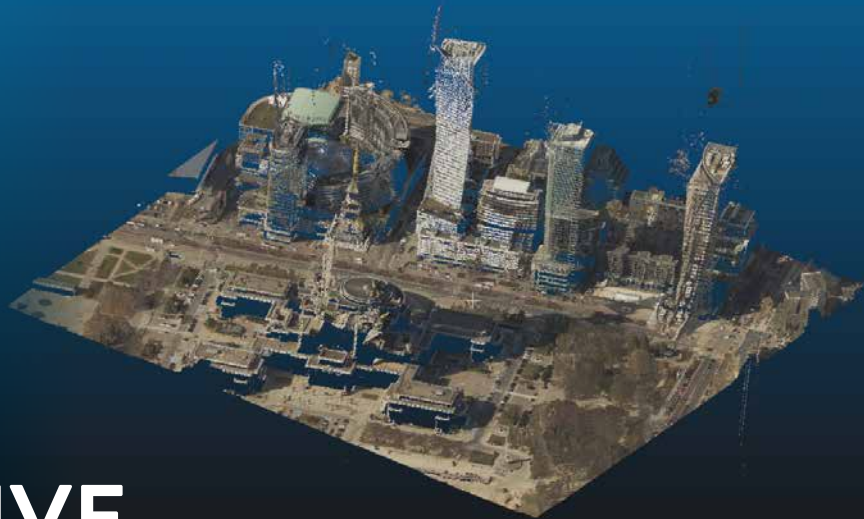




# SAMPLE: AN INNOVATIVE, COST-EFFECTIVE WAY TO MANAGE OBSTACLE CLEARANCE AT AIRPORTS



To ensure the safety of aircraft and compliance with international regulations (such as ICAO Annexes 14 and 15), internal legislation established by civil aviation authorities (CAAs) mandate that airports and air navigation service providers (ANSPs) identify, evaluate, and mitigate air navigation obstacles in the vicinity of an airport. There are still numerous challenges associated with the management of these obstacles - such as properly identifying them, accurately evaluating the risks associated with them and balancing safety with operational efficiency. There are also challenges facing ANSPs and airport operators in providing electronic terrain and obstacle data (eTOD) data sets, such as the high costs of implementation and maintenance, a lack of standardisation across different countries and difficulties in integrating the eTOD data with legacy systems. Moreover, due to dynamic changes in cities' skylines and the rapid growth of uncrewed air vehicle (UAV) operations, the need for a reliable digital terrain model source is likely to grow significantly.

To address these issues, a new automatic air navigation obstacles monitoring system named SAMPLE<sup>1</sup> is being developed by a Polish consortium formed from the Polish Air Navigation Services Agency (PANSA), AP-Tech and Creotech Instruments. SAMPLE is an innovative system which uses cutting-edge technology to automatically derive accurate data on air navigation obstacles (and terrain), based on high-resolution Earth Observation satellite imagery and supplementary data for further advanced visualisation, risk analysis, reporting and automatic notifications.

Following extensive R&D activities SAMPLE is equipped with an innovative mechanism for efficiently processing multi-source data and providing a digital terrain model and other complex sets of information on objects and their parameters for any given area. Depending on the nature of the final customer - ANSP, CAA, airport operator, UAV operations manager, local administrative units, real-estate investors and so on - SAMPLE allows for the selection of required input data and the formatting of output data.



<sup>1</sup> SAMPLE – pl. System Automatycznego Monitorowania Przeszkód Lotniczych i Ewidencji

The innovative importance of this breakthrough solution lies primarily in its ability to integrate data from multiple sources generated via various technologies. The basic set of input data includes satellite images, synthetic aperture radar images, Point Clouds, video surveillance and UAV scans, including photogrammetric and LiDAR products. Furthermore, additional information such as NOTAMs or air navigation obstacle databases from local ANSPs can be added and cross-checked.

Novel machine learning and other proprietary artificial intelligence techniques are implemented in the analysis process to detect, measure, and categorise objects, as well as to anticipate the emergence of new air navigation obstacle - for example, tree growth analysis and prediction. Very complex analysis of a large area can take from a few seconds to several hours, which is significantly faster than traditional field surveying methods. Moreover, the system lowers the cost of data acquisition and increases its overall availability.

The outcome of the analytical process is essentially a digital terrain model providing information regarding all objects with the source data resolution. The output data can be provided to the customer in various formats, including AIXM 5.1, custom database or API, air navigation obstacles survey or a digital terrain model. SAMPLE can provide the documentation needed to report air navigation obstacles to the CAA and even execute such a report autonomously.

Air navigation obstacle data provided by SAMPLE complies with all formal requirements concerning integrity, resolution, and accuracy (considering the minimum confidence level specified in ICAO regulations for vertical and horizontal measurements). Achieving such high values for these parameters is possible due to the fusion of different high-accuracy data sets that cross-validate each other. The operational readiness of the system is being validated by the Polish ANSP - PANSA.

SAMPLE's automatic analysis can be performed at any requested time. The system identifies air navigation obstacles based on the dimensions of the obstacle limitation service

(OLS) defined in ICAO Annex 14 as well as the eTOD defined in ICAO Annex 15 and can also analyse any surfaces required by the customer. This allows flexibility in adapting to future regulations and analysing other restricted areas (such as building restricted areas).

SAMPLE, in addition to its basic functionality, also involves several complementary modules. One of them is the Airfield Remote Safeguard System (ARESS), an advanced system installed at an airport to detect real-time presence of air navigation obstacles within the runway approach surface. This module is primarily designed for instantaneous real-time temporary obstacles detection. It uses a dedicated optical system to provide a comprehensive analysis of objects within an 18 km range. Detected objects are automatically classified and stored in the SAMPLE database.

During the development process, SAMPLE consortium members regularly consulted with the Polish CAA to ensure that the system's output meets all formal requirements and are practically useful for the CAA, ANSP and airports. Furthermore, a meeting between the SAMPLE project consortium and representatives of all the Polish airports took place in Warsaw in January 2023. The goal of the event was to present the project concept and adapt the final product's assumptions to the real needs of the customers, such as airport operators. It is assumed that SAMPLE can successfully support, modernise or even replace the current processes for detecting and cataloguing air navigation obstacles in the future.

The system's creators expect that the cost of the service will be comparable to the expenses currently incurred by airport operators to effectively manage air navigation obstacles around airports, including commissioning surveys and creating detailed documentation. It is anticipated that the main SAMPLE services will be available for users in Q4 2023.

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**For more info: [www.info.sample.aero](http://www.info.sample.aero)**

