FIFE NESS SURVEY

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We're maritime archaeologists – that is, we're interested in the remains people have left behind which tell us of humankind's long relationship with the sea. In the past we've worked on sunken shipwrecks – victims of the Spanish Armada lost in the gales of 1588, East Indiamen wrecked on British shores at the start of their long voyage to the Far East, and most recently a small warship sent by Oliver Cromwell to invade the island of Mull off the west coast of Scotland in 1653. But not all the remains we investigate are under water. There is a veritable treasure-trove of information lying along our coasts, and that's what we've been exploring today.

We're working at Fife Ness on the east coast of Scotland, at the end of the peninsula which divides the estuaries of the Forth and Tay. Just off the headland is a dangerous reef, the Carr Rocks, which in the past has been a major hazard for shipping. In 1813 the great lighthouse-builder Robert Stevenson began erecting a stone beacon to mark the end of the reef, a difficult task because the rock on which it was to stand only uncovers for a few minutes at low tide. So the interlocking stones had to be prepared on land, and shipped out to be assembled as rapidly as possible on the reef.

What we've discovered is a circular jig cut in the rock, where workmen could dress the stones to shape, practice putting them together, and then load them onto lighters for the mile and a half journey to the reef. At the water's edge is a ruined stone-built quay. This was once linked to the jig by iron rails along which trolleys carrying the stones were pushed. No trace of the rails survives, but holes drilled in the rock for supporting stanchions show where the line ran.

We decided that the best way to record these complex features would be to take vertical aerial photographs. But a ladder or even a telescopic mast can't go high enough, while for safety reasons a conventional light aircraft isn't permitted to fly sufficiently low. Neither system would have enabled us to take fully vertical pictures anyway. So we've obtained our own 'eye in the sky' – a tiny HexaKopter drone (www.mikrokopter.de) which is gyroscopically stabilised and

linked to the Global Positioning System (GPS) for accurate positioning and altitude control.

It carries a camera which automatically adjusts itself to a vertical position (or whatever angle we want). A video link to the ground gives real-time feedback of what the camera 'sees', and when the framing is right a high-resolution digital photograph is taken. The photographs are subsequently rectified (adjusted by computer) to form an accurate plan. This is the first time we've used the system in the field and – joy of joys – it works! We're now developing the tool as an ideal method for speedily and accurately recording archaeological features around our coastline, and elsewhere too.

Nearby is another feature we recorded during today's visit. It's a tidal mill, whereby the rising tide filled a reservoir held by a stone-built dam, and when the tide receded it flowed through a narrow channel with a water-wheel which drove a millstone. Again the HexaKopter gave us the photographs we need to plot the detailed construction of the partly-collapsed dam walls and show the complicated cuts and slots in the natural rock in which the vanished water-wheel structure was bedded.

We're all in our various ways professionals, but we started this project as a private venture because we thought it would be interesting, useful, and fun. Dr Paula Martin is an archaeologist and historian who currently edits the *International Journal of Nautical Archaeology*; and Dr Colin Martin is a retired Reader from St Andrews University who specialised in shipwreck archaeology and aerial photography. Paula and Colin are both honorary members of staff at

University College London's Institute of Archaeology. Edward Martin is a commercial photographer with expertise in archaeological and museum work, www.em-photo.co.uk, and he flies the HexaKopter. As you may by now have guessed, it's very much a family enterprise! We hope you like our video and a selection of the photographs we took during our day in the field.


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