TRANSNAV
http://www.transnav.eu
the International Journal
on Marine Navigation
and Safety of Sea Transportation
Volume 10
Number 1
March 2016

DOI: 10.12716/1001.10.01.12

Position Cross-Checking on ECDIS in View of International Regulations Requirements and OCIMF Recommendations

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ABSTRACT: In this paper author suggest methods for position cross-checking on modern bridge equipped with ECDIS. Terrestrial navigation techniques in relation to newly implemented technology are adopted to fulfil international requirements and recommendations. Author proposes voyage recording procedures conforming to IMO requirements ready to be used as navigational procedures in Safety Management System. Vessel Inspection Questionnaire of Ship Inspection Report Programme is used to systematize the needs. Differences in approach between paper charts and ECDIS navigation are exposed and clarified serving as a guide for ships liable to undergo vetting inspection. Author shows both, advantages and weak points of various ECDIS features using as an example ECDIS manufactured by Japan Radio Company.

1 INTRODUCTION

Worldwide shipping industry is approaching the end of ECDIS implementation process on board ships. Unlike the other aspects of vessels operation procedures instructions related to ECDIS are not fully established what often creates uncertainty especially when the vessel is about to undergo vetting inspection.

In addition to other inspections and audits tanker vessels are subjected to be assessed by OCIMF Ship Inspection Reporting Programme. The Oil Companies International Marine Forum (OCIMF) is a voluntary association of oil companies having an interest in the shipment of tankers [9]. OCIMF formation commence in 1970 when major oil companies bond together to attain stronger influence in the international rules forming process. As for today (2016) 94 members are part of OCIMF. Wide experience in hydrocarbons transport is an excellent foundation for professional guidelines published by OCIMF. Even though those guidelines are only recommendations not the international rules they tend to set worldwide standards for tanker shipping industry. Besides extensive list of publications OCIMF has built a database of worldwide tanker fleet which consist detailed reports with regards to safety management systems. Ship Inspection Report Programme (SIRE) was established in 1993 and more than 180000 inspection reports have been prepared since then. SIRE database is a great tool for ship operators in process of selecting particular tanker for charter. Positive result of SIRE inspection is a clear indication that vessel is well maintained in accordance to safety international standards. SIRE examiners use the specific guidelines for carrying out inspections. Those guidelines named Vessel Particulars Questionnaire (VPQ) and Vessel Inspection Questionnaire (VIQ) are set of questions to be answered during inspection. Each question has a background in commonly recognized rules; for instance SOLAS, IGC Code, Bridge Procedures Guide, FSS Code, LSA Code, MARPOL, IMDG Code. Direct references leave almost no room for individual often subjective inspector interpretation. At present ECDIS related procedures are not completely settled what causes frequent confusions about its usage. It is an interest of all parties involved to agree on international standards and procedures for ECDIS service.

2 POSITION FIX AND POSITION CROSS-CHECK

ECDIS introduction changed the view at position fixing on board modern ships. Beside other benefits, unlike with paper charts navigation OOW can focus on the navigational situation without interruption for continuous position plotting. GNSS derived position (usually GPS) is unceasingly plotted on the ECDIS screen and the whole system is based on number of sensors which must be cross-checked by other means to keep the ship on the safe side [7]. ECDIS used in conjunction with traditional navigation methods like visual, radar, and celestial observations gives an overall perception of the current situation [11].

It is an imperative to understand the difference between position fixing and position cross-checking definitions. When paper charts were in use position fixing term apply as it was plotted on the chart manually by OOW. Position co-ordinates were obtained from GPS, radar or by visual observations and then plotted on the paper chart by navigating officer. Situation was pretty straight-forward: fix position and plot it on the chart. Nowadays when working with ECDIS ship's position is fixed and plotted on the chart continuously and OOW is responsible for cross-checking of position derived from GNSS receiver.

2.1 *Position cross-check intervals*

When using paper charts term position fixing interval meant how often position should have to be plotted manually on the paper chart by OOW. Additionally there was a requirement for confirming GPS derived position accuracy by use of other position fixing methods at intervals frequent enough not run into the danger in the time between fixes. At present, while using ECDIS position fix interval definition does not apply as fixing is already done and position is plotted unceasingly. Today we can say only about position cross-checking interval.

Table 1. Position fixing and cross-checking intervals

<table>
<tr><th></th><th colspan="2">GPS derived position</th><th colspan="2">Visual, radar, celestial, position</th></tr>
<tr><th></th><th>Plotting method</th><th>Required interval</th><th>Plotting method</th><th>Required interval</th></tr>
<tr><td>Paper charts</td><td>Plotted manually by OOW</td><td rowspan="2">Vessel cannot run into danger during the interval between fixes</td><td rowspan="2">Plotted manually by OOW</td><td rowspan="2">Not specified</td></tr>
<tr><td>ECDIS</td><td>Plotted Automatically by ECDIS</td></tr>
</table>

Evaluating question no. 4.26 in OCIMF Vessel Inspection Questionnaire it can be seen that interval for GPS position cross-checking by other methods is not precisely identified. It says that *"At least two methods of position fixing should be charted,* ***where possible****. Visual and radar position fixing and monitoring techniques should be used* ***whenever possible****. GPS derived positions* ***should always*** *be verified by alternative methods"* [8]. It is essential to specify position cross-checking intervals within Navigational Procedures in Safety Management System [13]. Let's study an example extracted from one of the major oil shipping companies' navigational procedures. Whilst the vessel was on the open ocean the position fixing interval set by company policy was one hour. This interval decreased gradually as the vessel approaches the land. When navigating in confined waters with pilot on board the interval for position fixing was set on 3 minutes. As a result navigating officer was required to plot the position manually (using mixed methods GPS, visual or radar) at very short intervals in order to navigate safely and conform to Safety Management System procedures. Situation becomes unsafe especially during night time when officer was forced to be a multitasker and focus in the same time on collision avoidance, monitoring the helmsman response on pilot's orders, reporting to VTS stations and other duties. OOW was constantly shifting between the chart room and conning position testing his rapid eye accommodation skills. In order to support bridge team it was quite common to engage another officer just for position plotting but it leads to work/rest hour's issues when arriving in port. SIRE inspectors are very sensitive about hours of rest regulations and studying VIQ question no. 4.9 it can be noted that bridge manning is underlined there *"Inspectors must take into account the impact of additional bridge manning upon the work load of any individual and impact of hours of rest regulations"* [8]. ECDIS introduction changed this ridiculous situation and improved safety of navigation significantly. OOW finally can focus on the navigational situation having advantage of real time position plotting on ECDIS display. What remains to be specified is a position cross-check interval. It is quite common that position cross-checking intervals are simply copied from previous position fixing interval requirements applicable for paper chart navigation. Lack of understanding of ECDIS system and advantages which comes with it leads to dangerous situation when navigating officer is required to cross-check his GPS position at absurd intervals. Once again, position fix interval and position cross-check interval are not the same things. Main goal of ECDIS introduction on board the vessels was to lessen the workload and improve navigation safety. GNSS derived position must be checked - no question about it, but cross-checking it every 3 minutes is like moving back to paper charts age. It is futile to keep continuous double positon monitoring. If GNSS is not to be trusted for a few minutes then what is the point of using ECDIS.

As a conclusion, the last sentence in VIQ question no. 4.26 *"The frequency of position fixing should be such that the vessel cannot run into danger during the interval between fixes"* [8] is always satisfied while working with ECDIS as the position is fixed continuously and the distance passed between fixes is always lesser than the distance to the closest danger.

3 VOYAGE PLAN STAGES

Question no. 4.25 in SIRE Vessel Inspection Questionnaire is a bit tricky. It states "The following should be marked on the chart, where it enhances safe navigation: (…) Methods and frequency of position fixing; (…) In the event that ECDIS is the primary means of navigation, the above should be taken into account" [8].

For ECDIS users term *should be* is degraded by the expression *should be taken into account*. It means that elements of passage plan required on the paper charts are not exactly the same as those required for passage plan prepared on ECDIS. For instance methods and frequency of position fixing markings cannot be done in the same way on electronic and paper charts. While using paper charts position fixing marking procedure is well known to everyone and does not require further explanation. On ECDIS where displayed chart scale is often changed sentence should be repeated endless times in one area in order to be visible at all times. Constantly repeated information about position cross-check frequency and its methods can result with cluttered chart picture therefore it is necessary to solve this issue in a different way. One of the methods is to split the route into the segments (Open Sea Navigation, Coastal Navigation and Confined Waters) and assign them with clear instructions in regards to frequency and methods of position cross-checking [5].

3.1 *Open Sea Navigation - definition and methods for ship position checks*

Open Sea Navigation could be defined as part of the ships voyage plan where no land is in vicinity [5]. At this stage ships position is obtained with use of GPS and could be confirmed either by Celestial Fixes or by comparison between GPS receivers. ECDIS users will take an advantage of having two GPS receivers what is required by IMO on every vessel equipped with two independent ECDIS stations [3].

3.2 *Coastal Navigation - definition and methods of ship position checks*

Coastal Navigation definition apply for the areas where vessel is closer to shore and radar or visual objects are available for GPS position cross-check. When navigating in coastal waters OOW duty is to employ Radar Overlay feature and terrestrial navigation position fixing methods to confirm accuracy of positions derived from GNSS plotted automatically on ECDIS [11]. In addition, comparison between two GPS receivers should be performed with use of the same methods as for Open Sea Navigation; that means secondary position symbol or secondary track display should be enabled as well as difference between positions alarm.

3.3 *Confined Waters - definition and methods of ship position checks*

Confined Waters or Pilotage Waters is a part of voyage plan where ship is in the area of shallow waters having limited room to navigate.

Confined waters examples:

- Canals
- Lock systems
- Rivers leading to port
- Confined areas among islands and reefs
- Waterways
- Traffic Separation Schemes
- Bays
- Harbors
- Port approaches

There is no rigid distinction between coastal and confined waters and the limits of those are to be set by Navigating Officer while preparing the Passage Plan. Since the utmost accuracy is essential throughout Confined Waters navigation, position cross-check frequency should be gradually increased [10].

3.4 *Voyage plan stages - methods of ship's position checks - summary*

Table 2. Position cross-checking summary

Voyage Plan stage	Visual comparison between two GPS receivers	Calculated comparison between two GPS receivers	GPS position accuracy confirmed by Visual/ Radar observation	GPS-position accuracy confirmed by Radar Overlay
Ocean Navigation	YES	YES	NO	NO
Coastal Navigation	YES	YES	YES	YES
Confined Waters	YES	YES	YES	YES

4 POSITION CROSS-CHECK METHODS

4.1 *Visual comparison between two gps receivers*

GPS positions could be compared visually or by calculating the difference between indicated co-ordinates. Secondary position source symbol must be displayed on the JRC ECDIS screen in order to check visually that positions derived from two GPS receivers match each other. Other manufacturers (i.e. Furuno) provide the function of displaying primary and secondary past tracks. With both systems OOW is able to see at glance that GPS positions correlates by confirming that either symbols or tracks seen on the display overlap each other.

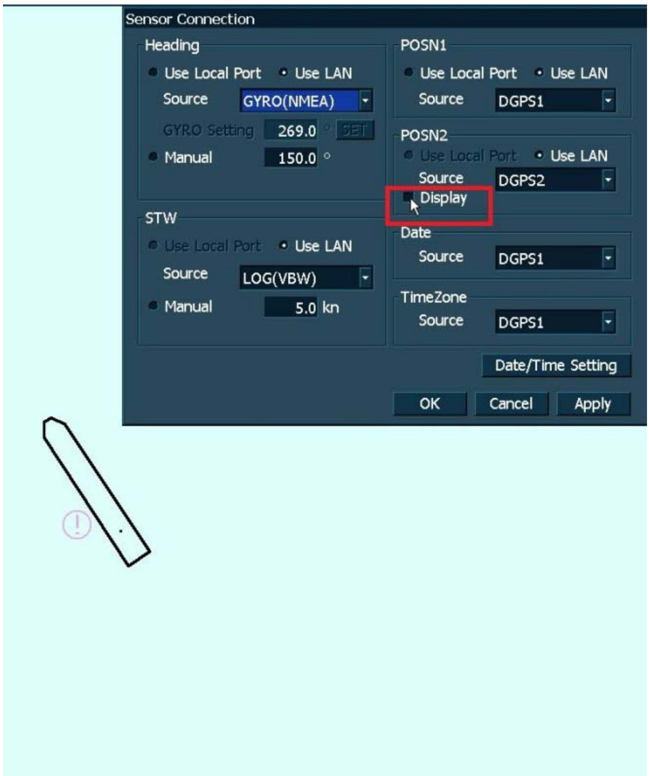

Figure 1. Secondary position symbol not displayed on the chart

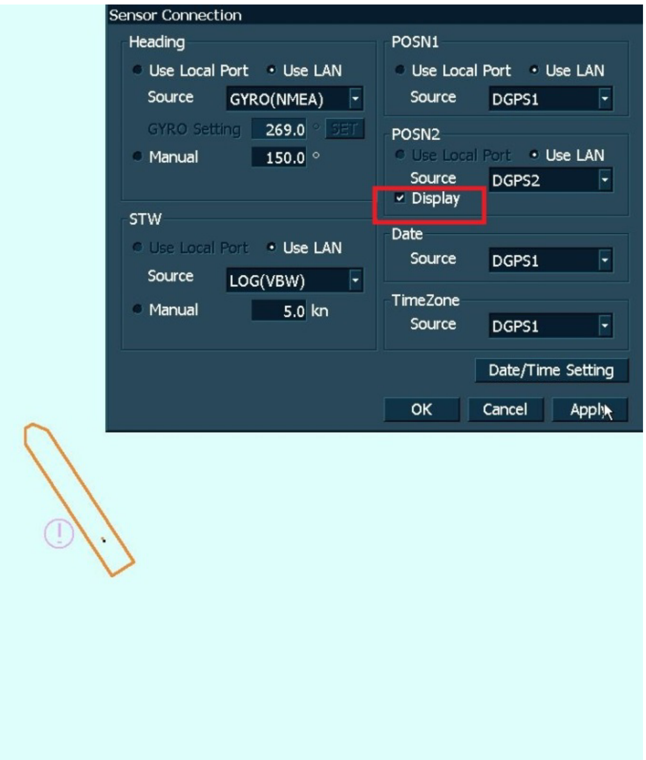

Figure 2. Secondary position symbol displayed on the chart

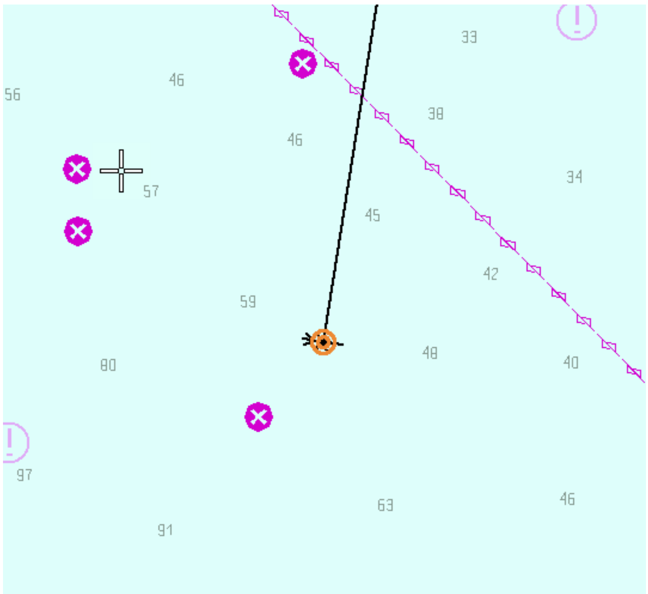

Figure 3. Two position symbols in proper correlation

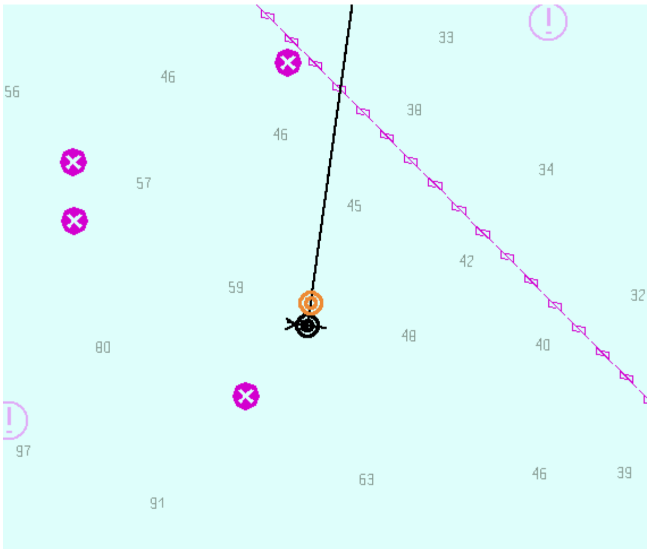

Figure 4. Position symbols not correlated

4.2 *Calculated comparison between two gps receivers*

Mathematical comparison between co-ordinates derived from two GPS receivers is performed unceasingly by ECDIS. OOW is warned by audio-visual indication every time when difference between positions exceeds preset value.

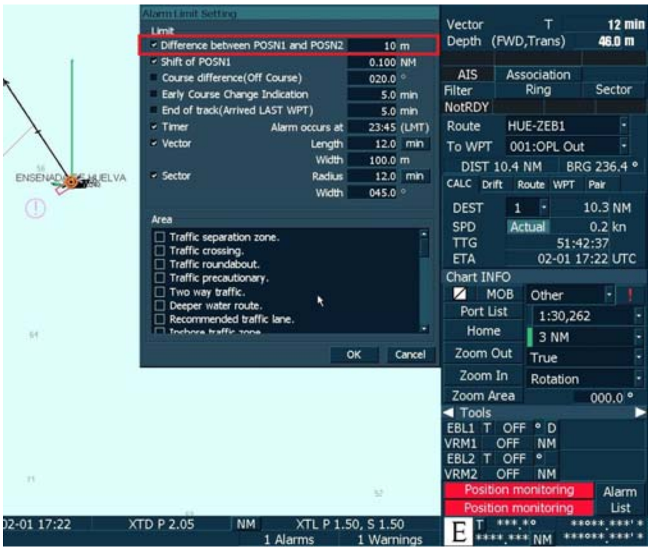

Figure 5. ECDIS alarm triggered by excess difference between positions

4.3 *Radar Overlay*

Radar Information Overlay (RIO) superimposed on ECDIS screen is one of the techniques satisfying necessity for GPS position cross-check when navigating within Coastal or Confined Waters. Beside of GPS position accuracy check RIO offers another advantageous feature that is sensor check. RIO is recognized by British Admiralty as the most immediate indicator of system accuracy [11]. When radar overlay matches charted features displayed on ECDIS screen it means that sensors connected to ECDIS works properly. When radar picture overlaid on ECDIS does not match charted coastline there is no reason for panic and immediate doubts in sensors accuracy. Officers need to bear in mind limitations of radars. Firstly coastline reflections generated at sharp angles appear further from shore that they actually are and therefore best interpretation gives a picture observed at right angles. Secondly, radar reflection is dependable on coastline characteristic. Charted flat desert coastline will generate poor reflection and rocky cliffs will give strong and evident echoes [2].

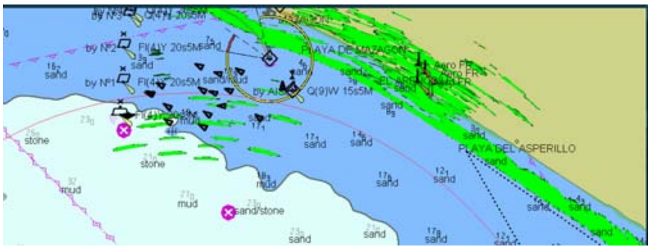

Figure 6. Radar Overlay not aligned with displayed chart

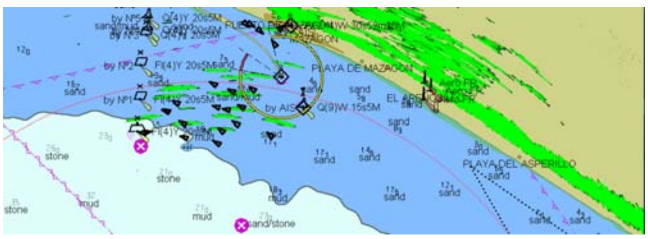

Figure 7. Radar Overlay not aligned with displayed chart

Figure 8. Radar Overlay not aligned with displayed chart

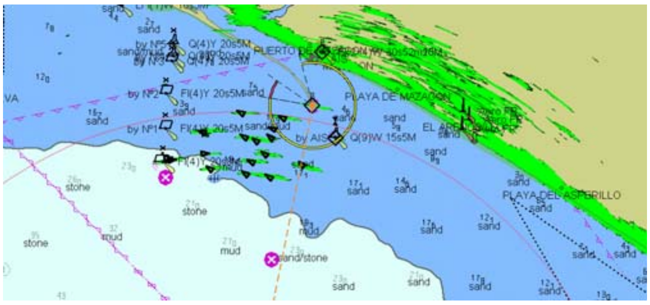

Figure 9. Radar Overlay correctly aligned with displayed chart

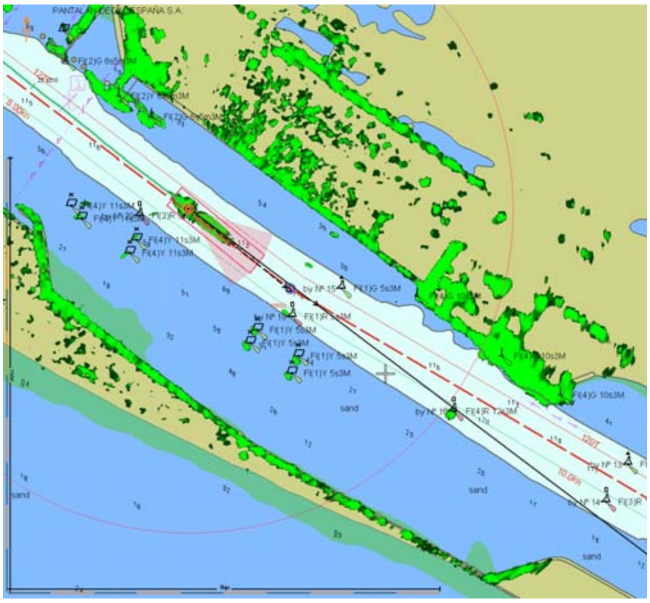

Figure 10. Radar Overlay correctly aligned with displayed chart

It is essential to adjust displayed radar picture as to not clutter presented chart data. Incorrectly adjusted radar overlay reduces navigation safety instead of improving it [12]. ECDIS provide features of various setting modifications to radar overlay.

JRC ECDIS offers following functions related to Radar Overlay:

- Radar Overlay transparency adjustment
- Radar overlay color pattern adjustment
- Range rings display
- Bearing scale display
- Gain adjustment
- Sea clutter adjustment
- Rain clutter adjustment

Figure 11. Radar overlay color pattern example on JRC ECDIS

Figure 12. Radar overlay color pattern example on JRC ECDIS

Figure 13. Radar Overlay settings on JRC ECDIS

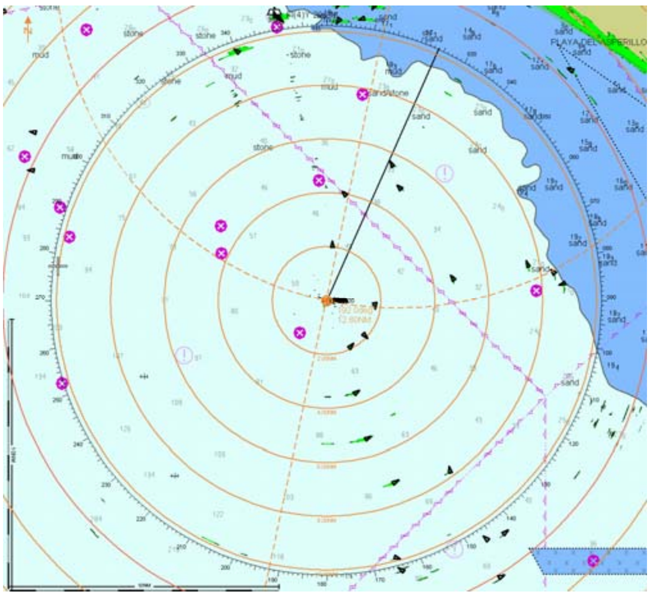

Figure 14 Range rings and bearing scale enabled on JRC ECDIS

4.4 *Terrestrial navigation techniques application for GPS position cross-check*

In addition to Radar Overlay function there are three different methods to confirm accuracy of GPS position while navigating within Coastal or Confined Waters by fixing observed position on JRC ECDIS:

- Visual or radar position fix with use of EBL, VRM features
- Visual or radar position fix with use of Cross bearings function
- Visual or radar position fix with use of LOP function

The whole idea is to combine two methods: traditional terrestrial navigation and newly adopted ECDIS functions. Fix classical observed position with use of new technology.

4.4.1 *Observed position fix with use of EBL, VRM features*

It is the simplest way to cross-check GPS position while navigating with ECDIS. Besides visual confirmation, JRC ECDIS calculates position at the intersection of EBL/VRM. Up to four lines of position can be used with that method; it gives plenty of combinations to fix position manually.

Position from two LOPs:

- Bearing & distance
- Bearing#1 & bearing#2
- Distance#1 & distance#2

Position from three LOPs:

- Bearing#1 & distance#1 + distance#2
- Bearing#1 & distance#1 + bearing#2

Position from four LOPs:

- Bearing#1 & distance#1 + bearing#2 & distance#2

Cross-checking GPS position with use of EBL/VRM is very simple and the procedure is as follows:

- Obtain bearing and distance from first radar mark (two LOPs)
- Obtain second distance to achieve more accurate position (third LOP)
- Transfer them to ECDIS by EBL and VRMs
- Compare association between GPS position symbol and position obtained from transferred radar data. Ensure that positions overlap each other.
- Compare association between GPS position co-ordinates and position obtained from transferred radar data. Position at the intersection of first bearing and distance is automatically calculated and displayed on the screen (marked with red frame on example picture)
- Push “Option” button to make a screenshot
- GPS position has been cross-checked by radar observation, results were saved in HDD and can be copied to any other computer

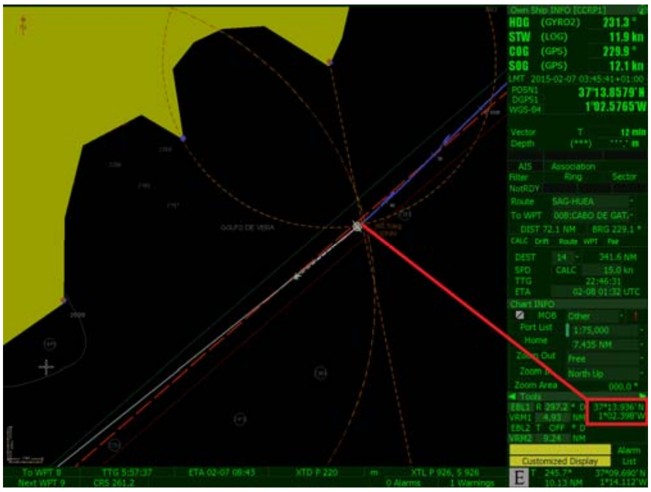

Figure 15. Observed position plotted with use of EBL/VRM on JRC ECDIS

Figure 16. Observed position fixed on JRC ECDIS with use of LOP function

4.4.2 *observed position fix with use of cross bearings function*

This method requires more time but unlike the previous technique with EBL/VRM it offers possibility to fix the position by more than four lines of position. Up to ten cross bearings can be plotted in the same time. Again, screenshot should be saved for voyage recording purposes. This method is useful in some specific instances like fixing position from three visual bearings. Cross Bearing function allows for visual comparison only. Co-ordinates visible on below screen indicate bearing starting position.

Figure 16. Observed position plotted by Cross Bearing function on JRC ECDIS

4.4.3 *Observed position fix with use of LOP function*

That is more sophisticated method of manual position fixing on ECDIS valuable when GPS failure occurs. It enables to set a reference point used for Dead Reckoning. Reference point function causes own ship position to shift and therefore it is not recommended by manufacturer to be used while navigating with properly functioning GPS receiver [1]. Reference point details are saved within ECDIS electronic logbook and can be assessed at any time.

Logbook

No	Time	Voyage DIST.(W)(NM)	Voyage DIST.(G)(NM)	Latitude	Longitude	STW(kn)	Event
87244	02:00:00(01:00+)	5466.9	118.7	37°28.007'N	0°42.514'W	11.9	Time
87245	02:10:00(01:00+)	5468.9	120.7	37°26.689'N	0°44.491'W	12.0	Time
87246	02:20:00(01:00+)	5470.9	122.8	37°25.372'N	0°46.448'W	11.9	Time
87247	02:30:00(01:00+)	5472.9	124.8	37°24.065'N	0°48.407'W	11.9	Time
87248	02:40:00(01:00+)	5474.9	126.9	37°22.732'N	0°50.385'W	12.0	Time
87249	02:40:49(01:00+)	5475.0	127.1	37°22.622'N	0°50.547'W	11.9	Navtex
87250	02:50:00(01:00+)	5476.8	128.9	37°21.412'N	0°52.340'W	12.0	Time
87251	03:00:00(01:00+)	5478.8	131.0	37°20.086'N	0°54.313'W	12.0	Time
87252	03:10:00(01:00+)	5480.8	133.0	37°18.746'N	0°56.217'W	12.0	Time
87253	03:20:00(01:00+)	5482.8	135.0	37°17.366'N	0°58.023'W	11.8	Time
87254	03:27:45(01:00+)	5484.3	136.5	37°16.312'N	0°59.362'W	11.9	Offset
87256	03:28:17(01:00+)	5484.5	136.7	37°16.587'N	0°59.163'W	11.9	Reference Point
87257	03:28:38(01:00+)	5484.5	136.7	37°16.464'N	0°59.316'W	11.9	Offset

Latest 2 Day(s) Filter View Navtex View REF Point Export Jump Column Setting Delete Navtex Input Close

Figure 17. Reference point saved in electronic logbook on JRC ECDIS

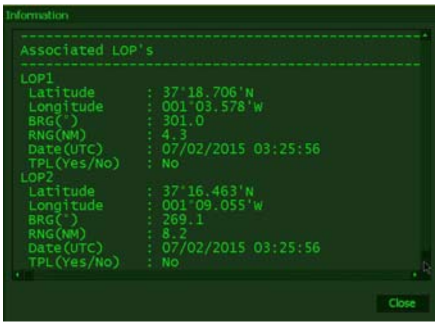

Figure 18. Reference point details saved in electronic logbook on JRC ECDIS

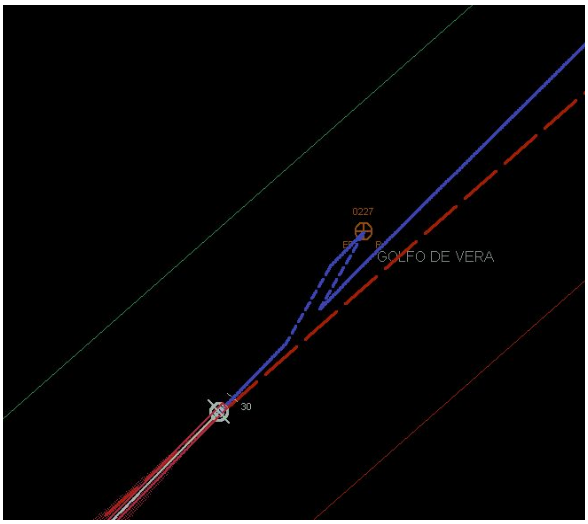

Figure 19. Ships' position shifted by LOP function on JRC ECDIS

5 VOYAGE RECORDS

Regulation 28 in Chapter V of SOLAS Convention obliges vessels to maintain detailed record of navigational activities in order to enable complete voyage review [6]. Paragraphs 4.23 and 4.26 of SIRE Vessel Inspection Questionnaire go even further specifying items to be recorded. One of the points is to keep complete record of GPS positions cross-checked by other position fixing method during last voyage [8]. To satisfy this requirement series of screenshots can be saved on ECDIS HDD. It is a good idea to set "screenshot" function under programmable option button as it will reduce the time required for this simple operation. Saving a screenshot on the ECDIS hard drive is an efficient and easiest way of recording our actions. It can serve as a proof for GPS position cross-checking utilizing observed position fixing, for use of Radar Overlay when in coastal and confined waters, use of proper safety contour settings etc. IMO resolution A.916 (22) requirements are satisfied as it clearly states that voyage recording should be permanent, handwritten, electronic or mechanical.

Furthermore, there is another advantage of making screenshots through the voyage. In that way we built a history of previously maiden trips, for instance if vessel is about to arrive at Ras Laffan waiting anchorage and bridge team is not sure about the congestion in the area it would be very convenient to check screenshots recorded from previous voyage. The last advantage is more psychological than practical. It is a great tool against negligence. Anybody who saves a picture of his ECDIS display will unconsciously care to have it in correct state. That is the way to make sure that Radar Overlay will be enabled in ample time, that safety vector and sector will be set properly etc. Before ECDIS introduction seafarers were collecting bunch of papers in order to comply with voyage history review requirement. At present shipping is in transition period and incorporation of both methods is observed. We use an ECDIS to record past positions but still equipment such as course recorder, echo sounder printer, engine telegraph logger are in use. It is highly possible that in the nearest future when ECDIS become one of the most important navigational tools on the bridge, all this additional gear won't exist anymore as it'll be replaced by electronically saved digital data. The main advantage of data saved within electronic log book is that information is easily referenced to ships position on the electronic chart.

With respect to position cross-checking records required by IMO following procedure could be applied. During Open Sea Navigation stage screenshot to be saved on the ECDIS HDD every hour. Saved screen will proof that comparison between two GPS receivers was done by visual and calculated methods. Additionally it could be seen that Safety Vector and Sector settings complies with applied Management Card. During Coastal and Confined Waters Navigation stages when Radar Overlay is superimposed on chart and navigating officer is required to use visual/radar marks for position cross-checking, screenshot can be saved every fifteen minutes. As mentioned before Radar Overlay is recognized as the best tool for sensors accuracy check, therefore OOW can use this handy feature in combination with visual/radar position fixes. With screen saving schedule shown in below table navigating officer is required to fix observed position every half an hour.

Table 3. Screen saving schedule

TIME	SAVED SCREEN
12:00	GPS accuracy cross-checked by observed position
12:15	GPS accuracy cross-checked by Radar Overlay (evidence that it matches charted features)
12:30	GPS accuracy cross-checked by observed position
12:45	GPS accuracy cross-checked by Radar Overlay (evidence that it matches charted features)
13:00	GPS accuracy cross-checked by observed position
13:15	GPS accuracy cross-checked by Radar Overlay (evidence that it matches charted features)

At present there is a noticeably trend of reducing time between cross-check by radar/visual fixes down to ridiculous intervals of a few minutes. Professionals responsible for company navigational procedures preparation claims that shorter interval between cross-check fixes will keep OOW alert. Better give a can of red bull for those sleepwalkers instead of validating odd rules applicable for whole shipping industry. ECDIS as all the other navigational systems require frequent checks but it is against the whole idea of its implementation to confirm its accuracy at absurd frequency. Same as with GPS receivers there are two gyrocompasses installed on the bridge. Do we check gyro-error every five minutes? It is not necessary because once its accuracy is confirmed we put a trust on it and just monitor for any abnormal behaviour.

Worldwide shipping is in the time then ECDIS related procedures are settled. If rules would be prepared with common sense they won't require to be changed within next years of ECDIS service and won't create headache to OOW working with it. ECDIS is very handy tool but it's easy to exaggerate newly adopted procedures and end up in the situation where bridge team workload increases instead of being reduced. Navigation officer role is to navigate not to carry on constant tests on navigational equipment.

Example (part of Voyage Plan):

"Our route is divided into three areas: Open Sea (far distance from shore, unrestricted speed), Coastal Waters (areas closer to shore, unrestricted speed) and Confined Waters (areas where Safety Contour is marked manually on the charts, speed restricted by squat and allowable UKC). Limits of those areas are marked on the charts. Follow below procedures.

OPEN SEA NAVIGATION

- *Use chart setting: "Open Sea"*
- *Save screen every 1hr*
- *Confirm GNSS position by Celestial observations*
- *Use autopilot "economy" mode, engage hand steering when required*
- *Note in log book times when hand steering /autopilot are engaged*
- *ECDIS to be set as per Open Sea Navigation Management Card*

COASTAL NAVIGATION

- *Confirm GNSS accuracy by Radar or Visual fix at least every 30min*
- *Use chart setting: "Coastal"*
- *Save screen every 15mins*
- *Set Radar Overlay on ECDIS / note time in log book*
- *At least every 15mins confirm alignment of Radar Overlay against ENC displayed*
- *Use Parallel Indexing Technique to monitor ship's movement*
- *Use autopilot "precision1" mode, engage hand steering when required*
- *Note in log book times when passing VTS sectors*
- *Note in log book times when hand steering /autopilot is engaged*
- *ECDIS to be set as per Coastal Navigation Management Card*

CONFINED WATERS

- *Confirm GNSS accuracy by Radar or Visual fix at least every 30min*
- *Use chart setting: "Confined"*
- *Save screen every 15mins*
- *Safety Contour is marked on charts by Limiting Danger Lines*
- *At least every 15mins confirm alignment of Radar Overlay against ENC displayed*
- *Use Parallel Indexing Technique to monitor ship's movement*
- *Use autopilot "precision2" mode, engage hand steering when required*
- *Note in log book times when passing VTS sectors*
- *Note in log book times when hand steering /autopilot is engaged*
- *ECDIS to be set as per Confined Waters Management Card"*

6 CONCLUSIONS

While preparing this paper I was looking for a solution which can be adopted on all ECDIS systems irrespective of manufacturer. One ECDIS is equipped with user-friendly LOP creator, another one has this function so complicated and not user friendly that drawing any line of position requires more time and attention. All ECDIS systems though are equipped with EBL and VRM what is required by International Regulations set in ECDIS Performance Standards [3]. That is why I focus mostly on this method. Moreover, EBL and VRMs are used every day by officers and they have no problems at all in quick and efficient operation with use of those functions. ECDIS is not a new system. Even more – it is hard to imagine for young seafarers that monitoring of the ships position could be performed not in real-time likewise with electronic charts. Electronic aspects which are very similar to those well-known from computer games are very easy to be adopted by young adepts. Officers, who experienced working on paper charts and all tasks related to it, will appreciate the most new tech solutions and see positive difference in navigation officer workload reduction. Looking up for all those changes it can be stated that new generation officers became more computer players than navigators. All right, there is a risk that we all become play station players unless it'll be clear that this is still a ship with human lives on it, where game over means really over and there is no restart button.

LITERATURE

[1] ECDIS JRC JAN-901B Instruction Manual, Japan Radio Company Ltd., 2013.

[2] Fadeev V., Radar Overlay to improve ECDIS [http://www.maritime-executive.com/article/Radar-Overlay-to-Improve-ECDIS-Navigation-2014-09-12], The Maritime Executive, 2014.

[3] IMO MSC.232(82), Adoption of the revised Performance Standards for Electronic Chart Display and Information Systems (ECDIS), International Maritime Organization, London, 8 December 2006.

[4] IMO, MSC.282(86), Adoption of amendments to the International Convention for the Safety of Life at Sea, 1974, as amended, International Maritime Organization, London, 5 June 2009.

[5] Instone M., ECDIS Procedures Guide, Witherby Publishing Group Ltd, Edinburgh 2012.

[6] International Convention for the Safety of Life at Sea, International Maritime Organisation, London, 2014.

[7] Marine Guidance Note 379 (MGN 379), Use of Electronic Navigation Aids, Maritime and Coastguard Agency (MCA), Southampton, 2008.

[8] Ship Inspection Report (SIRE) Programme, Vessel Inspection Questionnaires for Oil Tankers, Combination Carriers, Shutle Tankers, Chemical Tankers and Gas Tankers (VIQ 6), Oil Companies International Marine Forum, 2016.

[9] Tanker Management and Self-Assessment 2, Oil Companies International Marine Forum, Witherby Publishing Group Ltd, Edinburgh 2012.

[10] The American Practical Navigator, National Imagery and Mapping Agency, Bethesda, Maryland, 2002.

[11] UKHO NP232, Admiralty Guide to ECDIS Implementation. Policy and Procedures, 1 st Edition, United Kingdom Hydrographic Office, Taunton 2014.

[12] Weintrit A., Radar Image Overlay in ECDIS Display Versus Electronic Navigational Chart Overlay on Radar Screen, Prace Wydziału Nawigacyjnego, nr 22, Gdynia 2008.

[13] Weintrit A., The Electronic Chart Display and Information System (ECDIS). An Operational Handbook, A Balkema Book, CRC Press, Taylor & Francis Group, Boca Raton – London – New York – Leiden 2009..