

Obstacle Limitation Surfaces Evaluation

MITRE is helping the Civil Aviation Authority of Singapore (CAAS) assess the feasibility of modernizing the obstacle limitation standards at Changi Airport. MITRE's work could help CAAS support economic development by allowing certain land around the airport to be released for higher-density use with less stringent protection boundaries.

Background

MITRE is reviewing the system of safeguarding airspace near Changi Airport through the application of Obstacle Limitation Surfaces (OLS). OLS are imaginary surfaces that emanate from an airport and define the volume of airspace that should be kept free from obstacles to allow for safe aircraft operations (see Figures 1 and 2). Land near airports is often desirable for development, resulting in competition between airspace protection and economic considerations.

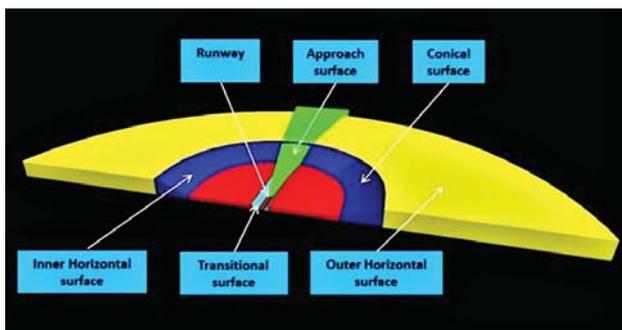


Figure 1. Three-dimensional Rendering of an OLS

OLS standards have existed fundamentally unchanged for decades, and the development of the OLS was not data-driven. However, aircraft performance, navigation systems, and flight procedure capabilities have evolved, allowing much more precise path keeping. Flight tracking capabilities have also evolved, and this data can be used to assess aircraft flight path keeping capabilities to refine the airspace protection requirements.

The International Civil Aviation Organization (ICAO), a specialized agency of the United Nations that oversees international air travel, has called for a significant review of existing guidelines regarding OLS, and for new guidelines to

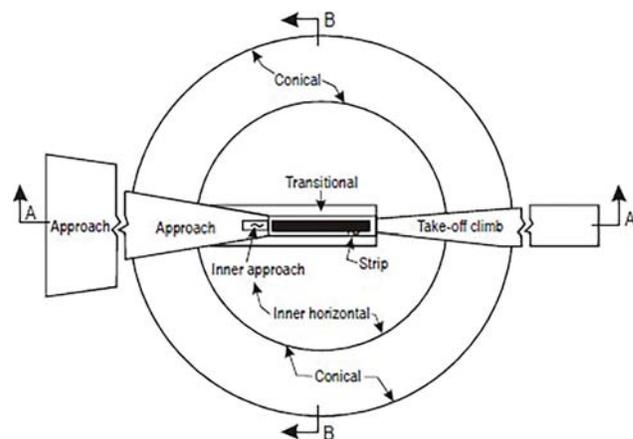


Figure 2. Plan View of an OLS

(Source: ICAO Annex 14, Aerodromes, Volume I, Aerodrome Design and Operations, Seventh Edition, July 2016)

be developed for conducting aeronautical studies to assess when obstacles can be allowed to penetrate OLS.

MITRE has extensive experience interpreting and applying obstacle limitation and clearing standards and surfaces, and has been closely involved with the Federal Aviation Administration's efforts to update and harmonize obstacle surface standards in the American airport environment.

The Effort at Changi

At Changi, MITRE has developed an analytical framework to identify and structure the performance parameters, safety factors, and logical arguments that are fundamental to the purpose of the OLS and therefore to their size and shape.

This framework will provide the basis for relevant metrics and for the data required to derive these metrics. MITRE will use the framework to assess the feasibility of modifying the OLS at Changi, and will conduct a safety analysis to establish the bounds for modifying the OLS.



The OLS analytical framework will provide CAAS with a thorough understanding of the OLS standards and requirements, and identify the key analytical requirements for subsequent OLS evaluation and revision. The OLS modification study will provide CAAS with sufficient information to assess the feasibility of modifying the OLS and then help CAAS select an OLS modification strategy.

CAAS's ultimate objectives include the following:

- Harmonize the safeguards established for ICAO OLS and the Procedures for Air Navigation Services-Aircraft Operations Surfaces to account for modern aircraft performance and navigation capabilities, and the different types of flight procedures.

- Establish a system that includes processes, criteria, and analytical tools that can be used to review the OLS to meet future needs.
- Establish a process for assessing the impact of breaching the OLS. The assessment can be in the form of an aeronautical study or an obstacle assessment tool, such as the Collision Risk Model.

Benefits

Modernizing the OLS at Changi will enhance efficiency and utilization of the airspace and the airport while supporting economic development in Singapore. For MITRE, this project also presents an opportunity to establish global leadership in comparative analyses of obstacle limitation and clearing standards and surfaces.