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Wind Turbines & Aviation Safety

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airsight supports wind farm developers to resolve complex wind farm planning issues related to aviation. As expert in aerodrome operations and air traffic control, airsight provide its expertise to make complex wind turbine projects possible and to optimise assets allocation.

Introduction

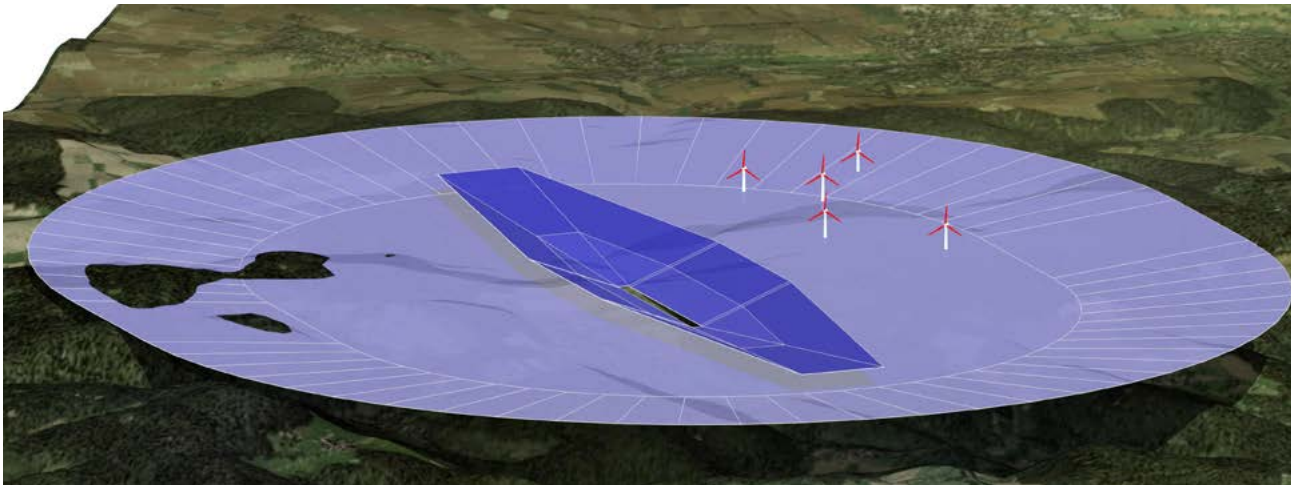
The growth of wind energy leads to more and more turbines being constructed near aerodromes. With a height of 150 m or more wind turbines can represent a serious obstacle for aircraft. In addition, in the vicinity of smaller airports where flight operations are conducted under visual flight rules, wind plants may represent a serious hazard to airport operations. Turbines can further have adverse effects on radar signals (e.g. reflection, distortion) which affect the safety of flight operations.

Therefore, when wind turbines are placed nearby airfields, it is necessary to consider all possible impacts on the safety of flight operations during planning and approval procedures.

airsight and its partners assists project developers planning new wind farms or single wind turbines in considering all aeronautical related aspects and in obtaining required authorisations.

International aviation regulations state that: „objects which extend to a height of 150 m or more above ground elevation shall be regarded as obstacles, unless an aeronautical study indicates that they do not constitute a hazard to aeroplanes."

ICAO Annex 14



Services

- Determination of possible constructible areas, and optimisation of the positionning of wind turbines
- Compliance verification of proposed facilities against applicable aviation regulations
- Obstacle clearance examination for approach and departure procedures for instrument, as well as visual flight conditions
- Compatibility assessments with aviation's Communication, Navigation and Surveillance equipment
- Development of mitigation measures (e.g. adaptation of existing flight procedures)
- Assisting in obtaining required authorisations from authorities and Air Navigation Service Providers

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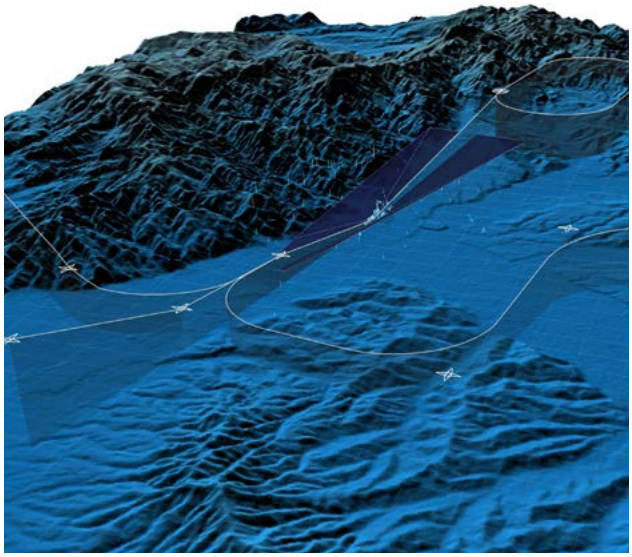
Wind Turbines and Aerodrome Operations

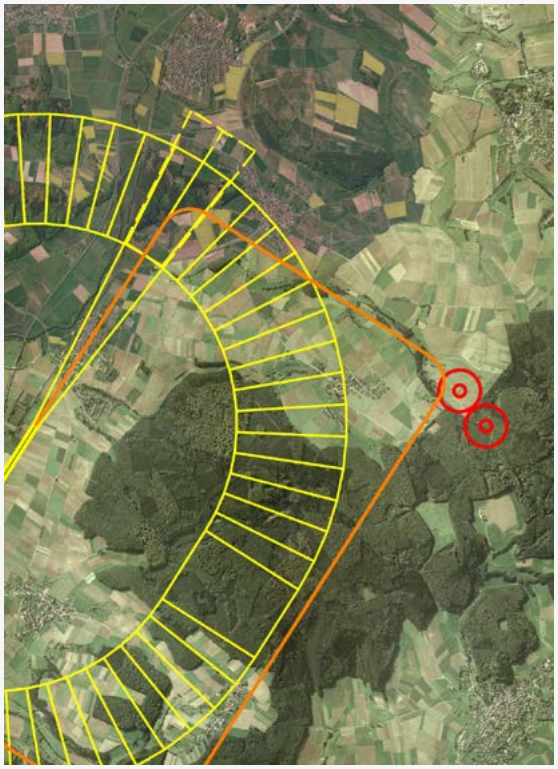
Wind turbines represent a physical obstacle to air operations. To minimise the risk of collision, the International Civil Aviation Organisation (ICAO) developed a set of regulations related to obstacles in the vicinity of aerodromes. These requirements are very complex, and represent a major restriction to new constructions of wind farms.

airsight's core competence is to deliver specialised expertise in the assessment of potential aeronautical obstacles. As demonstrated in numerous projects, airsight can assist project developers in defining the possible constructible area at an early project stage, as well as to evaluate and mitigate the impact of wind turbines on air operations - while taking into account diverging external stakeholders' interests (aerodromes, aviation/military authorities, air navigation service providers).



Most project developers only consider ICAO Annex 14 Obstacle Limitations Surfaces (OLS) when planning a wind farm in the vicinity of an aerodrome. This approach has a lot of limitations: it may greatly restrict the constructible area, and leave safety aspects unconsidered – possibly resulting in an objection of the project by the authorities.

airsight, as an expert in both airport operations and air traffic control, uses a more detailed approach enabling project developers to maximise their constructible areas and take all parameters into account. airsight assessments consider not only ICAO OLS criteria, but also ICAO PANS-OPS assessment surfaces and principles: these surfaces are generally less conservative as the simplified OLS models – but require in-depth expertise and tools in this subject area.



Visual Flight Rules Patterns and Routes

The assessment of Visual Flight Rules (VFR) procedures is often neglected by project developers or non-experienced consultants. If not properly considered, it may result in a rejection or objection by the authorities after months of planning!

A simple example, as illustrated on the left, is that ICAO OLS may not always protect VFR operations. To further complexify the problem – these procedures are not always published or accordingly regulated at a national level.

Optimisation of existing flight procedures

A conflict of interest often exists between wind farm developers and airspace users: existing routes greatly restrict the installation of wind turbines. Nevertheless, these conflicts may be resolved by redesigning existing procedures in collaboration with the stakeholders.

airsight has the capabilities to liaise with the affected aerodromes and adapt flight procedures to facilitate the feasibility of a wind farm installation. In this analysis, all factors are considered such as airspace restrictions, general obstacle environment, IFR flight procedures of other aerodromes nearby or noise issues.

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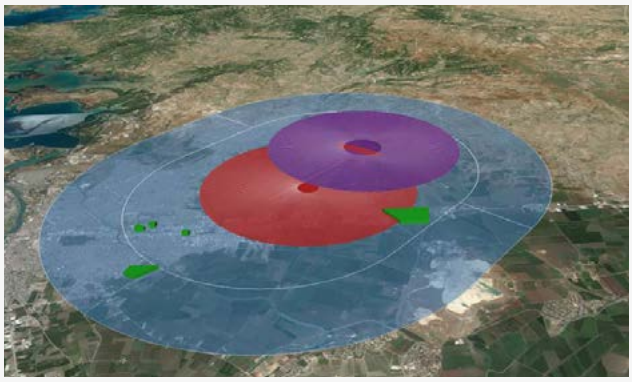
Wind Turbines and CNS Compability

Wind turbines may cause interferences on Communication Navigation Surveillance (CNS) equipment (radar, Instrument Landing System, VOR/DME/NDB, etc.) and consequently can affect the safety of air operations. Therefore, project developers must either comply with very restrictive requirements, or demonstrate that proposed developments do not interfere with CNS equipment.

airsight assist project developers in the planning phase in minimising interference issues with CNS equipment while avoiding costly measures (design revisions, relocation, or reorientation) as well as in obtaining the relevant approvals from relevant stakeholders (aerodromes, aviation authorities, air navigation service providers).

airsight and its partners conduct site specific assessments supported by numerical simulations to verify the availability or quality of CNS signals, and demonstrate to the authorities the feasibility of the proposed project.

European guidance is provided by ICAO EUR Doc 015 (managing building restricted areas). This document is internationally recognised and defines basic surfaces for the protection of CNS facilities.
These surfaces are often considered as arbitrary and very restrictive, resulting in major limitations for project developers, e.g. no wind turbine can be installed within a 15km radius from a radar antenna.
Nevertheless, case-by-case analysis can be conducted in collaboration with the local air navigation service providers, and in many cases simple and cost efficient mitigating measures can be investigated.



Such investigation considers numerous factors, such as the flight procedures, the redundancy of systems, the exact topographical situation, the signal characteristics, as well as new technological development (e.g. satellite based navigation, filtering and signal processing). These assessments enables more flexibility in the planning of wind farms, while fulfilling the interests of all stakeholders.

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Case Study - Safety Assessment of non-compliant wind-turbine lighting systems

Under Visual Flight Rules, pilots navigate under the principle "see and avoid". In night conditions, wind turbines therefore have to be equipped with appropriate lighting, defined by international and national regulations. As of today, some very large wind turbines (height around 200m) lighting systems may deviate from these regulations. For instance, some turbines may be compliant with international regulations (ICAO) – but not with the national regulations of the countries they will be installed. In case such standards cannot be met, e.g. for technical or economical reasons, a Safety Assessment can determine if such non compliances can be tolerated, or define alternative means or mitigating measures to ensure safe air operations. airsight successfully conducted such assessments, enabling wind turbines' manufacturers and project developers to provide their solutions with less restrictions.

Why airsight?

- Detailed knowledge of national and international regulations through many years of experiences in aviation projects, consulting and teaching activities
- Dedicated and highly qualified team of experts with extensive references on safety assessments, flight operations/ procedures as well as obstacle assessments
- Worldwide experience in dealing with National Aviation Authorities (incl. military) as well as projects involving stakeholders with diverging interests (airports, airlines, air navigation service providers, project developers)
- Highly efficient evaluations of specific areas (e.g. assessment of obstacles) through the use of specialized software solutions

References

- airsight methodologies for the safety assessment at aerodromes are recognised by Civil Aviation Authorities in e.g. Germany, Austria, Switzerland, Ireland, Luxembourg, Belgium, Turkey, United Arab Emirates, New Zealand, etc.
- airsight has assessed in the last three years the installation of more than wind 70 turbines in 15 individual projects, involving complex requirements, such as installation up to 1.5 km from aerodromes with heights 200m above ground.

airsight is an experienced and well-established company providing airports, air navigation service providers as well as civil aviation authorities and organisations with consulting and engineering services, training and software.

The airsight portfolio includes topics such as aerodrome design and operations, airport capacity and simulation, flight procedure design and obstacles assessment, aircraft noise, safety regulations and oversight, safety assessment and safety management systems supported by airsight's A-SMS software. airsight has an excellent track record, as the company conducted more than 400 consulting projects at 45 international airports since year 1999, including Bahrain, Brussels, Doha, Dubai, Dublin, Luxembourg, Malta, Warsaw, Vienna, Vilnius, Zurich, as well as most major German airports (e.g. Berlin, Dusseldorf, Frankfurt Main and Munich Airports).

airsight GmbH
Gustav-Meyer-Allee 25
13355 Berlin
Germany

Tel: +49 30 45 80 31 77
Fax: +49 30 45 80 31 88
Email: info@airsight.de
Web: www.airsight.de

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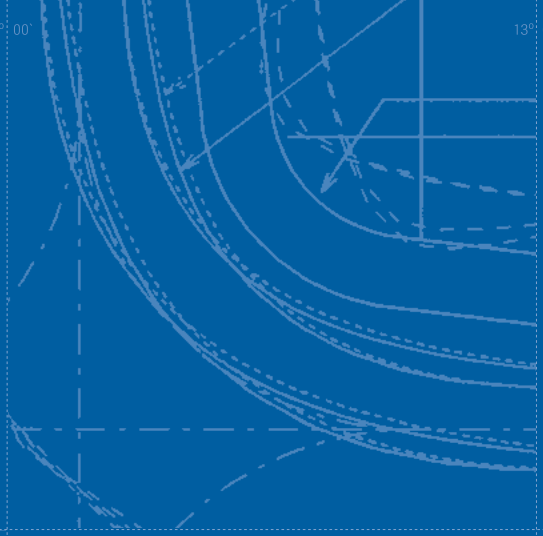

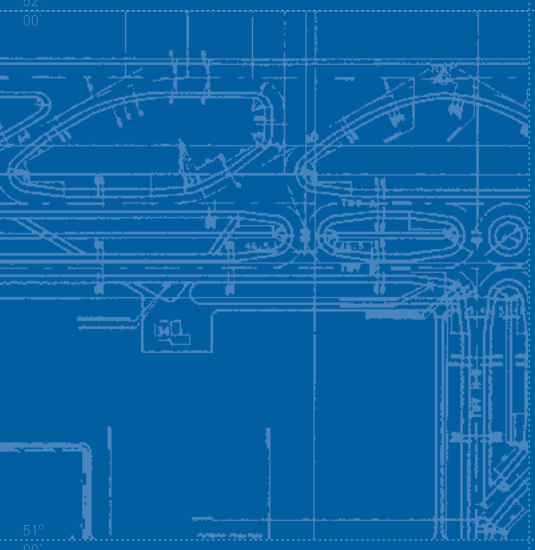

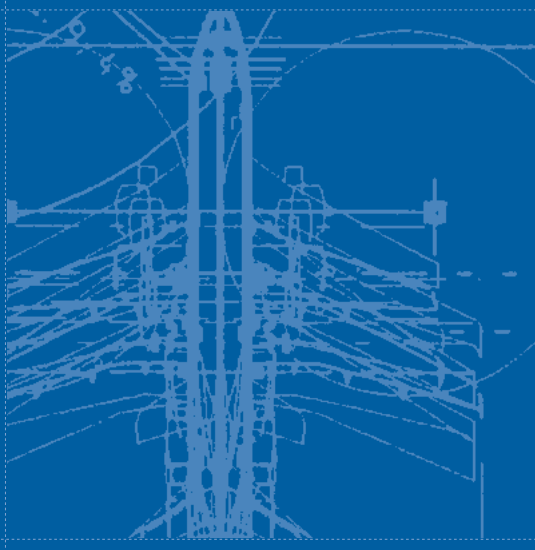

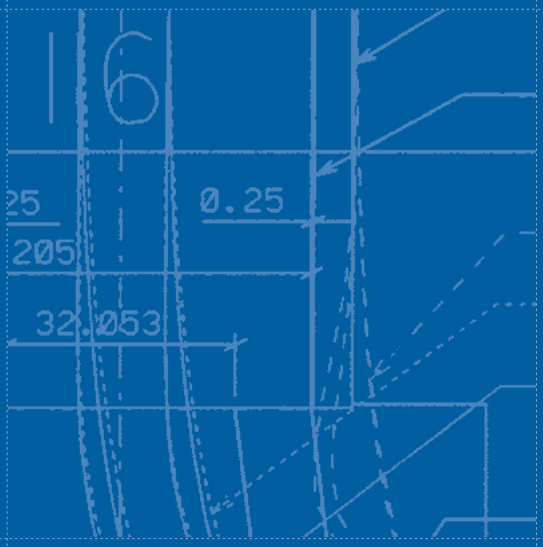

airsight GmbH
Gustav-Meyer-Allee 25
13355 Berlin
Germany
Tel +49 30 45 80 31 77
Fax +49 30 45 80 31 88
info@airsight.de
www.airsight.de

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