Fairey Surveys
newsletter
APRIL 1975
14
News of developments in the world of surveying and mapping

Management Changes

Best Wishes

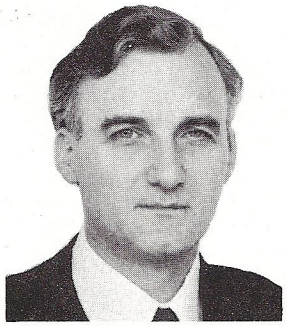
Mr. Walter P. Smith O.B.E., M.A., F.R.I.C.S., has been appointed Adviser to the United Nations on surveying and mapping and will be leaving Fairey Surveys to take up his appointment in New York during April 1975. We wish him every success and we are sure that all regular readers of our Newsletter will wish to be associated with this message.

Walter Smith has been Managing Director of Fairey Surveys since 1969, during which period he has published many professional papers on surveying and mapping primarily demonstrating the wide applications of aerial photography and photogrammetric measurement techniques. He has established international links with associated companies in many parts of the world and these will be carried on by Fairey Surveys new Chief Executive, Mr. A. C. Hayward, M.B.I.M., who will assume responsibility for all the companies within the Survey Division of the Fairey Group of Companies. The direct control of the professional surveying activities will be the responsibility of the Director and General Manager, Mr. L. Scott, F.R.I.C.S.

Welcome New Chief Executive

Tony Hayward joined Fairey's Guided Weapons Division in 1954 to supervise the trials and data reduction services associated with this activity. He was responsible for setting up and running a data reduction unit in Australia in support of air to air missile trials at Woomera.

In 1959 he became close involved in the groups successful commercial diversification programme and was reponsible for setting up and running two new subsidiary companies, Fairey Stainless and Fairey Filtration.



He was subsequently appointed Commercial Director of the Fairey Company. More recently he has been in charge of the re-organisation of the Fairey Marine Division, where he has transformed a company specialising in a limited range of leisure craft into an internationally successful military and commercial marine product division. In addition to this continuing responsibility the Fairey Group has asked Tony Hayward to take overall charge of the Survey Division and of its international development.

This appointment follows the Fairey policy of having senior Group Executives directly responsible to the Fairey Company for the mainstream activities of each product division.

Congratulations Director and General Manager

Mr. Lawrence Scott, F.R.I.C.S. is well known in professional surveying circles and has been with FaireySurveys since the early 1950's. He has previously occupied the positions of Chief Surveyor, Mapping Manager and Production Manager. In addition to being a Chartered Surveyor, Mr. Scott holds a Diploma in Management Studies. He joined the Company as a land surveyor and has had considerable overseas experience: milestones include the field control for the Kariba Dam Project in Central Africa and implementation of the field control and large scale mapping for an irrigation scheme in East Pakistan covering nine thousand square kilometres.

In addition to field survey, he has experience as a camera operator and navigator, flying photography with the Company's aircraft and was technically responsible for the first major contract, to be undertaken by a British Company, using the Airborne Profile Recorder equipment.

Mr. Scott was a Council member of the British Cartographic Society from its formation until 1972 including four years as Treasurer. He is currently on the Land Surveyors Divisional Council of the Royal Institution of Chartered Surveyors.

Remote Sensing

Paper presented in Scotland

The Remote Sensing of the Environment was the subject of the paper presented on behalf of Fairey Surveys Scotland by Dr. J. L. van Genderen, to a meeting at the Scottish Development Department, on the 11th February. This presentation was attended by 45 professional and technical staff from not only the Scottish Development Department but also various other Scottish office departments.

After a brief introduction to the various types of imagery most commonly used for the collection of environmental data, some specific case-histories were discussed and illustrated with slides and a display of examples. Included in this part of the presentation were many of the pressing problems of the 20th century, which Dr. van Genderen explained could perhaps be better solved only when all possible data had been collected, processed and fully understood. Studies in the following fields were discussed in great detail: Environmental Pollution, Land Use Surveys, Derelict/Despoiled Land and Waste Disposal Surveys, Natural Resource Surveys and Environmental Management Planning.

Operational Remote Sensing of the Environment

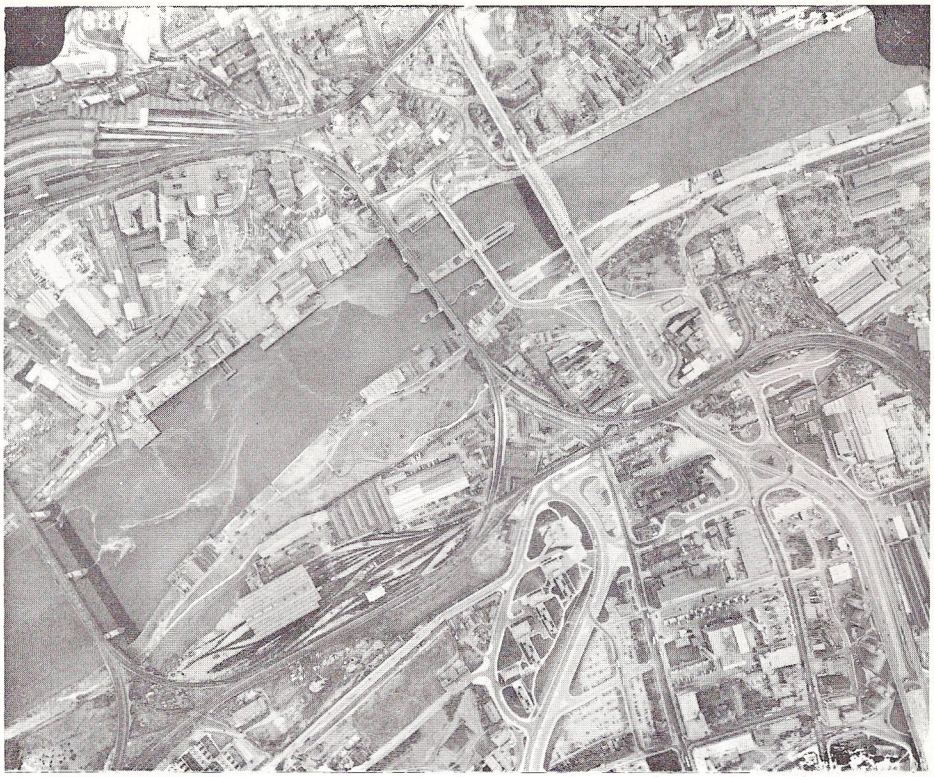
To coincide with the announcement of the contract awarded by the U.K. Government's Department of the Environment to Fairey Surveys Ltd. to map the areas of developed land for the whole of England and Wales by means of remote sensing, we are happy to include in this issue of our Newsletter a paper on remote sensing of the environment by J. L. van Genderen, B.A., M.Sc., Ph.D., a lecturer in the Department of Geography, University of Sheffield and coordinator of Fairey Surveys' "Environment and Resources Consultancy".

INTRODUCTION

Remote sensing of the environment is concerned with the rapid monitoring and measurement of environmental conditions by airborne and spaceborne sensors. Remote sensing refers to a series of closely related activities, which include not only the selection of appropriate instruments and platforms, but also data collection, processing, interpretation, distribution and analysis. The main sensors in operational use in the United Kingdom are aerial cameras and line-scan instruments. The former result in either the conventional black and white panchromatic vertical aerial photograph, or in colour, colour infrared (false colour), black and white infrared, or multispectral photography, where four different film types are employed to provide different images of the same area simultaneously. Line-scan instruments in use to date have been limited to thermal infrared line-scanners, although now the Bendix II band multispectral scanner is also available through Fairey Surveys' membership of the European Group for Environmental Studies, as reported in Newsletter 13. The principal platform on which such sensors are carried is the aircraft, although platforms may range from terrestrial photography, through towers, helicopters, aircraft, balloons and rockets to orbiting satellites, depending on the particular aspect of the environment under consideration. Some of the man *operational* applications of remote sensing for environmental management planning are: environmental quality studies, land-use mapping, derelict land and waste disposal studies, and natural resources surveys.

ENVIRONMENTAL QUALITY

The collection of data necessary to establish a base-line of environmental quality, as well as studies to determine the extent of the impact from existing development has to date usually been carried out by means of laborious, time consuming and hence costly field investigations. Remote sensing technology can provide a more efficient, systematic and cheaper approach to environmental data collection and field survey planning. To show how action may be stimulated to improve environmental quality through the collection, interpretation and use of remote sensing data, a series of steps and procedures are outlined below and used as guidelines to indicate how remote sensing can be used to accomplish any of the following types of objectives in the field of environmental quality assessment. (i) Collect data for land-use mapping. (ii) Detect alien substances in the environment. (iii) Identify specific pollutants and classes of pollutants. (iv) Monitor the source, movement and fate of pollutants. (v) Determine the effects of pollutants on the environment, and (vi) Analyse remotely sensed data to determine environmental quality, the susceptibility of the environment to degradation, and provide data for comprehensive environmental management planning.



Example of Land use.

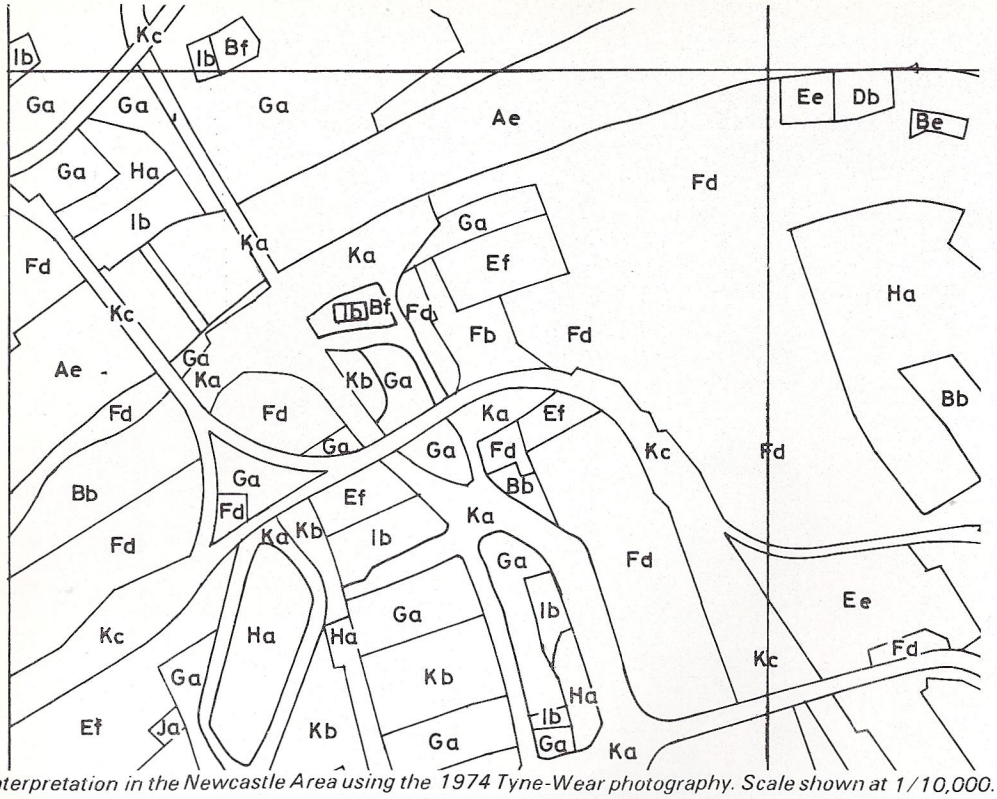
The first step in such an approach is to define the area or areas to be surveyed and then to collect whatever environmental data already exist. Such data are usually referred to in a remote sensing programme as ground truth information, and represent the first step in gaining an understanding of a region.

While the ground truth information is being collected, a set of high quality aerial photographs of the study area should be flown. After the aerial photography has been acquired, skilled photo interpreters would prepare land-use maps of the area. By measuring these areas, it is then possible to determine how much land is devoted to each activity. This type of information can be extremely useful to various people besides those conducting environmental pollution studies, and in most cases it is usually collected for reasons other than to determine environmental quality. However, many of these inter-departmental activities can and should be integrated. It is widely accepted in terms of cost, time and accuracy, that the best method of land-use mapping is by means of remote sensing.

When these steps have been completed, one can begin extracting the specific information concerning the detection, identification, and monitoring of environmental pollutants. It is not sufficient, for example, simply to acquire aerial photography and to file it for future reference. Relevant information must be extracted from the photography to serve both as a base-line against which to monitor subsequent change, and for taking and implementing planning decisions. By careful examination of the photography, interpreters can be helped to carry out a cataloging and inventory of effluents, sewage plant location, present industrial location, smokestack plumes, etc. By plotting this data together with such things as the location of heavy industry, which may already have been located during the compilation of the basic land-use overlays, a base map of pollution sources and indicators can be compiled.

Once the basic photographic coverage has been analysed, the requirements for further photography will become obvious. It is at this point that special sensors, altitudes, and film/filter combinations will be required. For example, it is highly recommended that false colour photography be flown over major urban and industrial areas, not only to determine vegetation stress due to pollution, but also to detect vegetation diseases such as Dutch Elm disease. Another technique is to fly thermal infrared line-scan over major river systems and estuaries to identify and record such features as oil spills and thermal effluents.

The next step in determining environmental quality is to build up an information system and a working model of the region. This involves the use of a computer to store the available environmental information on a particular region or country. One method is to digitize the photo interpretation map overlays on the basis of kilometre grid squares, thereby facilitating data extraction, and comparisons with subsequent data sets. Another method is to code and store the data so that it can be related to enumeration districts, allowing the data to be correlated with other Census information. Thus remote sensing is a systematic approach which facilitates the future use of the data for other purposes, including the work of other County or Government departments. Each new set of data may then be entered and compared with previously collected data. Out of such a comparison may come new information on which to base conclusions regarding environmental quality assessments. Fairey Surveys' "Environmental and Resources Consultancy" can advise Counties and Government departments on all these various stages. The final stage in such a regional environmental quality study is to initiate corrective programmes and practices. This involves decisions which must be made by the administrators, resource managers, ecologists, planners developers, etc. Once corrective actions have been taken, it is usual to monitor the region in order to assess the environmental improvements which have resulted. This, of course, can also be accomplished by remote sensing. Thus, if periodic remote sensor coverage is acquired, it can be used not only to produce new data to be analysed and entered into the information system, but it can also be used to assess the success or failure of the corrective programmes and practices.



Interpretation in the Newcastle Area using the 1974 Tyne-Wear photography. Scale shown at 1/10,000.

LAND-USE SURVEYS

Several aspects of land-use surveys have been mentioned in the previous section. The important point arising from this is that almost all planning decisions need land-use data. Whenever a project requires land-use mapping, there is always the question of the scale and level of information necessary. Whilst it may be necessary to photograph in detail a particular negative aspect of the environment such as vegetation stress resulting from a power station, one also needs to know what its place is in the total environment. To obtain this picture, one must use the so-called synoptic or smaller-scale data. An example of this is the Government Department of the Environment's project on land-use. This study will be particularly concerned with all developed areas in England and Wales, and will be carried out solely by means of air photo interpretation using existing 1969 RAF photography at a scale of 1:60,000. This will result in a series of well over 100 land-use maps being compiled at the new 1:50,000 scale within twelve months of commencement. The Department of Environment intend then to computerise the handling of the mapped information recording the situation as it was in 1969, especially for measurement purposes and in order to relate it to Census information. The mapped areas will be measured and form a data base-line for monitoring subsequent changes in the developed areas and for analysis of the spatial distribution of land-use.

Besides such national land-use surveys of developed areas, more detailed regional/county surveys can be undertaken by means of remote sensing. One example of such a survey is that done by Fairey Surveys of part of the Tyne-Wear County area in north-east England, where a pilot project was carried out which consisted of mapping fifty categories of urban and rural land-use at the six inch scale (1:10,560), using 1:5,000 aerial photographs.

DERELICT/DESPOILED LAND AND WASTE DISPOSAL SURVEYS

Fairey Surveys have developed operational systems for monitoring derelict/despoiled land, and also for collecting and analysing data for land reclamation.

For example, either very rapid, simple surveys can be carried out by means of air photo interpretation suitable for County returns to the Department of Environment, or much more detailed surveys of industrial and other forms of despoiled land can be provided by remote sensing. There is now available a complete remote sensing package for derelict land and land reclamation, and this package or selected parts thereof (depending on the problem under consideration), will provide an economical, fast and reliable way of locating, monitoring, mapping and handling land studies and land reclamation schemes.

There are many applications of remote sensing in identifying, locating, mapping and measuring present and potential tipping sites. The new County Councils, who are now responsible for the management of waste disposal, are also required to produce plans for the disposal of waste over the next ten years. Just four brief examples are quoted below of remote sensing applications to various aspects of waste disposal studies, which may be of interest to County Councils. These are:

1. Standard black and white panchromatic aerial photographs for analysis of individual waste disposal sites or for county wide systematic monitoring of all sites in a county.

2. Use of false colour infrared photography for detailed investigations into the environmental conditions at any particular site.

3. Volumetric measurements of waste disposal sites for assessment of capacity and for planned utilisation of available space, and

4. High density polyurethane land form models of individual waste disposal sites for planning and management purposes.

NATURAL RESOURCES

Remote sensing techniques, because of their speed and flexibility in terms of scale, are ideally suited for carrying out national and regional natural resources surveys. National forest inventories, surveys of regional water resources, agricultural surveys, geological and mineral surveys, etc. of large areas, can only be completed rapidly and economically by means of remote sensing.

For example, before the developing countries can decide how best to utilise their natural resources, they need to know what these resources are, where they are located, and in what quantities. This is where remote sensing can make a large contribution to data collection and analysis.

Other remote sensing applications for which methodologies have been developed and which can be offered as operational services to clients are studies of recreation and tourism, crop condition estimates, crop inventories, engineering, the conservation of high quality farmland, water catchment areas, timber resources, etc.

COSTS

One of the reasons put forward by many Counties for not making greater use of remote sensing techniques is the cost of having air cover flown. Some of the ways in which the costs can be reduced are discussed in the following paragraphs.

The formation of the new administrative County Councils has resulted in an urgent need to have up to date aerial photography not only for updating maps, producing new maps, etc., but also for planning purposes. The costs of having such air cover flown could be reduced considerably if proper rationalisation and collaboration was adopted, (i) between the departments of one County Council, and (ii) between neighbouring County Councils. There is much scope for consultation between departments of a County, such as those concerned with planning, public works, environment, etc., to determine their aerial photographic requirements, in order to maximise the usefulness of the photographs. Often photography is flown for one department at a scale, time of year, etc. which is not suitable for the data requirements of other departments of the same County, resulting in unnecessary duplication and costs. It should be realised of course, that not all the applications mentioned in this paper require a separate set of aerial photographs. One of the great advantages, in fact, of using remote sensing techniques is that with one suitable set of high quality photos, almost all of the applications mentioned can be carried out using experienced interpreters. This greatly reduces the cost of such studies, and is one of the main attractions of using remote sensing. Thus whilst it may be considered uneconomical to obtain complete up to date county air photo coverage for carrying out recreation studies, the same photography could be economically used for map revision, land-use mapping, derelict land mapping, waste disposal mapping, recreation studies, etc. That is to say, once the imagery is available for one purpose, all the other applications mentioned become economically very realistic propositions. Hence more use should be made of existing consulting advice, such as that which can be provided by Fairey Surveys. Such consultancy services help to reduce costs, optimise the uses of the photography, and draw on previous experience to decide scale, season of year, time of day, type of film, film/filter combination, mapping requirements, applications, etc.

CONCLUSION

The range of remote sensing applications described are now all available as fully operational programmes. This means that planners, engineers, etc. can be relieved from the time consuming and difficult task of attempting to collect and analyse such data by alternative expensive field techniques, leaving them with more time to concentrate on their main task — planning and decision making.

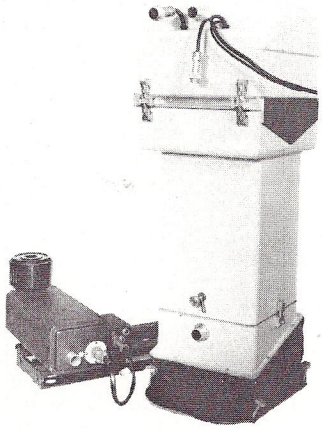
Air Conditioning of Airborne Cameras

Airborne cameras are often required to operate over a wide range of temperature and humidity. These variations can cause a considerable reduction in the quality of the image produced, by altering the focus of the optical unit due to thermal expansion of the lens cone and by introducing moisture on to the film and lens elements.

The Research and Instruments Group of Fairey Surveys has under Ministry of Defence Contract, developed an air conditioning unit in which the camera is housed, to maintain it's temperature at the optimum for correct focus and to avoid condensation forming on the camera or film.

The unit comprises a rigid container of G.R.P./foam polyurethane construction with an integral heat exchanger. The heating system is of the closed circuit type, air being forced round the camera and over a series of electrical back-heat elements. The heaters are controlled by a thermal sensor mounted adjacent to the camera. The container is provided with a detachable magazine cover to enable rapid changes of film, and a flexible bellows connection to the aircraft window to preserve the vibration isolation characteristics of the camera mounting.

The system can be tailored to meet the physical characteristics of most airborne cameras.



One of the many uses for County Cover

"The problem of waste disposal and the availability of suitable sites is a number one headache to many local authorities throughout the world.

The Royal County of Berkshire are tackling this site problem from a new angle.

Fairey Surveys have been requested to use County cover already completed to produce 1/500 plans with height information in a grid of spot levels.

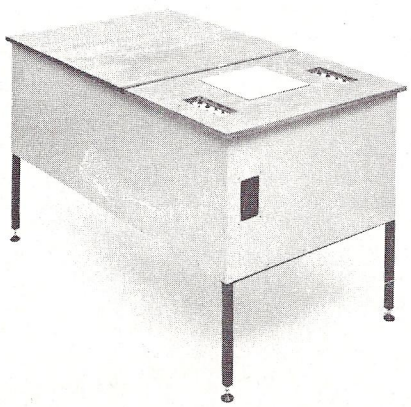
This will enable the volummetric capacity of the land to be calculated and assist the County Council in the assessment of possible solutions for the disposal of urban waste."

FREDDY WORTON

Congratulations to our Flight Trials Manager, Mr. F. J. Worton, upon his appointment as the first chairman of the newly formed Aerial Photography Group of the Royal Photographic Society. The inaugural meeting was held on the 28th January and already membership of the group spans the world with members from places as far apart as Mexico and South Vietnam. The aim of the Group will be to further wide interest in all branches of aerial photography including air reconnaissance, aerial survey, air to air photography, spacecraft photography and the many applications of aerial photographic technology.

The Fairey Colour Additive Viewer

The National College of Agricultural Engineering is building up an extensive library of ERTS-1 negatives covering different parts of the world. This cover is available to students and others for research purposes. Much of the current work is based on the information yielded by the Fairey Colour Additive Viewer. The research students have found the flexibility of the machine of great value and the variety of colour combinations and intensities has been found of immense assistance in resource identification. In particular, major structural features derived from geological factors have been revealed with great acciuracy and variations in grazing and land use intensity have been identified, giving, in turn, clues as to the likely intensity of soil erosion. In imagery of the Republic of Columbia one colour combination produced an image which was almost identical with an atlas representation of the land use of the same area. This was considered an excellent recommendation for the atlas!



More Leisure Maps

Latest subject areas in our series of Leisure Maps include Majorca, Ibiza and S.W. Ireland. All three are due for publication in April/May and represent a move into mass tourism areas for these increasingly popular maps.

Apart from the many complimentary letters received from satisfied users, we were delighted to learn that the Travel Editor of the Guardian considered our maps to be 'an example of how good a tourist map can be'. Perhaps the ultimate accolade appeared in Holiday 'Which' (1974) wherein it was disclosed that 'the best map we found was the Fairey Leisure Map" (of Corfu).

Model — Nigeria

As part of his retirement present, Brigadier S. O. Ogbemudia, the governor of the Mid-Western State of Nigeria, is to receive a highly detailed model of the state. The model measuring approximately 3ft. x 4ft. has been produced in Fairey Surveys' Terrain Modelling Department and has been flown to Benin City complete with presentation case and inscribed brass plaque. We too would like to wish Brigadier S. O. Ogbemudia success in his future posts.

Glasgow Transport Map

Fairey Surveys Scotland Limited has recently won a very interesting contract to design and produce a map showing public transport systems operating within the new Glasgow District. The map will be at a scale of 1/55,000 and will be a complete transportation plan indicating all bus routes, the underground system and all relevant British Rail services. The Greater Glasgow Passenger Transport Executive, who commissioned this project, are confident that it will assist in their efforts to improve the entire concept of urban transportation and will be invaluable to their plans for modernising the city's underground system.

Scottish Local Government Reorganisation

On May 16th the reorganisation takes place of the local government authorities in Scotland. The former Counties and Boroughs will be welded into nine new regions plus three Island Councils. At times of such upheaval, it is very difficult to maintain an accurate mailing list. We are therefore asking for your help by sending us details of people who would like to receive our Newsletter regularly or any amendments necessary in designation or address for people already on our mailing list.

We would like to offer our best wishes to all involved with the launching of the new regions and councils in Scotland.

If you require further information on items featured in Fairey Surveys' Newsletter or would like to be added to the mailing list for future issues,

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