

Features of training of marine ship radio specialists

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Abstract. The article discusses the features of training radio specialists for sea transport, taking into account international and national requirements for the qualifications of seafarers. It is emphasized that only persons who have diplomas and qualification certificates of the established form are allowed to occupy the positions of ship’s crew members. As part of the study, qualification documents were systematized for a GMDSS limited area operator, GMDSS operator, GMDSS second class radio electronics, radiotelephone operator and GMDSS first class radio electronics. The areas, types and tasks of the professional activity of the graduates of the educational program “Radio communication and electrical radio navigation of the marine fleet” have been determined. Among the main objects of professional activity, radio-electronic equipment on ships and coastal centers of sea and water transport is highlighted. It was emphasized that the results of training specialists are assessed by the acquired universal, general professional and professional competencies, i.e. the ability to apply knowledge, skills and personal qualities in accordance with the tasks of professional activity. The article examines modern trends in determining the quality of education by using internal and external assessments. It is concluded that the training of radio specialists for maritime transport in modern conditions is of great importance, especially taking into account the development of transportation along the Northern Sea Route and the industrial development of the Arctic. At the same time, the defining condition is the inclusion of international and national requirements in the educational process, then graduates in the field of radio communication and electric radio navigation of the marine fleet will be in demand in the Russian and foreign freight market.

Maritime transport issues are of great importance both in scientific literature [1–6] and in international and national regulatory documents. Only persons holding diplomas and qualification certificates of established standard are allowed to hold positions of ship crew members. Such procedures are defined by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 [7] and the Order of the Russian Ministry of Transport [8]. Thus, ship radio specialists, like all members of ship’s crews, in addition to the relevant professional education, must undergo certification, receive and confirm qualification documents with the established frequency:

- to the operation level: operator of the limited region of GMSSB, operator of GMSSB, radio electronics of the second class GMSSB, operator-radio telephone operator;
- to the management level—radio electronics of the first class GMDSS.

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The Global Maritime Distress and Safety System (GMDSS) was developed by the International Maritime Organization (IMO) and is an international system using modern terrestrial, satellite and shipborne radio communication systems.

The documents required for certification of ship radio operators are systematized in table 1.

Table 1. Documents for certification of ship radio specialists

No.	Position/Documents
1	Common documents for all positions: <ul style="list-style-type: none">• identity document; a document confirming fitness for work on ships for health reasons;• certificates of: initial safety training; training in lifeboats and rescue boats and rafts; preparation for fire fighting;• training in accordance with Regulation of the STCW Convention; security training
2	Operator-radiotelephone operator: <ul style="list-style-type: none">• certificate of completion of training for radiotelephone operators under a program that meets the requirements of the STCW Convention
3	GMDSS restricted area operator: <ul style="list-style-type: none">• a document on obtaining higher or secondary vocational education in the field of navigation;• certificate of completion of GMDSS restricted area operator training
4	GMDSS operator: <ul style="list-style-type: none">• a document on obtaining higher or secondary vocational education in the field of navigation;• certificates of sailing on ships for at least six months with the fulfillment of radio-communication duties;• certificate issued by a maritime educational organization on the completion of GMDSS operator training in accordance of the STCW Convention
5	Radioelectronics of the second class GMDSS: <ul style="list-style-type: none">• a document confirming the receipt of higher or secondary vocational education in the field of radio communication or in the field of navigation;• documents confirming the implementation of training programs, or certificates of sailing, confirming the experience of sailing at least six months with the performance of duties in radio communications;• certificate of completion of GMDSS second class radio electronics training
6	Radioelectronics first class GMDSS: <ul style="list-style-type: none">• a document on obtaining higher professional education in the field of radio communication or in the field of navigation;• diploma in radio electronics of the second class of GMDSS;• certificate of sailing for at least 24 months in the position of second class radio electronics

Graduates prepare for professional careers in the following areas:

- communications, information and communication technologies (in the areas of: provision and maintenance of transport activities; technical operation of transport facilities; information and telecommunication technologies in transport);
- transport (in the areas of: provision and maintenance of transport activities; technical operation of transport facilities; information and telecommunication technologies in transport).

Table 2. Types of professional tasks of graduates

No.	Types and tasks of professional activity
1	<p>Operational and technological type of tasks</p> <p>Tasks:</p> <ul style="list-style-type: none">• ensuring the uninterrupted operation of electronic systems;• monitoring and determining the operability of installed, operated and repaired transport radio-electronic equipment, predicting its technical condition;• technical operation of transport radio-electronic equipment in accordance with the requirements of normative and technical documentation;• support of work on the modernization of transport radio-electronic equipment, subject to agreement with the developer of the equipment, selection and replacement of its elements and systems;• marketing of services for the operation of transport radio-electronic equipment of various forms of ownership;• selection of security alarm systems, implementation, commissioning of security systems;• technical operation of communication systems and electrical radio navigation in maritime transport in accordance with the requirements of the STCW Code
2	<p>Organizational and managerial type of tasks</p> <p>Tasks:</p> <ul style="list-style-type: none">• ensuring the uninterrupted operation of radio electronic systems;• participation in the implementation of the functions of supervision over the safe operation of transport radio-electronic equipment;• conducting an internal audit and preparing certification of objects of technical operation of transport radio-electronic equipment

The educational program is focused on solving operational, technological and organizational and managerial types of tasks presented in table 2.

Among the main objects (or areas of knowledge) of the professional activity of graduates, radio-electronic equipment on ships and coastal centers of sea and water transport stands out: radar, radio navigation and communication systems, systems and means for monitoring and diagnosing the technical condition of the radio-electronic equipment in operation, systems for transmitting information about the movement of vehicles and external conditions of their operation, systems for integrated processing, display and registration of information about the movement of vehicles and external conditions, systems for controlling the movement of ships and warning systems for their dangerous approaches, radio communication systems and electric radio navigation of maritime transport.

The results of mastering the educational program are determined by the competencies acquired by graduates, i.e. the ability to apply knowledge, skills and personal qualities in accordance with the tasks of professional activity. Highlighted are universal, general professional and professional competencies.

Universal competences are the same for all educational standards for bachelor's and specialist's degrees:

- the ability to carry out a critical analysis of problem situations on the basis of a systematic approach, to develop an action strategy;
- ability to manage a project at all stages of its life cycle;
- the ability to organize and manage the work of a team, developing a team strategy to achieve a set goal;

- the ability to use modern communication technologies, including in foreign language(s), for academic and professional interaction;
- the ability to analyze and take into account the diversity of cultures in the process of inter-cultural interaction;
- the ability to determine and implement the priorities of their own activities and ways to improve them on the basis of self-esteem and education throughout life;
- the ability to maintain the proper level of physical fitness to ensure full-fledged social and professional activity;
- the ability to create and maintain safe living conditions, including in the event of emergencies and military conflicts;
- ability to use basic defectological knowledge in social and professional spheres;
- the ability to make informed economic decisions in various areas of life;
- the ability to form an intolerant attitude towards corrupt behavior.

General professional competences (GPK) determine training in the engineering field, which is shown in table 3.

Table 3. General professional competencies

GPC Group	General professional competencies (GPC)
Natural and scientific laws of the modern world and general engineering field	Ability to use the basic laws of mathematics, units of measurement, fundamental principles and theoretical foundations of physics, theoretical mechanics
Legal literacy	Ability to apply the foundations of Russian and international legislation in the field of professional activity
Information and communication technologies	Ability to present information in the required format using information, computer and network technologies, taking into account the basic requirements of information security
Engineering graphics	Ability to carry out measurements and instrumental control, process results and evaluate errors
Environmental safety and labor protection	Ability to apply technical means and technologies to minimize negative environmental consequences, ensure safety and improve labor in the field of professional activity
Modeling complex systems	Ability to apply the fundamental foundations of modeling theory as the main research method and a scientifically grounded method for assessing the characteristics of complex systems used for decision-making in various areas of professional activity

Professional competencies reflect the specifics of training radio specialists for marine vessels. The object or area of knowledge is radio electronic equipment on ships and coastal centers of sea and water transport. The relationship between the tasks of professional activity and professional competencies of graduates is systematized in table 4.

Modern trends in determining the quality of graduate training, incl. and marine ship radio specialists are developed using internal and external evaluation. As part of an internal assessment, students consider the conditions, content, organization of the educational process as a whole and individual disciplines and practices. Reviewing of educational programs is

Table 4. Professional competence of marine ship radio specialists

The task of professional activity	Professional competence
Operational and technological type of professional activity	
Security uninterrupted operation of electronic systems	Ability to commission, maintain and repair radio electronic systems
Monitoring and determining the operability of the installed, operated and repaired transport radio-electronic equipment, forecasting its technical condition	Able to test and determine operability of the installed, operated and repaired transport radio electronic equipment, predict its technical condition
Technical operation transport radio-electronic equipment in accordance with the requirements of regulatory and technical documentation	Ability to exercise Technical operation of radio communication equipment and electrical radio navigation in accordance with the requirements of regulatory and technical documentation
Maintenance of work on the modernization of transport radio-electronic equipment, subject to agreement with the developer of the equipment, selection and replacement of its elements and systems	Ability to participate in the modernization of marine radio-electronic equipment, form recommendations for the selection and replacement of its elements and systems
Carrying out marketing of services for the operation of transport radio electronic equipment of various forms of ownership	Ability to express competent judgments on the basis of marketing services for the operation of transport radio-electronic equipment of various forms of ownership
Selection of security alarm systems, commissioning and commissioning of security systems	Ability to make an informed choice of security alarm systems, perform commissioning of security systems
Technical operation of communication and electrical radio navigation systems in maritime transport in accordance with the requirements of the STCW Code	Ability to carry out the technical operation of communication systems and electrical radio navigation in maritime transport in accordance with the requirements of the STCW Code
Organizational and managerial type of tasks of professional activity	
Ensuring the uninterrupted operation of electronic systems	Ability to carry out organizational and methodological support for the technical operation of radio electronic systems
Participation in the implementation of the functions of supervision over the safe operation of transport radioelectronic equipment	The ability to organize safe conditions for the installation and commissioning of transport radioelectronic equipment
Internal audit and preparation of certification of objects of technical operation of transport radio electronic equipment	Ability to solve problems of internal audit and preparation of certification of objects of technical operation of transport radio-electronic equipment

carried out; development of objective procedures for assessing the level of knowledge and skills of students, competencies of graduates; ensuring the competence of the teaching staff; regular self-examination with the involvement of representatives of employers; informing the public about the results of their activities, plans, innovations. The current control of the progress, intermediate and final certification of students is carried out by using the funds of evaluation means, which allow assessing the achievement of the learning outcomes planned in the educational program and the level of formation of all declared competencies.

In order to bring the current monitoring of progress and intermediate certification of students closer to the tasks of their future professional activities, managers and employees of specialized organizations with at least 3 years of experience in this professional field, as well as teachers of related educational fields, are involved in these procedures.

- An external assessment of the quality of educational activities is carried out to confirm it to educational standards, and can be carried out within the framework of professional and public accreditation conducted by employers, their associations, as well as organizations authorized by them, including foreign ones. It is possible to implement it by authorized national professional and public organizations that are part of international structures in order to recognize the quality and level of training of graduates that meet the requirements of professional standards and the labor market.

- The training of radio specialists for maritime transport in modern conditions is of great importance, especially taking into account the development of transportation along the Northern Sea Route and the industrial development of the Arctic. At the same time, the defining condition is the fulfillment of international and national requirements in the educational process, then our graduates will be in demand in the Russian and foreign freight market.

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