

Perspective



Applications of RFID in Air Cargo

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Abstract

Adoption of RFID in airline industry lags behind other industries like Retail. In Airline industry RFID can be potentially used for tracking of ULDs, TD cargo shipments, passenger Baggage, other Ground Handling equipment, and aircraft spare parts.

This article delves into details of automated ULD tracking solution with RFID that can address most of the prevalent problems that airlines face in ULD management.

Selection of RFID tag(passive, active, ultra wide band, or WiFi), choice of frequency band, Electronic Product Code for tags, location of readers at airports, hosting the solution to make tag data accessible on internet, etc are important technical factors that need to be deliberated, and agreed upon by airline industry. Equally important factors are,

- An innovative Pricing model that apportions global costs of a centralized ULD system locally to individual airlines
- Encouraging airports/GHA to invest in a global RFID tracking solution,
- Selecting a Globally Scalable data sharing network with capability of working with airlines' internal systems, Barcodes, etc.
- Extending such a solution later for tracking TD cargo, aircraft spares, etc.

The ULD tracking solution can become RFID's inflection point in airline industry, transforming the air cargo industry. However a pure techno-centric approach will be woefully inadequate) to achieve this.

This paper makes case for comprehensive understanding of all underlying issues prior application of RFID technology in Air Cargo.

Background

“Airlines need to enhance profitability of their cargo operations by better asset utilization, focus on TD cargo, and reduce system inefficiencies, like ULD losses, demurrage payments, etc.

Airlines can substantially cut their cargo operational costs by efficient utilization of all Ground Handling assets deployed in cargo flight handling, particularly the ULDs. Rolling stock of ULDs is one of the factors that directly impacts cargo carriage capacity of airline. One of the endemic problems that airlines face is poor tracking of ULDs.

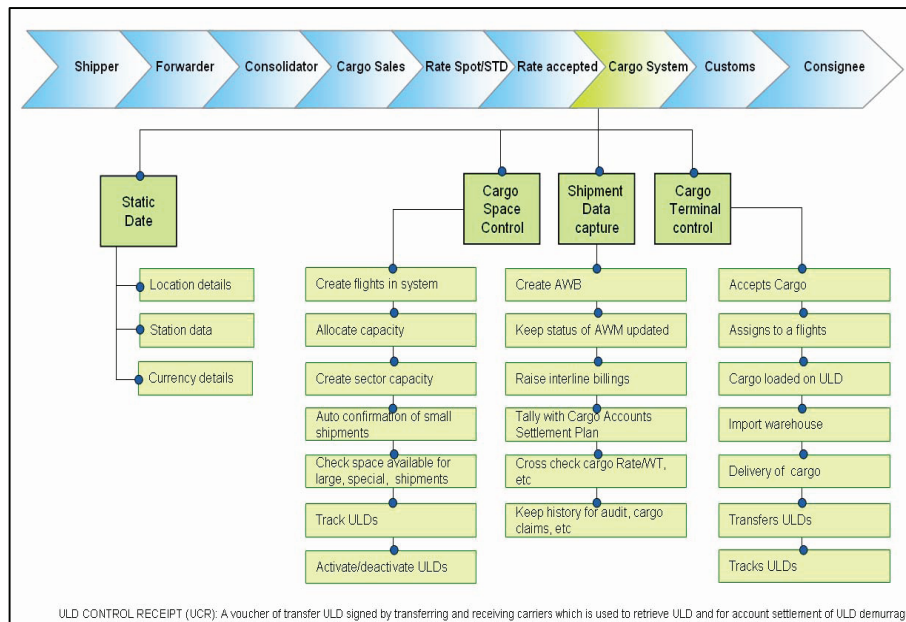
ULDs (Unit Load Devices) is a common term for aluminum metal pallets or containers used by airlines. Pallets are used to stack air cargo shipments, and containers for loading baggage on the aircraft. Considerable working capital of airline is deployed in maintaining rolling stock of ULDs. Airlines track the movement of the ULDs across their network, using legacy manual system.

What is tracking system used for ULDs? Every ULD has a numbering system using two letter alphanumeric IATA codes specific to the airline. The number is embossed or etched on the sides of ULD metal. The cargo booking system of airline has a built in module to keep the ULD stock updated, based on following message received.



- When the ULD is moved from one flight to another, following SITA teletype message (Type B message) is sent to airlines’ central computer.
 - UCM xxxxxx IN YY-101/date
 - UCM xxxxxx OUT YY-111/date
- With this message relayed to the airline HQ, (head quarter) by seven letter code, thru SITA network, say, LAXFMYY(Los Angeles based Cargo System HQ of YY airline), the system updates the location of ULD, as on the flight.

Each month, each online station of the airline is required to send out a stock control message, SCM, which too is a teletype message to the system HQ, giving stoontrol update with ULD numbers.



Disadvantages of present ULD tracking system are,

- Need of human intervention to read, record and relay ULD number by UCM, a teletype message sent to system address
- Rejection such UCM message by system due to human errors such as wrong format, etc
- ULD Tracking limited only “in and out of aircraft” leaving open possibilities of ULDs getting astray at many ill defined points around airport perimeter
- Lack of reconciliation of a ULD that goes out of system at one airport, and reappears from another airport.
- Lack of centralized data, visibility into other airlines’ tracking system in case of interlining of ULDs

Airlines have been considering various remedial measures such as, use of barcode, RFID (Active, or passive tags), GPS systems for asset tracking within airport perimeter. On other hand, Integrators, who run more efficient and highly profitable cargo operations, reportedly found no justification for making technology investments, such as RFID, in tracking ULDs or shipments. Reason may be the way integrator’s cargo operations are conducted; in a centralized warehouse with the integrator controlling every movement of ULDs, cargo shipments, never losing control over their assets , or shipments during entire life cycle of shipment/ULD in door to door delivery. Environment in which airlines’ air cargo operations are conducted is entirely different. First of all, airlines deal with multiple agencies like consolidators, GHAs, in addition to their own staff and frequently interline the ULDs to other airlines while transferring cargo. Further, directional imbalances exist in air cargo demand, necessitating empty runs of pallets. Hence there is acute need for a centralized, automated RFID tracking facility for airlines’ cargo assets,

TD cargo shipments, that works in tandem with internal cargo system of airline, supplementing and ultimately replacing the manual tracking system.

This paper explores steps for making business case using appropriate RFID technology in tracking of ULDs, cargo shipments, across all airports.

Automated RFID tracking ULDs will make following things possible

- Theft of ULDs will become difficult , if not impossible
- Accuracy of current location data of ULD will result in savings when airlines know for certain where the asset was last recorded, at which time, in which agency’s control area
- Make OAL(Other Airlines)/GHAs (Ground Handling Agencies) accountable while taking custody of airlines’ ULDs during interline transfers
- Faster turnover of assets over network, and thus increasing their utilization rate, and reduce ULD inventories
- Standardization of cargo handling processes at major airports

Making a business case on basis on ROI

RFID tagging of ULDs, or cargo shipments entails installing reader infrastructure at all major airports over world, hosting information database systems to make available to all airlines, for widespread adoption. There will be need for huge investments for a global rollout. No one airline can afford to go ahead alone and a global rollout will need to establish a clear road map, with an unambiguous business case on time tested methods of ROI such as Payback, NPV, and IRR.

ROI math for business case is based on following information:

- Historical data on yearly losses of ULDs, utilization rate over its productive life, in hours per year
- Replacement costs or book value of lost ULDs
- Cost of stock out, i.e. not having a required ULD, or costs of delay
- Cost of carrying additional inventory of ULDs
- Cost of initial investments in RFID infrastructure, tags, etc.

The ROI calculations will also require an agreement about method to be used, such as Payback, NPV, or IRR. Payback ignores the cost savings that accrue over entire duration of project, once payback is achieved. Moreover payback ignores “time value” of revenue streams. NPV, or IRR are more accurate methods for ROI as they take care of both revenue streams in entire lifecycle and time value of net outflows.

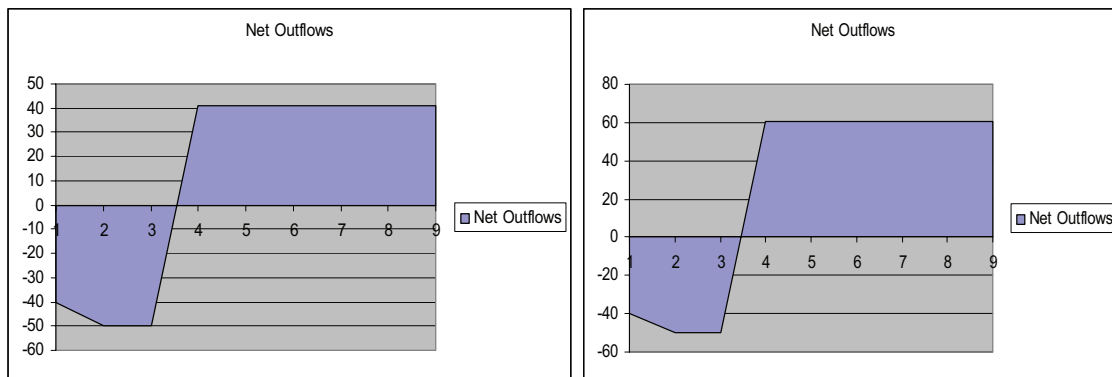


Chart A

Chart B

RFID tracking of ULDs, makes a sound business case, as can be seen from above chart A (based on Infosys proposal for ULD tracking with RFID), with positive NPV, as area representing payoffs is much bigger than the initial investments in RFID infrastructure. Airlines can potentially further optimize investment made in RFID infrastructure in tracking ULDs, by tracking premium TD express cargo across their network, comply with new FAA security regulations, etc. In this case, the returns on same investment will be much more, strengthening business case further, as can be seen from chart B.

Key decisions that airline industry should make are

- a. Selecting type of RFID tags, such as UHF passive, Active, WiFi active tag, for technological performance such as, read rates, accuracy, recommended read ranges, location of tag on ULD, location and number of reader locations at airport, global compatibility standards on data sharing, aviation safety issues, battery life, vendor management for procuring tags, other consumables, etc
- b. Single out only the pallets used in air cargo for RFID tracking and keep out the other 50% ULDs, namely the containers used for loading baggage. Reasons are that containers are rarely lost, airlines do not lose control over them. Limiting tracking to only pallets, will substantially reduce RFID infrastructure costs, expenses on tags, and so on.
- c. Encourage airports, airlines, GHAs or Cargo alliances to take a lead role in making capital investments in their base location, and use services of other providers at other locations
- d. Apportioning costs of a global rollout of RFID tracking to airlines based on usage, making the ASP model work on 24 x 7 basis at low costs.
- e. Innovative Pricing models, recommending additional charges for Airports or GHAs for recovering their capital investments in RFID technology.
- f. IATA taking a lead role for common industry standard for RFID solutions.

- g. Conduct RFID real life pilots for ULD tracking, and share results such as read rates, distance between tag, and reader, level of interference due to aluminum pallets, or “anti collision” knowledge to help limit radio signal interference with each other
- h. Optimize investments made in establishing RFID infrastructure by using it to track TD shipments, after market aircraft spares, passenger baggage, etc.

Few more application areas for RFID in Air Cargo

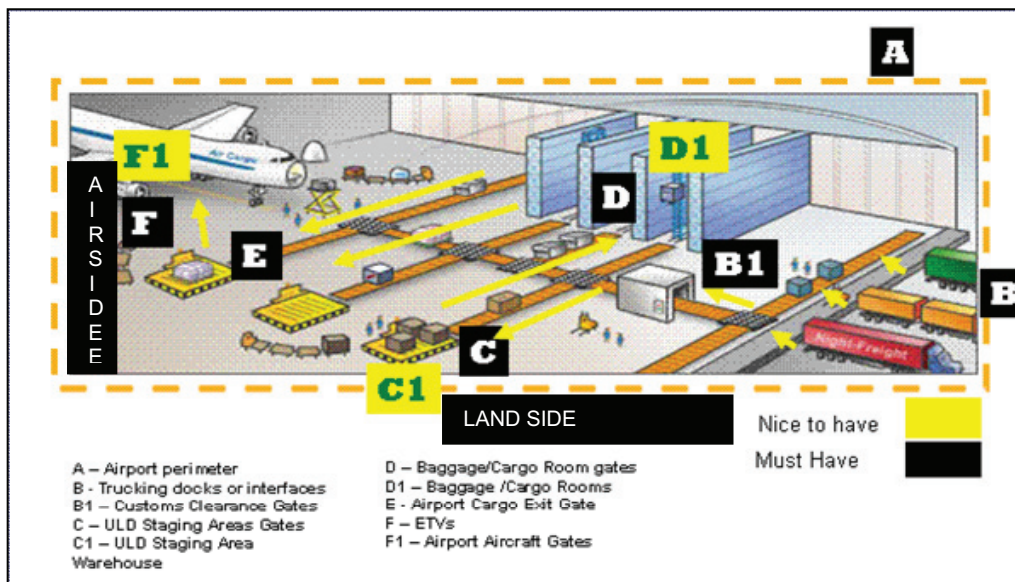
Some more application areas for RFID in Air Cargo space are listed below.



- Theft prevention of Valuable Air Cargo by concealed RFID tags. Airlines transport diamonds, jewelry, and other valuable cargo.
- Inventory management: RFID tags can dynamically update information of the object it is identifying. RFID can update information about the contents (shipments) in the container when shipments are added or removed at each station.
- Aerospace after market spares: Aircraft OEMs plan to use RFID to manage inbound parts and supplies. Better tracking through RFID can help airline industry to reduce \$ 50 billion spare parts inventories by \$ 5 billion.
- DGR (Dangerous Goods Regulations) Hazardous air cargo management.

Need for RFID pilots at various airports

Results of comprehensive RFID pilots at airports for ULD tracking are not available. Such pilots will be essential to make decisions about type of RFID tag, their location, number of readers at airport, steps to improve read rates by following standard procedures, link EPC code generated RFID tag, to an online database, providing a secure way of sharing product-specific information for airlines on internet, MIS statements , etc. If airline industry can standardize cargo handling procedures at major airports, it will possible to reduce the number of reader locations from six to three positions, leading to large cost savings. The tradeoff between type of tag, their costs, number of reader locations, and required read rate distances, interferences, noise, value perceived by airlines’ needs vis a vis the capital costs needs to be carefully analyzed.



Infosys has partnership with SAP for RFID. Infosys' track and trace solution based on OER (Object Event Repository) technology platform can support airline industry in development of further business applications, where ULD data is aggregated, and use data collected by RFID sensors, bar codes, as well as manual updating by SITA messages. Thus the new automated system will work in sync with existing manual system, making it possible for airlines to work simultaneously with both old, manual internal system as well as the new centralized RFID automated system.

Infosys view of application of RFID for Air Cargo

Infosys believes RFID technology has a clear business case for tracking of ULDs. However decisions about selection of RFID technology (passive or active tags), database of tag, industry standard numbering logic across different locations, agreements on location of tags, readers, hosting ASP solution across major airports, etc. need to be taken only after careful analysis, backed by results from real life pilots. Preconceived notions about particular RFID tag, as a magic bullet are born out of a pure techno-centric approach. This can result in individual airlines not able to justify a “technically heavy” solution, for lack of ROI, and a business case.

By delivering innovative, value-added ASP solutions, ensuring a low total cost of ownership (TCO), Infosys can help airlines adopt RFID technology to both enhance their existing business models in air cargo used for tracking, (ULDs as well as cargo shipments) and transition to new automated ones. Infosys can use SAP's state-of-the-art auto-identification, integration and event management technologies, OER (Object Event Repository) to collect, monitor and analyze real-time RFID information on products and assets moving throughout the supply chain. Hence Infosys can evolve global scalable solution based on standards established worldwide.

Conclusion

RFID pilots, at various airports, to comprehensively test centralized ULD tracking solution, can help airline industry not only in deciding upon appropriate technology platform, but also standardize handling processes in air cargo. Airlines can then reap additional benefits from investments made on the RFID ULD tracking solution across different geographical locations by scaling it further for extended uses such as tracking of individual (TD) cargo shipments(Cargo-2000 initiative), after market spares, baggage, etc. By choosing a technology (ie RFID tag frequency) based on preconceived notions, airline industry runs risk of “putting the cart before the horse” to use a cliché.

Infosys is ideally placed in evolving RFID ULD tracking solution for air cargo industry on strong foundation, due its deep domain knowledge of air cargo business, an established RFID practice that has delivered many solutions across a broad spectrum of industries, and partnership with SAP's RFID auto ID group. It is essential that airline industry works together with business transformation partners like Infosys for technology driven business solutions, such as global ULD tracking solution with RFID.

About the Author

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