

Wind Energy and Airports

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Introduction and Topic Specification

Wind energy plants are increasingly clashing with the air traffic regulations. In the focus of interest are problems of obstacle clearance of approach and take off sectors as well the guarantee of international instructions for airport operations.

My presentation is structured as follows. Firstly, I like to introduce the international air traffic regulations for approach and take-off procedures as far as obstacle clearance is concerned. In a second part, I want to ask where the

plant specific conflict potential of wind energy plants lies or whether there really is any such conflict. Thirdly, if there are plant specific conflict potentials, is there any solution between wind energy plants and aviation safety and how can it be realized?

1. International Air Traffic Regulations for Approach and Take-Off Procedures / Obstacle Clearance

a) Requirements of Airlines

From the point of view of the airlines the usability of airports does not only depend on the kind and quality of the typical instrument flying and the given infrastructure on the ground but it depends as well on whether an airport can

be run without or only little restrictions concerning take-off and landing weight.

The observance of the relevant guidelines and recommendations concerning the unobstructed approach has to be strictly differentiated from those concerning the take-off. Obstacle clearance is especially necessary to avoid operational restrictions of aircraft.

Two interrelated subjects have to be distinguished in international as well as national regulations if obstacle clearance is concerned:

b) Regulations / Organizations

The first subject is concerned with the operational regulations, which means standards that aircraft have to fulfil under certain operational circumstances (single engine operation). (obstacle clearance) The second subject comprises all obstacle defining regulations, key word obstacle clearance.

Regarding responsible organizations, supra-national, American and European as well as the respective national organizations have to be strictly distinguished.

A worldwide agreement on international regulations was found in the Convention on International Aviation (ICAO). This convention is constantly adapted to the changing conditions of air traffic. The original agreement dates from 1944 and was just amended by a treaty in Montreal.

There are different annexes to this agreement. In these annexes various interrelated subjects are laid down.

Annex 6 (OPERATION of aircraft) and Annex 14 (AERODROMES) of the ICAO are those which are of particular interest in this context.

Furthermore, it has to be taken into consideration that there are two international organizations that see to the implementation of the ICAO regulations: on the one hand the Federal Aviation Authority (FAA) for Northern America and thus practically for the whole American continent and the Joint Aviation Authority (JAA) for Europe on the other hand.

These organizations are responsible for implementing supra-national agreements according to the ICAO into regulations for the respective continents. For the European continent this is done by compiling guidelines for the implementation on a European basis. National laws and ordinances shall then put these regulations into concrete national terms.

c) Airports / Instrument Take-off and Approaching Procedures / Contact Flight
Operation on smaller Airports / ICAO Standards / Definitions

Airport

The ICAO Annex 14 1.1 defines an airport according to its regulations: A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

It is important to point out that the definition of an airport does not depend on the permissibility of one of the operational processes that means instrument flying or contact flight.

Obstacles

All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Obstacle Free Zone (OFZ)

The airspace above the inner approach surface, inner transitional surfaces and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangible mounted one required for air navigation purposes.

d) Obstacle Requirements

Now it is necessary to distinguish between instrument flying and contact flight.

Airports with instrument take-off and approaching procedures / Obstacle Free Zones

For airports with precision approach procedures Annex 14 establishes the following:

The approach surface shall be horizontal beyond the point at which 2.5 per cent slope intersects:

- a) A horizontal plane **150 m** above the threshold elevation; or
- b) The horizontal plane passing through the top of any object that governs the obstacle clearance limit

whichever is higher.

In ICAO Annex 14 4.3.2 regulations for areas outside the airport are established on a general basis as well:

Recommendation

In areas beyond the limits of the obstacle limitations surfaces, at least those objects which extend to a height of 150 m or more above ground elevation should be regarded as obstacles unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes.

In conclusion it can be said that for airports with instrument take-off and approaching procedures an obstacle free zone in the inner take-off and

approaching sector of 150 above ground elevation has to be guaranteed according to international regulations. It does not matter whether this area is in the inner approach surface of the airport or close to the adjacent zone. The closer adjacent zone is defined as a surface in a radius of 3000 m around the airport. (ICAO Annex 14 4.2.10)

The same obstacle free zone is valid for non-precision approach procedures.
(4.2.9)

The approach surface shall be horizontal beyond the point at which the 2.5 per cent slope intersects:

- a) a horizontal plane 150 m above the threshold elevation; or
- b) a horizontal plane passing through the top of any object that governs the obstacle clearance altitude / height (OCA/H);

whichever is the higher.

Exceptions are possible for contact flight procedures (VFR Procedures).

The relevant national legislator can allow exceptions from these regulations, especially under security aspects.

In conclusion, it can be said that the ICAO regulations determine an absolute limit for obstacle clearance at 150 m with the exception of the direct air corridor. There is even the possibility of an exception from these regulations after relevant administrative proceedings.

Regulations for In-Flight Operations

These regulations concerning obstacle clearance have to be distinguished from questions regarding regulations for in-flight operations according to ICAO. DOC 8168/OPS 611 Volume II prescribes the standards to be observed. With obstacle clearance being the point of interest it has to be asked additionally which operational requirements aircraft have to fulfil.

These operation regulations are the central norms to guarantee the security of air traffic.

National operation regulations according to German law as well as ICAO Annex 6 Jar-OPS 1 demand identically that aircraft of the aircraft category Alfa A, that means multiengine jet aircraft, all multiengine propeller turbine planes weighing more than 5.7 tons or having more than 9 passenger seats have to be able – amongst others – to fly with a broken engine securely over all obstacles in a prescribed high and continuing the take-off at the same time.

Internationally, it happens from time to time and is accepted, that there are a number of take-off flight paths that have been extended **later** and that could be used with the maximally admissible weight as far as the length of the runway is concerned but that are heavily restricted by obstacles in the take-off and approaching sector that were there **earlier**.

This means a reduction of the allowed take off weight and, under certain circumstances, of the approaching weight as well. But it does not automatically imply the obligation to remove the obstacles.

When talking about the specific risks of wind energy plants regarding obstacle clearance in the following, a relation between the aptnesses, thus

the operational reachable data of the relevant aircraft and the possible obstacles has to be established.

2. Plant specific conflict potential of wind energy plants

As far as I know there is no binding international provision that regulates the relation between aviation safety and wind generators and their related conflict potential. Following an inquiry, the Deutsche Flugsicherungs GmbH (German Air Traffic Control company) told in a letter dating August 18, 2001 the following:

"At the moment, a working group of air traffic controls prepares guidelines for the development of airports. The German Air Traffic Controls participates in this group on a European basis. These guidelines will consider the special circumstances of wind generators."

As a draft on national basis there are only marking requirements, which shall take the ICAO Annex 14 Volume 1 Chapter 6 into account. This is just a regulation of marking obligations (lighting).

Now I want to ask whether there are any plant specific conflict potentials that require special regulations for wind generators. Useful hints are given by the already quoted ICAO regulations.

When defining an obstacle the ICAO Annex 14 Chapter 1 differentiates between fixed and mobile objects.

Wind generators are so to speak in a double position:

They are immobile objects that show plant specific movements (rotor beat, movement of the rotor hub).

Looking from the perspective of aviation safety it has to be asked whether that causes any special safety risks and if so, how they can be counterbalanced.

First of all, the height as such as well as including the rotor perimeter is no problem at all: chimneys, power and lighting poles as well as microwave towers for telephone systems are taller and are licensed with relevant marking requirements, sometimes even in the direct safety area of airports.

The specific risk can only be the consequence of the movement of the rotor and the rotor hub. Special obstacle related limitations are not yet provided by the ICAO regulations.

The ICAO regulations do not distinguish between mobile and immobile parts of obstacles.

Annex 14 Chapter 6

3. Adjustment between the Plant Specific Conflict Potential of Wind Generators and Requirements of Aviation Safety

First of all diverging national regulations should be co-ordinated. According to German law, especially §12 following air traffic law, an obstacle free zone of 100 m above ground elevation has to be observed. In my point of view there is no compelling evidence for this in the relevant, already quoted ICAO regulation.

Apart from that, marking should be sufficient. Special consideration should be given to simple, reflecting marking by flags.