This is Fairey Surveys

RANGE OF SERVICES AVAILABLE INCLUDE

Aerial Photography

Black and White
Infra-red, Colour and Multi-Spectral
Photo Mosaics
Photo Maps
Helicopter Photography

Airborne Geophysics

Magnetometer, proton precession and high sensitivity
Scintillometer and Spectrometer
Radio phase and Electro-magnetic
From fixed wing aircraft and helicopters
Infra-red Sensing
Data Processing

Ground Surveys

Site Plans
Levelling and Setting Out
Electro-magnetic Distance Measurement

Mapping

Photogrammetric mapping at large and small scales
Orthophotography
Civil Engineering Plans and Volumetric Surveys
Terrain Models
Cartographic Service, including Road Maps and Atlases
Reprographic Service
Photo-Lettering Service

Resources Surveys

Agriculture
Soils
Regional Development
Irrigation Potential
Forestry

Specialist Services

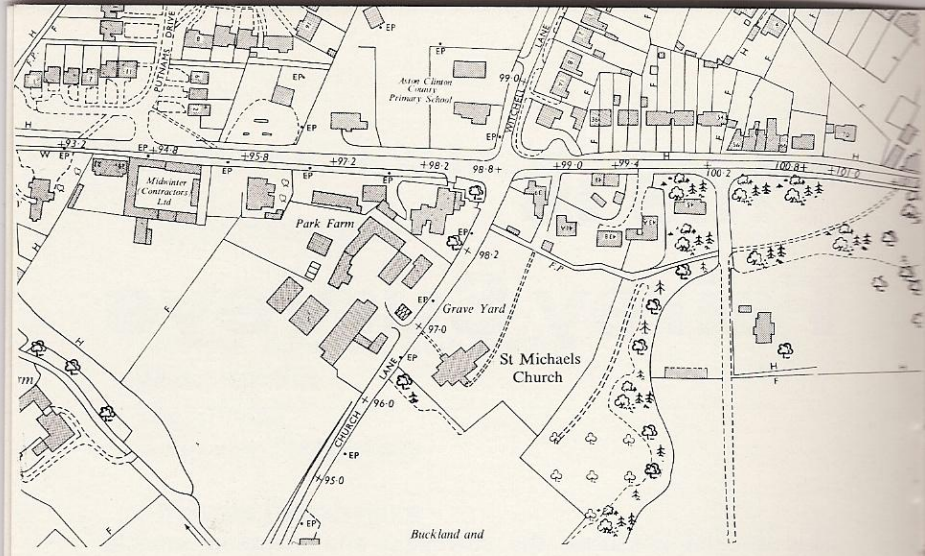
Flight Trials
Traffic Surveys
Pollution and Dereliction Surveys
Hydrographic Surveys
Instrument Design, Development and Calibration

This is Fairey Surveys

This booklet describes the surveying and mapping services offered by Fairey Surveys to all those concerned with the land and its surrounding water areas. Fairey Surveys measures faithfully by ground, aerial or marine methods, the shape and content of the earth's surface and records and interprets these measurements. This requires the use of a variety of surveying methods—topographical, photographic, geophysical, geological, remote sensing in a number of forms, and resources appraisal. All of these are available from a unique international enterprise—FAIREY SURVEYS.

This booklet gives only a brief outline of Fairey Surveys' operations. We welcome enquiries from engineers, administrators, scientists and surveyors with specific projects or queries.

Information sheets are available on request, giving greater technical detail on each of the services mentioned.

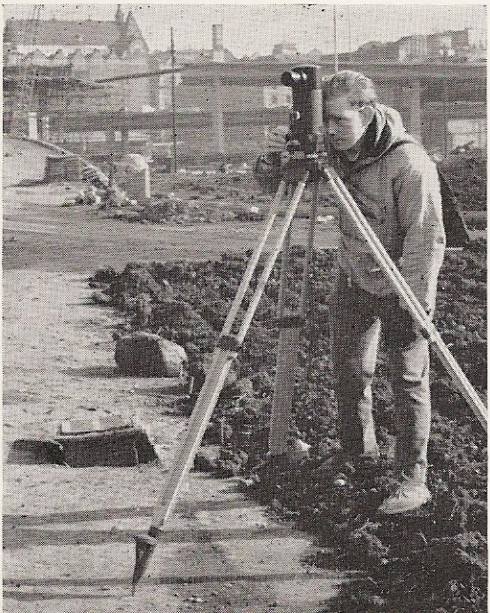


Section of a map made by Fairey Surveys for a local authority in the U.K.

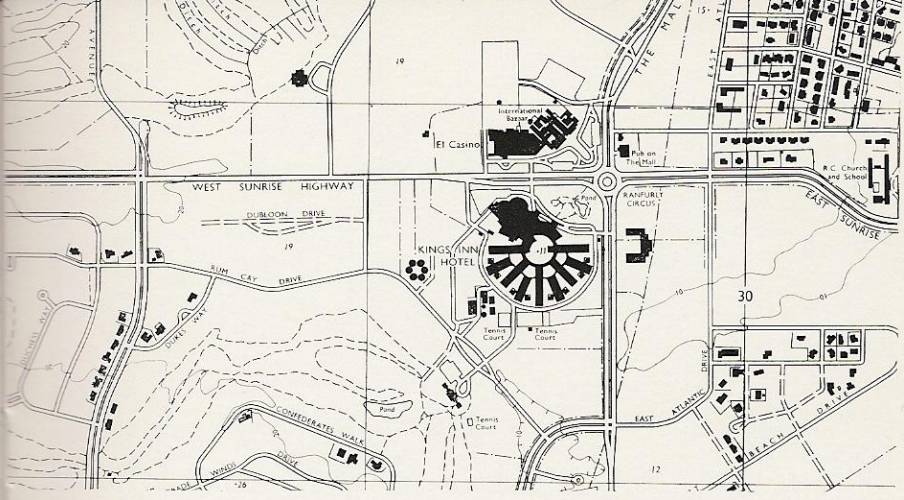
Surveys for the United Kingdom

Fairey Surveys' main base is in the United Kingdom and it is natural that domestic surveying projects should occupy a substantial part of the company's resources. The natures of domestic and international surveying requirements differ appreciably, and while both groups of clients benefit continuously from our total expertise and research facility, particular requirements are studied separately.

In the United Kingdom, Fairey Surveys' land surveyors are closely involved in large scale highway and engineering surveys, planning and setting-out of major works. The Company's aircraft and mapping resources handle a wide variety of tasks, from regional or county photographic surveys and mineral exploration to land-use or dereliction studies. In addition the increasing pressure on available land space has led to greater hydrographic surveying activity in off-shore areas scheduled for reclamation or barrage development.



Levelling on a Scottish motorway project with a Koni 007 automatic



Section of map made by Fairey Surveys of Freeport in the Bahamas.

International Operations

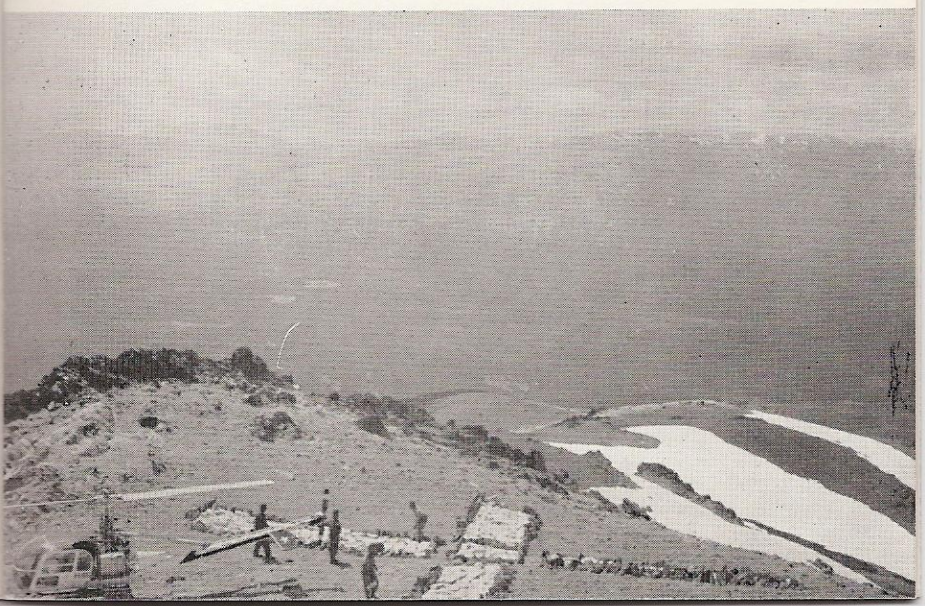
From a strong domestic base, Fairey Surveys has traditionally taken a very active part in surveying and mapping projects on behalf of developing countries.

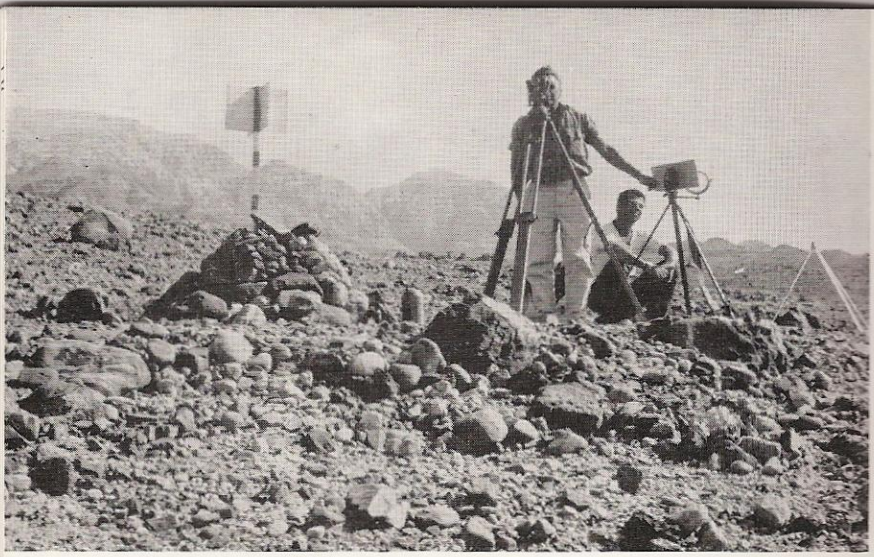
This has always laid special emphasis on the training and consultancy functions, combining practical production and operational experience with a sound theoretical foundation.

The range of surveying activities is wide indeed. In recent years it has included aeromagnetic surveys over the Atlantic seaboard of Portugal, precision levelling for irrigation planning around the Sokoto River Basin in Northern Nigeria, over 200,000 square miles of photography in Burma, international frontier surveys between India and Pakistan and between Argentine and Chile, road surveys and a major municipal mapping project involving 40 towns in Saudi Arabia.

Fairey Surveys works worldwide on behalf of governments, private enterprise and international financial and development agencies; there are many locally based surveying enterprises which bear witness to Fairey consultancy and training.

Marking a control station for aerial photography during mapping operations in connection with the demarcation of the Argentina–Chile frontier.





A Fairey Surveys observing party on the shores of the Dead Sea.

The Tools of Surveying

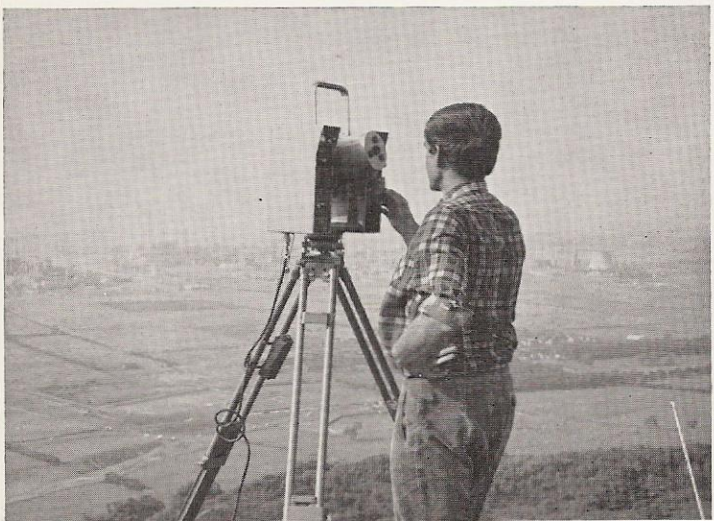
Ground Surveys

Fairey Surveys' staff of qualified land surveyors undertakes survey projects using classical methods but employing sophisticated instruments for maximum efficiency in the field. The equipment used consists of modern tacheometric systems and electromagnetic distance measuring instruments, including the Mk VI Geodimeter, the MRA 101 Tellurometer and the Wild Distomat D10. This ground survey service is available to government departments, local authorities, civil engineers and contractors either on a daily fee or on a project basis. A wide range of tasks is undertaken including large scale urban mapping, road re-alignments, setting-out of major works, subsidence levelling, harbour and estuarial surveys and, in developing countries, the establishment of framework traverse or level networks.

Geophysical Surveying

Geophysical exploration measures and maps certain physical properties of the earth's crust in order to discover the presence of minerals or, in the case of oil search, to help map the geological

A Mk. 6 geodimeter being used on the ground survey for the Teesside Parkway urban motorway project.



Fairey Surveys Dove aircraft fitted with magnetometer. The fibre-glass stinger at the tail houses a sensing head which must be positioned at least 6 feet clear of the aircraft metal.

structures with a view to locating those areas where oil might be trapped. Fairey Surveys' capability in airborne geophysical surveying includes the following types of survey:

Aeromagnetic—for oil search with low and high sensitivity equipment including the Barringer 101B Proton Magnetometer. Also used for mineral search at low altitude and for regional geological mapping at scales of 1:50,000 to 1:100,000 with contour intervals of 5 to 1000 gammas dependent on magnetic intensity.

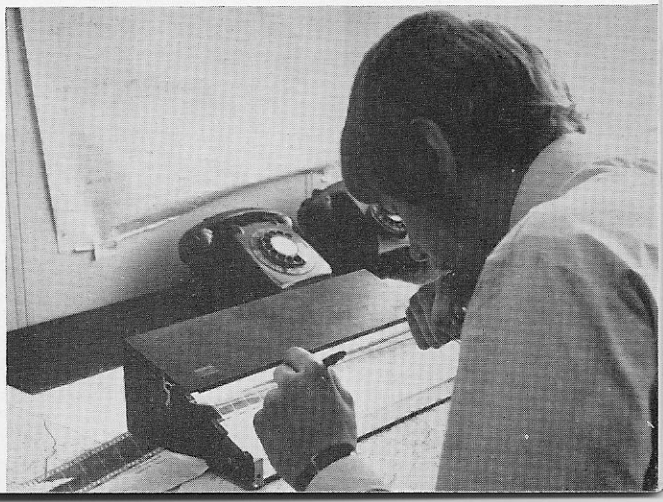
Radiometric—scintillometer and spectrometer surveys, usually conducted at very low altitudes, in the search for the radioactive minerals uranium, potassium and thorium.

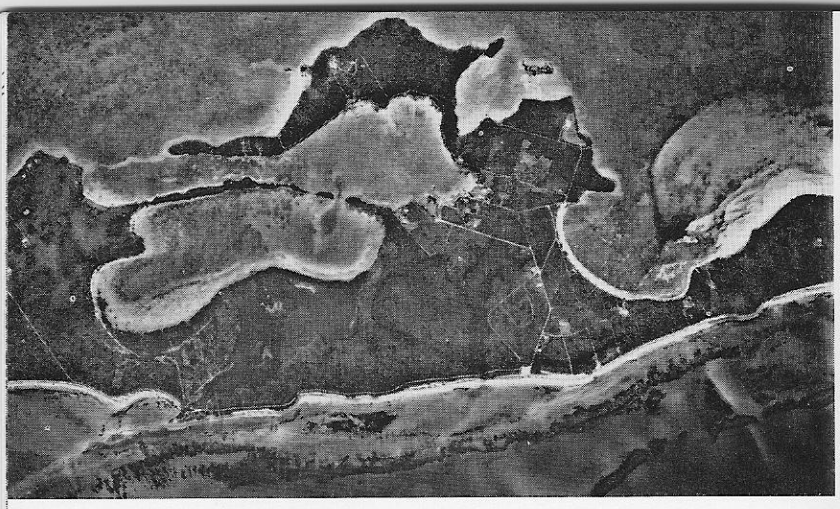
Electro Magnetic—generally E.M. systems are based on the measurement and interpretation of the decay of eddy currents induced in the ground by powerful electro-magnetic pulses transmitted from the aircraft. Used principally to detect massive and disseminated sulphide ore bodies.

Infra Red Linescan—using equipment designed specifically for civil applications, thermal properties of terrain and water surfaces are recorded to a very high level of sensitivity. The recording is on video-tape and can produce records across the entire dynamic range of the tape when played back in the laboratory. Thermal mapping has already yielded results in the fields of river pollution, location of fresh water outlets under the sea, moisture content in soils, soil boundaries, search for sub-surface voids, and geothermal activity and the pin-pointing of forest fires.

Fairey Surveys also work in close collaboration with associated specialists to provide a range of related services thus completing a comprehensive exploration service.

Compilation of geophysical data extracted from filmed records.





The panchromatic photograph of an island in the Bahamas should be compared with the identical view taken with infra-red sensitive film, right.

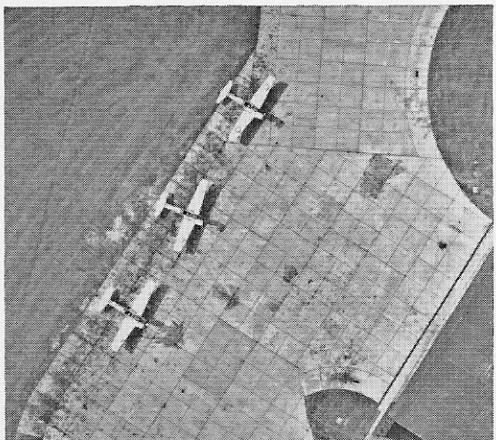
Resources Surveys

The increasing need for more effective use of natural resources, particularly in developing countries where increased food production is the top priority, has involved Fairey Surveys in the planning of integrated appraisal surveys covering soils, agriculture, forestry, and irrigation/power potential.

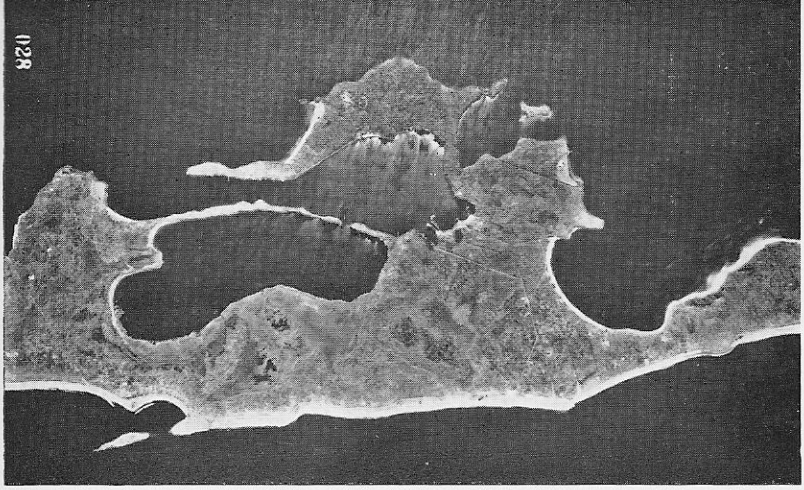
Fairey Surveys' staff in collaboration with specialists from universities and other agencies involved in particular aspects of this work, are available for consultation.

Aerial Photography

The first requirement for any form of aerial survey is **photography** of the highest possible quality. Fairey Surveys has a continuing research programme aimed at improving the quality of film emulsions used, the airborne cameras and their mountings, undertaken by staff who are recognised worldwide as leading specialists in their field. Most aerial photography is taken vertically with each negative overlapping its neighbour to provide the necessary stereo-pairs for plotting. Panchromatic (black and white) film is still the main film-stock used but infra-red, true-colour and false colour emulsions are all commonly employed on natural resources programmes and the mapping of coastal areas where conventional film does not easily provide the required information. Colour processing is another speciality of the photographic staff and has been demonstrated on a contract to photograph 19,000 square miles in Malawi, probably one of the largest colour contracts ever undertaken by a private company. Multi-spectral photography can also be taken using a battery of 70 mm cameras coupled with a 23 cm format survey camera.



Aerial photograph taken from a helicopter at 250 feet. Using such photographs, prepared surfaces can be contoured to an accuracy of 1 inch.



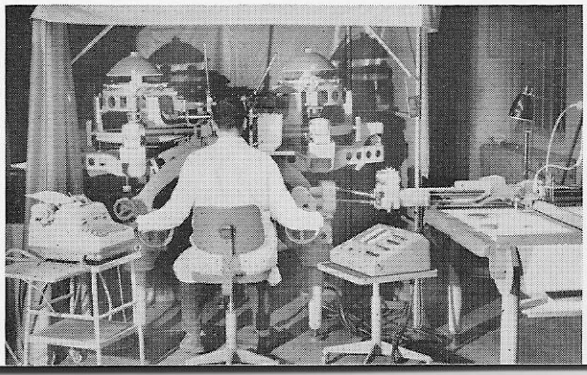
This clearly delineates the shoreline which does not show up clearly on the panchromatic film due to the clearness of the water.

The range of scales available is equally comprehensive. Contact scales from as large as 1:500, taken with a Wild surveying camera from a Bell J2 Helicopter flying at 80 metres altitude to 1:120,000 taken from an altitude of 12,000 metres.

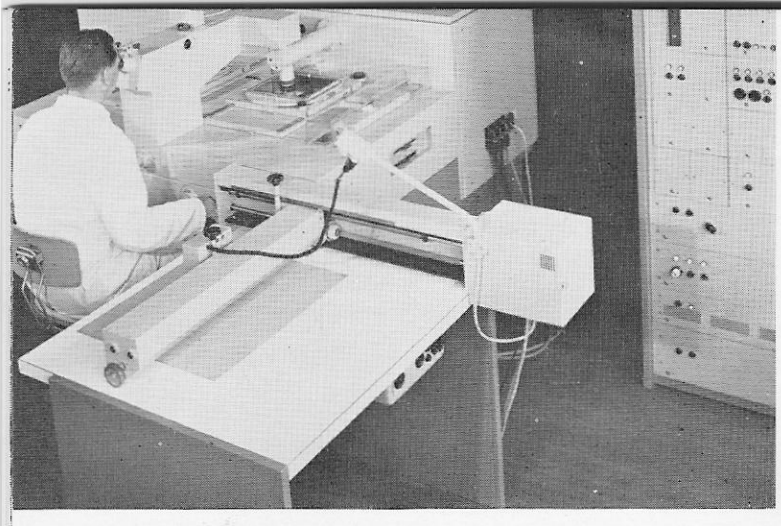
The photographic laboratories at Maidenhead, England, together with facilities available in associated and subsidiary companies in other parts of the world, offer a service which combines long experience on the part of the personnel with the best equipment available. **Photo-mosaics** are produced within weeks of the photography being completed and play a vital role in development programmes where speed is essential. In addition to photo-mosaics there is frequently a need for **photographic enlargements.** The quality of modern aerial camera lenses is such that full benefit cannot be obtained from a contact print. Preferably, it should be enlarged by anything up to 5 diameters and in this form can be of great value to town planners, engineers geologists and others.

Photogrammetric Mapping

Zeiss and Wild instruments are used exclusively to measure and record the planimetric data and height. Air triangulation techniques are employed to reduce to a minimum the number of ground control stations required and the observations are fed through the computer terminal at company headquarters for computer processing. In addition to the computer programmes prepared for air triangulation, Fairey Surveys has available programmes which utilise the numerical data from the plotting instruments to provide an even wider range of information. This includes the calculation of volumes of slag heaps, capacities of reservoirs, the centre line of a motorway, the area to be grassed in a cutting or, most frequently of all, the quantities of soil or rock to be cut or filled in the construction of a highway whether in the uninhabited regions of a developing territory or in the world's highly populated urban areas. The measurement of this digital representation of terrain shape is a service for which the plotting instruments are ideally suited.



A Wild A8 Autograph photogrammetric plotting machine complete with electronic read-out and tape punch.



The Zeiss equipment used by Fairey Surveys to produce orthophotographs.

In the United Kingdom the major requirement is for original surveys at 1:500 scale for highway designers, 'new town' developers and designers of other major works such as reservoirs and power stations. The remaining requirement is for 'improvement surveys' which call for revision and contouring of the nationally produced 1:1250 and 1:2500 map series.

Internationally the photogrammetric mapping experience of Fairey Surveys staff has been harnessed to major projects of which the following are typical examples.

Power Generation—the entire topographical mapping for the construction of the Kariba Dam on the great Zambezi River.

Town Planning—large scale maps for 112 townships in Iran, 40 cities and towns in Saudi Arabia and 32 towns in Libya.

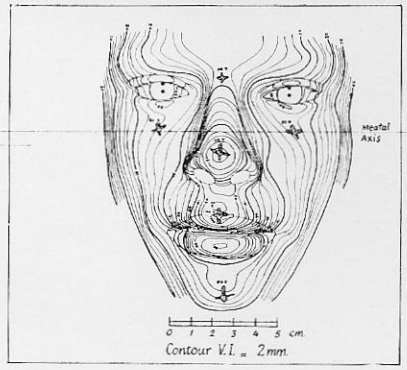
Transportation—contoured maps and Digital Ground Models for the construction of 400 Kms of strategic highway in Iran.

Irrigation—3,500 square miles of 1:8000 scale mapping with 1 ft contours in East Pakistan.

Reconnaissance Surveys—1200 Kms of potential road alignments in Saudi Arabia photographed and mapped in 60 days using Airborne Profile Recorder techniques.

The installation in March 1970 of the Zeiss Topo-cart has added orthophoto mapping to the range of services available.

Air triangulation measurements being fed from the computer terminal to the on-line program at the central computer bureau.



The contours of a patient's face recorded photogrammetrically.

This plotting instrument when used with the Orthophot attachment, converts the conventional aerial photograph, a central projection containing perspective distortions, into an orthogonal or parallel projection, thus making all the detail on the photograph planimetrically correct. This is achieved by scanning the stereo-model in narrow bands, while adjusting the measuring mark continuously to follow the surface of the terrain. These scanning movements are transmitted simultaneously to the Orthophot, which produces the differential rectification, and to the Orograph which controls the plotting stylus to produce a 'drop-line' plot from which contour lines can readily be traced.

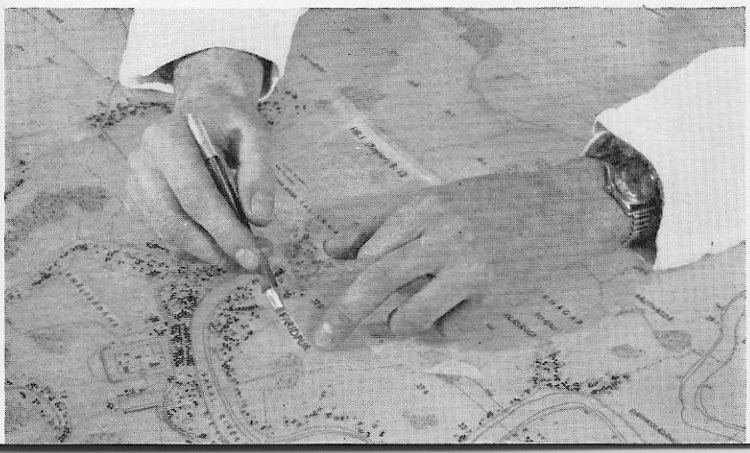
For certain applications this retention of all photographic detail with the planimetric accuracy of a line map has tremendous advantages.

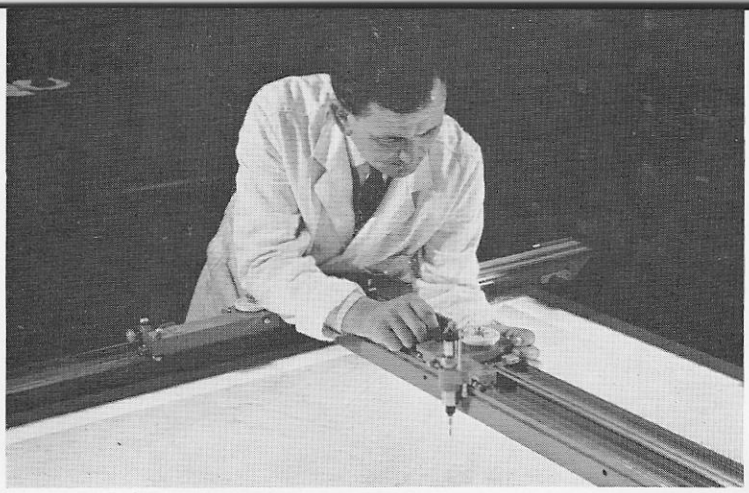
In addition to mapping, photogrammetric methods are used for other remote measurements in three dimensions. This service is known as **non-topographic photogrammetry** and Fairey Surveys has played a prominent part in the adoption of mapping instruments and techniques for the measurement of unique architecture, motor car bodies, steam pressure vessels, cattle and moving machinery. Perhaps the most well-known example is the work done in conjunction with Addenbrookes Hospital, Cambridge, Orthodontics Department. In this case, photogrammetric equipment is used to photograph the human face and prepare contour plots of the face morphology. These 'face maps' are used as an accurate record and as a planning aid by the Orthodontic Surgeon responsible for the remedial work.

Compilation and Drawing

Photographic interpretation and topographical map construction cannot be reduced to simple routine. For these fundamental processes Fairey Surveys employs a team of specialists, with the skill and experience needed to collect and assess data from photographs, field measurements and auxiliary equipment such as the airborne profile recorder. The subsequent scribing and fair drawing of the compiled map sheets is undertaken by a large drawing office staff justly proud of their reputation for high quality presentation. All the names and numerals required

Place names in Pakistan; the final stage of irrigation map.





Measuring co-ordinates on a large scale map.

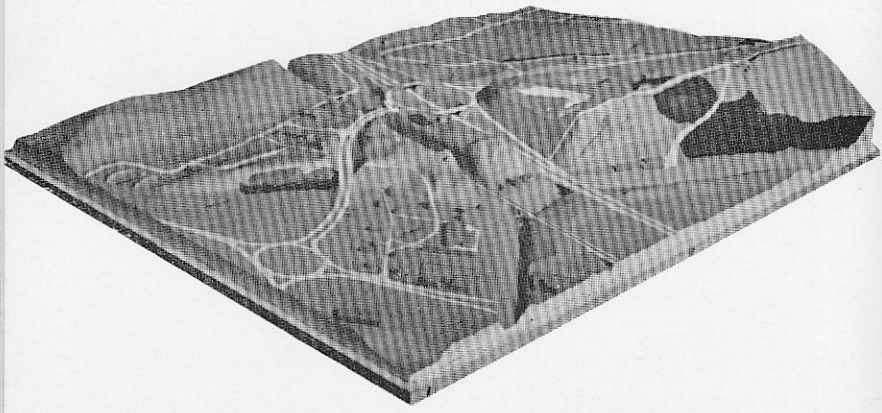
on the map face and margins are produced in the Monotype photo-lettering department. The instrument used can produce point sizes from 4 to 92.

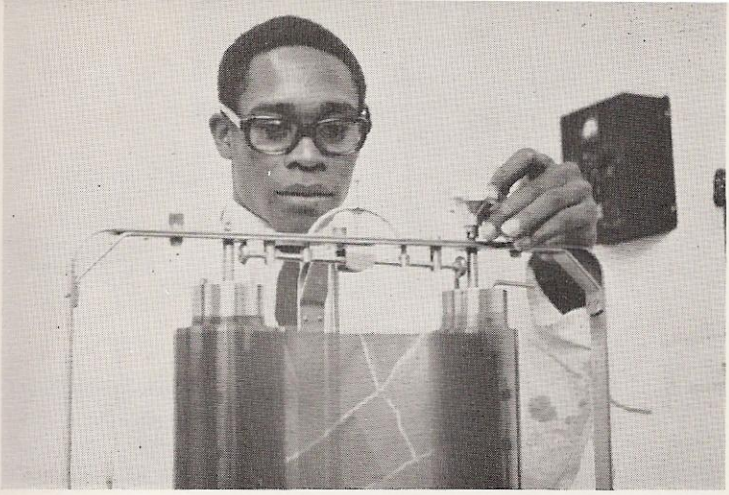
The fair drawing of original surveys is one part of the drawing office's work, the other is **cartographic design.** Road maps, atlases and book illustrations are produced to special design requirements. The increasing technical reputation of this department throughout cartographic circles is involving them in work for most of the best known tourist map and atlas publishers. A key staff of qualified cartographers work within the drawing office on these specialised small scale maps. Backing these experts is a modern **reprographic department.** Work carried out is primarily the photo-mechanical reproduction of maps on dimensionally stable plastic film thus ensuring maximum accuracy. The printing services use a variety of equipment including a Mailander 5C automatic flat-bed proving press and a Loftline 4 metre x 1 metre printing frame, both designed for high precision reproduction.

Terrain Modelling

Fairey Surveys has brought terrain models up-to-date with a new machine and a modern material. The machine converts contour plans directly into terrain models sculpted from expanded polyurethane. This material is lightweight but very rigid. The models can be supplied in terraced form or smoothed to a true-to-life appearance. Considerable cartographic detail can be shown. Users of these models include road construction engineers, town planners, architects, conservationists, boat designers and university lecturers.

A terrain model of the Puriton interchange on the M5 Motorway near Bridgwater, Somerset. Made to a scale of 1:1250 for the Ministry of Transport South West Road Construction Unit.





A trainee from Kenya examining film after processing. Part of his training as Kenya's first aerial photographer.

Technical Training and Consultancy

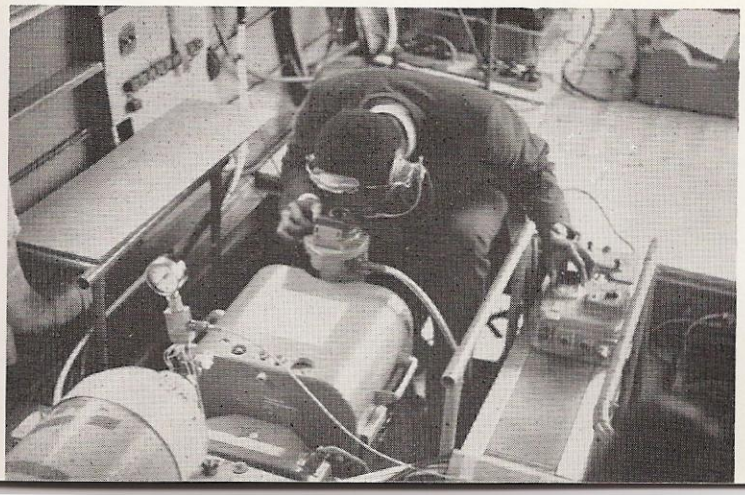
As this publication shows, surveying plays a vital part in a nation's growth. For this reason Fairey Surveys is particularly aware of its responsibility in providing training and advice in the developing countries.

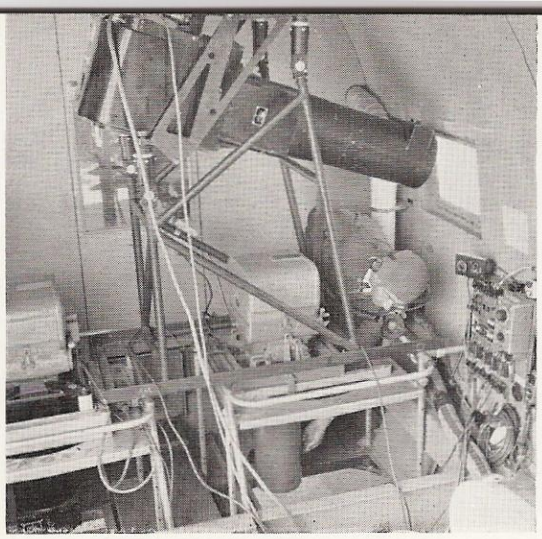
This can take two forms — field training is particularly valuable and Fairey has done this in the rice fields of East Bengal with teams of Pakistani levellers who were trained in irrigation surveying and in the air with Burmese pilots.

Training is also provided in the laboratory. In Africa, for example, locally-trained staff operate the latest photogrammetric plotting equipment and the photographic printing and processing facility. Where necessary Fairey Surveys will recommend that key personnel are brought to Britain for training at the company's headquarters.

One of the Company's largest training and consultancy projects was in Iran where it served as consultants and instructors in the establishment of a National Cartographic Centre. The consultancy covered the purchase of equipment and training of key personnel, the layout of laboratories and offices and the technical organisation of the new Department.

Operating a Swiss Wild aerial camera in a Fairey Surveys aircraft





A multiple camera installation in a DC 3 aircraft.

Research and Instruments

Flight Trials

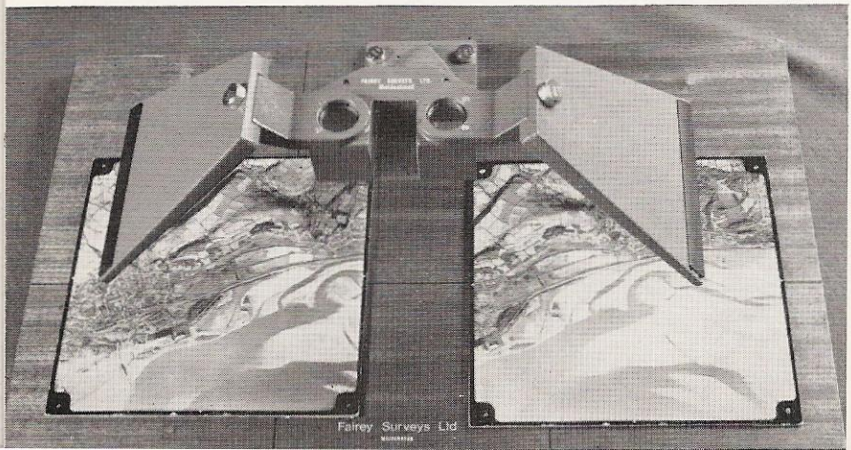
The Fairey Surveys Flight Trials Group has operated largely on behalf of the British Ministry of Technology working through the Royal Aircraft Establishment. Airborne trials of new equipment are carried out in all climatic conditions with an aircraft, specially fitted as a 'flying laboratory.' More than 20 years of testing and evaluating the most advanced airborne instrumentation has given Fairey Surveys' staff a pre-eminent position as flight trials experts.

Research and Instruments

A Research and Instruments Group exists within the framework of Fairey Surveys to ensure that the Company has the knowledge and the tools to carry on its services anywhere in the world. This group has both a maintenance and a design role. The sophistication of the equipment used on a modern surveying mission makes it almost essential that an electronics engineer be a member of the team, particularly when airborne geophysical exploration is involved. In the laboratory the designers and instrument makers have produced a series of special purpose instruments.

These include a 16/35/70 mm continuous film duplicator, a lightweight contact printer for 23 cm size film, a mirror-lens plotterscope for use with Wild and Zeiss plotting instruments and a mirror stereoscope called the Fairey Stereoviewer. The need for these instruments has developed during Fairey's practical missions both in the U.K. and worldwide and they are now available to outside organisations.

The Fairey Surveys stereo-viewer.
An inexpensive lightweight viewer for office and field use.



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Land is the raw material of nearly all wealth. But neither the development nor the administration of any plot of land can be planned economically or carried out efficiently without a complete and accurate knowledge of its size, its boundaries and the various natural and artificial features within its borders.

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