of the Defence Watch Ops Room Team, including the AAWO (Lieutenant Commander BATHO), were out of the Ops Room. An important air defence net (AAWC HF) was not manned and UAA1 Band 4 was blanked by an own ship SCOT transmission. Neither FWO nor AAWO were aware of this transmission and they had not given their permission for it. H, J
9. The few warning signs were misread by the FWO [redacted] and, in the very short time available, he took insufficiently swift and determined defensive action. Chaff C and D were not fired. The ship did not go to Action Stations or DC State 1 Condition ZULU. The Captain was not called. H, J
10. Although TI was attempted, 909 did not acquire and an unnecessarily lengthy re-acquisition drill was used. The AFT 909 received no indication. Neither Sea Dart nor 4.5 inch Mk 8 engaged the missile or the firing aircraft. 4.5 inch alarm procedure was not used. H, J  
*It is speculated as to whether the aft closed within 900's*
11. The GDP's Crew were not alert. Weapons were neither manned nor loaded. They were not able to indicate or engage. H, J

12. The AAWO reached the Ops Room about 50 seconds before missile impact, too late to play any effective part in the Ship's defence. J
13. The raid was not well handled by the AAWC in INVINCIBLE. J, S
14. If all the right reactions had been taken, very quickly indeed, and in particular if Chaff D had been fired on receipt of the CONDOR racket from GLASGOW, it might just have been possible to frustrate this determined and very professional SUPER E/EXOCET attack. J
15. In any such circumstances the provision of longer warning, as from AEW, must enhance the chances of successful defence. J
16. Some shortcomings in the Type 42's self defence capabilities against such an attack were borne out by the evidence heard. The most important of these are:- J
- a. Lack of a Jammer. *? Jamming EXOCET head would not have helped unless Chaff fired. could have been*
  - ✓ b. The very high reliance demanded of a number of operators if a Sea Dart of 4.5 inch versus sea skimmer engagement is to have any chance of success.
  - ✓ c. Lack of a Point Defence System.
  - ✓ d. Inadequate simulator provision, particularly for realistic 909 low target acquisition practice. E
17. A significant portion of the ship filled, extremely quickly, with thick acrid black smoke. Initially, this was caused by unused propellant (RDX/nitrocellulose/nitroglycerine), the combustion products of which include nitric oxide and carbon monoxide, and by Diesel; to which were later added noxious and toxic fire products from furnishings and other combustible materials. K, L, M
18. The smoke critically affected the ensuing struggle to control and save the ship. The Bridge, MCR and HQ1 had to be abandoned soon after impact, followed by the Ops Room, Forward Section Base and Sea Dart Quarters. Forward, smoke clearance measures were not effective. Aft, they were partially successful. K, L, M
19. In a very few minutes, the ship's fighting capability was reduced to a negligible level, largely due to smoke. K, L, M
20. The WEO and Computer Room Crew lost their lives, almost certainly by asphyxiation, following their very brave efforts to bring the ship's weapon systems back into service. Q, R
21. Prior to the attack the firemain was de-isolated. On impact it was breached at J Section, 2 Deck Starboard. Firemain pressure was lost immediately and was never restored. None of the ship's four fixed firefighting pumps (C, K, L, N) were effective after the attack. F, K, L
22. In the absence of firemain pressure, firefighting was largely restricted to boundary cooling, using portable electrically driven pumps (and buckets). This had little effect on the internal fires which rapidly spread through H, J and K Sections, and subsequently intensified, later spreading forward, probably to G Section, and aft, at least to the Hangar, P Section. K, L  
N, P

23. Using hoses supplied by portable pumps, and later from ARROW, re-entry attempts were made at 2 Deck Passage Starboard (M and L sections from aft), at 1H Starboard (Officers Cabin Flat) and at 1J (Starboard) Access Hatch. These were well planned, well briefed and determined attempts which were all beaten back by heat and smoke. K, L

24. Other noteworthy firefighting attempts were made at the FAMR Escape Hatch (02 Deck J Section), and through the missile entry hole with hoses passed to the Gemini. K, L

25. Following the early evacuation of HQ1, there was a lack of control and co-ordination both forward and in the ship as a whole. **No emergency DC Headquarters was set up.** L

26. There were a number of critical deficiencies in Damage Control and firefighting arrangements and equipment. In particular:-

- ✓ a. Forward escape manholes are too small for passage by men wearing BA.
- ✓ b. Lack of Upper Deck firefighting equipment dump.
- ✓ c. No Upper Deck control arrangements or position for fire fighting or Damage Control.
- ✓ d. Insufficient BA.
- ✓ e. Lack of alternative CO<sub>2</sub> drench operating positions.
- ✓ f. Failure of single action doors.
- ✓ g. Lack of through bulkhead hose connections.
- ✓ h. Non-availability of smoke for training.
- ✓ j. No escape hatch from Naval Stores, 3/2H.

Other shortcomings are at Annex L para 49. E, K, L

27. Although wearing an AGR in a smoke filled compartment can give life saving seconds, re-entry to a smoke filled area using AGR is very risky indeed. L, R, S

28. The performance of a number of Rover gas turbine pumps, collected from several ships, was abysmal. Of the five pumps eventually tried onboard SHEFFIELD only one, ex-ARROW, operated successfully. K, L

29. The ability of some important equipment to resist shock damage is suspect. Examples include the main computer (Outfit DAD/JZQ), C Fire Pump and between deck ladders. K, L

30. The ferocity of the subsequent fire in the Mess and Cabin areas on 1 and 01 Deck, indicates that desirable improvements in habitability have been made at the expense of essential Fire Fighting and Damage Control characteristics. M, N

31. The assistance of YARMOUTH, and particularly of ARROW, in boundary cooling and, in the latter's case, supplying hoses to SHEFFIELD, was determined and demanded a high degree of ship-handling skill. These attempts were seriously prejudiced by a lot of reported sonar contacts and torpedo alarms, all of which are thought to have been spurious.

K, L

32. At about 041750Z the Captain considered that:-

- a. After some 4 hours firefighting the situation was deteriorating. Internally the ship was burning fiercely in most of H, J and K Sections, and the fire was spreading aft.
- b. There was still no firemain pressure.
- c. The danger of the Sea Dart Magazine exploding was increasing.
- d. ARROW and YARMOUTH were particularly vulnerable to S/M or Air attack while alongside SHEFFIELD.
- e. SHEFFIELD's fighting capability was totally and probably irretrievably destroyed.

He ordered his Ship's Company to abandon ship. Most climbed over to ARROW, a few went to YARMOUTH by gemini, some were flown to HERMES.

K, L

33. The ship continued to burn, fiercely, for two days and some areas were probably still burning for up to five days after the attack. However she remained upright, and at normal trim and draft, until the weather deteriorated on 10 May.

N, P

34. On five occasions over the next 4½ days small parties visited SHEFFIELD by helicopter to assess the state of the ship, to salvage particularly important equipment, and to prepare for possible salvage.

N, P

35. CTG ordered YARMOUTH to tow SHEFFIELD out of the TEZ, with a view to temporary repairs at South Georgia. The tow was started early on 9 May and did reach the edge of the TEZ.

N, P

36. At about 100700Z May, in poor visibility and deteriorating weather, SHEFFIELD took on a distinct list to starboard. This rapidly increased. The tow was slipped and SHEFFIELD sank shortly afterwards, probably with a 90° list to starboard but even trim. The estimated position of sinking is 52°11'S, 53°50'W and depth approximately 1000 fathoms. At the time of sinking there was no towing crew onboard.

N, P

37. We consider there is no serious possibility of compromise of documentary or other classified material. We have separately reported on this (Annex N Appendix 2).

N, P

38. The only important equipment related to the 600lb Bomb known to have been onboard was one bomb trolley which was ditched before abandon ship.

P

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39. There were some shortcomings in the performance of key personnel of the Operations Department which contributed to the ship's failure adequately to counter the attack. Inexperience and personal inadequacy contributed, and there were some important errors of judgement. There was an unfortunate lack of experience in other important areas. J, L

40. [REDACTED] the on-watch PWO, possibly partly through inexperience, but more importantly from inadequacy, failed to react in accordance with standard tactical doctrine and teaching, in particular when he first heard of the CONDOR racket and also on other indications of the developing raid (see Annex J para 12). To this degree, he demonstrated negligence. H, J

41. Lieutenant Commander BATHO, the on-watch AAWO, spent far too long away from the Ops Room and did so without ensuring that anyone knew his precise movements. Arriving late, he made an incorrect judgement, based on his reading of the intelligence situation, in assessing the raid as MIRAGE III (see Annex J paras 3 and 9). In the circumstances his lengthy absence from the Ops Room demonstrated negligence. H, J

42. The ORS, CPO(OPS)(R) FILER, was totally inadequate. While his shortcomings did not amount to professional negligence he failed to keep efficient control of his Ops Room crew, particularly in respect of manning voice circuits and the absence of personnel. H, J

43. Captain SALT's background as a submariner, his lack of Air Defence and recent Surface Ship Warfare experience, along with an appointment to SHEFFIELD after the ship had carried out CTT, BOST and major Fleet exercises, meant that he was not well prepared and lacked experience for command of an Air Defence Unit facing a potent threat in a War situation. E, G, J, L

44. Similarly, the First Lieutenant, Lieutenant Commander NORMAN, an ASW Helicopter Observer, lacked relevant in depth experience of surface ships. After impact, he was somewhat at a loss, albeit in extremely difficult and demanding circumstances, and he was not able to control manpower effectively or direct effort decisively. K, L

45. The concurrent appointments of a Commanding Officer and Second-in-Command who had, in general, little or no relevant recent surface ship experience, and in particular were both very short on air defence background, was unfortunate.

46. There were many fine examples of individual bravery in the attempts to save SHEFFIELD, and the Board have separately drawn the attention of the Commanding Officer to those of which they are aware. Among the most praiseworthy are those who continued to man their quarters, in deteriorating conditions, long after the attack. In this respect we would like particularly to call attention to the conduct of the WEO, the late Lieutenant Commander J S WOODHEAD Royal Navy and the Computer Room Crew (Sub Lieutenant EMLY, ACWEMN TILL, WEA1 EGGINGTON, and WEMN2 WALLIS (all deceased)). K, L

47. Other brave acts which particularly impressed us were the re-entries to the smoke filled areas of the ship, often without BA, to save lives or gear. In this category we consider the conduct of the late POMEM BRIGGS of special note. K, L

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48. In both firefighting and subsequent salvage attempts we consider the MEO, Commander R ROWLEY Royal Navy, displayed considerable personal bravery and professional competence.

K, L

B

RECOMMENDATIONS

ANNEX A PARA

The principal recommendations of the Board are:-

1. In defence against the sea skimming missile, training and doctrine must stress heavily the importance of:-
  - a. Constant vigilance by all on watch. 7, 8, 11, 12
  - b. Not degrading own sensors, eg, blanking UAA1 by use of SCOT. 8
  - c. Instant, full reaction, in accordance with standard tactical doctrine and teaching, on first indication of possible attack. 9, 10, 11
  - d. The supreme importance of timely firing of Chaff, particularly Chaff D. 9, 14
  - e. Speedy 909 acquisition, even for the very difficult fast low flyer. 10
2. Improvement of the Type 42's self defensive capability against the sea skimming missile is required urgently. Areas for consideration include provision of a Jammer and a Point Defence System. 16
3. Efforts to simplify, shorten and improve 909 acquisition procedures, particularly for low targets, should be given high priority. 16
4. The provision of a realistic 909 acquisition simulator be investigated. 16
5. Smoke clearance arrangements in Type 42 Destroyers be reviewed. 18, 19
6. Methods of preserving the ability to control and fight the ship, even in heavy smoke, be investigated. 18, 19, 20
7. Facilities to permit escape through smoke filled areas be provided. 3, 17, 27
8. The revised advice to isolate Firemain at Action Stations be confirmed. 21
9. Early consideration be given to the arrangements for maintenance or restoration of Firemain pressure following extensive damage. 21
10. The further important deficiencies in Damage Control and Fire Fighting equipment and arrangements we have identified be investigated and remedied. 26
11. Urgent steps be taken to improve the performance and reliability of Rover Gas Turbine Pumps, or a replacement be provided. 28

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| ✓ 12. The susceptibility of all Type 42 equipment to shock damage be tested and remedial action taken where necessary. | 21, 29     |
| ✓ 13. Efforts to reduce the flammability and toxicity of furnishings and other materials should be continued.          | 17, 30, 33 |
| 14. All classified material held on board SHEFFIELD, except that known to have been removed, be written off.           | 37         |



G

INTELLIGENCE ASSESSMENTS

1. Scope. This annex considers aspects of the intelligence made available by CTF (and other sources) to CTG, his resulting assessments, intelligence available to the Commanding Officer of SHEFFIELD on 4 May and the threat perception in the ship prior to the attack. It concentrates largely on the air threat; but aspects of the S/M threat are also relevant.

CTG's Intelligence Appreciation

2. Background. The intelligence community clearly found themselves in the traditional difficulty of being asked to provide detailed information on capabilities, and assessments of intentions, on forces which were not a prime intelligence target. Some aspects were particularly important. These included the radius of action (ROA) of the Argentinian SUPER ETENDARD (SUPER E) fighter-ground attack aircraft in the EXOCET role, and the number and operational states of EXOCET missiles and SUPER E/EXOCET aircraft/missile combinations. ROA was critically dependent on whether the Argentinian SUPER Es had an Air-to-Air Refuelling (AAR) capability or not. The number of missiles known to be available was small and the state of aircraft/missile combinations was the subject of frequent intelligence updates.

Q99  
Q4798-Q4816

3. JOSEA. Basic information was provided in the JMIC ORBAT SUMMARY and EFFECTIVENESS ASSESSMENT (JOSEA) which was flown to Task Force ships and was held onboard SHEFFIELD. This document showed, diagrammatically, the unrefuelled low level ROA of the SUPER E (360 nm) and indicated that, if operated from mainland bases, this ROA bisected the Falkland Islands. It was clear from the text that the ROA for an EXOCET attack from high level, un-refuelled, would extend about 40nm further. The JOSEA also stated that Argentinian SUPER Es had a flight refuelling pod, but their AAR capability was not known. The JOSEA indicated that five Argentinian SUPER Es should be EXOCET capable by about 18 Apr and that the Argentinians were thought to have some 10 EXOCET missiles.

Q277  
Q4796  
Q4798  
Q4799

Q4800

Q4809

4. Signalled Intelligence. On 26 Apr CTF signalled (1) the Task Force with the assessment that Argentinian SUPER Es could be refuelled in flight by A4 SKYHAWKS. Hence there was the possibility that the SUPER E, with EXOCET, could reach South Georgia or an equivalent ROA. This covered all the Falkland Island TEZ, and would permit reasonably protracted low level operations East of the Falklands. On 4 May CTF signalled (2),

Q4800

Q4809

- (1) CTF's 261110Z APR 82  
(2) CTF's 040230Z MAY 82

and SHEFFIELD received, information that five SUPER Es were operating from Rio Grande. It was further assessed that probably only one SUPER E was fully equipped to launch EXOCET, although all could carry them. CTG was warned that there was clear evidence of the operation of an Argentinian 209 Class SSK in the close vicinity of the Falklands, where she had been for some time, but that there were no Argentinian surface ships in the area.

Q4817

Q4819

5. CTG's Assessment. In relation to SUPER E/EXOCET attack, CTG states (3) that his assessment of the threat was that: "SUPER E/EXOCET attack had been well recognised by all, for some days, as the most potent threat, and (they were) expected to be operating from Southern Argentinian air bases."

SHEFFIELD's Intelligence Appreciation

6. After early withdrawal from Exercise SPRINGTRAIN on 2 Apr, SHEFFIELD immediately set about studying available intelligence documents held onboard. Material was limited, both in quantity and detail; no specific NISUMs existed and considerable use was necessarily made of publications such as JANE's Fighting Ships and Aircraft. Nevertheless, the ship made a determined effort, including reading and studying material written about other friendly and non-friendly nations who possessed similar military equipment to Argentina. Two noteworthy examples are the French designed and operated MIRAGE III and SUPER E. Briefings and discussions were held onboard for key personnel.

Q22, Q49

7. Updated intelligence information was flown from the UK to Ascension, but it arrived after SHEFFIELD had sailed. Delivery was eventually made, via the Carrier Group, on about 21 or 22 Apr. SHEFFIELD was passed a sizeable and daunting bundle of intelligence material. On examination, it was found to consist of a number of largely uncorrelated briefs and memoranda, from a variety of sources. Apart from the JOSEA, which was welcomed as a quick look guide, and one particularly good Air Staff paper on the Argentinian Air Force, the remainder required sorting, reading and collating into usable form. Study and assimilation followed, but the ship found that some material was conflicting and contradictory. The major task was to sort everything out and achieve a clear, unambiguous understanding of the threat.

Q103  
Q99

Q286

Q6838  
Q109, Q277

Q108  
Q109, 282  
Q286

8. No doubt arose over the potency of the AM39. Also, SHEFFIELD fully appreciated the similarity between the MIRAGE III and SUPER E radars and the care that would be required in classifying ESM intercepts of the two.

Q112, Q279

Q100

9. During the passage to Ascension the TG concentrated on SAG procedures. CTG also assessed the threat priorities as surface, principally MM38 in terms of effectiveness, air and subsurface. X

Q26, Q61  
Q35  
Q111

(3) CTG's AAA/19F/25A 231910Z JUN 82

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These assessments much influenced SHEFFIELD's thinking in the early days. Nevertheless, CTF's amplifying signals on 26 Apr (1) and 4 May (2), which updated the SUPER E/EXOCET AAR capabilities, modified the ship's appreciation and the implications were well understood.

Q277

Q279  
Q2446

10. The Commanding Officer, in evidence, was at pains not to be critical of CTG's threat assessment, nor the way efforts were concentrated on SAG procedures. However, SHEFFIELD felt that both points were contributory factors to the possible confusion that existed over the placing of SUPER E/EXOCET attack in the threat league. Furthermore, he also realised that this carries no weight in the argument on classification of the raid on 4 May. SHEFFIELD was of the opinion that the subsurface threat was as great as the air threat. In short, prevailing water conditions, coupled with the sophistication of the 209 SSK, made it, in his view, a "submariners' paradise".

Q112  
Q99Q110, Q115  
Q113, Q321

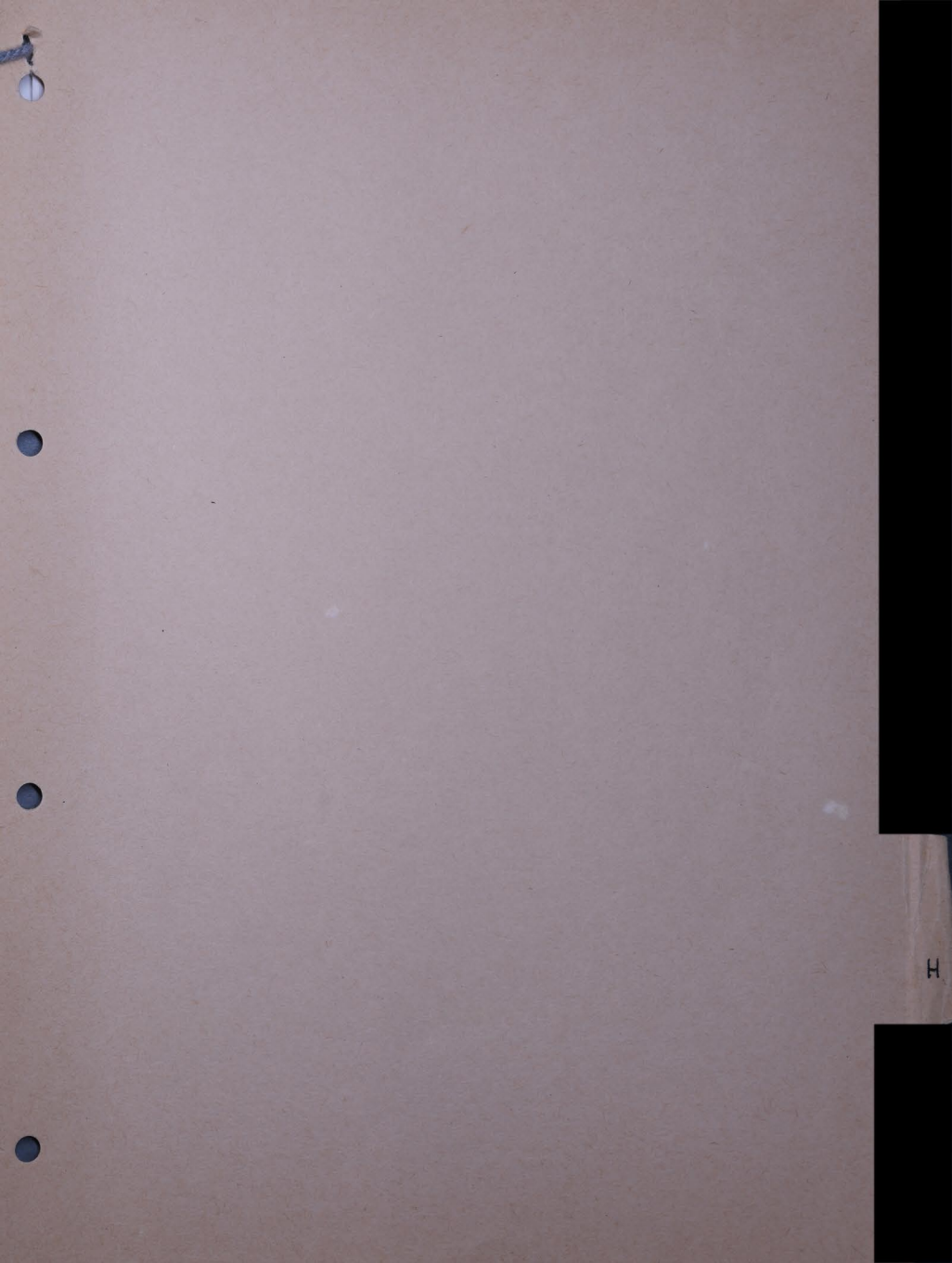
11. In summary, SHEFFIELD had not dismissed the possibility of an airborne EXOCET attack. However, it seems probable that the intelligence background, as outlined above, coupled with their experiences of 1 May when they believed the reported SUPER Es were actually MIRAGE IIIs (see Annex H) lulled the ship into a belief that future raids might well develop along similar lines. Indeed during the attack, despite GLASGOW's warning, the AAWO was "quite convinced that it was not an EXOCET attack" and this was his view until after impact. The PWO did not discover that it was an EXOCET until an hour later, believing till then that it was a rocket projectile. In the hot washup of the attack by the SHEFFIELD team, the SUPER E attack profile was described as "quite unlike that expected" (4).

Q376  
Q834  
Q835

*be they all thought it would  
be launched at long range  
and high-ish level.*

- (1) CTF's 261110Z APR 82  
(2) CTF's 040230Z MAY 82  
(4) ARROW's 19F 050012Z MAY 82

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H

NARRATIVE OF ATTACK

1. Scope. This annex describes operations in the Total Exclusion Zone (TEZ) from 1 May 82 up to and including the attack on SHEFFIELD.
2. On Saturday 1 May, the Task Group (TG) commenced operations in the TEZ in an area centred some 50 nm NE of East Falkland Island.
3. SHEFFIELD rated the S/M threat very highly, and realised that conditions much favoured the small 209 Class Argentinian submarines. The surface threat, including surface EXOCET (MM38) although potent did not appear immediate. The possibility of low level SUPER E/EXOCET attack was well understood, but there were reasons why the probability might not be rated very highly (see Annex G).
4. On that first day, the ship went to Action Stations (State 1, Condition ZULU) on numerous occasions at Air Warning YELLOW. These aircraft were engaging the TG's Naval Gunfire Support element inshore and when they closed within 100 nm some were successfully acquired by SHEFFIELD's 909s. State 1 was achieved in 5 minutes and Condition ZULU in 6 to 8 minutes, all of which was in keeping with previous practices. Because the day's experience proved that radar detection ranges of 160 nm were achieved on Argentinian aircraft, it was decided that Action Stations would subsequently be piped at Air Warning RED.
5. SHEFFIELD was dogged by what she (and others) regarded as false alarms on 1 May. In particular, SHEFFIELD believed that MIRAGE IIIs were being misidentified by UAA1 as SUPER Es because of the almost complete similarity between the radar parameters of the two aircraft. There were no raids on the offshore elements of the TG. However Chaff DELTA was fired on several occasions by other ships and one reduced pattern (4 x N4) by SHEFFIELD.
6. After an uneventful night, the ship went to Action Stations on Sunday 2 May anticipating retaliatory air raids on the TG in light of the heavy Argentinian air losses (five aircraft) the day before over the Falkland Islands. Nothing ensued.
7. The 2 and 3 May were quiet and the ship settled into a routine. The TG maintained its air defence posture eastward of the Islands, working from North-East, through East to South-East. Ships refuelled by night, often in unpleasant and sometimes extreme weather conditions. During this period, PLYMOUTH and BRILLIANT rejoined from South Georgia and the TG detected some aircraft on radar and identified them as Argentinian by ESM. No hostile Combat Air Patrols were detected over the Islands.
8. Throughout these two days, Air Warning YELLOW remained in force and no threatening aircraft came within 200 nm of the group. The weather went from one extreme to the other and a pattern developed; conditions were either heavy seas with good, clear visibility, or calm seas and fog with visibility down to 100 yards. If it was foggy over the Falkland Islands, it was often clear at sea.

Q98

Q110, Q111  
Q112, Q113  
Q115

Q117

Q117  
Q128  
Q127

Q99, Q117

Q106

Q100, Q101  
Q106

Q136

Q118

Q139

Q139

Q139

Q142

9. On the morning of Tuesday 4 May sunrise occurred at approximately 1130Z and the group emerged from fog into an unusually calm sea with visibility of 7 - 10 nm. By that afternoon the TG was about 40 - 50 nm South-East of the Islands. The base course was 250 and the AAW Axis 280. The three Type 42s occupied air defence stations some 18 nm up threat of the Main Body; SHEFFIELD was 45° left of the AAW Axis; GLASGOW on the axis approximately 340 - 15 from SHEFFIELD; and COVENTRY 45° right of the axis, approximately 010 - 27 from SHEFFIELD. (See Annex J Appendix 2). Q139  
Q152  
Q159
10. The weather had become fair and cool. The wind was Westerly at 12 knots and the sea calm but with a two metre swell. Visibility was about 7 nm. Radar conditions were unusual; anaprop was evident on E/F Band, some very long range ESM intercepts were being achieved, and many spurious radar echoes were appearing on displays, often generating convincing tracks. Sonar conditions were awful; but SHEFFIELD's sonar was active and a full SCR crew was closed up. Q1799  
Q2341  
Q196
11. The AAWC was in INVINCIBLE with Flag in HERMES. The COMPLAN included an HF Link 10 circuit (which, by all accounts, was working well), HF Intership RATT, and AAWC HF and AAWC UHF. Q299-Q301  
Q357, Q308
12. At 1200Z the Starboard Defence Watch closed up with normal staggering of key positions to minimise disruption. The ship was running on two Tynes with both Olympus at standby (two minutes notice), and was in State 2 Condition YANKEE. There were no WE OPDEFs extant which limited operational or tactical options (see Annex F). However, there are several indications of poor 992 performance (1), including the fact that SHEFFIELD did not hold land on 992. Important ME OPDEFs were outstanding on M2 Diesel Generator and NOVEMBER Hull and Fire Pump (see Annex F). Q152  
Q153  
Q490
13. Early into the new watch, the AAWC broadcast a SITREP confirming Air Warning YELLOW with no known hostile air activity within 200 nm of the TG. Captain SALT visited the Ops Room at about 1245Z to update himself, and then returned to his day cabin where he remained until missile impact. Q239, Q218  
Q239
14. At approximately 1340Z, the on-watch AAWO, Lieutenant Commander BATHO, left the Ops Room and proceeded to the Bridge to check the cloudbase. He then went to the Wardroom for a cup of coffee. Q186, Q187, 8  
Q227 Q228  
Q5129, Q5083
15. The subsequent sequence of events as far as can be determined, is given in the form of a narrative. The order is probably correct and is more important for analysis than precise timing. The times used represent the best fit from a considerable amount of evidence. There are two accurate sources; GLASGOW's UAA1 Backroll (see Appendix 1) and the private tape of Lieutenant Commander LISTER (Flight Commander, GLASGOW) (see Appendix 2). The time of impact, 1403Z, is believed accurate to - 1 minute.
- (1) GLASGOW's 19M 062040Z MAY 82.

SECRET  
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<u>Time (ZULU)</u>	<u>Event</u>	
1350	MCO asks EMD for permission to transmit on SCOT. AAWO's assistant (AB(R) BURNS) leaves Ops Room for heads.	Q580, Q3158 Q3028
	<u>COMMENT.</u> EMD did not seek PWO permission to transmit on SCOT. PWO was not aware of SCOT transmissions.	Q583 Q827 Q733
1351	SHEFFIELD starts attempting to access the satellite with SCOT transmissions. Access not achieved - attempts continue.	Q3160
	<u>COMMENT.</u> There is no record at RAF OAKHANGER or COMCEN Whitehall of a successful access. The SCOT Operator had occasionally had difficulties in satellite access.	Q3173
1355	Flt Cdr (Lieutenant LEYSHON) goes to Bridge.	Q1810, Q1900 Q1903
1356 30s	GLASGOW intercepts 3 sweeps AGAVE radar (SUPER E) bearing 245.	Q2533
	<u>COMMENT.</u> Timing was taken from GLASGOW UAA1 backroll (see Appendix 1), and accuracy is probably within $\pm 6$ seconds. Bearing accuracy probably $\pm 3^\circ$ . Assessed by CO and AAWO of GLASGOW as SUPER E raid.	Q4792
1358	GLASGOW calls "AGAVE 245: CONDOR 245" on AAWC UHF and HF. This was heard in SHEFFIELD as "CONDOR 225" or just "CONDOR".	Q593, Q8101 Q955, Q1029 Q1902, Q887 Q906, Q957 Q976, Q1013
	<u>COMMENT.</u> AGAVE radar, fitted in the AM39 capable SUPER E, had the nickname CONDOR at the time. SHEFFIELD was not guarding AAWC HF.	
1358 06s	GLASGOW intercepts a further 2 sweeps of AGAVE bearing 248 (see Appendix 1).	
	<u>COMMENT.</u> Precise timing.	
1358 15s	GLASGOW detects two close but distinct 965 contacts 240 - 40 closing.	Q2553, Q4745 Q4747
1358 48s	GLASGOW achieves AGAVE locked-on intercept (see Appendix 1).	Q553, Q4745
	<u>COMMENT.</u> Precise timing.	

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<u>Time (ZULU)</u>	<u>Event</u>	
1359 45s	GLASGOW detects two contacts on 992 and calls "Two low bogies - SW 25 miles". Aircraft heading 070/080.	Q4748, Q4773 Q4792, Q942 Q1026
	<u>COMMENT.</u> Heard in SHEFFIELD on AAWC UHF.	
1400 00s	GLASGOW released Hostile Aircraft (HA) track to Link 10 calling "ONEX".	Q943 et seq
	<u>COMMENT.</u> Time estimated. Some conflicting evidence on number of tracks, but believed to be only one. Received by SHEFFIELD, COVENTRY and INVINCIBLE. (2)	Q2354
1400 23s	GLASGOW pipes ACTION STATIONS.	
	<u>COMMENT.</u> From private tape transcript. Timing believed accurate. (See Appendix 2).	
1400 48s	GLASGOW repeats ACTION STATIONS.	
	See Appendix 2.	
1401 30s	Hostile Aircraft turn to starboard towards SHEFFIELD.	Q487
	<u>COMMENT.</u> Best guess of time. Reconstruction allows SUPER E on steady course for 20 seconds before firing. (10 seconds is minimum required). Turn observed in Ops Room of GLASGOW and SHEFFIELD. ✓	Q4748 Q4773 Q4792
1401 40s	SHEFFIELD FWD (Lieutenant TOLLEY) pipes "AAWO - Ops Room".	Q810
	<u>COMMENT.</u> This was the last main broadcast pipe made. Heard by most of the Ship's Company, many of whom reacted as if it were a warning pipe.	Q1537, Q1538 Q1699 Q5129, Q5200 Q4958 Q3901
1401 45s	SHEFFIELD MGD (B) (CGI ADAMSON), orders STAND TO.	
	<u>COMMENT.</u> 909s, Seadart Quarters and 4.5 stood to quickly. GDP crew had not achieved the stood to state by impact.	Q1345 Q1627 Q1536, Q2230 Q1561, Q2256 Q1699 et seq
1401 55s	Aircraft indicated to SHEFFIELD Fwd 909.	Q1345
	<u>COMMENT.</u> Target at about GREEN 40, but not indicated to Aft 909. Target crossing into Aft 909 Blind Arcs. Acquisition not achieved.	

<u>Time (ZULU)</u>	<u>Event</u>	
1402 02s	First EXOCET launched.	Q962, Q970 Q489
	<u>COMMENT.</u> Believed accurate within + 10 seconds relative to time of impact.	
1402 07s	GLASGOW fires Chaff DELTA.	
	See Appendix 2.	
1402 10s	Second EXOCET fired. On completion aircraft join as a close pair and turn South.	Q962, Q970 Q489
1402 10s	SHEFFIELD AAWO arrives in Ops Room.	Q331
	<u>COMMENT.</u> This timing is of considerable significance, as firing of Chaff DELTA by AAWO would have been too late. Many witnesses put this time much later at within 5 or 10 seconds of missile impact.	Q961 Q810 Q830 Q3104 Q4958 Q5042
1402 15s	SHEFFIELD Bridge visual sighting of missile smoke. OOW (Lieutenant WALPOLE) reports "Two contacts trailing smoke 297" to Ops Room.	Q1902, Q602 Q334, Q1916
	<u>COMMENT.</u> What was seen is consistent with the heavy smoke of two EXOCET boosts, the trails being formed during initial acceleration and the start of the sustainer burn.	Q7340
1402 30s	SHEFFIELD - Re-set/Re-Indicate aircraft to Fwd 909.	
	<u>COMMENT.</u> Time approximate. This may have occurred more than once.	Q1627, Q1360
1402 40s	SHEFFIELD Yeoman (CY NALDRETT) arrives in Ops Room	Q3100, Q3153
1402 45s	SHEFFIELD SCOT strangled. UAA1 Situation Display shows locked-on radar.	Q3170, Q616 Q2283, Q595
	<u>COMMENT.</u> Time believed accurate in relation to missile impact.	Q604, Q735 Q742
1402 50s	First missile body visual from SHEFFIELD Bridge.	Q1828 et seq
	<u>COMMENT.</u> Visual descriptions very complete. In addition to OOW, Flight Commander and Flight Observer saw the missile from the Bridge.	Q1902, Q1915 Q1916, Q1958 Q1970
1402 55s	Locked-on radar strobed by UAA1 Operator. Parameters seen which were subsequently recognised as EXOCET (AM 39).	Q603 Q610
	<u>COMMENT.</u> EWD saw EXOCET Head lock-on parameters and was in the process of locking them up when the missile struck.	Q749

<u>Time (ZULU)</u>	<u>Event</u>	
1403 (Datum time)	First EXOCET impact.	
1403 15s	Second EXOCET splashes approximately $\frac{1}{2}$ mile on SHEFFIELD's port beam.	
	<u>COMMENT.</u> Only one witness, who both heard and saw an "explosion in the sea" That it was an EXOCET is by no means conclusive.	Q4411 Q4420
1404 00s to 1404 30s	COVENTRY gains 6 sweeps on 992 of aircraft in starboard turn 6 miles South of SHEFFIELD (opening).	Q2345
	<u>COMMENT.</u> Possibly the close pair of attack aircraft departing after sighting missile impact.	

Appendices:

1. GLASGOW UAA1 Backroll - 4 May 1982.
2. GLASGOW Flight Commander's Private Tape.

GLASGOW UAA1 BACKROLL - 4 MAY 1982

This table is described in evidence given by GLASGOW's Ops Officer, Lieutenant Commander SALT, on 21 June 1982 (Q2532) and is an accurate copy of the actual UAA1 backroll.

<u>Time (ZULU)</u> (Note 1)	<u>Bearing</u>	<u>Frequency</u>	<u>PRF</u>	<u>PW</u>	<u>ARP</u>	<u>TTN</u>	<u>NOD</u>	<u>AMP</u>
13525	037	01.028 01.028	000192	00.75	07.8	A	N	1
13565	245	09.348 09.348	000498	01.00	02.4	B	N	1
3 A304C	A	(AGAVE)						
3 A304C	A	(3 SWEEPS) (Note 2)						
13581	248	09.348 09.348	000499	01.00	02.4	B	N	1
3 A304C	A	(AGAVE - 2 SWEEPS) (Note 2)						
13588	248	09.348 09.348	001746	00.95	00.0	0	0	2
0 00000	0	(AGAVE)	(Note 3)					

NOTES

1. Last digit of Time indicates minutes in tenths; eg 13525 equates to 1352 30s.
2. These two AGAVE intercepts are thought to be from separate aircraft.
3. This intercept at 1358 40s is believed to indicate, by change of PRF, that AGAVE was locked-on, possibly on GLASGOW.

GLASGOW FLIGHT COMMANDER'S PRIVATE TAPE

1. Shortly before 1400Z on 4 May, Lieutenant Commander LISTER was recording a private cassette tape to his wife. He is heard talking on the telephone to his Senior Maintenance Rating (SMR). During his conversation, he states that the "LYNX will go to ALERT 15 at 1400Z, which is in 1 minute and 25 seconds time". This time check has been used as a datum for his subsequent remarks and activities and events in GLASGOW.

<u>TIME (ZULU)</u>	<u>REMARKS</u>
1358	Flight Commander talking to his SMR on the telephone.
1358 35s (Datum time)	Remark: "GLASGOW LYNX to ALERT 15 in 1 minute and 25 seconds".
1400	Flight Commander changing into flying clothing; talking to wife.
1400 23s	GLASGOW pipes Action Stations.
1400 48s	GLASGOW repeats Action Stations.
1402 07s	Chaff DELTA (full pattern) fired.
1402 17s	Flight Commander's speculative remark: "SUPER Es broken through".
1404 30s	Moving aft (doors/hatches/etc)
1405 30s	Flight Commander arrives in hangar. Gives instructions to the Flight.
1407	Captain HODDINOTT gives Main Broadcast SITREP: "Two aircraft have closed the Force .....".
1407 30s	Flight Commander reports "LYNX at ALERT 15" to HC.



ANALYSIS OF ATTACK AND RESPONSE

1. By the afternoon of Tuesday 4 May, the TG was established in its air defence posture. The previous two to three days had been largely uneventful although hostile air activity had been evident. (See Annex H, para 4). Air Warning YELLOW had predominated and most onboard had overcome their initial apprehension, uncertainty and perhaps fear.

Q139  
Q139  
Q116

2. SHEFFIELD's Ship's Company was relaxed, in as much that no-one was uptight nor displaying signs of worry or concern for their own safety. Naturally enough the reaction to the likelihood of air attack was one of defending own life as much as defending the TG. The Commanding Officer was largely satisfied with the ship's state of training. Morale was high and everyone's mood good; but, the atmosphere onboard was understandably tense. There prevailed a sense of purpose, cheerfulness and a positive approach to teamwork. The ship was keen and ready to fight. However, some were beginning to get bored and a little frustrated from lengthy periods of inactivity. By now, the Ops Room had been in Defence Watches for just over two weeks, working a 6-4-4-6 routine (0200/0800/1200/1600/2000). Whole ship defence watches had been running for just over one week.

Q124, Q125  
Q10, Q53, Q59  
Q58, Q70  
Q116, Q124  
Q125  
Q239 et seq  
Q386  
Q70  
Q384, Q1068

3. At about 1340Z on 4 May, the on-watch AAWO, Lieutenant Commander BATHO, called up the Bridge on Command Open Line (COL) requesting a weather update. Sub Lieutenant WESTBROOK, as OOW2, had the con and responded reporting the cloudbase as 8/8 ths cover at 800 ft. However, the AAWO doubted this assessment and decided to see for himself. The AAWO's Assistant, AB(R) BURNS, recalls the AAWO leaving the Ops Room shortly after 1340Z. The Air Picture Supervisor (APS), LS(R) POWLEY, realised the AAWO had left the Ops Room but did not know where he had gone. But the PWO, Lieutenant TOLLEY, was not aware of his departure or absence. The on-watch AAWO (or PWO) did not require the Commanding Officer's permission to leave the Ops Room.

Q331  
Q3032  
Q810  
Q810  
Q163, Q165  
Q166

4. Lieutenant Commander BATHO visited the Bridge and the question of cloudbase was resolved. He then went to the Wardroom for a cup of coffee. The indications are that he was not long on the Bridge; some of the Bridge Staff recall his visit, and its purpose. By now it is estimated to be about 1350Z. The Yeoman, CY NALDRETT, had also left the Ops Room to visit the Bridge and collect the Captain's Signal Board. Meanwhile, the AAWO's Assistant was leaving the Ops Room to visit the heads. These actions severely depleted the strength of the air cell. Now, the AAWO's Tactical Display was manned only by the APS. Additionally, AB(R) MESSENGER, the Air Picture Reporter (Force), who normally sits at a Labelled Plan Display port side adjacent to the 966 Air Picture Compilers was alongside the PWO, listening to NESTOR to glean information. One of the Target Indication Operators, AB(R) WHITTAKER, also left to visit the heads, returning about 45 seconds before missile impact. Thus, the AAWO and three of his air cell of eight were out of the Ops Room, or out of position. Ops Room positions are shown in Appendix 1.

Q2029  
Q331  
Q2062, Q3093  
Q3087, Q3096  
Q3100  
Q3028  
Q976, Q1000  
Q1298 et seq

Q299 - Q303  
Q302  
Q309

5. The COMPLAN provided for AAWC UHF and AAWC HF. There were no Communications Security Policy restrictions on HF; it was already in use for Link 10 and some Intership RATT. UHF propagation conditions were good, and AAWC UHF carried most of the AAW traffic. AAWC HF was used from time to time as the range of the air defence screen increased. GLASGOW's on-watch AAWO, Lieutenant Commander HAWKYARD reports that Flag chopped ships to AAWC HF some 20 minutes before SHEFFIELD was attacked. The developing raid was reported by GLASGOW on UHF and HF. COVENTRY, who was guarding AAWC HF, heard the reports only on AAWC UHF. However, in SHEFFIELD's Ops Room no-one was guarding AAWC HF. There is conflicting evidence as to whether AB(R) BURNS (AAWO's Assistant) should have been on AAWC HF. ✓ LS(R) POWLEY (APS) says he should have been, BURNS says he wasn't, and CPO FILLER, the Ops Room Supervisor, didn't know. Sadly, this is all rather academic as BURNS was away at the heads anyway.

Q299

Q4752

Q2323

Q2357

Q303

Q1008 - Q1013

6. Appendices 2 to 6 inclusive, are a series of sequential diagrams reconstructing the attack.

7. GLASGOW intercepted three sweeps of AGAVE radar bearing 245 at 1356 30s (see Appendix 2). AGAVE radar is fitted in the SUPER E. The radar's nickname at the time was CONDOR. GLASGOW's intercept is confirmed by her UAA1 backroll. The intercept was reported, on AAWC HF and UHF, as "AGAVE 245 CONDOR 245". SHEFFIELD's Ops Room heard this report on UHF; however, it was heard as "CONDOR 225". GLASGOW intercepted two further sweeps of AGAVE at 1358 06s bearing 248 which correlated with two contacts, each of which painted twice on her 965, at approximately 240-40 (see Appendix 3). At about 1359 45s, GLASGOW gained 992 contact on and reported "two low bogies, SW at 25 miles". She released these tracks to Link 10, reporting "ONEX", having validated them as Hostile Aircraft (HA) (see Appendix 4). GLASGOW went to Action Stations at 1400 23s.

Q4745

Q4745

Q4747

Q1454

8. At this point, matters started going severely wrong in SHEFFIELD. The PWO, aware of the implications of a CONDOR racket, looked across towards the AAWO's position; it was then that he realised that the AAWO was not in the Ops Room. The PWO asked in the Ops Room if anyone knew the whereabouts of the AAWO. He shouted through the hatch to the MCO. Eighty seconds before missile impact, approximately 22 seconds before the first missile was fired, the PWO made the pipe "AAWO - Ops Room" on Main Broadcast. This pipe was heard throughout the ship; its urgency was noted by many, and acted upon by some (see Appendix 5).

Q836

Q810

9. The AAWO heard the pipe while in the Wardroom standing close to the Pantry door drinking coffee and chatting to two Stewards. Immediately, he headed for the Ops Room via 2 Deck Starboard passage, arriving at his display about 50 seconds before missile impact (see Appendix 6). He had little time to gather his wits. He did learn about the CONDOR racket; but, based on his reading of the intelligence assessment and his uncertainty as to whether the SUPER E had the range to reach the TG at low level, he assessed this raid to be a bombing run by MIRAGE IIIs.

Q331

Q331 - Q335

Q334

10. The raid could not be classified by his own UAA1. SCOT had been released, some time before 1400Z, to clear a TACSIG. Consequently Band 4 (INDIA) was blanked out. The Electronic

Q336 - Q345

Warfare Director, AB(EW) BATEMAN, had released SCOT without the PWO's or AAWO's approval, or knowledge. RO1(G) WILLIAMS, the SCOT Operator in the MCO, was still trying to access the satellite as the raid developed. Ironically, it was never successfully accessed. BATEMAN, once aware of the CONDOR racket, did call the MCO on interphone to order the strangling of SCOT. Unfortunately, this bought up more valuable time as there was a delay in strangling. It is likely that the SCOT Operator took time to answer the interphone, because he was busy. When WILLIAMS did receive the order to strangle SCOT the missile was just 15 to 20 seconds from impact (see Appendix 6). BATEMAN did not consider using the SCOT Emergency Cease Transmitting push sited above the AAWO's position. Apparently, SHEFFIELD's drill for strangling SCOT did not normally include use of this push.

11. As UAA1 Band 4 cleared, some 15 seconds before impact, a locked-on radar was seen on the Situation Display. This was strobed by the operator, and BATEMAN read the parameters off the Alphanumeric Display. By the moment of impact, he realised he had seen an EXOCET head. He did not have time to make a report. Thus, despite being made aware of GLASGOW's CONDOR classification, the AAWO had no internal ESM confirmation. He believed earlier CONDOR classifications from other ships had been misidentified and in fact were MIRAGE III radars. He did not consider the raid to be SUPER E. Because of this misidentification neither Chaff CHARLIE nor Chaff DELTA were fired. Had SHEFFIELD's UAA1 not been degraded from the time the raid started to build up, it is quite reasonable to suppose that the ship would also have intercepted the AGAVE radar and would have been able to confirm the presence of SUPER Es. In this event, even with the AAWO absent, people might have reacted more quickly.

12. As it was, SHEFFIELD, perhaps lulled into a sense of security by the false alarms of 1 May and subsequent period of inactivity, still did not carry out acknowledged and practised procedures; the ship was not piped to Action Stations; the Damage Control State/Condition was not raised; and the Captain was not called. It is the Board's opinion that despite his declared inexperience of the air environment, the PWO should have been capable of taking these measures.

13. The raid was not well handled by the AAWC in INVINCIBLE. GLASGOW's call of CONDOR was disputed by the AAWC and contacts declared spurious. In evidence, GLASGOW's on-watch AAWO stated that he persisted in trying to convince the AAWC that his was a genuine raid but to no avail. This is borne out by the Commanding Officer of GLASGOW who was at his COP when AGAVE was detected and was thus involved from the onset. The AAWC did not exercise his prerogative and call ZIPPO 4, thereby failing to alert ships to take self-defensive measures. The Board feels that he should have assumed the worst situation rather than override GLASGOW's assessment.

14. At 1358 48s, GLASGOW intercepted locked-on AGAVE radar (see Appendix 4). At 1400 23s she went to Action Stations, but did not fire Chaff until 1402 07s (see Appendix 6). At about 1401 30s,

Q580  
Q827  
Q3160

Q592, Q601  
Q3177

Q3179

Q585  
Q3178  
Q6035, Q6036

*Should have been either PO (AW) or 15 (AW) but EW was only an AB of ? marked initiative*

Q626  
Q603-2610

Q334  
Q302, Q303  
Q279, Q282

Q820 - Q825

Q825  
Q819

Q4745

Q4748

Q4792  
Q992  
Q4759

Q2532-Q2533

*Why so long?*

*Not so by the  
1402-02 diagram -  
GLASGOW no  
Chaff blooms  
ie: qc turned  
before GLASGOW  
fired Chaff*

both aircraft turned starboard towards SHEFFIELD. The timing of this turn may have been earlier as it is entirely possible the aircraft shifted target having seen GLASGOW's chaff blooms. It is conceivable that the Chaff DELTA may have developed in time to reduce the chances of a successful EXOCET attack on GLASGOW, persuading the pilot to attack SHEFFIELD instead.

15. In SHEFFIELD, it was not until about 75 seconds before missile impact, just under 20 seconds before the first EXOCET was fired, that the MGD(B) ordered his weapon systems to stand to (see Appendix 5). Fifty seconds before the first AM39 hit, we assess that a second EXOCET may have been fired, 10 seconds behind the first. Both aircraft then reformed as a close pair, broke starboard and headed South. GLASGOW's Link 10 track label followed this contact. It is possible that decorrelation occurred between the Link 10 received track and SHEFFIELD's own sensor confirmed track. The Board has been unable to establish whether or not this happened.

Q2404-Q2408  
Q2254 - Q2257  
Q1256  
Q965 - Q971

16. Just after the AAWO arrived in the Ops Room, 50 seconds before impact, Bridge personnel sighted two puffs of smoke with trails. These are believed to have been the boost efflux (the puffs) and sustainer motors (trails), from two EXOCETs. The OOW reported to the Ops Room a fast moving contact bearing 297. The Bridge staff were mesmerised by this contact approaching from between GREEN 40 and GREEN 45. It was not until the missile's last moments of flight that they realised the ship was about to be hit by an EXOCET. The OOW had time to yell "Take Cover" on COL, but not time to reach the main broadcast to warn the Ship's Company. All Bridge personnel took cover. No-one saw the crossing SUPER Es 8 miles to the West, nor the possible second AM39 which is thought to have passed ahead of the ship and splashed harmlessly about half a mile to port of SHEFFIELD.

Q1826 - Q1832  
Q1915 - Q1916  
Q1828  
Q1829  
Q1833  
Q4411  
Q4420

17. One aircraft of the pair was indicated to the FWD 909 just before they turned south. Problems with acquisitions on surface clutter were resolved by re-setting, injection of height and re-indicating. This may have occurred up to three times. This lengthy drill is unnecessary; SP NEG injections having been introduced into the ADAWS 4, Edition 3 program to speed recovery from sea clutter acquisitions (1). These new injections were not used in SHEFFIELD. No targets were indicated to ART 909 which had clear arcs to the aircraft initially and to the missile throughout. At no stage was a valid fire control solution achieved for either GNS 30 or GSA1. The 4.5 Mk 8 was never brought to bear, nor was alarm procedure used.

Q1250  
Q1454  
Q1488 - Q1494  
Q1465, Q1627  
Q1629  
Q1461  
Q1474  
Q1477, Q1565  
Q1561, Q1454,  
Q1471

18. There is some evidence that SHEFFIELD's 992 radar was performing below standard. Anaprop was generally giving long ranges for both GLASGOW and COVENTRY, but no such reports have come from SHEFFIELD. Attacking aircraft were seen at about 30 miles by other Type 42s. The missiles were seen beam on by GLASGOW at about 15 miles but not until 8 miles by SHEFFIELD despite the larger radar echoing area of the head-on aspect. Reports that other Type 42s on the screen held strong land echoes on 992, and SHEFFIELD held none, lend weight to the supposition that SHEFFIELD's 992 was off-tune, although she was slightly further from land.

Q2563  
Q2341  
Q2361, Q4747  
Q4792  
Q2564

(1) Seadart Newsletter 2/81

19. The GDP's crew of six ratings with A/LS(M) TROUSDALE in charge as MGD (V), had been relaxed. They were manning both LAS Sights in 20 minute tricks and when relieved were relaxing in the warmth of 02 Deck cross-passage or the 966 Flat/966 Office, 02H. Weapons were neither manned nor loaded. The MGD (B)'s order to stand to 75 seconds before impact, was received. But it took some time for TROUSDALE, who had been manning the Starboard LAS, to round up the rest of his crew. Consequently neither the 20mm nor LMG was manned or loaded at impact. TROUSDALE did return to his LAS, but soon found himself being ejected as a result of the missile impact.

Q2216, Q2228  
Q2218  
Q2457  
Q2458, Q2465  
Q2466, Q2252  
Q2231-Q2232  
Q2234  
Q2256  
Q2239

SUMMARY

20. The raid was detected by GLASGOW who reported and reacted correctly. The attack swung to SHEFFIELD who had a depleted Ops Room, UAA1 blinded and was manning only one of the two AAWC circuits. An incorrect assessment of the raid was made and chaff was not fired. No change was made to the ship's state of readiness or DC condition. The Captain was not called. One missile struck the ship, and a possible second missile missed and ditched close by. The Argentinian launch aircraft flew down ship's head, probably to observe the results of the attack. The AAWC did not accept GLASGOW's classification of the raid and remained unaware that SHEFFIELD had been struck for at least another 12 minutes (2).

21. If all the right reactions had been taken, very quickly indeed and in particular, if Chaff D had been fired on receipt of the CONDOR racket from GLASGOW, it might just have been possible to frustrate this determined and very professional SUPER E/EXOCET attack.

Appendices:

1. SHEFFIELD Ops Room Manning 4 May 1200-1600 Starboard Defence Watch.
2. Reconstruction of Events at 1358Z.
3. Reconstruction of Events at 1358 15s.
4. Reconstruction of Events at 1400 30s approximately.
5. Reconstruction of Events at 1402 02s.
6. Reconstruction of Events at 1403 plus.

PORT

M | L For'ARD

STARBOARD

LPD 966 APC 2
LPD 966 APC 1

AB(R) TAYLOR

AB(R) COATES

LPD (SLAVE) 992 APC 3	LPD 992 APC 4
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AB(R) VIVASH  
AB(R) FOSTER

A/S  
1077

LPD SPC	LPD SPR	TOTE SPS	LPD FC
------------	------------	-------------	-----------

AB(R) DUNN

AB(R) JONES

LS(R) KENT  
(STANDING AT GOP AT IMPACT)

SLT HALEY

SONAR 184		
SONAR OPERATORS		
HE	PPI	DOI

AB(S) KANE

AB(S) POWELL

AB(S) FITZGERALD

SC LS(S) MARTIN

AB(S) MORTON (SPARE)

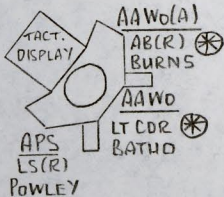
LPD APR (F)
TOTE

(VACANT)

(VACANT)

LPD APR (L)
AS 1077 A/MOT
LINK 14 T/P

AB(R) WESTROCK



JUD

ASWD

PO(S) BEECHY

ACPS

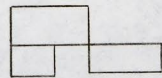
LS(R) WALLACE

PWO

LT TOLLEY

HC

AB(R) MESSENGER  
(APR(F) NESTOR)



OUT OF OPS ROOM WHEN ATTACK STARTED

ROOM

DOOR

ORS  
CPO(ORS)(R) FILER

AB(M) WHITTAKER

PO(M) TURNELL

AB(EW) BATEMAN

AB(M) DANGERFIELD

CG I ADAMSON

PO(M) WILSON

AB(EW) STEWART

GOPC

AB(R) GALWAY

TIOP	TIOP	MGO(B)	SDC	GC	EWD
LPD (SLAVE)	LPD	LPD	TOTE	TOTE	LPD

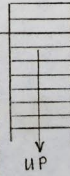
UAA I OP  
UAA I

CY NALDRETT

RO(L) DEACON

CY Ro  
COMMS DESK

GOP  
(LARL MK 14)



COMPUTER ROOM HATCH

K M M

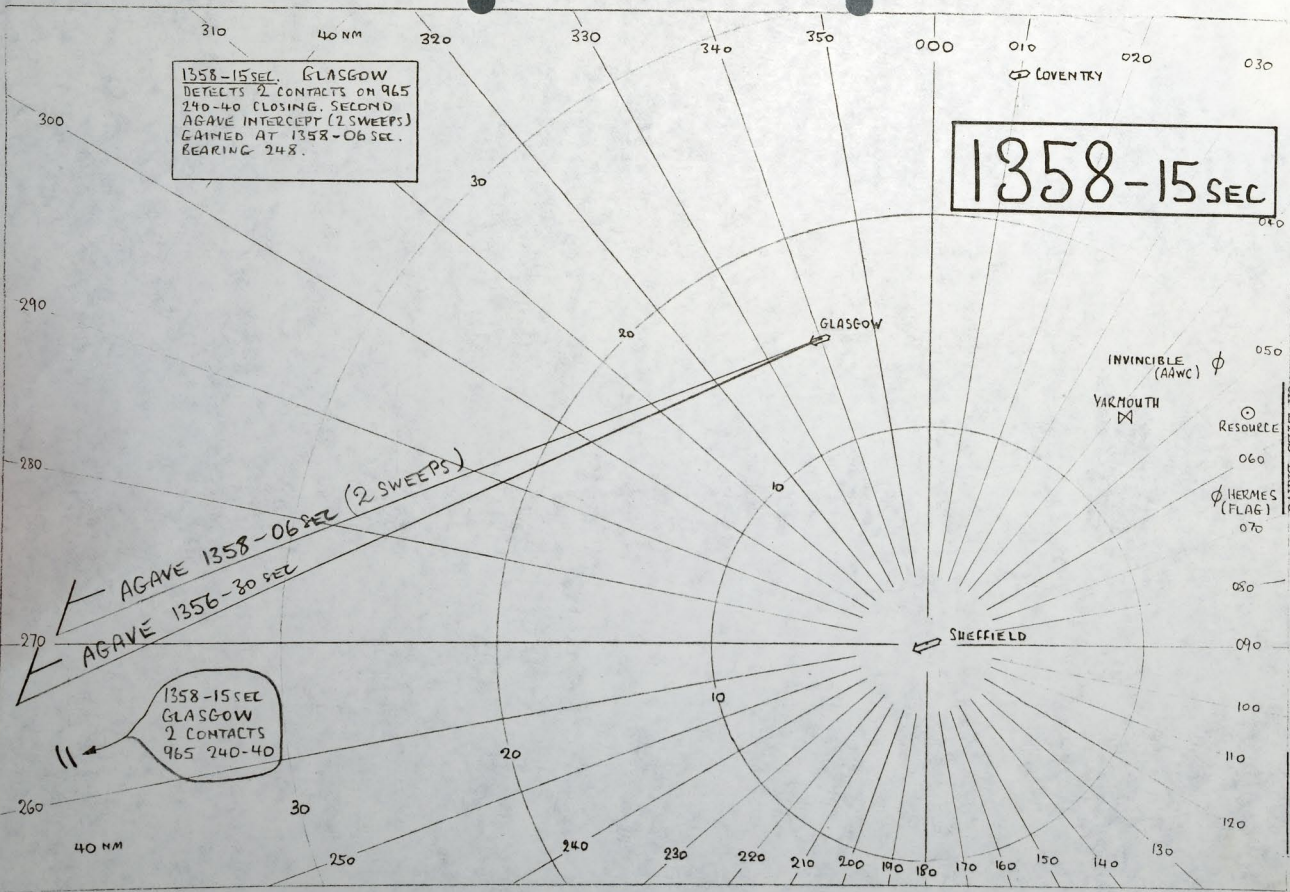
M | L AFT (MCO)

HMS SHEFFIELD OPS ROOM MANNING 4 MAY 82  
1200-1600 STARBOARD DEFENCE WATCH

RESTRICTED



SECRET



1358-15 SEC. GLASGOW  
 DETECTS 2 CONTACTS ON 965  
 240-40 CLOSING. SECOND  
 AGAVE INTERCEPT (2 SWEEPS)  
 GAINED AT 1358-06 SEC.  
 BEARING 248.

1358-15 SEC

AGAVE 1358-06 SEC (2 SWEEPS)  
 AGAVE 1356-30 SEC

1358-15 SEC  
 GLASGOW  
 2 CONTACTS  
 965 240-40

INVINCIBLE (AAWC)  $\phi$   
 YARMOUTH  $\boxtimes$   
 RESOLUCE  $\odot$   
 HERMES (FLAG)  $\phi$

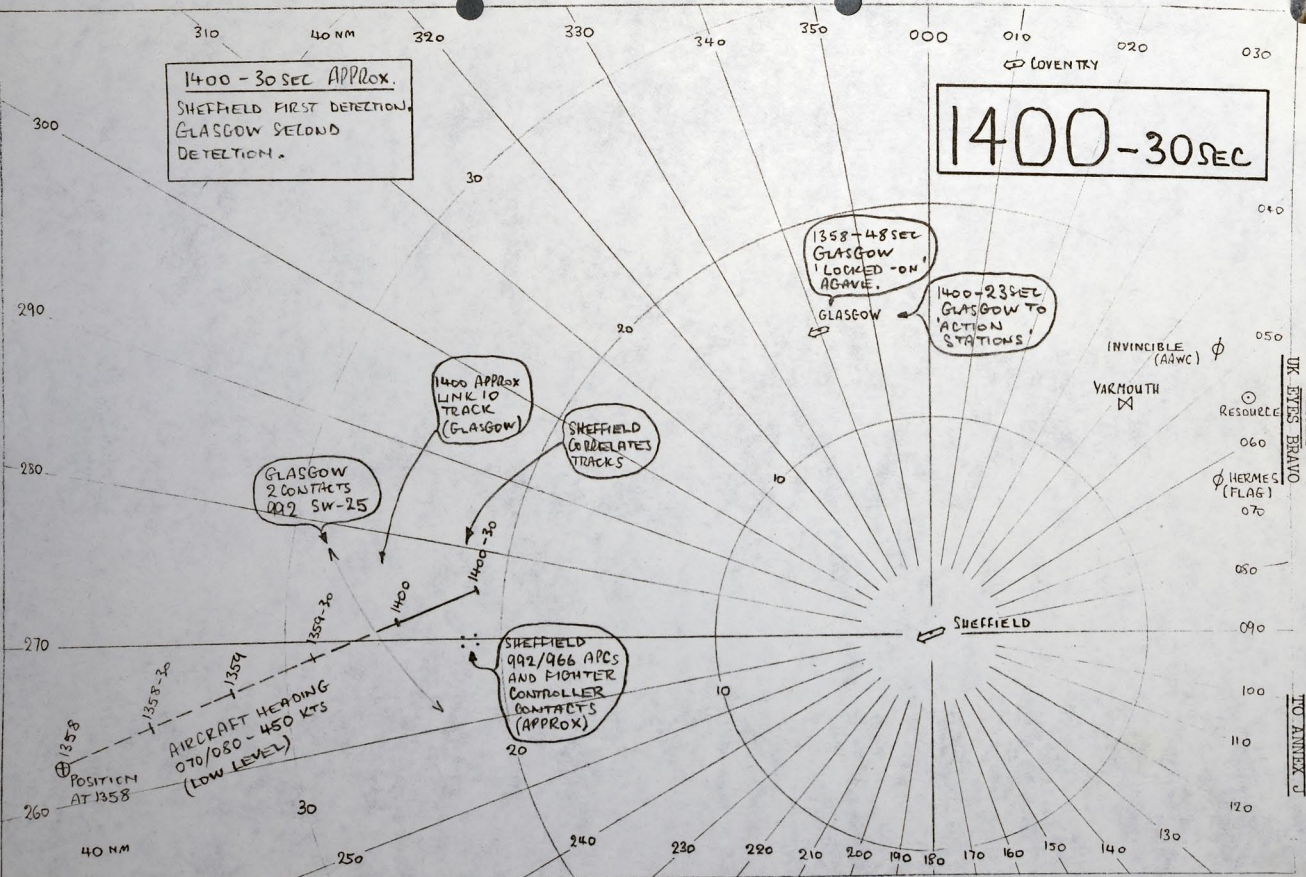
SECRET  
 THE EYES BRAVO

APPENDIX 3  
 TO ANNEX J

SECRET

1400-30 SEC APPROX.  
SHEFFIELD FIRST DETECTION.  
GLASGOW SECOND  
DETECTION.

1400-30 SEC



1358-48 SEC  
GLASGOW  
'LOCKED-ON'  
AGAVE.

1400-23 SEC  
GLASGOW TO  
'ACTION  
STATIONS'

GLASGOW  
2 CONTACTS  
092 SW-25

1400 APPROX  
LINK 10  
TRACK  
(GLASGOW)

SHEFFIELD  
CORRELATES  
TRACKS

SHEFFIELD  
092/066 APCs  
AND FIGHTER  
CONTROLLER  
CONTACTS  
(APPROX)

AIRCRAFT HEADING  
070/080 - 450 KTS  
(LOW LEVEL)

INVINCIBLE (AAWC)  $\phi$

YARMOUTH  $\Delta$

RESOLUTE  $\circ$

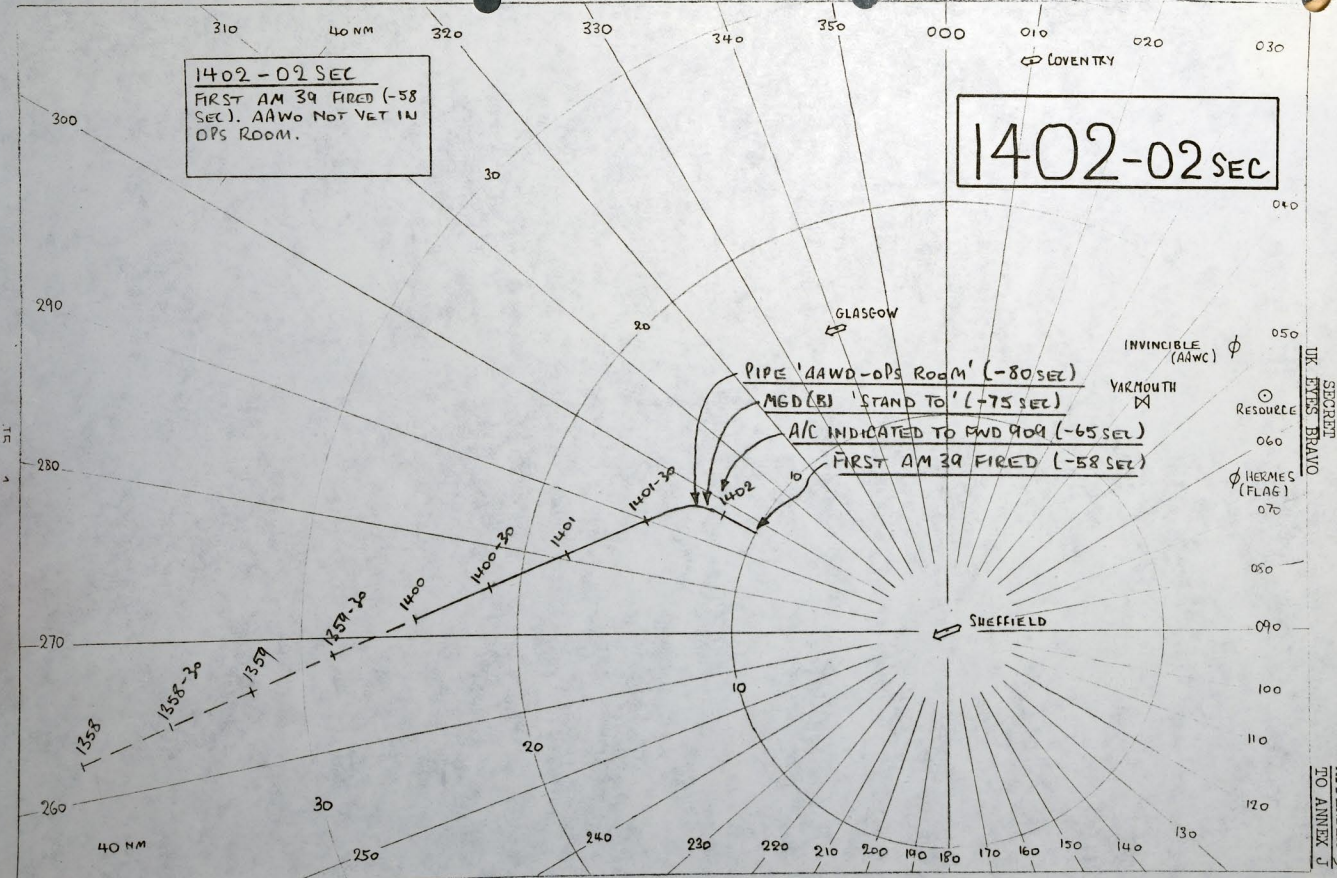
HERMES (FLAG)  $\phi$

SECRET  
UK EYES BRAVO

APPENDIX 4  
TO ANNEX J

1402-02 SEC  
 FIRST AM 39 FIRED (-58 SEC).  
 AAWO NOT YET IN OPS ROOM.

1402-02 SEC



SECRET  
 UK FTS BRANO

APPENDIX 5  
 TO ANNEX J

**1403 PLUS**  
FIRST AM39 HIT - SECOND MISSED. SUPER ETENDARDS OPENING SOUTH

**1403 PLUS**

1402 - 075EE  
GLASGOW CHAFF 'D'

GLASGOW

AM39 - 600 KTS

INVINCIBLE (AAWC)  $\phi$   
VARMOUTH  $\boxtimes$

RESOURCE  $\odot$

HERMES (FLAG)  $\phi$

FIRST AM39 FIRED (-58SEC)  
AAWO ARRIVES OPS ROOM (-50SEC)  
DOW SEES SMOKE TRAILS / CONTACTS (-45SEC)

SECOND AM39 FIRED (-50SEC)

AIRCRAFT BREAK RIGHT AFTER MISSILE RELEASE

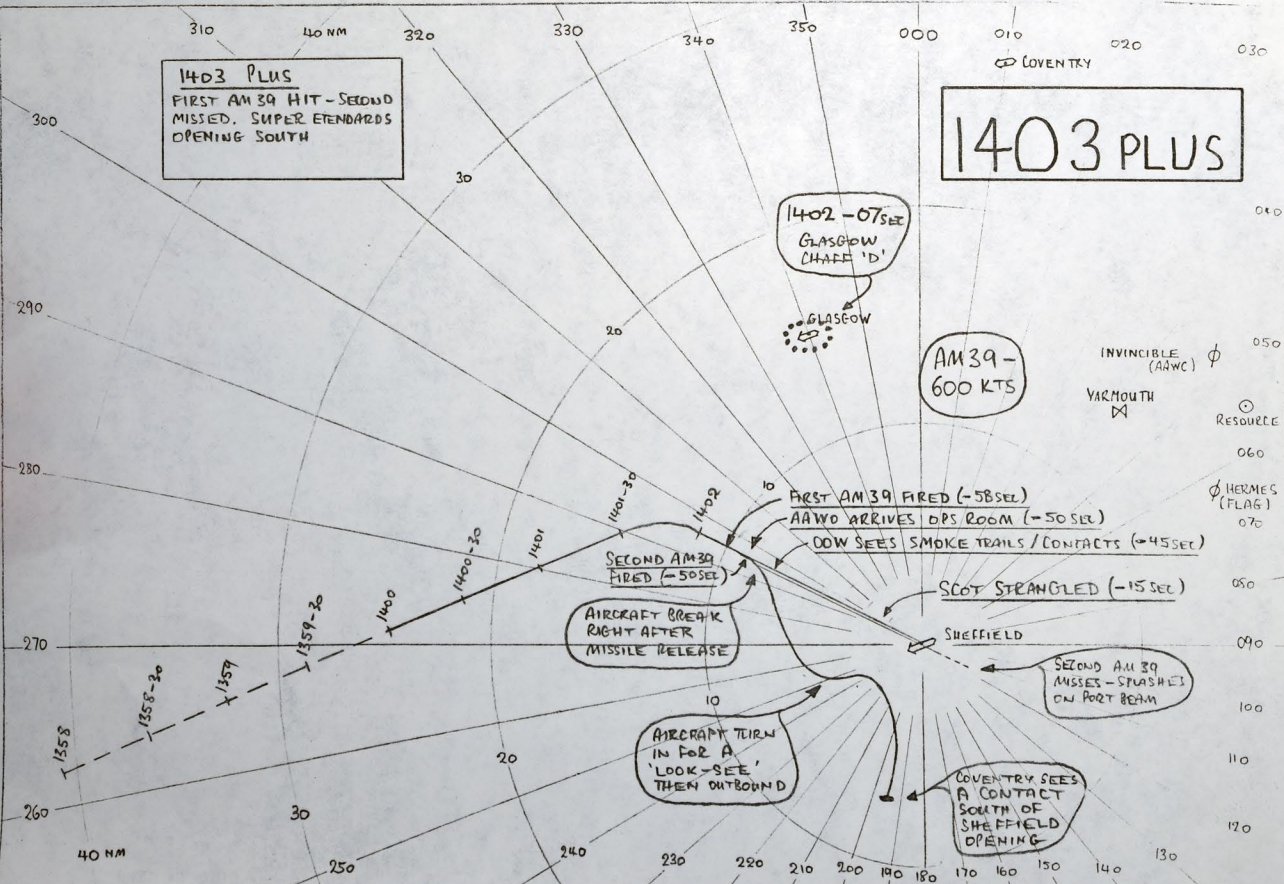
SCOT STRANGLER (-15 SEC)

SHEFFIELD

SECOND AM39 MISSES - SPLASHES ON PORT BEAM

AIRCRAFT TURN IN FOR A 'LOOK-SEE' THEN OUTBOUND

COVENTRY SEES A CONTACT SOUTH OF SHEFFIELD OPENING



UK EYES BRAVO

ATTACHMENT C TO ANNEX J

J6 - 1 UK EYES BRAVO



5

OTC LESSONS LEARNT

1. General. Two days after the attack on SHEFFIELD, CTG signalled the TG with the lessons learnt from the incident (1). The Board considered these lessons as a matter of urgency, found itself in broad agreement, and signalled CTG to this effect (2). All these points are covered in the body of the Report but the following brief comments are offered.

LESSON ONE. "UAA1 fitted DDGs acting as pickets must have SCOT strangled".

Comment. Agree. In future, OTCs need to make a policy statement covering SCOT transmissions and use of UAA1. If Intership HF RATT is in use it, rather than SCOT, should be used by SCOT fitted ships to clear inter Task Force traffic. Even the advent of UAA1 filters should not blind ships to the disadvantages of transmitting on SCOT.

LESSON TWO. "Tracks must be released immediately to Link 10".

Comment. Agree. In this incident, the delay in releasing GLASGOW's track to Link 10 was very short.

LESSON THREE. "Spurious radar contacts must not lull the senses or engender a feeling of well being through lack of collateral".

Comment. Agree. In war, better to assume the worst situation and react accordingly.

LESSON FOUR. "Beware of ignoring the advice of the ship in contact".

Comment. Agree. As the AAWC, one cannot afford to stand on dignity. Montgomery said: "It is upon the initiative of subordinates that the battle is finally won".

LESSON FIVE. "The SEA HARRIER does not have a satisfactory look down capability".

Comment. The need for AEW against the low flier became very obvious to the Board.

LESSON SIX. "Remember where the Falklands are - direct attack profile over sea from Argentinian mainland probably equals SUPER E".

Comment. In general terms, if in doubt, always assume the worst situation and react accordingly.

LESSON SEVEN. "Ample warning was in fact available for ASMD".

Comment. Agree. Have confidence in another ship's assessment and classification. Had SHEFFIELD been properly organised, she might have successfully fended off this very professional attack.

(1) CTG 19M 060414Z MAY 82.  
(2) CINCFLEET's AAA/19F Z5A 221253Z JUN 82.

LESSON EIGHT. "Too many airborne BLUE assets confuse picture - launching in response to a threat must be strictly controlled".

Comment. Agree. The need for continuous plotting of friendly assets cannot be over-emphasised.

LESSON NINE. "Beware of leaping to conclusions where ship is unexpectedly damaged. This and Lesson Three probably allowed second attack to approach unnoticed".

Comment. Agree. The Board has not examined the second attack.

LESSON TEN. "Assume the highest degree of AAW readiness possible in two watches when within SUPER E ROA".

Comment. Agree. In war, no-one is ever to leave his post. Once on watch, stay on watch.

LESSON ELEVEN. "AAWO/PWO must never leave Chaff DELTA Rocket Firing Panel unattended".

Comment. Agree. More personnel, ie APS, ORS, should be prepared to operate the panel, at the AAWO's or PWO's order, should the latter be involved with raids. Also, if in doubt, always deploy Chaff.

LESSON TWELVE. "Always be in Condition ZULU".

Comment. Condition ZULU, while being the obvious choice, does have major disadvantages. Movement of personnel proceeding to Action Stations is slower; door and hatch discipline will fall off the longer a ship remains in ZULU; ships should be allowed to implement a part ZULU, part YANKEE condition appropriate to their own internal organisation. Hard and fast rules can often cause frustration.

LESSON THIRTEEN. "Wearing AGR in smoke filled compartment provides life-saving seconds".

Comment. Agree. However beware of Carbon Monoxide poisoning. Re-entry to a smoke filled area wearing AGR is very risky indeed.

LESSON FOURTEEN. "These ETENDARDS appeared to spend between 10 minutes and possibly as much as 40 minutes finding their targets. We are not safe from ETENDARD attack anywhere in the TEZ".

Comment. Agree.

LESSON FIFTEEN. (Broad Conclusions).

Comment. Agree.

2. The Board is also in full agreement with CTG's further signalled lessons (3).

(3) CTG's AAA/19F/19M 071430Z MAY 82.