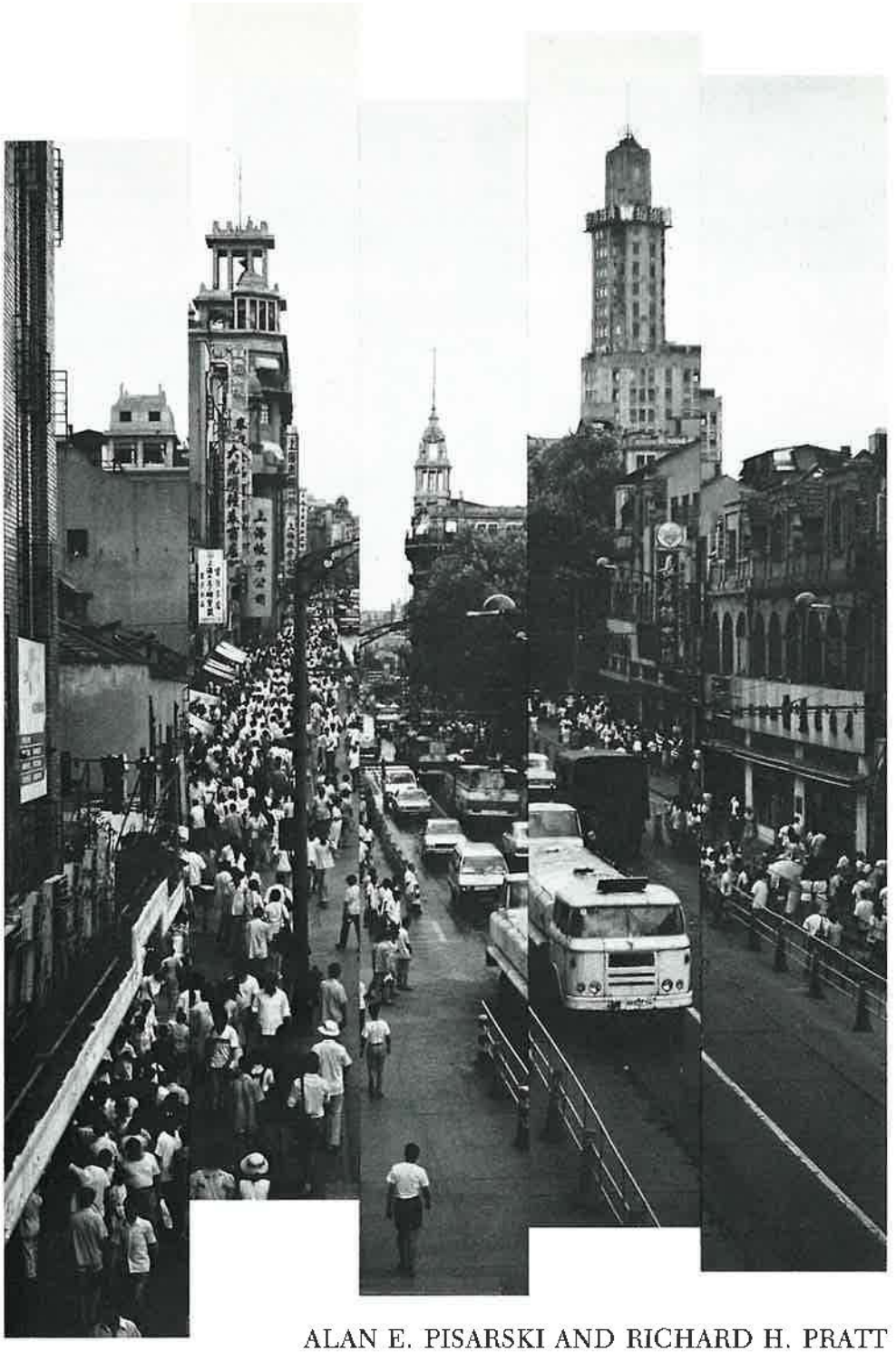

ALAN E. PISARSKI AND RICHARD H. PRATT

U.S. Transportation Planners to Assist in Urban Transportation Development in Shanghai

U.S. consultants Alan Pisarski and Richard Pratt visited Shanghai in September 1986 on request of the National Council for U.S.–China Trade to assist officials in a comprehensive planning approach to the city's transportation planning problems.

Mr. Chen Sheng-hong, Director of the Shanghai Comprehensive Transportation Planning Team, receives a presentation of TRB reports. *(Photographs from Shanghai Comprehensive Transportation Planning Team.)*

The Shanghai metropolitan area has formed a consortium of local agencies to study transportation problems. Working through the National Council for U.S.–China Trade, an association supported by American firms with an interest in fostering trade with the People's Republic of China, the Trade and Development Program of the U.S. State Department is providing Shanghai officials with technical assistance in transportation planning methods and applications. On request of the National Council for U.S.–China Trade, the authors visited Shanghai to assist officials in mapping out a plan for a comprehensive planning process. A key question in this technical assistance involves the flexibility of U.S. planning methods in responding to the unique conditions in Shanghai. Described in the article below are the current transportation environment in Shanghai and the transportation planning program currently under way.

The Shanghai Planning Environment

The Shanghai metropolitan area is perhaps the most important metropolitan area in the People's Republic of China. Not only is it the largest area in population, but it is also the most important economically. The location of a major proportion of national manufacturing, it is a growing center of science and technology. Its port, among the world's largest, handles a high proportion of the country's imports, exports, and intercoastal trade.

The present-day expanded central city of Shanghai contains about 7.5 million people in an area of 276 square kilometers. The former boundaries of the central city contain almost 6 million of that population in an area of 149 square kilometers, which is approximately the size of the District of Columbia with about 10 times the population. This generates a level of population density about 100,000 per square mile, unheard of in any U.S. city. Beyond the city boundaries lies a large metropolitan region where many of the manufacturing facilities are located. The entire metropolitan area houses between 12 and 13 million persons in an area of 6,180 square kilometers (about 2,400 square miles), roughly the size of the Washington, D.C., standard metropolitan statistical area.

The central city sits at the juncture of the Huangpu River and Suzhou Creek, historically the center of the European concessions that played a major part in the development of the city from the mid-19th century through the first third of the 20th century. Harbor traffic on the Huangpu River dominates activities in the city center. The river, approximately 200 meters wide, is filled with ocean-going ships loading and unloading, a large ferry system, and small-harbor traffic.

Although shopping and employment are extensive in the downtown area, the predominant work-travel flow is outbound in the morning to the many employment sites in the city's outskirts.

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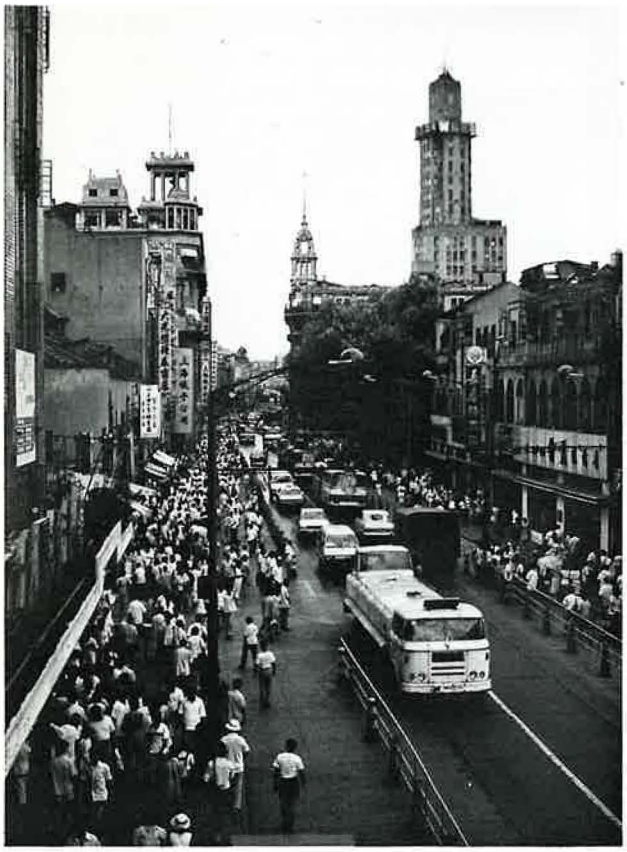
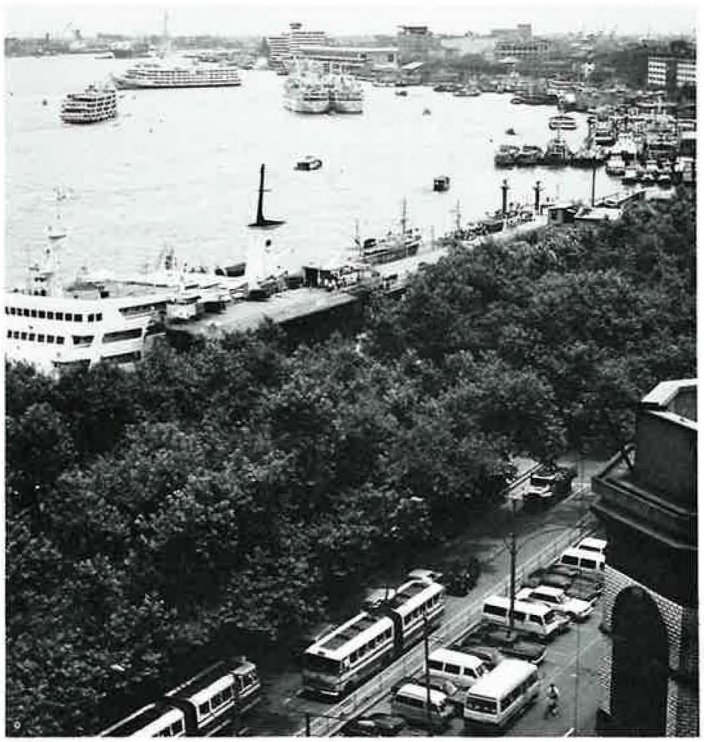


Nanjing Road, Shanghai's principal shopping street on which bicycles are prohibited.

Waitan, the waterfront historically known to Westerners as The Bund, features this broad arterial flanking a part of Shanghai's enormous Huangpu River port. Articulated diesel and electric buses with driver and two conductors provide the backbone of the city's intensive transit service.



The street system of the center city is a product of another time. About 900 kilometers of roads exist within the former central-city boundaries, constituting less than 10 percent of the land area. Streets are generally narrow, 10 to 16 meters. The typical blocks would be called superblocks if they were in U.S. cities. Road area per capita is about 2.1 square meters.

The outskirts of the city contain an extraordinary combination of land uses. A total of 7 satellite towns are being developed, and 33 county towns and more than 100 smaller towns dot the area. Large factory complexes are distributed throughout the outskirts, with small farms and rural populations interspersed between the major development sites.

Transportation Vehicles and Facilities

The unique characteristic of Shanghai is its lack of motorized vehicles. No more than 130,000 motorized vehicles of all

Shanghai's historic Waibaidu Bridge over Suzhou Creek where the reversible middle lane serves the outbound morning and inbound evening commuter flow. When manned, the police box controls the intersection traffic signals.

A Shanghai street market. Use of the city's limited street space is a crucial issue. Arterials and streets such as this border large superblocks of intense population and workplace density.

New two-phase traffic signals are supplemented by phases provided by voice control from a police box, such as this bicycle left-turn phase.

Bicyclists queued at a signalized intersection with pedestrian grade separation have their own nonmotorized-vehicle lanes, a standard feature of the wider arterials in Shanghai.

kinds operate in the metropolitan area, and almost none are privately owned. The overall fleet mix is as follows: passenger cars, 13 percent; buses, 6 percent; trucks, 39 percent; motorized bikes, etc., 13 percent; and other (predominantly tractors), 29 percent.

At first, it is difficult to conceive of how an area of 13 million can function on a daily basis and meet its economic requirements with so few vehicles. A large part of the answer is the bicycle fleet and how it is used. Almost 4 million bicycles operate in the area, with the number growing at about 300,000 per year. Bicycles are used extensively for personal trip making and for cartage of produce and materials. Three-wheel bicycles with provisions for carrying goods are common. Modified farm tractors are also extensively used for local hauling.

The other part of the answer to the question of how the city functions with so few vehicles is the transit system. Seven trips are made by transit for every three by bicycle. The state-owned Shanghai Transit Company operates more than 5,000 buses and trolley buses with approximately 60,000 employees. The network is extensive: more than 300 routes with a total length of 10,500 kilometers serve almost 15 million passengers per day. Excluding transfers, this passenger count equates to 8 million daily trips served. Fares are minimal; a monthly pass costs about U.S. $1.65. At that fare level the transit company earns a surplus, which is remitted to the government. Transit users with work trips more than 2 kilometers receive a transit subsidy from their employers of about 75 percent of the fare cost. Thus, the typical out-of-pocket transit cost to a rider is approximately $0.40 per month, which works out to about 1 or 2 percent of monthly income.

Peaking characteristics on the transit system are prodigious. Peak-hour ridership is measured at more than 1.4 million, with the heaviest routes carrying 13,000 passengers per hour in one

direction. This means headways of less than 1.5 minutes in peak hours on 26 routes. Even with a fleet that consists of approximately 70 percent large articulated vehicles with three-person crews and capacities of 150 or more persons, operating in a range of 12 to 20 kilometers per hour, overcrowding is a major problem.

In addition to the bus transit system, there are ferries and some intercity rail service. Passenger ferries operate 36 boats at 12 locations carrying more than one-half million riders a day, many with their bicycles. Ferries also carry the majority of car and truck crossings over the Huangpu River, typically with half- to three-quarter-hour back ups all day. The ferries compensate for the lack of bridges across the Huangpu. There is a two-lane tunnel under the river at a considerable distance south of the city.

Hua Lu, site of Shanghai's ancient city wall. Nonmotorized distribution of freight is a significant element of the transportation system.

The Shanghai Planning Program

Recognizing the need for a comprehensive approach to their extraordinary transportation problems, the local planning and transportation agencies of Shanghai formed the Shanghai Comprehensive Transportation Planning Team. Faced with the obvious need to develop additional highway, public transit, terminal, and goods-movement facilities, but constrained by limited funds for capital-intensive transportation projects, the municipality needs as-

Free-form traffic flow at an uncontrolled intersection. Shanghai drivers and bicyclists pass through such intersections in a continuous 5- to 10-mile-an-hour multiple weaving movement, aided by horn tooting and bell ringing.

An inland waterway port in the industrial northern suburbs of Shanghai. This facility specializes in building materials transshipped from canal boat to truck for distribution within the city.

surance that the projects it selects will be cost effective.

The practice of planning each transportation project individually, without a quantitative understanding of its effect on the overall transportation system, has led to legitimate concern that costly mistakes may be made. Moreover, there is no assurance that better alternatives are not being overlooked, including alternatives offering lower cost through emphasis on traffic operations and transportation management solutions. Municipal officials, lacking hard data on which to base transportation decisions, have postponed a large number of both short- and long-term projects until better methods of project evaluation become available. The planning team has been charged with the specific objective of providing the needed systematic, comprehensive, and coordinated urban transportation planning and project evaluation.

Approved by the Shanghai government late last year, at the request of the municipal science and technology commission, to undertake the requisite planning, the Shanghai Comprehensive Transportation Planning Team is comprised of representatives from organizations involved in transportation and traffic functions and is charged with making short- and long-term recommendations to the city government during the next 3 years. The recommendations will be specifically received by Vice-Mayor Ni Tian-zeng who is in charge of transportation.

The planning team's first and most monumental task is to quantify the city's transportation situation, starting with a series of inventories and surveys, most of which were to be performed by the end of 1986. The data collected will be entered into a data base for analysis, simulation, and modeling that will provide the basis for recommendations on specific transportation projects. The data development and analysis process is likely to take place during most of 1987; continuous work on model applications will take place over approximately 3 years.

By the beginning of 1988, the Shanghai planning team should be getting under way with full-scale evaluation of the most immediate transportation problems, based on the simulation of the current traffic situation completed during 1987. By the third year, the planning team's forecasting capability should be sufficiently developed to undertake

Shanghai's new pedestrian grade separations are a major component of the short-range traffic improvement program.

detailed studies of the impact of larger, longer-term transportation projects. Success in establishing a practical data base and transportation models should give the planning team an extremely influential role in the city's transportation decision-making process because of the ability to provide the quantitative analyses that have been lacking in the past.

The expected outcome of the planning is that the municipality will have a sound basis on which to move forward on a number of transportation infrastructure projects to meet outstanding transportation needs. The projects that evolve will undoubtedly include some with an operations and management emphasis and others entailing major construction. Major projects under consideration include additional Huangpu River crossings, ring and radial road improvements, railroad grade separation, and an impending subway plan.

The work program of the overall Shanghai Comprehensive Transportation Planning Project consists of seven primary tasks:

1. To carry out urban travel demand, traffic, parking, freight, and transportation system supply surveys and inventories.
2. To develop travel demand and supply models and simulations and to use them in combination with land-use planning in order to forecast future urban travel and freight movement.
3. To develop proposals for urban transportation policy in Shanghai.
4. To develop proposals for a comprehensive transportation system, including the road network, public transit and rapid transit network, goods-movement system, parking system, and traffic-control elements, along with connections to satellite towns and to port, railway, and air terminals.
5. To establish a transportation system evaluation methodology and to use this in conjunction with the modeling, simulation, and forecasting capability for the purpose of testing and evaluating the policy and transportation system proposals.
6. To select the preferred policies and comprehensive transportation system plan, along with a program of first-stage construction projects, including short-term measures to improve city traffic.
7. To establish a transportation information center for Shanghai.

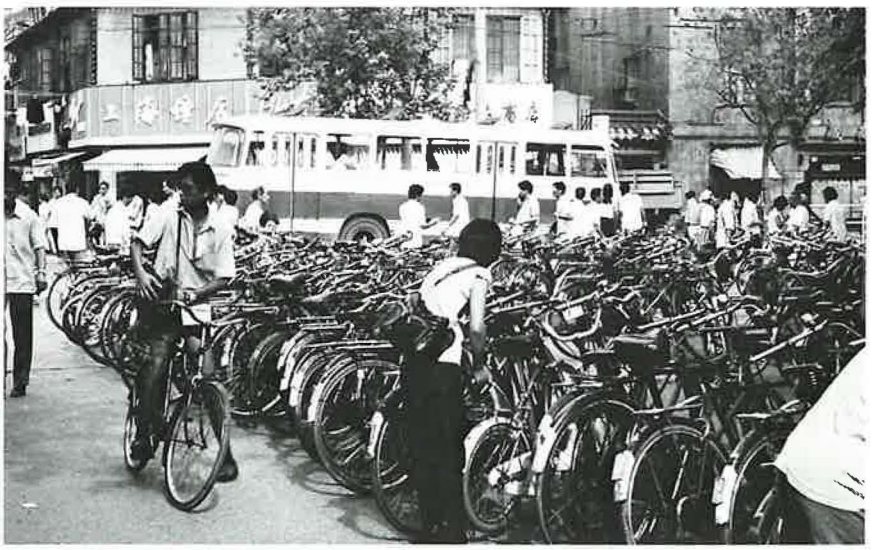
This work program is typical of the urban transportation planning process of many cities. In timing and scope, it is most comparable to the initial transportation studies of such cities as Chicago and Detroit. And similarly, continuing transportation planning processes will follow this initial transportation study for Shanghai.

The historic Chicago Area Transportation Study (CATS) formed the basis of the development of Chicago's urban freeway system and the redevelopment of its rapid transit system. The Shanghai Comprehensive Transportation Planning Project is similarly poised with respect to the development of Shanghai's transportation system. The Shanghai study is thoroughly modern, however, in its recognition of the importance of policy, its consideration of all transportation modes, its inclusion of traffic operations and other transportation system management, and its provision for interim studies in order to move into specific problem solving as soon as possible.

The U.S. Role

The Trade and Development Program of the U.S. State Department has worked with the Shanghai government to develop an American role in the Shanghai transportation planning process. The TDP staff found that the Chinese authorities have an extensive knowledge of, and interest in, U.S. urban transportation planning methods. Charged with assisting in the development of U.S. trade opportunities abroad, the TDP saw transportation planning as a unique opportunity for program assistance. Typically, TDP programs are more oriented to large-scale physical development than to planning-oriented service activities. However, given the importance of this planning effort for long-term urban transportation development, not only in Shanghai, but also in other major metropolitan areas of the People's Republic of China, the TDP has established an agreement with the Chinese authorities to assist the planning program utilizing U.S. technical expertise and supporting software.

At the end of 1986, the TDP placed for response, exclusively by U.S. firms, a request for proposals to obtain consulting services to assist the Shanghai



Bicycle parking in central Shanghai. Buses and bicycles together serve 96 percent of the home-to-work trips that cannot be accomplished by walking.

Planning Team. Approximately $380,000 will be available to fund assistance from an American firm for the first year of the planning effort. The activities of the consultant will be focused during the first year on networking and modelling assistance to the team.

The planned consulting arrangement is premised on the following assumptions:

- That the Shanghai Comprehensive Transportation Planning Team will have received sufficient municipal funding to establish a full-time staff of planners, engineers, and analysts with the requisite skills to manage the program.
- That major data collection programs will have been initiated by the Shanghai Planning Team and be substantially complete before the start of consultant activities. Data collection will include an extensive home-interview survey, surveys of passenger and freight vehicle movements, and inventories of roads, parking, and other transport facilities typical of the urban planning process.
- That local support for the process will continue and extend to support for utilizing the results of the planning process.

These conditions appear to be on the way to being fully met by the cognizant authorities. Advance team discussions and assistance regarding fundamental data collection activities, including survey design, sampling, network design, traffic-zone definition, and geographic coding procedures, found that a sophisticated capability to handle these needs has been established.

It is expected that the activities of the U.S. consultants selected will involve a series of about 20 tasks, some exclusively the responsibility of the consultant and others a joint effort of the consultant and the Shanghai Planning Team. Among other functions the consultant will

- Provide a transportation-planning software package and training in its use,
- Assist in developing network simulations and a transportation data base for the base year,
- Participate in developing evaluation and cost-effectiveness methods,
- Develop and calibrate travel-demand models and provide applications training, and
- Conduct a short-range planning analysis of parking and street space organization.

A key thrust of the program of assistance is to provide extensive experience and training to the Shanghai Planning Team, equipping them for independent operation in the future.

The program now under development, including a joint effort by the Shanghai team and an American consultant utilizing U.S. planning tools and methods, is a significant milestone on a number of levels. It is a significant opportunity to establish solid working relations between Chinese and U.S. transportation professionals; it is a commercial opportunity for American firms and products in an important potential market; and it is an exciting opportunity for American professionals to test their skills in a unique and new environment. Positive benefits from success in all three areas can be expected.

CALL FOR ARTICLES

Professionals in the transportation field are invited to submit to the Editor of *TR News* topical articles on innovative or state-of-the-art aspects related to all transportation modes. Articles that highlight the role played by research are especially desired. Feature articles should be 1,500 to 3,000 words in length and accompanied by appropriate, high-quality illustrations and corresponding captions.

Letters to the Editor are welcomed that offer comments on feature articles or responses to point-of-view articles, or in general discuss issues or raise questions related to transportation research or to TRB activities.

All articles and letters received are subject to review by the Editorial Board of *TR News* for suitability for publication and to editing for purposes of length and clarity. For further guidelines on submitting news items or full-length articles, see Information for Contributors on the inside back cover.

—Nancy A. Ackerman, Editor