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COMBINED SHOCK AND MINE PROTECTION BASED ON ALUMINUM ALLOY PARTS

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This paper considers the use of aluminum alloy parts for combined mine protection of armored combat vehicles. The study was concerned with anti-mine shields mounted on an armored combat vehicle body model. The model was made of 16 mm armor steel. The total mass of the model (without an anti-mine shield) was 31.1 kg. An anti-mine shield was gripped between two frames and secured with bolts. To eliminate the effect of the soil on the test results, the explosive charges were installed on a 70 mm metal plate. The charges were initiated with an ED-8Zh electrodetonator. TG-50/50 explosive was used. A DYTRAN 3200B acceleration sensor was mounted at the center of the model, and the sensor signal was measured using an experimental system. To assess the model acceleration without any energy loss by elastic or plastic deformations, the acceleration of the model with a rigid anti-mine shield (a rigid armor steel plate of thickness 10 mm and mass 10.7 kg) was assessed. A finite-element simulation of the model was conducted. The effect of explosion load parameters on the model acceleration was studied. The simulated and the actual deflections were compared using an EinScan Pro 2X Plus 3D scanner. The speed and the acceleration of the model with a rigid and a plastic anti-mine shield were simulated and measured. The results showed that annealed parts made of Al-Mg alloys, in particular AMg6 alloy, absorb the explosion energy better. Any of the anti-mine shields made of AMg6 alloy reduces the acceleration at the center of the plate and thus the load on the armored vehicle body by a factor of 20…25 in comparison with the anti-mine shields made of armor steel. It was shown that annealing best provides the required physical and mechanical characteristics of the load-bearing parts of anti-mine shields, it is advisable to shape and structurize their porous energy-absorbing elements by pressing up to 33 MPa, it is most advisable to paste the porous energy-absorbing elements to the load-bearing parts, and after separate tests of load-bearing part and porous energy-absorbing element material specimens it is advisable to try out combined constructions of anti-mine shields for armored combat vehicles of different purposes.

Keywords: *aluminum alloys, energy-absorbing elements, anti-mime shields, mine protection, armored combat vehicles, plasticity, impact strength.*

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