WHO IS THE TRANSPORTATION ENGINEER?

JOHN J. ROARK
Director of Transportation
North Central Texas Council of Governments
Arlington, Texas

FRUSTRATIONS IN TRANSPORTATION ENGINEERING

As an officer in the American Public Works Association, it was my opportunity this past year to visit with engineers in city, county, and state work all over the country. If I were asked to identify the most common feeling of the many engineers with whom I visited, I would have to say that it was a feeling of frustration—frustration in being unable to complete much needed projects, to implement improvement programs, and in general, a frustration in the inability to get things done.

It seems to me that we have a reason to be frustrated. I read an article a few weeks ago which proclaimed most proudly that citizen participation had stopped 111 freeway projects in 43 states—projects costing $4 billion.¹ This resistance to transportation improvements, which is so common to the frustrated transportation engineer, was given its marching orders by Charles Reich in The Greening of America. In this book, this best-selling book, Reich gives this advice to the American public,” resist the state, when you must; avoid it, when you can; but, listen to music, dance, seek out nature, laugh, be happy, be beautiful . . .”²

In a recent survey by the American Association of State Highway and Transportation Officials, some states reported that it is taking as long as 14 years to complete a major highway project. The report was not speaking of staged construction, but rather that time necessary to

complete the first workable section of a project, from initiation to completion.

Sometimes it seems as if we have intentionally developed and created a system to keep things from happening—to keep things from getting done. You are familiar with the obstacles of the system—OSHA, ERISA, EEO, A-95 Review, public hearings, environmental impact statements, etc. In regard to the environmental impact statement, Dr. Bill Ronan of New York, two years ago when he was chairman of the American Public Transit Association, testified before the Commission on Federal Paperwork. As an example of the problems encountered with environmental impact statements, Dr. Ronan used the EIS for the Metropolitan Atlanta Regional Transportation Authority. Dr. Ronan testified that the EIS for MARTA took 64 man-months to complete, at a cost of $234,000, and the 100 copies of the EIS that were sent forward weighed over 4,000 pounds.³

And so, as transportation engineers, we are frustrated with the system that seems to tie our hands in getting things done. I think sometimes we are like the Amtrak passenger about whom I recently heard. You are aware that one of the Amtrak lines runs from San Antonio to El Paso to Tucson, Arizona, and points west. The story is told of this man who got on the train at San Antonio, dog-tired after several days of partying in Old Mexico. He called the porter over just as the train was leaving, put $10 in his hand, and said, "I want you to put me off in El Paso. You see, he said, "I know I will go to sleep and, since I sleep very soundly, I need someone to put me off. Although I am very irritable when I am awakened, I want you to put me off. No matter what I say or what I do, I want you to put me off the train in El Paso." He relaxed, went to sleep—and woke up the next morning in Tucson, Arizona, madder than a hornet! He found the porter, stood him up against the wall at a brace, chewed him out, called him every name in the book, and stomped off to find his luggage and catch a bus back to El Paso. The conductor noticed the harrangue, and said to the porter, "What was the matter with that man? I don't believe I have ever seen a man madder in my life. He has got to be the maddest man I have ever seen." "Well," said the porter, "I'll say this. If you think he was mad, you should have seen the man I put off in El Paso last night!" I think sometimes we transportation engineers, frustrated in trying to get things done, feel like we have been put off the train in El Paso—that we have been forced off the path of accomplishment.

The success of the transportation engineering profession in the next 25 years will depend, to a great extent, on how well the transportation engineer profession fills the various roles assigned to it by the public. It would seem to me that we need to analyze the roles the transportation engineer has had to assume, how well we have filled the roles, and what we need to do to strengthen the profession. This analysis could change our perspective.

ROLES OF THE TRANSPORTATION ENGINEER

The transportation engineer does not fill just one role but actually fills several roles, both during his career development and in most of the positions which he might occupy. Role recognition is important in the development of a profession and of professionals. An illustration of this importance could draw upon the profession of arms—the military. The career officer, in his professional development, can be assigned duties as a line officer on the front lines of combat, as a staff officer to support a military activity, as a commander to conduct war in a major campaign, or as a strategic advisor to the elected leaders as to whether or not war should be conducted. The young officer who only sees for himself the role of a company grade line officer will probably remain in that capacity. Conversely, the young second lieutenant who feels called upon to advise the Joint Chiefs how to conduct the war will probably not advance professionally. Only the officer who recognizes the different roles he must perform and prepares himself for those roles advances himself and his profession to the fullest capability.

Likewise, the transportation engineer performs different roles. These different roles can be assumed during his professional development but different roles can also be required of a transportation engineer in a single job. It is important to recognize these roles if we are to determine the reasons for our current limitations and move to reduce these constraints.

Obviously, the role a transportation engineer assumes depends upon education and experience, the level of responsibility of the position, whether employment is as a consultant or an employee of a governmental organization, and, to a certain extent, the individual's level of understanding of the overall objectives of transportation. Any stratification of roles must consider the functions within transportation engineering, such as traffic operations, highway safety, transportation planning, geometric design, transit operations, and major construction. Given these considerations, one might generalize and identify three roles for the transportation engineer.
Traffic Manager

The company grade line officer of transportation engineering is the traffic manager. Principally identified with employees of local or state governmental entities, this role of the transportation engineer includes "front line" activities such as signs and signals, parking, etc. This role of the transportation engineer has been given new significance with emphasis on a systems approach to transportation system management. It has been broadened to include transit operations, carpooling, and bicycle paths. The primary objective of the traffic engineer is improved and efficient operation of the transportation system.

Staff Expert

Transportation engineering has its staff officers. While transportation planners, consultants, and educators are generally seen as filling this role, it is important to recognize that the transportation engineer of a city, county or state also fills a role of staff expert in transportation. It is the governmental transportation engineer who must assimilate information from planners, consultants, and educators and advise the elected officials on the future of transportation—whether petroleum will be available for future automobile transportation, whether investments in transit are appropriate, and whether facilities built today will be adequate in the future.

Major Implementor

The transportation engineer also fills a role of major implement of transportation projects and transportation systems. Included in this role is the programming and construction of freeways, major transit networks, and support systems of bridges, arterial networks, and major parking facilities. Too often this is not recognized as a role of the transportation engineer and the implementation of the major elements of the transportation system is left to other disciplines.

Three roles, then, are seen for the transportation engineer—that of traffic manager, staff expert, and major implementor. In analyzing the success of the transportation engineer in each of these roles, I have concluded that we have done an effective and efficient job as traffic managers, that we have been weak as staff experts, and that we have been highly ineffective as major implementors. As staff experts, we have been unable to provide direction in reducing transportation uncertainty for the elected official, and instead we find ourselves reacting in influences rather than providing sound advice. Likewise, as major implementors, we have become enslaved in red tape and watch helplessly as ward politics dictate the implementation of the transportation system.
I like the story about the great Leo Durocher and his attempt to teach a rookie how to play left field. Durocher put the rookie in left field and waved him back for the first batter. The batter hit a hump-back liner over the shortstop, which the rookie, on the dead run, could not reach. One the next batter, Durocher waved the rookie in, after which the batter hit a line drive over his head, which rolled all the way to the fence for a triple. Durocher charged to left field and said, "Gimme that glove and let me show you how to play left field." On the first batter, Durocher played in, only to have a line drive over his head all the way to the fence for a double. At the next batter, Durocher played back only to have the hitter pot a Texas leaguer in front of him for a base hit. Durocher charged into the dugout, threw the glove at the rookie, and said, "You see there, you dumb rookie, you've got left field so screwed up can't anybody play it!"

Before we conclude that left field in transportation engineering is so screwed up that no one can play it, let's take a look at the difficulties we have encountered in transportation engineering in trying to fill the roles of staff expert and major implementor. It would seem that a look at these difficulties would be the first step in improving our performance in these two roles to match our success as traffic managers.

DIFFICULTIES ENCOUNTERED BY THE STAFF EXPERT AND MAJOR IMPLEMENTOR

The transportation engineer has been ineffective as staff expert and major implementor for several reasons. He has encountered difficulties brought on by the dynamics of a changing urban structure. Many of these new challenges were beyond his technical training and his initial scope of understanding. Other difficulties he may have brought upon himself.

Problem No. 1

The transportation engineer is increasingly shackled by constraints of a very complex system characteristic of a technological society. This complex system is worldwide in scope. Urban areas in the United States are dependent on resources, products, and services coming from every part of the globe. Suppliers of these commodities elsewhere in the world are, in turn, dependent on events in the United States. Such a complex system is highly susceptible to changes taking place anywhere in the system. As a result of this complex system, the transportation engineer, as staff expert, faces a difficult task in developing sound programs for tomorrow's transportation.
Think for a moment of the complexities of this system. The U.S. now imports 50 percent of its oil. This means that the future of an urban area's transportation system is highly dependent on the up and down negotiations of two middle east dignitaries. Pricing mechanisms in transportation, including increased parking costs to improve air quality, and higher fuel taxes to influence modal choice, have been proposed and discussed at the national level. Implementation of any of these ideas will drastically affect the forecasts of the urban transportation engineer.

The transportation engineer, with responsibility for only a small subsystem of a very complex and interrelated total system, finds himself incapable of sound prophecy.

**Problem No. 2**

Transportation engineers are ineffective as staff experts and major implementors because the problem has been enlarged. We are asked to be social scientists and to address total problems of urban society.

As American cities developed in the age of the automobile, it was clear that a discipline was needed to maintain mobility in a flexible transportation system of private automobiles. Traffic engineers eagerly attacked the problem of mobility as any engineer would approach a problem—establish an objective and seek the solution which will achieve the objective in the most efficient manner. After all, this was what engineers were trained to do. Now, in the seventies, we have been told that we have responsibilities that are bigger than just mobility and we are chastised for not giving primary consideration to the social consequences of our transportation system. Your objective, we are told, is not limited to efficient mobility, but includes improved air quality, reduced energy consumption, equitable distribution of transportation benefits, general location of low-cost housing, and elimination of racial barriers. The "problem," we are told, is indefinable and can no longer be approached with engineering methodology. Our projects to solve mobility problems are shelved while sociologists and environmentalists debate what they call the "real" issues. We are no longer major implementors on the urban scene.

**Problem No. 3**

Perhaps the greatest difficulty facing the transportation engineer as major implementor is fragmentation of decision making in urban areas. The dictates of the courts requiring single member districts for local elected officials amplified an incompatibility between the engineering approach to urban problems and the manner in which urban decisions are made.
Historically, the engineering approach has enlarged its scope to attack the problem at the level necessary for solution. We celebrate Engineers Week at Washington's Birthday because he was considered an engineer. Today, we would classify him as an instrumentman at best, but, in his day, engineering was at the level of crude surveying. Later, engineers were imported for canal construction and engineering schools were begun for construction of canals, railroads, bridges, and roadways. As the engineering profession grew and became more specialized, we left the standard designs to technicians and sought solutions for bigger problems at higher levels. As our urban areas grew, engineering moved to system solutions for water distribution, sewerage collection, and ultimately, transportation. Because the systems solution became the necessary level for analysis, and as technology was developed to permit this total analysis, transportation engineers moved away from localized, isolated solutions.

Just as transportation engineering has moved to a systems approach, the courts have said that election of local decision makers on a citywide basis is unconstitutional. As we have enlarged our scope to see the whole transportation system rather than just a part, the decision makers have been forced to narrow their scope to see only a district or a ward.

As a result, implementation of a transportation system designed to serve the totality of an urban area is difficult to sell to an elected official who asks, "But, what will it do for my district?" We must remember that the American public does not punish its politicians for short-sightedness.

Problem No. 4

Another major difficulty of transportation engineers in getting things done in urban areas is one of our own creation. We have erected a barrier to ourselves because we have surrendered a major portion of our responsibility to the generalist. We have, in my opinion, concentrated too much on technical matters and let administrators, planners, political scientists, urbanologists, and other generalists assume the responsibility for the broad urban picture.

I am convinced that we have narrowed our perspective to purely technical matters. My reading of history tells me that engineers were, at one time, responsible for all the amenities that make urban living possible—clean, potable water; adequate disposal of waste, mobility through the transportation system; etc. Engineers were environmentalists long before the meaning of the term was known to journalists and writers. But over time, as cities have grown, engineers have concentrated
on technical matters. We have enlarged our scope to a systems approach, but we have narrowed our perspective to the technical aspects of urban development. We have let others take the responsibility for the big picture. As a result, the generalist has assumed that responsibility for the broad perspective. We, as engineers, have not reacted to the urban fragmentation problem and the generalist has stepped in and said, "Let me translate what those engineers are saying into a meaningful program." Transportation engineers are shunted away from elected officials by generalists whose only qualification are that they know more and more about less and less.

So we find ourselves as part of a complex system of worldwide politics. We are confronted with problems of ever-increasing magnitude and are charged with neglect when we do not solve all social problems with transportation engineering. We find ourselves competing for limited resources and see that the decisions are made on a purely political basis.

We see ourselves shut out of the decision-making process with generalists assuming more and more responsibility. We are left to the day-to-day operation of only a portion of the transportation system. What is left to us but to "listen to music, dance, laugh, be happy (and) be beautiful"?

A NEW APPROACH FOR TRANSPORTATION ENGINEERS

This time of crisis and challenge for transportation engineers could provide us with our greatest opportunity. The Chinese word for "crisis" is composed of two picture characters—the one meaning "danger" and the other "opportunity." What better opportunity could be provided to transportation engineers than a crucial era in urban transportation? When Nathaniel Hawthorne was dismissed from his government job in the Customs House in Salem, Massachusetts, he went home in despair. His wife, after listening to his tale of woe, set pen and ink on the table, lit the fireplace, put her arms around his shoulders and said, "Now you will be able to write your novel." Hawthorne did and literature was enriched with *The Scarlet Letter*.

I think it is time for transportation engineers to write their novel. I submit that it is time for a new approach for transportation engineers. For this new approach I suggest three steps to take:

*Step No. 1*

We must participate in the political process. We have longed decried the fact the many transportation decisions are political, but we have
remained aloof from the political process. We have adhered to an outdated philosophy that says our role is to submit recommendations and programs for the judgment of generalists and politicians. Perhaps we have been naive, Samuel Florman in his great little book entitled, *The Existential Pleasures of Engineering*, says:

> Perhaps engineers have been too honest and sincere, too naive, too innocent to function effectively. The world is run by politicians and entrepreneurs who are subtle and devious, aware of the ambitions and fears that motivate the average man . . .

Later, Florman suggests:

> If engineers could add a measure of sophistication to their other attributes, and then move away from their drafting table to infiltrate society as leaders of corporations, universities, government agencies, and community groups, society's chances of coping with its problems would be markedly improved.

It is time for us to recognize the political realities of the world in which we live. It is time for us to be sensitive to the decision-making process of politicians. We must not be satisfied to submit recommendations without taking steps to see that those recommendations are implemented. This would imply the need for less fragmentation among experts—a move toward an organized effort to strengthen the influence of transportation engineers. This is the second step in a new approach for transportation engineers.

**Step No. 2**

We must move to strengthen the position and influence of the transportation engineer. If the transportation engineer is to achieve success as a staff expert or major implementor, he must utilize certain political “principles” to influence political decisions. In other words, we must see our recommendations as the elected official sees them and perhaps organize our recommendations in a way to have a stronger influence in the political process. This is not to say that the transportation engineer should reduce the quality of his analysis—nothing can take the place of sound engineering analysis. What I am suggesting is a means of improving the way this engineering analysis is presented to the elected official. There are three such “principles” which I think would strengthen the influence of the transportation engineer:

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5 Ibid.
Principle No. 1
Information is valuable to the elected official and makes him available to the transportation engineer. You, as a transportation engineer, have information which the elected official recognizes as important. If this information can be presented to him in a way in which it is meaningful and understandable, the elected official will consistently demand that he have information from the transportation engineer before he makes decisions on broader matters.

Principle No. 2
A professional consensus on policy issues provides advance which cannot be ignored. If transportation engineers could develop a consensus on future transportation systems for our urban areas, they would represent a formidable body of expertise. The elected official then would find himself confronted with a consensus of expert opinion, not a divided community of experts. If the transportation engineering professionals can do this, they will find the elected official far more responsive to their recommendations and they will have a better audience with the elected officials.

Principle No. 3
Implementation of major projects requires a coalition of supporters. We have long recognized and seen the results of coalitions to oppose transportation projects. With single districts, it becomes more and more necessary to develop coalitions of supporters for major transportation projects. This is a political principle that is recognized in most endeavors. It is time for it to be recognized and adopted by transportation engineers.

So we must move to strengthen the position and influence of the transportation engineer. Only a strong coalition can deal with a fragmented decision-making structure.

Step No. 3
The third thing that we must do in a new approach to transportation engineering is to develop a renewed dedication to getting things done. Our basic objective as transportation engineers is to get things done. It is not to conduct debates, not to develop plans, not to develop extensive recommendations, nor to conduct public hearings. Our basic objective is to accomplish. We will not need to worry about turning into bureaucrats or becoming stagnant in creativity if accomplishment remains our primary goal. Gen. Douglas MacArthur said, “In war there is no sub-
stitute for victory." In transportation engineering, there is no substitute for accomplishment.

SUMMARY

In summary, in the new approach which I would suggest for transportation engineering, we must participate in the political process; we must strengthen the position of the transportation engineer; and we must develop a renewed dedication to getting things done.

Who is the transportation engineer? He can be bigger than any of us can ever conceive.

In the last year of his administration, President Andrew Jackson was asked who was his choice to succeed him as President. Jackson indicated that he wanted Martin VanBuren, who had previously served as his Secretary of State. The interviewer asked President Jackson who his second choice to succeed him would be. Jackson's eyes flashed as only the eyes of Andrew Jackson could flash and he responded, "By the Eternal, Sir. I have never made a second choice in my life."

I would hope that the transportation engineering profession would never make a second choice. I would hope that it would never accept second best to what it could be.