

MIDAS II... Mitigation of Radar Clutter from Wind Farms

Requirement



Figure 1 The moving blades of a wind turbine (left) can cause interference to Air Traffic Control Radar (right).

Many civil and military airfields are equipped with Primary Surveillance Radar in order to provide a safe and expeditious ATC service. As the radars are optimized to detect moving targets they can be particularly affected by rotating wind turbine blades within their coverage which perfectly mimic the characteristics of moving aircraft and defeat most radar filtering systems designed to reduce unwanted radar returns.

There are three main impacts of wind turbines on radar; clutter, obscuration and shadow, which can cause the ATC unit to lose an arc of coverage above the wind farm as shown below.

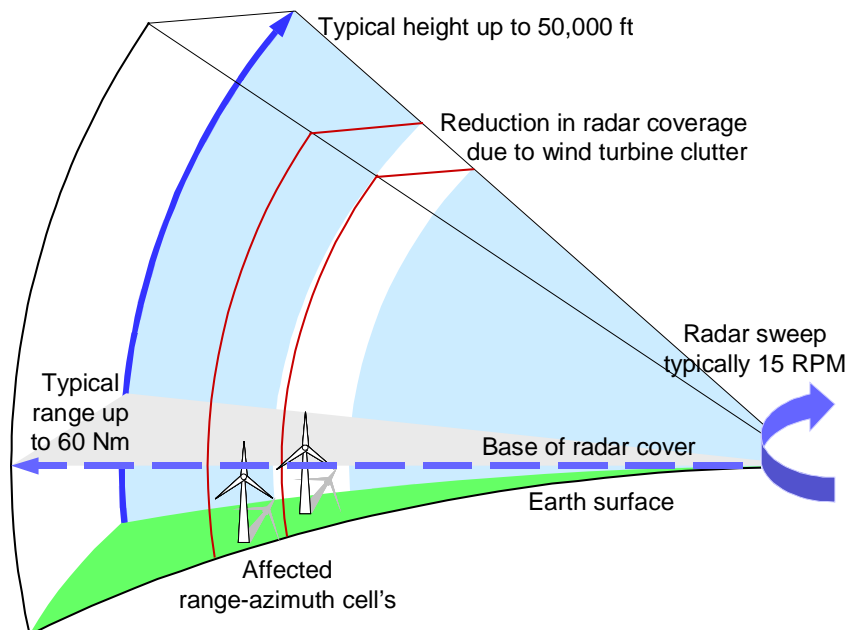


Figure 2 Typical ATC radar, showing the range, height and rotation parameters of radar coverage.

In general, the base of radar cover rises with distance, as the Earth's surface curves away below it.

A primary radar scans by range and bearing only, so the presence of a wind farm can cause clutter up to the full vertical coverage of the radar.

If this loss of coverage adversely affects the safe provision of a radar service, then objections can be raised during the planning process, and the development halted until a safe mitigation is provided.

Mitigating the turbine clutter

By virtue of distance or favourable terrain, neighbouring radar may provide coverage of the same airspace as the affected radar, but because the turbine blades are below its base of cover there is no interference.

As calculated by **Wind Power Aviation Consultants Limited**, this is precisely the situation surrounding the Red Gap Moor development. The radar at Durham Tees Valley Airport (DTVA) suffers interference, but the neighbouring radar at RAF Leeming does not.

Because Air Traffic Services are subject to Safety Regulation by the CAA, it is necessary to demonstrate that the sources of radar data can be transmitted and combined at Durham Tees Valley Airport with sufficient evidence to prove they may be used operationally, once the wind farm is built, and thus lift the planning objections.

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Technology Solution

The Key requirements are:

- Comply with the requirements of Safeguarding/Egmts/Policy/20101104 (Ministry of Defence Policy on Air Traffic Control Infill Patch Mitigation).
- Utilise existing operational data, to benefit from the pre-existing safety cases at both ATC units.
- Avoid any data manipulation that could invalidate the existing safety cases.
- Verify the radar coverage of both sources over the wind farm zone.
- Demonstrate loss-less secure data transmission from RAF Leeming to DTVA.
- Demonstrate real time radar data fusion and composite video presentation.
- Gain DTVA and CAA Safety Regulation Group understanding and support for the technology solution.
- Operate with any type of ATC radar source and display system, following site survey and configuration.

based on parallel assemblies of field-programmable gate arrays (FPGA) and takes advantage of their inherent high speed logic processing to compare and control each pixel from every input.

This approach is deployed in two forms: At RAF Leeming video is captured using Sentinel network based video distribution, and at Durham Tees Valley Airport the video processing uses MIDAS II technology.

At every stage, the system performs cross channel synchronization and ensures each internal process always has a complete video frame available from its preceding stages.



Figure 3 PCB of the MIDAS II showing inputs, processing stages and outputs. The control port and redundant power supply's are located top-right.

To achieve the high integrity level, throughput and response times, the solution completely avoids mathematical computations. Rather, the solution is

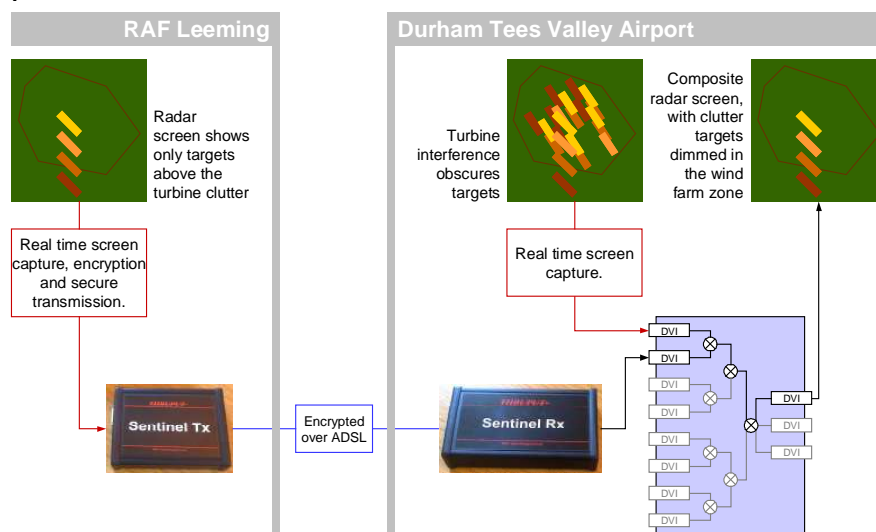


Figure 4 The radar data of RAF Leeming and DTVA are both captured from their radar displays as video data.

Both channels are passed through the video processor to create a composite with the clutter targets dimmed beneath the aircraft targets, which can now be clearly seen.