1979
FASTNET RACE INQUIRY

ROYAL YACHTING **ASSOCIATION.** ROYAL OCEAN **RACING CLUB**

REPORT

BY

SIR HUGH FORBES SIR MAURICE LAING

LIEUTENANT-COLONEL JAMES MYATT

TO

THE COUNCIL OF THE RYA AND THE COMMITIEE OF THE RORC

The research for this report was carried out under the direction of aworking party consisting of:—

Chriatopher Dunning	Vice Commodore, RORC
David Edwards	Deputy Chairman, RYA Council
John Clothier	Rear Commodore, RORC
Bernard Havman	Member, RYA Council
Jonathan Bradbeer	Rear Commodore, RORC
Alan Green	Secretary, RORC
Janet Grosvenor	Deputy Secretary, RORC
Bill Anderson	RYA Cruising Secretary
Joan Kimber	Inquiry Secretary

Most of the material on Which the report Is based was supplied by competitors in the 1979 Fastnet Race. The working party wish to thank the following individuals and organisations who provided Information or specialist advice: The Commanding Officer HNLMS OveriJssel; Rodney Hili, owner of the yacht Morningtown; HM Coastguard S.W. District, Lands End Coastguard and Falmouth Coastguard; the staff of the Flag Officer Plymouth and the Commander Southern Maritime Air Region on behalf of the Southern Rescue Co-ordination Centre; RN and RAF aircrew of RNAS Culdrose, RAF St Mawgan and RAF Kinloss; The Irish Naval Service; personnel of the RNLI; The Post Office, including the staff of Lands End Coast Radio Station; The Hydrographic Department; The Department of Trade, Marine Division; The Meteorological Office; Mlnlstere des Transports, Direction de la Meteorologier; The BBC; HM Naval Base, Chatham; Mr. Lawrence Draper, Institute of Oceanographic Sciences; The Royal Western Yacht Club of England; The Cruising Club of America; The CrUising Yacht Club of Australia; The Wolfson Unit for Marine Technology, University of Southampton; K. Adlard Coles; Mrs. Mary Pera; Andrew Besley; *Yachting World;* Specialist Research Unit; numerous yacht designers.

The compilation of the report of the inquiry was co-ordinated by Joan Kimber, Alan Green and Bill Anderson.

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Introduction

0.1 Great Britain has always been involved with the sea, and the Fastnet Race is but a part of this tradition. **In** 1979 the race took place in extreme conditions causing tragic loss of life and severe pressure on the race and rescue organisation. Following the loss of life in the 1979 Fastnet Race we were appointed jointly by the Council of the Royal Yachting Association (the National Authority in the United Klnqdom) and the Committee of the Royal Ocean Racing Club Ithe organisers of the race) to consider what lessons might be learnt from what occurred during the race and, if we thought fit, to make recommendations. A Working Party was set up under the joint leadership of Lieutenant Commander W S B Anderson, RN, Cruising Secretary of the RYA, and Alan Green, Secretary of the RORC, with the assistance of Joan Kimber, the Inquiry Secretary. The composition of the Working Party appears on page one. A comprehensive questionnaire was devised by the Working Party and sent to the skipper and two crew members of each of the 303 yachts, which started the race, Replies were received from 235 yachts, and these answers were analysed by computer. Replies were received from a further 30 yachts, but these were not included in the computer analysis, for the reasons given in table 1,3, A total of 669 questionnaires has been returned and the Inquiry would like to record its gratitUde forthis very high degree of response.

0,2 The questions asked in the questionnaire will be found at the head of each of the tables in which the detailed computer analysis of the answers is set out in appropriate sections throughout the report. **In** addition the Working Party obtained information from a number of organisations whose activities either did have, or might be thought to have had, an influence on the behaviour of yachts in the race or the rescue operation which was mounted. The skippers and crews of a number of yachts were interviewed as soon as they came ashore after compieting or retiring from the race, The main body of the report summarises the information obtained from all these sources, and .atternpts an evaluation of this information, The work involved, culrrunatlnq in this evaluation has fallen entirely on the Working Party, and we would wish to express our gratitude, as well as our admiration, for the way they have carried out this task, The conclusions and recommendations are our own.

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TABLE 1.1

Year	*Starters*	*Finishers*	*% Finishers*	*Elapsed Time of 5th Boat*
1955	47	44	93.6%	4 days 9 hr 51 mlns.

6-12 August

Light to moderate WNW winds veered northeriy and became very light and variable in directionori 7th. Between 7th and 10th winds were mainly light northerly after which they veered ENE and increased to moderate by 11th. Winds fell light again on 12th.

1957	41	12	29.3%	4 days 20 hr 16 mins.

10-15 August

The race started in fresh SW winds which increased to gale force by the evening of the first day. A short moderation to force 6, with occasional stronger gusts was followed by an Increase to gale force from the SW, and a slow veer to north with little decrease in strength. A very rough race.

1959	59	43	72.9%	5 days 8 hr 8 mins.

8-16August

Light and variable or calm at the start and for the first two days, then freshening winds ahead of a depression produced fresh winds, locally gale or even severe gale, in theFastnet area. 14th mainly moderate to fresh WSW winds decreased to become light or moderate by 15th and light variable or calm on 16th.

1961	95	62	65.3%	4 days 18 hr 21 mins.

5-11 August

Light to moderate WSW winds gradually decreased and became light variable or calm by 7th. On the 8th a small depression moved northsastwards into Western Approaches producing moderate to fresh winds reaching gale force on the southern side of the circulation between Scilly Isles and Fastnet. As the depresslon moved away northeastwards across UK mainly Force 3 to 4 westerly winds on the 9th decreased to become variable light or calm on 10th and 11th.

1963	127	103	81.1%	4 days 17 hr 15 mins.

10-16 August

Light to moderate westerly winds veered NW between Scilly Isles and Fastnet on 11th but the strength continued to be only light or moderate until 13th when it decreased further to become light variable or calm and these conditions continued until 14th. A light to moderate NW breeze set in from the western part of the course on 15th and winds continued to increase to moderate or fresh mainly SW until the end of the race.

1965	151	146	96.7%	4 days 9 hr 2 rnlns,

7-13 August

Light to variable or calm for most of race. It did however Increaseto light to moderate mainly SE on 13th.

1967	209	194	92.8%	3 days 23 hr 49 mins.

5-11 August

Light variable or calm becoming light SW on the 6th, Increasing to mainiy moderate and backing southerly on 7th. Winds remained very light and variable or calm between the 7th and 11th when winds started to increase a little from the SW but remained mainly light.

1969	179	169	94.4%	4 days 7 hr 55 mins.

9-16August

Light and variable winds local thunderstorms which may have produced some. gusts in their vicinity. Winds were light variable or calm throughout but increased a little from a northerly point to light to moderate on 16th.

1971	219	199	90.8%	3 days 16 hr 41 rnlns,

7-14 August

Mainly light SW until 10th when veering NW in Fastnetarea. Between 10th and 12th winds were mainly W to NW light and remained this way until they increased a little to give moderate SW towards the end of the race.

1973	268	247	95.7%	4 days 1 hr 27 mins.

Winds light variable or easterly with fog patches and a fair number of calm periods.

1975	268	239	93.4%	4 days 10hr22mlns.

The start was in force 3 westerly winds which freshened to give a fast sail to the Fastnet Rock. Visibility was intermittently bad at the Fastnet. The leaders found patches of flat calm round the Isles of Scilly, while the winners and those who went to the west and south found iight continuous westerly breezes.

1977	286	229	80.1%	5 days 10 hr 24 rnlns,

6th-12th August

Light and variable winds with long calm patches.

1979	303	85	28.1%	3 days 3 hr 52 mins.

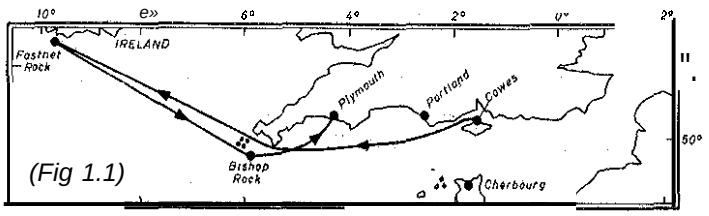
11-16August

WNW winds, light to moderate at first. backed and increased as a rapidly deepening depression moved across the Fastnet area on the night of the 13/14th August. There were associated storm force winds which decreased and veered northerly, before again freshening to gale force from SW on the 16th.

Section 1
Background

1A HISTORY OF THE FASTNET RACE IN RECENT YEARS

1.1 The course for the Fastnet Race is from Cowes, direct as safe navigation permits to the Fastnet Rock, then to Plymouth, passing south of the Sciiiies, a distance of 605 miles (see map below).



(Fig 1.1)

1.2 The first race over this course was sailed in 1925, and races have been sailed every other year, with a break during the 1939-46 war. The number of competitors has increased considerably during recent years, as the summary of races sailed since 1956 in table 1.1 shows.

1.3 The weather summaries in table 1.1 up until 1975 were provided by the Meteorological Office, from records of weather over a large area. In one case (1959) the record Is supplemented from a report which appeared in *Yachting World.*

1.4 There has been a number of races sailed in gale force winds but light to moderate weather predominated in races sailed between 1963 and 1977.

1.5 The time taken to complete the race depends upon weather conditions. Comparison with two of the roughest races, In 1957 and 1979 shows that speed has increased, the fifth boat to finish In 1957 averaged 5¼ knots and in 1979 8 knots. (The fifth boat is taken to represent an average/or the large class).

18 THE 1979 RACE

1.6 There were 336 entries in the 1979 race of which 303 started. Table 1.2 shows the results in each of the six classes into which the fleet is divided by rating bands. The rating of a yacht is a measure of her effective sailing length, with certain allowances for factors such as engine weight and propeller drag and penalties for features such as very light displacement or excessive sail area. The minimum size of boat which might qualify for entry is about 28ft length and the maximum about 85ft.

1.7 There can be no direct comparison of the results of this race with previous Fastnets as there has been no previous race which has resulted in the loss of more than one life nor have yachts previously been abandoned on anything like the same scale.

1.8 The one previous instance of loss of life in bad weather in a Fastnet Race occurred In 1931.

1.9 Much of the information on which this report Is based is derived from questionnaires completed by competitors. As the Inquiry is concerned primarily with the conduct of boats during the storm questionnaires from boats which retired or completed the course before the storm were not included in the main analysis. Table 1.3 shows a breakdown of the boats which did and did not supply answers to questionnaires.

1.10 Some of the computer analysis was carried out before the last reply was received from one of the abandoned boats. In the tables derived from this analysis the total number of boats Is 234.

1.11 Throughout the report it has been assumed that the sample of 235 boats which were exposed to the storm and constituted the base for computer analysis was a representative sample. Where the report refers to "the fleet" or "competitors" it does so on the basis of what is believed to be a valid assumption.

TABLE 1.2

Class	*Rating Limits*	*Started*	*Finished*	*Retired*	*No. of Crew Lost*	*Yachts Abandoned*	
						Since ***Recovered***	*Lost Believed Sunk*
0	42.1-70	14	13	1	—	—	—
I	33-42	66	36	19	—	1	-
II	29-32.9	53	23	30	-	-	-
III	26.6-28.9	64	6	62	6	4	2
IV	23-25.4	68	6	44	6	7	1
V	21-22.9	68	1	48	3	7	2
TOTAL		303	86	194	16	19	5

TA8LE 1.3

	Finished	*Retired*	*Abandoned*	*Total*
Included in main computer analysis	64	148	23	235
Completed questionnaire but not at sea during storm	1	20	-	21
Questionnaire returned too late for **inclusion in main** computer analysis	a	3	—	9
Questionnaire not returned	14	23	1	38

1C THE INTERNATIONAL OFFSHORE RULE

1.12 The International Offshore Rule liaR) is the measurement system for handicapping under which RORC races are sailed. The IOR was introduced some 9 years ago, replacing a number of national rating rules; principally the RORC rating rule in Europe and the Cruising Club of America rating rule in the United States.

1.13 The custodian of the lOR Is the Offshore Racing Council (ORCI. The aRC is an International body; the majority of councillors are nominated by the national authorities for offshore racing with two councillors nominated by the International Yacht Racing Union. The rating rule is therefore in the hands of an authority whose constitution ensures broad international representation and the council is respected as an authoritative impartial body, with adequate power to amend the rule whenever it appears necessary to do so.

1.14 The design of racing yachts has always been influenced strongly by the measurement rule under which, races are sailed. The aRC acknowledges the influence of the rating rule on design in the Introduction to the rule, which states: —

> RULE MANAGEMENT POLICY
> lOA exists to provide ratings for a diverse group of yachts, The Council will manage the Rule, changing It as necessary to permit the development of seaworthy offshore racing yachts.
> In changing the Rule, the Council will endeavour to protect the value of the majority of the .existing IOR. fleet from · rapid obsolescence caused by design trends, loopnoles In the Rule, and other developments which produce increased performance wlthoutoorrespondlng Increases in ratings. The Counctl Wnl ecttc discourage developments which-lead to excessive costs, or reduce safety or the suitability of vaohta for cruising, It will attempt to manaqeBule chanpesto minimize disruption to the existing fleet,
> The Council wtlteot promptlv to close loopholes as they are discovered.It will control and moderate design trends by penalizing design·features which depart signifiCantly from fleet norms while affecting as 'little as possible boats near the norms. The Councllwlll provide rerrospeotlve rating credits to extend the competitive life of older boats and reduce the Impact on the fleet of araduallmprcvementsln design.
> The Council-recognizes that there wl!l be conflict among these objectives and will do Its best to achieve a balance that will ensure the-long term vitality ofIOR,

1.15 Trends which have been noticeable in yachts designed to the IOR have included light displacement, broad beam, shallow hull form and large sail area. In 1978the aRC decided that these trends were reaching undesirable proportions which were not in keeping with the spirit and intent of the Rule. In particular boats of extreme light displacement and dubious ultimate stability were appearing and the Rule was amended to penalise boats of very light displacement and exclude potentially unstable boats from racing. At the same time measures were taken to penalise boats with excessively large sail area. The Rule is under constant review by an International Technical Committee which is alert for developments which might reduce the seaworthiness of yachts.

1.16 In analysing the results of the Fastnet Race certain parameters of boats have been extracted from their rating certificates to determine whether or not those which, In terms of traditional yacht design, might be considered unusual or extreme encountered particular problems. Details of the method adopted will be found in Section 3.

1.17 In considering the effect of the IOR on design it is difficult to separate trends which have resulted from improved technology,the availability of new materials and general progress of yacht design, which are likely to occur whatever rating rule is in current use, from trends which are the result of designers' endeavours to produce boats with the iowest possible rating and which are therefore directly dependent upon the current rating rule.

10 THE RORC SPECIAL REGULATIONS

1.18· The Ra RC Special Regulations. the safety rules for the race, are published in the club's annual racing programme. The regulations for 1979, together with amendments which were distributed In early May, are set out In Annex 1A.

1.19 These regulations are basically those of the Offshore Racing Council (aRC) the international authority for offshore racing, with certain amendments considered necessary by the RORC to take account of the particular conditions under which races are sailed around the British Isles. Similar modifications to the aRC Special Regulations exist for two other offshore races of similar length to the Fastnet Race, the Sydney- Hobart Race, organised by the Cruising Yacht Club of Australia and the Bermuda Race, organised by the Cruising Club of America. The major differences between the Special Regulations for the Fastnet and those for Sydney- Hobart and Bermuda Races include the foilowlng:-

1. Both make It mandatory for yachts to carry two way MF radio.
2. Both have specific regulations on crew composition. The CYCA requires a minimum of four persons on board each yacht, and sets a minimum age limit of 18. The Bermuda race is an invitation event, open only to CCAand Royal Bermuda Yacht ,Club or Service Academy members or to owners of yachts Invited by one of the sponsoring clubs,
3. Both require a safety inspection for every competing yacht before the start of the race.

1.20 British law controlling the design, construction and safety equipment carried by private pleasure vessels is set out In the Merchant Shipping Acts. Ocean racing yachts are not required to conform to any statutory standards for design or construction. Yachts of more than 45ft overall length are required to carry life saving equipment such as distress flares and fire fighting equipment on a scale similar to the Ra RC Special Regulations. Yachts of less than 45ft in overall length are subject to no statutory requirements but the Department of Trade publlshes recommendations for equipment to be carried in sea going vessels less than 45ft in overall length which are less stringent than the RORC Special Regulations.

1.21 All yachts competing in RORC races are liable to spot checks for compliance with the Special Regulations. Checks are carried out on a percentage of the fleet either before the start or after the finish of each race: often when the yacht is at sea in racing trim. Thus these checks are different in emphasis from the safety checks carried out by the CYCA and CCA, which are conducted at a pre-arranged time in harbour.

1.22 RORC checks for compliance with the Special Regulations are intended to make certain that there is no breach of the regulations on the part of an owner through inexperience or lack of understanding of the intention of the Regulations, and to see that no yacht is gaining an unfair advantage by stowing heavy items of equipment in any position other than an authorised stowage. Yachts have been disqualified from races for failure to comply with the regulations.

1E RELATIVE RESPONSIBILITIES OF OWNERS AND RACE ORGANISERS

1.23 It is a long accepted principle of seagoing that decisions affecting the safety of a ship and her crew can only be taken by her Master. He is the only person who has a complete picture of all the factors involved and is therefore the only person able to take decisions on matters of safety. Service authorities, shipping companies and the Department of Trade lay down regulations for equipment to be carried and issue general advice on matters of safety but do not attempt to dictate the action to be taken by the Captain or Master of a ship at sea.

1.24 All RORC races may last for 48 hours or more, twice the period covered by the shipping forecast, so whatever the actual and forecast weather at the start of a race there Is always the possibility of totallv different conditions before the finish.

1.25 It Is the general policy of the RORC to offer race starts In all conditions of actual or forecast weather. The only exceptions to this general policy are in cases where a combination of weather and tidal conditions at or shortly after the start appear to give rise to an exceptionally high degree of risk. This policy is intended to encourage only boats of seaworthy type to take part.

1.26 RORC Special Regulation 2 makes it clear that the safety of a yacht and her crew and the decision to start or continue a race rests with the owner. Every owner entering an RORC race signifies his acceptance of these responsibilities when he signs the entry form.

1.27 It is thought that if races were postponed or cancelled in the face of adverse weather forecasts there might be an incentive for designers to pay less heed to the ultimate strength and weatherllness of racing boats as the need for these qualities would be greatly reduced.

1.28 There have been many cases of yachts temporarily taking shelter from adverse conditions and subsequently continuing a race to obtain good results. A policy of abandoning races after the start has not been adopted in the past for three reasons: It has been felt that those at sea rather than those ashore are best able to decide whether or not to continue a race; the means of communication with competitors has not been available; and the same considerations dictate policy on abandonment after the start as cancellation before the start. Even if a race was abandoned this would not ensure that all competing yachts 'returned to harbour to take shelter. The warning of bad weather might be so short that the most seamanlike action would be to remain at sea, or even to gain an offing from the land to find sea-room to ride out the storm.

1F RORC RACE ENTRY AND CONTROL PROCEDURE, COWES AND PLYMOUTH

1.29 An owner wishing to enter a yacht In any RORC race including the Fastnet Race does so by completing an entry form (see Annex 1B) taken from the Annual Programme (which contains rules and regulations). About 10 days before the start of the race a set of "Provisional Arrangements" Is sent to each owner. Before the start of the race, each owner Is required to hand in a crew list to race headquarters and In return receives a copy of Sailing Instructions which Includes a list of entries. Race headquarters Is established at Cowes before the start of the Fastnet. The exchange of crew lists for sailing Instructions is designed to ensure that no yacht will start and sail the course without having lodged a crew list.

1.30 In a fleet of over 300 there are a few late withdrawals and a few late entries are accepted. At the start a number of experienced observers, both ashore and afloat, record sail numbers Idlsplayed, under the rules, on all the larger sails and on a side-cloth shown towards the committee), to attempt to verify that all yachts entered have started. Because it is Cowes Week and the Fastnet start Is of great Interest, there are large numbers of spectator yachts in the start area, many similar to competing yachts, so it is difficult, with the very large fleet, for the race officers to obtain a 100% accurate list of starters.

1.31 Further complications are introduced when yachts have identical or almost Identical names, or identical sail numbers (thouqh issued by different national authorities and bearing different national prefix lettersI e.g. K2468 is Morning Cloud; B2468 is Phantom Ill. Yachfs owned by a group bore the "family" name "Festina". Individuals were identified as "Festina Secunda", "Festlna Tertia", etc. The owners have already decided to re-name these yachts.

1.32 After the start race headquarters are transferred from Cowes to Plymouth. The race officers check their list of competitors against original entry forms, crew lists, the Cowes office records and observed sail numbers.

1.33 At any time after the start yachts may retire and those which do so are required to report to the RORC at the earliest possible opportunity. The list of competitors is thus continuously amended to take account of retirements.

1.34 The RORC procedure for verifying their list of starters Includes several cross checks. In normal races during the season, when fleets between 50 and 250 may be expected, without the complication of a large start during Cowes Week, the procedure appears to be perfectly satisfactory. However, as indicated above there Is some difficulty in the Fastnet Race.

1.35 Before the race, plans had been made with the Royal , Western Yacht Club of England (who contributed many volunteers and much support) for a race headquarters to be sited at a normally empty office block at Mlllbay Docks, into which most of the competitors were expected. The Royal Western Yacht Club would supply two teams to the offices: -

1. Information. To obtain information from coastguards and lighthouses and from the prearranged Admiral's Cup radio position reporting, via HM Coastguard. The team would log their Information on master sheets and Inform enquirers of race progress. They would be aided by a computer.
2. Domestic. To supply information and assistance to competitors in respect of laundry, taxis, water, fuel, accommodation, etc.

1.36 **In** addition the club prepared its clubhouse at Plymouth Hoe, a few minutes' walk from the docks, to receive large numbers of visitors. Transport was organised and stores obtained for the RORC team which manned the Plymouth breakwater lighthouse finishing line.

1.37 The RORC had commissioned the services of Datawest Limited, a computer agency which brought in a iarge and flexible Data General computer Instaliatlon to provide Instant progress reports on handicap (based on Admiral's Cup radio reporting schedules and actual sighting reports) and also a continuous results service when the fleet began to arrive.

1.38 At the nearby Duke of Cornwall Hotel the RORC established a Press Office with the assistance of the Admiral's Cup sponsors, Champagne Mumm. The Press Office had its own team of press officers and was normally equipped, together with high-speed telephone facsimile machines to connect It with the Amstelco telex centre in London.

Flgure2.t

COURSE OF FASTNET RACE
SHOWING CODE SQUARES USED FOR ANALYSIS

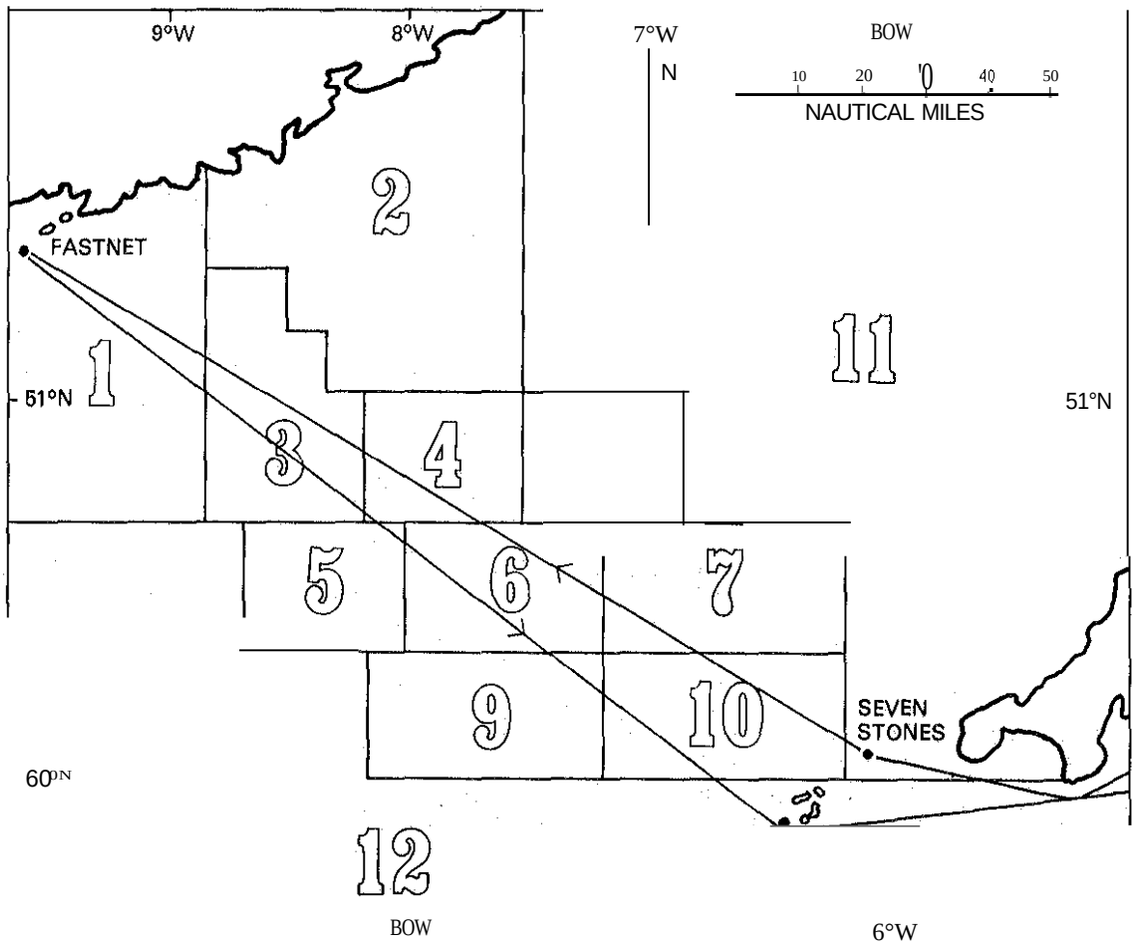


TABLE2.1

Question: At what time do *you* now feel that the weather was at its worst?

	Total	*Position Sector where weather was worst (Fig2.1),* 1	2	3	4	5	6	7	8	9	*10*	*tt*	12
BASE	235	63	13	49	19	16	10	11	6	1	4	2	2
Before 2400 13/B	3 1%	1 2%	--	1 2%									
2401-0200·14/8	22 .%	11 17%		4 8%	2 11%	2 13%							
0201,0400	71 30%	20 32%	2 15%	17 35%	6 32%	6 33%	2 20%	6 45%	1 17%	1 100%	1 26%		
0401·0600	69 29%	17 27%	6 38%	13 27%	7 37%	2 13%	3 30%	3 27%	2 33%		1 26%	1 50%	
0601·0800	29 12%	6 10%	3 23%	4 .%	1 5%	2 13%	3 30%		1 17%		1 26%	1 50%	1 50%
0801·1000	9 4%	1 2%		3 6%	1 6%	2 13%	1 10%						
Later than1000	S 3%			1 2%	1 6%		2 20%	2 18%					
AllNighl	22 9%	6 10%	1 .%	6 12%	1 ,%	3 20%	1 10%	2 18%	1 17%				
No Answer	18 .%	6 8%	2 15%	3 6%					1 17%		1 26%	1 50%	1 50%

TABLE2.2

Question: What was your estimate of the wind speed?

	Total	*Position Sectorwhere weather was worst (Fig 2, I),* 1	2	3	4	6	6	7	8	9	*/0*	*tt*	*12*
BASE	235	63	13	49	19	16	10	11	6	1	4	2	2
Less than Beaufort 8	4 2%	1 2%		2 4%									
Beaufort8	2 1%					1 7%							
Beaufort 9	12 ,%	2 3%	1 8%	1 10%			1 10%	1 .%					
Beaufort 10	48 20%	12 19%	2 16%	9 16%	10 53%	2 13%	2 20%	3 27%			1 26%		
Beaufort 11	92 39%	25 40%	2 15%	20 41%	1 26%	6 40%	4 40%	1 45%	3 50%	1 100%	1 26%	2 100%	1 50%
More than Beaufort 11	72 31%	22 35%	8 62%	13 27%	4 21%	6 33%	3 30%	2 19%	3 50%		2 50%		1 50%
No Answer	1 2%	1 2%		1 2%		1 7%							

TABLE2.3

Question: What was your estimate of the significant wave height? (see footnotel

		Position sector where weather was worst(Fig 2,1).											
	Total	1	2	*3*	4	5	6	7	8	9	*10*	11	12
BASE	235	63	13	49	19	15	10	11	6	1	4	2	2
0-19'	16 7%	4 6%	3 23%	4 6%		1 7%	2 20%						
20-24'	34 14%	10 16%	4 31%	5 10%	4 21%			3 27%					
26·29'	38 16%	11 17%		10 20%	3 16%	2 13%		3 27%	1 17%				
30·34'	68 29%	19 30%	2 15%	12 24%	6 32%	8 63%	5 50%	1 9%	3 50%	1 100%		1 50%	1 50%
35-39'	26 12%	7 11%	1 8%	5 10%	3 16%	1 7%		1 9%	1 17%		3 75%		
40-44'	17 7%	2 3%	1 8%	4 8%	1 6%	1 7%	1 10%	3 27%				1 50%	
45·49'	10 4%	4 6%	1 8%	3 6%		1 7%							
50'+	3 1%	1 2%					1 10%						
NO ANSWER	22 9%	8 10%	1 8%	8 12%	2 11%	1 7%	1 10%		1 17%		1 25%		1 50%

Signiflcant waveheight: of 99Individual waves, takethe33biggest andgivetheiraverage height.

Section 2
Weather

2A WEATHER CONDITIONS EXPERIENCED

2.1 Competitors were asked to report when the weather was at its worst and what they considered to be the wind speed, significant wave heights and maximum wave heights which they experienced. Answers received are shown in tables 2.1-2.4. The position sectors referred to are shown on the diagram in fig 2.1. The weight of evidence provided by competitors Indicates that the storm was at Its height between mldnlqht and 0800 on 14 August, the wind reached force 11 and maximum wave heights were in the order of 4O-44ft.

2.2 There is some evidence, derived from reports from competitors and their analysis by a meteorological expert, that there were quite small areas of exceptionally strong wind in area Fastnet during the early hours of 14 August. It is difficult to be more specific on this subject as the maximum scale deflection on most yacht anemometers is 60 knots and therefore no records are available to indicate the maximum winds which were encountered.

2.3 A Shell coastal tanker on passage through the area, which was off Fastnet at 0930 on 14 August reported "Wind WNW force 9—10, very rough seas and large swell". The master's unofficial description of the weatherwas "It was bloody awful for August but I have known it worse In this area at other times of the year".

2.4 Official reports from the area were almost non-existent. Merchant shipping provided two reports, of winds of 52 and 55 knots. The highest sustained wind speed recorded at a land station was 60 knots at Mumbles and Hartland Point recorded a gust of 67 knots.

2.5 Search and rescue aircraft operating in the race area on 14 August reported winds of 60-65 knots and a wave height of 50-60ft.

2.6 The cause of the storm was a depression Identified as low Y. During the weekend of 11-12 August there was a large depression over the Atlantic with Its centre south and west of Iceland. At 0100 on Sunday 12 August Low Y was a small secondary depression with central pressure 1006 mb and was located just to the south of Newfoundland. During the next 24 hours it moved rapidly eastnortheast into mid-Atlantic with little change of central pressure.

TABLE 2.4

Question: What was your estimate of the maximum wave height?

		81 Knockdown		*82 Knockdown*	
	TOt8!	*Yes*	*No*	*Yes*	*No*
Base	235	113	108	77	136
0-19'	6 3%	3 3%	2 2%	1 1%	3 2%
20·24'	6 3%	1 1%	5 5%		6 4%
26·29'	11 5%	3 3%	8 7%	1 1%	9 7%
30·34'	43 16%	16 16%	20 16%	9 12%	28 21%
35·39'	31 13%	16 14%	14 13%	10 13%	19 14%
40-44'	50 21%	25 22%	23 21%	21 21%	24 16%
45·49'	27 11%	17 15%	10 9%	10 13%	17 13%
50'+	29 12%	19 17%	10 9%	12 16%	16 12%
No Answer	34 14%	13 12%	16 15%	14 16%	15 11%

2.7 During the course of Monday afternoon and evening the depression deepened rapidly when it had reached a position about 250 nautical miles southwest of Ireland. At 1900 on Monday 13 the centre of the depression was approximately 200 nautical miles southwest of Valentia in Southern Ireland with central pressure about 984 mb. At 0100 on Tuesday 14 the centre was analysed as 978 mb Immediately to the west of Valentia and during the next few hours It moved northeast across Southern Ireland with central pressure remaining about 979 mb and crossed the eastern Irish coast near Dublin around 0830. Thereafter the depression curved on to a more northerly path crossing eastern Scotland during the afternoon with central pressure 982 rnb and reached a position 100 nautical miles north of the Shetiands by 0100 on 15 August when the central pressure had risen to 986mb.

2.8 The lowest pressure plotted on the synoptic charts was 979.2 mb reported from Shannon Airport at 0500 on 14. The situation at midnight on 13 August is illustrated in fig 2.2.

2.9 It is the opinion of the Meteorological Office that in sea area Fastnet freshening winds reached gale force 8 about 2100 on 13 August. Storm force winds with very high seas reached the Fastnet Rock area a little before midnight and moved rapidly east across the race area during the next three hours. Stormy conditions persisted until about midday and then a moderation spread across the area from the west. During the stormy period mean winds reached 50 to 55 knots at times (the upper reaches of storm force 10) and with gusts to 68 knots with waves as high as 50 feet at times.

TABLE 2.5

Question: At what time were you first aware of the severity of the depression?

Question: On what frequencies (programmes) were you listening?

		Time First Aware of Severity of the Depression							
		/3AUG					/4AUG		
	Total	*/40/- /600*	*/60/- /600*	*/80/- 2000*	*200/- 2200*	*220/- 2400*	*240/- 0200*	*020/- 0400*	*040/- 0600*
BASE	235	19	30	24	28	64	38	9	7
BBC Radio 4	183 **78%**	18 **95%**	25 **83%**	15 53%	17 **61%**	54 84%	34 89%	8 89%	4 57%
Coast Station	2 1%	-	-	-	-	-	-	-	-
Channel 16	12 **5%**	-	1 3%	1 **4%**	6 **22%**	2 **3%**	2 5%	-	
European Radio Stations	24 **10%**	2 **11%**	3 10%	4 17%	3 11%	6 8%	3 B%	1 11%	1 14%
Channel 72	1 *	-	-	1 **4%**	-	-	-	-	-
None	4 **2%**	-	-	1 **4%**	-	2 3%	-	-	-
Noanswer	20 **9%**	1 5%	1 3%	3 **13%**	3 **11%**	4 B%	2 5%	-	2 **29%**

(N.S. Some yachts were listening on **more than onefrequency)**

TABLE2.6

Question: Were you plotting any form of weather map?

Question: Old your barometer give you prior warning of the likely severityof the storm?

Question: Did your own observations of visible phenomena give you prior warning of the likely severity of the storm?

		Time first aware of severityof depression							
	Total	*/40/- /600*	*/80/- /800*	*/80/- 2000*	*200/- 2200*	*220/- 2400*	*240/- 0200*	*020/- 0400*	*040/- 0600*
BASE	235	19	30	24	2B	64	38	9	7
WERE YOU PLOTIiNG ANY FORM OFWEATHER MAP?									
Yes	88 **37%**	7 37%	12 40%	11 46%	9 32%	21 33%	16 42%	4 44%	3 43%
No	127 54%	10 53%	17 57%	11 **46%**	16 67%	41 84%	19 **60%**	4 44%	4 67%
Noanswer	21 9%	2 11%	1 3%	2 8%	4 14%	2 3%	3 8%	1 11%	-
DID BAROMETER *GIVE* PRIOR WARNING OFSTORM?									
Yes	11B 51%	9 47%	23 77%	14 58%	12 43%	32 60%	IB 42%	5 58%	2 29%
No	53 35%	7 37%	B 20%	7 29%	7 26%	27 42%	17 **45%**	3 33%	6 71%
No answer	33 14%	3 16%	1 3%	3 13%	9 **32%**	5 8%	5 13%	1 11%	-
DIDOWN OBSERVATION OFVISIBLE PHENOMENA *GIVE* PRIOR WARNING OFTHE LIKELY SEVERITY OFSTORM?									
Yes	54 23%	6 32%	5 17%	B **26%**	B 29%	16 **23%**	6 13%	2 22%	4 67%
No	158 **66%**	13 **68%**	22 73%	16 **67%**	14 **50%**	46 **72%**	2B 74%	7 78%	3 43%
Noanswer	25 **11%**	-	3 **10%**	2 **8%**	6 **21%**	3 **6%**	5 13%	.-	-

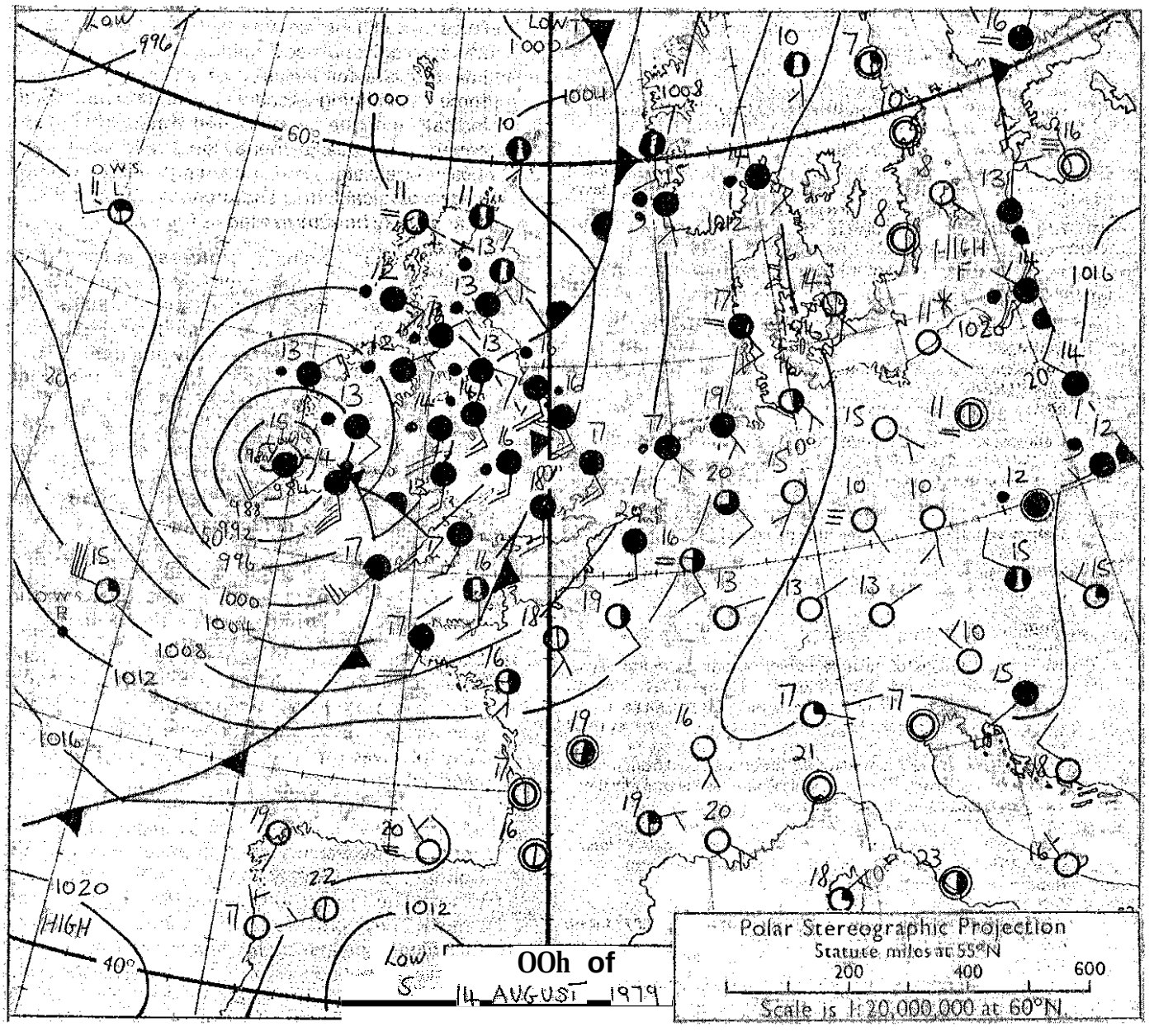
2.10 The storm was not without precedent. On the night of 15/16 August 1970 a depression of the same depth, 979 mb, moved on a very similar track across Southern Ireland into the Irish Sea. There were two previous deeper depressions over the United Kingdom in August. These gave pressures down to 967 mb at Cape Wrath in northwest Scotland in 1957 and to 968.3 mb at Southport in 1917. Winds were probably near to the previous records which gave a mean wind of 55 knots at Pendennis Castle in 1931. Wind gusts of 68·69 knots occurred in August in 1923, 1931 and 1975. Although this depression may not have created any new records it was undoubtediy severe for the time of year.

2.11 As low Y moved across the north of sea area Fastnet there was a marked and rapid wind veer. This resulted in the wind and waves coming from different directions. Those in the vicinity of the Fastnet Rock experienced the veer during the hours of darkness and for them the lack of conformity between wind and sea directions made conditions particularly difficult.

2.12 34% of the competitors in the race reported having experienced similar weather before, for 58% it was the worst weather they had ever experienced. The question from which these percentages are derived referred to "weather". It was for those who answered it to decide whether it referred to wind strength or sea state. Many very experienced competitors stated that the wind strength was not unusual but the sea conditions were the most dangerous they had ever experienced possibly because of the rapid wind veer. Most of the damage done to the fieet appears to have been caused by waves rather than wind. A special study of wave conditions was therefore commissioned from the Institute of Oceanographic Sciences and is included at Annex 2A, The study notes the Meteorological Office assessment of the weather, which put maximum winds at force 10, whereas most competitors believe that the wind was at least force 11 .

2B FORECASTS AVAILABLE TO COMPETITORS

2.13 Tables 2.5 and 2.6 show the forecasts to which competitors were listening, the use they made of these forecasts, the usefulness of their own observations of barometer and visible phenomena and the times at which they believed they were first aware of the probable severity of the storm.



Synoptic Chart at Midnight, 13*August 1979.*

2.14 The forecasts and gale warnings Issued by the Meteorological Office and broadcast by the BBC were asfollows:-

Shipping forecast Issued at **1255** on **13th,** broadcast 1355:
The general synopsis at 0700, **Complex low, 300 miles southwest of Iceland, 986, moving slowly southeast. Cold front with shallow waves, Viking,** t.undv, **North** Hrtlsterre expected **Fisher, Dover by 0700 tomorrow,** Low300 **miles West of Sole, 1002, expected West** Scotland 994 by **same** tlme, **with associated cold front through Northern England to Central Flnlsterre. The area** forecasts for **the next24hours:**
SOLE, LUNDY, FASTNET
Southwesterly 4 or6/Increaslng 6 or 7 for a time, veering westerly later. Occasional rain or showers. Moderate, locally poor, becoming qoodleter.
Reports from Coastal Stations **at 1200:**
SCILL Y
South bywest 5, Intermittent moderate rain 3 miles, 1013, failing.
VALENTIA
South 4; mist. 7 miles. 1009. falling slowly.
RONALDSWAY
Southwestby south 4. 13miles. 1011. failing slowly.
MALINHEAD
West by south 3. 27 miles. 1008 failing slowly.

Galewarning Issued at 1365. broadoast **at 1605:-**
SOLE; FASTNET, SHANNON
Southwesterly gales force 8 Imminent,

Shipping forecast Issued at 1706. broadcastat 1750:-
There are warnings of gales In Plymouth, slnlsterre, **Sole, Lundy, Fastnet,** Irlsh **Sea, Shannon,**
The general synopsis at 1300. Low North Cromartv, **1006,' moving steadily north, deepening slowly. Low 260 miles west of Fastnet sea area,g98,expected** Carlisle area, **993, by 1300 Tuesday. The** area forecasts **for the next 24 hours:**
LUNDY. FASTNET, IRISH SEA
Mainly southerly 4 locally 6, **inoreasing 6 locally gale 8, becoming malnly northwesterly** later. Occasional **rain then showers. Mainly moderate with fog patches for** a.time,
Reports from **Coastal** Statlons **at 1600:**
SCILL Y
Southwest 4. Intermittent slight raln,6 miles, 1010. failing more slowly.
VALENTIA
South by **west** 3, continuous **slight rain, 6 miles, 1005, falling.**
RONALDSWAY
South 3. 5 miles, 1009. failing.
MALINHEAD
East by north **3,** rain showers **In past hour, 16miles, 1006, falling.**

Galewarnlng Issued at **1805. broadcastat 1830 and 1906:-**
FINISTERRE, SOLE. FASTNET
Southwesterly gales force 8, Increasing severe gale' force 9, Imminent,

Gale warning Issued at 2245 broadcast **at2300:-**
FASTNET
Southwesterly severe **gales force 9, increasing** storm force 10, Imminent.

Shipping toreoeet, Issued at 2330, broadcast at 0015 on 14 **August:-**
There are warnings of gales In Forties, Cromarty, Forth, **Tyne, Dogger, Fisher, German Bight, Humber, Thames, Dover,** Wight, **Portland,"Plymouth, Biscay, Finlsterre, Sole,** Lundy, Peetnet, **Irish Sea/Shannon, Rockall,** Malin. **The general synopsis at ,1900 Monday. Low southwest Shannon, 990, expected northwest Scotland, 980, by 1900Tuesdaywlth** assoolated cold front moving **east, expected Viking, German Bight,** SouthBlscav **bysame time.**
The area forecasts for the next **24 hours:**
LUNDY. FASTNET, IRISH SEA
South to southwest veering westerly 7 to severe gale 9, locally storm 10in Fastnet. Rain then showers. Moderate to good.
Reports fromCoastalStatlons at 2300.
SCILL Y
Southwest 6/ continuous moderate rain, 3 miles, l002,faJllng qufcklv.
VALENTIA
South by east 6, intermittent slight rain/ 6 miles, 986, falling very rspldly,
MALINHEAD
Southeast4.22 miles. 998. failing quickly.

2.16 These forecasts and gale warnings were also transmitted by Coast Radio Stations. but little use was made of this service. largely because most of the competitors were out of VHF radio range. Lands End Hadlo broadcasts weather forecasts on VHF and MF at 2103 daily. At 2103 on 13 August Lands End broadcast for sea area Fastnet:-

> Mainly southerly 4, locally 6. increasing 6 to gale 8 locally severe gale then becoming mainly northwesterly 6.

2.16 Few competitors were listening to Radio 4 at 1600 on 13th when the first gale warning was broadcast. The 1366 shipping forecast had given little indication that there was a likelihood of gales and only 8% reported becoming aware of the severity of the storm between 1401 and 1600. It is not the general practice for those at sea to keep a continuous listening watch on radio 4 so the value of gale warnings is limited. Although offshore racing yachts can be sailed through gales and It is generally accepted that winds of force 8 in open waters away from areas of fast tidal streams cause some discomfort but no real danger. gale warnings are important to allow adequate precautions to be taken. The gale warning broadcast at 1830 and 1906 was the first to indicate that anything more than force 8 could be expected. It is unfortunate that the Meteorological Office issued the first two gale warnings Just too late for Inclusion In shipping forecasts. The force 10 warning broadcast at 2300 was the first to Indicate the true nature of the winds which would be generated in area Fastnet by low Y.

2.17 The forecasts and warnings issued by the Meteorological Office and broadcast by the BBC on 13 August may be summarised asfollows:-

1.	1366	Shipping forecast indicating strong winds. force 6-7 for a limited time.
2.	1606	Gale warning (force 8) broadcast on radio 4. Of limited value because radio 4 is not generally monitored.
3.	1760	Shipping forecast of winds "locally" gale force.
4.	1830	Warning of severe gale (force 9) broadcast on radio 4. The remarks under "2" above apply.
6.	2246	Warning of storm (force 10) broadcast on radio 4: again the remarks under "2" above apply.
6.	0016 On 14th	Shipping forecast confirming. as was already apparent to those at sea in area Fastnet winds of force 10.

2.18 Competitors listening only to shipping forecasts received approximately 3 hours warning of gale force winds and no advance warning of winds stronger than gale force. The minority who were listening to radio 4 at 2246 received approximately one hour's warning of winds of storm force.

2.19 The forecasts issued by the Direction de la Météorologie, Mlnistere des Transports in Paris and broadcast by Radio France (France Inter) and Brest le Conquet gave slightly longer warnings of gale force winds. The French forecasts differ in format from the British. They contain a short range forecast for 12 hours following the time of broadcast, probabilities for the next 12 hours and a general tendency for the period 24-48 hours after the time of broadcast.

2.20 The France Inter forecast broadcast at 0740 on 13 August predicted the possibility of gales in the Fastnet area for the night of 13/14 August and on the day of 14th. The forecast from Brest at 1733 on 13 August

forecast winds of 30-40 knots (force 8) and strong gusts (by convention this implies force 9-10) and this was repeated by the France Inter forecast at 1860 but without reference to strong gusts. Gaie warnings were also issued by both stations.

2.21 No shipping forecasts for periods In excess of 24 hours are issued by the Meteorological Office for broadcast by the BBC. Medium range forecasts and an individual consultancy service can be obtained on a repayment basis and the RORC had been receiving medium range forecasts from Southampton Weather Centre until the morning of 11 August. The last forecast, covering the period up to 2359 on 13 August made no mention of gales or storms.

2.22 Medium range forecasts issued by the Meteorological Office during 11 and 12 August indicate that at that time the forecasters believed that low Y might produce gale force, or even severe gale force winds late on 13 or early 14 August. On the morning of 12 August Southampton Weather Centre Issued a medium range forecast for area Fastnet which predicted winds of force 6 to 8, perhaps 9 for the afternoon and evening of 14 August.

2.23 Mr. D. M. Houghton, a member of the Meteorological Office staff but acting in a private capacity, briefed crews of the three yachts of the British Admiral's Cup team at 1830 on Friday 10 and at 1200 on Saturday 11 August. Mr. Houghton consulted the CFO Medium Range Forecaster prior to these briefings. The wind forecasts given by Mr. Houghton at 1200 on 11 August for the Fastnet area were: —

Sunday-Monday	Southwest Increasing 3 to 4.
Monday-Tuesday	Increasing southwesterly 5 to 7.
Tuesday-Thursday	Probably larger changes in wind direction associated with quickly moving troughs and ridges. Range, south to northwest force 3 to 8.

2.24 In the past there has been criticism of the BBC's practice of terminating broadcasts of weather reports from coastal stations Which follow the shipping forecast. The full reports from coastal stations' were broadcast with each shipping forecast during the crucial period on 13 August. During the course of the Inquiry this point was discussed with the Controller of Radio 4 who summarised the BBC policy and practice as follows:-

> **In July** 1978 we **confirmed our agreement for Shipping Forecasts on Radio 4 Jrom 23** November 1978 with **the** Marlne.Divlslon **of the Department of Trade.** This agreement **was** based on wlde-ranqlnq **discussions with marine Interests and the** .MetecrologicalOfftce. We agreed to broadcast: **-**
> (I) **Shipping** Pctecests ot **6 minutes duration as** tollower-.
>
> **0016·0020** (approx: **agreed** that this **forecast could-run longer If necessary)**
> 0626·0630
> 1366·1400
> 1760·1766
>
> **(Ii) Gale Warnings at the first available programme junction. If this is not after an hourly news bulletin then the warning is repeated after the next news (to ensure that mariners know where to look). Live sequence programmes are interrupted at the earliest appropriate moment to carry gale warnings,**
> **We have carried out this** agreement with **few complaints. On** rare occeelcne **we have broadcast a Shipping Forecast** late because of **an operational problem or programme *force majeure*** (the **Pope's speech),**
> **We have also occasionally dropped some coastal** station reports **when a Shipping Forecast has run more than 6 minutes.** We have **had several discussions with the Meteorological Office to try and ensure that the** toreceete **are written to run within 6 minutes.**
> **We have recently underlined the agreement to run at 6 minutes, but made It clear that In exceptional weather conditions we will** over-run **6 minutes If the Meteorological Office will give us some, albeit short, warning.**

2.25 A detailed report on the weather situation and forecasting of the Fastnet storm has been produced by the Meteorological Office. The Inquiry has considered that report and much of the factual Information on the weather In this section is derived from it. Two articles by leading meteorologists on the Fastnet Race weather have also been published by the specialist press. These articles are believed to give excellent summaries of the weather for the period and they are therefore included at Annex 2B.

2.26 The Meteorologicai Office report makes it ciear that as low Y crossed the North Atlantic on 11 and 12 August the medium range forecasters were aware that it might deepen as it approached the British Isles and generate gale force winds. However there were very few ships in the Eastern Atlantic and South West Approaches to the British Isles sending weather reports when the low pressure area approached. On 12 August the Central Forecast Office received no indication that low Y was In fact deepening. On the evening of 12 August and morning of 13 August there was no indication that strong or gale force winds would affect sea area Fastnet within the 24 hour forecast period. At this time low Y was deepening but there were no reports available to Indicate that it was doing so.

2.27 The Meteorological Office assessment of the actual weather on 14 August is based on very sparse information from the area in which the Fastnet Race fleet was sailing. The anemometer at the Kinsale platform which might have given a better record of wind strength was unserviceable at the time and there were very. few ships in the area. Anemometers and barographs fitted to yachts are not calibrated and checked to the standards applied to official meteorological recording stations. it Is hoped however that with the benefit of all the data now available from yachts a further study which is being carried out by the Meteorological Office to improve numerical forecasting in the type of situation which prevailed will be fruitful.

2.28 On the basis of the Information which was available the current state of the forecaster's art did not allow longer warning of the bad weather. There is at present no method of predicting with any certainty when a depression will deepen rapidly in the Western Approaches to the British Isles; so gales which arrive with little warning are a feature of our weather, which those who sail must expect to encounter from time to time. Warnings of gales are important to allow those at sea to take precautions such as stowing all gear above and below decks extra securely, preparing heavy weather sails for use and possibly amending navigational plans to avoid areas of tide-races and shallows where sea conditions are likely to be particularly dangerous.

2.29 The length of warning of storm force winds was oertainly not sufficient for the majority of competitors to run for shelter. Any that did so might have hazarded their yachts by arriving in the vicinity of the coast in a rising storm.

TABLE3.2

Question: Did you experience a knockdown beyond horizontal (including a 360° roll) (B2 Knockdown)

Comparison with Rated Dimensions

			82 Knockdown	
	Total	**Aban-doned**	*Yes*	*No*
BASE	235	23	77	136
Fastnat Class				
0	8 3%			6 4%
I	40 **70%**	--	5 8%	29 21%
II	40 17%		4 5%	33 24%
III	52 22%	6 **26%**	24 31%	24 IB%
IV	46 **20%**	8 35%	20 **26%**	19 14%
V	47 **20%**	B 35%	22 29%	24 18%
No answer	2 1%	1 4%	1 1%	1 1%

			82 Knockdown	
	Total	**Aban-doned**	*Yes*	*No*
BASE	235	23	77	136
BALLAST RATIO				
20 TO 24,6%	1 0%	--	-	1 1%
25 TO 29,9%	6 3%	1 4%	4 **6%**	1 1%
30 TO 34,6%	5 2%	1 4%	2 3%	3 2%
35 TO 39,9%	16 7%	2 9%	5 6%	11 8%
40 TO 44,9%	42 **18%**	5 22%	lB 23%	20 15%
45 TO 49,9%	60 **26%**	6 26%	20 26%	34 25%
50 TO 55%	64 27%	4 17%	19 25%	37 27%
Less than 20%	1 0%	--	-	1 1%
No answer	40 **17%**	4 **17%**	9 12%	28 21%

			82 Knockdown	
	Total	**Aban-doned**	*Yes*	*No*
BASE	235	23	77	136
LIOSP				
Less than 125	4 2%			3 2%
12lT0146	16 6%	3 13%	11 14%	4 3%
150 TO 174	16 7%	2 9%	5 **6%**	10 7%
175TO199	78 33%	6 26%	26 34%	45 33%
200TO244	50 21%	4 17%	15 19%	31 23%
225TO249	16 7%	2 **9%**	6 B%	10 7%
250+	7 3%	-	--	5 4%
No Answer	49 21%	6 **26%**	14 16%	2B 21%

			82 Knockdown	
	Total	**Aban-doned**	*Yes*	*No*
BASE	235	23	77	136
LIB				
Less than 2.4	9 4%	2 9%	6 8%	3 2%
2,5	9 4%	2 9%	5 **6%**	4 3%
2,6	36 15%	6 26%	14 lB%	19 14%
2,7	51 22%	3 **13%**	18 **23%**	27 20%
2,8	39 17%	2 9%	12 16%	25 18%
2,9	22 9%	2 9%	B **10%**	13 10%
3,0	5 2%	-- --	- --	5 4%
Mcrethena.n	14 6%	--	-	11 B%
No answer	50 21%	6 26%	14 18%	29 21%

			,82 Knockdown	
	Total	**Aban-doned**	*Yes*	*No*
BASE	235	23	77	136
B/eMO				
Under4	6 3%	--		5 4%
4 TO 4,99	15 6%	1 4%	2 3%	11 8%
5TO 5,99	71 30%	3 13%	17 **22%**	47 **35%**
6 TO 6,99	68 29%	7 30%	27 35%	36 26%
HO 7,99	21 9%	3 13%	15 **19%**	6 4%
8ormore	3 1%	3 13%	-2 3%	1 1%
No answer	51 22%	6 **26%**	14 18%	30 22%

			B2 Knockdown	
	Total	**Aban-doned**	*Yes*	*No*
BASE	235	23	77	136
T,R,				
40+	2 1%	-	2 3%	--
39,9 TO 36	20 9%	4 **17%**	10 13%	8 6%
35,9 TO 32	62 26%	3 13%	20 26%	37 27%
31,9T02B	76 **32%**	9 39%	25 32%	46 34%
27,9 TO 24	20 9%	1 4%	5 6%	13 10%
Less than 24	4 2%	-	-	3 2%
No answer	51 22%	6 26%	15 **19%**	29 21%

			B2 Knockdown	
	Total	Aban-doned	Yes	No
BASE	235	23	77	136
S,V,				
MorethanO	--	-		--
OTO·0.49	33 14%	3 13%	16 21%	13 10%
·0.5 TO·0,99	89 38%	12 52%	32 42%	51 38%
-1,OTO-l.46	50 21%	2 9%	15 19%	32 24%
-1.5 TO -1,99	10 4%	--	-	10 7%
Lessthan -2.0	3 1%	-	-	1 1%
Nosnswer	50 21%	6 26%	14 18%	29 21%

Section 3
Ability of the Yachts and their Equipment to withstand the storm

3A BOAT STABILITY

3,1 It has been alleged that In their quest for faster boats designers have gone to extremes which surpass the bounds of common sense and ignore constraints which should be imposed by the requirement for offshore racing yachts to be able to cope with any weather conditions which they might be expected to encounter, In particular light displacement, broad beam, shallow hull form and lack of both initial and ultimate stability have been singled out as targets for criticism,

3,2 In analysing the results of the race the following features of each yacht have been determined from rating certificates: -

a) Displacement/length Ratio

$$\frac{DSPL}{(0{,}01\,L)^3 \times 2240} = D/L \text{ ratio}$$

DSPL is the rated displacement (The closest approximation which can be obtained from measurements takenl and L is the rated length.

b) Length/ Beam Ratio

$\frac{L}{B}$ = LI B ratio

Where L Is the rated length and B the rated beam,

c) Beam/ Depth Ratio (to show trend toward wide shallow hulls)

$\frac{B}{CMDI}$ = B/D ratio

Where B is the rated beam and CMDI the centre mid depth immersed,

d) Tenderness Ratio

Tenderness ratio (TR) is derived from a measurement of the inclining moment required to heel the yacht through 1o, It therefore gives an indication of Initial stability and hence ballast ratio. The lower the value the more stable is the yacht.

e) screening Value

The screening value (SV) Is calcuiated from the tenderness ratio and other hull measurements to ensure that the yacht is self righting at 90° angle of heel. A negative value indicates positive self righting at 90°. Boats with positive SV values are required to show that they have an adequate safety margin of positive stability by righting themselves from 90° with weights attached to the mast.

3,3 It has also been alleged that the underwater lateral profile encouraged by the rating rule results in boats which have unseaworthy characteristics. In fact the present rating rule, in common with all previous rating rules, neither measures nor controls underwater profile, so developments towards very short fin keels have occurred because this configuration is believed to be the fastest and not because it confers a rating advantage. As no measurements of underwater lateral profile are taken it was not considered feasible to analyse the performance of boats with different underwater profiles.

TABLE3.1

Question: Did you experience a knockdown to horizontal or almost horizontal during the stormIIBI Knockdown)

		Fastnet Class					
	Total	*0*	I	*If*	*Ifl*	*IV*	*V*
BASE	236	8	40	40	62	46	47
Ye'	113 48%	3 36%	11 28%	14 **36%**	28 54%	26 54%	30 54%
No	lOB 48%	6 63%	26 66%	24 **60%**	21 40%	16 36%	16 34%
No Answer	34 6%	-	3 8%	2 6%	3 6%	6 11%	1 2%

3.4 Concern has also been expressed about the apparent lack of directional stability and tendency to broach exhibited by some modern racing yachts. Tendency for any yacht to broach increases in direct proportion to speed and power applied through sail area. Modern keel shapes are highly efficient In terms of lift/drag ratio but they do not add to directional stability In the way in which a longer keel increases the radius of a yacht's turning circle; nor do they act as a roll damping fin in the way that a longer keel is believed to act. Lack of readily available data has precluded any detailed investigation of this subject, but neither has any factual evidence emerged from the 1979 Fastnet Race to indicate the subject merits special study In connection with the ability of yachts to survive storm conditions in the open sea. There were *very* few boats of traditional long keel configuration sailing so comparisons cannot be made,

3.5 48% of the fleet (112 boats) reported that on one or more occasions the yacht was knocked down to horizontal during the storm, Table 3,1 shows that as might be expected the smaller boats were generally more vulnerable. Knockdowns to horizontal (referred to In the tables in this report as a BI knockdown) have always been a potential danger in cruising and offshore racing yachts in heavy seas; therefore no attempt has been made to analyse the causes or effects,

3.6 33% of the fleet (77 boats) reported experiencing knockdowns to substantially beyond horizontal, lnoludlnq total inversions and full 360° rolls, This type of knockdown (referred to in the tables in this report as a B2 knockdown) is a rare occurrence and an analysis of those boats involved, the factors Which might *have* been expected to have been important, the resulting damage and injury and the number of boats badly knocked down which were subsequently abandoned has therefore been carried out.

3,7 Table 3.2 shows the comparison of measurements taken from rating certificates with boats Which were knocked down past 90°, It can be seen that, in the sea conditions experienced, characteristics which appeared to Increase a yacht's likelihood of suffering a knock-down past 90° include: lack of initial stability as indicated by high tenderness ratio and low negative screening value; wide beam as indicated by low L/ B ratio (there is only a slight Indication that this factor was slgnificantl; wide shallow hull form as indicated by high B/CMDI ratio. There is little indication of any relationship between baliast ratio or length/displacement ratio and vulnerability to knockdowns, It must be stressed that while these tabulations appear to indicate trends towards, for instance, wide boats being prone to knock-downs past 90°, they do not constitute proof that all wide boats will inevitably suffer knockdowns, High B/CMDI and low LIB ratios are generally associated

with the smaller boats; and boat size to wave size ratio Is an important factor which will always make smaller boats more vulnerable. In classes 0-2 the percentage of severe knockdowns was 11 % compared with 46% in classes 3-5.

3.8 Table 3.3 shows the severe knockdowns related to whether or not the boat was subsequently abandoned and also indicates the extent to which boats of which there were six or more of a similar type sailing were involved. The OOD 34 appears from this tabulation to have been particularly vulnerable but it is impossible to say whether this was due to the design of the boats or the fact that boats of this size and speed encountered particularly severe sea conditions. With only 11 boats of this type included the sample is not large enough to be statistically reliable. The' connection between severe knockdowns and subsequent abandonments is clearly shown in table 3.3.

3.9 Table 3,4 shows the amount of sail carried, speed through the water, aspect presented to the waves and whether or not warps or drogues were in use at the time of the knockdown. No positive conclusion can be drawn from table 3,4, as there are no control groups against which comparisons can be made. It was not possible to ask questions such as "What was speed through the water when the boat might have been, but was not, severely knocked down?". These tables do, however, indicate that the factors related to in the questions were not of outstanding significance.

TABLE3.3

Question: Old you experience a knockdown beyond horizontal IIncludlng a 360° rolllIB2 knockdown)?

			Type of Yacht (6 ormoreInFleet)			
	Total	Abon-doned	000 34	Oyst-8,37	UFO 34	com-8S$832
BASE	236	23	11	7	6	9
V"	n 33%	22 96%	9 82%	2 29%	2 33%	3 33%
No	136 68%	1 4%	2 16%	3 43%	3 60%	6 66%
NoAnsw9r	22 9%			2 29%	1 17%	1 11%

3.10 The damage suffered in severe knockdowns is listed In table 3.5. 37% of the boats in this category did not report any significant damage. The largest category of damage was dismasting but this should not be taken to Indicate weakness of rig. In many cases boats were rolled through 360° and to construct rigs which would withstand the very large forces Involved would necessitate stronger hulls to support them, and the start of a spiral towards more heavllv constructed boats, requiring more sail to drive them. The general pattern of damage Is much as would be expected in yachts subjected to the violent accelerations and enormous forces involved in a bad knockdown, total inversion or 360° roll.

3.11 Injuries to crew members are categorised In table 3.6. Five of the six reported Instances of loss of life were the indirect rather than direct results of knockdowns, the

TABLE3.4

ATTHETIME OFTHE KNOCKDOWN BEYOND HORIZONTAL

***Question:* Whatsail was**sst?

	Total
Base	77
None	45 58%
Head-Sail **Only (LargerthanstormJlbJ**	1 1%
Storm Jib Only	20 26%
Mainsail or Trlsall **Only**	4 6%
Jib Et Mainsail or Trlsall	3 4%
No Answer	4 6%

***Question:* Whatwas the aspect presented by** the boat **to the waves?**

	Total
Base	77
Astern (±30°)	10 13%
Quarter (30°·60°)	20 26%
Abeam(±30°)	26 34%
Bow (±60°)	13 17%
No Answer	8 10%

***Question:* Whatwas thespeed throughthewater?**

	Total
Base	77
0·1.9 knots	12 **16%**
2-3.9 knots	13 17%
4·5,9 knots	20 26%
6·7.9 knots	11 **14%**
B·9,9knots	4 6%
10+ knots	5 6%
No Answer	13 **17%**

***Question:* Werewarps/drogue in use?**

	Total
Base	77
No	53 69%
Warps	16 21%
Drogue/Sea Anchor	4 6%
No Answer	6 69%

casualties being washed overboard and not recovered, One man was lost when his harness was released to enable him to gain the surface from an upturned yacht, One casualty was reported to have been trapped in the cockpit of an upturned boat for some minutes, was revived by artificial respiration after the boat righted herself but died about 46 minutes later. (See also sections 3G and 4C).

3.12 Several crews reported that buoyancy aids gave useful protection against injuries which might otherwise have been sustained by crew members being thrown across the cabin, One crew rigged safety lines along the saloon which they found invaluable as a means of preventing injury, (See also Section 3D).

TABLE 3,5

Question: **At the time of** knockdown **beyond horizontal was there anysignificant damage to theboat?**

	Total
Base	77
Yes/Other	11 14%
Floor Damage	7 9%
Dismasted	12 16%
Minor Rig Damage	6 8%
***Deckl*Deckhousel Coachroof**	1 1%
Hatches/Washboards	5 8%
Instruments/Aerials	4 5%
Liferaft Lost	2 3%
Windows	6 6%
Accommodation	5 6%
Steering	4 6%
Loose Gear Lost	2 3%
NonelNo	20 26%
No Answer	8 10%

TABlE3,6

Question: At the **time of the knockdown to beyond horizontal was there anysignificant damage to the crew?**

	Total
Base	77
SrnallInjurles	14 18%
Serious Injuries	12 16%
Loss of Ufe	6 8%
No Answer	8 10%

3.13 Table 3.7 shows the extent to which skippers believed that knockdowns were inevitable in the specific circumstances in which they occurred, whether any specific design defect was responsible and whether there was any doubt about the ultimate self-righting ability of the boat,

3,14 The answers received show a consensus of opinion that it was the severity of the conditions rather than any defect in the design of the boats which was the prime consideration. In narrative answers, however, there are five accounts of boats which spent between 30 seconds and 6 minutes totally inverted. As the period of the waves was no more than 13 seconds it can be inferred that these five boats attained positive inverted stability during the passage ofthree waves, All five boats did right themselves, but all were subsequently abandoned, although only one actually sank, These five reports give grounds for concern about the ultimate self righting ability of certain boats and a full stability analysis of two boats, one of a type which reported remaining inverted for five minutes and another which reported very rapid self-righting, was commissioned. The results of this analysis will be found in Annex 3A,

3,16· Much of the damage to yachts and many of the abandonments stemmed from yachts being knocked down substantially past 90°, While it is accepted that under the prevailing conditions some of these knockdowns were inevitable it is believed that the incidence of bad knockdowns was unacceptably high, It is also believed that boats in classes 3-6 with wide shallow hulls are at greater than average risk under these conditions,

TABLE3,7

Question: Do you consider, with hindsight, that the knockdown indicated a basic defect in the designed stability of the boat?

Question: Do you consider, with hindsight, that any boat of similar size would Inevitably have suffered a knock-down or roll in the circumstances?

Question: Old the length of time the boat took to recover from a knockdown cause you to doubt the uitimate self-righting ability of the boat?

		82 Knookdown	
	Total	*Yes*	*No*
BASE	205	61	123
DID KNOCKDOWN INDICATE BASIC DEFECT DF DESIGN?			
Yes	2 1%·	1 2%	1 1%
No	110 54%	69 97%	47 38%
No answer	94 46%	1 2%	76 62%
WOULD ANV BOAT OF SIMilAR SIZE INEVITABLV HAVE SUFFERED KNOCKDOWN?			
Yes	89 43%	53 87%	32 26%
No	27 13%	6 10%	18 16%
No answer	89 43%	2 3%	73 69%
DID IENGTH OF RECOVER VTIME CAUSE DOUBT ABOUT SEIF-RIGHTING ABILITY OF BOAT?			
ves	1 •	1 2%	–
No	106 62%	69 97%	43 36%
No answer	98 48%	1 2%	80 66%

TABLE3,8

Question: Wasthere anysignificant damage to the rig?

		Fastnet Class						*82 Knockdown*	
	Total	*0*	*I*	*If*	11/	*IV*	*V*	Yes	*No*
BASE	236	8	40	40	62	46	47	77	136
Yes	42 1B%		6 **13%**	4 10%	11 **21%**	9 20%	12 26%	29 38%	12 9%
No	182 77%	8 100%	32 80%	34 **85%**	40 77%	34 74%	33 70%	48 62%	119 88%
No Answer	11 6%		3 8%	2 **6%**	1 2%	3 **7%**	2 4%	–	6 4%

3BDAMAGE

3.16 Table 3.8 shows the extent of reports of significant damage to rigs. Much of this damage was sustained in knockdowns, and was therefore caused by weight of water rather than pressure of wind. Table 3.9 gives some indication of the causes of damage. This table is of limited value, largely because at the time skippers and crews were preoccupied with minimising further damage and there was little time or inclination to ascertain the cause,

3,17 A number of skippers have commented on the problems of severing the rigging after a dismasting,to avoid the possibility of the mast puncturing the hull, In one instance the wreckage of the mast was deliberately left alongside the boat and the crew stated that It was useful as a sea anchor, There must, however, have been considerable risk to the hull. The traditional bolt-croppers often carried in compliance with Special RegUlation 10.4 found. IIttie favour, Bolt-croppers are believed to be ineffective in severing rod rigging and the problems of using this tool, which requires two hands, were thought to give rise to unacceptable risks of being washed overboard,

3.18 One crew used hacksaws to sever rod rigging, It should be possible for four people to work simultaneously and they felt that it was reasonable to carry four hacksaws, They commented that a minimum of six spare blades should be available for each saw as the breakage rate was high and even if blades did not break they were quickly blunted. One saw frame and at least twelve blades is a more common proposal. Another crew disconnected the shrouds from the chain plates by removing the pins, They commented that the operation would have been much easier if the retaining split pins had been splayed rather then bent back through 180·,

3.19 Table 3.10 describes the damage inflicted on accommodation, A number of narrative reports comment on the inadequacy of securing arrangements for batteries and cookers which were dependent on gravity acting in the general direction of mast to kee!.In several boats cookers and batteries fell out of their mountings, Both items are potentially lethal missiles and the acid spillage from batteries made them doubly dangerous, Fully sealed batteries are now commercially available, Special Regulation 7,31 makes specific, although probably insufficiently detailed, reference to the installation arrangements for cookers,

3,20 Table 3.11 shows the Incidence of steering failure, This is the only type of damage to which the larger boats appeared to be more susceptible than the smaller and this is certainly due to the number of larger boats equipped with a particular type of carbon fibre rudder, Tests are being carried out to ascertain the cause of these failures,

TABLE3,9

Rlg Damage

Question: **Doyou nowfeel that you know the**cause? **(comment)**

	Total
Base	42
Sea State/Pressure of Water	6 **12%**
Knockdown/Capsize	7 17%
Shrouds Breaking	1 2%
Shift of Internal **Ballast**	1 2%
Overstress	3 7%
Other	B 19%
Reasons not **known**	B 19%
No Answer	10 24%

Question: **With hindsight, would better** pre-race **checks have avoided this damage?**

	Total
Base	42
Ves	7 **17%**
No	33 **79%**
NoAnswer	2 6%

TABLE3,10

Question: Was there anysignificant damage to the accommodation and Interiorflttings?

		Fastnet Class					
	Total	*0*	I	11	III	*IV*	*V*
eASE	235	8	40	40	52	46	47
Yes	31 13%	–	1 3%	3 8%	9 17%	8 17%	9 19%
No	177 75%	7 88%	33 83%	31 78%	37 71%	34 74%	34 72%
NoAnswer	27 11%	1 13%	6 **15%**	6 **16%**	6 12%	4 9%	4 9%

Question: Doyou now feel that you knowthe cause? (comment)

	rotet
BASE	31
Flood	2 6%
Materials NotAbleto Withstand	9 29%
Materials Not Properly Fixad	12 39%
Knockdown/Capslie	4 13%
No Answer	6 19%

TABLE3.11

Steering Gear Damaged

Question: Wasthere anysignificant damage to the steering gear?

		FestnetClo$s						
	Totel	*0*	I	11	III	IV	*V*	*Aban-doned*
BASE	235	8	40	40	62	46	47	23
Yes	25 11%	–	9 23%	2 6%	5 10%	3 7%	6 13%	4 17%
No	196 83%	7 88%	28 70%	34 85%	46 88%	40 67%	39 83%	18 78%
No Answer	14 6%	1 13%	3 6%	4 10%	1 2%	3 7%	2 4%	1 4%

Question: Do you now feel that you know the cause? (comment)

	TOtel
BASE	25
Carbon Fibre Rudder/ Rudder Broken/Weakness of Structure	14 66%
Wheall Pedestall Tiller Broken	6 32%
No Answer	4 16%

Question: Were you able to make satisfactory **emergency steering** arrangements? (commentl

	Total
BASE	25
No	6 24%
Trailed Spinnaker Poles	3 12%
Rigged Steering Oar	3 12%
Emergency filler	7 28%
No Answer	6 24%

3.21 Table 3.11 also shows the success achieved in rigging emergency steering arrangements. Under half the boats which suffered steering gear faiiure reported. being able to make satisfactory emergency arrangements. Speciai Regulation 10.3, as it stands, appears to be inadequate and although the proposed change which will come into force in 1980Is an improvement it is doubtful if it will be fully effective. Either an emergency rudder, to be fully effective, would have to be stronger than the normal steering arrangements or a lower degree of directional control would have to be accepted.

3.22 Several competitors expressed the view that emergency rudders were an unrealistic ideal. If the boat builder, working under. factory conditions, had been unable to manufacture one that was strong enough, there was little hope of a yacht's crew doing so under conditions of extreme difficulty.

3.23 It is unlikely that emergency steering arrangements which give the same directional control as the main rudder will ever be developed, unless boats carry complete prefabricated alternative steering equipment. However a number of yachts were brought under directional control with jury steering gear.

3.24 In the long term there can be no advantage in terms of racing success to be gained by accepting periodic steering failures as the inevitable penalty for lightly built rudders. Designers who specified carbon fibre rudders for boats sailing in this race are accutely aware of their high failure rate and are already taking positive steps to establish the exact cause of the failures in order to prevent a recurrence.

3.25 Tables 3.12 and 3.13 itemize the hull damage sustained. Most of the 34 boats which reported under this category

TABLE3.12

Question: Did you experience significant structurai damage to the hull, including hatches and companionways?

		Fastnet Class						
	rotsl	*0*	I	11	III	IV	*V*	
BASE	235	8	40	40	62	46	47	
y"	34 14%	1 13%	2 6%	2 6%	9 17%	7 16%	11 23%	
No	185 78%	6 78%	35 88%	35 88%	42 81%	33 72%	34 72%	
No Answer	17 7%	1 13%	3 6%	3 6%	2 4%	6 13%	2 4%	

Type of Yacht			
000 34	*Oyst- «Sr*	*UFO 34*	*Cont- essa 32*
11	7	6	9
6 45%	–	–	3 33%
6 66%	6 86%	6 83%	6 67%
–	1 14%	1 17%	–

Length/Olsplocemeilt						
Less than 120	*121· 149*	*tso- 174*	*175- 199*	*200- 224*	*225- 249*	*250+*
4 –	16 6 33%	16 3 19%	78 11 14%	lIO 6 12%	16 1 6%	7 –
4 100%	10 67%	11 69%	61 78%	39 78%	16 94%	7 100%
–		2 13%	7 9%	6 10%		

TABLE3.13

HULL DAMAGE

Question: Do you now feel that you know the cause? (Comment)

		Rig Damage		*Accom, Damage*		*Stoerlng Damege*		*Type of Yacht*			
	Total	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*000 34*	*Oysr· er37*	*UFO 34*	*Cont· essa 32*
BASE: STRUCTURAL DAMAGE TO rHE HULL	34	14	20	12	21	4	29	6		–	3
Washboard Lost	6 16%	–	6 26%	2 17%	3 14%	1 26%	4 14%	1 20%			1 33%
Washboard Damaged	Z .%	1 7%	1 6%	1 8%	1 6%		2 7%				
Loss of Equipment	4 12%	2 14%	2 10%	–	4 19%		4 14%			–	2 67%
Building Defeot	6 16%	1 7%	4 20%	1 8%	3 14%	–	6 17%	1 20%			
Knockdown/Capsize	7 18%	3 21%	3 16%	3 26%	3 14%	1 26%	4 14%	–	–		
fmpaot ollon Wave	3 9%	2 14%	1 6%	1 8%	2 10%	–	3 10%	1 20%			
Mast Compression	1 3%	1 7%	–	1 8%		–	1 3%	–			
Should Have Carried Stormboard	1 3%	1 7%	–	–	1 6%	1 26%					
Flexibility of cceeh Roof	Z 6%	1 7%	1 6%		2 10%		2 7%			–	1 33%
Damage to Structure of Hull	4 12%	1 7%	3 16%		3 14%		4 14%	1 20%		–	
No Answer	7 18%	3 21%	3 16%	4 33%	2 10%	1 26%	6 17%	1 20%	–	–	

The tableshowsthe extent to which yachtswith hull damage also experienced other types of damage.

did so with reference to Items of ancillary hull equipment rather than damage to the main structure of the yacht and It Is a considerable credit to builders and designers that under such severe conditions so little structural damage was done.

3.26 Table 3.12 compares hull damage with length/displacement ratio. The lighter boats appear to have been more susceptible to hull damage than the heavier. 23% of boats with an L/DSPL figure of less than 176 reported hull damage, compared with 12% of boats with an LIDSPL over 176.

3.27 Table 3.14 shows the extent to which boats reporting hull damage also reported other types of damage. The related subject of watertight Integrity is dealt with In Section 3C.

3C WATERTIGHT INTEGRITY AND BILGE PUMPING ARRANGEMENTS

3.28 Table 3.14 shows the extent to which lack of watertight integrity was considered a problem. With one third of the fleet reporting that it was, this is clearly a question which requires investigation.

3.29 It might be thought that the dispiacement of a boat would be relevant to her watertightness but this was not in fact the case; no particular pattern emerges from a comparison of length/displacement ratio with watertightness.

3.30 Competitors were asked to comment on significant water entry points, and Table 3.16 lists the responses. More crews listed significant. entry points than stated that water entering the boat was a problem, indicating that offshore racing crews accept a certain amount of water below as a fact of life.

3.31 The largest category of response refers to companionways. Some crews were reluctant to keep all the wash-boards in place because they felt that communication between companionway and cockpit was essential. Others discovered that the only way of positively securing the wash-boards was to lock the hatch over them from the outside and some were reluctant to do so because of effectively trapping those off watch In the accommodation. Some of those with angled sides to companionway entrances commented that this was bad design, as each wash-board had to 11ft only a few inches before it fell out completely. In general crews felt that the sides of the companionway

TABLE3.14

Question: A questionnaire following the 1956 Channel race gale revealed that the majority had serious problems caused by watar entering the boat through cockpit lockers, hatches, ventilators and similar openings not normelly under water. Old you have similar problems?

Question: Old the amount of water In the boet affect the decisions taken?

	Total	Length/Displacement: Less then 120	12'-149	150-174	175-199	200-224	226-249	26fJ+	Type of Vcom: 000 3'	OyM' 8r37	UFO 3'	Cont·esse 32
BASE	234	4	16	16	77	60	16	7	11	7	6	6
WAS WATER ENTERING THROUGH OPENINGS NOT NORMALLY SUBMERGED A PROBLEM?												
V"	77 33%	1 25%	7 47%	4 25%	28 36%	14 28%	7 44%	2 29%	5 45%	2 28%	3 60%	2 22%
No	152 65%	3 75%	6 53%	12 76%	48 62%	35 70%	9 56%	5 71%	6 56%	4 57%	2 33%	7 76%
No Answer	9 3%				2 3%	1 2%				1 14%	1 17%	
DID AMOUNT OF WATER IN BOAT AFFECT OECISIONS TAKeN?												
V"	26 11%		3 20%	2 13%	11 14%	4 8%	1 6%	1 14%	2 18%	1 14%		1 11%
No	200 65%	4 100%	12 80%	14 88%	64 83%	43 88%	16 94%	8 88%	8 62%	5 71%	5 83%	7 78%
No Answer	8 3%				2 3%	3 6%				1 14%	1 17%	1 11%

TABLE3.15

Question: **Do you** now feel **that any of the following** were **significant water entry points?**

	Tote/
Base	234
Companionways	
Yes	98 42%
No	113 48%
No Answer	23 10%
Hatches/Skylights	
Yes	35 15%
No	178 **76%**
No Answer	21 9%
Ventilators	
Ye,	33 **14%**
No	181 77%
No Answer	20 9%

	Tote/
Base	234
Cockpit Lockers	
Yes	48 20%
No	167 71%
No Answer	21 9%
Engine Controls/Fuel Filling Points	
Yes	9 4%
No	204 87%
No Answer	21 9%
Hull to Deck Joint'	
yes	9 4%
No	204 87%
No Answer	21 9%

	Total
Base	234
Opening Port Light,	
Yes	6 3%
No	205 88%
No Answer	24 10%
Multiple Small Leaks Under Deck Fitting,	
Yes	21 9%
No	191 82%
No Answer	22 9%
Mast Coat	
Ye,	35 15%
No	175 75%
No Answer	24 10%

entrance should be vertical or nearly vertical and that it must be possible to secure and open the hatch from both inside and outside. A number commented on the lack of strength of both hatches and companionways and a minority felt that it was necessary to carry spare wash-boards. Some of those who lost or broke wash-boards plugged the aperture reasonably effectively with a bagged sail.

3.32 Many crews made strong comments about the dangers of inadequate closing arrangements for companionways, stressing that this was a major and Important weakness. Several boats which were abandoned were left with main hatches open and wash-boards out and were subsequently recovered. However by the time these boats were abandoned the storm had started to moderate.

3.33 Table 3.15 lists a number of other significant water entry points. Greater attention to detailed design and construction could eliminate most of these. The report of the investigation into the 1956 RORC Channel Race which was sailed In storm force winds showed that many boats shipped large quantities of water through openings which are not normally immersed. That report stated that those findings were passed to designers and builders without comment. Some of those lessons were either not properly learnt or appear to have been forgotten. Since the Fastnet race a number of builders have taken action to modify stock boats which were shown to have weak features.

3.34 Table 3.16 shows the methods used to pump or ball and competitors' assessments of their efficiency. There is at present no Special Regulation which requires boats to carry buckets with strong lanyards and many competitors think that this is an omission which should be rectified. It seems unfortunate that regulations are considered desirable to teach owners the value of elementary equipment. Several crews commented adversely on the use of the heads pump as the second bilge pump. They felt that it was In the wrong part of the accommodation, too far forward in the hull with insufficient space to work and that the complicated plumbing involved was inappropriate to such an important item of equipment.

3.35 Pumps which discharged into the cockpit were also criticised, as when there was a large quantity of water in the hull the cockpit did not drain effectively and had itself to be balled. The lack of any adequate bilge sump caused much annoyance, and although it was probably not relevant to the ultimate safety of the yacht, it was oertalntv a factor in lowering morale and increasing the risk of hypothermia due to wet clothes and bedding, because of the difficulty in removing the last few gallons of water from a hull with no depth of bilge or sump. Many competitors reported that a stirrup pump was extremely useful for removing water which could not be drained into the main bilge and for clearing the water from boats with very shallow bilges.

3.36 The most serious defect affecting watertight Integrity is the design and construction of wash-boards. The blocking arrangements for the main companionway should be totally secure, yet openable from above and below decks.

TABLE 3,16
BILGE PUMPING

Question: **Dld the bilge pumping arrangements prove satisfactory?**

	Total
Base	234
Yes	177 76%
No	47 20%
No Answer	10 4%

Question: **WIth hindsight, what alterations** would you **make to the pumping arrangements? (Comment)**

	Total
Base	234
None	76 32%
Bigger Capacity Pumps	14 6%
Better Below	11 6%
Better Cockpit	7 3%
Sump	23 10%
. **Better** Drain-Holes	16 6%
Handle Stowage	6 2%
Additional Pumps	36 16%
Re-site Pumps	23 10%
No Answer	64 23%

Question: **Old you use buckets to** bail?
Question: **Old you** find them **effective?**
Question: If Y.DU dld not **carry buckets, would you do so in future?**

	Total
Base	234
Old You Use Buckets *to* Bail?	
Yes	69 29%
No	153 65%
No Answer	12 6%
Old You Find Buckets Effective to **Ball?**	
Yes	69 29%
No	B 3%
No Answer	167 67%
Would You Carry Buckets in Future?	
Yes	27 12%
No	6 3%
No Answer	199 65%

TABLE3.17

Question: Were you able to keep the cabin In reasonable order?

		Fastnet Clsss						81 Knock-down		82Knock-down	
	Tot8/	0	I	11	III	IV	V	Yes	No	Yes	No
BASE	235	8	40	40	Sa	46	47	113	108	77	136
Yes	185 79%	7 68%	36 88%	28 70%	42 81%	34 74%	38 81%	85 76%	93 86%	68 76%	114 84%
No	38 16%	1 13%	3 8%	8 20%	8 16%	8 17%	9 18%	25 22%	10 9%	17 22%	17 13%
No Answer	12 6%		2 6%	4 10%	2 4%	4 9%	1	3 3%	6 6%	2 3%	6 4%

3D COMFORT AND SECURITY OF ACCOMMODATION

3.37 A number of questions on the adequacy of accommodation was asked and the answers given appear in tables 3.17-3.20. The only general shortooming which appears from these tables to have been widespread throughout the fleet was a lack of adequate hand rails or "crash" bars but the full tables are oonsidered worth inoluding beoause they draw attention to a number of items of detail which could easily be improved.

3.38 It will be noted that only' two boats reported loose batteries as a specific hazard. Many more boats oommented that batteries oame loose and were a hazard, but this point was made as a general comment rather than in' answer to a speoiflo question in the section of the questionnaire dealing with "Comfort below/routine". Although a relatively small number of boats actually reported problems with loose gear a number of others spent a great deal of time clearing up gear whioh had been thrown out of its stowage. They did not, however, consider this a problem, merely an occupational hazard.

3.39 Some stowage arrangements prevlouslv found secure at any angle of heel beoame totally ineffective when boats were inverted and a number of reports draw attention to the hazard from tins of food which became. potentially lethal missiles as boats turned upside down. Cookers whioh dropped out of gimbals were even more dangerous and it is essential that such heavy items of equipment should be looked in position by positive fastenings and should not rely on gravity to keep them in place.

3.40 Speoial Regulation 6.7 states the requirement for all Items of heavy equipment to be securely fastened and Speoial Regulation 7.31 requires oookers to be seourely fastened. These regulations are specifio and appear to require no elaboration in that they already refer to the heaviest items. However it would appear that a number of orews regard the requirement for secure stowage as being met by retaining devices whioh are satisfactory only up to normal angles of heel but are ineffeotive if the yacht is rolled past 90°.

TASLE3.18

QuestIon: Did you find loose gearwas a problem or a hazard?

	Total
Base	235
No	156 56%
Yes	40 17%
Batteries	2 1%
Food	6 3%
BrokenGlass	1 •
Cookers	9 4%
Other	19 8%
No Answer	12 5%

TABLE3.19

Question: Was anyone seriously injured while below?

Question: With hindsight, would you now fit extra hand rails?

	Tota!	82 Knockdown		Fit Extra Hand Rail	
		Yes	No	Yes	No
BASE	236	77	136	47	178
Yes	12 6%	11 14%	1 1%	3 6%	9 6%
No	218 93%	68 86%	134 99%	43 91%	169 95%
No Answer	6 2%		1 1%	1 2%	

Question: Was *the* injury inevitable or did It result from poor interior design? (Comment)

	Total	B2 Knockdown		Fit Extra Hand Rail	
		Yes	No	Yes	No
BASE	12	11	1	3	9
Inevitable	5 42%	5 45%	-	1 33%	4 44%
Mighthave beenevolded	3 25%	3 27%	-	-	3 33%
From Poor Design	1 B%	1 9%		1 33%	-
No Answer	3 25%	2 18%	1 100%	1 33%	2 22%

3E DECK ARRANGEMENTS

3.41 Table 3.21 shows the replies to questions on deck layouts and arrangements. The 38 boats whioh oommented that there were insuffioient hand holds and harnessattaohment points give grounds for concern. This matter is commented on in detail in the seotionon safety harnesses. The percentage reporting inadequate toe-rails was much smaller but might be oonsidered indloative of a serious deficlenoy, albeit in a minority of the fleet, whioh is not at present covered by a Special Regulation.

3.42 A significant number of boats lost important items of deck gear and safety equipment. A smaller number commented that items of safety equipment were so seourely stowed that they were not Immediately available when required. Equipment such as lifejackets and marker buoys. must be immediately available when required, and oompetitors have commented that stowaqes for this equipment oan only be really satisfactory if they are Incorporated as integral features of the deok layout at the design stage. Similar comments referring to liferaft stowage are dealt with in the appropriate section.

3.43 61 crews felt that the cockpit draining arrangements were unsatisfactory. A number commented that Special Regulation 6.31 should be changed to specify a maximum time for the cookpit to drain rather than a minimum area for the drains. This is a sensible and

TABLE3.20

COMFORT BELOW

	Total
Base	235
Was Ventilation a Problem?	
Yes	49 21%
No	179 76%
No Answer	7 3%
Did you have bunks with Secure Leeboards for Half Crew?	
Yes	208 89%
No	18 B%
No Answer	9 4%
Was it Possible to Pump Bilges from Below Deck?	
Yes	180 77%
No	45 19%
No Answer	10 4%

	Total
Base	235
Would you now Fit Additional Handrails/Crash Bars?	
Yes	178 76%
No	40 17%
No Answer	17 7%
Do You Consider Boat Provided Sufficient Secure Bunks?	
Yes	205 87%
No	22 9%
No Answer	8 3%
Do You Consider Ability to Pump Bilges from Below Deck to be Slgnlflcantl	
Yes	183 78%
No	36 15%
No Answer	16 7%

TABLE3.21

COCKPIT/DECK LAVOUT

	Tota/
Base	235
Did You Feel that Non-Slip Surface. on Deck Were Adequatel Ve.	189 85%
No	27 11%
No Answer	9 4%
Did You Feel that Toe Rails were Adequate?	
Yea	204 87%
No	15 6%
No Answer	17 7%
Were There Sufflolent Hand Holds/Harness Attachment Polnts?	
Yes	190 81%
No	38 16%
, No Answer	7 3%
Was thers Speclal Provlslcn **for Helmsman's Safety Harness?**	
Yes	103 44%
No	126 54%
No Answer	6 3%
Was a Surfeit of Halyard Falls/Control Line End. a Problem?	
Yes	26 11%
No	194 83%
No Answer	16 7%

	Total
Base	235
Was Loss of Useable Halyards a Significant Probleml	
Yea	11 5%
No	199 85%
No Answer	25 11%
Were Winch Handles/Other Items of Deck Equipment Lost?	
Yes	44 19%
No	181 77%
No Answer	10 4%
Were Items of **Distress/Rescue Equlpment Lost Overboard?**	
Yes	45 19%
No	180 77%
No Answer	10 4%
Was any **Distress/Rescue Equipment too Securely Stowed?**	
vee	14 6%
No	203 86%
No Answer	19 6%
Were the Self-Drainlng Arrangements In Cockpit Satlsfactcrv?	
Yes	162 69%
No	61 26%
No Answer	12 5%

TABLE3.22

Question: **What percentage length of luff of mainsail remains when** fully reefed?

	Total
Base	234
0-20%	21 9%
21-40%	66 24%
41·60%	100 43%
61·80%	35 16%
81·100%	–
No Answer	22 9%

Question: **What percentage length of luff do you consider necessary?**

	Total
Base	234
0·20%	29 **12%**
21·40%	60 **21%**
41·60%	62 22%
61·80%	7 **3%**
81-100%	2 **1%**
No Answer	96 41%

TABLE3.23

TRISAILS

Did you carry a Trisail7

Yes	52 22%
No	168 **72%**
No Answer	14 **6%**

Did you set a Trls.1I7

Yes	19 8%
No	162 69%
No Answer	53 23%

Did you Feel-a **Need to Carry a** .Trlead?

Yes	105 **45%**
No	104 **44%**
No Answer	25 **11%**

practical suggestion; three minutes is suggested as the maximum acceptable time for a cockpit to drain but there would be difficulties adapting existing boats to meet this standard.

3.44 Comment on the deplorable lack of towing points forward in modern racing yachts has been received from an RNLI Coxswain who was involved in towing in abandoned yachts after the storm. The traditional sarnson post is seldom fitted to racing yachts as it adds nothing to speed and is a heavy structure in the forward part of the boat. There is no requirement In the Special Regulations for any form of securing point for anchor cable, although 8.31 is specific on a requirement for two anchors.

3.45 An adequate strong point and fairlead for anchor and towing warp is a requirement which was not highlighted during the race, but a number of yachts suffered unnecessary damage afterwards because of the need to improvise fittings which should have been integral features of the deck layout.

3FRIGS

3.46 Questions which competitors were asked to answer about rigs were intended to discover whether the sails carried on board were adequate for storm conditions. Table 3.22 summarises the views expressed on mainsails. A number of crews experienced considerable difficuity rigging the third slab-line to pull down the last reef. Many found that it was necessary to lower the main fully, rig the line and then re-hoist the sail.

3.47 The answers to questions on trisails are shown in table 3.23. Only 36% of those who had a trisail on board actually set it. However half of those who expressed a view on the need to carry a trisail said they feit that there should be one available.

3.48 Table 3.24 shows the responses received to questions about storm jibs.

3.49 A meeting of offshore sailmakers was held on 20 September 1979 to discuss existing and anticipated legislation on storm sails in the light of experience in the Fastnet Race. Certain extracts from the minutes of that meeting are of interest and will be found at Annex 3B.

3.50 Specific regulations on storm sails are likely to have to be very detailed If they are to be effective. Yachts with different rig and hull configurations present different requirements for storm sails. Some boats work to windward satisfactorily under just a storm jib, others require some sail set aft of the mast and a headsall and a third category make good progress under a deep-rested mainsail or trlsail only. Each of these three types requires a different combination of sizes of storm sails.

3.51 Sail limitation rules, designed to limit the number of light and medium weather sails, need careful phrasing to ensure that they do not in any way curb owners' freedom to carry adequate storm sails.

TABLE3.24

STORM JIBS

	Total
BASE	234
Do You Feel that Area of Storm Jib is Correct? Yes	m **76%**
No	40 **17%**
No Answer	17 **7%**
Do You Consider Sheeting Arrangements For Storm Jib Were Adequate? Yes	212 **91%**
No	10 4%
No Answer	12 5%
Were the Provisions for Attaching Storm Jlb **Adequate?** Yes	167 71%
No	15 6%
No Answer	52 **22%**

3G SAFETY HARNESSES

3,52 Table 3,25 summarises the types of harness carried by the Fastnet fleet, the instances of harness failure and the probable causes of failure.

3,53 The RORC Memorandum on Safety at the head of the Special Regulations emphasises the importance of adequate attachment points, Special Regulation 11,3 requires all yachts to carry a safety harness for each member of the crew and draws attention to the British Standard Specification for harnesses 1BS4224) ,

3,54 Very few manufacturers offer harnesses which have been tested by BSI in accordance with BS4224 and carry the BS klternark. Full compliance with the standard adds considerably to the cost of a harness and it appears that the sailing public do not consider this additionai cost is worth the guarantee of reliability which a kitemark on a harnessshould confer,

3,55 Several competitors reported that some or all of the harnesses carried were of their own manufacture, generally "improvements" of standard models. Many of those who commented favourably on harnesses felt that two lines, each with its own hook, were an advantage. Harnesses which were simple to put on were also appreciated and those who had combined harness/life jackets felt that there was considerable benefit in combining the two Items of safety equipment in a single unit, Conversely harnesses which tended to snarl and twist when being put on and harnesses which were incompatible with iife jackets attracted unfavourable comment.

3.56 The following detailed comments on instances of harness failure have been received:—

1. Harness buckle failure, The makers have subsequently issued a press release stating that on one early model the buckle can slip if the harness is put on inside out. They have asked owners of these harnesses to return them for exchange with a more modern harness, fitted with a buckle which they claim to be totally secure,

2, Three men went overboard wearing jacket type harnesses, One was lost due to the line between the harness and the clip breaking, One was lost because the point of attachment (guardrail) failed, The third remained attached,

3, The belt of a jacket/harness pulled out. The webbing belt and line remained attached to the yacht. This occurred during a knockdown and in the same incident another crew member wearing a similar harness remained attached,

4. The line of a harness broke at the point where there was a knot in the line,

5, The cast stainless steel hook of a harness straightened by ¼" and released itself, This occurred during a knockdown and the boat remained totally inverted for lonq enough for the crewman concerned to swim back to the upturned boat.

6, Two crewmen were washed overboard, one harness remained attached, the other failed,

TABLE 3.26

Question: **Harness attachment pointused**

	In cockpit	Going forward
Base	236	236
Deck Strong Points **& Stanchion Bases**	57 **24%**	41 **17%**
Specially Fitted Strong Points	51 **22%**	24 **10%**
Jack Stay	61 22%	87 **37%**
Rigging	12 **6%**	27 **11%**
Steering Pedestal	9 4%	—
Tce-ralt/Cap-ra'l	43 18%	26 11%
Guard. Railsl Stanchions	20 **9%**	26 11%
No Answer	10 **4%**	26 **11%**

TABLE 3,26

Question: **Which makes of harness were used on board?**

	Total
Base	236
No Specific **Makers-Name**	61
Ptasttmo	26
Gibb	2
Henri L10yd	27
Hellv-Hansen	11
Klm	36
Haward	18
Mcklllop	6
Westaway	3
Crewsaver	12
Secumar	6
Maltan	2
Sowester	3
Lirakls	7
Jlm Buoy	3
Ancra	4
Equinoxe	2
Others	29

Question: Werethere **Instances of harness failure?**

	Total
Base	236
ves	26 **11%**
No	204 87%
No Answer	5 **2%**

Question: **Do you know the cause?**

Base	26
Hook Failure	6 **19%**
Hope/Line **Failure**	2 8%
Harness Failure	10 38%
Broken Attachment **Point**	6 **23%**
No Answer	4 **16%**

Although badly hurt with a serious headwound the detached crewman was able to grab a line which was thrown to him and was pulled back on board.

7. One man was nearly lost when the ring on his harness broke. The skipper of the yacht, a physicist, comments that he finds It a serious error that the ring Is made of poor quality bronze and chromium plated.

8. The buckle of a harness came undone because it had been put on the wrong way round.

9. The buckle on a harness is reported as holding under strain, but liable to come undone when there is no load on the line.

3.57 Table 3.26 summarises the attachment points used for harnesses. 28% of the fleet reports that with hindsight they wouid make changes to the points used for harness attachment. Further comment on the use of harnesses and man overboard prevention and recovery will be found in Section 4.

3.58 The importance of harnesses and harness attachment points are stressed in Special Regulation 11.3 and the Memorandum on Safety. However six lives were lost as the result of the failures of harnesses or harness attachment points. The regulations appear to be adequate but they were not fully observed by all owners and crews.

3H LIFE RAFTS

3.59 Table 3.27 shows the replies to questions on stowage of life rafts and estimated time to launch. Speciai Regulation 11,41(i) states the requirement for stowage of life rafts. It may be assumed that the majority of owners believed that their life raft stowage arrangements complied at least with the spirit of the Special Regulations but it is clear that under storm conditions many did not do so. Table 3.28 shows the spread of makes of life raft throughout the fieet and the number of life rafts which were used.

3.60 12 life rafts were washed overboard, of which 8 were stowed in the cockpit and 4 on deck. In several cases rafts stowed in cockpits were secured in place only by the lid of a locker, so that as soon as the locker was opened, which some did accidentally, the raft either fell out or was washed out. One of the deck stowed rafts which was lost went overboard still secured to the chocks on Which it was stowed.

3.61 One crew reported being unable to use either of the two rafts which were on board. The first was washed off the cabin top and the second could not be extracted from its stowage under the cockpit sole because the floorboards jammed.

3.62 Only one crew made the positive comment that the life raft was stowed too securely. However, the skipper of the yacht which took off the crew estimated that it took only *five* minutes, under extremely difficult conditions, between the time of taking the decision to abandon and the full crew being embarked in the inflated life raft.

3.63 Several competitors commented that they believed that the best place to stow the life raft was in the cabin. However, in one yacht in which the raft was stowed in the cabin it was brought into the cockpit and launched as a precautionary measure, an operation which took two to three minutes. The raft inflated upside down, it was righted but the painter then tore away and the raft was lost.

3.64 Table 3.29 shows the answers to a number of questions provided by those who actually used rafts. These answers reiate to approximately 25 hours which survivors spent in rafts, during which there were six capsizes.

3.65 With the exception of rafts which Inflated upside down and had to be righted most crews reported successful boarding. The tragic exception was the case of a raft which capsized when there was one man on board stowing emergency gear which was being passed to him. At the time the raft was secured on a short painter, which snapped and the crewman and raft were lost.

3.66 There were several compiaints about the painter being on the opposite side of the raft to the canopy opening, which made access unnecessarily difficult. The crew of one yacht boarded their raft through the observation hatch (not easy in life jackets), Several crews reported difficulty cutting the painter when it was not located on the same side of the raft as the canopy opening.

3.67 A number of valuable comments has been made on the subject of life raft stability and the use of drogues. One life raft capsized after 15 minutes. All the crew were attached by their harnesses and righted the raft fairly easily but all survival equipment was lost. Two hours later the raft capsized again and it was much more difficult to right as the crew were cold and tired. By this time the canopy was tearing. The crew were all rescued safely by another yacht after 6½ hours in the raft. They were not able to stream the sea anchor straight away and did not use one.

3.68 A 6 man raft capsized when a crewman was lighting a flare. It is not known whether the drogue was in use. An 8 man raft of the same make capsized before the sea anchor had been located. The raft was righted but immediately capsized again and the bottom ring and

TABLE 3.27

Question: How long do you estimate it would take to launch the raft?

	Total	*Where Stowed*			
		On Deck	*In Cabin*	*Cock-Pit*	*Below Cockpit*
BASE	235(15)	62(2)	13(3)	120(6)	35(3)
0·16 seccnoe	89(5) 38%	26(2) 40%	4 31%	43(3) 36%	17 49%
16-30 Seconds	46(4) 20%	9 16%	1(1) 9%	29(2) 24%	6(1) 17%
31-59 seconds	16(1) 7%	4 6%	1 8%	7 6%	3(1) 9%
60-1,59	38 16%	12 19%	4 31%	-19 16%	3 9%
Over 2 Minutes	27(4) 11%	8 13%	2(2) 16%	14(1) 12%	3(1) 9%
No Answer	19(1) 8%	4 6%	1 8%	8 7%	3 9%

Figures in bracketsrefer to rafts used and are basedon tect. All others are opinions.

TABLE 3.28

LIFE RAFTS CARRIED AND USED

Manufaoturer

	Tota/	*Beaufort*	*Avon*	*RFD*	*Dunlop*	*Ange-vin/ere*	*RAF*	*Winslow*	*Hendic*	*Other; Not known*
CARRIED	236	74	66	23	8	10	2	6	1	66
USED	16	6	4	2	–	2	–	-	1	1

floor broke away from the top ring and canopy. This raft had recently been serviced, but not by an authorised agent.

3.69 An 8 man raft inflated upside down, it was righted, then capsized after 45 minutes in use and the canopy broke away. The raft is described as being "sausaged by a wave". No drogue was In use.

TABLE 3.29

USE OF L1FERAFTS

	Total	Beaufort	Avon	RFD sUNivB	Angevinlere
BASE	15	6	4	2	2
DIDIT INFLATE AS EXPECTED?					
Yes	10 67%	4 80%	4 100%	-	2 100%
No	3 20%	-	-	1 60%	-
No Answer	2 13%	1 20%		1 60%	
WERE THECAeWABLETOBOARD WITHOUT ENTERING SEAFIRST?					
Yes	12 80%	4 80%	4 100%	1 60%	2 100%
No	-	-	-	-	-
No Answer	3 20%	1 20%		1 60%	
WAS THERETIMETO COLLECT SPARE CLOTHING/GEAR BEFORE BOARDING?					
Yes	7 47%	3 60%	2 60%	1 60%	-
No	4 27%	1 20%	1 26%		2 100%
No Answer	4 27%	1 20%	1 25%	1 60%	
WEAeYOUABLE TOSTREAM SEA ANCHOR STAAIGHT AWAY?					
Yes	5 33%	2 40%	2 60%	-	1 60%
No	4 27%	1 20%		1 60%	1 60%
No Answer	6 40%	2 40%	2 60%	1 50%	-
00 YOUFEEL THAT SEAANCHOR AFFECTED aEHAVIOUA OFTHE RAFT?					
Yes	3 20%	2 40%	1 26%	-	-
No	3 20%	-	1 26%	1 60%	1 60%
No Answer	9 60%	3 60%	2 60%	1 60%	1 60%
0i0 THEAAFTCAPSIZE INUBE?					
Yes	6 33%	2 40%	1 26%	1 60%	1 60%
No	7 47%	2 40%	3 76%		1 60%
No Answer	3 20%	1 20%	-	1 60%	
WAS THESEAANCHORIN USEAT TIMEOFCAPSIZE?					
Yes	-	-		-	-
No	4 27%	1 20%		1 60%	2 100%
No AnswElr	11 73%	4 80%	4 100%	1 60%	
WERE ALL/NEARLY ALL OFCREW SEATEDWHEN RAFTCAPSIZED?					
Yes	4 27%	2 40%	1 26%	-	1 60%
No	2 13%		-	1 60%	1 60%
No Answer	9 60%	3 60%	3 76%	1 60%	-
DID YOUFEEL THATWATER IN THEAAFTWASADVERSEIY AFFEC ING STABILITY?					
Yes	1 7%	-	-		1 60%
No	7 47%	2 40%	3 76%	1 60%	-
No Answer	7 47%	3 60%	1 25%	1 60%	1 60%
DOvou FEEL THAT REASONABLE DISCIPLiNEWASMAINTAINED DURING BOARDING1					
Yes	10 67%	4 80%	3 76%	-	2 100%
No	1 1%			1 60%	-
No Answer	4 27%	1 20%	1 26%	1 60%	
WERE YOUASLETOTAKE *RIT* INTOTHERAFT					
Yes	-	-	-	-	
No	8 63%	3 60%	3 76%	1 60%	1 60%
No Answer	1 47%	2 40%	1 26%	1 60%	1 60%
WAS COLD WAS AN IMPORTANT FACTOR?					
Yes	8 63%	2 40%	3 76%	1 60%	1 60%
No	3 20%	2 40%	-	-	1 60%
No Answer	4 27%	1 20%	1 26%	1 60%	-
WERE YOUABLETO KEEP ACCESS DOOR CLOSED?					
Yes	3 20%	1 20%	1 26%	-	1 60%
No	5 33%	1 20%	2 60%	1 60%	1 60%
No Answer	7 47%	3 60%	1 25%	1 60%	-

3.70 The crew of a 6 man raft streamed their drogue without any problem but the skipper considered that the raft became sluggish, with waves breaking over the canopy and the crew feared a capsize. The drogue was pulled in and the raft became more buoyant and lively. The raft did not capsize and the crew were all rescued in under an hour. The skipper subsequently consulted the manufacturers who agreed that in the prevailing conditions the raft would ride better without a drogue.

3.71 However, the raft which was longest afloat before rescue (8 hours), a six man, did not capsize and the crew comment as follows on the use of the drogue:-

> "The drogue was deployed when the raft was cut adrift from the yacht. It lasted between half and one hour and then carried away apparently at twO points-one at the drogue and the other at one of the yoke lines to the raft. A second droque was made from meterlels on-board but this too failed after some hours,
>
> The drogue performs three functions:
> 1) To reducethe rate of drift;
> 2) .Tc.stabillsethe raft's attitude to the wind;
> 3) To stabilise the attitude of any bottom pockets on the raft to the sea.
>
> . I do, not know, what, If any, stabllity pockets were fitted to the bottom of the raft. In any event; ,it did not capsize although It was "banana'd" on several occasions and half filled with water by breaking waves. On each occasion the hoops over pressurised and vented off and consequently needed pumping up by hand. The attitude of the raft to the seatherefore seemstobe unimportant.
> It is desirable that the fixed side of the raft cover be.held to the wind not only to keep the wind out but breaking seas also. This relievesthe strain on the tasteninqs, However, if these are secure, this aspect too becomesof less Importance,
> Finally, one Is left with the desirability or otherwtse ot reducing the rate at drift,' and, I am led to the conclusion that in storm conditions, if there is sufficient sea room, life Is more comfortable and the raft less at risk if It is allowed to driftalthe same rate as the waves".

3.72 Other adverse comments on the performance of rafts related to the protection from the sea and from cold which the rafts afforded. Many crews felt that the securing arrangements for canopy accesses were Inadequate and several felt that this point was of greater significance than was keeping the access to leeward. Cold was a hazard faced by the crews who were in rafts for any length of time. Some suggested that foil "space blankets" would solve this, others that an inflatable floor would have been a considerable improvement.

3.73 Trials carried out on foil "space blankets" some years ago Indicated that they were likely to be of little use in a life raft. The blankets are extremely efficient In preventing loss of heat by radiation but the major heat loss suffered by survivors In a life raft is by conduction through the raft floor, against which a foli blanket affords little protection.

3.74 Several comments received relate to the lack of hand holds on the outside of rafts. Morningtown's crew had a raft alongside for a short time but they were unable to hold onto it or turn it round to gain accessto the canopy opening.

3.75 Life rafts clearly failed to provide the safe refuge which many crews expected. Seven lives were lost in incidents associated with rafts of which three were directly attributable to the failure of the raft and the yachts which these seven people abandoned were subsequently found afloat and towed to harbour. However 14 lives were saved in incidents in which survivors took to rafts from yachts which have not been recovered. Many crews used rafts successfuliy to transfer from yachts to helicopters or other vessels. It is asking a great deal of any very smali craft to expect it to provide safe refuge in conditions which overwhelm a large yacht but this is what life rafts are expected to do.

3J LIFE JACKETS

3.76 91 % of the fleet reported that their yachts were equipped with life jackets to 8S3595, and 37% that they were equipped with buoyancy aids. 43% reported that lifejackets were worn as standard procedure during the storm, 53% that they were not. 39% reported that life jackets impaired working efficiency, and an Identical percentage reported that they did not.

3.77 Crews appeared to attach considerably less Importance to life jackets than to safety harnesses as items of safety equipment. Only 10 reports on life jackets in use were received, two commented that the buoyancy provided was very effective, seven that it was effective and one that it was ineffective.

3.78 Three reports were received of bodies being sighted or recovered floating face down in the water although a life jacket was being worn. In one instance the wearer's head appeared to have slipped out of the collar and the life jacket which was then attached only by a waist tie had slipped round to the wearer's back. It is not known whether this jacket, of a make which conforms to 8S3595, was put on correctly in the first place. The post mortem carried out states that the wearer died of exposure, not drowning, so it is likely that up until the time of death the life jacket did provide adequate buoyancy. However, authoritative comment on the incident by the rescuers indicates that there Is some doubt as to whether the 8ritish Standard Specification is totally effective as It contains no requirement for a positive retaining strap for the collar.

3.79 A further report of the same make of jacket concerns a crewman who jumped into the water to be rescued by a helicopten-

> **"The Ufe jacket was a very effective device and kept the head well clear of the water, The auto-Inflation device only semi-inflated the Jacket,"**

3.80 One life Jacket, to a design which Is no longer manufactured but which conforms to 8S3595, was criticised for Its manual inflation mechanism. The mechanism was accidentally activated after the jacket had been inflated by mouth and the wearer thought he was going to be strangled before the jacket burst. The instructions clearly state that the manual Inflation device must not be activated if the jacket has already been Inflated by mouth. However, the wearer felt that a possible death penalty was a little harsh for anyone who Ignored or accidentally contravened the manufacturer's Instructions.

3.81 Four of the six men lost overboard through harness failure were not wearing life jackets. As none of the yachts Involved was able to recover the lost men it is not possible to state that a life jacket would have been effective In saving life, but it must be assumed that It would have increased the chances of a successful rescue.

3.82 In some cases the views expressed by those who did not use life jackets may have been conditioned by the lack of compatibility of life jackets and safety harnesses. There Is a strongly held belief that the first priority must be the safety harness and the life jacket is therefore of secondary importance. Throughout the competitors' comments on life jackets the argument for incorporating the harness and life jacket as a single garment is repeated. A number consider inflatable jackets too flimsy to wear as standard procedure and those with permanent buoyancy too cumbersome. There is a marked lack of agreement on the ideal life jacket, opinions differ on the relative merits of permanent buoyancy, oral inflation, manual Inflation and automatic Inflation.

TABLE3.30

Question: **Howare theflares normally stored?**
Do you nowconsider that stowage satisfactory?

	Total	*Stowage Satisfactory*
Base	235	198
Dry Container IWaterproof	143 **61%**	125 **63%**
Storage on F.ntrance to Hatchway	21 **9%**	18 **9%**
By/Over Chart-Table	37 **16%**	33 17%
Violnlty of Quarter Berth	14 6%	11 **6%**
Cabin Locker	16 **6%**	11 **6%**
ReadytoUse	7 3%	7 4%
Cockpit Locker	12 6%	11 6%
No Answer	13 6%	7 4%

3.83 Apart from the inconvenience of wearing them, and the lack of compatibility with safety harnesses there seems to be no proof of major aspects of life jacket design or construction which gives cause for concern.

3K PYROTECHNICS

3.84 Table 3.30 shows the answers received to a question on flare stowage. In general competitors were satisfied with their stowage arrangements for flares. There was, however, some criticism of the large Polythene jar in which one manufacturer supplies the full flare outfit required by the Special Regulations; It Was considered Inconvenient as It was very difficult to find the required type of flare without emptying the entire contents of the jar,

3.85 Table 3.31 summarises the use of flares and table 3.32 lists the adverse comments which were made. The majority of those who used flares found that they did not have as many asthey would have liked. It is not known, however, whether this was due to indiscriminate use or a genUine shortcoming in the number required by Special Regulations. Several crews commented that they had ample red handflares but not enough red parachute rockets.

3.86 One report indicates that flares worked effectively in spite of having been left floating In a pool of water In a life raft for over an hour.

3.87 In spite of strong recommendations on the standardisation of firing mechanisms a number of crews reported confusion caused by different firing methods for different flares. However desirable full standardisation of firing methods may be, It has been pointed out by manufacturers that to change production lines to a single standard would be extremely expensive and would prevent any further development of new Improved mechanisms.

3L ELECTRICS/ENGINES

3.88 Several yachts reported losing the use of all electrlcs or of one or more Items of electrical equipment during the race due to flooding. Damage to electrical equipment is probably an inevitable result of flooding and no attempt has been made to analysethe causes and effects.

3.89 Table 3.33 shows the extent to which competitors were able to maintain battery power during and after the storm. 77% of the fleet used normal navigation lights throughout and 89% reported that they were aware of the presence of other yachts in their vicinity at the

TABLE3.31

PYROTECHNICS

	Total
Base	235
Old You Usa White Hand Plarea? Yes	23 10%
No	200 **85%**
No Answer	12 5%
Old You Use White Illuminating Rockats7 **Yes**	8 3%
No	201 86%
No Answer	26 11%
Did You Use Red Distress Rockets? Yes	41 17%
No	173 74%
No Answer	21 9%
Old You Use Red Hand Flares? Yes	23 10%
No	189 80%
No Answer	23 10%

	Total
Base	235
Old You Use Varey Pistol Flares? Yas	7 **3%**
No	195 83%
No Answer	33 **14%**
Old Flares Perform as Expected? Yea	41 **17%**
No	23 **10%**
No Answer	171 73%
Old Anvptarea Fall to Ignltal **Yes**	12 **5%**
No	48 20%
No Answer	175 74%
With Hindsight. Would You Carry Additional Flaresl Yas	35 15%
No	112 48%
No Answer	88 **37%**

height of the storm. 16% of the fleet reported major difficulties with either compass or cabin lighting. The questionnaire contained no specific questions on the use of engines. However, it is known that several yachts used their engines during the storm to help maintain steerage way, to keep the yacht at what was considered a safe angle to the waves or to Improve pointing to make an offing from the Cornish coast. At least two dlsmasted yachts retired under power unaided. Of the three yachts which picked up survivors from other yachts or life rafts, two used their engines to Improve manoeuvrability. Some competitors who tried to use engines to manoeuvre during the storm reported being unable to do so because they had no electrical power available for starting.

3.90 Some competitors suggested that there should be a Special Regulation requiring the carriage of a specified minimum quantity of fuel. The basis for this suggestion was In most cases general opinion rather than specific fact.

TABLE3.32

Question: Commentbriefly **on performance offlares**

	Total
Base	52
Failure Due to Losing Striker Overboard	2 4%
Useless/Ineffloient	14 28%
Satisfactory	28 66%
Excellent	4 **8%**

TABLE3.33

Question: How regularly do you normally charge batteries during a racel

Question: What percentage of the normal battery capacity do you estimate you had available during the storml

	Total	Frequency Charge Batteries				
		Not Spec,	Dally	Twice Dally	1·2 Days	Once In 2 Days
BASE	235	38	120	34	9	17
0-25%	21 9%	2 5%	7 6%	4 12%	2 22%	1 6%
26-60%	23 10%	5 13%	13 11%	2 6%	-	2 12%
51·75%	53 23%	6 21%	29 24%	10 29%	1 11%	3 16%
75%+	110 47%	16 47%	65 46%	14 41%	6 67%	10 59%
Don'tknow	3 1%	-	2 2%	-	-	1 6%
Noanswer	27 11%	5 13%	14 12%	4 12%		

Question: What percentage of normal battery capacity did you heve by the end of the race or on entering harbour if you retired?

	Frequency Charge Betterles				
Total	Not Speo,	Daily	Twice Daily	1-2 Deys	Onceln 2Days
235	36	120	34	9	17
29 12%	4 **11%**	14 **12%**	4 **12%**	2 22%	2 **12%**
22 9%	6 16%	11 9%	-	-	3 16%
25 **11%**	3 6%	11 ,%	7 21%	1 11%	1 6%
121 **61%**	16 47%	66 55%	19 56%	6 67%	7 53%
1 ▪	-	1 1%	-	-	-
37 16%	7 19%	17 14%	4 **12%**	-	2 12%

Section 4
Ability of Skippers and Crews to withstand the storm

4A LEVEL OF EXPERIENCE OF SKIPPERS AND CREWS

4.1 There is no qualification in terms of competence or experience for skippers or crews to enter the Fastnet Race. The less experienced skippers and crews might have been expected to be more likely to get into difficulties than the more experienced. Each skipper was asked to assessthe experience of his crew as either "Very experienced", "Of adequate experience" or "Somewhat short of experience". He was also asked to comment on whether, with hindsight, he felt that different action might have been taken if the crew had been more experienced. The answers to these totally subjective questions are tabulated in table 4.1. As would be expected, the skippers who felt that they or their crews were somewhat short of experience also tended to consider that with a more experienced crew their actions would have been different. However a relatively small percentage of the fleet felt that the crew were short of experience.

4.2 Seasickness was considered IIkeiy to have been a considerable problem in exceptionally rough conditions. Competitors were asked "How many of their crew might normally be expected to be incapacitated by seasickness?", "How many were somewhat incapacitated?" and "How many were seriously incapacitated?". Tables 4.2 and 4.3 show how expectations of seasickness compared with the numbers who actually suffered, Although the numbers somewhat incapacitated were slightly higher than the pre-race expectation the numbers seriously incapacitated were slightly below expectation.

4.3 The use of anti-seasickness pills was also examined. Table 4.4 shows that only a quarter of the fleet normally use anti-seasickness pills but that they were generally effective. It can not be inferred from these answers that everyone who suffers from seasickness will find pills an effective preventative. Many people do not take anti-seasickness pills because they have been unable to find a brand which is effective for them and Is alsofree from side effects such as drowsiness

4.4 A more objective question on experience was asked by inviting skippers to complete the box in Fig 4.1 to show their experience of races and passages of various distances. Answers to this question were tabulated against abandonments, severe knockdowns and various categories of damage and the results are shown in table 4.6. **In** this tabulation there is a slight indication that boats with very experienced skippers, Who had completed 7 or more races Or passages of over 600 miles were less Involved in abandonment, severe knockdown and damage than boats whose skippers had completed 2 or less races or passages or over 600 miles. The indication is, however, very slight and certainly can not be taken as evidence that boats skippered by yachtsmen with little long-race experience were at exceptionally high risk.

4.5 The experience of crews as teams with a background of experience sailing together In their present boat was also examined. The ctiterla for the question were the number of races over 200 miles in which at least two thirds of the crew had sailed together in the boat. Table

TABLE4.1

Ouestion: Would you describe the crew of the yacht that you ware sailing as:
veryexperlencad?
having adequate experlenca?
somewhat short of experience?

Ouestion: Do you now feel that the actions taken might hava been differentif the crew had had more experience?

	Total	*Crew Experience* Very	Adeauete	Short
BASE	235	124	120	18
Ves	39 **17%**	10 8%	26 22%	10 56%
No	178 76%	106 **85%**	89 74%	8 44%
No Answer	18 **8%**	8 6%	5 4%	

TABLE4.2

Question: **How many on board might normally be expected to be somewhatlncapacitated by** sea-alckness?

	Tot.i
	Base 236
1 Person	61 22%
1 or 2 People	18 **8%**
2 People	35 16%
3 People	13 6%
4 People	3 1%
5 People	2 1%
6People	1 0%
7 People	1 0%
NoAnswer	110 47%

TABLE4,3

Quest/on: **How manywere*somewhat*** lncapacltatedbv **seasickness?**
Question: **How many were*seriously*** **Incapacitated by seasickness?**

	Somewhat *tnoepsat-toted*	***Seriously*** *Incapaci-teted*
Base	236	236
1Person	66 28%	36 16%
1 or 2 People	10 4%	10 4%
2 People	31 13%	6 2%
3 People	11 6%	3 1%
4 People	8 **3%**	1 0%

Fig.4.1

Passaqae **or races**	**None**	1-2	3-6	**7 or more**
100 M 200 M				
200 M-600 M				
Over 600 M				

TABLE4.4

Question: **Do you** ncrmaliv take antl-seaalck **plUs and if so what do you normally take?**

	Total
Base	66
Stugeron	29 62%
Sea Legs	2 4%
Dramanine	4 7%
Quells	3 6%
Avomlne	6 9%
Manlne	4 7%
Others	9 16%
No Answer	3 6%

Question: How effective did *you* find them?

	Totel
Base	66
Moderately Effective Yes	23 41%
No	7 13%
Highly Effective **Yes**	32 67%
No	2 4%
Ineffective Yes No	7 13%

4.6 shows the answers received as a fleet total and for abandonments. There is again a slight indication that the highly experienced were less likely to abandon but there Is no strong evidence to show that crew team experience and familiarity with the boat were factors of overriding significance.

4.6 There were 49 reported instances of individuals who had particular problems coping with the very severe conditions on account of physical fitness. handicap or disability, advancing years or extreme youth. Table 4.7 shows how competitors categorised these problems. These aspects of the ability of individuals to cope with storm conditions have not been examined in depth. A vary small number of skippers has reported that in future they would be more rigorous in excluding people with potential for these problems from their crews and with only 49 reported problems in a total of some 2,600 competitors the problem does not appear to merit further investigation. There certainly do not seem to be any grounds for limiting the responsibility of owners for the selection of their own crews. Indeed a few skippers who were not satisfied with the experience or stamina of their crews retired before the storm.

TABLE4,6

Question: **On how many races over 200 M had at** leeat.twc-thlrda **of your FASTNET crew previously sailed together in the boat?**

	Totel	*Aben-doned*
Base **None**	236 64 27%	23 6 26%
1-2	43 18%	7 30%
3-6	77 33%	8 36%
7 or more	46 19%	2 9%
No Answer	6 3%	

TABLE4.5 SKIPPER EXPERIENCE

			82Knock-Down		*Damage Riq*		*Damage Accom,*		*Damage Steering*		*Damage Hull*	
	Total	*Aban-doned*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*
BASE	236	23	77	136	42	182	31	177	25	196	34	185
100-200 MILES												
None	2 1%	-	-	2 1%	-	2 1%	-	2 1%	-	2 1%	-	2 1%
1-2	7 3%	-	2 3%	5 4%	1 2%	6 3%	1 3%	4 2%	-	7 4%		6 3%
3-6	19 8%	3 13%	6 10%	10 7%	4 10%	16 8%	4 13%	12 7%		19 10%	3 9%	16 8%
7 or more	182 77%	19 83%	63 82%	100 74%	36 86%	137 76%	24 77%	143 81%	24 96%	148 76%	29 85%	145 78%
No Answer	25 11%	1 4%	4 ,%	19 14%	1 2%	11 12%	2 6%	16 9%	1 4%	20 10%	2 6%	17 9%
200-600 MilES												
None	e 3%	1 4%	3 4%	3 2%	-	6 3%	-	6 3%	-	6 3%	1 3%	6 3%
1-2	28 12%	4 17%	13 17%	13 10%	4 10%	24 13%	7 23%	19 11%	4 16%	24 12%	3 9%	24 13%
3,'	41 17%	6 26%	14 18%	24 18%	11 26%	28 15%	7 23%	30 17%	1 4%	39 20%	7 21%	31 17%
7 or more	132 56%	10 43%	42 55%	75 55%	25 60%	100 55%	16 52%	'103 58%	18 72%	105 54%	21 62%	103 56%
No Answer	29 12%	2 ,%	5 6%	21 15%	2 6% "	24 13%	1 3%	19 11%	2 8%	22 11%	2 6%	22 12%
OVER 600MilES												
None	29 12%	3 13%	10 13%	17 13%	3 7%	25 14%	4 13%	23 13%	4 16%	24 12%	, 15%	23 12%
1-2	11 22%	, 22%	20 26%	29 21%	12 29%	39 21%	6 19%	43 24%	, 32%	42 21%	e 24%	42 23%
3,'	11 22%	6 26%	16 21%	30 22%	10 24%	38 21%	10 32%	38 20%	4 16%	44 22%	10 29%	37 20%
7 or more	77 33%	6 22%	23 30%	45 33%	11 26%	81 34%	a 26%	11 33%	7 28%	54 33%	9 26%	11 34%
No Answer	26 11%	4 17%	, 10%	16 12%	6 14%	20 11%	3 10%	17 10%	2 ,%	23 12%	3 9%	21 11%

TABLE4.7

Question: **Did anyone on board have** particular problems **in coping with the conditions?**

	Total
Base	235
Yes	50 **21%**
No	177 75%
No Answer	11 **5%**

Physical Fitness	
Yes	9 IB%
No	18 **36%**

Handicap or Disabll1ty	
Yes	4 8%
No	20 40%

TooOld	
vee	7 **14%**
No	26 **52%**

oo Young	
Yes	10 20%
No	22 **44%**

TABLE4,8

SURVIVAL TACTICS

Question: At the height *of* the storm what do vou now feel was the principal danger? (Comment)

		Survival Tactics Adopted				*R,I-R,4*			
	Tota/	***Heave*** *to IRIi*	*Lie barepoles (R2i*	*Run off barepoles (R3i*	***Stream warps*** *IR4i*	*Any two*	*Any* ***three***	*All* ***four***	***None***
BASE	235	26	86	57	46	40	13	–	86
Steep Breeklnq **Sea**	103 44%	10 39%	46 53%	26 **46%**	19 41%	17 43%	7 54%	–	33 38%
Gear Damage	6 3%	1 4%	–	1 2%	1 2%	1 3%	–	–	4 5%
Man Overboard	15 6%	1 4%	5 6%	4 **7%**	6 13%	3 8%	2 15%	–	6 7%
Hull *Damage*	7 3%	1 4%	1 1%	2 4%	3 7%	2 5%	–	–	2 2%
Rig Damage	13 6%	1 4%	6 7%	3 5%	4 9%	5 13%	–	–	4 5%
Excessive Speed	9 4%	5 19%	3 3%	4 7%	3 7%	5 13%	1 8%	–	1 1%
Knockdown/Capsize	37 16%	3 12%	18 21%	12 21%	10 22%	5 13%	3 23%	-	5 6%
Crew Injury	15 6%	3 12%	5 6%	3 5%	5 11%	3 8%	1 8%	-	4 5%
Collision	11 5%	3 12%	4 5%	1 2%	-	1 3%	–	–	4 5%
Steering Damage	7 3%	1 4%	4 5%	3 5%	2 4%	2 5%	1 8%	–	1 1%
Sailing Under	3 1%	1 4%	1 1%	-	–	–	–	–	1 1%
Pooped	10 **4%**	1 4%	5 6%	3 5%	2 4%	3 8%	1 8%	–	4 5%
No answer	30 13%	3 12%	5 6%	3 5%	1 2%	3 8%	–	-	21 24%

TABLE4,9

Question: If ever faced with a similar situation would you do the same thing again?

		Survival Tactics Adopted				*R,I-RA*			
	Total	***Heave*** *to tnn*	*Lie barepoles IR2i*	***Runoff*** *barepoles (R3i*	***Stream warps*** *(R4i*	*Any two*	*Any* ***three***	*All* ***four***	***None***
BASE	235	26	66	57	46	40	13	–	86
Yes	179 76%	19 73%	77 90%	52 91%	39 **86%**	35 66%	11 86%	–	49 57%
No	3	–	2 2%	1 **2%**	2 4%	1 3%	1 8%	–	1 1%
No answer	53 23%	7 27%	7 8%	4 7%	5 11%	4 **10%**	1 8%	–	36 42%

48 TACTICS DURING THE STORM

4.7 There are four accepted categories of survival tactics which may be used in severe weather: heaving-to, lying a-hull, running off under bare poles, and running off with warps streamed to reduce speed. The tactics adopted by each boat depended upon her skipper's assessment of the principal danger, which his survival tactics were designed to avoid or to minimise. All competitors were asked to state, with hindsight, what they now feel was the principal danger. This was an open question to which any reply could be given, and the answers are shown In table 4.8. The largest category of responses was general rather than specific, identifying the danger in terms of sea conditions, rather than the damage which the sea might inflict on the boat or her crew.

4.8 There is little significant difference between the answers given by those who adopted different tactics during the storm. It Is perhaps Inevitable that those who lay a-hull under bare poles, thus giving up the ability to take any avoiding action for particulariy large steep waves, showed the highest percentage of those who identified sea conditions as the principal danger. It is extremely difficult to ascertain the effectiveness of each type of survival tactic. Table 4.9 shows the numbers reporting having used each of them (a number of boats tried different tactics at different times). In each case about 80% of those adopting each method considered that the boat was safe as a result, although of course under those conditions safety must be assumed to be a relative term.

4.9 Competitors were also asked If they adopted other survival tactics at the height of the storm. Table 4.10 shows the responses, in terms of sail carried or a particular method of heaving-to. More detailed reports which can not be subjected to quantitative comparison have been received. Those reports, together with detailed reports of capsizes, confirm that "The greatest danger was of being caught by a particularly steep breaking wave". Many skippers felt that in daylight, provided the boat had reasonable speed and control, there was a chance of seeing these waves in time either to avoid them or meet them at the least dangerous angle of incidence. Extracts from reports give an Indication of the tactics adopted by a number of boats and their skippers' assessments of their success:-

Class	*Comment*
Class I	Heavy knockdown while lying a-hull. This tactic would never have been used if the steering gear had not failed.
Class I	Kept sailing. It worked well.
Class I	No problems while the boat was kept sailing on a close reach.
Class I	Rolled and dlsmasted by exceptionally steep wave. The sea was very confused and the actual angle of approach of the wave was Impossible to Judge.
Class III	Lay a-hull safely for three hours before being badly knocked down. Then ran off purposely fast, 5-10 knots, which seemed to work well.
Class III	Could not slow the boat down enough In spite of warps streamed. Experienced heavy falls off waves, one resulting in a capsize.
Class III	Rolled while running with warps streamed. The boat would have been safer if she had been sailing two knots faster.
00034	Lay a-hull for half an hour, then experienced bad knockdown. Then tried lying with sail over the bow to hold head up to sea, seemed satisfactory at first but after 1½ hours boat was rolled 360°. Ran off with warps and drogues streamed for 12 hours, a tactic which seemed to work well but by this time the sea was easing.
00034	Lay a-hull for half an hour, then rolled over by a wave which would have capsized us whatever angle it had approached from.
00034	Kept sailing under storm Jib, which was too big. Would have been much happier with a trlsail.
Class IV	Kept reaching under storm Jib but suffered several knockdowns.
Class IV	Seemed to be safe as long as we could keep the boat absolutely stern-on to each wave.
Class IV	Ran directly before waves successfully for several hours, but then rolled over when caught by a cross sea which appeared from nowhere.
Class IV	Broached while running under bare poles and then rolled upside down by the next wave which caught her beam on.
Class IV	Three bad knockdowns while running with warps streamed. The boat was probably sailing too slowly.
Class IV	No tactics seemed safe. Knockdowns occurred both reaching under storm Jib and running under bare poles with warps streamed.
Class IV	Running under bare poles with warps streamed was safe. Without the warps the boat went too fast, on any point of sailing.
Class IV	Very bad knockdown, almost a pitch-pole, while running down sea to go to the assistance of another boat.
Class V	Two bad knockdowns while hove to. Further two knockdowns at speed, up to 15 knots, down wind. Best tactics

TABLE4.10

Question: If you employed survival tactics which you have been uneble to describe above please state what they were

	Tot"l	*Adopt same tactics* Yes	No
BASE	235	133	4
Jib only	13 6%	9 7%	1 26%
Maln/Trlsall only	6 3%	4 3%	-
MalnlTrlsall & Jib	7 3%	7 **6%**	
Hove to/Tiller lashed	6 2%	3 **2%**	1 26%
Hove to/Tiller manned	B 3%	7 6%	
No Answer	196 93%	103 77%	2 60%

Class	Comment
	appeared to be to keep sailing to windward.
Class V	Kept going to windward under storm jib, luffing to the worst seas. It worked well and wouid probably have been even better using a trlsaillnstead of the storm Jib.
Class V	Lay a-hull during darkness and kept sailing during daylight. No real problems.
Class V	Capsized while trying to sail to windward. Could not maintain sufficient speed to meet the sea on the bow.
Class V	Knocked down once to about 120⁰ during a period of 19 hours that the boat was lying a-hull.
Contessa 32	Kept sailing to windward, with no particular problems.
Contessa 32	Kept the boat sailing, with no particular problems.
Contessa 32	Heavily knocked down while lying a-hull.

4.12 From analysis of the experience gained during the Fastnet storm it is clear that ail the established types of survival tactics provide a measure of safety in very severe wind and sea conditions. Many competitors have suggested that given adequate storm sails a skilful and determined helmsman could avoid the worst waves, or meet them at an angle of encounter which would minimise their effect. Others have reported that at the height of the storm there were some waves which were of a size and shape such that there was no defensive tactic which would prevent them from rolling or severeiy damaging a yacht caught in their path. The views expressed depend upon the actual skill of the helmsmen on board and probably on chance which may have determined whether or not a yacht was caught by a particularly severe "rogue wave". Because of their speed of formation and transient nature, even during daylight hours these waves can be almost impossible to avoid.

4.13 Table 4.11 shows the extent towhIch competitors tried to steer their boats during the storm and the extent to which they felt, with hindsight, that it was Important to try to do so. The majority. felt at the time that it was Important to keep the helm manned and many of those who did not do so now feel that they should have done.

4.14 No magic formula for guaranteeing survival emerges from the experiences of those who were caught in the storm. There Is, however, an inference that active rather than passive tactics were successful and those who were able to maintain some speed and directional control fared better.

4C WATCHKEEPING ROUTINES AND GENERAL ORGANISATION

4.15 The ability of any vessel to remain efficient in severe weather depends upon the ability of her skipper and crew to conserve their strength. That ability is traditionally derived from a watch keeping routine which ensures that everyone has as much opportunity for rest as conditions allow, that there Is an adequate supply of food and that routine safety precautions are so well practlced that they remain an integral part of the general pattern of sailing.

4.16 Table 4.12 shows the extent to which watch keeping routines were maintained; crews considered that they were adequately fed and lack of sleep or exhaustion were considered important considerations. In general the yachts with more experienced skippers fared slightly better, their crews certainly seemed to be better fed, and lack of sleep or exhaustion were less widespread.

4.17 Several competitors reported that extreme cold was an Important problem. Very few who remained on deck were able to keep dry and In boats which suffered severe knockdowns those on deck were of course soaked. A few boats reported keeping the whole crew on deck during the height of the storm because of the danger of being trapped In the cabin during a knockdown. This Is now seen to have been a mistake. Two lives were lost as a result of people being trapped In cockpits; in one case the safety harness of a trapped and injured man was cut to free him from the cockpit and hewas unable to retain his grasp on the yacht when It righted; in the same incident a crewman drowned as a result of being trapped in the cockpit of an upturned boat. There were no Instances of yachts ,sinking upside down and all those temporarily trapped In cabins had time to abandon the yacht after she righted.

4.18 Many skippers actually restricted the number on deck at the height of the storm to two and in a few cases to just the helmsman with a man on standby waiting under the hatch. In a minority of boats the helm was lashed and the whole crew retired below, keeping as good a lookout as possible through the cabin windows. In these boats the skipper felt that the risk of collision was small compared with the risk of a man being lost overboard. As 51 yachts reported one or more crew being washed overboard, several on more than one

TABLE4.11

Question: Was It possible to *keep* someone at the helm at all times?

	Tota!	Heave to (flIJ	Lt, Bare Poles fR21	Run Off Bare mSI	Strm. Warps (R4)	R,,·R.4 None	Any
BASE	235	26	86	67	46	149	86
Yes	190 81%	21 81%	67 78%	54 95%	41 89%	126 54%	86 76%
No	21 9%	2 B%	17 20%	2 4%	4 9%	19 13%	2 2%
No Answer	24 10%	3 12%	2 2%	1 2%	1 2%	6 3%	19 22%

Question: Do you think it was significant to keep the helm manned?

Total	Yes	No
235	190	21
172 73%	165 87%	7 33%
37 16%	22 12%	14 87%
2B 11%	3 2%	

occasion, It was obviously sensible to reduce the number on deck, and therefore at risk, to the minimum.

4.19 It is probably not possible to manufacture foul weather clothing which will give complete protection against the conditions experienced by the Fastnet Race fleet. In one case a yacht had to be abandoned when a crewman was changing out of wet clothes and he took to the life raft in his underclothing. In general, however, there were few reports of crews having to remain in wat clothes for iong periods and the risk of changing into dry clothes was minimal compared with that of becoming hypothermic due to spending long periods in wet clothes.

4.20 It is not possible to determine the extent to which hypothermia. was a problem. A few reports of hypothermia have been received, but in general this seems to be a danger which offshore racing crews recognise and guard against. A few crews reported that they had taken no precautions to protect clothes in lockers against water and as a result they were completely without dry clothes to change into. The majority, however, kept 'spare clothing in Polythene bags or waterproof hold-ails and were not reduced to the state of having no dry clothes.

4.21 Safety procedures for the use of harnesses, and in some cases the recovery of men overboard, were severely tested by the storm. Those with two lines on safety, harnesses found them invaluable for use in the cockpit, particularly for the helmsman who had considerable difficulty if he was not held firmly in place. Many crews used the tails of sheets in addition to harnesses to lash themselves firmly into the cockpit. Several skippers reported reluctance to send anyone onto the foredeck at the height of the storm because of the obvious danger of losing them overboard. Inadequacy of harness attachment points and lack of adequate toe-rails may have influenced decisions on saii changes and once a yacht was down to bare poles the dangers of foredeck work were a disincentive to setting a storm jib, even if the yacht was not lying safely without sail.

4.22 There have been insufficient reports of the use of man overboard recovery equipment such as horseshoe lifebelts, dan buoys, marker lights and buoyant heaving lines to draw any conclusions on the effectiveness of these items of equipment.

TABLE4.12

COMFORT BELOW/ROUTINE

	Total	Experience of Skipper-Passages or Races over 600 miles				Fastnet Class					
		None	1-2	3-6	7+	0	I	II	III	IV	V
BASe	115	29	52	52.	77	8	40	40	52	46	47
WAS IT POSSIBLE TO MAINTAIN A WATCH KeEPING SCHEDULE?											
Yea	199 85%	20 69%	47 90%	44 **85%**	68 88%	8 100%	38 88%	33 83%	44 85%	36 76%	42 89%
No	26 11%	7 24%	4 8%	6 12%	6 8%		4 10%	6 16%	7 13%	8 13%	3 8%
No Answer	10 4%	2 7%	1 2%	2 4%	3 4%	~	1 3%	1 3%	1 2%	6 11%	2 4%
WAS IT **POSSI8LETO SERVE HOT/ACCEPTABLE** FOOD DURINO **STORM?**											
Yes	**169** 72%	**16** 65%	37 **71%**	37 **71%**	83 82%	8 **100%**	31 78%	30 76%	37 71%	31 67%	32 68%
No	65 26%	12 41%	14 27%	11 21%	12 16%		8 2.%	10 26%	13 26%	11 24%	14 3.%
No Answer	8 3%	1 3%	1 2%	4 8%	2 3%		1 3%		2 4%	4 9%	1 2%
DID YOU CARRY FOOD SPECIALLY PREPARED FOR SEVERE CONDITIONS?											
Yes	104 44%	13 45%	26 48%	21 40%	36 45%	1 13%	18 45%	16 38%	26 48%	2. 43%	24 51%
No	123 52%	16 52%	27 52%	26 64%	39 61%	7 88%	21 53%	24 60%	26 60%	22 48%	22 47%
No Answer	6 3%	1 3%	~	3 6%	3 4%		1 3%	1 3%	1 2%	4 9%	1 2%
DO YOU CONSIDER LACK OF SLEEP/EXHAUSTION WAS A FACTOR IN ACTIONS?											
Yes	43 18%	9 31%	14 27%	7 **13%**	6 8%	1 13%	3 8%	to 26%	to 19%	i0 22%	9 19%
No	176 76%	19 68%	35 67%	41 79%	68 88%	7 88%	36 98%	27 68%	41 79%	29 63%	37 79%
No Answer	14 6%	1 3%	3 6%	4 8%	6 6%	~	2 6%	3 8%	1 2%	7 16%	1 2%

4.23 The circumstances of the Fastnet storm were such that accurate navigation was unlikely to be a crucial factor, After the race there were suggestions that the Ra RC rule on the use of sophisticated navigational aids added unnecessarily to the dangers of the race. Attitudes to navigation, the importance attached to the subject and the accuracy achieved have therefore been examined,

4.24 In 90% of the fleet one member of the crew had specific responsibility for navigation. Table 4,13 shows the accuracy whioh oompetitors believed that they achieved, the extent to which uncertainty of navigational position was an important factor which influenced the decisions taken and the attitudes to a change of rule to aliow the use of sophisticated navigationai aids,

4,25 The navigational aids which are prohibited from use are specified in general condition 121nl:

> "For the guidance of owners the following are specifically prohibited: Radar; Ornnl: Loran; Satnav; Deooa; Omega; automatic or selt-seeklnq direction finders; pre-arranged radio transmissions for the use of individual competitors including vacht-to-vacht, and vacht-to-shlp transmissions "

4.26 There Is some support from oompetltors for a relaxation of this rule, but twioe the number who would support a relaxation would oppose It, As only 11% of the fleet reported that uncertainty of navigational position was a factor which Influenced the decisions taken there would seem to be little firm evidence that a relaxation would make racing slgnifloantly safer,

4,27 Competitors' views on the extent to which depth of water affected sea conditions are shown in table 4.14, The topography of the seabed between Lands End and the Fastnet is shown on British Admiralty Chart 2649, published in 1978, Over most of the area there are depths of 100·120 metres, shoallng to 62 metres over the Labadie Bank, 71 metres over North West Bank and rather under 60 metres around the Fastnet Rock Itself, At the western end of North West Bank there Is a rock outcrop, Halg Fras, with a least depth of 38 metres but this Is about 10mlies southwest of the rhumb line from the Fastnet to the Bishop. The charted soundings and depth oontour lines are derived from random sources as there has never been a fuli systematic survey of the area.

4.28 The majority of competitors felt that the depth of water did. affect the sea state but this may have been a subjective answer which is not supported by expert opinionlsee Annex 2AI, It Is possible that there are shoals or deeps in the area which have not been reported to a charting authority and less than half the fleet were able to navigate to an accuracy of better than ± 5 mlies. It is therefore impossible to derive any reliable Indioatlon of the extent to which the shoals such as Labadle Bank affected sea conditions,

4.29 Table 4,16 shows the extent to which yachts had sufficient charts on board and the degradation of charts due to flooding. At the time of the race there was a printers' strike at the Hydrographlc Department which gave rise to some shortage of chart supplies. It is, however, disturbing that 18% of the fleet should report that there were not sufficient large scale charts on board to give them an unrestricted choice of harbours of refuge.

TABLE4,13

Question: During the storm/ were you able to keep an accurate position plot
- lal To betterthan ± 5 miles?
- (bl To betterthan ± 15miles?
- (c) Worse than ± 15miles?

Question: Was uncertainty of position a significant factor in action taken during the storm?

Question: With hindsight, would you support a change of RaRe policy to allow the use of hyperbolic fixing equipment and other sophisticated navigational aids, (remember that all sophisticated equipment is a drain on yacht's batteries)?

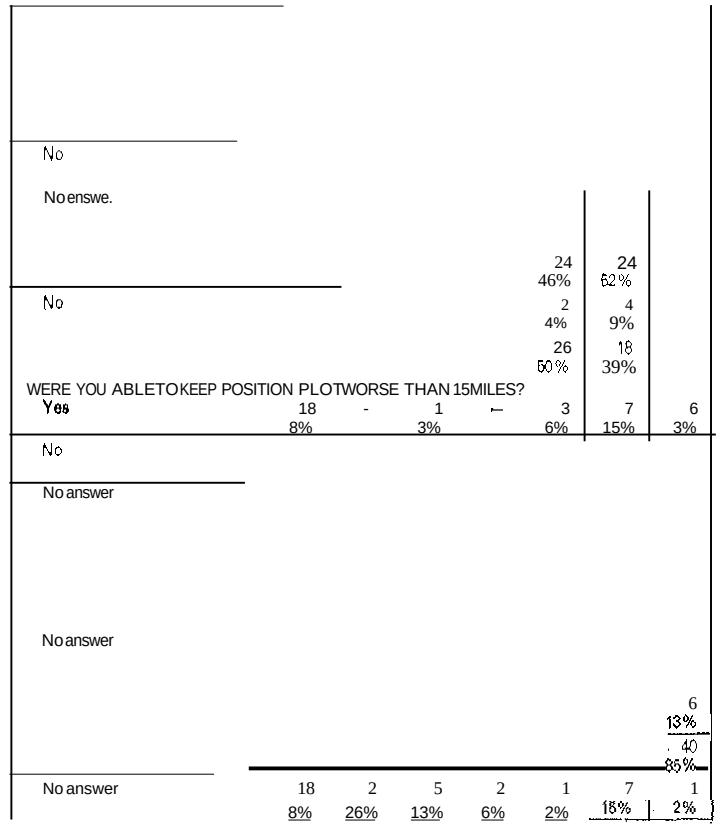


TABLE 4.14

Question: Did *you* make any attempt to avoid areas of "shoals"?
Question: Do you consider. with hindsight, that the depth of water significantly affected the sea condition?

		Fastnet Class						82 Knookdown	
	Total	0	I	11	III	IV	V	Yes	No
BASE	235	8	40	40	52	46	47	77	136
DID VDU ATTEMPT TO AVOID AREAS OF SHOALS?									
Yes	62 26%	3 38%	11 28%	14 **36%**	14 27%	9 20%	11 **23%**	24 31%	32 24%
No	147 63%	4 60%	25 63%	23 58%	33 63%	30 65%	30 64%	45 58%	92 58%
No answer	27 11%	1 13%	5 13%	3 8%	5 10%	7 15%	6 13%	8 10%	12 9%
DO VOU CONSIDER THAT DEPTH OF WATER AFFECTED SEA CONDITIONS?									
Yes	135 57%	7 88%	21 53%	27 **68%**	26 50%	23 **50%**	29 62%	48 62%	76 56%
No	75 32%	-	14 35%	9 23%	20 38%	17 **37%**	15 32%	21 27%	48 **36%**
No answer	26 11%	1 13%	6 13%	4 10%	6 12%	6 13%	4 9%	8 10%	12 9%

TABLE 4.15

Question: Did you have sufficient up to date charts and navigational publications on board *to* consider making use of harbours of refuge?
Question: Did navigation become much more difficult or impossible. because of deterioration of the chart due to repeated soaking?

		sestnet Class					
	Total	0	I	11	I1I	IV	V
BASE	235	8	40	40	52	48	47
DID VOU HAVE SUFFICIENT CHARTS TO CONSIDER USING HARBOURS OF REFUGE?							
Vs.	182 **77%**	8 **100%**	32 60%	29 **73%**	41 79%	32 70%	38 81%
No	42 18%	-	6 13%	9 23%	10 **19%**	10 22%	8 17%
No answer	11 5%	-	3 8%	2 5%	1 2%	4 9%	1 **2%**
DID NAVIGATION BECOME MORE DIFFICULT DUE TO CHART SOAKING?							
Yes	65 28%	1 13%	5 13%	6 15%	19 37%	18 39%	15 32%
No	160 88%	6 75%	32 80%	32 80%	32 62%	25 64%	32 88%
No answer	10 4%	1 13%	3 8%	2 **6%**	1 **2%**	3 7%	-

TABLE4.16
Primary and Contributory Reasons for Retirement I Primary-- then Contributory)

	Total	Fostnot oess						Length/Displacement							82Knock-down	
		0	'	II	III	'V	V	Less then 120	121-149	160-174	176-199	200-224	225-249	250+	Yes	No
BASE	235	'	40	40	62	46	47	4	15	15	78	60	16	7	77	136
GENERAL CREW **FATIGUE**																
Yes	13 6%	-	-	2 5%	2 4%	2 4%	7 15%	--	--	1 ,%	4 5%	5 10%	1 6%	1 14%	6 ,%	7 5%
No	ea 27%	1 **13%**	6 15%	' 20%	15 29%	12 26%	20 43%	1 **26%**	4 27%	7 44%	22 28%	17 34%	4 26%	-	27 35%	33 24%
NoAnswer	169 68%	7 88%	34 85%	30 **76%**	36 67%	32 70%	20 43%	3 76%	11 73%	' 60%	62 **67%**	28 56%	11 69%	6 86%	44 57%	**96 71%**
Yes	46 20%	-	3 ,%	' 20%	12 23%	10 22%	12 26%	1 25%	4 27%	2 13%	ie **21%**	12 24%	1 6%	1 14%	17 22%	27 20%
No	44 19%	1 13%	4 10%	5 13%	9 **17%**	11 **24%**	13 28%	-	2 13%	5 31%	15 **19%**	13 26%	3 19%	2 29%	18 23%	23 17%
NoAnswer	146 62%	7 88%	33 83%	27 56%	31 60%	25 64%	22 **47%**	3 **76%**	9 60%	9 56%	47 60%	25 60%	12 76%	4 57%	42 **65%**	86 63%
SEA-SICKNESS																
Yes	3 1%	--	--	2 5%	1 2%	-	--	-	-	-	' 1%	-	2 13%	-	-	3 2%
No	76 32%	1 13%	6 15%	a 20%	20 38%	12 **26%**	27 67%	1 **26%**	s 40%	' 60%	26 33%	20 40%	3 19%	1 14%	36 **45%**	36 29%
No Answer	'56 56%	7 88%	34 85%	30 **75%**	31 60%	34 74%	20 43%	3 76%	' 60%	' 60%	51 65%	30 60%	11 69%	6 86%	42 55%	94 69%
Yes	22 ,%	-	1 3%	3 ,%	6 12%	7 16%	5 11%		1 7%	1 ,%	e 10%	7 14%	1 ,%	1 14%	' 10%	13 10%
No	81 26%	1 13%	6 13%	' 15%	11 **21%**	14 30%	22 47%	1 **26%**	4 27%	e 38%	21 27%	17 34%	2 13%	2 29%	25 32%	32 24%
No Answer	162 69%	7 88%	34 85%	31 78%	36 67%	25 64%	20 43%	3 76%	10 **67%**	' 56%	49 63%	26 62%	13 91%	4 57%	44 67%	91 **67%**
LOWCREW MORALE																
Yes	5 2%	--	-	1 3%	,4 ,%	--	-	-	-	--	4 6%	--	,' ,%	--	2 3%	3 2%
No	80 34%	1 13%	e 16%	11 26%	19 37%	14 30%	27 57%	1 **26%**	7 **47%**	9 56%	25 **32%**	20 40%	4 25%	1 14%	35 **46%**	42 31%
No Answer	160 64%	7 88%	34 85%	28 70%	29 56%	32 **70%**	20 43%	3 76%	' 53%	7 44%	49 53%	30 60%	11 69%	6 86%	40 62%	91 67%
Yes	23 10%	-	3 8%	1 3%	6 12%	' **17%**	5 11%	-	2 13%	2 13%	' 12%	e **12%**	1 ,%	2 29%	' **10%**	16 11%
No	56 26%	1 **13%**	4 **10%**	7 18%	' 17%	14 30%	21 **46%**	1 25%	3 20%	6 38%	**18** 23%	18 38%	3 **19%**	1 14%	24 **31%**	30 22%
NoAnswer	164 56%	7 88%	33 63%	32 80%	37 71%	24 62%	21 46%	3 76%	10 67%	' 60%	51 65%	26 52%	12 15%	4 57%	45 56%	91 **67%**
PERSONAL FATIGUE OFSKIPPER																
Yes	3 1%	-	-	--	1 2%	1 2%	1 2%	-	-	1 8%	2 3%	-	-	-	3 4%	-
No	76 32%	1 13%	e 15%	9 23%	19 37%	13 **28%**	26 55%	1 25%	e 40%	' 80%	25 **32%**	20 40%	3 19%	1 14%	32 42%	41 30%
NoAnswer	156 **66%**	7 88%	34 85%	31 78%	32 62%	32 70%	20 43%	3 15%	' 60%	7 44%	51 65%	30 60%	13 81%	6 **86%**	42 55%	95 70%
Yes	26 11%	-	1 3%	3 ,%	7 13%	6 13%	9 19%		3 20%	1 6%	10 **13%**	7 **14%**	3 19%		9 12%	15 11%
No	60 26%	1 13%	6 13%	' 20%	12 23%	15 33%	17 **36%**	1 26%	4 **27%**	5 **31%**	20 **26%**	18 38%	2 **13%**	3 43%	24 31%	33 24%
No Answer	149 63%	7 88%	34 **85%**	29 73%	33 63%	26 64%	21 45%	3 75%	' 63%	10 **63%**	48 **62%**	25 50%	11 69%	4 67%	44 **57%**	88 65%
ACTUAL DAMAGE TO BOAT																
Yes	45 19%	--	9 23%	4 10%	' 17%	6 13%	16 34%	--	6 40%	7 44%	13 **17%**	10 20%	1 6%	' 14%	27 35%	18 13%
No	67 24%	1 13%	3 ,%	9 23%	18 31%	11 24%	16 34%	1 **26%**	4 27%	4 26%	21 27%	14 28%	4 25%	1 14%	21 27%	33 24%
No Answer	133 67%	7 88%	28 70%	27 M%	27 62%	28 63%	15 32%	3 **75%**	5 33%	6 31%	44 66%	26 62%	11 **69%**	5 71%	29 38%	86 63%
Yes	23 **10%**		1 3%	2 6%	9 17%	3 7%	6 13%	-	5 33%	,%	,%	2 4%	1 6%	1 14%	16 19%	7 6%
No	64 23%	1 **13%**	4 10%	7 18%	9 17%	16 35%	17 36%	1 25%	-	3 19%	22 28%	20 40%	2 **13%**	2 29%	16 21%	34 25%
NoAnswer	16' 67%	7 88%	35 **88%**	31 **78%**	34 66%	27 59%	24 **61%**	3 75%	10 67%	12 75%	50 64%	28 56%	13 **81%**	4 67%	46 **60%**	95 70%
INJURYIFATALITY																
Yes	10 4%	-	-	1 3%	2 4%	,4 ,%	,3 ,%	-	--	1 6%	4 5%	,4 ,%	-	--	7 9%	,2 ,%
No	73 31%	1 13%	6 16%	11 28%	20 38%	10 22%	23 49%	1 25%	e 40%	7 44%	23 29%	18 **36%**	5 31%	1 14%	27 35%	43 32%
NoAnswer	152 66%	7 88%	34 **85%**	28 70%	30 M%	32 70%	21 46%	3 75%	9 **60%**	' 50%	51 66%	28 56%	11 69%	6 **86%**	43 56%	91 **87%**
Yes	13 6%				6 12%	4 9%	3 6%		3 20%		6 **8%**	3 6%	-		9 12%	3 2%
No	65 28%	1 13%	6 15%	8 20%	13 25%	16 35%	19 40%	1 26%	2 13%	5 31%	24 31%	18 **36%**	4 26%	3 43%	20 26%	41 30%
NoAnswer	167 67%	7 88%	34 85%	32 80%	33 63%	25 67%	25 63%	3 75%	10 **67%**	11 69%	48 **62%**	29 56%	12 76%	4 **57%**	48 62%	92 68%
RISKOF WORSENING EXISTING SLIGHT DAMAGE																
Yes	22 9%	1 13%	1 3%	2 6%	7 13%	,4 ,%	7 15%	-	6 33%	2 13%	,7 ,%	3 6%	1 6%	-	13 17%	a 6%
No	63 27%	-	6 13%	10 25%	16 31%	12 26%	18 38%	1 25%	2 13%	6 38%	21 27%	18 38%	5 31%	1 14%	23 30%	38 28%
NoAnswer	180 64%	7 88%	34 85%	28 **70%**	29 56%	30 65%	22 47%	3 76%	' 63%	' 80%	50 64%	29 56%	10 63%	6 86%	41 63%	90 66%
Yes	25 11%		-	5 13%	6 12%	5 11%	9 19%	-	1 7%	2 13%	12 16%	,4 ,%	' ,%		15 19%	9 7%
No	47 20%		6 16%	6 13%	7 13%	14 30%	13 26%	1 25%		4 **26%**	16 19%	**16** 32%	2 **13%**	3 43%	11 14%	33 24%
NoAnswer	163 69%	' 100%	34 85%	30 **75%**	39 75%	27 69%	26 63%	3 75%	14 93%	10 63%	61 65%	60 60%	13 81%	4 67%	61 66%	94 69%

	Totsl	FIISfnet Cllss						Length/Dlspllcement							82Knock·down	
		o	I	II	III	IV	V	Less tha 120	121-149	150-174	175-199	200-224	225-249	250+	y"	No
LACK OFCONFIDENCE INABILITYOFYACHT TOCONTINUE																
y"	12 5%	-	-	2 5%	4 8%	2 4%	3 6%	-	1 7%	-	6 8%	2 4%	-	-	9 12%	3 2%
No	68 29%	1 13%	6 16%	10 25%	18 36%	10 22%	22 47%	1 25%	6 40%	6 56%	20 26%	19 38%	5 31%	1 14%	26 34%	40 26%
No Answer	156 66%	7 88%	34 66%	28 70%	30 68%	34 74%	22 47%	3 75%	6 53%	7 44%	52 67%	11 68%	11 69%	6 88%	42 66%	93 68%
y"	9%	-	1 3%	3 8%	6 10%	9 20%	4 9%	1 25%	1 7%		6 10%	6 16%	-		10 13%	11 6%
No	67 24%	1 13%	5 13%	5 13%	11 21%	13 28%	21 45%	-	3 20%	7 44%	20 25%	16 32%	4 25%	3 43%	20 26%	33 24%
No Answer	168 66%	7 88%	34 65%	32 80%	11 69%	24 52%	22 47%	3 75%	11 73%	9 56%	50 64%	26 52%	12 75%	4 57%	47 61%	92 56%
SEVERE LOSS OFBATTEAY CA ACITY																
y"	2 1%	-	-	1 3%	-	-	1 2%	1 25%	-	-	-	1 2%	-	-	..	2 1%
No	61 34%	1 13%	6 15%	11 28%	20 38%	13 28%	28 80%	-	7 47%	9 56%	27 35%	20 40%	5 31%	1 14%	36 47%	43 32%
No Answer	152 66%	7 88%	34 66%	28 70%	32 82%	33 72%	18 38%	3 75%	8 63%	7 44%	51 65%	11 68%	11 69%	6 88%	41 63%	91 67%
y"	-16 7%		1 3%		7 13%	5 11%	3 6%	-	2 13%		3 4%	7 14%	1 6%	-	9 12%	6 4%
No	72 31%	1 13%	6 16%	6 20%	13 25%	18 39%	24 61%	-	3 20%	7 44%	28 36%	20 40%	3 19%	3 43%	27 35%	41 30%
No Answer	148 63%	7 88%	33 83%	32 80%	33 63%	23 50%	20 43%	4 100%	10 67%	8 56%	48 62%	23 48%	12 75%	4 67%	41 53%	90 56%
UNCERTAINTY OFNAVIGATIONAL POSITION																
Yes	8 2%	-	2 6%	1 3%	1 2%	-	1 2%	-	1 7%	-	3 4%	1 2%	-	-	3 4%	2 1%
No	7' 34%	1 13%	5 13%	11 28%	20 38%	13 28%	27 67%	1 25%	6 40%	9 56%	25 32%	22 44%	6 31%	1 14%	36 45%	42 31%
,NoAnswer	161 64%	7 88%	33 83%	28 70%	31 60%	33 72%	18 40%	3 75%	8 63%	7 44%	50 64%	27 54%	11 69%	6 86%	39 51%	92 66%
Yes	8 3%	-		2 5%	1 2%	2 4%	1 2%	-	1 7%	-	2 3%	-	1 6%		3 4%	2 1%
No	76 32%	1 13%	6 15%	8 20%	14 27%	20 43%	25 63%	1 25%	3 20%	7 44%	27 36%	23 48%	3 19%	3 43%	29 38%	43 32%
No Answer	153 65%	7 88%	34 66%	30 75%	37 71%	24 62%	21 45%	3 75%	11 73%	9 56%	49 63%	27 54%	12 75%	4 67%	45 68%	91 67%
SHORTAGE OFFOOD/WATER/FUEL																
Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No	84 36%	1 13%	6 16%	12 30%	22 42%	13 28%	28 60%	1 25%	7 47%	9 56%	27 35%	22 44%	4 25%	1 14%	36 47%	45 33%
"Ne Answer	151 64%	7 88%	34 88%	28 70%	30 68%	33 72%	19 40%	3 75%	8 63%	7 44%	51 65%	28 56%	12 75%	6 66%	41 63%	91 67%
Yes	1 0%		-		-	1 2%	-	-	-	-	-	-	1 6%	-	1 1%	-
No	77 33%	1 13%	8 16%	8 23%	14 27%	20 43%	25 53%	1 25%	4 27%	7 44%	28 36%	23 46%	3 19%	3 43%	30 39%	43 32%
No Answer	157 67%	7 66%	34 66%	31 76%	38 73%	25 54%	22 47%	3 1,76%	11 73%	9 66%	50 64%	27 54%	12 76%	4 67%	46 60%	93 66%

4ERETIREMENTS

4.30 Competitors were asked' to state their primary and secondary reasons for retirement. The answers are shown In table 4.16.

4.31 A total of 171 crews Who returned questionnaires retired from the race. Table 4.16 lists a total of 120 primary reasons connected with boat or crew failure which were given, but many crews listed more than one primary reason. When no primary reason Is given a retirement may be assumed to be for reasons not associated with damage to yacht or crew. It would be misleading to suggest that a large number of boats retired In disarray. Table 4.17 shows the pattern of retirements of boats Which provided detailed reports. The majority of yachts which were not significantly damaged retired because, having regard to the forecast of further gales, they considered it the prudent thing to do; crews who heard of the disasters which had overtaken other yachts lost all Interest In the race and felt that the responsible course was to get out of the area In order not to Impede the rescue authorities. Yachts without R/T were anxious to make port as soon as possible to report their safety (as requested in an announcement broadcast by the BBC) and allay the anxiety of their families and friends.

4.32 Many yachts decided that discretion was the better part of valour. Although close to or approaching the Fastnet Rock, they considered the conditions were too dangerous to carry on and round the Rock. Many yachts which had safely ridden out the storm found that they had been blown many miles to leeward and a long beat to the Rock held little appeal.

4.33 Some competitors who sought shelter in Irish ports might, under rather different circumstances, have been expected to continue the race when the weather moderated. However the reports of loss of life, which at one time suggested that the final toll was likely to be much higher, made it Inappropriate for anyone who had made harbour to set out again towards the Fastnet.

4.34 24 yachts report that they asked for or accepted some degree of assistance in sltuatlons which technically did not amount to distress. 17 yachts were towed or escorted into harbour by RNLI lifeboats. Five of these had lost their rudders, one had been dlsmasted and

TABLE4.17

STATUS OF BOATS RETIRING EXCLUDING BOATS ABANDONED

		Undemaged but had been Kn00 eddown		Damllged but	Towedinor eecortedbv	Received assistance to enter
	Undemaged	B		Unaided	Lifeboet	Harbour
Clas.O	0	0	0	1	0	
Class 1	2	2	1	7	4	
CI'ss2	9	6	0	3	3	
Cla.s3	9	7	6	6	4	
Class 4	13	3	8	7	2	
Class 5	8	8	10	10	4	
Total	41	26	24	34	17	6'

_"Not analysed by class.

abandoned and another had been dismasted but was under jury rig. Many of these yachts made their own way to within a few miies of harbour and only sought or accepted assistance to ensure safe entry with a damaged yacht. Several crews reported seeking tows into berths as they were unable to start their engines and to sail into the berth wouid have involved an unnecessary risk of minor damage. One dismantled yacht reported that she obtained 35 litres of fuel from a French fishing boat before proceeding to Plymouth under her own power. A number of yachts called up fishing vessels, helicopters and coasters in their vicinity to seek confirmation of navigational position.

4.35 Table 4.18 shows that 44 yachts originated a distress call and lists the reasons for doing so. There appears to have been some misunderstanding of this question, which was intended to apply to yachts originating distress calls on their own behalf but at least two competitors who relayed distress calls are known to have given positive answers. 33 skippers consider that they acted correctly in originating distress calls. No criticism of the other 11 skippers is implied as the consequences of delaying a distress call are likely to be much worse than the consequence of making a premature or possibly unnecessary call. Too many unnecessary calls could, of course, overload the avaiiable rescue services but neither competitors nor rescuers have reported anything to give reason for concern on this point.

4.36 Questionnaires were returned by a further 20 yachts which were not included in the computer analysis as they had retired before the storm. 10 skippers decided to retire on or shortly after the 1750 shipping forecast on Monday 13 August which forecast winds southerly 4, increasing 6 locally gale 8. Gale 8 however is not a deterrent to the majority of Offshore racing yachts. Eight yachts retired early owing to damage or gear faiiure incurred before the storm. One yacht retired because a diabetic crew member was not well, and one skipper was concerned about a badly seasick crew member who had joined the crew at the last minute.

4.37 The high percentage of retirements should not give any cause for concern. Most of the yachts which retired did so for sound reasons, based on a seamanllke assessment of the situation and prevailing conditions.

4FABANDONMENTS

4.38 24 yachts were abandoned, of which 23 returned questionnaires. The 24th abandoned yacht is believed to have sought assistance from a helicopter after she had lost her rudder and broken both spinnaker poles which were being used as an emergency rudder. She was in no Immediate danger at the time but her skipper decided that It would be wrong to remain on board with gaies still forecast, a lee shore some 40 miles away and no means of exercising directional control in the prevailing conditions.

4.39 Of the 24 abandoned yachts only five have not been recovered and one of these five sank under tow. There has been considerable criticism that yachts were abandoned too hastiiy, the criticism being based on the premise that a damaged yacht is a safer place than a life raft. Considerable weight is given to this argument by the fact that seven lives were lost from three life rafts and in each case the yacht was subsequently recovered. But it was not easy to make this assessment at the time,

TABLE 4.18

Question: Which of the following did *you* consider applied at the time of originating a distress call?

Question; Do you feel now, with hindsight, that you acted correctly in originating a distress signal in the prevailing conditions?

(Primary reasons are given first, followed by contributory factors.I

	Total	Aban-doned	Distress Signal Correct: Yes	Distress Signal Correct: No
BASE	44	22	33	6
CONCERN THAT YACHT IN SINKING CONDITION				
Yes	8 18%	6 27%	a 24%	--
No	17 39%	7 32%	12 36%	4 67%
No answer	19 43%	9 41%	13 39%	2 33%
Yes	4 9%	3 14%	4 12%	
No	15 34%	7 32%	10 30%	4 67%
No answer	26 57%	12 65%	19 68%	2 33%
DAMAGE TO HULL OR RIG				
Yes	25 67%	17 77%	20 61%	3 50%
No	8 18%	1 6%	7 21%	1 17%
No answer	11 26%	4 18%	6 18%	2 33%
Yes	6 11%	3 14%	3 9%	1 17%
No	8 18%	3 14%	7 21%	1 17%
No answer	31 70%	16 73%	23 70%	4 67%

	Total	Aban-doned	Distress Signal Correct: Yes	Distress Signal Correct: No
BASE	44	22	33	6
MAN OVERBOARD/INJURY/FATALITY				
Yes	8 18%	5 23%	8 24%	
No	14 32%	7 32%	9 27%	4 87%
No answer	22 60%	10 45%	16 48%	2 33%
Yes	6 14%	4 18%	6 16%	1 17%
No	13 30%	8 36%	9 27%	3 50%
Noanswar	25 57%	10 45%	19 58%	2 33%
LOSS OF CONFIDENCE IN ABILITY OF BOAT TO CONTINUE				
Yes	6 14%	5 23%	3 9%	2 33%
No	12 27%	4 18%	10 30%	2 33%
No answer	26 69%	13 59%	20 61%	2 33%
Yes	12 27%	10 46%	11 33%	
No	8 18%	2 9%	6 18%	2 33%
No answer	24 55%	10 45%	16 48%	4 67%

	Total	Aben-doned	Distress Signal Correct: Yes	Distress Signal Correct: No
BASE	44	22	33	8
CONCERN FOR GENERAL SAFETY OF CREW				
Yes	24 65%	13 69%	16 48%	5 83%
No	5 11%	3 14%	5 15%	
No answer	15 34%	6 27%	12 36%	1 17%
Yes	11 26%	8 36%	9 27%	1 17%
No	3 7%	1 5%	2 6%	1 17%
No answer	30 68%	13 69%	22 67%	4 67%
IN URGENT NEED OF TOW				
Yes	3 7%		2 6%	1 17%
No	13 30%	6 27%	10 30%	2 33%
No answer	28 64%	16 73%	21 64%	3 50%
Yes	6 11%	4 18%	4 12%	1 17%
No	15 34%	8 36%	12 36%	2 33%
No answer	24 65%	10 45%	17 52%	3 50%

when the yacht appeared to be in danger of sinking and full confidence was placed in the life raft as a means of survival.

4.40 Table 4.19 shows that with one exception, the abandoned yachts had been knocked down to past horizontal, and all of them had suffered severe damage to their hull, steering or rig. 17 were "calculated" abandonments, in that the crew remained on board the yacht until help in the form of a helicopter, ship or another yacht arrived. In several of these cases the life raft was used to effect transfer to the rescue vehicle but the raft was launched only as a means of transfer. Only six yachts were abandoned before help was at hand. Of these six yachts two have not been recovered and may be considered to have been in sinking condition at the time they were abandoned. Two had suffered knockdowns and major damage to superstructure so that although they were recovered, at the time of abandonment there was excellent reason to believe that they were unlikely to survive a further knockdown. Thus only two yachts were abandoned simply on the grounds that the life raft was likely to provide more security than the Virtually undamaged hull of the yacht.

4.41 The 17 skippers who took the conscious decision to abandon to a helicopter, ship or another yacht believed that at the time there was an unacceptably high risk to the crew if they remained on board the yacht. It would be Improper to question these decisions without lengthy and detailed Investigations of the circumstances which led to them. Such investigations would, it is believed, be pointless; there is certainly no evidence that those who originated distress calls did so for any reason other than that they believed their yachts were in grave and imminent danger, nor that conditions of grave and Imminent danger did not In fact exist.

4.42 The methods of rescue by which survivors were taken to safety are described In Section 5. The presence of efficient rescue services clearly added to the total number of yachts abandoned, as many of those who were taken off by ships and helicopters would not have abandoned unless rescue had been at hand. There have been allegations that the rescue services positively encouraged crews to abandon their yachts but no evidence has come to light to support these allegations.

4G FATALITIES

4.43 The Council of the RYA, the Committee of the RORC and all those concerned with the 1979 Fastnet Race regret most deeply the tragic loss of life that occurred.

4.44 15 men from yachts participating In the race died. The clinical cause of death, for those whose bodies have been recovered, has been established as drowning, exposure or exposure and drowning. The circumstances In which these deaths occurred were as follows:-

a) Three were lost after the capsize and disintegration of their life raft.

The yacht first got into difficulties at about 0100 on 14 August while motoring to stand by another yacht which was already in trouble. She experienced two severe knockdowns, in the course of which she was dismasted and lost her rudder.

After righting from the second knockdown the skipper was found to be over the side but still attached by his safety harness. Two of the crew pulled the skipper back on board, while the remainder set about launching the liferaft. The decision to abandon the yacht appears to have been taken Instinctively. During the second knockdown the yacht shipped a considerable amount of water and her crew described her as half full. They felt that, withouhmast or rudder, she was at the mercy of the waves and it was only a matter of time until she was rolled over and sank. In fact the yacht was later recovered and her salvors say that when they found her she had about two feet of water in the cabin.

The abandonment to the liferaft was accomplished successfully. The yacht Morningtown sighted the liferaft and after several unsuccessful attempts succeeded in laying alongside it. Morningtown's crew had great difficulty in holding onto the raft and they were unable to gain access to the canopy opening. While the raft was alongside, Morningtown's steering wires jumped the quadrant and by the time this defect had been repaired she had lost contact with the raft.

Shortly after the brief contact with Morningtown the raft was capsized and the two buoyancy chambers were torn apart. The crew remained in the lower half of the raft but there was only one attachment point, (the remains of the painter or the drogue line) to which one man was able to clip his safety harness. An hour later two of the survivors were washed out of the raft and it was impossible for the others to rescue them.

Three hours later, at about 0630, the lower half of the raft was again capsized and all but one of the survivors found themselves clinging to the lanyards of the upper buovancv chamber, which had become completely separated from the lower. One man died while still clinging to the lanyards before a helicopter arrived at about 0945. The helicopter lifted off two survivors but the remaining three were heavily entangled and unable to extricate themselves. By this time HNLMS Overijssel had arrived at the scene and she rescued the remaining survivors.

b) Three were lost while attempting to climb the pilot ladder of 11 coaster from their capsized liferaft.

Four men were lost from the crew of this yacht. She was lying a-hull, battened down, when she rolled slowly through 360°. One crewman was trapped under water and badly Injured. The yacht was dismasted and below everything was in total chaos. Half an hour later while two men were bailing with buckets down below and three men were in the COCkpit, one at the helm and two pumping, the yacht was caught by a massive breaking wave and rolled quickly through 360°. The three men In the cockpit were all washed overboard. Two remained attached by their life lines but the third man was washed away, either his harness or the point of attachment haVing parted.

The survivors then took to the life raft. The yacht has subsequently been recovered and at the time of recovery there was extensive damage to the bulkhead at the forward end of the cockpit. It would therefore

TABLE 4.19

METHODS OF ABANDONMENT AND STATUS OF YACHTS ABANDONED

	Total	Abandoned to Life Raft	Abandoned to other Yaoht	Abandoned to Ship! Helicopter
BASE	23	6	1	16
82 Knockdown	22	6	1	15
Structural Damage to Hull	6	2	1	3
Lost Steerlnn	6	1	-	5
Dismasted	16	4	-	12

appear reasonable for the crew to have assumed that if she capsized again she might sink very quickly, Flares were lit and a coaster approached, At that point the raft capsized, As help was at hand no attempt was made to right the raft and the men clung to it while the coaster, rolling heavily, put a pilot ladder over the side, The coaster had to make several passes at the raft before laying alongside it, Two young crew members managed to grasp the ladder and climb up it, but two other men who managed to get hold of the ladder were unable to climb it and fell back into the sea, one of them being pulled back by his harness which was still attached to the life raft, The fifth man iost his hold on the life raft and fell under the stern of the coaster,

c) One was lost when theUferaft in which he was stowing emergency gear capsized and broke adrift.

The sequence of events leading to this fatality started when the yacht tried to go to the assistance of another. While trying to manoeuvre through the heavy seas she was capsized and her rudder broke,

During the capsize the yacht shipped a considerable quantity of water and the crew's efforts to remove it were initially unsuccessful, They suspected a leak In the vicinity of the rudder post but it was SUbsequently discovered that the hull was still tight.

The crew decided that they should prepare to abandon the yacht and launched the Ilferaft. They secured it alongside on a short painter and one man boarded it to stow emergency gear which was passed to him by the others. While he was doing so the raft was capsized, its painter snapped and both raft and crewman were washed away, Nothing could be done to recover the lost man astheyachtwas already disabled,

d) Two were lost after being trapped In the cockpit of an Inverted yacht.

The exact sequence of events is difficult to ascertain. During the early hours of 14 August the yacht was heavily knocked down several times and then ran off under bare poles with warps streamed. The entire crew remained In the cockpit for most of the night but the skipper went below to send a distress call, While he was doing so he was hit on the head by an item of loose gear, believed to have been a tin of food, He was concussed and thereafter lapsed into unconsciousness from time to time.

The yacht was rolled through 180° and remained upside down for a period of time estimated by various members of the crew to have been between two and five minutes. Two of the crew were thrown clear but remained attached by their harnesses. A third crewman extricated the skipper by cutting his safety harness, but after bringing him to the surface he lost his grasp on him and the skipper was washed out of reach. One of the three crewmen in the water climbed onto the upturned hull and the yacht then righted herself, dismasted.

The three conscious survivors were able to climb back on board. They found that two crew members who had been trapped in the cockpit throughout the capsize were lying motionless in the bottom of the cockpit and assumed they were dead. They launched the life raft and abandoned the yacht, They were unable to do anything about recovering the skipper and they were subsequently rescued by helicopter,

One of the unconscious casualties came to some time later, in the water alongside the hull. (It seems that the yacht may have capsized again while he was unconscious). He was able to climb back on board and with the aid of a winch he pulled his semi-conscious companion into the boat, His companion was still alive and responded to resuscitation but died about three-quarters of an hour later, The one remaining survivor spent some 12 hours bailing the disabled yacht and keeping a lookout for rescue before being lifted off by helicopter,

e) Six were lost after being washed overboard from yachts. (seealso b above)

(i) A crew member was washed overboard and lost from a yacht which capsized 1180°) while close reaching under storm Jib, The boat had been behaving well until hit by a large breaking wave. Two men in the cockpit were thrown overboard, One man was attached by two hooks, one to the toe-rail and the other to the jackstay. He considers that he broke the first impact by hanging on by hand as his arm and hand both suffered injury, but the line still took considerable force as was shown by the bruises caused by the belt. The line of the other crew member broke, It is thought that there was a knot in the line,

A buoy with light attached was immediately thrown overboard; the yacht gybed and returned to the light, scanning the sea with searchlights for some twenty minutes before deciding that further search was hopelessand a danger to the rest of the crew.

(Il) The skipper was iost from a yacht which capsized while running under bare poles, streaming warps, and travelling at about 5-6 knots, The skipper was at the helm, The other man who was In the cockpit describes how he himself was thrown Into the water as the yacht capsized; he was surrounded by a mass of broken water pulling very strongly away from the yacht and all that held him was his harness, As the yacht righted he found the mainsheet and was effectively scooped up by the yacht and landed in the cockpit. He then found that the skipper had been washed away leaving the clip, safety line and webbing.belt of his harness stili attached to the yacht.

Oil) Three men were washed overboard from a yacht when she was severely knocked down while reaching under storm jib, traveillng at about 7 knots, One man remained attached by his harness and was recovered, but the two others were lost. So far as it has been established the safety line of one harness parted, and in the other case the harness was clipped onto the guardrail, which failed,

(lv) A crew member was washed overboard when the yacht was picked up by a rogue wave and rolled about 140°, At the time the yacht was broad reaching under storm jib, with four warps in use, doing 8-10 knots. The whole harnesswas left on board and had come undone. As the engine was saturated It took sometime to return to the man in the water. At the first attempt they missed him by 10 yards. At the second attempt another crew man tied himself to a long line and jumped into the water to try and pick up the man overboard, but missed him by only a few yards. Several more attempts were made to pick up the man in the water without success, until it became clear that there was no sign of life, and that further manoeuvring was placing the yacht and her crew in danger.

4.45 In .everv case there were a number of contributory factors which are described elsewhere in this report. The common link between all 15 deaths was the violence of the sea, an unremitting danger faced by all who sail.

Section 5
The Search and Rescue Phase

5A EXTENT OF THE SEARCH AND RESCUE OPERATION

5.1 The first indications of difficulties with the Fastnet Race fleet became apparent during the late evening of Monday 13 August, when a number of yachts reported problems with rudders and steering gear. At this time the fleet was spread over about 140 miles between Lands End and the Fastnet Rock. Rescue operations began when the Baltimore life-boat left her station at 2215 on Monday 13 August In answer to a distress signal from a rudderless yacht. Between midnight and 0200 on the morning of Tuesday 14 August, numerous red flares were reported and Mayday calls intercepted, and four further life-boats were launched to join in the rescue operation.

5.2 After daybreak, the SAR operation consisted of two phases. The first, which took place on Tuesday 14 August, involved the rescue of survivors from 24 abandoned yachts and was largely completed by dusk on that day. The second, which Involved accounting for the safety of all competing yachts, ran concurrent with phase one but continued until 1412 on Thursday 16 August when all yachts were accounted for.

5.3 The extent of the Search and Rescue operation is summarised In reports from the Southern Rescue Co-ordination Centre (which is set out overleaf) and The Royal National Lifeboat Institution (Table 5.1)

TABLE 5.1

RNLI SERVICES TO FASTNET RACE YACHTS

Time	*Stetion*	*Hours at Sea*	*Services Rendered*
13 August			
22.15	Baltimore	10 hours	Towed in rudderless yacht.
14 August			
02.40	Courtmacsherry Harbour	0.7 hours	Search for rudderless yacht.
02.55	Ballycolton	5.1 hours	Escorted rudderless yacht.
03.00	St. Mary's	5.6 hours	Search for rudderless yacht.
03.20	Courtmacsherry	7.7 hours	Search for rudderless yacht.
07.01	St. Ives	3.4 hours	Search for yacht originating Mayday call.
07.06	Sennen Cove	9.4 hours	General search.
08.00	Ballycolton	11.3 hours	Towed in yacht.
08.30	St. Mary's	11 hours	Escorted yacht Into harbour.
09.06	Baltimore	11.9 hours	Towed in rudderless yacht.
09.08	Dunmore East	16.9 hours	Towed In yacht with rig damage.
11.00	Courtmacsherry Harbour	13.1 hours	Towed in rudderless yacht.
19.04	Padstow	3.5 hours	Took doctor to yacht and escorted yacht into harbour.
19.30	St. Mary's	1.5 hours	Escorted yacht for night entry into harbour.
21.00	St. Mary's	2.6 hours	Towed In yacht.
22.12	Falmouth	12.7 hours	Towed in rudderless yacht.
22.33	Padstow	14.4 hours	Took over tow of damaged yacht and landed one crew member.
15 August			
00.60	L1zard-Cadgwlth	1.1 hours	**Transferred and landed** two survivors **from coaster.**
01.00	Dunmore East	0.6 hours	Escorted yacht into harbour.
01.05	Angle	0.9 hours	Escorted yacht into harbour.
01.30	Dunmore East	0.3 hours	Escorted two yachts into harbour.
01.59	Angle	6.3 hours	Escorted yacht into harbour.
01.53	Falmouth	6.3 hours	Took Over tow of abandoned yacht.
13.00	Padstow	0.2 hours	Assisted yacht into berth.
19.06	Ciovelly	12.9 hours	General search.
15 August			
04.14	Penlee	3.5 hours	Took over tow of abandoned yacht.
	TOTAL	169.6 hours	

In accordance with the traditions *01* **RNLI crewmen, no salvage claims have been made with regard to** these yachts.

Extraot from report of Southern Resoue Co-ordination Centre (Time. GMT preceeded by day of month)

1. At 140216 MRCC Lands End requested Southern Rescue Co-ordination Centre assistance for **several yachts** In **difficulty In area 6050N-0810W. Because of the severe weather** and poor vfslbflltv **In the area it was agreed that** the air **search would be** delayed until first light. Moreover 4 lifeboats and HMS ANGLESEY were already **proceeding lathe DATUM, and the Dutch Warship** OVERIJSSEL, the Race Guardshlp, was In the general area,

2. The SAR Nimrod at KINLOSS IRescue 011 was brought to **advanced readiness at 140334,** briefed at 1.40363 and **was airborne** at *140418.* CULDROSE were Informed of the situation at *140345* **and a Wessex was airborne at 140435, At 140446 a Sea King was launched** followed shortly **afterwards by 2** weseex. Rescue 01 **arrived at the** scene at **140530, established communication with Southern Rescue Co-ordination Centre, assumed Scene of Search Commander, and co-operated with** surface **shipping, yachts and helicopters in locating yachts** .In distress **and bodies in the water. Weather in the area at this time was reported as Wind Velocity** 250/60, sea state 8, Visibility 3 Nautical Miles, Cloud 8ase 1200 tt, wave height 50-60 feet.

3. As events unfoidedit was realised that a potential major disaster was probable, and et *140715* CULDROSE was asked to provide as' **many** helicopters **as possible, YEOViLTON was** contacted and asked to support CULDROSE, SAR Wing **FlnnlngJeyhad** ne assets available and **it** was decided **not to denude** -Ooltlshail **of its Sea** Kings at thls steae, **in case similar problems occurred elsewhere around** the coast, St: **,MAWGAN andKINLOSS were asked to prepare aircraft with SAR fit and to be prepared for a protracted operation, ODIHAM was asked to keep a Wessex** en.stand **byasa back upfor SAR HeloForces.**

4, At 140851 HMAS ROLLICKER was diverted to the scene and at *140915* HMS BROADSWORD was ordered to sail from the Sound. At 141616 RMAS ROBUST was selled. BROADSWORD assumed Scene of Search Commander at 141730. At 151735 CINCFLEET detached SCYLLA to the scene to replace OVERIJSSEL and ordered RFA OLNA to sail at 151730 from **Portsmouth.**

6,Consecutlve Nimrod sorties, with occasionally z elrcraft **on task simultaneously were flown until 161500. Helicopter operations wereffown continuously on 14/16 Aug** from **first to last light and sometimes Into the dark hours,** and for **most of the 16** Auq. **At-night 2** Sea Kings were **held at** ts.mlnutes. **Search areas** were continually **adjusted** to take account of winds and **tides, Itls estimated that 20,000 square miles** of ocean were searched. **Communloatlons amongst** all search **agencies Were generally-good throughout** the operation, **The major problems** hampering the search forces **were poor** weather, the **large number of yachts involved and the inability of yachts to communicate with the search units.**

6. Of the **303 yachts that started the '79 Fastnet** race, **24 were abandoned/and** the majority of these subsequently **recovered; 139 survivors** were rescued by **SAR** services and **15** veohtsrnen **lost** thelr.Jlves. Full details **of the SAR** proceedings are at Annexes **C, D andE.(Reproduced** 'as Annex **6A** to thfs reportl

5.4 The majority of emergency rescues were carried out at distances of 60-80 miles from land, Where the speed of helicopters working in daylight in co-operatlon with Nimrod aircraft made them the most effective rescue vehicles. The life-boats worked closer Inshore, towing and escorting damaged boats which had retired from the race into harbour, by day and night.

5.5 Comments after the race suggest that the role of the guardship for an offshore race is generally misunderstood. In the past the Royal Navy has provided a guardshlp for the Fastnet and other RORC races, as operational commitments have allowed. No British warship was available for the 1979 Fastnet and In view of the international nature of the race the RORC requested a guardship from the Netherlands Navy who provided the destroyer Overljssel. The role of the guardship for an offshore race has never been clearly defined. It is certainly not intended to provide safety cover in the way that a rescue boat provides cover for a racing dinghy fleet. The availability of HNLMS Overijssel in the Fastnet area was, therefore, to some extent fortuitous. She played a very full part in the SAR operation both as a communications relay and in the actual rescue of survivors. However the presence of a warship acting as guardship, although very valuable, can not be guaranteed as ships are likely to be made available for this duty only when other operational commitments allow.

5.6 The yacht Morningtown was also at sea in the race area acting as a communications relay, her owner having generously volunteered to undertake this task. Again she was not primarily a rescue vessel, although she also played a full and valuable part in the SAR operation.

5B CO.ORDINATION OF SEARCH AND RESCUE

5.7 HM Coastguard have statutory responsibility for the co-ordination of search and rescue In the United Kingdom. The ability of HM Coastguard to co-ordinate SAR depends to a large extent upon the co-operation of the race organisers and individual participants.

5.8 The procedure adopted by the RORC to confirm that yachts had started in the race has been described In section 1. When the storm hit the fleet on the night of 13-14 August the organisers did not have a 100% up-to-date accurate list of competitors, as opposed to entrants, and neither HM Coastguard SW District, nor Maritime Rescue Sub Centre (MRSC) Land's End, who were rapidly becoming involved, had a list of entrants. The initial phase of the SAR operation involved a search for yachts and crews actually in distress so a list would have been of little value. The rescue authorities were alerted by Mayday calls, radio reports offlare sightings and reports from HNLMS Overljssel and Morningtown of yachts In difficulties.

5.9 Rescue operations on 14 August were certainly complicated by the number of yachts in the search area and the difficulty experienced by aircrew in differentiating between yachts in distress and yachts hove to, running ottbefore the storm and lying a-hull in relative safety. There were a number of survivors in liferafts and also empty liferafts which had broken adrift from their stowages and inflated.

5.10 During 14 August about half the fleet was accounted for: some 150 yachts had been positively identified as having retired to harbours of refuge; been abandoned and all crew rescued or confirmed dead; or still at sea and known to be in no difficulty. Having spent the day rescuing over lOO survivors the rescue authorities believed that the search should continue until all yachts had been confirmed safe or their crews rescued.

5.11 A number of yachts which communicated by radio with searching aircraft, or Which were overtlown by low flying search aircraft, assumed that they would be reported as safe. On return to harbour, however, they found that this had not always been done (no doubt because of pressure on the SAR organisations) and that they were listed as unaccounted for.

5.12 The search operation carried out on 15 and the morning of 16 August involved a larger number of ships and aircraft than the search and rescue operation on 14 August. It did not result in the saving of further lives but this can not be taken as a reason why it should not have been carried out. After a fleet of yachts has been subjected to storm conditions, with the abandonment of over 20 yachts and the known loss of 16 lives, any responsible SAR authority must feel a duty to continue to search for possible casualties until all yachts known to have been in the area of the storm have been accounted for.

5.13 In addition to the lack of an up-to-date list of competitors, search and rescue authorities have commented on a number of features which made this search more difficult:

Identification of Yaohte

The -most promlnent Identifying **feature of a yacht Is her sail number. Under storm conditions with** only a **storm jib set or all sails furled the sail number is not displayed. All yachts are required to carry a strip of canvas** with the **sail** number displayed **on It, but this was not effective as It was seldom used at the height of the storm.**

It has been suggested by aircrew **involved In the search that the** sail number **should be marked on** the deck **of each yacht, in reflective tape. This would enable** vachta **to** be identified Irrespeotlva **of the sail** carried and **would give some chance of** Identllylngayacht at night.

One RNLICoxswa'!n· has suggested that each competing yacht should display a race numberonher hull. This would, however, **be less visible from the air.**

Knowledge of air **search techniques**

Aircrew carrying out night **search In fixed wing aircraft have commented that** few yachtsmen appeared **to** be aware of **the aircraft night search procedures In Annual Notice number 4 of Admiralty Notices to** Marinera, **particularly with regard to the use of green·flares.**

Identlfloatlon of lIIarafts

Oonsjdereble searchtime **was** wasted Investigating **empty** lifetatta. **As will be seen from** the section **on life rafts the problem was exacerbated by the number of** rafts lost **overboard. It has been suggested that aUlife** rafts should **carry the name or sail number of their parent vessel.**

At present rafts **are marked with a serial number but this is only visible on close Inspection** and matching a **raft serial number to Its parent vessel takes** a considerable **time.**

To mark a raft with the name or sail number of a yacht might involve a delay in **supplying the raft. It** would either **have to be** markedduringmanufacture **before being** packedIn **Its** cannlster **or valise** or.Itwould have to **be** marked during an annual-survey,

[Alternatively e eerlatnumber **written in large** characters-on **the top** and bottom 01the raft could ease theldentlflcstlon problem. lfthe **raft serial number were to be included on** the crew llst **of each race entrant/ thellnkIng·of rafts to yachts would** be **slmpllfledJ,**

Staggarlng the Start

It has been **suggested that there might be some benefit In spreading the** start of **the Fastnet Race over two days, It Is, however, nowagreed thatthis** would be **unUkelytohave anymerit** from the point **of view of rescue authorities. The size of the fleet made the task of accounting for all the yachts at** sea a **difficult** one, **but the** actual danger to any **Individual yacht was not made** worsebecause **of the number** sailing in the **race.**

Use of Radio

HM Coastguard and SAR units have suggested **that the search** could have **been carrled** out much **more** oulcklv **if all competing yachts were fitted with** VHF' radio **transceivers. Aircrew also commented that if each yacht or liferaft had carried** an Emergency **Position Indicating Radio Beacon (EPJRB)·** survivors **would have been located** moreeasily. **Both these points are elaborated on later In this section.**

5.14 As the storm receded on Tuesday 14th and news media broadcast the tragedy around the world so the pressures on race headquarters multiplied; most staff worked round the clock and many extra volunteers appeared and helped. At this time the computer was re-programmed and collated data from many sources producing print-outs giving the status of all yachts in the fleet. Naval staff were seconded from HMS Drake under the auspices of the Chief of Staff at Mount Wise, Plymouth. All telephones in the building were converted to information supply points, extra lines were installed and the British Transport Docks Board as well as the Royal Western V.C. and the Press Office furnished yet more information points. The local Post Office Telephone Manager offered immediate assistance to the RORC and organised his exchange team of operators to receive copies of the computer print-out so that they too could deal authoritatively with hundreds if not thousands of telephone enquiries.

5.15 The computer print-out became most important to the operation and twice copies were despatched by hand to MRSC Lands End with the assistance of a private helicopter (whose owner volunteered his servicesl and also Devon and Cornwall County Constabulary.

5.16 The Data General computer was fundamental to the information exchange at Plymouth. The high-speed multiple print-out could quickly provide the latest information to telephone points. But it was clear that the public telephone service was for a long period in "log jam" due to the intense concern for Information by relatives and friends.

5.17 Since the tragedy, discussions have been held with the BBC department operating "CEEFAX" (similar to the ITV system "ORACLE"), a newly introduced national computer-based information service of which Britain is a pioneer. The generic term "TELETEXT" (which includes CEEFAX and ORACLE) describes systems in which written and diagrammatic information is retrieved from a central computer store and displayed on an adapted television set at the command of the user. Teletext signals are superimposed on normal BBC or ITV transmission or in variations called "VIEWDATA" and "PRESTEL" brought to the television set through a telephone line.

5.18 The Fastnet incident with its information computer has pointed to the possibility for the race H.D. computer to be directly linked (a single telephone line would dol to a central Teletext computer. Once this link Is established all new data at the scene is immediately available to all TV sets so fitted; thus the number of Information output points is multiplied by the number of Teletext-fitted sets in the country, or, in the not-too-distant future, across the world. The user will need only to call up the appropriate alphabetical "page". Developments by BBC engineers include a prototype small printer which can operate direct from the television set.

5.19 Information from a central source is not only needed by the public, including relatives and friends, but also by rescue services. Again, Teletext should be capable of contributing. Firstly the basic information as presented for public use would In a great number of cases also assist rescue services; secondly, a simple code could be employed to pass information not suitable for public broadcast.

5.20 Such a system would operate for the good of the community in any case of disaster similar to the Fastnet. There are obvious advantages to be gained from the development of a national emergency teletext service. In the meantime, progress reports of principal sailing events might be welcomed for their own news value on the Teletext services and the exercise wouid form a valuable liaison.

5.21 The ·quality of Incoming information was often unknown. Names of yachts and locations were frequently garbled. However the race organisers were able to unscramble much of this garbled information. The sightings of yachts at sea after they had reported retiring from the race safe and well often renewed doubts about their status, although they were invariably sailing home after the event. A computer can not solve all the problems of race organisation and rescue co-ordination. There is always likely to be a need for race officers and helpers, with a background of offshore racing experience, to evaluate information.

5.22 A special unit was established within race headquarters to make contact with the relatives of those involved in reported incidents. When a death had been confirmed the next of kin were Informed as soon as possible, except when skippers or other crew members had said that they themselves would contact the relatives.

5.23 The multihull "Bucks Fizz" capsized with the loss 01 her crew 01 four whilst following the race. She was the lone starter from Yarmouth, Isle of Wight, in an event organised by the Multihull Offshore Cruising and Racing Association IMOCRAI. The RORC had agreed, in advance, to take the time of any multihull arriving at Plymouth, and MOCRA held responsibility for entries, rules and regulations and race results. Contacts were established between MOCRA and the RORC in Plymouth and as information came in relatives of the trimaran's crew were informed by MOCRA who held the crew list. MOCRA is holding its own inquiry into this accident.

6C **USE OF RADIO**

5.24 32 boats were equipped with HF or MF R/T and a further 10 with "Emergency Only" MF R/T. MF and HF radio is not widely fitted in cruising or offshore racing yachts in Northern Europe. The rigorous standards set for type approval of sets result in the cheapest MF R/T costing over £2,000 to install. In the USA and Australia M/F equipment can be installed at a cost of about £500 because the standards for type approval are much less rigorous.

5.25 The authority responsible lor type approval standards in the UK is the Home Office and unofficial consultations after the Fastnet Race indicate that there is some hope of standards being relaxed lor MF R/T fitted in yachts in which there is no statutory requirement 10r two-way radio to be carried.

5.26 A much larger number of competitors carried VHF R/T , and table 5.2 shows that it was fitted in the majority of the large boats but in only a quarter of the smaller. This table shows the proportion of boats in which the radio remained serviceable. Table 5.3 shows the cause of radio failure and includes both MF and VHF. Table 5.4 shows the ranges at which communication was achieved with both MF and VHF.

5.27 Ouring the race HNLMS Overijssel and the yacht Morningtown were acting as radio reiay ships for position reports from the Admiral's Cup Fleet. As the storm developed both these vessels ceased operating with the Admiral's Cup yachts as they were fully occupied reiaying distress traffic.

5.28 In spite of the fact that 65% of the competing yachts were fitted with VHF radio, communications during the SAR phase of the event were less effective than they might have been. With the exception of the Admiral's Cup yachts there was no overall radio organisation, with no special frequencies allocated for position reporting and no set listening or reporting scheduies. Thus VHF Channel 16, the international distress and calling channel, became heavily overloaded. This is not to impiy that the radio procedure or discipline were universally bad, in most yachts they were quite good, but the sheer number of boats trying to communicate with SAR ships and aircraft, with each other and with Coast Radio Stations, imposed a very heavy load on the system.

5.29 There were instances of lack of radio discipline and bad procedure which added unnecessarily to the overloading of the available communication channels.

TABLE 5.2

Question: Do you carry VHF R/T? *Question:* Did it remain operational?

		Fastnet Class						*Setterr* *0-25% remaining*	
	Total	*0*	*I*	*1/*	*11/*	*IV*	*V*	***Storm***	***Harbour***
BASE	235	8	40	40	52	46	47	21	29
DO YOU CARRY VHF *R/T?*									
Yes	153 65%	7 88%	36 90%	34 85%	38 73%	24 52%	13 **28%**	13 62%	18 62%
No	55 23%	–	1 **3%**	3 **8%**	8 15%	16 35%	26 **55%**	5 **24%**	8 28%
No answer	27 11%	1 13%	3 **8%**	3 **8%**	6 12%	6 13%	8 17%	3 14%	3 **10%**
DID THE VHF RIT REMAIN OPERATIONAL									
Yes	115 **49%**	7 88%	30 75%	29 73%	25 48%	17 37%	6 13%	6 29%	11 **38%**
No	36 15%	–	8 20%	4 10%	11 21%	7 15%	6 13%	6 29%	7 24%
No answer	84 36%	1 13%	2 **6%**	7 18%	16 31%	22 48%	35 74%	9 43%	11 **38%**

TABLE5.3

Question: If you had a radio failure, do you know why?lcommentl

		Festnot ***Class***						***Battery*** *Q.26%*	
	Totel	*0*	*I*	*1/*	*11/*	*IV*	*V*	***Storm***	***Harbour***
BASE	45	–	9	6	12	10	8	8	9
No Battery Power	10 22%	–	1 **11%**	2 **33%**	3 **26%**	2 20%	2 25%	5 63%	4 44%
Radio Receiver Swamped	4 **9%**	–	1 11%	1 17%	1 **8%**	–	1 13%	–	1 11%
Aerial Failure/ Destroyed	9 20%	–	–	–	4 33%	3 30%	2 25%	1 **13%**	1 11%
Reason not Known	9 20%	–	2 22%	2 **33%**	2 **17%**	3 30%	-	1 13%	–
No answer	14 **31%**	-	5 **66%**	1 **17%**	2 **17%**	3 **30%**	3 **38%**	1 13%	3 33%

TABLE 6.4

Question: At what range were you able to communicate:
la) by MF? (b) by VHF?

	Total	MF/HF Ooer.	VHF Oner.
BASE	235	36	115
MF			
Less than 30 miles	3 1%	1 3%	2 2%
30-50 miles	7 3%	3 8%	4 3%
More than 50 miles	9 4%	6 14%	6 4%
Not Used	5 2%	3 8%	1 1%
No Answer	211 90%	24 67%	103 90%
VHF			
Less-than **16** miles	23 10%	4 11%	17 16%
16-19 miles	6 3%	1 3%	3 3%
20-24 miles	16 7%	2 6%	12 10%
26-30 miles	25 11%	6 17%	22 19%
More than 30 miles	27 11%	6 14%	18 16%
Not Known	9 4%	2 6%	8 7%
No Answer	129 55%	16 44%	35 30%

One yacht which called continually on channel 16 VHF to an Irish Coast Radio Station for a long period was a particularly blatant example of overloading caused by Ignorance. That particular Coast Radio Station is MF only and does not have VHF facilities and the regulations clearly state that If a station does not reply, the call should not be repeated, initially for 10 minutes and thereafter for 30 minutes.

6.30 The SAR authorities and the Coast Radio Station at Lands End did not know until some time after the start of the SAR operation the names of the competing yachts and whether or not each was fitted with radio. Thus It was some time before any effective action was taken to co-ordinate the record of boats which were safe and this Is believed to have contributed significantly to the length of the second phase of the SAR operation.

6.31 Table 6.6 shows how the 44 distress calls made during the race were originated and gives an indication of whether or not they were answered promptly. A number of boats made radio Mayday calls at the same time as using flares but there is no strong Indication of radio having been more effective than flares to call for help.

60 USE OF RADIO IN FUTURE RACES

6.32 As the SAR authorities have laid great emphasis on the Importance they attach to the use of radio the Inquiry has considered how radio might be used more effectively in future races, It Is believed that an organisation could be devised which would minimise the requirement for a prolonged search In the aftermath of a storm, although It Is doubtful If compulsory radio in all yachts and a comprehensive radio organisation would actually have resulted in saving more lives in the 1979 Fastnet Race,

6.33 On the basis that 66% of the Fastnet Race fleet carried VHF radio, It might be assumed that 2 way radio Is becoming an accepted Item of offshore racing equipment.

6.34 There Is one serious drawback to mandatory position reporting schedules. The radio failure rate during the Fastnet Race was 16% for VHF fitted yachts, as opposed to an abandonment percentage of 8%. In any weather the radio failure rate Is likely to exceed the number of yachts In distress by a similar amount. A radio failure, or even an alarm clock or memory failure, causes a yacht to miss a reporting schedule and there Is a danger of over-reaction. The present system of assuming that all Is well unless there is an Indication of trouble has much to recommend It over a system In which a yacht Is assumed to be In trouble if she is not positively known to be safe.

6,36 If radio Is to be made compulsory It must also be made as reliable as possible and the equipment required should Include an emergency aerial which can be rigged If a yacht is dlsmasted or loses her masthead aerial and a reserve power supply for use if the main batteries become unserviceable.

6,36 The three factors which prolonged the search after the Fastnet storm were the number of competitors, the distance of many yachts from land and the Initial absence Of a contingency plan for keeping tally of yachts reported safe. The case for compulsory radio is therefore strongest for races In which there Is a particularly large number of entries, and In which the course takes competitors a long distance offshore (but the limited range of VHF has to be considered),

6,37 The current regulations which discourage the use of MF radio In yachts In Northern Europe make It necessary to consider VHF as more realistic than MF, For the Fastnet type of incident the range advantage of MF would be highly desirable and it Is therefore essential that the possibility of a relaxation of MF type approval standards for voluntarily fitted yachts should be explored with vigour before Introducing a regulation for compulsory VHF,

6.38 A communications plan for a race In which radio was compulsory would have to be drawn up by the organising club and made known to HM Coastguard, the rescue authorities and the Post Office, It is

TABLE 6.5

Question: Old you originate a distress signal, by any means?
Question: What was the time Interval before your distress signelwas acknowledged?
Question: What means of making distress signal was used:
MF radio?
VHF radio?
Pyrotechnics?

	Tote!	Tlme/nterva/ Less than 5m!n	More than 6mln	Never
BASE	44	9	8	6
MF RADIO				
Yes	5 11%	—	1 13%	—
No	21 48%	4 44%	5 63%	4 67%
No Answer	18 41%	5 56%	2 25%	2 33%
VHF RADIO				
Yes	16 36%	4 44%	2 25%	3 50%
No	17 39%	4 44%	4 50%	2 33%
No Answer	11 26%	1 11%	2 25%	1 17%
PYROTECHNICS				
Yes	31 70%	7 78%	8 100%	5 83%
No	3 7%	1 11%		
No Answer	10 23%	1 11%	—	1 17%

suggested that the communications plan should take account of the following factors:-

1, The availability of competing yachts or escort vessels fitted with VHF and MF or HF to act as radio relays,

2, The availability of frequencies and the compatability of foreign and service equipment with the frequencies.

3, The need to guarantee compliance with radio schedules,

4, The use of radio in the early stages of any race to check on starters and early retirements.

5, Communication between the organising club, HM Coastguard and Coast Radio Stations.

6, Possible future relaxations of type approval for MF radio voluntarily fitted in yachts,

7, Alternative communication plans for normal and emergency use,

5E EMERGENCY POSITION INDICATING RADIO BEACONS

5.39 It has been suggested that the SAR operation would have been simplified, with a possible saving of more lives, if all yachts had carried Emergency Position Indicating Radio Beacons (EPIRB),

5.40 All EPIRB currently available operate on one or more of three distress frequencies, 243MHz, military aircraft distress, 121 ,5MHz, civil aircraft distress, and 2182kHz, international maritime MF distress, Each of these frequencies has limitations.

5.41 243MHz is monitored by some military aircraft and by mIlltarv airfields when flying is in progress. It is a VHF frequency (although it is sometimes referred to as UHFI and the range is therefore limited to line of sight. 121 ,5MHz is monitored by civil aircraft when they have radio capacity available. In controlled airspace, In which all aircraft fly around Northern Europe, the frequency Is seldom monitored because aircraft do not have sufficient radio capacity. Because of the relatively short flight times of aircraft the rescue services are alerted very quickly by the non-arrival of a plane and a search can always be instituted within at the very most a few hours and more usually a few minutes after an aircraft has crashed, Under these circumstances an EPIRB is an Invaluable aid to the location of survivors, It is, however, much less effective as a means of raising the alarm, because of its short range end the iack of frequency monitoring stations in coastal waters.

5.42 2182kHz is monitored by HM Coastguard and certain fishing vessels at sea are also required to monitor the frequency, Direction finding facilities are limited and the general use of the frequency by shipping internationally makes direction finding difficult. It is the present policy of the Home Office to discourage the voluntary carriage of EPIRB in yachts in coastal waters because of the doubtful efficiency of the beacons and the degrading of the system by inadvertent operation which would, it is believed, inevitably result from increased numbers of beacons,

5,43 It would no doubt be possible to set up a special EPIRB frequency monitoring service for races such as the Fastnet. On the other hand offshore racing yachts should not expect a higher degree of safety cover than other yachts or vessels, The basis of the sport Is that the risks are exactly the same as in all other forms of sea-going and to provide special rescue services which would not be available unless racing would be totally contrary to the spirit and Intent of the RORC and other clubs and associations which organise races offshore.

5F METHODS OF RESCUE

5.44 Most of the crews who abandoned their yachts were lifted off by helicopter. Crews in dismasted yachts and life rafts were lifted direct and those in yachts whose masts were still intact either iaunched life rafts or jumped into the sea before being lifted.

5.45 Helicopter aircrew were working under extremely hazardous conditions and it is a.great credit to them that they provided such effective rescue service. Aircrew report that in generai survivors co-operated well. The rescue task would have been simplified if all yachts had been fitted with radio telephones. There were a few cases in which crews did not understand the limitations to helicopters imposed by standing rigging and some crews were understandably reluctant to jump Into the sea, In one case a crew took the decision to abandon, but as it took 30 minutes for the first crewman to be lifted out of the sea the decision was reversed, the remainder of the crew deciding that it would be safer to remain in the yacht, This was the only instance of a pick-up taking any length of time, and in other cases the whole crew was lifted In 20-30 minutes,

5.46 Survivors from three yachts were rescued by HNLMS Overijssel. In two cases this involved survivors in life rafts, In the other the rescue was carried out direct from the yacht, HNLMS Overjssel was handled with skill and determination under hazardous conditions and members of her ship's company accepted considerable personal risk in recovering these survivors, The use of men working in scrambling nets was crucial in recovering the exhausted survivors from the remains of one of the rafts,

5.47 HMS Anglesey rescued one crew, who transferred by iife raft from their severely damaged yacht, Two crews were taken off by fishing vessels, and one by an oil rig supply vessel. In each case the rescuing vessel handled the operation skilfully and effected the transfer successfully.

5.48 Two survivors from one crew were successfully rescued from their upturned life raft by the coaster, Nanna, Three other members of this crew were lost during the rescue as they did not have the strength to climb the pilot ladder which was lowered to them.

5.49 Two crews who had taken to their life rafts were rescued by the yachts Lorelei, (SHE36) and Moonstone (00034), In each case the rescuing yacht used her engine to manoeuvre alongside the raft and effected the recovery without loss of life. One damaged yacht was taken in tow by the yacht Dasher (Nlcholson 55) but the damaged yacht capsized and her crew took to their life raft to transfer successfully to Dasher, Dasher carried out the tow and rescue under bare poles,

5.50 Several yachts which were riding out the storm attempted to go to the assistance of other yachts in difficulties, In a number of cases this resulted In the rescuing yacht herself getting into difficulties as soon as she attempted to manoeuvre ln the heavy seas,

5.51 It has been suggested that those who finished the race acted thoughtlessly in continuing rather than going to the assistance of yachts In distress. The large yachts which completed the course were already rounding the Scillies on the morning of 14 August and If they had returned to the Fastnet area, or If the smaller yachts had lingered to search for survivors, it would have increased the number of yachts at risk and further complicated the SAR operation. It would have been foolhardy for yachts to attempt to join the search and there is no evidence that any competitor failed to answer a distress call.

Recommendations

RACE ORGANISATION

00.1 Unless ocean racing is to cease entirely (and we do not regard this as a serious proposition) the first question that should logically arise is whether the organisers of any ocean race should, either by postponing the start or by ordering abandonment before the finish, seek to eliminate the effects of extreme weather conditions. The weather experienced by the Fastnet fleet was unusually severe, but it was not entirely unprecedented. Winds reached over force 10 with very heavy seas, but conditions of this severity are not unknown in long-distance sailing and even In the British Isles yachts sailing offshore must expect, if only very occasionally, to encounter such conditions. At present shipping forecasts are not issued by the Meteorologicai Office for broadcast by the BBC for periods in excess of 24 hours. Even this period has been shown to be beyond the range of accurate prognosis. In the present case the warning given of the approach of a force 8 gale was 9 hours, about the length of warning that might normally be expected. The increase to force 9 was forecast about 6 hours before the worst of the wind and to force 10 only about 1 hour beforehand, though the warning given to the competitors was in fact much less than these periods. Even if the organisers had been throughout in direct touch with the Meteoroiogical Office they could have taken no action either by postponing the start or by ordering abandonment of the race which couid have affected the position in the 1979 Fastnet. We do not think that organisers of offshore races should be expected to take decisions of this kind except, perhaps, as the RORC does at present, where predictable conditions of weather and tide at, or shortly after, the start Indicate an exceptional degree of risk. The arrival of force 8 gales with little warning is a feature of our weather which all who sail must expect to encounter from time to time, and no ocean racing skipper wouid regard such a wind as involving conditions which would ordinarily dictate the abandonment of the race. A timely forecast of winds In excess of this might well influence a skipper to consider taking shelter if conditions were appropriate, or, if proper seamanship dictated, remaining at sea with suitable precautions against heavy weather; but he would be in a much better position than would be the race organisers to make a proper assessment of the position. We do not think therefore that organisers should be expected to order abandonment of the race after the start: we find the reasoning behind current RORC practice, of offering race starts in all conditions of actual or forecast weather, while making it clear that the decision to start or continue a race rests with the owner, convincing; and even if means of communication with all competitors were available, we would not recommend any policy which would place on the race organisers a duty which is traditionally and properly assigned to the master of every sea-going ship.

00.2 If we assume that future ocean races may take place In which extreme weather conditions may be experienced, we should then logically consider how the effect of these conditions could be minimised. We think that such possibilities could be examined under four broad headings:-

- Ial the design and construction of competing yachts and of their equipment;
- (b) the level of experience of competitors, including the procedures adopted at the approach of and during bad weather;
- (c) weather information available and the means of communicating it to skippers to enable them to take appropriate decisions;
- Id) co-operation, including means of communication between skippers, race organisers, and search and rescue authorities.

YACHT DESIGN

00.3 Before examining this question, and this applies in varying degrees to other questions as well, It would be well to recall that the conditions experienced at the height of the storm, whilst no doubt precedented, must be regarded as an exceptional experience for most yachtsmen other than those engaged in very long distance sailing and in other waters than those in the South of the British Isles.' There is abundant evidence, for instance, that it was the severity of those conditions rather than failure in yacht design which was regarded by participants in the race as the prime factor in knockdowns-themselves one of the major causes of abandonments. Nevertheless there appears to be a disturbing correlation between certain design characteristics and lack of stability, as exhibited by severe knockdowns. The special analysis referred to in paragraph 3.14 has produced further illumination of this problem. We do not believe that we should make any specific recommendation in this area, as the subject is highly technical. We do recommend, however, that the findings

of this section of the report, together with the results of the special analysis, should be placed before the ORC with a view to their considering whether further changes in the measurement rules might not be required. The RORC should also consider whether the Special Regulations should not be amended to permit the eiimination of yachts whose design parameters may indicate a lack of stability. We can find insufficient evidence to lead us to recommend any alteration in the size limits for entrants.

YACHT CONSTRUCTION

00.4 With the exception of damage to steering gear, the damage sustained by the 1979 Fastnet Race fleet was consistent with what might be expected in the prevailing weather conditions. The following conclusions and recommendations refer to specific weaknesses detacted.-

a) Steering Gear. The damage sustained to steering gear gives grounds for concern. Much of it was attributed to the weakness of carbon fibre rudders and the designers who specified the use of this material for rudder construction are aware of the seriousness of the problem and are taking steps to analyse the cause. In general it must be fully understood that no system of emergency steering as required in Special Reguiation 10.3 can be relied on to give more than the minimum directional control necessary to enable a yacht to return to harbour, but it is nevertheless important to have such a system and to make sure that it works.

bl Watertight Integrity. The most serious defect affecting watertight integrity was the design and construction of main companionways. It is recommended that the Special Regulation relating to the blocking arrangements for main companionways should be extended to introduce specific requirements for the blocking arrangements to be totally secure but openable from above and below decks. It is understood that the ORC has already made some changes in this area. It Is also recommended that the Special RegUlation relating to bilge pumping should require bilge pumps to discharge overboard and not into a cockpit, unless the cockpit is open ended.

c) Comfort and Security of Accommodation. It is evident that the stowage arrangements in some boats are designed to be effective only up to 90° angle of heel. It is recommended that the Memorandum on Safety should draw attention to the need for the securing arrangements for heavy items of equipment and all stowages to be effective in the event of a total inversion.

d) Deck Arrangements. The present cockpit drainage arrangements In some boats are inadequate. It is desirable that the present Special Regulation on this subject which refers to minimum diameter of drains should be replaced by a requirement for cockpits to drain within a minimum time. It is realised that the implementation of this regulation could prove difficult In some existing yachts. It is also recommended that the Special Regulation relating to anchors should be extended to include a requirement for a strong securing point on the foredeck and a bow falrlead for anchor cable and towing warp. It is recommended that the RORC should Introduce a Special Regulation requiring adequate toe-rails to be fitted, especially forward of the mast.

SAILS AND EQUIPMENT

00.5 a) Storm Sails. The Special Regulation relating to storm sails does not fully cover the requirement but it is doubtful if any regulation could be effective for all types of yacht. It is understood that the ORC's new regulation which includes the provision of a trisail has emphasized the owner's responsibility for ensuring that storm sails, adequate for the size and type of yacht, are on board, and in consequence it Is unnecessary to make any further recommendations. Attention is drawn to the advisability of carrying a hacksaw with several spare blades, for severing standing rigging from the hull in the event of a dismasting.

b) Safety Harnesses. In spite of an adequate Special Regulation and a paragraph in the Memorandum on Safety, six lives are believed to have been lost through the failure of safety harnesses or their attachment points. It is recommended that the RYA and the RORC should draw attention to the importance of the following points;-

1. The need for harnesses which comply with 6S4224, which are regularly surveyed and maintained and for which strong attachment points are available.
2. The need for double harness life lines in severe weather conditions.

3. The danger of clipping onto guardrails, as in heavy weather these do not necessariiy constitute strong attachment points.
4. The need for an adequate deck line or lines led from the cockpit to a point forward of the mast for use as a harness attachment point, and the advantages of having permanent life lines in suitable places which can be clipped to harnesses.

In addition we would like to emphasise the practical advantages of a harness which is manufactured as a combination harness and life jacket (See our recommendation 00.6d below).

c) Life Rafts. There is evidence of shortcoming in the design, structural standards of, and weather protection afforded by the life rafts which were used. It is recommended that the RYA should approach the Department of Trade and request the Department, to draw up in consultation with the RYA, RORC and life raft manufacturers, a specification for yacht life rafts, and to accept responsibility for over-seeing the construction of rafts built to this standard.

dl Life Jackets. No reports have been received which give major cause for concern about life jackets. There was however evidence to suggest the desirability of requiring life jackets to be fitted with collar retaining straps and of requiring jackets with both oral and manual or automatic infiation to be fitted with pressure relief valves. It Is recommended that the British Standards Institution be invited to consider these two points. Although there is no conclusive evidence that failure to wear life jackets caused loss of life in the race, the large number of competitors potentially at risk through falling to do so is disturbing. A combined harness and life jacket is in fact available on the market but it is clearly not widely used. We think that the advantages of such an article are considerable. We therefore recommend that the RYA should initiate discussions with manufacturers of harnesses and life jackets with a view to the wider production of combined harnesses/life jackets. At an appropriate stage it might be necessary to involve the Department of Trade and the British Standards Institution In these discussions.

e) Electrics/Englnes. Several damaged yachts retired safely under power. There is also some evidence that the use of engines improved tne maneouvreablllty of yachts in picking up survivors and in some cases assisted in maintaining steerage way in storm conditions. In addition the use of engines for maintaining battery power was shown to be of importance. The RORC should consider whether engines should not be mandatory for safety reasons and whether alternetive methods of starting engines should be required when the starting battery is flat.

EXPERIENCE AND PROCEDURES ADOPTED

00.6 a) Skipper and crew experience. There is no evidence that the level of experience of the skippers and crews taking part in the 1979 Race had any significant bearing on the total of knockdowns, Instances of severe damaqe, abandonment or loss of life. Under Special Regulation 2.1 it is rightiy the responsibility of the owner to ensure that the yacht is manned by an experienced crew who are physically fit to face bad weather. There appears to be, purely on this evidence, no warrant for the imposition of any experience requirement for skippers, or crew, for entry in the Fastnet Race. Nevertheless we think that the RORC would be wise to consider whether some qualification for entry in the longer ocean races is not now required.

b) Tactics during tha storm. Insufficient evidence has emerged to indicate the best tactics to guarantee survival in very severe conditions where there is a lack of conformity between wind and sea directions. There is however a generai inference that active rather then passive tactics were successful and those who were able to maintein some speed and directional control fared better.

c) Navigation. There is insufficient evidence to support any recommendation relating to the RORC general condition prohibiting the use of sophisticated navigational aids. A small percentage of the yachts racing did not carry sufficient iarge scale charts of harbours of refuge and it is recommended that the Special Regulation on charts should be expanded to ensure that all competitors carry an adequate chart outfit.

d) Retirements. The high percentage of retirements should not give cause for concern. Most of the yachts which retired did so for sound reasons, based on a seamanlike assessment of the situation and prevailing conditions.

e) Abandonments. At least two yachts were abandoned prematurely. This conclusion has been drawn after three months research and it must be

remembered that the crews involved believed that their lives were at risk If they did not take the decision to abandon within a very few minutes. The old adage "Stay with your boat" appears to be relevant.

INFORMATION AVAILABLE TO COMPETITORS

00.7 The most important Information which becomes available to ocean racing competitors during the race is the forecast of the weather. A forecast of heavy weather may influence a racing skipper not only as to his tactics; it may dictate future action from a decision about probable sail changes to whether to seek shelter, to abandon the race, or to be prepared to adopt survival procedures. In the 1979 Fastnet a warning of a force 9 severe gale in the Fastnet area was released by the Meteorological Office at 1805 on 13 August, only 10 minutes after the previous shipping forecast had finished. This did not appear In the shipping forecast until 00.15 on 14 August. The broadcasting of gale warnings by the BBC at times other than the shipping forecasts has been shown to be of limited value to yachtsmen: a permanent radio watch on appropriate channels in case a gale warning might be broadcast is out of the question on even the best manned ocean racing yacht. Shipping forecasts occur at roughly six hourly Intervals and it Is clear that, in the unpredictable state of much of our weather, an accurate prognosis even for 6 hours ahead can not reasonably be expected on every occasion from the expert forecasters. At the critical time those yachts in the area worst affected could have received earlier warnings if they had sought alternative sources of radio weather information. Perhaps the only recommendation we can make is that the RYA should take appropriate steps to emphasize to the Meteorological Office the Importance of the shipping forecasts and of producing in time for those forecasts the most up' to-date information; gale warnings disseminated during the period of broadcast entertainment are unlikely to be received by yachtsmen. We should also emphasize the importance of seeking every available source of radio weather Information in worsening conditions.

SEARCH AND RESCUE

00.8 The organisation set up by the RORC with the assistance of the Royal Western Yacht Ciub of England became over-stretched due to the unprecedented and unforeseeable scale of the Search and Rescue operation required. In the circumstances it reacted with extraordinary and commendable promptitude to the strains put upon it. It is recommended that in future for races of this length and with a very large number of entrants a contingency organisation, using modern data processing and transmitting equipment, should, when possible, be setup and exercised in collaboration with search and rescue co-ordinators, The Search and Rescue organisations worked in a fashion which can only excite the admiration of all who can understand the difficulties of the task which they were called upon to fulfil. It is clear from the evidence that If there were shortcomings in the race organisation, these did not add to any difficulties the Search and Rescue organisations may have faced during the rescue operations. The main lessons to be learnt are concerned with two facets of these operations, firstly the identification of yachts whose crews required assistance, and seconcnv the extent of the search undertaken to ensure that all yachts were accounted for.

IDENTIFICATION OF YACHTS REQUIRING ASSISTANCE

00.9 A yacht In distress, whether racing or not, should be in no different position from any other vessel. The use of flares and of Mayday radio calls by vessels in distress are part of the universal practice of seamen. The large number of yachts which potentially might have been considered as in danger added to the difficulty of identifying those which were in fact in need of assistance. Difficulties with igniting flares were reported; the rescue authorities suggest that yachtsmen in some cases appeared to be unaware of the official search procedures; the display of identifying numbers seems to have been haphazard: and there Is in any event disagreement between sea and air rescue authorities as to the best method of displaying means of identification. We feel that we are unable to make any specific recommendations here, other than that the subject requires further intensive study. We recommend therefore that the RYA should take the initiative in providing a forum for discussion of this subject between that Association, the RORC, HM Coastguard, RNLI, and the other Search and Rescue authorities with a view to producing comprehensive guide·lines for procedures and equipment for yachts in distress.

ACCOUNTING FOR AN OCEAN RACING FLEET

00.10 The evidence discloses that the inability of the race organisers to provide the Search and Rescue authorities with precise lists of the fleets engaged in the race, coupled with the lack of information about the identity of yachts which were already safely in harbours of refuge, prolonged the search which was designed to ensure that the authorities could account for every yacht in the race. Again we feel there is difficulty in making specific recommendations. We do recommend, however, that the RORC should take steps, possibly by introducing a gate at the start, to ensure that an accurate record of the starters in an ocean race can be made. We also recognise that the proximity of a large spectator fleet poses problems over which the Race Organisers have no control. It is probable that only a harbour authority can deal with this problem, and we recommend therefore that, whenever the popularity of any offshore race as a spectacle is likely to make the task of recording starters difficult, the race organisers, in conjunction if necessary with the RYA, should approach the appropriate harbour authorlty with a view to securing an acceptable measure of spectator control. We also feel that there is much to be said for a requirement that all yachts in the ionger ocean races should be equipped with two-way radio and that an appropriate radio organisation should be set up by the RORC in consultation with the statutory authorities; however, due to the many technical problems involved, we feel unable to make any recommendation other than that this should be given more detailed study by the RORC.

CONCLUSIONS

00.11 We have only attempted recommendations where we think the evidence justifies this; but a great many other lessons were learnt by competitors and race organisers in the 1979 Fastnet Race. These are detailed in the body of the report and are commended to all those who sail offshore or who organise races. For most of the competitors the sea conditions they encountered were outside their previous experience, so that errors were inevitable. We have not attempted to enumerate these errors because the general standards of seamanship, navigation and certainly of courage, were commendably high. It does not appear to us that the size of the fleet In itself contributed to the scale of the disaster, though it is clear that the sheer numbers made the search and rescue operation more extended. There must, however, come a point at which the size of an ocean racing fleet will present unacceptable problems to the organisers and perhaps to other authorities which may be affected or involved. We invite the RORC to give this question further study in the light of the difficulties experienced in the 1979 Fastnet Race.

The problems encountered during the race resulted from a storm in the open waters of the North Atlantic during which exceptionally severe sea conditions were experienced. Many of the lessons learnt are applicable to heavy weather in general, but there are other hazards which may confront yachts in heavy weather which did not arise in the 1979 Fastnet Race.

The Fastnet is a supreme challenge to ocean racing yachtsmen In British waters. In the 1979 race the sea showed that It can be a deadly enemy and that those who go to sea for pleasure must do so in the full knowledge that they may encounter dangers of the highest order. However, provided that the lessons so harshly taught in this race are well learnt we feel that yachts should continue to race over the Fastnet course.

In the tejt-hand margin: a *vert/ca*I *line Indicates* a *change* In 1979
a *star* Indicates a *modl/lcatlon by RORC* Prescript/on

MEMORANDUM ON SAFETY

Manoeuverabiltty of Ships: There is now greatly Increased commercial traffic in waters around the United Kingdom. Some large single-screw ships cannot manoeuvre easily and owners are urged to bear this In mind at all times.

Lookout: Particular attention Is drawn to the importance of keeping a full and proper lookout, especially when low-cut sails are set..

Use of Engine to Prevent Collision: If a yacht has to take urgent avoiding action to prevent a collision, the engine should be used and the circumstances reported on the declaration. *(See RORC General Condition* 14) Auxiliary engines should be kept in a condition In which they will start readily.

White Flares: White flares may be used at any time to draw attention to the presence of the yacht. Flares carried for this purpose should be kept in readiness for instant use.

Lamps: Aldls lamps should not be aimed at ships' bridges for long periods as this can obscure the pilots' vision.

Clip Points and Deck Lines: The usefulness of safety harnesses depends on strong practical clipping points being available; owners should ensure that crew can clip on betore coming on deck or unclip after going below, and should where possible arrange guide-lines so that crew can work along the deck safely and efficiently.

Lifebuoys liferafts and llfejackets are recommended to be fitted with retro-reflective materials as an additional aid to search and rescue operations (Merchant Shipping Notice No. M696).

Radar reflectors: care should be taken to display these correctly as otherwise their efficiency Is much impaired (see Regulation 8.7).

MINIMUM EQUIPMENT AND ACCOMMODATION STANDARDS

1.0 INTRODUCTION... check points

1.1 This section Is *based* on Categories 2 & 3 0/ *O.R.e. Special Regulations 1978, and* Is *modi/led by RORC Prescriptions* In *Italics.* (see 1.3)

* *1.2 Specl/lc alternatives/or Category 31n these regulatlonswll1 be accepted* In *yachts* sailing *the short course* In races 4, 6 *and* 10 *and* In Classes V-*VIII* In *races* 7 *and* 12 (Categories 2 & 3 *differ* In *only* a *few* points):

1.3 Checkpoints have been Included as indices In *the text and arerepeatedln the right hand column. These are Intended as an aid* to *checking by* owners *and* Inspectors.

2.0 OWNER'S RESPONSIBILITY

2.1 The safety of a yacht and her crew Is the sole and Inescapable responsibility' of the owner, who must do his best to ensure that the yacht Is fully found, thoroughly seaworthy and manned by an experienced crew who are physically fit to face bad weather '. He must be satisfied as to the soundness of hull, spars, rigging, sails and all gear '. He must ensure that all safety equipment Is properly maintained [3] and stowed' and that the crew know where It is kept and how It Is to be used [5]. 1 23 45

2.2 Nothing In these regulations in any way detracts from or reduces the complete and unlimited responsibility of the owner.

2.3 It Is the sole and exclusive responslblllty of each vacht to decide whether or not to start or continue to race.

3.0 BASIC STANDARDS

3.1 Yachts shall be self-righting (see IOR Part XII). They shall be strongly built, watertight and, particularly with regard to hulls, decks and cabin trunks, capable of withstanding solid water and knock-downs '. They must be properly rigged and ballasted, be fully seaworthy and must meet the standards set forth herein '. 1

"Properly rigged" means (Inter alia) that shrouds shall never be disconnected. 2

3.2 All equipment shall function properly, be readily accessible and be of a type, size and capacity suitable and adequate for the Intended use and the size of the yacht, and shall meet standards accepted In the country of registry '. 1

3.3 Inboard engine Installation shall meet standards accepted In the country of registry and shall be such that the engine, when running, can be securely covered', 1
and that the exhaust and fuel supply systems are securely Installed' and adequately 2
protected from the effects of heavy weather '. 3

4.0 INSPECTION

4.1 A yacht may be Inspected at any time. If she does not comply with these special regulations her entry may be rejected, or she will be liable to disqualification or penalty under *General Condition 17.*

6.0 STRUCTURAL FEATURES

6.1 The hull, Including deck, coach roof and all other rarts, shall form an Integral, essentially watertight, unit and any openings In It shal be capable of being Immediately secured to maintain this Integrity (see 3.1). For example, running rigging or control lines shall not compromise this watertight unit. Centerboard and daqqerboard trunks shall not open Into the Interior of the hull. No hatch forward of the BMAX station shall open Inwards excepting ports having an area of less than 110 sq. In. (670cm'). Hatches shall be so arranged as to be above the water when the hull Is heeled 90°. All hatches shall be permanently fitted so that they can be closed Immediately. Cockpit companionways, If extended below main deck level, must be capable of being blocked off to the level of the main deck at the sheer line abreast the opening '. When such blocking arrangements are In place this companionway (or hatch) shall continue to give access to the Interior of the hull'. 2 3

Cockpits opening aft to the sea: The lower edge of the companionway shall not be below main deck level as measured above '. The opening shall not be less than 50 per cent of max, cockpit depth X max. cockpit width, The requirement In 6,31 and 6,32 that cockpits must drain at all angles of heel, applies '. 1 2

6,2 Cockpits must be structurally strong self draining and permanently Incorporated as an Integral part of the hull', They must be essentially watertight, that Is, all openings to the hull below the main deck level must be capable of being strongly and rigidly secured '. Any bow, lateral, central or stern well will be considered as a cockpit for the purpose of 6.22, 6,31 & 6.32 [3]. 1 2 3

6.22 The maximum volume of all cockpits below lowest coamlngs shall not exceed 9% L times B X FA '. The cockpit sole must be at least 2% L above LWL. * *height of the cockpit* sole *shall apply only to yachts built after* 1.1.73 [3]. 1

6,31 For yachts 21 feet rating and over: Cockpit drains adequate to drain cockpits quickly but with a combined area (after allowance for screens, If attached) of not less than the equivalent of four ¾ Ins, (2,0 cm) diameter drains '. Yachts built before 1.1.72 must have drains with a combined area (after allowance for screens, if attached) of not less than the equivalent of two 1 in. (2,5 cm) drains '. Cockpits shall drain at all angles of heel [3]. 1 2 3

Yachts built before 1.1.77 may conform to 6.32, If Category 3 applies [4]. 4

6.32 For yachts under 21 feet rating: Cockpit drains adequate to drain cockpits quickly' but not less in combined area (after allowance for screens, If attached) than the equivalent of two 1 Ins. (2,5 cm) diameter drains [2]. Cockpits shall drain at all angles of heel [3]. 1 2 3

6.4 Storm coverings for all windows more than two square feet In area '. 1

6,51 Sea cocks or valves on all through-hull openings below LWL, except Integral deck scuppers, shaft log, speed indicators, depth finders and the like " however a means of closing such openings, when necessary to do so, shall be provided '. 1 2

6.6 Soft wood plugs, tapered and of various sizes " 1

6.6 LIFE LINES AND PULPITS

6.61.1 For yachts 21 feet rating and over: Taut double life-lines', with upper life-line of wire' at a height of not less than 2 feet (60 cm) above the working deck [3], to be permanently supported at intervals of not more than 7 feet (2.15m)1 [4]. When the cockpit opens aft to the sea, additional life lines shall be fitted so that no opening Is greater In height than 22 Ins, (56 cms.). 1 23 4

6.61.2 Life-line terminals: A taut lanyard of synthetic rope may be used to secure life-lines, provided that when In position Its length does not exceed 4lns, (10 cm) '. * *Apart from synthetic rope lanyards, insulators may not be used as life-line connections unless their construction Is such that* a *metal interlock is provided which will fully maintain the strength of the life-line* in *the event of* physical *collapse of the insulating material* [2]. 1 2

6,61.3 Stanchions shall not be angled from the point of their attachment to the hull at more than ten degrees from vertical throughout their length '. 1

6.61.4 For yachts 21 *feet* rating and over: Fixed bow pulpit (Forward of headstay) , and stern pulpit (unless life-lines are arranged as to adequately substitute for a stern pulpit) '. Lower life-lines need not extend through the bow pulpit [3]. Upper rails of pulpits shall be at no less height above the working deck than upper life-lines '. Upper rails In bow pulpits shall be securely closed while racing '. Any lifeline attachment point will be considered as a stanchion In so far as its base shall not be situated outboard of the working deck. 1 23 4 5

6.61.5 Overlapping pulpits: Life-lines need not be affixed to the bow pulpit If they terminate at, or pass through, adequately braced stanchions 2 feet (60 cm) (18 inches (45 cm) In yachts under 21 feet rating) above *the* working deck " and set Inside of and overlapping the bow pulpit [2] provided that the gap between the upper life-line and the bow pulpit shall not exceed 6 ins. (15 cm) [3]. 1 2 3

6.61.6 Pulpit and stanchion fixing: Pulpits and stanchions shall be through-bolted or welded 1, and the bases thereof shall not be further In-board from the edge of the working deck than 5% of B'max, or 6 ins. (15 cm), whlcheverls greater 2. Stanchion bases shall not be situated outboard of the working deck '. 1 2 3

6.62.1 For yachts under 21 feet rating: Taut single wire life-line 1, at a height of not less than 181ns. (45 cm) above the working deck 2, to be permanently supported at Intervals of not more than 7 feet (2.15m) '. If the llfe-line Is at any point more than 22" (56 cm) above the rail cap, a second Intermediate life-line must be fitted 4. If the cockpit opens aft to the sea additional life-lines must be fitted so that no opening Is greater In height than 22 Ins, (56 cm) '. 1 2 3 4 5

6.62.4 For yachts under 21 feet rating: Fixed bow pulpit and stern pulpit (unless life-lines are arranged as to adequately substitute for a stern pulpit) 1. Lower life-lines need not extend through the bow pulpit z Upper rails of pulpits must be at no less height above the working deck than upper life·lines '. Upper rails In bow pulpits shall be securely closed while racing '. The bow pulpit may be fitted abaft the the forestay with Its bases secured at any point on deck, but a point on Its upper rail must be within 161ns. (40 cm) of the forestay on which the foremost headsallls hanked '. Any life·line attachment point will be considered as a stanchion in so far as Its base shall not be situated outboard of the working deck. 1 2 3 4 5

6.7 Ballast and Heavy Equipment: Inside ballast In a yacht shall be securely fastened in position. All other heavy Internal fittings (such as batteries, stoves, gas bottles, tanks, outboard motors,etc.), and anchors and chains shall be securely fastened (see 8.31).

6.8 Sheet winches shall be mounted in such a way that no operator is required to be substantially below deck.

7,0 ACCOMMODATIONS

7.11 Toilet, securely Installed (or fitted bucket-Category 3 only).

7.2 Bunks, securely installed.

7.31 Cooking stove, securely Installed 1, capable of being safely operated in a seaway', with safe accessible fuel shutoff control. 1 2

7,41 Galley facilities 1, Including sink' (sink not essentlal- Category 3 only), 1 2

* 7.52 At least one securely installed water tank, plus at least one additional container holding 2 gallons (nine litres) *and kept full of water for emergency* use, (Category 3 only, alternative to 7.52: Water In suitable containers).

8.0 GENERAL EQUIPMENT

* 8.1 Fire extinguishers, readily accessible and of the type and number required by the country of registry, provided there be at least one ' *In yachts rating* less *than 23 ii.* ' *and at least two in suitable and separate parts of yachts rating* 23 *ft, and over* '. 1 2

* 8.21 Bilge pumps, at'leasi two, manually operated 1, one of which must be operable with all cockpit seats and all hatches and companionways closed 2. *At least one of the bilge* pumps *shall be securely fixed to the yacht's structure* '. (Category 3 only, alternative to 8.21: One manual bilge pump operable With all cockpit seats, hatches and companionways closed.) *See also General Condition 14.* 1 2 3

8.31 Anchors. Two with cables except yachts rating under 21 feet, which shall carry at least one anchor and cable 1. Anchor(s) and any chain shall be securely fastened In the position recorded on the Rating Certificate when not In use. 1

" 8,41 Flashlights1 water resistant 1, one of which Is suitable for signalling ',with spare batteries ana bulbs '. 1 2 3

8.5 First aid kit 1 and manual'. 1 2

8.6 Foghorn 1. 1

* 8.7 Radar reflector 1. *If the radar reflector* Is *octahedral it must have* a *minimum diagonal measurement of* 181ns (46 *cm),* or *if not octahedral must have* an *"equivalent echoing area" of not less than* 10 m^2, *The minimum effective height above water is* 12 *ft,* (4m). *Octahedral reflectors should be displayed in the "catch rain" position.* 1 2

* *8.9 Shutoff valves* on *all fuel tanks* '. *The yacht's electrical system must be equipped with fuses* or *circuit breakers and be capable of being isolated* '. 1 2

9.0 NAVIGATION EQUIPMENT

9.1 Compass, marine type', properly Installed' and adjusted'. 1 2 3

9.2 Spare compass 1. 1

9.3 Charts 1, light list' and pllotlng equipment '. 1 2 3

9.5 Radio direction finder. *See General Condition* 12 (e).

9.6 Lead line or echo sounder 1. 1

9.7 Speedometer or distance measuring Instrument 1. 1

9.8 Navigation lights, to be shown as required by the International Regulations for Preventing Collision at Sea, mounted so that they will not be masked by sails *or* the heeling of the yacht 1, Yachts under 7m LOA shall comply with the regulations for those between 12m and 7m LOA (I.e. they shall exhibit sidelights and a stern 1

light). *Each sidelightbulb must have* a *manufacturer's rating of at least ten watts. In yachts over* 12 m. L.OA, *each sidelight bulb must have* a *manufacturer's rating of least* 25 *watts* 2. *Sternlight bulbs must have* a *manufacturer's rating of at least five watts*'. 2 3

10.0 EMERGENCY EQUIPMENT

10.1 Emergency navigation lights with self contained *power* source *sufficient for the duration of the* race.

10.21 Special storm sail(s) capable of taking the yacht to windward In heavy weather (Category 3 only, alternative to 10.1: Heavy weather Jib or heavyweather sail in boat with no forestay and reeflng equipment for mainsail.)

In addition to the scale set out In *IOR* 895, *the foliowlng may be carried: one heavy* jib *of cloth heavier than the weight of the* mainsail *cloth with* an *area not greater than 0.135 IG', which can be hoisted* In *the* same *way* as *the largest genoa (e.g. with luff tape of hanks) and which* does *not contain reef points.*

The following rule Is *expected to apply from 1.1.1980 but yachts are urged to comply* as *soon* as *posslble:-*

10.22 Mainsails shall be capable of being so *reefed that the effective luff* Is reduced *to 60%* P or a *trysail shall* be *carried* on *board.*

10.23 At least one storm or heavy-weather Jib If designed for a seastay or luff-groove device shall have an alternative method of attachment to the stay, or a wire lull.

10.24 No yacht shall have less than two halyards each capable of hoisting a sail.

10.3 Emergency steering equipment. *The /allowing* rule Is *expected to apply from 1.1.1980 but yachts are urged to comply* as soon as possible:- *All yachts shall carry* an *emergency tiller capable of being fitted to the rudder stock. Crews shall be aware of alternative methods of steering the yacht* in *the event of total rudder failure* In any sea *condition.* An *Inspector may require that thiS method be demonstrated.*

10.4 Tools' and spare parts 2, Including adequate means to disconnect or sever the standing rigging from the hull In emergency'. 1 2 3

10.5 Yacht's name on miscellaneous buoyant equipment, such as life jackets, oars, cushions', etc. Portable sail number 2. See General *Condition 10.* 1 2

10.61 Yachts fitted with VHF transceivers are recommended to install VHF Channel 72 (156,625 MHz Simplex). This *Is* an international ship-ship channel which. by "common use", could become an accepted yacht-yacht channel for ocean racing yachts anywhere In the world.

10.62 Radio receiver capable of receiving weather bulletins. *See General Condition* 12 *(d).*

11.0 SAFETY EQUIPMENT

11.1 Life jackets, one for each crew member '. *Inflating-type life jackets must* be *checked regularly for proper* air *retention.* Owners *are recommended to consult British Standard 3595,* 1

11.2 Whistles attached to life Jackets '. 1

11.3 Safety belt (harness type) one for each crew member '. *Owners are recommended to consult British Standard 4224.* 1

11.41 Life raft(s) capable of carrying the entire crew and meeting the following requirements:

(I) Must be carried on deck (not under a dinghy) or Ina special *stowage* opening Immediately to the deck containing life raft(s) only. *Each life raft shall* be *stowed* so *that* one *person can get It to the life-lines within* 10 seconds. *(Category* 3 *only, life raft(s) need not be carried* on *deck* or In *special stowage but attention* Is *called to Special Regulation* 3.2. *and the 10-second rule).*

(II) Must be designed and used *solely* for saving life at sea.

(III) Must have at least two separate buoyancy compartments, each of which must be automatically Inflatable; each life raft must be capable of carrying Its rated capacity with one compartment deflated.

(Iv) Must have a *self-erecting* canopy to *cover* occupants.

(v) Must have been inspected, tested and approved within one year by the manufacturer or other competent authority and *each life raft shall have* a *valid annual certificate; this* or a *copy must* be *kept* on *board the yacht.*

(vI) Must have the followlnq equipment appropriately secured to each raft:-

1 Sea anchor or drogue
1 Bellows, pump or other means for maintaining Inflation of air chambers
1 Signalling light
3 Hand flares
1 Baler
1 Repair Kit
2 Paddles
1 Knife

(vII) *The number of crew shall not exceed the* official *capacity of the life raft(s)* as *specified by the manufacturer.*

*	11.52 At least one horseshoe-type life ring [1] equipped with a drogue [2], a *whistle* [3], a self-Igniting high-intensity water light or a *self-Igniting light having a duration of at least* 45 *mlnutes,* [4] and a pole and flag '. The pole Is to be attached to the ring with 25 feet (Sm) of floating line' and is to be of a length and so ballasted that the flag will fly at least 8 feet (2.45m) off the water [7]	123 4 5 6 7
	11.61 Distress signals stowed in waterproof contalner(s):-	
	11.63 Four red parachute flares [1].	1
	11.64 Four red hand flares '.	2
	11.65 Four white hand flares [3].	3
	11.66 Two orange smoke day signals [4].	4
	11.67 It Is *recommended that white flares are kept separately from red flares '. Mini-flares* or *pistol-fired flares are .acceptable Instead of hand flares. (See Memorandum* on *Safety).*	6
	11.7 Heaving line (50 foot (16m) minimum length [1], floating type line ') readily accessible to cockpit [3]. *Patent lines such* as *Balcan are acceptable.*	1 2 3

ROYAL OCEAN **RACING CLUB**

20 ST. JAMES'S PLACE, LONDON, SW1A 1NN. Tel. 4935252,4994264

RORC SPECIAL REGULATIONS 1979

1. Horseshoe IIferings and dan buoy. There Is no change In the regulations on these Items and the rule Is as in 1975. Due to a printing error part of the rule was. omitted In 1979and the correction Isas'follows:-

Delete Special Regulation 11.52

Insert
* 11.52 At least one horseshoe-type life-ring equipped with a drogue, a *whistle* and a self-igniting light having a duration of at least 45 minutes within reach of the helmsman and ready for Instant use.

* 11.53 At least one more horseshoe-type life-rlnq equipped with a drogue, a whistle, dye marker, a self-Igniting high·Intensity water light, and a pole and flag. The pole is to be attached to the ring with 25 feet (Sm) of floating line and is to be of a length and so ballasted that the flag will fly at least 8 feet (2.45m) off the water. *A self·ignitinglight having a duration of at least* 45 *minutes may be usedinstead of a high·intensltywater light.* (Category 3 Only: 11.53 optlonal.l

2. Inspections at the beginning of the season have shown that special attention should be drawn to certain regulations, Including some which are new in 1979 (please see RORC Special Regulations and also the IOR MkIII for full details. The IOR may be purchased from the aRC, 19 St. James's Place, London SW1A 1NN-tel. 01.6298701.):-

lal Anchors, chain and ballast. See Special Regulation 8.31 and IOR 202.H. "Anchors and chain shall be secured in *clearly markedstowage".* "Batteries shall be secured In . . . proper stowage." "The measurer shall affix a notice In the yacht . . . of the Items and weights . . . this notice shall always be displayed . . • during the validity of the Rating".

Ibl Compass adjustment. See Special Regulation 9.1: "compass, marine type, properly Installed and adjusted". Production of a recent deviation cardwill provide an Inspector with good evidence thatthls regulation has been complied with.

(c) Emergency steering. See Special Regulation 10.3.

Whether or not this Is purpose, built, or whether it Is the Intention to use parts of the yacht's gear normaliy used for other purposes, It Is recommended that the emergency steering method be thoroughly tried out In advance (note Special Regulation 2.1 "... the owner ... must ensure ... that the crew know where it Is kept and how ItIs to be used")

Idl Forestay adjustment. See IOR 802.6.

"... the forestay shall be fitted *and not adjustedwhilst racing.* An exception isa yacht rigged with all spreaders clearly swept aft. **In** this casethe forestay may be adjusted but no stays abaft the mast may be adjusted Whilst racing."

lel Man overboard drill. An Inspector may ask when this was last carried out.

If! Liferaft servicing. Attention **is** invited to Department of Trade Merchant Shipping Notice MS74, which makes clear the importance of having liferafts serviced at service stations approved by either the Department of Trade or the IIferaft manufacturers. Rafts have been found to be unusable after service at some other service stations.

10.5.79

E. Alan Green
Secretary

Royal Ocean Racing Club

Annex 18

RACE ENTRY FORM 1979

20 St. James's Place, London, SWIA INN.

Race No.	Race	Date
	MAY	
1	Cervantes Trophy (Closing date 23rd April)	4th
2	Seine Bay (Closing date 7th May)	18th
3	*Mlddle Sea	19th
4	North Sea (Closing date 14th May)	25th
	JUNE	
5	De Gulngand Bowl (Closing date 28th May)	8th
6	Morecambe Bay (Closing date 4th'June)	16th
7	Morgan Cup (Closing date 11th June)	22nd
8	Harwich-Harwich (Closing date 11th June)	22nd
9	*Services Offshore	28th
lOWest	Mersea-Zebrugge (Closing date 18th June)	29th
11	"Isle of Man	30th
	JULY	
12	Cowes-Bay of St. Malo (Closing date 25th June)	6th
13	"Clyde-Cork	14th
14	*Skaw	18th
15	Hartlepool-Ilmutden (Closing date 9th July)	21st
	AUGUST	
16	Channel (Closing date 23rd July)	3rd
17	Fastnet (Closing date 23rd July)	11th
18	Plymouth-La Rochelle (Closing date 23rd July)	18th/ 19th

"For entry to these races see Programme

Entry fee per race

Class

MklIl/IlIA

RORe

Members & Club Yachts	All others
O&1 70-33ft.	
£21	£28
II 32.9-29ft.	
£17	£22
III 28.9-25.5ft.	
£15	£19
IV 25.4-23ft.	
£15	£19
V 22.9-2111.	
£12	£16
VI. 20,9-19,5ft.	
£10	£13
VII & VIII Under 19,5 ft.	
£ 8	£11

Admiral's Cup yachts pay £250 for the series, this includes races 16 and 17, Overseas entries may pay fees on arrival but must enter before closing date.

Name of yacht .

Sail No ..

!.OR Mk III IlIA. .

Rating Issue by .

Age date (on rating certificate) .. , , .

Rating issued by: .. , , .

Date of Issue , .

Full name of Yacht Club (not RORC) for Club points Championship (G.c. 23).

Owner , ', , , .

Sailed by , , . , , .. , .

Sailing for (country) , , .

Hull colour , , . .. Rig .. , .

Designer , ', .

Type, .. , , L.OA , . , , .

Builder ., ... L.W.L. , .

Material . , , , .. , , , ..

During the RORC season this yacht wl1l normally be kept at ..... , ... ,." .. ',

Radio transmitters-Distress set, type:

Main set: VHF/MF/HF, type:

Channels: 16/72/M/67/2182/2301

ae power , . , .. , , .. , .

This Declaration must be Signed

I agree to be bound by LY.R.U. Racing Rules R.YA Prescriptions, RORC General Conditions and Special Regulations. The yacht wl1l be available for Inspection.

If any alteration likely to affect the rating Is made* I wl1l notify the Rating Secretary immediately. (*Such as those to sail plan, mast, ballast, trim, engine or propellor.)

I understand that the RORC and organising clubs accept no responsibility for loss of life or Injury to members or others, or for the loss of, or damage to any vessel.

I have read paragraphs 108 and 109 of the LO.R. and accept the owner's responsibilities therein.

Signed Date ..

Please enter my yacht

for races numbers , .

Entry fee for races at £ .

Late fee If applicable (half entry fee) £ ., .

Bank charges (If paying by overseas draft) (£1.50) £ .

TOTAL £ .

Name (please prtnt) .

Address .

. , , .

Tel: Day Evening .

Annex2A

Report by the Institute of Oceanographic Sciences on Severe Wave Conditions During the Fastnet Race-August 1979

General Situation

The primary cause of the high *waves* seems to *have* been a lenticular area of strong winds of about 50 knots which approached from the west along the line of the 50° latitude. The east-west extent of the wind field was much larger than its north-south extent. At about 1800 on 13 August at 10°W the winds were southerly of 30-40 knots, and by midnight they were westerly of 50 knots. At 0600 on 14 August this speed was maintained at 10°W and the narrow wind field, of 50 knots, had extended eastwards to just north of the Scillies. The waves produced by the earlier southerly wind would have been travelling as swell from the south in the Fastnet area during the early morning of 14 August, and the higher newly generated waves from the 50 kt winds would have been *travelling* from the west, or *even* from slightly north of west, before dawn on 14 August.

Wave Conditions—heights

The worst *wave* conditions would *have* occurred between about 49° and 51° N; they would have arrived at 10°W at about midnight on 13-14 August. To the north of this band, conditions would not *have* been quite as severe, but the residual swell from the southerly wind of late on 13 August would have made a confused sea. In the area of most *severe* weather, within about 50 miles north of 50°N, waves probably achieved a significant height of almost 10 metres (33ft). If one accepts the validity of yacht reports of force 11 and *over* it might have approached 14 metres (46ft). The most likely highest individual *wave* every three hours would be close to about twice the significant *wave* height. Considering the periods of the two principal systems (see belowl such waves could have possessed steep or near-vertical-sided profiles. Individual *wave* crests of the larger waves would have been travelling at speeds of about 30-40 knots.

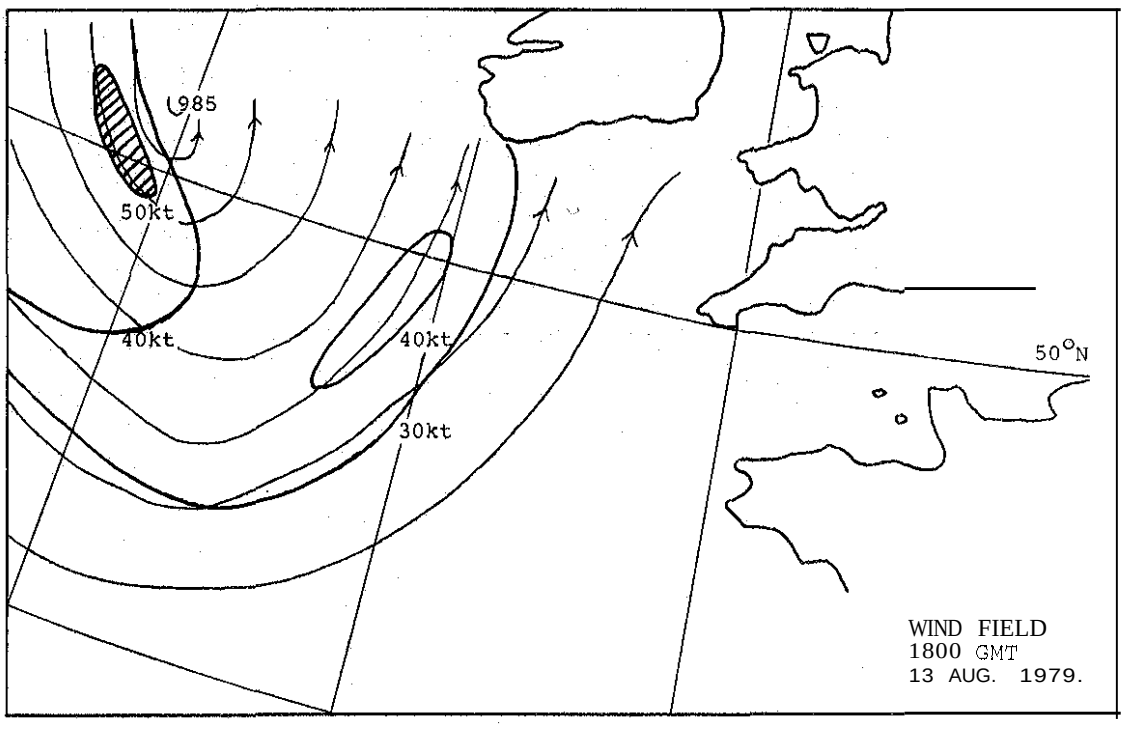
Waves at DBI (48½ ON 9°WI increased from a significant height of 4 metres at 0200 to 6 metres at 0400 which fits in well with the Wind-field data. They remained at around 6 metres until about noon on 14 August and then decreased.

Effect of tide

This is likely to *have* been negligible in the Fastnet storm area.

Effect of shallows

There would have been no obvious effect caused by shallows 100 ft, or more below the surface. The Labadie Bank is about twice this depth.



Wave Conditions-periods

The wave periods from the southerly winds would have been around 10seconds and those from the westerly and more severe winds would have been of about 12to 13seconds.

Wave conditions have been hlndcast using the 10S method (Darbyshire and Draper 1963).

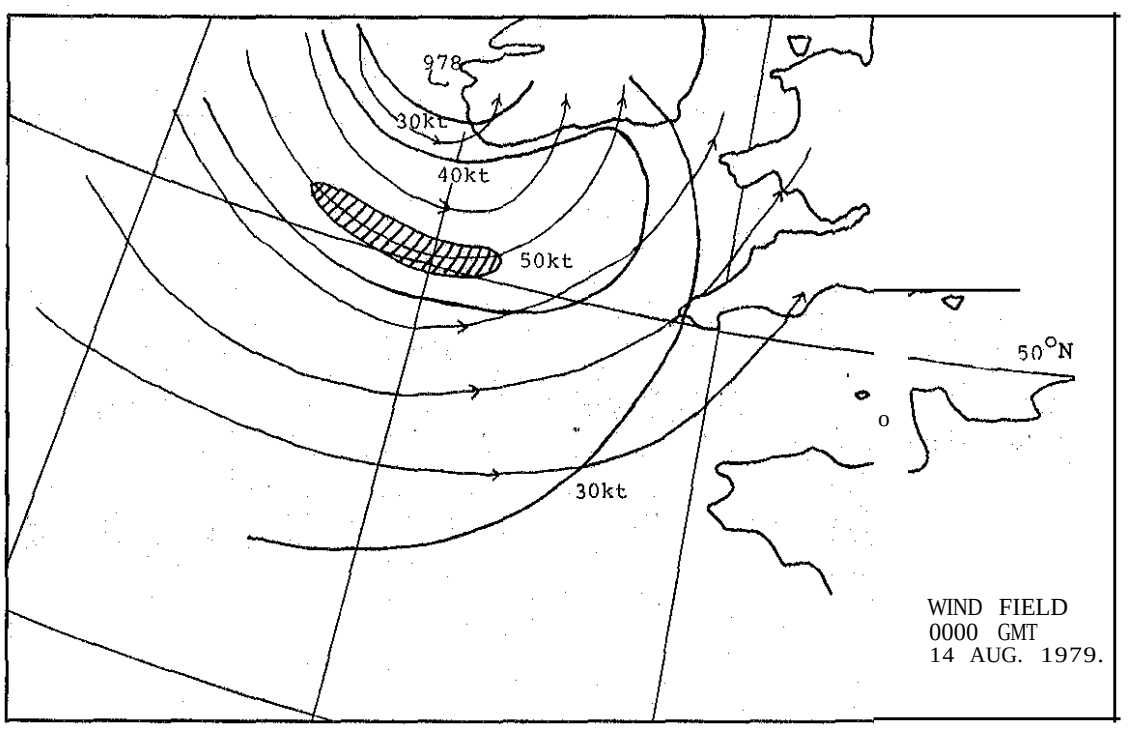
The wind-field analysis was provided by the Meteorological Office, Bracknell.

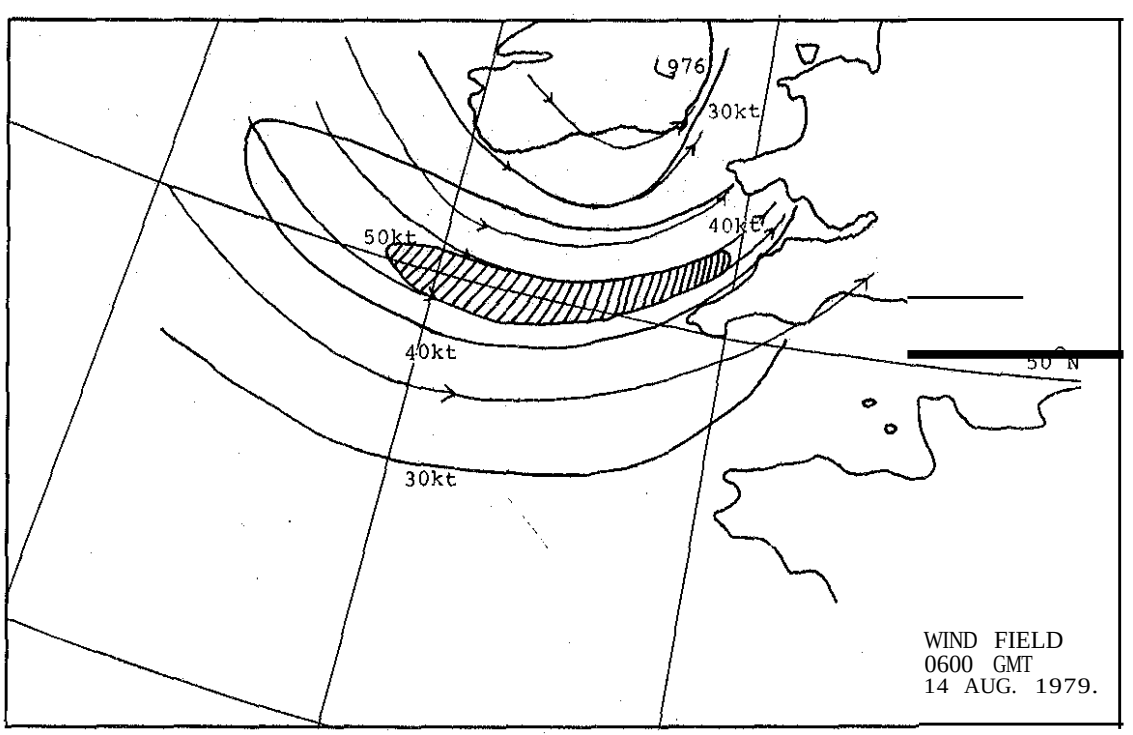
L. Draper
lOS, Wormley.

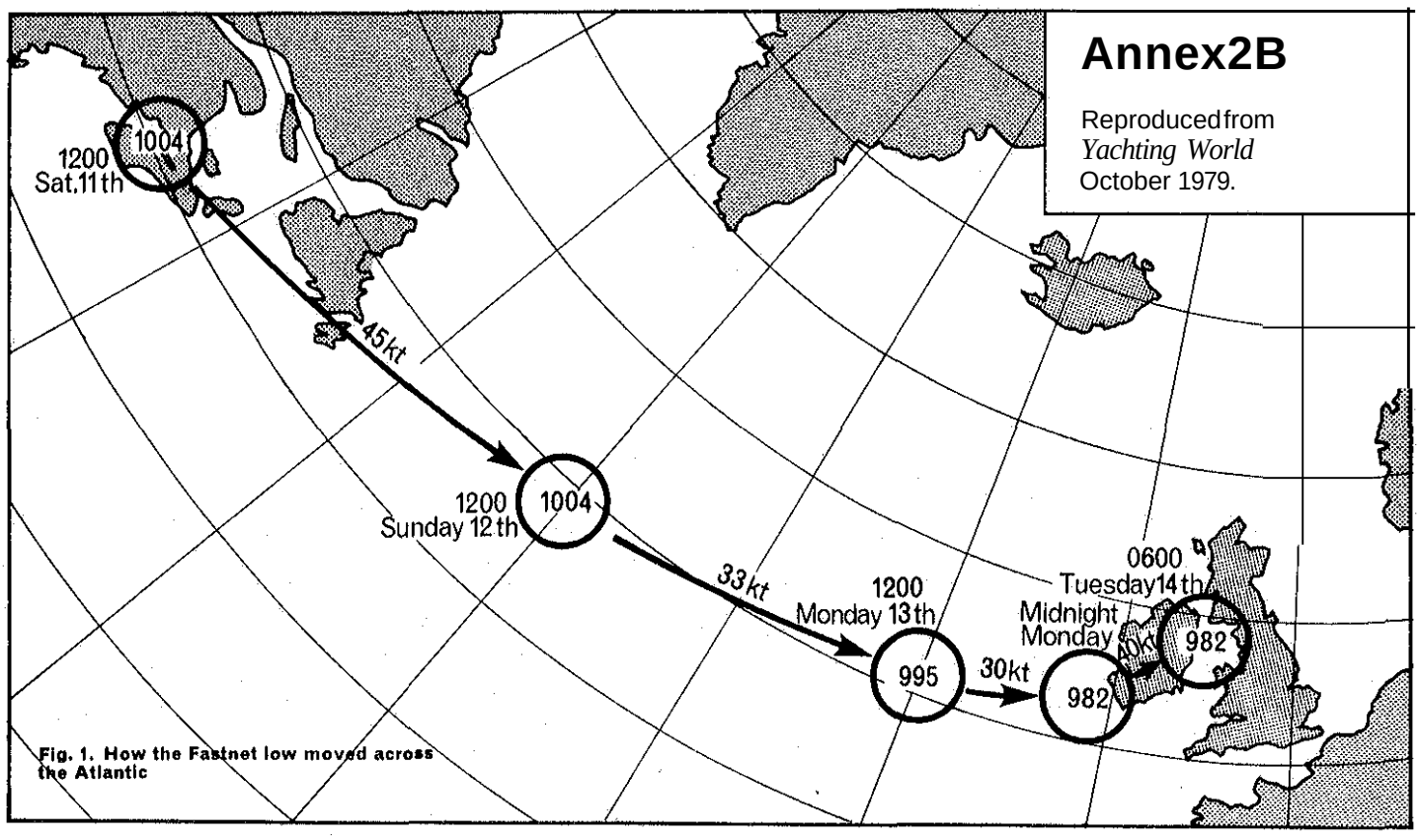
References

Hogben, N. and Lumb, F.E. 1965 Ocean Wave Statistics.

Darbyshlre, Mollle and Draper, L. 1963
Forecasting wind-generated sea waves.
Engineering. London. April1963







Annex2B

Reproduced from
Yachting World
October 1979.

Fig. 1. How the Fastnet low moved across the Atlantic

The Storm

The progress of the Fastnet depression Is explained by Alan Watts

THERE are things about the weather of the Fastnet storm that are In many ways mysterious, things we do not yet know and things we may never know. Already, however, with the verbal reports of those who were there, certain patterns have emerged but, until the full enquiries are over, some details are missing; some questions unanswered.

On a personal note one very odd thing is how I was prompted to ask Hayden Laboratories at Chalfont St. Peter If they would lend me a Nagrafax facsimile printer to follow the weather of this Fastnet. I had the Idea months ago, forgot It, and then, almost too late, oame back to It. Hayden Labs. sent the maohlne down and Installed It on Friday, 10 August —just In time for me to find my way around the fax sohedule and to program *my* time switch to pick up the charts I wanted by the time the race started.

I expected to be following "soft" weather patterns-simply divining wind shifts as the long run of depressions, whloh had ended the little summer of June and July, continued to feed trough and ridge" warm front and cold front, through the space between an all-but stationary low centre near Iceland and a reluotant ridge from the Azores High that persisted In staying In Biscay and Finisterre for many days.

That, of course, Is how It all started. The *Dally Telegraph* headline on the Monday morning was "Imp among leaders, but pace Is slow". The end of the second paragraph said "With a slow first 24 hours hours at sea, hopes of a brlsker pace than for the last three Fastnet races were beginning to recede". How little anyone knew.

Tony Falrchlld wrote his piece for the *Telegraph* on Sunday when the low that was to cause all the trouble was stili Innocuously In mld-Atlantlc. It had not even started to deepen at that time, but It was batting on rapidly at some 45 knots *(rapidly* Is a term close to the top of the official scale for speed of depressions). ft was the 24 hours between midday Sunday and Monday that saw It begin to slow down and deepen, but oh so slowly, to 995 mb. From this time on the low was on ItS storm-foroe course for Fastnet (Fig. 1).

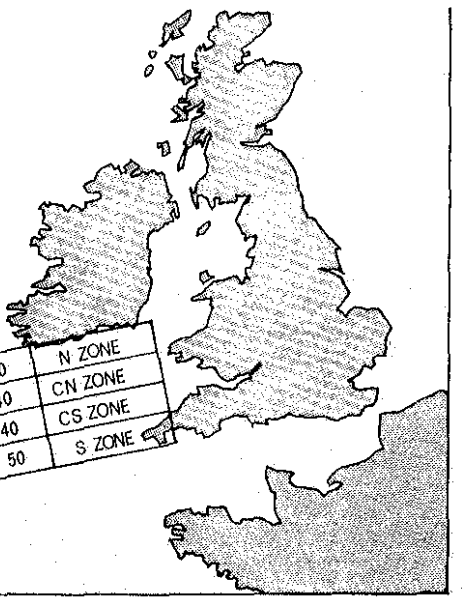
The combined deliberations of human and computer forecast tschnlque, however, did not see this low doing anything at all, for the 24 hour prognosis (broadcast by Paris National) for 1 a.m. Tuesday Issued at 0615 Monday morning merely showed a small wave depression In Fastnet. Had the feature been correctly forecast, It would have led to light, cyolonlcally variable, winds. They thought Its central pressure would be of the order of 1010 mb, I.e. It would literally be disappearing. At this time the offlolal view seemed to be that the Fastnet low was a dead duck, not many hours before It became a roaring tiger.

Forecasting the Fastnet storm

At 1505 on Monday the BBC broadcast the following warning "Sole, Fastnet, Shannon. South westerly gales Foroe 8 Imminent." (Imminent means "within the next six hours".) They Included gale warnings for Lundy and Irish Sea In the same broadoast. That forecast was originated In the Central Forecasting Offioe at Bracknell at 1355, I.e, as soon as the preliminary analysis of' the 1300 observations had been made. There Is a direct Telex link between CFO and the BBC for this purpose, but because of the system there was stili a 70-mlnute delay between origination and broadcast.

At about the same time as the warning of Force 8 for Fastnet was being broadcast, the Met. Office originated extensions to Flnlsterre

Fig. 2. By dividing the race **area Into northern.** central northern, **central southern and southern zones and** measuring **the distance apart of the** Isobars, the **gradient wind speed** (the speed **at** a level eleer et **surface frlotlon) can be given between 1300 Monday and 1300 Tuesday.** Take two **thirds of these speeds as representative of mean speeds at yacht level. but Individual gusts can be up to gradient speed**



MONDAY 13th		TUESDAY 14th					
13	19	06	04	07	10	13	
18	25	75	75	70	40	40	N ZONE
20	30	75	75	40	40	40	CN ZONE
25	30	40	75	75	60	40	CS ZONE
30	40	40	50	65	65	50	S ZONE

and Plymouth. All the above warn. Ings were. of course. repeated In the preamble to the shipping forecast at 1750.

The next forecast of importance to Fastnet was originated at 1805 and was broadcast at 1830, repeated at 1905. It said "FInlsterre, Sole, Fastnet. South westerly gales Force 8, Increasing severe gale Force 9 Irnmlnent". So the warning of Force 9 was broadcast well in advance of the wind gathering to strength 9. As time went on, however, the gap between warnings and the actual arrival of wind of that strength telescoped.

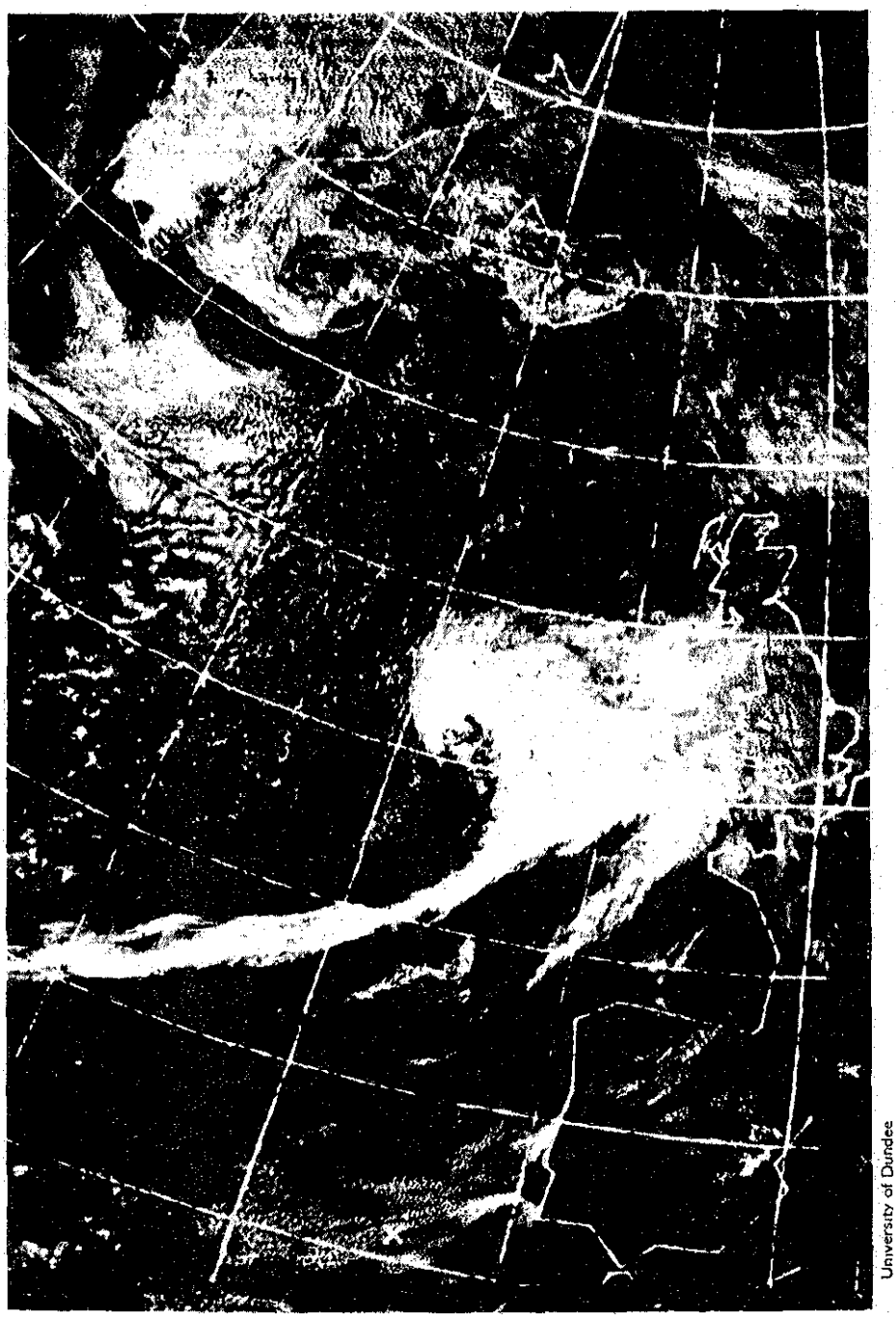
It was while they were draWing up the 2200 chart that the forecasters realised that the Isobarswere tlqhtening to such a degree as to make it Inevitable that Force 10 would occur In Fastnet. So at 2245 they sent the BBC the following "Soie: Severe gale Force 9 veering north westerly and Increasing storm Force 10 Irnmlnent.Fastnet: South westerly gales severe Force 9 increasing storm Force 10 Imminent. Shannon: North westerly gales severe Foroe 9 increasing storm Force 10 imminent." The BBC, now well-alerted to the Impllcations, broadcast this Within a quarter of an hour of Its origination, t.e, the warning went out at 2300.

Richard Matthews, owner of *Oystercatcher* 79 tells me that at 2300 they were 50 miles south of the Rock and somewhat to windward of the dead-beat course. He estimated the wind at 45·50 knots (Force 9/10) With a rising am seaway. No warning of Force 11 was actually issued, but it can be argued that the difference between Force 10 and Force 11 ·for yachts at sea Is a rather academic one. For *Oystercatcher* the wind did not reach Force 11 until about 0300.

It Is evident from this that the warning of storm Force 10 coincided with the arrlvai of the storm force winds themselves for much of the fleet. Until a more detailed analysis Is done, we shall not know how many, or where they were. It Is Interesting to note that *Oystercatcher* had winds of 40 knots (top of Force 8) by 2000 that evening, so the forecast of winds of that strength came out some five hours ahead of the wind.

From the foregoing It Is obvious that there was no possible warning that could have been given to the Ileet in advance of It becoming evident that a Force 9/10 storm was about to occur In Fastnet. The warning of Force 8 gales was not something that would make the ocean-racing crews consider making for shelter particularly as, In the case of the Admiral's Cup boats, national pride waS at stake. By the time Force 10 was forecast, Force 10 was already there.

Before eastlqatlnq the forecasters



University of Dundee

Fig. 3. **How the TIROS N satellite saw the Fa.tnet low at 1837on Monday, Reference to Fig. 1 will** ,how **where the low** centre **was atthl. time. The long taU of cloud lies alono the cold front** while thick cteud **covers the centre off Ireland**

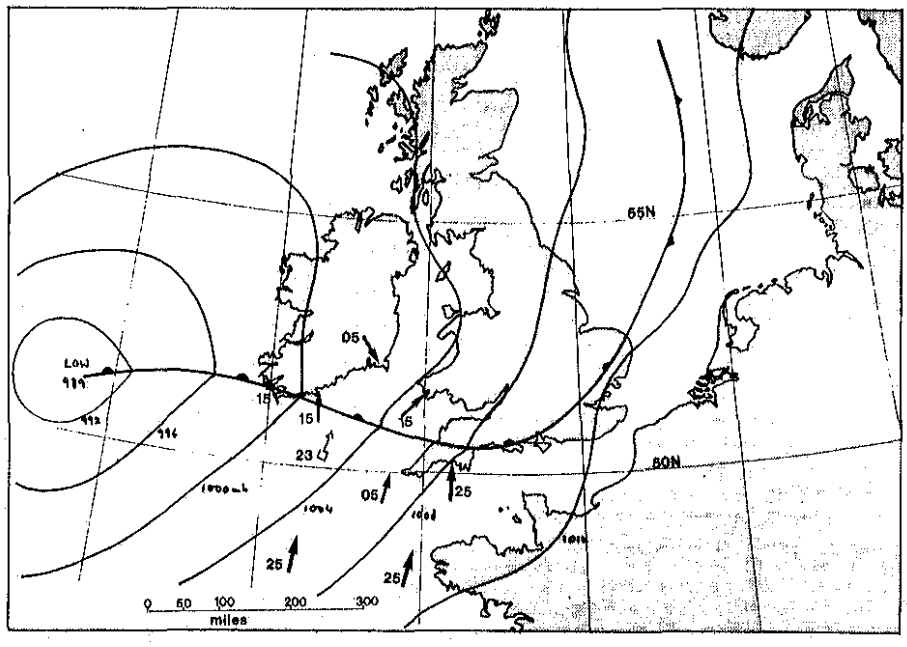


Fig. 4. The weather map for 1900 Monday. **The calm before the storm-SolIIY had 5 knots-and strangely In Wexford the light wind** was blowing contrary to **the trend** In the Isobars

for not recognising earlier that a storm-terce situation existed, It must be realised that the nearest station to the Fastnet Rock, Valentla Observatory, at 2200 only showed a tendency of some 6 mb/3hr. This tendency of the barometer Is recog·nlsed as an Immediate forecast of Force 6 (If It is not Indeed already blowing Force 6), but need not lead to Force 8.

At no time, except briefly between 0100 and 0200, did Valentla show anything like the 10 mb/3hr that makes Force 8 a near certainty. On the southern vstoe of Fastnet the synoptic station Is Scilly (St. Mary's) and squally they showed no tendency that would lead to anything like the winds experienced In the sea area to the north of them. Ships In the Vicinity might have sent reports that would have led to a quicker appraisal of the situation, but unfortunately two that did report sent their pressures wrongly.

In fact the practised eyes of the forecasters saw that these ship reports were wrong and, divining that the originators had misplaced the decimal points (which I know from experience Is quite easy to do) corrected them,

It Is an unfortunate fact that ships which ply the Atlantic and faithfully send in their weather reports to Portlshead for onward routing to Bracknell give up when they reach "small waters"llke Fastnet, and another hazard Is that many who might report In calmer oondltlonsdo not do so when the wind and sea rise with the onset of a gale., They say they have other more Important things to dol

NoStorm·force tendency

vaohts noting their own barometric readings In their logs some 50 miles south of Valentia would have seen a Force 8+ tendency developing after about 2200, but at the time of writing there Is as yet no evidence that tendencies of storm-force proportions were recorded anywhere.

That Is another of the oddities of this very odd storm. It would help the final analysis If skippers or navigators were able to supply, via this magazine, details of barometer readings, times, .positions and state of wind and sea so that we could find out If, perhaps, there was a storm within a storm.

Credence Is given to the last contentlon by Rodney Hili of *Morning·* fown-the Admiral's Cup radio relay vessel-who reports that.. at the height of the storm with distress flares going up and while In the vicinity of the Labadle Banks, they appeared to be In a situation akin to the eye of a hurricane with bright stars above and all around the Impression of swirling clouds of mist and murk, and the "Impossible" seaway that was tossing craft over and roiling them under In some cases several times. That kind of seaway speaks of sudden wave-making Impetus generated over a relatively small area and the shoallng ground of the Labadle Banks may have had something to do with It. But not much. There Is a hint of a metsorologlcal mystery here.

The weather charts shown In Figs. 4-7 do not reveal anything veryodd other than the fact that, by a strange twist of fate, the strongest winds were In a corridor which lay south of Ireland and across the Fastnet fleet. They appear to have first risen to their storm force 60+ knots Just south of the Fastnet and then to have extended their zone of Influence southwards across much of the fleet (Fig. 6). There may actually be amendments to be made to this simple picture when the stories of the participants can be pieced together.

The growth of the seaway oonstltutes another puzzle, The wind which generated the sea, as opposed to the swell, was of short duration yet referring to *oystercatcher's* observatlonat 2300 of a srn sea with a 45·50 knot wind, Which had only Increased by5to 10 knots In the previous three hours, we can estimate what theory says the waves ought to have been.

Some time .ago Peter Dseks, who Is the Senior Forecaster, Offshore at the London Weather Centre (and deeply Involved with forecasting sea conditions for the 011 rigs) sent me copies of the graphs they use for predicting wave height. These are a mixture of Darblshlre and Draper's curves for coastal waters and World Met. Organisation graphs for deeper waters.

In many ways Fastnet Is oceanic and not coastal and to get 6m waves with a 40·50 knot wind, the WMO graphs estimate requires the wind to have blown at this strength and In one direction for some six hours, I.e. in *Oystercatcher's* case, since at least 1700 that afternoon. Yet the 1900 chart (Fig. 4) Indicates a surface wind speed of no more than about 25 knots Atlantic-wards of the Fastnet fleet. The period of the waves would then be about seven seconds.

A well-known fundamental relation tells us that the wavelength $L = 5 \times (\text{period})^2$ So that the wavelength should have been around 75m. I am sure that the majority of crews will tell us that the wavelength was nothing like that. It was disastrously short with massively breaking tops so that yachts were being crested, slid·Ing down the steep leading edges to meet the lnevltabls rollmq-over condltlon where centre of gravity goes on and keel does not. The momentum of rotation precipitates the masthead Into the water, while the Impetus of the following wave throws its weight under the temporarily upturned keel and completes the roll. The time Involved Is of the same order as the one Intimated by the theory.

The waves In the area of the Labadle Banks and elsewhere were not In line with the theory, however. They were more of the shape we experience on a small scale In a wlnd·agalnst·tlde chop. In this case, that signifies the sudden arrival of a very strong wind before a corres·pondlng seaway has had time to develop.

It speaks of more than normal frictional force between wind and water of the kind that occurs when the wind Is trying to force wave·making against the Inertial reluct·ance of the water to move. I may be wrong here, but the shoallng over the Banks should not have contrlbutsd much as the lower levels of the wave motion would not have reached so far down In so short a time.

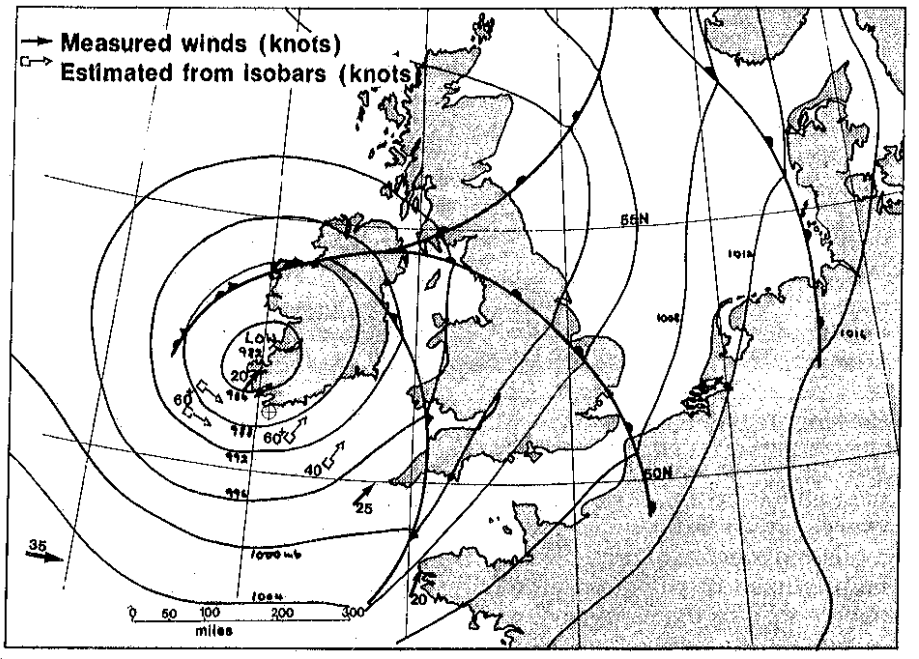
Certainly the tidal streaming through the area was against the wind from about 2000 In the southern and central southern zones (as defined In Fig. 2) and from about 2200 In the central northern and northern zones, but the speeds are not more

than half a knot so this Is not a truly significant factor although It adds its contribution to the forces that formed the short, steep seaway.

The Wind Shift

The Intense seaway of the early hours of the Fastnet storm were, it seems, due to the sudden arrival of storm-force south westerlies, but there is another factor which needs to be taken Into account. The higher a wave, the slower It travels. Conversely the lower it Is, the faster it travels. Thus the low waves travel out of storm areas leaving the higher ones behind. A presage of hurricanes is the sudden arrival of low swell In an otherwise calm situation.

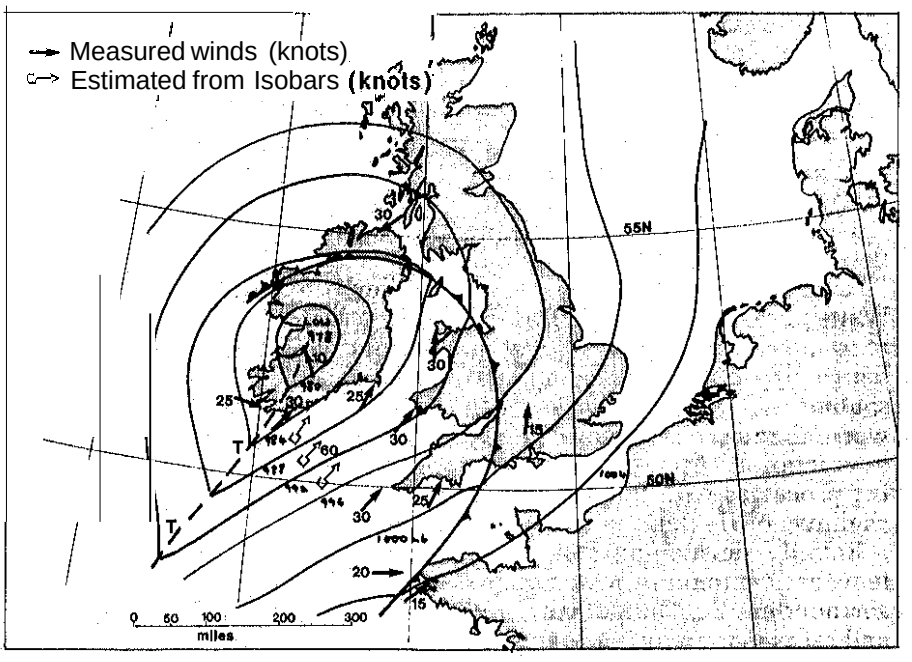
The plot of the forecasts Issued by the BBC on Monday evening shows that by 2100 it was blowing Force 9 from the north west in Sole; not long after 2200 it had Increased



Fig; 5, The storm corridor **develops with surface winds above** &0 knot. off the **Fastnet** (0100 **Tuesday)**

to Force 10. In coastal waters with a wind speed of 55 knots (top of Force 10), the maximum wave height after the wind has blown for two hours (I.e. at midnight in this case) is some 7' 5m with an average height of about 5m and a period of about eight seconds. These waves would have travelled at some 25 knots, but the lower waves of the spectrum of heights would have travelled at perhaps twice this speed.

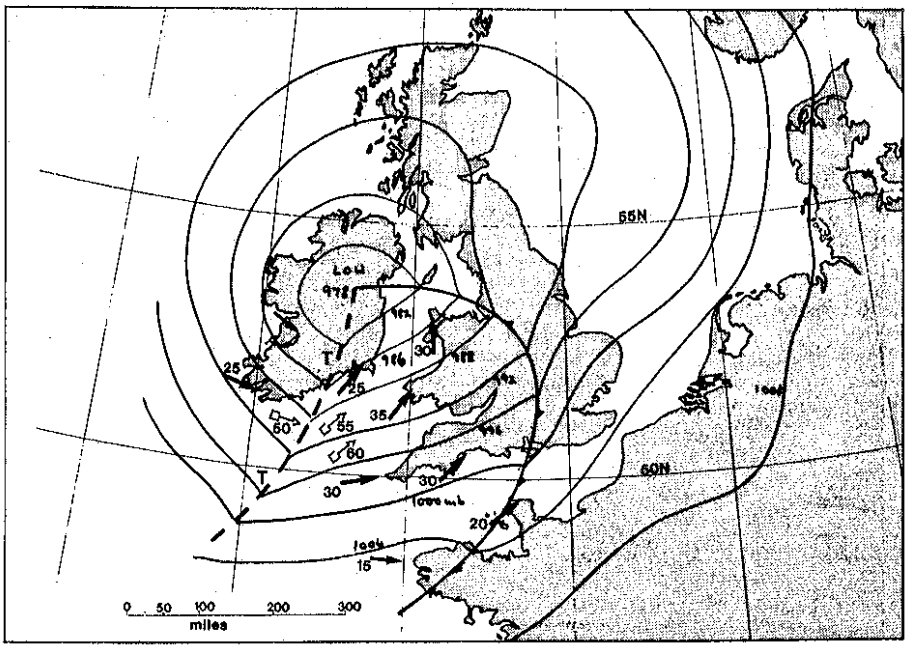
In two hours, waves generated from the north west In Shannon would have run into Fastnet under the weather and have met the perpendicular seaway due to the Force IOin Fastnet. This cross-sea wave Interaction Is the most likely candidate for the extreme wave conditions met 50 miles or so south of the Rock.



Fig, 6. The height of the storm (0400) when the vtelent **storm"lorce Wlndt(F'orce 11) had spreadaero," much ofthefl**eet, All land **atatlons fall, to record anything above 30 knots** meen-epeed, **A** treuuh-une **(T) with 890° shift on It** begins to **move acro•• the area**

Long before the trough shown In Figs. 6 and 7 had worked round Into Fastnet, the effeots of winds many miles away would have been making their Impact on the fleet.

Thus we begin to understand the Fastnel storm; a storm where the seaway was the governing factor In an extreme situation. In the Channel Storm of 1956 where the winds grew along the Channel to the same ferocity as this year, there was not the same cross-sea problem as here. Yachts at sea were able to run under bare poles towing warps before the simple seaway, high as it was. This time the boats did not have a chance. No amount of seamanship would have prevented many of those which rolled, or were knocked down repeatedly, from succumbing to their fate. The cruel sea saw to that.



Fla.7. Off the Rock the wind shift. and relentl, but It stili blows storm to violent .tormforce,ove, the r••cue operation. The wind drop. to Force to behind the trough

Reproduced from
Sail,
October 1979.

Tracking a **killer storm**

By Robert B, Rice

Severe storms can be found raging over the earth's surface nearly every day. Usually their development, movement, and strength can be predicted in advance, allowing people to take the steps necessary to protect life and property. From time to time, though, a severe storm develops quickly and attains a place in history.

Such a storm developed late Monday, August 13, 1979, and continued into Tuesday, August 14, exploding almost without warning in the midst of the Fastnet fleet.

The strongest winds caught the fleet strung out across the Irish Sea. As British meteorologist Alan Watts observed, "There is no kind of shelter in that box of waters between southwest England and southern Ireland. The weather is worse than oceanic because of the interaction of Atlantic wave-making processes with the developing shallows of the land masses."

Rapidly developing storm systems are common over the waters surrounding the United Kingdom, and races in these waters are often plagued by gales and steep seas. The 1979 Fastnet storm developed a central pressure of about 980 millibars, which, although notable, is not uncommon. Many races held within the past 30 years have seen storms of this intensity rip through the fleet. (Heovy Weather Sailing, by K. Adlard Coles, is filled with tales of these storrns.)

The story began across the Atlantic on Thursday, August 9, as a weak disturbance moved eastward across the United States into the Gulf of Maine on August 10. Although the storm system was small and relatively weak at this point, it had already begun its history of death and destruction by spawning tornadoes and severe thunderstorms across the Ohio Valley on Thursday, and over southern New England on Friday (killing two people in Massachusetts and socking the 1/24 worlds off Newport, Rhode Island, with winds up to 35 knots).

As a preceding storm system became stationary southwest of Iceland, the weak storm raced eastward across the Atlantic over the weekend, reaching a position near 48°N, 19°W by 1200 Greenwich Mean Time (GMT), Monday, August 13, with a central pressure of about 1007 millibars (Fig. 1),

At this time, the system gave only subtle hints of what was to happen in the next 12 hours, The only tangible clues were the vast amount of cold air in the associated upper-level low-pressure trough and the storm's climatologically dangerous surface position. Aloft, the air temperature was on the order of -25° to -30°C, which is comparable to winter normals, It is this presence of cold ail' over warm, moist SUI'face ail' that often feeds storm development.

Climatologically, all waves or minor storm systems approaching these waters around the edge of a depression in the Icelandic region must be viewed with suspicion. Even so, there is nothing in the 1200 GMT reports to warrant a forecast for conditions as severe as those that were experienced.

During the six hours from 1200 to 1800 GMT, the storm began to intensify and move rapidly east-northeast. By 1800, the central pressure had dropped to about 995 millibars, and the storm center was near 51oN, 13°W (Fig. 2). It was between 1500 and 1800 GMT Monday that questions about the storm's potential development were

Figure 1: 1200 GMT Monday-storm center 1007 millibars

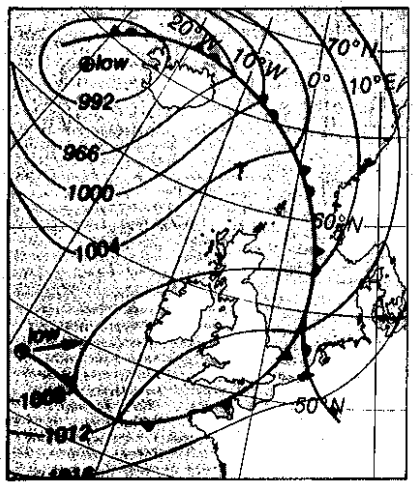


Figure 2: 1800 GMT Monday-storm oenter 996 millibars

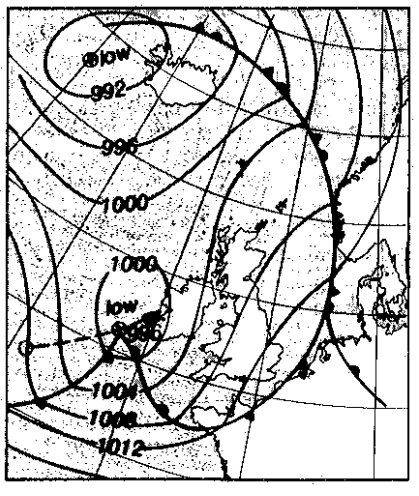
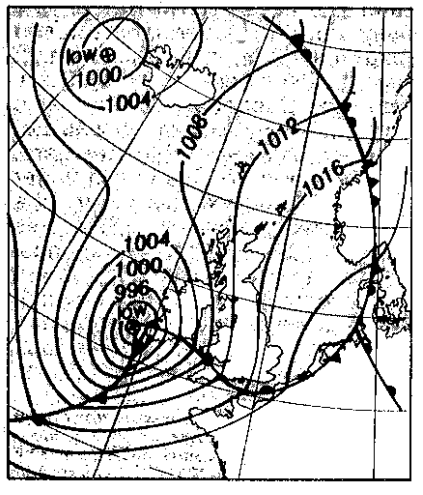


Figure 3: 2100 GMT Monday-storm center 983 millibars



answered. The development rate of two millibars per hour, although not extreme, indicated that the rapid deveiopment just beginning would be likely to continue. The combination of development rate and forward speed were giving barometric falls of up to three millibars per hour at locations just ahead of the storm.

At 1625 GMT the Meteorological Office issued a Force 8 gale warning for Plymouth, Fastnet, and the Irish Sea, which was broadcast on the 1650 BBC shipping forecast. Soon thereafter, at 1705 GMT, the warning was upgraded to "Southwest gale Force 8 increasing severe gale Force 9 imminent." (The term "imminent" in British forecasts means "within six hours.")

The weather map for 2100 GMT (Fig, 3) shows the truly explosive development that was under way within the decelerating storm system. Valentia, on the southwest Irish coast, reported a pressure of 989 millibars and winds gusting to 48 knots. The rapidly developing pressure gradient suggests that gusts of 50 or 60 knots were already being felt over the water south of Ireland, eastward to around 7°W. These higher winds generally occur ahead of a developing storm in the region of maximum pressure falls, and again behind the storm and its associated cold front in the rapidly rising pressures. The latter region is apt to provide the strongest pressure gradient along with a wind shift, and this feature later became important in the storm's life cycle.

At 2145 GMT, as the wind really began to freshen on the course, the Meteorological Office issued a new warning: "Southwest gale Force 9 increasing to Force 10 imminent." Although the leaders (including the overall winner, Tenacious), had already rounded Fastnet Rock and had the wind abeam, most of the fleet was still spread out behind, struggling to beat into a rising wind and sea.

By midnight GMT (Fig. 4) the storm center was off Galway Bay with a central pressure near 980 millibars, which then held fairly steady for the next six hours. The associated cold front had moved to a position just east of Fastnet Rock, where the rapidly rising pressure gradient created Force 10 and higher winds from the west-southwest.

At 0250 GMT Tuesday, the Meteorological Office issued a further warning that the strongest winds were yet to come—Force 9, locally gusting to Force lQ-veering westerly over the next six hours.

Just over three hours later, at 0600 GMT, the storm. center had moved to a position near Londonderry, while its attendant cold front had whipped eastward into the coastal sections of Scotland and England. As often happens, the front hod accelerated out of the principal low-pressure trough, which extended across eastern Ireland and out to sea east of Fastnet. The rapidly rising pressures behind this trough created what Alan Watts calls "the most potent feature of the tragedy:" As the principal trough sped east, Watts says it created "o wickedly confused seaway as the Force 9-10 winds ahead of it were suddenly replaced by an almost right-angled shift to the northwest. It is this feature, perhaps more than the wind strength, that had so many craft in terrible trouble." Reports of rogue seas of 50 feet and wind gusts to 80 knots can therefore be accepted as realistic, despite the relatively short duration and fetch of the wind.

By 1200 GMT Tuesday, the storm had moved on to the Moray Firth off northern Scotland, heading for the Shetland Islands (Fig. 6). The squares to the north of the storm center in Figure 6 represent the continued six-hour plots as the storm moved on toward the Norwegian Sea. This retreat from the scene allowed sea conditions to subside over the area, which permitted the widespread deployment of air *Isea* rescue units to aid the stricken yachts. Had the storm lingered on for several days, the toll would very likely have been even more staggering.

Robert B. RIce is Chief *Meteorologist for* Weather Services Corporation, a private weather forecasting and *meteorological* consulting *firm.*

Figure 4: 0000 GMT Tuesday-storm center 979 millibars

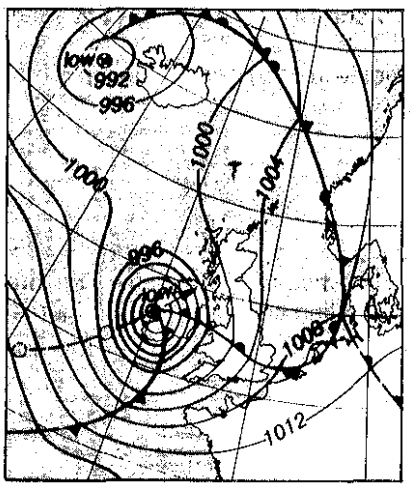


Figure 5: 0800 GMT Tuesday-storm center 983 millibars

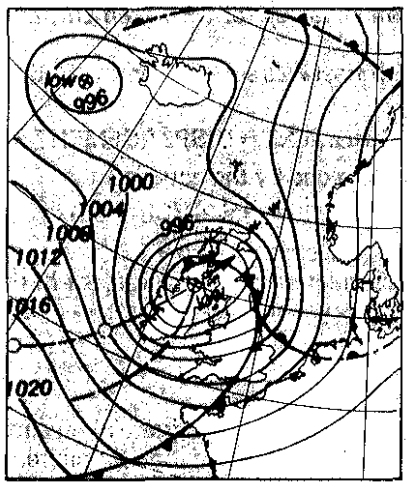
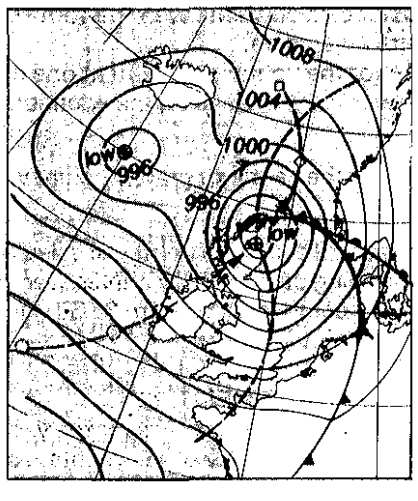


Figure 6: 1200 GMT Tuesday-storm center 983 millibars



Annex3A

UNIVERSITY OF SOUTHAMPTON, HIGHFIELO
SOUTf',AMPTON, ENGLAND S09 5NH
TELEPHONE (0703) 555995

WOLFSON UNIT
FOR MARINE TECHNOLOGY
AND INDUSTRIAL AERODYNAMICS

Report No. 431 November 1979

ROYAL YACHTING ASSOCIATION

Stability Conditions on
Contessa 32 and 1976 Half Tonner

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INTRODUCTION

The following report describes an investigation into the statical stability of a Contessa 32 and a Haif Tonner designed in 1976.. *(The designer feels that the Half Tonner is representative of yachts of her size and type designed at that time).*
A programme of work was set out in a proposal issued by the Wolfson Unit on 18.10.79 and was agreed by Cdr. W. Anderson, coordinator of the Fastnet Race Inquiry, in his letter of 26.10.79.
Hydrostatic and statlcal stability data were computed for the two yachts and were used in conjunction with data on the respective I.O.R. Rating certificates to assess and compare the stability of the two yachts.

THE YACHTS CONCERNED

The yachts selected for the investigation were a Half Tonner, and a Contessa 32.
Both yachts took part in the 1979 Fastnet Race.

PREPARATION OF HYDROSTATIC AND STATICAL STABILITY DATA

Lines plans of the two yachts, together with drawings of their deck, coach roof and cockpit arrangements were supplied by their respective designers and builders. Suitable data were lifted from these drawings adequately to define the vessels for the Department of Trade approved computer programs used to carry out the calculations. Figures 1 and 2 Illustrate the data used in each case.
Hydrostatic calculations were performed to obtain values for Displacement, LCB, VCB and BM for each yacht floating at Its measured waterllne.
A value for the righting moment at one degree of heel was supplied on the Rating certificate in each case, and with this a value of GM was calculated using the equation:

$$\text{RIGHTING MOMENT} = \text{DISPLACEMENT} \times GM \sin \theta$$

A value for the centre of gravity height was then yielded by the equation.

$$VCG = BM + VCB - GM$$

A summary of the results of these calculations is presented InTable 1.
Free trimming stability (GZ) curves were then calculated for the yachts, for both intact and flooded conditions. The intact GZ curves are compared in Figure 3. GZ curves for the yachts experiencing two stages of flooding are compared in Figures 4 and 5, with their intact curves.

DISCUSSION OF RESULTS

Examination of the GZ curves for the yachts in their Intact state (Figure 3) reveals the following main points.

1. The initial stability of the yachts is similar, l.e, the slopes of their GZ curves at zero heel angle are similar.
   In fact the Contessa 32 is Initially slightly more stable with a GM of 3.1ft compared to the Half Tonner's GM of 2.781t.
2. The Contessa 32 has a greater maximum GZ value. This Is largely due to the Contessa's low centre of gravity location and large coaohroof. The latter is the cause of the hump In the GZ curve which appears after 70^0 heel.
3. The Contessa 32 has a greater range of positive stability. The point of vanishing stability occurs at 156^0 compared with 117^0 for the Half Tonner. When a vessel heels past Its point of vanishing stability it will become stable In the inverted position. Its stability whilst upside down will depend upon the slope of the GZ curve at 180^0. The Contessa 32 would be less likely to remain upside down after a capsize since the slope of its GZ curve at 180^0 is low, and it need only be rolled through 24^0 in order to regain its upright stability.

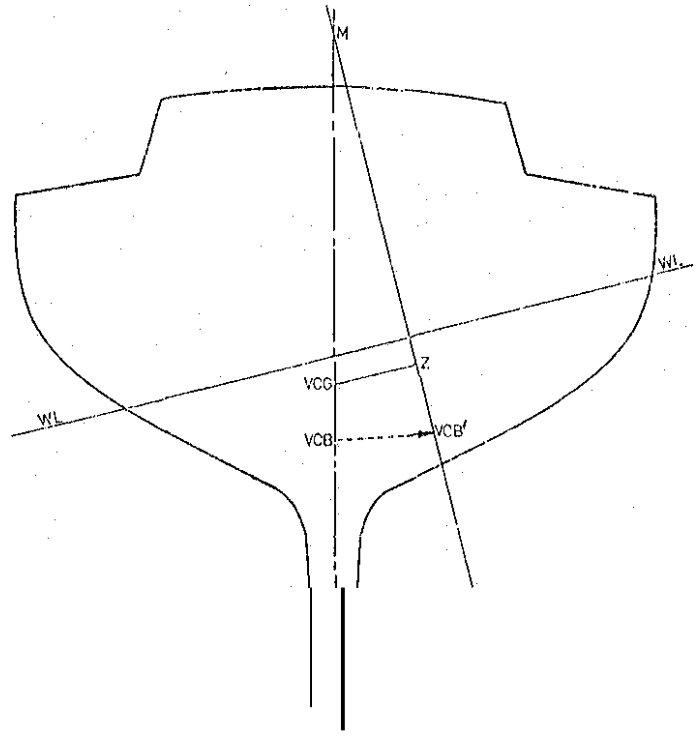
4. The energy absorbed by a yacht from a sudden gust of wind is represented by the area under its GZ curve multiplied by its displacement. The Contessa 32, with a greater displacement, and a greater area under its GZ curve at any given angle, can absorb more energy than the Half Tonner. It cannot be assumed however that the Contessa would survive a gust capable of capsizing the Half Tonner, since the work done by the wind on the yacht is dependant on the sail plan and hull windage. As we have confined ourselves to an examination of the hulls, we can draw no conclusions on this point.
The effect of flooding on the two yachts is very similar Isee Figures 4 and 5) in that the angle of vanishing stability of the flooded boat is increased in both cases examined, which implies it will be less likely to remain inverted should a capsize occur.
It is likely that a capsized yacht will experience flooding, and as sinkage continues it will become increasingly easy for a wave or gust of wind to roll the boat back into a stable, upright position, since the area under the negative part of the GZ curve is decreasing.
In Interpreting these data it must be remembered that the results are dependant on the following assumptions:
A. The VCG derived from the Rating certificate represents an accurate assessment of the vesel's centre of gravity.
B. When flooding, the flood water uniformly permeates the underwater space by 95%.
C. The aluminium mast is free flooding.
D. The displacement calculated using data contained in the Rating certificate correctly represents the sailing trim of the vessel, ego no crew were aboard.

CONCLUSIONS

The Half Tonner has an initial GM of 2.781t, a maximum GZ value of 1.61ft at a heel angle of 53 degrees, and a heel angle of vanishing stability of 117 degrees.
The Contessa 32 has an initial GM of 3.1ft, a maximum GZ value of 2.3ft at a heel angle of 78 degrees, and a heel angle of vanishing stability of 157 degrees.
For both yachts the addition of flood water increases the range of positive stability.

TABLE 1

	Contessa 32	Half Tonner
Displacement (lbs)	10112	8320
LCB 1ft aft of STN 51	-0.86	-0.84
BM (ft)	3.34	4.09
GM (ft)	3.10	2.78
VCG (ft above measured WL)	-0.75	0.65

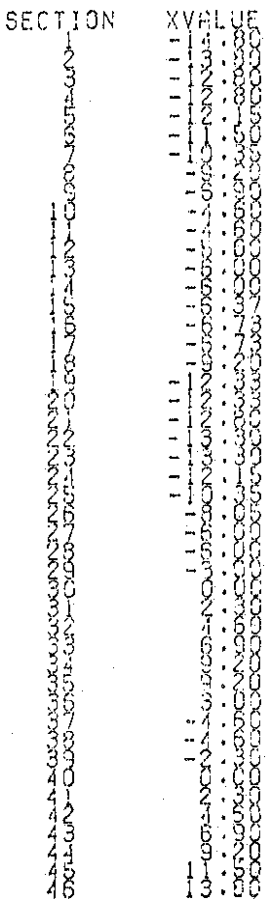


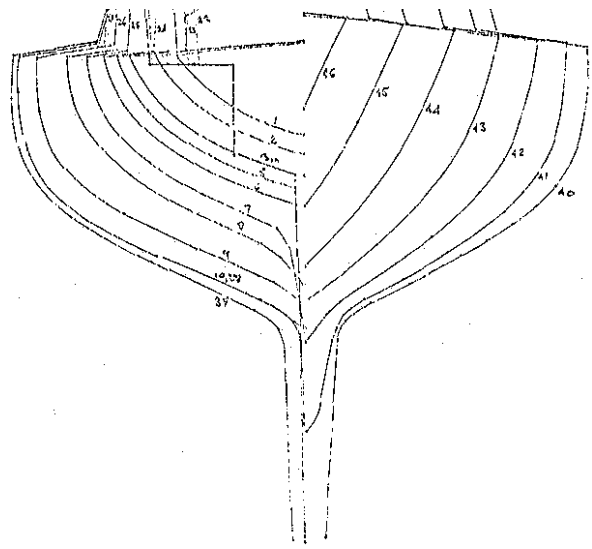
NOMENCLATURE

LCB - Longitudinal position of the centre of buoyancy
VCB - Vertical position of the centre of buoyancy
VCG - Vertical position of the centre of gravity
BM - Vertical distance of the transverse metacentre (MI above VCB
GM - Vertical distance of the transverse metacentre (M) above VCG
GZ - Horizontal length of the righting lever

Hull Data lifted for Computer C I I
-Contessa 32- a cu atlons

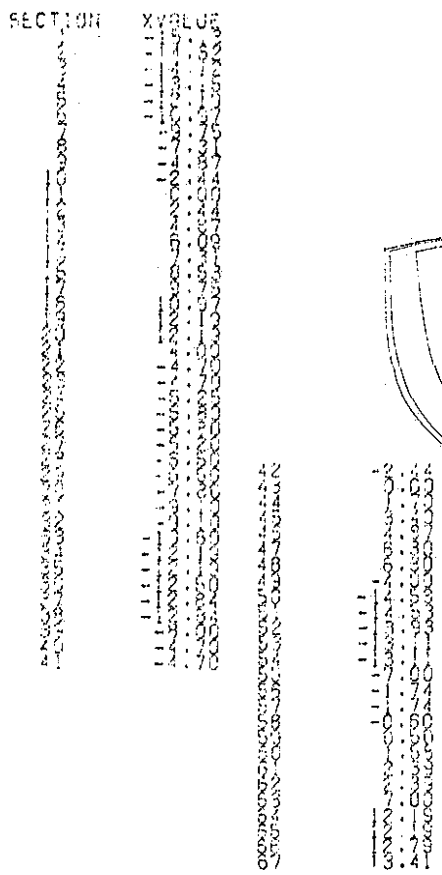
FIGURE 1

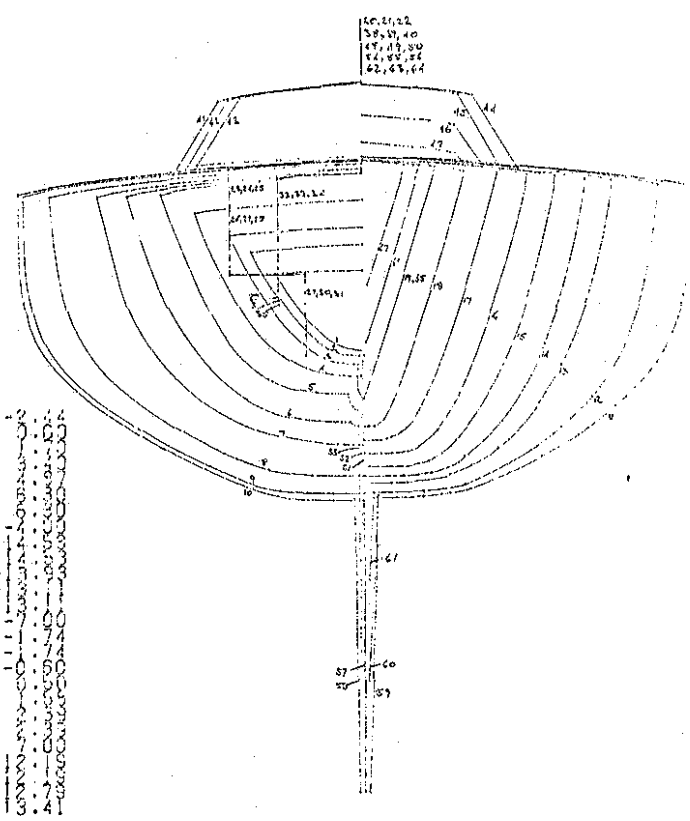




Hull Data lifted for Computer
— Half Tonner — Calculations

FIGURE2





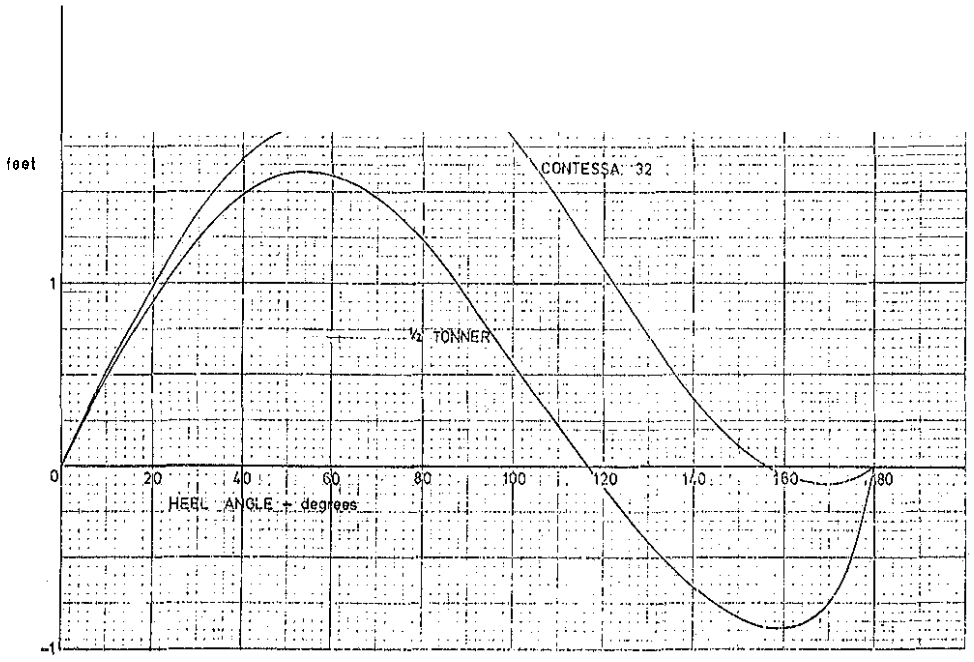


FIGURE3

Intact GZ Curves for Contessa 32 and Half Tanner

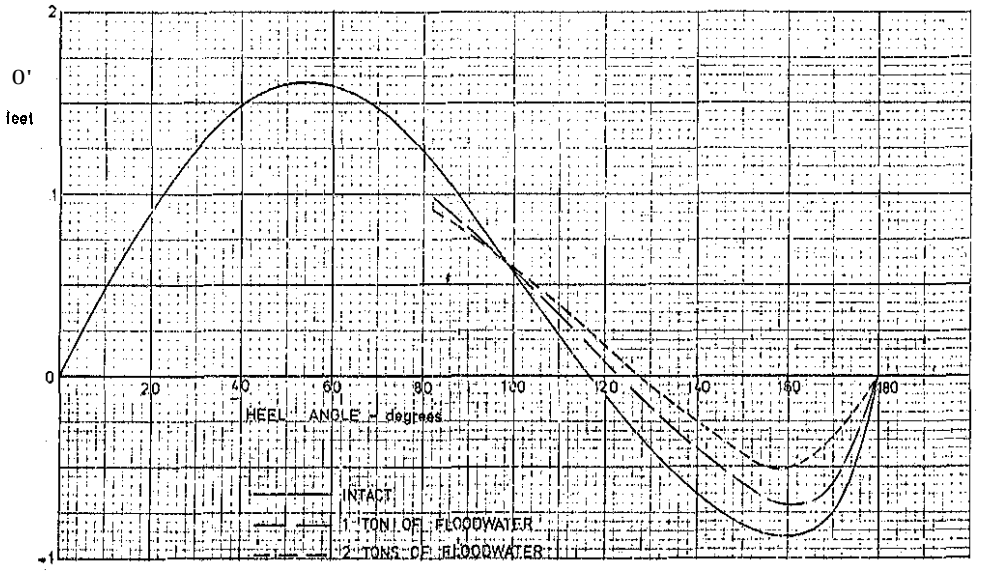


FIGURE4

Effect of Flooding on Stability of Half Tanner

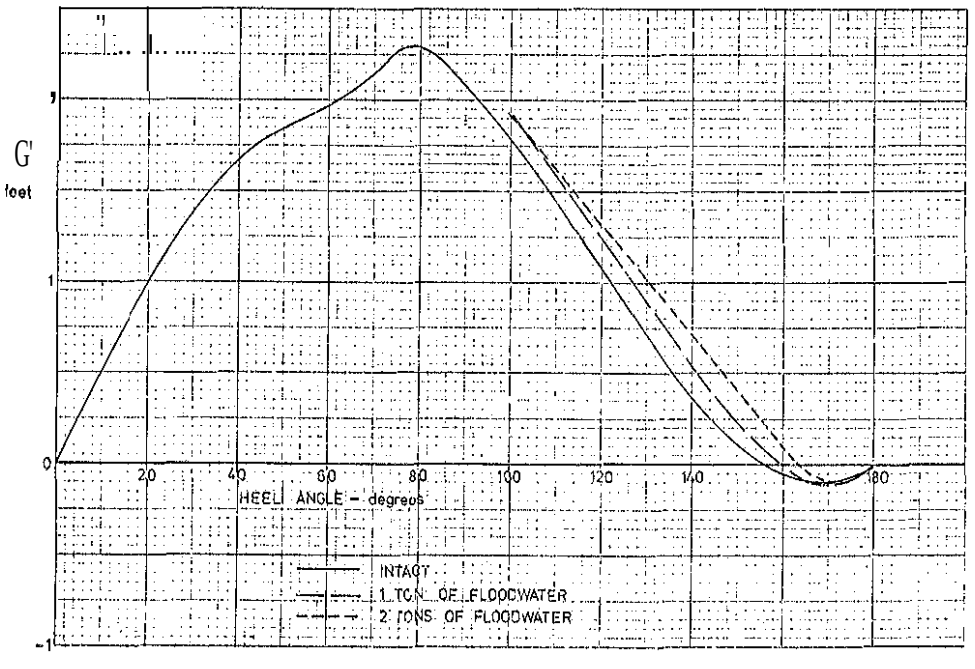


FIGURE5

Effect of Flooding on Stability of Contessa 32

Annex3B

Extract from the Minutes of a meeting of Offshore Sailmakers held on 20 September 1979 to discuss existing and anticipated legislation on storm sails in the light of experience in the Fastnet Race

1. Reefs and Reefing Systems

A suggestion that regulations may be desirabie to ensure that entrants in certain categories of offshore races could reef their mainsails down to, say, 40% of the full P measurement met with universal opposition. With the reef cringle half way along the boom, the power of an end mainsheet would be doubled, *creating* immeasurable loads on the sail, calling for extra heavy reinforcing. It was felt that, if a rule was considered desirable, it should define residual area rather than a percentage of P. It was agreed unanimously that no rule should enforce reefs to reduce area by more than 50%.

The manner in which many boats set out on offshore races with only the lowest reef pennants rove was the subject of some discussion. The use of the third reef in such cases required the reef pennant for the first reef to be re-rove often under hazardous conditions. It was felt that the Special Re,gulatlons Committee might consider this point in connection with regUlations for Category 1 and 2 races.

Attention was drawn to American regulations demanding the use of main boom topping lifts permanently rove in Category 1 and 2 races. This was unanimously opposed due to the risk of unnecessary chafing to stitching on the leech area of the mainsail.

2. Storm Trisails

Little experience was avallabie at the meeting from which recommendations on trlsails could be framed and discussed. It was agreed, however, that if many modern yachts carried trisalls it would be a difficult and arduous task to set them. The meeting agreed unanimously that any rule concerning trisails should include the ability to set a trisall from deck level as never having to reach higher than 5' from the deck or coachroof. This implied the need for gates and junctions in tracks and extrusions on the mast of a type which were no longer fitted to modern spars. It was felt, too,that the difference in shape between a normal trlsail and reefed mainsail would Impose additional loads at the head of the sail which would tend to pull the head out of the bolt rope extrusion. Any additional support for the head of the trisail with a toggle or parral ball arrangement would be Impractical due to its inability to pass the spinnaker pole cups and In some cases the very low lower spreaders. In the light of these difficulties, the meeting agreed that no recommendation be made for any regulations concerning trisails. If, however, legislation on trisails was COnsidered necessary, the meeting recommended that their size should be approximately 0.18 x P x E.

3. Storm Jibs

In the light of Inconsistent reports as to whether yachtsmen had found their storm jibs too large .or too small, the meeting considered the possibility of limiting storm jib size to 2 x B x D so that the area became related to the boat's inherent ability to carry sail. Whilst this formula would overcome the current tendency for I to get larger at the same time as displacement tended to become lighter, it was considered unsatisfactory to relate sail measurements to hull measurements which could only be computed after flotation tests and were therefore not fixed.

The only section of the I.O.R. restricting storm jibs was Rule 892.1, the sole intention of which was to define a storm jib for the purpose of limiting the number of sails on board. It was felt that the tendency to use a Rule as a yardstick had again occurred in this instance and should be discouraged. It was also felt that the size of a storm jib was the responsibility of the yacht's designer rather than the rule makers. For example, the storm jib on the OOD 34 had proved to be significantly too large and was also well outside the limit defined In 892.1.

In the light of the purpose of Rule 892.1, the meeting agreed that the existing definition of a storm jib remained satisfactory although some reservations were expressed as to whether a jib not exceeding 0.05 I' would be totally effective in some ¾ rig boats. It was felt, however, that the experience of the Fastnet Race did not necessarily shed any light on this matter since the purpose of a storm jib should be to enable the yacht to make progress to windward so long as it could carry any sail at all. In the Fastnet storm this windward situation had not existed.

ANNEXES C, D, AND E
TO THE REPORT OF SOUTHERN RESCUE CO·ORDINATION CENTRE
(TIMES GMT)

Details of SAR Units Involved
Fixed Wing Aircraft

	Aircraft	*Squadron*	*Time Airborne*
1.	NIMROD MK 1	201 SON KINLOSS	9.00 HRS 14AUG
	NIMRODMK 1	201 SON KINLOSS	8.00HRS 14AUG
	NIMROD MK 1	201 SON KINLOSS	9.20 HRS 15AUG
	NIMRODMK 1	201 SON KIN LOSS	8.58 HRS 15AUG
	NIMRODMK 1	120 SON KINLOSS	9.45 HRS *15/16* AUG
	NIMRODMK 1	120 SON KINLOSS	8.22HRS 16AUG
	NIMRODMK 1	42 SON ST MAWGAN	5.40 HRS 14AUG
	NIMRODMK 1	42 SON ST MAWGAN	8.46 HRS 14AUG
	NIMRODMK 1	42 SON ST MAWGAN	9.15 HRS 14/15AUG
	NIMRODMK 1	42 SON ST MAWGAN	6.25HRS 15AUG
	NIMRODMK 1	42 SON ST MAWGAN	7.15HRS 15/16AUG
	NIMRODMK 1	42 SON ST MAWGAN	9.10 HRS 15AUG
	NIMRODMK 1	42 SON ST MAWGAN	9.02 HRS 16AUG
		TOTAL	109.25 HRS
	FRENCH ATLANTIOUE		8.00 HRS 16AUG
	IRISH BEECH KING AIR		18.30 HRS
	6 SORTIES		
		TOTALFIXEDWING	135.55HRS

Helicopters RN

2. Total Helicopters HRS and Sorties as follows:

WESSEX NAS CULDROSE 771 SON	
27 SORTIES	62.35 HRS *14/16* AUG
SEA KING NAS CULDROSE 706 SON	
25 SORTIES	112.10 HRS 14/16AUG
LYNX NAS CULDROSE	
10SORTIES	20.20 HRS *14/16* AUG
TOTAL	195.05 HRS

Helicopter RAF and Irish Air Corps

3. WHIRLWIND 'A' FLIGHT RAF CHIVENOR
2 SORTIES 4.20 HRS
WHIRLWIND 'B' FLIGHT RAF BRAWDY
7 SORTIES 12.50 HRS
THIS INCLUDED 1 SORTIE BY SEA KING FROM RAF COLTISHALL ATTACHED TO:
RAF BRAWDY TOTAL 17.10 HRS
IRISH HELICOPTER 2 SORTIES 4,20 HRS
TOTAL ALL HELICOPTER HRS 216.35 HRS

Military Surface Vessels

		Time On/Off Task
4.	HNLMS OVERIJSSEL	- *1160630*
	HMS ANGLESEY	- *1161315*
	HMS BROADSWORD	*141730/161315*
	HMSSCYLLA	*1602001170925*
	RMAS ROLLICKER	*141730/161315*
	RMAS ROBUST	*141630/161315*
	RFAOLNA	*160600/161315*
	IRISH PATROL VESSEL DIEDRE	

Other Known Non Service Vessels Participation

5. NUMEROUS LIFE BOATS FROM BOTH UK PORTS AND IRISH PORTS
MV NANNA-WEST GERMAN
DUTCH TRAWLER SIDE NUMBER SCH 6
MVCHESTREE
TRAWLER SANYANN
TRAWLER PETIT POISSON
TRAWLER MASSINGY

Naval Movements (Times **Zulu)**

14Aug

0238 ANGLESEY proceeding to assist yacht CONDOR, OVERIJSSEL already assisting other yachts in area.
0851 ROLLICKER diverted to 51 N 0700W ETA 1730.
0915 BROADSWORD ordered to proceed from Sound-carrying out heeling trials and requires fuel-ETD 1330.
1000 ROBUST ordered to prepare to sail.
1430 BROADSWORD sailed-making good 21 knots-assuming duty of SOSF when at Lands End 1730.
1433 ROBUST sailed-to patrol Lizard to Scillies.
1730 BROADSWORD assumed duties SOSF. ANGLESEY, OVERIJSSEL, ROBUST, ROLLICKER in search force. Ships allocated individual square areas to search.

15Aug

0735 BROADSWORD ordered to continue search throughout day.
1531 OVERIJSSEL dead bodies recovered now in poor condition returning to Plymouth ETA 160630.
1735 CINCFLEET (1516451 detached SCYLLA to join search force vice OVERIJSSEL, OLNA to join sail 1730 from Portsmouth.

16Aug

0200 SCYLLA joined search force.
0600 OLNA arrived off Scillies.
0630 OVERIJSSEL arrived Plymouth sailing later to return Den Helder.
1315 All race yachts accounted for. Search called off-SCYLLA to remain as guardship. BROADSWORD, ANGLESEY, OLNA, ROBUST, ROLLICKER, PIAWPO.

List of Rescues by Individual Uhlts-Hellcopters

	Time	*Helo C/S*	*Survivors/Yachts*	*Remarks*
1.	*14Aug 79*			
	0815	R77	1TARANTULA	REMAINDER OF CREW STAYED ON BOARD
	0946	R97	2TROPHY	5MISSING AT THAT TIME
			3GRIMALKIN	3 MISSING AT THAT TIME
	0948	R20	5MAGIC	COMPLETE CREW
	1025	R21	8CAMARGUE	COMPLETE CREW
	1130	R98	1 ARIADNE	TAKEN TO TRELISKE HOSPITAL TRURO
	1139	R20	5 SKIDBLADNER	ALL LIFTED FROM L1FERAFT
			6GAN	
	1212	R77	6HESTRUL	
	1400	R97	7GRINGO	COMPLETE CREW
	1512	R30	1 FESTINA TERTIA	HYPOTHERMIA CASE
	1630	R98	1 GUNSLINGER	YACHT OK 1 LOST OVERBOARD NIGHT *13/14*
	1655	R21	10 GOLDEN APPLE	COMPLETE CREW
	1722	R25	4 FLASHLIGHT	COMPLETE CREW
	1830	R96	5 ALLAMANDA	COMPLETE CREW
			6 BILLY BONES	COMPLETE CREW
	1920	R21	1 INJURED GRIMALKIN	
			1 DEAD GRIMALKIN	
	15Aug 79			
	0130	R90	COMPLETED LAST SORTIE OF THE DAY, BUT REMAINED ON 15MINS NOTICE.	
	16AUg 79			
	1555	R97	RECOVERED 1 BODY, FLOWN TO TRELISKE HOSPITAL TRURO. TOTAL OF 74 SURVIVORS RECOVERED ADMITTED TO CULDROSE SICK BAY—3 DEAD.	
	17Aug 79			
			BRAWDY WHIRLWIND RECOVERED 1 BODY.	