Press Release

Effective Container Inspection at BORDer Control Points

The C-BORD Project Field Tests Innovative Technologies for the Non-Intrusive Inspection of Cargo at European Borders

In May 2018, C-BORD starts field testing five new and enhanced non-intrusive inspection technologies at three representative European customs inspection sites.

Toulouse, 14th May 2018. Following three years of research and development, the C-BORD Consortium is ready to deploy its equipment for field tests on customs inspection sites. Prototypes for enhanced X-ray imaging and passive radiation detectors have been developed, as well as prototypes for new technologies not yet available on the market today for large-volume cargo inspection: Evaporation Based Detection, Tagged Neutron Inspection, and Photo-fission. Project partners will deploy their prototypes for a mobile **checkpoint at a Hungarian-Serbian land border** crossing in May, for a rapidly relocatable checkpoint at **a medium-sized port in Poland** in June, and finally for a **fully-automated seaport in The Netherlands** in September. **Researchers working together with Customs and industry will assess the technologies individually, and, importantly, the added value of combining technologies, thus exploiting their complementary strengths, with data visualisation in a single user interface.** The X-ray, passive radiation detection, and Evaporation Based detection devices will inspect pre-selected commercial cargo and all five technologies will inspect "mock-up" containers, in which target threat materials can be placed, to gather as much data as possible on the effectiveness of the devices and their suitability for Customs' operational environment.

Customs organisations worldwide are constantly looking to improve inspection processes to stop the trafficking of dangerous or illegal goods which could harm citizens, while at the same time facilitating the flow of legitimate commercial cargo across borders. Advanced technology is a key means to address this dual need. The C-BORD project responds to the challenge with its modular system of new and enhanced technologies for the Non-Intrusive Inspection (NII) of cargo containers adaptable to different types of border checkpoints and with a single user interface for Customs decision-making.

Today, containers are typically inspected with X-ray imaging and passive radiation detectors. If no anomaly is found, the container continues on its way. However, if the customs officer suspects a problem, the container is opened, a time-consuming and potentially hazardous process. With the field testing, the C-BORD partners hope to demonstrate that the technologies used in combination can

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provide more information to the customs analyst, reduce false alarm rates, and reduce the unnecessary opening of containers.

About the technologies

For **X-ray imaging**, in C-BORD Smiths Detection has developed a new detector technology to reduce image distortions in mobile mode, caused by road irregularity, creating detection system oscillations while the cargo is scanned. A new representation for material discrimination has also been investigated to improve material discrimination through identifying objects in cargo by de-overlapping them from the background and surroundings. Both techniques tested in the laboratory have led to improved image quality for medium-energy X-ray scanners.

For **passive radiation detectors**, the innovations developed by Symetrica Ltd and the French Alternative Energies and Atomic Energy Commission (CEA) improve material identification to reduce nuisance alarms from Naturally Occurring Radioactive Materials (NORMs), such as ceramics or fertilizer, and the localisation of radioactive sources within the container. Fixed and mobile devices have been developed as well as detectors fully integrated in a mobile X-ray scanner. When combined with cargo manifest data and overlaid on the x-ray image, preliminary results have shown that the probability of threat detection can be further increased.

The **Evaporation Based Detection** system samples the air in a cargo container to detect Volatile Organic Compounds and trace particles whose patterns are indicative of targeted substances such as drugs or explosives. Through machine learning, the system can be trained to be sensitive to additional substances of interest to Customs, which is faced with evolving threats, for example, from new synthetic drugs. Similar systems exist today for small volumes, such as luggage inspection, but no system has yet been able to handle the large volume of a cargo container with high levels of diverse background chemical signatures. This is the challenge for C-BORD partners University of Manchester, ESIEE, CEA and Bonn-Rhein-Sieg University.

The **photo-fission technique** has not been tested in a European port scenario ever before. This technique uses the same linear accelerator as high energy (9 MeV) X-ray scanners, and by counting the slight differences in time of flight of emitted particles, Special Nuclear Materials (SNM) are detectable, even when hidden behind dense materials. SNM, which can be used to create a nuclear weapon, is of particular interest for national security.

In the **Tagged Neutron Inspection System**, neutrons emitted by a neutron generator can penetrate materials and produce reactions that provide information on the elemental composition of the cargo – the ratio of carbon, nitrogen, and oxygen in the case of explosives. Algorithms have been developed to interpret the data and comparison with reference tables allows the classification of material. The C-BORD prototype, with integrated shielding, is designed to reduce the restricted area around it. Explosives, drugs, and cigarettes are the main targets.

Both photo-fission and tagged neutron inspection techniques investigate a specific area within the container identified in the x-ray scan as ambiguous and thus are designed to work in combination with X-ray as second-line inspection devices.

Smiths Detection has designed a **common user interface**, based on the X-ray image, in which the results of inspection from the various devices can be viewed by the customs analyst. The analyst can review results of first line inspections, direct the positioning of second line inspections, and make an informed decision based on the combined data. Standardisation of data formats to allow interoperability and data sharing is also an area in which C-BORD lays the groundwork for the future exploitation by Customs.

About the project

C-BORD is a 42-month research project which started in June 2015. The 11.8m€ project is funded by the European Union within the Horizon 2020 Programme under Grant Agreement 653323. The consortium comprises 18 partners:

Customs organisations: Agenzia delle Dogane e dei Monopoli, Izba Administracji Skarbowej w Gdańsku, Ministerie Van Financiën Directoraat Generaal Belastingdienst, National Tax and Customs Administration of Hungary;

Industry: Costruzioni Apparecchiature elettroniche Nucleari C.A.E.N. SPA, Smiths Heimann SAS, Symetrica Security LTD;

Research and academia: Chambre de Commerce et d'Industrie de Région Paris - Île-de-France, Commissariat à l'énergie atomique et aux énergies alternatives, Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung E.V., Hochschule Bonn-Rhein-Sieg, JRC - Joint Research Centre - European Commission, Magyar Tudomanyos Akademia Energiatudomanyi Kutatokozpont, Narodowe Centrum Badan Jadrowych, The University of Manchester, Universita Degli Studi Di Padova;

Service providers: ARTTIC SAS, Ecole Normale Supérieure.

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