Significance and safety of the cargo operations of the vessels aground

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**Abstract:** In the world and domestic practice the cargo operations in scattered instances are carried out with the partly or completely setting down of the vessel aground. The lack of legislation in the safety practice of the cargo operations in the shoal waters in grounding condition provides the fairly widespread lack of the legal base of the operations above. The performance of the scientific-research works problem is specified for the basis of the development of the legal framework, technical and manufacturing-technology documentation and specialization program for personnel training for the work in shoal waters.

**Keyword:** cargo operation safety, unimproved port facilities, NAABSA, AAOSA.

1. **INTRODUCTION**

The near-term perspectives of the social and economic development of the Far Eastern and Far Northern coastal districts to a significant extent are determined by the influence geopolitical and economical factors of the development of the industry and maritime activity in the Far Eastern and Arctic region direction of the National Politics.

The common vector of development has been prescribed by the Maritime Doctrine of the Russian Federation and the goals, principles and responsibilities have been designated up to y. 2020 full range of the functional and regional activities practically including.

The main purposes of the National Maritime Politics in the Arctic Coast are as the follows: Arctic exploration and reclamation; upstream of the biomass supplies and mineral raw materials; ice-class vessels development for shipping; Arctic maritime traffic development; the transport system development Northern Sea Route including; conditions creation for the strategic potential components deployment.

Priorities of the of the social and economic development of the Arctic and subarctic coast are naturally embedded into the system of goals implemented by the means of the Russian Federation Strategy of the maritime activities development up to y. 2020 (Maritime Strategy).

The enormous resource potential rest in the deposits located in the Far East and Far North coast, and in the transit and shallow water zone (e.g. the acting enterprises and the attractive projects of the Polymetal Company in the Far Eastern region – fig.1). All the technologies and the facilities and also the great experience necessary for effective, safety and economically advantageous exploration of these areas are available. At the same time for the effective and long-term maritime activity in the Far East and Far North coast realization the existing problems to be considered.

The delivery of the outsizal equipment (fig.2) in unimproved port facilities required for implementation of the development of the deposits and the infrastructure development. The mineral products recovered are to be loading in the same conditions and to be delivered into the ports with the processing industry.

The infrastructure development is also constrained by the complex ice situation (fig.3) constrains the navigation period and essentially increases an accident risk.
2. PROBLEM SPECIFICATION

In the global and domestic practice the cargo operations in scattered instances are carried out with the completely or partly stranding of a ship (fig 4, 5). The necessity above appears in the shallow water while falling tide and/or with cargo operations handling in unimproved port facilities. The elevation changes in the particular areas of the Okhotsk Sea rose up to 13m.

At the present time the transport infrastructure development is one of the top priority missions in the reclamation of the Far East and Arctic. However the poor utilization of the Far Eastern and Arctic coast necessitates carrying out the cargo operations near the reclamation places or traditional activity in the condition of the unimproved port facilities.

With the vast and, in common, positive experience of the cargo operations above there was collected a lot of the hull damages especially while moving the loaded ship up to afloat condition by pushing with the bulldozers or by pooling with the anchors or the other ships. These damages become the reason for putting the ship out for repairs. There were some cases of the loss of ships damaged while moving from stranded conditions in the bad weather followed.

One of the cases above is the loss of the m/v Amurskaya 28 October 2012 after the loading at the miniport Kiran (Khabarovsk region). One of the main reasons declared the water intake into the buoyancy compartments of the m/v Amurskaya due to the break of water tightness of the submerged body as a result of the invisible damages may be caused by the pooling the ship ashore, touching the ground in loaded condition and moving the ship from the ground to afloat condition while loading in unimproved port facilities with the “foreshore” method.

Also some cases of the vessel’s suction on the oozy grounds reported with the deluging followed while tidal rise. The special problems occurred with the mass casualties with the bottom damages due to breaking wave slap.
The liability for the accidents and casualties as usual attaches to the ship’s master and miniport’s captain. The traditionalism and positive experience of the cargo operations in the shoal water can not be used for the justifying as far as the legal basis is entirely lacking and the technical and work study of the cargo operations in shoal waters are ill-conceived.

The lack of the regulatory standards of the accident prevention of the cargo operations in the shoal water in the grounding conditions performed the diffused legal basis of the operations above. The compilation of the charter-party with the conditions above needs to include the BIMCO (The Baltic and International Maritime Council) approved condition NAABSA (not always afloat but safely aground) or AAOSA (always afloat or safely aground).

The lack of the safe aground standards leads to the underwater survey (or dry docking) requirements by some classification societies after an every ground contact. As far as RMRS (Russian Maritime Register of Shipping) rules consider the grounding as an accident and not as a special particular case therefore in this basis it is compulsory to require the underwater survey after every grounding. This is a very expensive operation and often impossible in the unimproved port facilities condition.

Usually the special particular cases are made an in-depth study in the vessels’ design process according to RMRS rules. The execution of these rules to be approved by the Register and fixed by the special note in the vessel’s class if required thus implementation the legal basis in conformity with the comprehensive engineering study, developing operation manuals on the safety and security arrangements of the vessel, crew, cargo and environment.

A great experience of the cargo handling aground has been obtained in global practice. In condition of a great population density the problem is solved in the special sea walls (fig.6) where the ships periodically raised up and grounded in condition of a still water.

In a condition of the unimproved port facilities the term safe aground is a traditionally subject matter of a dispute especially in a part of an underwater survey payment between the Charterers, Owners and Underwriters [1].

This uncertainty in the regulatory regime and the legal base leads to the circumstances that the navigators (often with the tacit agreement with the Owners) try not to fix the mere fact of the cargo operations aground in the ship’s log and/or in the other official documents thus resisting for the statistical sampling creation for the accidents investigation. To a great regret the casualties above often become well known with the human losses occurred and in
all the other cases the participants try to change the reasons of the occurrence to any other circumstances not bound with grounding and moving the hull relative to the ground.

One of the effective methods of solution it the development of the special vessels which can even not to touch aground directly with the hull (fig. 7). The existing domestic experience of the landing craft carrier’s development is very useful but they have a limited draft and the enforced flat bottom for the direct contact with the ground. The service life of the sips above is essentially limited with the rareness of the landing operations and can not be applied for the merchant fleet.

In light of the foregoing the necessary condition for the safety cargo operations in grounding conditions is the realization of the complex of the scientific-research works to be approved in principle the development of the legal framework, technical and manufacturing-technology documentation and specialization program for personnel training for the work in shoal waters.

In the fig.8: \(d\) – draft of the ship afloat; \(d_1\) – draft of the ship aground; \(d-d_1\) – draft difference producing the working pressure aground.

First it is advisable to separate the ships with the hull construction corresponding to the special requirements of the “Rules of the Classification and Construction of Sea-Going Ships” RMRS [2] and all the other ships.

The cargo operations aground are to be classified as follows:
- grounding due to pure falling tide without rolling and moving the hull aground (fig.8);
- moving the loaded ship up to afloat condition by pushing with the bulldozers or by pooling with the anchors or the other ships (fig.9);
- suction possibility on the oozy grounds with the deluging followed while tidal rise and mass casualties with the bottom damages due to breaking wave slap;

Here the special methods of the bending moments and shearing forces calculation required in grounding condition and the also local strength of the hull construction to be considered with the ground reaction.

The scheme of the main scientific-technical problems in the ground vessel encounter performed in the fig.10. For the solution of the problems above the experimental researches of the breaking clear of the bottom of the ships’ models with various bottom construction have the particular significance.

The problems of the impact interaction hull with the ground require the background study. The results are of a great importance as for bottom local strength and for the deck with the support girders wit the cargo on deck.

The conditions of the ships’ rolling in the breaking waves regarding the condition of loading heel and trim are the source information for the investigations above. Also the stability to be checked in such a conditions.
The soil properties in the shoal areas have the particular significance. The field trial to be carried out with the methods developed. The foreshore places to be prepared with the conditions required and periodically to be surveyed for coincidence.

![Diagram](image_url)

*Fig. 10 Scheme of the main scientific-technical problems in the ground vessel encounter*

Also the problems of the effective protection of the propeller-rudder system in shoal waters and independent power supply while the vessel aground to be considered.

Excessively fire protection condition and crew safety conditions to be specified for grounding conditions.

An agreement with the Russian Maritime Register of Shipping of the commencement of the cooperative efforts in the complex of the problems specified agreed on at the present.

The primary focus on development of the conditions and requirements for the basis of the formalization of the classification characteristic of the suitability of the vessels to the working condition above.

Excessively the conditions of the certification and docking periods for the specialized vessels to be specified.

Specificity of the opening stage of the work is that formalization of the technical standards can not solve all the complex of the problems in the stage of the designing of the special-purpose machinery. For the solutions above the wide and comparatively expensive range of the scientific-technical works to be required witch may be of interest for the government institutions and services and also for regional business enterprises commercial freight traffic including.

It is to be noted that the Register itself does not participate in cargo handling in grounding conditions with the unimproved port facilities. Therefore the regulatory and legal framework and organizational formats are out of scope of it’s’ activity. Nevertheless it is expected that the Register may regulate some onboard documents for the control of the conditions of the operations in shallow water for people, vessel and cargo safety.

**CONCLUSIONS.**

The results of the current stage of the scientific-research works should be as the requirements for the special-purpose machinery and the recommendations for the formulation of the technological cards of the cargo operations in the shoal waters in grounding condition the pilot model of the check lists according ISM Code requirements including.

The next stage of the scientific-research works should be an optimization of the design-layout solutions for the special-purpose vessels’ competitiveness and safety improvement.

**REFERENCES**
