



Research on the Training Needs and Main Curriculum System of Water and Land Transportation Support Talents

Zhijiang Yuan^a, Mingdong Lv^{b*}, Xiaogang Jiang^c

Department of Navigation, Dalian Naval Academy, Dalian, China

^ayuanyr0531@163.com, ^b1213730780@qq.com*, ^c280836854@qq.com

Abstract.In view of the important significance of talent cultivation for water and land transportation support, starting from the mission and task of the position, this paper systematically analyzes the ability cultivation needs of water and land transportation support talents. On this basis, a supporting main course system for ability cultivation has been constructed, and the main course content points have been analyzed. The research results have a certain supporting role for the cultivation of water and land transportation support talents, and also have reference value for other related talent cultivation.

Keywords: Ship; Amphibious talents; Curriculum system; Ability development

1 Introduction

At present, China's security threats mainly come from the sea, with prominent contradictions in the surrounding maritime security environment and an increase in uncertain factors. The water and land transportation support capability is an important prerequisite and means for responding to crises, controlling situations, and winning wars. China has a variety of models of land and water delivery vehicles, and their combat capabilities are closely related to the talent of land and water transportation support[1]. Starting from the mission and task, it is important to systematically analyze the needs for talent cultivation in land and water transportation, and construct corresponding curriculum systems[2-3].

2 Analysis of the demand for talent cultivation in water and land transportation support

Water and land transportation support talents, as the mainstay of the utilization of water and land transportation power, have various requirements in terms of ability cultivation. The specific analysis is as follows:

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2.1 Political Thought

Understand the basic principles and spiritual essence of Marxism and the theoretical system of socialism with Chinese characteristics; Possess a scientific worldview and outlook on life. Political determination, patriotism for the people, honesty and trustworthiness, compliance with discipline and laws, and obedience to orders[4].

2.2 Strategic and tactical ideas

Having a global perspective, systematic perspective, development perspective, and long-term perspective, possessing solid basic knowledge, basic thinking methods, and knowing the national and political conditions of major countries and neighboring countries in the world.

2.3 Physical Psychology

Having a healthy physique, a sound personality, and good humanistic literacy, possessing a good temperament and style, and possessing good physical and mental conditions for engaging in the command profession of land and water transportation support.

2.4 Engineering knowledge and application ability

Be able to apply mathematics, natural sciences, disciplinary foundations, and professional knowledge to solve engineering and practical problems in the field of land and water transportation support command[5].

2.5 Ability to use tools

Capable of developing, selecting, and using appropriate and reasonable technologies, resources, modern engineering tools, and information technology tools for the field of water and land transportation support command, including predicting and simulating complex engineering problems, and being able to understand their limitations.

2.6 Innovative design capabilities

Be able to design solutions for complex engineering problems, design systems, units, or process flows that meet the needs of the professional field of water and land transportation support command, and reflect innovation awareness in the design process.

2.7 Research and application capabilities

Able to conduct research on complex engineering problems in the field of land and water transportation support command based on scientific principles and methods, including designing experiments, analyzing and interpreting data, and obtaining effective conclusions through information synthesis.

2.8 Communication skills

Able to effectively communicate and exchange with industry peers and the public on engineering technology and military practice issues in the field of water and land transportation support command, including writing reports and design drafts, presenting speeches, and clearly expressing or responding to instructions. And possess a certain international perspective, capable of conducting military communication and exchange with foreign countries in a cross-cultural context.

2.9 Navigation duty and group training management ability

Possess the ability to navigate on duty vessels, possess departmental training and management skills, and carry out ideological and political work. Able to solve policy, regulatory, professional and other issues that arise during work.

2.10 Professional norms

Possess core knowledge of naval profession and professional knowledge of ship to sea operations, able to understand and abide by naval professional norms in practical work, and faithfully fulfill responsibilities.

2.11 Social Responsibility

Able to conduct reasonable analysis based on engineering related background knowledge, evaluate various problem-solving solutions in the field of water and land transportation support command, and understand the impact on society, environment, health, safety, law, and culture, as well as the responsibilities that should be borne.

2.12 Lifelong learning thinking

Having the awareness of self-directed learning and lifelong learning, able to continuously learn and adapt to development, and able to timely understand the latest theories, technologies, and international cutting-edge trends in the field of land and water transportation support command.

3 Design of the Main Course System for Cultivating Water and Land Transportation Support Talents

To achieve the goal of cultivating the ability of water and land transportation support talents, a main course system has been constructed from four modules: "ideological and political foundation, general education, subject foundation, and professional knowledge", as shown in Figure 1.

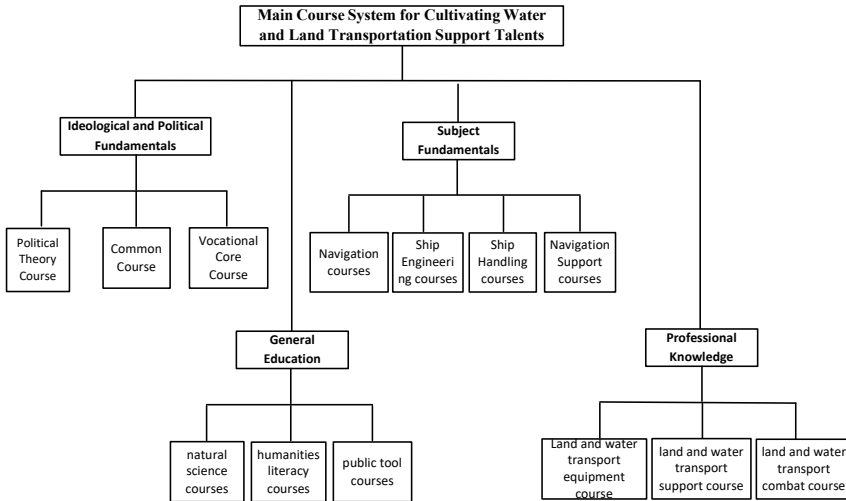


Fig. 1. Main Course System for Cultivating Talents in Water and Land Transportation Support

3.1 "Ideological and Political Fundamentals" Course Module

In the "Military and Political Fundamentals" course module, students' ideological and political foundation will be strengthened from three aspects: "Political Theory Course, Common Course, and Vocational Core Course". In terms of political theory courses, In terms of common courses, courses such as "Military Sports" and "Fundamentals of Military Theory" will be studied; In terms of vocational core courses, students will learn courses such as "Fundamentals of Navigation", "Ship Manoeuvring and Navigation Duty Officer", "Ship Group Training and Management", "Introduction to Ship Engineering", "Ship Damage Management Training and Organization", "Practical English for Ships", and "Introduction to Oceanography".

3.2 "General Education" course module

In the "General Education" course module, students' higher education foundation will be strengthened from three aspects: "natural science courses, humanities literacy courses, and public tool courses", so that they have a solid scientific and humanities literacy. In terms of natural science courses, I will study courses such as "Advanced

Mathematics", "Linear Algebra", "Probability Theory and Mathematical Statistics", "Complex Functions and Integral Transformations", "College Physics", and "College Physics Experiments"; In terms of humanities literacy courses, I will study courses such as "Speech and Writing", "Introduction to Logic", "Speculation and Innovation", and "Leadership Literacy"; In terms of public tool courses, courses such as "College English" and "Fundamentals of Programming" will be studied.

3.3 "Subject Fundamentals" course module

In the course module of "Subject Fundamentals", establish a solid foundation for students from four aspects: "Navigation courses, Ship Engineering courses, Ship Handling courses, and Navigation Support courses". In terms of navigation courses, I systematically study courses such as "Navigation Mechanics", "Navigation Mathematics", "Astronomical Navigation", "Electronic Chart Display and Information System", and "Mechanical Drawing"; In terms of ship engineering courses, study courses such as "Ship Structure and Performance" and "Ship Power Plants and Auxiliary Systems"; In terms of ship handling courses, study courses such as "Ship Handling and Collision Avoidance" and "Ship Handling and Seakeeping"; In terms of navigation support courses, study courses such as "Navigation Meteorology and Oceanography", "Ship Safety Management", and "Fundamentals of Radio Technology".

3.4 'Professional Knowledge' Course

In the "Professional Knowledge" course module, consolidate students' professional knowledge from three aspects: "Land and water transport equipment course, land and water transport support course, and land and water transport combat course". In terms of water and land transportation equipment courses, study courses such as "Ship Deck and Landing Channel System", "Water and Land Transportation and Command", and "Air Cushion Ship Transportation and Command"; In terms of water and land transportation support courses, study courses such as "Principles of Ship Assembly Loading" and "Ship Damage Management Training"; In terms of courses related to land and water transport operations, study courses such as "amphibious tactical command" and "coordinated command of land and water forces".

4 Key Points of the Main Course Content for Water and Land Transportation Support Talents

Figure 1 shows the main course system for cultivating talents in water and land transportation support. The following will analyze the main content points of the courses involved in this system, laying the foundation for cultivating talents in water and land transportation support.

4.1 Geographical Navigation

Through learning, students will understand the types of coordinate systems and the coordinate systems used by countries around the world, and master the types of coordinate systems used in China's charts and their mutual conversion methods; Understand the principle and usage of Gaussian kilometer network projection, and master the Mercator chart network drawing method; Understand the impact of hydrological and meteorological factors such as wind and current on ships' route execution, and master the methods of chart operation and trajectory calculation for ships sailing in wind and current; Understand the types, uses, and usage methods of commonly used Chinese version navigation books and materials for offshore navigation in China, and master the operation and usage methods of Chinese version navigation books and materials; Understand the reasons for the positioning errors of land marks, master the principles and methods for handling ship position errors, and learn to analyze the reasons for selecting, measuring, and evaluating the results of land mark positioning from the perspective of ship position errors; Understand the navigation methods of radar navigation in night fog, master the selection of anchor positions and the method of anchoring designated anchor positions; Understand the methods and processes for measuring ship speed, inertia factors, and gyration factors, and learn to develop and measure ship navigation performance; Understand the general steps of drafting a navigation plan, master the basic methods and procedures for route design and navigation assurance, and be able to design the route for offshore navigation tasks.

4.2 Navigation Meteorology

Through learning, enable students to understand the impact of marine hydrological and meteorological conditions on ship navigation safety; Understand the brief history and trend of the development of maritime meteorological support, and understand the responsibilities of naval navigation command officers in maritime hydrology and meteorology; Understand the relationship between meteorological factors and weather and climate, understand the structure of atmospheric pressure systems and weather distribution, understand the pathways of air saturation, understand the effects of temperature advection, atmospheric convergence and divergence, and atmospheric vertical stability on weather changes, understand the macro conditions of precipitation, sea fog, and strong winds, and master the law of wind pressure and its applications; Understand the principles of atmospheric thermal circulation, understand the distribution of pressure bands, wind bands, and monsoons in the near surface layer and their impact on weather and climate change, understand the basic characteristics of the activity of the westerly trough ridge in the troposphere, and understand the basic characteristics of the actual distribution of average sea level pressure field; Master the weather distribution characteristics, weather process characteristics, and activity patterns of weather systems such as fronts, temperate cyclones, cold high pressure, subtropical high pressure, and tropical cyclones, understand the structural characteristics and weather effects of various types of fronts, temperate cyclones, cold high pressure, subtropical high pressure, and tropical cyclones, understand the weather characteristics of small and medium-sized weather

systems, master the activity patterns of sea fog and strong wind (wave) weather processes that affect China's offshore areas, and understand the easterly waves. The weather characteristics and activity patterns of the tropical (equatorial) convergence zone and small and medium-sized weather systems; Understand the principles of weather chart analysis and wind pressure law application, understand the application of temperature advection, satellite cloud images, radar images, and meteorological fax images in weather analysis, understand the basic methods of weather forecasting, understand the basic ideas of ground and high-altitude situation forecasting, and master the methods of ship supplementary weather forecasting; Understand the basic knowledge and variation patterns of the main hydrological factors that affect navigation, such as waves, tides, tidal currents, ocean currents, storm surges, and sea ice. Understand the simple prediction methods of ocean waves, master the calculation methods of tides and wind-driven currents, master the calculation methods of tidal currents using the T-D value table method and the Chinese Navigation Guide Data, and understand the information calculation methods of navigation hydrological charts in the English version; Understand naval navigation meteorological support information and acquisition methods, understand naval ship typhoon prevention regulations and weather warning information, understand commonly used numerical prediction product information for long-distance navigation, and master the organizational methods of independent ocean hydrological and meteorological support for ships; Understand the classification methods of world climate and the characteristics of various climate types, understand the climate characteristics and navigation impacts of China's offshore and important maritime channels, and understand the climate characteristics of the world's oceans and polar regions.

4.3 Modern Navigation Technology

Through learning, students can understand the history, current status, and trends of mainstream navigation systems, understand the navigation reference coordinate system and its transformations, and understand the Earth ellipsoid representation method; Understand the architecture of satellite navigation systems such as Beidou, GPS, GLONASS, GALILEO, etc., understand the calculation principles of satellite orbit, user position, and speed, understand the satellite signal system and receiver workflow, and understand satellite signal processing technology; Understand satellite navigation errors and their processing methods; Understand the basic concepts and their interrelationships of specific force, absolute acceleration, implicated acceleration, and Coriolis acceleration, and understand the principles of inertial navigation velocity and position calculation; Understand the motion law of a single degree of freedom gyroscope and the working principle of a stable platform, understand the control principle and error characteristics of an inertial platform, understand the initial alignment and comprehensive correction principles of inertial navigation, and understand strapdown inertial navigation technology; Understand the basic principles and related applications of other systems such as matching navigation, underwater acoustic navigation, relative navigation, and combination navigation.

4.4 Ship maneuverability and seakeeping

Through learning, students can understand the physical significance and characteristics of the form of ship maneuvering motion equations and their hydrodynamic derivatives; Understand and master the relationship between K, T indices and maneuverability in the steering response model, and master the method of establishing ship maneuvering motion equations; Understand the basic theory of motion stability and master the methods of judging motion stability; Understand the characteristics of ship rotation motion, as well as the maneuvering motion characteristics during acceleration, deceleration, and braking; Understand the maneuverability test methods of free self-propelled ship models and master the basic methods of obtaining characteristic maneuverability parameters through these tests; Master the simulation and prediction methods of ship maneuvering motion; Understand and master the relevant theories of regular and irregular waves; Master the basic theories and methods of applying linear theory to study ship roll motion; Understand and master the theoretical analysis and calculation methods of ship sway motion; Understand the analysis and prediction methods of ship pitch and heave motion; Understand the prediction methods of various dynamic responses; Understand the evaluation indicators of seakeeping, understand the equipment and organization of seakeeping tests.

4.5 Ship Power Plant and Auxiliary Systems

Through learning, students can understand the nature, status, and development process of power plants and systems, master the main types and characteristics of modern large ship main and auxiliary power plants, and understand the basic knowledge of thermal engineering; Understand the basic concepts and composition of marine diesel power devices, understand the basic working principles of diesel power devices, and master the use and management of marine diesel power devices; Understand the basic concepts and components of marine steam turbine power plants, understand the basic working principles of steam turbine power plants, and master the use and management of marine steam turbine power plants; Understand the basic concepts and components of marine gas turbine power plants, understand the basic working principles of gas turbine power plants, and master the use and management of marine gas turbine power plants; Understand the basic concepts and components of ship nuclear power plants, understand the basic working principles of nuclear power plants, master the use and management of nuclear power plants, understand the basic concepts and components of joint power plants, and understand the working principles and characteristics of joint power plants; Understand the basic concepts, composition, and functions of ship power systems, and understand the general principles and characteristics of ship integrated power systems; Understand the basic concepts, composition, and functions of shipboard systems, and understand the general principles and characteristics of shipboard systems.

4.6 Ship Structure and Performance

Through learning, enable students to understand the forms and characteristics of ship internal zoning; Understand the calculation methods for shear force and bending moment of ships resting on waves, as well as the ultimate bending moment; Understand the basic knowledge of ship stealth; Understand the characteristics and use of ship hull line diagrams; Understand the main numerical integration methods for ship hull calculations; Understand the representation method of ship floating state; Understand the calculation methods of ship weight and center of gravity; Understand the calculation method of ship drainage volume and buoyancy center position; Understand the determination of draft changes during load increase and decrease; Understand the characteristics and representation methods of initial stability; Understand the impact of movement and load increase or decrease on the buoyancy and initial stability of ships; Understand the influence of free liquid surface and suspended load on the initial stability of ships; Understand the stability of ships during docking and the process of ship tilting tests; Understand the static stability curve and the interpolation curve of the ship shape stability arm; Learn the static stability curve and dynamic stability curve; Understand the main factors affecting large angle stability; Understand the calibration methods for ship stability; Understand the concept and types of ship damage and water ingress; Understand the standard requirements for permeability and damaged water inflow; Understand the calculation methods for buoyancy and stability when a single cabin is damaged and flooded; Understand the calculation methods for buoyancy and stability when the cabin group is damaged and flooded; Understand the calculation method of immersion length and allowable cabin length; Understand non sinking guarantee measures; Understand the basic characteristics, load adjustment requirements, and basic methods of new ships.

4.7 Ship maneuvering and navigation duty officer

Through learning, students can understand the composition and causes of ship water resistance, and understand the factors that affect ship water resistance; Understand the effects of propellers, rudders, and wind and current on ships; Understand the motion performance of ships; Understand the vehicle and rudder commands and their meanings, and be able to issue vehicle and rudder commands correctly; Master the maneuvering methods for maintaining the ship's route, turning, and turning; Understand the factors that affect the gripping force of the anchor and the role of the anchor in ship maneuvering, master the maneuvering methods and steps for lifting a single anchor, and master the judgment and handling methods for dragging the anchor; Master the configuration of ship mooring lines and commonly used terminology for mooring lines, master the preparation work for ship berthing and disembarking from the dock, and master the general maneuvering methods for ship berthing and disembarking from the dock; Understand the impact of strong winds and waves on ship maneuvering, and master the maneuvering methods of ships in strong winds and waves; Understand the provisions of the International Regulations for Preventing Collisions at Sea; Master the operational rules of ships under various visibility conditions; Master the lights, shapes,

and sound and light signals, and be able to determine the type, size, and dynamics of incoming ships; Master the method of judging the situation of maritime encounters and the division of collision avoidance responsibilities; Understand the principle of relative motion, master radar plotting skills, and master the operation and usage methods of typical ARPA; Master the general process and maneuvering methods for rescuing drowning personnel at sea, and master emergency maneuvering and disposal measures for ships; Understand the provisions of the Maritime Accident Encounter Rules (CUES) and learn how to apply them; Master the main responsibilities of navigation duty officers and the organization and implementation methods of navigation duty officers.

5 Conclusion

At present, water and land transportation support talents play an important role in winning future wars. Starting from the job mission and tasks of water and land transportation support talents, the paper systematically analyzes the needs for cultivating the ability of water and land transportation support talents, and constructs a supporting main course system, especially analyzing the main content points of the main courses in the system. The research results have a supporting role in cultivating talents for water and land transportation support, and also have certain reference value for the cultivation of other related talents.

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