SATELLITE CONTAINER TRACKING

# Isotrack Final report additional information

**Grant Agreement number: 218414-2 (FP7-SME-2007-1)**

**Project acronym: ISOTRACK**

**Project title: ISO Shipping Container Tracking and Monitoring System**

**Funding Scheme: Research for the benefit of SME Associations**

# Table of Contents

# 1. The Consortium

| No. | Beneficiary | | Country | Type of Organisation and contact |
|---|---|---|---|---|
| 1 | ADS | | Europe | SME-AG<br><br>Contact: Ray Lee |
| 2 | CLECAT | | Belgium | SME-AG<br>Contact: Niels Beuk |
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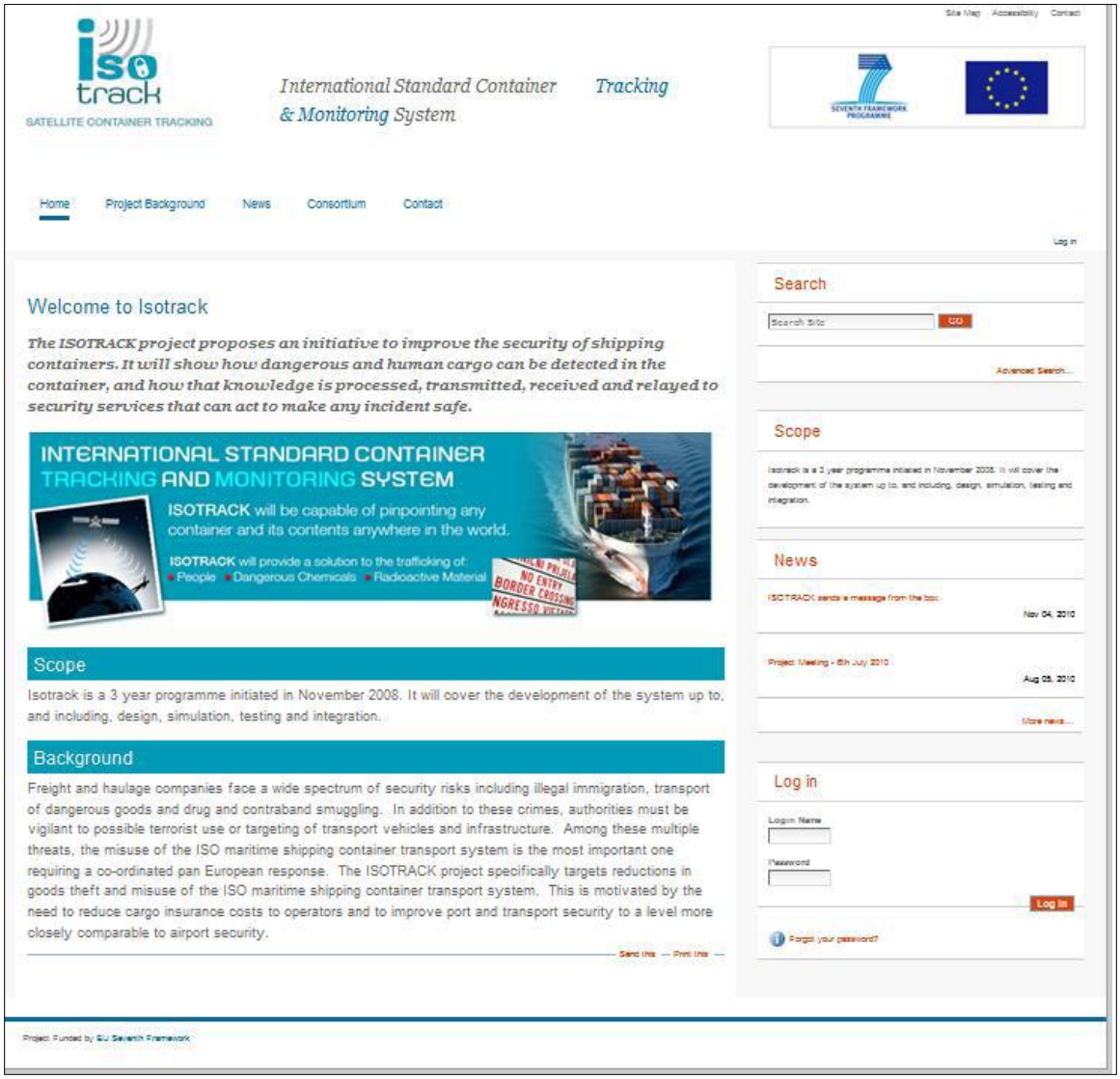
| 5 | ZOCA | | Netherlands | Other-SME<br>Contact Henny Roeland |
| 6 | TTS | | UK | Other-SME<br>Contact: Dougie Bryce |
| 8 | Containerships | | Finland | Other<br>Contact: Tomi Invenius |
| 9 | Lloyds Register | | UK | Other<br>Contact: Ian McCartney |
| 10 | ISRI | | UK | RTD<br>Contact: Orlando Davy |
| 11 | TI | | Norway | RTD<br>Contact: Ben Hagaas |
| 12 | NSBS | | Bulgaria | SME-AG<br>Contact: Polixena Krastanova |
| 13 | Astrata | | UK | Other-SME<br>Contact: Rory Stephen |
| 14 | EMA | | Slovenia | Other-SME<br>Contact: Zlatko Mastnak |

## 2. Project logo and banner


# 3. Project Website homepage




**http://www.isotrack.info**

## 4. Project Flyer/Leaflet

# ISO-track

*ISOTRACK will be capable of pinpointing any container and its contents anywhere in the world.*

*ISOTRACK will provide a solution to the trafficking of:*

- *People*
- *Dangerous Chemicals*
- *Radioactive Material*

Approximately 250 million container shipments take place annually which accounts for 90 % of cargo movements. Less than 2 % of containers are X-rayed or checked at ports, and a large portion of the inspected containers are selected randomly causing severe delays at the ports.

Freight and haulage companies face a wide spectrum of security risks including illegal immigration, transport of dangerous goods and drug and contraband smuggling. In addition to these crimes, authorities must be vigilant to possible terrorist use or targeting of transport vehicles and infra-structure.

The ISO-track project was an initiative to improve the security of shipping containers. It shows how dangerous and human cargo can be detected in the container, and how that knowledge is processed, transmitted, received and relayed to security services that can act to make any incident safe.

## Features

The main features of the ISO Track system are:

- A composite container door tested to the ISO 1496 standard
- The composite door system can be fitted to new containers at the point of manufacture.
- The composite door can be retro fitted to existing metal shipping containers
- The composite door is transparent to radio frequency communication
- Antennas are fitted inside the door to protect against damage
- Sensor system will detect intruders, C02, VOCs and Radiation and can have tandard sensors fitted as required.
- Early warning to the authorities when there is a container based threat through multiple wireless interfaces.
- Accurate, real time position data on the container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## 5. Project Consortium News letter

This newsletter format was used to periodically inform the project consortium of the project progress.

# NEWS 2

Introduction from the Project Co-ordinator Mr Ray Lee

Our last meeting at the beginning of July, saw us reach the 18 month half way stage of the ISOTRACK project. It seems only five minutes ago that we all met for the first time at UK-ISRI for our inaugural meeting, so I have no doubt the second period of the project will pass by very quickly. It would be fair to say that the meeting in July was challenging, with some areas where we need to show an improvement. There were however, a lot of positives, and I think we can move forward with considerable optimism about the final outcome of the ISOTRACK project.

As we now move forward, we are entering what I believe is the business end of the project, where all the hard work of the last 18 months will I believe, put us in good shape for a successful conclusion. A number of interesting experiments and testing are currently taking place, and I look forward to our next meeting, in addition to the usual business of the meeting, we will see a live demonstration of how the door works/operates.

I would like to take this opportunity to thank all members of the consortium for their various contributions to date, and look forward with you to seeing a conclusion that seriously improves the protection and safety of freight movements around the world.

Ray Lee


Project Meeting: London JULY 6TH 2010

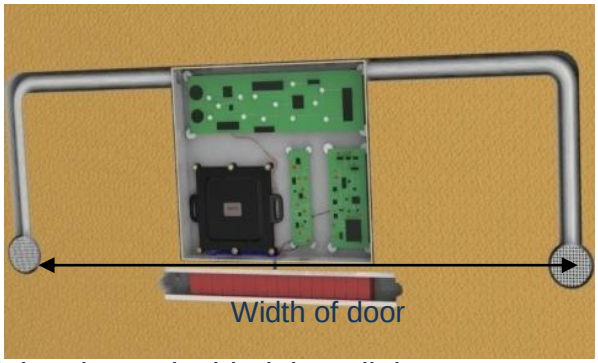
A successful but late (original meeting was planned for April 2010) Month 18 meeting was held in London at the premises of ADS chaired by the coordinator Mr Ray Lee. There was a good attendance by the Consortium for this meeting along with the EC Project Officer Karin Johansson who was attending an Isotrack meeting for the first time following taking over the post from Barbara Mester and the external reviewer Dr Azarian.

Work to date: All the Technical work carried out to date was on track, both the door and the electronics designs were presented in detail at the meeting by Richard Fletcher and Bjarte Jegerstedt from ISRI and TI respectively. There were concerns however by Karin Johansson on the project documentation that required improvement from all concerned.

Container Door & Electronics near completion!

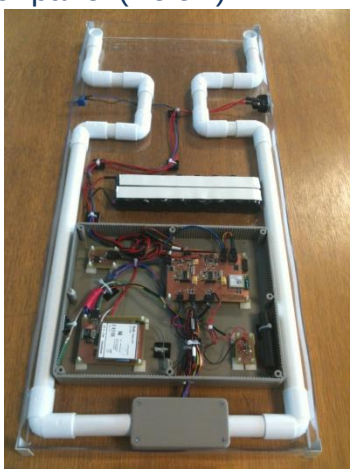
The door design being carried out at T.I. and the electronic "Sensor Pack/RF communications" which will be integrated into the door are both close to completion and are expected to be tested in the coming months. TI have produced two designs, one is a small door section to test with the electronics from ISRI built into it, the other is a full size door which will be shipped to the Lloyds approved test site in Widnes and be tested for conformity to ISO 1496. ISRI and T.I. visited the test facility in September to discuss testing arrangements.

ISRI's electronics have changed somewhat since the beginning of the project. Initially it was thought that sensor ports should be as wide apart as possible to allow maximum coverage of the container (Right).




Latest Design

Due to design issues and further investigation it has been decided that all the electronics including sensors and a small fan is now to be housed in a plastic box measuring 700 x 300mm and only 32mm thick making it very easy to integrate into a door panel (Below).



Test r

NEWS!! Isotrack goes to print

Extract from portstrategy insight for senior port executives article in 27 Aug 2010

ISOTRACK sends a message from the box

> Technical details are not being revealed so far, but the partners behind ISOTRACK, an €2m EU-funded project to develop a container tracking and monitoring system, are promising a failsafe device capable of detecting low-level radiation, VOCs, etc., just as soon as any such material is placed inside the Container.
>
> A prototype of the device, which is designed to be integrated into the container, tamper-proof, capable of low-cost retrofitting and with very long battery life, will be ready in October and a working model will follow in April 2011, says Dougie Bryce, exploitation manager for the consortium and a director of timber shipping group TTS.

ISOTRACK developed from TTS's initial concept simply to track containers. The company got into discussions with innovation and technology R&D Company PERA ISRI – both are based in Melton Mowbray – and the consortium went live in November 2008 with FP7 grant funding from Europe. Other partners include Lloyd's Register, Astrata, Bluetraker and Finnish line Containerships.

NOTICE!

## Cargo Container Security and Tracking

RFID, RTLS, OCR and GPS Technologies, Sensors, Satellite, Cellular, and Wi-Fi Services

This study explores the tracking and security of freight ("cargo") containers as they are transported across international trade routes, including maritime environments (e.g. ports, oceans, etc.). The report covers maritime asset management solutions that are enabled with a family of integrated wireless technologies to provide real-time, global tracking, security and communications features. The solutions are largely segmented by either container tracking or container security functionality, and primarily targeted at government and commercial markets.


The research also focuses on the adoption of next-generation wireless technologies as enablers of cargo container tracking and security with a primary focus on active RFID and RTLS technologies. The market for active RFID and RTLS cargo container tracking and security solutions will grow at a 19.2% CAGR to $386.3

million in 2014. Legacy tracking (barcode, OCR, GPS), security (mechanical seals) and communications (satellite, GPRS, Wi-Fi) technologies are also covered.

# Events

News Improved Project Website launched

Electronic box with RF Comms and sensors completed

Composite door being manufactured at Sairp Composite

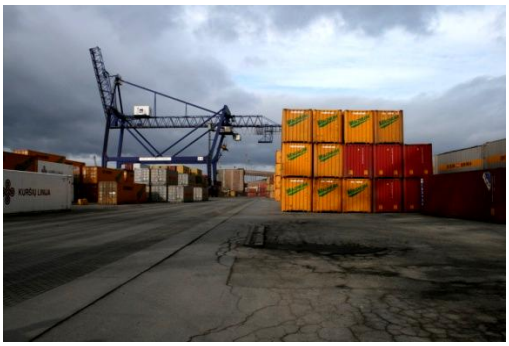
Container and hinges etc supplied by Containerships

Exploitation and Dissemination work in progress

Container testing to be performed at Lloyds Register approved site (MCTS Ltd, Widnes)

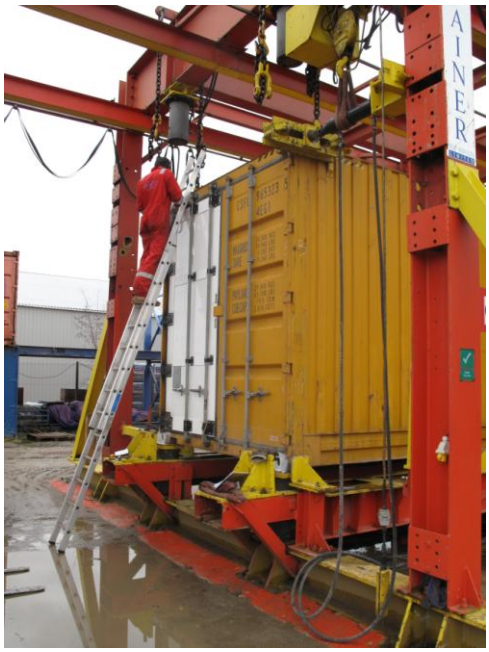
# Next Meeting

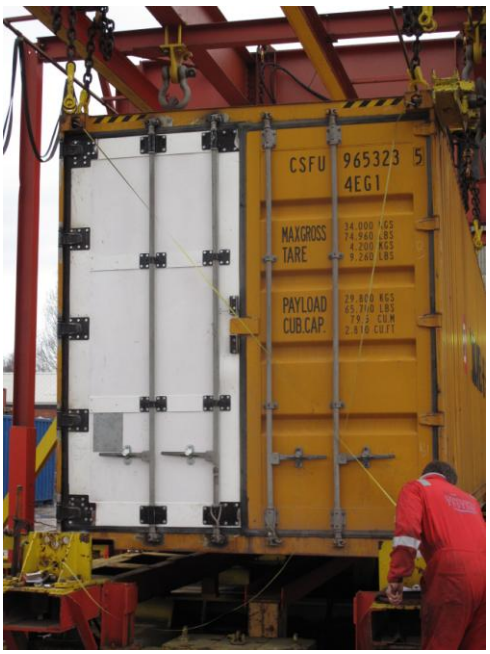
Ian McCartney of Lloyds register will kindly be hosting the project meeting on the 24th November 2010. The venue will be the Lloyds Register office at the Cunard building in Liverpool, UK and it is planned to visit the container testing site in Widnes to see the container fitted with the composite door



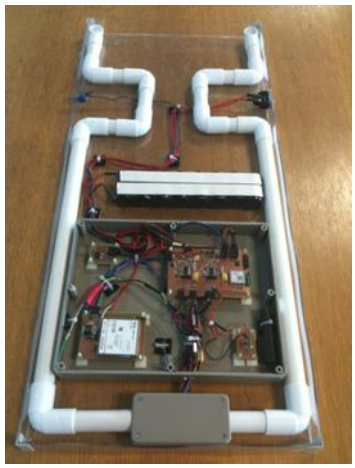
## 6. Isotrack photographs general

Composite door testing and construction



Isotrack Electronics



Communications and sensor prototypes


Isotrack Router module

Isotrack Module installed in the prototype door

Isotrack Module installed in the prototype door with cover fitted

## 7. Isotrack Publications

CONTAINER TRACKING

# Inside track

*Cargo Security International reviews the development phase of Isotrack, an EU-funded container tracking and monitoring system*

The launch of a press release or a demonstration at a trade show is often the first time that the wider world is alerted to the development of new technology. However, as those engaged at the research and development (R&D) sharp end of a project's life cycle are only too well aware, the embryonic stage of any technological development is one of immense challenges, uncertainties, but above all, possibilities.

A review of the *Isotrack* project, a European Union (EU)-funded programme to develop a tamper-proof container tracking and monitoring system, provides a very useful insight into the nuts and bolts process of early system development. While the device is still some way away from coming to market, the project focus is very much on solving the all too present problem of both tracking a container and ensuring its security.

### Simple need

As Dougie Bryce, director of timber shipping company **TTS** and also exploitation manager for the Isotrack consortium explains, the germ of the idea for the device came from a simple need to be able to track containers (although the scope of the project has already evolved into wider areas of application).

'TTS is based in Melton Mowbray in the UK,' says Bryce, 'and by coincidence the town is also home to **PERA**, one of Europe's leading innovation and technology R&D companies.

'We approached PERA with a view to developing our concept. To cut a long story short, with PERA's help we ended up putting a consortium together which applied for a **European Commission (EC)** grant under the *Seventh Framework Programme (FP7)* to develop Isotrack.'

The Isotrack consortium is chaired by **ADS**, the trade organisation which represents UK aerospace, defence and security industries. Consortium founder member TTS is responsible for dissemination and exploitation and also provides shipping expertise. PERA/ISRI is heading up the development of the technology in association with Norway's **Teknologisk Institutt**, and the **Astrata Group** is supplying the tracking and mapping solutions. **Lloyd's Register** is providing its global shipping expertise, while **Containerships** of Finland will draw on its knowledge of container trades, and **EMA**, through its Bluetraker system, will provide a ship-to-shore solution to ensure that the containers are 'visible' at all times, even when passing through extreme latitudes.

*'The Isotrack consortium claims that the unique selling point of its device is that it will be fitted inside the container'*

### Secured funding

With secured EU funding of €2 million ($2.75 million), the project went live in November 2008 and prototype development was, at the time of writing, on target for a November completion date, when a report on project progress will also be submitted to the EC.

The fundamental aim of the project is to develop a tracking and monitoring system that incorporates volatile organic compound (VOC), carbon dioxide ($CO_2$) and low level radiation sensors, as well as the detection of door intrusion. One might suggest that a number of systems with these capabilities are already commercially available, but the Isotrack consortium claims that the unique selling point of its device is that it will be fitted *inside* the container. Precisely how this will be achieved is being kept under wraps at the moment but it is understood that the system will be housed in a radome which will be encapsulated within the container. The final touches are also currently being made on patent application submissions relating to the incorporation of the sensor technology within the container space.

The system is designed to be modular so that a number of sensor types could be interfaced with the system depending on

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the end user application. A $CO_2$ sensor, for example, would detect the presence of human cargo while a vibration sensor could detect the movement of the whole container. With the current prototype specification, a passive infra red (PIR) sensor has not been included as this would have to be mounted outside the radome within the container. Yet again, at present, intrusion can only be detected via the door of the container, but future applications could potentially incorporate air pressure sensors that could detect a breach in the fabric of the container.

The sensitivity of the system is such that the loading of cargo is detected immediately, as well as its removal or reorganisation within the container. An intrusion or sensor alert will be sent in real time using global positioning system (GPS), global system for mobile communications (GSM) messaging or Iridium satellite.

There are, of course, instances of cold spots in GPS and GSM coverage, but the system is designed to resend alert messages. Whilst at sea, communication will be via satellite and in future system variants the consortium intends to include satellite transmission as a back-up to GPS/general packet radio service (GPRS).

The Isotrack box has been designed to permit user interrogation, and there will be an alarm database where all recorded incidents are stored with the details of container location.

The issue of a short battery life is often a limiting factor in the successful use of a tracking device: supply chains are often made up of a number of intermodal transits, each element of which can fall prey to delay or diversion. Furthermore, all the sophisticated sensor gadgetry in the world counts for nothing without a failsafe power source.

Dougie Bryce of TTS stresses the longevity of the Isotrack system's battery lifespan: 'It will have a dramatically extended battery life compared to other systems; we believe we can safely talk in terms of years rather than a month as is the present limit for some systems.'

Battery life is significantly extended because the system's electronics switches to sleep mode, and is only activated when an incident occurs.

The development phase of the project must be concluded by November 2011, and over the next year the consortium plans to test the system onboard a container vessel. What happens to the Isotrack project post-November 2011 can't be predicted at this stage in the development cycle although Bryce points out that there is an EC mechanism for further funding after the end of this phase of the project.

## Broad potential customer base

Clearly a broad potential customer base and the potential for volume production would be the ideal future scenario for the Isotrack team, but the reality is that bringing technology to market can be a time-consuming and difficult process.

Bryce is confident that the base cost of the system can be economical, and the retrofit market also offers major supply opportunities. He acknowledges, however, that until the necessary patents are in place and a demonstration model has been produced, discussions with potential manufacturers can only be couched in general terms.

Initial approaches to possible end users have to date been directed towards US homeland security agencies and related departments and organisations. Beyond this target sector, however, Bryce sees that 'the commercial potential for this system is enormous'.

Although beyond the current scope of the project, Bryce points to the potential for 'instant manifesting', whereby radio frequency identification (RFID)-tagged goods could be identified by an integrated RFID reader at the point of stuffing or removal.

'Any pilferage would be reported as it happened, so we will be stepping up our approach on commercial applications from here on,' says Bryce.

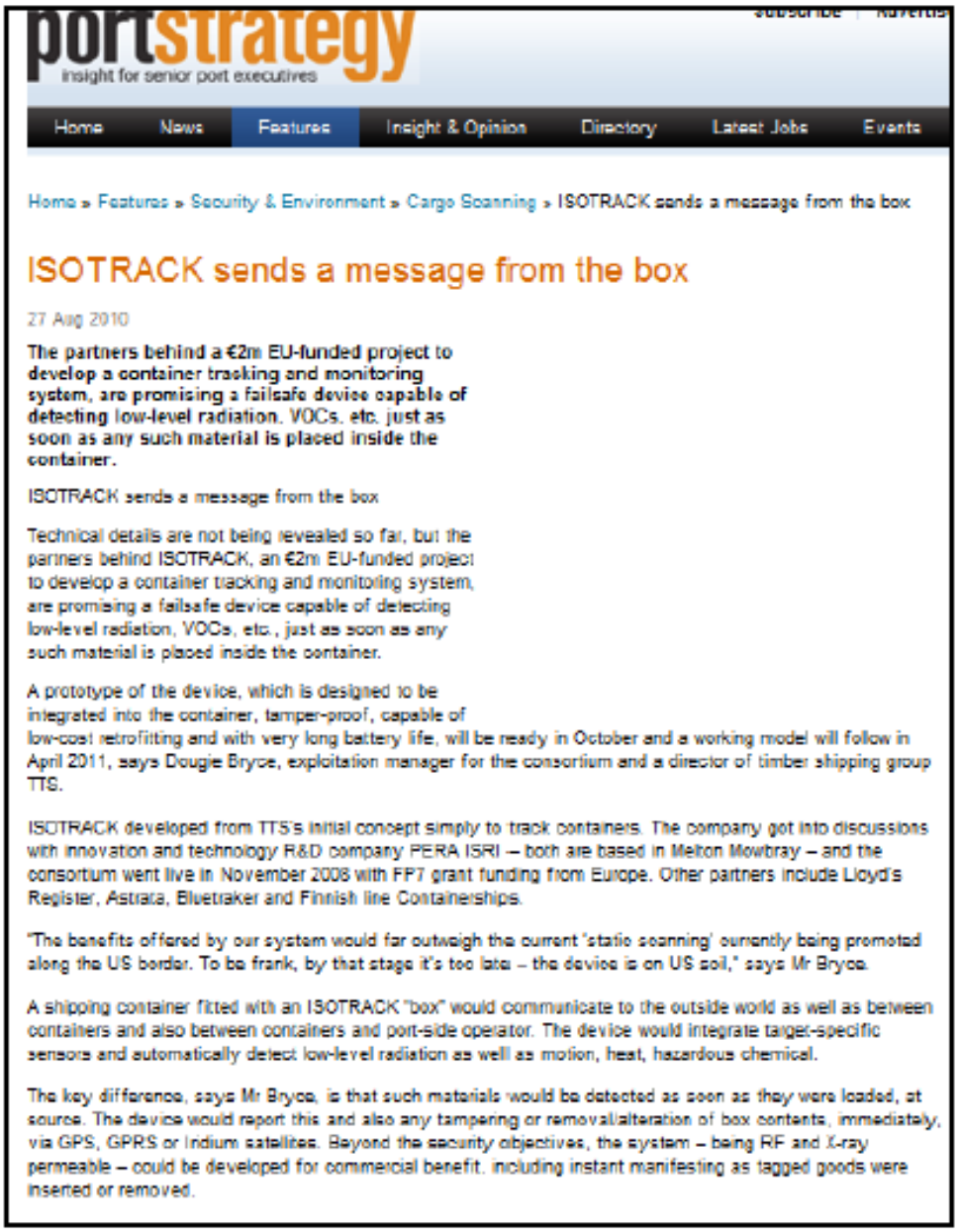
The year ahead is set to be an interesting one for the Isotrack developers, so for those interested in the issue of container security, the message (both literally and figuratively) must be 'watch this space'!

*'The system is designed to be modular so that a number of sensor types could be interfaced with the system depending on the end user application'*

isotrack
SATELLITE CONTAINER TRACKING

### Isotrack consortium

ADS : www.adsgroup.org.uk
Astrata Group: www.astratagroup.com
Containerships: www.containerships.fi
EMA: www.bluetraker.com
Lloyd's Register: www.lloydsregister.co.uk
PERA: www.pera.com
TTS: www.tts.co.uk
Teknologisk Institutt: www.teknologisk.no



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## ISOTRACK sends a message from the box

27 Aug 2010

**The partners behind a €2m EU-funded project to develop a container tracking and monitoring system, are promising a failsafe device capable of detecting low-level radiation, VOCs, etc, just as soon as any such material is placed inside the container.**

ISOTRACK sends a message from the box

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A prototype of the device, which is designed to be integrated into the container, tamper-proof, capable of low-cost retrofitting and with very long battery life, will be ready in October and a working model will follow in April 2011, says Dougie Bryce, exploitation manager for the consortium and a director of timber shipping group TTS.

ISOTRACK developed from TTS's initial concept simply to track containers. The company got into discussions with innovation and technology R&D company PERA ISRI – both are based in Melton Mowbray – and the consortium went live in November 2008 with FP7 grant funding from Europe. Other partners include Lloyd's Register, Astrata, Bluetraker and Finnish line Containerships.

"The benefits offered by our system would far outweigh the current 'static scanning' currently being promoted along the US border. To be frank, by that stage it's too late – the device is on US soil," says Mr Bryce.

A shipping container fitted with an ISOTRACK "box" would communicate to the outside world as well as between containers and also between containers and port-side operator. The device would integrate target-specific sensors and automatically detect low-level radiation as well as motion, heat, hazardous chemical.

The key difference, says Mr Bryce, is that such materials would be detected as soon as they were loaded, at source. The device would report this and also any tampering or removal/alteration of box contents, immediately, via GPS, GPRS or Iridium satellites. Beyond the security objectives, the system – being RF and X-ray permeable – could be developed for commercial benefit, including instant manifesting as tagged goods were inserted or removed.

http://www.portstrategy.com/features101/safety-and-security/scanning/isotrack

Port Strategy article August 27th 2010

НСБС Българската асоциация за спедиция, транспорт и логистика
The Bulgarian Association for Freight Forwarding, Transport and Logistics NSBS

# НСБС – партньор в проекта Isotrack

## Системата Isotrack ще позволява прецизно локализиране на всеки контейнер и неговото съдържание по цял свят

През 2009 г. НСБС подписа Consortium Agreement и се включи като партньор в проекта Isotrack, финансиран по 7-ата рамкова програма на Европейската комисия. В консорциума участват още UK Intelligent Systems Research Institute Limited RTD, Teknologisk Institutt AS RTD, Lloyd's Register EMEA, CLECAT, T.T.S. Shipping LTD. Проектът е с продължителност 3 години.

Основната цел на Isotrack е да се повиши сигурността на контейнерните превози. Финансирането по този проект е продиктувано от 9/11 Commission Recommendations Act на американския Конгрес за повишаване на мерките за сигурност, чийто разпоредби налагат до 2012 г. товарите във всички контейнери, предназначени за САЩ, да бъдат 100% сканирани. Системата ще открива наличието на химически експлозиви, радиоактивни вещества, нелегални пътници и опити за проникване в контейнерите.

В рамките на проекта Isotrack ще бъде разработено ново поколение контейнерни врати, които да заменят използваните досега стоманени. Те ще бъдат създадени от нов тип материал, който ще позволява преминаването на радиовълни. Проектът включва и разработването на сензор и техническо оборудване, които ще бъдат здраво капсулирани в контейнерната врата.

За проследяване на контейнерите ще бъдат използвани мрежите GPS, GSM и ZigBee. През февруари 2009 г. е извършен предварителен тест на системата Zigbee в Containerships UK на пристанище Тийспорт, Мидълзбро.

За да се изберат подходящите материали за новото поколение контейнерни врати, изследователите, които работят по проекта, тестват различни материали, пропускливи на радиовълни. Вече са готови списъците на такива материали, както и на различни смоли, които предпазват проникването на влага в контейнера. Изследователите смятат, че стъклото или керамичните фибри са най-подходящите материали за производството на врати. Обмисля се също така и поставянето на подходяща защитна обшивка на външната повърхност на вратите.

В рамките на проекта се тестват и различни сензори (ISRI). Обмисля се и капацитетът на електрическите акумулатори, как ще се извършва смяната им и колко често. Изследователите смятат, че капацитетът трябва да бъде възможно най-голям и вероятно ще бъдат разработени с режим sleep mode, за да се осигури продължителната им употреба.

НСБС ще се включи активно в работата на проекта по време на тестване на новата система и ще популяризира резултатите на проекта.

*Поликсена Кръстанова*
*директор НСБС*
*координатор на проекта*



Article published by project partner NSBS of Bulgaria

**NEW TRACKING DEVICE WILL AID SHIPPING COMPANIES**

**In 2008 the European Commission approved a project under their Framework Programme 7 initiative for a novel device that tracks containers world-wide, improving security, reducing losses and improved logistics controls and costs associated with ISO shipping containers.**

The project has been well received by the European Commission and resulted in a request for the consortium to undertake a follow-on FP7 Demonstration project.

The concept behind the device was to design a new tracking system to solve security and cost issues. Currently, 90% of all world cargo moves in containers and approximately 250 million are shipped annually. Transport operators face theft of goods, illegal immigration, transport of dangerous goods and drugs and contraband smuggling. Authorities must also be vigilant to possible terrorist use or targeting of transport vehicles and infrastructure. Plus there is little or no control over possible mis-use of containers as less than 2% of containers are x-rayed or checked at port. Current tracking devices require external antennas and are prone to damage or vandalism.

Melton Mowbray based TTS Shipping Ltd approached Research and Technology Organisation 'ISRI', a subsidiary of Pera Innovation Ltd. (www.uk-isri.org), also based in Melton, with an idea for container tracking. TTS Shipping Ltd worked with ISRI on the concept to create a sophisticated product for transport cargo containers that encompasses container tracking, sensing and event reporting anywhere in the world. They have working models, patents and will shortly take it to market.

The basic concept is to replace the existing container door with composite doors which are transparent to RF and X-Rays. Tracking and sensing electronics to detect door opening, the presence of chemical explosives and other terrorist items, low level radiation and stowaways would be encapsulated in the doors, thus greatly improving security and reducing losses.

ISRI Project Manager Orlando Davy confirmed that they have tested a prototype on a ship with exciting results. The potential applications for this device is that the container can be tracked from its destination and throughout its journey the owners will know exactly where the container is and detect if it had been tampered with. Once the container arrives at its destination, it could communicate the manifest, provide notification if there had been an intrusion and automatically complete the electronic purchase cycle (payment at point). Electronically tagged goods can be read going in and out of containers via an RFID reader also encapsulated in the door. The device also has real commercial value as it costs no more to buy than a normal container door.

Euro News Article

Director of TTS Dougie Bryce said: "From the outset ISRI has given our project fantastic support. They helped us through the grant application process and - where we brought in commercial partners, ISRI introduced to the project consortium, the R&D/Technical partners and Trade Associations without whom our grant application would have fallen at the first hurdle.

Many of the technical refinements that make our project special came from ISRI's think tanks. It is fair to say that without ISRI we would not have a marketable product as we now know it, as with hindsight, our idea in its initial form just would not have worked. Our experience with ISRI and its staff has been tremendous and I would wholeheartedly recommend ISRI to anyone wishing to develop their own "special idea".

**Director for Northern Europe, Ian Claris said:** "It was a brilliant project from beginning to end, well-conceived, well written and well managed. It has been a harmonious consortium and the net result is a request for a FP7 Demonstration Project from the EC."

The consortium consists of ISRI, TTS Shipping Ltd, Lloyds Registry, TI, Association of Defence Supplies, Clecat, European Trade Association, Bulgarian Freight Forwards Association, Astrata, Sairp, Bluetracker and ZOCA and finished working on the project in October 2011. It was funded through the EC FP7 Research for Associations scheme.

The next step for the company after the Demonstration Project is to access funding to market the product and sell it on a fully commercial basis. A new trading company has been established called Stellarview Ltd that will take the product to market.


Euro News Article


Euro News Article