



## **Component Testing in Munitions Monitoring: Innovative Test Method Shows Promise**

**One of the tasks entrusted to the Science and Technology competence area (S+T) is to ensure that Swiss munitions are safe and fit for purpose. S+T carries out component tests so that it can issue reliable statements regarding the condition of the munitions without having to test complete systems. For complex systems such as intelligent munitions or guided missiles in particular, component tests make it possible to cut back on live firing tests and hence save costs without lowering safety standards.**

Testing of components and sub-systems play an increasingly important role, as the overall systems are generally becoming more complex and expensive. Component tests and system simulations are carried out under laboratory conditions that are reproducible and comply with safety requirements.

### **Clear advantages**

The advantages compared to traditional system tests are clear. The component tests not only yield financial and technical benefits but also take account of ecological aspects: pollution is minimized, especially in terms of noise emissions (indoor testing is possible) and filtering of exhaust gases. One drawback is that the component tests usually entail destruction of the component concerned. That means the item tested is no longer available for further testing or for reintegration into the system. In terms of life-cycle monitoring, however, these tests make it easier to identify even minor alterations – such as ageing effects – than when complete system tests are run.

### **Disassembly: the first sub-process**

Some of the work processes involved in isolating the subsystems and components for testing are hazardous. The munitions must first be disassembled by S+T (see inset) to expose the components and explosives. All propellant components are subjected to chemical analysis and combustion testing by S+T, the aim being to obtain information about the components' condition and their future use in the system.

### **Variety of measuring techniques used**

S+T frequently deploys specially developed operating and measurement tools for assessing the condition of the munitions. In the field of ignition and detonation in particular, short-term measurements are essential for analyzing the condition of the components, e.g. measurements of pressure/time curves on fuse heads and capsules, rocket components (such as gas generators and safety elements) and various detonating and explosive devices. Depending on the sensors used, the test bench also measures other physical parameters such as energy release, acceleration, temperature and light.



## Deployment of our own electromagnetic mass accelerator

The electromagnetic mass accelerator makes it possible to simulate the striking mechanisms in weapon systems. All the mechanically initiated munition systems introduced into service in Switzerland can be characterized by their weapon/munitions interface. Both the mass and the geometry of a firing pin and the velocity with which it penetrates the primer can be set variably. Despite their numerous advantages, it should be mentioned that component testing does not take the place of system testing but allows it to be reduced to meaningful dimensions.

*What is disassembly?*

*Disassembly of munitions is not simply a dismantling process but involves taking the munition apart under laboratory conditions with strict observance of safety criteria. In doing so, proper account must be taken of safety aspects and possible risks.*



Figure 1: Disassembled anti-tank system

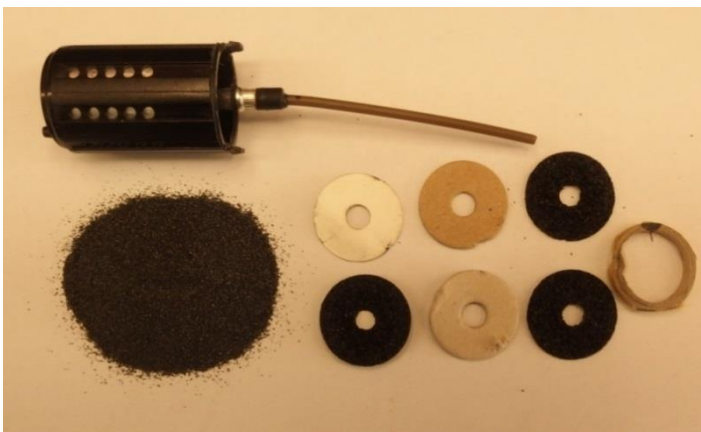
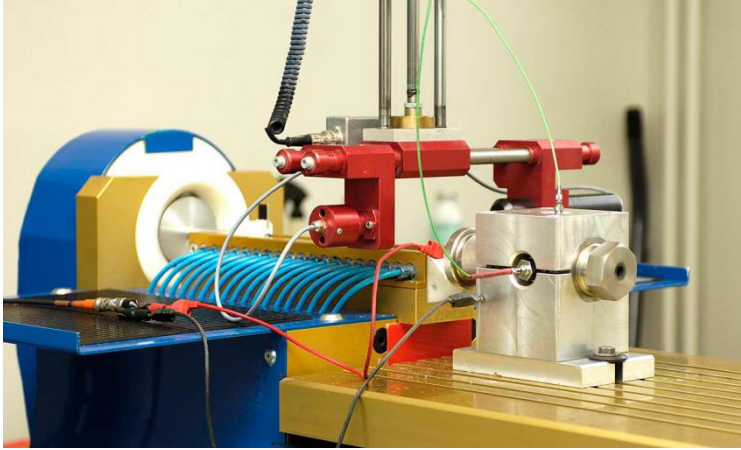


Figure 2: Disassembled rocket motor from anti-tank system



**Figure 3: Electromagnetic mass accelerator for simulating impact energy (constructed by S+T)**

Author: S+T, FBWTE Bernhard Krebs