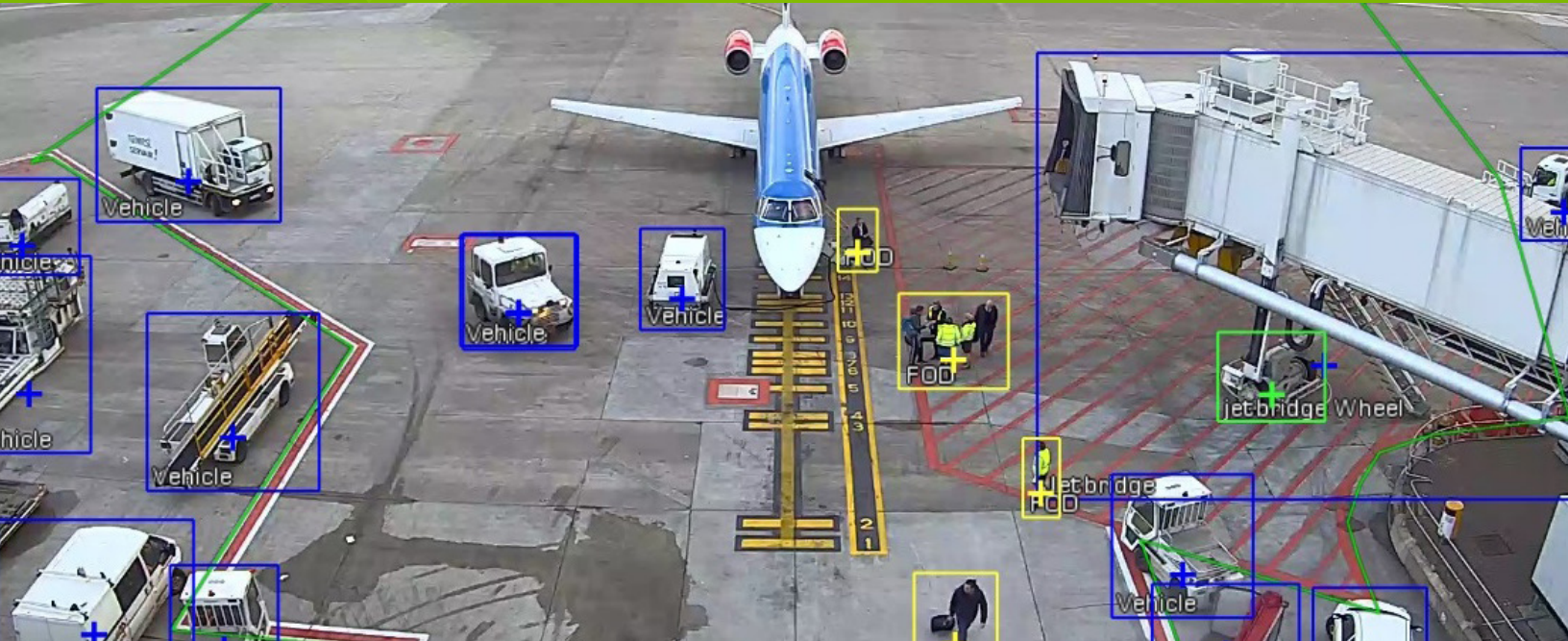# WHAT TOWER? CONTROLLING AIR TRAFFIC WITH AI

Fort Lauderdale - Hollywood International Airport

nVIDIA

Searidge Technologies lets air traffic controllers "see" aircraft and objects through AI-powered software running on GPU workstations.

FROM RADAR TO TOWERLESS AIRPORTS:
HOW AI IS TRANSFORMING AVIATION

Brussels Airport

It wasn't long ago that airports relied on expensive radar systems to track and identify aircraft and other objects on runways and taxiways. Then along came a CPU-based computer vision product from Searidge Technologies, promising superior performance at a lower price.

While it represented a significant advance at the time, the requirements of customers began to change. It became clear that Searidge needed to evolve their technology roadmap.

Fast forward 10 years—Searidge has been successfully providing remote applications and remote tower services to the aviation industry; today, they offer the most advanced digital tower solution on the market with the largest number of global users.

Searidge added deep learning and artificial intelligence to the equation in 2015 and introduced Aimee—an advanced neural network framework for the development of artificial intelligence (AI)-based solutions for air traffic control and airport efficiency. It has been transforming airport operations since. Air traffic controllers equipped with Searidge's technology don't need a direct sightline anymore. Instead, they can use Aimee to create an augmented reality view, implement business rules, and generate alarms.

Aimee analyzes video feeds from as many as 200 cameras, enabling air traffic controllers to look past occlusions, see through limited visibility, and track objects, whether or not they're in motion. They can watch every runway, taxiway, tarmac, and gate area without looking away from their workstations. In other words, Searidge's AI, powered by NVIDIA GPUs, is effectively eliminating the need for traditional control towers.

CUSTOMER PROFILE

	Organization	**Industry**	**Location**	**Founded**	**Company Size**	**Website**
	Searidge Technologies	Intelligent video for aviation	Ontario, Canada	2005	45 people	www. searidgetech.com

Digital Control Tower

NVIDIA® Quadro ® P6000 GPUs

NVIDIA® TensorRT™

NVIDIA® CUDA®

NVIDIA® cuDNN

NVIDIA® Video Codec SDK

Caffe

THE SEARIDGE SOLUTION: PUSHING THE LIMITS OF DEEP LEARNING

Airports that deploy Aimee are equipped with GPU-powered workstations and camera-based sensors for air traffic surveillance and management. Aimee enables them to perform deep learning-based tracking, classification, and target positioning from camera images. It can also stitch together real-time panoramic views.

The ability to use deep learning to detect aircraft and other objects within images is the core of Searidge's technology, and the company trains its neural networks by combining imagery from the airports it serves. Once its systems and cameras are deployed, Searidge asks airports to record normal operations for 24 hours. It then annotates the resulting imagery and adds it to its existing training database.

To train on so much data, Searidge uses workstations running as many as four NVIDIA Quadro® P6000 GPUs, and the process takes between five and seven days. To speed that up, Searidge sometimes taps cloud-based GPU clusters for additional computing power.

Because the trained neural network needs to deliver real-time performance during the inference stage, Searidge is implementing NVIDIA TensorRT. Running TensorRT on GPUs will optimize model performance for tasks such as tracking, classification, positioning of targets in images, and generating warnings when anomalies—such as an object in a location that could cause delays—are detected.

The replacement of CPU-based computer vision algorithms with deep learning approaches has spawned new thinking, and Searidge expects it will lead to many new air traffic control applications in the near future.

"We are still trying to find the limits of the technology," says Chris Thurow, Searidge's head of research and development.

> "The technology is heading more toward guiding the air traffic controller in decision making. AI can pick up things that might escape human notice, and maybe even predict situations and recognize patterns."

Chris Thurow,
Head of research and development, Searidge Technologies

THE AI-POWERED FUTURE OF AIRPORT OPERATIONS

Searidge's innovative technology isn't just transforming the air traffic controller experience; it's enabling the aviation industry to embrace a new era, one in which the iconic control tower is becoming obsolete.

The company's deep learning software is helping to fuel an emerging movement in the industry, namely a shift toward "remote towers." The ability of technology to sift through video data in real time, detect and identify objects, and even provide insight and guidance means that air traffic controllers can be pretty much anywhere. As a result, control towers are no longer being built or renovated but instead moved to new, sometimes off-site locations.

Eventually, the technology will enable a single remote tower to manage multiple airports, thereby saving airports significant money by preventing them from each having to employ separate air traffic control teams. Searidge's Thurow also envisions the near-future introduction of "AI assistants." "The technology is heading more toward guiding the air traffic controller in decision making," Thurow said. "AI can pick up things that might escape human notice and maybe even predict situations and recognize patterns. That would be ideal."

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