THEORETICAL JUSTIFICATION OF THE SAFETY OF MANEUVERING OF FLOATING VEHICLES

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When analyzing the current realities of the use of amphibious technology, it is important to emphasize that maneuvering safety is one of the priority areas for ensuring the effective operation of this type of machinery in complex operational environments. Maneuvering should be understood as changes in direction and speed of movement due to the action of steering devices and propulsion systems under various hydrodynamic conditions–on calm water, in currents, when entering the water, going ashore, and mooring to vessels and berths.

Floating vehicles, or amphibious vehicles, are a unique type of equipment capable of moving both on land and on water. This versatility makes them indispensable in combat situations, rescue operations in remote areas, and various sectors of the civilian economy. With the onset of rf full-scale military aggression against Ukraine, the importance of mobility and reliability in military equipment has grown significantly. Under such conditions, amphibious vehicles allow for the rapid transfer of personnel, equipment, and cargo across water obstacles without the need to deploy additional engineering structures such as bridges or pontoon crossings. This significantly reduces the time required for troop maneuvers and minimizes the risk of personnel and equipment losses. It also preserves the element of surprise in both defensive and offensive military operations.

To ensure the correct and effective use of floating combat vehicles (in particular, the BTR-4E), theoretical modeling of kinematics and motion dynamics, analysis of hull stability on water, evaluation of motion resistance, braking characteristics, and vehicle response under variable loads is required. Comparing foreign models (AAV7, ZBD-2000) allows identification of promising directions for the modernization of domestic designs.

In the civil sphere, amphibious vehicles are used in low-accessibility environments: during rescue missions, in construction in wetlands, agriculture, forestry, tourism, and energy infrastructure. In all these cases, ensuring safe and predictable maneuvering is a critical factor for operational efficiency and reliability.

Thus, the problem of amphibious vehicle maneuvering safety requires a comprehensive scientific and technical approach, including numerical modeling, multifactor analysis, and design optimization. The implementation of such research necessitates interdisciplinary collaboration, the involvement of highly qualified specialists, and adequate funding. In conditions of limited resources and challenges brought about by martial law, the support and development of national scientific and engineering potential capable of creating high-tech domestic amphibious equipment is of particular relevance.