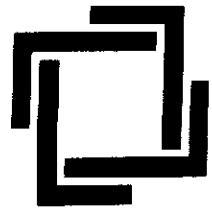

CONSULTANT STUDY ON THE REMOTE-SENSING INDUSTRY

A REPORT TO THE TASK FORCE ON
THE FUTURE OF THE ONTARIO CENTRE
FOR
REMOTE SENSING (OCRS)

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CONSULTANT STUDY ON THE REMOTE-SENSING INDUSTRY

1. INTRODUCTION

1.1 Purpose of the Study

This study is a contribution to the work of the Task Force that has been set up within the Ontario Ministry of Natural Resources with the following objective "To propose, by July 31, 1981, an institutional structure within Ontario that will permit the orderly development of new remote sensing technology within Ontario and will maximize the potential economic benefits derived from the operation of the Ontario Centre for Remote Sensing".

The objective of the study has been stated as follows:

"To investigate the private sector companies in Ontario that can benefit from the output of the OCRS and assess the present and potential economic benefits that the output of the OCRS can have on those companies as well as on Ontario, and to report by June 12, 1981."

1.2 Conduct of the Study

Apart from initial briefings by the Task Force and the Directors and staff of OCRS, the study has been conducted largely by interviews with senior individuals in 21 companies that are involved in some way with remote sensing. The categories of industry are described in Section 1.3 below. This report is the result of the analysis of those interviews against the background of written and oral information about the activities of the OCRS. The list of interviews is contained in Appendix A.

1.3 Categories of Industry

The activities of the companies that were interviewed fall into five principal categories. The number involved in each category is shown in parentheses:

A. Use of remote sensing, as clients. (7)

B. Manufacture of equipment for remote sensing or for interpretation. (4)

C. Conduct of remote-sensing surveys. (9)

D. Provision of aircraft as platforms for remote sensors. (3)

E. Interpretation of remote-sensing data. (11)

The total of the figures in parenthesis exceeds 21 because most companies are involved in more than one of these activities.

2. INDUSTRY PERCEPTIONS OF OCRS

2.1 Introduction

The following sections contain a summary of the significant comments that were made in the course of interviews with senior individuals in companies whose work is in or related to remote sensing.

In accordance with our usual policy no attribution is made, but where a particular view came from a single individual, a minority of those interviewed, or was that of a particular type of industry, it is so indicated in the text.

The views are categorized under the following headings:

- R and D activities
- Training, Information and Promotion
- Use of OCRS Facilities
- Provision of Services by OCRS
- Cost Recovery
- Relations with Industry
  - Cooperation
  - Collaboration
  - Contracting Out
- Institutional Status
- The Potential Scope of OCRS

2.2 R and D Activities

It can be said that those industries that are familiar with OCRS regard R and D as one of its legitimate activities. In comparison with other groups across the country OCRS appears to rate highly. It is perceived as a "good working group" doing what many in the private sector cannot do, namely developing new technology and translating it into end uses. OCRS is generally seen as having good facilities and good, helpful people. The majority of those who know OCRS, including some who perceive it as a competitor, would like to see it continue and expand its role in the development and proof of feasibility of new-remote sensing techniques.

Not surprisingly, perceptions of the value of R and D in OCRS varied according to the standpoint of the observer - in particular according to the category of industry he was in (1.3 above).
Isolated critical comments that were made are summarized below:

- "The work of the Centre is "pretty esoteric" and not enough practical applications are developed."
- "The R and D (in OCRS) should be related more closely to "real" (commercial) needs and not necessary only to the needs perceived by OCRS."

- "OCRS needs to do feasibility studies on new techniques but a close watch should be kept on the stage at which industry should be brought in."
- "OCRS needs to do R and D of its own in order to "keep its hand in", to retain its capability for monitoring the quality standards of commercial work and to maintain the interest and level of competence of its own staff. However contracting out some of its R and D could help OCRS remain closer to reality. There should be more contractual relationships with industry in the R and D field."
- "While we do R and D contracts for the Federal Government we are inhibited from doing them for the Ontario Government because of the existence of OCRS."
- "We do not see an increasing need for OCRS - type information because the projects are too scientifically directed."

2.3 Information-Based Activities

2.3.1 Education and Training

The OCRS training courses are seen in industry as an appropriate and necessary part of the OCRS mandate. The need for them appears to be greatest in client groups (i.e. consultants and other large client companies) and least in the small but competent interpretation companies who feel, with some justification, that their staff is as knowledgeable as that of OCRS. Independent of the probable degree of use of the courses there was widespread support for their continued existence. As in the case of R and D a number of useful individual comments were made, the most significant of which are summarized below:

- "OCRS undertakes education and training for universities and industry. Those who are geographically well-situated close to OCRS use OCRS equipment to do their own work."
- "The courses run by OCRS are well set up and we plan to send some of our people to them in the near future."

- "OCRS training courses are valuable."
- "OCRS efforts in education should continue in cooperation with the universities. Some of it could also be done by industry. A company like ours has major R and D content and, consequently, differs very little from OCRS in the quality of personnel and their ability to teach. This applies to some other small highly specialized high-tech companies."
- "Training in remote sensing at OCRS of our consultants who are experienced in other fields has been of great value to us."
- "We appreciate access to OCRS hardware and training courses."
- "OCRS may be protective of its developments and does not include familiarization with them in its seminars."

No unfavourable comments on the training program could be found in the interview reports, even though some companies did not see them as being particularly useful to them. Several companies saw OCRS as fulfilling an extremely valuable role in educating prospective overseas clients. This aspect of education will be dealt with in Section 2.3.3.

2.3.2 Information

The flow of information from OCRS to the industry, either on paper or by word of mouth, appears to be far from uniform. Some companies are thoroughly familiar with OCRS while others are hardly aware of its existence. Geographical location was often referred to as an aid or inhibition to contact. There was relative unanimity that OCRS had a particular responsibility to educate potential users of remote sensing and thereby stimulate its more widespread use. There was a strong feeling that OCRS does not do this job as effectively as it could, perhaps through lack of resources. Typical of the comments are:

- "We receive little or no information from OCRS but a good deal from CCRS."
- "A problem needing solution is how to get information to users."
- "There appears to be only marginal use of OCRS data by (name of Company). Receipt of OCRS literature is spotty and notification of seminars often arrives too late."
- "We receive OCRS literature but do not find it useful since it is aimed at those too low on the learning curve."

- " A particularly sore point are the OCRS questionnaires. They take a lot of time to complete, are not well constructed from the responders point of view and their usefulness is not apparent."
- "I took a course at OCRS three or four years ago but have not had much contact since."

2.3.3 Promotion of Remote Sensing

The views of the industry are typified by the following comment by one of those interviewed. "OCRS has a very important role in liaison with government agencies (and often potential users), thus establishing confidence in remote sensing as a technique. This is an ongoing responsibility of OCRS which must continue. It is very beneficial to an industry which has continual difficulty itself in establishing confidence in the techniques in the minds of the clients".

The importance of OCRS as a place to indoctrinate overseas clients of Ontario industry in the scope and value of remote sensing was emphasized by several companies.

Other comments included:

- "OCRS has a lead role in the Province. Its existence increases the visibility and importance of remote sensing in the Province. Greater freedom and visibility for OCRS will enhance this aspect of its work."
- "OCRS aims at developing the user market."
- "A major barrier to the use of remote sensing appears to be communication. The Cornell Centre publishes a monthly news letter in which their activities are described, publications referenced and plans outlined. Perhaps OCRS could do a similar thing."

2.4 Use of Equipment and Facilities

Even some companies who viewed OCRS as a competitor felt dependent upon it for the use of facilities and equipment. It is clear that one perceived role for OCRS is the acquisition of highly-specialized equipment that would not be justified for one company to purchase. There was considerable discussion, under this and subsequent headings, on how to draw the line between competition and cooperation involving OCRS and industry. This subject is discussed in more detail in Section 2.7.

In the meantime some significant quotations are:

- "In situations where OCRS has highly specialized equipment available, industry would willingly pay for its use, particularly on foreign contracts."
- ".....wondered whether OCRS would be in competition with industry, offering similar services, or whether they would acquire expensive systems that could not be purchased by a company. These might then be leased to the private sectors for specific projects."
- "Where industry pays OCRS only the cost of the equipment, not OCRS labour, should be recovered."

2.5 Provision of Services

There was not much comment on the provision of remote-sensing services, as separate from the use of facilities, to industry by OCRS. The comment on the provision of such services to government, which is often perceived as competition with industry, is dealt with in Section 2.7 below. A few of those interviewed saw OCRS as providing a systematized information and data service:

- "On the question of additional services, it was suggested that OCRS could establish a service index of aerial photography. This would assist users by helping them locate photography done for purposes other than the one in hand. In the present situation everyone is doing his own thing and a central service index would be helpful."
- "A "one stop shopping" for all remote-sensing data would be helpful. This should include federal data."
- "One ambition in respect to remote sensing is to see established a full data-handling capability for Canada."
- "Weather data from OCRS was crucial to the success of the project."

2.6 Cost Recovery

The dichotomous attitude of industry to OCRS is equally apparent with respect to cost recovery. On the one hand companies believe in principle that OCRS should charge full going rates for any work on which they recover costs, so as not to enter into unfair competition with industry. On the other hand, in practice, many companies are glad to avail themselves of OCRS services free, at cost or at sub-commercial rates as a matter of

expediency. The representative of one Company said:

> . "Many countries such as France subsidize the remote-sensing industry to the extent that it is almost a part of government. Without services such as those provided by OCRS, industry would find it difficult to compete for foreign contracts. We use the imagery available at OCRS, do our own viewing and interpretation and therefore do not pay a fee."

One company suggested that OCRS did not charge anything like commercial rates for analysis and interpretation of surveys for the Ontario Government. He questioned whether the work would in fact be done at the same intensity if the Government had to pay commercial rates.

Another said the Alberta Government had "gone right out of photo-interpretation (in-house) because they found it too costly. It now contracts out all such work to private companies".

Other comments included:

> . "Cost recovery should be the rule for operations but risky R and D should be funded by some other means."
>
> . "One service gets in the way of normal OCRS activities. It is the supply on request, free of charge, of land inventory maps.

They should be provided only on a cost recovery basis and supplied, along with similar products by the Ministry of Natural Resources."

- "Projects having direct application should be subject to cost recovery. When there is no clear industrial objective, no cost recovery should be sought."
- "OCRS should not seek paying clients outside government and only inside government for experimental one-off projects (not for ongoing projects). It should expand its educational and training role and help foster the development of the industry for which purpose it will need a substantial budget. The government may have to pay more to industry than to OCRS the first time it has a new type of job done, but this would be an investment in industrial development."
- "OCRS must not offer the use of its equipment or facilities at less than the going commercial rate (or the commercially-derived "fair cost" of new processes). Otherwise this will inhibit the acquisition of similar resources by industry. OCRS will grow (in the wrong direction) at the expense of industry."
- "The Ontario Ministry of Natural Resources finds it cheaper to use OCRS than industry because the basis for OCRS cost recovery is far from rigorous."

- "The balance between sustaining grants and contract income must be watched carefully in bodies such as OCRS. Too great an emphasis on cost-recovery implies almost certain competition with industry. The general appreciation is that OCRS has good facilities, and good people who are helpful. At present it is perceived that the facilities can be used for R and D purposes but not for operations. It was suggested that they should be available on a cost recovery basis for operational use."

2.7 Relationships of OCRS with Industry

2.7.1 Cooperation

There was a general acceptance of OCRS by much of the industry and recognition that OCRS does have competent specialists. Some felt that OCRS may be too prone to undertake projects on its own, instead of looking to the private sector where equal or greater expertise in a particular area may exist. The cooperation of OCRS experts with counterparts in the private sector should be developed further, according to some of those interviewed.

The nature of that cooperation was also discussed. While there was acceptance of the OCRS role in R and D

and, in some cases, pilot operations many felt that OCRS should not undertake ongoing projects nor be an intermediary between the Provincial Government and the industry in relation to them. It was suggested that the Provincial Government should contract directly to industry for its services and offer the assistance of facilities of OCRS where appropriate to the succsssful bidder. The strong interest in cooperation with OCRS is illustrated by some of the following comments:

- "With a more open policy on the part of OCRS and the entering into joint projects, all the problems with OCRS would disappear."
- "When there are commercial opportunities, the work should be done by the private sector."
- "The big opportunity in the future lies in data management - producing products from existing data. Industry should be in the forefront if there is a profit to be made."
- "OCRS should learn more about the operations of consulting firms in order not to compete and to enable them to offer more appropriate services."
- "It was felt that OCRS should try to join with the private sector on projects rather than sit back and wait to be asked or, worse, start up competitive projects on their own."

- "Industry should be given the prime role in Ontario government contracts with OCRS services provided as part of the RFP."
- "We have interacted with OCRS on behalf of several clients who are mainly in the federal or provincial government or bodies such as the conservation authority with a very small proportion in the private sector."
- "We have no hang-up on OCRS doing experimental work but feel that the line between that and commercial service work must be drawn very carefully if OCRS expands."
- "There was a visible worry that OCRS was going too far in promoting projects as opposed to methodology. Both interviewees stated that the projects should be left to industry, although they recognized that OCRS might participate."
- "OCRS should be freer to undertake cooperative projects with industry (joint venture) but with some reservations on whether the choice of company to cooperate with OCRS could be made fairly and, in particular, be seen to be made fairly."
- "We would be interested in cooperative ventures or sub-contracts related to Ontario government projects. We would also be interested in any way in which OCRS developments on sensors and interpretation could be transferred to us to extend the range of services we could offer to overseas clients."

2.7.2 Competition

There were strong feelings in a number of companies that OCRS could be a source of unfair competition to industry if it undertook to provide services based on established techniques. The general perception in industry is that OCRS rates for a given service do not reflect the true cost and, consequently, undercut commercial rates. However there is no complaint when industry itself benefits from the cut rates. Most of those interviewed understood the difficulty of drawing the line and made constructive suggestions.

There was little or no tendency to say that OCRS should be abolished because of real or perceived competition ---- rather that competition was a factor to be considered in the re-definition of the OCRS mandate. Only one specific case was cited in which OCRS won a contract in direct competition with industry.

A number of those interviewed drew the analogy between OCRS and ORF with regard to competition with industry. One said, pejoratively

- "OCRS is the ORF of remote sensing."

The extent of the comments that follow illustrates the concern of the industry that OCRS has clear guidelines in the future as to how to deal with this problem.

- "OCRS, sometimes tries to do work for which it is not well qualified while the appropriate expertise resides elsewhere."
- "The OCRS software was recently upgraded to current standards, and the system was expanded to include two work stations. As a result OCRS has the best facility that exists in Canada for providing a digital image analysis service. Did this upgrading contract "put the competition into business?"
- "OCRS should never offer or provide survey or interpretation services even to Ontario government clients. Even the pilot projects they do could be done more efficiently (i.e. fewer man hours) in industry."
- "We have mixed feelings about going to OCRS. Services based on established techniques should only be offered by private industry."

- "The Company has never come into conflict with OCRS nor felt unfair competition from it."
- "As the capability for Landsat interpretation develops, clients should look towards private industry, not OCRS for that interpretation."
- "While circumstances cause the size of a company to follow fluctuations in the economy, the same is not true of a place like OCRS which at least maintains its size even if it has to intercept commercial work to do it. It is questioned whether commercial work can be done in OCRS as cheaply as it can in industry when real costs are considered."
- "He wondered if OCRS would be in competition with industry offering similar services - or whether they would acquire expensive systems that could not be purchased by a company; these might then be leased to the private sector for specific projects."
- "It would be very difficult to draw a firm line between the legitimate activities of OCRS and those that rightly belong to industry. Therefore, a referee is necessary to help draw that line in any contested area. This could be done by the nomination of a small board representing government and the private sector which would be capable of making rapid, good, solid judgements."

- "OCRS should not undertake ongoing or repetitive work either for governments or industry. All such work should be done by industry on a commercial basis. If industry needs to invoke OCRS help in such projects so be it. But OCRS should not seek to perform commercial work."
- "OCRS should not enter into competition with the remote-sensing industry and certainly not at rates that do not include the full overhead cost computed at commercial rates. It may provide services at commercial rates in conjunction with a commercial prime contractor to a government or industrial client."
- "OCRS should be the adjunct to industry not the intermediary or the prime contractor. An independent structure for OCRS would increase its competitive role."
- "There is a dichotomy of industrial views on OCRS. On the one hand industry is sensitive to any hint of unfair competition by OCRS in the commercial market - especially as industry perceives OCRS as a government-subsidized operation which has no obligation to represent its full overhead costs in its fees for services. On the other hand a company, which does not itself specialize in remote sensing, cannot justify much of the larger equipment that is necessary for remote-sensing jobs and relies on OCRS for access to it."

"The Company is interested in cooperation with OCRS on joint ventures. It is recognized that such cooperation is limited at present by bureaucratic financial controls. It should be more openly available."

- "OCRS competition is a real problem, particularly for Ontario Government business."
- "OCRS should try to get itself in a position where it could cooperate, not compete with industry."

2.8 Institutional Studies

The future institutional status of OCRS was discussed in terms of its potential influence on the OCRS budget and on facilitating cooperation between OCRS, government and industry.

Discussion generally moved quickly towards the Crown Corporation option. Some were content to see OCRS remain a part of a government department. None could envisage it moving out into the private sector. The analogy to ORF was drawn several times but few envisaged OCRS as part of ORF, partly because some see ORF as too active (and too successful) in seeking government contracts.

The majority of those interviewed who had views on the question would like to see OCRS have greater freedom (and increased funding)

to foster cooperation with industry. However some had reservations about such freedom in case it caused OCRS to enter more deeply into competition with the industry.

The following comments illustrate these and other points of view:

- "On the question of institutional arrangements, we favour a Crown Corporation. This would ensure that OCRS undertakes the type of work that they profess to undertake."
- "In respect of organizational arrangements we believe that, if the OCRS mandate is development, a Crown Corporation would be appropriate. If it is surveying, that should be done by the private sector."
- "We would be suspicious of a move to make OCRS a Crown Corporation because that would give it an obligation to recover costs and therefore compete with industry."
- "We are not in favour of a Crown Corporation as, in our judgement, the overhead would be doubled. An arrangement such as ORF would be suitable."
- "It was suggested there be two organizations; one a crown agency type to pursue technology transfer; the other closely allied to a University to undertake research. The difficulty of linking the two was acknowledged."

- "We have no opinion on the preferred status for OCRS, but the first step is to establish a clear set of objectives and the institutional arrangement will follow."
- "If a Crown Corporation is necessary in order to get the "clout" to obtain the funds to foster industrial development then that is the road to take."
- "We would fear commercial competition from OCRS if it were privatized because if it remained OCRS it would retain a privileged position with the government. A Crown Corporation with clear guidelines relating to competition would be preferable."
- "If OCRS went private it would lose its central role. That central (lead) role is important. Most industry is not up-to-date in its use of remote sensing. Industry will not take the lead in furthering the art of remote sensing. OCRS must continue to have this role. Therefore a Crown Corporation configuration is probably the most appropriate. We do not rule out the possibility of some industrial support for the core operations of a new OCRS as well as contracting in or joint venture. This should be taken into account in writing the new terms of reference."
- "Cooperation is needed between industry, provincial organizations such as OCRS and the Federal Government. The present organizational status of OCRS militates against that communication. It is very difficult for OCRS to initiate a program and communicate it at a level that will have any impact on the Federal Government."

2.9 The Role of OCRS

Some of those interviewed had given a good deal of thought to the future of OCRS and, in particular, to what the scope of its activities should be. Some of that thinking has been reflected in the preceding sections of this report. It only remains to summarize it and to quote further comments that were aimed directly at this subject.

In summary it appears that the activities of OCRS that are generally welcomed by or acceptable to industry include:

- Education and Training.
- R and D (with some contracting out).
- Making highly specialized equipment and facilities available for the use of industry.
- Conducting experimental R.S. surveys.
- Promoting remote sensing in the Province.
- Providing information and data.
- Collaborating with industry in appropriate projects.
- Contracting to industry for flying and other services.

What was not acceptable was direct competition with industry for ongoing projects for which the techniques had already been established, even though the projects required the use of OCRS facilities. In these cases industry felt that the client (even the Ontario Government) should contract directly with industry and invoke the assistance of OCRS to the chosen contractor.

Comments on the future role of OCRS were fairly extensive:

- "The appropriate role for OCRS is:

  1) investigate new techniques and report on them.
  2) act as a co-contractor or sub-contractor with industry.
  3) in the area of education (which they do well).
  4) provider for large facilities for lease."

- "OCRS should meet provincial needs in areas where there are not profits to be made and hence no commercial interest. For example, they might advise on private sector competence. OCRS might take on work for other provinces where local expertise is absent."
- "There is a role for OCRS in the acquisition of equipment and systems that could be leased to the private sector."
- "OCRS has capability to deal with applications but seems to stop short. The problems of applying remote-sensing data to forest fire fighting is an example where advances could be made."
- "OCRS do a great deal of training which is extremely useful to industry, not for their staff but to refer foreign clients to. OCRS is valuable in offering training courses, in doing experimental work and, above all, as a marketing tool for the R.S. industry."

- "One perceived role for OCRS is the acquisition of highly specialized equipment that would not be justifiable for one company to purchase. This could be used by a variety of companies on a cost recovery basis."
- "OCRS was going too far in promoting projects as opposed to methodology. Projects should be left to industry, although OCRS might participate."
- "Specific areas of OCRS development should be identified at any given time together with others which would be the exclusive domain of the private sector."
- "As new satellites come along, such as SPOT, with improved resolution, there will be a greater role for OCRS in terrain evaluation technology. He foresees the possiblity of undertaking all forestry mapping this way and is optimistic about using Canadian technology in foreign countries. He also suggested the possibility of selling the technology to other provinces."
- "If Ontario did not have an OCRS, we would need to create one."
- "OCRS is a good back up to industry and is operating in the proper role."
- "The central functions of OCRS are new process development and the transfer of new processes to industry - not the provision of established services that are available from the private sector."

- "At some stage each new technique should be "hived off" to industry. As an example industry might well be under contract to OCRS to maintain the Landsat inventory that OCRS is currently maintaining itself. OCRS is seen as dynamic, continuously changing and not clinging to any established technique. The line between new development and commercial services must be very clearly drawn. There should be a "sunset law" for OCRS on each of its activities."

- "There is a provinical responsibility to take and use the data acquired by the Federal government. OCRS has a big role in developing the techniques and transferring them to industry so that the commercial entities are in place and competent to exploit the information available from new generations of satellites."

- "The question of economic benefit derived from the export of remote-sensing services was discussed as something to be encouraged. The transfer of technology to industry has been inhibited by the circumstances in which OCRS has to operate within the Ministry. It is often unable to act in a timely manner or to initiate studies rather than respond to government or industry requests. Moreover it does not receive the income generated by its activities, as all income goes to the Provincial Treasurer."

- "We would place strict conditions on OCRS development. We see it continuing to take the lead in the development and proof of feasibility of new remote-sensing techniques. However it should never go beyond proof of feasibility or pilot demonstrations."

3. THE PRESENT STATE AND FUTURE PROSPECTS OF THE REMOTE SENSING INDUSTRY IN ONTARIO

3.1 Introduction

A much more intensive study would be necessary in order to draw an accurate picture of the remote-sensing industry in Ontario. There is no effective definition of the industry; consequently bodies such as the federal and provincial departments of industry, Statistics Canada and the professional associations are unable to provide accurate directories of the industry. No previous attempt appears to have been made to estimate the manpower and expenditure in industry on a well-defined range of remote-sensing activities.

An attempt is made in the following sections to give a qualitative account of the extent of various remote-sensing activities in Ontario industry. Quantitative data are introduced whenever possible but it must be realised that the figures, which were mainly acquired in the course of interviews are far from complete and, in many cases represent our own estimates. In order to protect the confidential nature of some of the data, only aggregate figures are quoted.

3.2 Industrial Clients for Remote Sensing

Industrial clients of the remote-sensing industry include:

- oil and gas companies
- mining and exploration companies
- environmental specialists
- consulting companies

The evidence obtained from sampling these industries in Ontario would indicate that most of them are only just beginning to appreciate the potential of remote-sensing techniques for solving problems and saving time and money. Even some large companies indicated that their total expenditure on remote sensing was only a few thousand dollars a year. Generally remote sensing was the part or full-time responsibility of a single individual whose salary would not be included in that figure for expenditure.

Resource companies in other provinces now have expenditures on remote sensing running into millions of dollars while, in Ontario, the principal clients for remote sensing appear to be the Federal and Provincial Governments with some business from overseas.

The awareness of the potential benefits of remote sensing appears to be very low in many client industries. Several remote-sensing companies made it clear that they saw OCRS as

the spearhead of a campaign to educate client industries.

There appears to be room for enormous growth in client demand for remote sensing as the conservatism of potential clients is eroded. It is impossible to quantify this potential growth.

3.3 The Remote-Sensing Manufacturing Industry

The remote-sensing industry includes not only the manufactures of sensors, instruments and ancillary equipment but also those who manufacture equipment for analysing remote-sensing data.

In the companies that were sampled there appeared to be a stable business in remote sensors and associated equipment amounting to two or three million dollars a year. The demand for interpretation equipment seems to come mainly from abroad. Equipment designed by Ontario companies is attracting a lot of attention. One company sees the potential export market for its products growing from the current $1-2 million to in excess of $10 million in the forseeable future.

3.4 The Remote-Sensing Service Industry

The two main remote-sensing services are the conduct of surveys and the analysis of the resulting data. Often both services are performed by the same company. Most companies that conduct remote-sensing surveys also do some interpretation. There are, however companies that specialize mainly in interpretation. The industry is characterized by a number of relatively small companies generally with an annual turnover of less than $1 million each. Other than these there are a few larger survey companies for which remote sensing is a very small fraction of their activities. An exception is Geoterrex, which specializes in geomagnetic surveys and does 85% of its surveys for overseas clients.

We traced at least $20 million annual turnover in Ontario companies that do remote-sensing surveys and interpretation. About 6 million of that figure is related to multi-spectral imaging and related interpretation while in excess of $14 million relates to other forms of remote sensing (e.g. geomagnetic, air quality, etc.) which are currently less closely related to the OCRS program. The above figures relate only to the companies that were interviewed and represent low minimum figures for this category of industry.

3.5 Provision of Aircraft

Generally the cost of flying is included in the figures for the companies conducting remote-sensing even though it is usual for them to contract the flying out to survey companies that specialize in providing aircraft as platforms for cameras and other remote-sensing equipment. Remote sensing represents only a very small fraction of aircraft utilization in these companies for which the main business is aerial photography and/or aerial surveys.

4. CONCLUSION

Accurate data on the size of the remote-sensing industry in Ontario is hard to come by for the reasons given in 3.1. The material in the preceding chapters is based on the survey of a limited but significant sample of the client and performing industries.

It would appear from this limited survey that remote-sensing business in Ontario is currently at least $20-30 million a year. The figures could be conservative. It has been remarked that the use of remote sensing is growing rapidly in other countries and in other provinces, particularly in western Canada. It would be very surprising indeed if the potential for the growth of the use of remote sensing were not realized in Ontario during the next few years. The increased definition that is expected in the images from new satellites could help to trigger such growth. The industrial nuclei to perform this work are in place. There is a need not only to keep abreast of new technology and its application, but to educate potential client industries and encourage them to take advantage of those techniques that could save them time and money over conventional methods.

The Ontario Centre for Remote Sensing could play a major role in stimulating the growth of the remote-sensing industry, given an adequate budget, a degree of institutional freedom and an appropriate mandate.

APPENDIX A

OCRS Study: Remote-Sensing Industry

List of Interviews Involving Philip A. Lapp Ltd.

May 7th	Dr. J. Vcleck, University of Toronto (with Task Force)
May 7th	Mr. Paul Rennick, Acres Consulting Services (with Task Force)
May 12th	Dr. L. Sayn-Wittgenstein Director Dendron Resource Surveys Ltd. Box 6493 Station J Ottawa, Ontario K2A 3Y6 (613) 225-6903
May 14th	Mr. J.R. Depper, President Terra Surveys Ltd. 2060 Walkley Road Ottawa, Ontario K1G 3P5 (613) 731-9571
May 14th	Mr. Lee Godby Canada Centre for Remote Sensing Ottawa, Ontario
May 15th	Dr. A.F. Gregory President Gregory Geoscience Ltd. 1750 Courtwood Crescent Ottawa, Ontario K2C 2B5 (613) 224-9565
May 19th	Mr. J.G. Hutcheson, Co-ordinator Marine and Pipeline Division Logistics Department Imperial Oil Ltd. 111 St. Clair Avenue West Toronto, Ontario M5W 1K3 (416) 924-9419
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