

The Role of Navigational and Hydrographical Support in Ensuring Safety of the Caspian Sea

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***Abstract* - In the article have been analyzed the main factors affecting the security environment in the Caspian Sea, the importance of the navigational and hydrographical support as an affecting factor, the existing navigational and hydrographical support's difficulties in ensuring security in the existing offshore oil and gas infrastructures, strategically important islands and coastal facilities in the part of the Caspian Sea belonging to the Azerbaijan Republic and the measures that must be taken according to the new challenges. Approaches and proposals have been given about necessity creating new Traffic Separation Scheme, Recommended Roads in order to realize ensuring the accomplishment of the special steering regime and navigational safety in all directions. The accomplishment of the hydrographical support's importance also has been emphasized against estimated navigational threats according to the context of the effective preventing in new fairways and recommended roads. Beside of realized activities in direction of increasing the effectiveness of the navigational support, has been focused on issues about increasing effectiveness of the hydrographical support.**

***Keywords* - Caspian Sea, ensuring security of the transportation, navigation and hydrography, Trans-Caspian fiber optic route, Traffic Separation Scheme.**

I. INTRODUCTION

From ancient times to the present, the Caspian Sea, which has rich hydrocarbon resources, its geographical, political and economical characteristics have been the subject of extensive research. From a geostrategic point of view, its location at the intersection of important communication lines has greatly increased the importance of the Caspian Sea and, especially, in the period after the independence of the Azerbaijan, Turkmenistan and Kazakhstan Republics, it has been involved into the interests circle of not only the coastal countries, but also the world's leading states. For this reason, the scientific monitoring of the processes related to the Caspian Sea and the factors affecting its security environment have particular importance from the point of view of international relations (Figure 1.) [1].



Fig. 1. Caspian sea is the junction of the important communication lines

The continuous increase in the demand for oil and gas natural resources in the world has led to the intensification of the processes taking place around this region, the interstate competition and rivalry for supremacy. At the same time, these factors are accompanied by the strengthening of the world positions of the Coastal countries of the Caspian Sea, especially Azerbaijan, Kazakhstan and Turkmenistan, which are rich in hydrocarbon resources, and the expansion of their integration into the international world, for this reason, screening of the aspects that can affect ensuring the security of the Caspian Sea through the researcher's review is one of the most actual issues.

One of the factors defining the actuality of the subject chosen as a research object is related to the determination of the legal status of the Caspian Sea. The actions taking place in the direction of establishing the security environment in the area on the basis of determining the legal status of the Caspian Sea, is also important in terms of taking into account the interests both coastal countries and Western countries, Turkey, and other actors [2. p.12-14].

Another reason that brings the actuality of the article to the fore is Azerbaijan's location on geo-economically important communication lines connecting East-West and North-South, Azerbaijan's special importance in alternative energy projects, and its responsibilities which are taken on security issues. Achieving a general agreement between the coastal countries regarding the legal status of the Caspian Sea and obligations related to ensuring navigation safety in accordance with the requirements of the signed convention also stipulates the implementation of navigational and hydrographical support activities, which have been delayed for certain reasons from the time of the Soviet Union to the present. As an aim, it should be mentioned that in sea aquatoria where offshore oil and gas infrastructures are located, due to incomplete navigational and hydrographical support, a number of navigation incidents occur, resulting in the loss of human life and economic losses. The incidents that occurred in the aquatorium of offshore oil and gas infrastructures for 2015, were analyzed and presented. The reasons and lots of occurred incidents have been researched. As a result of the research, it became known that the failure in providing adequate level of hydrographical and navigational support in the area of offshore oil and gas infrastructures has become the reasons of undesirable endings [3. p.23].

II. SECURITY ISSUES IN THE CASPIAN SEA

In ancient times, the Caspian Sea was connected to the Black Sea, and later these two water basins were separated from each other. It can be said that the Caspian Sea has had many names during its centuries-long history, based on the interesting ideas and assumptions of thinkers and travelers who studied the Caspian Sea in antiquity. According to various sources it has been written, the number of these names is 40, according to some sources, 70, and some even 100. The reality that the name of the Caspian Sea wasn't same in different periods of history is proven as a historical fact. Those names were usually given after the names of the population, large tribal groups, ethnic groups, or after the names of the cities, provinces or countries located on its shores. All because of that, the Caspian Sea had the names Hyrkan, Khazar, Caspian, Cimmerian, Sarmatian, Darband, etc. The basin bordered by the basin of the Northern Dvina and Pechora rivers in the North, the Ural mountain range in the Northeast, the Aral Sea basin in the east, the Black Sea slope rivers basin of the Great Caucasus in the Southwest, the Don and Dnieper river basins in the West, and the Neva river basin in the Northwest, European peoples called the Caspian. This name has been taken from the name of the Caspians living on its South-West coast [4]. According to the results of scientific analysis being considered a border lake Caspian, covers the shores of five countries located around of it: Azerbaijan, Kazakhstan, Turkmenistan, the Islamic Republic of Iran and the Russian Federation.

The main factor affecting the security environment of the Caspian Sea is its importance at the global and regional level. The Caspian Sea has been focused centre of many states, empires, historians, travelers and others since ancient times. Its location on the ancient Silk Way, the intersection of the transport corridors connecting Europe with the Caucasus and Central Asia and the Volga-Caspian waterway, its rich flora and fauna, and hydrocarbon resources have greatly increased the importance of the Caspian Sea, established the reasons to attract attentions both for the countries of the region and the leading states of the world. In many historical informations, large point of views are expressed about attracting the attention of the empires that have existed on the shores of the Caspian Sea since the Middle Ages. This interest increased even more with the coming to power of the Romanov dynasty in Tsarist Russia. The territory from the Caucasus mountain range to the Persian Gulf was included in the sphere of interest of Tsarist Russia. With Ivan IV's occupation of Kazan in 1552 and Astrakhan Khanates in 1556, access to the Caspian Sea was opened for Tsarist Russia [5, p.30]. In the second half of the 16th century, after the territories of the Kazan and Astrakhan Khanates were annexed to the Moscow state, the Volga-Caspian waterway had been come under Russian control. The Volga-Caspian road, which was an alternative to the main trade route under the control of the Ottoman Empire, became even more important as it met the interests of Western countries, especially England. The reduction of the time spent on transportation by the alternative route made it possible for the Volga-Caspian road to play the role of the main trade artery from the middle of the 16th century [6, p.253].

During the Soviet Union's existence times, the need to research the factors affecting the security environment has been partially overshadowed by the approaching Astara-Hasangulu line principle and recognition of Iran's right to use the Caspian Sea for commercial purposes only. By imposing restrictions on the interests of Western countries in this way, point of views were formed that there is no need to analyze the effects on the security environment in the Caspian Sea.

With the fall of the Soviet Union, the coastal countries of the Caspian Sea Azerbaijan, Kazakhstan and Turkmenistan demonstrated new approaches based on their national interests. Recognizing the fall of the Soviet Union as an opportunity, the Islamic Republic of Iran also began to take advantage of the Caspian Sea, which is rich in hydrocarbon resources, by bringing to the fore directions which could have been used for. The rich hydrocarbon resources of the Caspian Sea and the efforts of the Caspian littoral countries to take advantage of these rich hydrocarbon resources in accordance with their national interests already come to the fore as the main factor affecting its security environment.

Western countries are increasing their efforts to protect their interests in the region and solve problems related to global threats and security issues in the Caspian Sea region. In particular, it should be mentioned that according to the forecasts of the European Union (EU), which ranks second in terms of energy consumption in the world after the United States, the use of natural gas continues to increase year by year. With the start of the Russia-Ukraine conflict in February 2022, the EU is trying to minimize its dependence on Russian gas by reducing the import of natural gas from Russia. By looking at the International Energy Agency's analysis of "The European Union's demand and supply of natural gas" for 2023, it becomes clear that although they have reduced the natural gas imported from the Russian Federation, a certain percentage increase in the import of natural gas from alternative pipelines and liquefied natural gas in 2021 compared to last year, 60% more imports were realized. Thus, the volume of imported liquefied natural gas in 2021 was 80 billion cubic meters, and in 2022 it was 130 billion cubic meters. Imports are expected to increase as the EU plans to meet the needs of Ukraine and Moldova. Taking into account that the reduction of dependence on the import of natural gas from Russia is chosen as the main goal by the EU, it will further increase the interest in the Republic of Azerbaijan in the concept of alternatives strategy, including the Trans-Caspian East-West line, which is planned to be realized between the Azerbaijan and Turkmenistan Republics [7]. According to the information provided by another source, it should be noted that the total cost of European countries for purchasing energy resources from abroad is one billion euros per day. European countries import 60% of the total energy resources consumed, i.e. 60% of the total energy resources and 83.6% of natural gas. The dependence of some of the European countries on one country in terms of the provision of energy resources indicates that future problems are imminent. The Russia-Ukraine conflict, the US military operations in the Middle East, cause the EU to turn to new energy sources, which once again brings to the fore the relevance of the Trans-Caspian route, which is planned to be implemented in the Caspian Sea. The "Energy Security Strategy" document adopted by the European Union in 2023 contains notes on the preparation of short-term measures, the increase of energy production and the development of political and economic activities in the direction diversifying of energy sources [8]. Reaching agreements with Caspian littoral countries wishing to export energy resources to the European market, the possibility of safe transportation increases the EU's interest in the region.

In terms of factors affecting the security environment in the Caspian region, the possibility of terrorist acts by international terrorist groups that may arise from the increasing strategic importance of the Caspian Sea, the lack of action in taking necessary measures to ensure safe shipping, and the lack of efficiency in cargo transportation should also be taken into account. The economic extent of the damage caused by unconventional threat elements in offshore oil and gas infrastructures and strategically important infrastructures operating on the coast is quite huge. Since these numbers are measured in billions, states are always being under pressure to take preventive measures to prevent such threats [9. p.2].

Today, the Caspian Sea has the great importance in the context of providing alternative energy sources. Achieving significant agreements between the Caspian littoral countries increases the actuality of the usage of existing communication routes and lines in the Caspian Sea. This, in its turn, determines the necessity to increase the efficiency of navigational and hydrographical support in the existing transportation routes in the Caspian Sea.

III. THE ROLE OF NAVIGATIONAL AND HIDROGRAPHICAL SUPPORT IN ENSURING SECURITY

At the time when the international security system is facing a number of problems, the increase in threats and risks has already become a trend, and the application of traditional mechanisms to prevent all these threats once again proves that it does not play a decisive role in achieving the desired results. The Caspian Sea is facing a number of threats today. The existence of threats and dangers that will make the Trans-Caspian International Transport line of special importance face large-scale problems in the future, and the feeling of their tendency to increase from time to time stipulates that efforts to eliminate them should be fully spent, even more than necessary.

As a conclusion of long-term discussions, the signing of the "Convention on the Legal Status of the Caspian Sea" at the meeting held at the level of the heads of coastal states in Astana on August 12, 2018, is considered a significant achievement. According to Article 3, Clause 9 of the Convention, which was approved by the law of the Parliament of the Republic of Azerbaijan on February 12, 2019, the main obligation of the parties was to ensure the safety of swimming [10. p.4]. The selection of Azerbaijan, which has gained a great reputation as a reliable partner of the world and regional countries, as a junction of important communication lines increases the responsibility and accountability in front of us. Projects to ensure telecommunication connections between Asia and Europe are also being implemented in the Caspian Sea. The "Trans-Caspian Fiber Optic Cable" project implemented in the context of ensuring global telecommunication security is a clear example of this [11]. Thus, the execution of tasks such as the realization of the safe and efficient operation of the existing offshore oil and gas infrastructures, global telecommunication lines, Baku International Sea Trade Port, the implementation of a special navigational regime and the navigational support in the part of the Caspian Sea belonging to the Republic of Azerbaijan, including the climate changes influences on rapid decrease of the water level of the Caspian Sea and the increase in the economical importance of the Baku International Sea Trade Port, indicates the necessity to effectively implement and increase the effectiveness of navigational and hydrographical in order to ensure the safety of navigation (Figure 2.) [12].



Fig. 2. The Presidents of the Caspian Sea coastal countries meeting about “The legal status of the Caspian sea”

Referring to the 1:200000 scale 23 B navigational chart of the Absheron Peninsula published in 2007, it should be mentioned that the Traffic Separation Scheme established in the direction of Boyuk-Zira

and Jilov Islands, the main fairway intended for the movement of merchant ships and many recommended roads are also located very close to offshore oil and gas platforms and subpipelines. This, in turn, creates the conditions for the occurrence of navigation incidents and accidents, terrorist acts, and as a result, many undesirable situations, which may occur in conditions of limited visibility, as well as due to the carelessness of free navigation. On June 29, 2017, the Arya 141 seismological research vessel belonging to the Azerbaijan State Oil Company lost control during its operation, collided with the oil and gas platform 34 in the sea, and many people lost their lives, and the fact that there was a risk of environmental pollution of the marine environment proves that The Traffic Separation Scheme provided in the sea area close to the oil and gas infrastructures does not fully meet the minimum risk requirement [13]. As an example of an undesirable navigation accident that occurred during difficult navigation conditions while sailing in limited visibility conditions, the collision of the tanker "Konstruktor Zhivotovsky" belonging to the Russian Federation with an oil rig in the waters of Azerbaijan on May 12, 2021 [14]. The research has been carried out and the analysis of the navigational accidents that have taken place, confirm the need for the creation of a new Traffic Separation Scheme suitable for the purpose.

Another reason that makes the issue of proposing a new Traffic Separation Scheme, fairways and Recommended Roads for merchant vessels is providing the Caspian Sea part of the important international communication route that will connect East-West and North-South. Thus, with the collapse of the Soviet Union, there were disagreements arising from the national interests of the Republics of Azerbaijan and Turkmenistan. Especially during the Soviet Union, the "Kepez" oil field, discovered by Azerbaijani oilmen, had become the subject of great discussion. However, according to the Memorandum of Understanding on the joint exploration, development and exploitation of 70% of the "Kepez" oil field, which has been the subject of dispute between Azerbaijan and Turkmenistan since the 1990s, Azerbaijan is currently implementing bilateral and multilateral international megaprojects with Turkmenistan [15, p.68]. At the same time, when proposing fairways that will be part of the new Traffic Separation Scheme to be used for economical purposes, the principle of realizing the passage by sea in a shorter time should be taken into account.

Taking into account all the mentioned and to organize the effective protection and defence the existing offshore oil and gas infrastructures in the sector of the Caspian Sea belonging to the Republic of Azerbaijan, for the purpose of providing to ensure the safety of free navigation of ships, the realization of economically important sea transportation connecting East-West and North-South in a short time, a special navigational regime, have been proposed to place buoy number 4 indicating the beginning of the fairway at the coordinates Lat=39° 48,0' N; Lng=49° 53,6', the creation of a circular traffic system, Lat=39° 48,0' N; Lng=49° 53,6', having in the point the cancellation of the recommended road number 9 for certain political and economical interests, to connect the recommended road number 8 with the courses 179° 5 - 359° 5 by making it 1,4 nautical miles wide and reciprocal lined to the buoy number 1's circular traffic system indicating the beginning of the fairway, to establish the fairway with courses 270° 0 - 90° 0 having reciprocal lines, 1.4 nautical miles wide and running 78 nautical miles to the East, to place buoy number 5 indicating the beginning of the fairway at the end of it, to cancel recommended roads number 2 and 34, having in the point the cross of recommended roads number 1 and 2 with the bouys' number 5 and 2 circular traffic systems indicating the beginning of the fairway, and all of these, in turn, are considered to be a substantial work done in the direction of increasing the effectiveness of navigational and hydrographical support. In accordance with the mentioned changes, in order to increase the effectiveness of navigational support, it is necessary to mark the right and left edges of the newly established fairway with lateral buoys (Figure 3).

Among the numerous works to be done in connection with increasing the effectiveness of navigational support, issues of hydrographical support should also be brought to the fore. The manual on the rules of conducting hydrographical research shows the rules of conducting research related to hydrographical support. In addition to addressing the issues of conducting depth measurements, specifying position data, determining the characteristics of the seabed, and determining the important features to be measured by observing the seabed, special, first, second, and third-order methods applied during hydrographical research are disclosed [16]. Taking into account sea level changes due to climate changes [17] and the presence of a large number of active underwater mud volcanoes in the direction of Sangi-Mughan Island, the water level changes during the survey should be measured with 95% reliability and ± 5 cm accuracy in order to bring the depth indicators measured in the hydrographic surveys performed in the theater to the first degree. Mechanical measurement of the water level should be carried out using a mareograph device and a level ruler. The readings taken from the mareograph device must necessarily be marked as initial readings using a level ruler. The water level should be recorded at least every 10 minutes when only a level ruler is used. Depth measurement is the most important issue, and there are many important works in this direction in the specially mentioned areas. In Sangi-Mughan Island, during the investigations in eve of reconnaissances by operational planning in 2022, it was observed that the coastline of the island is gradually increasing, which once again emphasizes the need to increase the effectiveness of the hydrographical support with the mentioned methods. As a result of conducting seabed exploration, four anchored seabed mines were discovered, the mission of mine neutralization and providing safe navigation under the Azerbaijan Navy Operational Control accomplished out on May 8-10, 2022 [18], the importance of seabed exploration in increasing the effectiveness of hydrographical support has been proven once again. For this reason, it is proposed to measure the water level, measure the depth, dig a channel, explore the seabed, and take immediate measures based on the results to increase the effectiveness of the hydrographical support on the proposed new fairway and the recommended roads.

CONCLUSION

As a conclusion of the research carried by the method of analysis and synthesis, and the experience gained during the long-term service, the necessity to make changes in the traffic separation scheme, fairways, and recommended roads is confirmed. A new traffic separation scheme, fairway, and recommended roads are introduced for the purpose of realization effective navigational and hydrographical support in ensuring security of the offshore oil and gas infrastructures. In the creation of the presented new traffic separation scheme, the implementation of new strategically important economic projects should be taken into account, and the factor of reducing the time spent on activities in projects implemented at the international level should also be taken into account.

Thus, in the proposed new traffic separation scheme, the issue of increasing efficiency and navigational security is solved by revising the rules of hydrographical support, carrying out simplification in the traffic separation scheme.

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