

THE USE OF THE ELECTRONIC MAP IN THE SURVEILLANCE OF THE ROMANIAN SOVEREIGNTY ON BOARD THE SHIP

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Abstract: According to United Nations Convention on the Law of the Sea, the sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea. Under the law 17/2002 – Republished in Official Journal of Romania no. 252, April 8, 2014, article 2, „The Romania territorial sea includes the strip of the sea adjacent of shoreline, where appropriate, internal waters, having the breadth equal to 12 nautical miles, measured from baselines”. The observation, surveillance and Romanian border control at the Black Sea is in responsibility of the complex system SCOMAR. The operational units of the system include navy, land and air force. On board, the ships unauthorized entry in the territorial sea or contiguous zone can be detected using the radar. Using the electronic map facilities, the authors performed the territorial sea and the contiguous zone starting from the baselines. Thus, these areas were made as zonesto overlap on radar. The aim of this paper is to show how electronic map can be used on board the ships for surveillance of the territorial sea or contiguous zone.

Key words: sovereignty, territorial sea, contiguous zone, electronic map, radar

1. Introduction

Romania is a sovereign state and its borders are the Black Sea, Bulgaria, Ukraine, Hungary, Serbia, and Moldova. Two thirds of the border is traversed by the rivers (Danube, Prut, Tisa) and the seaside (Black Sea), and a third is traced to the earth. Romania is a coastal state due to its proximity to the Black Sea. As a result, Romania's sovereignty extends to the Black Sea area on the territorial sea. (Article 2 – Convention) [5]

The limit of Romanian territorial sea is set at 12 nautical miles measured from baseline. (Article 3 - Convention)

The limit of Romanian contiguous zone is set at 24 nautical miles measured from the baselines. (Article 33 - Convention)

In this area the Romanian exercise the control for preventing and punish infringement.

The exclusive economic zone of a coastal state is the zone where the state exercise the control regarding sovereign rights and jurisdiction according to Convention (Article 55 - Convention). This zone shall not extend beyond 200 nautical miles from the baselines.

The Law no. 17/2002 – Republished in Official Journal of Romania no. 252, April 8, 2014, regarding legal regime of the internal waters, territorial sea, the contiguous zone and exclusive

economic zone of the Romanian legal status of these areas.

Under this law, Article 2: „The Romania territorial sea includes the strip of the sea adjacent of shoreline, where appropriate, internal waters, having the breadth equal to 12 nautical miles (22.224 meters), measured from baselines” [8].

The nautical miles (NM) is the unit of distance equal to the length of a minute of arc of terrestrial meridian. Our country has adopted the following standard value of nautical miles: 1NM = 1852 meters. The nautical mile symbol is M, NM or NMI. By international agreement, it has been set at 1,852 meters exactly (about 6,076 feet). The international nautical mile was defined by the First International Extraordinary Hydrographic Conference, Monaco (1929) [1-4].

This is the one accepted by the International Hydrographic Organization and by the International Bureau of Weights and Measures (BIPM) [1]. It is used especially by navigators in the shipping and aviation industries and also in polar exploration. It is commonly used in international law and treaties, especially regarding the limits of territorial waters.

According to Law 17/2002 – Republished, the geographical coordinates of the Romanian baselines are split into 8 segments from A to H (Tab. 1).

Table 1. The geographical coordinates of the Romanian baselines
 (Low no. 17/2002 – Republished)

The segment	The points	Geographical coordinates of the points	
		Latitude	Longitude
A	1	45°10'51"N	029°45'56"E
	2	45°08'42"N	029°46'20"E
B	2	As the segment A	
	3	44°50'28"N	029°36'52"E
C	3	The line biggest reflux	
	4		
D	4	44°46'52"N	029°31'48"E
	5	44°43'38"N	029°03'10"E
E	5	As the segment D	
	6	44°31'26"N	028°52'26"E
F	6	As the segment E	
	7	44°07'15"N	028°41'50"E
G	7	As the segment F	
	8	43°59'14"N	028°40'09"E
H	8	As the segment G	
	9	43°44'20"N	028°34'51"E

The geographical coordinates are corresponding to Krasovski 1940 ellipsoid. Nauticalcharts, commonly used by seafarers, are made in Mercator projection, based on the WGS-84 ellipsoid. This projection is central, cylindrical, normal and conformal. The Mercator is the most common projection used in maritime navigation, primarily because of rhumb lines plot as straight lines.

2. Data and Methodology

As agreed by the Parties in Article 1 of the 2003 *State Border Régime Treaty*, the International Court of Justice (ICJ) the principal juridical organ of the United Nation, establishes (Haga, 3 February 2009) the single maritime boundary delimiting the continental shelf and the exclusive economic zones of Romania and Ukraine in the Black Sea (Fig. 1).

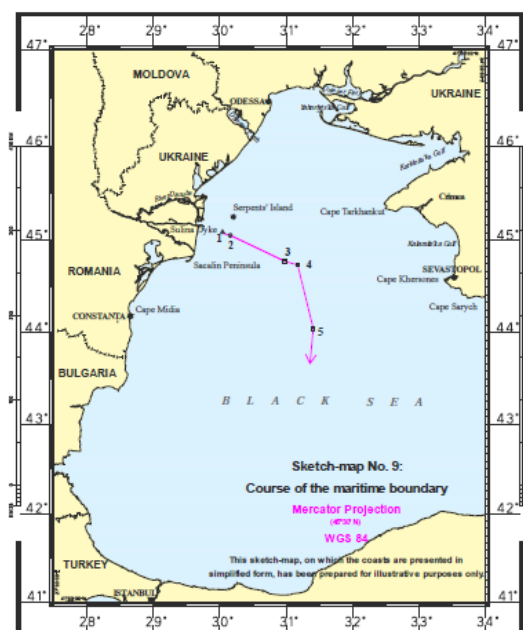


Fig. 1. Course of the maritime boundary. Sketch map

The maritime boundary delimiting the continental shelf and the exclusive economic zones of Romania and Bulgaria in the Black Sea is in negotiation.

At this time the maritime boundary is starting from the southeast point of the H segment of the base line, and continue to the latitude parallel until is join with the azimuth 185°23'54.5" (Tab. 2).

Table 2. The geographical coordinates of the continental shelf and the exclusive economic zones of Romania and Ukraine

The Law	Geographical coordinates	
2003 State Border Régime Treaty	45°11'35"N	029°41'28"E
	45°08'58"N	029°57'34"E
	45°05'21"N	030°02'27"E
2009 Haga International Court of Justice	45°03'18.5"N	030°09'24.6"E
	44°46'38.7"N	030°58'37.3"E
	44°44'13.4"N	031°10'27.7"E
	44°02'53"N	031°24'35"E
	Azimuth 185°23'54.5"	
1997 Agreement Bulgaria – Turkey Black Sea Boundary (table C1.T26.)	43°26'49"N	031°20'43"E
	43°19'54"N	031°06'33"E

3. Results and discussions

The observation, surveillance and Romanian border control at the Black Sea is in the responsibility of the complex system SCOMAR. The operational units of the system include navy, land and air force.

Through the sensors, the SCOMAR system carries out permanent monitoring (24/7) of the surface water area, contiguous area and exclusive economic zone (up to 100 nautical miles off shore). On board the ships the surveillance of the maritime zone is performed using the radars equipment.

For this study we used the facilities of the electronic chart (ECDIS) Navi-Sailor 3000 for plotting and determining the territorial sea and contiguous zone.

An Electronic Chart Display & Information System (ECDIS) is a computer-based navigation information system that complies with International Maritime Organization (IMO) regulations and can be used as an alternative to nautical paper charts [6].

ENCs are vector charts that also conform to International Hydrographic Organization (IHO) specifications stated in IHO Publication S-57. [7].

For this purpose we used the geographic coordinates corresponding WGS84 ellipsoid from Tab. 1 and 2 to represent the exclusive economic zone (Fig. 2).



Fig. 2. The Romanian exclusive economic zone and the continental shelf

To represent the territorial sea they were introduced in an electronic map all baselines and the perpendiculars on them at a distance of 12 nautical miles (Fig. 3).

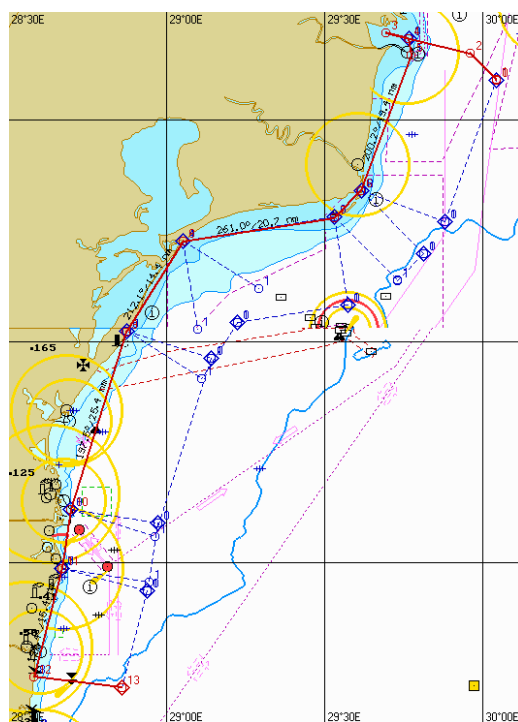


Fig. 3 The base lines and the perpendiculars on them

Thus, following intersections was obtained territorial sea of Romania (Fig. 4).

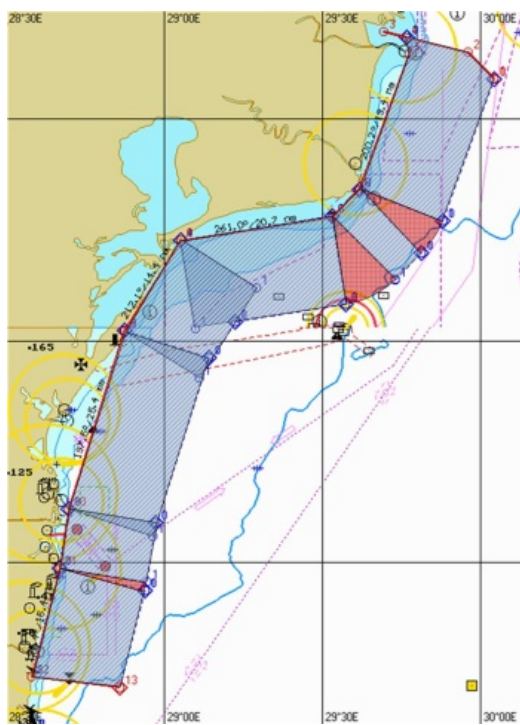


Fig. 4 The Romanian territorial sea

In the same way, has been drawn the perpendiculars on the baselines at a distance 24 nm to obtain contiguous area (Fig. 5).

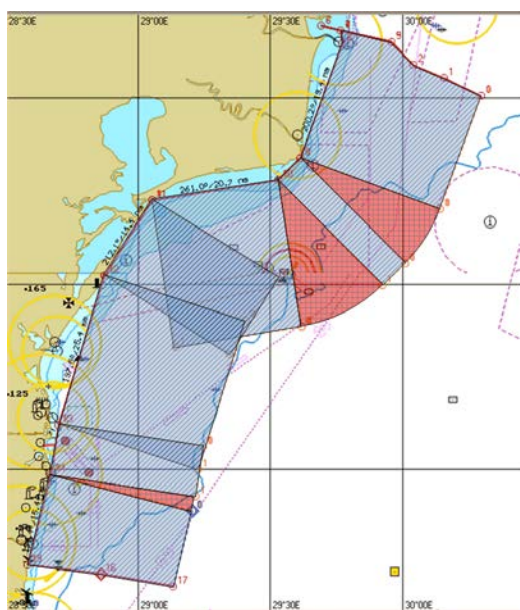


Fig. 5 The Romanian contiguous zone

Conclusion

The transposition of the Romanian legal provisions concerning the territorial sea, contiguous zone and exclusive economic area on a map in WGS84 projection ensure a high degree of accuracy compared to a classical paper chart.

A map can also be easily installed on ECDIS software and hence the ship surveillance radars.

The electronic map of these areas of interest for Romanian Naval Authority can be developed with multiple layers of information that would provide speed, flexibility and a high degree of confidence in the use of this information.

Using an electronic map to represent the territorial sea and the contiguous zone can achieve their precise geographical coordinates.

Using GPS equipment connecting the electronic map and radar can be displayed the two areas on the radar. Thus, it is easier to track the traffic and unauthorized entries (Fig. 6 and 7).

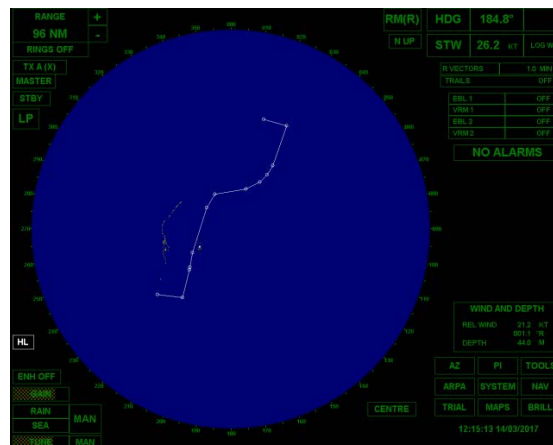


Fig. 6. The territorial sea on radar

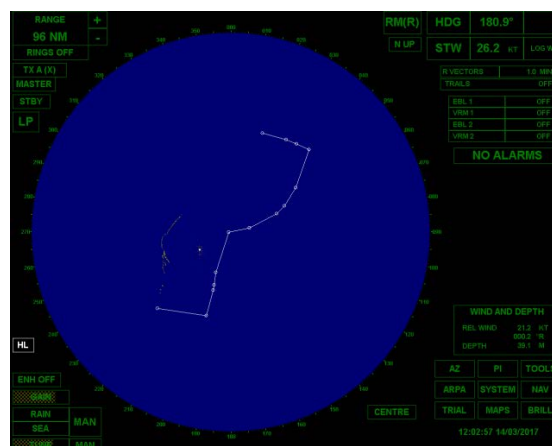


Fig. 7. The contiguous zone on radar

Using the radar as traffic-control equipment can be detected small boats, fishing vessels or boats not fitted with identification equipment (AIS).

On board the ships it is easier to track the traffic and unauthorized entries as small boats, fishing vessels or boats not fitted with identification equipment (AIS).

Bibliography

- [1] International Bureau of Weights and Measures, 2006, The International System of Units (SI) (8th ed.), p. 127, ISBN 92-822-2213-6
- [2] Cojocaru, S., *Tratat de navigație maritimă – vol. I*, Editura Ars Academica, București 2008
- [3] Bosneagu, R., 2015, *Navigația Maritimă*, Ed. ExPonto, Constanta
- [4] Bosneagu, R., 2013, *Navigația electronică. Navigația ortodromică*, Ed. DHM, Constanta
- [5] Toma, A., Baroană F. *Considerații privind securizarea frontierei navale a României*, Buletinul Forțelor Navale nr.7, pag.103-108, 2007.
- [6] United Nations Convention on the Law of the Sea, Montego Bay Convention
- [7] "Introduction to Electronic Chart Systems and ECDIS". International Hydrographic Organization. Retrieved 2010-07-13.
- [8] "S-57 IHO Transfer Standard for Digital Hydrographic Data". International Hydrographic Organization. Retrieved 2010-07-13
- [9] <http://www.monitoruloficial.ro/>