

DIGITAL APRON MANAGEMENT

Driving benefit from digital apron control

By: Searidge Technologies

Data collection and analysis, used effectively, helps to improve efficiency, increase safety, and assists resource management. Searidge Technologies has been delivering these outcomes in aviation for well over a decade, positioning the company among the most experienced and innovative in this space. The company's digital platform – used initially to provide out-of-the-window video imagery for tower and apron controllers – has evolved to support not only remote control services, but also enable multiple different actors to interact in real-time with other airport and airline stakeholders.

“Several suppliers have a digital airport platform, but none of them have a certified platform that has managed as many movements as Searidge.”

Searidge Vice President Technology, Marco Rueckert

A pioneer in remote apron control

Searidge pioneered the remote apron management concept at Malta International Airport in 2010. At that time, Malta Air Traffic Services (MATS) was relocating the international apron and moving the apron management unit to the existing control tower. With no view of the apron area from the new location, MATS deployed the Searidge solution to replace the apron controllers' out-the-window view and provide full situational awareness of the area. The system has expanded since initial install and is still in operation.



Building on the success of this site, the solution evolved to include artificial intelligence which was deployed at Fort Lauderdale-Hollywood International in 2017, replacing the airport's two ramp control towers with one Virtual Ramp Control System (VRCS) facility that enables just two controllers to manage the airport's 60+ gates. The VRCS features two six-panel video walls that display panoramic, real-time views of the movement and non-movement areas of the airfield and provide ramp controllers with enhanced thermal and pan/tilt/zoom images in a mouse click. The platform also relays flight updates to the airport's Flight Information Display System (FIDS), tracks ground service equipment, and monitors stand occupancy status using Searidge's Artificial Intelligence (AI) engine Aimee.



FLL: Virtual Ramp Control System

“Automatic visual tracking of everything reduces human bias/error and drives benefits for the whole airport ecosystem. When you start with clean data, all the applications downstream stand to benefit.”

Searidge Vice President Technology, Marco Rueckert

The value of data layers

Recognizing the value of this digital environment, Delta Airlines implemented the Searidge platform at LaGuardia Airport as part of a major redevelopment of Terminal C. Once complete, Delta's Terminal C will consist of 37 flexibly sized aircraft gates distributed among four concourses. In this instance, the central VRCS hosts ramp controllers, gate coordinators and planners who manage aircraft turn around and monitor the whereabouts of ground service equipment. Amassing data on Delta operations provides a basis for additional applications and has prompted Delta to launch a research project aimed at building a safety net around the gate. Delta is working with Searidge to leverage Aimee's proven AI capabilities to recognise safety hazards and provide alerts via the digital platform. This includes recognizing whether ground handling staff are wearing PPE; service vehicles have performed brake checks before approaching aircraft; and training Aimee to recognize when vehicles or ground handlers are in close proximity to rotat-



Delta Airlines at LaGuardia

ing aircraft engines. Automating these functions provides an extra layer of safety and mitigates against human error.

“We're seeing significant interest from many airports and airlines who want a scalable approach to modernizing their operations. The Searidge platform enables customers to select any desired mix of features, including digital apron services, gate turnaround analytics (Aimee), and ground surveillance apps that can be run on mobile devices.”

Searidge Vice President Sales, North America, Rick Koller

Second generation Aimee engine

More than five years' operational experience using AI tools in the airport environment sees Searidge's Digital Apron Management System evolve to support an increasing number of data driven applications. In addition to video imagery, customers can use the platform to build a data dashboard to support activities such as stand allocation and management, automated alerts, safety nets, and interactions with Air Traffic Control (ATC). Aimee sits above the platform's core infrastructure, ingesting data and recognizing patterns that enable the different applications within a multi-tenancy structure. For example, the video detection and recognition engine can distinguish between targets irrespective of occlusions and crossing traffic, and can accurately predict optimum taxiway routings based on real-time traffic movements.

“Our partnership with NATS, one of the top air navigation service providers, is helping us introduce AI technology into more domains. To my knowledge, there is no AI approved for use in real-time air traffic control operations today which is why we are working with the regulator to build a robust safety case”

Searidge Vice President Technology, Marco Rueckert

Second generation functionality drives a new machine vision technique that creates a perfect contour of each target in place of more commonly used box outlines. The silhouette shows the angle and rotation of the aircraft or vehicle, for example at runway entry/exit points or in the gate area, to deliver more precise target detection and tracking which in turn drives more use cases. Searidge is collaborating with parent company NATS and the UK Civil Aviation Authority (CAA) to develop the safety case to support the introduction of AI applications into safety-critical air traffic control operations. The first of these efforts is the development of a real-time hold line surveillance system to monitor aircraft exiting the runway. Tested in a performance study with 30,000 movements at London Heathrow, the technology achieved accuracy rates above 98% during all conditions of light and climate, with the only performance correlation identified as camera placement. A separate study in Singapore with modified camera locations achieved even higher accuracy.

The digital airport environment

The Searidge platform consists of non-proprietary components that minimize vendor lock-in while providing a facility for aviation stakeholders to share data with each other in a cyber-secure environment. Searidge's open access technology enables Hong Kong International Airport to share data across different operational sectors as it transitions to a three-runway layout, managed by a newly implemented Integrated Airport Centre (IAC). The Airport Authority and Civil Aviation Department have access to a stream of data from numerous sources including optical sensors, radar surveillance systems, airfield lighting, and flight information data feeds. The platform provides real-time situational awareness that supports operations ranging from taxiway routings to stand management, aircraft turn around and ground handling services.



HKG: Integrated Airport Centre

The platform makes available real-time airport data relating to stand management milestones to air traffic control for the first time. Understanding the efficiency

of aircraft turn around and identifying potential early/late departures can help tower controllers predict clearances with more accuracy and reduce their workload. Sharing data-driven progress charts across the platform creates opportunities for performance improvement and delivers more precise Airport-Collaborative Decision Making (A-CDM) milestones. Future capability enhancements will use the data to drive machine learning applications and apply AI to introduce additional safety nets and efficiencies in day-to-day airport operations.

“The suggestion is not to consolidate airports and air navigation service providers into one entity, rather, in the next few years there’s going to be a lot more technology convergence where common data is being shared across different ecosystems that will enable stakeholders to provide a better service, whether more efficient, safer or more cohesive.”

Searidge CEO and Co-founder, Moodie Cheikh

From research laboratory to operations

Searidge is working with several airport partners to develop more applications in a digital apron environment. For example, the work with visual docking and guidance specialist ADB SAFEGATE aims to bring closer integration between ground and tower operations, expanding on existing shared stand management operations at airports including Fort Lauderdale, Hong Kong and London Heathrow. A collaboration with UAE General Civil Aviation Authority specifically targets the use of AI and explores opportunities to introduce Searidge’s technical expertise in digital airport solutions to the UAE.

Dubai International Airport meanwhile has added a Searidge platform to its research laboratory to explore opportunities to use the existing Traffic Light Automation



DXB: Traffic Light Automation System

System (TLAS) already in operation to support apron management services. Searidge’s TLAS tracks and predicts aircraft movements at four critical vehicle intersections, automatically switching traffic lights to red to prevent vehicles crossing two parallel taxiways. The platform provides apron controllers with information such as push back clearance, aircraft call signs and visibility conditions, all of which are time-stamped and could support additional applications. The digital environment provides a natural progression to resource management for vehicles and assets at the gate.

Technology in this field advances at a rapid pace, making it difficult to predict confidently beyond six months. For this reason, Searidge draws on academic research and results published by other industries to supplement its own research and bring a competitive advantage to the aviation sector. The company’s added value is less about the algorithms and learning, but more about their application, integration and certification in a safety-critical aviation setting.

Future vision

Digital Apron Management has expanded rapidly from a visual to a data domain. It has moved beyond the initial smart stand objective of streamlining processes and enhanced efficiency to create a digital environment that adds an extra layer of safety, monitors human actions, and logs historical data. This allows analysis and machine learning to help future performance and predict future events. Searidge is exploring applications including trajectory prediction seconds ahead of aircraft or vehicle movements to support early warning systems and avoid potential conflicts. The technology also identifies optimum routes around the airfield to avoid congestion and speed up taxi routes.

Multiple facilities can benefit from the results when findings are shared across stakeholders at different airports. Relaying operational feeds to a central command centre can help tactical decision-making based on real-time information as well as provide back-up services in case of anomalies at any one airport.

Drawing on more than 15 years’ experience in remote control and digital services, Searidge leads many of these developments. The company is moving rapidly to the next level, where the technology not only identifies issues but proposes solutions that result in more efficient, safer operations. Working with the user community, Searidge is building a digital environment capable of supporting convergence across the industry.