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ANALYSIS OF ORGANIZATIONAL AND ECONOMIC APPROACHES TO MANAGEMENT AND CHARTERING PARAMETERS IN CONDITIONS OF UNCERTAINTY OF VESSEL WORK

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Summary. *Maritime transport in Ukraine is in a state of permanent turbulence of the businessenvironment, and therefore the recovery of the market of complex transport services and sea transportation under the influence of military operations in Ukraine is prone to significant fluctuations. In the present conditions, when researching international holdings in the field of shipping, the activities of which are aimed at maximizing the current financial indicators. The authors of the study conducted an analysis of the functioning of various forms and types of charter contracts between subjects of the business environment in maritime transport. Aspects related to long-term planning of fleet chartering of shipping companies are considered, taking into account economic trends, the state of the freight market and the dynamics of military influence on economic processes in Ukraine. The authors considered the organizational and economic mechanism of formation of freight strategies for shipping companies. Therefore, the organizational and economic mechanism of freight marine vessel is for shipping companies to implement a development strategy*

in order to preserve the existing positions of the freighting and shipowner on the market. Thus, there is a need to review the organizational and economic approaches that regulate the freighting of ships and the need to improve the system of indicators of the efficiency of the chartering of sea vessels by shipping companies in the context of the strategic goals of transport safety.
Key words: *shipping company, economics management, freighting, charter, uncertainty, ship operation.*

Introduction. Shipping as a specific transport industry is carried out in the absence of complete information and clear knowledge about the commercial and production conditions of a particular voyage and the operation of the ship as a whole for the considered period. Therefore, the planning of the work of vessels within the framework of fleet management should be carried out taking into account possible deviations from the predicted operating conditions and parameters of the production process. A system of aggregated factors of uncertainty in the process of production and commercial activity of shipping companies has been established, which takes into account their essence and the specificity of the relationship. Uncertainty of the conditions of commercial operation of the ship in the process of management determines the possible deviation of the planned results, the value of which is "risk". The influence of elements of the freight time and operational period on the carrying capacity was studied. The possible negative influence of the system of uncertainty factors on the change of the main resource of the sea vessel - the carrying capacity - has been determined.

Analysis of previous studies and statement of the problem. The concept of "business environment" is quite complex and complex, because it includes a multidimensional system and requires a systematic approach to its definition. The conditions formulated in various types of freight contracts are the main factors that cause uncertainty and, as a result, possible deviations of production parameters and the results of the ships' work as a whole [1]. At the same time, various types of freight contracts cause specific risk situations for the shipowner, which can lead to corresponding deviations in production parameters and the overall efficiency of cargo flow maintenance. In the literature, there are many definitions of this term, which differ not only in wording, but also in principled approaches to understanding this concept [2]. Thus, as previously noted, production and commercial risks and deviation parameters in shipping are inextricably linked. Rather, this problem concept appeared as an evolution in the understanding of the role and impact of business on society and the marine environment [3].

Research goal and objectives. The purpose of this work is to analyze organizational and economic approaches that take into account the specifics of trends in the ship chartering market, which is based on comprehensive monitoring that determines specific organizational and economic directions of its functioning, in the conditions of uncertainty in work in maritime transport.

Main part. For the level of a specific voyage, an expression of a possible reduction of the time charter equivalent - the main efficiency indicator - is formulated

- under the influence of the system of relevant factors, methodological bases for taking into account possible deviations of flight parameters in the process of operative management of the work of vessels to ensure the necessary level of efficiency have been developed. The basis of the proposed approach is a system of

deviations of time and cost parameters of the production process, which arise under the influence of uncertainty factors [4]. For the situation of the operation of ships under long-term freight contracts, the impact has been established:

- weather conditions and force majeure circumstances to reduce the planned volume of transport work due to changes in the time parameters of the production process;

- the impact of uncertainty due to the specific conditions of long-term freight contracts (for cargo and ports), which lead to a possible decrease in the volume of transport work due to a decrease in the volume of transportation and an increase in transportation distances;

- the influence of the dynamics of the freight market on the potential losses of shipowners, as well as on the change in the volume of transport work as a result of its minimization by the charterer in accordance with the possibilities of the terms of the freight contracts. In general, based on the nature of the production process in shipping and the characteristics of the commercial conditions of operating ships over a long period of time (years), the following points were analyzed:

- the influence of weather conditions and force majeure circumstances on the reduction of the planned transport load due to changes in the time parameters of the production process;

- the impact of uncertainty caused by the specific conditions of long-term contracts for the transportation of goods (cargo, ports): a possible decrease in the volume of transportation due to a reduction in the volume of transportation and transportation distances; and

- the impact of changes in the freight market situation on the shipowner's potential losses (for example, in the case of using leased tonnage for the transportation of cargo in time charters); as well as changes in transportation volumes as a result of minimization of transportation volumes by the charterer in accordance with the terms of the charter agreement.

In this case, transport operations mean the transportation of certain cargoes between certain ports within a certain area or within a certain scheme of ship (line) operation. To solve these problems, it is necessary to allocate vessels according to specific types of transport operations in order to ensure, in principle, the maximum financial result (profit) taking into account the required volume of transportation. The main idea of such distribution is to maximize the efficiency of using vessels with certain characteristics and technical and economic indicators in the provision of transport services [5]. As already mentioned above, long-term charter contracts are characterized by a range of transport process parameter values (voyage time, cargo volume, operating costs, etc.), which is formed due to the lack of a clear distribution of ports of call and cargo flows. One of the most important points of long-term charter contracts, which introduce uncertainty into the parameters of the production process in the shipping industry, is the designation of the unloading ports. This clause rarely specifies a set of ports, usually using a port option (as discussed above in the example of voyage charters). Thus, the uncertainty of the situation with the ports of loading and unloading at the time of concluding the contract and during its execution may lead to a decrease in the volume of transportation in the transport operation.

In the above-mentioned voyage charter contracts, the situation of the port of discharge was considered, which introduces uncertainty into the parameters of the

shipping production process even at the voyage level. Of course, most 3-, 6-, and 12-month contracts for the provision of transport services do not specify ports [6]. In rare cases, a specific port of loading is specified, but in most cases the charterer has a port option, that is, the right to choose between several ports. Thus, the transportation distance is not a clearly defined parameter, and its limits lie between the maximum and minimum possible distances. This situation is not always reflected in the differentiation of freight rates [7]. In other words, different levels of freight rates are specified for each pair of ports in one contract, and a single (average) rate is specified in the other. Let's analyze this situation in more detail. In the table 1 presents information on the distances between ports. All ports are within 580-820 miles of each other.

Table 1.

Distance between ports, miles (data for calculation example)

Ports of loading	Ports of destination the vessel		
	Port B1	Port B2	Port B3
Port A1	600	680	750
Port A2	650	800	820
Port A3	620	780	580

data generated from [9]

For the calculation example, the work of a vessel with a carrying capacity of 10,000 tons, with an operating speed of 11 knots, an operating period of 340 days, an average freight rate of $20/ton was considered. The round trip time between each pair of ports included in the list of loading/unloading ports is presented in Figure 1.

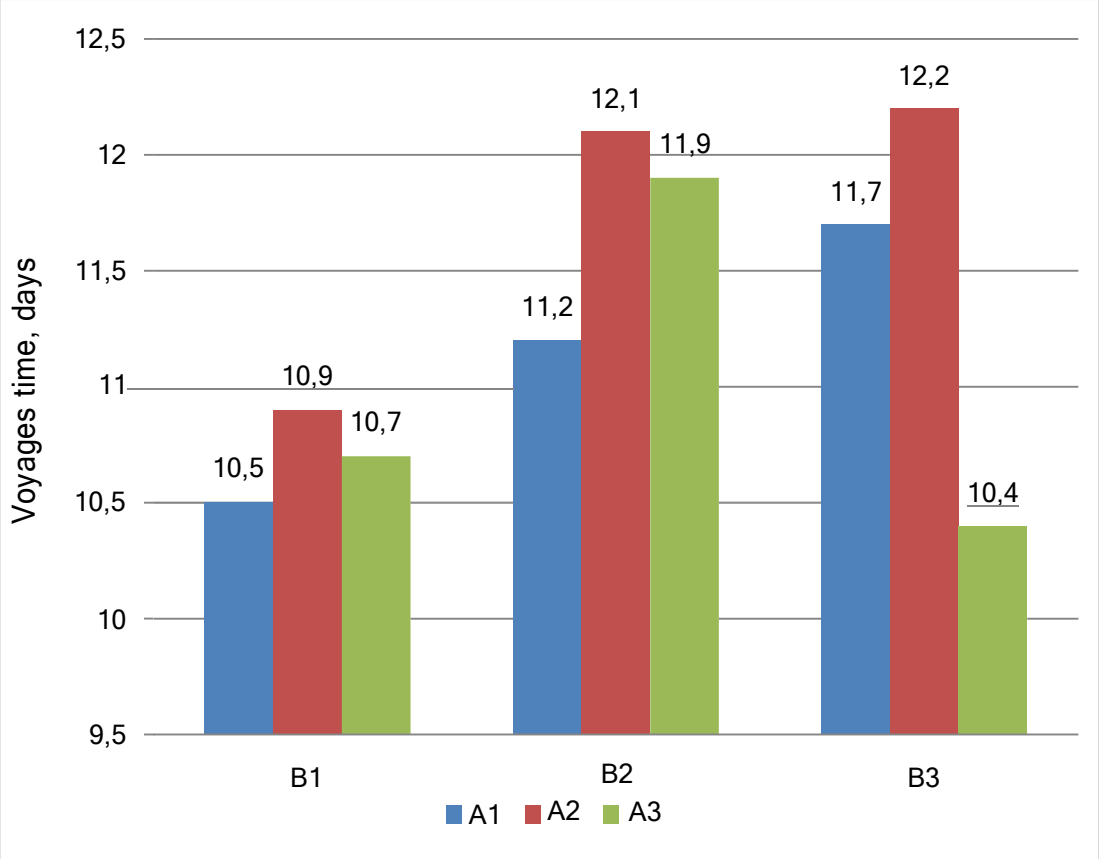

Fig. 1. Round voyage time of vessels between pairs of ports (table 1), days
data generated from [9]

The following five situations are possible:

1) All freights are performed with the same frequency (that is, all possible transportation from port to port under the terms of the contract are performed with the same frequency);

2) 50% of voyages are short (10.4-10.5 days), and the rest are performed with the same frequency;

3) 50% of voyages are longer (12.1-12.2 days), the rest are performed with the same frequency; and

4) 75% of voyages are shorter flights (10.4-10.5 days), other flights are performed with the same frequency; and

5) long voyages (12.1-12.2 days) prevail (75%), others are performed with the same frequency [8].

For such conditions, the main technical and operational indicators were calculated: average voyage duration (weighted) - Fig. 1; the carrying capacity of the vessel within the accepted operating period - Fig. 2. And the amount of annual freight is also calculated – Fig. 2.

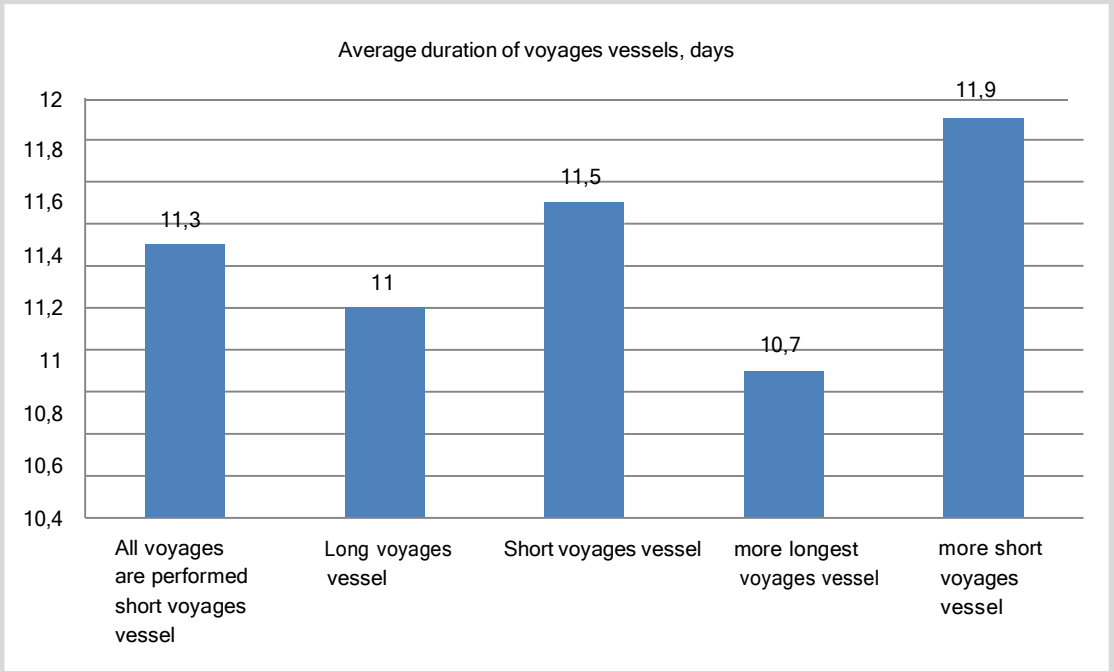

Fig. 2. Weighted average duration of voyage, days
data generated from [9]

As can be seen, even in relatively small "transport sectors" (for example, in the Black and Eastern Mediterranean basins), the technical, operational and economic indicators deviate quite strongly from the "average" option, that is, the option in which all flights are performed with the same frequency.

Figure 3, illustrates such deviations for the carrying capacity of ships. This, of course, leads to a deviation of the annual cargo volume (Figure 4.), which, in turn, leads to a deviation of the profit from the operation. Possible deviations of profit from the "average" option for the considered calculation example and for

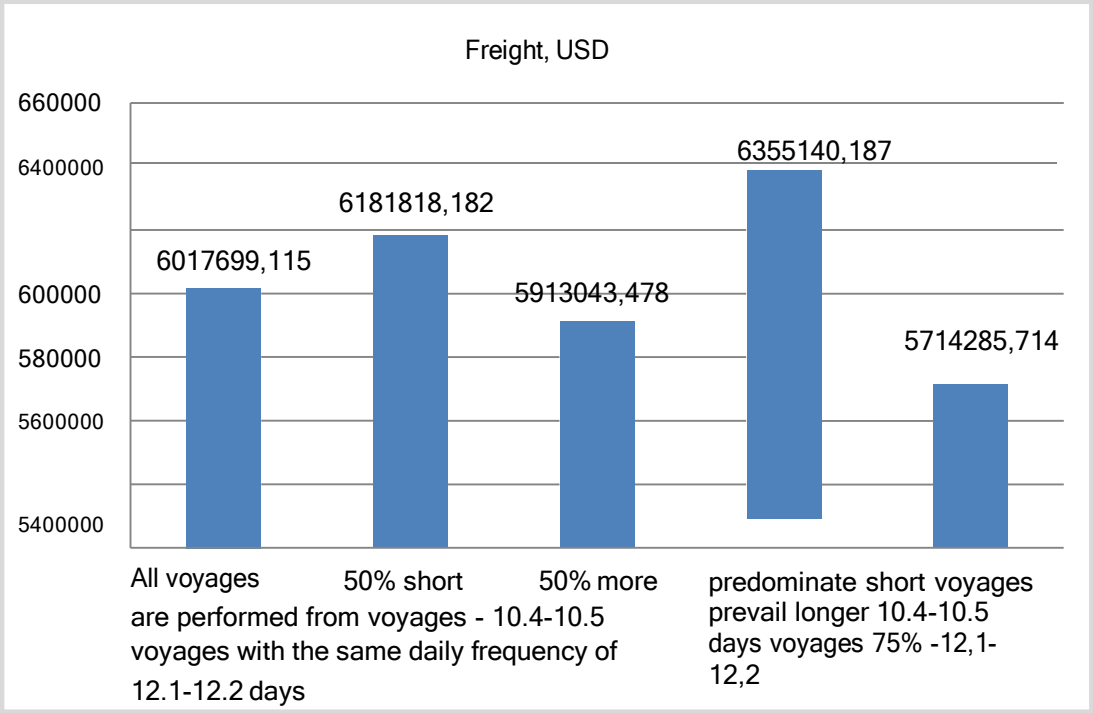

Fig. 3. Annual amount of freight, USD
data generated from [9]

permissible variations in the operation of the vessel are shown in fig. 5. As can be seen, even for a relatively small vessel (10,000 tons deadweight capacity), just under the influence of uncertainty at the loading port, the deviation in profit is more than 200,000 USD [9].

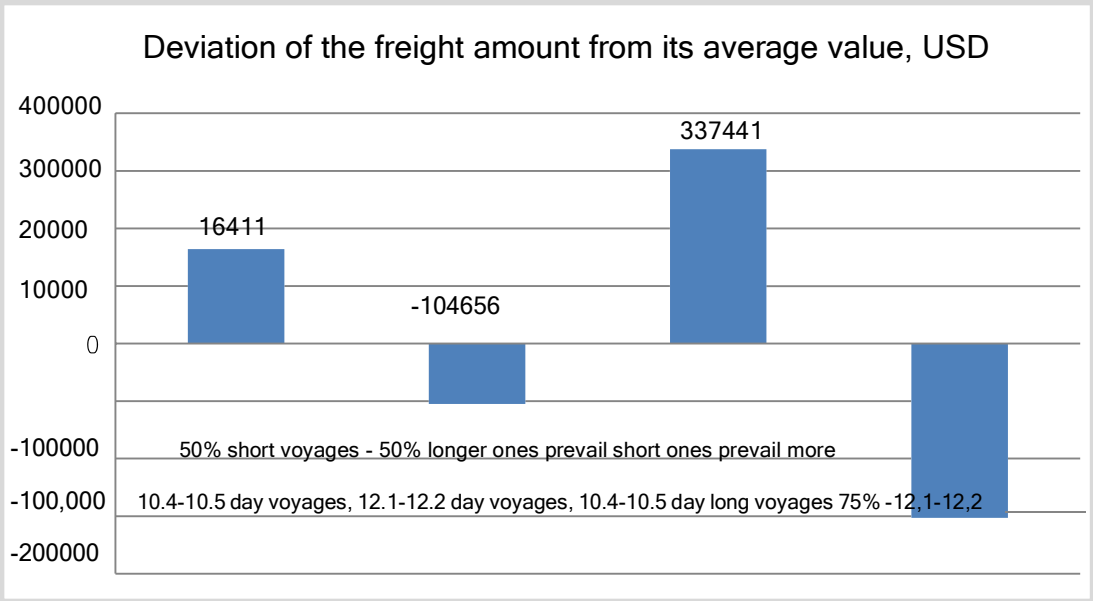

Fig. 4. Deviations of the freight amount from its average are possible value, dollars of USA
data generated from [9]

Such deviations are much higher for vessels of larger tonnage and over a longer transportation distance.

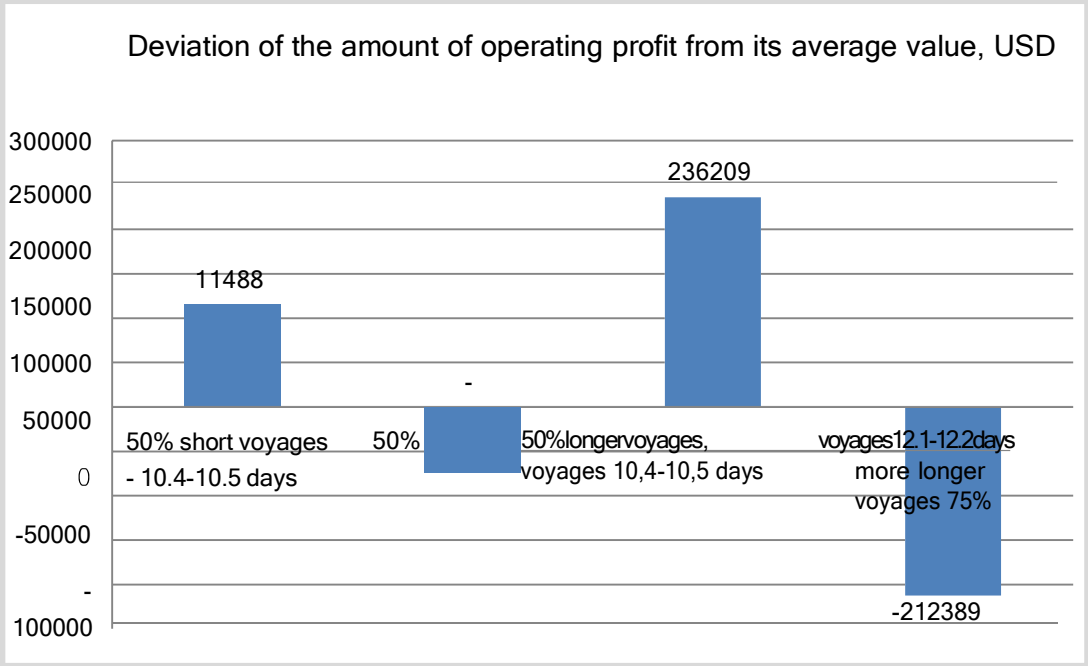

Fig. 5. Possible deviations of profit from operation from the average version of the vessel's operation, dollars of USA.

data generated from [9]

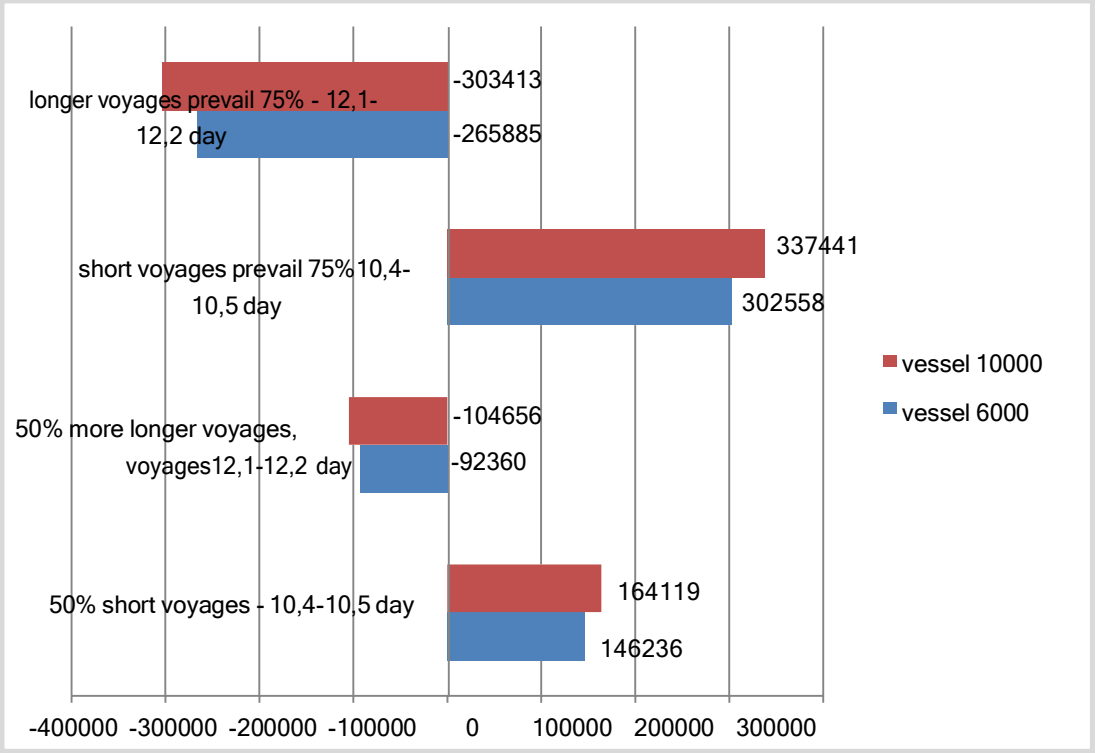

Fig. 6. Comparison of possible deviations of the amount of freight from of the "averaged" version of the operation of vessels by carrying capacity 6000 ton and 10000 ton

[author's development]

The figure 6, a compares the uncertainty of loading and unloading ports. This figure 6, presents a graphical chart comparing the probability of freight rate

deviations over one year for 6,000 and 10,000 ton vessels. This is a computational confirmation of the thesis that the probability of deviations in the operation of the vessel depends on its size [11]. In order to ensure the maximum parity of such deviations in long-term contracts for transport services, it is necessary to justify them in advance with appropriate calculations and analysis, as well as to establish differentiated freight rates that take into account the cost of port call and the duration of the voyage (for example, based on the conversion of time charter as shown below). Thus, after analyzing the technical, operational and economic indicators of many of the main options for the operation of the vessel under a long-term charter contract, it is possible to justify the freight rate that ensures "average" efficiency [12].

Another approach to ensuring the efficiency of long-term charter vessels is to base average freight rates (in situations where there is uncertainty about the port of loading) on the basis of expected time charter rate equivalents.

In addition, during the fulfillment of obligations to cargo owners under these contracts, it may be necessary to engage vessels on a time charter basis in situations where own vessels are engaged in cargo transportation on the free freight market [13].

In such situations, the distribution of ships between separate types of transport operations is not considered in scientific publications, but there is a practical need to solve this issue [16].

It should be noted that the allocation problem (or assignment problem) is a classic problem of operations research and is widely used in the field of decision-making, in particular, in fleet management. An example can be the model presented in [14]. In principle, in such tasks, ships are allocated depending on the cargo flow or scheme (in the case of liner shipping) that needs to be served.

Most of the available models are based on a deterministic version of the operating conditions of vessels, which are:

1) the era of planned economy (domestic scientific school);

2) linear shipping situation, focused on clearly defined ports of call, specific schedules and average loading of vessels.

Stochastic models for solving problems related to the distribution of ships are usually used during long-term (more than one year) planning. In particular, work [15] considered the problem of the distribution of vessels between operational regions and between two variants of commercial operations, taking into account the stochastic nature of freight rates (the basis was taken from the results of statistical studies and the need to use the normal distribution law of the variation of freight rates was justified).

Thus, in the existing theoretical base, uncertainty in the management of ship operations is considered at a higher strategic level of management. This applies to specific transport directions and specific transport corridors, despite the fact that it was shown above that some parameters of the transport process (for example, flight time) are random variables with a normal distribution law.

In the case of long-term freight contracts, the details of the terms determine the range of parameters of the transport process, and it is difficult to talk about any specific type of distribution law in this range.

Conclusions. Focusing on fairly stable cargo flows (cargo flows in the area), it was established that shipowners can organize the operation of their vessels to service these cargo flows during the annual period according to the following basic options:

1) operation of ships in a tramp form, which is not significantly tied to specific cargo flows and charterers. At the same time, the ship provides transportation of any cargo in a certain area.

2) vessels that operate in the form of continuous voyages and provide cargo transportation between several ports. The contractual basis in this case is a long-term charter contract. At the same time, the different conditions of such charter contracts create certain risk situations for the shipowner, which can lead to deviations in the relevant production parameters and the overall efficiency of the cargo flow. A scheme was developed to reflect the system of uncertainties and their possible influence on the parameters of the production process and the operational efficiency of the vessel during the annual period.

In order to take into account uncertainties in the process of operation and management of the vessel in the first situation, two modified approaches to determining the equivalent value of time charter rates are proposed:

a) the first approach takes into account the possibility of increasing the flight time, reducing freight rates, increasing the number of port calls and refueling costs; this approach considers the "worst case" scenario for the vessel's operating conditions;

b) the second approach is based on consideration of the dynamics of freight rates and the periods of their different values, thus taking into account both the seasonality of cargo flows and general market trends.

For the second situation, the methodological basis for ensuring the efficiency of vessels operating under long-term charter contracts was developed based on the setting of two operating conditions - the loading port stipulated in the contract and the equivalent expected freight rate in case of uncertain conditions at the loading port. Further research in this area may be related to the study of complex diversification of freighting by carrying capacity and versatility of types of sea vessels.

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АНАЛІЗ ОРГАНІЗАЦІЙНО–ЕКОНОМІЧНИХ ПІДХОДІВ ДО ПАРАМЕТРІВ УПРАВЛІННЯ ТА ФРАХТУВАННЯ В УМОВАХ НЕВИЗНАЧЕНОСТІ РОБОТИ СУДЕН

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Анотація. *Морський транспорт в Україні, перебуває у стані перманентної турбулентності бізнес-середовища, а тому відновлення ринку комплексних транспортних послуг і морських перевезень під впливом воєнних дій в Україні має схильність до суттєвих коливань. У теперішніх умовах, при дослідженні міжнародних холдінгів в сфері судноплавства, діяльність яких направлена на максимізацію поточних фінансових параметрів. Авторами дослідження був проведений аналіз функціонування різних форм і видів чартерних договорів між суб'єктами бізнес-середовища на морському транспорті. Розглянуто аспекти пов'язані з довгостроковим плануванням фрахтування флоту судноплавних компаній із урахуванням економічних трендів, стану фрахтового ринку та динаміку воєнного впливу на економічні процеси в України. Авторами було розглянуто організаційно-економічний механізм формування фрахтових стратегій для судноплавних компаній. Отже, організаційно-економічний підхід фрахтування морських суден є для судноплавних компаній варіантом реалізації стратегії розвитку, щоб зберегти існуючі позиції фрахтувальника та судновласника на ринку. Таким чином, постає необхідність у перегляді організаційно-економічних підходів, якими регулюються фрахтування суден та необхідність поліпшення системи показників ефективності фрахтування морських суден судноплавними компаніями у розрізі стратегічних цілей транспортної безпеки.*

Ключові слова: *судноплавна компанія, економічне управління, фрахтування, чартер, невизначеність, робота суден.*