

SESSION 1.

A LOOK INTO THE FUTURE OF LAND SURVEYING.

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I am very pleased that the Programme Committee gave me the title "The Future of Land Surveying" without any further qualifications. It gives me the freedom to make my own definition of the future.

I choose the year 2,000, only 33 years away - most of you will still be hale and hearty by that time - barring a nuclear war - and from the viewpoint of the student finishing high school today we will be looking at the conditions when he is in command.

I repeat that I am very pleased with the title because having chosen the year 2,000 I can say that there is no future for land surveying - as we know it now - so I can sit down, unless you would like me to talk about surveying in the year 2,000.

Now I just propose to take a few minutes to review the past and present before informing you of what my crystal ball tells me.

18th and 19th Century.

In the first two centuries of Canada's development, the Land Surveyor played roles of primary importance in contributing to the safety and efficiency of navigation in our waters; the orderly settlement of our land and design of our cities; in the design and construction of our roads and highways and later our railroads; and in the location and development of our renewable and non-renewable natural resources. These resources included, in addition to land, the water, forests, water power, minerals, fishery, wildlife and recreational facilities of Canada.

The Land Surveyor was truly professional and held equal status with the Doctor and Minister in the eyes of citizens of Canada at that time.

20th Century.

In the twentieth century, we have witnessed tremendous changes in techniques of surveying. The changes began slowly with the first Department of Geodesy established within the Government of Canada in 1908, aerial photography during the 1920's and the European Theodolites in the 30's. During the Second World War and the two decades after a tremendous advance in equipment and knowledge was made which we have all witnessed and are witnessing today.

A few examples reminding us of these tremendous achievements are appropriate at this time. The Shoran system provided the possibility of quickly providing a framework of horizontal control over large areas for mapping purposes. The Shoran network of northern Canada is an outstanding example of the application of this technique. In the early 1950's, the introduction of the geodimeter, an electro-optical instrument measuring distances ranging from a few meters to five kilometers to a very high degree of accuracy greatly facilitated and strengthened the propagation of horizontal control. By 1957, Wadley, in South Africa, had developed an "all weather" electronic system of instrumentation which he called the tellurometer.

In 1959 the first monument on a planned provincial co-ordinate system were placed establishing the control network on which all legal surveys were to be related. Now three Provinces and the Government of Canada have legislation and regulations using the co-ordinate system to assist in the recording of title of land.

With the recent development of Aerodist, an airborne system using the tellurometer principles of distance measurement, it is possible to provide horizontal control at intervals of 90 to 100 kilometers for areas which are economically inaccessible by other methods. Added to and associated with these developments is the impact of digital and analogue electronic computers and the use of artificial satellites for survey purposes.

In aerial photography for land mapping, we have witnessed great advances in lens design for cameras, film, aircraft vehicles and navigation. The airborne profile recorder for recording the height above terrain of the airborne camera equipment was developed in Canada. Very recently in the U.S., instrumentation involving a laser beam has been developed to record height above terrain.

It is fair to say that the practising photogrammetrists are currently involved in a transition from analogue methods to analytical methods. Developments in this field include stereo-comparators, mono-comparators with automated digital output for very precise measurements of co-ordinates of points on aerial photographs, and the analytical plotter invented at NRC. The stereoniatic, another Canadian development, has led the way to automation in photogrammetry. Hydrographers have been involved in analogous developments which include electronic positioning and recording of ships' courses and automated depth soundings.

Electronic computers have opened up vistas in data processing, data banks, data analysis and research, particularly in those areas which involve vast quantities of data. Surveying, mapping and land registration is such an area. To use electronic computers efficiently and to obtain maximum information, one must understand the fundamentals of the problem.

The above paragraphs are not intended to give a complete picture of developments in surveying and mapping, they only indicate dramatic changes, over a brief period of time, in concepts knowledge, and abilities needed by personnel working in these fields.

But these new developments affecting our own profession have all been made by members of other professions. The Surveyor has become the user (technician) and not the innovator (why?). Other professions have strived to improve their educational standards, realizing that without continual raising of their educational qualifications there is a relative lowering of standards with respect to other

professions such as business administration, nursing, etc.

The twentieth century has also shown us that where there a lack of education in any field, be it a new field or an old one, like land surveying, professionals from other fields are solving the problems. Glaring examples are town planning, highway design, subdivision calculations, etc. It is even worse when specialized professionals within the land surveying profession, because of their professional judgement want to lose their ties with land surveying such as the geodesist, photogrammetrists, etc.

I feel that this indicates that the surveyor has been unrealistic in his definition of his goals in that he has not realized the significance of his professional judgement. The Surveyor is being criticized far more outside his profession on his professional judgement than within his profession. Are we not on a par with that of an electrician who rewires an old building? The electrician has to conform to laws and regulations about safety and keep the costs within reasonable limitations. The consequence of his poor judgement could mean suffering for many innocent people, whereas the consequence of poor judgement by the land surveyor could lead to an argument and possibly to litigation. Is their professional level not somewhat akin to ours? Are their qualifications and skills so different?

Professional judgement always involves the "why". How much do land surveyors have to say about the "why" when they are doing a job? The usual reason is that the law dictates or a lawyer advises a client that a survey is necessary. The initiative is not with the surveyor. How often does the land surveyor say "this ought to be done, I will take the initiative and bring the appropriate people together, outline a programme and get on with it." If the land surveyor were truly professional he would be consulted on whether or not a survey should be done. Is this not the professional judgement the surveyor now lacks?

The optometrists faced the same problem and once they set their goal not on selling glasses but on consulting "eye examination" they slowly began to be recognised as professionals.

As long as a land surveyor's main object is to keep his crews regardless of whether the job is useful, necessary, or wise, and as long as he is being paid, the public will treat him as he is - as a skilled technician. President Lincoln once said " You can fool some of the people all of the time, all of the people some of the time, but you cannot fool all of the people all of the time. Gentlemen, you are not fooling everybody." The public sees you as you are! The university students see you as you are! They are not interested in what they see. The choice is yours - you can either make drastic changes or stay as you are, only yourselves are being deceived.

Think! A land surveyor of the last century - if he could return from his happy hunting ground, he could within one week be competitively surveying in any province and within a month be doing satisfactory work.

Have we progressed? Have we not lost the 20th Century?

21st Century.

Having lost the 20th century, let us not lose the twenty-first century.

In North America, today, about half of our population is now in the twenty to thirty year group. We oldsters call them immature and a bit unbalanced. The more vocal members call us aging scoundrels, wastrels and hypocrites. For the world they face, is one we never knew. For instance, the "welfare state" is here to stay; retirement at the age of 50 will be normal in ten years. Also the "blue collar" worker will gradually merge with the "white collar" worker since control of the electronic means of production will require not work as we know it, but knowledge.

Also our youthful population knows no hunger or fear. They have an inconceivable self-assurance about practically everything based not on indifference nor ignorance, but largely on realistic knowledge.

In politics, they think little of provinces or nations, but of the world. In business, they envisage international trade in the dimensions we reserved for the larger communities. In industry, they recognize the need for crash programmes in the facilitation of production, not just in a community or country, but in the whole wide world. In fact, the whole world is their oyster, not just a neighbourhood or village.

Now if we can peek into the crystal ball we find two industries on the national scene that will have untold effect on our association. They are education and housing.

Formal schooling will start at the age of 4, and continue for the professional class at least to well over 30 years of age. Mankind's productive "working" lifetime will become something like 20-25 years, of a few days each week.

And what will support this currently almost unbelievable world? What will pay the bill? The signs are already evident.

The current surge of population explosion is the last mankind will see. Even in the "under-developed" countries, the Pill is beginning to change the structure of civilization. On this continent, the effect will be sensational. For while the human urge to perpetuate a family will remain, it will come under rigid control - the control of monetary wherewithal within the family. Education will become our biggest "industrial" boom in history. In every form, and with every device, this will be the growth industry of the future.

Housing is a crisis need of today and must in the near future take precedence over practically every other national want. Houses fully furnished will be bought, traded and junked within a twenty year period becoming a commodity instead of an investment.

With this as a background, what does the crystal ball tell us of surveying in the year 2,000?

1. Instrumentation.

1. (a) Improved tellurometers, geodimeters and laser type devices (e.g. geodolite) even lighter, more precise, more portable and more foolproof than you have today will be easily operated. An operator will not need to know any electronics to get readings, any semiskilled technician will be able to operate the instruments.

(b) Photographic recording theodolites by which it will be possible to obtain a photographic record of the target, of the monument of the nadir of the circle horizontal and vertical azimuth as well as a digital out of the crisis.

In effect, there will be instruments that will do almost everything but select the stations to be observed and set themselves up.

2. There will be coordinated monuments every few hundred meters (feet will be obsolete) with coded numbers stamped on top so that the photographic nadir recorder can automatically make a permanent record of the setup.

3. (a) High altitude (perhaps satellite) photography from monthly photo patrol flights will be available by the 5th day of the following month at the regional photo library.

(b) Low altitude photography from the semiannual patrol flights in May and October will also be available from the regional photo library.

(c) Special low altitude photographs will be available on a cost-sharing basis at any time to any specifications.

4. Picto or orthophoto maps at large and small scales will be available on special order 15 days after the flight date. Annually revised editions of picto-maps will be on sale at the community library or cultural recreation centre. Release of new editions for developing areas will be a regular "event".

5. All construction and utilities above and below ground will be coordinated in three dimensions and fed into the district environmental data centre ready for automatic updating of the district line maps.

6. Line maps will be printed in quantity and stored only at small scales, say 1:250,000, for hinterland areas and at medium scales, say 1:50,000 for inhabited areas. Large scale maps and engineering maps will be printed to order by the computer plotter, will be correct to the hour of printing, and will be available within 48 hours. Map specifications will indicate the features to be printed as well as those to be suppressed.

7. Legal surveys will be by coordinates and property transfers will be integrated with the above data and fed into the district environmental data centre.

That is my prediction, now where will the professional surveyors be?

1. He will not be operating instruments. He will not be subdividing land.

2. He will be planning the monumentation, photo specifications and programming for new subdivisions, urban renewal projects, and recreational and resource area developments.

3. He will be directing the computer analysis of field and photogrammetric projects in progress (Men and Machines will continue to make mistakes).

4. He will decide when a project or part of a project is up to specification for transfer to the District Environmental Centre.

5. He will be in touch with building and landscape architects to coordinate the timing of survey activities with other professionals and will direct technicians accordingly.

6. He will supervise technicians working on systematic inspection and restoration of monuments in relatively settled areas. (There will still be vandalism and unregistered small construction projects that will destroy monuments).

7. He will plan the location, marking and tying-in of the permanent photo-control points and will supervise the technicians working on continuous inspection and maintenance of these points.

8. He may be in programme development.

9. He may be a consultant to bio and geo scientists re specifications for special purpose photography.

Conclusion.

There is a story about a mad scientist who crossed an elephant with a parrot. He was after an animal which could not only remember, but which also could tell what it remembered. What he got was a ten-ton bird that ate peanuts!

Whether or not our first interdisciplinary efforts toward an electronic data bank for surveyors, yields a ten-ton bird, it will probably not be long before someone learns how to incorporate a wise old owl into the mixture to produce a powerful, modern tool for managing one of our most precious resources - land - one tends to forget, first, that our land is limited in quantity and, second, that each piece, like a fingerprint, has a uniqueness which cannot be duplicated in any other piece - the uniqueness of location.

Are we going to be the remnants of a proud but lost profession or are we going to exercise professional judgement by broadening our horizons to create a challenging profession that will attract the alert, discerning youth of the 1970's. The facts are already on the wall, the decision is yours.

DISCUSSION

MR. J. LEITCH: Mr. Roberts, in New Brunswick, what system of surveys do you have? In other words, is it similar to New York State or is it like Ontario. In Ontario, the monuments govern, in New York State, the written word governs - which is the system?

MR. ROBERTS: Let's put New Brunswick on a transitional period between. Our new Surveys Act states that having coordinates of any corner, you can describe a lot by coordinates, and they are primary evidence. In other words we can go completely digital and have in a lot of descriptions. You don't have to put any posts courses, distances, just the coordinates of the corners, accepted by law as a description of a parcel of land.

MR. J. LEITCH: Yes, but is it the marks on the ground that govern for the position of ownership?

MR. ROBERTS: Yes. This has to be left with the court. We couldn't go that far. We can't take away the post in New Brunswick from the people. The monument governs all else - it's the old common English Law of property ownership, and we didn't feel we could take this away from the public, but it is rather odd in a subdivision, you go out and stake the whole thing, and the original monuments are immediately lost anyway in construction, so you can't go back to the originals at any time, so do enough so that you can control the location of each house and describe the lots by coordinates and sell them that way. If a man wants to put up a fence then a surveyor can come back and show him where they are. But we're talking two things in the changeover. You've got to get your mind changed over. The trend is 100% towards digital, numerical recording of land. You can put that in a computer - you can integrate it with everything else, but you can't put a monument in or a post or anything like that. Now we're in a transition period and I would say 8% - 10% of the surveys done today are done on the digital numerical system.

MR. R. SMITH: You're ten years out in your estimate. We presently have Toronto on coordinate surveys you know. We presently are holding meetings with various people to set up urban data bank space and geocodic coordinates. We are having meetings with IBM to set up digital mapping because of the progress of overall city mapping. You're ten years out, I hope.

MR. ROBERTS: I hope I am, because I picked up 30 years there are certain centres under the University, certain places in the United States that have been working for three years on a centre for just recording the titles of land; I'm just talking about the average practitioner within the Association. At the same time, I think you brought out the point, the people who are doing all this are outside the Land Surveying Profession. We are the users and not the innovators.

MR. E. LA FONTAINE: I appreciate your speech, Monsieur, but I was hoping you might go to the year 2050 for one reason only, I agree with this gentleman, it will come to us sooner than we think, and I thought we might discuss the situation where the development of our country has reached the stage where surveys are no longer necessary - terrestrial surveys let us say, ... I hope. We might have to consider some terrestrial surveys, we might have to consider submarine surveys, but I think

we are going to reach a state and we have in our highly urbanized communities, where the survey itself is no longer necessary. Boundaries are defined by structures, by concrete permanent evidence which after two years of recognition no longer requires a survey. I believe that this state is reached in some areas, even in the North American continent, and I'm satisfied it's reached in Europe in some places where it's just useless to survey the Grotenberg Castle, because everyone knows where the Grotenberg Castle is, and I thought you might have commented on that, and I would appreciate hearing that.

MR. ROBERTS: I meant to observe this when I said that the Association as we know it today will be non-existent. In other words, the work you're doing today will be non-existent. By the year 2,000, you won't have any work to do if you are going to depend on this - this is what I meant. I didn't count for 100 years from now - I was using the year 2,000.

MR. P. BILL: I wanted to comment, Mr. Roberts, to clarify the record and not contradict a previous speaker. I know of nowhere in the United States where a written description would take precedent over a monument, providing the monument could be demonstrated to be the one cited in the description.