PhD Thesis Abstract

CONTRIBUTIONS ON THE DEVELOPMENT OF A NEUTRALIZATIONS SYSTEM OF IMPROVISED EXPLOZIVE DEVICES

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Reviewing the terrorist acts committed in the world, their frequency, the dramatic effects in terms of victims and material damage and the diversity of methods and means used, form the real picture of the magnitude and complexity of terrorism. The analysis of the incidents and terrorist acts revealed that about 80 % of them had been carried out by using exclusively improvised explosive devices (I.E.D.) known to the public as the infernal devices, homemade bombs or car bombs for cars. Depending on the purpose, the I.E.D. sites are hidden in different containers that usually have a totally harmless look. Regardless the technical complexity, an improvised explosive device is defined as bbeing completely made up of a load of explosives, a means of initiation and a coating of masking assembled so that the initiation of the explosion to occur instantly or on order as in the case of wired explosion , radio one, etc. Additionally I.E.D. may be provided with other elements such as safety devices in handling and transport, safety devices to defuse generally called "trap " that are designed to prevent the application of classical methods of defusing. They are nothingelse but supliment devices for trunk or those that activate the primer beeing capable of producing explosion when trying to defuse or accidental maneuvers are performed. The main component of an explosive device is an explosive, generically called active or neutral explosive charge. The explosive transforming of a payload gives rise to a great deal of energy on the environment that acts as a useful work of moving and destruction. The quantity and quality of these effects and actions depend on several factors, among which the most important are the amount and the nature and characteristics of the explosive used , the nature and configuration of the shell , the resistance of the environment , the level of protection etc. and the elements to be taken into account in the actions of neutralization. Today it is widely accepted that there aren't accurate and secure solutions to defuse or neutralize the activity of a I.E.D. There is an important distinction between neutralization and defusing a I.E.D. which usually takes place in public spaces or areas and that of military ammunition that can be destroyed in special designated areas. While at some conventional munitions one can know their characteristics, at I.E.D. sites this is not possible , given their constructive diversity. Generaly speaking the structure and composition of I.E.D. sites depends on the ingenuity of the person that realized it, the nature and quality of materials used, the masking - concealment , the targeted nature of the objects to be destroyed, the possibilities of location, the time available for making, placement and priming. Of significant importance in the neutralzing activity is the choice of the type of disruption agent, based on the target current , on the characteristics of the material (tire) in which the improvised explosive device stands . If the improvised explosive device (called therefore I.E.D.) is in a metallic case (eg car body, pipe, thin-walled metal crates) for punching , should be used steel projectiles . The use of these agents disruption involves taking more risk , which must be taken into account, such as:

- because of the characteristics of different shock of these materials , it is possible that I.E.D. accidentally operate ;
- Usually pyrotechnic intervention is done in urban areas ; therefore it must be remembered that the drawing with metal bolts , it is propelled like a bullet in the gun, which can injure bystanders or cause property damage;
- Scattering debris I.E.D. when you pull on it directly with agents other than water is much higher , hence the difficulty in sampling some post- neutralization.

Hence the certain requirements for disrupting, requirements that this work aims to meet:

- Light weight, easy handling of the entire system (hard - disrupting);
- Use in certain areas and targets;
- the action must ensure the time of the separation of the constituent elements of the I.E.D. lower than the reaction time (stimulus) required for its initiation (eg.during the transport of electricity through wires connecting the source - electric detonator must be greater than the time required for mechanical separation);
- Socket structure of I.E.D. should be damaged so as to provide visualization inside the content;
- Surface scattering must not be large to allow further sampling of a trace in order to a reconstruction of I.E.D.

With the technological milestones set the specific requirements pyrotechnic intervention, the work is divided into seven chapters as follows:

- Chapter 1 presents the current state of knowledge on methods and techniques of neutralization I.E.D. respectively disrupting existing types and their technical and tactical characteristics;
- Chapter 2 deals with the technical-tactical- disruptors2 and DR RICHMOND;
- Chapter 3 presents contributions to the design technology for the new disruptor, contributions generated by tactical and technical characteristics of parallelism disruptors RICHMOND DR-2;
- Chapter 4 presents mathematical models problem solving direct internal ballistics;
- Chapter 5 presents contributions to modeling, numerical simulation of operation disruptor and experimental research of ballistic characteristics of its inner, intermediate and outer;
- Chapter 6 presents experimental research on terminal ballistics and the disruptor interaction with the improvised explosive device;
- Chapter 7 presents conclusions and personal contributions.