



Research Program 4 Impact, Protection and Safety

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Switzerland attaches great importance to security. To make competent assessments of national safety and security issues, knowledge weapons and ways of providing protection against them is indispensable. The 'Impact, Protection and Safety' research program being undertaken by the Science and Technology (S+T) competence sector at armasuisse monitors the development of defence technology in the area of chemical, kinetic and electromagnetic effectors. Protection concepts are designed and investigated in order to minimize the consequences of attacks against our own forces and infrastructures. Expertise is being specifically developed within research projects and with partnerships.

Research focuses on knowing the effectors possessed by a potential attacker, estimating the risks posed to our own forces and designing appropriate measures of safety and protection. In order to achieve these goals, developments in defence technology are constantly monitored and the physical limits of weapon and protection systems are ascertained. In many current conflicts, the opposing parties' forces are asymmetrically organized and equipped. In this context, inexpensive but efficient systems that are available throughout the world (e.g. RPG-7) as well as improvised explosive devices (IED) assume greater significance.

It can be assumed that new effectors based on high-performance lasers or microwaves will be used in military operations in the future. Conventional systems are also being constantly improved. These developments are being continuously monitored in order to assess both new and conventional concepts and in order to derive the appropriate protective and safety measures.

The 'Impact, Protection and Safety' research program will safeguard the technical and scientific expertise used to produce expert assessments relating to procurement

projects for weapon and protection systems. It will also produce important knowledge of relevance to ammunition surveillance, thus helping to ensure that ammunition and explosives are handled safely. This is achieved by designing monitoring studies, conducting research projects and constructing demonstrators, and is all done with the involvement of an international network of specialists drawn from universities, industry and government institutions.

The 'Impact, Protection and Safety' research program includes four areas of expertise

- (1) Impact
- (2) Protection and safety of mobile platforms
- (3) Protection and safety of infrastructure
- (4) Computer models and simulation



Areas of expertise



Impact

A comprehensive overview and knowledge of the potential effects of current and future threats and weapon systems; basic principles and technical expertise in respect of the internal, external and terminal ballistics of thermokinetic weapons and electromagnetic effectors; technical expertise regarding safety for handling and storage of explosives, incl. vulnerability, ageing and environmental impact.



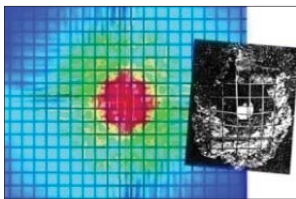
Protection and safety of mobile platforms

Basic and specialist knowledge for assessing modern protection concepts for mobile platforms; ballistic protection; protection against mines and electromagnetic effectors (lasers, HPE); reducing mass and volume of armours while retaining the same level of protection; ballistic and thermal properties of modern composite materials; electromagnetic shielding potential of nanomaterials.



Protection and safety of infrastructure

Expertise in protecting infrastructure and buildings against thermokinetic and electromagnetic effectors; assessing the dynamic properties of construction materials such as fibre-reinforced concrete; concepts for the structural hardening of buildings; shielding of important infrastructure from high-power electromagnetic fields.



Computer models and simulation

Modelling and simulation of the external and terminal ballistics of thermokinetic effectors; calculating electromagnetic effects, including non-ionizing radiation; basic principles for material models; numerical simulation of highly dynamic phenomena.

Technology demonstrators



Active protection against kinetic penetrators

In collaboration with RUAG Defence, the possibility of providing active protection against long rod penetrators was examined. Trials were conducted with ammunition calibers of between 30mm and 120mm. The results illustrate the feasibility of such active protection systems and show the degree of precision, both as regards timing and locational accuracy, which needs to be achieved to provide the necessary protective effect.

Networks

The requisite professional skills build on a broad network of partners from business, universities (including universities of applied science) and other research units in Switzerland and abroad. To ensure that these skills are properly developed, there is close contact and an ongoing exchange of information with users and with planning, procurement and testing units within the DDPS.

State partners / federal government

- armasuisse – Procurement & Real Estate, Bern
- Federal Office of Police, Bern
- Federal Office for Civil Aviation, Bern
- NBC-EOD Center of Competence, Spiez
- Forensic Science Institute Zurich
- Direction générale de l'armement, FRA
- US Army Corps of Engineers, Washington, USA
- Wehrtechnische Dienststelle 91, Meppen, DEU
- NATO / PfP

Universities, universities of applied sciences/industry

- ETH, Lausanne & Zurich
- University of Bern
- University of Florida, Gainesville, USA
- SUPSI, Canobbio
- BFH, Biel
- FHNW, Windisch
- GDELS / Mowag, Kreuzlingen
- Rheinmetall Air Defence, Zurich
- Rheinmetall Nitrochemie, Wimmis
- RUAG Schweiz AG, Thun