



CONVERGENCE, COLLABORATION AND A COMMON TECHNOLOGY PLATFORM:

Future proofing seamless airport operations

By: Searidge Technologies

Since early 2022, arrivals and departures at Hong Kong International Airport have benefited from the adoption of pioneering digital technology by the airport authority and its partners. In a visionary move, the team at HKIA is engineering a digital transformation that opens up a whole new way of working centered around access to common data, through a single technology platform. The benefits permeate across all operational areas in terms of safety, efficiency, predictability, and commercial performance, providing a template for other large and complex hub airports seeking to streamline airport and air traffic control operations.

Initially developed to support Hong Kong's complex transition to a three-runway system, the infrastructure has evolved into a key decision-making tool for operators, service providers and users. Advanced digital technology has steadily taken the place of conventional systems to drive a convergence between airport/airside and tower operations, merging previously separate processes. Behind this collaborative ecosystem is a digital platform designed and developed by Searidge Technologies to support multiple applications and underpin future development. The backbone of the Searidge Platform consists of non-proprietary components, making it an ecosystem that emphasizes openness and minimizes data silos and vendor lock-in. The Platform provides a facility for aviation stakeholders to share data with each other in a way that adheres to cybersecurity best practices and provides high availability/fault tolerance.



Unlocking new applications

Airport Collaborative Decision Making (A-CDM) has long been recognised to improve efficiency and resilience at high intensity runway operation airports, and management systems including the Airport Operational Database (AODB) and Airport Operations Plan (AOP) have broadened the concept to include predictive management of airport processes. The Searidge Platform introduces a holistic approach that spans these and multiple future applications by means of open-access architecture capable of supporting any number of microservices. This digital environment provides the interface between users – whether airport operators, ground handlers, air traffic control, airlines, support services, emergency response or security – and the information they need.

Hong Kong International says the digital platform “enhances information exchange and real-time situation awareness between air traffic control officers and airport operational personnel”. This “Smart Airport” concept led to the joint development, by the Airport Authority of Hong Kong (AAHK) and the Civil Aviation Department (CAD), of a Digital Apron and Tower Management System (DATMS) comprising both digital apron management and digital tower facilities that enables “more effective deployment of manpower resources to support long term growth at HKIA”. The same digital infrastructure supports a new

Integrated Airport Centre (IAC) and provides a springboard for the growth of additional services.

The IAC has access to a stream of data from numerous sources, including optical sensors, radar surveillance systems, airfield lighting, and flight information data feeds, all facilitating the tracking and management of aircraft movements. Combined with information from ground handling operators, baggage handlers and catering supply services, stand and apron management teams, the centre provides visual and digital views of all operations in real-time. The benefits include more predictable operations, increased safety, more efficient resource management, improved analytics and enhanced capacity.

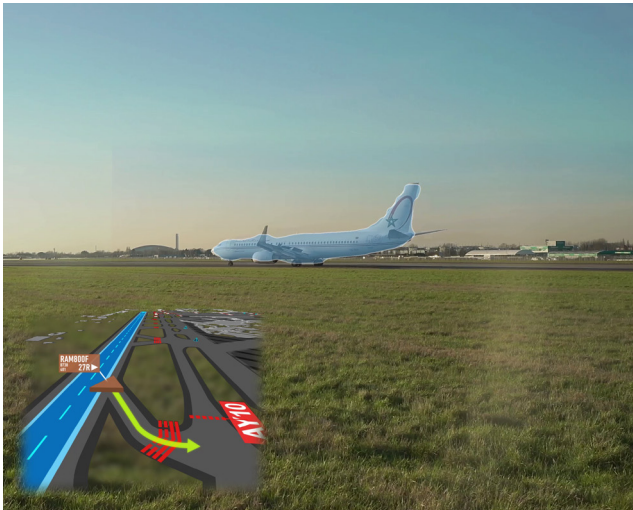
Digital transformation can unlock a host of existing as well as new services in response to market needs. Equipped with surveillance data, air traffic data, flight updates, weather, AODB and airfield lighting, all using the same single platform, how much more powerful is your ability to deliver a new application such as Uncrewed Traffic Management (UTM) for example? Searidge has integrated almost every system into the company’s digital tower platform over the past 15 years, positioning it front and centre of the digital transformation already underway in control towers and on the airfield.

Intelligent approach

Integrating Artificial Intelligence (AI), powered by machine learning technology, into this digital environment brings further opportunities to improve performance, for example by using real-time data and historical data to support decision-making. At London Heathrow, Searidge is working with parent company NATS to deploy its AI capability Aimee to improve airfield operations. Using a Digital Tower Laboratory, Aimee analyses data from ultra-high definition 4K cameras on the airfield to geo-track aircraft and signal to controllers when aircraft have cleared the runway. For a busy airport like Heathrow, the decision-support tool offers capacity gains in tower-in-the-cloud situations, safety enhancements and reduced controller workload, benefits which prompted the Civil Aviation Authority of Singapore to partner with Searidge to enhance the smart digital tower installation at Changi Airport.



Hong Kong International Airport, Integrated Airport Centre (IAC)



Aimee detecting the runway exit of aircraft at the northern runway at LHR

At two major Middle East hub airports, the Searidge Traffic Light Automation System (TLAS), a combination of high-definition airfield cameras and an advanced surface movement guidance system, monitors airfield vehicles and aircraft, and provide information to aid in the control of the airports' service road traffic lights. The TLAS provides information to a central apron management facility and advises when it is not safe for vehicles to enter the apron and maneuvering areas. The Searidge TLAS uses advanced AI algorithms as part of Aimee to process the video information and provide traffic light state change suggestions to the lighting operators. The next generation TLAS will incorporate A-CDM and surveillance data to enhance the operational safety and efficiency of the lighting changes and the vehicle traffic.

Airfield safety is also a major part of Aimee services at Fort Lauderdale-Hollywood International Airport where the AI model monitors gate occupancy and automatically updates flight information displays through integration with the AODB. The first US facility to transition to virtual ramp control, the airport installed controller working positions with tower-like window views in the operational control centre to replace restricted views in the ramp control towers. Controllers now rely on high-definition video and thermal cameras to track aircraft in any kind of weather,

day and night, and move them from gate to gate faster. Not only have incidents of wingtip collisions reduced, airfield efficiency has improved since deploying the digital infrastructure six years ago and the Searidge Platform has amassed years of data that informs further developments.

Future applications of Aimee will extend the aircraft and vehicle recognition capabilities such that vehicles and events associated with aircraft turnaround processes, coupled with real-time and historical data analysis, will enable a more accurate prediction of schedule disruption.

Connecting stakeholders

These projects illustrate a shift towards more collaborative and cohesive operations at busy airports, where access to common data not only tracks operations but predicts future performance. Searidge anticipates extending this connectivity to beyond current airport and air traffic control users to include landside applications such as emergency services and security. AI is an important part of this process by providing the right information, in the right way, at the right time, helping to manage higher traffic volume without over-extending controller workload. Digital transformation is not just about introducing new technologies or collecting different systems under one application, it's also making sure the data is provided in a way that matches the needs of the users.

The Searidge environment is central to enabling connectivity between different players and applications. The Platform was designed with multi-tenancy in mind, meaning that the data from different stakeholders and systems is completely segregated by design and only the data that is intended to be shared is accessible by other stakeholders. This is underpinned by the fact that the Platform provides capabilities such as communication encryption, data integrity checking, and safety monitoring for all information within the ecosystem by design, ensuring cybersecurity for all applications independent of suppliers. The Searidge Platform further enables collaboration between stakeholders through its modular and hardware agnostic design, allowing the ecosystem to scale as the operation does without being dependent on specific equipment manufacturers and models – minimizing the impact of supply chain issues.

With this flexibility in mind, Delta Airlines is working with Searidge to expand digital services beyond an initial virtual ramp installation at LaGuardia. After successfully consolidating two ramp control towers into one facility, applying machine learning to the data opens up opportunities to introduce efficiencies at the airline's other hub operations. Searidge is also working with the airline to automate stand management functions by combining real-time ground handling data with airline and air traffic updates on the status of inbound and outbound flights.

Sharing airfield systems strategies is the aim of the Complex Airfield Systems Strategy group set up in 2022. Made up of airport operators including AAHK, London Heathrow, Frankfurt, Toronto and Vancouver; air navigation service providers like NATS; airlines such as American Airlines, British Airways; and vendors including ADB Safegate, ArgosAI, Moog, Searidge and Thales, the group is exploring the benefits of integrating diverse systems through joint research. The group aims to de-risk innovative integration projects and illustrates a shift from traditional product development to more collaborative ways going forward.

Future applications

The challenge for aviation is bringing different actors to the table in a highly segmented industry. Convergence calls for change in culture, process and technology in a digital environment, an area Searidge first entered with its remote/digital tower concept 15 years ago. Digital towers have since moved into mainstream operations and digital technology is behind almost every operation on the airfield and in the tower. The next step is recognising the additional benefits that come from digital transformation, in particular the value of sharing data between industry sectors. Applications already feature resource management, stand allocation, apron safety nets, airfield lighting guidance systems and automated alerts at major facilities around the world. Hong Kong International is the first airport to recognise the value of convergence by creating an ecosystem around the Searidge Platform that takes this concept further. Connecting operators, users and service providers by means of a single, common data ecosystem, this open, participative infrastructure continues to expand as more microservices are added. Importantly, users continue to access further value from the information available and direct their efforts towards building more efficient operations.