Part III

Construction and Investigation of the Dynamic Characteristics of Tracked Vehicles
Nowadays the unmanned vehicles are becoming more and more common. Therefore there is a need for innovative mechanical constructions capable of adapting to various applications regardless the ground, air or water/underwater environment. Military operations in order to complete successfully require a vast amount of information and high quality equipment and vehicles capable of movement both in a city and terrain. An example of such are tracked vehicles. As well as in today’s and tomorrow’s army, tracked vehicles will be one of the most important equipment. As it is known this equipment is expensive, and extremely stressful experiments on this equipment should be conducted carefully. An answer for this problem is to conduct experiments on a computer model. Design, construction of such models require research inter alia in the field of kinematic and dynamic relationships inside entire suspension system. Elements of the vehicle are grouped in few subsystems, like suspension, wheels or tracks. During prototyping phase of the object a high fidelity model is constructed and later verified using the prototype. For instance the damping value estimation can be estimated based on tolerance area of characteristics of real damper.

One of the main threats to tracked vehicles are mines and IEDs. Therefore it is extremely important to research the impact of explosive on the tracked vehicles and especially the crew inside. It is known that the impact of explosion on the crust (hull) of a vehicle creates a secondary wave phenomenon. The phenomenon rests on the interaction of the bottom and sides of the vehicle as a membrane. The membrane moves the pressure pulse acting on the armour inside the vehicle. The increase of pressure inside the vehicle causes the damage to internal organs ultimately leading to the death of soldiers. In the case of armour penetration, even a more rapid increase of pressure is possible. One of the basic ways to protect crews of vehicles is opening the hatches of vehicles. Nevertheless, this method is not applicable when the vehicle moves in a contaminated area. High mobility in all terrain and weather conditions is one of the most significant features of the light armoured vehicles. As well as that, such vehicles have good independence, setting them as a primary military equipment to be used by stabilization forces of many countries. However, they are exposed to many threats among which are improvised explosive device (IED). As a consequence, contemporary technical and tactical requirements put strong emphasis on proper layout of the hull in order to provide a good cover for the crew. Therefore it is required to analyse the impact and effects in both ways: numerical and experimental. The chapter presents also experimental results of impact of IED on vehicles and special manipulators. It is essential that maximum stress during the explosion do not exceed the material parameters.