THE WRECK OF

THE SS
RICHARD MONTGOMERY

A SUMMARY REPORT

The **COASTGUARD** Agency

an Executive Agency of the

Department of Transport

July 1996

COASTGUARD

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SS RICHARD MONTGOMERY

CONTENTS

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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 still possible that those explosives remaining on board could become dangerous, the likelihood of a major explosion however 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 biennial 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. In recent years 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 major advances in sonar technology on the recommendation of the MOD Salvage Organisation, it was decided that a sonar survey should be carried out, in preference to the use of diving surveys.

6. The latest survey was organised by the Coastguard Agency (an executive agency of the Department of Transport) and was completed in July 1995 under the supervision of the MOD's salvage organisation. The results obtained from the contract which have been vetted by the Ministry of Defence and accepted by the Coastguard Agency fully supports the decision to change to the advanced sonar system used in this survey.

THE COASTGUARD AGENCY'S CONCLUSIONS

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 - this remains a safer course than attempting to clear it. The survey has shown that the wreck continues to deteriorate slowly and that the tidal regime and seabed scour surrounding the wreck is imposing strains on its structure. It is possible that, due to the continual deterioration, other breaks in the hull could occur but it is not possible to manage such changes in the wreck in any way.

CONCLUSION: 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 Transport to Medway Ports to provide for the continual 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.

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

THE CONDITION OF THE MASTS AND DERRICKS

9. As a result of the previous 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. It was recommended that advice be sought from MOD before removing the masts and derricks. Accordingly representatives from MOD, the Coastguard Agency and Medway Ports made a further visual 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.

CONCLUSION: that the masts, derricks and warning notices remain in situ, subject to inspection during subsequent surveys.

PREPARATIONS FOR NEXT SURVEY

11. The next biennial survey is due in the Summer of 1997 but MOD consider, and the Coastguard Agency agree, that a survey should take place in the summer of 1996 so that the full benefit of the greater precision obtained by electronic measurement of the wreck can be realised.

CONCLUSION: that another sonar survey be undertaken during 1996.

THE 1995 SURVEY OF THE WRECK

12. From time to time over some 20 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 1995 by Sonar Research and Development Limited under contract to the Secretary of State for Transport. The survey was organised by the Coastguard Agency and was supervised by the Chief Salvage Officer to the Ministry of Defence (Navy). For the first time 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.

DETAILS OF THE SURVEY

Date of Survey

13. The preparation work of installing equipment on the contractor's survey vessel commenced on 7th July 1995 and was completed on 8th July 1995. This operation was completed by two engineers from Sonar Research & Development Ltd (SRD). The system was fully checked and calibrated ready for the survey to commence on 9th July 1995.

Electronic Equipment deployed during the Survey

14. The Seabed Visualisation System - was used to provide a continuous electronic scan of the seabed. The survey required it to be used in two of its modes of operation. The deployment required the use of two standard bathymetric transducers and one forward looking transducer. The transducers were mounted on a single bracket over the side of the survey vessel and a vertical aluminium pole hinged to an aluminium cross beam over the cabin roof. A gate attached to the port side of the vessel held the pole in position. The transducer head was approximately two metres below the surface of the water which reduced the effects of surface noise.

A motion compensator was used to eliminate from the survey results the effects of heave, pitch and roll generated by the vessel's movements

A Seastar DGPS positioning system was used with positions converted to WGS84 UTM zone 31 using SRD's own in-house software.

The Heading was provided by the use of a Sperry SR-50 gyrocompass.

Tidal information was provided by a radio link to a SRD portable tide gauge. The gauge was referenced to the Sheerness (Standard Port) Tide gauge.

Data Collected and Processing Techniques

15. The Seabed Visualisation System allowed for all raw sonar data and on-line processed data to be recorded during the twelve-hour survey. Data was gathered at a positional resolution of 20 cm for the normal bathymetric seabed survey and at a positional resolution of 10 cm for the high detail survey of the wreck, both surveys were performed at a vertical resolution of 1 cm. The data was temporarily stored on 500 Mbyte hard disks before being transferred to 8 Gbyte DAT tapes. The majority of the processing of the collected data was performed on-line with the required enhanced processing being performed later. The raw data was stored to allow for different techniques of processing to be performed.

Results

16. Considerable scouring had taken place since the vessel ran aground. The scour extends -300 to +100 metres to the sides of the wreck along the major tide axis. The majority of the scouring would have taken place during the initial period with only a limited amount of scouring taking place since. The historical data collected during previous surveys indicated that the wreck was now in a state of equilibrium. Monitoring the edges of the scour might indicate any changes in the geometry of the wreck.

17. In order to fully understand what was happening to the seabed surrounding the wreck, SRD devised a method of 'removing' the wreck from the digital map. This required redigitising the raw sonar data immediately next to the wreck, ignoring the wreck itself. This had the effect of lifting the wreck out of the area but leaving its footprint. From this it could be seen that seabed support for the wreck was limited. It is possible that both sections of the wreck will further split due to the lack of support caused by the scouring. Previous surveys have highlighted a crack in the forward section of the wreck but not the underscour from which it resulted.

18. A closer plot of the wreck provided a view of what was happening to the deck of the wreck. It could be seen that most of the deck was still intact and that the wreck broke its back immediately forward of the super structure. The two separate sections of the wreck could be seen to be tilting to starboard at a angle of twenty two degrees.

19. Detailed analysis of the raw sonar data was undertaken to provide detail of the overhangs of the wreck and to detail any abnormalities in the wreck. A total of nine objects overhanging the side of the vessel were identified. These tended to be in the region of two to three metres in length. The locations of the overhangs corresponded to the locations of the masts of the wreck.

20 Both the port and starboard sides of the forward section of the wreck had been found to have a crack in them. These were the same cracks as were reported in the previous surveys. It is probable that the separate forward section of the wreck will split

at these points due to the stress exerted by the lack of seabed support. The aft section of the wreck may also follow suit for the same reason.

21. The starboard side of the forward section had been found to be bulging out. The side bulges approximately two metres for a distance of sixteen metres. The end of the starboard section had also been found to be protruding where the splitting of the wreck into two sections occurred when it originally went aground.

22. The plots produced can only give a two dimensional representation of the site of the wreck. To aid the perception of the wreck a three dimensional model of the wreck and the surrounding terrain was made. Sonar Research & Development Ltd. constructed the model of the wreck and the model of the seabed terrain was produced in conjunction with Hull University. The model is shown in figures 1 & 2.

SUMMARY OF RESULTS

23. The wreck was found to have caused a considerable amount of scouring to the seabed since it ran aground. This had resulted in making significant changes to the terrain. Though the scouring was ongoing it was considered that the wreck had now reached a state of equilibrium and that general tidal flow would not alter the position of the wreck. Though the wreck is thought to have reached the state of equilibrium the hull is undergoing considerable forces due to the lack of support by the seabed. Further under scouring will increase the stress levels on the hull, increasing the chances of further splits in the wreck.

24. It has been confirmed that both sides of the separate forward section of the wreck were cracking with the starboard side bulging out up to two metres. It is possible that this section will split in half.

25. Continued precise monitoring of the seabed will provide information on the stress imposed on the wreck structure. If the stress increases the wreck might suddenly disintegrate which would result in the remaining munitions on board being exposed to the sea or falling into the adjoining related seabed scour.
Precise monitoring of the geometry of the wreck and detailed examination of the hull of the wreck will provide early indication of further deterioration of the wreck.

26. It was considered that the 1995 sonar survey should be repeated annually for at least four years so that an accurate data base can be generated. This would establish in more detail the changing condition of the wreck and would allow a measurement of the rate of change of the scanned features of the wreck and the seabed.

IMPLICATIONS FOR THE DANGER OF THE WRECK

27. The previously identified cracks in the hull of the wreck have again been detected by the latest survey. Although the wreck is in a state of equilibrium, the stress exerted by the lack of seabed support may result in further splits in the wreck which has lain on the seabed in two sections since it went aground in 1944.

28. If this happens some of the remaining munitions on board exposed to the sea and fall in to the seabed scour created by may be the wreck. The release of such material is, however, likely to be piecemeal without endangering the remaining cargo. As the wreck is lying within a secure basin our advisors are of the view that any munitions released would almost certainly remain in the vicinity of the wreck.

29. It is 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.

30. The precise electronic scanning technology used by the contractor for surveying the wreck and the surrounding sea bed for the purposes of the 1995 survey has distinct advantages of the previous method of survey which employed divers. The greater precision obtainable by this method in the poor visibility of the waters surrounding the wreck will enable a measurement of the rate of change of the scanned features of the wreck and the seabed. This will allow the changing condition of the wreck to be established in more detail. For this reason - and to establish beyond doubt that, should any munitions fall out of this wreck, they will be contained in the trench surrounding it is desirable that further surveys be conducted annually.

31. It is 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 do not exist for a "controlled" explosion nor for the clearance of the wreck.

COASTGUARD

July 1996

ANNEX

CONTENTS

THE HISTORY OF THE WRECK

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 Transport. 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 two 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. All the bombs could therefore be handled - with care - when the accident occurred.

Condition of the explosives

8. TNT does not react with water, and will not explode if it is damp. Over time, however, if it is kept dry, it goes through a more sensitive phase before ultimately becoming non-explosive. The condition of the TNT will also depend on how cold it has been kept over the years.

9. The cluster bombs pose a different problem. They were made of brass with integral fuses made of a lead compound. In salt water, this compound will combine with brass to produce a highly unstable copper compound which could explode with the slightest disturbance. This compound is however also highly unstable and, if formed, will wash away in a few weeks, thus reducing the danger.

Risk of an explosion

10. 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.

11. 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.

12. So, the risk of a major explosion is believed to be remote. It will eventually pass altogether, but it is impossible to say when this will be. It would be very dangerous to try and find out by removing the silt.

KEILCE explosion

13. 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 5km 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

14. 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. The Port of Sheerness Limited keep a close watch on the site by sight and by Radar, and maintain buoys and warning notices under contract to the Coastguard Agency.

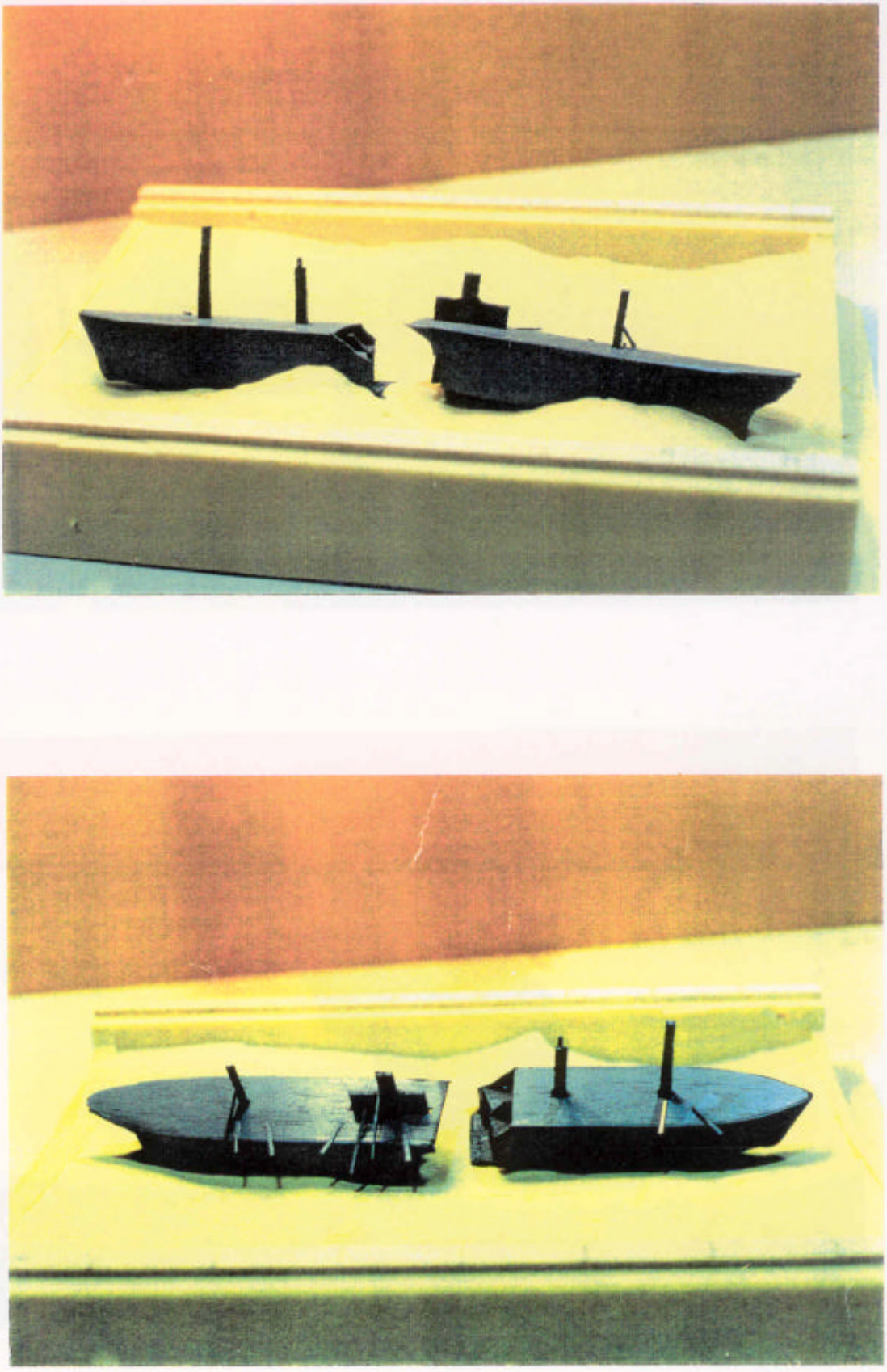

Figure 1 - The 3D Model

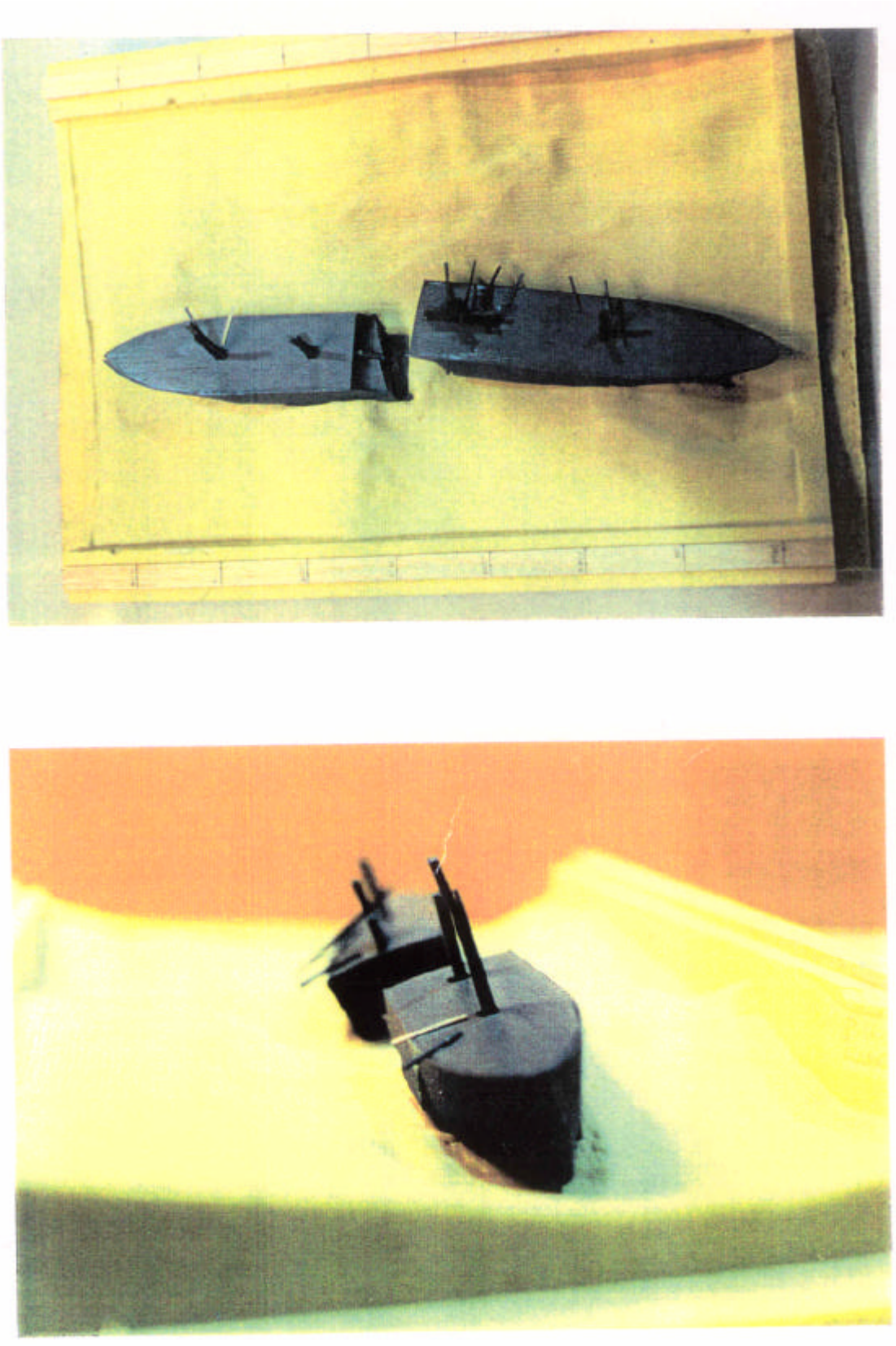

Figure 2 - The 3D Model