

Quantitative Collision Risk Model For Zurich Airport



PROJECT DESCRIPTION

Enhancing Airspace Safety: Development and
Application of Quantitative Collision Risk Model
at Zurich Airport



Improving Zurich Airspace with a Data-Driven Study

The airspace around Zurich airport is in the process of being redesigned. SKAI Data Services developed a quantitative collision risk model to support the design of a safe and efficient airspace.



Zurich TMA and identified infringements (black lines)


The airspace around Zurich airport is complex: constrained by geography, regulatory requirements and used by many different users – from airliners to general aviation aircraft, gliders, and hot air balloons. As a result, airspace infringements are a relatively frequent occurrence. In 2019 alone, 154 airspace infringements were reported in the terminal airspace of Zurich airport. Airspace infringements are particularly problematic because they constitute a potential mid-air collision risk between the infringing traffic and traffic on instrument flight procedures.

SKAI Data Services was mandated by Swiss Federal Office for Civil Aviation (FOCA) to develop a quantitative collision risk model for the terminal airspace of Zurich airport. The aim of the project was to ensure the safe ongoing operation of the airspace after the implementation of an anticipated redesign. The redesign of the terminal airspace of Zurich airport was initiated by FOCA in response to a safety audit (2012) which identified the airspace complexity as being safety critical.

The collision risk model was used to establish the required buffer size to protect traffic on instrument flight procedures from aircraft infringing on the terminal area and flying into the controlled airspace without clearance.

Maximizing Safety, Minimizing Wasted Space

«The use of state-of-the-art collision risk modelling has allowed us to optimize airspace use, while at the same time assuring an acceptable level of safety. This methodology was well received during the stakeholder consultation and facilitated a productive discussion on the subject.»

Jeroen Kroese, Expert Policy- and Rulemaking Airspace – FOCA 

When an airspace infringement occurs, air traffic controllers need to have enough time to react and divert traffic on the instrument flight procedures away from intruding aircraft. A protective buffer around the instrument flight procedures provides an adequate intervention time for the air traffic controller to deconflict the situation. This is achieved by defining the dimensions of the protective buffer of the instrument flight procedures to ensure that the target level of safety is met.

SKAI's noteworthy contribution lies in its novel approach and the method which were used in this project. The collision risk model is heavily data-driven and allows for different buffer dimensions for different approach and departure procedures. It facilitates a more efficient use of the airspace as it is more nuanced than a one-size-fits-all approach. The resulting buffer dimensions are larger in areas where the risk of a collision is larger, and smaller in areas where the risk is low – meaning that the buffer dimensions ensure that no airspace is wasted unnecessarily.

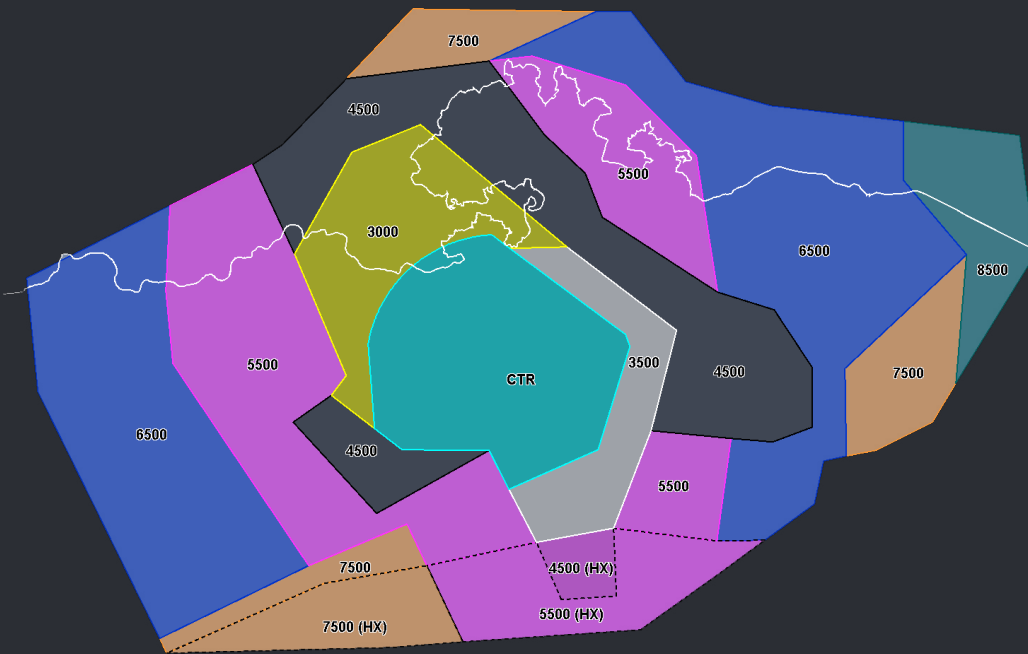
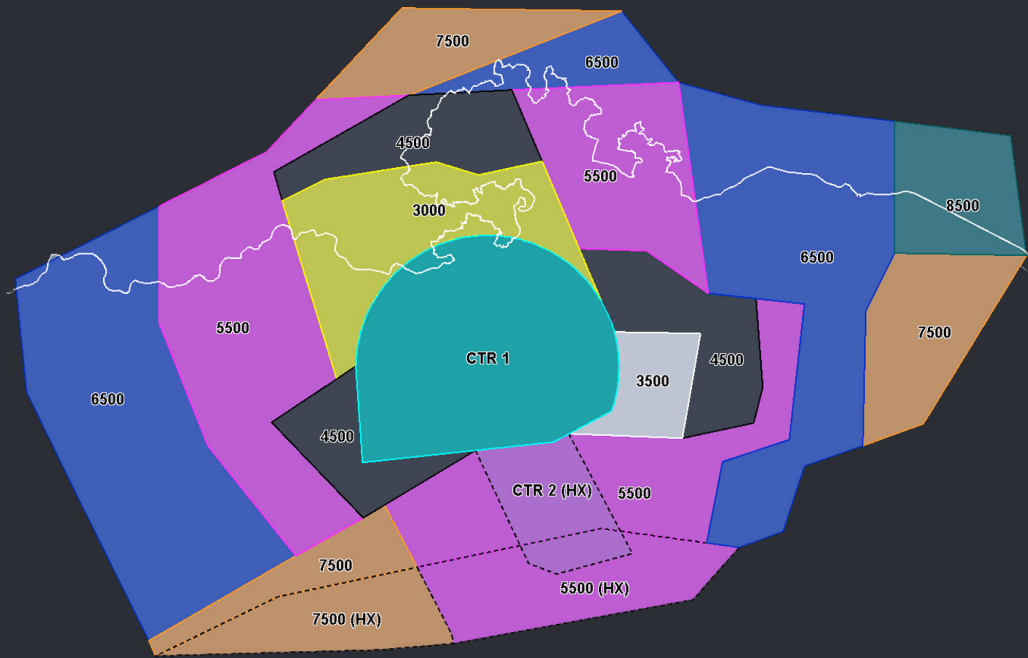
Quantitative risk models and assessments clearly have multiple advantages:

- ♦ **Safety** – They ensure that operational risks remain below the established target level of safety.
- ♦ **Objectivity** – They have an objective, data-driven dimensioning of the safety buffer provides a foundation that the different stakeholders can agree on.
- ♦ **Efficiency** – They allow airspace designers to allocate sufficient airspace to ensure safety, but without wasting airspace that can be used by other users.
- ♦ **Conflict reduction** – They allow for a more objective discussion among stakeholders, thus reducing disagreements in the airspace design process.

For more information or inquiries on how we could help your organisation, feel free to reach out to us via e-mail at:

contact@skai-data-services.com

ZURICH TERMINAL AIRSPACE BEFORE AND AFTER



Zurich terminal airspace before (top) the redesign and the draft/proposed redesigned airspace (bottom). The redesign was made by Skyguide on the basis of the collision risk modeling results. Illustrations kindly provided by Skyguide.