MUSAS

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MULTI SENSOR ANTI SNIPER SYSTEM

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INNOVATING SOLUTIONS

AREVA

IDS INGEGNERIA DEI SISTEMI S.p.A.

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1 Introduction

This document summaries the activities and results of the project "Multi Sensor Anti Sniper System" carried out by the consortium MUSAS led by GMV (Spain), and including 01dB-Metravib (France), IDS Ingegnieria dei Sistemi S.P.A. (Italy), PIAP (Poland), GMV Skysoft (Portugal) and the University of Udine (Italy) under contract A0380RTGC.

MUSAS concept is based on deploying several sensors of different types (acoustic, radar and image sensors) in every element of a squad (patrolling vehicle, dismounted soldiers and a support UGV) to complete a network of on-field sensors whose information is fused.

This project was managed and funded in the frame of the EDA R&T Joint Investment Programme on Force Protection A-0120-RT-GC by the Contributing Members:
Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.

2 Objectives

MUSAS project has explored innovative approaches in the field of detecting, localizing and classifying snipers in real time before and after the first shot. The information so obtained is disseminated among the units in order to optimise the resources for the avoidance and neutralisation of these threats. More specifically, the following concepts have been incorporated:

- Multi-sensor approach: MUSAS integrates several technologies, acoustic, radar and image processing.
- Multi-platform approach: fixed, wearable, vehicle mounted.
- Data fusion: A data fusion mechanism has been added to exploit the synergies among the data acquired by the different sensors on the different platforms.
- Before-the-shot detection: searching for sniper's signatures in visible and infrared imaging, as well as exploiting operational data as a preventive mechanism.
- Integration into the Future Combat Soldier (FCS): to study the feasibility of the integration of such system into a FCS system, exploiting its capabilities while not constraining national programmes.

3 Project organization

Entity	Country	Point of contact
GMV (leading entity)	Spain	Mr. Héctor Naranjo, hnaranjo@gmv.com
01dB-Metravib	France	Mr. Fabrice Parodi, fabrice.parodi@areva.com
IDS - Ingegneria dei Sistemi	Italy	Mrs. Marina Marra, m.marra@ids-spa.it
PIAP	Poland	Mr. Rafal Czupryniak, rczupryniak@piap.pl
GMV Skysoft	Portugal	Mr. Jose Neves, jneves@gmv.com
Università degli Studi di Udine	Italy	Dr. Christian Micheloni, christian.micheloni@uniud.it

4 Project Results

The design and implementation in MUSAS of a Laboratory Demonstrator with sniper detection capabilities, as well as the subsequent Test Campaign with real fire in open-field and urban sites, have provided a proof of feasibility of the innovative approaches stated in the objectives. Likewise, the results so obtained allowed producing a suitable roadmap for the follow-on technology development.

The technological advancements have been quite focused on improving the detection, classification and localization capabilities of the application. The results in this area have mostly surpassed the requirements stated by the end-users during the Workshop held at the beginning of the project in July 2008.In summary, during the Test Campaign, the demonstrator detected and classified sniper activity, localizing the threats accurately. This information was distributed in real time to all the squad members and reported by means of sound and visual warnings. Contributing to the situational awareness, the snipers were placed on the Geographic Information System and even the operator was provided with images of their locations, as in the top right photo below.

MUSAS demonstrator has proved the feasibility of integrating a sniper detection application into the Future Combat Soldier (FCS) system, for which a specific FCS application was built during the project.

MUSAS approach has consisted of sharing common functionalities and resources between the FCS system and the sniper detection application. Due to this coordination, the former has incorporated sniper detection capabilities while the latter has been granted access FCS resources such as navigation data and its Geographical Information System, what has proved useful for the correct classification of the sniper as friend or foe.

By exploiting the real-time communications of the FCS system, this scheme is able to disseminate the detections reported by the sensors of a node to all the squad members. Thus, it keeps a Common Operational Picture of the sniper presence on the battlefield.

Finally, MUSAS has proved the feasibility and utility of deploying a UGV equipped with the sniper detection system and networked with the FCS system. This has also led to some considerations regarding potential enhancements in the UGV operation and performances.

6 Conclusions

MUSAS has provided a proof of feasibility for building a near-future prototype able to detect, classify and localize the sniper threat, integrated into FCS systems.

The detection, classification and localization of the sniper **after-the-shot** should be focused on a multi-sensor and multi-platform approach to consolidate the performances achieved by exploiting sniper's multiple signatures:

- Incremental development of the acoustic and radar sensors for military platforms, getting adapted to narrower constraints in weight, size, ergonomics and power autonomy: from fixed deployments, through vehicle and UGV applications to the deployment on the dismounted soldier.

- Implementation of fusion algorithms to search for sniper patterns in the sensory data.

- Exploitation of the operative capabilities of the Future Combat Soldier system such as navigation, Geographical Information System and data from other C4I systems.

The **before-the-shot** detection is more challenging since there are not physical signatures that can be univocally ascribed to a sniper that is not still firing. In this case likewise, a multi-sensor approach will increase the detection capabilities, making it more difficult to use effectively counter-measures for all the sensors. This will require:

- Definition of the sniper's features and behaviours.

- Development and integration of sensors suitable for before-the-shot detection such as visible, infrared, long-wavelength infrared hyper-spectral sensors, scope reflection sensors, etc.

- Development of the algorithms to exploit the data provided by the sensors, optimizing the detection, classification and localization capabilities.

As a last point, MUSAS project has defined and proved the value of certain innovative approaches, so drawing some guidelines for the production of sniper detection systems deployable on the battlefield. Their implementation should incorporate a thorough assessment of the relevant stakeholders (military experts, researchers and industry) of the Member States.