

The FAA's approach to runway safety

ADS-B vs. A-SMGCS: Vincent Lamercy explains the choices

Runways are the final safety frontier. Many of the recent accidents in aviation relate to runway safety. The Airbus A350 colliding with an ATR72 in Haneda in January 2024, the LATAM flight hitting a fire truck on a runway in Lima in November 2022 and the EasyJet flight having to go-around at the last minute because of a light aircraft on the runway in Bordeaux in December 2022 are the latest examples.

Runway safety is a multi-faceted problem. Surveillance on the ground is not as good as in the air. Air Traffic Controllers (ATCO) are working under high-load and many Air Navigation Service Providers (ANSPs) are chronically understaffed.

From a pilot's perspective, navigating airports is one of the hardest tasks, especially at night, or in rainy, or foggy conditions. Visibility from the cockpit is limited, approaching an airport at night looks like a sea of lights and finding one's way around is not easy, especially at complex airports requiring crossing active runways.

A-SMGCS - An answer for large airports

Major hubs use complex and expensive Advanced Surface Movement Guidance and Control Systems (A-SMGCS), which require significant investments, a variety of sensors to be installed, long design phases, and intensive ATCO training. In Europe, the first implementations started at large airports as early as 2001. The cost of such solutions limits their use to major airports.

When the Federal Aviation Administration (FAA) ran an Operational Needs Assessment (ONA), it identified 230 airports across the United States requiring a technological solution to improve ATCOs' situational awareness. This finding was supported by statistics showing an increasing number of runway incursions.

Even if the FAA had the sufficient budget available, no company could provide this number of systems in a reasonable timeframe.

Fast-tracking ADS-B based tools

At this point, the FAA decided to make use of one advantage: the widespread use of Automatic Dependent Surveillance – Broadcast (ADS-B) technology. The rate of aircraft equipped with ADS-B transponders is close to 100% and transponders for ground vehicles are reasonably cheap. This was not the case in the early 2000s, when the first A-SMGCS implementations were deployed in Europe.

The FAA announced in April 2024 plans to implement the Surface Awareness Initiative (SAI) system at the first four airports by July 2024 and scores of other airports by the end of 2025.

This is important because: "We're committed to doing everything possible to make our runways even safer," said FAA Administrator Mike Whitaker. "This cost-effective technology provides controllers with timely and accurate depictions of aircraft and vehicles on the entire airfield in all weather conditions."

The FAA wanted to leverage existing products and technologies and get solutions deployed quickly. A call for tenders was launched, with an unusual timeline: 90 days from contract award to deployment. Three months to survey the selected airports, deploy equipment, train ATCOs and start operations.

Picking such a short timeframe was a clear signal: the FAA wanted to get off-the-shelf products with minimal development and focus limited efforts on configuration, deployment and training. The FAA's choice of suppliers is revealing: SAAB, Indra and uAvionix. Two well-established companies and a newcomer, created to leverage the power of ADS-B.

At the end of a 90-day period, systems were deployed, put into operation, and controllers were trained. This *tour de force* by the FAA and its partners is remarkable and it is worth getting a closer look.

Knowing and understanding the limitations is good enough

The solutions rely mostly, if not only, on ADS-B, where a full A-SMGCS also uses approach radars, multi-lateration systems and Surface Monitoring Radar (SMR). The costs and efforts relating to using radar, and especially SMR, can't be compared with ADS-B only, but SMRs allow for detecting objects without a transponder.

It is important to keep one thing in mind: those tools are an SAI, a safety net that warns ATCOs when something potentially unsafe happens. They are not an air traffic control tool - no ATCO shall rely on it to know for example, if a runway is clear. This nuance makes a difference in design and certification.



ABOVE: Lined-up on the runway at Larnaca airport

An A-SMGCS offers a certified level of certainty and ATCOs can base their decisions on it, where the tools deployed by the FAA make use of the best available data to warn in case of doubt. From a human factors perspective, there is a risk that operators rely too much on tools provided "for information only" and this can be managed by appropriate training.

A lesson for the rest of the world

Is this fast-track approach applicable outside of the United States? The pragmatic approach of installing commercially available products for supporting situational awareness can be applied anywhere. The United Kingdom's Civil Aviation Authority also started adapting its regulatory framework to allow for "ADS-B only" flight information displays, making them affordable for smaller airports and airfields.

It is possible to have lower-costs, good enough support systems and with proper training, operators can make the best possible use of it and safety will benefit from it, even at smaller airports with little budget.



ABOVE: Entering a runway in fog and rain