SEABIRD FLIGHT HEIGHT ANALYSIS USING HIGH-RESOLUTION DIGITAL VIDEO AERIAL SURVEYS

HiDef
AERIAL SURVEYING LIMITED

HiDef has worked to provide a method that is transparent, workable, auditable and can provide unbiased measurements.

Calculation of seabird flight height to help inform planning decisions using collision risk modelling has been a thorn in the flesh of the offshore wind industry since it began. Digital aerial video data can offer a cost-effective solution to obtaining flight heights of birds across entire sites concurrently with density estimation by measuring the sizes of birds in the video compared to the sizes of birds known to be flying at the sea surface.

The calculation is undertaken utilising 'knowns': known measures of bird length, known measures of aircraft altitude and known measures of bird size near sea level. Reasonable variation is considered; racial differences for populations and sexual dimorphism show that many bird species come in a range of sizes. Though this slightly muddies the waters, the HiDef method allows error margins to be calculated and provides regulators with confidence that these issues are being accounted for.

The basic premise of the HiDef system is that the closer a seabird flies to the aircraft the larger it will appear in the image recorded. If the bird were flying at aircraft height it would fill the frame, but if it is 500m away it will be much smaller. The HiDef method allows each object to be measured a number of times over a period of around one second; typically six images of each object. As well as improving identification and detection rates, it allows a range of measurements to be made of the same individual bird.

SUMMARY OF BENEFITS

Data are collected at the same time as population counts

Collects data for nearly all birds unlike LiDAR which misses most birds

Transparent and auditable measurement process

Unbiased data from aircraft flying at a high survey altitude (550m)

No bias (attraction and flushing) from the aircraft as occurs with seabird survey ships and low flying aircraft for LiDAR

Reduced human time at sea minimises health and safety risks

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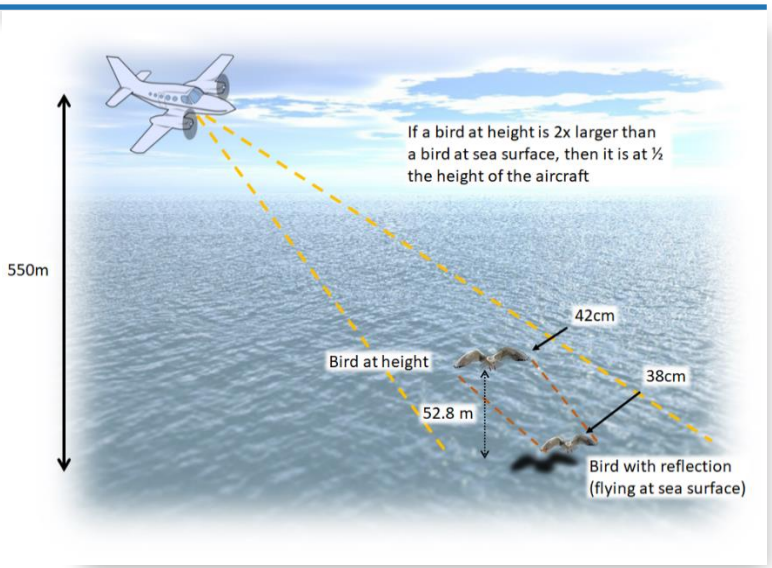
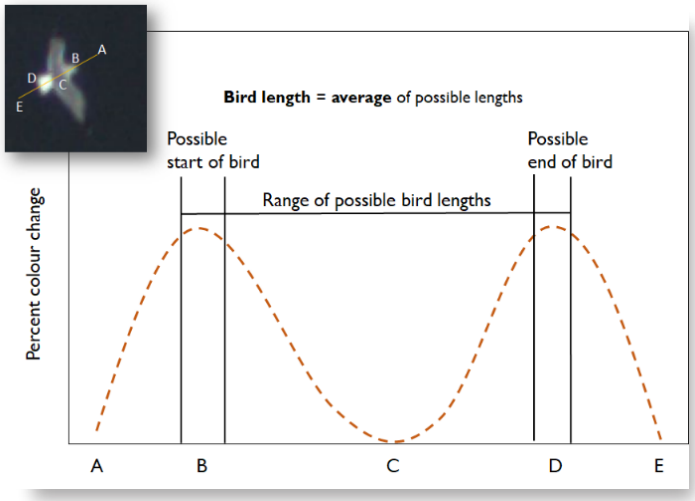
Method

Ideally a bird would be parallel with the aircraft and sea surface to allow the best measurements of size to be obtained. However, seabird trajectory is rarely straight forward, and their biology means that they bank, shear, twist, turn and effectively contort in relation to the camera. This limitation can be overcome by taking multiple measurements of the same bird in different video images.



Within three metres of the sea surface, under certain lighting conditions, birds produce a reflection off the sea surface. This only occurs at low levels and has allowed HiDef to create a database of measurements, allowing for a 'known', size of a species at or near sea level to be created. This creates a baseline for other measurements to be compared against.



HiDef operators take the measurements using a tool which records the position of either end of the bird based on colour change between pixels to improve the measurement accuracy.

The known size measurements for the bird species at or near sea level and the aircraft altitude are then combined with the size of each individual bird to calculate a flight height. Sometimes, bird measurements fall outside the range of possibility, which usually arises if the bird is contorted in relation to the camera and measures particularly short (i.e. a diving gannet when viewed from above will measure much shorter than a bird in constant horizontal flight), or rarely may measure long if there is any image blur. This is accounted for by removing these few cases that might bias the overall sample.

Validation

HiDef undertook measurements of objects from the aerial footage of known size and validated the size and height measurements. Football goalposts and parking bays were measured but for a more realistic check at ground level, HiDef measured the size of A4 sheets of paper using a camera system operating at typical survey altitude. A similar process was completed for a number of other objects at known height, notably road markings on the Humber Bridge. Here the known height above sea level allowed a double check of the accuracy of the HiDef system. Robust returns from these validation exercises supported the confidence in the system and the method. **The process has been presented to regulators and developers and is now being used on a number of pre-consent and pre- and post-construction developments in the UK and Ireland.**

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