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# PREMIUM: PREDICTION MODELS FOR IMPLEMENTATION OF MUNITION HEALTH MANAGEMENT



The project PREMIUM is aimed at improving the HUMS (Health and Usage Monitoring Systems)-based management of munitions through the establishment of models for the estimation of the ageing and health status of munitions. Ageing models are still inadequate or missing information for many materials or components constituting the munitions; moreover, a common EU approach to ageing prediction

### **Work Strands**

Kick-off of the project is scheduled on early May.

R&D activities on HUMS (Health and Usage Monitoring System) started in 2009 in order to improve the maintenance of its systems, reduce costs and support the customer through after-sales service. The challenge is to shift to Condition Based Maintenance (CBM) from the current predictive one and thus overcoming its conservative approach to health management of munitions. The long-term goal is to get real-time knowledge on the health status of weapon systems and their remaining lifespan under safe conditions anywhere and anytime. This road-map was supported by EDA through 3 Cat.B Projects: MINERVE - SESAMO (Sensors for Structural Monitoring) - MLM (Munition Life Management).

should be recommended for new concept materials that are continuously being developed and applied in sub-assemblies.

#### **Objectives**

The aim of this project will be the study of the ageing of energetic materials (rocket and gun propellants, warheads, igniters etc.) or non-energetic components of munitions or missiles (i.e. seeker etc.).

In fact, ageing of energetic materials or components has a high impact on the lifecycle cost of munition and on the budget of the Armed Forces. The current approaches to maintenance are either reactive, including high costs, or predictive and too conservative: the residual safe life of a weapon system can only be determined by periodic assessment (calendar based maintenance) through a slow, expensive sampling process and destructive tests. The application of results from the sample to the entire stockpile is usually a difficult and risky task: when stockpiles are used in many operational environments, the sampling of the most exposed items will lead to conservative predictions about safe residual life. Other existing non-destructive methods, like radiography, involve a large logistic effort and they are not suitable for an exact overview of the health-status of the energetic material and its residual life. Due to the limited number of samples from a stock, the currently applied munition surveillance approaches have drawbacks: they might under- or overestimate the condition of most objects of the fleet. That causes early disposal of weapons that are still in good condition - or safety/performance issues. In order to save costs, a condition based maintenance scheme for munitions is an important approach, to ensure safe, reliable and an efficient management of resources.

The goal of the project is to customize and integrate new ageing models into HUMS units, in order to improve the reliability of the condition-based approach to health management of munitions. The consortium will study an innovative approach to ageing models, it will run trials and modelling for some suitable materials/components and it will provide an assessment of their implication at system level. This will raise the TRL level of HUMS to 6/7 and will provide an improved and integrated EU defence capability for the condition-based maintenance of complex systems. It will include the embodiment of innovative multi-parametric sensing techniques and an integral HUMS unit with dedicated software e.g. in a rocket motor design or in medium/large calibre munition.

The project will cover the following aspects:

- WP 1 Definition of requirements
- WP 2 Adaptation of available ageing models to the project
- WP 3 Ageing tests
- WP 4 HUMS Performance Demonstration
- WP 5 Implications at system's level

## Way Ahead

The expected final TRL level of the project is 6/7; this will provide an improved and integrated EU defence capability for the condition based maintenance of complex systems.

The expected way-ahead of the project is the harmonization of the management approach across Europe and the development of a shared approach to the surveillance of weapon systems.

## Link to TBBs, other CapTechs:

- OSRA TBB10 - Munition Life Management



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**EDA Activities** 

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