



Case Study: Air Canada Cargo RFID Technology Pilot

RFID Pilot Plan

This project was initiated through the collaboration of University of Florida Associate Professor, (Packaging Science, ABE Co-Director, and Center for Food Distribution and Retailing), Jean-Pierre Emond and Air Canada Cargo Systems Manager, André Forest. Franwell, Inc., an associate member of the UF Research Center for Food Distribution and Retailing (CFDR), was brought on board for their RFID technology expertise and ability to implement the pilot with a comprehensive solution that would prove the concepts to be tested.

Prior to this cooperative effort, Jean-Pierre Emond, Ph.D., had invested considerable time testing produce and other items with high water content, as well as metals, and he thought that testing RFID with cargo would be particularly challenging. After running initial tests in the RFID lab at the CFDR using cargo provided by Air Canada, Professor Emond was convinced that a pilot to prove the concept of tracking cargo via RFID would be successful. He approached Air Canada Cargo officials who also were interested in the possibilities that RFID technology brought to the air cargo industry; they had already considered the possibility of doing a pilot using RFID, but not necessarily with their cargo division. Franwell was excited about the opportunity to expand their efforts to promote automated identification by means of radio frequency for tracking all kinds of inventory, as well as the opportunity to show how RFID can have a positive impact on business processes in diverse industries.

Originally, Air Canada had considered using their own software and network to communicate with an interface that would pull data from their system to encode the RFID labels; ultimately, however, they found it more practical to use a parallel system rather than their existing network. The benefit of using two different systems quickly became apparent. Both the UF and Franwell teams knew from previous experience with another ongoing pilot they co-sponsored, called the V2, or "Visibility Validated" Project (involving the CFDR, produce suppliers, a retailer/distributor, and other technology partners), that tracked shipments could be viewed from a centralized Web portal for global Internet access. Although the fresh food supply chain and the transportation/logistics industries are vastly different, Professor Emond and Franwell believed a similar solution, involving a Web page with detailed inventory visibility, would be ideal for Air Canada's purposes.

Pilot Objectives

There were two main objectives for Air Canada Cargo's RFID technology pilot and both objectives were satisfactorily attained.

- The first objective was to identify potential for improvement of processes at Air Canada.
- The second was to demonstrate the capability of RFID technology in the cargo environment.

Conditions Critical to Success

There were specific elements requisite to the success of this pilot. If any of these criteria were not successfully met, the pilot would not have gone forward.

Primarily, pilot implementation should have little or no impact on current Air Canada Cargo systems and workflow. It was crucial that no major time or labor commitment would be required from Air Canada Cargo personnel. However, input from Air Canada Cargo employees who used the RFID technology solution was highly valued; all participants were encouraged to provide feedback.

Another critical factor to the success of this pilot is that the RFID technology pilot would produce clear results which could be analyzed and compared with Air Canada's current processes. To prove the concept of tracking cargo via RFID, from shipping at the Miami airport to receipt at the Toronto airport, RFID data that was read and recorded could be viewed in real time. Further, the data that was captured at the shipping and receiving points could be compared with Air Canada Cargo's normal processes, referred to as the "current system."

Challenges to Overcome

Although Franwell had considerable RFID experience with other industries, working with air cargo was an entirely new endeavor; determining the right approach to meet or exceed pilot objectives was the first challenge. The Franwell team discussed several viable options before finalizing the technology requirements. A major concern on the part of Air Canada Cargo that the pilot not inconvenience or negatively impact their own daily processes could have been problematic, had the solution not been so straightforward and user friendly.

The cargo environment itself, a high-volume airport, presented multiple challenges. A significant issue was connectivity to the Internet. Airports have a great deal of concrete which impacts the level of Internet signals received via cell phone. The use of a PC MCIA card was a good way to provide the Internet Service. However, if for some reason the Internet were not available, the RFID system would wait until the Internet was available to send the information. Once connected to the Internet, another possible issue was picking up extraneous signals. A great deal of wireless communication takes place at airports and that kind of noise could create problems. Added to these concerns, is the tight schedules at airports; with pre-determined departure times, loading of packages and containers had to go quickly and smoothly.

Positioning of the tags and orientation of the antennae were also important considerations. Cart mobility helped resolve the antennae concern. If a package contained water, and the RFID tag was placed directly in the middle, facing away from the reader, the data would not be picked up (although the data for each individual package within the container was associated with the container itself). The simple solution was to instruct those handling the packages to place the RFID tag in the corner; when this was done, the read rate was 100%.

Potential obstacles were not insurmountable and testing went very well.

Implementation of Pilot

During the planning stages, Air Canada identified the processes they handled with their current system and the parallel processes anticipated for an RFID pilot. Along with the UF CFDR team, they provided information requirements essential to Franwell's development of a technology plan.

Franwell, Inc. developed the RFID pilot solution, a stand-alone RFID system for sending and receiving cargo data, with the ability to track and trace the Air Waybill transactions from any remote location with Internet access. This also involved the creation of a centralized Web page for global access to prove the concept that cargo could be tracked via RFID technology, providing instant reports to Air Canada Cargo employees with little or no inconvenience. It was not within the scope of this initiative to integrate Franwell's RFID software with Air Canada's business software; however, complete integration was always doable, as the Franwell RFID system is by design both flexible and scalable.

Part of the Franwell solution involved selecting the right equipment to accomplish the project objectives. Mobile carts with PCs and fixed RFID readers mounted on them were utilized at both shipping and receiving locations. Additionally, a Printronix® MP2 printer was mounted to the cart at the shipping (RFID tagging) site. Air Canada Cargo provided the PCs, Symbol Technologies® contributed their XR400 RFID readers, and PowerCart Systems provided the battery-equipped carts. A touch-screen monitor enabled Air Canada Cargo employees to use quickly and easily the Franwell RFID system (a database tracker) with minimal disruption to other normal cargo processes. Connectivity to the Internet was an essential part of the tracking process, and Franwell determined that a cell phone network would be the best way to obtain Internet service. They used a PC MCIA card to provide the wireless connection.



Pre-Pilot Proof-of-Concept Testing

When the initial processes were incorporated into Franwell's RFID system, the team went to Orlando International Airport (MCO), selected for pre-pilot testing because of its proximity to Franwell headquarters, as well as for its high-volume cargo traffic. The preliminary tests were for verification of Franwell's RFID software system, cellular Internet connectivity, and communication between the Franwell application and the Web portal. Items shipped from MCO were received at the Lester B. Pearson International Airport (YYZ) in Toronto, which was selected because it is the largest cargo hub in Canada.



Performance tests were also conducted as project team members tested RF identification of individual packages as they were placed in unit load devices (ULDs). The ULDs were not RFID tagged for proof-of-concept; however, the loading process was tested from varying antenna angles for read range and read rate and the curtain-like opening of the ULDs was tested in both up and down positions to prove that the individually tagged packages could be read when out of line of sight. Finding the best orientation without the necessity of re-alignment was extremely helpful.

Although cargo to be shipped from MIA was manually handled by companies under contract to the airport, Air Canada personnel were able to determine that the RFID solution would not interfere with their normal operations (an important aspect to be continually monitored throughout the pilot). Proof-of-concept findings, that current processes were not hindered and that a 100% read rate was achieved, encouraged Air Canada to move ahead with the actual pilot. Therefore, after testing only three shipments during the pre-pilot phase, Air Canada was ready to move the shipping operation from MCO to Miami International Airport (MIA) for the actual pilot. MIA was selected not only for its high-volume, but also for the great diversity in cargo contents.

Pilot Processes

In Miami and Toronto, Air Canada employees were trained in the use of the Franwell RFID system. The following steps involved in the RFID processes were simple for Air Canada employees: tagging, loading, shipping, receiving, and unloading. The actual content of the packages placed in the ULDs was not part of the testing, although various products, from tropical fish to computer parts, were used. The importance of the data is that much more information was captured through the use of RFID technology than is possible with a bar code alone. Workers scanned for bar codes, as usual; therefore, reading the RFID tags upon loading, and then associating them with the RFID-tagged ULDs added an extra step to the process. However, that extra step had very little, if any, impact on the workflow; instead of being manually scanned, the RFID tags were simply passed in front of a reader as they were loaded.

The RFID shipping process involved collecting information such as the number of pieces, route, weight, origin, and final destination. When this information was entered into the computer, an Air Waybill was printed. For the Air Canada project, when a sticker (or label) was printed, an RFID tracking chip was included on back and this was placed on the package to be loaded and shipped; team members chose to use labels the same size as those normally used by Air Canada employees as part of the effort to minimize impact on the current system. The RFID receiving process simply reverses the shipping process actions, in that RFID-tagged cargo was read when received and unloaded, simultaneously updating the Smart Airbill database and Web portal.

Air Canada's current process that utilizes bar codes is limited to information with a single-type code for all instances of a particular product. By contrast, RFID technology, with greater RFID tag data capacity, allows for any tag to have a unique code. The uniqueness enables individual product tracking as it moves from point to point through the system. Another value of RFID technology is that tracing back provides not only the unique identity of the RFID tag, but it also gives a unique serial number for the individual item. Beyond knowing that there are a certain number of boxes, for example 80, in a container, RFID technology enables one to know if a box is number 1 of 80 or number 79 of 80.

The Air Canada pilot lasted only seven months (including planning time) from inception to completion. After only two weeks of shipping and receiving RFID tagged cargo, Air Canada ended the pilot because it consistently satisfied the success criteria they had established.

Pilot Results

The Air Canada pilot was a complete success because all elements critical to its success were satisfied and because the reading of RFID tags in both the shipping and receiving processes provided 100% read rates. Additionally, every possible challenge to the effectiveness of this project was easily resolved. The pilot objectives were not only successfully met, but they were accomplished in a very short frame of time.

Air Canada, Franwell, and the UF CFDR teams, confirmed that an RFID technology-based solution is feasible within the cargo environment by demonstrating that the reading of RFID tags is not problematic. The pilot partners successfully demonstrated the validity of RFID technology to the air cargo industry by proving that it can provide accurate and timely data to airline businesses. Finally, the project also clearly showed that RFID of itself is a technology that can improve processing techniques. The automation of business processes, as well as location-based tracking with minimal disruptions to the current system, proved that RFID technology could provide tangible benefits.

Pilot ROI

What the pilot gave back to Air Canada Cargo was the reality of short-term ROI. The value received was immediate because the visibility of inventory enabled a clear comparison of goods recorded with the actual physical inventory. The results of the Air Canada pilot hold tremendous potential for the air cargo industry, as a whole. Having true inventory visibility from point of origin to final destination was of immediate benefit, especially when Air Canada personnel could access the information from any location with Internet access. The accuracy of inventory knowledge provides greater control and enables those managing cargo to do so more easily. Minimizing losses is another considerable value. The data captured could include more information that is descriptive, and as more information that is specific becomes available, more uses can be derived from that data, thus increasing the benefit of RFID technology to a company.

According to Jean-Pierre Emond, RFID technology could allow airlines to have much more refined tracking of packages with many possibilities for automated segregation of packages according to specific parameters (not used in this pilot) which would reduce the amount of time it takes employees to manually handle such processes. Professor Emond foresees the possibility of airports offering RFID tracking as a service to cargo companies. The proven ability to obtain cargo information quickly and easily, and to track and trace goods with accuracy that would aid decision-making processes, is a huge advantage to any company. Data value is greatly enhanced when integrated with a company's business system, which is the next step to long-term ROI.

The potential to take such a pilot much further is a wide-open door. When one airline company commits to using RFID technology, it is likely that others will follow. Air Canada has taken a huge step toward the future of better air cargo management. As with all leading edge developments, RFID technology for the airline industry requires careful planning and implementation, but the rewards are visible and verifiable.

Partners

The principal organizations involved were Air Canada Cargo, The University of Florida IFAS CFDR, Franwell, Inc., Symbol Technologies, and PowerCart Systems. All partners contributed financially to the labor involved in the pilot, as well as donations of equipment.



Air Canada Cargo enlisted the involvement of several people in the project, from top management at their corporate headquarters and a team of IT personnel to Cargo Operations and Facility Managers at the airports used as pilot venues. In addition to covering travel expenses and funding the participation of one student from the University of Florida, Air Canada personnel were active participants in the planning of the project. The Air Canada Cargo team consisted of Project Manager, Andr  Forest; Michael Ricciardi, Steering Committee members (which included one UF representative), Claude Morin, Lise-Marie Turpin, Lise Fournel, and Robert Eardley; IT Personnel, Darcy Noonan, Grant Fengstad, Bob Eardley and the ITSI group; Cargo OPS representatives and Cargo Facility Managers at airports YYZ and MCO.



At the **University of Florida**, Jean-Pierre Emond, Ph.D., was the PR liaison. He also maintained the relationship with project vendors and brought in the camera crew (University of Florida students) to film the video on the Air Canada pilot. Students also participated in much of the preliminary testing.



Jeff Wells, President and CEO of **Franwell, Inc.**, was responsible for the technology commitment that involved Franwell resources and Franwell provided the development team for the project. The scope of development responsibilities included project design and functionality, installation, implementation, and training of Air Canada employees on the RFID solution, referred to as the "Smart Airbill System."



Symbol® USA and **Symbol Canada** provided Gen2 RFID tags, as well as the antennae-equipped XR400 RFID readers. Symbol selected the best available resources for the Air Canada pilot; this included providing the conversion to labels, as well as the tag inlays that were encoded. The XR400 is EPCglobal certified and has proven to be a highly effective and dependable piece of equipment.



PowerCart Systems Inc. Director of Business Development, Paul Strathdee, was very helpful and provided the mobile battery-powered carts used by Franwell to assemble and equip with RFID hardware.

About Air Canada

Air Canada is Canada's largest domestic and international full-service airline and the largest provider of scheduled passenger services in the domestic market, the transborder market, and each of the Canada-Europe, Canada-Pacific, Canada-Caribbean/Central America, and Canada-South America markets. Passenger transportation is the principle business. Headquartered in Montreal, Air Canada is a wholly owned subsidiary of ACE Aviation Holdings Inc. (ACE). Today, Air Canada is the 14th largest commercial airline in the world. Air Canada is also the largest transportation and shipping airline company in Canada. Although their headquarters are in Montréal, Quebec, in the Montréal-Pierre Elliott Trudeau International Airport, Air Canada's largest hub is in Toronto, Ontario, at the Lester B. Pearson International Airport. Other primary hubs are located in Vancouver and Calgary. <http://www.aircanada.com/en/home.html>

About the UF IFAS CFDR

The CFDR is the first research center of its kind worldwide to focus on perishables food distribution and retailing. The mission of the Center for Food Distribution and Retailing is to provide the food industry and the scientific community with a unique environment for developing knowledge that will assure food quality and safety throughout the whole distribution chain. In order to study the impact of new technologies, cultivars, or operations, it is important to approach the whole chain in a multidisciplinary way – a systems approach. With six disciplines involved: engineering, horticultural science, packaging science, food science, logistics & operations, and economics, it is possible to cover all aspects involved in a distribution chain from the growers to the retail stores. <http://cfdr.ifas.ufl.edu/>

About Symbol Technologies

Symbol Technologies, Inc., founded in 1975, is a global leader in secure mobile information systems that integrate application-specific hand-held computers with wireless networks for data and voice and bar code data capture. Symbol products and services increase productivity and reduce costs for the world's leading retailers, logistics and transportation companies, government agencies, manufacturers, and providers of healthcare, hospitality, and security. www.symbol.com/index.html

About PowerCart

Founded in 1997, PowerCart Systems Inc. is an innovative company serving many Fortune 500 companies, and is solely dedicated to providing "power for the wireless world" through battery-equipped carts. PowerCart Systems Inc. provides businesses with unprecedented freedom by allowing them to take power to the point of activity for several applications, including POS systems, in-aisle printing, inventory management, and medical patient care. PowerCart has helped businesses to "cut the cord" in retail settings, manufacturing and distribution centers, hospitals and more. <http://www.powercart.com/>

About Franwell, Inc.

Franwell, Inc. is a leader in RFID research and development, system implementation, and integration for diverse business operations. Our products and services include a complete set of RFID solutions for a variety of industries, such as apparel, retail foods, and pharmaceuticals, as well as an enterprise application for the fresh food wholesale industry. Franwell expertise comprises financial and business management, software engineering, and sales relating to production, logistics, and distribution. We have more than 20 years' experience in computer technologies, including software development of ERP/WMS applications, and Franwell has dedicated well over a decade to emerging RFID technologies. www.franwell.com