



## YOUR SAFEGUARDING SPECIALISTS

The safety of aircraft operations in the vicinity of an airport depends on the environment around the airport being protected from changes which could have a detrimental effect on safety. This process is known as safeguarding, and is essential to ongoing aviation safety.



Whilst the primary objective of safeguarding is to protect aviation safety, development in the vicinity of an airport is both necessary and desirable. A secondary objective of aviation safeguarding is to facilitate maximum development potential whilst maintaining aviation safety requirements.

Cyrrus has a thorough understanding of safeguarding processes and objectives that can enable development on and around an airport, allowing the airport to realise maximum development potential whilst ensuring the ongoing safety of aircraft operations.

Cyrrus has expertise in all areas of aviation safeguarding from impact analysis to developing mitigations, which could reduce or remove the impact of a given development on aircraft operations.

## OBSTACLES

The introduction of new obstacles in the vicinity of an airport can reduce safety margins and, in the worst case, pose collision risks to aircraft. It is therefore vital that airports consider any construction within the safeguarded area of the airport to ensure that it does not cause an obstacle risk. In certain circumstances full Collision Risk Modelling (CRM) may be necessary to inform the decision makers whether the OLS penetration can be accepted. Cyrrus has the expertise and tools to conduct comprehensive CRM assessments.

### Obstacle Limitation Surface

The control of obstacles around an airport is based on Obstacle Limitation Surfaces (OLS). The OLS is a series of complex 3D surfaces described around a runway where the control of obstacles is necessary. Ideally, no new construction would be allowed to penetrate the OLS. If a proposed construction does penetrate the OLS, then the impact of that penetration must be assessed. Once the impact is known, then mitigation options can be considered to ascertain whether the proposed development would have an unacceptable effect on the airport operations.

Cyrrus provides OLS mapping around runways, allowing airport operators and local planning authorities to determine if a proposed development requires detailed assessment or an Aeronautical Study. An online web based interactive assessment tool can also be used by customers if required.

Should an assessment be necessary, you can trust Cyrrus' extensive expertise to evaluate the potential effects, identify mitigations, and provide robust advice to airports and developers.

Cyrrus delivers a full assessment of aeronautical obstacle surveys against the OLS to inform the airport operator on the control of obstacles in the vicinity of the airport.





## OBSTACLES

### Instrument Flight Procedures

Instrument Flight Procedures (IFP) comprise the nominal tracks of an aircraft around a runway and in the surrounding airspace. Each IFP has its own unique set of obstacle surfaces.

It is commonly believed that the OLS protects the IFPs, however this is not the case and developments that are below the OLS can still adversely affect IFPs, resulting in increased sector altitudes, increased approach minima or changes to IFP profiles.

Cyrus is an accredited IFP design organisation and can provide thorough assessments regarding the effects of proposed developments on IFPs. Cyrus offers IFP safeguarding mapping around runways to allow airport operators and local planning authorities to quickly determine if a proposed development requires detailed assessment or an Aeronautical Study. In addition to this there is also an online web based interactive assessment tool currently in development.

Should an assessment be necessary, Cyrus' extensive expertise can evaluate the potential effects, identify mitigations and provide robust advice to airports and developers.

The controlling obstacle is a Digital Vertical Obstruction File (DVOF) obstacle 'UK0105A504F'. This is a Tower, Metal and lighting undetermined.



Controlling obstacle in the Final phase of the Missed approach

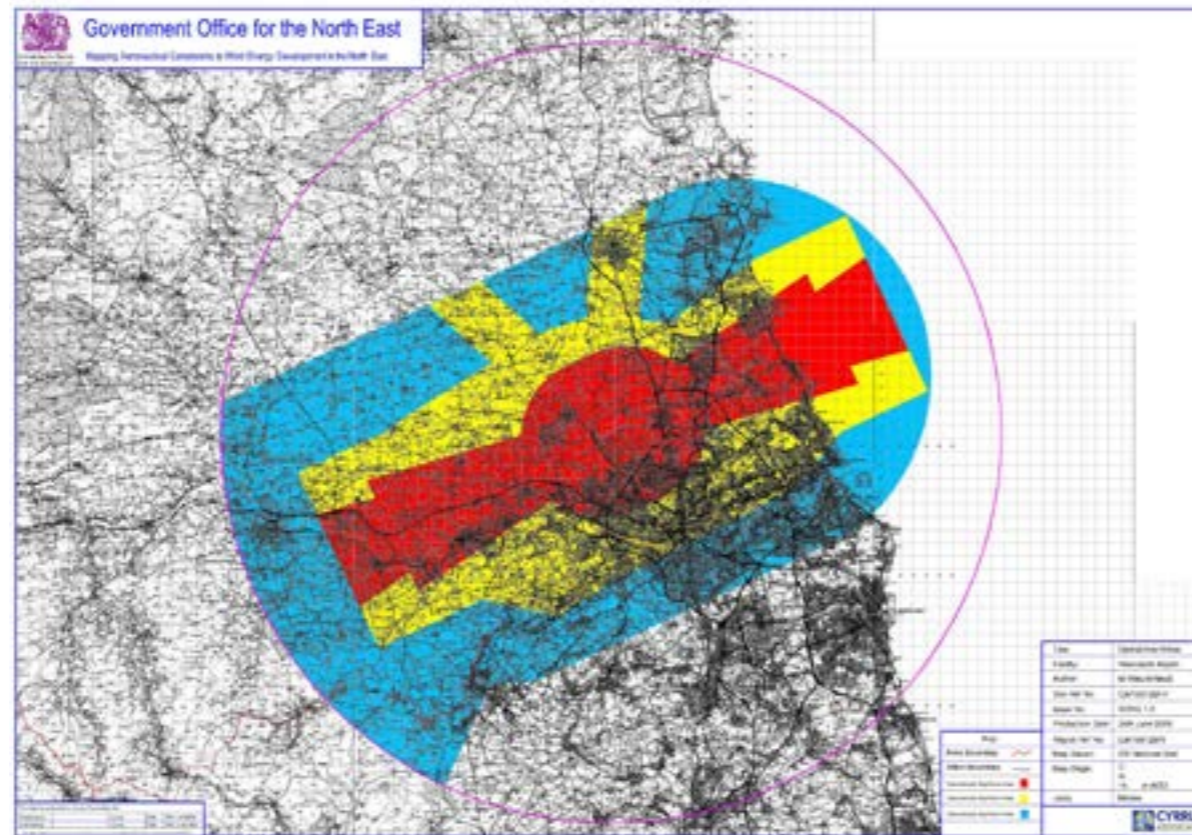




## WINDFARMS

Wind turbines can also have a substantial effect on aviation. They can be significant obstacles as well as having a detrimental effect on radio navigation and surveillance systems.

Cyrrus has a wealth of experience of working with the wind energy industry and has been involved with identifying potential aviation issues with proposed developments, whilst providing advice and mitigations, to enable the disparate objectives of the aviation and renewable energy industries to be realised.



### Mapping

Cyrrus are pioneers when it comes to mapping wind energy constraints in the vicinity of an airport, allowing airport operators to determine the magnitude of the effects of wind energy development in particular geographic areas. The mapping also allows wind energy developers to understand the severity of aviation issues that might be associated with wind energy development in a particular location.



## WINDFARMS

### Radar

Aviation radar has difficulty discriminating between wanted aircraft targets and unwanted radar returns from wind turbines. Cyrrus' extensive expertise in this area can establish the effects of a proposed windfarm, clearly identifying aviation related issues that are likely to arise.



### Mitigation

Whilst wind turbines can cause significant issues for aviation radar, there are several technical mitigation solutions available. Whilst there is no single solution to address every radar/windfarm issue, Cyrrus has used its extensive knowledge to develop patented radar data processing techniques to remove turbine clutter from radar displays.





## GLINT AND GLARE

Solar reflection can cause visual distraction or even momentary blindness to pilots during the critical phase of approach and landing. This aspect of safeguarding is vital, especially when considering the proliferation of solar energy installations and buildings with reflective glass.



### Solar energy

Cyrrus provides detailed assessments regarding the effects of solar energy installations on aviation through analysing the proposed solar installations. Cyrrus analysis and simulation tools can determine which flight procedures are potentially affected by solar reflection, and the time and dates at which the effects may occur. This informs suitable mitigation measures to ensure that flight safety is maintained.

### Buildings

Reflective glass buildings are becoming more common, which increases the risk of solar reflections having an adverse effect on flight safety. Similar to solar energy analysis, Cyrrus determines which flight procedures are potentially affected by solar reflection and the time and dates at which the effects may occur. This informs suitable mitigation measures, or even changes to the building design to ensure that flight safety is maintained.



## COMMUNICATIONS



### VHF/UHF

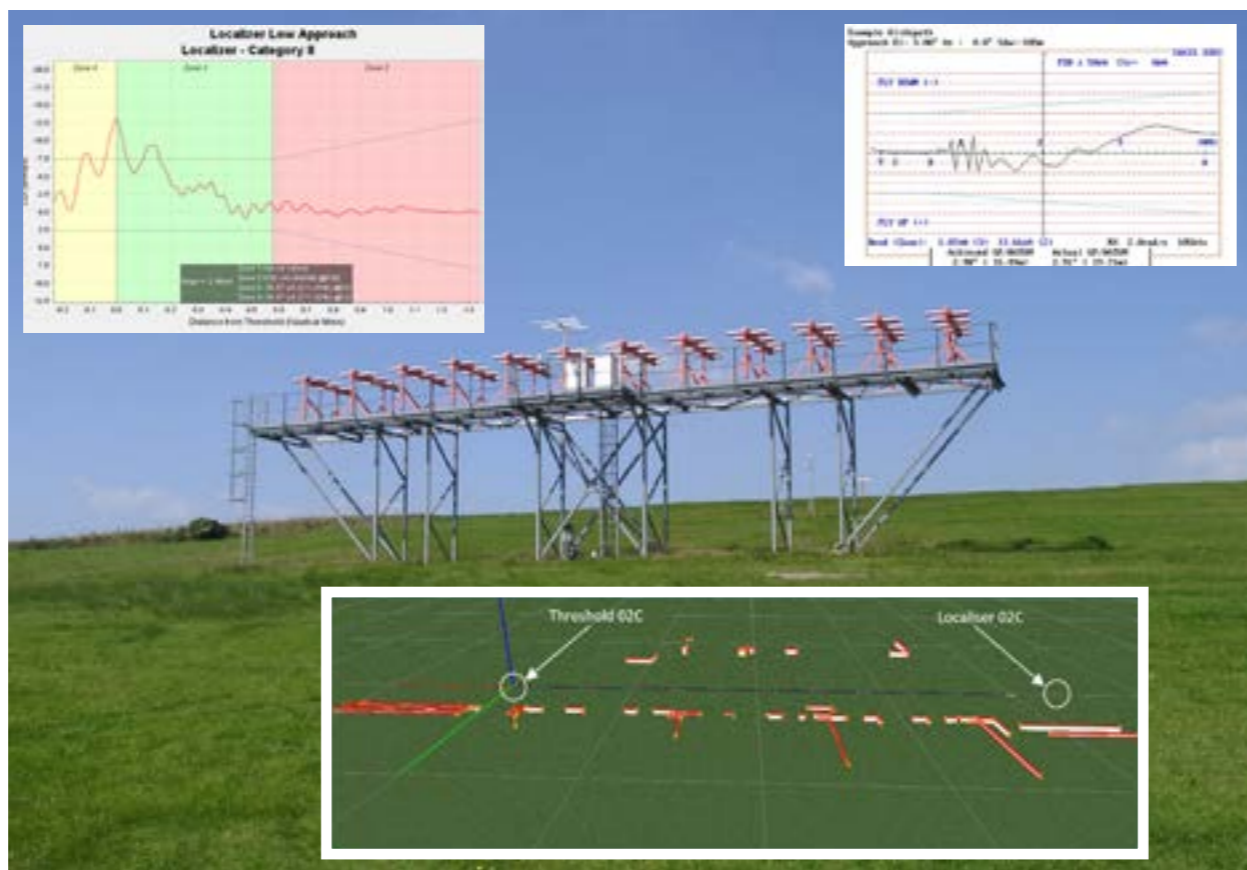
Developments and obstacles can affect the coverage of radio communication systems and windfarms can also introduce interference to radio communications.

Cyrrus undertakes modelling to determine the potential effects of proposed developments on radio communications and provide suitable mitigation options.



## NAVIGATION SYSTEMS

The performance of aeronautical communication, radio navigation and surveillance facilities is dependent on the environment in which they operate. Changes to that environment may also result in changes to the facility performance. The technical safeguarding process ensures that planned developments do not have an adverse effect on the performance or safety of an aeronautical technical facility.



### Instrument Landing System

The Instrument Landing System (ILS) is a radio navigation facility which allows automatic approach and landing in times of poor visibility.

Changes to the environment can cause disturbance to this safety critical system. Cyrrus has extensive expertise and advanced computer modelling and simulation software to accurately determine the effects of building developments on the ILS. Often, this allows us to determine appropriate changes to the design of the proposed development in order to minimise any potential disturbance of the ILS.





## NAVIGATION SYSTEMS

### Distance Measuring Equipment

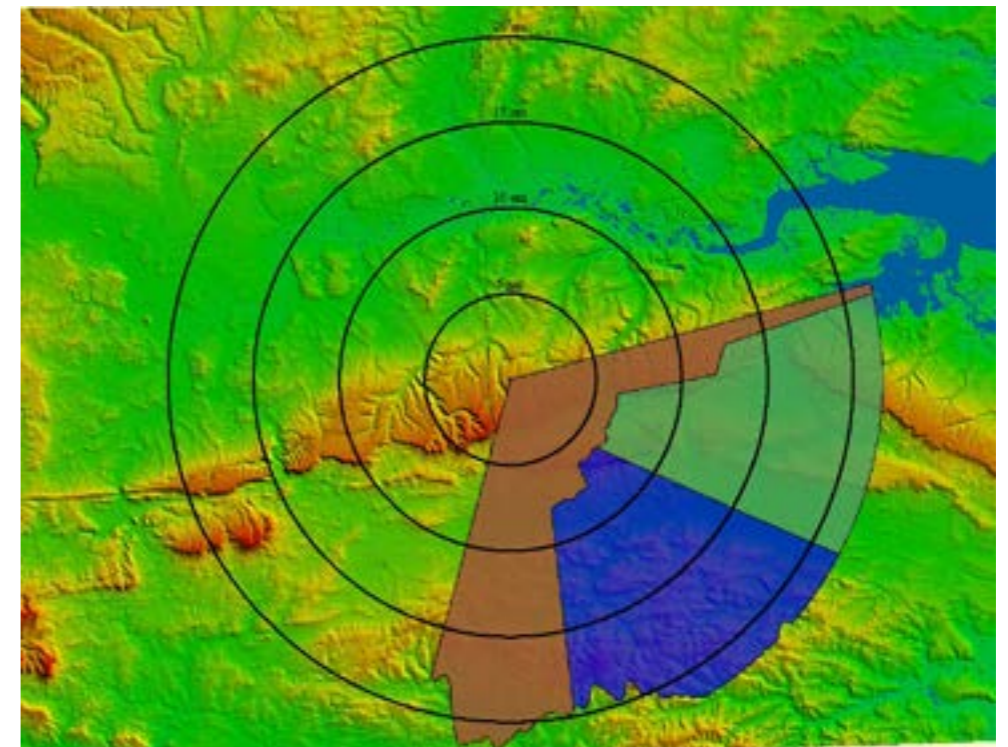
The reflective surfaces of buildings can cause multipath interference to the Distance Measuring Equipment (DME). Reflections can cause interference or even false range information. Building developments can also screen the DME signal, preventing aircraft from receiving a signal in certain areas. Cyrrus analysis can identify potential effects and advise the facility operator accordingly.

### Very High Frequency Omnidirectional Range

Very High Frequency Omni-directional Range (VOR) provides bearing and navigation information to suitably equipped aircraft. Cyrrus has extensive expertise and advanced computer modelling and simulation software to accurately determine the effects of building developments on the VOR.

### Tactical Air Navigation

TACAN is a radio navigation facility that combines the functions of DME and VOR, Cyrrus can identify the effect of building developments on TACAN facilities and advise facility operators accordingly.





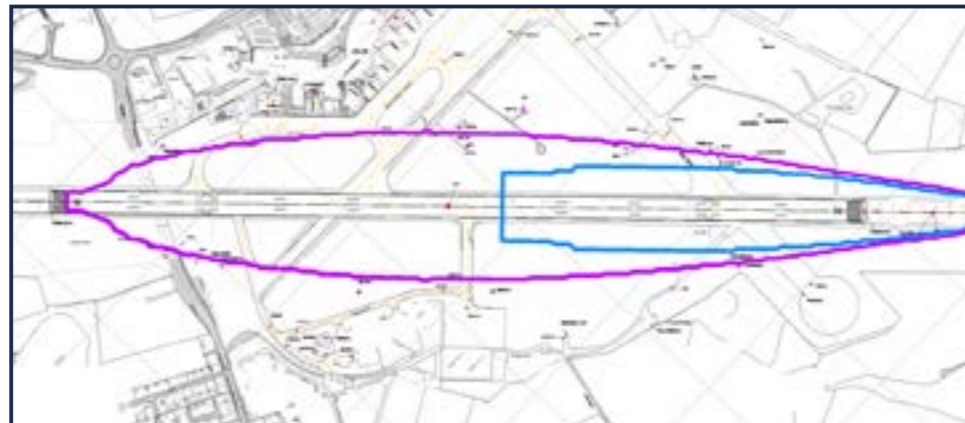
## NAVIGATION SYSTEMS

### Non-Directional Beacon

Non-Directional Beacons (NDB) operate in the MF part of the radio spectrum and have specific safeguarding requirements. Cyrrus has vast experience regarding NDB facility performance investigations and technical safeguarding.

### Ground Based Augmentation System

Ground Based Augmentation Systems (GBAS) are an augmentation system for Global Navigation Satellite Systems (GNSS) to facilitate precision approach and landing. These systems have their own specific safeguarding requirements.



### System Performance Modelling

Where the performance of an existing system is sub-optimal, Cyrrus investigates the cause of the disturbance, and identify measures that the facility operator can implement to improve performance. System Performance Modelling can also inform improvement or upgrading of the category of operation of an ILS.

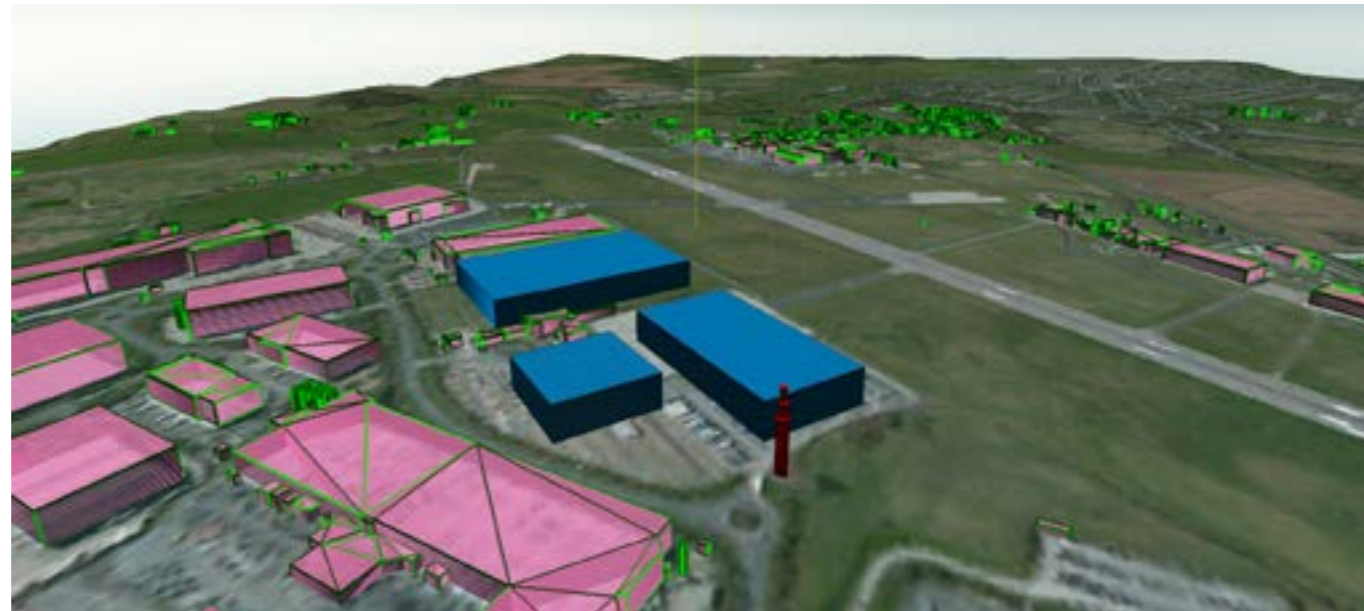
### Critical Sensitive Areas

Cyrrus uses advanced modelling and computer simulation tools to accurately define ILS critical and sensitive areas for any airport based on the actual ILS equipment and configuration. This analysis also informs the implementation of Lower Than Standard Cat I (LTSC-I) operations.

## SURVEILLANCE SYSTEMS

### Primary Surveillance Radar

Primary Surveillance Radar (PSR) is very sensitive to changes in the environment. Cyrrus analyses the potential effects of a planned development and advise suitable mitigation solutions. Cyrrus remains at the forefront in the field of the effects of wind turbines on PSR, and has extensive experience of the development of potential solutions.



### Secondary Surveillance Radar

Building developments can cause shadowing and false targets on Secondary Surveillance Radar (SSR).

Cyrrus' analysis advises the facility operator of potential effects on the SSR and possible mitigation solutions.

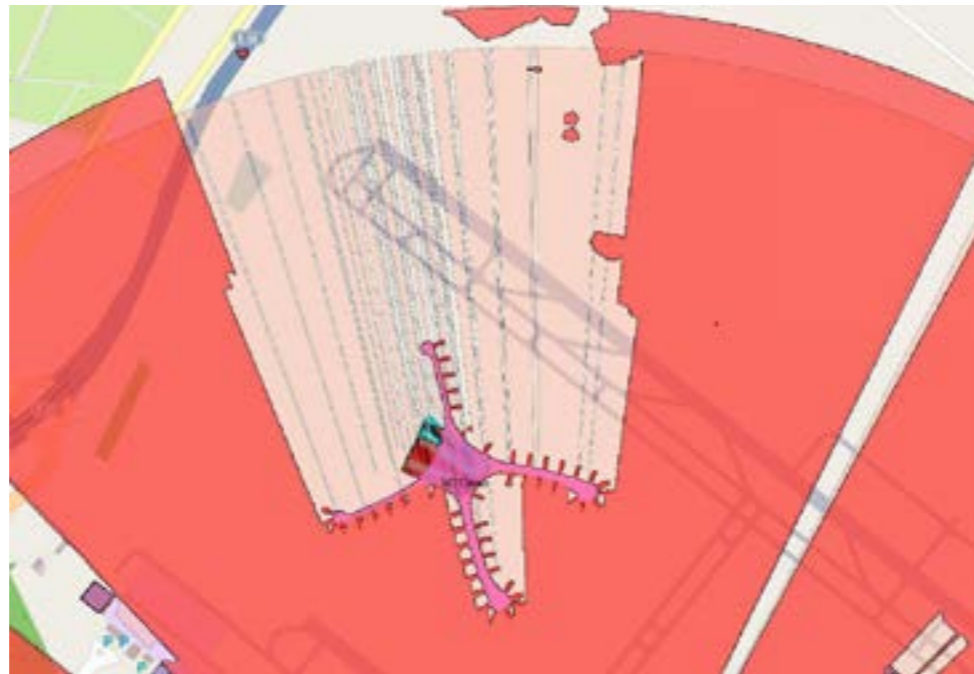




## SURVEILLANCE SYSTEMS

### Surface Movement Radar

On-airport development can cause shadowing and blind spots to Surface Movement Radar (SMR). 3D radar modelling can identify potential blind spots and also possible solutions, including the identification of alternative SMR sites.



### Precision Approach Radar

Similar to PSR, environmental changes can have adverse effects on Precision Approach Radar (PAR) performance. Cyrrus is able to investigate the effect of potential development on the PAR and advise the facility operator accordingly.

### Direction Finder

VHF and UHF Direction Finders (DF) are used primarily as situational awareness tools for Air Traffic Control (ATC). Technical safeguarding ensures that the DF continues to perform to the desired class of operation.

### ADS-B and MLAT

ADS-B and MLAT are newer surveillance technologies available to ATC. Each has their own unique set of safeguarding criteria to ensure that the system continues to meet its performance specification. Cyrrus is able to investigate the effect of potential development on these systems to inform the facility operator.



## LIGHTING/VISUAL

Aeronautical Ground Lighting (AGL) provides visual reference and warning to pilots at night and at times of poor visibility. Safeguarding is necessary to ensure that the AGL continues to provide the appropriate level of service to pilots.

### Line of Sight

Developments can cause a visual obstruction, preventing ATC from having visual contact with aircraft and with vehicles on the airport. Cyrrus uses 3D modelling to assess visual obscuration caused by potential developments.



### Lights Likely to Cause Confusion

Lighting may be installed as part of a development that could be confused with AGL, or may cause glare which is distracting to pilots. It is necessary to assess any new lighting in areas where confusion to pilots may arise.

### Obscuration

Developments can cause obscuration of AGL, preventing pilots receiving the appropriate visual references. Cyrrus uses 3D modelling to identify any adverse effects of developments on AGL systems. Precision Approach Path Indicators (PAPI) have their own unique protection surfaces to ensure visibility to aircraft on approach to land.

### Lasers

Lasers can be hazardous and cause flash blindness and glare. For this reason, the installation of lasers for advertising or light shows in the vicinity of airports must be controlled. Cyrrus provides advice on laser safeguarding and processes to deal with un-notified laser incidents.



## MAPPING

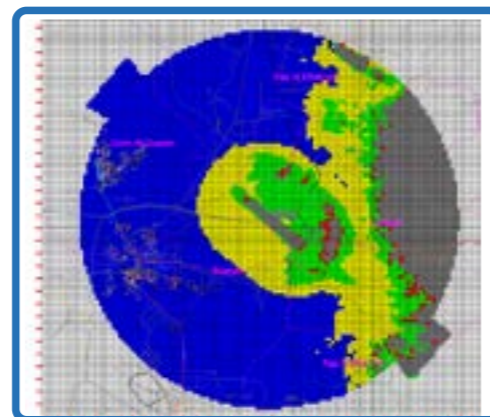
Cyrrus provides several levels of mapping to the aviation industry to fulfil both regulatory obligations and inform the airport and local planning authority of aviation restrictions.

### Obstacle Limitation Surface Mapping

Produced by Cyrrus' accredited IFP designers, Obstacle Limitation Surface (OLS) maps are provided in two forms:

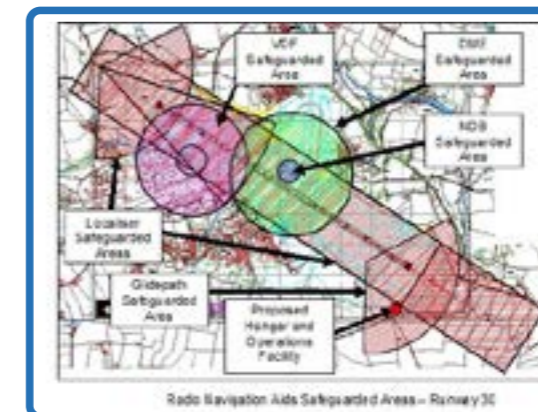
Airports can be provided with contour maps detailing the OLS elevations around a particular runway, allowing airports to make an informed decision on the acceptability of a proposed development.

Local Planning Authorities are provided with easy to interpret colour coded OLS maps which identify planning applications that must be referred to the airport for detailed assessment.



### Technical Safeguarding Maps

To safeguard technical facility performance, technical safeguarded volumes are described around each facility. Penetration of these technical safeguarded surfaces require a detailed technical assessment to inform the facility operator of potential effects. Cyrrus offers technical safeguarding maps based on international guidance, national regulations, manufacturer's recommendations or bespoke criteria developed specifically for a particular operator.





## MAPPING

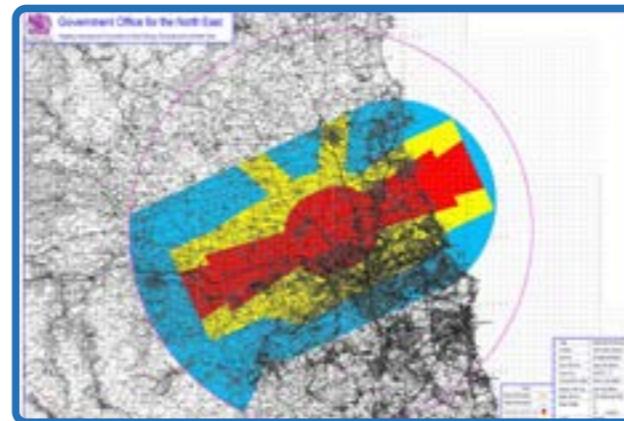
### Instrument Flight Procedure Safeguarding Maps

As an accredited IFP design organisation, Cyrrus produces IFP safeguarding maps based on 3D IFP primary and secondary protection areas. Mapping is available in both contour or colour coded versions.



### Windfarm Area Maps

Windfarm mapping identifies the operational significance of airspace surrounding an airport in terms of wind energy development impact. This colour coded mapping informs both airport operators and wind energy developers of the areas of most concern, providing a level of consistency and traceability. Additional mapping can be provided to identify Radar Line of Sight to various turbine heights.



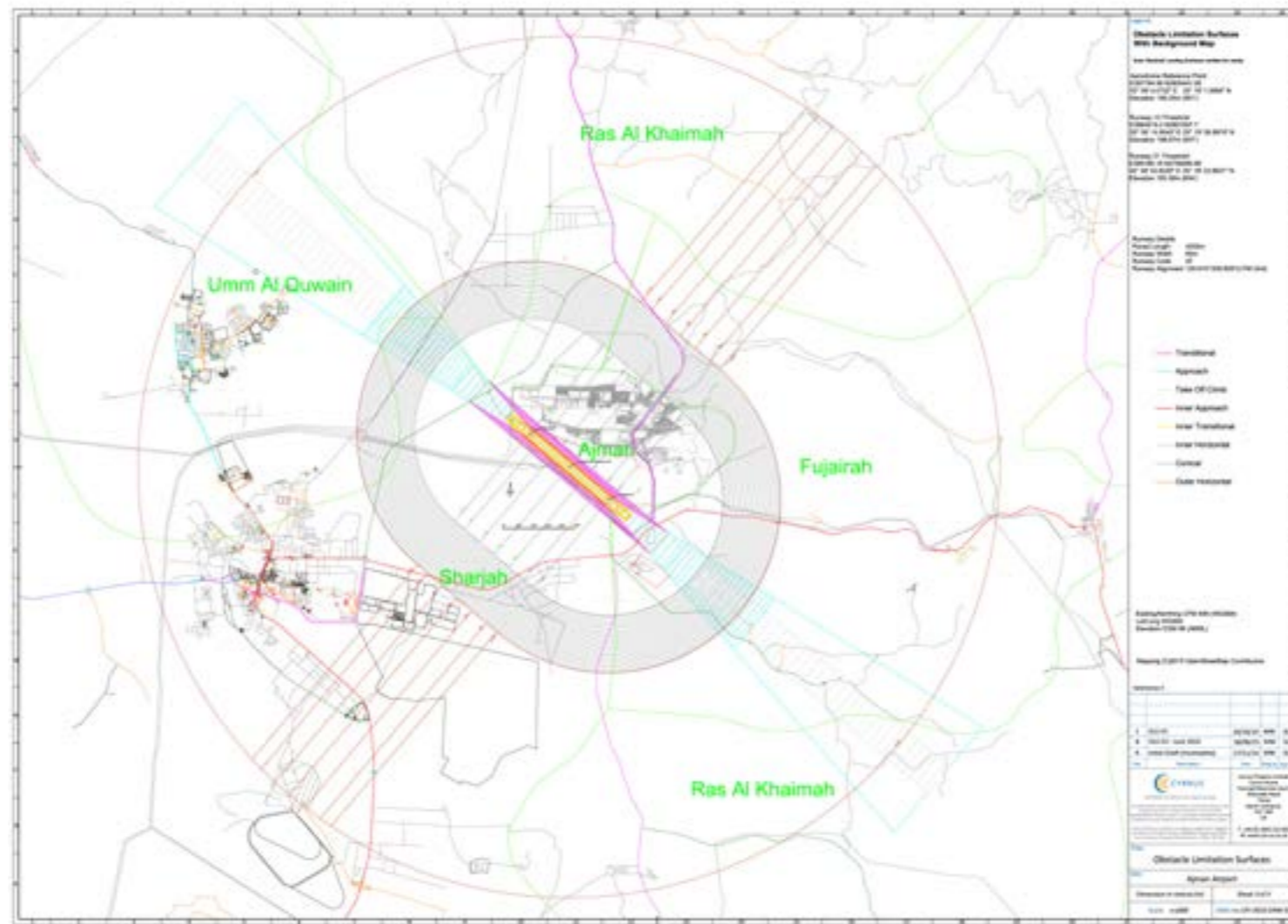
### Critical/Sensitive Area Drawings

Cyrrus uses computer simulation to determine ILS Critical and Sensitive Areas (CSA) based on the actual ILS equipment at the airport, category of operation, types of aircraft and the runway configuration. This ensures that the CSA is appropriate to the airport operation and protects the safety of users. The drawings further assist the airport in assessing the locations of holding points and any operational restrictions that ATC need to be aware of.





## OBSTACLE LIMITATION SURFACE



Example OLS diagram enabling obstacle assessment



## WHY CHOOSE CYRRUS

### Cyrrus – Your Safeguarding Specialist



- Extensive experience in all aspects of aviation safeguarding.
- Cyrrus recognises that safeguarding is not about preventing development. Safeguarding is about facilitating development whilst maintaining aviation safety.
- Cyrrus works with airports and developers to identify optimal solutions to meet conflicting objectives.
- Cyrrus provides consultancy and advice on safeguarding processes in addition to specific assessment commissions.
- Cyrrus provides training courses in all aspects of aviation safeguarding.

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