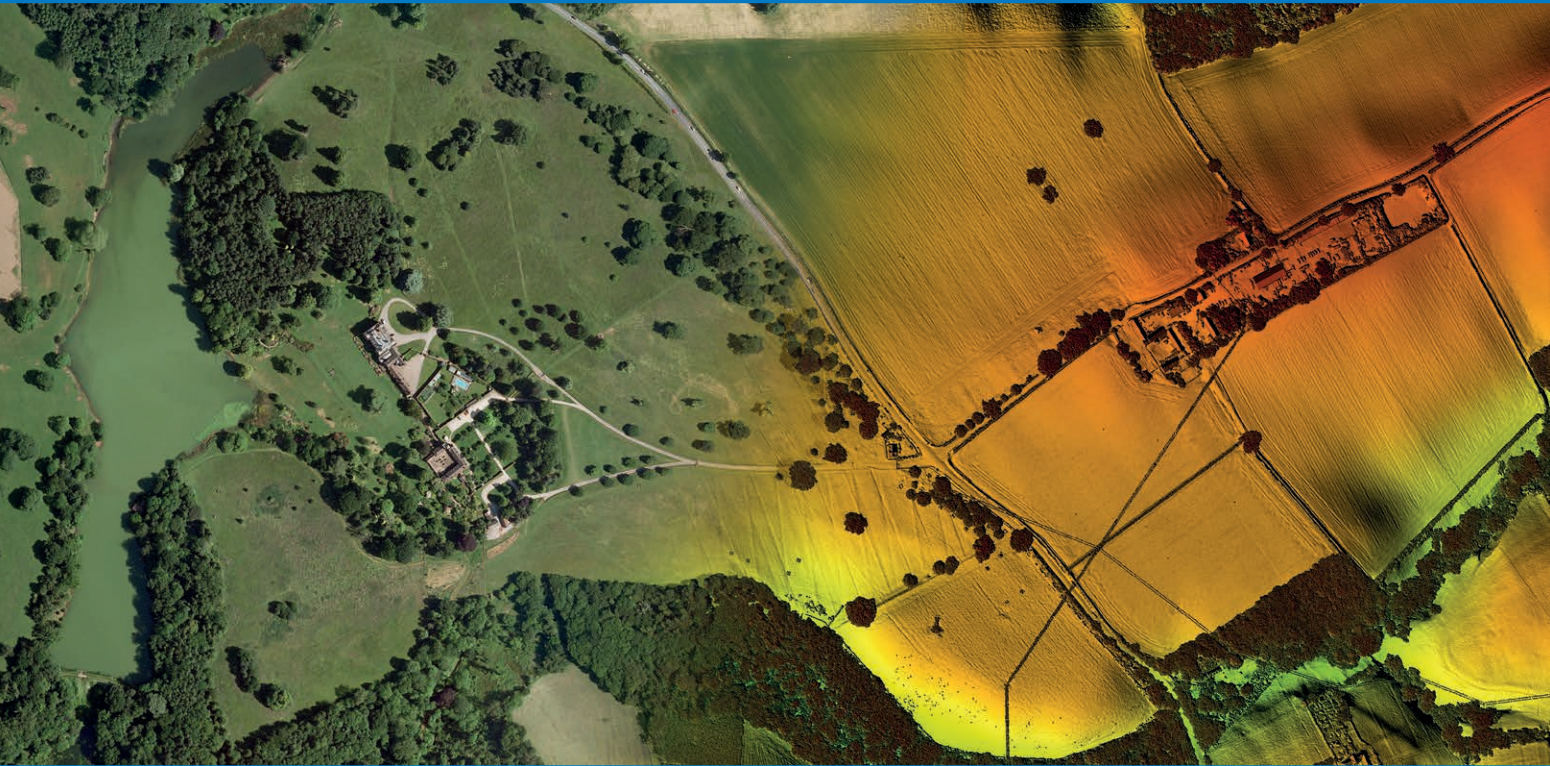




Bluesky services for

Archaeology & Heritage

*"Bluesky data...
A window to the past"*



Bluesky 3D Laser Maps AONB for Archaeological Studies

Aerial mapping company Bluesky has used aircraft mounted lasers to create 3D maps of potentially important archaeological sites in Devon. Funded by Historic England (formerly English Heritage), the LiDAR surveys were commissioned by Devon County Council's Historic Environment team with support from the Blackdown Hills Area of Outstanding Natural Beauty (AONB) and The East Devon AONB. Using a range of visualisation techniques, the Bluesky LiDAR data will be modelled to provide accurate representations of earthwork remains, providing new information for known monuments and revealing previously unknown sites. The Bluesky LiDAR data has already been used to provide valuable information in advance of a public consultation on road improvement works on the A30 trunk road.

"LiDAR data is a valuable tool in archaeological landscape studies as it provides a very accurate model of the ground surface. The data can be re-visualised in a number of ways to give multiple views of the same site, and in wooded areas can be used to reveal features that are often inaccessible to archaeological field surveys and opaque to traditional aerial surveys."

"Due to its quality and detail, the Bluesky LiDAR data can also be used to provide accurate georeference for archaeological features – visible on historic aerial photography but not on more recent images. The data also has the potential to provide further insight into the historic landscape through techniques such as viewshed analysis."

commented Cain Hegarty, Project Manager at AC Archaeology and part of Devon County Council's Historic Environment Team.

The three locations captured by Bluesky were in the East Devon and Blackdown Hills AONB, all previously under-mapped and under-studied but thought to be of great archaeological potential. The first transect of LiDAR targeted the western scarp of the Blackdown Hills, an area known to have been important in the Roman iron industry and locally significant for whetstone mining. The second study area was the naturally and culturally important landscapes of the Pebblebed Heaths, while the third and largest transect extended from Sidmouth north-east to the Blackdown Hills, taking in the route of the A30.



LiDAR used to show the archaeological features underneath the tree canopy

The Bluesky LiDAR surveys were carried out as part of the Historic England's National Mapping Programme (NMP), developed for the identification, mapping and recording of archaeological sites and landscapes from aerial photographs and other remotely sensed data. The archaeological survey is being carried out by historic environment consultancy specialists, AC Archaeology, with

the new information being recorded directly into Devon County Council's Historic Environment Record (HER). The NMP methodology and standards provide the means for expert aerial interpreters to identify and record information to a consistent standard, in order to enhance the understanding of past land use and aid the identification and analysis of archaeological landscapes and monuments.

Bluesky Laser Maps Help ArcHeritage Reveal Hidden Treasures for the National Trust



Terrain map of National Trust's Canons Ashby Estate

3D maps created from aircraft mounted lasers are helping the National Trust uncover secrets at the historic Canons Ashby estate in Northamptonshire.

Working with specialist archaeological and heritage practice ArcHeritage, the National Trust commissioned aerial mapping company Bluesky to complete a LiDAR survey of an area of 690 hectares, around and including the estate. From the millions of individual laser measurements collected, Bluesky created high

resolution 3D models of the bare earth surface (Digital Terrain Model / DTM) and of its surface features, including building and trees, (Digital Surface Model / DSM).

Analysis of the Bluesky models has already uncovered evidence of more than 300 potential archaeological features within the survey area, whilst comparison with aerial photographs, dating back to the 1940s, is helping to identify more recent features and activities.

"The use of the Bluesky LiDAR data within such an important piece of historic landscape research gives a much better understanding of the site and its immediate environs, and is one of numerous studies that will help to inform conservation and interpretation at Canons Ashby. High quality LiDAR data, such as that supplied by Bluesky, has already led to some amazing discoveries at other National Trust landscapes, and we are confident that the data will add to and enrich the story of the Canons Ashby landscape."

commented Anna Badcock, Director of ArcHeritage.

The Bluesky LiDAR data is also being used by ArcHeritage to create a Zone of Theoretical Visibility (ZTV); a computer generated tool that helps to identify the setting of Canons Ashby. The ZTV will help the National Trust understand the potential extent of views from Canons Ashby House, providing a useful tool for making decisions based on the visual impact of future landscape changes.

Canons Ashby, named after the Black Canons who founded the Augustinian Priory in the twelfth century and the medieval word for farmstead 'ashby', has been owned by the National Trust since 1981. Famous for its Tudor manor house, incorporating the priory remains as well as terraced gardens, the house and gardens have survived largely unaltered since the 1700s. Canons Ashby is a Scheduled Monument, comprising the remains of the medieval monastery, castle settlement and fields, post medieval houses, gardens and parklands, and is located within a Conservation Area and Grade II Registered Park and Garden.



Hi-res aerial photo of National Trust's Canons Ashby Estate

Bluesky aerial laser maps reveal WWI Battle of the Somme secrets for TV show

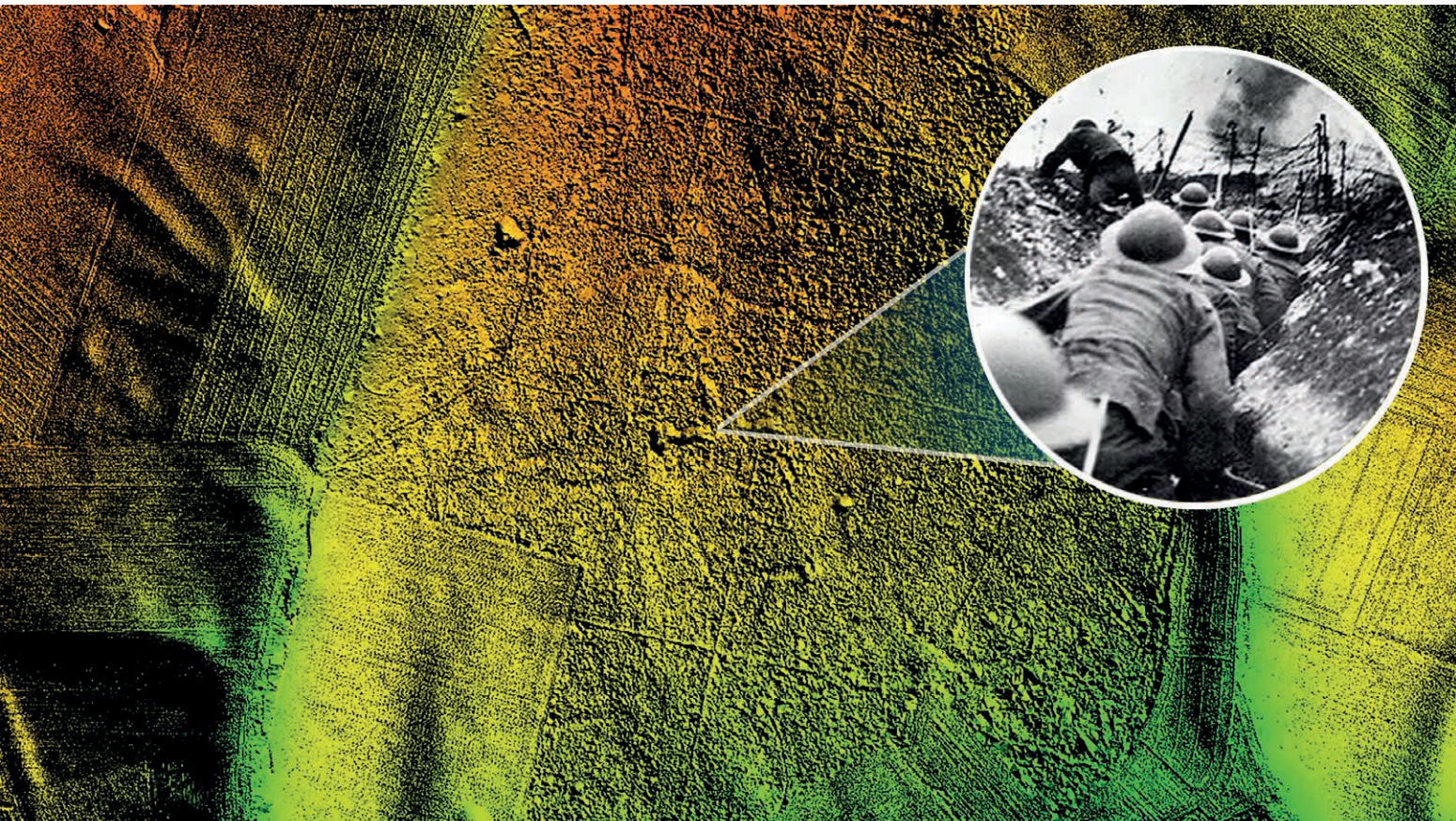
An aerial survey using aircraft mounted lasers has revealed previously undiscovered evidence that might potentially help to dispute accusations of a lack of determination by Welsh soldiers during the first Battle of the Somme in the Great War of 1914-1918. Aerial mapping company Bluesky flew an area of northern France called Mametz Wood, capturing accurate 3D measurements of the terrain and ground cover. Specially commissioned by Bearhug TV, the Bluesky LiDAR survey revealed two distinct and previously unrecorded topographies for further investigation and analysis.

"The Bluesky data allowed the experts to read the landscape from the air, seeing through the trees and vegetation. This revealed a number of clues in a never before seen landscape. It was hoped that these discoveries might give a better understanding of the difficulties faced by the soldiers on the ground."

commented the programme's producer, Louise Bray of Bearhug TV.

In the years since 1916, there has been uncertainty as to why Mametz Wood proved so hard for the Welsh Soldiers to clear; there were even accusations of a 'distinct lack of push'. As part of a BBC TV documentary which explored the history of Welsh soldiers on the Somme through the eyes of rugby player Gareth Thomas, the evidence revealed by Bluesky LiDAR data was used to evaluate the topography of landscape and help the archaeological team focus their efforts on the ground.

Using specialist software, the Bluesky LiDAR data was stripped of tree cover and other features to reveal the bare earth surface. The resulting 'moonlike' image clearly showed two crater-like features with rectangular sides, so, not shell holes, which were not on any other map. To the east of these anomalies was another, more subtle feature, also not depicted on war time maps or in reconnaissance information.



First World War trenches, battle of the Somme, Mametz Wood, Northern France

"The first feature identified from the Bluesky LiDAR survey turned out to be a pre-war quarry. Not depicted on maps at the time, this could very well have stopped the troops in their tracks. However, the second anomaly turned out to be far more significant.

A series of deep interconnected German trenches was discovered, which the experts say was incomparable

on the entire Somme battlefield. This was a major new discovery that would never have been made without the Bluesky LiDAR data, and might finally allow accusations of lack of determination on the part of the Welsh troops to be put to bed!"

continued Bray.

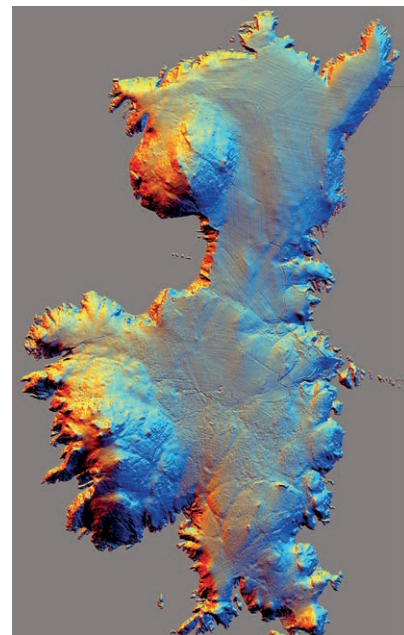
Bluesky 3D Laser Maps will help protect Coastal Heritage Sites in a new €4 million EU Project

The Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) has commissioned aerial mapping company Bluesky to capture highly accurate laser maps of six coastal locations in the Irish Sea. The five-year CHERISH project, funded through the European Union's Ireland-Wales programme, will analyse coastal and island archaeology and maritime heritage sites most affected by climate change, coastal erosion, storms and rising sea levels. The early acquisition of the Bluesky LiDAR data for CHERISH will provide the first 3D data for many of the Welsh islands under study.

CHERISH scientists will use the Bluesky data to produce new archaeological mapping and management maps for the tourist and heritage sites, which include the renowned nature reserves of Bardsey and Ramsey Islands, highlighting climate change threats for owners and managers. The Bluesky LiDAR data will also be used to produce stunning 3D visualisation and animations and the results will, in due course, be made available via the CHERISH project website.

"The Bluesky LiDAR data represents a vast new resource of high resolution landscape data, giving us new spatial information on the built heritage, archaeology, geology and landscape of these remote locations. The Bluesky data will also complement the use of other innovative visualisation and geomatic data solutions by the joint nation CHERISH Survey Team, including 3D photogrammetry derived from aerial photography and drone surveys, and ground based laser scanning and archaeological survey using differential GPS."

commented Dr Toby Driver, Senior Investigator at The Royal Commission.



Airborne laser scanning (LiDAR) of Ramsey Island (Crown: CHERISH PROJECT 2017. Produced with EU funds through the Ireland Wales Co-operation Programme 2014-2020. All material made freely available through the Open Government Licence).

"This is an exciting new project, bringing a strong partnership of archaeologists, geoscientists and maritime specialists to bear on the significant challenges posted by climate change."

added Christopher Catling, Secretary (CEO) of RCAHMW.



3D animation of Bardsey Island (Ynys Enlli) in North Wales, generated by draping aerial photography over the new LiDAR dataset (RCAHMW – CHERISH Project)

The key objective of the CHERISH project is to increase knowledge and understanding of the impacts (past, present and near future) of climate change, increased storminess and extreme weather events on the cultural heritage of reefs, islands and headlands of the Welsh and Irish regional seas. The project targets data and management knowledge gaps, employing innovative techniques, such as the Bluesky LiDAR, to discover, assess, map and monitor heritage assets, disseminating the results and developing best practice for future climate change adaption.

Findings

Not only has this led to the discovery of new archaeological sites but it also provides an accurate and precise dataset which can be used to monitor environmental changes on the island as a result of climate change.

"We have added a wealth of new archaeological sites to the story of Ramsey Island, using an incredible 3D dataset which has presented us with a stunning view of the island in enormous detail."

said Dan Hunt, CHERISH archaeologist at the Royal Commission

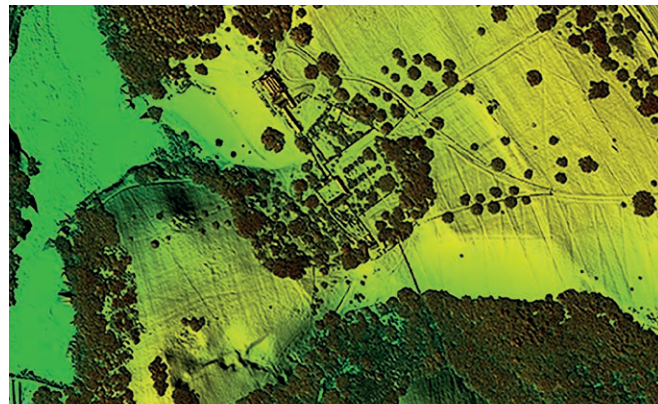
The new survey has revealed exciting sites such as Bronze Age round barrows, a prehistoric coastal promontory fort, the possible site of a lost chapel and a multitude of ancient field systems. These discoveries are forcing archaeologists to change their interpretation of how humans would have interacted with Ramsey Island during the last 4,000-5,000 years. Different 3D visualisations have revealed many archaeological earthworks for the first time which are either inaccessible on foot or are too subtle to see on the ground due to bracken and scrub vegetation.

National Trust Deploys Laser Survey Aircraft from Bluesky to Map Shropshire Estate in 3D



[Aerial imagery of National Trust, Dudmaston Hall](#)

The National Trust has turned to aerial laser mapping to create accurate 3D models of the Dudmaston Hall estate in Shropshire. Working with aerial mapping company Bluesky, the Trust plans to improve access to the historically and culturally important estate. Measurements captured using aircraft mounted lasers have been used to create the 3D visualisations of the 17th century country mansion estate and woodland areas. The Bluesky laser data, known as LiDAR, is now being used to underpin and inform other survey activities, and allow for improved access to the estate through the design and creation of additional walking and cycling routes.



Digital Surface Model of Dudmaston Hall created from Bluesky LiDAR data

"We are always looking to improve the visitor experience at our properties through new attractions and better access to existing facilities," commented Sue Briggs, Outdoors Project Manager for the National Trust at Dudmaston. While we had some aerial survey images of the main hall and gardens, much of the estate was previously unmapped. Working with Bluesky to capture the LiDAR and create detailed 3D visualisations, we now have a much better understanding of the topography of the site."

"The Bluesky LiDAR data is already helping us plot routes through the woodland area for improved access by walkers and cyclists, and is underpinning other activities including an historical landscape survey and archaeological study."

commented Sue Briggs, Outdoors Project Manager for the National Trust at Dudmaston

Bluesky undertook the LiDAR survey in November 2016 in accordance with tight project deadlines and uncertain weather conditions. The resulting 16 ppm (points per metre) data was delivered to the client for use at both a local level and also in the main National Trust GIS and mapping systems by specialist staff and stakeholders.

Dudmaston Hall is a traditional example of a country estate comprising a late-17th century mansion, landscaped gardens, parkland, managed woodland, lakeside and farmland. Dudmaston also includes the nearby village of Quatt, a model village designed by London architect John Birch for the workers and tenants of the estate.

Today Dudmaston Hall estate contains an outstanding art collection, described as 'one of Britain's most important public collections of modern art', including sculptures by Henry Moore and Barbara Hepworth, plus an extensive collection of mid-20th century Spanish paintings and pottery.

Bluesky Aerial Laser Survey set to Reveal Hidden Iron-Age Archaeology

High tech aerial laser surveying technology is being employed to reveal the hidden archaeology of an Iron-Age hill settlement in Lancashire. Visually, the archaeological features are very difficult to see, but the Bluesky laser survey, commissioned by the Morecambe Bay Partnership, is expected to reveal previously undiscovered details of the settlement at Warton Crag. Identified as an important 'Heritage at Risk' site, the site has already been subject to low level archaeological investigations, which have identified remains from a small, well defended hill fort.

Morecambe Bay Partnership commissioned the Bluesky laser survey as part of the Heritage Lottery Funded Headlands to Headspace initiative - designed to improve the understanding of Morecambe Bay's natural and cultural heritage and help conserve that heritage for future generations. The Bluesky LiDAR system uses lasers to accurately measure the earth's terrain and record features on the ground in 3D. The dedicated survey plane is also equipped with aerial photography equipment, and will fly over the site during the winter months when the tree and canopy cover is at its minimum.

"It is imperative that we get a better definition of the archaeological remains that are currently 'hidden' by the dense vegetation cover. This will enable us to develop conservation strategies for the site and work towards reducing the risk to the archaeological remains. The site is currently on Historic England's 'at risk' register, so this work is crucial in developing partnerships and strategies to protect the monument for future generations."

commented Louise Martin, H2H Cultural Heritage Officer at the Morecambe Bay Partnership.

"Working with Bluesky, utilising their state of the art LiDAR system and proven experience in this field, we hope to reveal previously undiscovered details,"

The laser equipment provides a fast and cost-effective method of capturing highly accurate measurements of the entire site and its surroundings with minimum impact on a nationally important wildlife conservation site, a Site of Special Scientific Interest, in an Area of Outstanding Natural Beauty."

added Martin.



Survey area of Iron-Age hill settlement in Lancashire

Bluesky will process the millions of individual laser measurements to create detailed 3D computer models of the earth's relief – a Digital Terrain Model (DTM) and ground surface including buildings and vegetation – a Digital Surface Model (DSM). The 25cm resolution models created by Bluesky are compatible with all

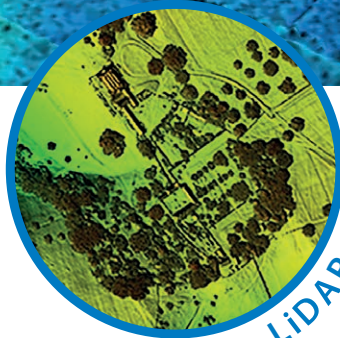
leading Computer Aided Design (CAD) packages and Geographic Information Systems (GIS), allowing Morecambe Bay Partnership to understand the 3D data in the context of existing mapping, model different scenarios and strategies and share information with project partners.



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About Bluesky

Bluesky is a specialist in aerial survey including aerial photography, LiDAR and thermal data, using the very latest survey technology, including two UltraCam Eagles and a Teledyne Optech Galaxy LiDAR system integrated with a PhaseOne camera and thermal sensor. An internationally recognised leader with projects extending around the globe, Bluesky is proud to work with prestigious organisations such as Google, the BBC and Government Agencies.

Bluesky has unrivalled expertise in the creation of seamless, digital aerial photography and maintains national "off the shelf" coverage of aerial photography, DTM and DSM through an ongoing three-year update programme. By purchasing a world first sensor for the simultaneous capture of LiDAR, Thermal and Aerial Photography data, Bluesky is in the enviable position of being able to provide customers with unique and cost-effective solutions.


Bluesky is leading the way in developing innovative solutions for environmental applications, including the UK's first National Tree Map™ (NTM™), solar mapping and citywide 'heat loss' maps and 3D models.

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