



Parasol – is the technical solution for an environment-friendly need-based identification of wind turbines



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Why is it necessary?

NEED-BASED OBSTRUCTION LIGHTING

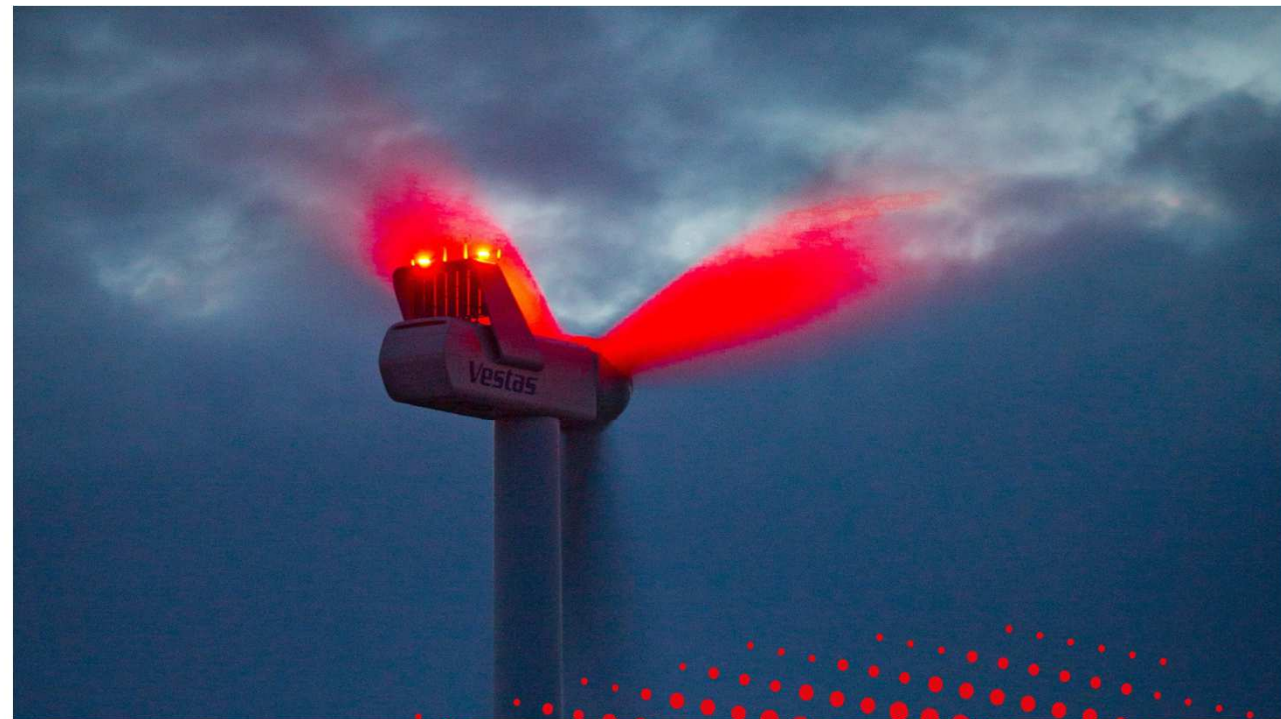


Need-based obstruction lighting



Wind turbines with a total height of 100 m and higher have to be equipped with aircraft warning lights.

At night, the identification is performed by red blinking and flashing lights.





PARASOL – "Keep the night dark "

Need-based obstruction lighting



- Blinking lights in the night sky lead to a decline in the population's approval
- Nighttime warning lights attract birds (bird strike on blades)
- In most cases, air traffic requiring obstruction lighting is very rare.



Need-based obstruction lighting



Need-based obstruction lighting means that the identification will only be activated if a flying object enters the airspace.

For most of the wind farms, this event occurs very rarely and only for a short time. Thus, the night is kept almost completely dark.





What is the difference between “normal” radar and

PASSIVE RADAR



Functioning of "normal" RADAR



(Quelle: Wikipedia)

Radar station emits signal, waits for echo and calculates the distance on the basis of the time shift.



Definition Passive Radar



A Passive-Radar-System is a radar system which does not emit electromagnetic radiation. At no time.





How does

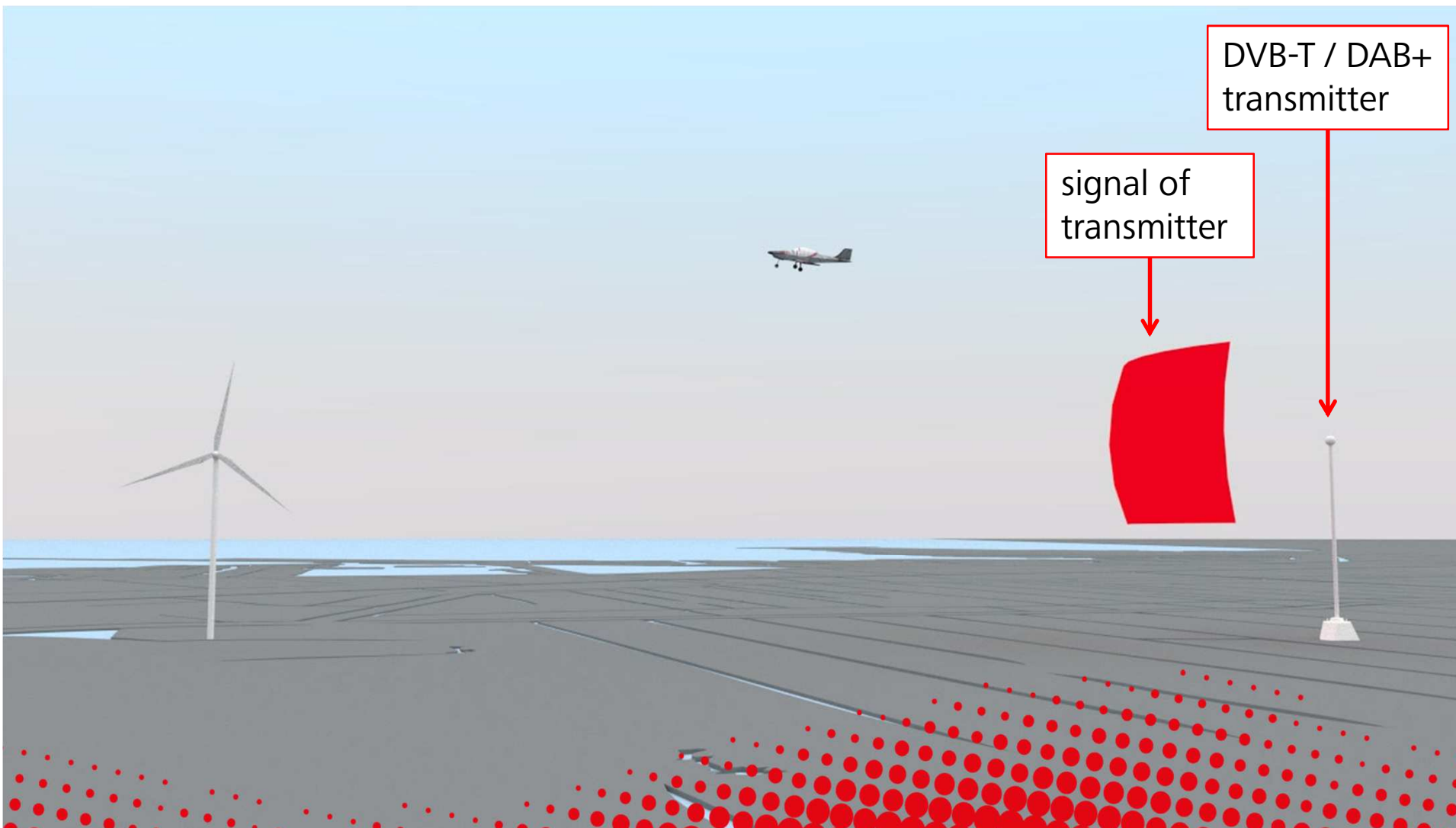
PASSIVE RADAR

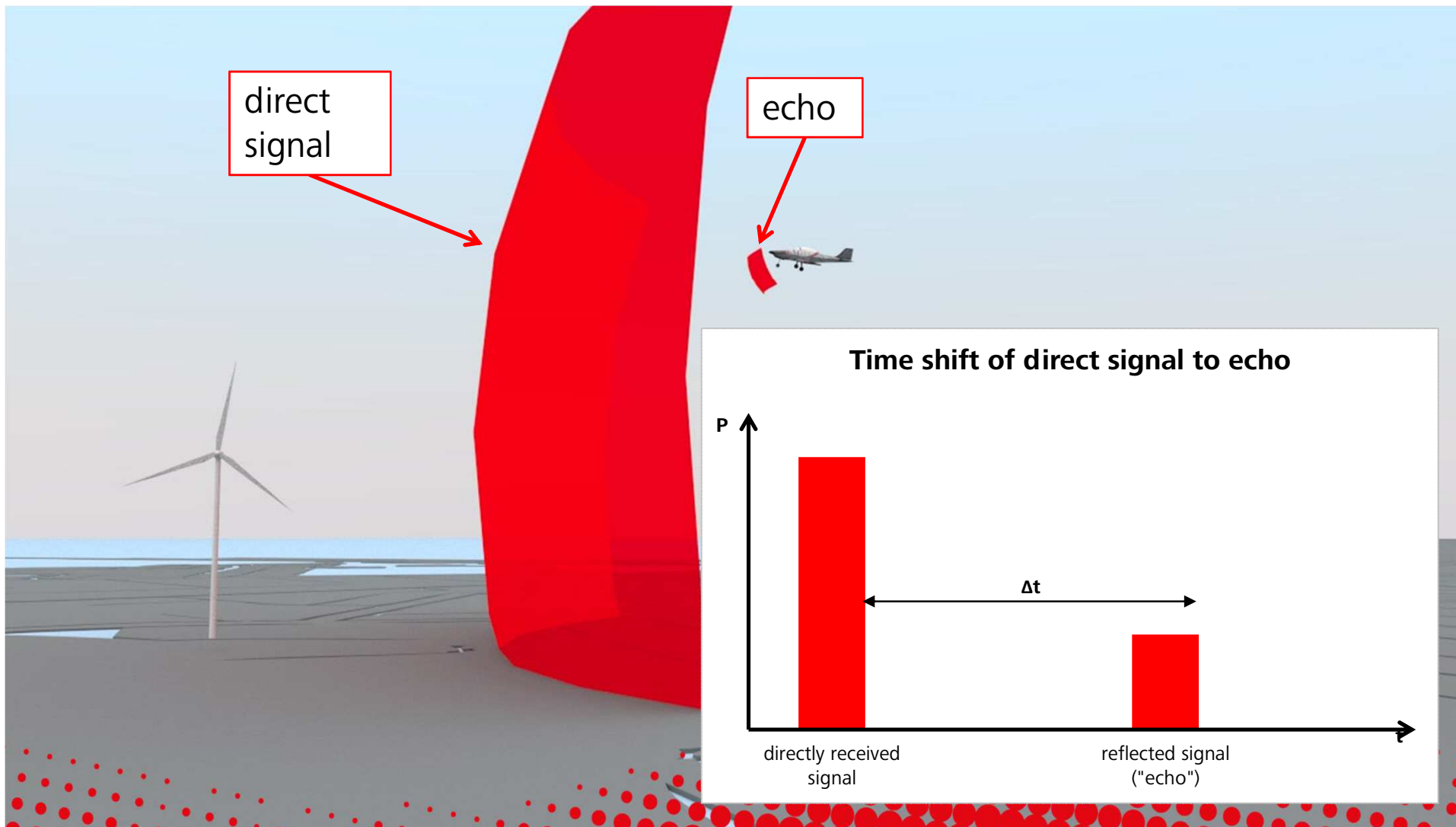
work?



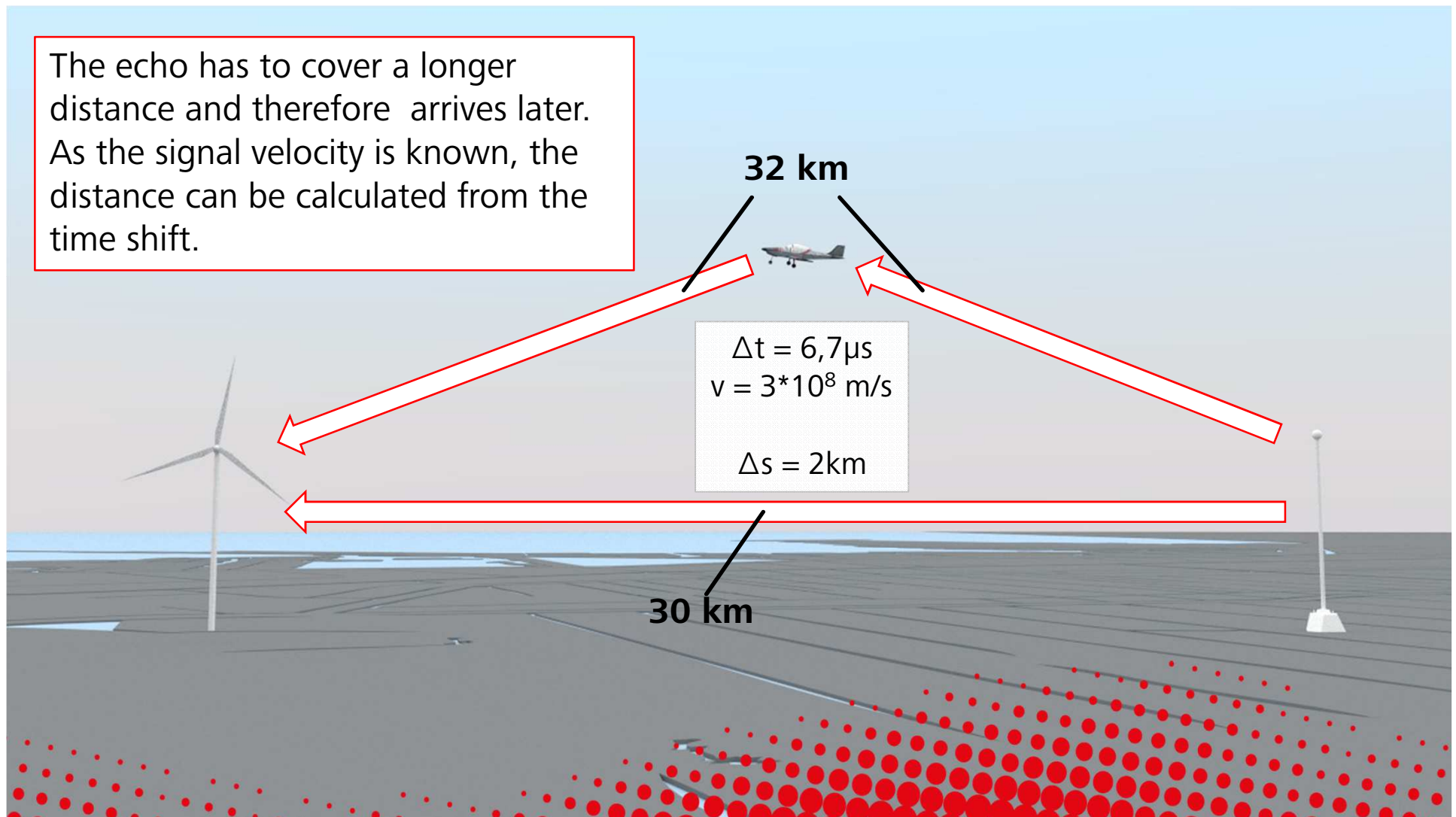
DVB-T / DAB+ transmitter

signal of transmitter

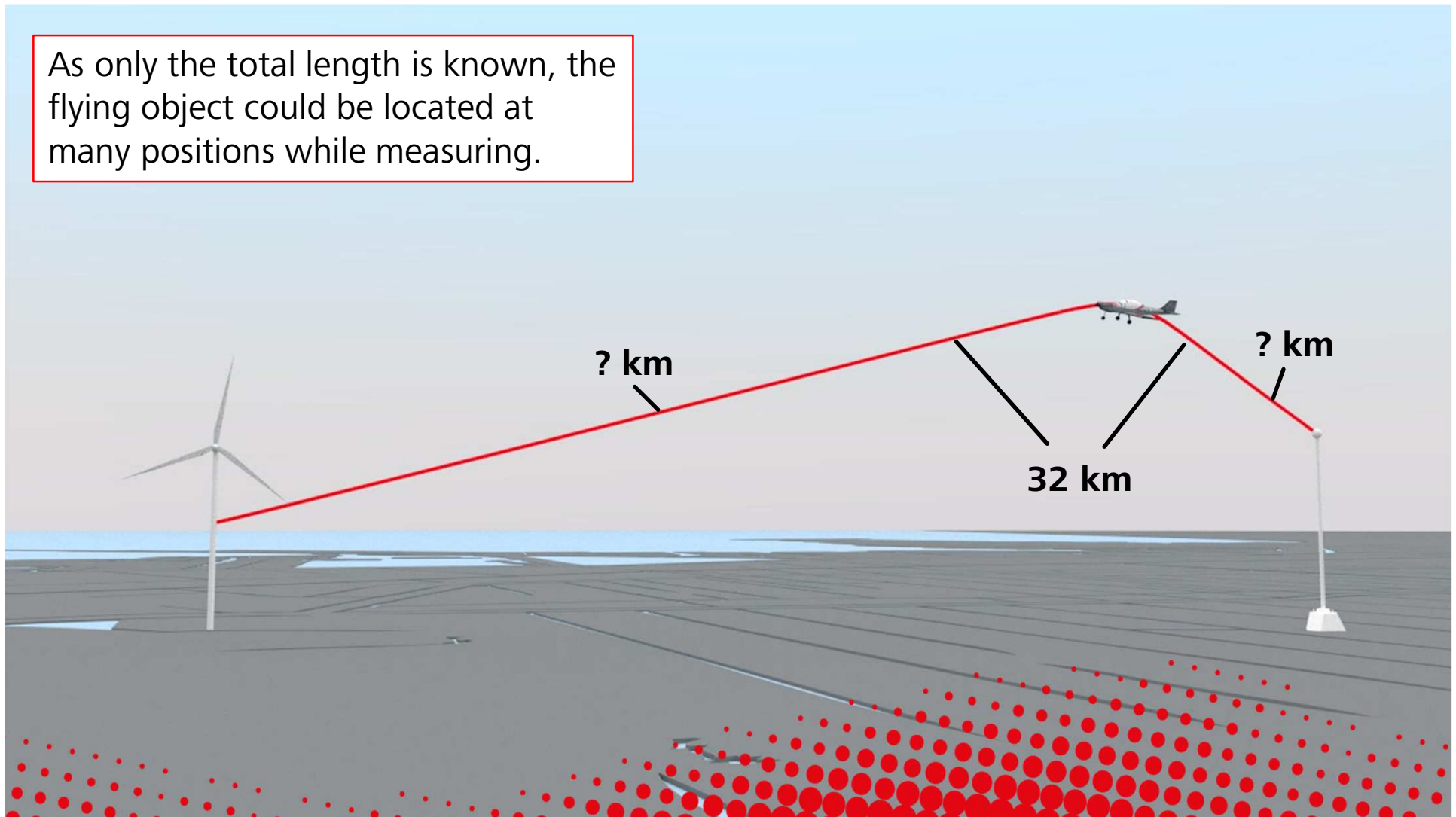




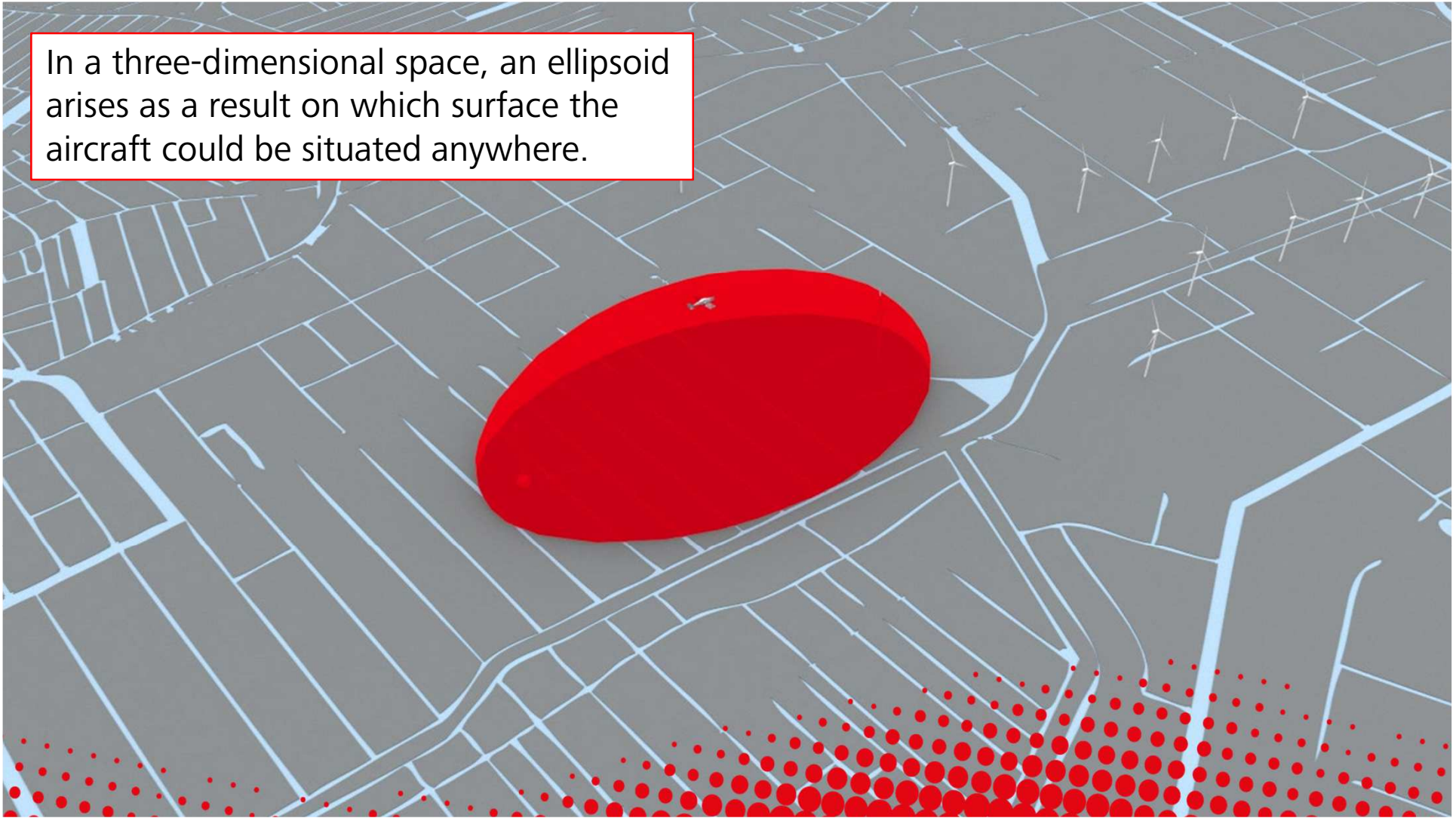
The echo has to cover a longer distance and therefore arrives later. As the signal velocity is known, the distance can be calculated from the time shift.

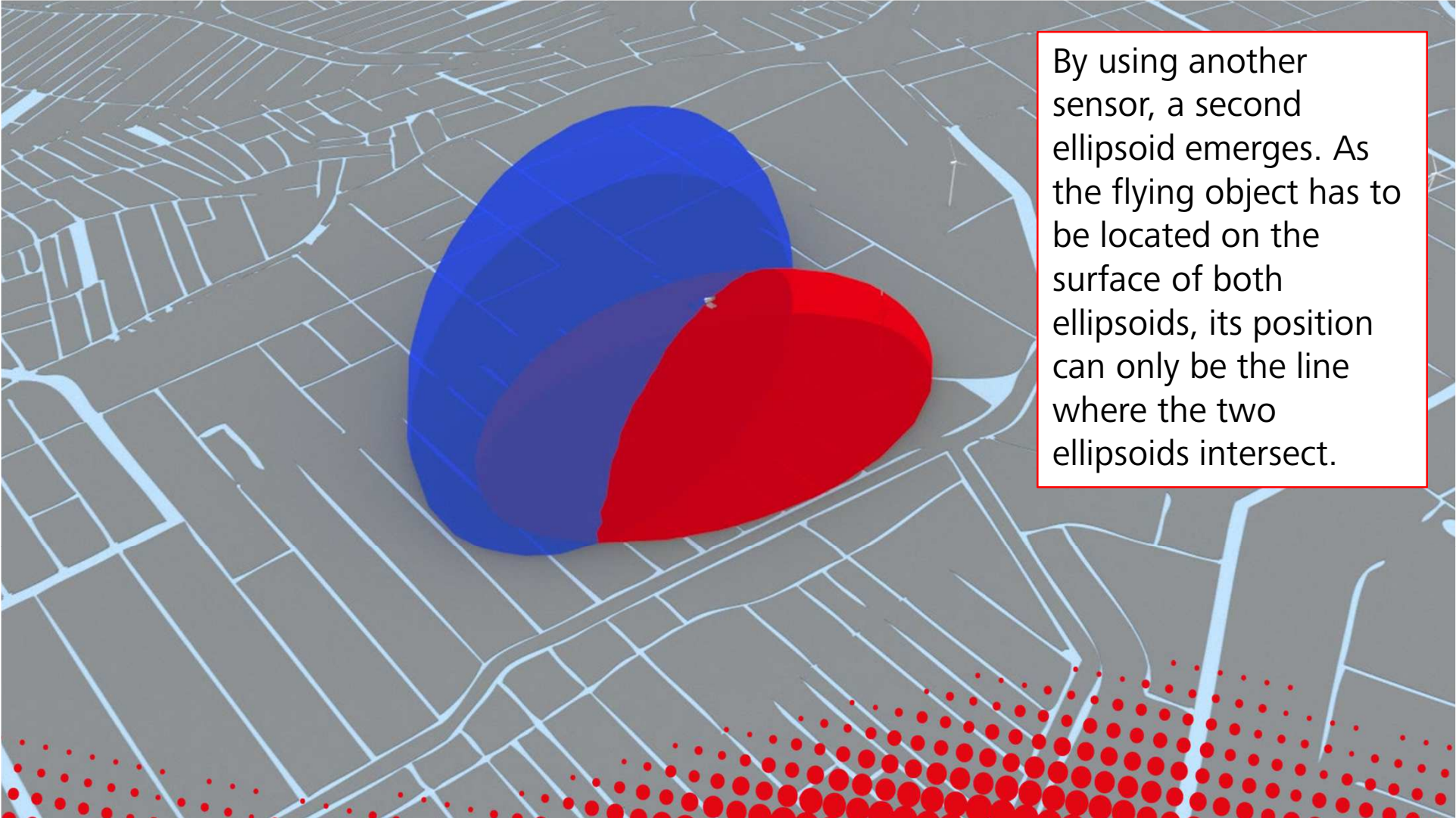


As only the total length is known, the flying object could be located at many positions while measuring.

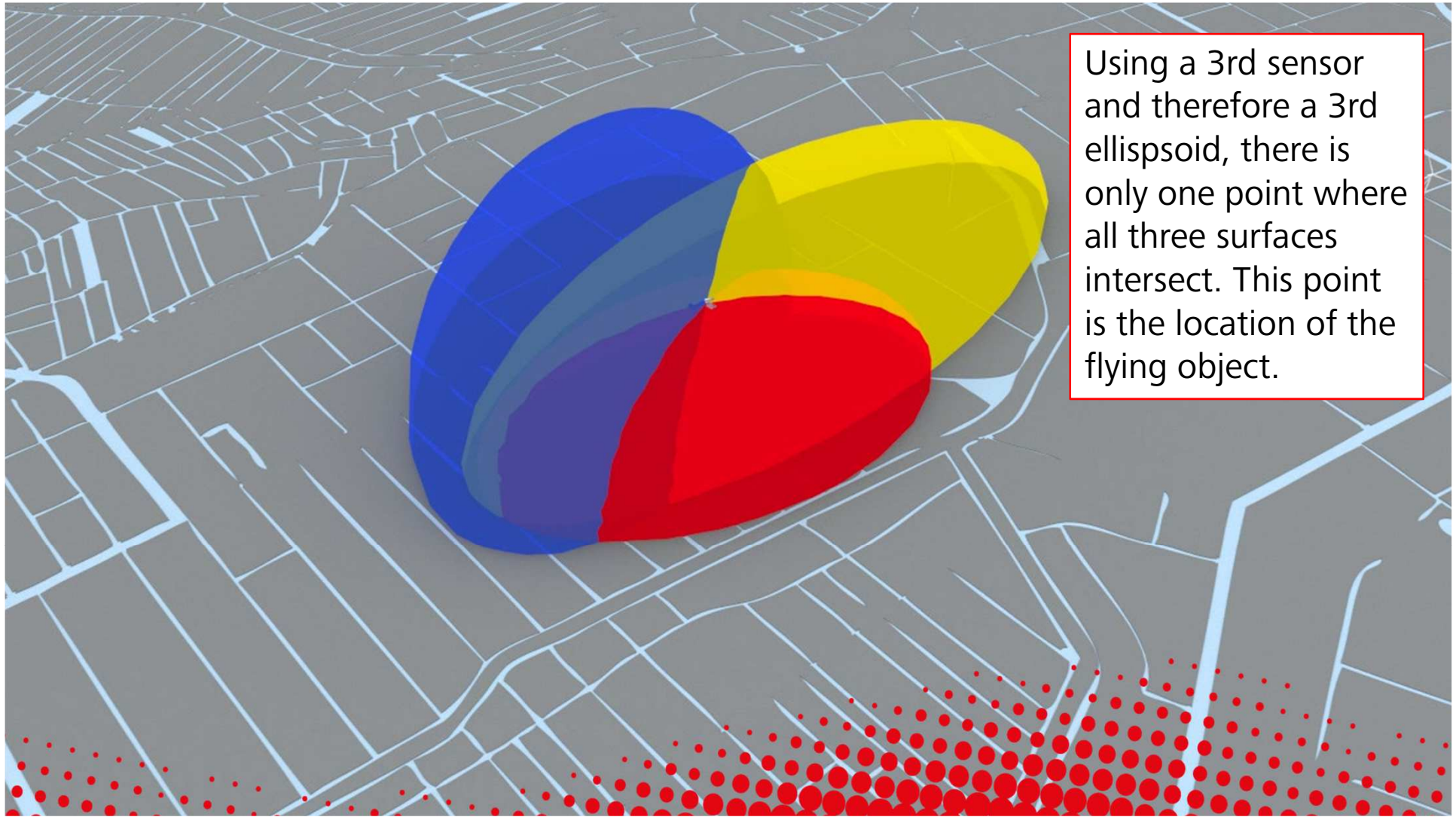


In a three-dimensional space, an ellipsoid arises as a result on which surface the aircraft could be situated anywhere.





By using another sensor, a second ellipsoid emerges. As the flying object has to be located on the surface of both ellipsoids, its position can only be the line where the two ellipsoids intersect.



Using a 3rd sensor and therefore a 3rd ellipsoid, there is only one point where all three surfaces intersect. This point is the location of the flying object.

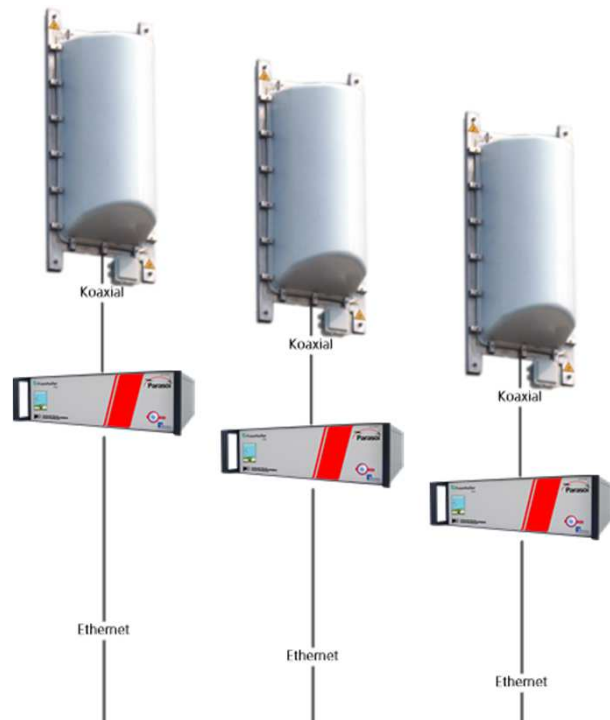


Technical specifications

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Parasol - System



The Parasol-System consists of the following components:

- 3 sensor units incl. tower fastening
- 3 analysing units
- 3 cable sets

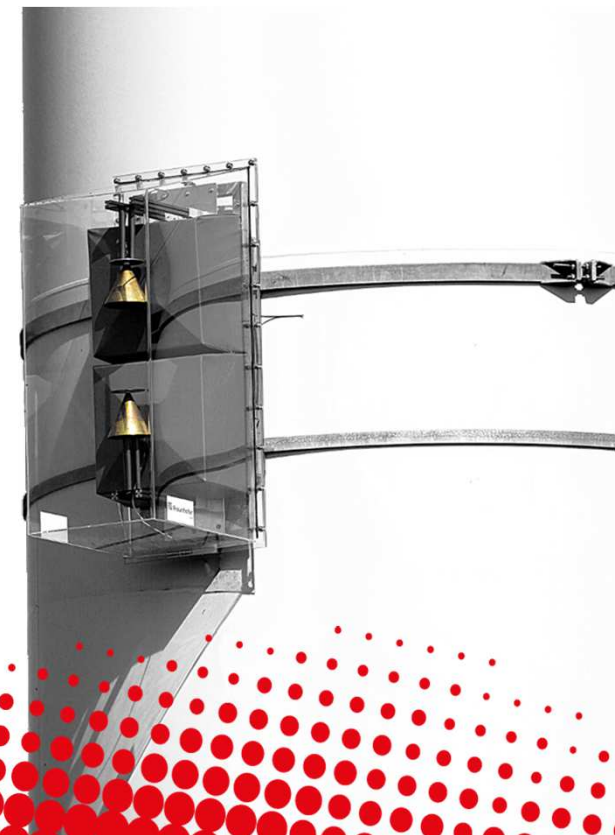
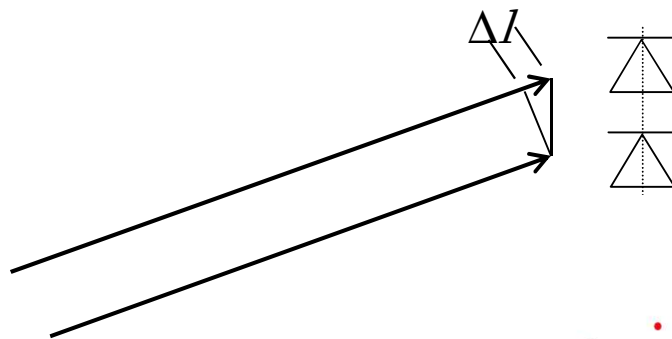


Parasol – sensor unit



By installation of 2 antennas which are offset in their heights, an additional height measurement by interferometry takes place.

Thus, a reliable difference between ground vehicles and aircrafts (even in low heights) can be made.






Parasol

V 205780

PARASOL – “Keep the night dark”



PARASOL – “Keep the night dark”



Project execution

PARASOL



Project execution

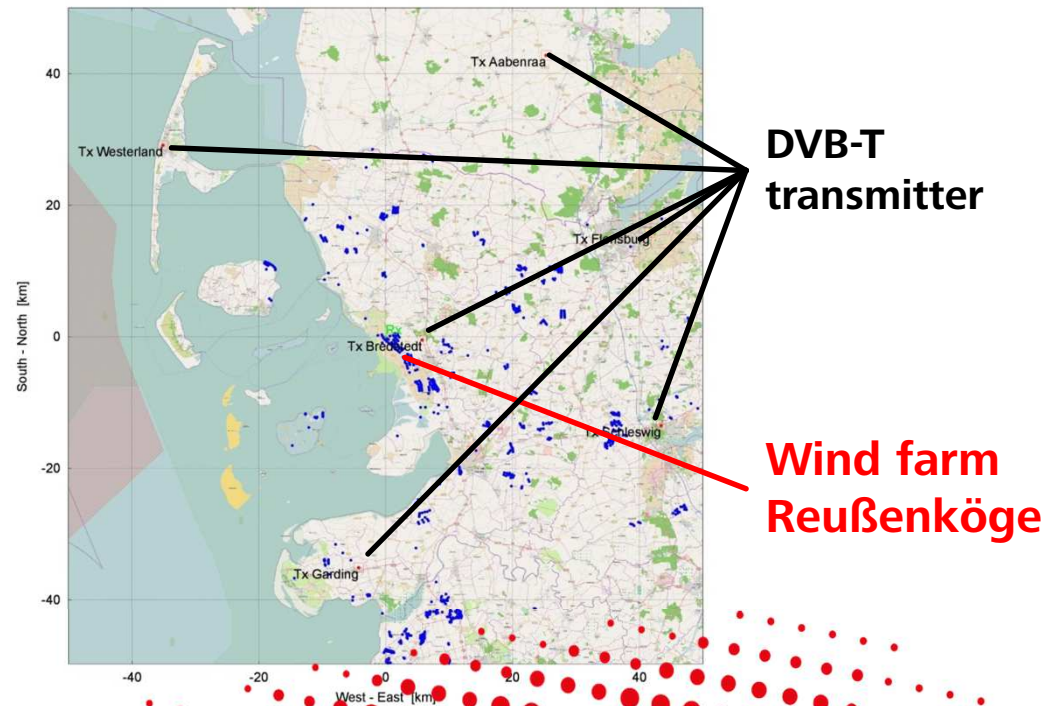


- Inquiry including technical specifications
(GPS coordinates, WT type, hub height, diameter of blades, fibre optic wiring diagram)
- Offer
- Placement of the order
- Sensor deployment by simulation model
- Validation of simulation results through measuring on site
- Installation of Parasol-System at the wind farm
- Acceptance test of the system along with test flights
- Service & maintenance through Parasol operation control centre

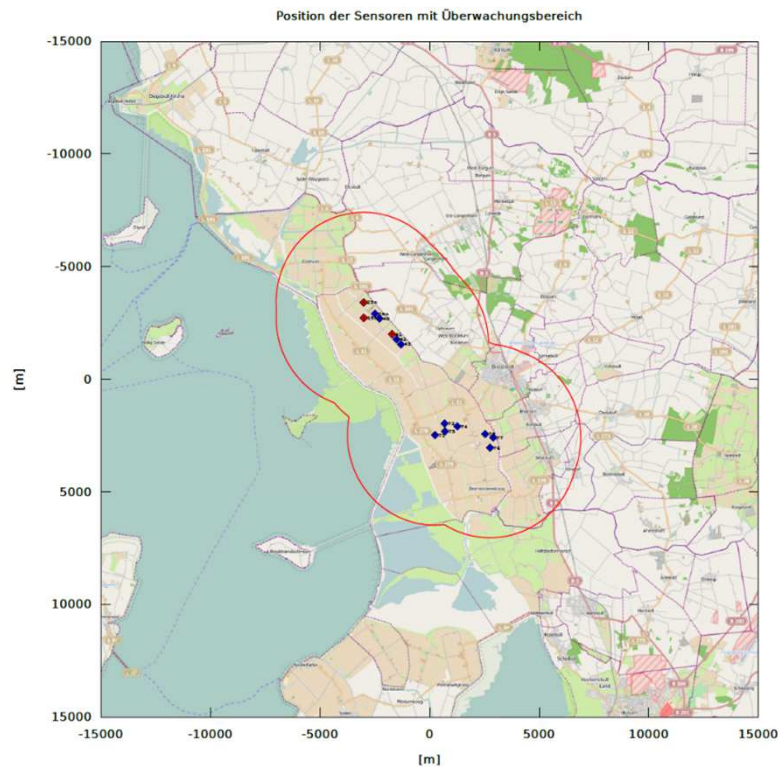


Sensor deployment

In the course of sensor deployment, the coverage of the possible position and alignment of each sensor as well as the available transmitter will be calculated by a simulation model.



Parasol – The supervised area



Wind farm Reußenköge

14 WTs with need-based obstruction lighting

3 antennas are installed to the WTs and thereby form one system

The supervised area stretches on a radius of 4 km around the outer WTs and 600 m above ground level.



Parasol – Coverage of the system

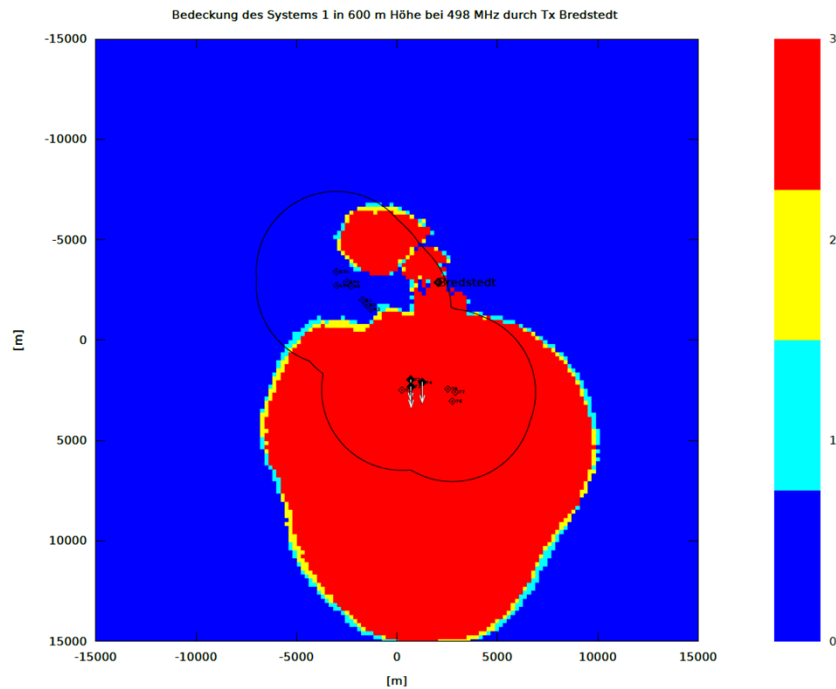


Wind farm Reußenköge

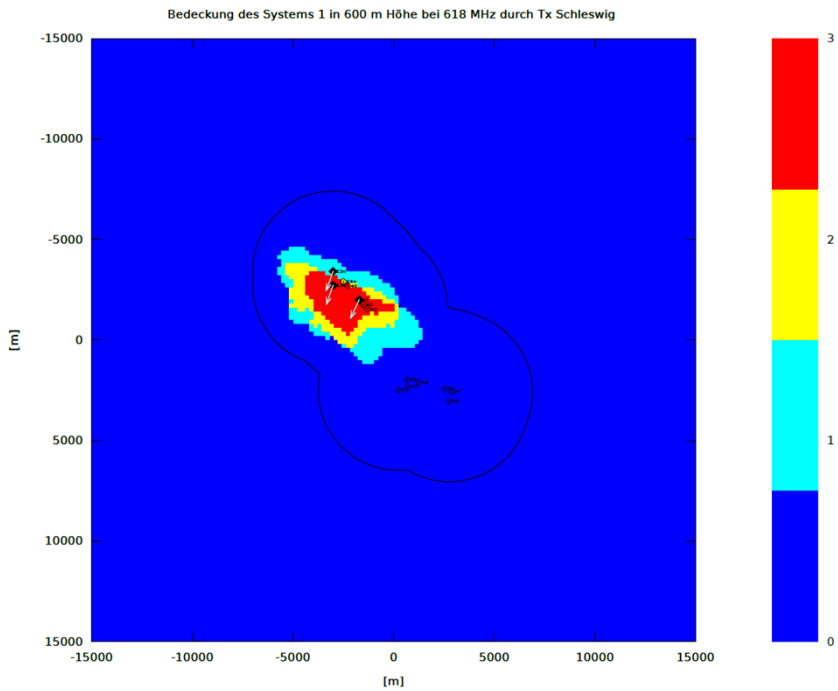
Coverage of the system in a height of 600 m

Used transmitter: Bredstedt (498 MHz)

This constellation is not adequate to cover the wind farm!



Parasol - Coverage of the system



Wind farm Reußenköge

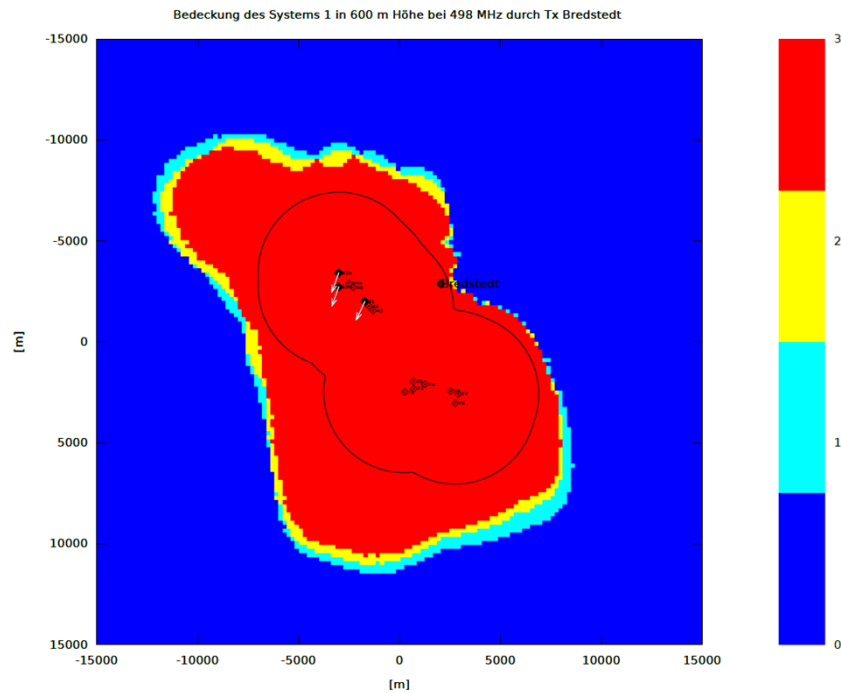
Coverage of the system in a height of 600 m

Used transmitter: Schleswig (618 MHz)

This constellation is not adequate to cover the wind farm!



Parasol - Coverage of the system



Wind farm Reußenköge

Coverage of the system in a height of 600 m

Used transmitter: Bredstedt (498 MHz)

This constellation is adequate to cover the wind farm!



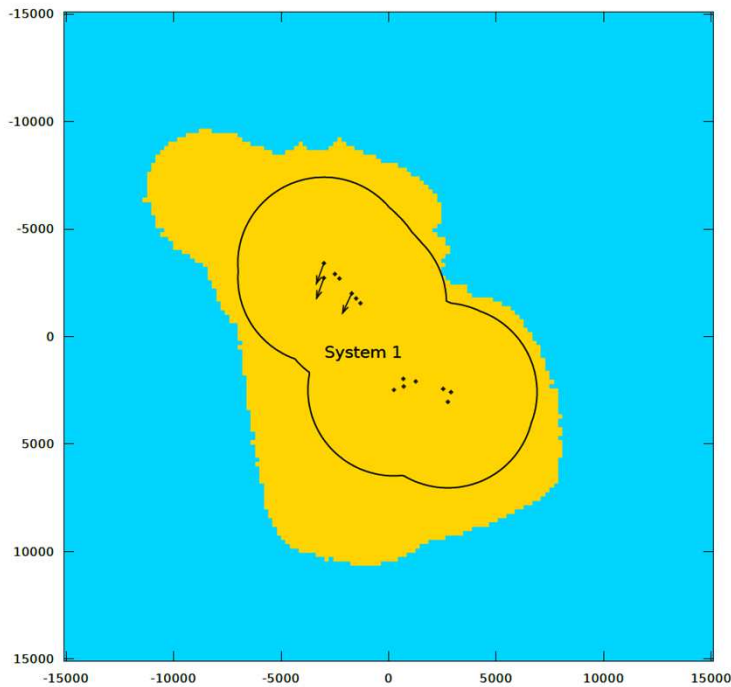
Parasol - Coverage of the system



Wind farm Reußenköge

In this case, the area covered by the system stretches on a length of app. 20 km and on a width of 10 km.

Additionally built wind turbines in this area can be incorporated afterwards.



Parasol – Ultralight aircraft



Breezer Aircraft



The ultralight aircraft fleet of Breezeraircraft is especially well suited for the acceptance test of the Parasol-System because of their radar cross section required by the German general regulations concerning obstruction lighting (AVV).



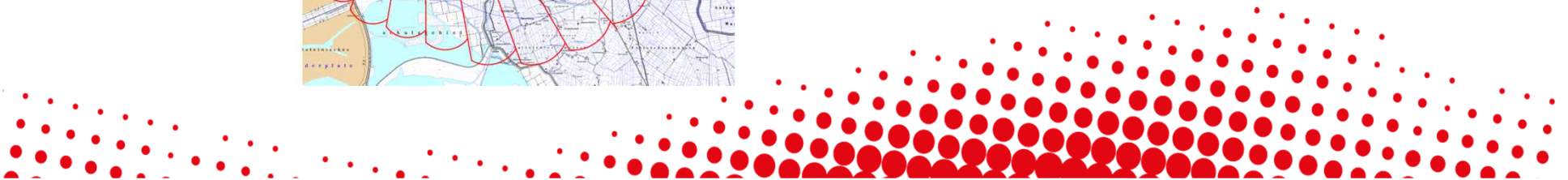
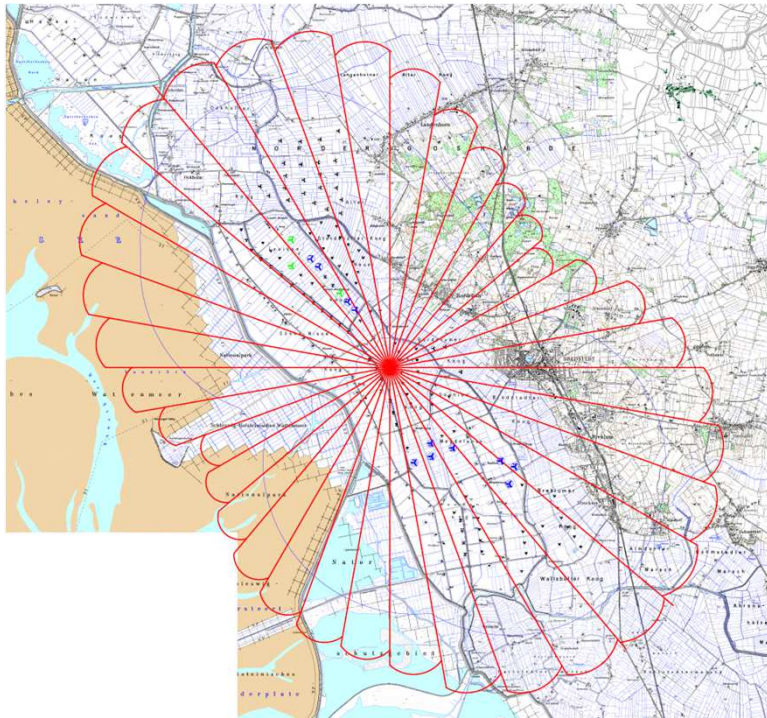
Parasol – Air way



Acceptance test of the system

Departures at 2 heights:

1. 450 m (300m above the highest WT)
2. 600 m (maximum required height)





Approval

PARASOL



Parasol - Approval



The approval is undertaken in 2 steps:

1. Examination (according to documentation)

- Functional description
- System description
- Service concept
- Standards to be used

2. Location-based evaluation (Based on field tests on site)

- Location description (topography, airspace ...)
- Pre-test flight reports
- Function test with aircraft



Parasol - Advantages



- approval promoting wind energy
- environment-friendly – no emission of additional electromagnetic radiation
- good at price – no radar transmitter needed
- all-round supervision – also within and above the wind farm
- DVB-T, DAB+ and LTE as transmitters are extensively available
- no activation of warning signal on detecting swarms of birds



Parasol – Download Handout



The complete presentation as well as
therein contained videos can be
downloaded via the following link:

<http://handout.passivradar.de>



Parasol – Sales department



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**Thanks for your
attention.**

