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# ***Electronic Seal Evaluation Program***

**Chel Stromgren  
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# Container Security – Background

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- The security of the Intermodal Container System has become an area of major concern for the national security of the U.S.
- Current system was built on efficiency, not security.
- Multiple initiatives underway to improve security.
  - U.S. Congress (Maritime Transportation Security Act of 2002 (PL 107-295))
  - TSA (Operation Safe Commerce)
  - U.S. Customs (Container Security Initiative, Customs Trade Partnership Against Terrorism)
  - IMO (SOLAS Port Security Code)
- All of these initiatives focus on better use of information and technology to identify and screen container shipments.
- All directly or indirectly reference use of “Electronic Seals” or “Smart Containers” to establish chain of custody, detect tampering, track shipments.

*E-Seals are assumed to be a major component of future container security.*

# What is an E-Seal?

- Electronic device used to monitor status and chain of custody of intermodal container shipments.
- Seals the doors of a container.
- Can positively detect tampering with the doors of the container.
- Holds data concerning (at least) container ID & tamper status and can transmit data to a reader.



# Electronic Seal Project – Background

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## The problem: E-seals are largely unproven technology:

- Applied only in extremely limited scope by military or shippers tracking high value cargoes).
- Unknown how e-seals will work in the desired, wide-spread application.
- Technologies are still developmental, many new developers / manufacturers entering market, no agreement as to operational usage, functionality / design, or even technology
- Little to no assessment of how use of e-seals will effect operations, economics, or efficiency of the system.

OSC and CSI will address the end-to-end vulnerability / security issues (what can e-seals contribute).

However, it is **critical** to also address the technical/operational issues (will e-seals work/how will they impact the industry/what are the economics?)

# Electronic Seal Project – Background

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Cargo Handling Cooperative Program (CHCP) is a joint government-industry taskforce intended to explore technologies and processes that could improve the U.S. cargo movement system.

Sponsor and direct research into issues that will directly affect members.

In past have gained significant experience in testing and evaluation of RF tracking and monitoring technologies.

Ideal entity to explore industry E-seal issues.

# Electronic Seal Project – Overall Goals

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Provide evaluation of e-seal technology that will:

Allow government and industry to make rational, information-based decisions regarding the implementation and legislation of container security that will result in actual reductions in vulnerability and will minimize negative impact on the system.

# Electronic Seal Project – Specific Goals

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1. Provide a test-bed to perform evaluation of e-seals.
2. Evaluate the relative performance of different potential technical solutions in a common environment.
3. Evaluate impacts of technology insertion on industry.
4. Evaluate and solve technical issues involved to insure successful implementation of potential technologies.
5. Establish requirements for future technology development
6. Provide technical support for the functional establishment of end-to-end systems.

# Electronic Seal Project - Current Steps

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## Phase 1 (May - Oct, 2002):

- Reviewed current technologies, state of development, availability, & potential economics.
- Conducted industry survey to discuss opinions/concerns about e-seals and container security.
- Drafted a document detailing industry issues with e-seal implementation.

## Phase 2 (Nov, 2002 - June, 2003):

- Laboratory and field testing of basic e-seal operation (focus on operation at gates).
- Development of computational simulation of e-seal performance.
- Comparison of e-seal technologies, design features, functionality.
- Work with industry / manufacturers to define future e-seal parameters.

# Electronic Seal Project - Identified Issues

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Who will control/implement system?  
Who will pay for the system?  
What will be the operational profile of the system?  
Operational standard versus security standards?  
Will it be a monolithic or distributed system?  
How will interoperability be assured?  
Disposable versus re-useable seals?  
Indicative versus barrier seals?  
What data types are necessary/desirable?  
What are the cost/performance trade-offs?  
Are extended sensor capabilities desirable?  
RF e-seal frequency and communication protocols?  
Application of e-seal to exported containers?  
Application of e-seals to empty containers?  
Immediate application versus phased application?  
How will e-seals benefit logistic planning?

# Electronic Seal Project - Future Steps

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- Advanced field testing of e-seal operation (on-road, on-rail, on-crane).
- Evaluation of end-to-end e-seal system operation.
- Evaluation of operational impacts of e-seals (positive and negative).
- Development of scenarios for system implementation.
- Evaluation of economics.

# Container Security – Structure

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In order to meet requirements, an integrated approach is needed:



## **End-to-End Solution Implementations**

Immediate improvement in security  
Flexible backbone for future expansion  
Provides assessment of end-to-end vulnerability and industry operations  
Evaluate several unique trade-lanes

## **Technology Test-Bed**

Real-world testing of multiple technologies  
Provides community with technical and economic data for multiple solutions  
Redundant testing does not lock into a single technology  
Will establish requirements for next-generation of devices



These activities are not exclusive. Technology test-bed will be an integral part of the end-to-end system. Testing will provide technical support for solving problems with end-to-end applications.