

SUPPLEMENT No. 521

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ESTONIA's shedule, ETA-PILOT and NaviSailor 2100.

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The International Accident Investigation Commission of
MV ESTONIA.

Kari Larjo
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**ESTONIA's shedule,
ETA-PILOT and NaviSailor 2100.**

ESTONIA's master notified the officer of the watch a few minutes after 01.00 that ESTONIA was one hour late. The automatic speed control ETA-Pilot and the navigation computer NaviSailor 2000 were able to give this information with ease. Master's statement is an important hint about the last discussions on the bridge.

Testimonies about being late.

The trainee second officer was on the bridge before the midnight and the master was there also. The master remarked that the vessel was late but he did not mention any specific time for it (Turku 29.09.94).

The AB seaman of the watch testified in Gothenburg the 31th march 1995 that captain stated prior the accident that the ship was one hour late. The hearing was documented by Kari Lehtola (in finnish) as follows:

- * The AB seaman left the car deck for the bridge at 00.50 where he arrived about 01.00.
- * The AB seaman was present when the captain arrived to the bridge. The captain asked how many main engines were on. He noted also that the vessel was about on hour late. The discussion was between the captain and the mate.

The information was in fact very precise and not 'about one hour' as the AB seaman heard it.

Background.

ETA-Pilot is an automatic propulsion control device. It was installed on m/s Viking Sally after her delivery from the shipyard in Papenburg. The installation took place between the years 1981-1984 when the vessel was sailing between Turku and Stockholm.

NaviSailor 2000 (Trans Marine, UK) is a navigation computer with electronic chart, route planning facility and an online GPS function. The system was delivered to Estline 26.01.93.

The ETA-Pilot speed control.

The ETA-Pilot has three operating modes.

1. **The Consumption mode** is utilized in tanker and bulk carrier traffic. This mode is unsuitable for passenger traffic tied to tight schedules.
2. **The Speed mode** adjusts the propeller pitch automatically to maintain the selected speed.
3. **The Estimated Time of Arrival (ETA) mode** employs a user defined speed profile. The speed is programmed between the Way Points and they are restricted for legal speed limits, for squat in shallow water and for fairway bends. The speed is free on the open sea passage and the computer uses vessel's maximum speed as an upper limit. Required time of arrival is fed in the computer and the Eta-Pilot will answer if it will be achieved or how much the vessel be late.

Captain **Anders Andersson** employed by the Hornet company told the commission (07.08.1995) that 'the ETA Pilot was normally used' ('Man kör normalt med ETA-Pilot'). He did not define the operating mode.

Captain **Bengt Skogberg** the master of m/s Mariella told Kari Larjo (12.09.1996) that the ETA-Pilot speed mode was used even in heavy wether. ETA-Pilot worked safely in heavy seas when the speed command was low enough. Captain Skogberg stressed that the ETA mode should newer be used in heavy sea because the automatic control would use too much power to keep the vessel on the schedule.

Technician **Leif Hagner** from Vaasa revealed (30.09.96) that the Raytheon Doppler speed information was unreliable. Mr Hagner connected the GPS speed to the ETA-Pilot when Estonia sailed for Silja Line between Vaasa and Umeå as Wasa King. With reliable speed information ETA-Pilot operated satisfactory.

The NaviSailor 2000 navigation computer.

ETA is always visible to the next the WayPoint. The default speed is zero for the open sea passage and for the archipelago the speed limits and the allowance for the shallow water are programmed into the WayPoint database. NaviSailor utilises the GPS Speed Over Ground to calculate the time to the next WayPoint.

The reconstruction of the time schedule at 01.00hrs.

Time schedule at 01.00hrs in normal conditions.

Normal condition means low sea state and average speed 17.0 knots from Naissaar to the Swedish archipelago. Estonia was 7 minutes late at 01.00hrs compared to her normal schedule. This means that captain Andresson did not compare the situation at 01.00hrs to the normal condition.

Time schedule check with the chart work.

To solve the time schedule problem on the chart the master had to measure the distance from the position at 01.00hrs to the entrance of the Swedish archipelago. He estimated most likely that the distance to Armbågen could be covered with the speed at the moment 14.5 knots. After Armbågen the sea state should have decreased and the appropriate speed should have been 17.0 knots to Söderarm. From Söderarm to Marö the fairway is sheltered and there are no speed limits an maximum speed 19.0 knots should have been safe. This graphical solution should have revealed that the vessel was 34 minutes late. The graphical method was too cumbersome. It is doubtful if the master had time to use this graphical method during the short time the AB seaman and the master were simultaneously on the bridge.

Time schedule check with the ETA-Pilot.

One can use ETA mode as a calculator. The ETA-Pilot should have utilised the actual speed 14.5 knots as maximum speed for the remaining distance to the Way Point where the speed limit of 12.0 knots begins at 01.00hrs. The ETA mode would have informed the master that the vessel was 1 hour and 3 minutes late. His comment that Estonia was one hour late was very accurate.

Time schedule check with the NaviSailor 2000.

The easiest way to find the ETA to Stockholm was to enter the Stockholm WayPoint number and the present Speed Over Ground (SOG) as set speed in the computer. The NaviSailor should have informed at 01.00hrs that the vessel was 1_{hr} 3_{min} late. According to the NaviSailor operation manual (version 09/93) it takes only few keystrokes to get the data:

- <F2>
- ETA/Calc
- WayPoint number
- Speed (in this case 14.5 knots)
- <Enter>

Conclusion.

The master noted about 01.00hrs that the vessel was one hour late from her schedule. His comment is very accurate and relates to the method the automatic speed control ETA-Pilot and the navigation computer NaviSailor 2000

calculate the schedule. According to the reconstruction she was one hour and three minutes late at 0100. It is likely that the master got the information from the navigation computer which was online to the GPS position fixing system. Master's concern about the schedule reveals that he was not aware of the state of the bow visor at the moment.