

Disengage

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MV ESTONIA

Investigation Report

on

Video Footage

and

Other Matters

Ham, 12th December 2001

This report covers the initial findings from the video tapes supplied to Disengage featuring the Car/Passenger ferry 'ESTONIA' before and after it sank in the Baltic Sea on the 28th September 1994.

Following instructions from the 'German Group of Experts investigating the sinking of the car/passenger ferry 'ESTONIA' Disengage has conducted a full review and examination of all submitted video tapes featuring the wreck of the 'ESTONIA'. The video tapes supplied to Disengage have been listed in appendix 1. These cassettes have been examined with relation to format, quality and content. This examination has also included the production of still images from the video tapes supplied. These images cover damage on the vessel, debris on the sea bottom, activity on wreck site and other areas of potential interest.

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All references to top and bottom when describing a position within this report refer to the vessel in its normal operational condition not in its current partially inverted condition.

A. The Video Tapes.

1. Introduction.

The investigation of the video tapes has been conducted by Disengage in the UK. Using a combination of a multi format VHS video player, Sony DHR1000 digital video recorder, FAST DV Master firewire image capture device and PC based Adobe image processing software. The aim of the investigation conducted by Disengage at the beginning was to assist the explosive expert Mr B Braidwood in identifying possible explosion damage to the vessel. This has been completed and now the aim has been to identify the technical nature of the videos, provide fully detailed listings of the content of the cassettes, provide still images of any items of possible interest to the overall investigation and identify any anomalies in the content of the cassettes including missing sections of tape and unidentified activity of wreck site.

2. Background Facts.

The Car/Passenger ferry 'ESTONIA' was originally built by Meyer Werft of Germany and delivered to its owners as 'VIKING SALLY' in June 1980. In 1993 the vessel was sold to the Estline Shipping Company, renamed 'ESTONIA' and was based in Tallinn operating a route between Tallinn (Estonia) and Stockholm (Sweden).

On the 27th September 1994 the 'ESTONIA' sailed from Tallinn on a scheduled voyage to Stockholm reportedly carrying 1081 people, 40 trucks/trailers, 25 cars, 9 vans and 2 buses. On the 28th September 1994 at approximately 01.53 after a series of events detailed in other reports including the loss of the vessels bow visor and in worsening weather conditions the 'ESTONIA' disappeared from the radar screens of a ferry in the vicinity and sank. The vessel now lies in a depth of approximately 80 meters of water, in International waters in the Baltic Sea. The visor was found about one nautical mile west of the vessel.

Background of Tape Sources

Originally 13 cassettes were submitted to Disengage for analysis. Of these 13 cassettes 4 were from diver activity and 9 were filmed from Remote Operated Vehicles (ROV's). There were also a number of cassettes supplied by the commission that were labeled with different names but were duplicates of earlier cassettes.

Between 31st July 2000 and the 02nd August 2000 Werner Hummel and Martin Roolvink visited the Headquarters of the Finnish Criminal Police at Vantaa near Helsinki, in the National Bureau of Investigation, to view the original cassettes held by the Finnish authorities. The cassettes requested by the German team were from the divers and ROV's used between the 2nd and 18th October 1994 from onboard Finnish vessels. The German team quickly discovered that the footage on the cassettes shown to them by the Finnish Authorities was cut in the same places as those that had been received by the German Group of Experts. In fact, several of the cassettes shown had less footage than the cassettes

supplied to the German Group of Experts. In conclusion, the visit made by Werner Hummel and Martin Roolvink to the Finnish Authorities only demonstrated the confusion that surrounds the location and contents of the video cassettes. Whether this confusion is a product of a will full obstruction or incompetence is not clear.

In August 2000 and additional 5 cassettes were made by the Rabe-Bemis Expedition to the wreck. An independent expedition using ROV's and an amateur diving group.

- 2nd October 1994, 3 ROV cassettes were made during a survey by the Finnish Board of Navigation.
- 1 ROV cassette made by Finish ROV's on 9th-10th October 1994.
- Subsequently the Swedish Sjöfartsverket contracted the Dutch salvage company SMIT TAK BV from Rotterdam, and its Norwegian subsidiary Rockwater from Stavanger, to carry out a detailed diving investigation of the wreck and its surroundings. From the 2nd-6th December 1994 divers produced 3 video cassettes and ROV's a further 2 video cassettes.
- 1996, cassette was made during the removal of fuel from the vessel.
- August 2000, 4 ROV cassettes, and 1 diver cassette were made by the Rabe-Bemis Expedition.

There are two main differences between videos made by ROV's and videos made by divers.

- The ROV videos show data on screen during recording, including date, time, course, depth and camera pitch angle. The ROV's are also generally well lit due to them carrying more than one light to conduct filming by.
- The diver videos carry no data on screen resulting in dates and times being estimated from brief official documentation and on screen encounters with ROV's from which we have information. The picture quality from the divers videos is also hampered because of the poor lighting used on the head mounted cameras. The single very bright light tends to bleach out the images and has been made worse during the duplication process.

3. Technical Findings

The investigation has covered the contents of 18 different cassettes that contain footage from the wreck site covering various dates.

- It has been confirmed by the contractor used for the survey, Rockwater, that the original master recordings of the underwater survey were made on VHS cassettes in a PAL format. Due to the poor quality of the copies received, tests have been conducted and have shown that the copies supplied have been played back and duplicated on PAL/SECAM machines without the necessary converters in place. The main symptoms of this are the breakdown in colour definition, excessive brightness and tracking problems.

- It has been confirmed by the contractor used for the survey, Rockwater, that it is normal practice for cameras to continue recording, for safety and continuity, throughout a survey whether it is conducted by ROV's or divers. This is especially relevant when an ROV such as the Sprint unit are used as they are only image platforms with no other capacity than the collection of stills and video. Out of 13 different cassettes made before August 2000, only 4 have no cuts. It has also become apparent that the breaks repeatedly occur in the same areas on the vessel, this is detailed in appendix 3.
- Comparisons between the cuts in the footage, the on screen timing and the VHS time code do not match up. Most of the occasions when a tape cut takes place, the elapsed time on the ROV 'on screen clock' is greater than that on the VHS cassettes, especially obvious when most of the cuts are only a matter of seconds. This would mean that these cuts in the footage were made at the time of duplication, and not when the survey was taking place.
- The recordings made in August 2000 illustrate clearly the quality that should be available on the original cassettes. The technology used during this filming is comparable with that used in 1994, and the conditions on the wreck site were also similar. The August 2000 recordings also show the depth of investigation that can be completed in a very short period of time on the wreck site.

4. Content Findings.

The investigation has covered the contents of 18 different cassettes that contain footage from the wreck site covering on various dates. Still images have been produced to document some of the findings listed below.

There are many anomalies that can be identified in the contents of the cassettes, even with the poor quality reproductions supplied. There are two main conclusions to be made from the content and a number of other general findings.

4.1 Un-documented activity.

- Having reviewed cassettes from the 2/10/94, 9/10/94, 2-4/12/94 and the 29/08/00 there is evidence that between these dates there has been movement of what would be expected to be stationary items such as ropes and debris. These movements have not been documented in the available footage. This is clear on the hawsers to the Port side of the bow ramp, damage to the underside of the navigation bridge, damage to the bow ramp and missing metal samples from the damage at the bow of the wreck.

- Having reviewed cassettes from the 2/10/94, 9/10/94 and the 2-4/12/94 there are occasions when other activity is taking place on the vessel, visible by other ROV and diver lights on footage, this activity is not covered in the available cassettes. On tape B40c/number 19 the divers have cut some items from the bow and are taking them to the crane for lifting, one diver is at the upper Port side of the ramp and the other is at the bottom Starboard side of the ramp. The diver who is standing on the Starboard side bottom of the bow ramp near the hinge has his attention drawn to movement below him and turns his head twice towards the seabed. On both occasions another diver is visible on the Starboard side of the ramp below him, this diver is wearing different equipment from the two divers already detailed and also has an umbilical and is not explained in any of the other footage. See appendix 3.
- There is evidence indicating that there has been movement of the bow ramp at some point before it came to rest in its current position. The evidence visible on the tapes is the two hawsers trapped inside the car deck on the Port side near the manual side lock. The other evidence is on the Starboard side where the suspected explosion has caused considerable damage on the front bulkhead, there is a large flap of this metal caught between the ramp and the bulkhead (see appendix 4).
- On tape B40d/number 9 the diver says that he is going to the seabed, but there is no tape showing this part of the survey.
- On tape number 11 from 1996 the debris that was trapped behind the Port side ramp hinge in earlier surveys has been removed, there is no tapes covering this activity.
- The footage from August 2000 shows the clearest examples of activity that has not been documented. The area around the bow ramp shows many signs of violent activity, including cracks in the bow ramp itself, damage to the bulkhead around the ramp and a change in the gap between the ramp and bulkhead itself. This shows that there has been extensive activity around and movement of the ramp itself since the last official films were made.
- The footage from August 2000 also shows a large piece of the damaged starboard front bulkhead to be missing which had still been there in June 1996.

4.2 Tape Cuts.

Having reviewed the cassettes, there are areas on the vessel that cannot be documented properly due to cuts in the footage. These areas are the Starboard mudline, bow ramp hydraulic actuators and locking hooks, seabed debris and car deck in general.

- When the ROV's go to the Starboard mudline the tape is cut between the funnel and bridge or until the ROV arrives at the Starboard rudder or moves to another area on the hull away from the mudline. There is no video documentation of the complete Starboard mudline on the cassettes we have reviewed.
- The bow ramp actuators have both been bent and damaged, however the diver does not attempt to conduct any kind of detailed investigation. Apart from a brief comment about the eye on the end of the Starboard actuator on tape B40c/number 19 there is no other comment or video documentation of these important items.
- It is possible to access the car deck and on tape B40c/number 19 a diver enters to inspect the locking pins, on the video taken of this there are a number of other items briefly visible that are not looked at, mainly the damage on the Port side bulkhead near the ramp and the mattresses and other material visible on the inside of the Port side ramp hinge. On cassette B40b/number 20 the ROV attempts on several occasions to enter the car deck and fails. On several of these occasions the operator believes he has entered the car deck but then discovers he's wrong and on the seabed. On the final occasion they are sure they have entered and this is very difficult to confirm due to several cuts in the tape, but on the later diver cassette B40e/number 10 from the same date and time the diver sees the ROV on the seabed at the same time as this footage.
- Due to the large number of cuts on ROV tape B40b/number 20, including one cut of nearly one hour no conclusions can be made. There is however some confusion in this ROV's activities as during the hour long cut in the ROV's footage the diver sees the ROV active and inside the bow ramp. From the limited footage available from the seabed near the Starboard bow of the vessel it is difficult to identify many of the pieces visible, however some wooden pallets with bags on can be seen as well as other debris. This is made worse by the very regular cuts in the footage throughout the time the ROV's are viewing the seabed.
- On the ROV survey conducted in 1996/number 11 the tape is dated from the official source as 19/06/96 but it is cut so badly that it goes back in time by whole days to the 09/06/96, 26/04/96, 17/06/96, 11/06/96 and contains still images from a video pause during duplication.

- On cassette B40a/number 6 dated 4/12/94 the opening dialogue on both the screen and audio commentary states that this is cassette two. Starting at 2 o'clock in the afternoon and featuring footage shot by the SPRINT ROV, no cassette has been received labeled as number one or any timed recording before this time on this date.
- In the time and date order of the cassettes, tape B40e/number 10 chronologically comes before tape B40d/number 9.

4.3 General.

- On two of the cassettes that have been supplied with the official tape logs, that have been supplied as documentation generated at the time of filming, they do not correspond with the content of the video cassette.
- It has been confirmed by the contractor used for the diver survey, Rockwater, that it is common practice for divers to be equipped with two different ear pieces to allow both the dive supervisor and technical personnel to communicate with the diver. It is apparent on the diver video B40c/number 19 that the diver is receiving instructions in another earpiece. It is unfortunate that these instructions have resulted in the missing of potentially important areas of the vessel survey. As there are no transcripts of these other communications conclusions cannot be drawn regarding this.
- On cassette simo1/number 4 of the 2/10/94, at an early stage of the investigation, the operator takes a lot of time and effort to get a clear panning shot of the vessel name on the Port bow. This includes turning off the on screen ROV information and repeatedly shooting the name on the bow from different angles for more than 30 minutes.
- On video Jutta 1/number 2 at time 17.56.45 there is a reference to a 'sub link', I have not been able to find out what this refers to.
- ROV video B40b/number 20 goes down towards the S mudline and during this movement it films a number of lateral scrape marks on the underside of the hull, this is visible from 18.44.41 on tape B40b/number 20.
- There is a large amount of repeat coverage of certain areas of the vessel without any new information, procedure, agenda or evidence being discovered.
- When the divers are in the area of the Port side of the nav bridge there is a large amount of damage on the underside of the Port side wing of the bridge. The lower wire strengthened glass window is also broken trapping what appears to be a victim in the strengthening wire from the window.

This is visible on tape B40e/number 10 when the diver investigates this area.

- A victim is visible near the starboard bridge-wing on the seabed.

In order to get some clarity into this rather dubious and confusing video scenario, Werner Hummel and Martin Roolvink from the German Group of Experts visited the Headquarters of the Finnish Criminal Police at Vantaa near Helsinki, in the National Bureau of Investigation, to view the original cassettes held by the Finnish authorities. The cassettes requested by the German team were from the divers and ROV's used between the 2nd and 18th October 1994 from onboard Finnish vessels. The German team quickly discovered that the footage on the cassettes shown to them by the Finnish Authorities was cut in the same places as those that had been received by the German Group of Experts. In fact, several of the cassettes shown had less footage than the cassettes supplied to the German Group of Experts. In conclusion, the visit made by Werner Hummel and Martin Roolvink to the Finnish Authorities only demonstrated the confusion that surrounds the location and contents of the video cassettes. Whether this confusion is a product of a will full obstruction or incompetence is not clear.

5. Conclusions

- Format problems resulting in poor duplication and footage quality, that have not been recognized or addressed at time of duplication, have hampered independent investigation of the official cassettes. The lack of format conversion during duplication has resulted in a large drop in quality, combined with the tape cuts it has meant that reaching conclusions from the tapes and still images has been far more difficult. This is highlighted when making a comparison between the poor quality cassettes made by the official teams and the very clear images available on the independently shot cassettes, both of which were shot with similar equipment.
- There is a disturbing lack of continuity in the cassettes due to the large number of tape cuts. These tape cuts appear to have been made at different times and with different levels of competence. The cuts vary between very clean, single frame cuts with no interference on screen, to long pieces of interference and on several occasions the contents not only change location but go back in time and date. The worst example of this type of cut occurs on the most recent cassette from 1996 that jumps back in time nearly two months. Very few of the tape cuts that have been documented in this report occur in locations where victims could be, or are located, and they are not due to technical issues, leaving no apparent reason for their existence.

- The fact that the tape cuts repeatedly occur in the same areas of the vessel on different cassettes from different times and dates does not allow us to generate full documentation of a very serious casualty. This is a particular concern as the areas that lack documentation are very important to the investigation and include the Starboard mudline and car deck.
- The cassettes made in August 2000 are the clearest evidence of the massive amount of activity that has taken place on the wreck site without any cameras being present. Due to tape cuts and poor quality duplication, the initial investigation of the cassettes from 1994 and 1996 was made much more difficult and only raised more questions. Having reviewed the high quality and un-cut cassettes from 2000, we are able to show that extensive activity has taken place in the most important areas of investigation on the vessel, especially around the bow ramp and the Starboard mudline.
- The time comparisons detailed in this report illustrate that the activity of some of the ROV's and divers visible on the cassettes supplied is not documented in its own right due to lack of tapes or tape cuts. On several occasions this un-documented activity is in areas where there is a lack of overall documentation, including the car deck and bow ramp locks. This is of particular concern where divers using different equipment and not using cameras are visible.

Conclusions regarding this casualty are almost impossible to make until the full un-edited cassettes are released for independent investigation. The fact that no one from the Joint Accident Investigation Commission of Estonia, Finland and Sweden is willing or able to produce this evidence is highly suspect.

B. Other Sources of Information.

6. Introduction.

Due to the nature of the casualty, and the various theories that have been presented including explosives and explosions, it would be possible to use remote sensing devices to introduce additional evidence.

Three different types of sensor could help the investigation, underwater listening, seismic and satellite. All three could offer valuable information and two could offer definitive proof of an explosion.

7. Underwater Listening.

Over many years the US Navy deployed a network of underwater sensors to track Soviet submarines. Named SOSUS, these devices are very sensitive and are present in almost every ocean around the world. SOSUS is highly sensitive and is capable of hearing the slightest noises including propellers, boats launching and whale calls. The US also has the experience to be able to distinguish between specific contacts and background noise. This includes the identification of explosions and collisions.

In recent years the US Government has allowed public access to allot of the SOSUS information. This has been used for a global survey of whale populations and other scientific research. However as yet they have not declassified the information recorded from the Baltic. Having contacted the US Navy it was confirmed to me that this information was as yet un-available to the public. It may be possible to make a special application for the information in light of the special circumstances of this investigation.

8. Seismic Sensors

Throughout the world, arrays of Seismic sensors exist. In the Baltic region alone there are more than thirty sub stations and two main stations, one in Kongsberg, Norway and one in Kevo, Finland.

Since the introduction of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The International Data Centre in Vienna has been collecting data from around the world to ensure that Nuclear testing is not taking place. As signatories to the CTBT, Sweden, Finland and Estonia all contribute to the Data Centre. This information is very comprehensive and the interpretation of it is highly advanced. The ability to differentiate between explosions and seismic activity has existed for many years. The sensors are also sensitive enough to pick up minor explosions both on land and at sea.

Although allot of information is available to the public, the interpretation of it is very complicated. The enquires I have made have resulted in large amounts of data that needs to be viewed by a seismologist to be understood.

9. Satellite

The multitude of satellites that orbit the world collect an enormous range of information. This includes weather data, temperature changes, photographic images, infrared traces and other readings. There are several satellites that view the North of Europe constantly and some of these have infrared sensors capable of identifying quite small objects. These satellites also have other sensors that I do not the capabilities of.

As with the Seismic data, there is allot available to the public, it is however highly specialist and difficult to interpret.

10. Conclusions.

In the case of such a serious casualty I believe that it is worth investigating additional sources of information that may help the investigation. This is especially important as the existence of an explosion or collision during the casualty is being investigated. The data from these different collection methods could prove the existence of an explosion or collision beyond doubt.

However, due to the casualty taking place in the Baltic, there is one complication. The US controls allot of the information collected from the systems described above. The Baltic has always been a very sensitive area for the US and it has yet to declassify the information from the area.

It may be possible to submit a specific and detailed request to the US authorities for the brief period when the casualty took place. If the US would release the SOSUS information for that period it could prove beyond doubt the existence of an explosion or collision.