

A SURVEY OF THE WRECK OF  
THE SS RICHARD MONTGOMERY

A SUMMARY REPORT

The Maritime and Coastguard Agency

an Executive Agency of the

Department of Environment, Transport and the Regions

June 1998

A SURVEY OF THE WRECK OF  
SS RICHARD MONTGOMERY

CONTENTS

INTRODUCTION.....	Page 3
CONCLUSIONS AND RECOMMENDATIONS.....	Page 4
The Existing Policy.....	Page 4
The Continual Observation of the Wreck.....	Page 4
The Condition of the Masts and Derricks.....	Pages 4-5
A SUMMARY OF THE 1997 SURVEY OF THE WRECK.....	Page 5
CONDUCT OF THE SURVEY.....	Page 5
DETAILS OF THE SURVEY	
Scope of Work.....	Pages 5-6
Analysis of the Survey Data.....	Pages 6-7
Comparison with 1996 Data.....	Page 7
FINDINGS.....	Page 8
ANNEX A	
The 1997 Survey Technical Operations.....	Page 9
Technical Aspects of the 1997 Survey.....	Pages 9-11
ANNEX B	
The History.....	Pages 12-16
ANNEX C	
Monochromatic Gradient Plot.....	Page 17
ANNEX D	
Colour Contour Plot.....	Page 18

## INTRODUCTION

1. The SS RICHARD MONTGOMERY grounded and split in two off Sheerness in 1944 whilst carrying a cargo of bombs.
2. A large part of the cargo was successfully recovered at the time. No explosions occurred when the ship grounded or during the subsequent salvage operation, and none have occurred since.
3. It is probable that some of the munitions remaining on board are still capable of detonation but the likelihood of a major explosion is remote. Experts have consistently advised that the best way to keep the risk to an absolute minimum is to leave the wreck alone. The site is therefore designated a prohibited area under the Protection of Wrecks Act 1973.
4. Whilst the risk of a major explosion is remote, it is considered prudent to monitor regularly the condition of the wreck. Therefore routine surveys have been undertaken to assess the condition of the wreck and to check for any new signs of possible danger.
5. Until 1984 surveys were carried out by Ministry of Defence (MOD) salvage divers. More recently the surveys have been undertaken by commercial diving contractors, working under MOD supervision. Following the 1993 survey, in view of the limitations placed on such methods by the poor visibility under water at the site, and on the recommendation of the MOD Salvage Organisation, it was decided that full advantage should be taken of the major advances in sonar technology, in preference to the use of diving surveys.
6. This survey, in 1997, was the second of three annual surveys conducted on behalf of the Coastguard Agency (an executive agency of the Department of Environment, Transport and the Regions) by Sonar Research and Development Ltd of Beverley. It was completed in July 1997 under the supervision of the MOD's Salvage Organisation.

## THE MARITIME AND COASTGUARD AGENCY'S CONCLUSIONS AND RECOMMENDATIONS FOLLOWING THE 1997 SURVEY OF THE WRECK

### THE EXISTING POLICY OF NOT DISTURBING THE WRECK

7. There is no evidence from the latest survey to change the consistently applied policy of not disturbing the wreck - that this remains a safer course than attempting to clear it. The inspection of the wreck shows that there has been no significant change in the structure below the surface. There has been some movement in the debris overhanging the side of the wreck. This proves that any other method for the inspection of the wreck would be extremely dangerous. The 1996 survey indicated that the scouring of the seabed in the vicinity of the wreck is continuing as it has for the past 53 years. The 1997 survey has shown that further scouring has only taken place at the bow, the break and at the stern of the wreck with a slight build up in other areas. The seabed surrounding the wreck appears to be in a stable condition. This will be further confirmed by the 1998 survey.

RECOMMENDATION: that the wreck should remain undisturbed.

### THE CONTINUAL OBSERVATION OF THE WRECK

8. The wreck remains under close observation under a contract let by the Secretary of State for the Environment, Transport and the Regions to Medway Ports to provide for the continual 24-hour guarding of the wreck. The Company are well placed and equipped to undertake this role and the contract has been operating to the Secretary of State's satisfaction.

RECOMMENDATION: that the continual close observation of the wreck be maintained.

### THE CONDITION OF THE MASTS AND DERRICKS

9. As a result of the survey in 1993 it was stated that the condition of the masts and derricks was such that serious consideration should be given to removing them in an attempt to stabilise the surrounding deck areas.
10. Advice was sought from MOD who made an inspection of the masts which found that they remained sufficiently robust to leave largely undisturbed, subject to ongoing inspection during subsequent surveys. As a consequence it was clear that the existing warning notices placed on the wreck could also remain in place. The 1997 survey indicated that minor "trimming" of the fixings to the masts might be necessary during the 1998 survey but this will not disturb the integrity of the masts themselves.

RECOMMENDATION: that the masts, derricks and warning notices remain in situ, subject to ongoing inspection and further attention in 1998.

#### THE 1997 SURVEY OF THE WRECK

11. From time to time over some 25 years, and on the recommendation of the Committee on Hazardous Wrecks, surveys of the wreck have been arranged in order to monitor conditions. The most recent survey was conducted in July 1997 by Sonar Research and Development (SRD) Limited under contract to the Secretary of State for the Environment, Transport and the Regions. The survey was organised by the Coastguard Agency and was supervised by the Chief Salvage Officer to the Ministry of Defence (Navy). The survey made use of a high resolution electronic scanning sonar system developed by the contractor and linked to a microprocessor system to produce a detailed survey of the seabed, over a wide area in the vicinity of the wreck. Both the MOD and the Coastguard Agency were satisfied that the survey was properly and competently carried out in compliance with the contract.

#### CONDUCT OF THE SURVEY

12. A technical description of the conduct of the survey is at Annex A below. The tide gauge and Kinematic GPS base station were established at Sheerness on 23<sup>rd</sup> July 1997. Survey operations started on 24<sup>th</sup> July with a confidence check whilst alongside. The vessel then sailed for the site of the wreck, some 2 miles north-east of Sheerness.
13. The survey was carried out during a period of good weather. The survey area was in the lee of the Isle of Sheppy and sea conditions remained calm throughout the duration of the survey. The survey area lies at the eastern extremity of Sheerness Middle Sand and is to the south of the Great Nore anchorage and north of the Medway Approach Channel. During the course of the day there were several shipping movements which temporarily impeded survey operations. This did not cause any problems.

## DETAILS OF THE SURVEY

### 14 SCOPE OF WORK

Sonar Research and Development was contracted to survey the wreck of SS RICHARD MONTGOMERY and an area of 400 metres around the wreck. The company was required to locate, identify and map any loose wreckage and munitions on the seabed. The full work scope was completed. The wreck was examined in detail resulting in no noticeable deterioration below the water line. An area of small contacts in the break of the wreck was again detected.

### 15 ANALYSIS OF THE SURVEY DATA

SS RICHARD MONTGOMERY ran aground on Sheerness Middle Sand in 1944. Since her grounding, the presence of the wreck has caused localised changes in the seabed topography. The most noticeable change was to the scouring that has occurred around the wreck. Scouring has caused the wreck to settle into the seabed, having the effect of making the wreck appear to "sink".

- 16 Hydrographic surveys have shown, in general, that sand banks are at their shallowest over neap tide periods. This survey took place over the spring tide period to ensure that the survey vessel could pass over the wreck in safety at high water. Therefore the depths obtained over the shallowest parts of the banks might not necessarily be the least depths.

The following features within the survey area might be observed from the solid contour plot at Annex D.

**The Wreck Site** The wreck site occupies the central part of the survey area. It is the area enclosed by the 9-metre contour and may be considered to be the area of seabed topography most influenced by the presence of the wreck.

**The Medway Dredged Channel** The Medway dredged channel occupies the southern part of the survey area, which is orientated in the region of 072°/252° and is bounded by the southernmost 9- metre contour in the survey area.

**The Sheerness Middle Sand** The Sheerness Middle Sand occupies the central part of the survey area. This sand bank is most extensive in the western part of the survey area. It is broken by the wreck site and continues to the east of the wreck site. The 6-metre contour of this feature is continuous to the north, and to the south this feature is continuous along the 8-metre contour.

The Great Nore Anchorage      The Great Nore Anchorage forms a north eastern boundary to the survey area.

The survey shows that the 15-metre contour is more extensive than shown on the published chart. This contour now extends some 10 to 30 metres from the east side of the wreck into two elongation's to the west side of the wreck. On the east side, the contour is at its maximum distance from the wreck opposite the centre part of each section. The elongation at the bow of the vessel extends some 80 metres on a bearing of 238°, at the stern the elongation is shorter at only 25 metres to the south west. From the colour contour plot at Annex D it can be seen that the shallowest parts of the wreck are at a similar depth to the shallow parts of the Sheerness Middle Sand.

A monochromatic gradient plot at Annex C reveals details of the ship's structure. This plot also reveals details of small seabed topographical features such as sand ripples over the area.

When compared with the 1996 survey, which was also carried out at Spring tides, it can be seen that the scouring process which has effectively "sunk" the wreck over the last 53 years appears to be ceasing.

#### 17      COMPARISON WITH 1996 DATA

The detailed differences between the findings of the 1997 survey and those produced by the 1996 survey were as follows:

In general the majority of differences of depth of the seabed were within 0.20 metre. The average depth for the survey area had remained almost constant between the 1996 and 1997 surveys. All of the features visible in the last two surveys had been found again during the 1997 survey. The sand waves to the north and west were clearly visible. Material had accumulated to the south and west of the wreck outside the 10-metre contour. Material had scoured to the north of the wreck within the bounds of the 6-metre contour. An object 2 metres across, situated 190 metres from the wreck at a bearing of 347° has been identified as an artefact of the wreck but is not clearly identifiable. This object is exposed. It does not give rise to concern. It is too large to be an item of ordnance and appears to be a part of the vessel's structure, probably from the above decks superstructure.

18      No significant changes in position or orientation of the wreck were observed. It was possible to survey the complete superstructure of the wreck. This was not possible in previous years due to weather. The debris located at the break in the wreck covered an area approximately 8 metres by 4 metres with a maximum height of 2 metres above the surrounding seabed. This was the same as in the 1996 survey.

- 19 There had been a further scouring of about 0.5 metres at the bow, at the break and at the stern of the vessel. On average there has been a 0.2-metre accumulation around the wreck. The average depth within a 200-metre radius of the wreck had reduced by 8 centimetres. The seabed support for the forward section of the wreck was virtually unchanged. There had been a reduction in the support to the aft section of approximately 6%.
- 20 The objects situated to the west of the aft section were visible on the gradient chart. Inspection of the raw survey data had again revealed that the objects were not exposed but were affecting the surrounding seabed.
- 21 All of the debris overhanging the side of the wreck had been detected again with some slight movement in position. The crack in the starboard side of the forward section had again been detected. The crack in the port side of the forward section had not been detected but its presence could not be eliminated.

## 22 FINDINGS

As a result of the 1997 survey, the following findings can be stated:

- a. the wreck remains a significant influence on the seabed topography of the survey area.
- b. the contractor's Seabed Visualisation System had shown good repeatability and a very valid comparison had been made with the 1996 survey results.

It was not possible to prevent any changes occurring to the wreck because of its size and condition and the danger which would be caused by any deliberate interference with it.

It was clear that the site of wreck should remain undisturbed and continue to be designated a prohibited area under the Protection of Wrecks Act 1973, under the close observation of the Medway Ports. The conditions did not exist for a "controlled" explosion nor for the clearance of the wreck.



## 1. THE CONDUCT OF THE 1997 SURVEY OPERATIONS

The survey was conducted using pre set north/south run lines. Two sets of line data were generated; one set to cover the whole area at a 15- metre interval, and another set to cover the wreck examination area at a 10- metre interval. Each line was identified with a number and a total of 56 lines were generated to cover the whole survey area. Twelve shorter lines, at 10- metre intervals, were generated to cover the immediate vicinity of the wreck.

The area immediately to the west of the wreck was sounded on 24<sup>th</sup> July and the area to the east of the wreck was sounded on 25<sup>th</sup> July. The wreck was surveyed over the high water period on 25<sup>th</sup> July.

Over the period of high water on 25<sup>th</sup> July a series of high resolution passes were made around the wreck using the starboard transmitter only. Run lines closest to the wreck were conducted at either slack water or down tide. Two sets of transverse lines at standard resolution were run across the wreck at the Master's discretion.

Small gaps in coverage may be present in the vicinity of buoys and in shallow water. These gaps do not have a detrimental effect upon the achievement of the aims of the survey.

Tidal streams were not measured, but by observation it could be seen that they were setting strongly approximately east/west. The set of the tidal stream could be easily seen on the buoys which mark the danger area around the wreck. In consultation with the Master, the vessel worked on the downtide, or "safe" side of the wreck.

## TECHNICAL ASPECTS OF THE SURVEY

### 2 GEODETIC CONTROL

The survey was referred to the WGS 84 Datum, WGS 84 Spheroid, and plan data was presented at various scales on the Transverse Mercator projection using the Universal Transverse Mercator Grid Zone 31(Central Meridian 3° East).

### 3. NAVIGATION

Primary positioning was provided by a Trimble 7400 RTK DGPS system consisting of 1 base station and 1 rover station. The base station was positioned at Sheerness Signal Tower trig 51° 26' 47".152 N 000° 44' 39".584 E. Secondary positioning was supplied by a Racal Landstar Beacon DGPS system. The Landstar system was used for the first day's survey and the Trimble RTK system was used for the second day's survey. Both systems have been checked and found to be in agreement.

#### 4. SOUNDING DATUM AND TIDE GAUGE

Chart datum at Sheerness, 2.90 metres below Ordnance datum Newlyn, was chosen as the Sounding datum. Data was reduced to sounding datum using tidal data from Sheerness, no co-tidal data was used.

Tide readings were obtained using a Sonar Research and Development Ltd portable tide gauge, whose datum was referred to the tide gauge at Sheerness. The tidal data was compared with data from the permanent tide gauge at Sheerness, and a good agreement was obtained.

#### 5. SEABED VISUALISATION SYSTEM

The Seabed Visualisation System provides a continuous electronic scan of the seabed. The system was configured with 3 sets of transducers designated centre, port, and starboard. The port and starboard transmitters were high resolution, and the centre transducer was standard resolution. The whole area was surveyed using standard resolution. A detailed high resolution survey of the wreck was carried out over the high tide period on 25<sup>th</sup> July.

The transducer array was attached to a hinged arm which was bolted to a bracket welded to the deck of the vessel. The rig was further supported by a gate which held the arm in a vertical position. When out of water the weight of the array and arm was supported by a block and tackle and further secured with rope sea lashings.

#### 6. PERIPHERAL INSTRUMENTS.

The following peripheral instrumentation was used:

Heading	Anshutz Standard 20 (SEC-OP) gyro compass
Motion	TSS335b
Position (Primary)	Trimble 7400 RTK DGPS
Position (Secondary)	Racal Landstar Beacon
Tide	SRD portable tide gauge.

## 7. CALIBRATION.

The system was pre-calibrated before transit to Sheerness.

A sound velocity of 1508 m/sec was used.

## 8. DATA GATHERING.

The Seabed Visualisation System stores raw data and on line processed data on 1.6 Gbytes discs. Data was gathered at a position resolution of 20 cm for standard resolution data, and at a positional resolution of 10cm for high resolution data. Both data sets were gathered with a vertical resolution of 1cm.

## 9. ON LINE DATA PROCESSING.

The data was processed on line to give an assessment of data coverage and quality. Further data processing to remove noise spikes and to compose high resolution representations of the wreck was carried out at the survey contractor's factory.

## 10 SEABED-POST PROCESSING.

All seabed and wreck data was processed at standard resolution. The data processing procedure was a staged process consisting of:

- a. Filtering of on line data to detect and remove spurious returns.
- b. Visual inspection of adjacent swathes.
- c. Creation of Digital Terrain Model (DTM)
- d. Visual inspection of printed data.
- e. Final Chart Printing.

## 11 WRECK POST PROCESSING.

Data obtained during the standard and high resolution passes of the wreck was processed as follows:

- a. Replay of Raw Data.
- b. Application of Tides.
- c. Visual Inspection of on line data and the removal of any spurious returns.
- d. Visual inspection of adjacent swathes.
- e. Creation of DTM.
- f. Visual Inspection of printed data.

In order to assess the extent of the seabed supporting the wreck, the wreck echoes were filtered out of the records using manually set gates. These plots showing the wreck's contact with the seabed are included amongst the graphics.

ANNEX B

CONTENTS

THE HISTORY OF THE WRECK

THE HISTORY .....	Page 14
Responsibility for the Wreck .....	Page 14
The Committee on Hazardous Wrecks.....	Page 14
The Explosives On Board.....	Page 15
Condition of the Explosives.....	Page 15
Risk of an Explosion .....	Page 15
The KEILCE Explosion.....	Page 16
Measures taken to Contain the Danger.....	Page 16

## THE HISTORY

1. The SS RICHARD MONTGOMERY was a Liberty ship, 441' 6" long and 7146 gross tons, of a mass-produced design not necessarily intended for more than a single voyage. The ship sailed from the USA to the UK in August 1944 with some 7000 tons of bombs. On arrival, it was anchored in the Thames Estuary, at its confluence with the Medway, off Sheerness. On almost the next tide, however, the ship's anchor dragged and it drifted on to a bank running east from the Isle of Grain (at 51°78'57"N 00°47'12"E) about 700' north of the Medway Channel. The ship grounded amidships on the crest of the bank and - this being a weak spot on this design - shortly afterwards broke its back. The wreck now lies in some 15 metres of water, with the masts protruding at all states of the tide.
2. The wreck lies about one and a half miles from Sheerness and the Isle of Grain and five miles from Southend. It lies on a bank across the tide.
3. The wreck is not an obstruction to navigation - indeed, it serves to mark for other shipping the bank on which it grounded.
4. Intensive efforts were made after the grounding to unload the cargo and about half was removed. The two stern holds were probably emptied. The other holds were less accessible. When the wreck flooded, it had to be abandoned. The remaining cargo represents some 1700 tons of explosive material; the balance being the heavy bomb casings etc.

### Responsibility for the wreck

5. The UK Government has assumed de facto responsibility for monitoring the wreck - firstly through the Board of Trade and, since 1983, through the Department of Environment, Transport and the Regions. It has relied upon expert advice provided by a Committee on hazardous wrecks comprising various experts from the Ministry of Defence, the Home Office and the Health & Safety Executive, together with the Port of London Authority and the Medway Ports . The Committee sought advice from US experts on the contents of the wreck, the design of the munitions carried, and the nature of the hazards they posed. The Committee is now formally disbanded, but the Department still has access to the experts if needed.

### The Committee on Hazardous Wrecks

6. The Committee's consistently firm advice was that no attempt should be made to disturb the site. In the Committee's opinion, any such action would increase the likelihood of the very explosion that must be avoided if at all possible.

## The explosives on board

7. The Committee's advice was based on the most exhaustive information available about the types of explosives involved, and the likely effect upon them of age and/or contact with sea water. The bombs thought to be on board are of three types. The bulk are standard, un-fused TNT bombs. In addition, some 800 fused cluster bombs are believed to remain. These bombs were loaded with TNT. They could be transported fused because the design included a propeller mechanism at the front which only screwed the fuse into position as the bombs fell from an aircraft. These two types of bombs could therefore be handled - with care - when the accident occurred. There are also some smoke bombs on board (paragraph 10 below).

## Condition of the explosives

8. TNT does not react with water and is extremely stable, particularly if stored at a steady, low temperature. As it has been contained in metal bomb cases there has probably been little change in its chemical or explosive properties as a result of the long period of immersion.
9. When the condition of the munitions was first assessed there was considerable concern over the possibility of the formation of very sensitive copper compounds from reaction between the lead azide in the detonators with the brass components of the fuses of the cluster bombs. This would have been a possibility whilst the fuses contained significant amounts of air but as the fuses will probably all have been flooded for many years and the sensitive compounds referred to are all soluble in water this is no longer considered to be a significant hazard
10. Following the 1996 survey a review was made by the Defence Evaluation and Research Agency of the information available as to the probable condition of the munitions still remaining in the wreck. The review concluded that the munitions would retain their explosive power but would be no more sensitive than in their normal state. Any fuses present in the wreck would have deteriorated to the extent that they were no longer functional. The white phosphorus filling of the smoke bombs is stable under water but is capable of spontaneous ignition if exposed to the air.

## Risk of an explosion

11. The break in the ship has already exposed the contents of No 3 hold, where most of the cluster bombs were believed to be stored, but without an explosion occurring. There are two reasons why a cluster bomb fuse in an unstable condition could explode without even setting off the cluster bomb to which it is attached. The fuse is not screwed into the main charge, and the main charge might now be wet or non-explosive. The same reasons make it even less likely still that such a fuse could detonate the main cargo.

12. It is believed that, left to itself, the wreck will break up gradually. There is a good prospect that all the ordnance will get wet in this process and will become neutralised. Even if the water has not already rendered them inert, a small explosion at any distance from the wreck will not set off the bulk of the cargo. The risk would significantly increase, however, if the wreck were to be disturbed by moving it or attempting to unload it.
13. The risk of a major explosion is believed to be remote and is probably becoming even less likely with the passage of time. It may eventually pass altogether, but this is not likely to be for some considerable time. It would probably be very dangerous to try to find out, particularly if this involved significant interference with the wreck site.

#### KEILCE explosion

14. The policy of not interfering with the wreck was reinforced by experience in 1967 with the wreck of the KEILCE, which was lost in 1946 carrying a similar amount of explosive and lying about 5 km from Folkestone harbour. This wreck was disturbed in the course of efforts to clear it and an explosion occurred.

#### Measures taken to contain the danger

15. The site is the only one designated as a dangerous wreck under the Protection of Wrecks Act 1973. It is an offence to interfere with it in any way. This augments measures taken in the 1960s which included additional buoys and a Notice to Mariners designating the site as a "foul area" where trespassers would be liable to prosecution. Medway Ports at the Port of Sheerness keep a close watch on the site by sight and by Radar, and maintain the buoys and warning notices under contract to the Coastguard Agency.



MONOCHROMATIC GRADIENT PLOT

Scale of difference in slope



