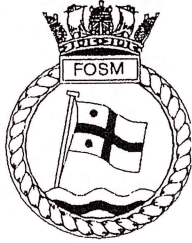


D/FOSM/X/5200/25

unclass/NPM



Flag Officer Submarines
Eastbury Park
Northwood
MIDDLESEX
HA6 3HP

MOD: xxxxxxxxxxxx
BT: xxxxxxxxxxxx
Fax: xxxxxxxxxxxx

The President and Members
of the Naval Board of Inquiry
To Be Convened on 28 November 2000

21 November 2000

BOARD OF INQUIRY - INSTRUCTIONS

References:

- A. QRRN Chapter 57.
- B. QRRN Chapter 45.
- C. The Yellow Guide.

1. You are to assemble at 0830 on 28 November 2000 as a Board of Inquiry whereof
 xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx, is to be the President, and hold a careful investigation into the
 circumstances surrounding the grounding of HMS TRIUMPH on 19 November 2000. The
 members of the Board of Inquiry are to be xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.
 xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx. You should draw appropriate, logical conclusions and make
 necessary recommendations. (538)
(540)
(544)

2. You are to call before you such witnesses as are necessary to enable you to conduct a full
 inquiry. Recommendations should be put forward, if appropriate, which might prevent similar
 occurrences in the future. You are directed to investigate in detail all aspects of the submarine's
 navigation plan and all documents, including charts, that were in use. Your Inquiry should
 include, but by no means be limited to, a review of the following:

- a. Extract of Fixing Log
- b. Original Chart
- c. Original Rough Chronological narrative
- d. Big Brother Tape
- e. Little Sister tape
- f. SNAPS tape
- g. Ship's Log
- h. CO's/DCO's Orders

You are to ensure that all relevant matters that come to your attention during the course of your
Inquiry are fully covered.

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*Ships Manager
+ Fleet System
Processes*

3. The Inquiry is to be conducted in accordance with the directions contained within the References. If you require any further advice you should contact ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~ ~~XXXXXXXXXXXXXXXXXXXX~~ FOSM on extension ~~(XXXXXX)~~

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(544)

4. The report of the Board is to be accompanied by minutes of the evidence taken. The questions in the minutes are to be numbered consecutively and the name and rank, rating or title of each witness are to appear at the head of each page of his evidence. The report and minutes are to be signed by the members of the Board and are to be in triplicate.

5. Recording/audio typing equipment and typing and secretarial support will be made available by the Captain Second Submarine Squadron to be used at the President's discretion.

~~XXXXXXXXXXXXXXXXXXXX~~
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~~XXXXXXXXXXXXXXXXXXXX~~

~~XXXXXXXXXXXXXXXXXXXX~~

RAdm

FLAG OFFICER
~~XXXXXXXXXXXX~~
24 NOV 2000
SUBMARINES

Information:

CINCFLEET
Captain Second Submarine Squadron
The Commanding Officer HMS TRIUMPH

4

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The Captain (SM)
First Submarine Squadron
Belmore House
HM Naval Base Clyde
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G84 8HL

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SM 520/03

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1 December 2000

Sir

BOARD OF INQUIRY – GROUNDING OF HMS TRIUMPH ON 19 NOVEMBER 2000

References:

- A. QRRN Chapters 8, 19, 23, 45 and 57.
- B. SGM Section 7 (Control Room Watchkeeping Officers)/para 0320 (SMCC Responsibilities).
- C. Guide to the Conduct of Boards of Inquiry (The Yellow Guide).
- D. D/FOSM/X/5200/25 dated 21 November 2000 (BOI Instructions).
- E. FOSM LAL 221130Z NOV 00 (BOI Records).
- F. The Submarine Navigation Manual (SMP 7).
- G. Command Tactical Guidance S&T Class (SMP 407).
- H. Trafalgar Class Ship's Standing Orders.
- I. BR 45(3).
- J. BR 8675(2) (SNAPS Operating Information).
- K. BR 8768(2) (NATO SINS Operator Instructions and Checks).
- L. HMS TRIUMPH LGH/WBF/WBB 211250Z OCT 00 (OPDEF X3/X6 Officers).

1. We have the honour to submit the report of our Inquiry into the grounding of HMS TRIUMPH on 19 November 2000.

INTRODUCTION

2. After her return to Devonport from a five month deployment on 27 Oct 00, TRIUMPH was reprogrammed to conduct SMCC 2/00, ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~ ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~ ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~ ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~ ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

(S26)

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She therefore sailed again for FOST running with the SMCC embarked on 7 Nov 00. Due to the compound effects of previous programme changes and the impact on her personnel, she landed some 30% of the Ship's Company, who were replaced by Trafalgar Class qualified personnel from other submarines.

1.14, 1.15

NARRATIVE (ZULU time throughout)

3. On 19 Nov 00, TRIUMPH completed a SUBTACEX with USS TOLEDO in the NFXAs and, from 0748, commenced a 22 knot transit towards the North Channel. The submarine had last taken a navigational fix at 182332; this was a good GPS fix which indicated that NATO SINS was accurate and which fell within 0.5nm of the SNAPS CP(IC) position. Shortly after completion of the SUBTACEX, at around 0830, ~~xxx~~ SMCC ~~xxxxxxxxxxxxxxxx~~ handed Conduct back to TRIUMPH's ~~xxxx~~ ~~xxxxxx~~ ~~xxxxxxxx~~. Shortly after this, at around 0900, the Duty Commanding Officer (DCO), ~~xxxxxxxxxxxxxxxx~~ handed over to his relief, ~~xxxxxxxxxxxxxxxx~~. The watch had changed at around 0700; officers of the oncoming Control Room watch were as follows:

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(540)
(544)

1.19, Encl 6

1.4
8.8
2.12

a. OOW - ~~xxxxxxxxxxxxxxxx~~ (newly AWC qualified, but at the time without BSO or TWS qualifications; joined TRIUMPH 16 Oct 00).

1.14, 4.9

b. 2OOW ~~xxxxxxxxxxxxxxxx~~ in HMS TURBULENT, in which he had spent under two weeks at sea. Onboard as temporary relief for ~~xxxxxxxxxxxxxxxx~~ he joined 36 hours before sailing. He had completed IWC some two years before and since then an appointment ~~xxxxxxxxxxxxxxxx~~.

1.14

c. ~~xxxxxxxxxxxxxxxx~~ - Warfare Officer Part III trainee (loaned from HMS TURBULENT).

d. ~~xxxxxxxxxxxxxxxx~~ - Supply Officer Part III trainee (stood down for most of the watch).

e. ~~xxxxxxxxxxxxxxxx~~ - WEO (an experienced officer, but only in the Control Room for SCOOW watchkeeping, alternating with ~~xxxxxxxxxxxxxxxx~~).

3.1

4. The outgoing DCO had considered the approach to the continental shelf and had given orders to the oncoming OOW about coming shallow and slowing down as the shelf was approached. These orders were written on the bottom contour chart in use (F6817). Knowing that the ~~xxx~~ would review the approach to the shelf with the oncoming ~~xxxxxxxxxxxxxxxx~~ played no further part in the Control Room from when he relinquished Conduct until after the grounding. The periodic orders for the period contained instructions to run the 778 and 780 "continuously as approach the continental shelf". In the DCO section of these orders, an instruction was given to "run the 780 continuously from 5nm to the 200m line".

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(540)
(544)

4.32, 4.43
8.9
8.12
Encl 2
Encl 2

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5. At around 0945, the xxx and OOW discussed the approach to the shelf. 1.20, 2.14
 Concern regarding the poor weather experienced over the previous few days led them
 to consider an approach which was deep and fast for as long as possible. This would 1.2C
 allow a more manageable SOA following surfacing, once over the shelf, for the
 inward transit to recover the towed array before proceeding to Faslane for Special (S38)
 Forces dry drills. Realising that this decision should also involve the 'xxxx' the (S40)
 oncoming duty student, xxxxxxxx was brought into the discussion. As a result of (S44)
 this discussion, the previous plan was amended to allow more time deep and fast; this
 altered the position of the depth change to 100m from the 400 fathom to the 300 2.20, 4.70
 fathom line. Pencilled annotations on Chart F6817 were amended accordingly and
 previous instructions erased. On completion, both the 'xxx' and 'xxxx' departed the 2.21, 4.35
 Control Room until shortly after the grounding. 2.32

6. Both the 'xxx' and 'xxxx' believed their subsequent instructions to the OOW
 were clear and had been understood. Whilst they had no reason to doubt navigational
 accuracy, they believed that the revised orders allowed ample scope for any (S38)
 navigational errors. These instructions involved changing depth and slowing down in (S40)
 two stages, calling the 'xxxx' and running the 780 Echo Sounder continuously from (S44)
 some time before reaching the 200m contour. The 'xxxx' also gave verbal instructions
 to take "regular" snap soundings both to check longitude and for training. Periodic
 Orders permitted free use of the echo sounders. The OOW understood that the new
 instructions permitted use of the echo sounders for snap soundings, replacing any
 requirement for continuous transmissions. The 2OOW, meanwhile, believed that 2.35
 continuous soundings were still required as previously directed and understood that
 the requirement for snap soundings was more for the training benefit of 'xxxxxxxxxxx' Encl 2
 rather than solely for navigational purposes. 4.68
 6.43
 Encl 14, 7.43

7. On the chart table, the CP(IC) mode was selected on SNAPS and a manual EP
 was generated in the DR position. Considerable uncertainty remains over the
 generation of DR and EP, compounded by confusion onboard over the SNAPS
 CP(IC) mode; both these aspects are discussed later. At 0953 an alteration to 054
 was made to range a contact, before paralleling the planned track again. Although no
 records whatsoever were submitted to support any use of the echo sounders (S38)
 throughout the watch, the 2OOW, instructing 'xxxxxxxxxxx', took three snap soundings (S40)
 on the 778, probably shortly after 1000. The 'xxxx' on hearing these soundings, (S44)
 rebuked the 2OOW for transmitting more than once, indicating that this was not good
 submarine practice. One sounding was achieved, reportedly somewhat shallower
 than expected. This was not used to update the navigational position and the 2OOW
 could not relate the sounding to an exact time. Meanwhile, the OOW remembers that
 he believed the sounding was inside the 1 nm POE centred on the CP(IC) position. Encl 1
 This sounding was not recorded or reported to the 'xxxx' or 'xxx'. Encl 4

8. At about 1030, or shortly thereafter, verbal evidence revealed that the 780
 echo sounder was run. No sounding was achieved, although heavy reverberations 4.115, 6.106
 were apparent. It appears very likely that the 780 was on the wrong scale to display
 the echo trace, either through incorrect application of keel depth, incorrect evaluation
 of expected depth, or a combination of the two. At around the same time, the leading
 edge of the POE was apparently approaching the pencilled chart annotation for

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coming shallow. The OOW stated that he felt concern at this stage and was about to order Ship Control to change depth. Neither the ~~xxx~~ or ~~xxxx~~ were consulted, nor were they in the Control Room during this period. 4.115

9. At 1035, before the OOW ordered any change in depth, TRIUMPH grounded whilst proceeding at 22 knots and 200m. Indications of this grounding were noise, reported variously as rumbling and air-type sounds, together with a slight bow-up angle. The SCOOW ~~xxxxxxxxxx~~ ~~xxx~~ and planesman ~~(xxxxxxxxxxxx)~~ reacted swiftly and positively; the planesman took planes in manual and applied rise, whilst the SCOOW reduced speed using astern propulsion. Emergency Stations was piped on the basis of the unexplained noise. At this stage both the OOW and 2OOW suspected grounding and the OOW recalls ordering a shallow pitch angle. Within 20 seconds of the initial indications of grounding, the ~~xxx~~ arrived in the Control Room and ordered Main Ballast to be blown in normal. ~~xxxxxxxxxx~~ on arrival in the Control Room shortly afterwards, noted that the 780 echo sounder was running on the 400-600m range scale. TRIUMPH surfaced in a safe, controlled fashion. A GPS fix taken after surfacing put TRIUMPH just under 3 nm to the East of the CP(IC) position, thus confirming the grounding. 1.60
(538) 9.32
(540)
(544) 4.115
1.62
8.18

DISCUSSION - COMMAND AND MANAGEMENT

10. Command and Conduct. It is considered that the procedures and responsibilities for Command, Conduct and Charge were well understood by all personnel and there was no confusion which could have contributed to the incident. Ref B

11. Ship's Company Dilution. In the Board's opinion, considerable risk was taken in diluting the Ship's Company in order to manage leave, appointing, drafting and morale in TRIUMPH. Whilst the ~~xxx~~ accepts full responsibility for this initiative and was not subject to direct pressure from any superior authority, this was clearly a questionable step, particularly in view of the demanding operations inherent in SMCC running. The initial period of FOST running was described as chaotic, until teamwork had been established. Notwithstanding the risk mitigation in having SMCC onboard to check that appropriate standards were being achieved and the ~~xxxx~~ insistence that all reliefs should be suitably qualified, the inexperience of the Control Room Watchkeeping Officers at the time of grounding must be viewed as a contributory factor. The temporary ~~xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~ shouldered an extremely high workload in preparing both pilotage and operational plans from scratch, whilst having little or no time to absorb his responsibilities or to become aware of the capabilities of navigation systems onboard. It is noted that TRIUMPH had already sent an OPDEF, before returning from her deployment, relating to the fact that both X3 and X6 billets had been relieved by Officers who were not BSQ(T) qualified (Reference L). This cites "significantly reduced Control Room experience", even before the decision was made to dilute the Ship's Company further. 10.2, 10.3
1.15
(538)
(540) 10.5
(544) 6.131, 6.132

16. In addition to this unknown and unidentifiable bias, the CP(IC) position can also be significantly affected by a number of other factors. The extent and nature of the effects of these factors are currently unknown. Examples of these factors are:

- a. The reference datums used by SINS, SNAPS, GPS and the chart.
- b. The log error in use in SNAPS (default 5%).
- c. The incorrect acceptance or injection of drift.
- d. The incorrect injection of tidal stream.

Because of the above potential error factors and the method of formulation of the CP(IC) position, with check fix periodicity greater than 4 hourly, its use as an accurate representation of the submarine's position must be questioned. The reliance on the SNAPS CP(IC) by all levels of the Command chain shows a basic misunderstanding of the information being displayed on the chart table. Each witness expressed dissatisfaction with the level and ambiguous nature of the guidance on SNAPS, views that are shared by the Board.

3.15

17. From examination of the data recorded onto the SNAPS magnetic recording tape, the system onboard TRIUMPH reverted from the CP(IC) mode to CP(EP) mode on several occasions prior to the incident. The printouts indicate that the system was reset each time to CP(IC). The positional printout gives CP(IC) positions, course, speed, depth and tidal information each minute; it is believed that the tidal information is misnamed and actually represents the range and bearing of the SNAPS derived EP position at that time. Reading the information would indicate that SNAPS was operating correctly by alarming and reverting to the EP mode each time the discrepancy exceeded the programmed limits. When the system was returned to the CP(IC) mode of operation, the differential between CP(IC) and EP was, as a matter of course, accepted. If the continual reversion of SNAPS to CP(EP) mode had been investigated by the Command team, then the positional discrepancy could have been discovered prior to the incident.

18. It was understood by the Command and the maintainers, but not by the OOW orxxxx that the AGILOG fitted to TRIUMPH under-read the submarine's true speed by approximately 10% at speeds above 10 knots. SNAPS should therefore have had the system log error manually amended from the default setting of 5% to 10% every time the submarine's increased above 10 knots.

1.39, 1.40
2.5, 3.26
Encl 3

19. On surfacing at 191042, the resultant error between the GPS position (5551.69N 009 13.07W datum unknown) and the displayed CP(IC) position (55 52.7N 009 17.8W datum unknown) was 290 degrees at 2.9 nm (when plotted with no datum shift applied on Chart F 6817). The accuracy of the NATO SINS IC position could not be verified at the same time due to the poor state of the records. Although the precise error within SNAPS, that led to the positional error experienced by TRIUMPH, can not be positively identified, the resultant discrepancy is not considered excessive, given the 10% log error for the 3 hour transit in excess of 10 knots and the other potential sources of error. It is also believed that SNAPS was operating correctly in that it repeatedly alarmed and defaulted to CP(EP) mode prior to the incident.

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20. Pool of Errors. Reference F Para 0750 states that each NATO SINS system should have a position keeping performance of better than 1.3 miles in 30 hours. Para 0752 states that the Pool of Errors (POE) should be estimated on equipment performance and history. The POE has been widely adopted as a 1nm circle around the IC position and it was this POE that the OOW and ~~xxxx~~ applied to the SNAPS CP(IC) position. As previously argued, the SNAPS CP(IC) position is not the NATO SINS IC position and the use of a static 1nm POE around this point was incorrect and failed to take into account the log and other errors inherent in the position.

21. Use of Echo Sounders. The correct use of echo sounders, as intended by the Command, as TRIUMPH approached the continental shelf would have alerted the ~~xxxx~~ and OOW to the proximity of the 200m contour. The running of either echo sounder would also have provided a check on the positional information being presented on the chart table. The failure to continually run either echo sounder was a major contributory factor to the incident.

Encl 8

22. Chart Work. The chart work was of a poor standard with records being insufficient for a true and precise record of the submarine's track to be reconstructed. The lack of any coherent DR and EP accounting for the easterly ocean current of 1/2 - 1 knot, in accordance with the West Coast of Scotland Pilot (NP 66), was a contributing factor to the incident.

CONCLUSIONS

23. The Board conclude that:

a. HMS TRIUMPH ran aground in 200m of water at 1035 on 19 Nov 00, in the vicinity of 55 51.69N 009 13.07W, as indicated by a GPS fix taken 7 minutes later, after surfacing. The grounding was caused by poor navigation. Contributory factors included a widespread misunderstanding of SNAPS operation and poor chartwork.

Para 9, Para 15

b. Current Command guidance on navigation equipment, particularly SINS and SNAPS, is confusing and inadequate.

Para 16

c. The Command Team was not aggressive enough in addressing known problems in Command Guidance on SNAPS and perceived AGILOG inaccuracy at high speed.

d. The ~~xxxxxxxxxxxxxxxxxxxx~~ decided to alter the original plan for the dived transit towards the continental shelf by electing to remain deep and fast for longer in order to reduce the subsequent surfaced SOA. ~~xxxxxxxxxxxxxxxxxxxx~~ ~~xxxxxxx~~ and imposed an increased risk on the safety of the submarine when the previous navigational fix was some 9 hours old.

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e. On completion of the SUBTACEX at 190800, there appears to have been some Command relaxation in supervision of Control Room activities.

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d. The operational sections of navigational equipment publications and SMP7 should be reviewed to give clear guidance on the capabilities of SNAPS and its relationship with all variants of SINS.

Para 231

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

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Lieutenant Commander Royal Navy

FLAG OFFICER
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Commander Royal Navy

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Captain Royal Navy

Annexes:

- A. Index of Transcripts of Evidence from Witnesses.
- B. Transcript of Evidence from Witnesses.

Enclosures:

- 1. HMS TRIUMPH's 520 dated 23 Nov 00 (and enclosure thereto).
- 2. CO's Periodic Orders 181900z - 191900z Nov 00.
- 3. WE Department Night Orders for 18 Nov 00.
- 4. Photocopy of Control Room log 18 and 19 Nov 00.
- 5. Photocopy of Fixing Log Sheets 159 - 166.
- 6. Photocopy of NATO SINS Fixing Log.
- 7. Tracing of chart F6817.
- 8. Chart F6817.
- 9. DCB Tape. *Held in registry*

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- 10. SNAPS.
- 11. Wordsafe Tape.
- 12. Little Sister Tape.
- 13. Original narrative.
- 14. Lt Tabberer Initial Thoughts.
- 15. Machinery Order Log Sheet.
- 16. SNAPS Tape Positioning Information.
- 17. SNAPS Recording Log.

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