Case study: Navigation Performance Monitoring by EDA

Whenever an accident occurs at sea, the competence and quality of the mariners is often criticized. However it is too late to do anything and the consequences and cost can be huge in both lives and money. We will show in this article how a dramatic reduction of near accidents was accomplished within few months using the EDA.

The practice of investigating every near-miss event is common in aviation, but unheard of in the maritime industry. At the same time, major accidents due to human errors are increasing, including groundings and collisions that cost lives, pollute the seas and lose property. Complaints about deteriorating level of seafarers are very common, and can be heard of at any marine conference or gathering, but no real action is taken to check the current navigation performance in order to assimilate navigation safety standards. Training is of course very important, but is obviously not enough. What else can be done?

The solution Totem Plus came up with is simple: analyze the navigation data from VDR and/or ECDIS, find the events that are considered not safe and should have not happened, and instruct your ships that it is not the standard you want on your vessels. The solution is called EDA, short for E-navigation Data Audit, and it enables fast and easy determination of Near Misses as well as analyzing navigation data.

A pilot project for the EDA is underway for several months. The first data to be analyzed was for March 2016, of a ship sailing from the Suez to Germany. 18 events of close proximity ("Near-collision") were discovered, with 4 of them showing clearly severe breach of the International Regulations for Preventing Collisions at Sea (COLREGS). As expected, after sending the EDA report to the ship early in April, there were NO such events in April when the ship sailed back to Suez. Similar safe conduct was observed also in May during a voyage from Suez to the Far East.

The program is friendly and its use is intuitive. The user can define the criteria that he wants to find by using recorded information such as speed, depth, distance from other ships etc. (distance can be calculated from either AIS or ARPA). "Near collision", for example, can be defined as an event where another ship passed at a distance smaller than 0.4 miles, while steaming at speed greater than 15 knots and at a depth greater than 30 meters (see picture 1). Speed and Depth values are so chosen to limit the findings to open sea and to filter out entry to ports etc. Other events (such as near grounding) can be declared at will. Once the criteria for the search are defined the program will search all available data files to find a possible match. The criteria can also be given a title and be saved for future use.

Hanevieim 6 Ramat Hasharon Israel 47279 T:+97235497295 F:+97237602722 Email: totemplus@totemplus.com www.totemplus.com

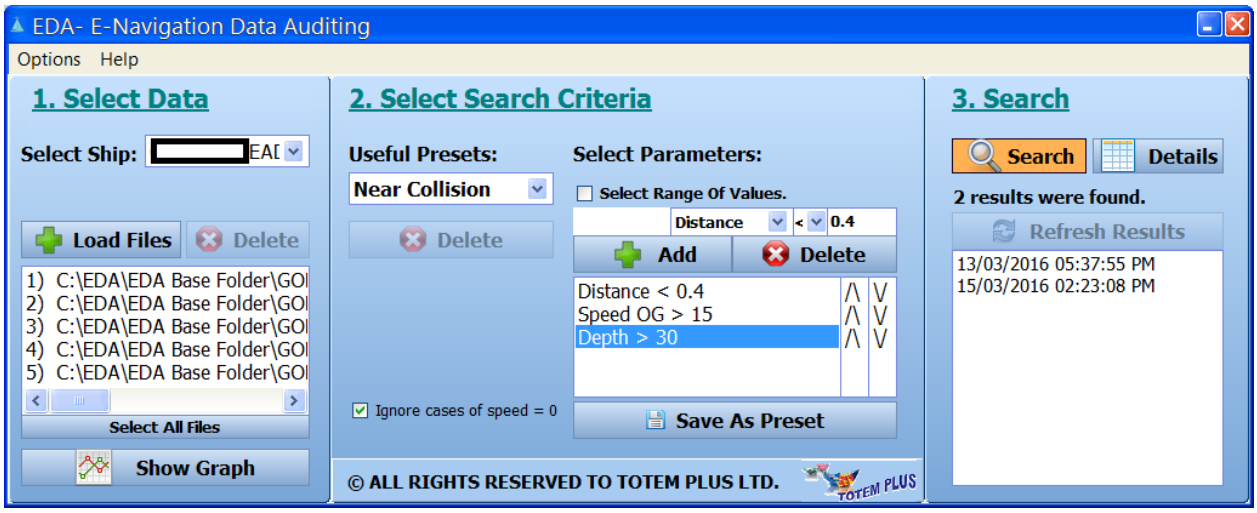

Figure 1: Search for Near Collision.

In the example in figure 1, showing a search for “Near Collision”, two events matching the requested search parameters (as defined above) were detected. Replay of the exact data showed that one event is justified, while the other event showed clearly that the ship was violating the International Regulations for Preventing Collisions at Sea.

The full list of the 18 incidents discovered during the first month of the case study (March 2016) is shown in Figure 2. Analysis of these events showed 4 events were the vessel violated the regulations:

1. Not giving way to a Fishing vessel crossing from Starboard, forcing the other vessel to alter course and speed. Close proximity detected was 0.36 miles.
2. Mixed action (first turn to starboard then turn to port) resulting in close proximity (0.36 miles) to an ARPA target.
3. Mixed action on an ARPA target resulting in close proximity (0.23 miles). Target had to change course - possibly to avoid the vessel under investigation from passing close on the target’s stern.
4. Not giving way while overtaking in a separation zone, forcing the other vessel to increase speed to 19 knots in order to pass clear. Minimum distance recorded was 0.08 miles.

A similar search for “Near Grounding” is given in Fig.3, showing a ship sailing in 15 Knots over very shallow waters – less than 2 meters - something to be frowned at.

Results Information . Double click to see details of a specific result.

	Time	Position Long	Position Lat	Wind Direction	Wind Speed	ROT	Depth	Speed OG	Course OG	Heading	Target Number	Distan	Bearing	COG Of Target	SOG Of Target
1	22-03-2016 13:05:47	002° 39.182' E	49° 53.254' N	345.00	10.50	-2.80	57.40	17.00	75.50	73.90	ARPA 67	0.08	109.10	72.40	15.14
2	22-03-2016 13:07:11	002° 38.586' E	49° 53.353' N	14.00	20.20	0.00	57.90	17.10	75.70	74.10	ARPA 67	0.13	96.90	75.70	18.94
3	21-03-2016 18:14:21	002° 52.165' E	51° 28.297' N	345.00	20.50	-0.80	18.20	16.00	245.90	245.10	AIS 236597000	0.21	323.19	64.80	12.10
4	22-03-2016 11:00:49	003° 33.357' E	49° 48.703' N	329.00	13.60	-6.20	64.10	17.20	96.30	92.20	ARPA 17	0.23	181.80	27.30	1.44
5	17-Mar-16 00:23:10	007° 34.337' E	33° 56.736' N	345.00	12.00	0.00	117.00	16.90	177.40	176.90	ARPA 27	0.26	10.00		
6	10-Mar-16 15:34:53	014° 33.198' E	43° 44.779' N	74.00	28.10	2.10	74.20	16.40	314.60	316.20	ARPA 17	0.26	77.30	268.40	11.64
7	31-03-2016 17:36:10	007° 53.522' E	53° 52.103' N	59.00	25.80	0.90	13.00	16.70	281.50	282.30	AIS 211464260	0.26	192.14	113.00	1.50
8	02-Mar-16 06:01:19	033° 22.312' E	28° 09.684' N	345.00	14.00	-0.60	56.80	15.80	317.00	316.10	ARPA 37	0.29	241.30	141.20	0.70
9	23-03-2016 03:34:13	002° 56.522' E	51° 22.542' N	329.00	21.50	2.30	10.30	16.70	68.80	70.00	AIS 256021000	0.29	353.50	268.90	10.80
10	31-03-2016 17:21:20	008° 00.340' E	53° 51.250' N	59.00	24.40	0.00	13.40	16.50	282.50	282.50	AIS 246650000	0.30	6.72	100.10	13.50
11	31-03-2016 18:39:36	007° 24.186' E	53° 50.800' N	104.00	13.60	-4.50	18.40	16.70	261.20	261.00	ARPA 27	0.30	169.60	284.40	3.34
12	02-Mar-16 12:22:04	032° 34.701' E	29° 37.446' N	104.00	4.30	-1.90	40.20	15.10	351.70	352.10	ARPA 77	0.31	251.00	351.80	11.75
13	22-03-2016 10:27:22	003° 47.507' E	49° 49.720' N	14.00	16.90	1.30	66.00	15.10	74.90	74.90	ARPA 37	0.32	175.20	257.10	3.46
14	22-03-2016 21:01:07	000° 53.979' E	50° 27.270' N	14.00	22.10	-1.10	36.00	17.90	65.40	64.90	AIS 227314310	0.32	347.32	344.30	3.00
15	15-Mar-16 14:23:08	000° 26.401' E	38° 47.698' N	29.00	16.30	12.20	147.70	15.60	200.50	202.10	ARPA 87	0.33	82.30	276.10	10.49
16	02-Mar-16 03:30:51	033° 53.694' E	27° 41.658' N	345.00	22.50	0.00	36.90	16.00	310.00	310.20	ARPA 37	0.34	212.00	82.40	7.17
17	13-Mar-16 17:37:55	009° 25.632' E	38° 27.252' N	59.00	16.90	-5.10	55.60	19.30	283.40	283.90	ARPA 17	0.36	29.20	151.90	8.24
18	22-03-2016 19:48:31	000° 20.754' E	50° 21.683' N	329.00	20.30	0.10	37.80	18.40	80.50	80.10	ARPA 57	0.36	128.60	78.30	13.44

Figure 2: Full list of close proximity during March 2016

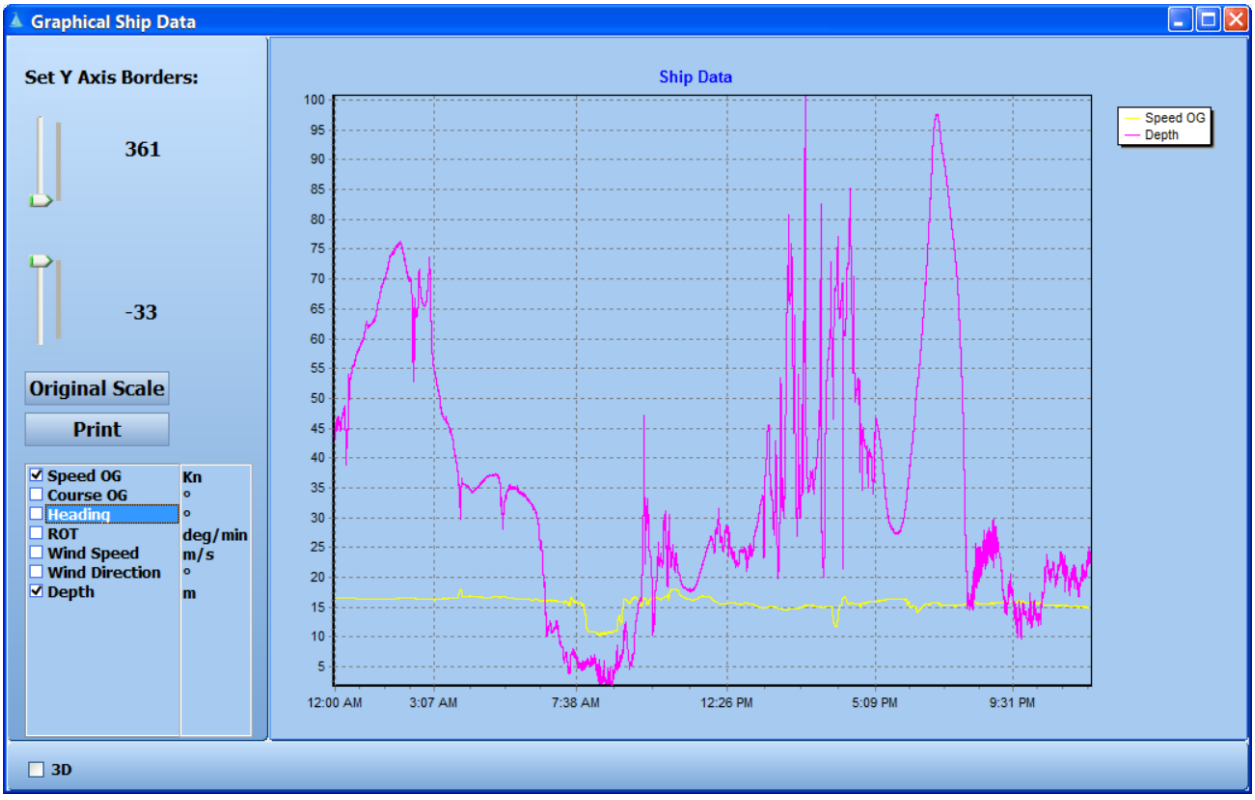

Figure 3: Graphical comparison of recorded information can be helpful.

The above examples show clearly that monitoring the way ships are navigated is needed in order to educate the seafarers and **enhance the required safety standards**. The idea behind EDA is not to find culprits and punish them but to inform the sea farers what are the standards the owners want to keep. Using EDA can therefore help in reducing major accidents due to human errors and can help to avoid their unnecessary tragic outcomes by implementing and adhering safe navigation standards.

As mentioned above, the case study showed marked improvement in Crew performance between March 2016 (start of the pilot project) and May 2016, after the ship was advised on the March findings.
The reports can be seen in
http://www.totemplus.com/extras/EDA_Report_Name_not_disclosed_March2016.pdf and
http://www.totemplus.com/extras/EDA_Report_Name_not_disclosed_May_2016.pdf .

In May report you can also see some preliminary analysis of bridge sensors performance.

EDA is given freely with every TOTEM ECDIS or TOTEM VDR, and the analysis can be done by the owners themselves or as a service by Totem Plus.