Advanced Surface Movement Guidance and Control Systems don’t just help avoid collisions and improve airport safety, they also contribute greatly to more efficient traffic flow management at small and mid-sized airports with limited resources.

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The rise in air traffic in most countries is no longer a challenge confined to major international air hubs. Increasingly both smaller and medium-sized airports are faced with the problems of dealing with a higher density and frequency of take-offs and landings, sometimes to relieve congestion from larger airports nearby, but also as a result of the rapid increase and growing popularity of air transport in general.

A common by-product of increased air traffic is the parallel growth of ground vehicles on aprons, whether it be fuel tankers, maintenance trucks, or passenger and luggage transport: increased air traffic automatically means increased ground activity. Coordinating the arrival and departure of aircraft with ground traffic is now as much a concern for smaller and regional airports as it has been for many years for their larger, better financed cousins.

Small airports, big challenges
The rapid growth of low-cost carriers in many countries, with their preference for smaller airports, has further increased the pressure on many regional airports and hubs to improve their throughput via more efficient use of technology. Enabling the safe and swift transfer of passengers and luggage, as well as for the quick refuelling, reboarding and turnaround of aircraft, and the ability to deal with future growth in aircraft and passenger numbers and their supporting ground vehicles, is as much an economic as a safety imperative.

Finally greater restrictions on airport planning and development, whether due to cost or environmental considerations, may further limit the options for smaller airports in dealing with increased traffic.

A question of resources
Large international airports often enjoy direct government funding and support and the advantages of charging higher fees for landing rights and slots that allow them to invest in state-of-the-art infrastructure and technology to deal with growing congestion. By contrast smaller and medium-sized regional airports lack financial clout and leverage and are compelled to turn to alternative, more cost-effective solutions to manage air and ground traffic and avoid, or at least minimise, bottlenecks and the risk of collisions, whether on the ground or in the air.

In addition many of the aircraft that use smaller airports are not equipped with the latest onboard technology such as Mode-S transponders. Mode-S gives controllers the most accurate and up-to-date information on aircraft position and speed, enabling them to optimise scheduling and processing of aircraft and ensure safe and efficient ATM in and around the apron. Finally the impact of bad weather, which often plays havoc with air schedules at regional airports, can also be limited by the intelligent use of technology.

For these and other reasons an increasingly popular solution for smaller airports is Advanced Surface Movement Guidance and Control Systems (A-SMGCS). This has been around since the early 1990s, and is sufficiently well established and recognised to be governed by a worldwide standard issued by ICAO. There are several variations in the types of components used in A-SMGCS solutions currently in operation around the world; one example is a project recently developed by COMSOFT for Budiarto Airport, Curug in Indonesia.

COMSOFT has a global reputation in the design and development of integrated ATC and ATM solutions, including safety critical, real-time surveillance processing systems such as Multiple SDPS Tracking Systems, Safety Nets, Surveillance Communication and Application Gateways. COMSOFT is a well-established player in Indonesia as a provider of ATC solutions currently in operation around the world. The A-SMGCS solution currently being developed there is an example of a project recently developed by COMSOFT for Budiarto Airport, Curug in Indonesia.

The complete solution involves the delivery and installation of a local-area multilateration surveillance system with A-SMGCS at the airport, and a wide-area multilateration surveillance system for the area around the airport. The LAM/WAM-Curug solution consists of several major subsystems that, along with existing or planned equipment, combine to provide the controller with a highly accurate, real-time overall traffic situation picture, known as the fusion process. By using components designed for high performance and reliability, the resulting solution can perform as well as if not better than a secondary surveillance system that depends on a Mode-S transponder on board the aircraft.
As recommended by ICAO, the COMSOFT solution takes a modular approach that uses existing infrastructure such as bandwidth and power consumption, and makes it easy to add to and develop the system in future as needed. The system as a whole can be monitored and analysed remotely, enabling the recording of surveillance data and tracking of systems to create statistics for more detailed analysis.

**A-SMGCS: How it works**

The Quadrant Central Processor (QCP) is the central unit of the LAM/WAM-Curug system, generating an air situation picture by processing all input data from the Quadrant Sensors positioned around the airport, and performs all the algorithms for multilateration and calibration. The QCP provides the Quadrant Interrogator Controller (QIC) with essential information on the air situation. By analysing the air situation to determine which targets are missing key data, the QIC uses its knowledge of available information to schedule specific interrogations to fill in the air situation picture, which are performed by the Quadrant Transmitters.

The Quadrant Sensors (see picture left) are the key instruments for providing surveillance data to the QCP. The sensors, along with all support devices including network equipment and power supply, form the Quadrant Sensor System and guarantee continuous operational performance of all systems, at all times. The QCP and A-SMGCS also support ADS-B.

Built in test functions inside all the main subsystems monitor and report on the operational state of each system independently of any external control and monitoring systems, enabling 95 percent of failures to be located or isolated. In addition surface movement radar (SMR) can be integrated to give enhanced visibility and accuracy of the ground situation picture.
Aircraft and pilots will also enjoy greater security and certainty at take-off, landing and taxiing, especially in bad weather situations with poor to zero visibility. Tower controllers have an accurate picture of the situation on the ground and around the airport that assists them in safe air and ground management, as well as improved and more efficient processing and stacking of arriving and departing aircraft.

The information processed by the QCP is then displayed on the PRISMA surface movement guidance and control display system (SMGCDS) (see panel below).

**One size fits all**
The COMSOFT A-SMGCS product is a new solution optimally scaled for small and medium-sized airports, but with the potential to serve larger airports in the future as the product is developed. By employing available infrastructure, such systems offer airports like Budiarto in Indonesia a safe, cost-efficient and adaptable solution to provide an accurate and real-time air situation picture that performs as well as if not better than the SSR systems used in much larger and more advanced airports.

A runway incursion occurs when two or more aircraft or vehicles occupy a runway simultaneously, creating the risk of a collision. The PRISMA SMGCDS provides reliable monitoring of runways and the detection of potential or actual incursions and conflicts between airborne aircraft and ground traffic, and displays a visual and audible alert or warning to the controllers.

**SEEING IS BELIEVING**
The PRISMA SMGCDS is the main interface of executive operation of ATC. COMSOFT’s fully automated modular ATM system can be integrated easily with the other components in the A-SMGCS solution. The information from the sensors, processed and channelled by the QCP, is displayed via PRISMA, providing controllers with comprehensive ATCO situation awareness on the movement area, showing the position and identification of all aircraft and vehicles, including runway collision avoidance detection and alerts on an easy-to-follow, user-friendly interface.

It presents controllers with optimal routing maps showing the most efficient route for each aircraft clearly designated, as well as guidance for pilots and ground vehicle drivers with directions for the assigned route.

PRISMA's flexibility and modular design mean it can be deployed separately as a standalone flight plan processing unit or as part of an integrated ATC/ATM solution, enabling integration of radars, multilateration and ADS-B (Quadrant) sensors.