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THE FUTURE OF HIGHWAY PLANNING

G. P. ST. CLAIR, Presiding

A Look to the Future

E. H. HOLMES, *U. S. Bureau of Public Roads*

• ALTHOUGH EVERY FACET of planning in administration must surely have been well covered by previous papers and discussion, a few thoughts are presented with the hope that duplication or repetition may serve to add emphasis, and that some ground may not have been so thoroughly turned over but that it may be plowed again to advantage.

It is understandable that the problems facing the highway administrator in meeting today's crises are so complex and demanding as to give him little opportunity to think about the future. And even taking the time to look ahead it is difficult, if not impossible, to visualize what the future holds. If the concept of 1960 as visualized in 1940 or 1930, or 1920, could be reconstructed, how would those visions correspond to today's realities. What is hard to accept is that choices in transportation, as in other aspects of life, 20 or 30 years hence will be made on the basis of physical, economic, and social conditions at least as different from today's as today's are from those of 20 to 30 years ago. In trying to visualize transportation and travel in the future, it is necessary to consider not only the quantities involved (which perhaps can be estimated) but the different social and economic conditions within which those quantities must be accommodated. In large measure it will be through the facilities being designed and built today that they will be accommodated. To-

day's highways involve far greater capital cost and enjoy or suffer through a far longer life than those of a generation ago. They represent a far greater investment of public funds and have a far greater impact on the communities they serve than their earlier counterparts. Work done today and in the years ahead will be judged by another generation in the light of a standard of living and degree of affluence that does not exist today. It has to be then, that in building today for another generation, it is necessary to plan for that generation's use of what is built. There is no alternative if the highway planning responsibility is to be met.

In trying to estimate what the future will demand of facilities there are logical, successive steps leading toward an answer that might not be too difficult to follow were it not for the distractions and the confounding effect of many side issues. A logical start is to estimate the total transportation need for the area of concern for the year of interest. This estimate would probably require first some projection or forecast of population and from this the production and consumption of goods and services, or the probable uses of the land included in the area. By relating land use and economic and social factors to transportation requirements for the past and present, there is the possibility of projecting, or perhaps better, forecasting, the total future transport requirements. This is an obvious first step, but logical

as it is, too few forecasts start in this way. Therefore item 1 in "A Look to the Future" might be: Estimate total transportation needs.

The next step is item 2: Estimate what portion of the total transportation needs will or must be met by highways. Both people and goods must be considered, and the problem logically divides between rural and intercity, and urban. Here the nature of the goods to be produced and consumed in the area becomes important, as do the other probably available forms of transportation. The movement of people within and through the area as influenced by the distribution of its population, the location of its employment centers, its attractions to outsiders, and the extent to which this movement will be served by highways must be estimated. In the urban areas the daily and peak-hour movement of people are presumably the most critical factors. What portion of this movement will be served by transit? How will urban renewal and redevelopment change the character of the city and consequently its transport needs? Current values for most of the factors in this item can be reasonably estimated from measurements that can be made now or have recently been made in many areas, so defining or describing the present situation should not be too difficult. In some cases past measurements will permit the establishment of trends. But what of the future? Can trends, where they are available, properly be projected into the future, and what if there are no past trends? But item 2 should not be too difficult.

Next comes item 3, or perhaps it is 2a, for now the confounding elements begin to appear—one in the form of technology. Others will enter in also as 2b or 2c to the point where orderly listing of successive steps becomes more difficult. The many interactions that will be possible will open up a variety of combinations of assumptions. Decision must be made whether to follow through a particular combination or to abandon it. The forecaster is thus faced early in his process with the necessity of deciding whether he can afford to discount a possible eventuality, or to

take the time and effort to pursue it to a probable or possible dead end. These early decisions can have such crucial bearing on the ultimate answer that it takes real courage to discard a possibility. There is reason behind the suggestion of several years ago, that the planning function might be labeled "The Department of First Assumption." The first one may be the decisive one.

But to return to the next item, 2a, what of the effect of technological developments and other factors that may influence the choice between highway transportation and other modes? The growth of the "piggy-back" operation must be taken into account, especially in its intercity aspect. Will it become a significant factor generally, or only in special cases? The recent inroads in auto carrying by highway with the introduction of three-deck railway auto-carriers has had significant effect already on some highways. What will its future impact be elsewhere? To what extent did revised freight rates make auto carrying by rail feasible, and what other rate or regulatory decisions will influence demand for highway transport? Will movement of goods by air become a serious consideration?

In urban areas the division between public and private transportation is of critical importance for many reasons. This ratio in the future will be influenced by the size and character of the metropolitan areas, but also it may be as strongly influenced by technological advances. Subways, monorails, "super-rails," and more acceptable commuter rail service promise to redress the impact of the automobile on urban transportation, at least in the views of their proponents. But will they? Their effect cannot be ignored in planning.

Technology in highway transportation itself does not stand still. What will be the size and weight of the future highway vehicle? Can a highway structure be built to meet the requirements for today's loads and be forever restricted to loads of today's limits? What will be the speed, acceleration, grade ability and braking characteristics of motor trucks or truck trains 40 years hence? Will they be as different

from today's vehicles as those of today are from the trucks of 1920? What will be the characteristics of passenger cars of the future? Will there be town cars and highway cars, or cars with speed and acceleration characteristics significantly different from today?

What about the highway itself? To what extent can its capacity be increased by electronic warning and guidance systems, or even by full automation? In urban areas what should be expected in the way of more efficient traffic signal control systems, computer operated? Here without doubt is the widest area available for improvement in urban transportation. To what degree will it be explored and exploited?

With such a variety of possibilities to explore or ignore, any logic in numbering successive steps seems to have disappeared. But by now an over-all estimate of highway transportation demand should be attained, either restrained or boosted by considerations such as those just mentioned. The next step is the determination of the facility required to meet that demand. Demand will range from that of the vacationing tourist to the urban commuter, from the farmer's pickup truck to the line-haul trucker, from the school bus to the TV serviceman, from the RFD carrier to his now-motorized city counterpart. These differing needs will be accommodated by different systems, each comprising routes on which similar characteristics of demand predominate. Grouping of roads and streets into systems is of key significance not only with respect to providing service, but also for organizing their financing.

With roads thus classified into systems of like characteristics, the next logical step is to decide what is required in the way of structural and geometric design standards to meet the needs on each system. This step requires consideration of the numbers of vehicles and their distribution by routes, estimated from earlier steps, to be expected in the future, and of their performance expectancies from other earlier steps. The product of this operation is a determination of highway requirements, by systems, to meet the demand. The next

step is simple enough—compare the future needs with the present facilities, determine the life expectancy and salvage value of the present roads, and calculate the cost of overcoming the current and future deficiencies. Of course a few confounding elements appear here, too, such as future price levels, improved construction equipment, and scarcity of materials, but they should be possible of handling with relative ease.

This procedure has been followed through so often that it has become a stylized or almost classical process. It is one of the two halves of the customary needs study. The other half is the financial study in which the financial resources to meet the estimated needs are inventoried, and projected or forecast as clearly as possible.

At this point will appear another series of confounding elements. First, the total resources will probably fall far short of the total needs. And beyond that there is every likelihood that the current distribution among the different systems, rural and urban, is far out of tune with the relative needs of those systems. Now, then, is the time to take a hard look at the demand for transportation, and the highway needs to supply it. Economists outside the highway field often take issue with estimates of demand for highway transportation, especially in urban areas, on the grounds that what is measured is usage, not demand. In their view the existence of a facility invites use and satisfies not necessarily demand, but desire. But in any event if the gap between what is defined as need and resources is too great, then another look at demand may be required to be sure it is not overstated.

It also may be necessary to re-examine need. Are the standards selected actually needed, are they the minimum, or are they desirable standards? Perhaps overgenerous allowances have been made for speed and freedom of movement in the future. If it is evident that the estimated needs mathematically arrived at are clearly beyond foreseeable resources, cutbacks must be made or slowdowns accepted. The question

will become one of degree, in which the effect on the budget, on the users, and on the public of any reduction of standard or stretchout of program should be measured and appraised.

Of course there is also the other side of the equation—resources. Perhaps the first inclination in trying to close any gap between needs and resources would have been to look at resources. The highway itself represents but one-tenth of the cost of highway transportation, so perhaps it would not be illogical to increase the highway share. Even a major increase in the highway cost would involve but a small percentage increase in the total.

The financial aspects of highway planning are far more complex than the physical aspects. Not only is the total amount of financing important. The relative financial support derived from non-users and users, and the distribution of the users' share among the various classes of users and vehicles, are also matters of real import. The voluminous Highway Cost Allocation Study, presented to Congress a year ago after 4 years of study, is testimony to this point.

Over the years support for highways, once drawn entirely from general funds, is now derived primarily from highway users, and for the Federal-aid program, entirely from user sources. Highways produce many benefits to other than highway users, to individuals and to the community as well. Has the pendulum swung too far? Is there justification for recovering some of these benefits to help close the gap between needs and resources, and if so, is there a feasible way to do it?

What are the benefits accruing to the various classes of highway users from the highway program, and is there a reasonable balance between the benefits they receive and their support of the program? What is the cost of providing highways for the various classes and numbers of vehicles using them and is there a reasonable balance between these costs and the user taxes they pay?

Are the taxes paid by residents of cities, for example, applied to the different road systems in proportion to the

use of these systems by city residents? This relationship is a key not only to the distribution of funds to the different systems, but also to the reasonable extent of the systems if their cost is to be kept in reasonable balance with their usage and within the ability of the jurisdictions involved to support them.

Other and less tangible items also enter into the problem of resources and equity of financing. The items thus far mentioned are tangible and measurable, and to some extent predictable. There are less tangible benefits to the public, however, that should not be overlooked, and which might well justify support not solely from direct beneficiaries, but from general government funds. One intangible is the effect of economy of scale. Highways are a peculiarly good illustration of the effect that public works have on the over-all economy. They are not an additive, but a multiplying factor, and their benefits to the whole economy increase with time in a geometric ratio. Should there then be a deliberate investment of general government funds for this reason?

Another intangible, perhaps also justifying investment of general funds, is the increased quality of living that highway transportation obviously produces, a type of benefit perhaps not measurable, but shared by all, users and non-users alike.

Then finally, for this discussion at least, on the resource side of the equation, are funds supplied by higher levels of government. What will be the trend in State support of county roads or city streets, through actual construction, through financial aid, or through return of State-collected revenues to local jurisdictions? From the State viewpoint, what is the future of Federal aid? More and more States are finding their entire highway revenues required for maintenance, operation and administration of their systems and for matching Federal aid. Nothing is left for wholly State-financed construction, even off the Federal-aid systems. What will happen if needs continue to rise after 1972 and the 90-10 program is discontinued? Will States be able to finance the heavier maintenance costs of future higher-

standard highways with larger traffic volumes and heavier loads? Will the continued extension of the Federal-aid secondary systems, with inflexible apportionments for those systems, some day produce an intolerable maintenance and replacement responsibility? There are not now answers to all these questions, but planning cannot ignore them.

Now, if through consideration of these foregoing items and others involved—some balance is achieved between needs and resources, and amounts of money are determined to be annually available to meet the accepted needs, the administrator faces his next step—developing the annual program. This is perhaps the weakest link in the whole process of highway administration, and it is probably the one for which the least analytical support can be mustered. Beyond that, it is a politically important step because it exposes to the public view the results of all the administrator's cerebration up to now. Presentation of an annual program is indeed a moment of truth for the administrator.

To what extent should future needs be provided for in today's construction? Should roads adequate for twenty or more years hence be built now at the expense of meeting other current needs? Should stage construction be employed to greater degree, taking into account the probability of higher costs and disturbance to traffic in the construction of later stages? To what extent can the program be concentrated on certain areas or routes of importance, at the expense of needed work elsewhere? Or can the program be concentrated on one system at the expense of others? How can an economically sound, defensible, long-range program be developed, with some assurance that projects scheduled for 4 or 5 years hence can actually be started when scheduled?

How can the priority of a city street improvement in one city be established in comparison with the importance of concentration on an expressway in another? To what extent should improvement in operating efficiency through better traffic signal control take precedence over physical improve-

ments in the same city, or in another city? How can the relative priorities of rural and urban needs be defined, and how can the priority of correcting a structural deficiency on one route be differentiated from a geometric inadequacy on another?

These are simply more confounding elements, but once we have a way worked through them, a program emerges. That is the administrator's goal, or at least one of many. From then on it becomes engineering's responsibility.

There is little new in all these items. Good administrators take them into consideration in one way or another, and have been doing so over the years. There is one new factor emerging, however, as urban highway programs become more critical—the comprehensive plan.

There seems to be increasing clamor that the highway plan be articulated with the general or over-all plan, that the highway plan and program in urban areas be made the responsibility of the city planners, or that the highway program be stopped or retarded until transit has been given opportunity to show its value. Highway officials are placed in defensive positions, with implications that they have gone ahead with complete disregard of general plans or community values.

The facts are, of course, that highway officials do give proper attention to plans where they exist and where they have official approval and public acceptance. The facts also show, however, that there are virtually no comprehensive, accepted development plans for the metropolitan areas from which much of the clamor arises.

In these circumstances what does the administrator do? He can go brusquely ahead without regard to over-all planning considerations, or he can do his best to encourage and assist in the development of general plans, at least to the point of assurance that the highway program will be consonant with good planning principles and community desires. There is overwhelming evidence that he chooses the latter, constructive alternative.

Without doubt a principal planning function in future highway administration will be found in this area of coordination with comprehensive plans. A great deal has been done already by State highway agencies working with officials and planners of local jurisdictions to ascertain facts and make projections or forecasts of future transportation needs. Basic problems arise, however, as to the extent to which transportation facilities will merely serve or will help to shape the future community. Even more fundamentally, what will the citizens of the future community want in the way of living and working conditions, and how will the economic, cultural, and social environment develop around their desires or potentials?

An example of this very basic problem can be seen in the recently released "Year 2000" plan for the Washington metropolitan area. This plan envisions radiating corridors within which will be found all cultural development, and between which will be sectors of farm land or open space left undeveloped. The plan would require that people live in high density apartments or housing along the corridor, and work primarily in the central core. Transportation would be by rapid transit, and by highways within the corridors.

This plan is advanced as a concept, and widely published in the press. But there is no way by which public approval or disapproval of such a plan can be ascertained. There are no alternatives among which the public might choose. There is no machinery by which public opinion can be reliably obtained. And if there were, would the public of 1962 be expected to visualize what the public of "Year 2000" might want or be able to afford?

Yet as noted in the beginning of this discussion, the highways being built today will be serving the public of "Year 2000" and long after. At least they will if current ideas of life expectancy of the various elements such as right-of-way and grading are at all reasonable. So the question must arise as to whether the administrator can rely on such plans to indicate the demand or desire for

highways 40 years hence, or whether he should deliberately follow this plan in an effort to bring about its intended result. If the latter course is urged upon him, how can he be sure he is acting in the public interest and fulfilling his responsibility for expenditure of public funds unless the authors of the plan can satisfy him that it has genuine, proved public acceptance? The planners can speak in conceptual or even fanciful terms, but the highway administrator has to think in quantitative terms, in geometric and structural standards and designs. Until the planners can translate their concepts to quantitative terms, they have given the highway administrator, and his many colleagues in public and private life, little to tie to. Despite this seemingly impossible gap, however, it has to be accepted that highway planning must be coordinated with general planning to the maximum extent that the limitations of either will permit. And it must also be accepted that the highway administrator has a responsibility, as custodian of public funds, not only to accept general planning to the maximum degree it can be employed in his work, but also to encourage and assist in the advancement of general planning in his own interest, and in the public interest.

This has been a long and perhaps rambling recitation of items that might have sounded like an inventory of unknown things. It is not that. It is more an inventory of things about which not enough is known, and it is not known to what degree inadequate knowledge or incorrect assumption in the case of one or another of these or other items may lead to incorrect or unsatisfactory decisions. As noted previously, highway administration does take into account, consciously or subconsciously, all or most of the items mentioned in the day-to-day decision making process. Otherwise, this country would not have the finest transportation system the world has known. As the nation moves ahead, however, transportation problems become more intense and their solutions more complex. Likewise, the stakes become heavier—almost alarmingly great.

Correct decisions pay off in handsome benefits, but incorrect ones become costly indeed. To help him in these decisions the administrator will need to fortify his judgment with quantitative values in every possible area, and find means to array the many areas of judgment in order of their importance in relation to his ultimate decision.

The reason that the whole planning process is so complex is that so many steps are not merely dependent on the preceding ones, but through interaction and feedback, themselves affect the earlier steps. In presenting this picture, it might be well to have resorted to the methods used in illustrating the "systems analysis" approach to complex problems, for indeed highway planning is ideally suited to that approach. Illustrating the system involves the familiar sketching of squares, circles, rectangles, triangles, and other geometric shapes, each outlining an item or area of importance to the solution of the problem. Each geometric shape is connected to one or more other shapes by solid, dotted, or dashed lines, singly or in multiple array, with arrows going one way or the other, or both ways. The use of many words rather than a concise chart is because it takes more words to explain the chart than to express the thoughts without it. The author's experience is that in trying to follow such a chart, he usually flies off on a tangent at some point, or finds himself hopelessly trapped in some geometric shape with all the arrows pointing in and no way out.

But there are now an increasing number of analysts trained to think in terms of such flow charts, to follow successive steps of a process and apply the interactions and feedbacks, and to test whatever alternatives appear feasible, and there are the computers to enable them to do it.

The planning process can be viewed as a systems analysis problem. Planning will not relieve the administrator of his responsibility for decision nor eliminate the need for his judgment. But it will in many areas permit him to replace estimates with firm values. In other areas it will define limits within which his estimates may be confined. And it will spell out the importance or unimportance of each of the items involved. Mathematicians of today would embrace this whole process within their discipline, in what they would call the stochastic approach.

Research in planning, it should by now be obvious, would thus involve the setting up of the stochastic equation or the systems analysis process, and undertaking to supply or find the values to be attached to each term or step found to be significant. It also should be apparent in reviewing the areas of uncertainty that the quantification of the now-qualitative terms will usually involve non-engineering disciplines. Engineering should be drawing from the fields of geography, economics, sociology, mathematics, and city planning.

This represents a more sophisticated approach to planning and decision making than heretofore followed. But there is a need for more sophistication in the future to be better able to make correct decisions and, in the face of mounting criticism and public concern, to develop and defend the highway program that is so vitally important in the future of this nation. That is what planning must do.

Resources, human and material, are at hand or fast becoming available to permit this more sophisticated approach. Highway administration in the future will not only accept it, but must insist upon it.

DISCUSSION

Winfrey.—If we are going to get anywhere with planning in the sense that I visualize planning—and that is not day-by-day operations at all, but

looking way ahead into the future and trying to set up some goals in transportation—the highway field is only just one part of the whole system to be con-

sidered. I think we have to consider all modes of transportation, including those that we do not know anything about today. They do not exist now but they will exist some day.

It looks as though we can get further by bringing minds of many different orders into the picture—the sociologist, the psychologist, the economist, the political scientist, and the highway engineer.

But the highway engineer alone cannot do the job. No one discipline or no one man alone can do the job. It takes a combination, just as we have found in many of the lines of both practical research and pure research. If men of many different minds can be brought to bear on the problem, chances of success vary as the number of different minds bearing on the problem.

If I were to criticize the highway engineering profession, I would criticize it most strongly from the viewpoint that it has stuck to highway engineering—the thing it knows most about; but in so doing, the highway engineer has failed to grasp his opportunity in building a real transportation system for this country. He has been too much at home, and his vision has been screened by his own device, which has not permitted him to penetrate beyond his immediate job of being a highway engineer.

We never can develop a highway transportation for the urban area for the country as a whole until we break down that barrier. I think we can break it down best by inviting in help.

The highway business today is just one big compendium of psychology and sociology and economics. I think therein we have to get our help, and it is high time we were getting it. If we do, I am sure that we can really do some "ultra" long-range planning.

Babcock.—We have a tendency not to get into this long-range approach that we are thinking of as highway people, because we are running around spending 90 percent of our time trying to catch up with an existing problem. I was particularly interested in Mr. Hill's ideas on building an expressway.

Wherever you build it, there is going to be traffic on it.

What we are doing today is committing the future. We are committing the future to the point where we may be in a position where no new form of transportation can develop, because of the way the future is fitted into what we do today. The engineer is dealing with a physical thing, which, once put down, is going to be there for 40 years. I wonder if we have already reached the point of no return—if we have already committed the future to exactly the present mode of transportation.

Holmes.—I think we are fairly rapidly committing that future to automotive transportation. I am not sure that is bad. We have a form of transportation now that has greater "personality" and flexibility than anything ever before. Until something more flexible and personalized than the automobile comes along, we have to look toward the highway as providing this transportation for the future. That could well shape the city.

It seems that the planners have not visualized and taken advantage of the potential of the form of transportation that we want to live with. Most of them are still insisting on traditional plans.

I think we are committing the country to many years of automotive transportation. But as Mr. St. Clair said in response to a letter that came in the other day: At least once we build it, it is already paid for. So the people who are using it, have bought it and paid for it. "We can't lose."

Schwender.—Actually, many millions of automobile owners are committed to automotive transportation in many respects.

Oliver.—I rather think they committed us more than we committed them.

Levin.—On this point of committing the future: Are we committing the future any more with this new mode of transportation, motorized transportation, than the waterways did with their physical plans or the railroads are now doing with their plans? They are tak-

ing their place in history subject to a newer technology, and it could be that in another 25 or 30 years somebody will think of a smarter way of surface transportation that will begin to submerge motor transportation.

This is the way of life. It is inherent in the economics of a free society that you do commit the future up to a point.

In Washington, for example, we are building a complex within three square blocks. This is going to commit the future of Washington for many years to come by the private investment of this vast capital. Therefore, even outside of the transportation field, it is a characteristic of our economy that we are making decisions which commit the future. How else do you build a structure?

Telford.—I agree that if we did not commit the future we would not get very far. That is not a bad thing, as long as it is committed constructively.

At a conference in Los Angeles, about three or four months ago, we got into the field of electronic controls. Out of the discussion came something that none of us had really expected, and none of us really followed through. Essentially it pointed to the possibility of specialized vehicles with a specialized way on which they would travel, with capacity to move people or goods, using electronic controls, but separated from what is termed the conventional vehicle.

There are a lot of things that may be ahead of us that we do not really know now. When we start considering them, we come up with some of these eccentric ideas. And who knows, some of them may work. I am sure that there will be further developments that we only vaguely see now, and they can grow out of what we are doing.

St. Clair.—I think that we do, to a degree, commit the future, but that the future can take care of itself and will create obsolescence in the thing that we do, as it has in the past. The world goes jogging along in spite of the fact that some things depreciate a little faster than the original builders contemplated. That is one of the ways of the world that we have to put up with. But that

does not relieve us from the obligation of doing the best we can.

Campbell.—We all realize the value of having specialists in planning departments or divisions, but what about the man that works with them? What kind of a man should he be? Should they all be specialists or should there be a core of people who are highway engineers? If so, what kind of training should they have for the job in the planning division, and is there any way to train people to enter into the planning division?

St. Clair.—Should the leader of the planning department, who is to straw-boss a group of experts, be a highway engineer himself? Should he be, as I am sure the administrative group feels, a product of business administration? Should he be perhaps the man who evolves from the expert group as the real leader?

Winfrey.—I can answer that very simply—find the best man to do the best job. It does not make any difference what his education or profession is. There are some engineers who can do it and there are other engineers who cannot. It comes down to just finding the best man, the man who really is a planner with vision.

Hill.—In Michigan, there is a city planner as the head of our planning division. The chief of the office of planning, who heads the planning division, the route location division, and the programing division is an engineer who has been in the highway department for many years. But the chief of the planning division has been a city planner.

We also have a cooperative arrangement with Michigan State University, by which we take about five or six of the planning students to work about 3 or 4 hours a day and every summer in our planning office.

Paterson.—I think there are a set of personal characteristics that enter into a determination of who you want in planning, but I think there is also a content area that has to be satisfied. Possibly the easiest way to specify is to take the recent Area Redevelopment Administration bill, which provides assistance to so-called distressed areas.

On the one hand, you have a basic economic problem which is related to these distressed communities. You also have certain social characteristics which are related to them.

If you take a sociologist and an economist and set them down, you are going to have an argument immediately. The sociologist is concerned more with providing for the immediate requirements of the families that are distressed than he is about the possible long-run implications of policies which are formulated.

The economist is concerned more on the public policy side, with maintaining

a free enterprise system. This gets into a problem. I think that we need both disciplines in resolving the question, but I think the subject matter content is extremely important for rationalizing these problems.

Campbell.—Of course, Mr. Winfrey gave the answer—to get the best man. But in application, who is the best man? Suppose he has the proper attitudes, drive, imagination and other desirable personal qualities, then what do we add to them? If we are going to train a man, what subjects should he be conversant with as he enters a job in the planning division?