

ELSIS AG
electronic logistics & security information systems

**Test results of the e-Tracker,
a new **modular and flexible**
Loran-C based
goods tracking system**

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By Marc Clerens, ILA Director
Presented by Professor Peter F. Swaszek,
Program Chair for ILA-35

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I am presenting today on behalf of Marc, President of the Supervisory Board of ELSIS AG and ILA Director, who was prevented to join for family reasons



Elsis logistics tests in 2006

- From April-June 652 test drives were made, covering ~120.000Km
- Area covered from Scandinavia to Greece and Spain to Scotland
- Tests under normal logistics operating conditions (trucks, buildings)
- e-Tracker autonomous without external antennae and battery
- Total of 18,310 position transmissions, of which 7,977 Loran positions because of the actual poor Loran coverage in Europe
- E-Tracker total test results indicate a position availability of 99,4%
- Tests made under the supervision of Fraunhofer Institute, Magdeburg.
- Fraunhofer Institutes, a leading German organisation for applied R&D in Europe with staffing of 12.000 and a 2005 budget of 1,250 M€

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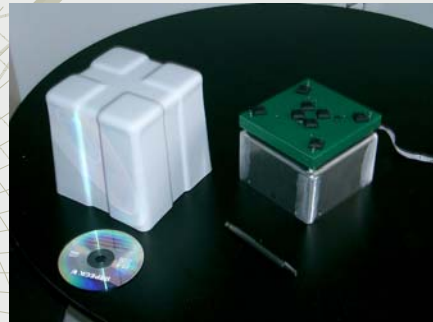
Here are the main facts and figures of the tests.

All positions were obtained with the e-Tracker having its concealed antennae and partially located inside containers and buildings



e-Tracker 1. Generation

- Reelelektronika Loradd
- Loran H-Field antenna
- GPS Receiver (Sirf III)
- GSM-module
- Batteries
- 1 position/hour transmitted
- Dimensions: 18x18x19cm
- Weight: ~4 Kg



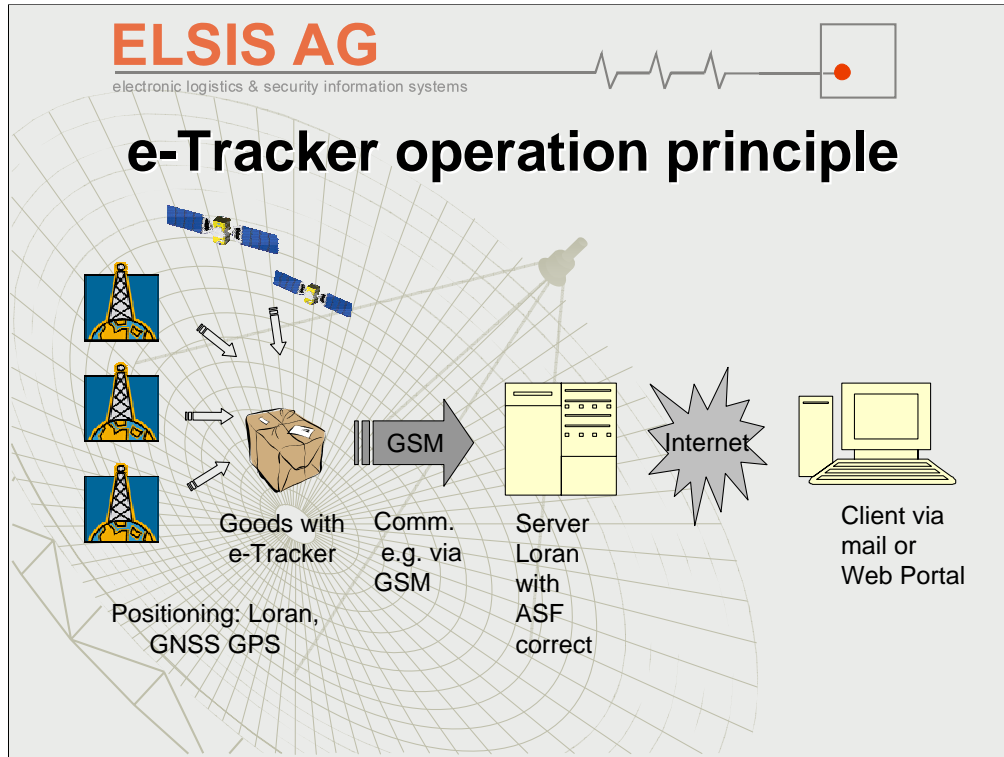
e-Tracker 1. Generation

The 1. Generation e-Tracker is equipped with a Loradd receiver of Reelelektronika.

The weight is mainly caused by the batteries required for the high power consumption of the test set up.

Long operating times without excessive battery weight can be achieved only with power consumption optimised equipment.

Logistics requires a minimum of 18 months but, depending on the frequency of the data transmissions, up to 5 years is possible with the new generation



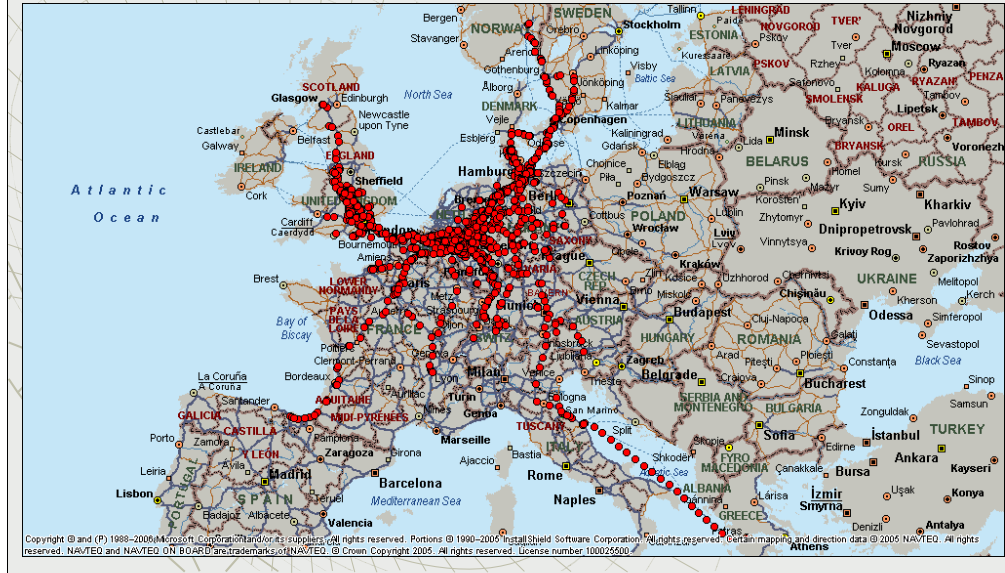
Principle of collecting position data by Loran, GPS and GSM.

Raw data, received by the e-Tracker, is transmitted per GPRS (fall-back SMS) to the server, where the position computing is done with all available methods (also ASF correction for Loran).

The client can access its information according to his requirements. Direct interface with the SCEM is possible.

Possibility to inform client when transport delays occur optional.

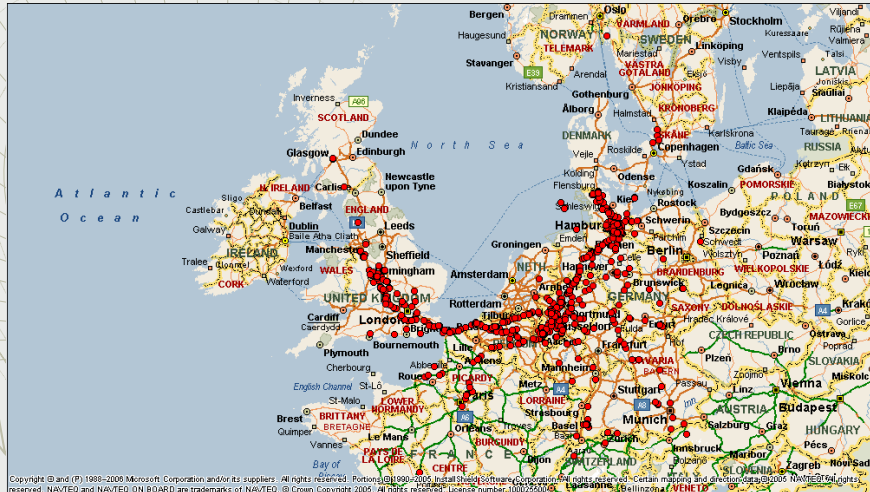
Overview of all systems position test results



This map shows the total received positions **with all navigation systems** of the e-Tracker (Loran, GPS & GSM)

Between Italy and Greece, w/o Loran coverage, all the positions were received by the other navigation systems. The e-Tracker was installed inside a container, who in turn was parked together with the truck inside the ferry.

Overview of all Loran positions only



This map shows the Loran positions only.

The poor Loran coverage is obvious. The vicinity of the Sylt station produces a few, error positions (several km) in northern Germany.

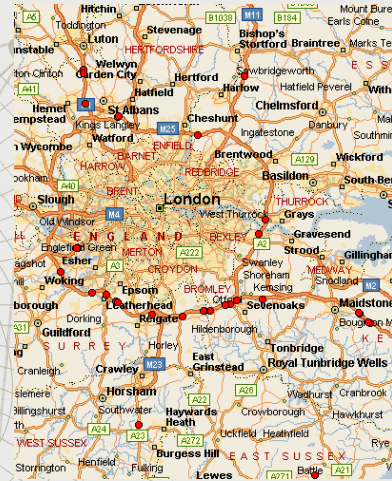
Loran positions obtained with good Loran coverage provide sufficient precision for logistics applications. Position accuracy is no prime concern for logistics (requirement $< 1\text{Km}$)= Sufficient for SCEM (Supply Chain Event Management)

Positions in LONDON area

e-Tracker all systems



e-Tracker only LORAN



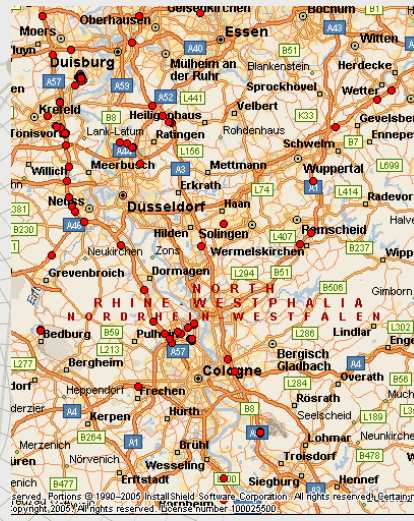
The above 2 maps show that, with good coverage, Loran delivers sufficient positions, even with the concealed antennae and in most difficult environmental conditions (inside containers, in buildings, etc.)

e-Tracker positions Cologne area

e-Tracker all systems



e-Tracker only Loran



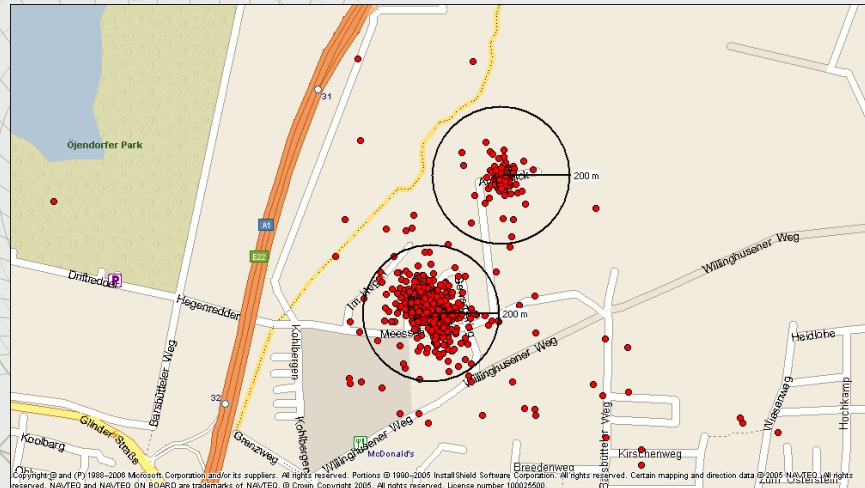
You will note that with good Loran coverage our e-Tracker can fully deliver all requirements logistics, with Loran signals only.

Consequently, Loran is the ideal back-up system for goods tracking in case GNSS dysfunction occurs

(e.g. because jamming: intentional or not)



LORAN positions inside a warehouse



Within a circle of 200 meters one can see that the Loran positions are more than sufficiently accurate for logistics applications.



GNSS enhanced with LORAN

Quote from GPS World (1 Oct.06) by Ivan G. Petrovski

«As new and renovated satellite navigation systems arrive and applications and innovative commercial ideas increase, *the general expectation of GNSS navigation performance will soon conflict with system limitations*»

The ELSIS tests clearly show that more than 99% reception of positions can be reached by combining LORAN with GNSS and GSM. Furthermore, LORAN is also the most appropriate GNSS back-up system

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« GNSS is rapidly penetrating mass markets. General users expect the same availability and ease of use as, for example, a radio. The same performance will be expected from GNSS navigation, i.e. to get their position everywhere »

Ivan G. Petrovski

Director of the Institute of Advanced Satellite Positioning Technology at the Tokyo University of Marine Science and Technology, and head of R&D and a member of the board of directors for GNSS Technologies Inc., Japan. Formerly a research fellow for the Japanese Science and Technology Agency's national Aerospace Laboratory and a consultant for Apollo Aerospace Inc. in the United States. EAB (GPS Advisory Board) member since 2004.



Main conclusions of the test

- Loran provides good logistics positioning accuracy
- Loran coverage in Europe insufficient for logistics
- Actual Loran receiver costs prohibitive for logistics
- Unsatisfactory Loran coverage hampers demand for low cost Loran receivers
- Market price Loran in logistics applications < 120\$
- Strong improvement of Loran coverage imperative and urgent, for land-based Loran applications
- If no Loran coverage improvement happens, Loran may miss the mass market for land-based tracking

Therefore ELSIS AG adapted their e-Tracker

The results are in conformity with our expectations, even surpass them, but the poor Loran coverage in Europe is a real handicap.

If during the coming years no proper Loran coverage is achieved, the possibility for land based navigation might disappear, at least for mass markets. Only security niche markets may remain



e-Tracker Basic Unit

Consisting of:

- GNSS Receiver (Supersense)
- 2 GNSS antennae (omnidirect.)
- GSM-module
- Batteries (up to 5 years)
- Monitoring of battery status
- Tracing with low power
- Aviation mode (switch-off)
- Dimensions: 115x115x34 mm
- Weight: 450 grams



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The small size of the basic e-Tracker allows easy dispatch, even by normal mail.
All components used allow all transport modes (no dangerous components)

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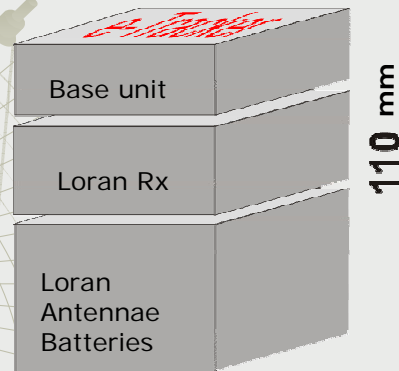
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e-Tracker Modular and flexible

ELSIS is ready to bring out the smallest cheapest and lowest power consuming Loran receiver in the world, as soon as proper Loran coverage is available:

- 2 Patents pending for a Loran receiver and its 3-D antennae
- System modularity allows expansion of equipment, allowing customers to upgrade at any time, in accordance with available technology



ELSIS has done their home work and can bring out on relatively short notice the required Loran module for mass market application.

The picture shows a Loran set-up w/o high integration, as applicable for the limited security market segment.

For mass-market applications the dimensions will be much smaller.

European tracking market: 2 main market segments

Tracking Market

GOODS

ASSETS

Our investigations indicate that the two main European market segments are GOODS and ASSETS



GOODS Tracking

WHAT?

- Pallets
- Parcels
- Art works
- Collection items
- Dangerous goods...

WHY?

- Theft
- Just in Time (JIT)
- Temperature
- Acceleration ...



The variety of goods is very large, but here are a few examples.

Also the main reasons for wanting to track are indicated but many other reasons may prevail



ASSETS Tracking

WHAT?

- Trailer
- Container
- Construction equipment
- Automotive (Old-timers)
- Yachts...

WHY?

- Theft
- JIT
- Monitoring
- Inventories



Customer contacts indicate ever more assets who need tracking.

A recycling company contacted us to obtain information on their containers positions or whether they (containing e.g. scrap metals) are being removed illegally.



Availability of e-Trackers

- A certain amount of e-Trackers 1. Generation (with GPS, GSM and LORAN) are today available for further tests & demonstrations
- Delivery of the 2nd generation e-Tracker basic unit with GNSS & GSM starting during 4. quarter 2006
- Delivery of e-Tracker extensions with additional sensor functions starting 1. Quarter 2007
- Availability of Loran units depending on the Loran coverage situation

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The Loran mass market product development in Europe can only take place when an increased Loran signal coverage is provided.

If no important improvements take place in the near future the mass market applications may disappear.

The high security market will then be the only Loran application, not requiring large quantities.



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