

DETERMINING THE CONDITIONS FOR SAFE TOWING OF AN UNDERWATER VEHICLE IN CONDITIONS OF CROSSED BOTTOM RELIEF

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Among the technical means for studying the World Ocean, a special place is occupied by underwater towed systems consisting of a towing vessel, a communication cable and a towed underwater vehicle. These systems are widely used in oceanography, the navy, industrial fishing and geological exploration. Ensuring the operational reliability of the use of these systems requires a study of the permissible parameters of the bottom surface along the course of the towed underwater vehicle in the area of operations (angle of inclination, height of obstacle). In the course of the conducted research, the steady-state motion of the underwater towed complex "vessel – communication cable – towed vehicle" was simulated in the longitudinal-vertical plane using the application program developed at the IMTP FEBRAS, based on the numerical integration of the equation of a flexible inextensible thread in a steady flow. The paper presents the results of calculating the influence of the towing speed and the length of the communication cable on the tension of the cable ends and the immersion depth of the apparatus with zero residual buoyancy. Taking into account the identified dominant dependence of the communication cable shape on the towing speed, a calculation was made of the acceptable values for tracking the slope of the bottom surface and the safe elevation above the immersion depth of the apparatus to avoid obstacles along the route. In these calculations, the vertical movement of the towed apparatus was achieved by changing the length of the communication cable at a given speed.

Keywords: towed underwater system, communication cable, flexible inextensible line equation, towed underwater vehicle, cable length adjustment, terrain slope tracking, obstacle avoidance

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