

## SALVAGE OPERATIONS OF HISTORICAL SHIPWRECKS

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Recently the public has been informed of the potential salvaging of the Vrouw Maria shipwreck found in the waters of the outer archipelago of Finland in 1999. Private parties proposed a recovery plan for this ship, partly based on our detailed salvaging project from 1988 of yet another very well preserved shipwreck, that of the St-Mikael in Nagu (finnish archipelago). While the plan for the St-Mikael could be used as a basis for the salvaging of the Vrouw Maria, it is important to note that many new technical developments have occurred in this field since then. Requirements for marine archeologists, as well as for salvaging operations in general, have significantly increased in recent years; thus if a recovery plan were to be drawn-up for the Vrouw Maria, it would require its own specific customizing. The following description of the salvage plan for the St-Mikael gives an indication of what should be taken into account for such an operation.

### TECHNICAL DIVING RESEARCH AND SALVAGING PLAN OF THE ST-MIKAEL SHIPWRECK 1987 - 1988

This ship most likely sank during a period between October 27th and November 2nd, 1747. A Dutch-type, 3 masted-galleon which was en route from Amsterdam to St-Petersburg; it at a length of 24 meters and measured 7 meters wide. As a result of Dr. Christian Ahlström's meticulous archival research, the vessel was identified as the St-Mikael, because of the royal horse carriage it had on board, destined for the Empress Elizabeth of Russia. The ship was steered by captain Carl Pouls Amiel when it sank near the island of Borstö with crew and passengers. It also carried high valued goods such as gold and porcelain objects, which is why it is deemed a treasure ship. It now lies at a depth of 40 meters in the Baltic sea.

It wasn't before the end of the 50's, beginning of the 60's, that Swedish divers carried out the first explorations of the then still unnamed shipwreck, temporarily identified as Borstö 1. Ten years elapsed before the Office of Maritime History (current Maritime Museum of Finland), part of the National Board of Antiquities, sent divers to investigate the shipwreck.

Helsingin Sanomat (the largest circulation newspaper in Finland) and telecommunications giant Nokia, at the occasion of Finland's 75th anniversary of independence, funded a recovery plan of the ship. Through Projektikonsultit Oy, KAREG Consulting Engineers was mandated to make a study of the wreck and devise a plan for the salvage operation. The required diving surveys were carried out between the July 25th and August first, 1987. Juhani Grönhagen, from the Office Maritime History, was nominated supervisor of the operations by the National Board of Antiquities of Finland. Because of the depth and particular circumstances of the wreck, divers could only perform two tasks per dive. Instructions to the divers by Kari Avellan, were given directly and by way of written notes. The diving team consisted of the following divers; Teemu Leiviskä, Ari Ilola, Timo Leinonen, Kimmo Kivistö and Mika Keskinen. Project leader Kari Avellan and project supervisor Juhani Grönhagen also carried out some dives. Our most senior diver, Teemu Leiviskä, wrote a record for all the dives. Through a phone line, divers reported their discoveries and findings. All these communications were recorded on tape, and after verification, were transcribed to a record. Recordings which are kept in the author's archives include among others, two near miss situations.

During this study, the ship's hull structure, geometrical dimensions, as well as its overall state and damages were examined. In addition, also examined were the ground conditions at site, including the depth of soil which had penetrated the hull as well as its volume and weight. The piercing of the hull was performed to examine its structure in detail, and to gather some wood specimens. Soil samples were collected from the ship's cargo bay, as well as from the bottom and sides of the vessel. From these samples, water content, specific gravity, bacterial erosion, flexural strength and bar pressure were determined. Analysis of the data and results was performed at the Technical Research Center of Finland.

Planning for the salvage operations and all relevant structural calculations were produced by the author. Before the actual lifting of the wreck could take place, additional measures were to be implemented. These measures included lifting of cargo from the ships' deck, mammoth pumping of the deck and partial mammoth pumping of the bay. The lifting proper, which was forecasted during 1989-1990, was to be realized by a lifting frame, hung from pontoons. Large canvases were to be fitted underneath the wreck either by hydraulic probe or water jetting. These canvases would then be attached to the lifting frame. To ensure the right distribution of lifting forces on the wreck, a simple mechanical self-aligning cable system was devised. Lifting would be realized with eight hydraulic lifts, activated in phase as cohesion suction between the ship and soil would dissipate. Mammoth pumping of the chassis would be realized in phase with the help of a strengthened rubber tube. The pontoons would gradually be balanced with ballast tanks, and during the operation, the force of the hydraulic lifts would be monitored by manometer. The hull of the vessel would then be thoroughly inspected before the final lifting. The first lifting would bring the vessel up by 1.5 meters after which the bottom would be inspected. The vessel would then be floated to a Helsinki dock where additional mammoth pumping and examination of the cargo bay would take place.

The salvage plan for the wreck of the St-Mikael by KAREG Consulting Engineers and accompanying technical diving research are part of the report by Projekticonsultit Oy. This report is entitled "ST-MIKAEL preliminary report for possibilities of salvage, 11.1.1998 Appendix". The preliminary report with relevant appendices was delivered to the Maritime Museum of Finland.