

THE UNITED KINGDOM NATIONAL REPORT FOR PHOTOGRAMMETRY AND REMOTE SENSING 2000 - 2004

Prepared for the External Affairs Committee of
The Remote Sensing and Photogrammetry Society

by
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ABSTRACT:

The National Report of the United Kingdom describes current activities and new developments in photogrammetry and remote sensing during the period 2000-2004. The balance between photogrammetric and remote sensing interests is tabulated and new research, recent implementations and organisational developments are considered. The increasing use of digital imagery and lidar systems, the availability of imagery via the Internet, and the recently completed merger of the former Photogrammetric Society and Remote Sensing Society are noted as features of the report period.

1. COMPILATION OF THE REPORT

This short report follows the pattern of earlier reports. The information presented is partly derived from a 5 page questionnaire circulated to UK organisations in January 2004 and partly from other reports and the authors' personal knowledge of activities assisted by ISPRS Committee members. The lead author is Chairman of the Remote Sensing and Photogrammetry Society (RSPSoc). Much of the corresponding 2000 report (Kirby and Malthus, 2000) remains valid, and the structure of the present report has been maintained to reflect updated information although this may involve some repetition. This also reflects the modest number of (thirty) respondents on this occasion. Eleven of these were commercial organisations or other private sector individuals; twelve from (tertiary) education or specialist research establishments and seven from Government departments or agencies. Just under one quarter of respondents identified that their primary involvement with remote sensing and photogrammetry concerned both fields equally. One third identified photogrammetry as their primary activity. Forty six percent identified remote sensing as the primary activity. Opinions expressed by questionnaire respondents and by the authors do not necessarily reflect the views or policy of RSPSoc, the Royal Institution of Chartered Surveyors (RICS) or the Institution of Civil Engineering Surveyors (ICES).

2. INSTITUTIONS AND PUBLICATIONS

The Remote Sensing and Photogrammetry Society is the UK's adhering body to the International Society for Photogrammetry and Remote Sensing. This function is facilitated through an ISPRS Committee within the External Affairs Committee of RSPSoc and replaces the former UK National Committee for Photogrammetry and Remote Sensing, which has disbanded. The membership and joint funding for the ISPRS Committee are derived from RSPSoc, RICS and ICES. The ISPRS Committee supports the current (UK-based) Secretary General, Prof. Ian Dowman and coordinates UK contact with ISPRS directly and via liaison with UK Commission Correspondents and the UK-based Chairs and Co-Chairs of respective ISPRS Commission Working Groups.

RSPSoc is a new Society formed in 2001 through the merger of the Photogrammetric Society and the Remote Sensing Society. The memberships of the two Societies voted in August 1999 by overwhelming majorities in favour of the merger, reflecting the trend in both the technology and its application. During the latter part of the last reporting period (1996-2000), the two Societies functioned jointly and thereafter as one society. Thus, the activities in this report reflect the merged status. Besides maintaining the objective of co-coordinating and promoting remote sensing and photogrammetry activities, the Society has a significant role in the encouragement of commercial and government participation in remote sensing and photogrammetry, both nationally and internationally. Current membership levels are relatively stable at c. 1100, of which 45 are corporate members.

The Society produces a number of publications. The quarterly *Newsletter* is an informative source of news and comment valued by the membership. The Society also publishes an annual report, conference proceedings and occasional monographs. The official journals of the Society are *The Photogrammetric Record* which is issued free to members and the *International Journal of Remote Sensing (IJRS)*, which is available to members at discounted rates. The two journals are key pillars of the Society. The *Record* is now published four times per year, whilst the *IJRS* expanded from 18 issues (of 200 pages each) to 24 issues (of 200 pages each) from the beginning of volume 23. The online edition of the journal is proving popular with readers and members of the Society. 2003 was a particularly significant year for *The Photogrammetric Record*. After a period of 50 years during which it has been published by the Society the *Record* is now being published under an equal partnership arrangement between the Society and Blackwell Publishing Limited. An additional benefit which has materialised during the year has been electronic access to past and new papers via the "Synergy" website (www.blackwell-synergy.com) all linked to the major on-line bibliographic databases.

Since October 2000 *The Photogrammetric Record* has published 58 refereed articles of which the authors of 25 articles

are resident in the UK and 33 resident abroad. In addition, numerous shorter contributions and reports have been published, the authorship equally divided between the UK and overseas. Substantial book reviews are also a feature. *The Photogrammetric Record* is edited by Mr. Paul Newby, supported by 13 members of the International Editorial Board, which reflects its international stature. Prof. Arthur Cracknell is Editor in Chief of the IJRS. The journal has published 1,064 refereed articles since August 2000 of which the majority of authors are resident abroad and approximately 15 percent are resident in the UK. The journal has also published 450 shorter communications in the "letters" section, with the authorship similarly representative of the UK and overseas.

Following changes introduced during the last review period, individual membership of the Society ranges from Ordinary, to Associate Fellow and Fellow depending on peer-reviewed levels of qualification, experience and achievements in photogrammetry and/or remote sensing. Considerable emphasis is placed on Corporate membership which is open to commercial organisations, research institutions or university departments. Student membership is also available and represents a significant and active group within the society.

The Society operates a variety of Special Interest Groups (SIGs). On merger, two types of SIG were developed. Those wholly owned by RSPSoc include: Modelling and Advanced Techniques (MATSIG), SAR, Archaeology and GIS. Affiliated SIGs, a new category covering those that reach well beyond RSPSoc include: the Geological Remote Sensing Group (GRSG), jointly affiliated to the Geological Society of London, and the Ocean Colour SIG (OCSIG), shared with the Challenger Society for Marine Science. The National Association of Aerial Photographic Libraries (NAPLIB) became an Affiliated SIG in 2003, promoting the use and preservation of historical aerial photographs. SIGs expand and contract as the subject matter dictates and additional SIGs related primarily to photogrammetry may well develop with time.

The Society maintains an active programme of technical meetings and details are available on the website (www.rspsoc.org). The major event is the Annual Conference (proceedings available on CD-ROM) at which the Annual General Meeting is held. Through a bulletin board, newsletter and web site the Society can usefully disseminate information about upcoming events that are of interest to all members. Members organising related conferences around the world are welcome to contact staff at the Society office, who will be happy to publicise events through the Society's distribution channels.

The Society has a large overseas membership and caters for the needs of these members by promoting their research and providing a forum for the exchange of expertise and knowledge. The Society is also actively maintaining and establishing links with other related Societies both within the UK and abroad. Principal amongst these is collaboration with the European Association of Remote Sensing Laboratories (EARSeL) and with the former European Organisation for Experimental Photogrammetric Research (OEEPE), now EuroSDR.

The Society External Affairs Committee is strengthening relations with the Natural Environment Research Council (NERC). Co-operation is also being enhanced with the British National Space Centre (BNSC). The Association for Geographic Information (AGI) and the British Association of Remote Sensing Companies (BARSC) will provide an increasingly important focus for future collaboration. The

merger has not yet brought any further realignments within the geomatics industry. The AGI has recently restructured its operations and the joint annual conference and exhibition of AGI has been dismantled. The conference will remain in London currently whilst the exhibition (renamed as GeoSolutions) will return to Birmingham.

Within the reporting period, there has been a substantial number of new UK publications or UK-authored works in photogrammetry and remote sensing, including:

- 2000 - *Window on the UK 2000*, CD-ROM, British National Space Centre and Remote Sensing Society.
- 2000 - *Datums and Map Projections for Remote Sensing, GIS & Surveying*, J.C. Iliffe. Whittles Publishing.
- 2000 - *Manual of Aerial Survey: Primary Data Acquisition*, R. Read & R.Graham. Whittles Publishing.
- 2000 - *Proceedings of the Annual Conference of the Remote Sensing Society, RSS.*
- 2000 - *Mathematical Principles of Remote Sensing*, A.S. Milman, Taylor & Francis.
- 2000 - *Introductory Remote Sensing*, P. Gibson & C. Power, Routledge.
- 2000 - *Introductory Remote Sensing Principles and Concepts*, P. Gibson & C. Power, Routledge.
- 2001 - *Vertical Aerial Photography and Derived Digital Imagery - Client Specification Guidelines*, RICS Geomatics.
- 2001 - *Environmental Remote Sensing*, T. Malthus, Wiley.
- 2001 - *Close Range Photogrammetry and Machine Vision*, K.B. Atkinson (editor). Whittles Publishing.
- 2002 - *Uncertainty in Remote Sensing and GIS*, G.M. Foody & P.M. Atkinson (editors), Wiley.
- 2002 - *Earth Observation Data Policy and Europe*, R. Harris, A A Balkema.
- 2003 - *Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging*, J. Thurston, Wiley.
- 2003 - *Guidelines for the use of GPS in Surveying and Mapping*, RICS Geomatics.
- 2004 - *Computer Processing of Remotely Sensed Images*, Third Edition, P. Mather, Wiley.
- 2004 - *Spatial Modelling of the Terrestrial Environment*, R. Kelly (editor), Wiley.
- 2001-2004 *Proceedings of the Annual Conferences of the Remote Sensing and Photogrammetry Society, RSPSoc.*

3. DATA ACQUISITION AND PROCESSING

Investment in aerospace survey photography and digital imaging has continued at a steady pace in the UK over the past four years, leading to the introduction of new technology and working methods.

3.1 Aerial survey photography

At the Ordnance Survey of Great Britain (OSGB), the conversion from analytical to digital plotter based production was complete by 2001. Between 1996 and 2000, almost all the map detail capture and editing was performed using orthorectified imagery. Since early 2001, all photogrammetric update has been carried out on digital workstations, using scanned stereo photography. Digital aerial triangulation was introduced just before the period in question, and has been in routine use since. Direct sensor orientation (using the Applanix system) was introduced during this period, and now forms part of the image preparation flowline. In June 2001, monochrome photography was replaced by colour photography, to aid in photo-interpretation. Colour orthorectified imagery production began during the period in question, to provide the products in the new imagery layer of OS MasterMap. The OSGB maintains

an active Research & Innovation department, including a group working exclusively on remote sensing and photogrammetric research. Work includes the use of new techniques for capturing and updating spatial data from imagery; change detection and feature extraction techniques from many sources, including digital aerial imagery, satellite sensor imagery, synthetic aperture radar and airborne lidar data. Ordnance Survey Northern Ireland (OSNI) have upgraded their digital photogrammetry systems, enabling direct update mapping of the vector mapping database and linkage with newly complete orthophoto coverage of Northern Ireland.

Two major aerial photographic projects started late in the last reporting period and are ongoing. Simmons Aerofilms Ltd and Infoterra collaborated to produce accurately-controlled 1:10,000 scale colour photography marketed as "UK Perspectives". The orthorectified aerial photography database is claimed as currently the only fully maintained imagery dataset of its type for England. Cooper Aerial Surveys produced 1:11,000 scale colour photography for the Millennium Map Company. A millennium map of England based on aerial photography was completed for England in 2000. Wales and Scotland are in the process of completion.

3.2 Cameras and navigation

The use of GPS-based systems for photo-navigation has been widely adopted, because of the perceived advantages of achieving more precise flight lines and the potential for reducing errors in navigation. Nevertheless, experience is showing that GPS-based systems are not entirely trouble-free, suggesting that thorough training is needed in their use, backed by knowledge of the air navigation methods that evolved before GPS was introduced. In the UK, numerous navigation systems are in use, including the Tracker System, Computer Controlled Navigation System 4, Autonomous GPS and real time L-Band Differential GPS; dead reckoning and Ordnance Survey maps also continue in use.

3.3 Airborne digital imaging

Commercial airborne digital imaging is offered by Aerofilms Ltd. using a Daedalus AADS 1238 multispectral scanner and by the NERC using a Daedalus AADS 1268 multispectral scanner and a CASI scanner. The prospect of digital air survey cameras produced by Leica Geosystems and Z/I Imaging is generating considerable interest in the UK. Z/I Imaging launched the Digital Mapping Camera (DMC) in 2001, and now have digital cameras being used in digital production workflows around the world. Z/I Imaging and the Leica Geosystems ADS40 have seen a growing market acceptance and rapid customer take-up of large-format digital aerial camera systems for survey and map production. The long-term storage and retrieval of original imagery in digital form are major considerations.

NEXTMap Britain is a new product available for England, Wales and South Scotland. Initially funded by Norwich Union Insurance, NEXTMap Britain has utilised Intermap's STAR-3i® IFSAR to generate a seamless digital height model dataset. The dataset offers DSM and DTM postings at 5m and orthorectified imagery at 1.25 m postings. Data for North Scotland will be available later in 2004. More details can be found at: http://istore.intermaptechnologies.com/nm_britain.cfm

The Ordnance Survey has announced it will include an imagery layer within the new Digital National Framework (DNF). The population of this layer has caused some debate within industry. A pan-government agreement is making this digital map and

image data available across all UK government departments to stimulate coherent service provision via e-government. This is galvanising private sector airborne image and mapping operators to develop their services.

3.4 Laser Scanning (Lidar) capabilities

This reporting period has seen a dramatic rise in the use and application of lidar/laser scanning, both airborne and terrestrial. Over sixty percent of respondents indicated working with airborne systems and thirty percent with terrestrial. This burgeoning level of activity is clearly shown in Figure A-1 where "lidar / laser scanning airborne", a relatively new category in the national report, already ranks close to "remote sensing with space imagery" and "photogrammetry with GIS" as a mainstream technical area identified by many respondents. This rising trend is expected to continue into the future.

3.5 Satellite remote sensing

In September 2003, Surrey Satellite Technology Limited (SSTL) successfully launched the latest three satellites of the Disaster Monitoring Constellation (DMC). SSTL and its partners propose a network of affordable micro-satellites providing imaging on a daily basis as an affordable solution to the problem of disaster assessment and monitoring from space. The satellites, for Nigeria, Turkey and the UK, will join AISAT-1, another Surrey-built satellite, launched for Algeria in November 2002. Together they will transform the ability of international disaster relief organisations to monitor and provide emergency assistance to disaster-stricken zones. The DMC may be activated by organisations such as Reuters Foundation AlertNet and the International Charter. Operational use of the system is expected to develop during 2004.

Sira Electro-Optics Limited built the Compact High Resolution Imaging Spectrometer, (CHRIS), for the BNSC. This instrument is now in orbit on the European Space Agency miniature satellite PROBA. CHRIS provides multispectral coverage over the range from 400 nm to 1050 nm with a minimum spectral resolution in the range between 2 and 10 nm. The ground sampled distance is 25 m to 50 m selectable. 2002 saw the launch of the long awaited Envisat. UK instrument designers provided major inputs to the spacecraft payload and UK investigators are now also active in developing the data applications. The Department of Environment Food and Rural Affairs (DEFRA) part sponsored the AATSR instrument.

3.6 Development of web-based distribution

With Internet resources now routinely used in commercial and research environments, 2000-2004 has seen further development of web based distribution facilities. One example is at Infoterra, where development of efficient raster web delivery techniques currently includes serving the Imagery Layer of OS MasterMap™. More widely they have developed thin band web delivery engines for data and value added products, and claim the creation of Europe's largest geographic ISP centre. In the public sector, DEFRA's Rural Development Service is making orthophotography available over their Intranet (2003 onwards) for a wide variety of users and registers the use of the satellite imagery based digital map product Land Cover Map 2000.

3.7 Development of Internet based teaching materials

Geomatics.org.uk offers free resources to teachers to support geographic information and surveying teaching in schools.

Supported by the UK land and offshore survey industry, it aims to provide all the information needed to learn about geomatics and to promote the profession through raising awareness. The site provides extensive teaching resources to help bring geomatics into the classroom with ideas and examples for many subjects and age groups. Kit loans of professional survey equipment are offered and there is also information on the profession, career paths and various case studies.

The BNSC web-based Learning Zone has been especially designed to support teaching and learning across the curriculum from Key Stage 1 learners up to Key Stage 4 or in Post-16 education. The site contains lesson plans, worksheets and many other National Curriculum-focused resources to find out information about the Solar System, Earth and Satellites.

A significant development in education for students of remote sensing in 1996-2000 reporting period was the National Learning Network for Scotland. Emphasis was placed on short interactive, multimedia lessons on key topics in remote sensing and a sample of application areas. Although the project is now complete and funding has ceased the materials are still available online at: <http://nl.n.paisley.ac.uk/projintro.htm>

3.8 Data Calibration Issues

Data calibration and validation issues were included for this reporting period to reflect the importance of this topic in the UK. It is an attempt to establish the degree of awareness amongst the UK community and to assess whether specifications and standards are applied to ensure that data and products are fit for purpose. Indeed, sixty five percent noted calibration (of all equipment) as a major concern and part of their QA procedures. Interestingly, of these however, only half followed any specific guidelines or specifications other than those indicated by clients when carrying out contracts, yet seventy five percent report that they did suggest possible specifications to clients. Around sixty percent of respondents conduct their own checking/calibration procedures in-house. Around two thirds felt they had adequate information on calibration and a third recognised they would benefit from some more information. No respondents felt they needed significantly more information on calibration. Overall, the practitioners working primarily in photogrammetry were the least likely (on average) to rely solely on calibration data provided by the data provider or sensor operator whilst those working in remote sensing and other technologies (e.g. lidar, GPS) expressed a stronger need (on average) or preference to rely primarily on the supplier's calibration information.

4. RECENT ACTIVITY

Individual activities are not necessarily representative of the continuous day-to-day implementations of photogrammetry and remote sensing in the UK, but the major UK events from the report period are noted. Figure A-1 (Appendix A) reflects the variety of remote sensing and photogrammetry activity during 2000-2004 in the UK, obtained from the questionnaire returns.

4.1 Education and Research

A number of the academic respondents identified several areas of recent activity during 2000 to 2004 that included the expansion of postgraduate level courses and the development of new research themes. Particular themes included: sensor integration, airborne and terrestrial laser scanning, spaceborne InSAR, radargrammetry, increased use of biophysical

modelling, data assimilation data in meteorology and oceanography, landslide mapping and environmental change monitoring. Thermal surveys, hyperspectral mineral mapping, global oil seep studies from SAR, the inference of nearshore bathymetry from X-band radar tracking of waves and increased use of satellite-imaged temperature and colour (for plankton and suspended sediments) for assimilation into numerical model predictions was also identified. This breadth is also reflected in the fact that education and research institutes displayed the widest range of involvement of all respondents across principal techniques and applications.

The NERC Airborne Remote Sensing Facility (ARSF) conducted a Mediterranean campaign during April and May 2004 with an enhanced instrument suite including a lidar unit. Oxford University/RAL held Spring Schools in Quantitative Earth Observation. 2002 event focused on the application of EO to the study of earth radiation and climate. The 2004 event centred on the possible impacts on data assimilation practices that may emerge from novel computing architectures and the opportunities provided by the emerging electronic Grid.

The *Window on the World* and *Window on the UK 2000* CD-ROMs developed by BNSC, continue to be used to raise public awareness of earth observation. They are aimed at business and education users with little prior knowledge of remote sensing.

4.2 Industry

Operationally, UK commercial operators have been affected by a number of developments:

- the development of commercial high-resolution airborne digital sensors and the rise of orthorectified imagery as a commodity, increasingly available online.
- the commercialisation of technology developed in the defence and intelligence industry – especially the deployment of VHR satellite sensors, and the small (but growing) availability of derived products.
- the growth in the use of non-optical sensors (lidar, radar) for specific tasks, notably the production of high-resolution digital elevation models, especially with aerial photogrammetric and remotely sensed imagery for UK sites
- the development of direct sensor orientation techniques, resulting in a reduction in the cost of aerial triangulation.

Other trends which were noted:

- The loss (and doubtful replacement of) Landsat7.
- Reduced financial returns especially on aerial survey work but some exceptions to this for overseas contracts.
- Continued low volumes of operational work from institutional organisations (in Europe).
- Merging of remote sensing technologies has accelerated as digital acquisition increases.
- Change of emphasis towards end-to-end GIS services.

Across the whole community, most corporate members indicated constant levels of activity or even modest expansion in terms of staff numbers or turnover during the 2000 to 2004 period. Academic organisations also saw some expansion in staff and/or student numbers. No respondents noted significant reductions in personnel over the period.

The UK commercial initiatives to provide national air photo cover at large scale, available to all and relatively cheaply via the web, have begun to change the public's appreciation of aerial imagery, and provide a viable market. However, although the Ordnance Survey's policy of contracting mapping services

to independent companies was generally welcomed, at the same time the tendency for private and government companies in the UK and W. Europe to sub-contract work overseas is seen as detrimental to the home-based photogrammetric industry. A general shortage of trained specialist photogrammetrists in the UK was noted.

A small minority of respondents felt that significant RS applications effort and research uptake has been lacking in the UK, inhibiting UK industry competitiveness. However, the majority of respondents indicate a range of significant positive changes that have impacted on research and commercial activity. The most frequently cited changes in the photogrammetric community relate to the rise of laser scanning as a credible source of survey and environmental data and the continued increase in the use of digital imaging technology. The movement from analytical to digital, noted as intensifying in the national report 4 years ago, has continued. Most companies that have only recently started operations with imagery (either aerial or close-range) use digital processes exclusively, and may have started with no previous experience of analytical photogrammetry. Specific software packages for handling digital data were listed by many respondents, these being either standard commercial packages, modelling tools or other software developed in house.

5. SIGNIFICANT CHANGES 2000 to 2004

In respect of the most significant developments in photogrammetry and remote sensing in the UK during the period 2000-2004, most comment concerned changes in EO funding under NERC, the opportunities presented by the GMES programme and specific reference to technological issues. Consolidation for the industry has been provided by the profile and continuing rise of "geo" applications in their broadest sense.

Increased difficulty in obtaining research funds to support UK research has been noted. It is attributed in part to increased competition for research funds and a tendency for UK Research Councils to preferentially support large and high profile initiatives, such as the EO Centres of Excellence (see below). At the same time, major joint EC (FP6) and ESA activities, linked to GMES, are providing significant funding opportunities for commercial operators and the well funded research laboratories. Whilst the UK has been successful in this area during the reporting period, the benefits are not spread widely. On a European scale, the development of the GMES collaboration between ESA and the EC has changed (and bundled) the priorities of the Earth Observation activities in the European framework programme and the ESA Service Element.

GMES represents new opportunities to open up an institutional market for EO and BNSC provide the UK lead in coordinating national activities under the GMES initiative within ESA and the EC FP6 programme. Within the UK, BNSC coordinate an inter-departmental working group to inform UK government and research departments and define UK priorities for GMES. The UK leads two current GMES GSE projects: "TerraFirma" on Europe-wide subsidence monitoring from SAR interferometry and the recently launched "Respond" project on Humanitarian Assistance to develop an Open Service Partnership that will support humanitarian interventions globally. UK consortia are engaged in many of the other ten GMES GSE projects currently ongoing.

Lord Sainsbury (UK Minister for Science and Technology, including space) announced the publication of a new UK Space Strategy in December 2003 following public consultation. Key drivers behind the strategy will be to promote an innovative and competitive space sector and ensure that UK citizens, scientists and enterprises will have access to advanced space-based systems and services. BNSC partners are developing their supporting space plans and budgets to meet this new strategy. Due to restructuring, DTI funding for 2003/04 could only support a reduced national programme of projects. However, it was able to support a combined New Techniques for Observation Needs (NEWTON) and Service Mission Support (SMS) programme. The GIFTSS Government partnering programme to stimulate institutional markets operated throughout the reporting period. In line with the new UK Space Policy, the DTI is developing a revised Space Plan based on new funding mechanisms to support a national programme for exploiting the commercial potential of EO. More information is available at www.bnsc.gov.uk

The NERC, which is primarily responsible for the exploitation and use of EO for environmental science applications, has recently assumed greater responsibility for science in Earth Observation in the UK. It now manages the UK ESA subscriptions to the Earth Explorer missions, the EO Envelope Programme and Envisat operations and exploitation. NERC also coordinates a number of EO initiatives including their new Centres of Excellence, the New Observing Techniques (NOT) programme, the LINK programme and an Enabling Fund along with scientific instrument development such as HIRDLIS and GERB. NERC issued its Draft Strategy on EO for consultation 2003. This aims to shape the future direction of NERC's work towards using EO to create a more sustainable environment for the future and will contribute to UK funding policy. It will have implications for the scientific research community, and will also require cross-cutting collaboration with the UK industrial base with respect to forthcoming mission selection and exploitation priorities.

During 2002, NERC inaugurated a number of EO Centres of Excellence¹. These are in addition to the already established NERC Centres and Institutes² that research and use remote sensing data in a variety of applications to meet diverse needs. The Centres of Excellence programme is one of the most significant recent UK developments, and channels significant research funding plus a big institutional push towards priority areas of science, under the NERC "Science for a Sustainable Future" Strategy. The first NERC Earth Observation Workshop took place in March 2003. The second meeting was held at Plymouth in June 2004. Further information is available at <http://www.nerc.ac.uk/funding/earthobs/>.

6. SUGGESTED CHANGES 2004-2008

Commercial companies, universities and government agencies are broadly optimistic about the future of remote sensing but less confident with regard to photogrammetry. Tables 6.1a and 6.1b show that actual levels of activity compared fairly well

¹ The Centre for Terrestrial Carbon Dynamics (CTCD), Centre for Polar Observations and Monitoring (CPOM), Centre of Observation and Modelling of Earthquakes & Tectonics (COMET), Data Assimilation Research Centre (DARC) and the Environmental Systems Science Centre (ESSC).

² These include the Centre for Ecology and Hydrology (CEH), the British Geological Survey (BGS), the British Antarctic Survey (BAS), the Southampton Oceanography Centre (SOC), the Plymouth Marine Laboratory (PML) and the Proudman Oceanographic Laboratory (POL).

with the 2000 forecast.

	Photogrammetry	Remote Sensing	
Expanding	11	12	
Constant	3	2	
Diminishing	3	0	

Table 6.1a. Forecast of UK activities 2000-2004

	Photogrammetry	Remote Sensing	Other*
Expanded	11	18	4
Constant	8	8	0
Diminished	2	1	2

Table 6.1b. Actual (reported) UK activities 2000-2004

The outlook for 2004-2008 is similar (Table 6.1c) although, clearly, other related areas (lidar, GPS) are beginning to feature more highly. Within remote sensing, the GMES initiative and the related GEO process have injected reasonable optimism for expansion of the industry along with the launch of new platforms and instruments. The prospects in photogrammetry are less well defined but will inevitably feature more lidar and digital camera work. In addition, the continued integration of remote sensing and geographical information systems was seen very much as a positive influence, which would be significantly enhanced by the increasing importance of Internet delivery.

	Photogrammetry	Remote Sensing	Other*
Expanding	6	18	9
Constant	8	3	0
Diminishing	7	0	0

Table 6.1c. Forecast of UK activities 2004-2008

* Includes: GIS, GPS, Lidar scanning, data modelling and data distribution as well as sensor specific applications.

7. SOURCES OF INFORMATION

The main sources of information on UK remote sensing and photogrammetry activity include: *The Photogrammetric Record*, edited by P. R. T. Newby, the *International Journal of Remote Sensing*, edited by A. P. Cracknell, and the Remote Sensing and Photogrammetry Society *Newsletter*, edited by P. Mather. Information about the Society and its activities can also be found on its WWW home page: <http://www.rpsoc.org>

More information can be also be gained by visiting the websites of the RICS Geomatics Faculty (<http://www.rics.org/geo/>), the ICES (<http://www.ices.org.uk>) and RPSoc corporate members (<http://www.rpsoc.org/society/societyMembership/membCorp.htm>). Useful additional information is available from relevant UK trade associations, which are: BARSC (<http://www.ukspace.com/trade/barsc.htm>) and the United Kingdom Industrial Space Committee – UKISC, (<http://www.ukspace.com/trade/ukisc.htm>). The BNSC provides a variety of news, policy, education and industry information.

8. ACKNOWLEDGEMENTS

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9. REFERENCES

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APPENDIX A: SUMMARY OF UK ACTIVITY 2000-2004

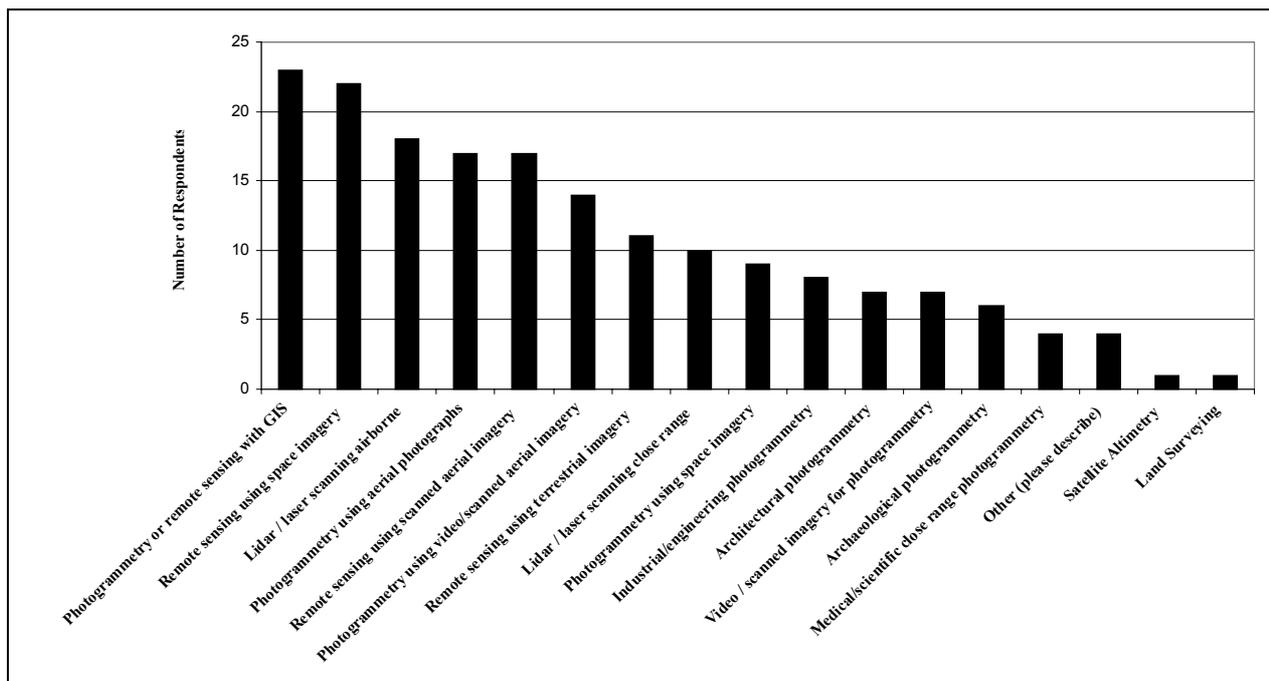


Figure A-1. UK Remote Sensing and Photogrammetry Activity in the Period 2000 to 2004 as Reported by Respondents