Presented by

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Enhanced Cargo Monitoring

- Container Communication Interface

Study Item

International Aircraft Systems Fire Protection Working Group
Meeting in Atlantic City on November, 1st-2nd, 2005

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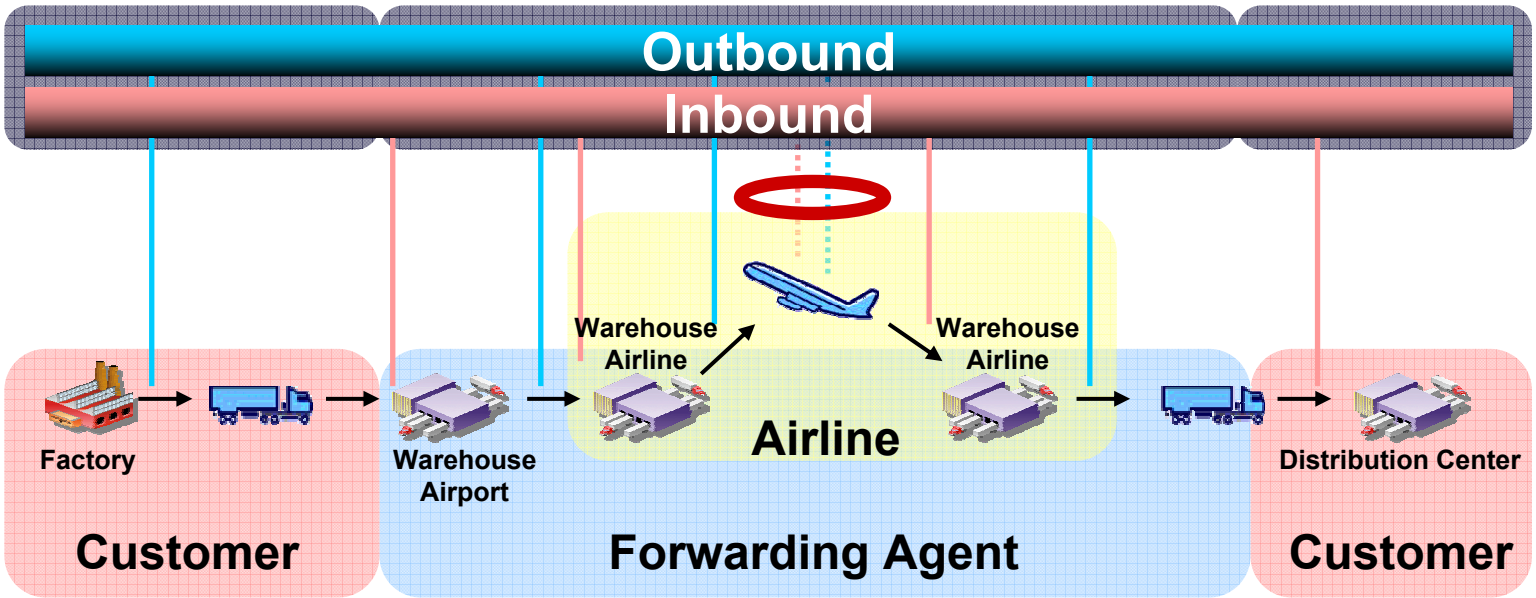
Cargo Compartment Fire Detection

- JAR/FAR 25.857 requires a smoke or fire detector system for cargo holds
  - Such systems monitor
    - –directly the compartment
    - –indirectly the goods loaded in containers/palettes
  - Corrective actions are initiated by the cockpit crew or automatically

Transport logistic

Air freight can be a weak point



There is an interest to know

- which cargo is on board (on which location)
- specific to type information like temperature, humidity, acceleration,….

Air Freight Aspects

- Air freight increases rapidly
- Just in time delivery is a real challenge
- Air freight containers/pallets (ULDs) are packed by third parties
- Inspection time is very limited
- Transport security risk is linked to volume
- ……..

In specific cases monitoring of goods within containers may contribute to security

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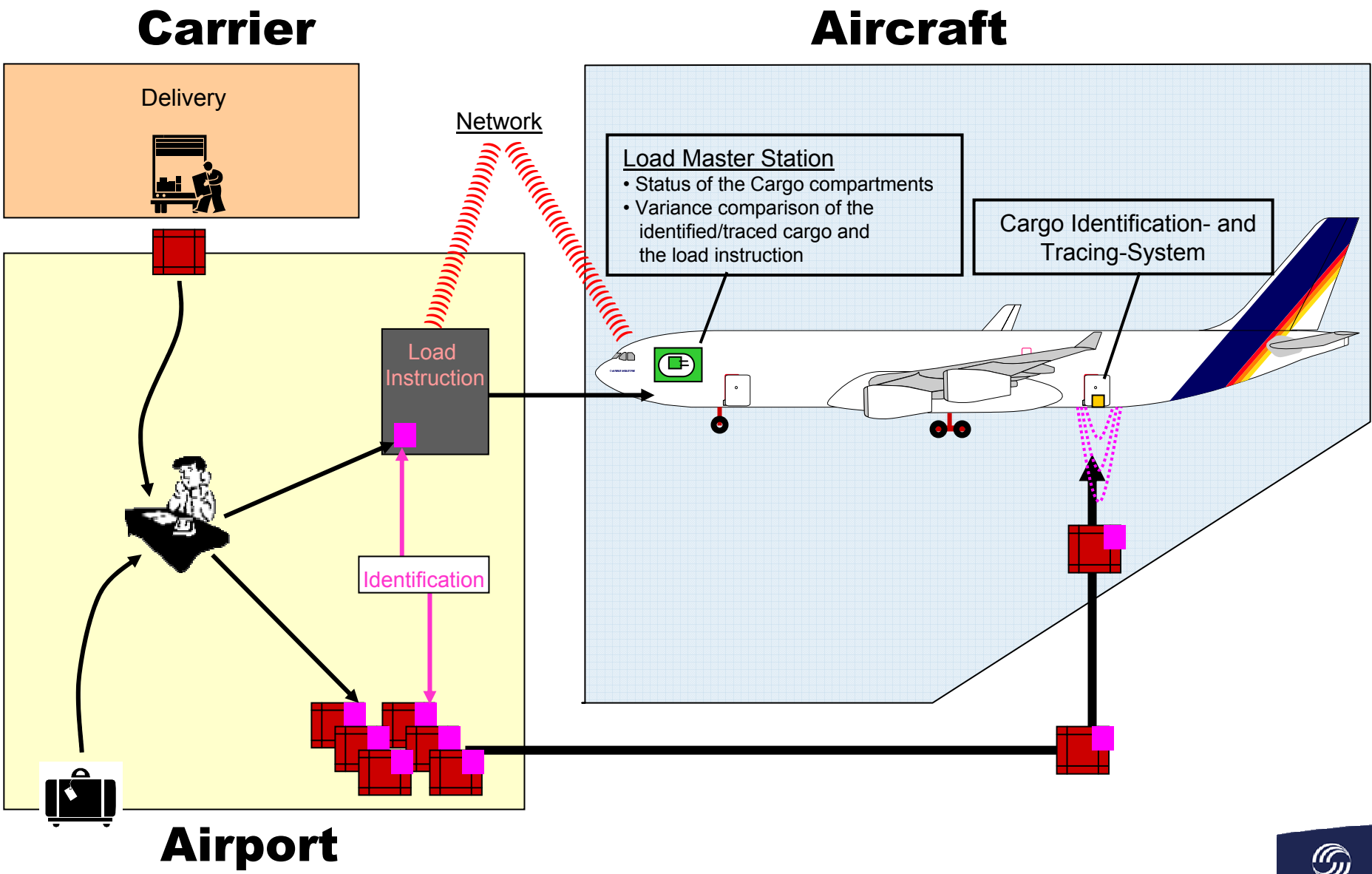
Monitoring needs

- Customers & insurances want to know what happened to the shipment (liability issues)
- Forwarders need to increase monitoring of goods
- Security authorities expand their focus on **.....**
- Improvements maybe feasible for
  - temperature sensitive goods (Vaccines /Pharmaceuticals)
  - hazardous materials (HazMat)
  - high valuable cargo (electronics, pharmaceuticals)

Such a monitoring needs communication between container and aircraft

Enhanced Air Freight Logistic –automatic ULD identification



Container Communication Interface (CCI)

- **The container com-interface shall**
  - enable data exchange between container & aircraft
  - be based on industrial standards like
    - RFID (868 to 915 MHz)
    - WIFI (Wireless LAN 2,4 GHz)
  - have hot plug ability (auto log in)
  - provide an interface to a SENSOR PLATFORM
  - be furnished with a battery pack
    - maybe solar assisted

Use of RFID capabilities for cool chain aspects

- If readers are installed in aircraft they can be used to:
  - interrogate cargo (within the container)
  - acquire data from dedicated goods
  - enhance the monitoring
  - set off a warning
  - …….

This could be an improvement for sensitive goods (not only for e.g. Vaccines/Pharmaceuticals)

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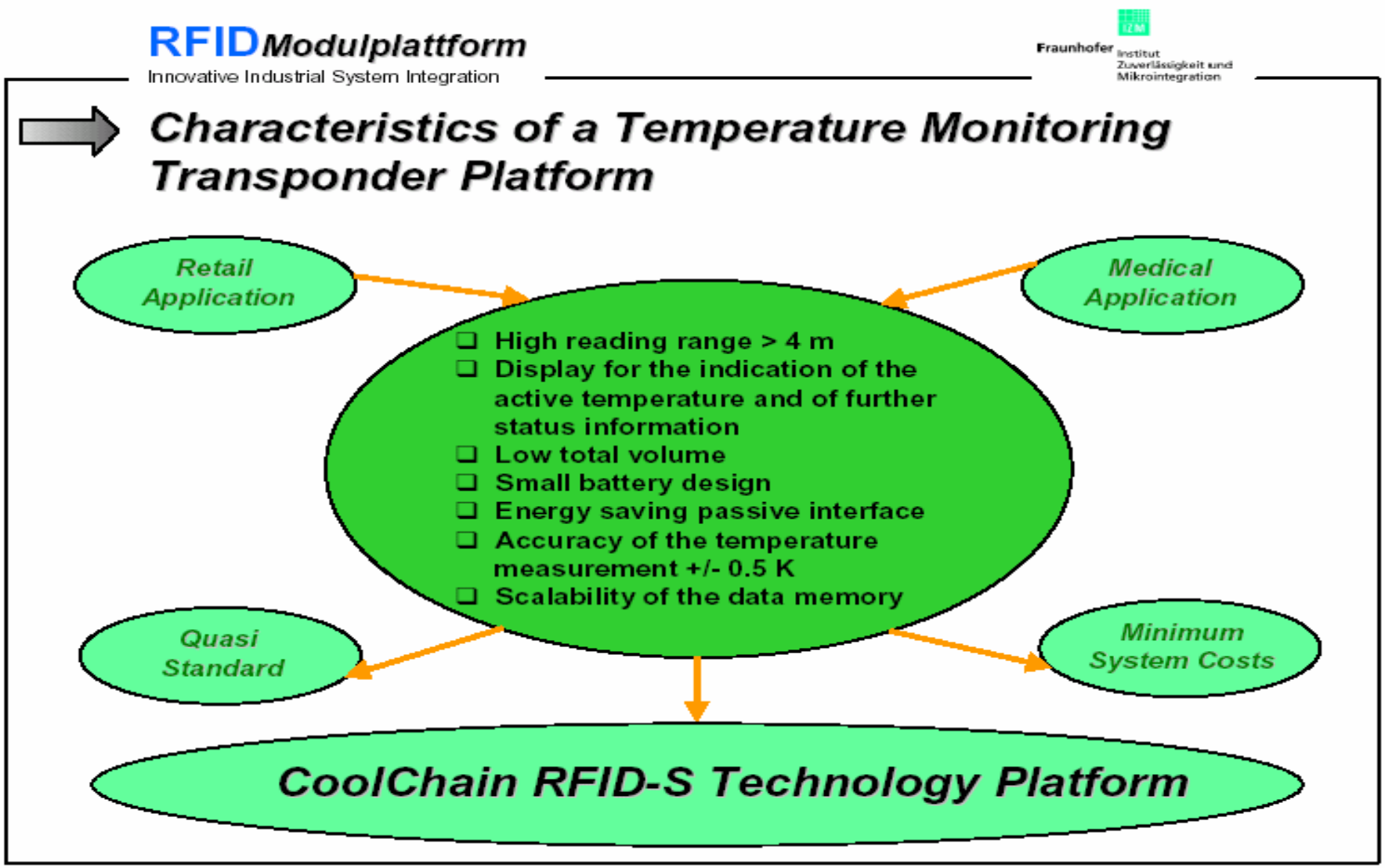
Example:
- Sensor Platform for cool chain monitoring

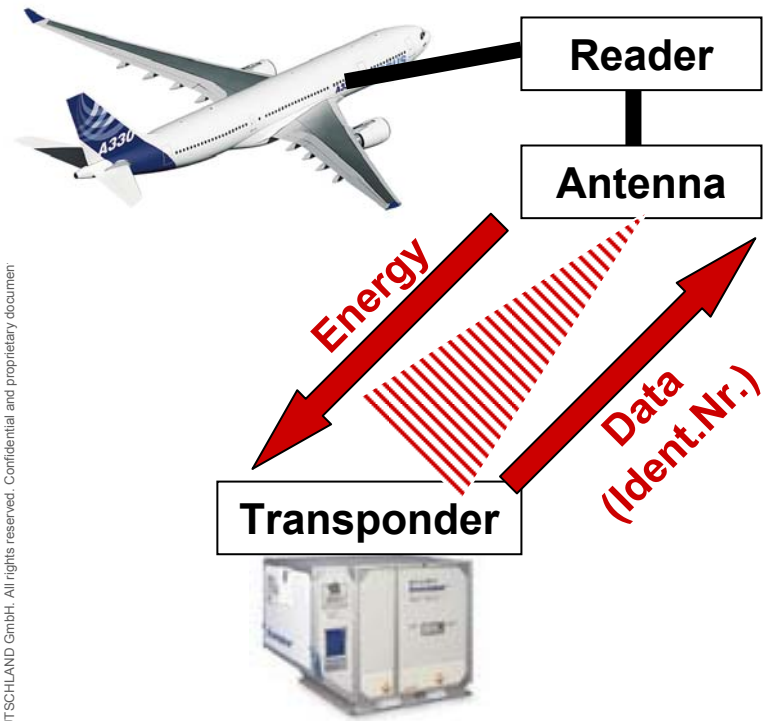


Example:
- Study on automated Container / Pallet Identification

Test Objectives:

- Technical feasibility for RFID based automated identification of airfreight ULDs at the cargo door area of aircrafts
- Definition of optimized position of RFID antennas and transponders

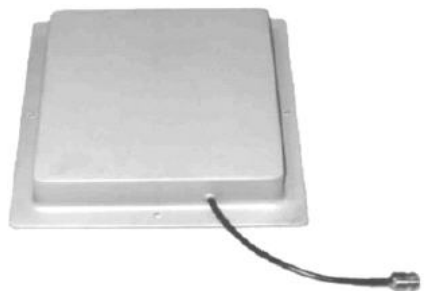
Technical concept:



RFID components (UHF - 868 MHZ):

Reader

Antenna



Transponder (passive)

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Example:
- Study on automated Container / Pallet Identification

Test conditions for trials:

Following parameters have been changed during the trials and tests:

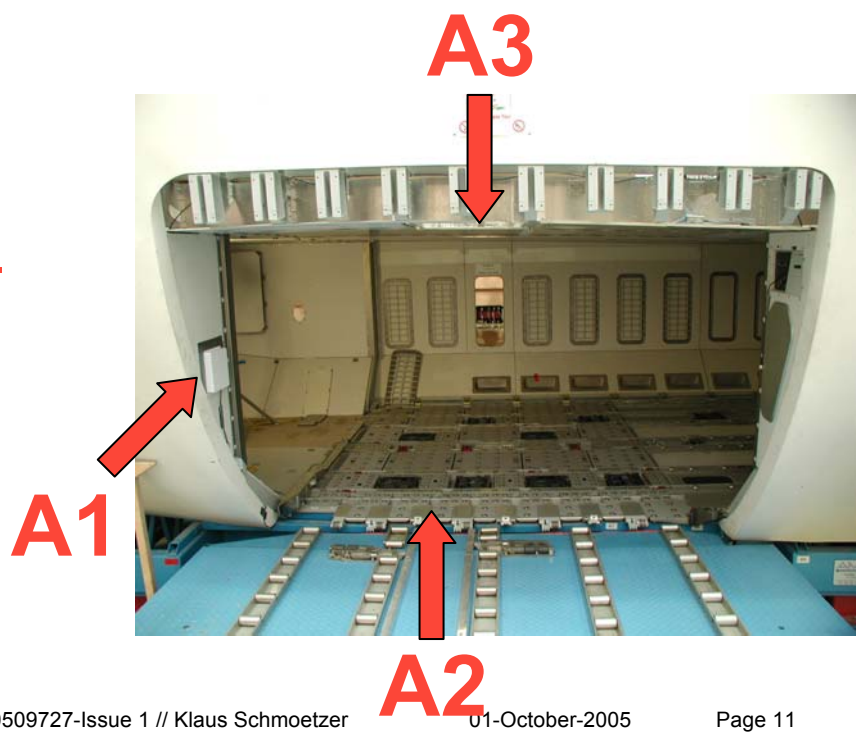
- Antenna positions
- Antenna architectures (fields)
- Transponder positions
- Transponder architectures
- Transmitting power (antenna output, range: 0.6-3.0 Watt)
- ULD weight (an empty ULD suffers more vibrations than a fully loaded)
- Dry / wet transponder

Antenna positions at cargo door:

A1: Left / right side

A2: Floor of cargo door area

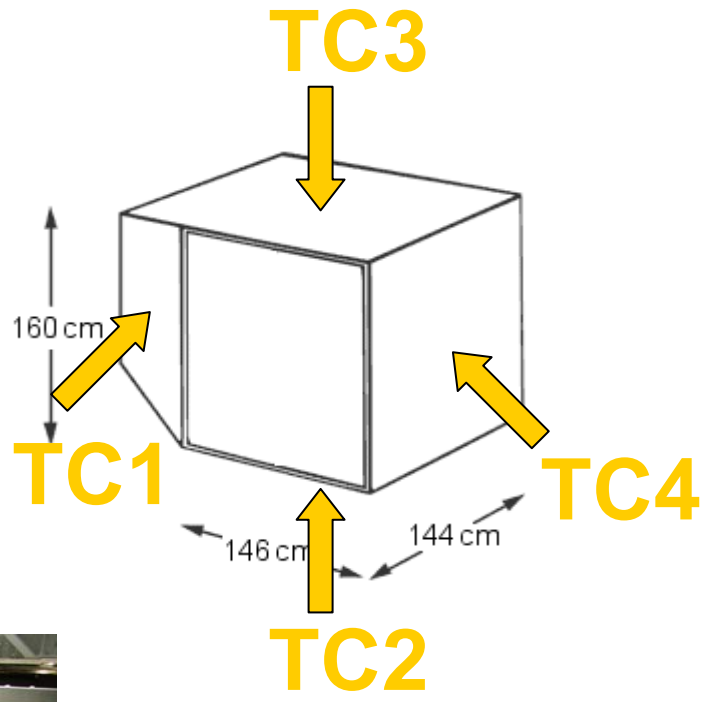
A3: Ceiling of cargo door area

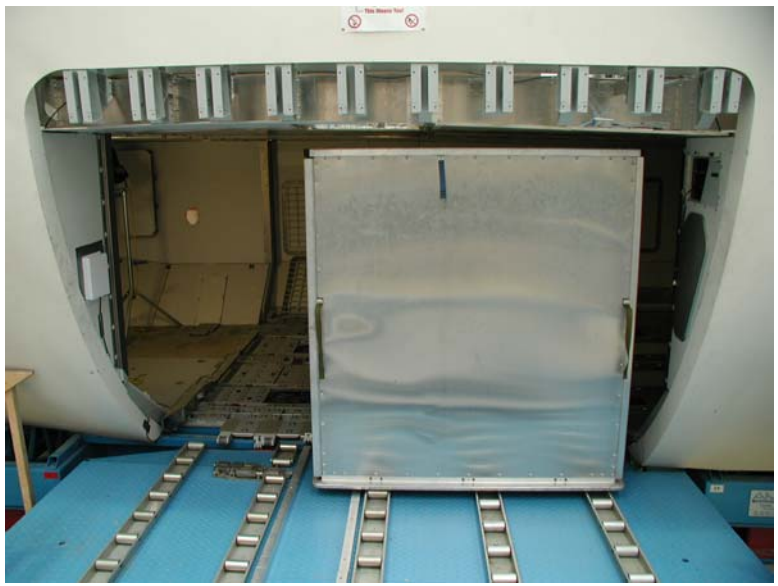


Example:
- Study on automated Container Identification

Transponder positions on container:

TC1: Left / right side [document pocket]
TC2: Bottom side of container
TC3: Top side of container
TC4: Front / back side

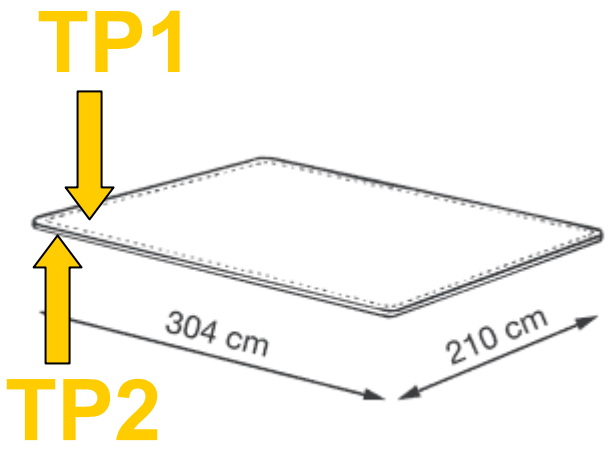


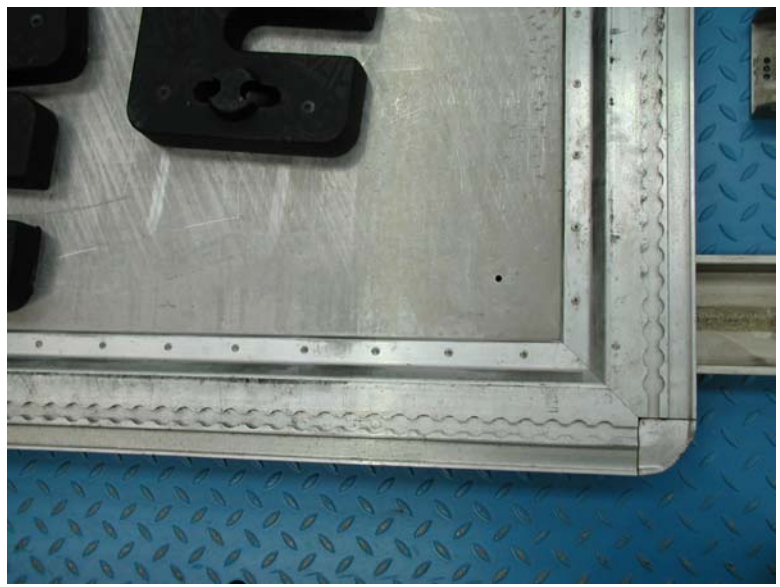


Example:
- Study on automated Pallet Identification

Transponder positions on pallets

TP1: Top of pallet (fastening rail)
TP2: Bottom side of pallet





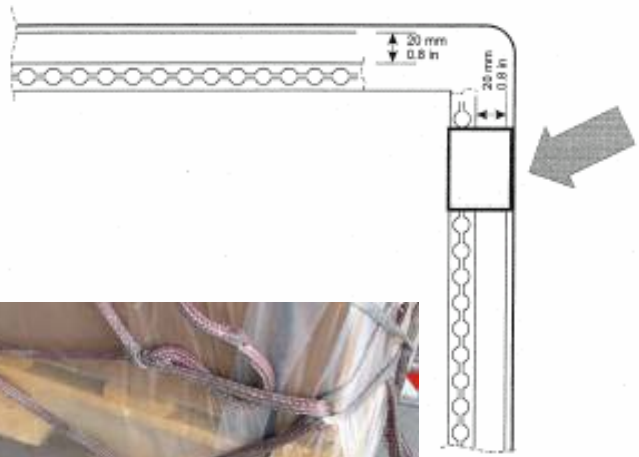
RFID location at ULD

-IATA recommended place is not always useable

IATA Recommended Practice 1640 — Attachment 'A', Appendix 'B'

RECOMMENDED PRACTICE 1640
Attachment 'A'
Appendix 'B'

TAG POSITIONING



Air Freight Logistic

Automated onboard identification of cargo can contribute to enhance of security

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Benefits of RFID assisted air freight handling

- Automated tracing of goods
- Automated verification of aircraft load instruction
- Reduction of false loading
- Reduction of ground time
- Paperless data transfer
- Electronic Bill of Loading
- Wireless interface can be used to enable more services than simply RF-Identification e.g.:
  - change/update information on relevant item
  - self control / monitoring means
  - memorize what's of interest
  - data exchange (e.g. actual temperature, history ..)

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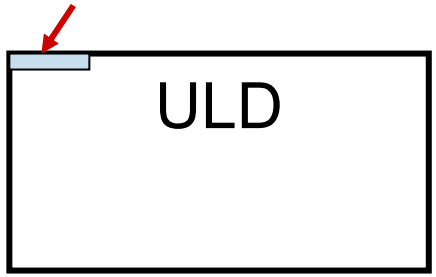
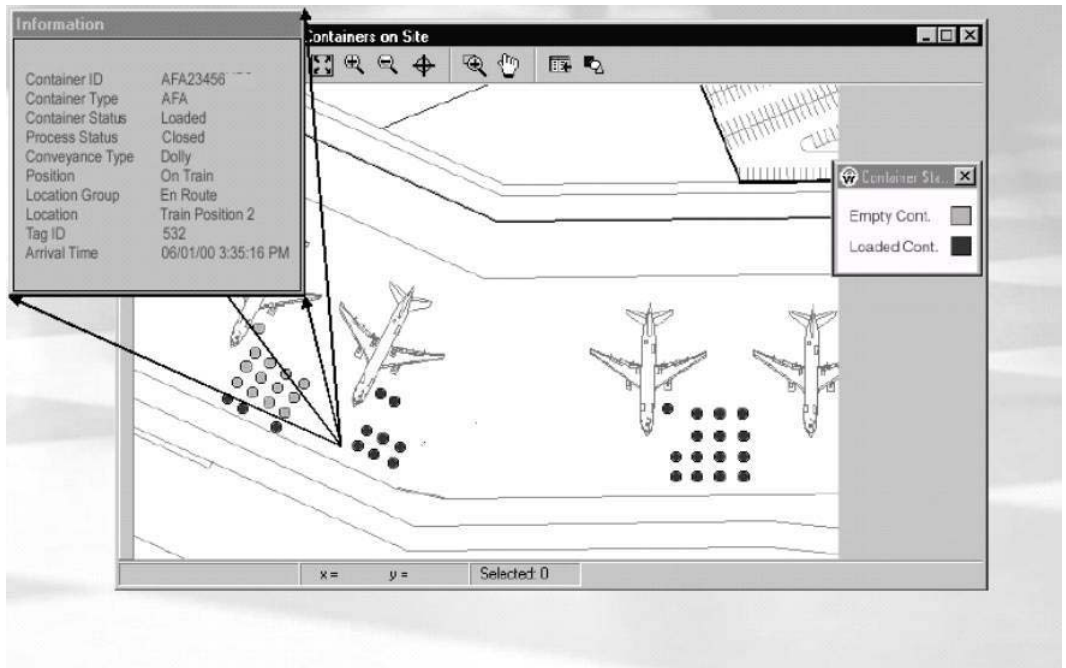
High valuable or important cargo

- **High valuable Cargo needs specific attention:**
  - we should know where it is
  - unexpected movements might be detected automatically

- GSM/GPS-Module
- RFID-Tag e.g. with temperature sensor





RFID within Air Freight Logistic

Which type of RFID maybe needed within air freight handling?

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Air Freight related RFID standardisation

Subject	Added Value	RFID Type	Cost
Labeling	•EPC •P/N & S/N •Life Cycle Data	Passive	0.5 – 1 €
Tracking	Localization of ULD	Semi-active	20 €
Quality assurance	•Trace ability •Sensor based data gathering (temp. humidity)	Active	50 – 200€
ULD / Cargo Monitoring	Monitoring & interaction	Active	100 – 500€

Outlook / Conclusion

- Introduction of a Container Communication Interface
  - enables placement of sensors close to the cargo
  - supports gathering of real time data
- Data exchange seems feasible in the range of
  - 850 to 950 MHz (GSM Cell Phones) or
  - 2,4 GHz (Wireless LAN)
- The associated Sensor Platform enables
  - an enhanced cargo monitoring e.g.
    - Hazardous materials (overheat / fire)
    - Cool Chain aspects
    - Explosion prevention / protection
    - Specific to type security issues

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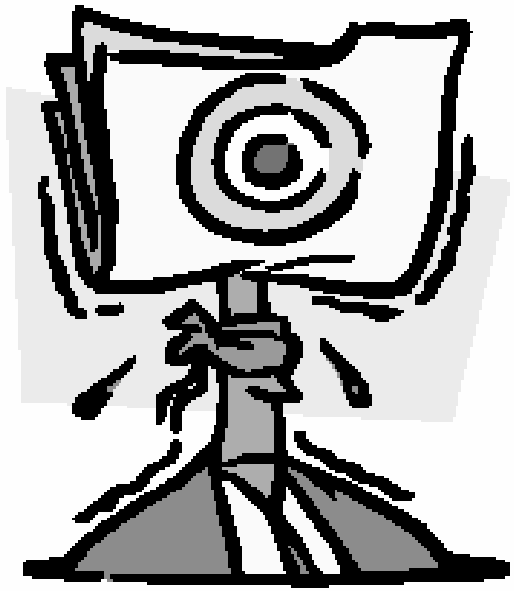
Cargo Communication Interface

Your Turn



Questions?

October 24th, 2005 –at flight operation center TLS