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Capability Project

Structural and non-structural damage evaluation of software modules incl. image-based monitoring

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ABBREVIATIONS AND ACRONYMS

ABBREVIATION	DESCRIPTION
ARU	Anglia Ruskin University
FOI	Swedish Defence Research Agency
FORTV	Swedish Fortifications Agency
GS	GeoSIG Ltd
HBM	Hottinger Baldwin Messtechnik GmbH
ICP	Integrated Circuit Piezoelectric
LPS	Local positioning system
NDEA	Norwegian Defence Estates Agency
PCB	PCB Piezotronics, manufacturer of piezoelectric sensors
PETN	Pentaerythritol Tetranitrate
RDX	Research Department Formula X (i.e. Cyclotrimetylenetrinitramine))
TNT	Trinitrotoluene
TUD	Technische Universität Dresden

EXECUTIVE SUMMARY

D7.2 shall include reporting of efforts for T7.3.2, T7.4 and T.5. The entire consortium is expected to contribute with regards to the evaluation of the components they develop.

D7.2 shall provide evaluation of the RECONASS components (sensors, comms, PCCDN and modules) from a technical perspective. This should be performed in accordance to the technical requirements/specifications (and/or functional requirements/specifications) delivered in WP1 (D1.3 and D1.4).

The descriptions from the DoW of T7.3.2, T7.4 and T.5 follow:

Sub Task 7.3.2 Structural Testing (Task Leader: FOI)

A multi-storey building in scale (initial estimates indicate ½ scale) where high explosive is detonated in two steps. First step is an explosion outside the building resulting in part damage of one side of the building. Second step is a small blast inside one room of the building. Local positioning of tags will be recorded before and after blast event. Data from the experiments will be correlated with assessment of structural condition before and after event. This part of work will be in cooperation with DBA. The finite element model of the building will be made by DBA. Some façade elements will be included in the building. Moreover, the whole RECONASS system (including the communication system and the PCCDN) will be used to provide the base station and stakeholders (THW, members of the User Group, associate partners, regular partners in this work) with data and information on the monitored building under blast loading so that it can be evaluated.

Partners' Roles:

ICCS will install and test the communication gateway into the test site building in Sweden.

TUD will support the test design and the evaluation of the local positioning data

FOI, the task leader, will design the test, build the building on the test site and perform the experiment. Moreover, it will write a report on the evaluation of the integrated system that will include a summary of the feedback of the end users that will be involved.

RISA will provide the PCCDN Tool and use information from this task to evaluate it in terms of interoperability, allowance for collaborative work, fusion of external data, functionality, etc.

DBA will produce the finite element model of the building and will use data from the experiments to evaluate the Module on Structural Assessment.

GS will provide the acceleration sensors of the monitoring system and use data from the tests to evaluate it.

THW will evaluate the input it will receive from the test.

ARU will provide the strain and temperature sensors of the monitoring system and use data from the tests to evaluate it. ARU will also install the monitoring system (including the tags) for the tests, including activities that are not specific to GS's expertise.

Task 7.4 Evaluation of Non-Structural Damage Assessment Sub-Module (Task Leader: FOI)

FOI will use the VEBE code to evaluate the non-structural damage assessment sub-module Also data from testing under 7.3.2 will be used by **TECNIC** to evaluate the same module.

Task 7.5 Evaluation of the detailed image-based monitoring of the building exterior and structural changes (Task Leader: ITC)

UAV-based oblique images will be acquired of the test building (simulating data from established commercial services such as Pictometry), and used to (i) test how well damage assessed at the building exterior based on measurements from the monitoring system can be detected in 3D image-based assessment, (ii) to determine level of detail and accuracy façade changes (shifting, tilting, loss of façade elements) automatic mapping using oblique data, (iii) determine how damage mapping of the area surrounding the monitored building based on oblique aerial imagery can be calibrated/improved based on sensor information, (iv) determine how accurately external debris piles can be mapped and their volume quantified, and (v) to what extent Pictometry-like oblique image-data obtained with an inexpensive UAV solution may be suitable to replace commercial services such as Pictometry, at least for localised monitoring of a sensor-equipped building and its environs.

Partners' Roles:

ITC, the task leader, will use test data to determine if oblique airborne data provide the detailed exterior building damage information needed, to calibrate/improve standard satellite-based damage maps, and to assess how the data integrate to the PCCDN.