Hardware Sessions

Introduction to Hardware

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Boyle: It is a great honor to be asked to come here--I always enjoy these meetings. I am noticing the increase in automation since the last meeting USGS hosted in 1969. For the recording of the session, we had a very nice court stenographer hammering away on a little shorthand typewriter (and those of you who have read the report know what a wonderful job she did, and after editing, how interesting it made the reading of that meeting). Today, we have automation--tape recorders rolling away--and I hope we can maintain the same standard of reporting that we had at that other meeting.

My job is just to give a 15-minute introduction. We have a little extra time, but I am not going to use that up. I want to mention the meetings we have had for the International Geographic Union in Ottawa in 1970 and 1972 from which two books were produced. This Commission of the International Geographic Union, in which I am involved as a hardware person, is producing another book for next year. For this, I want to make certain, as far as hardware is concerned, that I am up to date with all those people here who have hardware systems in cartography or in geographic information systems. While there are not many geographic information systems with special hardware at the moment, I want to check that we are as complete as possible. I have two of my engineers sitting in this hall and a geographer from the University of Buffalo; they will buttonhole the people we know for a few minutes to ask if the information we have about their equipment--the control software and any special software--is correct and up to date. So I hope you will be kind and just tell them. It will only cover about 10 or 12 lines in the final copy, but we want it to be correct. This is a wonderful opportunity to take advantage of the people who are here. If anyone thinks they may not have been reported in any of the publications before, and has something interesting in the way of the subject matter, please make contact with me, Duane Marble, or Roger Tomlinson. Thank you.

The chairmen and the panels have had their instructions. They are here to stimulate discussion among you. These meetings, with discussion from the floor, are very important. All of us who were at the 1969 meeting were converted, maybe foolishly, to the fact that automation was going to occur. I think that we have been proved right over these years, but this is arguable. As this meeting is larger, it may mean that there are more people who are converted, or it may mean, and I hope it does, that there are people here who

are not convinced of these ideas. Interaction between those who believe, those who have ideas, and those who do not believe is the central theme of this meeting. It is your meeting, not just for the people sitting up here on the panel--they are only instigators of discussion. I really hope that the panels, the chairmen, and you as members really take advantage of this opportunity for discussion. As a university professor, I am pleased that the attitude of lecturing is disappearing; in fact, this year I am finishing my last purely lecture course. I now conduct interactive courses and I find this wonderful. Some professors do not like this method, but it certainly makes, as far as I am concerned, good engineers--not people who have just sat, listened, and mentally recorded information. We know that they can use it by the time they finish this interaction, and I hope that we can get the same atmosphere into this meeting.

You will find that the people we have chosen for the panels have strong opinions; this is one of the reasons they were chosen. One reason I am here is that I am quite content to state my own opinion, for better or worse. I am perhaps in the fortunate situation that I do not have anyone, any massive organization over me to answer to as long as I am ethical in what I say. I do not have to follow any party line--it's my own judgment and the judgment of the team members I have in my group who help me in these ideas. All the people on the panels were asked to come because they have strong views, have good ideas, and are good thinkers. Make them work; make them bring out their ideas.

We are certainly in need of more transfer of information in automated cartography; we are trying to help with the International Geographic Union book. To those people who have useful, written articles, I hope you will make them available and let other people here know what is available. Our group will produce a list of available articles, and I am asking that the audience and all other panels do the same. I think this interchange is extremely valuable.

I specifically asked people from industry to come along on the panels today. I have spent about a third of my life in industry. At many meetings, particularly on automated cartography, there has been too great a preponderance of users in government and not enough of the people who are actually doing the gutsy, very often unappreciated work in industry. These are dedicated people with brilliant ideas, and you can learn so much about what is possible and what can be done from them. I am sure their participation will add to the conference.

We were talking about the audience and whether or not they were converted to automation; I hope that here in the audience today we have many cartographers in the older sense who do things by manual means. I hope that we will be getting an interchange between these two types of people. If you do not believe in what is said this week, I ask you for a minimal appreciation of the fact that other people use or will be using your data. I could go on talking about this for hours, but I will just give you one example. Please remember when you are preparing your data (assuming that it is useful data, and I hope that there is no cartographer here who makes useless data) that somebody will be wanting to digitize it. If you put labels across lines on the same overlay sheet, you have

made problems for people afterwards. An extra $10 on another piece of plastic for another overlay sheet may save a couple of thousand dollars of digitization work later on. Now, I could go on with many more examples but I hope that comments will be made about this in your cartographic groups. The preparation work that we now have to do on overlay sheets from the mapping agencies in order to make them easier to handle has raised this issue to importance.

We have been going through a considerable number of trials and tribulations about hardware over the last 10 years. Some people have jumped into getting hardware at too early a stage just because they had the money. Some did not really think in terms of having a hardware system--they put bits together which were incompatible, and so on. Other people just did not plan properly, and we have a large number of pieces of hardware around and even in use which are not very useful. We have been through a learning stage. There has also been a stage over the last 10 years where the reliability of the equipment has changed from a very debatable factor to something that is fantastically good. Ten years ago anything mechanical was good and reliable, while anything that was electronic was "maybe it will work, maybe it won't work." Now the reliability of electronic equipment has far, far surpassed anything imagined in reliability and far surpassed mechanical work. I, for one, appreciate a mixture of the two, but I generally try to avoid mechanical options and replace it with electronics. This is a change in the state of the art of hardware; I expect many people still find it difficult to believe this change, but it is true.

When you purchase equipment, please make certain that you do a proper system design and that you have properly analyzed your use. It is absolutely vital if you are going to be satisfied. Make certain that you can have good maintenance of your hardware. In cartographic establishment (and I know quite a number that have perhaps $2 million worth of equipment and not a single screwdriver in the building) it is quite a problem because these are complex hardware systems which must be maintained.

Changes have been coming about in the last few years. There has been a change from user development to a professional approach. I selected the order of the panels today, and you may think it rather strange that we start off with output devices. You might say why don't we start off with input and move through a sequence of events? Well that is the normal way, but I said no; I do not want it that way for a very good reason, in my opinion. The actual drafting side has become, over the last few years, a much more professional activity than the digitization and the interactive editing side. The latter are much newer, need more work, and are changing. For a number of people and for a number of years, automated drafting has been a truly professional activity--no doubt about what happens, no doubt about accuracy. Thus more is known about it, more assurance is there--I thought that I would have that first so as to begin on solid ground. Then we will go into the other things which are partly good and partly debatable and where I myself believe that the problems are essentially finished although we need a couple of years to finish them off. We will talk more about that in later sessions.

We will talk much about the advantages of humans, the advantages of machines, and of course the great advantages of interaction. Whatever you are doing, use the best of the machine and the best of the human--these two working together are the most exciting. We are now breaking through, but it has been a very, very exciting battle, trying to make the best of the two for cartography.

I have talked about the importance of defining the real need. However today we are going to assume that when you have said that you want something, you want it. I hope that this aspect is discussed in some of the later sessions. There is one issue running through the whole system of cartography, from the beginning to the end--you need clean data. Many people have not paid enough attention to the cleanliness of their data. You should do this in the digitization--use and produce clean data. If this cannot be done, you should clean it up as rapidly as possible. I feel this is a thread that should run through all our work; if the equipment will not handle or produce clean data, be suspicious.

I am going to give a short introduction to each panel, and then become one of the perhaps more obnoxious members of the public. If any awkward questions should be asked, I will use the opportunity to keep the discussion thriving.

I have been in automated drafting for a very long time. I put the first drafting table on the first digital computer in Britain--that was quite a long time ago. You can imagine all the clanking relays that went onto that machine. It has been very delightful to watch the wonderful machines which are now made for this work. As long as you make up your mind what you want, you can get high accuracy or high speed; usually you must realize that you cannot get both quite at the same time, although the high-speed systems are now reaching higher accuracy and vice versa. It has been very interesting to watch some of the breakthroughs, particularly in 1964 when purely digital plotting--the CalComps and the Gerbers--started. If any of you are small users of cartography and drafting, I would suggest that you do not get into the business of precision automatic drafting. If you are big enough to run two shifts per day, fine; but if you are the small user, I would rely on someone else to do your drafting. It is a tough professional activity to do it well; unfortunately, at the moment there aren't any good commercial groups providing this service. Government departments tend to be overloaded if you are not in their department, but I hope that such contract groups will arise.

There is no major cost problem in automated drafting; it is now down to the hundreds of dollars per sheet. There are no major problems; the problems which will be talked about in the next hour are problems of increasing the flexibility of these devices. We are going to cover all the latest methods, not only the old x-y drafting units, which are extremely good and are perhaps the most commonly used at the moment, but the newer drum scanners, laser plotters, microfilm units, and additions to the x-y plotting systems.