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14th April 1986

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De Turing,

ADMIRAL HILL-NORTON'S REPORT ON WARSHIP DESIGN

Thank you for your letter of 1st April 1986 asking for more information about Mr Bryars' report.

I enclose a copy of the report, which deals with the non-technical issues. The small number of points which Mr Bryars left over for further investigation have all been followed up satisfactorily.

The Policy Unit papers also touch on technical matters; so far as these are concerned, we are waiting to see how they are presented in Admiral Hill-Norton's report before completing the detailed commentary we already have in hand.

*Professor Grypitts,
We spoke. You will
want to note the conclusions. I
find it difficult to judge
the evidence.*

*Yours sincerely
John Howe*

(J F HOWE)

*N. L. W
18.4.*

Timothy Flesher Esq
10 Downing Street

Handwritten text, possibly a signature or address, is visible in the center of the page. The text is faint and difficult to decipher, but appears to be written in Cyrillic script.



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M. K. P.

10 DOWNING STREET

NLW

As agreed on the telephone, my instruction, like yours is to refer to MOD - rather than prolong a technical debate which neither of us are qualified for - and wait for H-N's report which hopefully will be leg down.

PK

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10 DOWNING STREET

From the Principal Private Secretary

21 April 1986

ADMIRAL HILL-NORTON'S REPORT ON WARSHIP DESIGN

Thank you for your letter of 14 April with which you enclosed a copy of Mr. Bryars' report on the MOD and Thornycroft Giles. We have noted that Mr. Bryars has concluded that the Departments' assessment of the S90 proposal was fair and comprehensive and that there is no evidence to prove improper involvement of the MOD in the development of the HKPC design.

X I note, too, that Mr. Bryars believes that some of these matters may be raised in the Hill-Norton report, and I should be grateful if you would keep us in touch with all developments on that report.

N. L. Wicks

John Howe, Esq.,
Ministry of Defence.

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PUSNW
7-THE MOD AND THORNYCROFT GILES

My report is attached. There are, I fear, one or two loose ends which I have not been able to tie up in the time available. Subject to these, I offer the judgement that the Departments' assessment of the S90 proposal was fair and comprehensive and that there is no evidence to prove improper involvement of the MOD in the development of the HKPC design.

2. The records on both these topics are, I fear, of formidable dimensions. There has also been an extensive professional correspondence over the years between Warship Department, Mr Giles, British Shipbuilders and others on the Osprey issue, part of which I have not seen and part of which I have only been able to skim. There may thus be evidence which I have not unearthed and which a more prolonged study would have brought to the surface. But, if forced, I think I would hazard the guess that, some surprising disclosure apart, further reading would not change my basic conclusions.

3. Copies of the two Annexes are held by Mr Cox of Warship Department in Bath. But the attached is the only copy of my covering report. In it, in the hope that it will help handling, I have not referred specifically to the No 10 dossier, many of whose criticisms may of course be reported more openly in the Hill-Norton report.

4. On the subject of handling, I am conscious that my report may not be particularly well timed. It precedes the Hill-Norton report and C of N has asked Warship Department for a line by line commentary on the No 10 dossier (except for the breach of copyright section) which should be available in 10 days time or so. This will, of course, cover the technical as well as the procedural aspects and may shed a little more light on the latter.

5. The position of Professor Rawson will, I believe, need consideration. I had a useful discussion with him (on which I could expand orally) and was able to cover many of the points in the No 10 dossier because they had also come up in the meetings which Mr Giles' lawyers have had with him in connection with the High Court case. But I thought it right not to disclose to Professor Rawson either the existence of the No 10 dossier or the No 10 visit to Bath. Rawson would, I believe, take the gravest exception to the former; and if the contents of the dossier are reproduced in the Hill-Norton report in anything like the same personalised terms, I would not be surprised if he felt it necessary to consider his position. He is already very much upset by the whole Giles business, which he feels has blighted 10 years of his life.

6. I ought also to draw attention to sub para d. on page 2 of Professor Rawson's letter of 11th February 1986 in the folder. I could say a little more about this, if needed.

J D Bryars

J D BRYARS
28 February 1986

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PUS

THE DESIGN FOR THE HONG KONG PATROL CRAFT AND THE
S90 PROPOSAL OF THORNYCROFT GILES AND ASSOCIATES

I have now completed the inquiry which you asked me to make into these two matters (my terms of reference are reproduced below). My report consists of this minute and its accompanying Annexes. Copies of some relevant papers, not all to be found readily in the main Departmental records, are contained in the accompanying folder. My conclusions are given in paragraphs 25-27 and 40.

2. My work has been done mainly within the Warship Department in Bath. There and elsewhere I have been given free access to papers and records (which are voluminous) and afforded every assistance, for which I am grateful. I have consulted Departmental records, and within Warship Department, as widely as I could within the time available. But I am conscious that there exist papers, in particular Private Office records and a very copious professional correspondence extending over many years, not only with Mr Giles, about the Osprey-type design and the tests done of it, which I have not had time to read, at least in full. I should also add that, in recording my views, I have sought to avoid technical judgements, which I am not competent to make.

3. My thanks are due in particular to Mr J Cox AD/WS for the help he has given me.

The design for the Hong Kong Patrol Craft

General

4. I was asked "to inquire into the involvement, if any, of the MOD in the development by British Shipbuilders of the design for the Hong Kong patrol craft". The background is the claim by Osprey Ltd in the High Court that in designing the hull form for the Hong Kong Patrol Craft (HKPC)(the Peacock class), British Shipbuilders (BS) used information derived from

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tests which they admit to have carried out unlawfully on a model of the Osprey design, and a separate suggestion, not at present the subject of legal action, that the MOD may have been implicated in this unlawful testing.

5. To set the matter in context a narrative of main events in the development of the design of the HKPC is enclosed at Annex A. Attention may be drawn to the following points:

- a. A design and build contract was decided upon at an early stage as the appropriate method of procuring the HKPC (para 2). Development of the design, including the hull form, was thus to be the responsibility of the shipbuilder, though subject to monitoring by the MOD (para 6). The MOD's requirements were stated in a Procurement Specification but this said little about hull design (para 6).
- b. Steps were taken by MOD to involve a range of UK firms in a study of "craft options" and in the competition for the order, including the designers of Osprey (paras 1, 3 and 4). But the two shipbuilders associated with the Osprey designers were among those who eventually withdrew (para 5).
- c. As regards hull design, Hall Russell (HR), the shipbuilder who eventually won the competition, submitted two lines plans, the first with their tender of 3rd November 1980 (para 7) and the second, described as substantially different, with their retender of 13th February 1981 (para 9). The second lines plan was said by the firm to have been developed in consultation with Vickers Shipbuilders Ship Model Experiment Tank (SMET) at St Albans, where a series of tests had been carried out over the preceding two months (para 10). After award of the contract, the MOD received reports on continuing model tests at SMET and monitored modifications in the lines plans (paras 14 and 15). But the final lines plan

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was basically that submitted with HR's retender (para 15).

6. From this it may be inferred that the MOD's involvement in British Shipbuilders' development of the design for the HKPC was limited to considering craft options; issuing the Procurement Specification with invitations to tender (though there was little reference in this to hull design); adjudicating upon tenders; and monitoring the development of the design by HR. But, because of the background described in paragraph 4 above, it is necessary to consider whether there is evidence either in the main Departmental records or elsewhere of MOD complicity in the Osprey model tests unlawfully carried out by BS and of the MOD thus knowingly benefitting from the alleged use of these tests to assist HR in designing the HKPC.

Specific criticisms

7. In the 'further particulars' to Osprey Ltd's claim against BS it is said that in designing the hull form for the HKPC BS would have obtained great value from tests on Osprey and Azteca models done at BS SMET, St Albans (30) during the period January-April 1981 (16); that models for Hall Russell's tender for the HKPC contract, which were derived from old designs, were built between 24 December 1980 and 2 February 1981 (15) and tested at SMET at the same time as the Osprey and Azteca models (16) and that there was still no acceptable design for the hull form for the HKPC at about the end of February and in March 1981 (18). It is also said that further, different hull forms were tested at SMET between about July and September 1981, and that a final hull form was subsequently submitted to Hall Russell, whose tender, based on this final design, was submitted to the MOD in February 1982 (sic)(28). It is claimed that although the final hull form of the HKPC was not a copy of the [Osprey] lines plan, it nevertheless shared certain characteristics with the Osprey hull form and principally was capable of

See folder

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unconventionally high speed in relation to its length, beam and displacement (29). The value of the 'Osprey' tests to BS is described as residing in the information they provided; about the possibility of designing a hull form capable of meeting the HKPC tender requirements (and in a hull form having general Osprey characteristics); about measures of performance for different developments of models for the HKPC; and about correlation factors for vessels of the Osprey type which would have been of value in the designing and testing of the HKPC hull form (39).

8. If proven, these statements would show the MOD to have benefited from the use made by BS of their Osprey tests. But the complicity of the MOD in the tests turns on other more direct suggestions that have been made viz:

- a. that in November 1980 there were discussions between BS and the MOD, notably Mr Daniel and Mr Manderville on the one hand and Mr Rawson on the other, about the Osprey;
- b. that on 26 March 1981 Mr Rawson told BS that Mr Giles had found out that the Osprey tests were being conducted;
- c. that on Monday 13 April 1981 Mr Rawson wrote a letter to Mr Giles of Osprey Ltd displaying knowledge of an unlawful test carried out at BS Dumbarton on Saturday 11th April.
- d. that a phrase in an internal MOD document (a letter of 16 June 1982 from Controller to CER) viz "standard methodical series of resistance and seakeeping trials conducted on the Osprey in model and full scale" referred to the unlawful tests on Osprey conducted by BS at SMET St Albans;
- e. that the MOD may have paid BS for the unlawful Osprey tests done at St Albans.

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Comment

9. The statements about hull form contained in Osprey's writ (para 7 above) will require technical investigation but certain observations may be made.

10. First there is a formal assurance by BS that HR and Brooke Marine, the other contender in early 1981 for the HKPC contract, had no access to any copyright information concerning the Osprey design. In a letter of 8 May 1981 to Director of Contracts (Ships) Mr Daniel of British Shipbuilders said:

"You will recall that the responses to the Ministry's invitation to tender for the HKPC were returned on November 4th 1980. It is a matter of record that British Shipbuilders' Hydrodynamics tank at St Albans started to look at the characteristics of a wide beam form like OSPREY in December/January 1981.

You have formal assurance on behalf of British Shipbuilders that:

- a. What was known of the OSPREY design did not influence the designs proposed by British Shipbuilders
- b. Messrs Hall Russell and Messrs Brooke Marine had no access to any copyright information concerning the OSPREY design
- c. (On a point of accuracy) no writ has been served on British Shipbuilders at the present time."

11. Mr Daniels first paragraph somewhat reduces the force of his second since, as noted above, a substantially different hull form was submitted by HR with their retender of 13 February 1981 and model tests for HR continued after the date of his letter. But there are other comments that may be made.

12. First a statement about the 'parentage' of the revised hull design was contained in HR's retender (see Annex A para 10 on pages 11 and 12). This referred to "studies of the

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resistance of over six hundred fast warship forms including corvettes, frigates, destroyers and patrol boats of twenty seven navies". Among a list of nine "notable recent examples" the Azteca class (designed by Osprey Ltd) appears. But the use of the word "studies" rather than "tests" and the reference to twenty seven navies suggests that what HR had examined were data in the public domain rather than data derived from tank trials of the kind described as having been done unlawfully at St Albans (para 7 above, first sentence)

13. Second there is the evidence of a meeting held at SMET St Albans on 18 February 1982 to allow BS as Defendants in the case before the High Court to demonstrate to Osprey Ltd as the Plaintiffs the way in which the hull form of the HKPC had been derived. BS contended that, contrary to the Plaintiff's claim (para 7 above), the HKPC hull form was derived from two "parents" drawn from designs of the 1960's. An independent observer, Mr Silverleaf, invited by BS to attend the meeting, stated in his report (a copy of which was passed to the MOD by BS) that the explanation given by BS of the method and procedure used to design the hull form was complete and entirely clear; that he was fully satisfied that the HKPC hull form was derived entirely from the two "parents" claimed for it by BS by well established and commonly used design procedures and that the HKPC form differed radically in almost every significant design feature from the Osprey form as indicated by the model displayed at the meeting and by the drawing supplied by Osprey Ltd. I understand that the view that the characteristics of the two hull forms are different is one shared by the Sea Systems Controllerate.

See folder

14. Third there is the question of timing. The hull design of the HKPC was in essence fixed at the time of their retender in February 1981 (see para 5c above). No record has been found of any revised hull form submitted in February

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1982 (see para 7 above). Indeed I understand that after February 1981 the next lines drawing sent to the MOD (Drawing 314) was dated 6 July 1983. Unless the small changes made after February 1981 were highly significant it would seem at least open to question whether HR's hull design for the HKPC was any more dependent on the unlawful Osprey tests carried out by BS at the times claimed (January - April and July - September 1981) than the tests for hull forms to designs done for HR, also described as having been performed in the period January - April 1981 (see para 7 above).

15. Lastly there is the suggestion that the HKPC proved capable of unconventionally high speeds. It has been suggested elsewhere that the HKPC was 2-3 knots faster on trials than the tank tests had predicted, as had the Osprey and Azteca designs, and that this points to a similarity between them. The information I have been given is that the contract speed for the HKPC was exceeded by more than 1 knot only by the first ship of the class on the first of its two contractual speed trials, which was conducted in conditions not considered typical by the MOD, and that it would be fair to treat the contract speed and the speed achieved in tank tests as about the same.

see folder

16. The claims described in para 7 above will be for the High Court to decide, taking into account the relevant evidence including no doubt that referred to in paragraphs 10-15 above. But, as noted above, the question of MOD's complicity in the unlawful Osprey tests turns more directly on the criticisms listed in paragraph 8. These are discussed in turn below.

17. 8a. It has been suggested that Mr Manderville, the personal assistant of Mr Daniel, at BS wrote to Mr Rawson in MOD on 24 November 1980 as follows "at our meeting on Friday, you said you required certain information" The inference drawn from this and from an entry ("Osprey

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meeting at Bath") in Mr Daniel's diary is that the MOD were interested in TGA's designs. I have found a copy of a letter of 24 November 1980 from Mr Manderville to Mr Rawson but this reads rather differently viz "As promised at the meeting between yourself and Mr Daniel at your office last Friday, I attach the following documents". There follows a list of enclosures: first a letter of 23 October from Mr Daniel to Mr Rawson covering copies of two letters from Mr Giles, to Mr Atkinson and Mr Moor of BS, and a copy of a short note from Mr Moor to Mr Daniel: second a letter from Mr Giles to Mr Daniel: third various documents handed to Mr Daniel by Mr Giles: and fourth a report (EEL report No X/0/2843) which I believe to have been a report commissioned by Mr Giles. A copy of the letter and the first of its enclosures is on the attached folder. It is evident from this letter of 24 November that there were discussions between BS and the MOD about the Osprey design at around that time. But the terms of Mr Daniel's letter of 23 October suggest that the initiative may have come from BS rather than the MOD. Professor Rawson was not able to inform me of their content.

see folder

18. 8b I have not found evidence to support this statement.

19. 8c It is suggested that in a letter to Mr Giles dated Monday 13 April 1981, giving the results of his studies on certain aspects of the Osprey design, Mr Rawson used information which he had obtained of an unlawful test on an Osprey model done by BS Dumbarton during the preceding weekend. The evidence put forward in support of this suggestion is that in a graph attached to his letter Mr Rawson showed a resistance curve for the Osprey at 373 tonnes: no test of the Osprey designs had even been done at this tonnage but a test at 373 tons is said to have been done at Dumbarton on Saturday 11 April and it is suggested that Mr Rawson was given the results of this test over the telephone and may have assumed that 373 tonnes was intended. Mr Rawson has explained that in his letter of 13 April he was using Osprey data provided in earlier correspondence by Mr Giles himself. This did not include data at 373 tonnes but Mr Rawson has said that this was a standard tonnage used over many years for

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evaluating the Osprey design.

20. 8d The substance of the letter referred to is discussed elsewhere in this report (para 39 and Annex B para 11). The point at issue here is the suggestion that the only standard methodical series of tests ever done on the Osprey was the unlawful series of tests done at BS St Albans and that the letter accordingly indicates knowledge of the unlawful tests at a senior level in the MOD.

21. The letter was drafted for C of N in Ship Department, originally, I believe, by Mr Rawson; and the draft was submitted without lengthy explanation of its contents. The wording should not, therefore, I suggest, be taken as proof of any detailed knowledge on C of N's part of the tests referred to in it.

22. As regards the wording it has been suggested to me by Warship Department that this may have been misunderstood. Two quite separate references are thought to be in question: the first ("standard methodical series for resistance") being to a NPL report of 1969 "Design data for high speed displacement hull of round bilge form" on the resistance characteristics of a series of geometrically related models representing what was then good practice for 'fast round-bilge displacement type model hulls'; the second ("seakeeping trials conducted on the Osprey in model and full scale") being to data generally available. If this is so, the wording of the letter would not appear to bear any meaning relevant to the claims of Osprey Ltd in their case before the High Court.

23. 8e I have found no evidence to support this contention. A check is being made with the Contracts Departments of all contracts payments made to BS for services of this kind during the period in question, but the results are not yet available.

24. I believe that it is also relevant to note that in a recent letter to the Department reporting discussions which Osprey Ltd's solicitors have had with him about the case before

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the High Court, and at which some of the above points have been touched on, Professor Rawson has emphatically denied that he was given information about unlawful tests done by BS over the weekend 10-13 April 1981. He writes:

"There is no fragment of truth in this accusation"

and

"What I do know is that the point [in the graph attached to his letter of 13 April 1981 to Mr Giles] had nothing whatsoever to do with any activities within British Shipbuilders at St Albans or at Dumbarton and that at that time, nor indeed since, have I had knowledge of the results of the illicit trials admitted by Mr Moor. Nor do I believe that any member of my staff even had such information".

see folder

Conclusion

25. My first conclusion is that there was MOD involvement in the development by British Shipbuilders of the design for the Hong Kong patrol craft to the extent which is usual for "design and build" shipbuilding contracts (para 6 above).

26. Beyond this there is the question of MOD complicity in the unlawful Osprey tests carried out by BS. Comparison of the stages of development of the hull design of the HKPC by the shipbuilder (HR) with the timing assigned by Osprey Ltd to the unlawful Osprey tests by BS suggests that such complicity is at least open to question (para 14 above).

Undoubtedly there were discussions between BS and the MOD late in 1980, and no doubt at other times, about the Osprey design but these do not appear to me to amount to proof of collusion in the unlawful tests (para 17 above). Innocent explanations have been put forward of two other specific criticisms (paras 19 and 20-22 above) which I suggest may be accepted provisionally but which I suggest should be examined further (particularly the point about 373 tonnes). I have found no evidence to support two other specific criticisms (paras 18 and 23 above) but the question of payments to BS is still being investigated. I believe that full weight should be given to the statements about the parentage of the HKPC

hull form made by the shipbuilder (HR)(para 12 above) and by BS and the independent observer Mr Silverleaf (para 13 above) as to the assurance given by BS (para 10 above) and the statements made by Professor Rawson (para 24 above).

27. My second conclusion is, therefore, that, subject to further investigation of the points noted above, no evidence has been put forward which proves MOD complicity in the unlawful Osprey tests carried out by BS.

The S90 Proposal

General

28. I was asked, in the light of the conclusions of the first part of my inquiry "to examine the method of assessment by the MOD of the S90 proposal as a possible solution to the RN staff requirement for an ASW Frigate, from the statement of the outline staff target in early 1981 to the announcement of the Type 23 design decision in October 1983; and to consider whether this assessment was fair and comprehensive". This examination had been made necessary by suggestions that the MOD's rejection of the S90 design may have been improper and the reasons for it unsound.

29. Once more, a narrative of main events is enclosed, at Annex B. The following points may be noted.

- a. From the outset of the Type 23 frigate project, there was strong pressure to contain the costs of the ship: with this object, commercial designs were examined, YARD was commissioned to produce a cheaper design to meet the NSR and cost sharing and international collaboration were explored. On the other hand the Type 23 was conceived from the start as a "long thin" ship: a "shortfat" design appears not to have been formally considered. This suggests a settled conviction in the MOD that the demands of effectiveness and economy would be best met by the traditional "long thin" frigate design, despite known claims of the cheapness of the "short fat" hull (paras 1-4).

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- b. A "short fat" S90 design for the Type 23 was suggested by Thornycroft Giles and Associates (TGA) in April 1982 at a meeting between Mr Giles and C of N. Although the Type 23 programme was then well advanced, TGA were not discouraged from making a documented proposal and Mr Giles was provided though at a late stage, with a copy of the NSR (a fuller version than normally supplied to industry) (paras 5 and 9)
- c. The S90 proposal, put forward initially by TGA in May 1982, was studied by the MOD in the period May-July 1982. TGA were given an opportunity to provide a "validation" of their proposal. To fit in with the Type 23 timetable TGA were asked to produce this by January 1983; but the MOD accepted a slippage until late May 1983, despite growing misgivings on the part of C of N about the wisdom of allowing the validation to proceed. TGA's validation report was studied separately and independently by the MOD and YARD in the period May-July 1983. The results of a further separate and independent study, by the DSAC of the S90 design philosophy, became available at the same time. None of these MOD YARD/DSAC studies in 1982 or 1983 concluded in favour of the S90 proposal. (paras 7, 16, 19, 20 in particular)
- d. During this period, and in the final run up to the decision on the design of the Type 23, TGA were given a number of opportunities to present and explain their ideas eg at technical meetings with the MOD in July 1982 (para 19), June 1983 (para 19a) and September 1983 (para 28): to the Hull Committee of the DSAC in March 1983 (para 21); to YARD in June 1983 (para 19d); at a meeting with C of N, the Chairman of the Marine Technology Board of the DSAC and the Managing Director of YARD in July 1983 (para 25); and at meetings with US of S(DP) and his advisers in July 1982 (para 15) and September 1983 (paras 29-31). In order to assist discussion, TGA

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were offered copies of the YARD and Hull Committee reports. Written representations from Mr Giles were also received by Ship Department of the MOD, by C of N, by YARD and by US of S(DP) during this period.

- e. Departmental consideration of the S90 proposal was given at Ministerial and senior official level both in 1982 and in 1983. The lead was taken by US of S(DP) and C of N: but the Secretary of State and Minister(DP), CSA and VCNS also took part.

30. From the sequence of events it is difficult to reach any other conclusion than that TGA were given ample opportunity, as well as more time than could comfortably be accommodated in the Type 23 development programme, to present, discuss and validate their S90 proposal. It is also evident that the amount of time and staff effort assigned by the MOD at all levels, including Ministerial and senior official levels, to assessing the proposal was considerable: and this deployment of effort was made despite long held and strong professional reservations within the Ship Department of the MOD about the suitability of the "short fat" design for ships of frigate size. Nor is it easy to see any procedural deficiency in the Departments' assessment. Indeed it may be noted that steps were deliberately taken to arrange a separate and independent review of the S90 proposal by YARD and to encourage a similar review by the DSAC; the eventual decision on the Type 23 design was taken on the basis of a broad identity of view between the 3 independent studies conducted by the MOD, YARD and the DSAC. The records point to occasions on which Mr Giles acknowledges that he had been given a fair hearing (Annex B paras 10 and 25), though at other times he was critical (Annex B paras 30 and 33).

Specific criticisms

31. However, specific criticisms have been made of the MOD's assessment and these must be considered. Criticisms which amount to a different technical evaluation of the S90 proposal will call for a professional view. Other criticisms may be summarised as follows:-

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- a. The report of the Hull Committee of the DSAC was produced without the prior knowledge of TGA so that TGA had no opportunity to make representations before it was sent to Ministers.
- b. The Hull Committee's report was produced on the basis of data which the Committee knew to be incomplete and outdated, even though a summary validation report containing full and up to date information from tank tests had been made available to it. The report relied solely on incomplete data supplied by Mr Giles in his paper of 10 March.
- c. The Hull Committee's report was critical of matters upon which the designers had not been asked to supply information, eg weapon fit; noise attenuation; the need for clean conditions, nuclear, chemical and biological defence; vulnerability to fire and smoke; and the need to apply shock standards.
- d. The Hull Committee's report contained a statement that "a vessel of the size of the S90 will not gain any benefit from a hydrodynamic lift at the operational speeds that are required". This was based on an erroneous view held by Mr Rawson, Chief Naval Architect in the MOD at the time, which had been disclosed by him in correspondence with Mr Giles in April 1981 and was not subsequently corrected by him.
- e. During their validation TGA might not have been given adequate access to all MOD information and might not have been kept adequately informed of changes in the NSR (Annex B para 30).
- f. TGA had not been given enough time to study the YARD report on the validation: discussion of important points had been cut short at the final technical meeting on 16 September 1983 and YARD figures circulated at that meeting had been misleading (Annex B para 33).

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Comment

32. On 31a It would be surprising if Mr Giles thought anything other than that the Hull Committee would report their views on his ideas. As regards timing it is the case that the Hull Committee's report was sent to Minister(DP) by CSA on 7 July 1983 ie before TGA were given a presentation on the Hull Committee's report at their meeting with C of N on 18 July. On the other hand the report was submitted by CSA only as one judgement to be taken into account by Ministers together with other assessments presented to them. C of N's final submission was made to US of S(DP) on 19 July after his meeting with TGA and US of S(DP)'s decision, which took into account all the information and appraisals available to him, was not made until after the further meetings with TGA on 16 September 1983. At C of N's meeting on 18 July Mr Giles was offered a copy of the Hull Committee's report. I have found no conclusive evidence that Mr Giles actually received a copy but the knowledge of its contents displayed by critics suggests that he did. At US of S(DP)'s meeting with TGA on 16 September 1983 the Chairman of the Hull Committee was present and explained his report but Mr Giles is not recorded as taking the opportunity to dispute its findings in any very specific terms.

33. As regards 31b the full version of the Hull Committee's report stated that it was based on the paper on the action of water and the S90 frigate design submitted to the Committee by Mr Giles in February 1983; on the Committee's discussion with Mr Giles on 10 March 1983; and on a letter from Mr Giles dated 11 March 1983 giving further information. I have found no record of the Committee receiving a summary validation report containing full and up to date information from tank tests; it may be noted that the date of the validation report sent to the MOD was 20 May 1983, whereas the date of the Hull Committee's report was 16 May 1983. It was of course open to Mr Giles to make representations about the report, for example at his meeting with C of N on 18 July at which the Chairman of the Marine Technology Board was present (and at which incidentally Mr Giles is recorded as acknowledging that his proposals "had been given full consideration"). But whether further information

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would have changed the Committee's views is open to question. Their (summary) report said "no amount of further testing or detailed designing is likely to affect our conclusions in any important respect". YARD and the MOD, who of course saw the validation report, reached the same broad conclusions.

34. As regards 31c it may be noted that of the four pages of main discussion in the Hull Committee's report, in its summary form submitted to Minister(DP), two pages were devoted to discussion of TGA's proposals about hull form, form of construction and use of diesel engines: one and a half pages to discussion of the space and volume available in the TGA hull form for weapons, radars etc and of weights of hull and machinery etc: and a half page to the question of the vulnerability of the S90 as a "two compartment" design (a feature described as having been confirmed by Mr Giles in discussion). The reference to noise, clean conditions, nuclear, chemical and biological defence and shock standards occupied 6 lines and the reference to fire and smoke was confined to the statement that "...we have been given no information, and therefore cannot comment on the arrangements in the S90 design either for fire and smoke control, or for damage control". Even so some discussion of these points (brief though it was) would not appear to have been inconsistent with the very broad terms of the Hull Committee's interest which it described in the opening paragraph of its summary as the costs of the procurement of warships and the possibilities for the design and construction of less expensive platforms; and to the extent that the specific points had not been covered in the Committee's discussion with Mr Giles in March 1983 there was opportunity for him to take them up later. (Incidentally I have been able to find no record of the detailed terms of reference of TGA's validation described by the critics and contrasted by them with the Hull Committee's study).

35. At 31d the truth of the sentence quoted from the Hull Committee's summary report calls for a professional judgement. But, whether true or false, a link between that statement and Mr Rawson seems very unlikely. Mr Rawson was not one of

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the official members of the Hull Committee though he was an official member of the Marine Technology Board which endorsed the Committee's conclusions: and my understanding is that the drafting of the Hull Committee's report was very much the work of its Chairman, consulting mainly the independent members (Annex B para 22). As regards the view disclosed by Mr Rawson in correspondence with Mr Giles, I understood that this was not an erroneous view but a correct view poorly expressed and consequently misunderstood and that agreement on the point at issue (the square/cube law) was later reached in correspondence (though I have not seen it) between Mr Rawson and Professor Garwin of the USA, an associate of Mr Giles.

36. With regard to 31e and 31f it may be observed that the last major change in the NSR (length increased to 123m: 4/5" gun added; and other post Falklands improvements made) is dated 20 January 1983; Mr Giles said the latest version he received was dated 10 March 1983. It may also be observed that to the extent that there was failure to supply TGA with information they needed, or that misunderstandings arose, there was no shortage of time to put matters right. TGA's proposals were before the MOD for some eighteen months, from May 1982, until the Type 23 design was decided in October 1983. Within that period TGA's validation occupied some 10 months from July 1982 to May 1983; consideration and discussion of it occupied another 4 months.

Other points

37. Two more general comments may be added. The first is that there may be a tendency on the part of critics to underestimate the independence of the DSAC. Any such view would seem misplaced. I doubt whether any official member would be inclined to regard the Hull Committee on the Marine Technology Board as a prisoner of the Department or indeed as anything other than a thorn, potential or actual, in the Department's side. The independence of the Hull Committee was something which CSA was very anxious to establish when he discussed their report with members of the DSAC in June 1983

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(Annex B para 23). It would be wrong in my view to regard the Hull Committee as in any way determined by the professional view of the MOD on the S90 proposal. Indeed, as noted in para 21 of Annex B, it was precisely to obtain an independent view on the S90 proposal that, as I understand it, a review by the Hull Committee was proposed by C of N in early 1983.

38. The second comment is that critics of the DSAC report seem to underestimate the importance of other sources of advice on the S90 proposal, namely the MOD's own professional view and the appraisal by YARD. Minister's decision on the Type 23 design was not determined solely by the Hull Committee report, important though it undoubtedly was. It was the coincidence of view in three independent appraisals that was the significant feature as C of N noted in his advice to US of S(DP) in July 1983 (Annex B para 26).

39. One further specific comment may be made. It is perhaps regrettable that the MOD did not itself carry out model tests to validate the S90 proposal. It would not have done so expecting success: given their long held views on the 'short fat' design and their initial appraisal of the S90 proposal put forward in May 1982 their expectation would have been quite otherwise. When the Department of Industry sought Mr Rawson's views in January 1982 on a proposal by TGA for the model testing and research phase for the S90, Mr Rawson's advice, admittedly given on a personal basis, was that there was insufficient promise in Mr Giles' designs to warrant further interest.

see folder

However further model tests later in 1982 would have been a useful check upon the Departments' judgement and it may be noted that C of N's approach to CER in June of that year seeking further testing of the S90 proposal was intended to provide, if possible, an opinion independent of Ship Department (Annex B para 11). But refurbishment work at AMTE Haslar and TGA's own reservations about involvement with AMTE led to the validation of the S90 proposal being transferred to TGA themselves (Annex B

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pages 16-17).

Conclusion

40. For the reasons given in paragraph 30 above I believe that the MOD's assessment of the S90 proposal should be regarded as fair and comprehensive. Subject to a professional view on the statement referred to in paragraph 31d (see para 35 above) I do not consider this conclusion to be over turned by the specific criticisms listed in paragraph 31 above.

J D Bryars

J D BRYARS

28 February 1986

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DEVELOPMENT OF THE DESIGN OF THE HONG KONG
 PATROL CRAFT (HKPC): NARRATIVE OF EVENTS

Procurement of the HKPC

1. The Naval Staff Target for the HKPC (NST 7015) endorsed by the NPC on 8 December 1977 called for studies of a range of "craft options" to meet the requirement including UK "off the shelf" designs. Ship Department's report on these studies of 6 June 1978 noted that 5 UK firms had been invited to put forward ship designs - Vosper Thornycroft (VT), Brooke Marine (BM), Hovermarine Transport (HT), TT Boat Designs (TT) and Associated British Machine Tools Makers (ABMTM) - but concluded that there was "no available craft which fully satisfies the spirit and letter of the NST" (para 2a of covering minute). In the evaluation of options (para 27 of main report) it was noted:

E9
 1900/1
 Pack 1

DG Ships
 minute
 9750/003/08
 D113 on
 SS432/19801
 3/8/B

"TT Boats submitted their OSPREY design
 The Osprey design appears to meet the requirements but it must be remembered that it is a much larger craft than those with which the firm is familiar. It is not

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unreasonable to expect there to be more teething troubles than with a vessel from an experienced firm. There are also difficulties in framing a contract to cover a design agency separate from the shipbuilder. While these difficulties in no way rule out the Osprey design, they do mean that it cannot be accepted as a single solution at this stage."

2. Procurement of the vessels by a competitive tender design and build contract was approved by the Minister of State in June/July 1979; reflected in the Naval Staff Requirement for the vessels (NSR 7015) endorsed by the NPC in September 1979 and announced by USofS(RN) in Parliament on 8 November 1979. The NSR said that tenders for the contract were to be based on a Ship Procurement Specification using the NSR as a definition of the requirement; that tenderers were to be permitted to employ the services of an independent design firm if they so wished; and that the designer who had provided "craft options" (see paragraph 1 above)

E85
1900/1
Pack 1

Expended
Statement
Section 5
paragraph 3a

Hansard
8 Nov 1979
col 764

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were to be warned of the intention to despatch a preliminary enquiry letter to prospective tenderers, who might be inviting their cooperation. In responding to the Parliamentary debate on 8 November 1979 on Fishery Protection vessels, but devoted largely to the Osprey design, USofS(RN) said that the Osprey was one of three designs selected as potential HKPC. None of these was completely suitable; procurement would accordingly proceed on the basis of design and build competition among UK shipyards; and that it would be "up to Osprey's designers to arrange with an appropriate shipyard to tender on the basis of their design if they wish to do so."

ditto
paragraph
5a and b

3. These decisions were put into effect in early 1980. On 5 February 1980, following earlier correspondence (this included a letter of 3 April 1979 in which Ship Department gave notice to TT Boat Design of the consideration being given to the procurement of HKPC and of the need for them to be associated with a UK shipbuilder if their design was to be considered) and a meeting in Bath in

Behind E14
on 1900/1C

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January, Osprey Ltd advised the MOD in a letter to Mr Rawson of Ship Department that Appledore Shipbuilders and Richard Dunston (Hessle) were interested in associating themselves with Osprey in putting forward a proposal for the HKPC. They asked that these shipbuilders should be included in those invited to tender. They noted that Osprey Ltd, as owners of the Osprey design, would be responsible for providing the builder with design information and that TT Boat Designs and Commander Peter Thornycroft would act as consultants to Osprey Ltd and would have overall responsibility for coordinating the design requirements with Osprey Ltd and the chosen shipyard.

E41
1900/1
Part 2

4. On 8 February 1980 there was an internal discussion in Ship Department of the choice of firms to be invited to tender and implementation of the procurement procedures stated in the NSR. Criteria for the selection of firms were agreed; and Appledore and Dunston, the two firms named by Osprey Ltd, were included in the list of 4 firms which was considered the minimum

Minutes of
meeting
enclosed on
1900/1
Part 2

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the Department would wish to see invited to tender. It was agreed that probably only ABMTM and TT Boats/Osprey Ltd should be included in the list of design agents who might be associated with shipbuilders (to whom the technical requirements would be passed direct). Letters were accordingly sent to ABMTM and TT Boats Design on 1 April 1980. These covered copies of the preliminary enquiry sent to a final list of 8 shipbuilders, including Appledore and Dunston, selected on the basis of their relevant experience and ability to provide lead yard service to a Hong Kong builder.

Behind E14
on 1900/1C

5. Of the 8 shipbuilders approached Dunston and one other declined to receive invitations. Approval to seek tenders from the remaining 6, including Appledore, was sought on 16 May and given by the Minister of State on 22 July 1980. Provision was made for the shipbuilders submitting the most technically acceptable and cost-effective proposals to be called to clarification meetings. Invitations to tender were accordingly issued on 25 July 1980. 3 firms subsequently withdrew from the

M1 and
E10 on
D/S/R432F/
1980/64/01

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competition, including Appledore who said they felt unable to meet the requirement to provide lead yard services in support of Hong Kong. (This explanation was later challenged by TGA). Tenders were received from the 3 remaining firms, Hall Russell (HR), Brooke Marine (BM) and Vosper Thornycroft (VT) on 4 November 1980. VT's prices were held to be out of line. BM and HR were accordingly called to clarification meetings following which revised tenders were submitted on 13 February 1981. Both designs were considered to be satisfactory except for a shortfall in top speed, noise problems and removal routes (BM only) but HR was judged to have clearly won the competition on grounds of price, design and other factors. Following a preliminary report to the Minister of State on 7 November 1980, which at that stage made no recommendation, approval to place the order with HR was sought on 3 June 1981. A contract with HR was placed verbally on 3 June 1981 and the full Terms and Conditions of the Contract were sent to the firm on 24 June 1982.

ditto M5

E37 on
1900/1C

E69

ditto

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Development of the design of the HKPC

6. The MOD's requirements for the HKPC were set out in the invitation to tender and the accompanying Procurement Specification (No 2106 of June 1980). The latter covered, amongst other things, speed, endurance, seakeeping and protection. Good manoeuvrability was called for (1025) and "dimensions to the minimum consistent with adequate strength and seakeeping ability and the other requirements stated in the specification" (1015). There was a reference to "a good fast oceangoing form with good manoeuvrability, with raked stern, knuckle bow and transom stern" (2001). But otherwise, apart from draught and freeboard, hull form and lines were not specified. Responsibility for the design, for the hull and generally, rested with the shipbuilder. The Specification stated however (1048), in accordance with practice, that, during the development of the design, Ministry representatives would visit the shipbuilder to hold design stage review meetings at which the design would be "closely monitored".

NS 7221/785
94/1 of
25 July 1980

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7. A lines plan (Drawing No D/713/E) was submitted by Hall Russell (HR) with their tender of 3 November 1980. This showed dimensions of overall length 64.4m and beam 10.5m and a displacement of 810 tonnes. There was no discussion of the plan in the "amplifying comments" of the tender. At a technical meeting with HR on 2 December 1980 Ship Department expressed some concern that speed would fall short of the requirement and discussed with the firm how displacement might be reduced so as to increase speed. But there was no discussion of the lines plan. Ship Department deliberately adopted a "stand back" posture, to avoid any impression of interference with the hull design, which, as noted, was to be the designer's responsibility under the contract.

8. At a tender clarification meeting with HR held on 7 January 1981 (there was a separate clarification meeting with Brooke Marine (BM)) HR tabled a statement on revised design. This said that following the technical meeting the firm had

Minutes Ref
TW111/88/9/1
dated
21 Jan 1981
Annex H

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examined possible weight savings in an effort to achieve a displacement which with the proposed machinery fit would enable the vessel to obtain a trial speed of at least 26 knots. Their revised design was now being based on a displacement of about 715 tonnes. However the statement added:

"Despite the considerable reduction in displacement which has been achieved, we are still unable to predict a speed of 26 Knots using the E Boat form which we initially put forward. It became clear that we would require to look at an alternative form providing scope for the fitting of larger diameter propellers without resort to increased shaft rake and excessive encroachment on the draught limitation.

We are therefore adopting a new form which we believe will come close to meeting the specified speed requirements. A wax model is being made and it is intended to run resistance experiments at the design draught and have

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results available by mid-January."

9. As a result of the clarification meetings both Hall Russell and Brooke Marine (BM) retendered. HR's retender, received on 13 February 1981, was accompanied by a new General Arrangement drawing and a new hull form (Drawing No D/762/E) giving new dimensions (length 62.9m, beam 10.0m) and a lower displacement of 695 tonnes. Compared with the original tender, substantial differences in the new hull form were apparent to Ship Department.

10. No parentage was ascribed to the hull form accompanying HR's first tender; though it was described by the firm as an "E Boat form". (see paragraph 8). The following description of the new hull form, however, was enclosed in the Annex headed 'Design Philosophy' to HR's retender:

"GENERAL

Our proposed hull form has been developed in consultation with Vickers Shipbuilding Group

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Limited's Ship Model Experiment Tank at St Albans, where a series of model resistance tests have been carried out over the past two months culminating in the results shown in the accompanying Design Calculation Book.

In co-operation with AMTE Haslar, predictions of the sea-keeping properties of the form have also been made, using the PAT-80 suite of programmes and the results are summarized in the Design Calculation Book.

HULL PARENTAGE

The proposed form is not derived from any particular parent. Over the past few years our Consultants, Vickers, St Albans, have made studies of the resistance of over six hundred fast warship forms, including corvettes, frigates, destroyers and patrol boats for twenty-seven navies.

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Notable recent examples include LEANDER, Type 42 and Type 22 for the Royal Navy, SAAM Class for Iran, KROMANTSE Class for Ghana, ATTACK Class for RAN, AZTECA Class for Mexico and NUEVA ESPANTA Class for Venezuela.

Hull forms with the best achieved resistance when reduced to standard dimensions have been plotted as normalized offsets against block coefficient, thus it is possible to produce a form for a given Length, Breadth, Draft and Block Co-efficient.

Therefore, whilst the design is not taken from one particular ship, it is developed from many successful designs."

11. In Ship Department's assessment of the HKPC designs, both HR's and BM's, it was noted (13 March 1981):

D/S132/1981/
81/12 of
13 March 1981
on D/D131
1981/81/12

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"The HR lines have been developed in conjunction with Vickers, St Albans, drawing on experience derived from their studies on the resistance of over six hundred fast warship forms. Naked hull resistance models for the HR form have been run over the past 3 months."

At the internal Ship Department award of contract meeting on 17 March 1981 no discussion of HR's hull form is recorded.

D/S312/81/
12/1980 of
23 March 191
on ditto

12. At the Post contract Award meeting with HR in Aberdeen on 11 August 1981, that is after HR's success in obtaining the HKPC contract, it was noted:

HR minutes
enclosed on
D/S D131/
1980/23/18

"The Design Sponsor emphasised that the shipbuilder is fully responsible for the design. MOD's role was one of scrutiny only. The Ministry would make every effort to "turn round" drawings and return to the shipbuilder as speedily as possible."

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13. Subsequently, as provided for in the Procurement Specification (see paragraph 6 above) HR's design was monitored by the MOD at a series of Design Stage Review meetings with the firm. These were held at roughly monthly intervals and covered all aspects of the design: hull, machinery, weapons, ancillary systems etc. At the first of these meetings, held on 11/12 August 1981, the record says: ditto

"Model tests are to proceed on the basis of deep bilge keels

HR's proposals for model tests were outlined to MOD.

HR stated that any refinements to the hull form were anticipated to be of a minor nature. Much of the model testing will be related to optimising the size of the bilge keels with respect to speed and seakeeping. HR representatives will be visiting the St Albans Tank on Friday, 14 August, and Mr Barrett

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[DGS/D132] was invited to attend as an observer."

14. Reports were made to the MOD on continuing model tests at the SMET St Albans. There are copies in Bath of 8 reports submitted by BS St Albans between 12 May and 8 July 1982 of a variety of experiments on Model Hull STA 2266 and 2266 B. These covered resistance and propulsion, manoeuvring, declining, shaft hatch twist, rudder angle, wake survey and regular head waves.

15. At Design Stage Review meetings a number of minor changes in the hull form were noted, including a reduction in overall length to 62.6m following a stern change. It was noted at the fourth meeting, on 4 November 1981, that a final lines plan would be sent to the MOD. Following submission of interim lines plans a final as fitted lines plan (HR Drawing No 314) was forwarded to the MOD in October 1983 after completion of the first ship. This showed dimensions of 62.6m overall length and 10.0m beam

D/S D131
1980/23/18

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and a displacement of 700.4 tonnes. The line form is described as basically that submitted with HR's retender of February 1981 (Drawing No D/762/E) with minor differences only.

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ASSESSMENT BY THE MOD OF THE S90 PROPOSAL AS A POSSIBLE SOLUTION
 TO THE RN STAFF REQUIREMENT FOR AN ASW FRIGATE: NARRATIVE OF
 EVENTS

The Naval Staff Target and Staff Requirement (NST and NSR 7067)
 for the Type 23 frigate

1. The Type 23 was conceived as a relatively cheap and simple class of frigate to take the place of the Type 22 frigate in the naval construction programme. It was to be predominantly an anti-submarine warfare (ASW) ship, with the towed array (TA) as its main anti-submarine sensor. The Outline Staff Target (OST) for the vessel, as endorsed by the Fleet Requirements Committee (FRC), was circulated on 24 March 1981. The NST was endorsed by the Operational Requirements Committee (ORC) on 5 November 1981. The NSR was circulated, as DEP 2/82.OR 5/82, on 16 April 1982 and endorsed by the ORC and Defence Equipment Policy Committee (DEPC) on 6 May and 17 May 1982 respectively.

D/SSC/RW310
 /1884/1A
 E26

ditto
 /1F E34,
 /1G E45D,
 /1H E5

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2. Two observations may be made about this phase of the development of the Type 23. First, high priority was given throughout to the containment of cost. The ship itself was seen from the outset as a deliberately chosen cheaper alternative both to the Type 22 frigate (1981 unit production cost (UPC) Batch 2 without Outboard £120m) and to such other options as the Type 25 interim ASW light frigate studied in the late 1970s (estimated UPC £96m-£108m) which CofN and VCNS had considered at the end of 1979 but thought too costly (Report of the SWDCG Working Party 12 of 12 March 1981). During development of the NSR a target UPC of £67.5m at September 1980 prices was set for the Type 23; increased shipbuilder involvement in the design was sought (Yarrow Shipbuilders were selected as the lead shipbuilder); and a variety of methods of reducing cost were studied, though without positive results. These included collaboration with the Dutch, joint funding with British Shipbuilders (BS), and the use of commercial designs for small frigates being developed by the British shipbuilding industry. With the same object in view, a contract

ditto
1/A
E1A

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was also placed with YARD to study the NSR for the Type 23 and to design and cost the ship using conventional and less conventional approaches.

3. These initiatives were pressed at various senior levels in the Department. Evaluation of commercial options was called for personally by CofN and VCNS at a very early stage in April 1981. Shortly afterwards, in May/June 1981, CDP asked Mr Daniel of British Shipbuilders to produce sketch designs of a cheap towed array corvette and of a cheap Type 23 both for the RN and for export, and the Secretary of State was reported as urging British Shipbuilders in May/June 1981 to take the lead in suggesting a frigate with export potential which would "also go a long way to meeting the RN's requirement for a new, smaller frigate". The YARD study was proposed to the DEPC by CofN, in May 1982, after a general discussion with USofS(DP) in April. It was intended as a fresh look to determine whether "an alternative approach to the NSR might produce the same capability more economically": the

ditto
E30A

ditto
1/B
E11

ditto
E17

ditto
1/H
E25

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object being to introduce an element of competition into the design of the Type 23".

4. The second observation that may be offered is that the hull form of the Type 23 appears to have been settled at a very early stage. The report of the SWDGC Working Group 12 already referred to, which was described as a report on the Type 23 frigate prepared by DG Ships Forward Design Group said (paragraph 8.6):

ditto
1/A
E1A

"A 'long low' style has been adopted for the Type 23 leading to a hull relatively long for its displacement with minimum superstructure but with a high free board. This gives good top speed and seakeeping characteristics and generous main deck area providing some potential upper deck space for fitting future undefined weapons."

This approach was approved by CofN at a presentation given to him on 5 February 1981. Although his approval appears to have been provisional, there is no available evidence of any later consideration of hull form, at least at the

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higher levels in the Department, until the S90 proposal was made. On the other hand, as noted above, there was no reluctance to consider novel methods of reducing cost or of achieving greater cost-effectiveness. In April 1982 the NSR, while observing that "It has been established that the NSR can be met within a platform length of 115 metres" (paragraph 38), noted that "a radical approach has been necessary in designing the Type 23 frigate within the target UPC". (paragraph 37).

ditto
1/G
E45D

Proposal of the S90 hull form by Thornycroft, Giles and Associates

5. Use of the S90 hull form for the Type 23 frigate was first proposed at a meeting between CofN and Mr Giles of Thornycroft Giles and Associates (TGA) held at the latter's request on 28 April 1982, ie just before endorsement of the NSR by the ORC and DEPC. In discussion CofN noted the awkwardness of the timetable. He said that the Type 23 design had been evolved between British Shipbuilders and MOD's Ship Department and

ditto
1/H
E15

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that after approval of the NSR "all details would have to be finalised and tenders would be sought for fixed price contracts". He "felt bound to point out that the consortium was coming rather late into the exercise". However, although he "had to advise of the difficulty that it would face, principally due to the timescale of the remaining phases of the Type 23 programme," he said that "he would not discourage the consortium from submitting a proposal and that NSR documentation would be provided to Mr Giles".

6. On 28 May 1982 Mr Giles submitted his "private proposal for the Type 23 frigate" to CofN, with a copy to USof(DP). He described it as "discussing a programme of work necessary to demonstrate the feasibility of producing a Type 23 alternative of the capability required by NSR 7069, but at a ship platform cost which is substantially lower than that of conventional types." British Aerospace Dynamics Group (BAeDG) and Frederikshavn Vaerft (FHV) of Denmark had been consulted in its preparation. The proposal

ditto
E33

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envisaged that TGA should acquire a contract from the MOD to fund their research programme needed to prove the adequacy of the S90 hull configuration; should seek simultaneously a separate contract from the MOD to establish the feasibility of building a hull to their design at a competitive price at Chatham; and "when the feasibility of the S90 project has been established" should obtain from the MOD a request to submit a project proposal based on it. It was foreseen that BAeDG and FHV, as well as TGA, would play a part in this process.

Examination of the S90 hull form proposal

7. There were three main stages in the examination of TGA's S90 hull form proposals (put forward, as noted above, on 28 May 1982). They were:

- a. An immediate study of the proposals by the MOD Ship Department: the results of this were submitted on 6 July 1982.

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- b. A validation of the proposals carried out by TGA themselves: this was completed on 20 May 1983.
- c. Appraisal by the MOD and by YARD of TGA's validation: both processes were completed in July 1983.

A review by the Maritime Technology Board of the Defence Scientific Advisory Council (DSAC) of "the design philosophy of the S90 frigate" ran in parallel with the second and third stages above, having begun in March and been completed in June 1983.

8. These successive stages in the examination, and the later consideration of them at Controller and Ministerial level, leading to the Department's announcement on 18 October 1983 of their decision on the design of the Type 23, are considered separately below.

D/SSC/1920/1A

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Ship Department's analysis of the proposal

9. TGA's proposal covered the performance and seakeeping of the S90 hull form, main and auxiliary machinery, weapons and sensor fit (the 'combat suite'), estimated cost, proposed further testing and research and production possibilities. It was unclear to what extent the NSR had been taken into account by TGA in drawing their proposal up. In discussion in the MOD (see below) Mr Giles stated in reply to a question on this point that an 'official' copy of the NSR had not reached him until 1 July 1982 though a copy of a different version of the NSR had been passed to him by USofS(DP) previously. (It was noted that if the latter was the full version of the NSR TGA was privy to information not available to other interested companies).

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10. At a meeting held in the MOD on 2 July 1982 with a team led by Mr Giles, and including representatives of British Aerospace and the British Hovercraft Corporation, there was a ditto

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technical discussion of five main aspects of the TGA proposal viz speed/power curves, propellers, machinery and auxiliaries; weapons and complement; upper deck layout; weight and space estimates; and cost and production proposals. The meeting did not discuss the relative hydrodynamic advantages of different configurations, which it was noted was being "pursued separately" (see below). For the MOD Mr Sanders (Ship Dept) summed up his view, at the end of the meeting, that "there was not much background to the proposal": it had not been satisfactorily demonstrated that the design was large enough in terms of length, volume or weight; the proposal was only a cursory view of the solution to the requirement. He was unconvinced that the ship would include everything needed to meet the NSR; it had not been demonstrated that cheaper standards of construction, if adopted as a means of reducing cost, were tied to shape and configuration; and it had not yet been possible to discuss the claims made for the Danish shipbuilding yard directly with it. He believed that the proposed timescales for design and

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production to be "completely unachievable" and showed a lack of understanding regarding the complexity of a ship to meet NSR 7069. No one issue in design, whether resistance, seakeeping or anything else, could be taken as paramount. Mr Giles for his part is recorded as concluding that "he thought Mr Sanders had understood the position well." He said he thought the S90 idea was "worthy of pursuit at least until it came up against the brick wall of the totality of the design": this was the purpose of the proposed further research. He said "he did not disagree in general with anything Mr Sanders had said'.

11. Before this technical discussion with TGA, DG Ships, in a minute to CofN of 16 June 1982, had given his opinion on the S90 proposal in forthright terms. He criticised all the major elements in the proposal: architecture (general arrangement and combat suite), safety, seakeeping and manoeuvring, propulsion and standards. Of the claims made by TGA that the short bodied form was cheaper, more voluminous, a better seakeeper and capable of carrying more payload, he said that none

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was supported or was believed to be supportable. He concluded amongst other things, and "insofar as it was possible to draw conclusions from the vagueness of the paper", that, as disclosed, the ship did not come near to meeting the NSR; that there was no way in which the design could meet the current timescale for the Type 23; that the claim for much lower hull costs rested on an unsupported contention about the capacity of a smaller ship with less volume and deck area to carry the necessary equipment and carry out the task; and that it was extremely unlikely that the proposal, when properly worked up to a ship design to meet the NSR, would result in a ship appreciably cheaper than that already evolved by the MOD and Yarrow. His view was that no action should be taken to encourage the feasibility study proposed by TGA. In his minute DG Ships did not consider TGA's claims for the S90 hull form. On his advice CofN had asked CER, in a letter also of 16 June 1982, to consider how best to establish an opinion on these claims, desirably independently of DG Ships, whether by providing TGA with the contract

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they sought, by carrying out tests for TGA, or by other means. DG Ships noted, however, that, if TGA's claims were supported and the advantage of adapting the S90 hull form considered worthwhile, a delay of 18-24 months in the Type 23 programme would have to be accepted.

12. The general conclusions of DG Ships minute were confirmed in a separate report submitted by the Type 23 Project Manager to CofN on 6 July 1982, that is after the technical discussion between the MOD and TGA. His judgement was unequivocal:

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"I have concluded that there is no credibility at all to the present [TGA] proposals and Giles admits that they are only ideas which the Ministry might find sufficiently attractive to pay for more detailed studies."

"It is my opinion that these proposals do not offer a credible design to meet NSR 7069".

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Validation of the proposal

13. A submission by CSA as chairman of the DEPC seeking the Secretary of State's approval to development of the Type 23 had been made on 27 May 1982, ie just before the arrival of TGA's S90 proposal. Reference was also made to the YARD contract (see paragraph 3 above). The Secretary of State's reaction to the submission was favourable. At a meeting which he held on 7 June he is recorded as saying that "the Type 23 design, as it stood, was a great achievement". Replying to a question by the Secretary of State about what would be got out of the proposed YARD study, CofN said that YARD would have a totally free hand to produce an alternative design, "though it would simply not be possible to go back to the drawing board with a completely different solution for the NSR given the required order date [for the Type 23] in 1984". CofN went on to say that the same consideration applied also to the private proposals for the Type 23 frigate which had been produced by TGA. He noted that "there was a

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longstanding and fundamental disagreement between proponents of designs similar to that of the TGA proposal and established naval architectural opinion. It ought to be possible to resolve those disagreements through model tests." It was agreed that this would be discussed separately.

14. This last point was taken up by USofS(DP) in a minute of 25 June 1982 to the Secretary of State, extracts from which follow:

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"At the meeting on the Type 23 alternative design which you held last week you decided that the Validation Phase of the Thornycroft Giles & Associates (TGA) proposal should be carried out on the lines suggested by Controller of the Navy in his letter to CER.
[see paragraph 11 above].

You felt that it would be preferable to resolve the almost philosophical questions of Ship design and that once this phase had been

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completed, you would be prepared to consider the remainder of the TGA proposal which would involve their preparing a design for the Type 23. You also made it clear that you did not wish the Validation Phase to be so prolonged as to prevent TGA having the opportunity to enter the Type 23 design competition. I undertook to discuss the question of timing of the Validation Phase with Controller and CER. In CER's absence abroad he was represented by DCRP who attended a meeting with Controller and myself yesterday and this is a note of the discussion.

The Controller's proposal, contained in his letter to CER, was that the Validation Phase should be carried out at AMTE Haslar. Since your meeting it has become known that the major refurbishment programme which is now underway at Haslar will effectively delay any work on new commitments such as the TGA proposal for many months, with the effect that it would be excluded from any further

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consideration. I should also mention that TGA expressed some reservations about their involvement with AMTE Haslar as an MOD Establishment, bearing in mind their current litigation. Since your meeting, TGA had counter proposed that the Validation research should be carried out as previously envisaged by them at the British Hovercraft Corporation (BHC) with a second opinion being obtained on one of the phases by the National Maritime Institute. TGA have now said that if this proposition is acceptable, their consortium would meet these costs in full, as opposed to the use of AMTE Haslar which would have involved a charge on CER's budget.

The Controller has accepted this proposal and the timing as described to me is that the Validation Phase would be completed by the end of January 1983.

It is only fair to put on record the fact that the Controller has consistently

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maintained the the position that while eagerly wishing to see competition injected into the Type 23 programme, he does not feel that TGA will be able to come up with a proposal in sufficient detail within the timeframe that he has in mind, that is to say, by about this time next year. I have argued, as indeed I did at your meeting, that once the Validation Phase has given us sufficient confidence to let TGA in for the final phase, they would have to give the Controller a guarantee that they would meet his time requirements with their proposals and they would not be paid for their work unless they met such requirements. The Controller remains anxious that all those involved with TGA, and particularly those who are going to spend money with them, should be aware of the complexities and constraints on the Type 23 programme before they embark further. The Controller and I, therefore, have agreed as immediate next action, the suggestion contained in Mr Giles' letter to DG Ships, namely that across the table discussions about his proposals could take

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place, should be taken up. The Controller hopes to convene, under the aegis of his Department, a meeting within about a week, which will be attended by the Type 23 Project Manager and relevant people from the Naval Staff and DGW(N). David Giles will be invited to bring with him anyone who is cleared to SECRET level and this will probably mean he will bring someone from BAe DG who are involved in TGA's weapons suite proposals. Action to set up this meeting is now in hand. [see paragraph 10 above].

In expressing my appreciation for your support so far on this proposal, I would like to repeat once again that my sole motivation is to examine, as rigorously as possible, not merely the procedures but the basic concepts and philosophies which sustain our current warship designs. I believe that this is a process which is long overdue but which is being brought into sharp topical focus by events in the South Atlantic and there is

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undoubtedly keen political and media interest in the subject for the first time. If the concepts that have sustained the Ship Department and their friends are as valid as they feel certain they are, then they have no cause to feel alarmed."

15. USofS(DP)'s round table meeting, attended by Controller and VCNS and by Mr Giles, Sir Raymond Lygo of BAeD and a representative of FHV, took place on 14 July 1982. Referring to the TGA proposal, USofS(DP) introduced the discussion as follows:

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E90

" While Secretary of State was interested in the concept he felt that, given the current debate on design philosophy, it would need to be validated as proposed in the TGA prospectus. He was, however, insistent that the validation phase should not be of such duration as to prevent TGA from competing in the Type 23 programme. Controller of the Navy proposed that the validation should be carried out at

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AMTE Haslar. Investigations revealed that Haslar was so tasked that it would be unable to perform this work. It was therefore decided that the TGA counter proposal, that BHC should carry out the evaluation, should be adopted and that this should be at the cost of the consortium.

In a long discussion CofN, while welcoming competition, expressed his reservations about the TGA proposal being practicable within the timescale needed for the Type 23 programme. He noted that TGA's claims for the S90 hull form should not be regarded as accepted by the MOD; any discussions before the results of the various model tests were known would not be fruitful. Summing up USofS(DP) said that it was for the consortium to decide whether they wished to proceed with the proposed validation or not. But "if they were to decide to do so then the validation phase would have to be complete by January 1983." In writing subsequently to USofS(DP) on 16 July 1982 Mr Giles accepted, subject to TGA's decision to proceed, this

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timescale for a research phase to establish the performance and seaworthiness of the S90 design, but added the conditions that TGA would require a decision from MOD within one month of the results of the validation being submitted and that TGA should be given full access to the relevant MOD Departments and Establishments for standards and data concerning Type 23 requirements. In replying on behalf of USofS(DP) on 2 August 1982, and forwarding a record of USofS(DP)'s meeting on 14 July CofN accepted those conditions.

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16. TGA subsequently decided to proceed with the validation. CofN repeated to USofS(DP) his concern about the wisdom of entrusting the design and build of the Type 23 to a firm without previous major warship building experience and about the potential risk to the Type 23 programme of allowing validation to proceed. But his advice in October 1982 that the validation should be called off was not accepted by USofS(DP).

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E12e

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17. As it happened progress with the validation was much slower than envisaged in the July 1982 understandings (mainly, it appears, because TGA had to obtain technical and financial assistance from other companies) and TGA's report was not submitted until 20 May 1983.

Appraisal of TGA's validation

18. TGA's report listed 7 companies which had joined TGA in the validation exercise. Its foreword said:

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by AD/WS

"The unanimous conclusion of all these companies is that the S90 validation programme supports the predictions of the initial proposal: and that sufficient potential has been demonstrated to warrant a period of detailed project definition which could lead to the realisation of a new type of warship design."

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The summary described the model tests conducted since July 1982 and concluded:

"The outcome of all those resistance and propulsion tests is that our initial predictions concerning speed and resistance of the S90 have been confirmed."

As regards seakeeping, after a description of data collected, the summary said:

"On the strength of this evidence we would question most energetically whether there is any data to support the traditional view that, in the S90 design, seakeeping in head seas is any worse than that of traditional frigate designs of the same displacement and greater length."

As regards seakeeping at other headings, the summary added that in the absence of suitable computer programmes and the suspected inadequacy of

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available UK basins for tests of this kind:

"the only technique left for the evaluation of other than head on following seas is the use of 1:10 scale free running models in the open sea, or to build a full scale ship."

19. On receipt of the validation report in the MOD the following steps were taken:

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- a. a clarification meeting was held with TGA on 15 June 1983 at which some additional information was given and at which TGA were given the opportunity of providing additional evidence;
- b. a technical assessment was carried out by MOD Ship Department and completed on 12 July 1983;
- c. YARD were requested on 2 June 1983 to conduct a separate and independent

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appraisal study of TGA's S90 proposal against the Type 23 NSR, taking into account TGA's validation report. This was completed on 8 July 1983;

- d. a presentation was given by Mr Giles and his associates to YARD on 14 June 1983.

During this period the report of the Hull Committee of the DSAC on the design philosophy of the S90 frigate (see below) reached CSA and was submitted by him to Minister (DP).

20. The conclusions of these separate appraisals which were carried out independently of each other, were not favourable to the S90 proposal. The YARD report identified what were considered to be a number of major design faults in the S90, including faults relating to space, power, and seakeeping, and a number of major non-compliances with the NSR, including standards, NBCD provision, noise, speed and endurance. Reservations were also expressed

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about production timescale, cost, especially fuel cost, and technical risk.

21. The review of the S90 design philosophy by the Hull Committee of Marine Technology Board of the DSAC began early in 1983 as a result, it is understood, of the personal encouragement of C of N, who wished to have the views of the Committee on the possibilities for the design and construction of less expensive ship platforms and also, more specifically, on the S90 proposal. Mr Giles accepted an invitation to make a presentation. His paper "The action of water and the S90 frigate design" was discussed with the Committee on 10th March 1983. At the time the Chairman of the Hull Committee was Mr Meek. There were 9 independent members and 4 official members drawn from the MOD Ship Department and AMTE.

22. Following the meeting with Mr Giles, the Hull Committee completed its review of the design philosophy of the S90 (16th May 1983). It is understood that the drafting was mainly the work of

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the Chairman, Mr. Meek. The review did not take account of TGA's validation report which was not then available. The Committee submitted the review to Marine Technology Board of the DSAC (Chairman: Mr Penny : 13 independent and 9 official members). The Board endorsed the Committee's conclusions at its meeting on 23rd June 1983. These were given in a summary version as follows:-

"We do not accept the claims of TGA for the S90 frigate design concept. We consider that the S90 has no advantages in terms of hydrodynamic performance over the conventional design concept for frigates and that on the contrary it is substantially more resistful and has excessive stability"

We also believe that the space available in the S90 would not be sufficient for it to fulfil the functions required by the Royal Navy of the Type 23 and that TGA's assessments of the weight of the S90, for its proposed dimensions and form, and of the power requirements are too low....

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Finally we must state our opinion that the short-wide hull form of the S90 design has such fundamental drawbacks as a concept for a modern class of frigate that no amount of further testing or detailed designing is likely to affect our conclusions in any important respect....."

One further conclusion, which did not appear in the later summary, ran :-

"Summing up, therefore, we see no merit in the S90 design concept, which we believe has been developed because of an overstrong attraction to the concept of a short, very wide hull. There seems to be an attachment to the historical arguments for the concept, based on applications to much smaller vessels which had entirely different missions from those of the modern frigate. This enchantment has been enhanced by the effects of optimism in estimating."

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23. Also on 23rd June, CSA discussed the review with the Chairman of the DSAC (Dr Trier) of the Marine Technology Board of the DSAC and of the Hull Committee. He wished to satisfy himself first that the members of the Hull Committee were men eminent in their field of naval architecture who were well able to judge the merits of the S90 proposal and second that they were truly independent of the MOD and not unduly conservative. He was given these assurances, subject to a reservation about the scope for total independence given the relatively small pool of experts. Mr Penny said that "the Hull Committee could not be seen as subservient to the Ship Department: the Committee aimed to be constructively critical of Bath's work as did....the Marine Technology Board." CSA expressed himself content and said he believed that the MOD should give full weight to the Committee's advice in considering how to proceed with the TGA proposals. On 7th July he submitted a summary version of the Hull Committee's report to Minister (DP), together with the record of his discussion with the Chairman.

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He said he believed that the Committee's review was a valuable judgment on the merits of the TGA design concept, which the Minister would wish to take into account with the other assessments he received.

24. In his report to CofN of 14 July 1983 DG Ships said, in summary:

ditto
Annex B
to E14

"The TGA proposal offered the prospect of greater weapon payload at a cheaper cost and in the timescale of the Yarrow Type 23. The YARD assessment shows that these prospects cannot be realised. The DSAC came to a similar view. Ship Department's assessment is in accord with these two views."

25. On 18 July 1983 CofN held a meeting with Mr Giles and his advisers to inform him of the main findings of the reports on his proposals. The DSAC and YARD reports were presented respectively by the Chairman of the Marine Technology Board of the DSAC and by Managing Director of YARD. Mr Giles was

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offered copies of both reports. CofN's report of the meeting said that Mr Giles "while disputing a number of the conclusions, agreed at the end of the discussion that his proposals had been given full consideration."

26. In submitting advice to USofS(DP) on 19 July 1983 CofN enclosed a summary of the views of YARD and Ship Department. He concluded:

ditto
E14

"The close unanimity of the conclusions of three separate studies [ie including the DSAC study] confirm the serious reservations I expressed last year and it is now clear beyond reasonable doubt that the TGA design, and the philosophy behind it, fall far short of meeting the the technical requirements of the NSR."

27. A meeting was held by Minister (DP) in the last week of July, attended by CofN and CSA, at which the Hull Committee of the DSAC gave a presentation explaining their findings on the S90 design. Mr

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Giles had meanwhile, in a letter of 22 July, made representations to YARD about their report and had also sought a meeting with Ship Department. In discussion between USofS(DP) and CofN it was agreed that TGA should be offered a further technical meeting with Ship Department and also an opportunity of making final representations to USofS(DP).

ditto
E17

28. These meetings took place on 16 September 1983. At the technical meeting there was a largely inconclusive discussion under six headings. On size of ship (space and weight) the MOD and YARD contended that the S90 was not large enough to contain all the features necessary to meet the NSR; that the space available for weapons, men and equipment forming the fighting 'load' fell at least 20% short and that the weights quoted for systems in the validation report were at least 300 tonnes light. TGA are recorded as not disagreeing but as pointing out that both the general arrangement drawing submitted with their proposal and their

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weight budgets were preliminary. On power and speed it was the judgement of the MOD and YARD that the S90 proposals were underpowered by some 8,000 kw (leaving aside their view that the ship was too small). TGA said this was not their conclusion. On endurance the MOD concluded that the endurance of the S90 fell short of the NSR requirement of 8,000mm by 1,400-2,300mm. Again TGA said this was not their conclusion. On noise reduction both sides agreed that the S90 did not meet the underwater noise targets specified in the NSR. On seakeeping and stability there seems to have been some convergence of view though the MOD had criticisms about some aspects of seakeeping and about damaged stability.

29. USofS(DP)'s meeting on the afternoon of the same day was attended by CofN, CSA, and the Chairman of the Hull Committee of the Maritime Technology Board of the DSAC; by other representation of the MOD; by YARD; by Professor Bishop of Brunel University; by Mr Giles and other representatives of TGA; and by representatives of BAedG, Dowty Electronics, Crossley, FHV and Groseby Dynamics.

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The MOD repeated their criticisms of the size, weight, power, endurance, seakeeping and damaged stability of the S90 and expressed reservations about programme dates and cost. YARD said that there were other areas of non-compliance with the NSR. The Chairman of the Hull Committee said that the Committee had wished to assess objectively TGA's proposal as an interesting proposal which claimed major hydrodynamic advantages over conventional hull forms. But they had found nothing to back up the claims. His Committee was convinced that the design had nothing to offer and he could not recommend any further consideration of it. Mr Giles did not reply to those points in terms but said that in his view the S90 met the requirements of the NSR and the requirements of stability and that TGA had an organisation which was financially, managerially and technically viable. He felt that the major objection to the S90 was its powering: there appeared to be no way to reconcile the YARD estimates of the power requirements, which were based on conventional ship designs, and TGA's estimates, which were based on their own experience

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with the Osprey and Azteca classes, both of which had exceeded the power characteristics that had been predicted from models.

30. In subsequent discussion some procedural criticisms were made from Mr Giles' side; that TGA might not have had equal access to information about noise, in particular access to AUWE information on noise requirements; that the NSR might have been changed since TGA's proposals were set in motion; and that TGA had been given insufficient time to study the YARD report. As regards the NSR, a copy of the original NSR had been sent to Mr Giles but he said that a later version he had requested had only been received on 10 March 1983 by which time his 1/20 model was already in the tank. From Mr Giles' side there was also some criticism that the MOD's thinking was tied too tightly to the Type 23 and that the MOD, for a very modest sum of money, was turning away the opportunity of exploring the development of a cheaper and radically conceived new weapons platform. From the MOD side on the other

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hand the general view put forward was that the S90 design did not hang together as a ship.

31. At the conclusion of the meeting USofS(DP) said that he would consider the arguments advanced and reach a decision as rapidly as possible.

32. At a "wash up" discussion after his meeting USofS(DP) is recorded as saying that he had heard nothing at the meeting to cause him to revise his view that the S90 project should not be proceeded with as an alternative design for the Type 23. He intended however to study the papers again during his forthcoming visit to the Far East and he would wish to have final consultations with Minister (DP) and the Secretary of State.

ditto
E34

33. In the letter of 16 September 1983 to USofS(DP) Mr Giles made renewed representations about the speed, endurance and seakeeping of the S90. These he repeated at length in a letter of 20 September to CofN. He said that the latest YARD graphic comparison of S90 powering estimates, circulated at

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the technical meeting on 15 September was "grossly misleading" and that at that meeting the MOD Chairman had not allowed TGA to discuss their views on a number of important points. Mr Giles said it would have been inappropriate to discuss the points at the afternoon meeting with USofS(DP) (where he is recorded as saying, after the MOD representatives introduction of the discussion (see above) that "he had never intended to answer all the abstruse points that had been made across the table").

34. USofS(DP) communicated his conclusion on the Type 23 design to Mr Giles in a letter of 12 October 1983 (in which he said he had taken account of the points raised in Mr Giles' letter to him of 16 September). He said:

ditto
E53b

"My conclusion is that the shortcomings of the S90 against the requirements for the new ASW frigate are so fundamental that the Ministry of Defence would not be justified in supporting the development of the proposal".

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35. USofS(DP) made a statement to the Press on 18 ditto
October. A Parliamentary answer followed on 1 E58
November. ditto
E58b

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