

The National Centre for
Environmental Data
and Surveillance

Compact Airborne
Spectrographic
Imager: CASI



ENVIRONMENT
AGENCY

Compact Airborne Spectrographic Imager: CASI

The Environment Agency spends £13.3m annually on research and development. A significant proportion of this is allocated to the environmental monitoring techniques topic managed by the National Centre for Environmental Data and Surveillance.

The Environment Agency has a duty under the Water Resources Act 1991 to monitor the extent of pollution in controlled waters and, under the Environment Act 1995, the Environment Agency has a duty to form an opinion of the general state of the pollution of the environment.

In order to help it carry out these duties, the Agency uses a Compact Airborne Spectrographic Imager (CASI) to remotely sense the state of the environment.

The CASI is designed to provide a flexible system which is easy to transport and straightforward to install and operate in small aircraft. The system has a "pushbroom" configuration, i.e. the full swath width is imaged instantaneously in a large number of spectral wavebands (up to 288) covering the visible and near infra-red regions of the spectrum between 430 nm and 870 nm. This can be used to construct hyperspectral image data sets for detailed studies of the spectral characteristics of ground or water targets. Spatial resolution can be varied from one to ten metres, and is governed by the flying altitude.

The CASI is operated in one of three modes:

- **Spatial mode:** All 512 swath pixels are recorded in up to 19 wavebands, the wavelength and width of which can be interactively specified by the operator.
- **Spectral mode:** Data from all 288 spectral bands are recorded from 39 pixels across the swath.
- **Enhanced spectral mode:** Data can be acquired over approximately 300 pixels in up to 72 channels.

Geometric correction is a routine step that is performed once the data are delivered, and is achieved through the use of a vertical gyroscope and a global positioning system. Radiometric correction can be performed both through preflight calibration constants and using an incident light sensor to measure the downwelling radiance at the aircraft.



Airborne surveillance using the CASI system

Typical applications are:

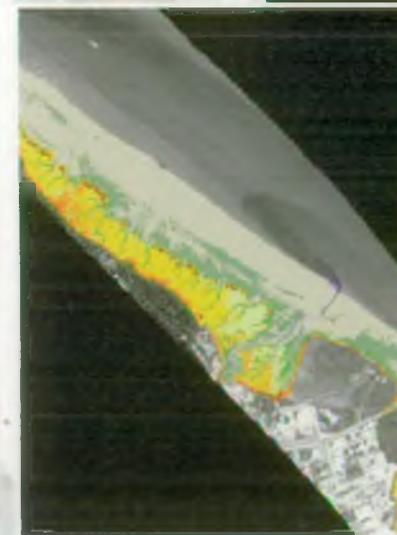
- land classification;
- landfill site assessment;
- identification and tracking of dissimilar bodies of water;
- monitoring and pollution detection;
- estimates of suspended solids concentration and changes in coastal morphology;
- estimates of chlorophyll-a for use in eutrophication studies; and
- mapping of mixing zones, outfalls and rivers.



Southampton Water: True colour composite CASI image, Fawley area



False colour composite CASI image, showing vegetation in red



Classification of CASI data showing different inter-tidal surfaces



Spectral profiles of various ground cover types in Langstone Harbour

Key	
Green	Terrestrial Vegetation
Light Green	Land
Orange	Upper Marsh - Phragmites & Agropyron
Yellow	Mid-Upper Marsh - Puccinellia (4b) with Aeluropus
Light Yellow	Low-Mid Marsh - Halimolobos with Spartina
Light Green	Pioneer Marsh - Spartina
Dark Green	Dense Algae
Light Green	Sparse Algae
Light Blue	Mud
Dark Blue	Water
Dark Blue	Wet Mud

One in a series of booklets describing techniques used by the Environment Agency's National Centre for Environmental Data and Surveillance. For further information please contact Nick Holden or Dr Richard Saull at the National Centre address shown overleaf.

MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

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For general enquiries please call your local Environment Agency office. If you are unsure who to contact, or which is your local office, please call our general enquiry line.

ENVIRONMENT AGENCY GENERAL ENQUIRY LINE

0645 333 111

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

ENVIRONMENT AGENCY EMERGENCY HOTLINE

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