Attached is the abridgement of one of the white papers that identify opportunities to improve the operation and management of nation’s transportation system by the US Federal Highway Administration. Please carefully study it and answer the following two questions in Chinese.

1. **Technical English (50%)**
   
   (1) Based on the author Joseph Sussman’s views, the emphasis in today’s modern surface transportation system must be on operations enabled by new advanced technologies. Why? (10%)

   (2) The author proposed 3F/3I/3R strategies to achieve the new surface transportation operations mission. What are these nine strategies? (30%)

   (3) Based on this article, what should be changed at the individual, organizational, and institutional levels in order to create the necessary focus on surface transportation operations? (10%)

2. **Case Analysis (50%)**

   Taking the mass transportation system, including city bus, highway bus, commuting rail, and metro (MRT), in Taipei metropolitan area as a case, please address the issues and propose similar 3F/3I/3R strategies to improve the operations for our mass transportation system.
Transportation Operations: An Organizational and Institutional Perspective

This is the fourth in a series on Transportation System Performance: Expectations Identify Challenges and Expectations from the Federal Highway Administration.

DUE TO THE NEED FOR A customer- and market focus in providing surface transportation, as well as constraints on building conventional infrastructure, the emphasis in modern surface transportation systems must be on operations, enabled by new advanced technologies. A focus on operations and new technologies has created what many regard as a new mission for transportation organizations. This new focus, together with changes in funding patterns reflecting shifts from capital to operations expenditures, also requires institutional change in the relationships among transportation organizations.

The emerging emphasis on transportation operations (as opposed to capital investment in transportation facilities) is driven by several factors. First is our limited ability to provide new conventional infrastructure, particularly in urban areas. A third factor is a set of new technologies, especially Intelligent Transportation Systems (ITS), that permit an electronic linkage between vehicle and infrastructure, creating an environment in which management of transportation operations can take a major leap forward. Finally, the growing consensus that development and environmental issues are addressed most appropriately at the regional scale fuels a desire to operate and manage transportation systems at that scale.

WHAT WE NEED TO BE SUCCESSFUL IN AN OPERATIONS MISSION

To be successful, the new operations mission must be funded, flexible and focused; it must be integrated, intermodal and information-based; and it must be regional, real-time and routine.

This set of characteristics can be abbreviated as SF/31/3R.

Funded. Of vital importance is ongoing and reliable financial support for operations. As we have learned over the years from deferred maintenance of conventional infrastructure, it is all too easy for operations funds to be cut in times of financial difficulty. If that occurs, the operations-based transportation services will quickly atrophy, and customer service will deteriorate. We need a change in federal funding policy for operations. Since 1916 the nation has focused on capital investment in pursuit of goals such as interstate commerce and defense. Today, an operation's role and funding mechanisms for operations vis-à-vis state and local agencies needs to be defined. Fortunately, steps to achieve this rebalance are underway, and the idea of making transportation operations a core mission of the Federal Highway Administration (FHWA) is moving forward.

Flexible. We need organizations that can respond flexibly to the many diverse issues that arise in operations on a daily basis. The differences between transportation planning and transportation operations are substantial. Most critically, they differ in time frame. While planning deals with the strategic shaping of the transportation system, operations are ongoing. Every day, operations begin anew. Within the planning framework, however, we should make an additional distinction between strategic planning and operations planning. Strategic planning deals with the development of plans that will guide the deployment of the transportation system over long periods of time, perhaps decades. Operations planning guides the day-to-day operation of the transportation network and it is through operations planning that flexibility can be achieved.

Focused. Discipline and focus is the required organizational ethos for opera-
tions. Organizations that have focused on strategic planning and operations planning may well have to undergo substantial institutional change to permit them to be effective operators of the transportation system. Operations has a different mindset than the one that is associated with various planning functions. Simply put, the operations mindset is that 24/7 operations never stop.

Integrated. An integrated organizational response is required to deal with operations under complex, geographically diffuse transportation networks. The physical, informational and political interconnections in a regionally scaled transportation enterprise determine its performance. Therefore, operations for a transportation system need to be integrated. This integration is a challenge. Organizations that have previously operated independently now will need to consider themselves part of an integrated team, and perhaps additional feedback loops will need to be put in place.

Intermodal. Operations should be based on an intermodal approach. Transportation services for travelers and freight customers, and the operations that support these services, need to be delivered on an intermodal basis in order to provide high-quality service at a reasonable price. Each mode has distinctive advantages and disadvantages. The challenge of transportation operators is to put differing modes together in such a way that advantages are maximized and disadvantages are minimized for each mode. Transportation agencies must reflect this intermodal perspective, and important changes within these organizations will be required, as well as changes in the relationships among them.

Information- and Customer-Based. New technology allows us to collect, process and disseminate information to our customers and the partner agencies that operate the transportation network. This information provides an important opportunity to measure our performance using customer-oriented metrics and improve the quality of the service we provide. Planning and constructing the transportation network are not performance as seen by our customers. Yet many transportation organizations are geared to measuring success with productivity metrics based on infrastructure planning and construction. Changing that mindset requires organizational change—evolving to customer-based performance metrics derived directly from the operations theater.

With information about the transportation system being central to operations, the importance of private-sector independent service providers is already emerging. Private-sector for-profit opportunities and public/private partnerships will need to be part of the new transportation institutional structures and operations mission.

Regional. Operations need to be conducted at a regional scale, preferably using a regionally scaled platform to support technical systems. This regional scale will require previously unlinked organizations to work together and share responsibilities and data. Further, these organizations collectively need to be capable of receiving and dispersing funds for operations effectively. This collective funding of operations suggests a natural question: in this regional context, what is the role for metropolitan planning organizations with regionally scaled responsibilities? Some organizations will be able to transcend their current planning and programming perspective, and others will not. If that transition is to occur, organizational incentives for change and the resources to perform changes are clear preconditions.

Real-Time. Operating situations are ongoing, dynamic and driven by random factors. Real-time is the temporal scale needed for responses by operating organizations. Professional activity in transportation has long focused on strategic planning (based on a time scale of years or even decades) and tactical planning (anticipating and responding to known events). But now the operations focus requires a real-time perspective, as response to changing conditions must be extremely fast if congestion, safety and security hazards are to be ameliorated or avoided. Fortunately the technology exists and more and more technology is now in place to enable transportation agencies to perform real-time operations.

Professional training and institutional perspective will be necessary for achieving the real-time vision.

Routine. Although individual stresses on the operating environment cannot be predicted, we can plan for generic kinds of service interruptions and treat them in a routine and decisive manner. We should minimize ad hoc-ism in our response to operating situations. Operations require planning. Knowing the chains of command and having contingency plans for "standard" situations is fundamental to transportation operations. If performance is to be achieved, the operations mindset, supported by effective operations planning, is a requirement.

THE AGENDA FOR CHANGE

The agenda for organizational change must be a strategic one, given the inherently slow pace of institutional change. Nonetheless, we need to initiate the evolution of transportation organizations today and change the relationships among organizations to create the necessary focus on operations. Change needs to occur at three levels: individual, organizational and institutional. At the individual level we need to be explicitly concerned with the development of a new cadre of transportation professionals, focused on operations. At the organization level we need a new core operations mission. This change will require strong leadership within these organizations and a strong vision of the future of that organization within the overall transportation system. At the institutional level we need to create the interorganizational structures that can operate the transportation system most effectively, especially given the need to provide transportation services at a regional scale. These regional partnerships are new institutions and establishing them is a long-term process. We should learn from successful regional approaches in land use planning, infrastructure planning and even operations.

This article is based on a white paper by the author. The complete white paper can be found on the Internet at www.ops.fhwa.dot.gov/nas_dialouge.htm.