Transcript of the

SEMINAR ON URBAN MASS TRANSIT

SHERATON-WAIKIKI HOTEL
HONOLULU, HAWAII

JANUARY 26-27, 1978

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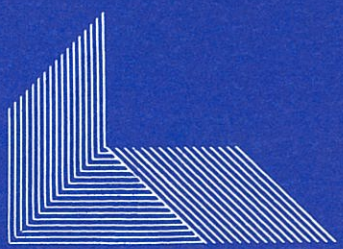

OFFICE OF THE LEGISLATIVE AUDITOR — STATE OF HAWAII

Transcript of the

SEMINAR ON URBAN MASS TRANSIT

Sponsored by

The Office of the Legislative Auditor

State of Hawaii

Sheraton-Waikiki Hotel

Honolulu, Hawaii

January 26—27, 1978

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Preface

On January 26–27, 1978, the Legislative Auditor, as requested by the Hawaii State Legislature, sponsored the Seminar on Urban Mass Transit for government officials and the public. The entire seminar was taped and recorded by court reporters, and this is a transcription of the proceedings.

The seminar was structured in two phases, each covering a day. On the first day, the City and County of Honolulu presented its mass transit proposal which it calls Honolulu Area Rapid Transit (HART). On the second day, a review team provided an appraisal of the HART plan. This transcript is presented in the same format as the seminar.

We wish to express our deep appreciation to state legislators, council members of the City and County of Honolulu, state and city officials, and interested citizens of our community, for attending the seminar. We also wish to thank Mr. Kazu Hayashida and his staff from the City Department of Transportation Services for their excellent cooperation and assistance in coordinating their portion of the seminar. And, finally, we acknowledge with thanks the efforts of all the seminar participants.

We hope that this transcription will be of value to all those who are interested in the issue of urban mass transit for Honolulu.

Clinton T. Tanimura
Legislative Auditor
State of Hawaii

February 1978

SEMINAR SCHEDULE

Program for Thursday, January 26

8:00 a.m. – 9:00 a.m. – Registration

9:00 a.m. – 9:15 a.m. – Opening remarks

9:15 a.m. – 9:45 a.m. – INTRODUCTORY REMARKS AND HART SLIDE SHOW
Kazu Hayashida
Director, Department of Transportation Services
City and County of Honolulu

9:45 a.m. – 10:30 a.m. – INTRODUCTION OF SPEAKERS
Kazu Hayashida

VIRTUES OF BUSES: MYTHS vs. FACTS
Jack R. Gilstrap
General Manager
Southern California Rapid Transit District
Los Angeles, California

10:30 a.m. – 10:45 a.m. – Coffee break

10:45 a.m. – 12:00 noon – HART PLANNING WORK AND REGIONAL IMPLICATIONS OF RAPID TRANSIT
Dr. John Bailey
Partner, Louis T. Klauder & Associates
Philadelphia, Pennsylvania

RIDERSHIP, COST AND OVERRUNS
HART vs. BUS ALTERNATIVE
Richard Bouchard
Vice President/Director of Transportation
Daniel, Mann, Johnson & Mendenhall
Los Angeles, California

12:00 noon – 1:30 p.m. – Lunch

THE NEED TO LOOK AHEAD
Louis Gambaccini
Vice President and General Manager
Port Authority Trans-Hudson Corporation
New York / New Jersey

1:30 p.m. – 3:00 p.m. – VALUE CAPTURE: UNTAPPED RESOURCE AND ECONOMIC BENEFITS
David Callies
Partner, Ross, Hardies, O'Keefe, Babcock & Parsons
Chicago, Illinois

Stuart Dixon
Project Director
Rice Center for Community Design and Research
Houston, Texas

Robert Harmon
Managing Principal
Robert Harmon Associates
Washington, D.C.

FEDERAL FUNDS: GRANTSMANSHIP STRATEGIES
Terrell Hill
Special Assistant to General Manager
Chicago Transit Authority
Chicago, Illinois

3:00 p.m. – 4:00 p.m. – Question and answer session

Program for Friday, January 27

9:00 a.m. – 10:30 a.m. – INTRODUCTION OF HART REVIEW TEAM
Dr. Andrew Hamer
Associate Professor
Department of Economics
Georgia State University

EXPLORING THE HART PATRONAGE PROJECTIONS
Dr. Kenneth Train
Senior Economist
Cambridge Systematics
Berkeley, California

COMPARING TRANSIT COSTS:
DOES RAIL MAKE SENSE?
Dr. Theodore Keeler
Associate Professor
Department of Economics
University of California – Berkeley

10:30 a.m. – 10:45 a.m. – Coffee break

10:45 a.m. – 12:00 noon – RAPID BUS STRATEGIES: THE UNTRIED OPTION
Dr. Kenneth Small
Assistant Professor
Economics Department
Princeton University

THE USES AND MISUSES OF COST-BENEFIT
ANALYSIS
Dr. Randall Pozdena
Assistant Professor
Department of Economics
Mills College

12:00 noon – 1:30 p.m. – Lunch

OBSERVATIONS ON THE HONOLULU TRANSIT PLAN
Dr. John Meyer
Chairman, Harvard/MIT Joint Center for Urban Studies
Cambridge, Massachusetts

1:30 p.m. – 2:30 p.m. – WHAT CAN HONOLULU LEARN FROM BART, METRO, AND MARTA? *
Professor Melvin Webber
Director, Institute of Urban and Regional Development
University of California – Berkeley

Dr. Andrew Hamer

2:30 p.m. – 3:00 p.m. – SOME LESSONS FOR HONOLULU – A CRITICAL SUMMATION
Dr. John Kain
Chairman, Department of City and Regional Planning
Harvard University

3:00 p.m. – 4:00 p.m. – Question and answer session

*BART .... Bay Area Rapid Transit
METRO .. Washington Metropolitan Area Transit Authority
MARTA .. Metropolitan Atlanta Rapid Transit Authority

HART PRESENTATION TEAM

Kazu Hayashida holds a bachelors degree in civil engineering from the University of Hawaii. He was the director and chief engineer at the Department of Public Works before holding his current position as director of the Department of Transportation Services of the City and County of Honolulu. He was a member of the Board of Water Supply and is active on several boards and committees, including Solid Waste Task Force, Alternate Energy Task Force, Technical Advisory Committee and Executive Committee of the Oahu Metropolitan Planning Organization, and the Statewide Transportation Council. Among other professional memberships, he is a member of the American Society of Civil Engineers, Hawaii Society of Professional Engineers, and the American Water Works Association. He was the recipient of the 1977 Engineer of the Year award.

Jack R. Gilstrap earned his masters degree in public administration at the University of Southern California. Prior to his current position as general manager of the Southern California Rapid Transit District, he has held other executive-level positions with the transit district as well as administrative posts with the California State Legislature and the State Department of Mental Health. Mr. Gilstrap is vice president of the American Public Transit Association and chairman of the association's Governmental Affairs Committee. He is also a member of the Federal Aid for Urban Systems Act Advisory Committee, Federal Urban Mass Transportation Administration's Capital Criteria Committee, and the National Safety Council's Board of Directors.

John Bailey is a registered professional engineer in Pennsylvania and he received his doctorate from the University of Pennsylvania. Among his other experience in the field of transportation, he was executive director of the Urban Traffic and Transportation Board for the City of Philadelphia; executive director of the Passenger Service Improvement Corporation of Philadelphia, an organization established to manage the commuter railroad system; and deputy general manager for the Southeastern Pennsylvania Transportation Authority. He was a professor in the Graduate School of Management, and director of the Transportation Center at Northwestern University. His current work includes administrative direction of railroad and rapid transit cost and feasibility investigations.

Richard Bouchard has a professional masters degree in civil engineering from the University of North Carolina. He was formerly Director of Planning for the State of Rhode Island, where he was responsible for organizing and managing the statewide planning program. The program successfully completed major statewide plans and implementation programs for public transit systems, an expanded highway system, and state-owned and -operated systems for airports, water distribution, sewers, and recreational facilities. Prior to his affiliation with Daniel, Mann, Johnson and Mendenhall, he was Director of Transportation Planning Assistance with the U.S. Department of Transportation. He is the author of many technical papers, principally in the field of transportation, presented at professional conferences throughout the United States.

Louis Gambaccini undertook his doctoral work at New York University and has a masters degree in public affairs from Syracuse University. Under the aegis of Woodrow Wilson National Fellowship Foundation, he served as a visiting fellow to small liberal arts colleges to promote greater understanding and sharing of experiences between the academic community and the outer world. His transit industry and professional activities include serving as Vice President–Government Affairs and as a member of the Board of Directors of the American Public Transit Association. He has had leadership roles in successful efforts to secure substantially increased federal participation in urban transit capital grants and in the establishment of operating subsidy programs through representation for the transit industry in meetings with the

U.S. Department of Transportation and presentation of testimony before congressional committees.

David Callies is a partner in a Chicago law firm of Ross, Hardies, O'Keefe, Babcock and Parsons. He received his LL.M. from the University of Nottingham, England. He is also an adjunct associate professor at the School of Architecture and Urban Planning, University of Wisconsin–Milwaukee. Mr. Callies is the co-author of *The Quiet Revolution in Land Use Control,* a study of recent state land use legislation, and *The Taking Issue,* an analysis of the constitutional limits of land use control. He was a contributor to a report entitled, "Alternatives to Urban Sprawl: Legal Guidelines for Government Action," prepared for the National Commission on Urban Problems. He is the author of a number of articles and papers on the subject of land use controls. He is presently serving as counselor to the Conservation Foundation in connection with a study of international comparative land use, development, and environmental law in eight countries. He is a past vice president of the Illinois Planning and Conservation League and a member of the American Society of Planning Officials and the Community Planning Association of Canada.

Stuart Dixon received his education in planning and architecture at Cornell University. His experience as a regional planner was gained in urban economic/policy planning, regional development, land use and housing issues, as well as historic preservation. As a financial analyst, his experience includes employment in urban technology industries, real estate and capital markets, banking, insurance, financial institutions, and investment research/security sales.

Robert Harmon is a graduate of the University of Southern California where he received his bachelors degree in economics and completed his graduate studies in public administration and econometrics. He was also a National Science Foundation Fellow at the University of Michigan and a resident economist at the Center for Real Estate and Urban Economics at the University of California, Berkeley. Mr. Harmon is currently serving as a senior economist to the Buffalo and Baltimore "Value Capture" and station development program efforts, and in this capacity he has had primary responsibility for input into social/urban economic aspects of the transit industry's future management information system development. His past experiences in the field of transportation also include the evaluation of urban development impacts and benefits and costs of the fixed guideway and flexible mode transportation system in several major cities such as San Francisco, Seattle, Atlanta, Los Angeles, Philadelphia, and Baltimore. Mr. Harmon is the chairman of the Transit and Urban Development Committee of the National Transportation Research Board and is a member of the Regional Science Association, the American Transit Association, the American Institute of Planning and Board of Directors of the Advanced Transit Association.

Terrell Hill graduated from Georgia Tech and worked in both building construction and land development in Georgia. He was involved with the San Francisco Planning and Urban Research Association and was named Director of the Market Street Development Project. His responsibilities included the design of that city's response to the construction of BART and the financing and adding of the Embarcadero station to that system. Mr. Hill was also deputy general manager of the Metropolitan Atlanta Rapid Transit Authority, where he was responsible for the political decisions and design of that system's legal, financial, transportation, and urban design plan. He has been involved in the transfer from private to public operation of some 20 transit systems. Among other activities, Mr. Hill was active in the successful fight to "Save San Francisco Bay."

HART REVIEW TEAM

Andrew Hamer is an urban economist who received his doctorate from Harvard University. He is a consultant with the Urban Regional Policy Group of the U.S. Department of Housing and Urban Development and also with the Metropolitan Atlanta Rapid Transit Overview Committee of the Georgia State Legislature. He also serves as a consultant with the World Bank in Washington, D.C., on matters pertaining to urban problems. Among his many publications are "The Selling of Railroad Rapid Transit" and "An Industrial Exodus from Central City."

Kenneth Train received his doctorate in economics from the University of California at Berkeley. At Cambridge Systematics, Inc., his research studies consist of development and estimation of demand models for various communication systems. Previously, he was a member of the University of California Urban Travel Demand Forecasting Project, which involved development and estimation of models of workers' choice of travel mode and analysis of policy issues related to mode-choice and auto ownership. His areas of interest include economic analysis and forecasting in the fields of transportation, energy, and health.

Theodore Keeler was a fellow at Harvard/MIT Joint Center for Urban Studies and received his doctorate in economics from MIT. He served as a consultant to the White House Council on International Policy, and the U.S. Senate Subcommittee on Administrative Practices and Procedures on airline regulatory reform. He was the principal investigator for the "Comparative Cost Study for Bay Area Transportation Mode" funded by the National Science Foundation. His research areas of interest include transportation economics, industrial organization, and public finance.

Kenneth Small received a doctorate in economics from the University of California at Berkeley, where he specialized in public finance, econometrics, and transportation economics. His dissertation was an evaluation of short-run policies for use of urban expressways, including reserved lanes, carpool priority measures, and congestion pricing. Dr. Small's research interests have included costs of highway transportation, urban travel demand, and air pollution. At Princeton University, he teaches transportation economics, urban economics, and industrial organization.

Randall Pozdena received his doctorate in economics from the University of California, Berkeley. In addition to serving as an assistant professor in economics at Mills College, he is a consultant economist at Stanford Research Institute. He also serves on the California Transportation Plan Task Force. His studies and research have primarily centered on analyzing the technical efficiency of public transportation systems. His latest work entitled, "User Benefits Analysis for Highway and Transit Improvement," will be published in the *Journal of the National Academy of Sciences."*

John Meyer, who received his doctorate in economics from Harvard University and was awarded the David A. Wells Prize in 1955, is the chairman of the Faculty Executive Board for the Harvard/MIT Joint Center for Urban Studies. He is a consultant with the Rand Corporation and the Council of Economic Advisers. He is the past president of the National Bureau of Economic Research, which publishes analytical documents that affect national policy. He is the senior author of the book, *The Urban Transportation Problem,* and has written several books and numerous articles on transportation industry and planning. His latest work includes a report for the U.S. Urban Mass Transportation Administration entitled, "Improving Urban Mass Transportation Productivity."

Melvin Webber received his masters degree in city planning from the University of California, Berkeley. He is the director of the Institute of Urban and Regional Development and, in addition, he is a professor at the College of Environmental Design, University of California. He also serves as a consultant to the Commission on International Relations for the U.S. Department of State, and to the Commission on Socio-Technical Assistance, Transportation Research Board, National Research Council for the U.S. Urban Mass Transportation Administration. His current research includes a study on "Alternative Organization Forms for Pluralistic Transportation Services" and "Analytic and Planning Styles Appropriate to High-Scale Post Industrial Societies and Those Appropriate to Less Developed Nations." He has written numerous articles, the most recent being "The BART Experience: What Have We Learned?"

John Kain holds a Ph.D. in economics from the University of California, Berkeley, and was a former research associate at the Rand Corporation. In addition to holding the position of a professor of economics at Harvard University, he is a senior staff member of the National Bureau of Economic Research and a consultant to the Task Force on Housing, Urban Coalition. He has done considerable research on transportation systems and their interactions with land use and metropolitan development patterns. He is the co-author of the book, *The Urban Transportation Problem,* which formulates critical appraisal of alternative transportation systems.

Thursday, January 26, 1978

INTRODUCTORY REMARKS

Clinton T. Tanimura

It is a little after nine, and I think it is time to get the program on the road.

Good morning. My name is Clinton Tanimura.

On behalf of the Hawaii State Legislature, I have the pleasure of welcoming you to this seminar on urban mass transit.

This seminar is being held to discuss what many believe to be the single most important decision this island faces today, namely, whether the City and County of Honolulu, with the assistance of the federal government and the state government, should proceed to build the system known as the Honolulu Area Rapid Transit, or HART, as it has come to be called.

The legislature has asked our office to hold this seminar in a way that will provide a balance perspective to the issues.

To provide this balanced perspective, the seminar is structured in two phases. Today, the City will describe the HART plan, the considerations involved in making the HART decision, and the reasons why it believes that HART would be the best system for Oahu.

Tomorrow, in the second phase of the seminar, a team of economists and planners will take a hard look at the City's proposal. They will, from various perspectives, present an appraisal of the City's plan.

Thus, over the next two days, we hope that the participants will leave us better informed on the issues of urban mass transit and the City's fixed guideway proposal.

Before we begin, there are a few housekeeping announcements that I would like to make. Those of you who have gotten into the spirit of this seminar by using public transportation to get here may disregard this first announcement. But for those of us who drove our own cars and are using the hotel parking facility, please take note of this, that there is validated parking. If you haven't already done so, you can stop by at the registration desk to have your parking ticket validated.

The luncheon sessions will be held in the Molokai Room, which is to the far right as you leave this room. For those of you attending the luncheon session, please have your luncheon ticket with you for collection at the table. If you have registered for the luncheon session but haven't picked up your luncheon ticket, please do so at the registration desk sometime this morning. And for those of you who have not registered for the luncheon sessions but now wish to attend, you can still register for the luncheons. We will keep the registrations open through the coffee break.

Everyone attending is welcome at the coffee break. It will be held around 10:15.

We also have a message center at the registration desk. You can use the phones there to make outgoing calls. You can also arrange for incoming messages.

Finally, in order to get through our tight seminar schedule I am asking that all questions from the audience be held for the question and answer session at the end of the day. We are reserving a full hour for questions from the audience beginning around three o'clock.

We expect to close today's session at about 4:00 p.m.

I would now like to turn over today's seminar to the City team for its presentation. I am very pleased to introduce the seminar leader for the City, the Director of Transportation Services for the City and County of Honolulu, Mr. Kazu Hayashida.

INTRODUCTORY REMARKS AND HART SLIDE SHOW

Kazu Hayashida

Thank you very much, Clint. I came in a car pool today, a concept that has really not worked but has possibilities.

Good morning, ladies and gentlemen. I am so happy to see so many of you here. I am pleased to see the high interest for this conference. We shall discuss one of the most important projects, one of the most complex projects, and a new project that offers great opportunities for this City. Like most things that are new we have champions that tell us of more and better opportunities. And then we have those prophets of doom. This latter group feeds on ignorance, advocates the status quo, appeals to the pocketbook—a most powerful weapon—and feeds on fear itself. Columbus went over the horizon and opened a whole realm of opportunities. But let's get closer to home. How many of you have received a promotion? When you received this promotion, you were elated with the opportunity to do more things, and yet there was that gnawing fear whether you were good enough.

Now, as you went up this success ladder, how many of you turned down a promotion because fear overcame confidence? This, in spite of a recommendation from your boss, who had the confidence in your ability to do a job for him. He was willing not only to risk his reputation but also to lose his job.

Today I offer you HART, a project that can open up new opportunities for Honolulu. I make this recommendation based on studies that began in 1971 and cost over $3,000,000. It really goes back to the Oahu Transportation Study that made a recommendation in 1967 that a fixed guideway in the central corridor of this City, from Pearl City to Hawaii Kai, is the way to go. I think that we have done enough studies to make a decision. No major project that I have been involved in has had the luxury of having all the answers. Every project report has had its critics who looked for loopholes. There were many holes, but the holes were not big enough for the project to fall into. At one point in time we had to rely on that gut feeling and make the decision and get going on the job. As I said earlier, we still have the opportunity to shape the City of Honolulu. Do we want to look like Toronto, or do we want to look like Los Angeles?

Toronto has planned the city so there is a series of high density areas that make it possible for other areas to remain less dense. To do this, they installed the fixed guideway system.

Los Angeles is a sprawling metropolis that has a high system of freeways and streets. You have your choice.

Do we want to look like Oslo, a city of 440,000 people that has concentrated the densities along the transit corridor and has kept other areas open for agriculture, recreational uses and other open uses? They built a rapid transit system and have added to it until they have over twenty miles of transit.

We are being compared to San Francisco, Washington, D.C., and Atlanta. These cities have more extensive and complex projects and much more complex political systems. They have many lines of political jurisdiction to cross.

Honolulu, on the other hand, has a relatively simple political system. It leads the nation in land use control, and we are going to have one agency that will run the bus and the fixed guideway system called HART. Therefore, we will have a better opportunity to make that marriage work and have a better opportunity to make it a success.

Today we will show you a slide show on the HART program, then, we will have an array of speakers who will speak on mass transit. They are what I consider in the real world situation. They are experienced in planning, designing, constructing, operating, and maintaining a system. They have experienced the joys of success and have wrestled with the problems from day to day. Some of them are trained in public affairs. They know how to relate transportation to the whole community, not dwell on transportation in itself. It will be an interesting experience for you, and I hope that as you have questions you will ask all the hard questions. There is no sense in having all the brains if you can't get the benefit from them.

So let's get on with the show. We have a slide show for you telling you what the HART program is all about, and then we will have the speakers.

Now, I am going to take the liberty of changing the program format. At the end of each speaker's presentation, we will entertain a few questions. Since time is of the essence, we will cut off the questions when the time is up. When you go to the coffee session, please get back to your seats on time because we will be starting the program right on time.

So with that, let's get on with the show. *[The slides presented at the seminar are not shown with the transcription.]*

HART SLIDE SHOW

Like most American cities, Honolulu has come to depend on its roads to move its people and goods. They've served us well, as automobile and truck traffic on Oahu grew from 4 vehicles in 1900 to over 400,000 today. But in the past ten years, while population increased 20 percent, automobile ownership increased by over 40 percent. As people and vehicles continue to multiply, the overloaded condition of our roads grows serious.

The yellow lines show portions of H–1 Freeway, King, Beretania, Kalakaua, Kapiolani, and Ala Moana Boulevard. According to national traffic standards, they've already reached a level of serious congestion at peak periods. Red-marked streets–Nimitz Highway, Ala Wai Boulevard, and Harding Avenue–are approaching that condition. Only the few green lines remain clear. Even they are reaching the overcrowded condition at peak periods.

We cannot solve the problem by building more highways and freeways. With its narrow, densely populated corridor between Pearl City and Hawaii Kai, Honolulu is unlike any major city in the nation. The sea on one side and mountain range close by on the other, don't permit us the luxury of devoting more land to roads. There are over 700,000 persons living on Oahu. Each black dot represents a thousand persons. Looking 20 years in the future, which is the time span the transportation planners must consider, growth seems certain to occur. A few years ago, state planning forecasted 924,000 people on Oahu by 1995. The red line indicates that state forecast. But recent population growth exceeded the State's expectation. The red square above the projection line shows the actual number. Consequently, the State revised its 1995 forecast to 965,000. Just recently, the State changed that number again—this time downwards to 881,000, which just shows that population projections are not an exact science, but we constantly examine and re-evaluate them nevertheless.

Location of employment centers in the future must also be considered. The red triangles show the major employment centers. To reach them, and to obtain greater use of the roads we have, the traffic engineers applied several techniques. Parking is restricted on many busy streets. King, Beretania, and others were made one-way. Reversible lanes were introduced. A contra-flow bus lane, with the buses moving against traffic, has been operating along Kalakaua Avenue in Waikiki. Turning movements are controlled. Bicycle riding and carpooling are encouraged. Staggered working hours are being tried. They help a great deal. But they are temporary measures; not long-term solutions.

As the population of Oahu grows and vehicles increase, roads will approach their point once again. They will be right back to where they were a few years ago. Imagine our roads struggling at peak periods with up to 30 percent more traffic than they carry today. Then you understand the congestion we will encounter.

There are other problems, too. Parking lots used to charge 25 cents an hour, but now ask as much as $2 per hour. Gasoline is already 79 cents a gallon and expected to increase, provided, of course, that there is any gasoline for private citizens to purchase in the future. Auto environmental costs are also high. Air pollution and noise pollution pose a cost to all of us. A cost which may be hard to measure precisely, but nevertheless exists. The logical solution is to find other methods of moving people on Oahu. That's why planners here and elsewhere are proposing new public transportation systems.

Mass transit should offer us an alternative so convenient and so attractive, that we would choose public transportation rather than use our automobiles for the journey to work. When we think of public transportation, buses come to mind. For regardless of the kind of transit system Honolulu may select, buses will have to serve as the principal public transportation system for several years to come.

The problem is that large numbers of buses clog the city streets and become part of the congestion problem, rather than its solution. You have a glimpse of the future with dependency on buses by observing Hotel Street in downtown Honolulu during the recent bus impact study. The study showed that only about 100 buses per hour can flow each way along Hotel Street rather than the 140 buses per hour that studies show would be required in the mid 1980's.

To suggest that they could operate on King, Beretania, Nimitz, and other busy streets ignores the fact that those roads are crowded already at peak hours. They are needed to move traffic cross-town. Although a lane on the outlying portions of the H–1 Freeway might be assigned exclusively to buses, the central section of H–1 is already overloaded.

If buses remain the sole means of public transportation, there would be so many that only new busways, constructed especially for the exclusive use of buses, could accommodate them. And even they would have difficulty in handling and loading that number of buses.

A few years ago the City and State jointly examined the concept of a cross-town busway. For purposes of comparison, we have drawn to scale some of the required bus facilities next to proposed fixed guideway structures. The busway structure cross-section is on the right with the fixed guideway structure on the left. The busway would also need acceleration and deceleration lanes. The busway tunnel on the right is compared here with the tunnel for a fixed guideway on the left. The busway station at the top compares with the fixed guideway station at the bottom. Also, an all-bus system would produce much more pollutants per year than a fixed guideway system. Most of that additional pollution would be concentrated in the critical downtown Honolulu area.

The cost of constructing just a seven-mile cross-town busway would be high, about $740 million. Its annual operating cost would also be a high $80 million. So you see, reliance on buses alone is not a cheap solution to the traffic problems of Honolulu! In the long run, it can become the most expensive solution. Buses are labor intensive. One operator can serve up to 700 passengers on a fixed guideway. For every 70 passengers aboard a bus, there must be one driver.

A few years ago, the Chicago Transit Authority compared the cost of operating buses and busways versus a fixed guideway system serving the same number of persons. They found the annual operating cost for the busway system would be 77 percent higher than the cost of operating the fixed guideway system. It's that continuing rise in operating cost that fractures the bus proposal. In summary, the capital cost of constructing busways would be higher than that of the fixed guideway. Operating costs would be higher. Environmental impact on buses would be greater. And of great importance, the carrying capacity of the bus system would be less.

Another factor must be considered. There is stronger passenger attraction to a fixed-guideway system. Spaciousness of the new guideway vehicles, higher speed, frequent service, riding comfort, and reliable all-day service, have a significant impact on passenger attraction. As an alternative to the bus, the consultants examined several other systems. One, known as "Light Rail Vehicles," is a new name for the old Honolulu trolley car. Although the modern version can accommodate a sizable number of passengers, their effectiveness is limited unless they are placed on their own right-of-way so that cross-traffic will not interfere. As that is done, their cost rises. Despite their name, Light Rail Vehicles are as large and as heavy as fixed-guideway cars. Consequently, their structures become just as expensive as the fixed guideway, while their passenger capacity is less.

That brings us to the more conventional fixed-guideway systems and probably the most publicized one in the world. BART—the San Francisco Bay Area Rapid Transit system. You've heard of its cost exceeding its original estimate. That kind of unpopular information is seldom reported for freeways, here or elsewhere. You heard about its problems, particulary when it did not stop properly at the Fremont terminal once and shook up several people, none of them seriously. But you did not hear that during the two-month period just prior to that BART incident at Fremont where no one was hurt, there were 440 reported traffic accidents and four people killed in traffic accidents along the 20 miles of freeway that parallel that same section of BART.

It's quite true that BART has had problems. Some were due to the fact that it was the first totally new rapid transit system built in the nation in 60 years. Many of the "bugs" in the system have been eliminated. Remaining technical problems are being worked out. BART consists of three separate East Bay transit lines shown on the right of the picture. They merge into a single subway line under the City of Oakland. Then BART descends 130 feet where it proceeds beneath the Bay in a tunnel several miles long, and then extends under Market Street in San Francisco. Even there, instead of operating in a simple tunnel directly beneath the street, BART is three levels down, below a pedestrian mezzanine and streetcars.

Imagine the difficulty and cost of constructing that elaborate system. Seldom is that complexity of BART explained. Nor is the attractiveness of BART mentioned by its critics. Everyone interested in rapid transit is learning from BART. Honolulu could learn to avoid the complexities of BART but still retain the outstanding qualities of the system.

Prior to BART, Toronto built the first subway in Canada. It is conventional in design and simple in operation. It is so successful that it has been extended. It had a phenomenal impact on generating higher land values and new development around its station sites. Property values increased so much that taxes collected were able to pay the annual amortization cost for its construction within the first eight years of operation. That's a factor deserving consideration in the Honolulu decision, even though it may not appear on the balance sheet at the outset.

One of the newest rapid transit systems in the United States is probably the simplest in concept and most successful. It's the Lindenwold Line operating since 1969 from downtown Philadelphia to Lindenwold in New Jersey. Its components are fairly standard. Its technology is not "far-out." Its stations are quite basic. This system receives little publicity because it did not overrun its cost estimates once construction was underway. Nor does it have operating difficulties. Furthermore, until recently, it was paying its operating cost out of the fares collected.

Lindenwold, with its simplicity and semi-automation has something to teach us. A comparison was made of the Lindenwold Line and Shirley Busway, which looks like this. The busway occupies the center section of the highway. It is reserved for the exclusive use of buses after they leave downtown Washington, D.C., headed for communities in Virginia. The two facilities are remarkably similar in the type of area and riders they serve. Yet in the first year, Lindenwold attracted 70 percent greater patronage than Shirley Busway. Some of that was

due to the fact that 99 percent of the Lindenwold trains ran on time. On the Shirley Busway, only 68 percent of the buses were on time during that year. At the outset, 40 percent of the riders on Lindenwold were former motorists new to transit riding. Now the number of former motorists riding the Lindenwold Line continues to rise. That brings us to the rapid transit system proposed for Honolulu.

We developed something we call HART, the Honolulu Area Rapid Transit system. We believe that HART is the best answer to the demands of the future. A system that would eventually consist of a 23-mile fixed guideway from Hawaii Kai to Pearl City, HART would have a feeder bus network and express bus system to outlying areas. The green lines show the feeder bus service.

The backbone of HART would be automated electric trains traveling at an average speed of some 35 miles per hour. Each car would seat about 35 passengers, with room for as many standees. From two to ten cars could be joined together in trains, depending on the passenger demand. The trains would operate from 5:00 a.m. around the clock to 1:00 a.m., seven days a week to make the system really convenient. During rush hours, trains would come about three minutes apart.

To complement the trains, a system of feeder and express buses would be operated. Instead of carrying a busload of passengers all the way from their homes to their destinations, the buses would drop the passengers off at the nearest guideway station. The buses would then be free to return quickly and circulate widely within each neighborhood.

Question has been raised whether the fixed guideway would be located properly for the future Honolulu. City Planning prepared four alternative growth policies for Oahu. All reinforce the need for the fixed guideway through the dense Honolulu corridor shown in red. Regardless of which alternative is selected, the bulk of our population and major job centers in the future, shown by the red triangles, will remain concentrated in that dense corridor for all four policies.

The consultants forecast that one out of three trips to work between Pearl City and Hawaii Kai would be made by public transportation during peak periods. Some planners believe that number would be surpassed if street congestion in Honolulu continues to grow worse and automobile costs increase. You cannot apply national ridership patterns automotically to Honolulu. We have unusually high densities. We have mounting traffic congestion. We have great mobility with outdoor activities every month of the year. We face extremely expensive costs for operating a private automobile, coupled with the already high cost of living in Hawaii. These are convincing reasons for greater use of public transportation in Honolulu if the transit system is really rapid and if it is made attractive for the potential passenger.

This projection of the number of passengers expected to use the fixed guideway-system shows a sharp peak in ridership between Kalihi and Kapahulu. This projection was prepared prior to the gasoline shortage of 1973. It was made before the installation of new bus equipment and the popularity of the expanded bus service. Based on those events, it's reasonable to expect ridership on the transit system to be even greater than the consultants predict.

HART trains may eventually travel along the dense corridor extending from Pearl City to Hawaii Kai. Our studies show that 14 miles of the route, extending from Aloha Stadium to Kahala Mall would probably attract sufficient ridership in the near future to justify its construction as the initial phase. The cost of constructing a 14-mile fixed-guideway system between Aloha Stadium and Kahala Mall is estimated to be $730 million if early approval of the federal agency is received, and if development of the system gets underway in mid-1978. That cost estimate assumes seven years will be required for the design and construction of the system. The cost of delaying the project is about $50 to $60 million per year based on current inflation rates.

It's estimated that the annual operating and maintenance cost for the system would total some $64 million a year. About $20 million of that would be paid by fares if we maintain the current fare structure. The rest would be paid by federal and local grants.

What would a $730 million project require in the way of local funding? If the U.S. Department of Transportation approves the system for Honolulu, federal law authorizes 80 percent federal participation for its construction. For the 14-mile system, it would mean approximately $585 million in federal funds would be made available to Hawaii. To match those federal funds, we would need locally about $20 million for preconstruction costs and $18 million per year thereafter for seven years for construction costs. It's hoped that the City and State would share the total cost of $145 million equally.

The effect of injecting $585 million from the federal government into the Hawaiian economy should not be underestimated. They are tax dollars from here and elsewhere that other communities would be happy to receive if Hawaii does not claim them. Although some funds would go to mainland firms for equipment and supplies, most of it would remain here. It would mean jobs and wages for many years. It would have a multiplier effect on the state economy, on this island, and the neighbor islands. It would contribute more to the Hawaiian economy than the local share of the system would cost us. It would have a powerful effect on the ailing construction industry. Even after the seven-year construction of the transit system ends, it would continue to generate economic waves throughout the community as areas around the station sites are developed further.

In fact, it has been estimated that because the federal transit funds would be spent so many times over here in Hawaii, first by the construction workers, then the retail merchants, then the wholesalers, etc.—with income taxes and excise taxes paid at every step—the State would gain more in taxes from the HART project than its 10 percent share would cost. Most importantly, this project would create a public transportation system that would improve the quality of living for our own people and our visitors for many decades.

Government agencies have spent much time and considerable funds analyzing all the transportation alternatives for Honolulu. In every case, their technical studies conclude that a fixed guideway and feeder bus system would be the most preferable system for the future of this community. After lengthy and intensive examination, the federal transportation agency now fully agrees with that conclusion.

In summary, there are only a few realistic choices from which we must choose for Honolulu's transportation future. We could choose to build more highways for our automobiles. The advantage of this option is that government need only provide the highways—private citizens would pay for their own autos, fuel, insurance, and maintenance costs. The disadvantage is that though tax dollars are conserved, the private costs to the public would be high. What's more, where would we put more highways in crowded downtown Honolulu?

Our bus fleet could be expanded. But though their initial cost would be relatively low, labor costs for 800 or 900 buses would be extremely costly. And remember that they would probably have to operate on their own busways, and busway structures are more costly, mile for mile, than fixed guideway structures.

Light rail vehicles are a possibility for Honolulu. Our studies show that an adequate system could be built to service Honolulu. They point out, however, that such a system would be just as costly as a fixed guideway system to construct but would carry fewer passengers.

A fixed guideway system could be chosen. Our studies show it would be reliable, rapid, and convenient. But like the rest of the alternatives it would require a great expenditure of funds, though less than the other alternatives.

Buses on a busway, light rail vehicles and a fixed guideway are the three most viable systems for Honolulu. But we also looked at a great many other options before discarding them as too costly or impractical. They included water-borne ferries, monorails, automated rapid transit, magnetic levitation, air-cushioned vehicles, and many more.

Other cities throughout the world are improving their transit systems. Fixed guideways are being selected because they furnish the most space-efficient method of carrying passengers. They provide the highest level of service in terms of comfort and speed. They have the least impact on the environment. They accommodate all age groups and income levels. They are attracting former motorists. They are attracting new riders into the transportation system. Of increasing importance, they achieve energy conservation.

It is no coincidence that, if you list the greatest cities in the world, you will find that every one of them selects public transportation as a major community objective. Now, Honolulu has the opportunity to develop a truly modern rapid transit system that could achieve that important objective of convenient and efficient mobility for all of us.

We will be fielding questions on that at the one-hour session at the end of the program.

As I said earlier, after each speaker speaks we will leave a few minutes so you can ask a few questions at this time. But at the three to four o'clock session we will answer more questions.

Now, our first speaker this morning is a true expert on bus operations. He doesn't have at this time a fixed guideway system. Mr. Jack Gilstrap is the general manager of the Southern California Rapid Transit District, which is the fourth largest public transportation agency, and the largest bus system in the United States.

The rapid transit district provides regional transportation services for the ten million residents of Los Angeles, Orange, Riverside, San Bernardino and Ventura Counties.

Mr. Gilstrap has served as a transit executive with the rapid transit district since 1960. He has served as a member of a Federal Urban Mass Transportation Administration Committee and other federal advisory bodies. He is a member of the Board of Directors of the American Public Transit Association and is a past vice president of that organization. He is a member of a special joint U.S.–U.S.S.R. transportation exchange delegation and has visited the Soviet Union in 1977 in that capacity. Mr. Gilstrap is a retired Navy captain and holds a masters degree in public administration from the University of Southern California.

May I introduce at this time Mr. Jack Gilstrap.

VIRTUES OF BUSES: MYTHS VS. FACTS

Jack R. Gilstrap

Thank you very much for that marvelous introduction. One thing you left out is that I can't be too smart because this is my first visit to Honolulu, and I tell you I am just enjoying it more than you can imagine.

Well, you appear to be at the crossroads or at least one of the crossroads in public transportation here in Honolulu. Important decisions are certainly soon to be made which will shape the future of your city and your State. As I have already indicated and as our chairman has told you, I am not an expert in Honolulu, although I love what I am seeing so far. But I do know buses, and I have lived with public transportation problems in one of our country's major urban cities, Los Angeles. And I feel that many of our experiences are pertinent to your situation here in Honolulu. So this morning I am going to take a few minutes to tell you a little about our system in Los Angeles. And if you get the idea that I am a little proud of it, that's right, because I am. Most of what you will hear is positive about our system–how our innovations are working very well; how our ridership has grown dramatically over the last three or four years; how our productivity is up. Our subsidy per passenger is down slightly. We are very pleased about that in the last year or so. But if you listen carefully you are also going to hear about some fundamental, long-range problems that we face with our all-bus system in the City and County of Los Angeles. You will also hear how we are working to solve all those problems, and to plan an integrated transit system for our community. And I think the kind of problems that I will reveal to you–and you already know some of them, I am sure–are the same kinds of things that you face here in Honolulu.

So with your indulgence I would like to present a brief slide show here. It won't be nearly as dramatic, as far-reaching as the one you have just seen, but I think it will concentrate on those questions about bus operations that are in many of your minds. [Only the slides which were available are incorporated in this transcription.]

Los Angeles–and I am sure many of you recognize some of these landmarks synonymous with sunshine, growth and sprawl, economic vitality and, incidentally, sheer size of urban development; where the city was built around the automobile life-style of more than one auto or truck for every two persons in Los Angeles County; one of the highest ratios, I am sorry to say as a transit man, of any metropolitan area in the world. Very interestingly it wasn't always that way.

This is a map of the dear old Pacific Electric Railway which, surprisingly enough, is one of the largest interurban rail systems ever known to mankind (Figure 1). In the early 1900's this fine old red car plied those tracks that we had—over 1100 miles of interurban rail service in Los Angeles and adjacent counties. But with hundreds of grade crossings which were built since the automobile came into fashion, we simply couldn't continue with that fine old system and match that competition. And, finally, the rail service gave way to buses, and private ownership to public operation. In 1957, and then later in 1964, the state legislature created our agency to purchase, consolidate the thirty some separate systems in the Los Angeles area, and bring into our area common fares and transfer privileges and coordinated services.

This is a map (Figure 2) that I always enjoy because the blue section represents the Los Angeles—Southern California Rapid Transit System service area. In the other little boxes, if you can make them out, are the cities—or I should say the three counties—San Francisco Bay area, the Atlanta area, Washington, D.C., and Baltimore, I believe, and the populations of those areas add up to a little bit less than the ten million people we serve. In other words, when I am talking to the people from Washington, D.C.,—Dick Bouchard—I would like to put this map up here and say, "Now, you folks in Washington are taking care of all these areas and it adds up to several million people. Our area is larger than all four put together." But I don't make out too well with that story, but it is worth the try.

Over the years the ridership has grown dramatically from 1973 to 1977, getting very close to a doubling of our ridership. We have done that by going out into the community, breaking our service out into logical planning sectors and working with the cities and the local community groups and interest groups in developing sector improvements. With their help, over 840 buses have been added over this period (Figure 3).

Operating statistics—I am sure you are not able to follow all of those numbers—but essentially the story is, over this six-, seven-year period, we have increased our buses about 50 percent; the route miles have doubled, annual miles more than doubled, and employees somewhere near the same pattern (Figure 4).

Our type of system in Los Angeles provides a variety of services—local, long haul express, special—all of the packages that are necessary to do a decent job. About 97 percent of our system, however; that is, the passengers on the system, are local passengers (Figure 5).

Turning to our fares (Figure 6), we are about in the middle. Our fare is 40 cents, and you can see that in some of the other major metropolitan areas some are cheaper, in the 15, 25 cent areas—and some in the East Chicago, New York, and Pittsburgh areas—and some of the others are up to 50 cents.

Operating ratios—and those of you who are going to follow this transportation matter carefully will want to be very careful to know about this ratio—operating ratio is the portion of your operating costs covered by the fares that are paid by the users (Figure 7).

In Los Angeles we are at a very respectable 40 percent. Actually, my controller told me before I left the mainland it is closer to 42 percent, and you can see how that compares with the ratios in some of the other major areas. The closer to the East Coast you get, the better that ratio looks in terms of the economics. Out here in the West, of course, we don't do quite so well because our cities are not quite as concentrated, and the transit job is a little more expensive. As I mentioned earlier, we have brought our subsidy down about 40 percent per passenger this year. We are very proud of that. Our revenue per mile is up substantially.

One of the most successful new programs in Los Angeles has been the El Monte Busway,

Figure 1

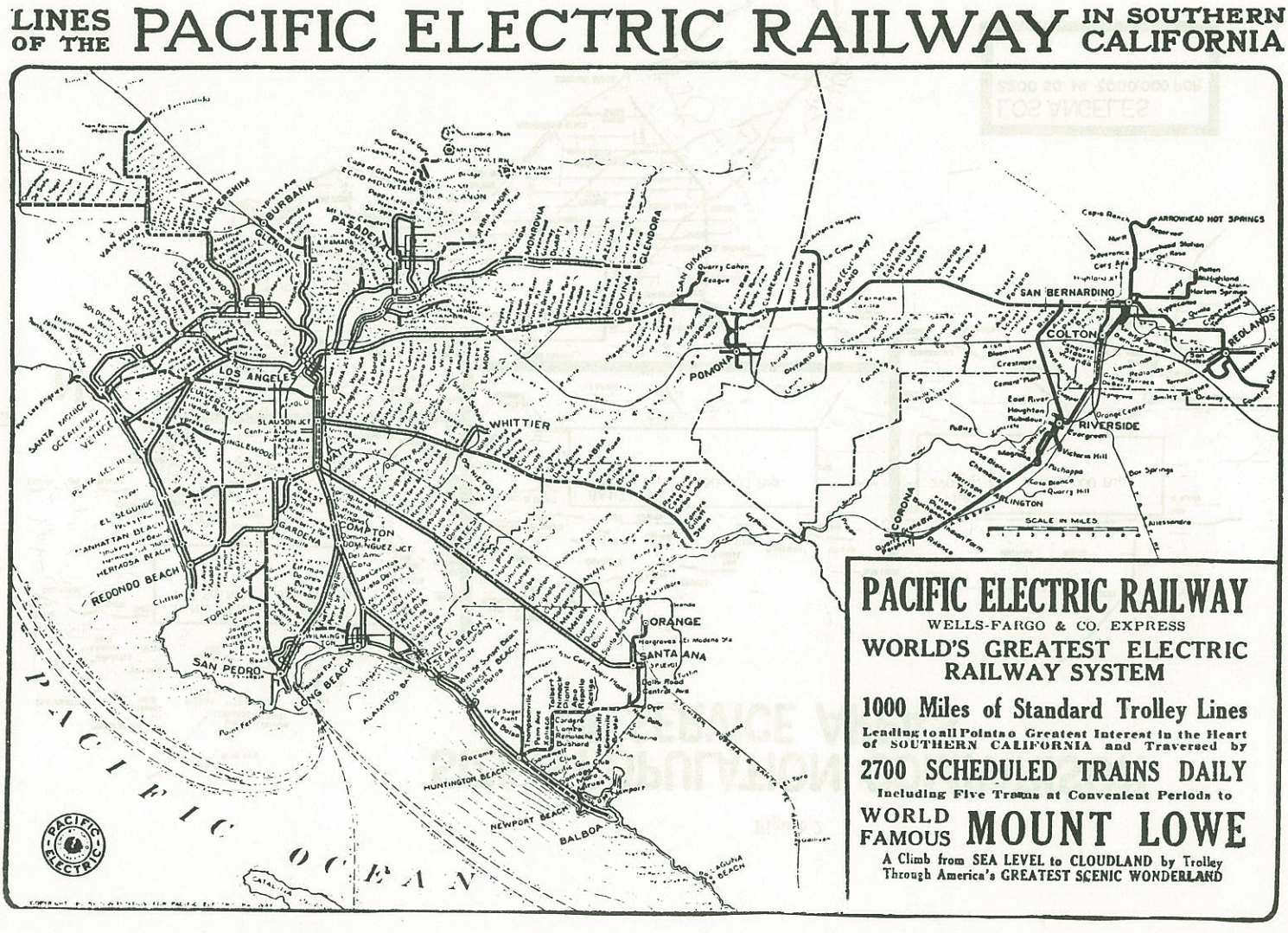

LINES OF THE PACIFIC ELECTRIC RAILWAY IN SOUTHERN CALIFORNIA
LOS ANGELES
PASADENA
GLENDALE
BURBANK
HOLLYWOOD
SANTA MONICA
VENICE
SLAUSON JCT
WHITTIER
COMPTON
GARDENA
REDONDO BEACH
TORRANCE
SAN PEDRO
LONG BEACH
ALAMITOS BAY
SEAL BEACH
ANAHEIM
ORANGE
SANTA ANA
HUNTINGTON BEACH
NEWPORT BEACH
BALBOA
LAGUNA BEACH
POMONA
ONTARIO
SAN DIMAS
GLENDORA
COVINA
MONROVIA
SAN BERNARDINO
COLTON
REDLANDS
RIVERSIDE
CORONA
ARLINGTON
ARROWHEAD HOT SPRINGS
SCALE IN MILES
PACIFIC OCEAN
PACIFIC ELECTRIC RAILWAY
WELLS-FARGO & CO. EXPRESS
WORLD'S GREATEST ELECTRIC RAILWAY SYSTEM
1000 Miles of Standard Trolley Lines
Leading to all Points of Greatest Interest in the Heart of SOUTHERN CALIFORNIA and Traversed by
2700 SCHEDULED TRAINS DAILY
Including Five Trains at Convenient Periods to
WORLD FAMOUS MOUNT LOWE
A Climb from SEA LEVEL to CLOUDLAND by Trolley Through America's GREATEST SCENIC WONDERLAND

Figure 2

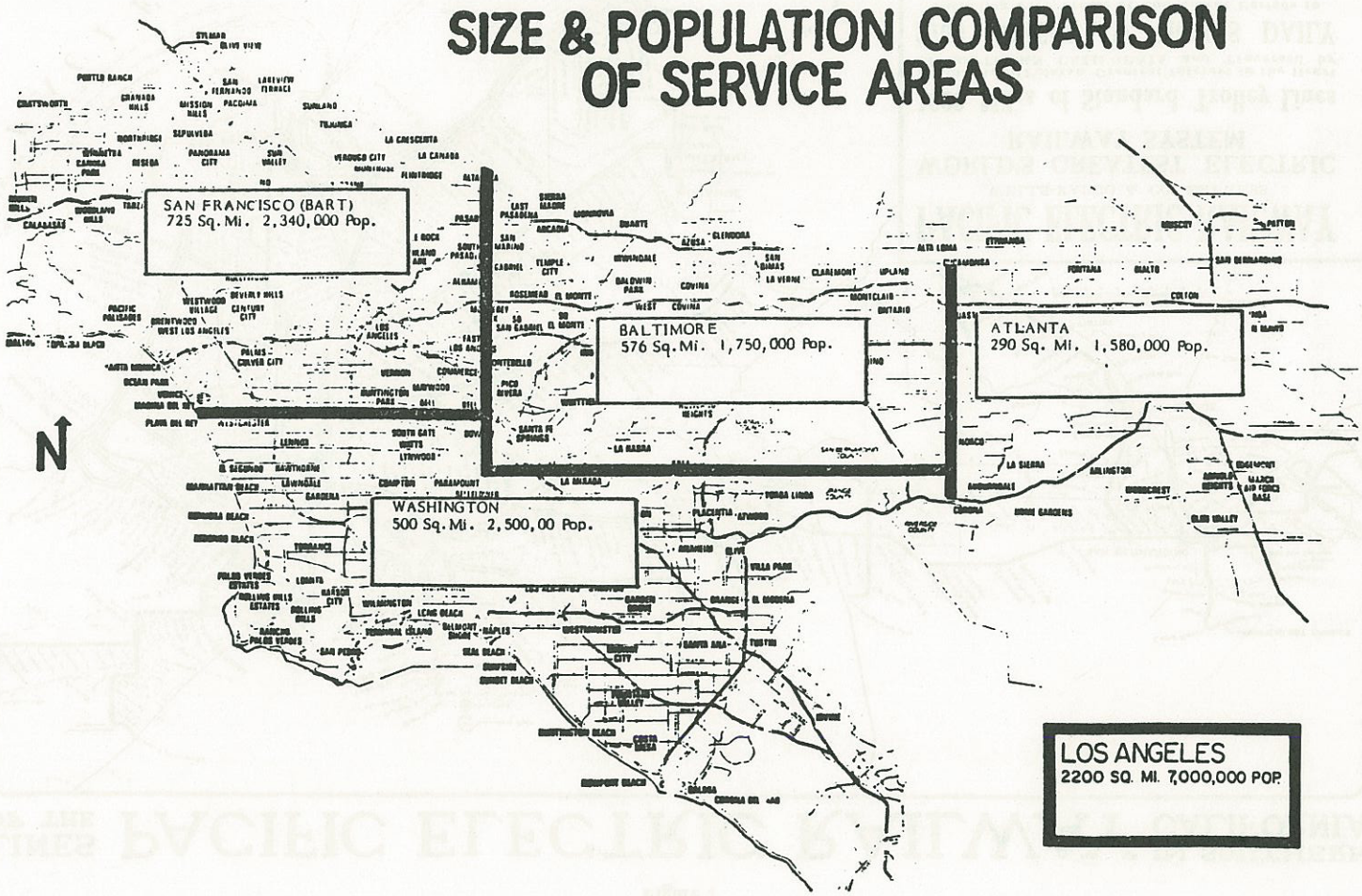

SIZE & POPULATION COMPARISON
OF SERVICE AREAS
SAN FRANCISCO (BART)
725 Sq. Mi. 2,340,000 Pop.
BALTIMORE
576 Sq. Mi. 1,750,000 Pop.
ATLANTA
290 Sq. Mi. 1,580,000 Pop.
WASHINGTON
500 Sq. Mi. 2,500,00 Pop.
LOS ANGELES
2200 SQ. MI. 7,000,000 POP.
N

Figure 3

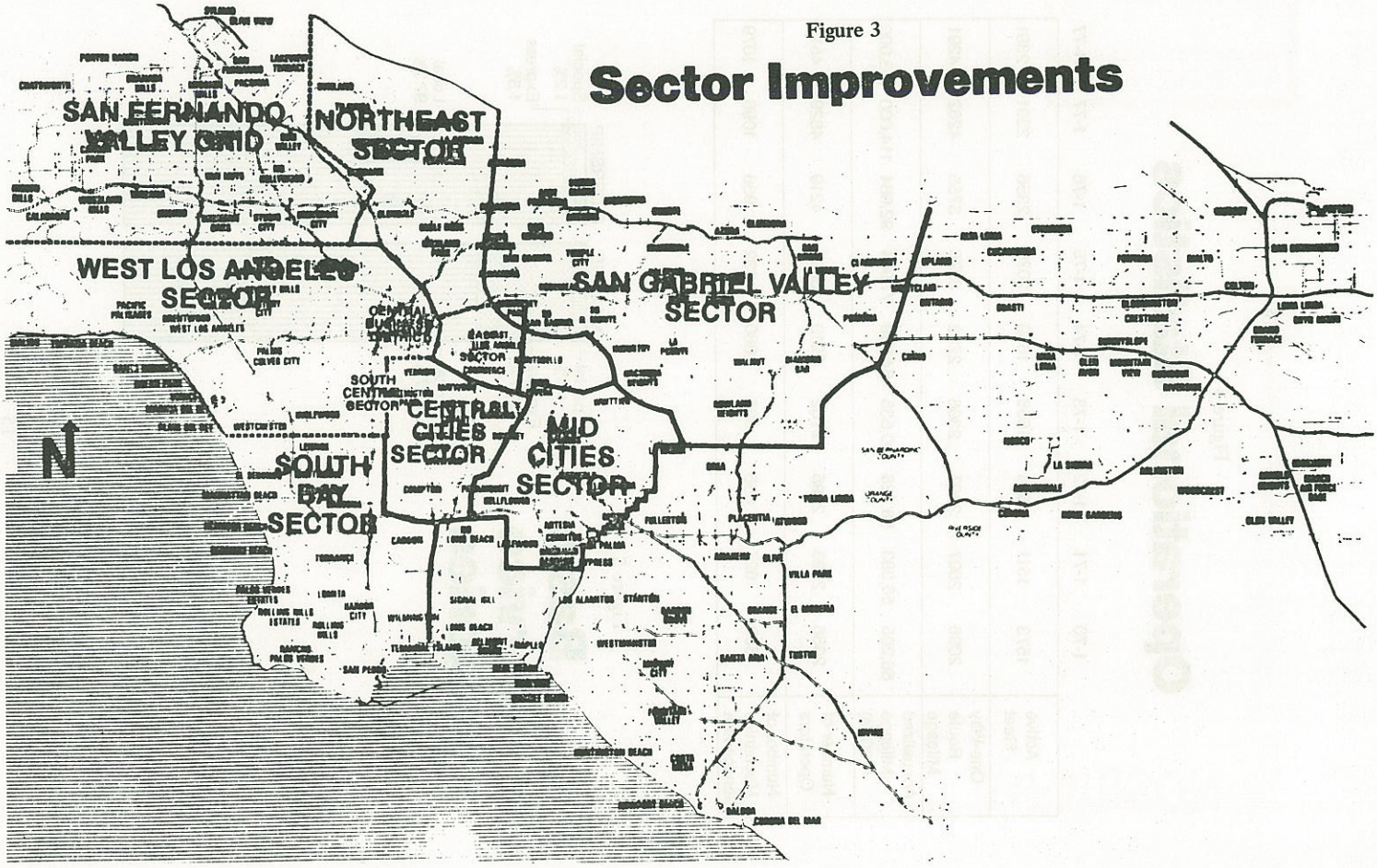

Sector Improvements
SAN FERNANDO VALLEY SECTOR
NORTHEAST SECTOR
WEST LOS ANGELES SECTOR
SAN GABRIEL VALLEY SECTOR
SOUTH CENTRAL SECTOR
CENTRAL CITIES SECTOR
MID CITIES SECTOR
SOUTH BAY SECTOR
N

Figure 4

Operational Statistics

	1-70	1-71	1-72	1-73	1-74	1-75	1-76	1-77	11-77
Active Fleet	1573	1511	1534	1556	1659	2070	2356	2391	2391
One-Way Route Mileage	2096	2097	2307	2308	2792	3276	3755	4262	4291
Annualized Mileage (000's)	56,295	56,383	58,228	60,535	64,939	71,904	92,684	114,000	103,000
Number of Operators	2386	2496	2595	2702	2913	3605	4219	4829	4514
Number of Mechanics Servicemen	622	627	656	666	680	732	936	1096	1079

Figure 5

Basic Service Categories

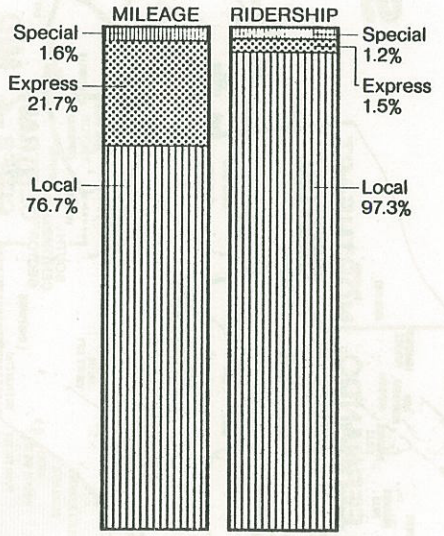


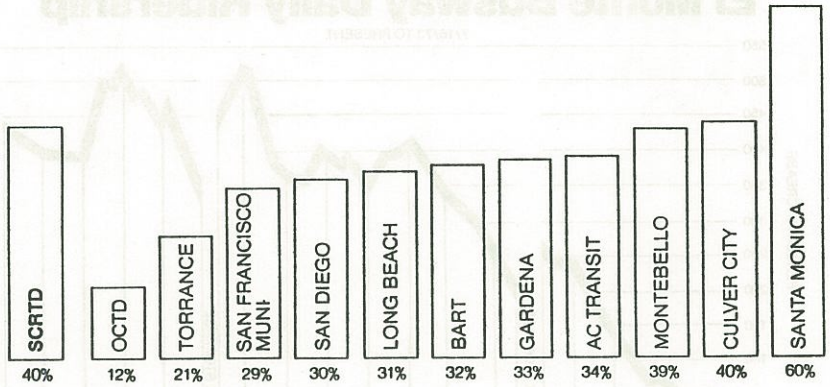
Figure 6

Comparison of Base Fares Major U.S. Properties

RTD	40¢
Miami	30¢
Atlanta	15¢
Baltimore	35¢
Boston	25¢
Detroit	40¢
Minn./St. Paul	30¢
St. Louis	25¢
New York	50¢
New Jersey	30¢
Portland	40¢
Pittsburgh	50¢
Philadelphia	35¢
Seattle	20¢
Chicago	50¢

Figure 7

Operating Ratio Major California Properties



which provides exclusive freeway lanes for buses and car pools on an 11-mile stretch of the San Bernardino Freeway you see here. That is smog, by the way, way in the distance—any of you not too sure about that. You will learn about that some day if you don't do the right things around here.

Express buses make two stops between El Monte and the Los Angeles City Hall. This happens to be the college station. It is just a way stop. We do not have parking there, but it happens to be a design which won an award. I don't know who designed this system, but, in fact, one of the engineering firms I think that has been working with you folks here in Honolulu had part of the work on this project.

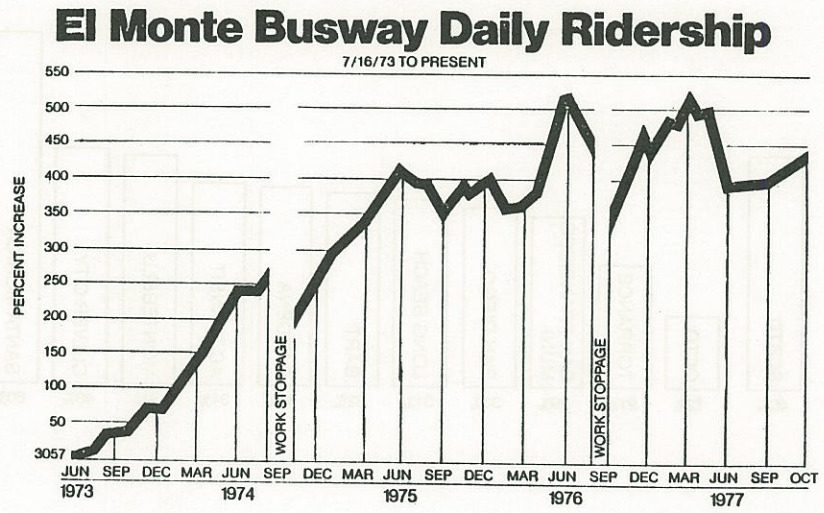
This is our terminal station. We have a 1400-car parking lot there, and most of the time it's full. It's a carousel design. It is a little difficult to make out here. The buses work very well around that station. We also bring the Greyhound service in and have, in a sense, sort of a transportation center there in the city. One of the reasons that people like this station is its modern design.

Ridership on the busway has grown, as has our ridership generally (Figure 8). We started out serving about 3000 passengers in this corridor before the busway. Now we are up to 19,000, 18,000 a day.

Those little yellow breaks there are what are sometimes called work stoppages. Other people call them strikes.

And those other little dips up there are called fare adjustments, or other people call them increases. And you can see that they do impact the ridership, but we have recovered from them nonetheless.

Figure 8



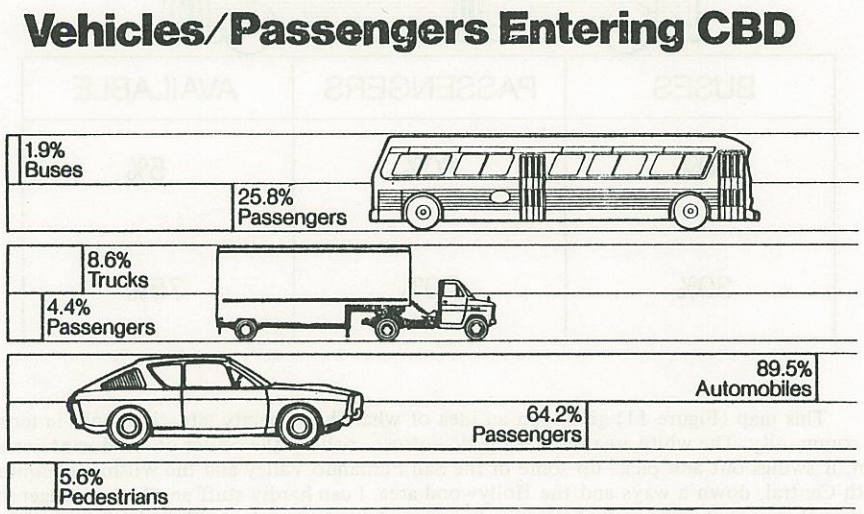
This is one of our favorite services in the downtown Los Angeles area, and I am giving you some little feeling for our system to show that we feel we have done probably as much with the bus as anybody in the country—all kinds of buses and all kinds of services.

Buses are carrying five to six thousand passengers a day and doing a marvelous job of circulation in the downtown area.

This is a picture of our contra-flow lane on Spring Street, one of the major boulevards in the downtown center, that is, the central business district. It is a contra-flow on a one-way street. It does very well unless you talk to the merchants along the street there, and they might tell you a little different story. But we think it is doing a good transportation job.

Transportation into the central business district is, of course, of concern as to the number of vehicles versus the number of people. We would like to show this particular slide (Figure 9) because it comes from our city traffic engineer, who is not always one of our very strongest supporters. But it shows here that we carry 25 percent of the people into and out of the central business district with only 1.9 percent of the vehicles. We think that is a very positive story about conservation of energy and street space.

Figure 9



And yet I would like to stop for just a second and say something about the busway you saw, those marvelous lanes and stations and all, and those that were getting us to the downtown business district. The problem is not getting to the downtown, but it is how to get into the downtown and through the downtown with our express bus operation. There is where it all rests. The real problem is with the system. And we feel that if we could ever solve that problem—and you will see in a moment some of our plans—we really could do the transit job in this city.

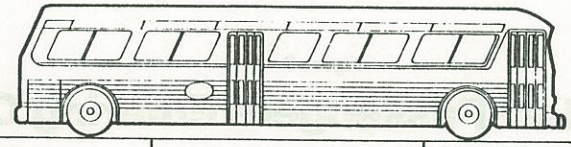
We have a big bus system serving all kinds of communities. And one of our problems—and I told you I was going to talk a little about the problems—you have heard some good news, and now this is some of the bad news—and that is the capacity (Figure 10).

Seventy percent of our system carries 80 percent of our passengers. And today I can only look to about 5 percent excess capacity available on that portion of the system. And obviously that presents very serious problems when you have additional demand out there in the street, as we have today.

The service area of high density sectors and pockets of low density offer the policymaker terrible choices. Do you take buses from the residential areas where maybe they have only limited service to begin with and put them into these areas where your capacity is low and you have people hanging from the straps now, not even able to get on the buses? Equity versus need is a very, very important matter that our limited capacity confronts our Board with on a daily basis.

Figure 10

Available System Capacity



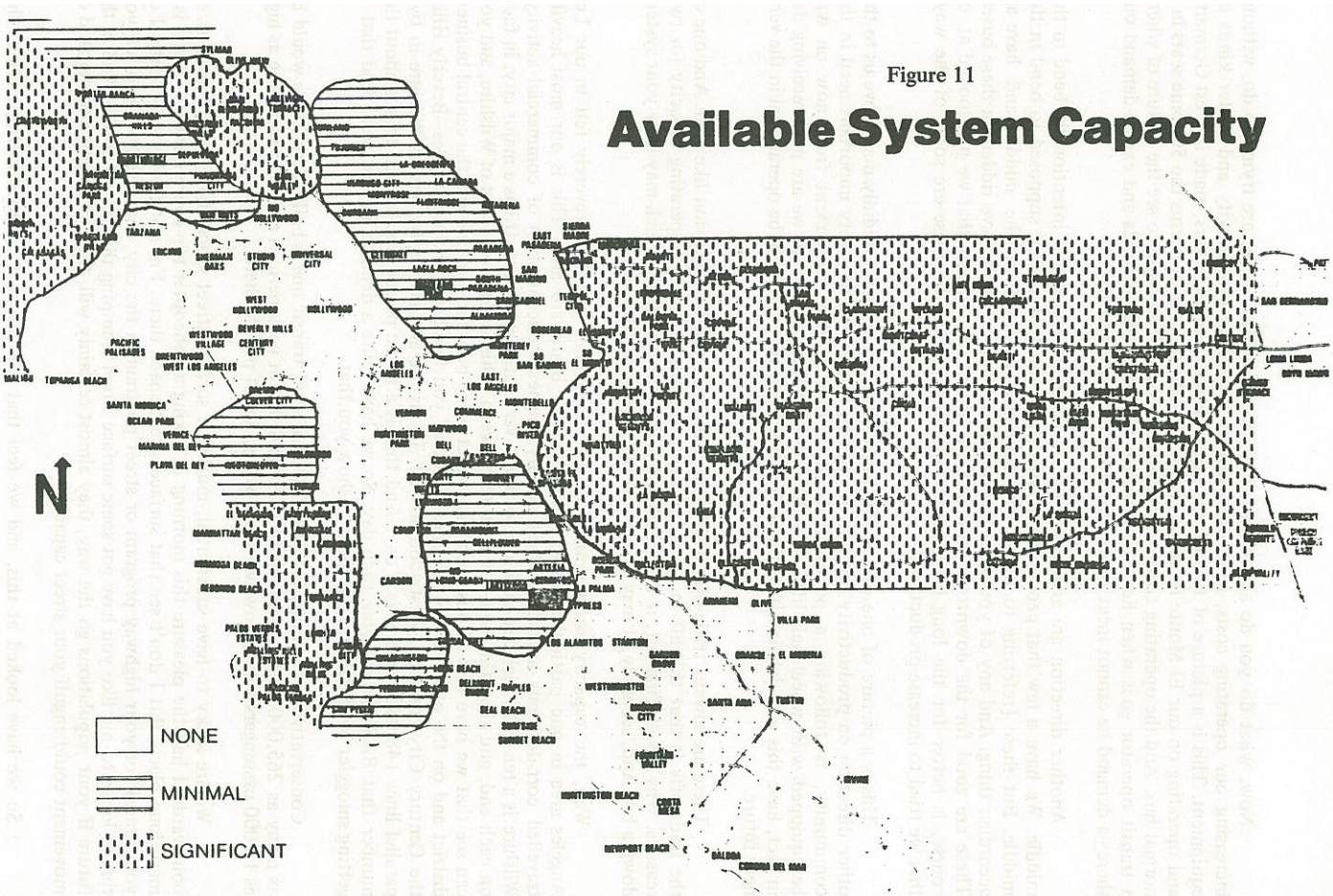
BUSES	PASSENGERS	AVAILABLE
70%	80%	5%
30%	20%	75%

This map (Figure 11) gives you an idea of what this capacity situation looks in terms of our community. The white area there is the downtown, right in the center of the downtown area. Then, it swings out and picks up some of the San Fernando Valley and the Wilshire community, South Central, down a ways and the Hollywood area. I can hardly stuff another passenger in the buses in that area. I can say that because I am out of town. But the truth is right now—and I am not proud of that—that our buses are overloaded now, particularly during the peak periods.

The next kind of shaded area which is sort of a brownish blotch there—I don't know what it is about people who make slides, they pick colors that you can hardly distinguish. I guess that is to see if you are really watching carefully. Anyway, there are some brown blotches that are a little different than the orange blotches. And they show that we have a little capacity in those areas. But then we get into the suburban communities—the orangish looking colors. We have lots and lots of capacity but not very heavy service.

Figure 11

Available System Capacity



Now, what do you do about this? Well, one of the things we are trying to do, without increasing our operating costs, is to look around for higher productivity and better kinds of equipment. This is a picture of two of our experimental double-deckers, made in West Germany and operating on our El Monte Busway. That is 80-some seats there versus the 50-some seats in a normal bus. And the operating costs are virtually the same. You begin to see the picture of where a transit operator goes when he is confronted with shortage of funds and excess demand out there—a demand he cannot meet because he does not have capacity.

Another direction are articulated buses. These are buses that intentionally bend in the middle. We have a few that people are making that bend that are not supposed to bend in the middle. But these [referring to slide] are supposed to bend in the middle and have an accordian thing. And any of you who have visited Europe probably have ridden on these buses. These are good for the downtown stop and go. The double-decker that we just looked at, of course, is better for the long haul, point-to-point operation. So these are some of the ways that we tried to increase productivity.

This is a picture of one of our brand-new buses, which, very candidly, may move us to the other direction on productivity because our Board, responding to a very important need in the community, is following a policy that all of our standard equipment from now on will be equipped with wheelchair lifts. The 200 buses of this type which we are now receiving do, in fact, have this wheelchair lift in them. And we hope that they will be operational in the very near future.

There are always trade-offs when you make an important decision like that. And one of the trade-offs is that this lift in operation may adversely affect our operating capacity for two reasons. Why? Well, first off, it takes awhile to load that passenger, which may slow your system down a bit. And, secondly, it may take a seat or two out of the bus.

Well, the capacity shortcomings of all-bus systems are most severely felt in our Los Angeles area in one particular corridor—the Wilshire Boulevard area. This is our most heavily travelled corridor, our area of highest density, highest concentration of commercial activity. Wilshire is a ten-mile, high-rise business corridor—very interesting area. It has a major city, in fact, on each end, and then this high-rise picture between. This is kind of a shot of Wilshire, and you can see that we have lots of buses on that street going between—on one end the central business district and on the other end of Wilshire—those of you familiar with Los Angeles—Beverly Hills, the Century City complex, Westwood and all. Today we are moving by bus on Wilshire in two parallel lines 148,000 passengers a day. And that is a lot of passengers. In fact, that is about the number that BART is carrying each day. So we have quite a demand in that area. And that is getting smoggier by the shot. I am sorry to show you that.

Conservative projections indicate that if a rapid transit line is built there, there would be as many as 265,000 passenger riders by 1990 and that at peak periods ridership would be as high as 14,000 passengers a day. Now, we are moving a lot of people there.

We are lucky to have substantial, multilane surface street space there, pretty good sized boulevards. I had the pleasure this morning of taking a helicopter trip over your City, and it is a marvelous place. But I don't see that surface street space there. I'm not trying to be critical of your transit or your highway program or street program in the city. I'm just trying to tell you that it looks to me like you have got some surface street cramping that is very severe. And in the future if your populations go the way, they almost certainly will, these problems and demand of movement could engulf your street capacity.

So we have looked at this, and we feel that we have got to do something about this

corridor. I can't do it with buses. I have tried. I have shown you the capacity problems and also the fact that the future seems to hold more and more of that for us. So what we are looking at, as you might imagine, is a rapid transit solution to the problem. We don't see buses being in any way capable of solving this situation there. The facts that we have developed overwhelmingly support the rail augmented by bus, as the approach and the way to solve it.

Here you have an artist's rendering of the way the subway would look under Wilshire Boulevard. You have seen these pictures and they are all beautiful. But essentially what you see here and what you saw a little bit earlier in the other slide presentation is the high capacity, high speed reliability factors that rapid transit can offer you. It can offer it to you in the suburban areas as well.

These are some of the statistics on our Wilshire situation. To move the 14,000 passengers per hour would require some 14 six-car trains, each one with an operator or 140 articulated buses, each with its operator. The labor costs for operating the buses would be approximately ten times greater than for the 14 rapid transit trains. This is an example of how bus transit is so labor-intensive (Figure 12).

Figure 12

Transit Facts for Wilshire Corridor

Estimated riders in 1990	265,000 per weekday
Estimated riders/peak hour/ one direction	14,000
Population density/ square mile	10,000 to 21,000
No. of six car rapid transit trains	14
No. of articulated transit buses	140
Operating labor ratio in favor of rail	10 to 1

Now, what does that mean? I will tell you what it means to an operator. It means that 80-some percent of my budget is labor. And when you have a labor situation where the wages do what this chart shows (Figure 13) and essentially what it boils down to is that the two topwiggly lines up there are our mechanics and operators who have far, far out-stretched the cost-of-living index which is one of those lines. You can probably read it better than I can. I think the CPI is the red line somewhere near the bottom. And we have also compared it to the county workers and other workers in the area. That kind of situation is extremely difficult to handle on a day-to-day and certainly a long-range basis.

Now, I am going to show you another slide (Figure 14) that is an effort to kind of give you a picture of the transit operators' dilemma. The two high points are the peak—the A. M. and

Figure 13

Comparative Wage Increases Since 7/67 RTD & Area Employers

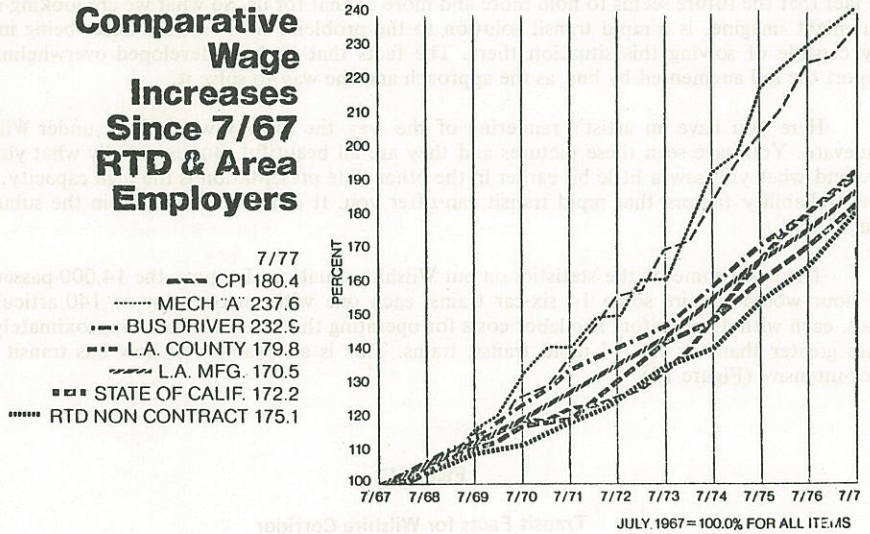
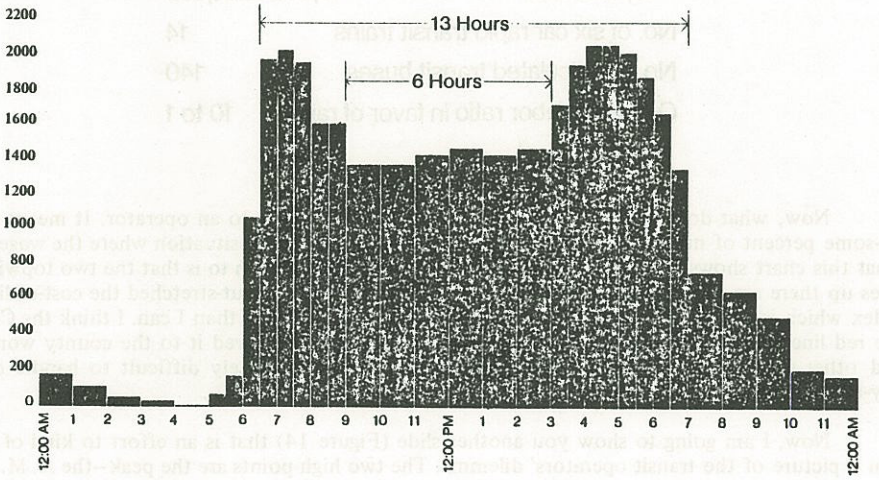


Figure 14

Scheduled Buses in Service



the P. M. peak. And the low point is what happens during the day. Now, that is about a 13-hour span across the two peaks, and those column bars are demand or ridership. Well, what this boils down to is that you have about a 13-hour spread work period when the real action is out there for transit with about a six-hour dropoff of the workload in the middle and a required eight-hour work day under your normal contract. Now, with stringent work rules under which most transit systems operate, it is very expensive for a bus system to provide the additional drivers needed to cover both peaks because one driver costs you overtime and in many cases you cannot legally have him work that full 13-hour span.

Our high labor cost—and these factors that I have indicated to you are not going to be avoided with the rail system because you're going to have workers there in those rail cars too. But when you have to have a row of buses like this on Wilshire Boulevard with the driver in each one, you can see how the realities of these peak-period needs and the labor contract work rules are magnified many, many times over where you can substitute a train, probably one train, maybe two, might very well accommodate that whole row of buses. In other words, two drivers working under that labor contract in those restrictions as opposed to maybe whatever that is—15 or 20. So that is the message, one of the key points I want to get across to you today. And that these labor costs go on and on and on. Also, the tremendous adverse environmental impact of these buses on aerial structures passing through a high density area is something you cannot overlook.

Now, buses on freeways—the reliability of that service is extremely questionable during peak periods, which is another factor any of you who rode by transit this morning are certainly aware of. A rail system can operate at that 99 percent efficiency that we have talked about.

Well, our conclusion is—I am sure you are aware of at this point—that while the rail capital costs in Los Angeles happen to be slightly greater than they would be for a substitute bus system, maybe two or three hundred million more for an all-bus system, that the long-range labor costs and the environmental considerations, the capacity potential that we talked about earlier and the other tangible benefits to system riders of rail far offset the necessary added capital investment we see in our city. In fact, we estimate that the favorable labor and equipment maintenance ratios for rail transit would offset the bus capital cost advantage in 15 years, and the rail system is good for maybe 50 years.

What are we doing in planning system? We have looked at the rail and the bus and have come up with the four-point program. I simply want to tell you that this is the same kind of program that you have been following here. It is the federally-sponsored alternatives analysis which forces a very rigorous discipline to look at all of the ideas. We are planning a four-point effort for the future. It incorporates a regional transportation systems management program. That is that TSM, which means simply getting the most out of the facilities you have today—ramp metering and other such things. Secondly, a freeway, a bus-on-freeway program, expanded express freeway operation such as you have seen and I have shown you on the El Monte area, a people-mover on the downtown-central core and a rapid transit Wilshire-type system in that high density area. We feel this plan, which we like to symbolize with—I will show you with this map where this all lays out—the black line is the rapid transit, the dot is the people-mover, the additional bus on freeway is red, and the green is the metered freeways to get free flow.

So this total combined program is symbolized here by this futuristic logo, which we think depicts the best of both worlds—bus and rail working in concert to meet the diverse requirements of our very complex urban area, and in my judgment your needs are parallel to ours. As manager of the largest all-bus transit system in the country, I want you to know I love buses. But I heartily endorse this integrated bus—fixed rail answer to our solution to our problems in Los Angeles and I certainly endorse it as the logical and necessary approach here in Honolulu.

Question and Answer

Q You showed us figures indicating the percentage growth in ridership. Is this about proportionate to the percentage growth in population, or is it a higher percentage?

A No. The growth in transit is much higher than the percentage growth in population.

Q You also mentioned that the subsidy per passenger has dropped slightly. To what do you attribute that?

A We have had to raise fares recently and to make several service reductions. What that means is that more people are simply riding fewer buses, which increases your general productivity.

Q You mentioned "The Wilshire concept," Wilshire Boulevard. And don't we have something comparable here in the City of Honolulu where we could concentrate on just one area, say, like Kapiolani Boulevard or King Street, and not have to worry about the enormous cost of a 14-mile and just relate the concept of the same thing that you addressed yourself to in the Wilshire concept?

A Let me be sure we understand. The Wilshire Boulevard concept involves perhaps 15 miles, 16 miles of rail service, and that is what we are looking at. As I understand your City's needs, you have to some extent a linear business development which would need somewhere between that, maybe 10, 12 to 15 miles also to do the proper transportation job.

Q I would like to know—apparently either the Council or the voters of the City and County of Los Angeles have turned down a rail proposal in the past, once or several times. How many times have they turned it down? Who has turned it down—the Council or the voters or both?

A We have had three unsuccessful votes of the people on rapid transit in Los Angeles. The first one was in 1968, and this was before the major federal program, which, as you know, now provides 80 percent of the costs to build the system. The other two votes were on very extensive, comprehensive rail programs, much after the pattern of the BART system. Now, I may part company just a little bit here with those who—and I am very proud of the BART system too because from an operational standpoint it is a beauty, and it is doing a good job—but I will tell you that the kind of thing we ran into in Los Angeles I would hope you can avoid here, and which I think the BART people would have been best advised to avoid, and that is building the total system at once. There are so many advantages to building it incrementally, and I think that is what you are planning here. When we went to the ballot with a comprehensive system, anywhere from 80 to 150 miles of rapid transit system, the questions and the costs and the impact on the communities are just magnified many, many times. And I think what happened with our voters is that they were not prepared to take that major a leap, and I could understand it. But we didn't do it that way. And now, we are going, I think, at it in a much more sensible way, more the Toronto approach—of building that first segment. And then the question is not whether you expand it. It is simply when and where do you extend it. That to me is a much sounder, more businesslike manner, and is why had we done that initially, we would have been successful.

Q A followup question, if I may. You indicated, of course, a ten-to-one labor ratio. Do you have any figures on how many buses you would have if you went to an integrated system of, say, your shortened line plus the Wilshire line that you have in black? How many buses would

you have in such an integrated system as to how many buses if you remained with an all-bus system in 10 to 20 years?

A That is a tough question to answer. I can answer a part of it. Our thought is that with the rail line we would add somewhere around a thousand buses. Now, today, we are operating about 2400 buses. We feel that we would add around a thousand buses up through the 1990 period. Now, I want to make a point that all of us have to keep in mind; that your planners and our planners are all assuming no major energy crisis. If there is an energy crisis, I mean a real one where we simply can't get the gasoline, the ridership projections and, in turn, the need for buses and extension of rail will just go right out of sight because we won't be able to move around unless we have a transit system. So I have answered part of the question. The other part is if we do not build the rail line, we just simply can't say about that. I don't have a real answer because what would happen is that we would not be meeting the demand requirements because the bus can't do it.

Q You are saying in effect even if you build a rail line you are still going to have 3400 buses?

A Yes.

Mr. Hayashida: Thank you, Jack. You will have an opportunity to ask more questions later.

We had a dilemma when we first got into the bus business. People were saying, "Don't get into it because people aren't going to ride it." We went from 17 million ridership to 55 million ridership today. And now the irony is that now we are doing such a good job they say the bus can do the job for the future. So we hope that we look at the problem very realistically, and hopefully we will come to a good solution.

Mr. Hayashida: The next speaker this morning is Mr. John Bailey. He is a partner in the Philadelphia transportation consultant firm of Lou T. Klauder and Associates. He provides administrative direction of railroad and rapid transit costs and feasibility investigation. He is currently conducting engineering and cost analysis of various rail and transit properties including the Penn Central Transportation Company. Dr. Bailey holds a BS degree in engineering from the Texas A & M University, a master's degree in governmental administration from the University of Pennsylvania and a doctorate degree in political science; also from the University of Pennsylvania. His expertise in dealing with public affairs as a city manager, transportation planner in a large transit district of the eastern U.S. makes him eminently qualified to deal with overall implications of rapid transit planning and implementation.

HART PLANNING WORK AND REGIONAL IMPLICATIONS OF RAPID TRANSIT

John Bailey

Thank you, Kazu, for that very nice introduction. It is a pleasure to be back in Honolulu and to present my views of the planning process to such an interested group of citizens and distinguished officials. My warm feeling toward this city was not enhanced very much by my sendoff from Philadelphia, a 13-inch snowstorm.

In a nutshell I have seven points that I want to make, and I am going to tick them off very rapidly for you, and then I will expand on them.

First, there is no technical or mathematical procedure to decide what is the best transportation system for Honolulu.

Honolulu is a unique city whose characteristics closely fit the service capability of rapid transit. Honolulu has carried out an alternatives analysis, which has literally met the federal test and has provided you with a nearly-signed check of federal funds for a half billion dollars. Honolulu's general and transportation planning processes fare well in comparison to the best U.S. practice and even fare well in comparison to what I would describe as ideal planning. Honolulu, that is, the city government, perhaps with some aid from the state, controls those factors that will have the greatest impact on ridership and, therefore, on the usefulness of a new transit system. The need for citizen involvement and communication with the citizenry requires the use of many techniques, and Honolulu, like other transit agencies, are using those techniques to communicate with those of you who ultimately have to bear the brunt of these decisions. Meetings like this, of course, are included. Finally—and I think the most important—is that the fiscal impact of this system is modest and manageable.

I would like to address first the way regions resolve issues as broad and as complex as the decision on HART.

Quoting from an MIT professor's recent paper, "It is now coming to be widely accepted that there is no rational, objective technical procedure for deciding what course of action is 'best' for a complex society such as a metropolitan area or a state. Such a society is composed of many different groups, each group with different values, needs and objectives. They do not agree on the 'values of society,' at least not at the detailed operational level required in choosing among alternative transportation projects or programs. In this context, no quantitative method such as economic analysis or ('cost-benefit' analysis) or other numerical methods can be used as the sole or even dominant basis for determining which action is 'best' in the 'overall public interest.' Rather, instead of erecting a 'smokescreen' of elaborate technical methodology, the analysis of alternatives should seek to catalyze constructive debate about conflicting objectives and priorities."

It is interesting that this was made just a year ago from an academic transportation planner who has long tried to find technical analyses and models that would facilitate regional planning decisions.

Other distinguished analysts have suggested that several views have to be considered. I am quoting again: "While systems analysis is no substitute for the political process (for example, in evaluating the relative weights to be attached to diverse objectives), when properly done, systems analysis provides a basis for projecting the probable social and dynamic effects of alternative transport decisions or operating procedures." Thus, we find two groups looking at it in very much the same way from both economic and engineering and planning viewpoints.

Now, shifting to my second point, and that is that you have a unique American city. First, the city, the county, the economic region and the geographical area of Oahu island are coterminous. It is the only city in the U.S. where that is true; certainly the only big city. Thus, land-use planning and other planning and investment programming decisions are better articulated by a single governing body than anywhere else in the entire United States.

And also unique is the fact that the city has a substantial share of the state population, jobs and other economic activity. Thus, the State Legislature here has a greater reason for

concern about the wisdom of local decisions than is true in other states. But, as a confirmed believer of the values of home rule and the making of decisions as close to the citizens as possible, I hope this remains a concern of the State and the State does not try to supplant the City in the actual decisional process.

Honolulu has no—or perhaps more accurately—very little indigenous energy and should be more concerned about energy conservation than other American cities.

There was an early understanding that the arable and usable land on Oahu was valuable and that it should be preserved for agricultural purposes as long as is feasible. Thus, the City developed with relatively high density, and this tendency, of course, was further constrained by the mountains and harbor into an elongated strip which is extremely narrow at the central business district. More than in any other U.S. city, this concentration of people in a narrow strip fits extremely well the potential usefulness of a single trunk line transit system.

Honolulu has had excellent support by civic and business groups in communicating the needs of the economy to a city government and interpreting some of the City's decisions for neighborhood and other citizens' groups.

When we shift from the broad-scale regional planning process to the project level, it sometime is difficult for us to conceive alternatives, particularly, by this time, the alternative of not building a project. Thus, the requirement by the Urban Mass Transportation Administration, that there be an alternatives analysis as a second phase of the planning process to force adequate consideration of such alternatives, is appropriate.

In Honolulu this alternative analysis has been carried out, and it is clear that the assessments were comprehensive and done well. The list of alternatives considered may not have been exhaustive. In my view this is appropriate, for this region is making a decision in the last years of the decade of the 70's, and you should not consider technology that might be available in 1990 or 1995. But, again, even if you anticipated that it might not be available, the theories of decision-making which appear most appropriate to me suggest that incremental decisions are not only easier for political leaders but also are the most appropriate. While feasible alternatives should not be ignored, the BART experience may suggest that even minor technological improvements have a high price, both in time and in dollars. My conclusion is that Honolulu would be better advised to use available, demonstrated, off-the-shelf hardware and current system design as your planners are proposing to you.

The alternatives assessed should be ones that will be dependable from the day the project is opened. Several of you who have seen the Lindenwold Line in Philadelphia or heard about it from several of us or seen it on the slides already probably have felt you can't escape that as a suggested model. However, I think you should note that Lindenwold has had an on-time performance of 99 percent and availability of cars and trains, day in and day out, over nearly a decade of over 90 percent.

An UMTA-prescribed alternatives analysis has been considered by regional managers in other regions as a process full of hurdles, and that, even after a region has cleared them all, the "Feds" are able to raise new hurdles in unexpected places. Fortunately, Honolulu has already met this test and it is clearly a favorable omen that the UMTA-administrators, several of them in fact, have indicated to you that the range of alternatives considered and the quality of the analysis are both satisfactory. This is a value or a step in the process that is not to be discarded lightly. In fact, it is worth a half billion dollars to you.

If you don't want it, I can assure you some others may and will take the money; even

some of the people on the platform today might be accused of trying to scuttle it so that they can have the money, which they need and want, and I believe are ready to accept.

Questions were raised when I was out here a year ago about the quality of the population projections within the systems planning and the project planning undertaken so far. And it appears it may be discussed again tomorrow. Any long-range projections of factors such as population which depend in large measure upon individual taste and decision, not only to create children, but on locational preferences, vacation preferences and the like are highly suspect to me. Fortunately, I think you do not have to decide whether or not the population projections are correct.

The question of future population on Oahu has long been an issue. I have seen the September 1973 Oahu Development Conference Summary of Alternative Urban Growth Strategies, and I like the conclusion I find there that quote "It is reasonable to assume that significant population growth will continue to occur; that the future population will maintain the unique characteristics of ethnic diversity and youthfulness; that population will remain concentrated on Oahu for economic reasons; and if government intervention in population growth does occur eventually, it will have little effect until after the year 2000. Thus, it appears that guiding Oahu's rapid growth will remain a matter of critical concern well into the next century."

I looked at other places to see if the range of population that you are worried about is unusual. For example, the Delaware Valley Regional Planning Commission in Philadelphia, the Year 2000 Plan has been reviewed. That commission is considering four alternative futures with population growth—from zero to plus 17.6 percent. However, they are considering other things will vary even more widely. The number of transit trips from 8 percent to a growth of 22. Employment growing from 9 to 31 percent; investment ranges from two and a half to four and a half billion for transport facilities; and even the consumption of agricultural soils from 1 to 11 percent. So you can see a variation of 18 percent there in long-range estimates is comparable and not a conflicting, controversial matter.

In my view the cycle for these large projects is long indeed. So long before the actual construction drawings are complete, if the region reaches an agreement on a different population projection, that would have a major effect on ridership estimates. And I am not certain it would. But, if so, that could be taken into consideration during final design.

More importantly, in my view, the key components of the regional development process will have an even greater impact on ridership than will future population on Oahu. These are: The location of jobs; the location of new dwellings; the amount of tourism; the amount of support given to attracting economic activity; and the kind and quality of the transport system. All of these are amenable to substantial control by the City or State. When a decision is made to build a new transit facility, one must assume that the City and State will reach compatible decisions on the above matters. For example, the general plan of Honolulu formally adopted already calls for such coordination and likewise the State is now suggesting the rebuilding or redevelopment of Kakaako. If this redeveloping occurs and if it provides expanded employment near the central business district and along the new transit system, the impact of each facility on the others will be highly favorable. Not only will the rapid transit system benefit by higher ridership and possibly lower unit operating costs because it will carry more people, but the new employment positions can be reached by people from a much larger section of Honolulu without the necessity of expanded streets, automobile ownership and use.

While I speak to you as an engineer, I have been involved in planning for public works since I became a city manager nearly 30 years ago, and was actively involved in that process in

the decades of '56 to '64 in Philadelphia. One could compare the quality of Honolulu's planning to ideals such as the definition I used earlier, or that which has been taking place in other cities. Frankly, I like a competitor's viewpoint and have quoted it at length and recommend it to you for your consideration.

He goes back to Daniel Burnham's admonition to "make no little plans," and it takes on a new meaning today. Whereas those words were originally spoken in the context of the City Beautiful or the City Monumental, they can well apply to the total environment approach which our future requires. The "little plan" of today is the plan which is based on a narrow concept, a plan which fails to relate economic, social and physical considerations to the comprehensive goal of optimizing the environment. The total environment approach is not that of the blueprint for the future imposed on a community by an established power structure of bureaucratic or socialistic government. It also rejects the idea of policy planning which depends entirely on specifications and the new advocacy planning which pits one group or lobby against another on the theory that the best point of view will prevail.

The philosophy which, for lack of a better term, we call optimization of the environment is based on the belief that the complex, interrelated problems of our communities can be solved; that community goals can be established and realized, and that the end result can be reflective of the needs and desires of the people. It is a philosophy characterized by the following principles: Solutions, not programs. Living plans, not paper ones. Long-range, not expedient planning. Continuous, not intermittent planning. Durable, not hypersensitive planning.

Honolulu has been looking for solutions, not for successive planning programs, and, in that sense, Honolulu's planning closely fits Pollard's suggestions of ideals which I have just ticked off.

Honolulu's plans have vitality. They have been adopted by the governing body, and they appear to have the support of the citizens at large, or at least significant numbers of you and of the civic organization in which you participate.

The City of Honolulu's planning process also compares well to that of many other cities within the country and it involves much more than any single academic specialist's viewpoint. The best practice in my view—and certainly the one with which I am most familiar—is that of Philadelphia about a decade ago.

About it a knowledgeable observer said, quote, "In my opinion it is the best planning and renewal operation that has yet been evolved. Out of it has come a Philadelphia that now has the dramatic quality it so conspicuously lacked 20 years ago. Capital budgeting and programming are among the main devices for implementing the comprehensive plan. A great many lessons can be learned by other cities from Philadelphia's experience. To this writer's knowledge, no other city has a process as complete, as sensitive to real policy changes, and yet as resistant to arbitrary or capricious manipulation."

And another observer described the Boston Transportation Planning Review as being "highly innovative in its approach but that it was a one-time study to resolve a particular set of crises issues (although the style is being continued to some extent by continuing organizations in the Boston region), but it has been repeated in only one other metropolitan area in North America."

As I consider both the Boston Transportation Planning Review and the Philadelphia process to be the best of contemporary practice, Honolulu fares well in comparison to those. Thus, I think Honolulu should not be fearful of undertaking a project of the magnitude of HART on the work done to date.

But in addition to the quality of the official, professional planning and programming process, the importance of citizen involvement has long been understood and practiced here.

I have looked at a comprehensive assessment of this process among transportation planning activities in the U.S. and find that it includes public hearings, citizen advisory committees, citizens in direct decision-making places, newsletters, mass mailings, public opinion surveys, radio and TV programming, laymen's editions of technical reports, organized speakers and/or presentational programming. You have viewed some of those and certainly I think you are following the best practices in the U.S. in that regard. Thus, Honolulu's efforts to involve citizens is something that I think should be encouraged, and meetings like this certainly fall right on that process.

I would like to conclude my technical comments with my view of the fiscal impact of this project. It appears large to you primarily because it is the largest single public works program in the City's history. However, if one looks at the total cost of movement of people in the society, the U.S. that is, and computes Honolulu's share, the project shrinks to a modest share of our 20-year budget. For example, in 1975, people in the U.S. spent approximately $177 billion or just over 11 percent of the gross national product moving ourselves around the globe. Of that $177 billion, 84½ percent was devoted to the automobile street system. Honolulu's bill for the movement of people based on an average of population and automobile ownership was over $500 million in that year. By 1978 the price level changes have already increased that to $600 million a year which you are spending to move yourselves around the globe. Thus, a $60 million contribution by the City and a like $60 million contribution by the State would be the equivalent of only two and a half months at the current expenditure rate you are already making. Or, putting it another way, the citizens of this region will be making a commitment of about 1.1 percent of your transport budget over the next 30 years.

I would like to discuss fares, but there really isn't time. In my view it is a political policy matter. I see nothing inherently better about a low fare, high subsidy system except it is help to the poor than I do about a high fare-low subsidy system except it won't get as many riders.

I certainly conclude that the political leadership in the nation and many states and this City's judgment that we need transit subsidies is hardly worth questioning.

In conclusion, my reassessment has found no reason to change my views of a year ago. It should be under construction just as soon as possible. I am mindful, however, of Edmund Burke's caveat that anyone who wishes to build a large public work should be prepared to devote his entire life to it. Perhaps even more to the point is his "mere parsimony is not economy . . . .Expense, and great expense, may be an essential part of true economy." I hope the Honolulu region proves it can make such a dedication unnecessary in the beginning of this third century after George III and make the decision for true economy as Edmund Burke suggested might be the case 200 years ago.

Mr. Hayashida: Thank you, John. John did two things. One, he talked—as an engineer he talked about a whole community involvement, so he really didn't talk as a technician. Secondly, he talked so much he ran out of time for questions. Now, John and I are very dear friends, so I take a poke at him.

Do you know what the difference is between a regular clock and John's clock? One says—the regular clock says "tick-tock, tick-tock," and John's clock goes "talk-talk-talk-talk."

But in all fairness to him we had a lot of stragglers coming in late, and that took part of the question and answer period. But all of you will have time at the three o'clock session, if you have questions to direct to him.

At this time I would like to introduce Mr. Richard Bouchard, who is the Vice President and Director of Transportation Programs for the consultant firm of Daniel, Mann, Johnson & Mendenhall. Some of the major mass transit projects currently under his direction are in Baltimore, Washington, D.C., Atlanta, Buffalo, San Francisco, as well as our HART system. Prior to joining the firm of Daniel, Mann, Johnson & Mendenhall, Mr. Bouchard was with the U.S. Department of Transportation as its Director of Transportation Planning Assistance and coordinated urban-rural transportation planning programs and highways, public transit railroads and aviation. Previous to that he was Director of Planning for the State of Rhode Island. Mr. Bouchard has a bachelor's degree in civil engineering from Rensselaer Polytechnic Institute and a master's in civil engineering from the University of North Carolina.

RIDERSHIP, COST AND OVERRUNS HART VS. BUS ALTERNATIVE

Richard Bouchard

Thank you very much, Kazu. I am very pleased to be here this morning. Unlike most of the speakers today and tomorrow, I find myself in Honolulu quite frequently. I find myself very close to the particular project which we will be discussing here today, and you could draw your own conclusions on the repercussions of that.

I've got five points that I want to make today as I talk about the patronage and cost estimates concerned with the proposed Honolulu Rapid Transit System and some of its alternatives.

First I want to talk about the history of transit planning here in the islands. I want to describe to you the alternates that have been studied and how those alternates have been studied over the clear fifteen-year history of this project. I want to describe the assumptions and the underlying methods that were used to forecast patronage and to forecast the cost estimates, because these assumptions and the methods really bear on the answer that comes out at the end.

I want to outline for you the forecasts themselves, both for the fixed guideway and for the most viable of all of the bus alternatives. I want to try to convince you if I can that these forecasts are reasonable. In fact, they're probably quite conservative when you compare them with other forecasts around the country, and, above all, I'd like to be able to illustrate that they form a real adequate basis to make the decision that needs to be made here on the island regarding transit over the next several years.

The subject matter is important. Patronage means different things in different cities. Here, patronage, when we talk about it, we're referring to the number of people that use the system. This really outlines in one number the benefits of such a system. It gives you an estimate of the amount of revenue that you can expect to derive from such a system. It tells you in terms of pluses what you can expect from such a system.

On the cost side it tells you what you've got to give up, how much you've got to spend to get those benefits. By comparing the costs with the benefits, hopefully you can decide whether you're a legislator, whether you're a councilman, whether you're a consultant like myself, or whether you're just a regular taxpayer, whether you're getting what you paid for.

Obviously, there are factors other than costs and other than patronage that go into the decision. John Bailey has outlined some of them, Jack Gilstrap outlined some of them and you'll hear many more over the next two days. But I think, in a nutshell, if you take a look at the patronage, if you take a look at the cost, that gives you a pretty good idea of whether you're at least in the ballpark or not. And with that let me ask for the lights to go down for a second and just cover if I can, very briefly, some of the history of transit planning here in Honolulu.

It began over fifteen years ago with the Oahu Transportation Study (Exhibit 1) and other people have talked about it this morning a little bit so I won't spend much time on it except to say that this was a joint City-State study which was very heavily participated in by all of the professionals at both the State and the City levels, and I think that study more than any other first alerted the island to the fact that there was a very serious capacity deficiency, transportation capacity, in downtown urban Honolulu. It defined the amount of that capacity deficiency and suggested—at that time it was only a suggestion—that the best way to meet that capacity deficiency was with a fixed guideway transit facility. The study didn't stop with that. It went on—not by our firm necessarily; many firms have been involved in this program over the years—but in 1968 and 1970, the City and County made a serious effort to study the long-term potential and the long-term implications of a bus system here in Honolulu and concluded that it should buy the local private bus company and turn it into a publicly owned system, and it's a system which, as Kazu pointed out, is one of the most successful in the United States in terms of the rapid increase in patronage that's occurred in that system. And while they studied in that period '68 through '70 of the potential for buses, from '70 to '71 the City and County took a second look at the existing street system and the existing highway system to see what they could do to get more out of that system than they were currently getting in terms of its capacity. And that study bore out the conclusions of the earlier transportation studies in the 1960's that the capacity deficiency did in fact exist, and while there are a lot of things you could do in terms of one-way streets, taking parking off the streets and things like that, the simple fact is that there was not enough capacity there and some new additional capacity would have to be provided.

Well, with those three studies kind of laying out the framework for future analysis, both the City and State again agreed to go back in and take a look at this thing called fixed guideway, try to assess its costs, try to compare it with other alternates, like the bus system, like personalized rapid transit system and other systems that were currently being discussed around the United States, and that with the so-called PEEP I (Preliminary Engineering Evaluation

EXHIBIT 1
HISTORY OF TRANSIT PLANNING IN HONOLULU

1963-1967	OAHU TRANSPORTATION STUDY
1968-1970	ISLANDWIDE BUS STUDY
1970-1971	HONOLULU TOPICS STUDY
1971-1973	PEEP I AND EIS
1973-1976	PEEP II
1976	ALTERNATIVES ANALYSIS REPORT
1977	EIS

Program) Study. Those studies were very sophisticated in terms of the amount of engineering detail that they went into on them. They refined, I think, perhaps more than any other studies what that capacity deficiency was downtown and really, I think, cleared up the question of whether additional highway capacity would solve the problem or whether transit capacity was the answer. And of course it concluded that the transit capacity was the thing that ought to be provided.

Then we went through a series of refinements on that in PEEP II where we moved the alignment to the fixed guideway system around to account for some of the environmental impacts that existed in the earlier alignment and bringing this up to 1976, where we went through, in essence, an alternative analysis program, which is the federal requirement that a couple of the speakers have talked about here this morning, were all of the material that have been done since 1963, and it was all re-evaluated according to one common base and all of the possible alternatives here in Honolulu were compared. And that was the report that went to the Feds here about a year and a half ago, and it was on that basis that the Feds have said, "We're willing to accept your judgment that fixed guideway is necessary in Honolulu."

On the next slide, (Exhibit 2) I'd like to if I could just quickly outline the alternates that have been looked at over the years here in Honolulu. We looked at an alternate called the do-nothing alternate, which means you don't do a damn thing. You just let the capacity deficiency exist and you let the capacity build up as it's going to over time and you let the chips fall where they may. Well, obviously, that doesn't solve the problem, and in an area like urban Honolulu which is growing quite rapidly, it's got some serious economic and social repercussions. So we kind of threw that out and I think most will agree with that.

We went through an alternate that would call for a greatly expanded freeway program. And while that alternate was chosen in the early '50's in a great many cities in the United States, I think the general conclusion, and you can look all across the U.S. and in fact all across the world, and see that that solution to the transportation capacity problem generally has been viewed as a costly one; both in terms of dollars and in terms of environmental impacts and in terms of relocation impacts. So we excluded that. You can widen the city streets. That's got the same kind of impact as an expanded freeway program.

We looked at a water-borne transit system. The problem there is that the water doesn't exist where the urban transportation deficiency exists. If water were down the middle of Hotel Street, Beretania and King or something like that, then we might have a solution there. But it doesn't and that isn't where the problem is, so that is no solution either.

EXHIBIT 2
ALTERNATIVES STUDIED

- DO NOTHING
- EXPANDED FREEWAY PROGRAM
- WIDEN EXISTING STREETS
- WATERBORNE TRANSIT
- EXPANDED BUS SYSTEM
- TSM
- FIXED GUIDEWAY (by length)
  - BUSWAY
  - PRT
  - LIGHT RAIL
  - HEAVY RAIL
  - RUBBER TIRED

We looked at two different systems relating to buses on existing city streets. Systems much along the line that Jack Gilstrap described here this morning in terms of doing everything you can to get the most out of your bus system. Those systems provide a real alternative for Honolulu, and you've got to compare that alternative with the fixed guideway and the political process.

And then we looked at a whole series of fixed guideway programs; the busway, personalized rapid transit system, light rail, heavy rail, rubber tired. In those, all in one unit provide the second alternate, which is viable, and as I go on with my talk here this morning I'm going to describe the cost and patronage implication of those two very different alternatives.

All of these studies are verified, I think, quite vividly that there is a transportation capacity problem here, that the island has a real affinity for public transit, and those two conditions combined provide a real sense of direction in terms of how to solve that problem. And the issue now is whether to expand the bus system or to build a new fixed guideway. And with that in mind I'd like to go to the next slide (Exhibit 3) and talk about patronage, estimating how many users will use the transit system in urban Honolulu.

EXHIBIT 3
INPUTS TO THE TRAVEL FORECAST MODELS

- TRANSPORTATION AND LAND USE POLICIES
- POPULATION AND EMPLOYMENT LEVELS AND PATTERNS
- TRAVEL CHARACTERISTICS
- ECONOMIC CHARACTERISTICS

This is a factor that's generally overestimated on all the urban transit properties in the United States. When we approached this subject here in Honolulu we vowed to ourselves to work closely with the City and County just to make sure that the assumptions that were used and the methodology that was used was conservative in nature so that some way down the line somebody couldn't put to us and say, "Hey, you guys are crazy. These forecasts aren't even reasonable." So we took very special care to make both our estimates and the assumptions on which they were based to be conservative.

There are really four or five factors that influence how many people will use the transit system. One, the type of transportation service that's available and the type and shape of the land use in the area which you're considering. And the population level and the employment level, from the pattern of distribution of those two factors. Travel characteristics in the region. What do people have an affinity for? Driving a car, riding transit—that type of thing. And then the economic characteristics of the user. How much does he make? How many cars has he got? That type of thing.

In terms of the transportation in land use policies, there were some very basic underlying assumptions. First, no new freeways other than H–1, H–2, and H–3 would be provided. No new street lanes would be provided in downtown urban Honolulu, and that the Oahu General Plan in 1964 would control the land uses.

We used basic population forecasts that were prepared, and employment forecasts that were prepared by the State Department of Planning and Economic Development. If you look at the bottom of that chart (Exhibit 4) you will see the population over the 25-year period from 1970 to 1995 goes up about 50 percent over that 25-year period, and employment goes up about 60 percent over the 25-year period. Then we distributed that employment population throughout the island as is shown on that chart. The numbers aren't very significant. I think John Bailey kind of summed it up this morning when he said, "Over the long run population forecast changed, employment forecast changed." But basically here, there is so much development, the pattern is set. On the island at the moment the densities don't change much and the relative numbers where people are located don't change very much. Now I'm going to come back to this chart in a little bit and tell you about some new forecasts that have come out and what implications we think they have on transit here in Honolulu, but leave you with this thought in this chart, that basically in Honolulu there's a density of population of about 6,000 people per square mile. In the core of that urban area that population density is around 11,000. I think if you recall some of the remarks that Jack Gilstrap made about L.A., you can see the relative difference here.

EXHIBIT 4
ISLANDWIDE POPULATION
AND EMPLOYMENT GROWTH PATTERNS

AREA	POPULATION (000s)			EMPLOYMENT (000s)		
	1970	1980	1995	1970	1980	1995
CENTRAL HONOLULU	407	485	574	259	306	410
CENTRAL OAHU	77	87	112	26	30	38
LEEWARD OAHU	45	49	78	13	18	39
WINDWARD OAHU	101	114	160	18	21	29
TOTAL	630	735	924	316	375	516

Let's go on to the next slide (Exhibit 5) and talk about another factor which is really important in estimating transit patronage, and that's how many cars are owned by the people on the island. We made surveys and took information from the census data and made forecasts of that particular factor, and about the only thing I want to leave you with on this factor is the estimates that have been used here are really quite reasonable. And if you compare them particularly with the mainland experience on the growth in vehicles per household, they're really reasonable. Here, I think they're maybe high because of the high cost of vehicle ownership.

Another factor which bears on this and really helps influence whether somebody will go downtown by an automobile or go downtown by a transit system relates to parking costs, and here for parking costs we used—I guess today it's got to be judged a really conservative estimate that it would cost you a dollar for you to park all day in downtown urban Honolulu—and I think that's a very conservative estimate in terms of today's actual experience.

So, with these kinds of assumptions in the background, we made some estimates of patronage here in Honolulu and the next slide kind of shows what those are. [Exhibit 6] I'm showing up here the estimates for really two systems; the fixed guideway, with or without its feeder system, and then what we call the TSM, which is really a greatly expanded bus system and, as you can see, the fixed guideway obviously carries more people. It carries more people because it flows free. It doesn't flow on an existing street or an existing freeway and it doesn't have to contend for space and time with the automobile. So on this chart I just simply leave you with the thought that patronage goes up over time from 1975 through 1995, and that the fixed guideway carries more people than the bus system. And you can, if you want, draw a compari-

son between the fixed guideway as HART and between the TSM as CERT and draw whatever comparisons you would like.

EXHIBIT 5
HISTORIC AND PROJECTED AVERAGE CARS PER HOUSEHOLD

YEAR	CARS PER HOUSEHOLD	
	HONOLULU URBAN AREA	NONURBAN AREAS
1960	1.01	1.11
1970	1.15	1.11
1980	1.27	1.21
1995	1.30	1.32

EXHIBIT 6
DAILY PATRONAGE FORECASTS

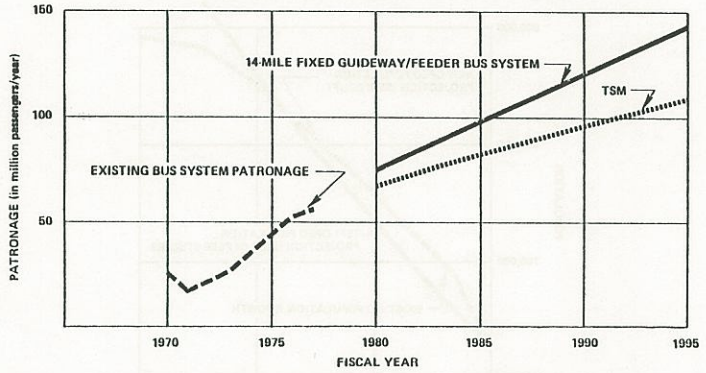
SYSTEM	1975	1985	1995
14-MILE FIXED GUIDEWAY WITH FEEDER	(170,000)[1]	322,000	473,000
14-MILE FIXED GUIDEWAY	(115,000)[1]	211,000	307,000
TSM	150,000[1]	277,000	367,000
EXPANDED BUS	170,000[2]		

[1] Prorated, assuming system in existence, for comparison only.

[2] 182,000 daily riders in 1977.

I'd like to, by the next chart, (Exhibit 7) kind of show you how this fits in perspective to what's happened in transit on the island over the past few years. This chart on the left hand side shows the growth in the bus system, a phenomenal growth when you compare it with other systems throughout the United States, and then the heavy line on the top shows you those patronage forecasts that I showed you on the previous chart plotted on a map, and the dash line below that the bus patronage estimates, again as they were shown on that chart.

EXHIBIT 7
TRANSIT PATRONAGE TRENDS
HISTORICAL AND PROJECTED PATRONAGE



There are two or three things here that you might take a look at. If you look at the existing bus patronage line there, the one on the left, right about where that arrow is, you can see that that line has taken a severe bend to flatten out. And this is the phenomenon that Jack was trying to get across a little bit earlier, that eventually your street system is so capacity restrained that it begins to really influence how many people you can carry on your buses. And I think that's a characteristic that's beginning to show up there now.

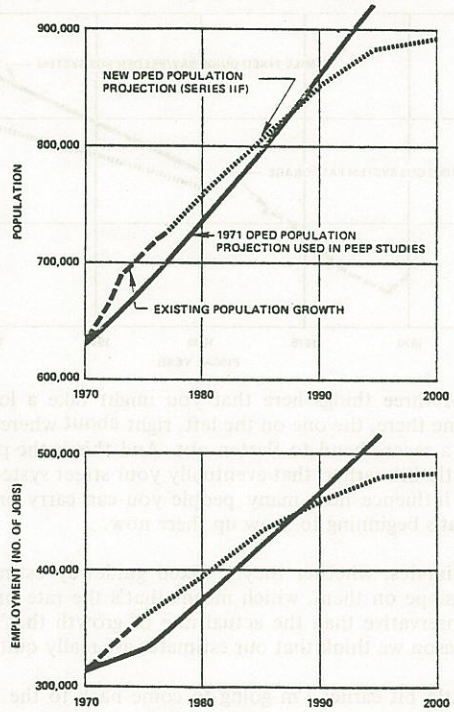
Now, all the estimates, whether they're fixed guideway estimate or whether it's a bus estimate, really have a slope on them, which means that's the rate of growth, a slope on them which is much more conservative than the actual rate of growth that's already occurred here on the island. So for that reason we think that our estimates are really quite conservative.

Now I said a little bit earlier I'm going to come back to the subject of population and employment in the general plan because these represent two new developments which have occurred here on the island since these original forecasts were made. Over that period the State Department of Planning and Economic Development has made a new series of population and employment projection. And even though those have not been approved yet by your regional planning organization, the State nevertheless made them and we want to know what the impact of those are going to be on the patronage on the system, so we've taken a look at that.

And then, secondly, the City Council worked hard for the better part of two years to adopt a new general plan and finally has one that represents a change—some change—in the concept over the 1964 plan, and we also want to know what the impact of that is. So here, on *Exhibit 8,* I'm trying to show three things really. The heavy line shows on both charts, the upper one being population and the lower being employment, the heavy lines show the rate of growth that we used when we made the patronage projection that I've just described.

The heavy dash line on the left hand side of the chart represents the actual growth in population and employment that's taken place in the islands up to today, and then the other dash line represents the new population and employment forecast which the State has made. And the conclusions we draw from this, and if you look where those lines cross at about 1988, that's where the dark black line crosses the dash line, the forecast in the actual experience are running ahead of the estimates that we used for the population. It means the island's grown faster in terms of population and employment than we assumed when we made our forecast.

EXHIBIT 8
COMPARISON OF OLD AND NEW POPULATION AND EMPLOYMENT PROJECTIONS FOR OAHU



So we say on that basis that our forecast is pretty darn good out to the year 1988. True, they aren't so good when we get beyond that with the forecasts, and I guess we've heard about two or three forecasts this morning dip below the forecast that we used when we estimated our patronage. But, basically, the system was justified in economic sense to the federal government, and we think that the City and County of Honolulu up to 1985—that's the basis that we used to make all of our comparisons. And since these population forecasts, no matter whose series you use, are good and agree out past 1988, close to 1990, we're not prepared to make any changes in our patronage forecast at the moment. We think they're good. We'll wait four or five years. Hopefully the system gets into design. We'll take a second look and verify it out beyond the year 1990, but it's too early to do that now.

What can be said about these forecasts? I think two things. First of all, we're prepared to say that these forecasts, the patronage are conservative. They're not optimistic, they're not high, they're very conservative. They're conservative sort of from two points of view.

No. 1, we underestimated the population growth and the employment growth by a significant amount. And we say if we went back and recalculated the patronage forecast we'd have to up it by 5 percent just to meet the growth that we already know is out there and we can measure.

Secondly, the Feds, when they reviewed the population forecast, I think rather severely chastised us for not including in the patronage forecast certain kinds of trips that everybody knows occurs. In all of our patronage forecast we don't have a single visitor accounted for. An example: In our patronage forecast we don't take a single tourist from the airport to Waikiki. We didn't account for Aloha Stadium and its impact. We didn't have any account for people who would walk from wherever they live or walk to the transit station.

Now, we wanted it that way because we wanted to be able someday to say the estimates were conservative, and if we go back and add these other things in here, we think we can add another 10 percent to the patronage forecast and still be on the conservative side. So we think our forecasts are conservative.

Secondly, we think they're reasonable. And I'm sure all of these fellows that are going to be here today and even some of them who'll be here tomorrow can take corridors, whether it's in Chicago or whether it's in New York or Washington, D.C., or San Francisco or wherever, and compare them on a quarter by quarter basis with this corridor here in Honolulu, the patronage forecast will agree with the patronage experience being generated in these cities. And then, obviously, it looks like a reasonable forecast when you compare it with the experience on the existing Honolulu bus system.

All in all, as general engineering consultants we're prepared to say that these estimates provide a reasonable basis upon which to estimate your revenue and your cost on this system.

So if I can switch now to the subject of costs, (Exhibit 9) I want to also say on that that the record in the United States clearly demonstrates that consultants generally do a darn poor job of estimating the cost of rapid transit systems in the United States. And people, when they talk about BART and WMATA, are right. The cost there greatly exceeded the estimate. Both the WMATA System and the BART System are very complex regional systems and it's not a simple job to estimate those costs. But if you look today in the United States at the Lindenwold Line and look at the extensions in New York, if you look at the extensions in Chicago, if you look at the Baltimore system, the Atlanta system, the costs aren't being exceeded any more. We know how to control them. There are four reasons why costs exceed the estimates.

EXHIBIT 9
REASONS FOR COST OVERRUNS ON BART AND WMATA

- ACTUAL INFLATION EXCEEDED ESTIMATED INFLATION
- ACTUAL CONSTRUCTION SCHEDULE EXCEEDED ESTIMATED SCHEDULE
- INITIAL COST ESTIMATES WERE MADE WITHOUT THE BENEFIT OF ENGINEERING
- DESIGN CHANGES WERE MADE AFTER INITIAL ESTIMATES WERE FINALIZED

The first is because inflation has gone up a lot higher and faster than anybody was able to estimate years ago.

Secondly, the actual construction schedule can exceed the estimated construction schedule. And that means money.

Thirdly, and this is really an important one on the BART System, the original cost estimates were made without the basis of a whole lot of detailed engineering. I don't know,

maybe they didn't know too well about what the soils would be or how much concrete would be required. So the estimates were made a little bit earlier.

And then the last point, and it's also an important one, there's a continual demand on transit system to change the design once you've estimated the cost. Make the station bigger. You know, make the line go another two miles to reach my development; that type of thing. So that's a fourth reason.

We've learned from this experience, and if I can, I want to just in a minute demonstrate at least one property where we've really profited as an industry from the experience on BART and WMATA.

If I can go to the next slide, (Exhibit 10) I want to show you just a couple of numbers from Baltimore. Now, Baltimore is a system that DMJM is designing, obviously, in Baltimore. It's a $700 million system. It's an eight-mile system, very similar to Honolulu's, except it's a steel-wheeled system instead of a rubber-tired system as we initially proposed here. But basically, it's the same kind.

On this system there are at present nearly $300 million worth of construction contract on the street, and they are digging and they are building. And the estimated cost of doing that construction was somewhere in the order of $269 million. The actual cost of construction is somewhere around $224 million, 20 percent—not 100 percent over but 20 percent—under the estimated cost of construction.

When these cost estimates were made in Baltimore, we had the exact same amount of engineering and planning work available to us that we have here in Honolulu. But we have taken advantage, I think, in Baltimore of the experiences of BART and WMATA and used those experiences to control cost. We've also done one thing in Baltimore which is very similar to what we're doing in Honolulu. We didn't estimate the cost on the basis of so much per mile or so much per station, but estimated the cost on the basis of how much concrete, how many hours a day does a laborer have to work to put that concrete in place, how many pounds of steel, and all of those kinds of stuff. We looked at it not from the standpoint of an engineer in an estimating sense, but from a standpoint of a contractor.

EXHIBIT 10
BALTIMORE CONSTRUCTION COSTS
($ millions)

ITEM	ESTIMATED COST	BID PRICE
STATIONS (CHARLES CENTER, BOLTON HILL, NORTH AVENUE, LEX MARKET, ETC.)	145.3	107.5
TUNNELS (BOLTON HILLS, MONDAWMIN, LEX MARKET, ETC.)	111.1	104.9
OTHER	13.4	11.5
TOTAL	269.8	223.9

NEARLY 20% BELOW ESTIMATE

Now the construction cost here in Honolulu, as I say, are based on the engineering that's been done to date and it gives an adequate base to make those cost estimates. Those estimates have been reviewed thoroughly by the same staff that estimated the cost in Baltimore, and they agree with them. They're being reviewed by the Feds time and time again, and they agree with them. They've been reviewed by a separate consultant hired by the City Council who also agrees with them. So we're prepared to say that the cost estimates aren't half bad here in Honolulu either. They're based on sound engineering; they've been checked thoroughly.

Kazu Hayashida of course doesn't come in and do his job as Transit Director from any city-type of position. He comes into that position from his position as Director of Public Works supervisor, advising some of the larger projects on this island, some of the most complex. And Kazu has a pretty good idea of cost estimates and how to control it.

If I could have the next chart for just a second, (Exhibit 11) the cost to build a rapid transit system. I want to put a little different prospective on that if I could. The federal share of that is $584 million that somebody's going to give you. What you really want to look at, I think, is the local share. And that's around $150 million. Or if you spread it over a period of eight years, it's about $18 million a year, spread half and half, according to our thoughts anyway, between the City and the State.

Now, much of that is recuperable and there will be people this afternoon who will show you how the benefits of this system can help recoup that cost. But $18 million a year is what we're talking about. The thing to compare that against is the bus alternative, and I deliberately didn't put the figures up here, although I think you can see that chart as to one side. I did not put the figures for the bus system up here because the bus system represents significant increase in highway capacity in order to build it. We had estimates up towards $740 million, depending on how much that capacity was provided by a freeway-type facility versus how much was provided by exclusive lanes on existing streets.

The point is, when you get right down to the bottom line on that system, whether it cost you on the bus system $10 million just to buy the buses, for example, that local share per year for eight years is very small. It's a difference between a million dollars a year and $20 million a year. The numbers are small, the difference is small. The difference is small when you compare that the rapid transit system generates, what, 2500 construction jobs. I saw in President Carter's tax plan the other day a proposal to provide $5000 per job for some multimillion number of jobs as welfare program over the next several years. 2500 employees at the rate of expenditure under the rapid transit system here gives you a job for $3500, and that's kind of a bargain.

EXHIBIT 11
CONSTRUCTION COST ESTIMATE
($ millions)

ITEM	RAPID TRANSIT
TOTAL COST	730
FEDERAL SHARE	584
LOCAL SHARE	146
LOCAL SHARE/YEAR FOR EIGHT YEARS	18

The construction costs really don't tell the whole story, especially when you reduce them to local costs alone. Take the federal money and say, "Thank you." Look at the local costs alone. The operating costs actually exceed the construction costs (Exhibit 12). Remember, we talked about $20 million a year. The existing bus system—you pay out more than that just to keep the existing bus system operating a year. And if you look across that chart, an expanded bus system would cost you darn near $50 million a year just to operate. A fixed guideway system, less than that. That's what Jack Gilstrap was talking about this morning that it cost less to operate a fixed guideway than it does a busway. And that's where your real costs come in over the years. I've also shown here the revenues which you can study at your own leisure of the deficit, and the point is that of all of the systems up there, the fixed guideway system in terms of its operation can be financed for about what you finance your existing bus system for the present time.

I want to make two more points and then I'm going to sit down. A lot of people have said that the Feds will only put so much money in Honolulu. That is, that they will only pay 80 percent of what you estimate the cost of this system, $546 million. And if this system costs more than you've estimated, you have to swallow that cost locally. That's a figment of somebody's imagination, in all honesty.

The policy by the federal government is that they will pay 80 percent of all eligible costs of a fixed guideway system in Honolulu. If this project is approved and we go into UMTA, the City goes into UMTA and says, "This project will cost $730 million," that's what UMTA will give you. You have to go back two years and say, "Look, we used an 8 percent inflation factor and inflation is now 10 percent so the system is going to cost more than the $730 million," UMTA will pay 80 percent of the difference in inflation as well.

If you go in and say, "We've decided to change our design because these population forecasts are changing all the time. They've really made an impact on the design of the system so we've got to make it bigger in certain areas," they'll pay 80 percent of that.

This provides a reasonable basis, I think, upon which local and state officials here can be guaranteed that the Feds will give you a fair shake in terms of the 80–20 cost estimate, and that they'll pay their 80 percent share of all of the legitimate cost of this system. I'm not going to draw any conclusions here today, but let me just try to make these couple of points.

The issue here is that there's not enough capacity where it's needed. If you're going to compare one system with another, find out and make sure that both of them first satisfy that

EXHIBIT 12
OPERATING COST & REVENUE ESTIMATE
($ millions)

ITEM	EXISITING BUS SYSTEM	EXPANDED BUS SYSTEM (TSM)	FIXED GUIDEWAY SYSTEM
O&M COST	25.6	46.9	41.0
REVENUE (current fares)	9.6	17.3	21.0
DEFICIT	16.0	29.6	20.0

crucial problem. If one of them does and one of them doesn't, then there's no sense in making any other comparisons.

If the alternate systems that you're looking at don't solve the problem, forget about it. So compare as you look at bus and fixed guideways whether they both solve that basic problem.

Also remember that operating costs per year really outweigh construction cost per year. Operating costs, you're going to pay forever. Construction costs, you're going to pay over a series of six or seven years. Take a look at those two things separately and decide them separately and make your decision on that basis.

So with that, I thank you very much, and I'll be glad to answer any questions you have.

Mr. Hayashida: Thank you, Dick. I think Dick has a clock like John's. To show you that I really didn't know what he was going to say up to the last minute, everybody was frantically writing the speech to the last minute, and I didn't know what he was going to say, except in general terms. I didn't know he was going to use me as an example. But I would like to relate one experience, and that is the Sand Island Treatment Plant. That's a $65 million operating plant. And that plant will be done with very little cost overrun, relatively very little overrun.

Cost can be controlled. Cost can be controlled by good engineering. I always advocate that we do good engineering in the beginning. Not at the end where we have to make a multitude of change orders. I found this through my construction experience that you cannot make or have a substitute for a good plan and good specifications, good contact with the contractors, good contact with the unions in a sizable project such as this. We haven't done many of these things yet, but we think that cost of the project can be controlled to a reasonable limit.

As I said, Dick used up most of the time for questions. I'm sure he will provoke many questions at the 3:00 o'clock session.

Luncheon Program

Mr. Hayashida: Mr. Gambaccini is the Director of Rail Transportation, Department of the Port Authority Trans-Hudson Corporation of New York and New Jersey. He assumed his current position in 1966, and in this capacity directs the rail transit operations, supervises the 1100 man administrative engineering and planning and operating staff and the $250 million modernization of PATH.

He also conducts planning of rail transit projects. Over the last ten years Mr. Gambaccini has served the term on the Government Affairs Committee of the Institute of Rapid Transit and the American Public Transportation Association, has served on transportation committees in the Department of Transportation and the Federal Program on Energy Administration and has served on numerous occasions before congressional committees.

He has established numerous policy planning and research committees for APTA and has served on the executive committee of the Transportation Research Board.

He has received baccalaureates from the University of Connecticut, his masters in public administration from the Maxwell School of Public Affairs, Syracuse University, and has done doctoral work at the New York University.

Mr. Gambaccini is a member of the Board of Directors and a Vice President of the American Public Transit Association, a charter trustee of Rutgers University, past president of the American Society for Public Administration, among organizations. So you can see that he is eminently qualified to talk on today's subject.

THE NEED TO LOOK AHEAD

Louis Gambaccini

As rigorous as Mr. Hayashida and Mr. Fujita have been about the schedule, I'm afraid he's used up all of my allotted time with that introduction.

I can't tell you how delighted I am to come home to Hawaii. Actually it's my first trip, but some 25 years ago when I was with the 25th Infantry Division in Korea and at war's end, the rumors were rife every month that we would be going home to Schofield Barracks. It took 25 years, but I'm delighted to be home in Hawaii. I hope it will be the first of many returns home to Hawaii.

H. G. Wells once observed, nearly five decades ago, that in England they had come to rely upon a comfortable time lag of 50 or 100 years between the perception that something ought to be done and the serious attempt to do it. In the context of those times and circumstances, the pace of change was perhaps adequate. In the United States we apparently have made some progress in that we have compressed this comfortable time lag to a somewhat more rigorous 15 or 20 years, as most of our projects in the northeast United States and perhaps your own transportation experience here on Oahu will attest.

Many may say that this time lag is as it should be. Major decisions concerning major public projects should have substantial periods of maturation for contemplation, consideration and argumentation—all before the actual commitment to implement is made. Others chafe at the time-consuming processes and push for immediate action. I suppose it is inevitable that the cautious want more documentation than they really can use, while the bold ones want more liberties than they can really take. It would seem to be the essence of prudent public policy and public decision-making that both extremes be avoided.

You on Oahu are at the threshold of addressing this kind of issue head on. The basic question before you is what kind of a city do you really want in the future and shall your public transportation network be structured to serve those future needs. It represents a very basic decision. It represents a huge commitment of both will and resources. I well recognize your ambivalence and I empathize with your agonies.

My empathy derives from years of personal efforts at the local, state and national levels in wrestling with just the kinds of questions that are now being posed here in Honolulu. If, as a community, you opt for a fixed-guideway system, how can you be assured that you are getting your money's worth? This same essential question has arisen in many guises almost everywhere in the evaluation of capital expenditures, operating assistance, bond referanda, or legislative efforts for greater levels of state or local support.

The question of financing, whether for the initial investment or the continuing operating assistance requirements is an important one. The public dollar certainly should be effectively

spent. But the question of covering costs is by no means the only criterion by which transportation alternatives should be measured. Costs are justified by the flow of benefits that they create. To the extent that many of these benefits accrue to the public sector, public funding is entirely appropriate. Nevertheless, the issue of costs seems to have become paramount in any public debate, particularly in public transportation systems where the choice, ostensibly, is between a quote "expensive," close quote, fixed-guideway system and a cheap or cheaper unbiquitous bus network. Inevitably the argument descends to a comparison of fixed-guideway costs versus bus—a false standard, I might note—which, in this narrow framework often concludes that the bus is cheaper.

I have argued this question many times. Viscerally, in the absence of cost criteria, most transportation analysts, even non-analysts, will accept fixed guideway as the superior solution to fulfill urban needs. But when the costs are introduced, the heated debate commences. I have long been convinced, when it comes to evaluating public transportation, at least, that our perception of costs is more acute than our perception of benefits. Dollar costs are specific and easily quantifiable, while indirect, societal costs are much more easily ignored. Benefits are often diffused and generalized. It is not that substantial benefits do not exist. It is rather that they are subject to more imprecise quantification which, in turn, leads to a great deal of contentiousness over the meaning and validity of the evidence submitted. Contrast this phenomenon as it relates to public transportation with the relative perceptions of costs and benefits in such areas as health, education or defense.

The critics of fixed-guideway have been clever in their exploitation of the cost issue. In the interest of so-called objectivity they exalt past and present relationships through time-consuming and unending arithmetic formulations. But I fear as we exhaust ourselves with defining and redefining the apparent lessons of the past we may very well find we have really lost the future.

Personally, I am optimistic about the future. I believe we can cope with the problems that confront us. I believe the future will be better than today. I have confidence that we can identify the problem areas and, with the combination of public and private initiatives can devise and implement the requisite programs to meet those future needs.

I see the fundamental challenge of the future, not so much what has to be done but marshalling the means by which to do it—identifying the roles each participant should play; whether public or private; the extent, nature and burden of the trade-offs; and the realizable advantages that can be achieved. I have great faith that, given reasonable objectives and an honest review of the alternatives and trade-offs, most constituencies will respond prudently.

A case in point: Objectively, we can calculate with respect to energy that the Germans and the Japanese have achieved very high levels of economic growth and consumer satisfaction without high levels of oil consumption—2.3 tons per capita per year in oil consumption in those two countries in contrast to the United States' consumption of 3.8 tons per capita per year. Yet, as a nation, we are now wrangling interminably over the short-term consequences of conservation. In the longer view, what are the real trade-offs? How do they affect near-term choices? How will decreased oil consumption affect the vitality of the American economy and what are the alternatives? Would increased prices for fossil fuels lead to a more sustainable society of the future? What's the best way to achieve the desired results? We really haven't answered those questions. And, as a result, our energy program languishes. Conceptually, we know generally what we need to do. Practically, we are not yet ready to do it. With energy, time is an important constraint. We cannot wait a century to deal with it. In this sense H. G. Well's observation is especially poignant.

As a contemporary problem, energy is on the minds of many. It is a situation where the rate of change has implications quite apart from and, in fact, more important than the direction of change. The direction has been obvious for 50 years. It is the rate of change that has made the current situation more compelling.

In urban transportation the circumstances are similar. Here we have, in essence, a flow of situations all converging into a single focus. With growth and decentralization our urban areas have suffered environmental degradation. Jack Gilstrap's frequent references to smog in Los Angeles, I think, is a dramatic underscore to that point. With growth and decentralization—I am repeating myself—congestion has increased. Land for development—whether residential or commercial—has become scarcer and more remote from preferred activity centers. With urban dispersion, the need for new and costly urban infra-structure grows—whether for transportation, community services or schools. Energy requirements have grown faster than economic growth. Older areas have lost much of their economic viability, with a disproportionate adverse impact on the less prosperous segments of the population. The need for public assistance of all types has increased. Tax burdens in older areas have ballooned, discouraging future economic expansion. In short, older areas in urban centers have become less productive as economic units unto themselves.

We have seen these things happen in the older cities in the East. The cure is as costly as it is complex. Overwhelmed by the enormity of the problem, some recommend a do-nothing posture or something very close to it. What will happen, will happen, they say. It doesn't pay to invest more time, effort and money in obsolete cities. They would, instead, let development flow according to the dictates of the marketplace, as if that were possible, to the newer urban areas without regard to the long-term social and economic consequences.

The newer cities, whose development has coincided with the emerging era of the automobile, have assumed a different urban configuration than the older cities which, frankly, is quite satisfactory to many of the inhabitants at this time. But in no way can these new cities invoke immunity against continuing change. It is alleged by some that the structure of the older cities, with clearly defined and strong CBD's, was an accident of history, whose growth was paralleled by the advancing development of railroad and street railway technology. And further, the pace of events clearly indicates, they say, that the decentralized urban form reflects the will of the people and that fixed-guideway transit in no way can reverse this trend.

That is a comfortable theory. But I submit the so-called modern urban form is itself an accident of history whose development paralleled the growth in the use of the automobile. The automobile appears to be the wave of the future, or at least it did so. I think that appearance is changing and has changed. In my view, the stability of an auto-type of urban structure, in the longer term, is at least as vulnerable to future events and change, if not more so, than the stability of older cities have been to the dynamics of change which has so affected them.

Currently, some 50 percent of our population is not licensed to drive. For them the dispersion of activity centers and increased dependence on private modes have worked to limit their freedom and mobility. Consider the extreme worsening of service availability and mobility for those without cars when compared to the service afforded by the extensive network of street railways, trolley systems, if you will, that criss-crossed urban and rural America some 60 or 70 years ago. And again, I refer to the dramatic slide that Jack Gilstrap presented this morning of the now defunct Pacific Electric Railway System.

The auto and the decentralization it promotes are prodigious and direct and indirect consumers of resources and the environment. And though the automobile offers a high order of freedom for some, the evolving structure of urbanization forces greater and greater dependence

on the auto for even the most trifling of needs—a form of transportation slavery without low cost of easy-to-achieve alternative. Such a continued trend in the future is not cheap in any societal sense. The long-term impacts on land use, increased municipal service and support requirements, job access and the like are virtually incalculable.

In my view the ethic of the future will be for greater efficiency—not in the narrow financial accounting framework, which has dominated recent debate on the subject of public transportation, but in the broader social senses of that term. We will not be able to be as wasteful as we have in the past. There will be increasing and greater pressures for more societal efficiency—a more economic use of all resources. We will have to be more cognizant of the consequences of dwindling supplies of liquid energy, unconstrained land use, declining viability of our central cities, poor access to jobs, limited mobility for the poor and the handicapped, and the degradation of the environment and certainly also the mounting cost burdens to support dispersed life style. Obviously, such social accounting will have to embrace far more criteria—both transportation and non-transportation—than the current conventional evaluation of public projects allows, and certainly will go far beyond the usual constraints of the profit-and-loss statement or the balance sheet. Other countries—especially those in Europe and Japan—have been compelled by circumstances to learn these lessons well. There are many models for us to study and emulate when it comes to the judicious allocation of resources for the greater good in the near term and for generations to come in the longer term.

To digress for a minute, if you haven't picked up at the rear of the meeting room this morning, I would strongly suggest you do so, a table, an inventory of transit developments around the world. I always marvel when I travel abroad at the overwhelming attractiveness of cities and how transit obviously is one of the major ingredients in making for the quality of life in cities. I am even more impressed by the data that you will see on that chart; that the decision to accelerate the commitment to public fixed-guideway systems all across the world in rich and poor countries has increased at a rate unprecedented in the last century. There was a period of several decades of dwindling interest in fixed-guideway extensions or commitments. In the last 10 to 15 years there has been a virtual revolution in the new commitment to extending current systems and building new systems of a fixed-guideway nature.

It is in the context or rather it is in this context that the costs of fixed-guideway transit should be evaluated. If public transportation and fixed-guideway transportation can again become a catalyst for developing more efficient and effective urban areas in the same manner that the automobile has been a catalyst towards decentralization, then the cost will be extremely cheap when viewed in this broader application.

It is only incidental that the express bus places higher on some of the rating charts, for the virtue of the bus is that it sins less, not that it sins not at all.

I would like to say a few words about the number of critics of fixed-guideway transit who have become so fashionable in recent years. Few of them really know about transit and even fewer of them could be considered transit professionals. Yet, from their posts of privileged irresponsibility they deplored traffic forecasting as a promoter's art and then would have us accept their hypothetical models whose premises and facts, despite bibliographies and diligent calculus, are at least as suspect as the forecasts they so decry. By their use of short run historical data, compressed in time frame and geography into highly questionable numerical values, they impart a certainty to their efforts on the assumption that the old ground rules have and shall always apply. And, further, they scarcely recognize and certainly do not publicize that their models are based on the unachievable. An express bus service or a van pool serves but a single market—the commuter. How can these services be compared with the conventional mass transit services that accommodate multiple mass markets? They assume a perfect substitutability of technology without regard to the intrinsic differences in service characteristics.

The problem is that many of the critics are so persuaded by their own apparent logic that they can allow no breach to their rigid equational symmetries. Some merely believe in their infallibility; others are sincerely convinced of it. My impatience really stems from this very rigidity. In no way do I nor any other serious planner or operator hold up fixed-guideway transit as a universal solution to all urban ills, nor do we suggest that it should be applied in all urban areas. Fixed-guideway transit is for some a strawman—a mythical fortress created for the occasion—against which the critics can mount their not-so-new weapons and methodologies.

Fixed-guideway to others, myself included, is a potential strategy, as is the bus, the ferryboat, the car pool, the van pool. In many possible applications fixed-guideway is the superior strategy. But whatever strategy is finally selected each should be evaluated not in the narrow context of transportation alone nor solely in the framework of accounting. It should be measured in the broader context of its contributions to the overall long-term aspirations of the urban society it is supposed to serve.

Were the exercises of the critics a truly disinterested endeavor to study and disseminate the best of what is known and thought, I could be more relaxed. But no deviation from their dogma is tolerated. All publicly supported fixed-guideway systems are bad. The sin must be cleansed. Their objective should be recognized for what it is. It is not to maximize societies' benefits over time but to minimize near term public dollar expenditures at a much lower level of service—notwithstanding the range of service or adverse service consequences for the future.

It would be presumptuous of me to attempt to prescribe the kind of transit system you should have here. That is rightfully your choice and your responsibility. But in reading about your transportation planning I couldn't help but be struck by the perceptiveness of the Oahu Development Conference which in 1973 noted, and I quote: "The urban form which would result from an auto-dominant transportation policy would be one of dispersal and sprawl rather than concentraion and order . . .most people would be housed in sprawling low density tract housing covering all the landscape. There would be a declining Central Business District and a proliferation of small district shopping centers. Low intensity utilization of individual sites would continue and additional sites convenient to transportation facilities would be required. Agriculture would gradually close down and tourism could suffer as a result."

And I submit that the proof of that statement is everywhere evident in the mainland.

I can only add that the thrust of that observation has gained a broader and even more compelling urgency in the past four and half years than it had when it was written.

Yet, whenever specific proposals are submitted to address these core issues, there are cadres of naysayers who will, quote, "prove," close quote, that the hoped-for results won't be achieved. On my own system, on PATH, though the context of decision-making was somewhat different, we too have, quote, "failed," close quote, to meet certain original objectives. Our goals were to preserve (1) an existing and essential rapid transit system which under free enterprise had gone bankrupt, (2) contribute to the economic health of the region by its continued existence, and (3) achieve these results without losing money on the operations, the operating costs.

We achieved the first two goals, but our financial losses have been greater than originally anticipated. But I can honestly and safely say that neither we nor any one of our every-day riders or the political officials in our region feel in any way that PATH is a failure. In a traditional business accounting sense we have not done as well on the balance sheet as was anticipated. Chiefly, if not entirely because of the political and legal decisions which have been imposed on the operations. We have, for example, maintained our 30-cent fare for 17 years, during which time, of course, there have been quantum leaps in all costs. But as an agency dedicated to

regional benefit, we believe we have had impacts far beyond our secret hopes and the accumulated deficits have represented. It was not cheap, but then again nothing is and particularly in congested, built-up urban areas. But the implications of not doing what we did, with its potential ripple effects on communities and people far beyond the physical limits of our system, would have been profound—profoundly worse.

I recognize the climate for our decisions was somewhat different from what you face here. We knew what the regional structure was and could better visualize the transportation and non-transportation consequences of a "no-build" decision. The decline of the region's transit services was a real world event. You have to postulate these conditions.

The external, or non-transportation, consequences of transportation decisions, can be illustrated in an energy framework. Overall, the New York region is very energy efficient, to which PATH has contributed, though this contribution has not been precisely measured. The typical New York-New Jersey-Connecticut resident uses about one-third less energy than the average United States citizen. Transportation energy use follows the same general pattern. The key to New York's transportation energy efficiency, however, is not merely that more transit trips are taken in lieu of auto trips. It stems from a more efficient urban form, which, in turn, leads to: (1) reduced need to make trips at all, (2) shorter trips, and (3) the availability of more productive corridors for the easier substitution of energy-efficient public transportation for trips made by private modes.

In the conventional analyses these indirect impacts are scarcely recognized. This lack of recognition of the ripple effect, of course, has been a major weakness of many of the purported, quote, "expert analyses," close quote, or energy conservation. The perceived limits of the scope of interactions is much too narrowly conceived. And, therefore, the conclusions of these critics are really of limited or of no value.

There are also many intangibles. We find in the New York region, for example, that 37 percent of the New Jersey automobile commuters destined for Manhattan's central business district come from one single transportation corridor. Coincidentally, that particular corridor is the only one without rail service. Its public transportation services are entirely handled by bus. Since, in the rail-oriented corridors, up to 95 percent of the potential market come by public transportation to the CBD, compared to 70 percent in the non-rail corridor, we can make an empirical observation that bus and rail, interacting and in combination can more effectively exploit and penetrate a potential market than bus alone. The real issue that should be addressed is not bus versus rail, but how can the different transportation elements—of which fixed-guideway and buses are but two—be best fashioned to achieve the wanted results. A mathematical model which merely establishes that 1000 people can be carried more cheaply by one mode or the other is completely divorced from the facts of the real world—irrespective of the length of the computer runs.

Before coming here to Oahu I was told by a mainlander, and an Easterner to boot, that Honolulu is probably the best suited of any developing urban area in the United States for fixed-guideway transit. Its topography, demography and the location of its major activity centers all lead to confirming the wisdom of the choice for fixed-guideway.

While my expertise must be tempered with but three days of personal observation and inspection, I must say that I agree. The lineality of the city, the natural funnels leading to and from the center suggest to me that the peak hour and off-peak traffic potential for your fixed-guideway systems are excellent.

Importantly, from an operator's view, this type of urban structure allows for a far better

balanced system with respect to peak-hour traffic flow which permits higher level of utilization of fixed facilities, equipment and manpower and, in turn, for better financial results. On PATH we don't have the benefit of this balance. The ratio of outbound to inbound traffic during our evening peak hour is about ten to one, which means we are almost deadheading, that is, running our trains empty, in the opposite direction of the flow of the peak traffic. Here I note that the ratio of traffic between the predominant and non-predominant direction is anticipated to be close to two to one, which means the vehicles will be better utilized in both directions for virtually most of the day. This is a characteristic of many European cities whose levels of utilization are measurably higher than most U.S. experience.

All in all, I am extremely optimistic about your opportunities for successful and economic implementation. In my view the planning has been deliberate, complete and professional. The route and station selection, the choice between aerial, surface and underground rights-of-way, appear to reflect a careful balance between the optimum and financial reality. Differences in opinion will persist, but, then, no plan can be perfect in all respects to all beholders.

Despite these positive aspects there is hesitancy and wariness. We are all somewhat numbed by the growing complexities of our society, the new, confusing and often contradictory impacts of such things as the need for environmental protection, energy conservation, job preservation and faster economic growth. Compared with the ebullient optimism of the "go-go" years of the 50's and 60's, we have become somewhat sobered by the events of recent years.

The realities of today, nevertheless, require a prudent response. Prudency does not imply abdication from the responsibility to look ahead, nor does it grant a license to undertake unduly grandiose schemes of nebulous worth.

I believe that your fixed-guideway approach to planning meets the test of prudency. For a limited commitment you are gaining a discreet and useful building block for generations to come upon which you can build and continue to plan for the future. You are acquiring a permanent infra-structure which will have value over the years. If time and circumstances suggest that the ultimate plan be altered, modified, or redirected, that choice remains with you in the later stages of your building-block approach.

It also offers you many additional options. You have the opportunity to restore to a much greater extent human dimension and human amenity to the central city. The pedestrian malls of Munich, Frankfurt and Cologne are excellent examples where returning central city to people by limiting the use of the automobile has led to increased attractiveness of the shopping areas and a higher level of overall business activity.

A transportation professor suggested to you a few weeks ago that the essential choice for Honolulu is to build your transit system now or to build it later. Given the opportunity represented by the probability of federal aid, the near-term and long-term flow of benefits and the almost certain higher costs and considerably greater difficulties of doing it later, it may be that you really can't afford to wait.

Mr. Hayashida: Thank you, Lou. You will be able to ask him questions later in the question-and-answer period. At this time you will have time to go to the restrooms and whatever you have to do. We will see you in the next room.

Afternoon Session

Mr. Hayashida: The first speaker of this afternoon is Mr. David Callies, and he will talk about Value Capture: The untapped resource and economic benefits.

Mr. Callies is a partner in the Chicago law firm of Ross, Hardies, O'Keefe, Babcock & Parsons. He is also an adjunct associate professor at the School of Architecture and Urban Planning, University of Wisconsin. He received his law degree from the University of Nottingham, England, with a thesis on land-use planning law. Mr. Callies is the author or contributor to a number of publications, among them "Value Capture Policy," "The Quiet Revolution in Land-Use Control," "The Taking Issue," and "Alternatives to Urban Sprawl: Legal Guidelines for Government Action." Mr. Callies has represented and counselled local agencies in various matters including the preparation of ordinances and resolutions by public bodies relating to transportation policy, the use of land and environmental controls. Incidentally, he was a guest lecturer at the University of Hawaii. Mr. Callies is a member of the Transportation Research Board's Land Use Committee, past vice president of the Illinois Planning and Conservation League, a member of the Council on State Government's Task Force on Natural Resources and Land Use Information and Technology. I will introduce his other two partners—who will follow Mr. Callies later on.

VALUE CAPTURE: UNTAPPED RESOURCE AND ECONOMIC BENEFITS

David Callies

Thank you, Mr. Hayashida.

It was four degrees below zero when I left Chicago. There are presently blizzard conditions there. Need I say that I am very happy to be here and that my wife wishes she were here too?

Value capture policy is something that we commenced an investigation pertaining directly to the City and County of Honolulu some four months ago. At that time, and to some of this same audience, I asked your indulgence. I said that we would investigate it; that we would make a report, and we would tell you what we found however it came out. We believe it is important.

I would like to briefly quote a former administrator of your Mass Transit Administration who, in a well-publicized statement, said, "Although we cannot yet say that value capture will be unfailingly successful in defraying the capital costs of development in all U.S. cities, it offers a major untapped source of transit revenue, and most of the initiative for the use of value capture techniques must come from the local level."

I am delighted to be able to say that the value capture analysis, the preliminary report which we are putting together, is very, very optimistic so far.

When I spoke to you last time, I defined generally value capture as government using its existing powers to acquire land or rights in land for a public purpose and then defraying the cost of acquisition by dealing in those values and capitalizing on increased value, which the government created itself by virtue of its public developmental activities.

We have been engaged in this investigation for the past several months. We have examined, first of all, the legal underpinnings of the various value capture techniques, which I will outline extremely briefly in a moment. And we have found that the underpinnings are there either specifically or by implication for the State of Hawaii and the City and County of Honolulu.

We have examined two stops—not necessarily prototypical—but two, at which there is some general agreement. Be there some form of fixed-guideway, those two stops are likely to be on that guideway and found that the potential recapture, the potential funds generated as a result of an application of a very fair and conservative mix of those techniques at those two stops alone run into many millions of dollars. We have examined as well as part of our program the general effect of a transit system investment in Honolulu with respect to its economy. And we have found there as well that the results exceeded, met or exceeded our expectations.

Now, it seems to me reasonably clear, given the tenure of the remarks so far today, the expectation of remarks tomorrow and what I have read in the papers, that the major issues before you are economic and financial to a large extent. And so I will hold my remarks with respect to the law to some very brief notes indeed. It may be the first time that you find a lawyer speaking to you so briefly on anything.

To set the stage for what is going to follow I would like to just reiterate that there are several techniques of value capture, but they fall into two essential categories: development-oriented categories and tax or assessment-oriented categories.

We have examined the use of the power of eminent domain to acquire land which is needed for the transit facilities themselves and immediate adjacent potential-related uses. And we have examined the use of air rights and other rights that would normally go along or accompany that kind of acquisition to be used in conjunction with the private sector. These are the developmental aspects of value capture. We have also examined certain taxation and assessment mechanisms which are presently used in the City and County of Honolulu in other contexts. The City and County already has the power and, in fact, exercises it and has exercised it to assess property owners for public improvements even though the property involved is as far as two blocks from the public improvement.

And your Supreme Court has held that that is a valid exercise of that particular power. Your Supreme Court is also liberal in its interpretation of public use in the exercise of eminent domain. Again, so far we feel very confident in what we have discovered to this point.

Now, these all have very positive consequences for the economics and the financial things, if you will, that you are investigating presently. This is beyond my particular field, expertise, if you will.

I am part of the team, and I would like to briefly introduce to you Mr. Stuart Dixon and Mr. Robert Harmon and to give you some note of their qualifications.

Mr. Dixon will essentially be covering the work at the two stops and specifically discuss with you the financial benefits which we feel are there at these two stops.

Mr. Harmon will be undertaking a more broad-ranging analysis of financial and economic benefits of which value capture is a part.

Mr. Dixon is Project Director at the Rice Center for Community Design and Research. That particular center, institute, as often misnamed, is associated with Rice University in

Houston, Texas. Mr. Dixon gained his financial analyst experience through urban technology industries, real estate and capital markets, banking, insurance, financial institutions and investment at research security sales. He also has considerable experience as a regional planner and has worked in urban economic policy planning, regional development, land use and housing issues as well as historic preservation. Mr. Harmon is the founder and managing principal of a specialized socio-economic planning and financial program management firm. The firm primarily serves public agencies as independent transit impact implementation and urban development consultants. He is considered one of the leading professionals in the emerging field of regional urban systems economics. He is an economist. His broad range of professional knowledge encompasses the application of operation, urban growth models, regional cost revenue, evaluation, value capture, joint use and integrated financial program development of national and regional transportation development policies and program.

He is also the chairman of the transit and Urban Development Committee, of the National Transportation Research Board, a member of the Regional Science Association, the American Public Transit Association, the National Tourism and Recreation Council, the American Planners, and the American Industrial Development Council. In addition, he is a member of the Board of Directors of the Advanced Transit Association and he has offered over 150 major reports and professional articles dealing with urban systems, economic analysis.

I have had the privilege of working with the Center and with Mr. Harmon for a number of years; with Mr. Harmon at the Center in a number of other cities besides Honolulu.

I would commit your remarks to them—to you. And with that I would like to turn over the balance of the presentation, first of all, to Mr. Stuart Dixon.

Stuart Dixon

Thank you, David.

I also am happy to be here in Hawaii. Houston is cold, and I understand possibly snowing. But unlike Chicago it will be gone when I get back.

The potential for value capture is, indeed, substantial. Based on our preliminary study of two-station sites on the proposed fixed-guideway system, the City and County of Honolulu could reasonably expect to recapture a minimum of 10 to 20 million dollars by the year 2000. This public share from participation in development around transit stations excludes the probable increment in property taxes. In our opinion the potential for such tax increases is of similar magnitude of about one to two million dollars annually from the time of completion of transit-induced improvements. Please note that these are not systemwide figures, nor is it possible to infer that the results could be replicated at all stations.

Many of you have heard the term "Value Capture," some perhaps for the first time here. It was coined to describe the tangible financial gains possible through local efforts to optimize the use of federal and matching funds for public improvements by leveraging private investment capital.

Value capture also implies increased integration and control of urban design, but such benefits although also potentially substantial to the community, are not addressed by our recent study. The introduction of most major public improvements such as a rapid transit system, stimulates more intense urban development leading to the creation and redistribution of wealth.

In the case of transit, land in the vicinity of such facilities, especially stations, increases in value largely due to this locational decision, which improves accessibility. Given the proper set of circumstances it is possible to magnify and recapture this incremental value. This is the concept and the core of value capture.

The techniques of two types of value capture have been defined.

The first, real property development, assumes the purchase and control of land adjacent to transit stops. Primarily, this promotes joint public and private participation in projects which generate financial opportunities not otherwise obtainable.

The second technique—taxation—is based on transit-generated income increments in property values and related ad valorem tax benefits.

A good illustration of this is in Toronto. As mentioned at this morning's presentation, one of these value capture concepts has been applied successfully in the development of that transit system. These represent leases of surface or air rights over the Young Street Subway Line. As of 1975 total annual income from this source was approximately $650,000.

In our preliminary value capture study of HART, two-station sites along the proposed 14-mile Phase One rapid transit corridor have been the subject of specific analysis. The two selected locations—Waikiki and Ward Avenue are not claimed to be prototypical of the system; rather they have been identified because of the particular potential for development associated with each.

Waikiki: Given the present pattern of high intensity urban growth at this location, the introduction of a transit station at the proposed Waikiki site will provide an even stronger focus for the gateway area.

Ward Avenue: At this site, based on major public sector redevelopment plans for the Kakaako District on which the proposed Ward Avenue station is located, the impact of a transit station on the area is likely to be a critical catalyst for development. For our study we generated several scenarios of potential development around these stops. These included a number of real property techniques with various development disposition alternatives of land acquired in connection with the planned construction of the fixed-guideway system. We also reviewed the localized impact on ad valorem taxes.

Just a few words on the methodology of our study, which will be submitted to the Department of Transportation Services next month. We reviewed the current status of the local real estate market. We obtained opinions on the prospects for specific sectors of the market. Informants were interviewed and included private developers, large property owners, financial and economic experts and public officials. From this survey plus other background data we determined a reasonable perspective of the outlook for the construction industry on the island. On balance, we believe that our market assumptions are conservative. Further, the range of development programs for the two sites are reasonable, and the timing of the development schedules used is realistic.

As noted earlier, the financial potential for value capture exemplified by these two locations is substantial. A minimum of 10 to 20 million dollars is anticipated over the next 25 years and a combined cash flow of several million dollars annually is expected after completion of the system. This represents a potential source, supplementary source of local funding available for a fixed-guideway system. This broader economic issue will be addressed by Bob Harmon. To date the team, comprising of David Callies, Bob Harmon and together with the Rice Center, has

worked in more than a score of cities with built or pending transit systems. An aggregate of 50 to 100 applications of the value capture concept have been identified.

Now, Bob Harmon will discuss some of these implications for Honolulu.

Robert Harmon

The major focus of my remarks today relates to the affordability of your proposed fixed-guideway system. In these comments I would attempt to address five fundamental economic issues that are important to your current considerations regarding the future capital improvements to Oahu's public transportation system.

The first two issues—net local share cost and cost efficiency—relate to the affordability side of the fixed-guideway rapid transit question.

The second two issues—induced benefits and opportunity cost—relate to the benefit side of the affordability coin. These well-documented economic factors are not usually openly discussed and are most often dismissed by proponents of maintaining the status quo or by those that evoke the philosophy that the best or optimum transportation solution is just around the corner—whenever that is.

Finally, I intend to highlight the redistributive or land-use impacts related to fixed-guideway systems in comparison to all-bus system alternatives. The bottom line of this economic overview will show why the real question should be phrased, "Can you afford not to go ahead with the implementation of the HART system?"

First, from the viewpoint of the local residents of Oahu, the net capital cost of the HART system would actually be approximately 50 to 60 million dollars—sixty million dollars, not the 730 million dollars that is cited as the total cost. This is true because 80 percent of the 730 million capital cost will be provided through a Section 3 capital grant from the Urban Mass Transit Administration. In fact, even if future inflation levels exceed the 80 percent level now taken into account in these estimates or if labor strikes or other unforeseen factors should delay the construction period, 80 percent of these costs would also be supported by the federal grant funds. In terms of the 730 million dollars' capital costs, this means that local resources—State and County—must only support 20 percent of the approximate 150 million dollars of the total cost. Two thirds of this 150 million dollars—90 to 100 million—will actually be recaptured in the form of excise and income taxes generated from the construction and the employment from construction employment, and equipment and material purchases related to the system's construction. The reason that 90 to 100 million dollars in new tax revenues will occur is because of the net impact of 580 million dollars in federal monies is increased by the multiplier effect. In the Oahu economy, for every one dollar of either export income or new investments that is received, there will be $1.70 generated in successive amounts of purchases and income. To demonstrate the economic significance of this magnitude of investment, I would like to point out that 580 million dollars in the federal grant monies is larger than the total amount of tourism expenditure that occurred in the islands in the entire year of 1971.

Secondly, in terms of total local costs, net capital costs and operating, the all-bus system is more expensive than the fixed-guideway bus-feeder system. The labor-intensive nature of the all-bus system was emphasized earlier today by the remarks of Jack Gilstrap of Los Angeles. It should be noted that the buses in their capital costs also are not free. Today the purchase of a new bus costs at least $100,000. The exclusive rights-of-way structure needed to produce high capacity bus services are most costly, in fact, than the aerial structure needed to support fixed-

guideway. The extensive local operational studies which have been conducted here have been reviewed and approved by the Urban Mass Transit Administration. Almost every professional who has been here and has reviewed these numbers has shown that the studies have been done not only by accepted techniques but, in fact, by comments that I have been witness to in Washington, have been stated as some of the best technical reports received, particularly in the alternatives analysis. The work shows that the full expanded bus system on a comparable service basis, if you are trying to provide maximum service to the residents of Oahu, would require in 1985, $80 million annually to operate. While the HART system, which actually attracts more riders and provides better service with fixed-guideway elements in the most densely developed urban core and full-bus service in the low density residential areas and feeder bus service to the stations, will cost $65 million to operate annually. The net difference—$15 million that would be realized, compared on this basis, would actually pay the entire net cost of the $50 to $60 million that we have identified from the capital costs of low-bid construction. To this point the economic reasons for the less expensive HART system, I believe, are compelling. But in the long term the fact that the less local money is to be required to build and operate this system, I think the greater is the importance in the area of socio-economics.

In this area of induced social and economic benefits, I will make my third point; that quantification of the user benefits—these benefits include parking, insurance cost savings, automobile operating savings, travel time savings—will produce at least two dollars for every one dollar of federal and local monies invested in the system and required to operate. This is in addition to the economic effects that I have cited earlier. Not quantified in this user-benefit analysis are the future savings in utilities and municipal services that could be achieved through the cluster-development pattern of growth associated with fixed-guideway transit stations. Several national studies, including the cost of sprawl, have shown that between 2 to 5 percent savings in the per capita cost in most public works and major municipal services can be realized from this type of development pattern. Additional case study documentation in comparisons of Toronto and Buffalo, New York, it has been shown that the rapid transit linear corridor development pattern produces between four to eight dollars per person in annual cost-efficiency savings. If a strong joint development program such as is being designed here is implemented to support the HART system, particularly in relation to your adopted development plan, these additional savings would average approximately five million dollars a year over the next 40 to 50 years. The cumulative savings could exceed 150 million dollars.

The fourth point. None of these benefits are achievable through development changes associated with an all-bus system. Because routes can change; because stops change, there is no reliance on the private sector that they can conform to building in a more organized fashion. Because of this reason, because these benefits could not be achieved, the opportunity costs, the costs of doing nothing or not building HART would exceed in real monetary terms the cost of building and operating the proposed system.

The fifth point. In response to these facts I have been asked several times this week, "Are not the development impacts simply changes in locations of island growth that would have occurred anyway?" In terms of total amounts of housing and office space this is essentially true. In terms of total land values and retail sales, my view of the system will actually produce increases in the local economy that are well over and above what would have occurred with an all-bus system. Earlier I cited that the cumulative value of the user benefits of the system exceeds the cumulative capital cost by a two-to-one margin. The actual quantified dollars of this estimate show that in today's money, taking into account the differences in inflation, user benefits will actually exceed 2.5 billion dollars. Now, for a long time these types of benefits have been hard to document. We are just starting to get some evidence that the land use markets take these into account. I would like to cite in documented case studies of the Lindenwold Line in Philadelphia they have shown that homes that were identical, the same tracts, the same house, built the same

time, that are in the service area of the station have appreciated at a higher rate annually since the system has gone in than homes in comparable locations that were identical in every other way. The approximate value of this increased appreciation very closely approximated the time savings and the types of user benefits that were being realized by those living in the service area. So the marketplace was taking these into account.

Other studies have shown that in cases where fixed-guideway transit has been built, people shift their income expenditures. In the case of Engleton Station in Toronto, surveys that were done by ourselves shortly after 1965, 1966, show that 97 percent of the people in the apartment dwellings sold their automobiles in the first year after residing in the building. Because of the fixed-guideway service, combined with the feeder bus service, they did this. And the next economic fact that was taken into account is that most of them shifted their budgets by either going to a larger apartment or made improvements in the apartments, taking into account the additional money that they had available by reducing their transportation costs due to the use of the system. This phenomenon multiplied over time would mean that there would be the same amount of housing, the same amount of office space, and the quality of the housing and the overall development of the construction would likely be higher.

In the case of retail sales, ongoing work and other fixed-guideway studies, particularly those relating to systems that serve the downtown—they are called downtown people movers—are indicating that, for visitors to cities, if you can provide a reliable way of getting them to and from where they are staying their amount of expenditures that are measured on a tourism basis are higher simply because they know they can go from one place to another without having help and because in a given time during their stay they can see more things and do more things.

We only have one real case where this can be shown. That is when they initially opened up the Washington, D.C., system. During the first 18 months the peak-hour ridership was during the noontime. It is called the "Metro-to-Lunch" group. And department stores took account of this. Some who took a Woodwarth & Lothrop that made a walkway from the station directly into their building—were able to receive substantial increases in retail sales over and above what they were able to do before.

We know from other social studies that are being conducted that people, who will not ride a bus, will ride a fixed-guideway system. As demonstration of this, the ridership to date in Washington, D.C., is three times what the traditional models were forecasting. The reason is that the system has induced riders. This increase is because of the fact that people now will go from what is the World Bank area, take the Metro to go shopping, and they can still get back at noontime. In effect they are expanding the pedestrian domain of both visitors and employees of the central area. Taking this observation to Oahu, if each visitor on their vacation trip here would be attracted to either go to Ala Moana Shopping Center one more time or to two or three more attractions, there undoubtedly would be a slight increase in the average expenditure. Given the amount of visitors here, you can where this type of transportation efficiency could make your tourism economy, that portion of the economy, grow in greater scale than it would under continuation of the present type of public transportation system.

Finally, through the value capture techniques outlined by my colleagues, a portion of the redistributive benefits can be recovered to offset the cost of HART. These value capture approaches could not be applied and the opportunities do not exist with the all-bus system. The 10 to 20 million dollars that was cited earlier as a measure of the value capture returns at two stations may be, in my view, less significant than the other side of the joint-development coin. Currently, the City of Baltimore is planning a joint development at the Lexington Market Station. Relative to your Ala Moana Shopping Center, it is about one-tenth the size. It is 200,000 square feet. There are 200 apartment units. Using very conservative engineering techniques in

measurement of ridership, this development will add about 500 to 600 new fixed-guideway riders and about 2800 to 3000 new bus riders. Over the 40-year life of the building, the old complex, this will mean that 40 million dollars in additional revenues to the transit systems will occur because of the joint development. So in many ways when we are talking about costs, and operational costs in particular, with fixed-guideway and coordination of development, you can control your costs by your own planning process.

In reviewing the overall comments that I have made today, the major points that I think we have made are, first, that the system will actually cost 50 to 60 million dollars on a net basis, after taking into account excise taxes.

The second point is that the overall costs of the HART system is less expensive than the rapid transit system, than the all-bus system.

The third point is the cumulative benefits from the user side alone are two-to-one over the total operating and capital costs of the system.

The fourth point, that the potential utility and infra-structure savings could potentially equal $150 million.

As we review each of these points, the actual true costs to you here on Oahu, if we would use a measuring scale and I could put each one of these on one by one, we have shown that probably in relation to the overall, the weight of the evidence, benefits to costs, are four to one in favor of you, the citizens of Oahu.

Mr. Hayashida: Thank you very much, Dave, Stuart, and Bob.

These are all opportunities. I think this has to be underscored. How much we take advantage of these opportunities is up to the coordination of many people, and there will be the Legislature, the Council, the city and state administration, the general planners, the land-use planners, all the public service agencies, private developers, and the citizens themselves—only through a coordinated effort can we maximize the opportunities to be gained. And it is quite important that we all work together.

We will entertain a few questions. Bob especially, the last speaker, will be leaving tonight. So we will take maybe a couple of questions before I call Mr. Hill.

Question and Answer

Q All three of you remind me of the morning paper which had an ad, an ad which said, "Sears Roebuck has a refrigerator. It was $565. Now it is $465. Come in and save $100." You are not saving $100. You are spending $465. All of your logic seems to be bootstrapped. We are 2000 miles out in the middle of the Pacific. We don't get what you get in Chicago—all the Midwestern states building up your economy if you have something. We have so much money, so much purchasing power, and we do not have any increment in that purchasing power, if we have an alternative way to spend it. I feel as if I had just seen an act of Houdini. Would you please explain.

A I think that the comparison that you have made is not a valid one, and the difference is that if you are desiring not to purchase the refrigerator, it doesn't cost you more money. I am not simply, in the remarks I have made, addressing the fact that something is going to cost more later on. In the area of regional development, if you are not making decisions that

will give you the most efficient land use, making decisions that will give you the most back from your transportation dollar, the decisions continue. And if you would take the scenario Lou Gambaccini pointed out at lunch that there are methods for showing this in quantified form—and we are very willing to provide in a lot of these questions additional documentation. But it is well recognized that these benefits do occur, and they are valid benefits.

Q I want to say a word to the Legislature. How many of you rode the bus this morning? Well, I did. I had my feet tramped on. I had the books coming down on my head. I had purses punching me in the side. So I can see why you want to drive your car. But how much better it would have been had we had the BART with comfort, plenty of room, beauty, time saved. And I enjoyed the BART from San Francisco to Fremont, and we made that travel time in 13 minutes. Here we have the bus system, and there are many disadvantages to it. The BART system, I think, offers a great deal. It increases work for the young people. It brings in revenue. It does a great many things for the community. Now, you have heard that pollution and smog and so forth causes lung cancer, and we are having the pollution from the cars. We are also having pollution from smoking. So I suggest at this meeting that we discontinue our smoking.

A Thank you very much. Maybe we can address pertinent questions to these speakers at this time, and later on we will have a chance to cover the wide range of subjects.

Q I would like to address this question to either Mr. David Callies or Mr. Dixon. During our recent trip to Washington, D.C., Lindenwold and San Francisco, myself and several other members of the Transportation Committee raised the question of value capture in each of these areas. I will quote the answers that I received and pose my question in two parts.

In BART we were told that value capture amounted to less than 2 percent in San Francisco. In METRO we were told that it could not be determined in the Washington, D.C., area. And for Lindenwold we were told that there was no data available for the Lindenwold system relative to value capture.

My first question is have you computed value capture for these area? And my second question is have you computed negative value capture for the areas between stations in Honolulu in your results?

A An initial and very quick response, and I will leave, if I may, the matter of some of the responses in the economic matters to Mr. Dixon. A privilege I have under the circumstances is having grabbed the microphone first, I suppose, and that is I would suggest that when he comes to town in a few weeks, you ask Manuel Patrone of MARTA, who had a number of comments to make about value capture at the recent Transportation Research Board meeting—all positive. And at that system it is primarily accidental because they were not going into it to do value capture-joint development per se. And I think I could make the same statement about a couple of other systems. I think it depends on which systems you look at and who is looking at it, but I will let Mr. Dixon respond, if he will, to some of the other matters.
Mr. Dixon: I didn't hear the percent you quoted.

Q From the BART administrators we received the figure in a joint meeting with them as well as some of the people who were, quote, "critics of the system," unquote—and I emphasize it was a joint meeting—the figure of less than 2 percent value capture was brought out for the San Francisco area. The data was not available.

A Two percent of what?

Q Two percent of the cost of the project was recaptured in the sense of value capture.

A Well, first I have to say since our study to date has only identified two stations here that we have not projected any particular percentage of the potential costs for the HART system.

Q But you have given us some figures to work with. Ten to 20 million dollars through the Year 2000 plus one to 2 million dollars. Now, computing it from there would be just a simple matter of arithmetic. However, my question is, do you have or have you computed value capture for Lindenwold, for METRO and for BART? That is the first question.

A The question on Lindenwold and the other three places—there was no effort to go about joint development or coordinated land use activities in the early 1970's. As an operational success, the land values that I quoted were what took place in the marketplace without private coordination.

The significance in Washington, D.C., has not been quantified at each station. I would believe that the experience in Washington, Baltimore and MARTA will be higher, probably reaching a potential of maybe 10 percent over all the systems cost. But this is because they are doing it in a coordinated fashion. In most instances—I think BART is a very good example. With only one or two cases was there a real effort to maximize development where it could accrue and take the opportunities that were not available now for incremental federal money just to do this. There is now federal grant money over and above your system cost available to coordinate development and to achieve these types of projects. This was not available when BART was built.

Q All right. My second question now is whether or not you have computed the negative value capture effect that would take place in localities between stations with particular reference to the Honolulu area?

A This was not computed, and studies that have gone back as late as 1930 have shown that there are no negative impacts in between the stations. If you have an area—I will go back to Lindenwold, like Camden, New Jersey, that is not growing and has a declining situation; it will not reverse it. You will have to either invest more dollars—it will reinforce the positive market values. There are no instances of quantification of negative influences in between. They would tend to have less impact. It would probably continue to appreciate at the same level or slightly higher than before. There are no cases where you have positive just at the station and negative in between.

Mr. Hayashida: Thank you, Bob. I think we will move on to the next speaker. We will have a chance to ask questions later again.

Our next speaker is Mr. Terrell Hill, who is the special assistant to the general manager of the Chicago Transit Authority, where he assists in the administration of that property. Mr. Hill was previously the deputy general manager of the Metropolitan Atlanta Rapid Transit Authority or MARTA where he directed and organized the successful referendum on rapid transit, the beginning of MARTA. Mr. Hill also served as an executive director of the Market Street Development Project in San Francisco where he directed efforts of the private association, organized and maximized the public and private development opportunities which would be available due to the construction of BART. Mr. Hill received his engineering degree from the Georgia Institute of Technology.

FEDERAL FUNDS: GRANTSMANSHIP STRATEGIES

Terrell Hill

Ladies and gentlemen, let me tell you—and I always hate to do this when I stand up to give a speech, but I feel that I really am a little bit, very much excited—and I should say this: It is a pleasure to be here. Now, for those of you who ever lived in Chicago and can remember what January was like, I assure you it is a pleasure to be here. More importantly, it is good to return to these islands.

Back in 1961 I first came to this island, and I came on a sailboat. I sailed out of the lagoon at Bora Bora and made my way north for some 14 days and came into Honolulu. And that is an incredibly thrilling and exciting way to see Hawaii.

Having seen it some 15 odd years ago, it also has given me a chance to see the change that has come over this great urban area. And I think that too is exciting. I think it raises instantly an enormous number of opportunities in my mind that you can and should address. I have seen the out product of an enormous amount of thought process, and this island has undergone a rather remarkable and delightful change. It is getting perilously close to the point where you must make another decision, and a rather major one.

Well, I was sent here today to walk from that chair to this podium to say something to you about public urban transportation. And before I get into what I was going to say, the gentleman that just asked a question about a minute ago about value capture, he asked it of three individuals up here that have an experience in value capture in certain cities. Unfortunately, the gentleman picked cities that they were not that familiar with, and the answer didn't come across that clearly. Well, I stand before you as an individual who has done in dollar volume one of the largest single value capture projects in this country. I did it in San Francisco, and that is the 2 percent that was referred to by the gentleman. But this is a problem and one that should be understood. When anyone goes to Atlanta or San Francisco or New York or Chicago and asks a question that is back at a point in time, it is always possible that the person answering the question was not there, does not know the answer and can, at best, give a slight answer. These gentlemen were not in San Francisco; they could not answer the question. The gentleman that was asked in San Francisco gave the answer of 2 percent, and that was silly. It was silly because he was asking a transit man, and transit individuals, generally speaking, have no background and no experience in value capture or corporate finance, et cetera. The transit system in San Francisco had a 792 million dollars ad valorem tax bond issue. Thirty-eight million dollars went into the Embarcadero Station. The total cost of the system has generally been acknowledged—and I say that because the system has changed dramatically. And what is there now was not what was built with the 792 million. That 792 million dollars of value capture was planned and programmed in the San Francisco system, and that incorporates in excess of 50 percent of the total cost of the system. That it has done so well, the initial projections of what the tax rate would be—and this was back in '62—has now dropped some 30 cents per hundred under what it was supposed to have been because of the enormous value capture that has been achieved in that system. But it is very important, the 792 million dollars of being taken care of by value capture and no other source of income. And that, I think, is exciting. It also tells me—Monday morning I am going to be in San Francisco—I must go back to the Rapid Transit Authority, and grab the general manager by the scruff of the neck and explain to him he misanswered the question. Forgive me for that intrusion into someone else's speech, but it happens to be something I know quite a bit about.

Now, we will try to get to my speech.

I stand before you as a graduate of Georgia Tech as an engineer—whatever kind Georgia Tech cranks out—and we have a good school song, and most people know we are rambling wrecks, and I kind of ramble around too. But the joy in my life was that I became involved in public urban transportation in San Francisco and was deeply involved in it. From there I went to Atlanta. I had the opportunity to design the rapid transit system in that city, and it was rather exciting. I personally hiked every inch of the 56 miles some 18 times, and many elements of it 20 or 30. I know how it was inserted, is to be inserted in that city, and why. And I also had the responsibility for the financial and the legal, the transportation plan, the urban design plan, all of those elements confined to the public information plan for MARTA.

The point I make is that we aimed high. The trip was slow. It was not overnight. It was not instantly produced. The goal was achievable, and the goal is being achieved. To go in that city today 14 miles of rapid transit, all under construction, and sometime a little better than a year from now you can go to Atlanta and jump on a train and ride where two major subcenters or major centers of that community are connected by rapid transit.

Now, Atlanta is not the city where you are going to get glowing, exciting readouts of the first transit ridership. Mainly because they made the decision to build the fourth and the third busiest part of the system first, and later they will build the first and the second. And there is kind of a reason for that, but that is their problem. They made a decision, and they made it in the entire community. And it is being brought into fruition.

More importantly, the concepts of urban land use and urban land development all are being undertaken. And we finally with the entire community are looking not on transit as the means to get to work. That is not what it is all about. The transit authority has a goal and an objective. The goal should be to make the city work. It does it by hauling people around, and that is kind of incidental.

The point is—and very clearly and should be understood—that public urban transportation is as necessary to a community as water, schools, garbage service, et cetera. And it is not something that you can look at and either have or either not have. You must have it. The level that you have depends on the quality of life you wish to have in your community. You can enhance the quality of life; you can have an assist to the program of development; you can accommodate movements of people without major disruptions to the rest of the community. This is exciting.

In Atlanta the economic, financial, physical, ecological, social and transportation planning process of that city was at a tipping point. Atlanta could have gone either way. Atlanta could have grown to become one of the sicko cities of the East like—forgive me—Cleveland or Newark, or it had a chance to be an emerging bud that could flower into being one of the greatest cities on the North American continent. It made that choice, and the choice is a good one.

The drama of the change in Atlanta has been enormous, and it is not just because somebody is going to get a chance to ride on a train. But it is also because people began to realize, whatever the level of congestion they have on the city streets today, it is the best it can ever be. From this day forward the quality of congestion is going to decrease—the development, the erosion of the noise and those are pretty severe ones—noise. The quality of life, the air quality, is going to be seriously increased. And proximity to streets and highways is something that took us a long time to get to the point, but we now know this is not that necessary an item in our urban centers. One thing began to happen in Atlanta—major structures—in fact, inordinately major structures began to be located at or near the transit stations. And Atlanta is

building a city that they now know won't work unless transit comes. But they are doing it deliberately. And that is a very exciting thing. The citizens made a decision. The development of the city is being tied to that decision.

But you are somewhat in the same way. You have economical, financial, transportation, ecological and social well-being of Honolulu at stake. How you deal with the subject is going to be a rather major issue. There are many ways to address the problem. There is paratransit. You could all run around in van pools and car pools. There is mini-bus. San Diego has 60 mini-buses. You could have an all-bus system. That is what you have today. You could have a busway system. We have got some of that in Washington, D.C. You could have a light rail system. That is the excitement of BART. That is going to open in a couple of weeks. BART, as you know, is not yet finished. You have your rapid transit system. That is what we have got in Chicago. The downtown people-movers. Four cities in this country are well under way in the development of those. They could have commuter railroads. We have 12 in Chicago.

There are many ways to approach the problem. You approach it first with a design solution. Is it aerial, rail or subway, and why each one of those? Well, clearly, geography counts. You can't climb a steep hill, so you go through it. That puts you in subways. Many, many times it is not just geography. Look at Chicago. It is flat as a biscuit. You stand on a soapbox and see more corn than any place in the world. And what we did there was to recognize that the environment counts. Streets could not have, and could not tolerate rapid transit cars flying down the middle of the street. It is a little dangerous. Not only that, we have a third rail, and it is particularly dangerous.

But you go through this design process, and you come up with solutions and you feed in all of the factors that you need to have, whether it is the size of the station, based on how much ridership, how many people, how long is the train going to be. All of these depend upon population desnity and corridor density volume. Again and again and again in this world people will say, "Well, gee. You can't have rapid transit unless you have two million people." That is nonsense. Oslo, Norway, four hundred thousand. "Well," they say, "that is not the problem. You can't do it because our urban density is so low." Do you know that urban density in Fremont, California, is around 500 people per square mile? I mean you could shoot cannon balls around there and not hit anybody. So urban density doesn't count either.

Well, if population doesn't count and urban density doesn't count, then what does count? Well, it can be a thing known as corridor density volume. And guess what? You have got a mountain here that just leaps right out of the bay, and across the base of the mountain you have a few streets—and I mean that, absolutely a few streets—that run from one end to the other. And, therefore, people pour down into this area and run along that corridor. And you can take relatively small density. And as they get into that corridor, the corridor density volume is enormous. Now, that is one of the secrets as to how you decide where to put freeways. And amazingly enough, the same thing that works for freeways works for transit. You don't ever hear traffic engineers talking about density of cities. You don't hear traffic engineers talking about population of cities. It doesn't count. It is corridor density volume. You have an enormous corridor density volume.

I had the good fortune to go up in a helicopter the other day. I was almost speechless. I was a little bit reminded of Sao Paulo, Brazil. The only difference is they just go all over the place. But the corridor density volume that slice through there. Wow! Just enormous, enormous. And, incidentally, all of the documentation that I have been reading for the past couple of weeks came to mind. Wow! There it was. That is the reason and a justification.

Well, you went through that process. You came up with an alternative analysis. This is

done across the United States, city after city beat their way to the door of UMTRA. They get inside and make their pitch, and some of them get approved. They are all major urban cities in America that have not yet cleared the hurdle of the alternative analysis. You know—and this is something I hope that everybody remembers—Honolulu stands alone in the United States of America as being the only alternative analysis ever submitted to the Urban Mass Transportation Administration that was approved that did not have an application for a grant filed right under it. You have nothing in Washington. They can't act on anything. They can't give you the money that you need. It is your money. You sent it up there. They are holding on to it. And I might add we have big teeth in Chicago, so if you don't ask for it in a hurry, we will. And that is exactly what happens. But that is something rather remarkable. So where are you now?

Well, I rather have the suspicion that you need to have your financial plan completed. And I say that not knowing exactly what I am saying. I talk to people and say, "Well, City is going to do this, and the City and County is going to do this, and the State is going to do that." And all I am saying is that final report has to be prepared, the legal plan. Where do you stand in this whole ball game? Most of all public information. What I have had the opportunity to do is talk to an enormous number of engineers and practitioners that I am familiar with, that I have known, that I trust. And I have seen the work that they have done.

Well, I rather suspect you also have to do a public information effort. I am telling you that because one has not yet been done in Honolulu. And when I asked, I found that you do not even yet have a public information plan ready. So then I am beginning to wonder what in the world are we doing here? I mean isn't this part of the public information plan? I find out "No." This is a state program, and that makes me a little nervous. Here we are debating a rather major issue. It is about like playing a card game of gin rummy and someone is still holding some of the cards. The facts are not out on the table yet. And yet there are people who appear to be attempting to make judgments and decisions when the facts are not before them. There has been an awful lot of controversy.

I used to get mailings in Chicago and news clips out here, and I used to be just amazed at the volume that is coming. The grass is very high. If all of those news clips have managed to fertilize the grass, I assure you it is very high. It is so high that when you do get around to dealing with your public information program, you better take some explanation to say, "Hey, now wait. Quit watering the grass. Now, we're getting ready to talk about something serious." I find—and I found this out today—I have spoken to several people here; that the public is confused.

Many in the news media are confused. That is very obvious in what I read. I mean that not only the newspapers but in the TV news; that agencies representing various groups of people, be they Chambers of Commerce, Oahu Development Conference, League of Women Voters, they too are confused. People are waiting for an answer. I happen to be in a very rare position. I have been shown the inside of what is coming. I think word will get out, and I think people will understand what is being done here and why. It is very exciting.

Well, the major point that I wanted to make was that nothing worthwhile ever came easy. You heard Mr. Gambaccini say that the gestation period for major transit system has increased, and it seems to increase again and again and again. No one ever in these United States in my judgment will ever build a system as fine and as quickly as BART did in San Francisco. I don't think we have that chance again. We do deliberate a lot longer. We have a lot of issues that we seem to look at, but ultimately you deal with a question of what kind of system you are going to get, beginning with paratransit all the way down to commuter railroad. There are a lot of alternatives. They break down into two basic ones. There is a bus and a train, and it becomes very clear that in city after city—and that is not hundreds or thousands but maybe 15 or 20 cities.

We begin to see that the bus is a highly discredited system. In Chicago we operate some 2,400 buses. We also have 90 miles of rapid transit. We also have 800,000 people a day to transfer between a bus and a train. And that is very exciting. And we saw great urban cities in America begin to lose their vitality in their central core. Chicago didn't lose. It grew. John Hancock, a hundred nine stories. Sears Tower, Standard Oil of Indiana, enormous developments. And that vitality was caused by a good strong public transit system.

Well, to you in Honolulu I only have about one remark to make. To you we throw the torch. Be it yours to hold it high.

Mr. Hayashida: We are ready to begin our question and answer period. I ask that all of you that have questions to ask, please speak into the microphone. We have a stenographer at the front, and she would like to transcribe your questions accurately as possible.

Before we begin our question and answer, we will have some of the highlights of the points that were made today. And I would like to ask Mr. Lou Gambaccini to recap part of it and Dr. John Bailey to recap the other half. So I will first call on Mr. Gambaccini.

Mr. Gambaccini: Mr. Hayashida asked me if I might just capsulize some of the highlight values, virtues, or advantages of fixed guideway. And I said I would be happy to try to do so.

Let me start by saying once again, as I did at lunch, no way am I or to my knowledge any responsible person proposing fixed guideway for any and all cities. But where there is a basic case for fixed guideway—meaning corridor densities and volumes that justify the cheap advantages of fixed guideway, then I would submit that some of the major advantages of fixed guideway are as summarized in the slide before you.

First of such advantages or values is that the assets and benefits that flow from fixed guideway commitment are available for present and future generations. A couple of examples to underscore that point. My own system was begun in construction 104 years ago and it has been operating continuously for 70 years. The New York City subway system, many of its lines have been in operation for more than 78 years. Indeed, London, London Transport has an active tunnel still in operation daily for rapid transit purposes. The tunnel was built in 1836, 142 years ago. I submit such investment has considerable utility for years. Indeed, if I may, I think the most dramatic underscore to that statement is a quote from a report that was a punishing indictment of BART.

This was a report that has probably been the most publicized of any reports on fixed guideway in the last two years. And it was a rather thorough, meticulous—and I might add—rather completely negative report about BART, which even at one point suggested its abandonment.

The report, after 40 pages in summary, concluded with this paragraph, and I quote, "But in the long run, say, in 50 years when the bonds will have been retired; when everyone will regard BART as just another built-in feature of the region, rather like Golden Gate Park, perhaps no one will question whether BART should have been either built or abandoned. It will then be regarded as a handy thing to have, a valuable, facilitator of trips that would not otherwise be made by the elderly and the young. A blessing that enriches the quality of the Bay Area life. And who will gainsay then the wisdom of having built a white elephant today?" Close quote.

I think there is a very, very pregnant series of thoughts that flow from that one concept of investments today for the benefit of generations over a hundred years.

Let me very quickly then move through the other points.

Where again there is a basic threshhold justification and a decision that fixed guideway is appropriate, there is nothing that comes close in the way of competitive alternatives or modes in efficiency on a cost-per-capita basis. Without question it consumes the least land and resources. Before our decision to completely rehabilitate our system at a cost of 250 million dollars, studies of our own planning department indicated that there would have been required some additional dozen lanes of highway capacity plus additional tunnel and bridge capacity to handle the equivalent of peak-hour traffic to our system. With respect to that again the conservation of land and resources has been the single most driving force in the decision by the number of cities summarized in that inventory, available at the rear of the room, particularly in the lesser-developed countries and increasingly in the more affluent countries who are beset increasingly with pressures of budget and of energy resources.

With respect to it being the chosen path in cities all over the world, as I mentioned at lunch, there has been a quantum leap in the number of such decisions. South America—the entire continent of South America—had one fixed guideway system since 1970 in Buenos Aires, which by the way continues in mint condition. The original rolling stock is absolutely in mint condition.

In the last couple of years new systems have been opened in Santiago, Sao Paulo. Others are under construction in Caracas and in Rio de Janeiro. And still others are planned in several other cities.

The Soviet Union has made a commitment to construct fixed guideway in all cities over one million population. Germany has made innumerable new starts in cities up and down West Germany. And significantly again, as I mentioned, it has resulted also in a very, very advantageous—or at least it has been partly responsible for the most advantageous ratios of energy consumption per capita in Germany.

Finally, compared with other modes the safety performance of fixed guideway is far away the best. My own system has been operating under our direction for 16 years. We have had one fatality in those 16 years. We have carried close to three quarters of a billion passengers.

I think it is significant that when there are incidents involving public transportation, they are instantly telegraphed around the world. Yesterday's Honolulu papers carried an item about a collison of two light rail cars in Philadelphia that shook up a couple of people. And when you contrast that with the 55 thousand people a year who lose their lives in automobiles or the innumerable accidents involving several fatalities that do not get covered beyond a very small local area. Contrast that with any incident affecting public transportation around the world, as in the case I mentioned, where a couple of people get shaken up, and it is an international headline news item.

Energy conservation, as I mentioned earlier, far and away one of the most significant criteria in the decision, especially in recent years in Europe with respect to the selection of fixed guideway.

Finally, environmental compatability. In environmental impact statement after environmental impact statement fixed guideway excels in virtually all the measures of environmental conversation and protection.

Mr. Hayashida: Thank you, Lou. And now Dr. Bailey will hone in on the HART system.

Dr. Bailey: HART results from years of comprehensive planning by all levels of government. HART has involved extensive public meetings to communicate both ways with the citizenry.

The City of Honolulu controls and coordinates the key factors effecting ridership. Public transport, street traffic, community development, land use regulation. The State recovers its entire proposed contribution towards HART. In fact, we found today that you literally will lose money if you don't build it.

HART produces 2500 construction jobs at the peak year to aid this section of your economy. HART does stimulate nearly all sectors of the Honolulu economy.

An equivalent bus system in capacity and service, if it can be provided, will be more costly than HART. Your street system is not adequate for an expanded bus use. If you choose that alternative, you have to have massive construction and suffer unnecessary pollution.

HART maximizes the use of existing publicly owned rights-of-way. HART improves mobility for both users and non-users and especially for the non-car owners, and it enhances the quality of life in Honolulu.

Massive federal funds are available to cover 80 percent of the construction costs of HART. Honolulu is the only city in the nation with an improved alternatives analysis that has not yet rushed a final application for funds to the federal government. If you, at the state and local level, do not make the decision to go ahead, the federal funds will be taken by others. Several here at the table said they would be willing. And you will have no advantage in reduced federal taxation.

QUESTION AND ANSWER SESSION

Moderator: Now we will entertain questions from the floor. Will you please state your question.

Question: Many people in our community live quite close to the central corridor along which many of the increased buses or perhaps fixed guideway would run. Has there been any comparison of the noise impact on those homes of one system versus the other; noise, of course, being an important element in the property value?

Panel response: Let me answer it to this extent. On the question of noise, studies that have been done to date suggest that all of our rubber-tired vehicle systems, whether it's the automobile or whether it's the bus or whether it's the fixed guideway that contains the rubber-tired alternative, have similar pitches of noise. The quantity of noise, the duration of it, is much more severe for the automobile system, a little bit less severe in the bus system, and least severe overall with the rubber-tired vehicle system. Our main concern there as we studied the prospects of implementing a fixed guideway system is the alternative that we would have the steel-wheeled system, and there the noise, of course, gets up in quantity. That pitch, I should say, is much above the rubber-tired system. The decision on whether the system would be rubber-tired or steel-wheeled is still under considerable debate.

Question: I'll have one more response from Mr. Gambaccini who has some experience with steel-wheeled vehicles.

Panel response: I can't respond precisely with respect to HART, but I can say that I have visited systems elsewhere like Berlin, Moscow, Munich, that are steel-wheeled on steel rail that are extremely quiet. So the technology is there. A lot depends on the engineering and on maintenance, but certainly the data, I'm sure, are available, particularly in the impact statement comparing the modes.

Question: When I first read the impact statement, one thing that concerned me was the impact on Kalihi. It was great that they would have worked on means to getting transportation to a job and all of a sudden, when I hear "recapture" bandied around here, I realize it is right in my own home yard. Now, in Kahala, we're in the throes of trying to buy our own land. In a survey done on the Tract A houses, the median homeowner was somewhere in the sixties with a fixed income. We have to buy our land, and on top of this, our taxes are going to be increased. I think there's something wrong with it, and I say to a similar degree this will happen to the people in Kalihi.

Panel response: I think that developments will take place around certain stations. But certainly not all of them, and I think that the land use planning should be instituted in every station before the choice is made to develop. But these things will be addressed specifically when the decision is made.

Question: I'm chairman of the Kalihi-Palama Neighborhood Board 13. I wasn't going to say anything today, but since Kalihi was mentioned, I thought I'd better. Now, there is no other community on this island that has studied mass transit, fixed guideway longer, than us in the neighborhood of Kalihi-Palama. We did it for three years during the Model Cities years. From 1971 to 1973, we had some rough debates, a lot of shouting, near fist fights, but by the end of 1973, we improved and we hasseled over three routes—King Street, Dillingham, and Nimitz—and the majority voted for Dillingham. Now, the two stations we went through—this again in the neighborhood board, we ran it for several months so that we could get input from the other neighborhood organizations, other neighborhood boards, and we got affirmative responses. Now, the station in Kalihi will be—there will be two stations—one we asked to be moved from Kalihi Kai School to the Dillingham Plaza. Now, around that area the value may result in taxes, but I don't see it resulting in increased home property taxes for Kalihi-Palama, which by the way is inhabitated mostly by tenants with absentee landlords, so we are not worried about Kalihi-Palama. The other station is in Iwilei, and Burger King recently purchased property there soon after. They must have been following on our deliberations, and if you pass that station on Dillingham and King next to First Hawaiian Bank, you will see Burger King coming up with the biggest parking lot of any Burger King in Hawaii. My worry there is that they're going to charge the city for a big sum of money for the station that's slated to be in that parking lot in that corner.

I have a question. Earlier, one of the speakers mentioned that 50 percent of the population—and I take it this is a flat percentage—are licensed to drive or not licensed to drive. Do we have figures in Honolulu about that? What percentage are licensed to drive in our population? I know that there are many among the elderly that I know in our senior citizens program who still retain their driver's license, but they don't drive. They retain it for identification purposes. Nationally it may be even higher than 50 percent. They may be licensed, but they may not be driving. Do we have that information?

Panel response: I don't know of any figures in Honolulu and we don't have any, but I would say this. That those kinds of numbers as I've studied around the country, they don't vary too much from 50 percent in any location I've looked at; so my guess is between 40 and 60, at least here in Honolulu.

Question: Dr. Bailey, this might be addressed to you, sir. Regarding the Lindenwold Line, I understand that you already have right-of-way because the rails are down. We want some elaboration on the cost in relationship to this; if you would do this, sir.

Panel response: There were rail lines in place along much of the right-of-way, but they were not used. They were owned by a railroad—a private railroad. The location in a few places was not precisely correct. I saw a summary of this, incidentally, in a Honolulu newspaper a few weeks ago, and pulling it out of memory, the cost of the right-of-way of the extension from the center was something like $22 billion. So it was not free by any means. And none of the rail was used. None of the rail itself. In certain areas, particularly in Hattonfield, the rail was dropped drastically because of community concern, and that increased the cost of construction substantially.

Question: I'd like to preface my remarks by saying I'm not against all kinds of transit systems, but I find myself in a position of asking all kinds of questions because I haven't been getting the answers for several years, and you and some of the other speakers mentioned some real world problems, and that is the first of my questions. Specifically, how do you intend to pay for HART? What tax measures? What amount on what levels?

Panel response: All costs of HART or public service will be rising and I think the budget of the City will not remain static. I think if we keep the same fare structure, the subsidies will increase—keep on increasing whether we stay with the bus system or we have an improved bus system. We will have to address whether the cost will be paid through a combination of increased fare and the City's revenue sources, which as you know are the real property tax, fuel tax, the vehicle weight tax, and parking fees. Now, we ask, of course, whether you would allow the counties to levy up to 1 percent general excise tax. These are the ways it can be paid.

Question: The point I am driving at is that we have seen some pretty detailed projections relative to local shares of approximately $146 million out of the $730 million that is to be spent overall. Yet, we have not received in detail from either the City or the State detailed recommendations on how the taxes are going to be used to pay for it. Specifically, are we going into an increase in the excise tax or are we going into vehicle weight tax? In short, the system has been outlined but no means of paying for it has yet been presented to us for consideration.

Panel response: I think you should remember, we will pay for HART the same way we will pay for the all-bus system. The decision is whether to increase the level of service, at least maintain today's level of service or to make it better. The cost will come and the funding will come from the same source; whatever is available to the City. Once that decision is made, we'll have to figure a way to finance it. And I think that the only sources that we have right now are your fuel tax, your vehicle weight tax, and your property tax. But the revenue to the City will also increase as improvements go up. Revenues also inflate, so revenue sources today will be worth more in the future. So that doesn't remain static. All of our costs have been projected till 1985. We have a $2 million budget right now, so without raising any taxes the ratio in 1985 would probably be the same.

Question: I just still would like to see a detailed presentation on that. If I may follow up a question to you and Mr. Gilstrap, relative to Los Angeles, he indicated that Los Angeles is projecting 14,000 persons for peak hour and 265,000 persons daily for its proposed Wilshire Boulevard rapid transit. Now HART is projecting a minimum of 18,000 persons per peak hour and 473,000 persons daily, and I was wondering if either of you could explain why HART's projection is higher than Wilshire Boulevard's rapid transit?

Panel response: I just might like to point out that I think this deals directly with the

point I brought out on corridor density volume. You have an enormous corridor here that has a very high volume of traffic on it. In LA, it has an enormous area and in going a quarter mile or half mile you have another street. There's a big difference and you can't compare apples and oranges as you are attempting to do. You really have to get down into the single, simple—what is the problem here in this community? I promise you there is nothing that I can translate from Lindenwold, from Cleveland, from Boston, from METRO, from BART to Atlanta. And in Chicago we are rebuilding the Loop. We are going to put in the subway. We are extending it to the airport and there is no relationship to any other city. You deal directly with the issue before you.

Question: Can you just follow up on a point right now? I will take exception to this comparing apples and oranges as we are dealing there with already similar figures and it is identical even though Los Angeles has much wider population base, wider area.

Panel response: What you're not getting is the relative density in population and area. It's plain and simple. It is higher here in Honolulu than it is in Wilshire Boulevard. Now, the reason for the volumes are the same. The Wilshire corridor is much longer at the moment. In terms of its bus service, and HART in terms of its existing bus service, that's why the numbers are the same.

Question: Well, Wilshire is 15 miles, HART is 14.

Panel response: I'm talking about the existing bus service—HART or the Wilshire versus the existing bus services today in Honolulu. I'm not talking about the proposed rapid transit system.

Question: I have a suggestion for a financing system for the taxpayers, and I feel that a most logical way to contribute our share for the financing system is to increase the vehicle weight tax and vehicle fuel tax and also increase parking charges for all-day use of parking structures.

Panel response: I would say that there is no single solution. It is entirely a political matter and the number of different solutions is almost as great as the number of different cities. The mix of sources of taxation and how locally each community determines who are the beneficiaries and who should pay really are completely unique to each regional kind of thing. I was struck by this a number of years ago when we compiled the data from around the world, particularly from other states, that there is just no pattern; and I think it's entirely a political matter.

Question: Today you told us that the guideway would tend to generate development around the guideway, and that may be fine. But my question deals with the proposed development in west and north Oahu as it is proposed now. Anything about alleviating any transfer station for that population?

Panel response: I guess you'd have to clarify the question a little bit.

Question: Well, my question is dealing with the fact that in west and north Oahu right now it's not as densely populated as Honolulu, but in the near future that is going to be changed. There are plans to develop that area—Kuilima, the North Shore. I've read articles about hotels going up there like the Waikiki strip and things like that. My question is, nothing today was said at all about alleviating transfer passenger problems. More people live there, and I understand you can't have community buses. But I also understand that the community buses are going to be dealing with the way the population is now.

Panel response: Well, if your question is with the future bus service being responsive to the needs in the areas that are outlined adjacent to the guideway, the feeder services that we've used in our patronage and our company's projections are responsive to the population, employment, and growth that would exist. If the 1964 plan were in existence, we already know that there's a need for a new one and it must be changed. The population distribution is by certain percentages, different before that fixed guideway is approved for construction or before those feeder systems would be put into existence. It could be continually adjusted to the population.

Question: The major thing I was concerned with is the way the streets are set up on that side of the island. All the roads are going to have your corridor density volume problem on the North Shore.

Panel response: You are suggesting that the volume gets so high that you need something other than buses.

Question: I just did not hear anything at all about that or even a thought concerning that type of situation.

Panel response: It is certainly true that the HART system doesn't satisfy all the transportation needs on the island. Any system is expandable. There are all kinds of other things you could do. Higher demands? They can be met by an updated bus system. That question you really need to address after you get the major issue decided is whether to build the fixed guideway or not. As other problems come, we will solve those.

Question: It appears to me that by deciding the major problem of solving fixed guideway or buses would really only put off the problem, because you're going to have it again. It's not really solving the problem but just moving it back to a later date.

Panel response: 1. I think that we have to look at transportation as a whole for this island. HART will help relieve some of the problems in certain sectors for the City and County of Honolulu. Certainly, if we add this guideway in, we can use it to bus people more efficiently. Let's say that we had a station at Aloha Stadium. We can get buses interfaced with that station instead of going all the way to town. That means that we can provide greater service with the buses or we might take a couple of those buses and use them in the North Shore or Ewa. So these systems will help make the whole system more efficient. Now, if you come and say that the roads are too narrow, that has to be looked at separately. You know if the decision for the outer areas is to make more roads, freeways, or streets, you know these decisions will have to be made. That will have to come after we study the area in the North Shore. I think this is the way we have to look at it. HART will not solve Haleiwa's problem. But, certainly, if we give you better bus service, it will help in that way, but we have to do more than that. And, certainly, we have to look for a special project that will address the need of that area.

2. I'd like to come back, if I could, to Representative Cobb's question and maybe elaborate on the answer because it's a kind of crucial question. What it says is that there is something wrong with the patronage. So let me—Jack Gilstrap, if I get too far on these numbers maybe you can correct me—say that if you take the Wilshire corridor, it has a certain density today and it has a certain drainage ditch, if I can use that term, and it's for all practical purposes twice the size of the island of Oahu, and people from all that whole tributary come down into Wilshire Boulevard. Now, when they get there, there's 150,000 people. That's 150,000 out of a very large number of millions in the tributary area. So the infinity for transit in Wilshire is different than the infinity here. Now, they say that there's a need for transit in the Wilshire corridor, but the infinity for it is really great. Secondly, the Wilshire corridor, and this is where

Jack may want to comment, is probably less susceptible for more new development. The infinity is different, and because the amount of development potential as it relates to the development that is already there is different in those two corridors, and that's why the numbers, even though they are the same now, may turn out to be different in the future.

Question: There may be some source which you could direct me to or cite to break these numbers down, because it's a complicated question. I'm wondering—between all the bus systems and one that involves a fixed rail of some sort of system, a portion of each is bused, and one case replaces buses with a fixed rail and if you set aside the part that is comparable, which is all the buses in the HART system, what is the capital cost for that portion of the system? If that is a major system, the different routes, essentially what is the difference between the two concepts? We are talking about $750 million. Are we talking about all the buses and the fixed rail investments or just the element of the cost of what we have today? That kind of analysis would help me understand.

Panel response: That's a process that includes fixed guideway and all of the bus system, lane engineering, construction, management, and all that type of thing. So it's a total cost figure, but you needn't worry about that figure because unless you would have started construction in 1977, you couldn't build it. That's the last estimate that we've made, and we made it at the time when we did the alternative analysis. It's now 1978, so that figure that somebody showed here this morning that said for every year of delay the price goes up $50 million, that continues to go up, but it's an all-inclusive figure. What we are trying to show is the comparison of the total cost. We have the breakdown. There is an engineering report and it condenses the cost estimate. I'll find out how much the stations cost, how much the buses cost, and I just don't know what the breakdown is offhand.

To answer your question accurately, it does include the cost that we already have, but it certainly has the figures for any replacement that we need during that period, if you understand that.

Question: Mr. Chairman, these concepts finally end up to be a big political problem. I recall in San Francisco where they put in the BART system, they tried to get San Jose in it and the people voted against it; in other words, the concept there was to put it through and finance it as a sort of like a big improvement district, and if I'm not mistaken, it created an authority there to finance this, and of course San Jose and San Mateo did not vote themselves in. Here, in Honolulu, we've been approaching this whole problem as a City/State problem. I wonder how many of you working in the various cities have had any funds or help from the State. Here, we're asking the State to put up half the original money. To what extent does the State help the various entities like San Francisco, Atlanta, in projects of this type?

Panel response: I guess everybody here could name a city where they could recite the experience. Let me just recite the experience in the State of Maryland, which is financing the entire cost of the construction of the Baltimore rapid transit system. I can also speak on the situation in California. We have a quarter cent sales tax statewide, which provides for both capital and operating expenses to the transit system in the various metropolitan areas. That is, funds raised in that county go to that county on the basis of that four cents sales tax. In Los Angeles County, a quarter cent sales tax annually produces around $75 million, if you can believe me. So that is direct state assistance to both capital and operating expenses. And in the Chicago region, we have regional transportation for which the state authorized the funds; however, they come from many sources. We are not so simple as Atlanta to give just a state sales tax, or something else. We get a portion of the sales tax funds, the 5 percent gas tax, the $5 billion for the snow that we push off the street, and the $14 per vehicle registered in the City of Chicago—there's about a million of them. We have a parking tax that's authorized where you impose

that on all those who park more than eight hours a day; anybody parking more than eight hours a day does not need his car. I don't wish to be offensive. If he does need a car, the user of the vehicle pays his share too. You're going to find, as you look around the country, some states have stepped in with a very big portion. Every state is doing it differently.

Question: I must assume that all the gentlemen on the panel did read the HART plan. There are some questions that bother me. The western end of the HART line is ideally located at the Aloha Stadium, which has much space. It has well-designed freeways into the area. But when you look at the eastern end, in the center of a residential area and in the center of a shopping mall, they're already congested with heavy traffic and buses. Is the 14 mile end terminal being planned at Kahala Mall a suitable approach, and what is the proposal for parking at that end?

Panel response: I suspect that you will probably get a different answer from each person here, and, obviously, we are not here to attempt to tell you what we would do. I think my role is to merely let you know what we have done in other cities. It's your city, you must make that judgment. It's your prerogative. Now, in Chicago, every line that we have stops in the center of dense developments. We have not yet had enough money to go as far as we'd like to. We are stretching and will continue to extend our lines. We have four lines that are planned now that will get under construction in Atlanta, which is, I think, somewhat analogous to your situation here. The question is, what is the minimum usable segment that makes sense? Now, I don't know what sense means, but you do the best you can. I do think it's important that you remember that the journey of a thousand miles begins with the first step. You have to start somewhere. You might be building one station downtown and that adds to the price. You've got to get enough for a system that has volume, that has some impact, and that makes sense financially. My judgment is, I've seen you look at 7-mile segments, 8-mile segments, 14-mile segments, and 23-mile segments. The general feeling, as I read the documents, is that you have what you believe to be a minimum segment that makes sense. Make no mistake about it. I don't think that's the end of it. I look at 23 miles. I'm kind of ambitious. I'd go beyond 23 miles.

About the station area and what goes in around those areas and how it blends in on what's already there. It is very difficult to design. It is a sensitive political problem and at this stage, clearly, not enough work has gone into that yet. Now, if it's an end of the line station, and as this would be a 14-mile guideway, the problem is, we don't want to stop here because of your requirements for parking. It's a doubly sensitive problem. What I can say, is that, if the island has decided to go for fixed guideway and gets into some detailed design, there is a lot of money to be spent on physical planning within the framework of community participation and local government's participation. There is a lot of work to be done on each station site and double work on terminal.

Question: I direct this question to Mr. Bouchard, because he indicated that the federal government is willing to bear the cost of inflation. Last year I wrote to the Secretary in the Department of Transportation and I received a reply. I'd like to quote from Mr. Page's reply. He said, and I quote, "It is our intention that any future construction grants grievance relative to a fixed guideway project shall be negotiated with a fixed ceiling on Federal contributions subject to a defined method of adjustment for inflation. Localities will be required to complete the fixed guideway project as defined in the grant agreement and to absorb any additional cost incurred, except under certain specified extraordinary circumstances." Now, that statement from Mr. Page does not seem to be unequivocal. In view of this statement from Mr. Page, I'd like to get your response relative to the federal government's bearing on the cost.

Panel response: I said that the federal government's bearing of cost overrun has two circumstances. The inflationary factor is different. . . .

Question: That, in effect, is not true. Say parking or maintenance or interrelations or increases of the cost of the construction.

Panel responses: 1. Well, obviously, if an application is submitted, it's efficient in its design. You want to question parking? If we in our engineering department here in the City, in our judgment were to submit a plan that the federal government thought that we didn't have enough parking spaces at a certain station and later on we wanted to change the number of parking stalls and the cost of the system went up, then we would have to go back and make a case for the additional parking facilities and make the case for the additional construction cost and get the federal government to approve it. If it did not get approved, then we have to live with that mistake or we'd have to raise the money somewhere else to justify that change in design. I hope that answers your question.

2. I think that question was such a good one, I'd like Mr. Gambaccini and Mr. Gilstrap and maybe myself to answer it. The Chicago Transit Authority spends about $100 million a year. I have yet to run into a situation where I've been constrained for the lack of funds. The federal government has changed its rulings very carefully to protect themselves against the kind of events that might happen. They now say, "If you are going to build a bus garage, we'll give you the money to design it. After it is designed, build it after you have a low bid. You then turn in the low bid. They give you the money and you build it that way." There is no concern for a cost overrun. That word "cost overrun" becomes a very amazing word. Some people think you go to jail if you have one, and I'm one of those; and, therefore, we don't ever have a cost overrun. And I might add, we do have about $30 billion a year in Chicago for amendments to the grants because of inflation and change of scope. I hope you do understand when you design your system, this is not a final detailed design.

3. I heard the quote and I think it is a very comforting quote. He's not saying there will be no supplement. You expressed—or he expressed it as a matter of intent. It was the intent that there will be no allowance for inflation. The transit industry protested vigorously. It is saying that is totally unreasonable. There are political avenues to achieve end results and one of those compelling arguments is that it should not have absolute restrictions when compared to other programs—the highway program. I have been the beneficiary of a substantial supplementary grant—an initial grant of $23 million—supplementary grant of $16 million in part to cover inflation and in part to cover functional changes approved by the federal government. I say, finally, that if you get a contract to a commitment in the order of $500 million, that is a very strong position from which to start. Obviously, then, there is a burden that you must carry to be able to justify and demonstrate whatever changes are made.

Question: Except for Aloha Stadium, which will provide a lot of parking for people in Pearl City and Aiea who would want to use the transit system to get to work, what proportion of importance is it to have parking in every station? If people in Kahala decide to reject that end of the transit system, could they be left out until they start screaming for it?

Panel response: No, I think a prudent engineer would say that if a 14-mile segment is chosen, we want to work with the community to make an impact study at least, because the system would eventually have to pass through there. As far as parking is concerned, we'll try to make parking available wherever we can but, obviously, in the very crowded downtown areas parking would be very difficult. So we'll try to capture all the riders by making it as complete as possible, but the location dictates what we can do for that station.

For example, in Chicago, they have 152 transit stations; in Chicago they have 2000 parking spaces at those 152 stations. At BART they have 24 transit stations. They have 20,000 parking spaces serving those 24 stations.

Moderator: I know we can go on and on, but the time has come. I want to thank the speakers for coming here to enlighten us on the subject of transit and I want to thank all of you in showing your high interest in coming to this convention. Thank you very much.

OPENING REMARKS

Clinton T. Tanimura

Let's begin our second phase of our seminar.

Good morning. Let me review for you the announcements I made yesterday that are applicable today.

First of all, don't forget to validate your parking tickets.

The luncheon program will be held, again, in the Molokai Room. Please don't forget to bring your lunch tickets with you, for they will be collected at the table.

Please check for your messages on the message board, out in the lobby.

And, finally, please hold your questions for the question and answer period.

Before going on to the program, I want to thank Kazu Hayashida and his staff for the excellent cooperation we received from the City during the planning stages of this seminar. I also want to express my appreciation to all of yesterday's participants for a most thought-provoking session.

At this time, I have the great pleasure of introducing to you Dr. Andrew Hamer of the Georgia State University, who will lead the presentation of the HART Review Team.

INTRODUCTION OF HART REVIEW TEAM

Andrew Hamer

In the name of the HART Review Team, I'd like to welcome you to this second day of the conference. Instead of lengthy introductions of the speakers, I'd like to take this time segment to discuss some general themes running through our presentations today.

This conference is unusual in that it allows for an examination of the received work of consultants proposing a rail rapid transit solution to the urban transportation problems of the particular areas in Honolulu. To my knowledge, such an exploration before the fact has occurred nowhere else in the United States, from the days of BART more than a decade and a half ago in San Francisco to the upcoming referendum on a rail transit plan in Miami this March. You might wonder how useful such a review can be. After all we are neither local residents nor employees of any segment of the transit industry. We have had to work under tight time and money constraints that prevented the undertaking of large-scale studies similar to the multimillion-dollar efforts of the HART consultants. That has forced us to rely on existing local documents and our own previous research in preparing our remarks for today. As an example of the constraints we

faced, I can cite our effort in trying to get behind the HART operating and maintenance cost figures provided in the consultants' summary report. Unfortunately, it was impossible to obtain the methodology used by them in creating that data. All we know out of the last few days is that the numbers in the report should be raised by about 26 percent to take into account inflation since the plan was made public. Otherwise, we are looking at numbers coming out of a black box, and that type of thing has occurred to us.

In trying to do this type of work, I hope you understand there are limits to the amount of information that we are likely to provide you. On a lighter vein, we have no colorful brochures, no slide shows to entertain you with, so it's likely to be a bit dull. Finally, you may find us stumbling over some of the place names in Honolulu. Let me apologize in advance for any goofs in that regard. I myself will go to my grave without being able to pronounce "Kalanianaole" without hesitating.

In spite of these limitations, I believe we can make a useful contribution. Past planning efforts in other cities suggest all too many cases where reliance on transit industry consultants led to a series of unpleasant surprises a few years later. Over and over again options have gone unexamined or have been looked at in only a cursory fashion. Repeatedly, potential local critics outside of the transit industry found themselves handicapped by a lack of knowledge of what questions to ask and what parallels to point to elsewhere. What was needed in those urban areas was some help in pinpointing the strengths, the weaknesses, and the uncertainties associated with technical reports which are both difficult to read and yet indispensable in making legitimate the decision to build a rail network. That is what we hope to do today. Ideally, we will leave you some sort of tentative framework for starting that process that will take you close to a surprise-free environment as is possible in matters of this kind. Then, of course, the decision is totally in your hands and you will commit yourselves to a course with eyes wide open, something that people elsewhere cannot claim to have done.

You're all probably aware—either from reading newspaper exchanges, or by looking at limited circulation papers prepared by other recent visitors—that the effort we are undertaking here has created some strong emotions. Raising questions about HART has proved to be a hazardous occupation. Some of you, perhaps, have copies of and read this morning's newspaper that contained an anonymous quote from one of yesterday's participants to the effect that we know nothing or very little about transit. I was tempted to put that one up on the locker room bulletin board the way coaches do before a football game. Instead, I recall the story about the emperor's invisible clothes and the nonexpert who made the discovery he was nude.

I hope that for a day or two we can operate on the assumption that people can reach different conclusions because they ask different questions and because they interpret data in different ways.

To illustrate the consequences of dragging the subject of ignorance or ulterior motives into the discussion, let me refer you quickly to an incident I uncovered years ago when I was looking at the decision being made in Washington at that time to build a rail rapid transit system. At a congressional hearing in 1963 an exchange took place between a Representative who favored the building of Washington's METRO system and a member of a regional organization bold enough to wonder out loud about some of the conclusions reached in the technical work done at the time. The exchange went as follows:

Congressman: Are you acquainted with the groups that were used by the transportation agency?

Answer: Yes, sir.

Congressman: Are they reputable, experienced people in the field?

Answer: Reasonably so; yes, sir.

Congressman: You mean there are better?

Answer: Oh, I think they are reputable; yes, sir.

Congressman: Now, if errors were made, they were made by professional, reputable people?

Answer: Yes, professional, reputable people.

And the give-and-take continued until the potential critic was left with a choice of accusing the consultants of fraud or keeping his mouth shut. He kept his mouth shut, and the metropolitan area lost an opportunity to begin a dialogue that would uncover some of the planning problems that are causing monumental headaches in the nation's capital today. The results of intimidation, in other words, are very unhealthy.

And what is the fuss all about? If I could anticipate some of today's speakers and at least anticipate my own remarks, I'd say that the HART proposal starts with a bus system that is operated with rather limited regard for the possibilities of the vehicle. The consultants recommend a costly option without first testing out whether some intermediate step, such as an express bus network operated with true priority access to roads and city streets, might not prove a more effective way to use your tax dollars. If at some future date such an option proves to be inadequate, the irretrievable portion of the investment made in a bus option would be small. The same cannot be said for the HART proposal. In fact, the premature commitment to rail could prove to be rail's own worst enemy. It is not inconceivable that, for the lack of caution, you could get a stump of a rail system with all of the utility of an amusement park contraption simply because you oversold the public and suffered from the subsequent backlash. By avoiding intermediate transit solutions, Honolulu may end up by accomplishing few of its original transportation planning objectives.

That's just a very personal opinion. I was warned, by the way, not to give you a rational opinion or lecture to you or something that professors have a tendency to want to do. I'm just saying that after years of hearing one point of view, it probably is time to hear a slightly different point of view. And I think that's what sets the framework of some of the things that we'll be doing today.

Let me conclude that by saying that if you have questions for the morning participants, we will try and fit questions in before lunch so you won't have to wait until the end of the day to ask the questions.

The first speaker is Ken Train, who is the Senior Economist for the consulting firm in Berkeley, Cambridge Systematics. He's a graduate of Harvard University and the University of California at Berkeley. He worked on a project to forecast demand in the San Francisco Bay Area, funded by the National Science Foundation. He's done research in choice of mode travel, household choices of the number and types of automobiles they own, and other such factors. He's currently doing research in telecommunications and energy, as well as in transportation.

Dr. Train will make some remarks about the problems involved in trying to build models to forecast patronage projection. Later on this afternoon, Dr. John Kain, in his summation, will make some further remarks, specifically referring to doubts concerning the size of the patronage projections in the Honolulu area.

EXPLORING THE HART PATRONAGE PROJECTIONS

Kenneth Train

On the table where you came in, there was a pile of papers that were handouts that we should have on this talk. Most of what I'm going to be talking about today relates to that handout, so it'd be very useful to get hold of a copy.

It was mentioned several times yesterday that the rapid rail transit system was recently built in the San Francisco Bay Area. This system is called the Bay Area Rapid Transit, or BART for short.

While BART was being built, I was working on a project at the University of California at Berkeley. Our objective at the project was to evaluate some forecasting methods that were being used to forecast BART demand; that is, our objective was to evaluate some ways in which we could predict the number of people who would take BART. Our objective involved three tasks. First, with information available only *before* BART was built, we predicted the number of people that would take BART. Our second task was, *after* BART was built, to observe the number of people who actually did take BART. We compared the number that we predicted to the number that we observed after BART was built and found that we had greatly overpredicted BART usage; that is, we predicted that many more people would take BART than actually did. So our third task was to discover the reasons for this overprediction.

We tried to find out why it was that we forecasted so many people to take BART, when many fewer indeed actually took BART.

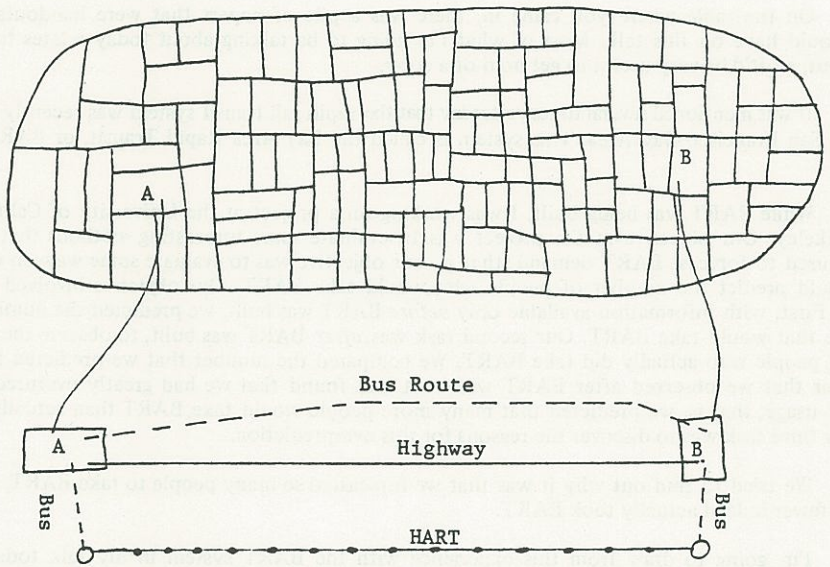
I'm going to draw from this experience with the BART system in my talk today. In particular, I'm going to relate, insofar as possible, my experience in predicting BART usage to the demand forecasts that have been produced for the Honolulu system. First, I'm going to give a brief description of how the forecasts were obtained for the Honolulu system. Next, I'm going to show you the forecasts that I obtained for the BART system and how those forecasts were off. And, third, and this is the most important part of my talk, I'm going to discuss the reasons that we overpredicted BART usage in San Francisco. And I'm going to try to relate those reasons to Honolulu. I'm going to try, insofar as possible, to determine whether similar problems could be existing with the HART forecast; whether similar problems could cause overprediction for the HART system.

I want to emphasize right here at the beginning, though, that San Francisco and Honolulu are two different cities. Any parallels that I draw between the two areas can only be taken as indications of potential problems. If we find that problems that we had with the BART forecast in San Francisco seem to be problems with the HART forecast here in Honolulu, that should not be taken as evidence that the HART forecasts were too high. It should only be taken as evidence that these are areas that need to be looked at again, that, perhaps, Honolulu, to avoid the same problems that we had with BART, should look at these problems and reevaluate its HART forecast. With that caveat, I'll go on.

Exhibit 1 on your handout gives a very schematic description of how the forecasts for HART were calculated. First of all, the entire Honolulu area was divided into many small areas. These were called zones. This is what the picture is supposed to represent: the whole area broken into lots of little areas or zones.

Exhibit 1

Honolulu area:



Step 1: Forecast the number of people living in zones A and B, the number of people working in zones A and B, the number of shopping opportunities in zones A and B, and so on.

Step 2: Forecast the number of trips taken between zones A and B.

Step 3: Forecast how many of the trips taken between zones A and B will be by auto, how many by bus, and how many by rail.

Step 4: Forecast how many trips will be taken on each segment of the highway, bus, and rail systems.

The forecasting method that was used can be most easily understood by considering only two of these regions. For purposes of illustration, I've labeled one of them A and one of them B, and then brought those down to the middle of the page. So, let's suppose, now, with zones A and B, there are three ways one can travel between those two zones. One can go on the highway by auto, which is represented between A and B, or one could go along the bus route, which is the dotted line between A and B, or one could go along the HART route. Going along HART entails taking a bus from zone A to the HART station, taking the HART train to the station nearest zone B, and then taking the bus back into zone B. The question is: how many trips will be taken on each of these modes? That is, how many trips will be taken on highway, how many on bus, and, most importantly for our situation, how many on HART?

There are four steps that are involved in determining these numbers. Now, I want you to understand the reason I'm going through these four steps is so that you will, later on in my

talk, be able to understand why it is that some of the problems we had with BART also could be occurring in the HART forecast. And, as a result, I'm only giving that information which is important to be able to understand the later points. The actual forecasting method that was used is far more complicated than these described four steps. But for my purposes, four steps are sufficient.

So what was done to get the forecast? First, we forecast what's going to happen in zones A and B in terms of employment, population, land use, the number of cars in each household—those things. That's step one. To do this, we have to forecast each of these numbers with each of the two zones. How is this done? This is done primarily through observing trends in the past. In other words, we observe how population has grown in these zones in the past and observe or continue this trend into the future. So, if population has been growing at a certain rate in the past, generally, the method that is used is to continue this trend into the future. The same is done with employment and with the number of cars the households own. All the variables need to be forecast for what's happening in zones A and B.

There are adjustments that can be made to this pure trending method. For instance, if it's known that a shopping center is going to be built in a certain area, then the employment or the shopping opportunities in that area are not simply those that are the growth that was used in the past, but this extra amount of shopping due to the known quantity of a shopping center. So when we know that certain things are going to change the growth rate, those are incorporated into the forecast. So that's step one. Step one is to determine what's happening in zones A and B in terms of employment, shopping opportunities—everything.

The next step in forecasting demand is to forecast the total number of trips between A and B; that is, the total number of trips by any of the methods—by auto, bus, or HART. How is this done? This is done by looking at two things. First, we look at the things that make people want to take trips or need to take trips between zones A and B; that is, we look at the shopping opportunities that are available in each of the zones; we look at the employment opportunities that are available in each zone. And, by observing these, we can observe the opportunities or the needs or wants to go from one zone to the other.

For instance, if there are many shopping opportunities in zone A, then there will be a lot of people who will want to go from zone B to zone A to go shopping. Similarly, if there are lots of employment opportunities in zone A, there'll probably be quite a few people who need to go from zone B to zone A to get to work, if they work in zone A. So that's one thing to look at. The other thing to look at, however, is the difficulty of traveling between zones A and B. If zones A and B are very close, then there's fairly very easy traffic. If they are fairly far apart or the highway routes between them are quite circuitous and hard to travel, then the difficulty is greater for traveling between zones A and B.

So, when we determine the number of trips that are taken between zones A and B, we look at these two counteracting effects. One is the number of opportunities for the needs for people who travel between the two zones. And the other thing is the difficulty of traveling between the two zones. As the needs to travel go up, the number of trips will go up. But as the difficulty goes up, the number of trips would go down. So these two effects are playing against each other to determine the number of people, the number of trips that will be taken between the two zones.

The third step is to divide the trips that are taken between the two zones among the various modes. Step two, we forecast the total number of trips that were taken between zones A and B. Now, step three is to determine how many of those trips were taken by bus, how many of those trips were taken along the highway route by auto, and how many, importantly, were taken

by HART. How is this done? This is done by determining the difficulty of traveling along each of those routes. That is, we determine the difficulty in traveling by bus between zones A and B, the difficulty of traveling by highway between zones A and B, and the difficulty of traveling by HART between zones A and B. To get these difficulty measures, we look at the time, primarily, that it takes to travel on each of these routes. For instance, the bus—we look at the amount of time it takes a person who lives in zone A to walk to the bus station. And we look at the amount of time that it takes for him to wait for the bus to come, the amount of time it takes him to ride on the bus, and then the amount of time that it takes after he gets off the bus to walk to the place he's going in zone B. So all these factors go into determining how difficult it is to travel along the bus route.

Similarly for HART, what we look at here is the time that it takes to walk to the bus station that will take a person to HART, then the time that it takes to wait for that bus, the time that it takes to travel on that bus to the HART station, the time that it takes to transfer at the HART station, the time that it takes to go along the HART route to the stop, and so on. We look at all of these measures, at the amount of time that it takes and, with these, calculate the difficulty in traveling between zones A and B.

Once we have the difficulty of traveling between each of the zones, A and B, each of the different modes, we can determine how many people will take each of the modes. For instance, if it's very easy to take HART between zones A and B but very difficult to take the bus, then many of the people will take HART. Similarly, if it's very easy to take the bus and difficult to take HART, and moderately difficult to drive because of congestion, then many people will take the bus. So this third step is to divide the total number of people traveling between zones A and B among those that will take the bus, highway, and HART. And that's done, based on the difficulty of travel between these two zones.

So, now, the last step is to determine how many people that take each of the modes will go from each segment of the systems. In the third step, what we did was to determine how many people would take HART, for instance. Now, the fourth step is to determine how many people will take HART between each of its stations. When we're only considering two zones, zones A and B, then the number of people who travel between zones A and B on HART will be equal to the number that travel between each of the stations that connect A and B. But when we start looking at a lot of different zone pairs, then it becomes more complicated. So the fourth task becomes to determine how many people will take each of the transit systems between each stop of the HART system and between each stop of the bus system.

These four steps are accomplished for each pair of zones. As I've described here, it's been done for only zones A and B. For each zone in the Honolulu area and each pair of zones, these four steps are followed through. So this will give us, after we've done this, all pairs of zones for the Honolulu area. The number of people who will go from each segment of the HART system will also tell us the number of people who will go in each of the segments of the bus system and the highway system. But we're concerned at this point with the HART forecast. Like I said before, demand forecasting method is more complicated than these four steps. It involves hundreds of establishments. But for the purposes of our discussion today, these four steps were sufficient.

Now, using this methodology, what forecasts were actually obtained for HART? In Exhibit 2—I'll read out the forecasts which were obtained for a 14-mile version of HART for the year 1995. As you know, the forecasts were obtained for different years and for different lengths of the proposed system. This is the forecast which was obtained for only the 14-mile system for the year 1995. As you can see, over 300,000 daily trips are predicted for the fixed guideway, that is, for the HART system, itself. Three hundred thousand trips will be taken a day. In addi-

tion to this, over 500,000 trips are predicted for the bus system which supports HART. That's the combination of both the local and express buses. These are the gross figures, the total numbers that will take the HART system. On the bottom portion of Exhibit 2, I give the predictions that were obtained for the number of trips that would be taken between each station for HART. As you can see, between Halawa and Pearl Harbor, it was predicted that over 54,000 people would travel on that segment of the system a day. Looking down the row of numbers, you see that the heaviest demand is predicted for the segment between Fort Street and the civic center. That has practically 152,000 trips per day on that segment of the system.

So, now, we've seen how the HART forecasts were made in a very general way, and we've seen slightly some of the information about what the HART forecasts were. Now, we're going to turn to the forecasts that we obtained for BART at the University of California.

Exhibit 2

Forecasts of 1995 Transit System Ridership with a 14–Mile Fixed Guideway

	Average daily trips
Fixed guideway	306,900
Local bus	386,600
Express bus	141,000

Source: Table 3–3 of PEEP II final report.

	Average daily trips on each segment
Halawa	54,200
Pearl Harbor	62,600
Airport	64,300
Keehi Lagoon	72,400
Kalihi	109,000
Liliha	130,200
Fort Street	151,800
Civic Center	150,000
Ward Avenue	149,200
Ala Moana	137,100
Waikiki	95,600
Moiliili	89,900
University	79,900
Sixth Avenue	70,000
Koko Head	55,000
Kahala	

Source: Table 2–2.C of *Patronage & Revenue Estimates,* PEEP II technical report.

At the University of California, we developed a mode choice model for workers in the San Francisco Bay Area. That is, we developed a methodology which would tell you whether a particular worker would take auto, bus, or BART to work. So our model, our methodology, dealt with only one of the steps that was outlined on the first page. That is, we developed a method for doing step three. That is, given a total number of trips that are taken, we developed a method that would tell you how many of these trips would be taken on bus, how many on auto, how many on the rail system which, in San Francisco, was BART. Also, our methodology

was only developed for workers, not all people. So we only dealt with work trips. These are the two restrictions in our methodology, and it should be very clear that when I'm talking about the forecast that we had gotten we were only dealing with a very small segment of an entire forecasting methodology. But, I think, even though we were only dealing with a small segment of demand forecasting, some of the conclusions that we came to can be relevant to the Honolulu system, since this small segment is a part of the entire forecasting methodology that's used here.

What we did was to build our methodology on the basis of information that was available only *before* BART was built. With this methodology, we forecasted the number of people by the number of workers that would take BART *after* BART was built. Then we observed the number of workers who actually took BART once it was opened for service. By comparing the predicted proportion of workers with the actual proportion of workers, we could determine how well our method worked.

In Exhibit 3 of your handout, I give you the shares that we predicted and the shares that we actually observed for the San Francisco area for workers. This is at the top portion of Exhibit 3. We predicted that 74 percent of the workers would take auto, a little less than 14 percent would take bus, and a little more than 12 percent would take the rapid rail transit system called BART. This is how we predicted it.

Exhibit 3

Percent of Workers Who Take Each Mode to Work

	Predicted	*Actual*
Auto	74.1	81.1
Bus	13.6	12.1
BART	12.3	6.8

Reasons for Overprediction of BART Usage

1. Many planned feeder bus routes were never actually added.
2. People dislike walking long distances more than we had considered.
3. We did not account for the fact that BART service was fairly unreliable, particularly during the early stages of operation.
4. Auto access to BART was more difficult than we had considered.

The next column tells you the number of people who actually took BART, the number of workers who actually took each of the modes. As you see, 81 percent actually took auto, compared to our 74 percent that we predicted. Twelve percent took bus, and less than 7 percent took BART.

Looking at the BART forecast, the predicted versus the actual, it's very clear that we overpredicted tremendously. In fact, we predicted that 80 percent more people would take BART than actually did. So the question becomes, What did we do wrong? How is it that our BART forecasts were so off? And, furthermore, are these reasons perhaps applicable to the Honolulu forecast?

We explored many reasons for our mispredictions, and there are many possible reasons that could be devised for our predictions being off. Of all the possible reasons that we explored, we found that four seemed to be very important.

The first reason that we found to be important for our overpredictions is that many feeder bus routes that had been planned for the Bay Area had never been actually implemented. As you recall, when the number of trips taken on each mode is devised on step three on the forecasting methodology, the way that we do it is to determine the difficulty of travel on each mode. Let's go back to Exhibit 1 of the handout. Suppose a worker is taking a trip from zone A to zone B, and we want to measure the difficulty of that trip along the BART system. Let's consider this now to be San Francisco. Instead of HART, we have the BART system. The way we measure that difficulty, as I said, is to measure the amount of time it takes to walk to a bus, the amount of time it takes to wait for a bus, the amount of time it takes to go on the bus to the BART system, etc. Now, suppose, though, that this bus did not exist, that connects zone A to BART. Then the person would have to walk all the way to the BART station. Well, the difficulty of going by BART is measured as the difficulty of going by bus to the BART station, the difficulty of riding BART, and the difficulty of going by bus from BART to zone B. Now, suppose that there were buses that connected BART to zones A and B and instead the worker had to walk to and from BART. If this were the case, the difficulty of taking BART would be much greater than if the feeder buses existed.

So, as you see, we calculated the difficulty for taking BART between each pair of zones based on the idea that all these feeder buses that were planned would be implemented. It turned out that these were not implemented. It turned out that many of the feeder buses which the planners thought would be put into operation were indeed not put into operation. Consequently, the difficulty of traveling on BART was far greater than what we had anticipated in our model. As a result, since we underpredicted the difficulty and since we thought the difficulty of traveling on BART was less than it actually was, we predicted that more people would take BART than actually did. This is one of the problems that we had with our BART forecasts.

Is this a problem with the HART forecasts? Could this same problem occur in Honolulu? It's hard to know, but it perhaps can. The HART forecasts were based on the assumption that new buses would be added to make access to HART easier. There was the assumption that more buses would be added to existing routes and new routes would be added to make access to HART easier.

For example, if we look at the 14-mile fixed guideway as being one of the alternatives in the year 1995, it was predicted that 580 buses would be required to supplement the fixed guideway system. In forecasting the HART usage, it was assumed these 580 buses would actually be in operation. To give you an idea of how many buses this is, currently there are about 380 buses in operation, including those that are in operation at any one time, plus the extras that are needed for breakdowns that occur, and things like that. The 580 figure also includes those that are required that would take care of breakdowns. So, currently, we have about 380 buses. The plan is that 580 will be implemented by 1995. The forecast is based on this.

It might be the case that all of these 580 buses will be in operation by 1995. There's going to be tremendous growth in the number of buses that are in operation in the Honolulu area. And, as I understand, the number of buses that are in operation now is going to go up very soon—I think in the next 18 months. And so it might be that these 580 buses will be in operation. If they are not in operation, however, the same problem will occur here as it occurred in San Francisco. There will be an overprediction of the number of people that take HART. It will be harder to get to HART than planned. Consequently, fewer people will take it.

The second reason we overpredicted BART usage is that we did not account for the fact that people really dislike walking for more than ten minutes. When we calculated the difficulty of taking BART, we had to include a term representing the difficulty of walking to the BART station or the difficulty of walking to the bus stop which would take you to BART. When we calculated this difficulty, we assumed that the difficulty of walking was related to the amount of time that was spent walking as represented in Figure 1 of Exhibit 4 of your handout. What we did was assume that the difficulty of walking was related linearly to the walk time. That is, the farther you walk, the difficulty of walking becomes greater. But it's a gradual increase. The difficulty of walking becomes gradually greater as you gradually walk more. This assumption implied that walking 12 minutes was twice as difficult as walking six minutes.

What turned out, I think, was that this assumption was incorrect. A person who worked on our project, Antti Talvitie, explored the question of the difficulty of walking in great detail. He found that the true relation or a relation that is more true than the one that we assumed is that the relation is like that in Figure 2 of Exhibit 4. What he found is that at ten minutes, people really start to dislike walking. People walk for ten minutes, but beyond ten minutes, it's really a hassle; and they don't enjoy it at all. And so the difficulty of walking over ten minutes is much greater than what we estimated. Put simply, people just don't like walking over ten minutes. If a person walks 12 minutes, that's much worse, much more than twice as bad as walking six minutes.

We did not take this into consideration when we made our forecasts for BART. As a result, all of the workers who lived more than ten minutes away from their BART station or ten minutes away walking from a bus that would take them to BART, we calculated the difficulty of taking BART to be less than it actually was. Since taking BART was less difficult in our calculations than it actually was, we predicted more people would take BART than actually did.

This is not a small problem. Perhaps the difference in Figures 1 and 2 seem unimportant —you know, mathematical relation is not very important. But it turned out to be extremely important. We predicted 12 times as many people would take BART by walking to BART than actually did. In fact, very few workers walked to BART. Less than 1 percent of the workers chose to go to work by BART by walking to BART.

This problem could cause more problems with the forecast for Honolulu. And the reason for this is that the difficulty of walking to the buses that would take the persons to HART was based on a figure like Figure 1 for the Honolulu forecast. That is, for the HART forecast, the assumption was made that the difficulty of walking increases gradually with the amount of time spent walking. No assumption was made that walking more than ten minutes is extremely difficult and people really dislike it. So the HART forecasts were based on the same assumption that we had with the BART forecast. Consequently, the same problem could arise with the HART forecast as we had with the BART forecast.

It turned out that, in using this assumption, quite a few people were predicted access to HART by walking. Of those people that are entering and leaving a 14-mile HART system during 1995 p.m. peak hour—this is the 1995 forecast for peak hour for a 14-mile system—the forecast showed that 44 percent of the people will gain access to the system by walking. If the actual number of people who are willing to walk to HART is lower than that, then predictions for HART would be too high. This is a problem that needs to be looked into. It might turn out that the true relation for Honolulu is different than the true relation for San Francisco. It might turn out here that people don't mind walking over ten minutes. I don't know. But this is a problem we had in San Francisco. It could be a problem here.

Exhibit 4

Figure 1

The Relationship Between the Difficulty of Walking and Time Spent Walking as Assumed by our Model

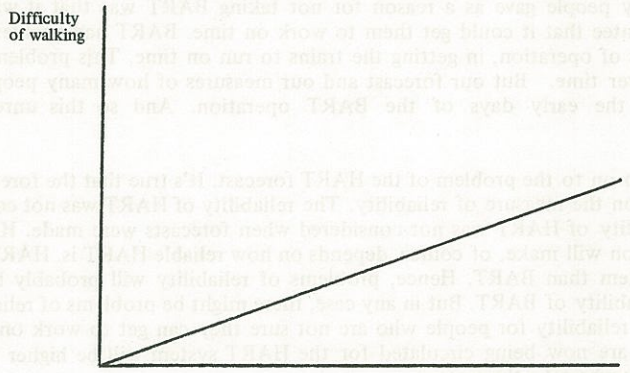
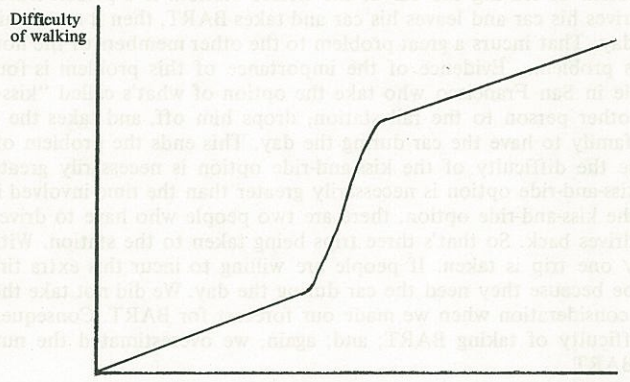


Figure 2

The True Relation Between the Difficulty of Walking and Time Spent Walking



The third problem that we found that caused our mispredictions in BART usage was the fact that we did not account in our forecasts for the unreliability of BART. In measuring the difficulty of taking any particular mode, the time that it takes to take that mode is only one consideration. Reliability is another consideration. This is particularly important for workers

who need to get to work on time, and if they don't they'll get docked or perhaps get fired. So reliability of the system is extremely important.

Our measures of the difficulty of taking BART did not incorporate a measure of its reliability. However, in examining questionnaires sent to people after BART was built—we sent them a questionnaire asking them whether they take BART, and, if they don't take BART, why don't they; if they do take BART, why they do. We examined those questionnaires and found that many people gave as a reason for not taking BART was that it was unreliable. It could not guarantee that it could get them to work on time. BART had problems, particularly in its early days of operation, in getting the trains to run on time. This problem has decreased tremendously over time. But our forecast and our measures of how many people took BART were taken at the early days of the BART operation. And so this unreliability factor was important.

We'll skip on to the problem of the HART forecast. It's true that the forecasts for HART were not based on the measure of reliability. The reliability of HART was not considered or the predicted reliability of HART was not considered when forecasts were made. How much of an error this omission will make, of course, depends on how reliable HART is. HART is a much less complicated system than BART. Hence, problems of reliability will probably be less than the problems of reliability of BART. But in any case, there might be problems of reliability. If there are problems of reliability for people who are not sure they can get to work on time, then the predictions that are now being circulated for the HART system will be higher than the actual number of people who take the system.

The fourth and final major reason that we overpredicted BART usage is that we did not analyze closely enough the difficulty for auto access to BART. In determining the difficulty of access to BART by auto, we considered the time that it takes a person to drive to BART, the time that it takes to find a parking place, the cost of driving to BART, etc. And we did not consider the problem of leaving the car at the BART station. If a person leaves his car at the BART station, drives his car and leaves his car and takes BART, then it means his family cannot have the car all day. That incurs a great problem to the other members of the household. We did not consider this problem. Evidence of the importance of this problem is found in the large number of people in San Francisco who take the option of what's called "kiss-and-ride." One person drives another person to the rail station, drops him off, and takes the car back home. That allows the family to have the car during the day. This ends the problem of leaving the car at BART because the difficulty of the kiss-and-ride option is necessarily greater, or the time involved in the kiss-and-ride option is necessarily greater than the time involved in the park-and-ride option. In the kiss-and-ride option, there are two people who have to drive to the station, and one person drives back. So that's three trips being taken to the station. With the park-and-ride option, only one trip is taken. If people are willing to incur this extra time going to the station, it must be because they need the car during the day. We did not take these problems of auto access into consideration when we made our forecast for BART. Consequently, we underestimated the difficulty of taking BART; and, again, we overestimated the number of people that would take BART.

It is not clear whether this would be a problem with the HART forecast. The HART forecasts were based on the assumption that people get access to HART either by walking or by bus. As I understand it from the documentations, except for rare cases, it's not clear how the access by walking and by bus was made. But it is clear that access by auto was not considered in getting the forecast for the HART demand.

After the HART demand forecasts were obtained, the number of people accessing the system by auto was calculated with a certain proportion of the total number accessing the sys-

tem. But in getting the forecast for HART itself, as I understand from the documentation, no consideration was taken of people accessing HART through auto. Since auto access was not considered, it's hard to know what would happen if it were considered. For BART, we misestimated the difficulty. In Honolulu, we didn't even consider it. I'm not sure whether that would cause an underestimation of the number of people who would take HART or an overestimation. But it's a problem, since we had it in San Francisco. It is a problem that needs to be looked into. And when it's looked into, hopefully, the difficulty of accessing by auto will be correctly specified. And the difficulty of leaving a car at the station and the difficulty of the kiss-and-ride option will both be correctly measured.

So those are the four major reasons we overpredicted the number of people who would take BART. I give them in the hope that the same mistakes won't be made twice. The same problems might be haunting the HART forecasts, for the reasons I have given you. If they do, then you can expect that the HART forecasts will be too high. In San Francisco, these problems produced a major share of the 80 percent overprediction that we got. The same overprediction, the same degree, might be occurring to the HART forecast. It's hard to know. But in any case, it's something that needs to be looked into and a second look given to the HART forecast.

Andrew Hamer: The next speaker is Dr. Ted Keeler of the University of California at Berkeley. He is a fellow at Harvard/MIT Joint Center for Urban Studies, received his doctorate in economics at MIT. He served as a consultant to the White House Council on International Policy, and the United States Senate Subcommittee on Administrative Practices and Procedures on airline regulatory reform. He was the principal investigator for the "Comparative Cost Study for Bay Area Transportation Mode," funded by the National Science Foundation. He has done considerable investigation in the area of transportation economics, is well respected in the field; and I'm glad to have him here.

COMPARING TRANSIT COSTS: DOES RAIL MAKE SENSE?

Theodore Keeler

At the outset, I must reiterate what Professor Hamer said at the beginning. My research experience relates to the mainland cities mostly, especially in the San Francisco Bay Area, and I cannot claim detailed knowledge of Honolulu. Nevertheless, I believe that there may be something here to learn from our research on the mainland, at Berkeley and elsewhere, about the comparative costs of rail and other modes of urban transportation.

In this presentation, there are basically four topics which I should cover. First, it is appropriate to summarize the intermodal cost comparisons which have been made in recent years and the results of these studies. Second, such cost comparisons have recently been attacked by various transport planners who questioned their usefulness as planning tools. I shall therefore discuss what intermodal cost comparisons can and cannot do. Although such comparisons do not solve all planning problems, I believe they are, nevertheless, considerably more useful and illuminating than some recent speakers here would have us believe. Third, I shall discuss the relevance of the results of the previously mentioned cost studies to the current situation in Hawaii, and I'd like to compare some of our relative cost estimates with similar cost estimates made by various consultants, especially DMJM [Daniel, Mann, Johnson and Mendenhall] for Honolulu. Although there are indeed differences between both cities and the studies, I believe that such a comparison can, nevertheless, be revealing in several respects. Fourth, and finally,

I would like to discuss briefly the difficulty often cited in connection with the bus alternative for Honolulu, the problem of inadequate bus street space, and the cost of dealing with it less expensively than the seven-mile busway. I shall touch on this only briefly, giving way to Professor Small's presentation in which he will cover the bus alternative in more detail. So let us consider three recent intermodal cost comparisons and the results that they find.

The pioneering study of this area was done in 1965 by Professors Meyer and Kain of Harvard, who will be speaking later today, and by Professor Wohl, now of Carnegie-Mellon University. In it, they compared all labor, capital, and fuel costs connected with providing auto, bus, and fixed-rail transportation for urban areas of various densities. Although Meyer, Kain, and Wohl did not take quantitative account of service quality differences such as frequency and convenience, they, nevertheless, attempted to standardize for service quality across modes. And they noted that, if anything, in their cost comparisons, bus had superior service characteristics to rail, with integrated feeder service and greater frequency given the smaller service unit. Their conclusions indicated that it is only in the largest and highest density cities such as Chicago that building a new fixed-rail facility might make sense from the viewpoint of minimum cost transportation. For medium density cities such as Pittsburgh and Detroit, Meyer, Kain, and Wohl found the bus to be distinctly superior to rail in cost characteristic for commuter trips.

After Meyer, Kain, and Wohl, the next important comparison of urban transportation cost was done by the Institute for Defense Analysis (IDA) group—Boyd, Asher, and Waxler—who compared bus and rail costs for a typical large U.S. city. Their study differed from that of Meyer, Kain, and Wohl, mainly in that it included the cost of travel time and also in that it optimized the transit service quality, traded off the value of waiting time against the cost of the increasing transit frequency, be it rail or bus. The IDA study was similar to that of Meyer, Kain, and Wohl in that it found bus strongly dominates rail in terms of cost for most situations. But, unlike Meyer, Kain, and Wohl, its calculations took quantitative account of the relative convenience of accessibility of each mode.

Finally, in 1975, yet another comparative cost study was completed, based on evidence from the San Francisco Bay Area. This study, *The Comparative Cost Study for Bay Area Transportation Mode,* was done by various researchers at Berkeley, including Professors Pozdena and Small, who are speaking here today also, and myself. The study based all its analysis on data it selected from the San Francisco Bay Area for local freeways, buses, and rail, the last, of course, being BART. This study included all types of costs included in the previous two studies, *plus* some additional ones, including pollution costs (to health, agriculture, and so on) and accident costs for each mode. Furthermore, it included the private auto in the comparison, and determined just how high auto user charges should be if roads were to be priced and invested optimally.

Regarding bus and rail transportation, the 1975 Bay Area cost study arrived at conclusions consistent with the previous two studies in that it, as well, found that for a medium-density city or a metropolitan area such as the San Francisco Bay Area, bus dominates rail in terms of cost. But, remember, these costs are considerably more widely defined, though the study arrived basically at the same conclusion.

Before considering the relevance of these studies to the case of Honolulu, it is worthwhile to comment briefly on certain criticisms which have been leveled against these cost comparisons, both here and elsewhere. Although I find it difficult to trace a thread of logic through these criticisms, I believe they can be represented as follows: cost studies are much too narrow for transport planning purposes because they do not allow for qualitative differences among the modes, involving subjective amenities such as comfort and convenience, as well as social and

environmental effects. Although intermodal cost comparisons cannot do everything, they can do more than such an evaluation would imply.

Conceptually, those studies which include valuable travel time (be it walking and waiting as described by Dr. Train) take full account of the relative convenience and comfort of each mode. To see this, consider what we mean by value of time. It is the amount which a traveler will be willing to pay to avoid an hour (or a minute or whatever) of a travel activity. The less pleasant the activity, the higher the value of the time in doing it. So it is that walking time is much costlier than in-vehicle time. Similarly, most travelers find some modes (such as motorcycles) sufficiently uncomfortable that they pay higher monetary costs for other modes, even given the same travel time, to avoid using that mode. This is equivalent to saying that the value of time traveling by motorcycle is prohibitively high for most people. On the other hand, there is little, if any, evidence that people are willing to pay more to avoid an hour of on-bus travel than an hour of in-train travel. Thus, it is hard to find scientific evidence of a subjective preference for rail travel so often cited by planners. And there is one serious convenience *disadvantage* that rail with feeder bus has relative to integrated bus—that is a transfer wait between the two modes which bus can avoid in a large portion of cases.

Professor Pozdena will be talking later about the extent to which the existing consultants, in fact, concluded correctly in these considerations. The point here is that, conceptually, the comfort and convenience of each mode can be accounted for in a cost comparison, provided that time costs are measured accurately. And Professor Train has talked briefly about the difficulty of doing that.

Similarly, as previously stated, our analysis has incorporated the environmental costs of pollution and the costs of accidents. In the cases of travel-time costs, pollution costs, and accident costs, it is obvious that they are not measured with complete accuracy. But if critics would challenge our conclusions, they should not throw all attempts at objectivity and logic out the window, claiming that purported knowledge of the "real world" is a substitute for analytical models. There's much to be said for knowing about the real world. But there is also much to be said about the need for analytical thinking about these problems. Rather, these critics should be precise in their comments, showing just where our models are wrong, and showing logically how plausible changes in assumptions would significantly affect our results. Although I have heard a number of criticisms of our intermodal cost comparisons, I have heard practically none which make sense analytically in the way that I have described. At this point, you might well ask what does all this have to do with Honolulu. That is the topic which we consider next.

Recall that all previous three studies cited indicate that, except in the very highest density cities, bus is less expensive than rail. And yet in its 1976 alternative study, DMJM rejected two bus alternatives as less economically desirable than fixed guideway. This conclusion is supported in companion studies by two other consulting firms.

The reasons behind this rejection of the bus alternative are basically two: first, with buses on existing downtown streets, there is not sufficient capacity to meet anticipated demand by 1995. And, second, if a grade-separated, seven-mile busway were built to accommodate these extra buses through central Honolulu, bus costs would be higher than fixed guideway, and there will be secondary benefits in that case that would make the fixed guideway favorable as well.

We consider first the conclusion that bus, with a partial provision of a separate right-of-way, is costlier than a fixed guideway. It could very well be that DMJM is right, and that special circumstances relating to Honolulu, the busway, and the fixed guideway system tend to give the guideway an advantage.

It is possible, for example, that though Honolulu is smaller than such cities as Chicago in population, its density is sufficiently high for reasons of geography to make rail preferable. To shed light on this, let us return to Meyer, Kain, and Wohl's results regarding the effects of density of settlement on comparative modal costs. Are Honolulu's densities high enough to make rail a viable alternative to bus by Meyer, Kain, and Wohl's calculations? A direct comparison of density between Honolulu and Chicago would at least be useful to shed some light on this.

The concept used by Meyer and his group to measure density of settlement is net residential density, the population per square mile of land devoted exclusively to residential purposes (excluding streets, stores, vacant lots, agricultural land, and so on).

Net residential densities in Chicago are very high, ranging from 200,000 people per square mile in the middle of the central business district (CBD) to just over 20,000, eighteen miles on either side of the CBD, except, of course, for Lake Michigan. Thus, a city well-suited for fixed-rail cost-wise, would have intensive settlement over a wide area. The specific numbers, of course, will change from city to city.

What is the Honolulu metropolitan area's net residential density? By my calculations (and confirmed independently by the calculations of Professor Webber, who will speak later) it is 17,000 per square mile (remember, this excludes nonresidential land). This is the *average* for Honolulu, but it's lower than the figure for 18 miles out from the Chicago CBD, to say nothing about the 200,000 figure for Chicago's core. There are, of course, variations for Honolulu, variations which we do not have the data to measure accurately. Nevertheless, it is difficult to believe that Honolulu has densities anywhere near the highest ones observed in Chicago, and even if there is some high density settlement, it cannot be extensive enough to arrive at a low average of 17,000 and still be comfortable in any way order of magnitude to that observed in a city such as Chicago. Also, it is difficult to believe that even the most optimistic of demand forecasts would give Honolulu such a density and, even if they did, there may be some reason to question whether the residents of this island *want* such densities.

It is safe to say, then, that it is not because Honolulu has densities high enough to justify fixed-rail transit as seen by Meyer, Kain, and Wohl's criteria that fixed guideway did so well relative to bus in DMJM's comparisons.

It is still possible that there are other differences that would actually make fixed guideway transportation more attractive in reality than rail on the mainland. But it is at least worth considering the possibility that the consultant's reports are overoptimistic about fixed guideway costs relative to bus.

Lack of both needed data and time prevents a thorough analysis of this possibility, but it is still possible to do a spot-check comparison of some of DMJM's figures for Honolulu with our own equivalent measures for the San Francisco Bay Area. Even with considerable differences between the areas and transit systems, the cost figures should at least be of the same order of magnitude.

Let us first consider some of the bus cost figures. Based on 1995 operating levels, the 1976 DMJM alternative study projects a total bus operating cost (both on and off the separate right-of-way with the guideway system) of about $40 million per year (excluding the cost of maintaining the busway itself). This estimate is based on prices for late 1974 and early 1975. Using DMJM's estimate of 1975 bus miles and bus hours, plus the bus cost equation developed by Fisher and Viton for the comparative costs study for Bay Area transportation modes, I calculate that a Honolulu all-bus transit system in 1995 will have an annual operating cost of about $30 million. Thus, the projected bus system cost is roughly one third greater than the

cost equation from our transportation cost study would project. This is a reasonable difference given that there was significant inflation from 1972, the year of our equation, to 1975, and, furthermore, wages and other costs in Hawaii should be expected to be higher than those of the San Francisco Bay Area. Thus, though it is impossible to verify the bus cost estimates with any great degree of accuracy, one can nevertheless say that they look "reasonable," if somewhat on the high side. The estimated purchase cost of $65,000 for a new bus (40 feet long) compares with an equivalent figure of $42,000 in 1972 prices for the *Comparative Costs Study*. Although the DMJM figure may seem somewhat high, it is not out of line, given a reasonable variation in bus costs, and given the inflation which occurred between 1972 and 1975.

Let us now consider the fixed guideway estimates made by the DMJM alternatives report. Again, based on 1974–75 prices, the DMJM report suggests the total operating cost by 1995 of $13.2 million for the 14-mile system, approximately $.683 per vehicle mile. On the other hand, BART's maintenance and operating costs in 1972 prices (but based on the highest expected BART vehicle utilization rate, estimated by Professor Leonard Merewitz) would be $1.12 per vehicle-mile with the same vehicle-mile per route-mile as for the planned Honolulu fixed guideway line. Thus, the estimated expected operating cost for the fixed guideway are only 60 percent of those for BART. There are several reasons why this might be plausible. First, the planned fixed guideway vehicles are indeed smaller and lighter than BART cars. Thus, a BART car seats 72, whereas the proposed fixed guideway vehicle seats 36. But is it realistic to expect cost to fall anywhere near proportionately, given that each car has separate wheels, motor, and so on? Furthermore, even if the proposed fixed guideway cars could cut cost per vehicle-mile proportionately with car length, the DMJM estimates for guideway operations do not allow for the one third extra margin over our 1972 cost for inflation and regional cost differences that its bus estimates allow. One potential objection to this comparison, incidentally, is that the BART figures are based on early 1972–73 operating cost experiences, when BART had serious start-up problems. This is not a valid criticism, for, again, we have based our estimates of BART operating costs on long-term projections of the highest anticipated levels of utilization and operation. In any event, the proposed HART system isn't anything technologically more adventurous than BART, for, in addition to automatic train control and automated fare collection, it proposes a form of tire and guideway never before used in a U.S. urban transit system of a major city. The mere fact that many high costs are connected with start-ups only does not mean that they should be ignored. BART, for example, continues to be plagued from what I see in the papers with start-up difficulties six years after it first went into service.

Consider now the *construction* costs of the proposed fixed guideway system for Honolulu. It is presumptuous, perhaps, to compare these costs with those of BART, given the differences in geography and the more complicated tunnel used by BART as explained yesterday for a short distance in downtown San Francisco. Nevertheless, it is worth seeing if the two systems have at least roughly equivalent costs, for there are a few similarities. First, both systems face somewhat challenging terrain and seismological considerations. Furthermore, the proposed 14-mile system has a 1.7-mile tunnel proposed, slightly over 10% of the route mileage, whereas BART is somewhat below 10%, excluding the transbay tube (which we shall exclude from the comparison completely). The point here is that, even if BART's tunnels are more complicated, there are fewer of them at least for the cost that we'll be comparing. As for differences in construction costs, I do not have access to an appropriate construction cost index for the two cities, but research done by the staff of the First Hawaiian Bank suggests construction cost as much as 30 percent greater in Honolulu than in the San Francisco Bay Area. This suggests that, if anything, the cost per route-mile of the fixed guideway system could be expected to be higher than the cost for BART. One should also expect the DMJM cost estimates for HART to be higher than those experienced for BART as estimated by us, because our figures are again in 1972 prices, whereas DMJM's are for 1974–75, and the intervening period was one of high inflation.

With these considerations in mind, we note that DMJM's construction cost estimates for the 14-mile HART system as of 1975 were $347 million, or $24.8 million per route-mile. This compares with $24.7 million for BART, excluding the transbay tube, in 1972 prices. These numbers are remarkably close, but they make no allowance for the 1972–75 inflation or the higher cost in Hawaii. It is impossible to be certain, of course, but there are nevertheless reasons to believe that DMJM's estimates of construction costs for the HART system could be over-optimistic.

Let us now consider the other bus alternative mentioned by DMJM, that of using downtown streets for buses. The main objection that DMJM gives to this is that there simply is not enough capacity there to meet projected demand. Professor Small will consider in more detail alternative methods of dealing with this matter, and I shall mention them only briefly. It is possible, for example, to turn buses around before they go through the CBD and/or perhaps building bus terminals to avoid buses clogging the streets.

For the sake of argument, however, let us consider the worst case alternative, the case in which demand might necessitate running all buses right through the CBD with several stops like the proposed trains. Even here, there would appear to be a cheaper way of accommodating the traffic than building a fixed guideway system. That is the possibility of a downtown bus tunnel, fed not by an above-ground busway, but by adjacent streets beyond the areas of tight congestion. I must emphasize that I am not in a position to determine the best location or for detailed feasibility of such a proposal, but it might be worth studying, for even such a worst case scenario would cost far less than even the shortest proposed guideway system.

It has been suggested by DMJM and Vorhees Associates in a 1973 study that the bus tunnel portion of the busway system considered, complete with three underground bus stations, could cost $56 million plus 23 percent in engineering and configurations, for a total of $69 million. While that is not cheap, it is far less expensive than the proposed guideway system. The latter, in 1974–75 prices was predicted to run between $410 and $712 million in total capital costs, depending on length. Again, these are 74-75 prices, it has to be remembered. This is considerably more than the bus tunnel figure, even allowing for inflation between 1972–73, and 74–75. Furthermore, even adding on cost of improvements to highways for buses elsewhere as suggested in the TSM plan and bus equipment and operating costs, I still calculate that this worst cast scenario is cheaper on a passenger-trip basis than the shortest guideway system, roughly by somewhere around 20 percent. I hesitate to use that figure because I have to note that DMJM's published figures are not adequate to make calculations such as these. And, in spots, I had to guess what they were doing to make them. So that 20 percent figure is extremely rough.

Incidentally, Professor Small will be talking about the trade-off between capital and operating costs and the extent to which higher bus operating costs offset the capital cost of the proposed fixed guideway system.

The purpose of my mention of the bus tunnel is not to propose that it be built so much as to show that there should be ways of meeting the most optimistic of DMJM's projected travel demands without the much higher expenses of either a full busway or a fixed guideway system. And all these conclusions are based on DMJM's figures, the best I could do with, which could be overoptimistic toward the fixed guideway in the first place.

In conclusion, there is some evidence that, when the least cost alternatives are considered, bus might emerge as more economical than fixed guideway in Honolulu, as it has in other similar-sized cities elsewhere in the United States.

Andrew Hamer: Our next speaker is Ken Small, who is an economics advisor at Princeton University. Ken received a doctorate in economics at the University of California at Berkeley, where he specialized, among other things, in transportation economics. He has written an evaluation of short-run policies for the use of urban expressways, including reserved lanes, carpool priority measures, and other methods to control congestion. He has spent several of the last days physically counting lanes all over the City. And, I think, he, probably more than the rest of us, has finally figured out the pronunciations of various streets and highways. So I'm anxious to hear his remarks.

RAPID BUS STRATEGIES: THE UNTRIED OPTION

Kenneth A. Small

It remains to be seen whether I will be willing to tackle the full name of the Kal corridor.

It hardly needs saying that it's a great pleasure to be in Honolulu working in what must be one of the most delightful cities an urban economist could be asked to come and study. I'd also like to say that I'm honored by the trust that's being placed on the thoughts and advice of myself and the members of the review panel. I've certainly come to realize in the few days I've been here that there are a lot of things that I don't know about Honolulu than there are of which I do know. But what I'd like to do is to offer you some thoughts taken largely from experience studying transit in other cities and then to try to indicate how I think they might be applicable to this particular city.

One of the alternatives to the Honolulu Area Rapid Transit, or HART, fixed guideway proposal is a low capital cost system of local and express buses running on existing highways. At least three recent consultants' reports have investigated this option and found it wanting. And what I would like to do is to review the entire question of how feasible and how desirable such a system of rapid bus transit might be for the Honolulu area.

Bus transit in Honolulu has already begun to take advantage of extensive Transportation Systems Management or, in the planning jargon, TSM, techniques, apparently with a high degree of success. Express buses operate on exclusive bus and carpool lanes on portions of the H–1 and H–2 Freeways and the Moanalua Freeway and also on the Kalanianaole Highway. The city street system includes a contra-flow of bus lane on Kalakaua Avenue. At least partly due to these innovations, I'm sure the average daily patronage on the MTL system has doubled from 1972–73 fiscal year to the present, far surpassing the levels preceding the strike of the early 1970's. Furthermore, the City and County of Honolulu has recognized wisely, I think, the desirability of extending these TSM measures for utilizing as efficiently as possible the existing facilities whether or not this is supplemented with a full-fledged rapid transit system. A plan was outlined back in 1975 called the "Short-Range Bus Plan for Oahu," and it is currently being implemented. This includes the median busway on the Kal Highway, exclusive lanes on the Pali Highway and H–1, and the extension of the exclusive lanes on the Moanalua Freeway; also, a number of bus lanes and signal preemption devices on major city streets.

Now, a great deal of experience has begun to be accumulated with Transportation Systems Management techniques throughout the United States. This is amply documented in a number of places, but what I'd like to do is to kind of give you from an economist's point of view what the underlying justifications for these kinds of priority measures are. And it's really quite simple.

First, for a given mode split (and the modes I'm talking about are the bus and auto), it's more efficient under congested highway conditions to allocate a little extra road space to those vehicles which carry more passengers per amount of road space used. And, second, as is well known, by improving the bus service characteristics relative to auto, you can expect to attract some patronage from auto to bus. And for a number of reasons which I don't think I have to get into, there are social benefits from doing that.

So, having spoken briefly about priority measures for buses, let me make some observations in general on urban transit which I think will be helpful in making a realistic comparison between systems, between all-bus systems on the one hand and a fixed guideway with feeder buses on the other. And the three areas I'd like to talk about are costs, transfers, and congestion.

Dr. Keeler has already discussed costs in some detail. And the point I'd simply like to bring out in this discussion is the following: that when you're talking about the cost of these two systems, you're talking about a quite different pattern of cost over time. You're trading off a very large capital expense for the fixed guideway system against operating expenses down the road, year after year, which at least by consultants' calculations would be greater with the bus system. We all face situations every day where you have to make trade-offs like this. When you're deciding whether to put insulation in your house, you're deciding whether to make the big decision now to save and pay fewer bills down the road. And the decision is one that requires a fair amount of sophistication. Probably, in an insulation question, perhaps I'm in the wrong city to be really using this as an analogy, but before the oil embargo most people in the northern parts of the mainland were finding that it did not pay to put insulation in their houses. After the oil embargo when the year-by-year operating costs of heating a house went up quite a lot, it's become much more favorable.

Which system is costlier depends on trading off its initial cost with the operating maintenance cost. And that is a problem, a technical problem, that is dealt with by economists and investment analysts, and the consultants are quite competent to do and have done. It is done by a procedure called discounting, which I won't try to give you the details of, but, basically, what it does is, it puts the future cost on an equivalent basis with the present cost, taking into account the compound interest phenomena which represents the alternative ways, the benefits of the alternative ways that you could use that initial money. Those comparisons were made for a HART system and an all-bus system in the DMJM's alternatives analysis. The results depend on how long you expect the projects to live, on the interest rate that you assume for this compounding factor using their central range of interest rate of 7 percent, which, I think, is pretty reasonable. Their figures for the cost of the two systems in 1975 come to just under $600 million for the HART system and just under $300 million for the bus system. These are the summary figures which are widely accepted in the profession as being an accurate way to portray cost, to summarize costs which take place over different amounts of time. So, by this criterion, HART is twice as expensive as bus. Professor Keeler has given us some reason to wonder whether it may be more than that. But I would simply like to point out that the question that I think must be answered is "What are you getting for this extra expense?"

While I'm on the subject of cost, I'd like to tackle one other issue, and that's the idea that you'd better build HART quickly, because the cost is going to go up $50 or $60 million every year you wait. First of all, that $50 or $60 million includes the federal share, and, yet, HART is being sold largely on the basis of the local share. If you take the local share of that $50 or $60 million inflation increase, it looks a lot less. But, besides that, that procedure ignores the opportunity cost of this investment, that is, if you put it off for five years, ten years, or twenty years, the expenditure out on the construction of HART, that's money that can be used elsewhere. It can be saved on taxes and used by private citizens, or it can be used in public policies, of which I understand there are a number of large capital investments on

the horizon for Hawaii that I'm sure are going to constrain the capital budget by a considerable amount. What I had in mind are water supply treatment and solving the waste problem, in particular. In addition, it may well be that the federal share itself is not entirely lost by waiting. In fact, at least one thing is clear in that the increase in cost for HART due to inflation will definitely be covered by the 80 percent federal sharing if the planning is put off, whereas, there has been some discussion yesterday about to what extent the federal government would help to cover the inflationary increases, in addition to the plan that's approved now.

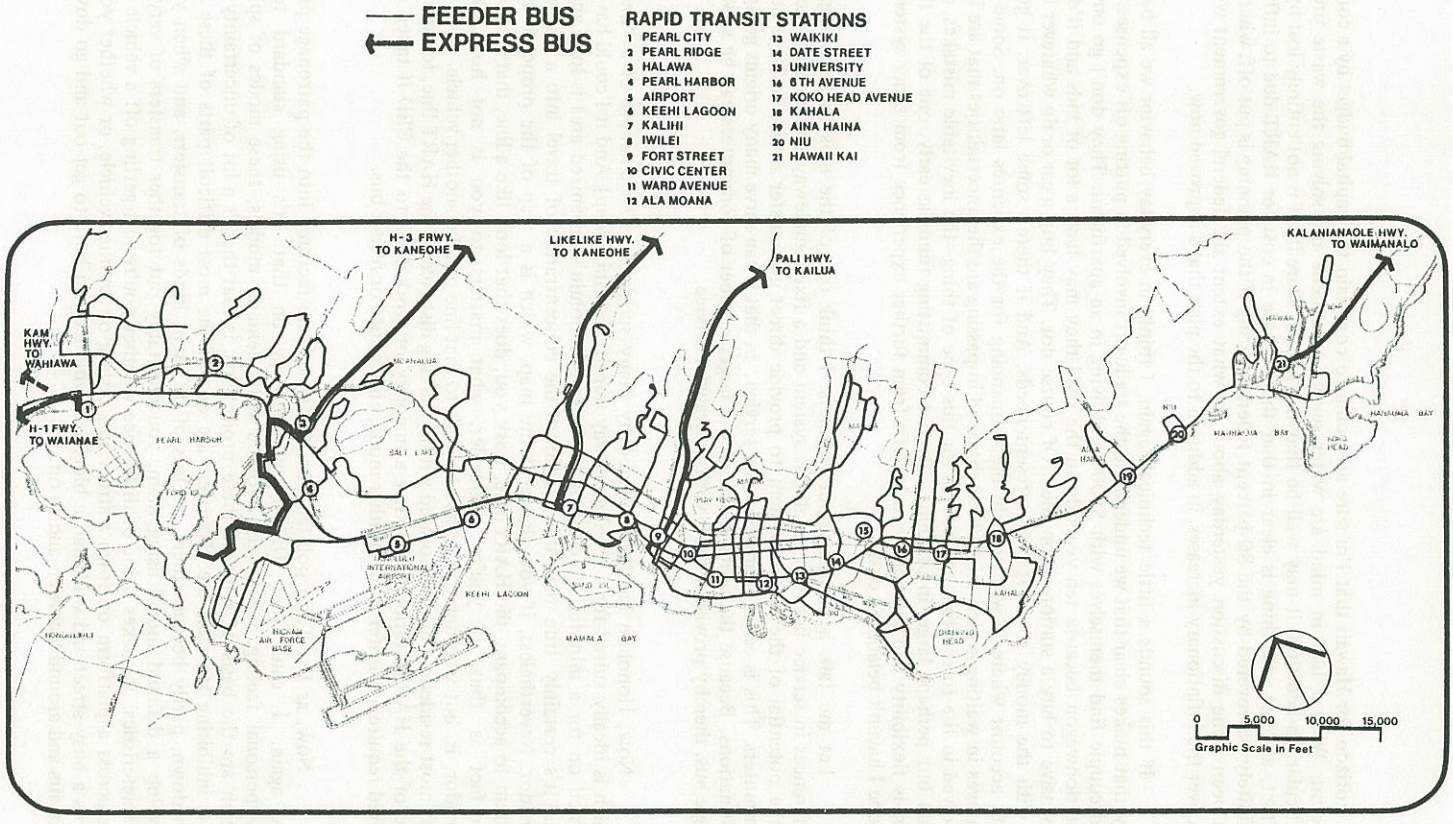
If this sounds a little technical, again, I think, in everyday behavior we all behave in a way that makes clear that we understand the trade-off involved in putting off expenses. A newly-wed couple find themselves with $5000 and living in an apartment. They don't go out and buy a stationwagon because ten years down the road they may have a lot of kids and it'd be more expensive to buy a stationwagon then. Of course not. They buy a car or do whatever they want to with the money to meet their present needs. And if there's some left over, it goes into a bank account where it will provide them financing for the expenses later on. Some other advantages in waiting which might be mentioned in passing are the uncertainties that are inherently involved in the forecasting procedures for this type of thing—the inevitable mistakes, one hopes small but perhaps large, in planning. By not committing funds as early, one of the things you gain is flexibility and the ability to benefit from further experience from other systems. Okay, I hope I haven't belabored cost.

Let me talk a minute about transfers. I think one of the most outstanding, intrinsic differences in service between an all-bus system and a fixed guideway system with feeder buses is the potential of the all-bus system to provide direct no-transfer service to large numbers of commuters. This is called many-to-many service, in that it can serve many origins going to many destinations. Because the units are smaller, a larger number of commuters can be served with a single bus, thereby providing them with no-transfer service.

Now, Honolulu has been offered by many speakers as an example of a "linear city" which is ideally suited for a fixed guideway transit. [Exhibit—Map] And if I could have the map turned on for a minute, it's certainly true that Honolulu's urbanized area is long and narrow. And it's certainly true that this facilitates the concentration of travel into a single-line wall corridor. Nevertheless, if you glance at the map, which is a map of the proposed feeder bus system to accompany the HART line, I ask you, does that look like a line, that is, a single line? The fact is that, if you're a traveler, what matters to you is not how narrow the corridor is, but whether you've got to walk to that line or take another vehicle. And the fact is that most residences are not located within walking distance of the HART line, to say nothing of one of the HART stations, and that a majority of work trips to the CBD if taken on HART would require a transfer from another mode, either auto or feeder bus.

Now, as Dr. Train pointed out, transfers were factored into the patronage projections; and, again, I can't fault DMJM's methodology on that. It's using standard techniques. My personal feeling, having also worked with demand models, these modes of split models which are the basis of a lot of these projections, is that there's a lot of uncertainty still as to how inhibiting transfers are. Transfers are one of the most difficult parts of these models to pin down, partly because there are lots of different kinds of transfers, and when you try to develop a demand model using them, you inevitably put together transfers of very different characteristics. It makes a lot of difference whether you're just getting off a vehicle and walking across a platform or down a street and getting on another vehicle, or whether you have to cross a busy street and walk half a block, or whether you have to get out and go down a flight of stairs and around a corner, and so on.

Urban Feeder Bus Network Map
1995 RECOMMENDED TRANSIT NETWORK



Source: *Honolulu Rapid Transit System, Preliminary Engineering & Evaluation Program, Phase II, Final Report,* November 1976, Figure 3–6, Feeder Bus Network, pages 3–15.

It's difficult to say whether all this means that the inhibiting factor of transfers on patronage was correctly taken into account by DMJM. I can only offer my personal judgment that present demand models probably do not accurately take into account the inhibiting effects of transfers on patronage. And I think that the many-to-many service potential of buses has very important advantages that ought to be weighed against whatever disadvantages are believed to accompany buses.

Now, let me talk a minute about congestion. One of the great disappointments of mass transit systems, either bus or fixed guideway, stems from the mistaken hope that, by attracting auto traffic to transit, the problems of congestion, air pollution, and noise will be greatly reduced. Experience in other cities have shown this not to be the case. And I think the reasons are not difficult to understand. The reason is that we tend to think of these things in terms of a fixed number of peak-period trips being taken. And the question is just what modes they'll be taken on. This, again, is standard methodology for forecasting but, in fact, it's well-known by people who really look at urban travel patterns not to be the case. There's a large reservoir, apparently, of unmet desire to travel by auto during the peak period, a desire which is limited primarily by the degree of congestion. For example, many individuals travel at other than their most preferred times of day in order to avoid peak congestion. So, as congestion is reduced by a new transit system or by expansion of the highway even slightly, individuals who previously took auto trips at other times or shorter auto trips to other places or didn't take auto trips at all now find it advantageous to take auto trips during the peak period, and thereby bring congestion back up to nearly the same level as it was before.

This phenomenon, sometimes called the law of traffic congestion, is so fundamental to understanding a number of things that I think it's worth illustrating. For example, it's fundamental to understanding why it is as the city grows traffic congestion often grows to a point of a barely intolerable level, at which point it stops growing, but instead the peak hour gets longer and longer. This is the so-called shifting peak phenomenon.

Similarly, many newly opened urban highways have been found to become congested within a few years even though it was believed when they were built that they had adequate capacities to handle traffic for a long time. Similarly, newly opened rapid transit lines have failed to substantially reduce the degree of congestion on parallel highways, although they sometimes reduced its duration. And this is borne out in a study performed by PPM, an engineering and consulting firm in the San Francisco Bay Area, in looking at the traffic across the San Francisco –Oakland Bay Bridge shortly after BART opened its transbay service.

That new freeways create their own demand has a considerable grain of truth in it, and a new transit system will not eliminate demand for highways during the peak hour. Only positive restraints on autos, such as auto-free zones, lane restrictions, turning restrictions, parking fee increases, tolls, and so forth, these are the only things that you can really expect to reduce the amount of auto travel.

Now, the import of this consideration for Honolulu Rapid Transit is lost in a travel demand forecasting procedure which takes total peak-period trips as given. As a result, the analysis that was done by consultants of the bus alternative–what they call the TSM alternative–was severely constrained by the belief that reducing the highway capacity available to autos would lead to unbearable congestion. And I quote from the DMJM transit alternatives analysis, "An unbalanced system that improves the transit system at the expense of automobiles would not serve the basic objectives of this plan." This statement was, then, the basis for limiting, for example, the number of curb lanes in the CBD reserved for buses to no more than one on each street. And the impact of this I'll discuss in a minute.

I think the question of whether transit is to be allowed to operate at the expense of auto should be opened to public choice and not built on the assumptions. What I'm suggesting is that the citizens of Honolulu have the opportunity to decide whether they want a system which adds to the total vehicular capacity of existing streets, thereby absorbing the anticipated growth in demand, or whether they want a system which reallocates the existing capacity in a more efficient way, absorbing not only the growth but some current travel as well. Either is a perfectly respectable goal, and I think Dr. Pozdena will discuss the role that cost-benefit analysis can play in helping to choose between those goals. My point here is simply that what the extra expense of HART over and above an express bus system is "buying" for Honolulu is, in a large part, the ability to maintain automobile traffic at essentially its current level.

Let me now turn to the question of feasibility of a system of expressing local buses operating on existing streets, because that is really the factor that led the consultants to severely question, or, to put it bluntly, to reject out of hand, the all-bus alternative.

The Transit Alternatives Analysis by DMJM envisioned a bus system for the bus alternative of 637 buses in 1985, going up to 914 buses in 1995. This is clearly a lot of buses. It's a major extension to the present system. And when they routed those buses through the city, they found several critical locations where the accepted capacity of a single lane to handle buses stopping and starting and loading and unloading passengers (which is about 80 to 120 buses per hour and that's a little less than one bus every 30 seconds) was exceeded by several places, notably on Hotel Street and on the King-Beretania couplet east of Richards Street, where up to 188 buses per hour were found to be needed.

Now, it's useful to bring out several of the key assumptions which underlie the consultants' pessimistic conclusions regarding downtown distribution with an all-bus rapid transit system. First, of course, is the patronage projections, which I'm not going to go into again, except to point out that, of course, if actual patronage turns out to be smaller than projected, then the distribution problems are correspondingly reduced.

Second, as I mentioned, the maximum of one lane was to allow for buses on each street, on the assumption that more would unacceptably reduce the capacity for autos.

Third, Hotel Street, though it was converted to an all-bus street for purposes of the analysis, was limited to two lanes on the assumption that passenger loading and unloading would require 13-foot sidewalks. And, therefore, the capacity of that street was limited to the capacity of a single lane in each direction.

Fourth, no special facilities for loading and unloading passengers had been considered, despite the fact that it is this part of bus operations, not the free flow of moving vehicles, which limits the bus volume which can be handled by City streets. You can send hundreds of buses per hour down a lane of traffic, even with stoplights, if they're not stopping to unload and load passengers.

It seems to me from this that a number of unexplored options are available which offer some hope of relieving the distribution problem. And I'd like to offer them, here, not as definitive solutions with all the details worked out that I can say will work, but as a "shopping list" of measures which I think offer considerable promise. Which, if any, Honolulu might want to choose would depend on a detailed study on updated patronage estimates and on some of the basic decisions about how much automobile traffic you want.

The first two suggestions I'd like to make relate specifically to the DMJM alternatives analysis. First of all, the obvious way to relieve the Hotel Street congestion is to route some of

the buses along, King, Beretania, Queen, and Halekauwila Streets, all of which are within easy walking distance of most of the downtown destinations. Another possibility is to keep Hotel Street closer to its present width, marking it with three lanes in a configuration such as was used in the Nicolett Mall in Minneapolis, which has stopped bus stops on opposite sides of the streets so that a continuous lane can carry buses in each direction around the bus stops; so that the stopped buses can be bypassed; thereby considerably increasing the capacity of a single lane. The success of this, I should mention, would hinge on being able to design bus stops so as to channel the pedestrian traffic on a relatively narrow sidewalk, say at eight and-a-half feet on each side if three 11-foot lanes were provided in the street.

A third possibility would be to use more than one lane for bus traffic at critical points. This is not necessarily to mean removing two full lanes from automobile use. There are a number of measures that can be used to squeeze lanes to merge some turning traffic with buses and so forth, and the CBD of Honolulu has a number of very wide streets where I think such measures are quite feasible.

And additional possibility which Dr. Keeler mentioned is to redesign bus routes so that not all of them can travel through this CBD, so that some of them come to the edge, turn around, and go back. If most peak-period trips have the CBD as their destination, then many of these trips could be accommodated by leaving people on the edge. There is an even more elaborate proposal which I really haven't thought about and I almost hesitate to mention, would be some kind of "people-mover" system within the CBD to handle that part of it.

Getting back to buses, if Honolulu is willing to consider some more expensive solutions but still at very moderate capital expense compared to the HART system, I can think of at least three possibilities. One which I think is very attractive would simply be the construction of off-street bus terminal facilities. As I mentioned, it's the loading and unloading which is the inhibiting factor in the CBD. Bus terminals would eliminate this problem. And I think there are a number of sites where there are existing parking garages which conceivably could have their first floor partially converted into a system such as the municipal garage on Hotel and Richards streets. Alternatively, at a greater expense, the terminals could be underground if that were found to be necessary. And the earlier Voorhees analysis of the busway system that Professor Keeler mentioned did include an estimate for the construction cost of three underground terminals, which was $36 million in 1972.

Second, it appeared to me that there are a number of potential sites where very modest street improvements could be made which would permit streets such as Queen Street, which is in the heart of the most rapidly growing area of the CBD, to carry much larger bus volumes than it can now by facilitating the routes for buses to get on and off the street.

And the final possibility is the most expensive possibility that I could imagine for solving the CBD distribution problem would be a bus subway, as Dr. Keeler mentioned, with stations through the critical part of the CBD. For example, although the Voorhees analysis costed out a two-way subway with three very large terminals for handling essentially all the CBD-bound passengers, I think a one-way subway going east-bound following approximately the route of the proposed HART subway could relieve a good deal of the problem on the four- and five-lane portions of King Street and, furthermore, free Hotel Street to be made one-way in the other direction. This would allow Hotel and Beretania, which together have a good deal of capacity, to handle the west-bound bus traffic. With three terminals, which were included in the Voorhees cost estimate, such a subway would offer at least as good a distribution as the three proposed HART terminals. And an upper limit on the cost would appear to be the $69 million in 1972 mentioned by Professor Keeler. I offer these as a succession of more expensive proposals, simply to indicate that I think somewhere in that menu is a proposal that would very likely suffice and at a cost of something less than the figures I've just been mentioning.

Now, I've been focusing on the central business district because that appears to be the critical limiting factor on the feasibility of an all-bus transit system. In terms of improving the travel times to the central business district, there are, of course, a number of measures which could be considered on the major incoming corridors, some of which are already in the City and County's plan and some more expensive of which, as you know, are now being considered by the State Department of Transportation.

I want to talk a minute about energy efficiency, air pollution, and noise. Let me just make two points about these.

First of all, in most cases, the differences between bus and rail transit are far less than the differences between either types of transit and autos. Particularly, when you talk about energy efficiency and air pollution, the total effects in Honolulu are going to be determined much more by the success of either of these systems that are attracting auto traffic than on the difference between the systems, themselves.

That, perhaps, does not apply to the noise question. It's rather difficult to compare a single bus with 10 to 15 cars since the timing characteristics of the noise are different. I wouldn't be willing to say that the bus system would be less noisy than the number of cars at these places. But the other issue that I think should be considered here is that when you're comparing HART and a bus system, you have a very comfortable margin of cost to play around with to make improvements in the bus system. And, in particular, paying more for your buses in order to buy some desirable environmental improvements does not raise the cost of buses very much. The capital expense of the buses, themselves, is a surprisingly small portion of the total cost of a bus system. The bulk of it goes into labor expense.

There are new buses available today which have fairly substantially reduced air pollution from the kind that we see now. For example, there is the flexible 870, which is currently meeting the very strict 1977 California bus emission standards. In addition, the question of electric buses, I think, is one that always needs to be looked at. Electric buses have been available from European manufacturers for a while, and one is now being used by an Australian company. Currently, to the best of my knowledge, electric buses cannot go fast enough to really be useful on the express runs, but some of them do appear to offer alternatives for the local service.

So, in summary, on the environmental effects, I think the effects of buses are very real and have no simple solution, though, to a considerable extent, they're dwarfed by the effects of automobile traffic. Current bus technology now offers a limited menu, at least, of options for ameliorating these effects, all at costs well within the margin of differences between bus and HART. Future technology may offer more options, but that remains uncertain.

In conclusion, I've offered a number of reasons why I think an express bus system operating on existing highways may be a more attractive alternative than it would first appear from the analyses done so far. A bus system would cost less. It would provide many-origin-to-many-destination, no-transfer service. While some difficulties would be encountered in the CBD if the system does attract the projected patronage, a number of existing modifications as I suggested seem to me to be possible. Some of these reduce the capacity of downtown streets for automobile traffic, others involve additional capital expense.

Which of these options, if any, is best for Honolulu is not up to me to say. I do hope that I've been able to put them out on a table where I believe they can and should be subjected to the same kind of thorough analysis as the various other alternatives, an analysis which I think is well warranted before a bus alternative is rejected as being unsatisfactory for Honolulu.

Andrew Hamer: Our next speaker is Randy Pozdena, a professor of Mills College in Oakland, California, with a doctorate in transportation economics from the University of California, Berkeley. He's been a consulting economist with the transportation center at the Stanford Research Institute and was appointed by Governor Brown of California to the State Transportation Plan Task Force. His latest work, "User Benefits Analysis for Highway and Transit Improvements," will be published this year by an agency of the National Academy of Science.

THE USES AND MISUSES OF COST-BENEFIT ANALYSIS

Randall Pozdena

I've got to say I'm enjoying my stay in Honolulu. My research obligations here haven't enabled me to enjoy very much of your sun and surf. So I'm looking forward to getting a tan from these lights.

When I was doing my research prior to coming to Hawaii, I ran across a book published by Stephan Greene Press [D. Hyman, *The Trenton Pickle Ordinance,* 1976] which purports to have catalogued unusual laws and statutes from the 50 states. Looking ahead, I referred to the book to find that Hawaii has a law on the books making it illegal to stick pennies in the ear. As an economist, I think this is a good law and see in it a relationship to cost-benefit analysis.

The function of cost-benefit analysis is, after all, the avoidance of those public sector errors that, in retrospect, make pennies in the ear seem like sound public policy. There have been many claims and counterclaims made regarding the proposed transit systems. In this confusion, simple, single, graspable numbers like benefit-cost ratios can be helpful.

The consultants to Hawaii have suggested that $2.20 in benefits will accrue for each dollar in costs. I would like to briefly discuss the rationale of cost-benefit analysis and to identify the ways in which it can be used and misused. In this context, I would like to review certain aspects of the cost-benefit analyses behind the fixed guideway transit system recommended to the people of Oahu by their consultants.

I sense in most transit planning studies a reluctance to embrace cost-benefit analysis in a serious way. In the 100-page *PEEP [Preliminary Engineering Evaluation Program] II* final report, I learned a lot about the basaltic geology and the islands' interlayered system of non-marine detritus. One and-a-half pages were devoted to the cost-benefit analysis, with no discussion of the confidence the reader should place in the sketchy estimate presented. This struck me as being not unlike a brain surgeon spending two hours describing the details of an operation and then neglecting to mention the risk to the patient's life. Partly, this attitude appeals to our impressions of the private enterprise sector of our economy where decisions are made, using common sense and sound engineering principles. Private developers on the islands don't seem to agonize for 13 years over their investment decisions. The important difference, of course, between the decision you have to make in a typical private enterprise decision is that, however crude the means in decision-making the private firm employs–gut feeling experience, extrapolation–it is ultimately able to test the success of its policies to the simple profit or loss calculation.

The pressures of the marketplace ultimately pass judgment upon the wisdom of all decisions. In effect, the ultimate cost-benefit analysis is in fact performed in the marketplace. All inefficient contenders are weeded out in a Darwinian fashion. As anything, the freshman economic student knows, as a matter of fact, these profit-motivated decisions ultimately produce socially appropriate decisions as long as there are enough competing firms, and pricing in this marketplace reflect all of the costs of the transaction.

The necessity to perform cost-benefit analysis arises in Honolulu and elsewhere because these ideal conditions do not hold for urban transportation activity. If they did, we could lie back and usefully rely upon the judgments of the private providers of transit service to provide us with the appropriate amount and quality of transit service; and a cost-benefit analysis function would be subsumed in the corporate planning activities. Instead, however, transit finds itself in a position where its major competitor, the automobile, is not, in the consensus of an economist, priced properly and, over the years, the ability of private enterprise in the transit industry to successfully compete in this environment, has declined precipitously.

Economists have pointed out elsewhere that the price paid by users of downtown freeways is not much more than the cost of the cement and a little maintenance. Using analogous pricing rules, building sites on Waikiki Beach should sell for the cost of raking away the sand, a circumstance that would leave the same, long waiting lines of developers that you find on your freeways in the morning with automobiles. The point is, we cannot trust private decisions in this market to yield socially desirable results. It may be very profitable in a private or commercial sense to operate our automobiles on crowded downtown freeways and streets to get to our jobs. But, if the price we paid included charges for the congestion delay we impose upon others, the air pollution and other unpriced effects, this activity may seem rather very wasteful. By contrast, urban transit may have the social or community virtue of reducing the usage of the wasteful automobile mode but the transit operator can't turn this virtue into revenues. So, here, in contrast to the auto, is an activity that is potentially valuable to the community but is uneconomical commercially.

Well, we've long ago resigned ourselves to subsidizing transit, but the function of cost-benefit analysis is to provide investment decision-making rules in this world where narrow profit-and-loss calculations mislead. Cost-benefit analysis should not, thus, be given short shrift in public documents. It is the sole, albeit imperfect, substitute for a host of economic signals produced in normal circumstances by the interaction of consumers and producers. Furthermore, it is the only correction that appears forthcoming for the distortions that exist in the urban transportation marketplace and a bad decision in the realm of public enterprises likely to be lived with for a long time, as those of us who live in San Francisco have come to know.

We should be particularly sure we are right in the first place, that is, particularly attentive to the assumptions and procedures we employ in cost-benefit analysis. If we can't be reasonably certain that we are right, we should take actions that are flexible under uncertainty. To argue the virtues and necessities of cost-benefit analysis is, of course, much easier than actually performing these analyses. I would like now to identify some of the sensitive areas in transit cost-benefit analysis and review portions of the HART cost-benefit analyses in this context.

The first point that I would like to make is that the major potential benefits of any transit project in this city or elsewhere are in a social savings or community savings that occur as a result of reduced automobile usage. Since, as I mentioned, the automobile appears to be severely underpriced in many of its uses, its social costs are greater than the costs paid by you and I, the users. If a transit system can successfully attract you out of your car and on to a socially cheaper system, community savings will result. What are these community savings? The value of reduction in congestion experienced by removing your car from the road, and some

reduction in the forms of pollution that would have been emitted by your car. You, yourself, may even enjoy some private savings of time and money (you must have, or you wouldn't be riding the transit system). But we know that these private savings alone will be insufficient to justify the cost of the transit system. If they were, the transit operator could charge you a little less than the amount that you save, and a profit could be derived solely from fare box revenues. We know that that doesn't work.

Several things should be obvious from this perspective. First, the total volume of patronage forecast for a system is not a good measure of benefits, since it is the automobile diversion estimates that are most critical. With inaccurate estimates of the number of riders drawn from the private automobiles, the biggest chunk of system benefits is inaccurately estimated. Drawing users out of the prior bus system is not as beneficial since the community component or social component per passenger of bus cost is far less than the automobile due to the higher occupancy.

Let's focus for a moment, specifically, on the transportation benefit estimates produced by the consultants to Honolulu in these categories. The ratio of transportation benefits to transportation cost was estimated at 1.9—a very sound investment. However, roughly 85 percent of these forecasted benefits of the 14-mile fixed guideway system depends upon the assumed levels of attraction of former motorists of the system. Almost half of the motorist-related savings, in fact, accrue to people who don't use the system; that is, remain on the roadway, benefiting from reduced congestion and travel time. And, not surprisingly, the benefits resulting from the diversion of previous bus users is only about a third of those resulting from the diversion of previous motorists on a per-rider basis.

Dr. Train has indicated some of the difficulties encountered in performing the HART-like forecast for patronage in a HART-like system earlier this morning. He argues that the modal-split estimates from which the diversion forecast must come are potentially unreliable. I think this is something that all forecasters agree with. They recognize that their science is an imprecise one. The old joke goes that forecasting is very difficult, especially if it's about the future.

But a forecast based on a 1970 origin and destination survey seems particularly unreliable. The patronage estimates used in the cost benefit analysis for HART seems to indicate that 60 percent of this system's patrons would be previous motorists. Coincidentally, the ill-starred San Francisco BART system planners also forecasted a 60 percent diversion rate. Unfortunately, in practice, the diversion rate has been closer to 35 percent, and the aggregate patronage forecasts have been less than expected by 50 percent. I hope that Hawaii does not find its system diverting fewer of a smaller number of patrons from the automobile as we have, because that is where the major benefits of the cummunity lie.

A related problematic area is the valuation of benefits in time and other savings that the system will provide its users. The assignment of values, dollar values, to time savings is a particularly risky process. It must be done, unfortunately. However intangible and qualitative the benefits may seem, the dollars you're spending are real. Recent researchers have improved our understanding of this valuation process. But it is by no means a resolved issue in application, and the sensitivity of the cost-benefit analysis to the assumed valued should be clearly revealed. They were not.

The HART cost-benefit analysis employed updated measures of values to time presented in a paper by a former colleague of mine, Dr. Gordon Thompson of Stanford Research Institute, at a highway research board conference in 1969. Dr. Thompson's research indicated that the value of time assigned should vary with the amount of time a traveler saves as a result of the transit project when doing transit cost-benefit analysis. If the time savings are small (on the order

of five minutes per trip, say), the appropriate value to use for work trips is eight times smaller than the value appropriate to larger time savings with a half hour or more per trip.

The HART analysts, while using and citing this work, used a higher value throughout their evaluation of a trip time benefit saving, in spite of the fact that the trip time saved by diverted peak-period motorists is estimated to be one and-a-half to three minutes per trip on the average. If Thompson's research is correct, this type of error implies a significant overstatement of the value of a major category of benefits. Over one half of the transportation benefits of the 14-mile guideway reported in the *PEEP II* final report are related to time savings. If the values are high, the benefits are high.

Similarly, in the cost-benefit analysis of HART in the alternative study, all components of time saving were treated as equally valuable. If a former motorist, for example, spent 35 minutes commuting by car, and after being attracted to the guideway spends 35 minutes in total time using and waiting for its feeder buses and guideway vehicles, the HART cost-benefit analysis treats this as a draw. In fact, however, 20 years' research indicates that the time spent walking, waiting, and transferring is of greater value to the traveler than time spent in the vehicle by a factor of two or three or more, that is, walking, waiting, and transferring are two or three times more onerous than in-vehicle time.

Since the HART fixed guideway system requires its patrons to transfer to and from buses to complete most trips, the treatment of all types of time as equally valuable overstates the benefits of the reported time savings. Half of the travelers on a 14-mile system will have to change vehicles at least once. And many others will spend time waiting and walking that they used to spend comfortably in their automobiles listening to their radios. Curiously, the patronage estimation discussion in the same report recognizes this time value problem and assigns a value of 2.5, but the cost-benefit analysis ignores it, leading to a potentially significant overstatement of system benefits. Most crucially, perhaps, the cost-benefit analyses count as a benefit to the guideway system all of the automobile operating costs, parking costs, and automobile ownership costs—savings that diverted motorists will experience—to the tune of $50 million per year.

There's a curious logic here that is best revealed, I think, by an example closer to home, literally. Let us say that you currently own your own home. Your monthly mortgage payments are $500 per month. Let us also suppose that you are indifferent between owning your own home and renting a nearby apartment for $300 a month. Why are you indifferent? It's cheaper. Well, it's because the apartment is noisier, less private, and generally less appealing, not unlike transit.

Now, however, the owner of the apartment lowers the rent by $5 a month. You abandon your indifference, pack up the kids, and move in. How much have you saved? What are the benefits? You've saved $5. Compared to your situation before the rent was reduced, you're $5 better off. That's why you moved. You pay less in cash but live in a less attractive home. The net effect is a $5 saving. If you apply the technique used in the alternatives analysis, you are $200 better off—the difference between your mortgage and the rent. Call your home the car, and transit the apartment, then you have precisely the logic of the cost-benefit analysis. Like your house, the automobile is expensive but appealing. Like your apartment, transit is cheaper but not as luxurious,whether it's waiting, crowding, transferring, and lack of privacy.

HART may indeed make the transit ride more enjoyable and attract riders and save them some money, but the cited calculations are overly large by some unknown multiple. This error applies, by the way, to 48 percent of the transportation benefits cited. Obviously, any value chosen by an analyst on a cost-benefit analysis can be debated. But, given the uncertainty of various assumptions and procedures, the cost-benefit analyses that have been performed for the

HART system reveal nothing of their sensitivity to the assumptions made. If, for example, the motorist diversion rates are overstated in a fashion similar to the BART system in San Francisco—something I hope is not true—the ratio of transportation benefits to costs reported in the *PEEP II* final report falls from 1.9 to .9. The economic terms for this is "oops!"

If the value of time used in the analysis is overstated by 30 percent, this ratio is further reduced to about .7. The effect of the overstatement of automobile cost savings and the home–apartment analogy reduced this still further, although, unfortunately, I can't calculate for you the rough degree of that production in the ratio.

Even if all of the assumptions and values employed to calculate the benefits and costs of the fixed guideway proposal were accurate, however, there's a very serious deficiency in the manner in which the analysis comparing alternative to the fixed guideway was conducted.

The first page of the *PEEP II* report suggested that a thorough and complete analysis of alternatives was performed. There're several serious flaws, however, in the way in which the alternatives to the fixed guideway system were treated. First, there seems to have been a tendency to assign the bus alternatives (the so-called "TSM" bus, and the busway alternatives) attributes the virtues of which have not been examined by any apparent cost-benefit analysis. For example, single-corridor route arrangements are employed in examining the busway system which requires users to transfer to and from the busway, a constraint which obscures the multiple origin, multiple destination service advantages of a rapid bus alternative that Dr. Small has pointed out. The busway alternative is forced to be as similar as possible to the guideway system. In some cases, as a matter of fact, the busway alternative is burdened with even more demanding attributes than are placed upon the fixed guideway itself. A portion of four-lane busway is required, for example, because of the need to offer express service as well as local service capacity and to cope with the system reliability problem. The guideway system does not have that constraint imposed upon it. Similarly, acceleration and deceleration lanes are needed, but this is a conclusion that should come out of the cost-benefit analysis, not an assumption of the analysis. These are attributes why deceleration and acceleration lanes might be desirable, but what are their benefits? What are their costs?

In a similar fashion, the base-line bus system is assumed to be configured at a maximum of 450 buses because additional buses would tie up two lanes of street traffic and reduce the capacity available for automobiles. It may be very beneficial to reduce the capacity available for automobiles and replace it with higher capacity transit service. As a matter of fact, the HART system, itself, will require the abandonment of two lanes of freeway and express highway capacity throughout about half of its line.

The high occupancy bus service that already exists in Honolulu appears to have been very successful and attracting former motorists. According to a University of Hawaii study, 70 percent of the Hawaii Kai express bus users used automobiles previously.

The low capital alternatives receive the shortest shrift in the alternatives analysis. The decision to reject the so-called "TSM" bus alternative as a viable option is based on the conclusion that if the TSM bus system attracts the same number of patrons as the fixed rail system, the volume to capacity ratio on City streets will make congestion unbearable. Comparing volume and capacity ratios, particularly without modeling any traffic changes, is not cost-benefit analysis. On this basis, the Golden Gate Bridge in San Francisco has had an unbearable traffic problem for 25 years. Our own analyses in the San Francisco Bay Area indicate that express bus lanes can be cost-beneficial even if the lane is removed from the peak-direction road capacity.

Dr. Small has argued this morning for the potential service advantages of the rapid bus

alternative. Yet, a separate patronage forecast for the nearest approximate to this alternative, the TSM alternative, was never performed. Instead, it's patronage was based on the fixed guideway forecasts or manual derivation. Using estimates based upon the characteristics of a potentially less attractive alternative hardly permits the rapid bus alternative to distinguish itself.

Finally, in the comparison of alternatives, all of the alternatives are evaluated over the same 30-year time period with the same patronage growth over time assumed for each. This seems fair, until you remember that it's going to take seven years to construct the guideway and could take much less for a bus alternative. As a matter of fact, the benefits of the fixed guideway transit system have to be nearly twice as large as they say they are for the guideway just to overcome a five-year difference in start-up time, assuming a 7 percent interest rate.

A final aspect of the HART cost-benefit analysis that should be touched on because of its particular relevance to the Hawaiian situation is the so-called regional income benefits. In the *PEEP II* final report, these benefits were estimated to be $190 million, significant enough to raise the cost-benefit ratio of the 14-mile guideway alternative to 22.2 from 1.9. 1.9 relates strictly to the transportation benefits. These benefits arise because of the joint assumptions that a large fraction of the funds for expenditure on the capital portions of the project is new money to the State and that the expenditure of these funds on fixed guideway construction will draw otherwise unemployed individuals into construction-related employment.

First, receipt of federal funds for transit system development by Hawaii may very well jeopardize its receipt of federal assistance in other areas, such as liquid, solid waste, hospitals, urban renewal, and so on. The legislators attending this seminar are the best judges of this possibility. But if it is the case, then the entire 80 percent federal participation is best not thought of as a net addition to aggregate federal support of the Islands. Also, what happens if the system that you invest in fails to live up to expectations? You can be sure that the federal government will be hard to find and the cost of an auxiliary bus system or whatever reparations are required will be strictly a burden borne by Hawaiians. Also, if this calculation is made, it should be made for all of the alternatives since federal programs exist to provide capital and other assistance to most forms of transit improvement. Further, the high leakage to the mainland economy takes considerable wind out of this effect even if it exists. In fact, temporary increases in income tend to be spent quite a bit differently than normal income. They tend to be spent on consumer durables like TVs, dishwashers, and automobiles that aren't made in the Islands. The television in my hotel room was made in Canada.

Finally, the expectation that a public transit project will have a significant impact upon the employment circumstances on the Islands depends upon a relationship between the expenditures in a business cycle. In the case of our ill-fated system in San Francisco, the expenditures began at a time when unemployment was high; but a regional and national economic expansion tightened the labor markets. BART found itself generating little or no new activity in the construction trades but simply bidding up prices in order to divert the busy labor to BART construction; in effect, BART itself caused part of its now famous cost overrun. The point is that these income effects are real enough, but beware of large numbers.

A further suggestion that has been made in the discussions about HART is that it will promote more orderly development than bus alternatives. This impression seems to derive from reasoning that because New York, Boston, Toronto, Oslo, Stockholm, etc., all have rail transit lines and are densely settled, the rail transit lines placed elsewhere will do the same, and development will be orderly.

The evidence available is not consistent with this claim. In California, for example, it was the suburban land developers who built railways serving suburban counties of San Francisco

in order to sell their land parcels. Even in Los Angeles, the archetype of an auto-dominated and auto-planned city, much of its spoiled form is owed to the early transit system, the Pacific Electric Railway, owned by the Southern Pacific Land Company, and building height codes, as much as it is owed to the automobile.

Contrary to casual impressions, between 1960 and 1970, a greater percentage of metropolitan growth occurred in suburban rings in Boston, Chicago, and New York than in Houston, Los Angeles, and Anaheim, auto-dominated cities. The reasoning here should be clear enough. If a transportation system, any transportation system, is effective at attracting riders, it does so because it makes travel easier. The HART patronage projections, themselves, suggest that even motorists who don't use this system will cut nine minutes off each trip. Many of these motorists will now find it possible and attractive to live farther away, adding to suburban development pressure. Any transportation improvement that improves transportation will do this.

From the standpoint of sprawl, then, we are led to the odd conclusion that the best system for Honolulu's future is the one that attracts the least riders. To cite the cases of cities like Toronto and Stockholm as modern examples of rail transit's effect on land use is to confuse the effects of land use controls on transportation. The city of Stockholm owns most of the land in Stockholm and develops it as it pleases. It places rail transit lines and then constructs new suburbs at their termini. Some, such as Jarfala, are auto-free. This avoids a transportation problem and creates a housing problem. When I lived in Sweden for a year and-a-half in 1968, there was an eight-year waiting list for apartments. This trade-off is behind the tidy facade of many European cities, and you should be cautious of suggestions that this is the way that Honolulu might necessarily go.

I have not attempted to review all of the dimensions of cost-benefit analyses that have been performed for Honolulu. Indeed, much of the analysis is useful. Rather, I have tried to point out several major failings of the work that has been performed for you.

First, the conclusions drawn are highly uncertain. This uncertainty is unrevealed in the analyses and it is not reasonable to ask the taxpayers of Hawaii, in my opinion, to participate in the venture without a further elaboration of these risks.

Second, potentially valuable, perhaps even superior, low-capital alternatives were severely slighted in the analyses, perhaps in a rush to satisfy UMPTA's [Urban Mass Transit Administration] belated requirements for this alternatives analysis, or perhaps in the eagerness to seek the most highly engineered alternative.

Even without further analysis, however, some useful conclusions can be drawn. Under circumstances of uncertainty, a transit alternative that can be changed or abandoned if things don't work out should be preferred. I've mentioned a little of the uncertainty of cost, that each dollar of operating and maintenance costs and capital costs overrun is a hard Hawaiian dollar and offsets the effect of the alluring 20 percent federal dollars. It must be frustrating as policymakers and concerned citizens to have so little firm information or analysis available after so many years of study. As a taxpayer in a region that made an uninformed decision, however, I would much prefer to be in your shoes.

Andrew Hamer: I guess that in spite of all our best efforts, we hit lunchtime; so we're going to have to hold the questions until the end of the afternoon session. Those of us speaking in the afternoon, I being one of them, will speak more quickly or say less things to make sure we get lots of time for questions.

Okay. The luncheon speaker will be Dr. John Meyer, and the lunch will be in the same room as it was yesterday. Thank you.

Luncheon Program

Andrew Hamer: The time has come for the luncheon address, and I'd like to introduce John Meyer. The introduction could go on and on, and I'll mention only a few factors.

He is currently at Harvard University; he has also been at Yale University. He's a former president of the National Bureau of Economic Research, which is a major research organization. He's done consulting work on transportation–most recently, at least to my knowledge, with the World Bank overseas; and he has a fairly good track record in making some observations about transit which I think are probably in order, given yesterday's luncheon speech which suggested that we might come out looking like pointy-headed, ivory tower intellectuals who shouldn't really meddle in these subject matters.

He, along with a couple of his colleagues, predicted what would happen with the San Francisco BART system before it was built and predicted it for the right reasons. He also predicted, in another area of transportation, the collapse of the Penn Central Railroad five years before it happened, and again for the right reasons. He is now director of CON Rail [Consolidated Rail Corporation], which is an organization which is attempting to salvage what is left of one of the major railroad networks in the eastern part of the United States. So, sometimes, I think maybe there is something worth listening to. And on that, I'd like to introduce Dr. John Meyer.

OBSERVATIONS ON THE HONOLULU TRANSIT PLAN

John Meyer

I suppose I should lead off by observing that if one's reward for making an accurate forecast is to come in and pick up the pieces later, one shouldn't be all that accurate in advance. Fortunately, I've had my inaccurate moments too.

My intent, today, is to discuss some of the difficulties commonly encountered in measuring the benefits of public transit investments, really building and extending on many of the comments made this morning. To the extent possible, I will try to relate my remarks to the specifics of your Honolulu situation. However, I should confess in advance that I shall only be partially successful in this effort. In particular, I would point out to you that I would not have the nerve or even the knowledge to volunteer an opinion as to why or why not or whether or whether or not you should proceed with the fixed guideway. I think that's a very complicated issue and one that, in the three days or so I've been here, I've learned a lot about but hardly enough to come to any kind of definitive conclusion. Furthermore, as I dug into this problem, first reading many documents that were sent to me back on the mainland and then coming here with questions that occurred to me on the basis of that reading, it's become clear to me that one question tends to lead to another. And I'm sure I'm far from completing this information-gathering exercise.

Let me illustrate. For example, as I read over the various documents that were passed on to me on the mainland, I saw several different estimates made of the mileage of your initial system. I saw talk of an eight-mile system, a ten-mile, a twelve-mile, and a fourteen-mile system. Indeed, reading these, I came to the conclusion that probably you were most serious

about the eight-mile system. However, when I cam here, I quickly discovered that the main emphasis seemed to be on the 14-mile system, costing approximately $730 million, or estimated to cost that. Now, it's quite clear that it makes a great deal of difference as to what the benefits and the costs will be depending upon just what size system it will be. Learning, by the way, that it'd be a 14-mile system, I managed to get a ride over the prospective right-of-way alignment, or whatever you wish to call it. And this was also a terribly instructive exercise.

As I went out, I learned for the first time that at the two ends of the system, for example, the system would be built at grade level and, in particular, would preempt a couple of existing lanes of expressway or freeway that are now in place. Now, very casually looking at this, I would guess that the elimination of two lanes at the Aloha Stadium end will probably not cause too many problems, but on the other hand, eliminating two lanes near Kahala will almost surely cause problems.

In the same vein, as I went over the alignment, I began to ask questions about what kind of parking would be provided—again, in particular, in Kahala. The answers were perhaps widely distributed mainly because I didn't ask those who knew the answers, although they seemed to be terribly knowledgeable people. There was a suggestion made that possibly a drive-in theater there might provide the parking. Other thoughts were expressed. One thing seems clear: that if it is decided that you need more parking there or if it is decided that you cannot lose those two lanes, the cost estimates may accordingly be modified. In fact, several aspects of the system could be modified under those circumstances.

Another source of uncertainty in the case of one question leading to another is really in the technology area. When I came here, I assumed that you would probably be going ahead with the rubber-tired system. Looking at it, it looked most similar to—in the U.S. equivalence—things that have been done in Morgantown and at the Dallas—Fort Worth Airport. Now, I'm sure that you wouldn't repeat the mistakes of those systems, but one would like to be reassured on that. And one would like more detail. I could, you know, point out somewhat invidiously that if one thought the BART system which used relatively traditional rail technology had some difficulties, Morgantown and Dallas—Fort Worth had many more in the start-up period.

Then, yesterday, I heard some encouraging thoughts in the expressions about imitating the Lindenwood line which indeed is a very conventional technology and has had a very good performance record. It certainly would, I suspect, have an easier start-up, prospectively, than any kind of rubber-tired system, especially one operating on heavy concrete types of supports.

Now, I'm sure there are answers and that one could thrash these out if one had time, but I do point out one thing. The relative start-up times and really the cost associated with delaying and taking a bit more time in investigating an alternative possibility does depend upon which one of these two systems—conventional rail, steel on steel, or rubber tire on concrete—that one might choose. One could also point out that there will be different kinds of trade-offs with these different technologies. For example, the rubber-tired one tends to have higher maintenance costs. Indeed, the first to use rubber-tire in urban transit were the French in the Parisian system, and they subsequently abandoned this because of the high cost.

Another problem that occurs with the rubber-tired system is that you do have heat generation due to extra friction. This has, for example, been something of a problem in the humid summer days in Montreal where they have a French-type system. Now, whether that would be a difficulty here or not I don't know, but one could guess that in your tunnels you might have some difficulties there that one would like to know more about. These are the problems that could easily be solved, but things that need investigation.

Another set of questions that occurred to me as I began—I sort of dug into this thing—really related to those estimates of your operating deficit. Many of the points on this were made this morning. The same kinds of questions occurred to me as they occurred to several of this morning's speakers. At any rate, I wondered as I looked at those forecasts if an all-bus system would give you a $9 million greater operating deficit than a fixed guideway with feeder bus system. Several things occurred there.

First of all, your fixed guideway system operating cost pointed out this morning did seem quite a bit low, running about 60 to 70 percent of the BART cost on a sort of an optimized BART basis. And, on the other hand, the bus cost did seem a bit high, although one could see that Hawaiian operation circumstances, as pointed out again this morning, might justify that increase. But beyond that, if you played with the numbers (unless I did my arithmetic wrongly) it appeared that the average annual operating cost per bus per year in the all-bus system was $88,000, whereas the average annual operating cost per bus per year in the feeder operation in the fixed guideway was $80,000. In other words, there was about a $7000 to $8000 differential there. Now, that's possibly true, although I can as easily, I think, make out an *a priori* argument that one would have the relationship the other way; that there would be a slightly lower annual operating cost in the larger bus system than in the feeder only.

Similarly—and I looked at the revenue estimates as I did the arithmetic—it appeared that there will be about 54 percent of the riders in a reduced-fare status; that is, students or the elderly in the all-bus system against about 42 percent for the mixed fixed guideway, feeder bus system. Now, again, there may be a good explanation of that, but I've asked the question a few times. In fact, I've often felt I had become a pest since arriving here three days or so ago, in trying to determine just why this would be the case. So there are many sort of uncertainties that linger on here which prevent me from feeling at all confident saying that building this system is either a very good idea or not a good idea. I doubt if I could come down on a hard conclusion either way. So, instead of trying to do that, I thought it might be useful if I went on to somewhat more general observations, the big picture, if you wish.

Specifically, I thought that I might address myself to three large issues that almost invariably arise in determining the benefits of any transit system. First, what kind of energy savings, if any, might be expected from building transit? Second, what will be the impact on the fiscal position of local government? And, finally, just what is it that one should call an economic benefit of a transit investment?

First, let me deal with the prospect for energy savings. The safest pronouncement on this is simply that it depends. It depends on a lot of detail that is often very difficult to predict. For example, from where will the riders for a new transit system come? Will they come from buses, or will they come from cars? From cars with high or low gas mileage? From being riders or drivers in cars? Or how will the new transit riders reach the system? By walking or by being driven and having kiss-and-ride, or by driving themselves and parking-and-riding? What use will be made of the vehicle that's left behind by other members of the family if somebody switches from auto to transit commutation? What kind of load factors will rail transit achieve? Specifically, will it achieve higher or lower load factors than a bus alternative? And, finally, one might say, will the new transit trip be more or less circuitous than the old trip? And this gets down to that question of those right angles and the transfers that were discussed somewhat extensively this morning.

Now, what we do know about energy use in transit is that, everything being roughly equal and especially if the load factors are about equal, a bus consumes about one half of the operating energy per passenger-mile that a train does. Furthermore, the bus, because of its flexibility and small unit of operation, usually can achieve higher load factors in most circumstances than

a train so that this advantage in energy consumption per passenger-mile would probably be greater in actuality than this one half figure. A properly designed bus operation is also more likely to achieve an origination and destination pattern that permits people to walk to and from the system. So, again, back to those issues about how do people get to and from the system. There may be some bias toward the bus system being slightly advantaged in terms of energy consumption. At any rate, there's one thing that's clear from this number. If most of the prospective riders for a new transit system will come from buses, a train system would have limited potential for saving energy. Similarly, if the rail transit riders were formerly riders in carpools, much the same holds true. What you really have to do to conserve energy, then, with any kind of fixed guideway or rail transit system is to attract a significant number of patrons who previously *drove.*

Now, roughly speaking, since today's car in the U.S. averages approximately 18 miles per gallon—I would suspect it averages a bit more than that here because you seem, on casual inspection, to have a much higher mix of relatively small cars. But, if it's at 18 miles per gallon, then one can say that the typical passenger mile in an auto consumes about twice as much energy as rail transit. In other words, auto stands to rail as rail stands to bus, roughly speaking.

Now, if those relationships fall fairly easily, then at least one quarter or one third or so of any new rail system users should be previous auto drivers to achieve an energy saving. The chances for energy conservation through rail transit use become considerably less favorable, however, if and when new cars meet the higher miles per gallon fleet standard as now mandated by Congress as perhaps already achieved to a considerable extent here in Hawaii; secondly, if and when any new transit riders drive or are driven to their stations; thirdly, if and when transit use increases the mileage of the typical commute; and, fourthly, if and when the auto left at home by the switch from driving to transit is used by other members of the family for trips not previously made.

Now, all of these four events seem reasonably likely. If they do occur, driver conversions to transit is a percentage of total ridership that must rise still higher for a new rail system to conserve on energy, probably to the levels that are simply unattainable. Just to give you some calibration on that, typically, about 50 percent of the rail transit users of new systems in the U.S. have been people who previously rode the bus. This has been the experience. Actually, it was much higher on the BART system at first, but I think it's now beginning to drop down to this level. About 20 percent came from being car riders or just new people who didn't take trips before, and 30 percent had come from car drivers. Consequently, if at the present 18 miles per gallon you need about 30 percent in order to break even; if you move up in your mileage per gallon figures, you're going to need much higher percentages of conversions that probably are really not attainable.

I would also make one remark in passing, and that's that, if rail transit doesn't conserve on energy it is also not likely to reduce harmful air pollution. Indeed, from the standpoint of human health, the situation will probably be made worse. Rail transit operating on electricity substitutes so-called stationary source pollution--that is, at the electric generation station – for the mobile source pollution of the automobile. Stationary pollution of the type typically generated in an electric generation plant tends to be rich in sulphuric emissions, whereas autos, at least until the advent of the catalytic muffler, are not. While research on the linkages between air emissions and human health is still very rudimentary, the one consistent regularity is that sulphuric emissions do harm human health. To put it as bluntly as possible, sulphuric acid does eat away lungs and a lot of other things.

By contrast, now, nitric oxide and carbon monoxide that emit so plentifully from autos do have some harmful effects on health, possibly. But this fact has never been established to

the same extent as for sulphuric emission, and it's especially true if these various carbon and nitric oxide emissions are kept to reasonably diluted levels, as indeed they should be with the present kind of automotive emission control policies.

Let me turn then to this fiscal impact issue, which really is a very rich issue. Let me start it by making an observation economists love to make all too often, and that is, "There's no free lunch." At least, it's a very rare thing. Maybe I got one today for speaking but, on the other hand, you can say I'm paying for it by being up here. Let's start on the free lunch thing by taking a look at your 20-cent local dollar. Thinking about that for a moment, maybe it isn't quite as cheap as it seems because, after all, that 80 cents has to be made up somewhere from federal taxes. One way of putting it is that I've looked at the taxpayer, and he is me. He's also you. And it also could be you in the sense that, if you get $500, $600 million for your system here, who knows, how does the federal bureaucrats say "No" to Portland, Oregon, or Portland, Maine, or Omaha or Seattle or Memphis or wherever, asking for proportionate amounts equivalent to this? Certainly, one can see some difficulties on that.

Furthermore, as was mentioned this morning, it isn't clear that you forego the federal grant forever by taking it in different forms or by postponing. This is not necessarily a once-and-for-all thing. Possibly, too, you might be better off getting it in bits and dribbles for, say, an improved bus system, bus terminals, possibly even to holding some in reserve as new technologies emerge for new installations, not only here in Honolulu but possibly in Hilo or your other emerging cities.

In general, I think you have to entertain the possibility that the amount that the federal government will grant is not unlimited for this or any other purpose and, that, if you take it in this form, your chances of getting it in some other form may not be as good. And then the real issue becomes, which is the best form to get it.

Then, there's the tax benefit issue, that you'll get some kind of tax benefit from increased property values, say, in and around the stations of a fixed guideway system. That was sort of suggested by several of the questions yesterday. This may be, in large measure, mainly transfers from one part of your community to the other. To really make it come out as a net addition, what you need is either one or more of the following: You have to have, because of having fixed guideway, some total increase in your total population. That might do it. Another possibility is, you push up the incomes or you, perhaps, substitute higher-income people or change the migration patterns so you get that. Another possibility is that, somehow or other, because of the savings that people might make on other activities, they will bid more for land and thereby push up the assessment so that you get it back in that form.

Now, there's possibly some little net addition from that. But I think the net's likely to be small. There's one more thing to remember about this. If what I said earlier about Portland and Memphis and Denver and where-have-you coming in for their $600 or $700 million, upgrading their transit systems correspondingly, your competitive advantage in this game of trying to race up work could easily be lost, so that even this net might disappear on the margin.

Recapture I found to be a very fascinating idea. It seemed to me, though, it had some limitations and also possibly some very serious political difficulties. It also struck me that the same basic principle could be applied to other public projects—roads would be the most obvious, possibly new hospital installations—you should buy up the land around it and charge doctors and drug stores high prices for locating there. I don't know. One could let one's imagination run, and it possibly could give you some returns. But I suspect they wouldn't be major, relative to the costs involved. In the long run, though, the fiscal impact is really going to come down to that operating deficit. And that brings us back to whether you really will have $9 million

lower operating deficit if you go the fixed guideway route. And, as I pointed out earlier, my guess is that you'll be very lucky to get the same operating deficit with the feeder bus and fixed guideway system as you get with the all-bus system, one of the many reasons being that when you go over to the fixed guideway bus system you're really installing two technologies—two technologies with different kinds of skills required, different kinds of management problems. And to really economize on that, it's not clear that you'll achieve it. In fact, the history has been that, in general, the systems that have had these mixed technologies have also experienced some of the largest deficits. Now, there can be a lot of reasons for this, and I wouldn't necessarily attribute it to the mixed technology, but I think it's something that you should worry about.

And, of course, the operating deficit is not the entire story. The one virtually certain financial effect of introducing rail is that the community's total investment in urban transit will increase. And, accordingly, some additional money for servicing and amortizing the debt, or if you don't pay for it immediately, with tax increases, will be almost inevitably needed. The total investment cost to the local community will depend, of course, on the final capital cost to any system which in turn depends on how many miles you build, to what specs you build them, or whether you do end up preempting those lanes in the freeways at the two ends, whether you provide park-and-ride facilities, and so forth. It also depends on the interest rates facing the community and the period over which the investment will be amortized. Now, one could debate long and hard about these numbers, but the seemingly sensible range for the local Honolulu contribution to capital cost appear to be somewhere between $100 and $200 million at a minimum for building this system. Correspondingly, the increase in annual debt service charges would probably be somewhere in the range of $10 to $20 million. Of course, if you weren't lucky, you're on the operating deficit, you might pick up some more there.

Now, if you are lucky on the operating deficit—and I'd say being lucky in this case is that you don't get any increase as compared to the bus system—this $10 to $20 million will represent the local net increase in annual cost with a fixed guideway. Certainly, the introduction of a rail system is not likely to have as one of its benefits a reduction in the local fiscal burden. Now, this, of course, is hardly surprising since, with the introduction of rail, new service capabilities or at least possibilities are being added to the local transit system. And, again, I come back to where I started by saying there just aren't any free lunches.

Now, let me finally turn to this question about measuring economic benefits in general. I should preface it by saying that this is one of those areas where economists do not absolutely agree. Wasn't it George Bernard Shaw who said, "Lead all the economists in and then they'd point in every which direction"? And I suspect this question of benefit measurement has some of that. But there is something, though, that they all agree on. It doesn't matter which economist you ask, they'll all say that they will count as a benefit what you can actually extract from the customer when he comes to the system or buys the product or buys the service. And, this, by the way, would hold true whether the investment is in the public or in the private sector. Now, some economists who are very strict constructionists would say that this is all that you should count because if you don't do it this way, or if you really get the money out of them when you use the thing, you won't make fair comparisons between the public and private sector.

Now, clearly, if you do it this way—in the case of public transit—there'd be very few public transit investments that would be justified on this narrow interpretation because what it really amounts to is how much you can get out of them at the fare box. Accordingly, now, many economists (and I include myself among this more broad-minded group and though I'd emphasize that it's far from being all of the profession) are willing to extend the concept of economic benefit in some cases, especially in certain public cases like this where the fares may be set with all kinds of other goals in mind, to include a somewhat larger sum. It's what the economists in their technical jargon call consumer surplus. And this is really what people would be willing to pay for the services of the new system, rather than totally do without it.

Now, to illustrate why this latter sum should be larger than the simple returns from the fare box, just consider the strong possibility that some people would be willing to pay much more than the going fare for the availability of the privilege of using transit. Some people might even be willing to pay for it even if they never use it. Of course, now, how much more is the important question. Now, one suggestion of how much more is in the final report on the Honolulu system. Specifically, it's suggested there that people would be willing to pay for use of transit a sum equal to what it now costs them to commute by auto. On reflection, though, one can see that there might be difficulties with such a concept. In particular, it seems probable that people will not view automobile commutation and transit commutation as exactly equal. In theory, of course, some people might be willing to pay more for transit. But, on balance, I suspect that most people would be willing to commute by transit only if they pay less. Transit service is not likely to be a perfect substitute for auto commutation. For example, it's not quite as private as the automobile as it has a less flexible schedule, it doesn't have as much carrying capacity—the trunk—for logistic purposes it's usually not quite as capable of matching the door-to-door availability of the automobile.

Of course, now, beyond this, you could still have some allowance for some of those externalities that were described this morning. One of the two that immediately comes to mind would be air pollution. But, as we saw earlier, this may be a rather weak reed to rest on because it isn't clear under some fairly realistic assumptions that there'll be much reduction of especially harmful air pollution from going over to transit.

And congestion is a real possibility. You might get some reduction in highway congestion. That would be another externality. However, some of the experience on this—again, BART's is a good example—will be, I suspect, discussed this afternoon by Professor Webber of the University of California. There, the experience wasn't terribly good in congestion reduction. That gets back to the car that's left at home. Maybe it travels about. Somebody else is driving it, and people who didn't take trips before are taking them when the roads are less crowded. You just don't know. So the externalities may be there, but they are weak reed.

If you really get down to it, this whole problem reminds me of a story that was told in Washington in the early 1960's. The story is probably apocryphal. But, at any rate, it's sort of a nice one. It involved Robert McNamara, who was then, of course, the Secretary of Defense and, as I suppose or hope most of you know, he was also a leading proponent at that time of benefit-cost analysis for evaluating new government programs. At any rate, as the story goes, one of the McNamara children once came home from school and found his father there and he proudly proclaimed to his father upon arrival that he had saved 15 cents that day by walking home from school rather than taking the bus, to which the father is purported to have replied very quickly, "Why did you not take a taxicab and save $1.50?"

Well, let me conclude by simply observing that you here in Hawaii have an interesting choice to make with regard to your proposed rail transit system. It's also a choice that does spill over, I think, in a lot of your growth and land development plans. Now, if my guesses—and I underscore that they are guesses—about your data are correct, it would appear that you are being asked to assume approximately $10 to $20 million in additional annual tax burden, possibly more if you're not so lucky on those deficits, to finance a major innovation—it certainly is an innovation that remains to be seen what it does, but it's a major innovation—in your public transit service.

Now, this innovation may attract a good deal of additional patronage and then, again, it may not. Whether it succeeds in doing so will largely determine what additional benefits in reducing air pollution, in savings to the community, and so forth, will accrue to the community from this prospective investment. Very much hinges on how well it does do—does it

really attract people or not. I would only caution you not to expect too much. As we've heard this morning, these forecasting exercises are very difficult.

I also observed that transportation is only one of many dimensions conditioning and modifying urban development patterns here and elsewhere. And so I would caution you to be skeptical to claims made by all concerned, including ourselves, that are here today. There's really great uncertainty attached to the estimates made in any exercise of this kind. As a colleague of mine at Harvard is fond of saying, "If only we had a private line to the good Lord up above to find out what the facts really are." And that's really what this case is. If we only had that private line, it'd be a lot easier.

Meanwhile, I would join some of the speakers this morning in cautioning you that perhaps it's best to proceed carefully and in very careful steps. It may be true that that fixed guideway is the right way, eventually. But I think you should establish that very carefully before taking the plunge. In fact, you really don't have much choice because, if it takes five to seven years to put the fixed guideway in place—that seems like a good probability; it might even go longer—you're probably going to have to do something in the intervening period, anyway. And that something is obviously to develop your express bus service to a greater extent. Willy-nilly and whether you like it or not, that's probably the main option over these next several years.

Let me conclude, then, by making one consoling observation. That's not a stand-pat solution, you'll notice. It does mean you do have some changeovers these next few years. Let me point out to you, the first law of traffic engineering is that people never get into infinite queues. On that happy note, I'll conclude.

Andrew Hamer: I think, perhaps, we should start if we hope to get out of here by four o'clock.

During this afternoon's session, the first topic to be covered will be some of the possible implications of experiences elsewhere. The three chosen for review are the system in San Francisco, the one that's partially in operation in Washington, and the one that will be shortly in operation in Atlanta. And so what are the implications of this, possibly for Honolulu?

The first speaker will be Professor Melvin Webber, who is a director of the Institute of Urban and Regional Development at the University of California, Berkeley. And, in addition, he is a professor at the College of Environmental Design at the same university. He has a rather long and distinguished career, only a part of which is described in the brochure that you have. And in order to give him more time to talk about BART and some of these other systems, I'll bypass that and introduce him directly.

WHAT CAN HONOLULU LEARN FROM BART, METRO, AND MARTA?

Melvin Webber

I'm sorry your chairman didn't offer you one other bit of biographical information, which is that some 23 years ago I was on the staff of Parsons, Brinkerhoff, Hall, and McDonald Engineering firm, a group in San Francisco who put together the initial design for the BART system. I was reminded of this vividly yesterday listening to some of the addresses, because I used to make those kinds of speeches. I don't mean that as a joke. We were very optimistic in those days, and it's been a very great disappointment to me to find that the outcomes that we hoped for have not happened. Let me come to that in a minute.

I suspect it's been surprising to most of you here—most of you being laymen of some sort, I suppose, not engineers and not doctors and lawyers—to find that so many experts seem to disagree with each other. That's peculiar because even seemingly straightforward questions don't get straightforward answers. The very confusing data, very confusing sets of interpretations, in part because of the complexity of the subject to be sure, must be very perplexing to all of you, as they are to me. If this were to go on, it might drive you and me, at least the more skeptical of you, to reject the conclusions of experts altogether. And so with the hope of averting that outcome, let me offer you a mite of solace by suggesting a way of thinking about professional advice.

I suppose it's apparent that one of the reasons that experts disagree is that, in some field, there's insufficient theory and experience to command the consensus. We were able to get to the moon because physicists and engineers had accumulated a lot of good theory and a lot of persuasive experience about mechanics and electronics. When they tried out their equipment, sure enough, it worked just about as they'd expected it would. Of course, they were lucky, too, but for sure, they also knew a great deal about the way gravity works and the way propulsion systems work, and they knew a lot about the way to go about designing computers and radios and rocket motors so that they'd work as intended. Of course, they also believed in their mission and their equipment. But, clearly, belief and desire were not enough for success. They also needed solid and tested knowledge, and they needed an experimental, trial and error, adaptive, an error-correcting process of design.

But, if those smart men who worked for NASA were to move over into the urban transportation field—if they were attending this meeting and sharing the platform with us—they'd be no better off than the rest of us. For the simple fact of the matter is, we have only partial knowledge of the topics that we're dealing with. Specifically, our knowledge about human behavior is inadequate to our questions. It's one thing to put a rocket motor in a telecommunications equipment in place and then to turn on the switch and tell it to go. It's quite another to put a rapid transit system in place and turn on the switches, because humans don't respond the way engines and computers do. Whether fortunately or unfortunately, as you prefer, they do what they want to do, and not what the designers hope that they'll do. And it's not always clear ahead of time what it is they'll do or why they might want to do whatever it is they do do. Moreover, what some groups want, other groups don't want. They choose something different. And, sometimes, more seriously, if one group gets what it wants, another group cannot.

Because we still lack sufficient knowledge about human travel behavior, we are unable accurately to predict how a new transport facility will affect travel patterns and traffic flows at some future time. Because we lack adequate knowledge about how transport facilities influence people's choices of places to live and places to work, we're also unable accurately to predict what land use patterns and what urbanization consequences may be caused by some new transport facility. Similarly, we are unable to predict with high confidence what future costs might be—it should be apparent from these discussions—or what economic consequences might follow.

It's not that we're wholly ignorant in these matters, you understand. There is a lot of partial knowledge, and some of it is held by one group and some by another professional group. It's also true that experiences in one place in time may differ from those elsewhere. Hence, on both counts, there's basis for genuine disagreement among honest professionals. Unfortunately, there's also a remarkable level of passion associated with one transportation form or another. And those preferences tend to cloud the deliberations. Our task in these discussions is to allay those passions and to examine whatever evidence each of us might have, seeking to make several lines of analysis and the several conclusions more readily available to those of you here in Hawaii who will be deciding what sort of transportation system to install here. I assume that so many

mainlanders were invited into this conversation because the organizers of this meeting recognized that none of us cares what you build. It's your city, not ours; and you will live with the consequences, not us, whatever it is that you decide to do. But it's not wholly apparent to an outsider (and I can speak for myself—it certainly has not been apparent to this outsider) which are the paramount objectives motivating considerations of the proposed rapid transit system. Having read a number of the reports and commentaries, I infer that the following are among the more compelling of your purposes. If I'm wrong about this, I wish you'd tell me right off, for the rest of my comments might not then be germane.

First, I infer that traffic congestion is a bother to you and that you expect it to get much worse in the future. Second, I understand that you expect the proposed transit system to promote employment, both in its own construction and then in fostering growth in the Island's economy. Third, I infer that many of you want to avoid building additional roadways. The fixed guideway for exclusive guideway transit vehicles is seen as a viable alternative to more roads. And, fourth, I infer that air pollution and energy requirements are also becoming worrisome and so you seek ways of reducing both. Is that essentially the core of it?

I shall try to avoid the temptation of voicing an opinion on the odds that HART might or might not foster the attainment of those purposes. Instead, I'd like to tell you how my metropolitan area made out when it chose the fixed guideway system in pursuit of similar objectives. But before I give you the evidence of BART's outcomes, let me first specify what I understand to be some essential characteristics of these two metropolitan regions.

First, evident to all of you, no doubt, is that, the Bay Area is a lot bigger than Oahu. Nearly 2.5 million people live in the three counties serviced by BART, and by another set of estimates, about 2.5 million people are in the service area of BART, some of which extends outside the three counties of the district. The larger metropolitan area holds about five million people. The structure of the local economy is very different from yours, with a large manufacturing sector and a major Pacific Coast banking and corporate administrative center localized in the offices of central San Francisco—the major employment center of the region. BART is basically different in design from HART. It's a 71-mile regional system. Yours is not a regional system. BART extends from central Oakland in four lines with station spacing averaging two and a half miles. It is thus capable of very high speeds; between some stations, it can move at 80 miles an hour. On the average, it runs at about 35 miles an hour in good weather. The Bay Area is also well-endowed with streets, highways, and freeways. It has acquired a firm auto-using habit, reflected in high ratios of auto-ownership.

You should also know that the Bay Area has one of the nation's best public transit systems, even exclusive of BART. The AC Transit District operates a high-quality and well-patronized bus system within the East Bay and then across the Bay. Some of its buses run on local streets, some on freeways offering high-speed, peak-hour express-commuter service to San francisco. Within San Francisco, there's an extensive diesel bus system, an extensive electric-bus system, electric street cars, cable cars, one of the few successful jitney services left in America, and, of course, a large fleet of taxis. Outside the BART's area, but also offering superior service to San Francisco, are the Golden Gate Bridge District's luxury express buses, which have been successfully converting motorists into transit patrons, and there's also its high-speed new ferry boats that offer 747-type comfort to suburban commuters from Marin County. All in all, the Bay Area is blessed with superior highway transportation and superior public transit services of many types.

By the time the decision was made to build BART, there'd been an extended public discussion spanning at least 13 years of exploring what sort of facility to build. That discussion sounded very much like the ones under way here in Honolulu, for many of the same policy issues

were debated, same problems were raised, similar objectives and hopes were voiced, and a similar final set of proposals resulted. In both areas, the proposal finally emerged to build a fixed guideway system.

In both areas, traffic congestion loomed large in the minds of civic leaders, and expectations of huge future traffic jams were key to the choices that emerged. Fixed guideway transit was expected greatly to reduce traffic congestion in the Bay Area by offering a viable alternative to the automobile. In both metropolitan areas, the advisors concluded that only a fixed guideway system was likely to one-up the automobile by offering the traveler a superior travel mode. In both San Francisco and in Honolulu, advisors concluded that a bus-type alternative would not work well enough. And both concluded that a fixed guideway plan would be the only one that would be financially viable. Similarly, both advisors predicted that the land-use effects would be advantageous, while also predicting that new, high-level accessibility would foster increased economic growth within the metropolitan district.

One other set of similarities should be included in this account because the spatial pattern of urban settlement and the resulting origins and destinations of trips are, of course, critical to the workings of various transport modes. Both metropolitan areas are built along narrow coastal shelves, in fairly mountainous country. The shelf is narrower in Honolulu than in most of the Bay Area, but both settlements are essentially linear with extensions following available valleys. The urbanized East Bay strip from Richmond to Fremont is about 40 miles long, and for most of the span, it's about three miles wide. The urbanized strip in Honolulu from Kahala to Pearl City is about 16 miles long and is typically about two miles wide. Honolulu's urban strip is narrower and shorter than the East Bay's, but the form is similar and the width is nearly the same—three miles on the East Bay, two miles wide here.

Residential densities are somewhat higher in the older established East Bay districts than they are in Honolulu, as best as I can tell from the kinds of calculations I was able to make. It appears that net residential densities in Berkeley and Oakland average about 23,000 persons per square mile, while in Honolulu they average about 17,000 persons per square mile. This is essentially the same calculation that Professor Keeler used this morning, and both of us are speaking in the language of net residential density—that's the land area in housing lots, excluding streets and schools and everything else. In the outlying East Bay suburbs, net residential densities fall to about 5000 per square mile. (And I guess it's the same out here in your suburbs. I should emphasize that all of these numbers are very rough, subject to better arithmetic and better data.) But the overall picture which is all I'm after here is of a similar, linear, urban pattern—albeit with higher densities in the East Bay strip. Net residential densities in San Francisco City are, of course, much higher than any of these—about 48,000 persons per square mile averaging over the whole city. That's the highest of any city west of Chicago, of course. The numbers are 17,000 here, 23,000 East Bay, 48,000 San Francisco.

Linear urban form in high densities, as several speakers have noted in the last two days are, of course, highly compatible with a single-line transit system, for many potential riders' houses are physically near the line and, of course, many of the potential destinations are as well.

So much then for the comparative geographies. Let me now report on the results of a large research project that has been aiming to find out whether the initial objectives that led to BART have, in fact, been realized.

The BART Impact Program is a major national research effort aimed at discovering BART's effects and testing to see whether its outcomes match the projections and promises that were made for it. This represents a full-scale effort on the part of the United States Govern-

ment to find out what happened as a direct result of building BART, which was, of course, the first chance the nation has had to test the outcomes of a new, modern, rail-transit system.

The study is being conducted by the Metropolitan Transportation Commission, which we call MTC. MTC is conducting a study with the help of perhaps a dozen consulting firms and some $8 or $9 million supplied by the U.S. Department of Transportation and the U.S. Department of Housing and Urban Development. MTC is scheduled to publish final reports on all except its land-use studies this spring, as I understand it; and those reports will surely be of interest to Hawaiians. Last October, most of the study groups gave some preview reports to the civil engineers who were meeting in San Francisco. Their findings corroborate the earlier findings from a university review that I had reported about a year before in a paper that some of you, I gather, have seen. Drawing on those several reports, then, let me briefly summarize some of the findings as compared with the expectations which were enunciated before BART was built.

The first important factor is that BART is carrying far fewer passengers than had been predicted at the time voters approved the $792 million bond issue in November 1962. Overall, BART is carrying slightly over half the numbers that were predicted. Some of that shortfall is surely owing to mechanical and electronic equipment failures that have been plaguing the system, for the trains, as several of our commentators have noted, have just not been running on time and have not been reliable. There are frequent breakdowns. And because of a single-track design, if one train breaks down, all those behind it have got to stop; and then a wave reverberates throughout the system; and the whole 71-mile system may get delayed. So, because it's been unreliable, some would-be riders have stayed with their cars, or continued to ride the bus. There's no telling how many would be riding BART today if it were fully reliable. But it is likely that the original forecast was overly optimistic under any circumstances.

That's in part because there never was a system of quite this kind built in the western metropolitan area of the United States. It is an area which had grown up with the auto highway system and had evolved with such a dispersed pattern of origins and destinations. Eastern and European cities differ in their spatial structure from ours, even though San Francisco, itself, of all the cities in the West, most nearly resembles those of the eastern models with the high density, highly concentrated business centers. BART's engineers simply had no directly comparable experience on which to base their forecast. And, besides, the state of travel-forecasting theory was not developed at the time that they did their work to the stage it is now.

So, by now, we're somewhat better off in that respect. For one thing, we have the BART experience to draw upon. Besides, a lot of research has been done on what is called the modal split, of which we heard something about this morning; that is, about the distribution trips among automobiles and various transit mode types. But, even now, we don't seem to know enough to predict with any precision. A major study, the one that Dr. Ken Train was telling you about this morning—a major study conducted at the University of California by Professor Daniel McFadden's group—has done what must be the frontier work in modal-choice theory. He finds that even with his sensitive tests he's unable, categorically, to distinguish travelers' preferences for trains versus buses, on the average.

That's a very important conclusion. It has large significance for you as it does for us in the Bay Area. McFadden's findings confirm those of other students of modal choice who find that travelers decide among public transit modes predominantly on the basis of cost to them in time and in money. More precisely, the average traveler, especially the average commuter, cares mostly about the amount of time it takes to get from the door of his house to the door of his workplace and about the out-of-pocket cost of that trip. All other considerations, such as comfort, speed of movement, and so on, are comparatively trivial as compared with expenditures of minutes and money.

McFadden's studies confirm other recent research which discovers that a person finds the psychic cost of getting from his own front door into a moving vehicle about two and a half times to three times greater than the cost they assign to time spent inside the moving vehicle.

BART's problem is that most travelers—virtually everyone who doesn't live within walking distance of a BART station, that is, less than ten minutes as we heard this morning—has got to make a feeder trip before he becomes a BART rider. That cost of gaining access to BART trains at each end of the trip is a major deterrent to potential users, perhaps the major deterrent. It is less deterring, of course, for those who can walk from a BART station directly to their jobs, as they can in downtown San Francisco and elsewhere.

Through-bus, on the other hand, that comes close to one's house and then goes downtown, demands fewer of those high-cost minutes. And, of course, one's own car parked out in front requires effectively zero minutes, hence, nearly zero psychic cost for that leg of the trip—the access to the moving vehicle.

Where BART can beat the through-bus in both access and in travel time, it has indeed attracted some bus riders. Where it can reduce the total time and money cost for motorists, it has indeed attracted some of them. But savings have not been sufficient to attract enough of them. On many routes it is slower than the bus and, of course, more costly as well. On most routes, it is slower than the car and typically carries that high access penalty as well. I hope in short order it will no longer be slower than a car when they get those bugs worked out. But we're told that we've got another couple more years of that to live with.

Well, as one result, highway traffic levels are about where they were before BART began to operate. That's partly because modest population growth has meant modest increase in the auto census as well. It's partly because the diversion of some former motorists and former carpool and bus riders has created some vacant space on the streets and freeways and on the bridge. And, as we've heard, the law of traffic congestion has assured that the available space is quickly filled by newly generated automobile trips.

The general conclusion of all the studies that have been made of BART is that BART is certainly serving the long distance suburban commuter trips just exactly as it was designed to do and as it was promised. But it is not yet carrying anywhere near as many as it was expected to. Most of its passengers were diverted from low-cost buses to high-cost trains. It has expanded the Bay Area's total transport capacity, and so more trips are being made by more people for more purposes. But it has not eliminated traffic congestion as it was intended to do. That, I suggest, is a true fact.

Because auto travel has not been reduced, neither have auto-induced sources of air pollution. So there is a consensus as well among MTC's consultants that BART has not affected air quality in the Bay Area.

One result of BART's low patronage is that the cost per ride is high, in the range of $4.50 for an average trip, if one simply computes the out-of-pocket cost to the transit agency. The average fare, on the other hand, is in the range of $.75. And, of course, that's not a formula likely to make for fiscal stability.

BART was to have been wholly financed from local sources, for it was designed before federal grants became available. Accordingly, residents of the BART district pay substantial property and sales taxes, both of them regressive, to support both BART and the local buses. And our studies find that the proportion of people riding BART are in the upper income groups than in the lower. I have asserted it elsewhere that the poor are paying and the rich are riding. And I suggest that that is a true fact too.

I can give you a scale of the annual cost—on my own property tax. My house is a modest house. It's appraised at, I think, $32,000 this year. It's underappraised, but that's what the assessor says it's worth. And our tax this year to support the AC bus and BART was $150. One hundred went to BART, fifty went to the bus.

Rapidly rising operating costs have been plaguing both of the systems, and both are in perpetual fiscal crises. Meanwhile, most travelers continue to drive their cars despite highway congestion, despite rising gas prices, and despite rising and direct-tax payments to the transit system.

On BART's transbay route, which is its major route across the Bay, when it first opened, the surveys conducted at that time found that 60 percent of all of the passengers were diverted from the bus. Among transbay commuters, at the time, nearly 70 percent were diverted from the bus; 30 percent from cars. This loss of passengers has weakened the bus system to that degree and appreciably raised its operating deficits. Because the buses are far less expensive to buy than were the BART trains, it's unlikely that anybody would have done that to them on purpose. As a rough estimate, I calculate that the passengers diverted from buses could be carried in those new GM buses that we've seen advertised, at a total capital investment for vehicles of about $17 million.

The BART system's capital cost was $1.6 billion at preinflation prices. The cost of buying a whole fleet of buses sufficient to carry all of BART's passengers projected to the year 1980 will be around $50 million, computed at General Motor's newly posted current price, which I understand is $95,000 per bus. Fifty million dollars is a little over what it cost BART for one year annual mortgage payment on its bonds.

So one is compelled to ask whether BART was worth it, especially in light of the current knowledge about travel demand which suggests that average travelers are attracted to either buses or trains when the cost in time and money are effectively equal.

Well, I would contend as some of you would that BART may very well have been worth it, if the returns express that the secondary urban consequences were sufficiently great as to have justified that capital investment. Among the more important of the expected urban consequences were the following: BART was expected directly to induce concentration of employment in the older business districts and thus help to avoid urban decline there. It was expected to cause smaller business centers to grow in suburban areas where none had existed before, each of them to be surrounded by higher density housing than would normally have occurred. It was expected to stem the trends to suburban sprawl. By making areas around stations highly accessible, it was expected to raise land values there. It was expected to promote further growth in the regional economy. At a later date, it was claimed that BART would reduce air pollution and reduce energy consumption as well.

It is now about 15 years after the voters approved the bond issue that set BART's wheels in motion. So investors have had a long time to accommodate to the impending new developmental force in our midst. It's now about five years since BART's trains first began to operate, and so travelers have had time to adjust to this new service option, as well. However, the developmental effects of BART have so far been slight.

There's no way to know for sure what BART's influence has been in the office construction boom in downtown San Francisco. There are arguments in evidence that suggest it was either minor or major. I'm inclined to the belief that BART was a significant influence in creating that explosive office construction boom but that it would have happened anyway although, perhaps, more slowly if BART had not been built. Essentially, that same conclusion

is also reported in a major study recently completed by Robert Knight and Lisa Trygg of the DeLeuw Cather & Company which was conducted for the Office of the Secretary of the U.S. Department of Transportation. They also confirmed the conclusions that virtually everyone else has drawn that BART has not yet had any detectible influences on land-use patterns outside the central business districts of Oakland and San Francisco.

I can tell you more about the land-use effects later on, if you wish, in the question period. But for the moment, let me report simply that BART has not had the influences that we planners had initially predicted it would have. Suburban development goes on just about the way it did before BART came. And it's plausible to conclude that, if anything, BART has caused further sprawl by making it easier and cheaper to commute from the distant suburbs to downtown jobs.

There's also a general consensus that BART's influence on land values is either slight or undetectable. An exception may be the one station that was studied very closely where land values actually fell when the BART trains arrived, owing to citizen protest against high-density of commercial development. In any case, I understand there is general consensus among land economists that rises in land values in one place are accompanied by comparable declines elsewhere so that the total land values in a city are unaffected by a new transport facility, only redistributed among places within the city. If that be true, the prospect for a net gain in property tax revenues does not appear to be very promising, even if BART were to induce a rise in land values at some stations.

Tax increases and possibilities for value-capture might be favorable if the transport installation led to a net expansion in the metropolitan economy, that is, if the BART system made the metropolis more attractive than other metropolitan areas so that outside firms looking for a place to locate would go there, or if it made local firms more profitable then total demand for locations would rise and so would land values. The Bay Area experience does not support those expectations so far, however.

One of the BART Impact Program studies is directed to the regional economic and fiscal impacts of BART. This is one of the MTC studies. The study was conducted by the management and economic consulting firm of McDonald and Grefe, Inc., in San Francisco. Let me quote the conclusions from the preliminary report that they delivered to the civil engineers' meeting last October. They say, "The Economics and Finance Projects findings do not support the hypothesis that improved transit service can attract business, commerce, or industry to a region. Corporate decision-makers do not consider transit service levels explicitly among the criteria governing the choice among regions as a location for economic activity." Later on, they go on to say, "The implications of these findings for urban and economic development policies include the suggestion that a frequently articulated justification for transit improvements in a region is no longer valid. This does not mean that an investment in transits represents a zero-sum gain for that region. An economic impact will result in public expenditures for transit which may represent a federal transfer of funds to a region which would not otherwise occur." They then conclude their comment by saying, "There is no question that transportation is a necessary condition for maintaining urban vitality, but it is not a sufficient condition. Therefore, transportation should be supportive of a broader economic development strategy, rather than making transportation decisions independent of economic housing and urban policy. Although there are favorable economic impacts of BART, they do not appear to sanction transit as the best vehicles for urban revitalization." That's the end of that quote.

They also note that the expenditure of a large sum in the construction of a major public works would itself generate employment that will, in turn, have some at least short-run, indirect benefits. And they then conclude that—I'll quote again—"If the primary economic impact of an

investment in transit results from the size of the expenditure rather than the object of the expenditure, a better investment in the region's economic development might be another, a different capital-intensive program altogether supported by a comprehensive low-capital transit system." That's the end of that quotation.

Well, then, having summarized McDonald and Grefe's conclusions, let me attempt to summarize my own. First, about BART, and then if you'll permit a mainlander to voice an opinion, an honest one about HART.

Based upon what I know about the state of knowledge in this field and about the inadequacy of theory in a prior experience, I'm inclined to be skeptical of anybody's forecast. Inevitably, a long-term forecast has a high probable error attached. No single-figure forecast is reasonable. All forecasts should be expressed as a range of prospects; and they should be explicit about the odds of their being wrong.

Thus, at a minimum, forecasts of potential riders should be expressed as a probable high and a probable low. For purposes of designing-in sufficient passenger capacity, one will then choose the high projection. For purposes of estimating revenues—the effects on auto use and bus use and the effects on urbanization—one would want to use the low estimate to be conservative. I'm inclined to discount optimistic, single-figure patronage projections by anybody. I must confess that, having been personally responsible for creating some of them in the early BART-design days, I speak to you with familiarity and very considerable humility. In turn, having lived through the high optimism of the BART system during its early design to its currently disappointing shortfalls from its forecasts, I commend a skeptical mind-set to all of you: forecasts are not facts about the future.

In view of the many inherent uncertainites associated with the projects of this kind, I also incline toward a cautious design. My private inclination, being no longer the optimistic big gambler in these matters, would be to approach the design of HART incrementally.

A large array of low-cost and reversible transport-improvement options is available to Honolulu that has not yet been fully tested. Since these options can be installed cheaply and since you can always change your design tactics if they don't work out as you expected they would, you'd not be locked in to a single strategy with little adaptability for change or adjustment. I'm thinking of the range of Transport System Management techniques, some of which have been tested here, others being tested in cities all over the world with marked success. You've heard of them all. Let me just enumerate some of them—like those traffic signals that have the capacity of detecting an approaching bus and turning the signals to green, exclusive bus lanes, express bus service, improved bus terminals and loading ramps, and improved bus vehicles of several types and sizes.

The range of paratransit services are looking good in some cities' experiments, including door-to-door services, jitney-type services, and van-pool arrangements of various kinds. Some cities are banning on-street parking, thus making a full, additional lane available to buses and cars. Others are using reversible lanes in large scale for increasing peak direction. Some are experimenting with large car-free zones, much bigger than you've done here, of course. Some of them hold downtown areas as being reserved for pedestrian use. Two cities are using road-pricing schemes in an effort to reduce peak-hour congestion and to more equitably assign the costs of congestion to those who generate it.

This partial inventory of options is to suggest that a lot can be done at comparatively low cost and that low cost does not necessarily mean lesser quality service. It could mean positively superior service to a fixed guideway system if the bus-based system were, in

fact, more closely to approximate the door-to-door service characteristics that now make the automobile the hands-down favorite for most people. I'm convinced that the single most important cause of BART's shortcomings was the failure to realize that it's the door-to-door, no-wait, no-transfer features of the automobile that make up the choice for most travelers; not its high speed, not its privacy, not its comfort, not its status; that public transit system which is most capable of collecting commuters near their homes and delivering them near their jobs without waits and without transfers has the highest odds of competing with the car. At this time in history, that system is some sort of a variant on the bus. At great cost, the Bay Area is learning that it is not a feeder bus linked to a mainline track system.

I'm inclined to conclude that a high-quality bus service, supplemented by a high-quality paratransit service would have the best odds of accomplishing what we in the Bay Area were seeking to accomplish back in the '60's. It need not have been a second-best choice. It could have very well been the first-best choice. To be sure, we may not have had sufficient street space to permit the speeds and fluidity of movement that high-speed buses would require. It may have been necessary to build some of the exclusive busways. And if so, they might have been cleverly designed to permit later modification into a fixed guideway system, should it later have been decided that a BART-type of HART-type system was appropriate. An incrementally developed system would have had the advantages of permitting local collection and delivery with mainline express routes. It would also have avoided the irreversibility that is inherent in a fixed guideway system of either the BART or the HART types.

Of course, it would also have lacked their glamour and elegance; the bus is pretty prosaic, in contrast. In the end, it may be that here in Hawaii both Hawaii's and Honolulu's citizens would choose the more expensive and fancier model, the Cadillac over the Chevrolet. You may very well be willing to pay the extra price, especially since 80 percent of the initial capital cost comes as a virtually free gift. But if you do, you should know what are the probabilities that it won't accomplish all that's expected of it.

If the BART experience is any guide to you, you should be aware that it might not attract many riders. It might not reduce either traffic congestion or air pollution. It might not change land-use patterns. It might not generate additional economic growth beyond the initial expenditures on itself. It might not do anything more than a low-cost improvement that the bus would have accomplished, and possibly much less. So I suggest that, if you do choose to build HART, I hope you do so with full knowledge of the odds that it probably won't accomplish your purposes.

If we in the Bay Area had made that sort of rational gambler's choice, that is to say, if we had made our bets against known odds, there'd be far less cause for disappointment today.

Andrew Hamer

In commenting on something, someone commented to me last night that it might not be the best of all possible political approaches, taking politics in the broadest sense, to go talking about other cities because people just sit there and say, "Well, what's that to do with Honolulu?" So what I basically want to do is talk about Washington and Atlanta for reasons maybe that haven't been thought of necessarily before. Some of it applies to San Francisco. Namely, these are basically auto-oriented cities with small amounts of bus, and they are now building rail.

Somewhat secondary to that, in writing about these cities and others, I have run across a lot of consultant reports, including reports written by the consultants that are working here; and they have generated in my mind, not a matter of motives, but a feeling that you've got to take every pinpoint forecast with an enormous grain of salt because things have a way of changing. I think one of the most useful things you could do, either here or at some other location, is to read past predictions of the way things are supposed to come out because those things get filed away after two or three years and then they never get looked at again. When I wrote a book in this area, I started going back to things written in the '50's and the '60's and the early '70's, which in this industry becomes sort of ancient history. It's amazing how people change their minds. And I want to sort of leave you with some of that spirit today.

When I wrote this book, *The Selling of Rail Rapid Transit,* about Atlanta, Washington, L. A., St. Louis, and San Francisco, I did so out of the sense of amazement that multibillion-dollar decisions are being made to build projects without very much debate. My training sort of suggested that serious questions should have been raised. When I asked some questions in Atlanta prior to our 1971 referendum that authorized the local funding for Atlanta's rail plan, I was told to keep my mouth shut because I hadn't read the technical report and because the opponents of rail in that city, at least, were a motley crew of uncertain talent. They included people like Lester Maddox, whom you probably heard of, and nobody wanted to be associated with him.

I regret I accepted that advice temporarily. Later, I undertook a review similar to the types of questions explored today. These included: "How justifiable is it to use pinpoint forecasts of employment and population for a period 20 to 30 years into the future? And, furthermore, how much faith can be placed in such projections when applied to small subareas like the downtown business sector or some residential sector like Hawaii Kai?" Second, "How reliable are the models of patronage projections which are used to translate these small-area forecasts into passengers traveling from one point to another, say, between 7:00 and 8:00 in the morning on some typical day in the year 2020?" The third question is, "How careful were the engineering consultants in exploring alternatives to rail rapid transit? Did they, in fact, take short-cuts which might be considered unacceptable?" And fourth, "How reliable were the construction and operating costs data used in the documents which ended up recommending rail?"

In the limited time that I have available, I want to address these questions with some evidence from Washington and some from Atlanta in a very summary fashion. And I'm not plugging my book, but if it's in the local library and you want to pursue some of these things, you'll find it and the references, as well as the text of this in the proceedings that is going to come out.

As to the first question, I concluded that it is, in fact, impossible to make pinpoint forecasts of conditions likely to prevail 20 or 30 years into the future. The difficulty of doing so, in fact, becomes greater the smaller the geographic area to which the prediction applies, if there is any sort of movement or behavior in employment and population over time; that is, relocation, decentralization. Forecasts for the Hawaiian Islands as a whole may be more accurate than small-area forecasts like those for a particular community like Aiea on Oahu, simply because there's a chance that mistakes made about Oahu's future can be cancelled out by mistakes made in the opposite direction about one or more of the other islands. The smaller the area you get to, the less of a chance you'll be able to cancel out mistakes made about one block with mistakes about the block next to it. Changing assumptions about the future of tourism on Oahu, for example, have led to fairly drastic revisions in the forecast for 1995 over just the last seven years. In 1971, the consultants assumed that Oahu's employment growth would total an extra 200,000 jobs, plus or minus, by 1995. Today, both the City (in its *Economy of Oahu* report) and the State (in its new II F forecast) [New Official State Population-Employment Projections as revised by U.S. Bureau of Census and Hawaii Department of Planning and Economic Development], assumed

that the growth rate will be such that the amount of added employment will be roughly, plus or minus, one half the rate used by the consultants in their reports.

Now, the reason that that's important, of course, is, no matter how that's distributed, those are work trips, journey to work trips, which are now no longer assumed to be taking place. I might point out that this is not the only place that this sort of change occurs. And, sometimes, the consultants are certainly not responsible for this type of change. In Los Angeles when I did a study there, DMJM and Voorhees, the two consultants that are here, were also there. They were plagued by a forecasting, a regional forecasting organization that started out in the late '60's seeing massive growth for Los Angeles County. And by the time they were ready to release their final report for a rail rapid transit system to be voted on, the forecast called for a gradual decline in the county population and employment. The consultants were left with one set of figures that were given to them several years back, and the general knowledge that the public was going to vote on the proposal was with forecasts which were no longer accepted by anybody. It's a very big problem!

In the less specialized economies of Atlanta and Washington, the problems have tended to be not so much the global numbers; that is, if you're wrong about tourism, it doesn't throw the whole regional forecast off. But we've had a lot of problems with the regional planners to put out the small-area numbers like downtown employment. Using very simple rules of thumb (and again without wanting to get into motives but sort of downtown improvement association-type people seem to be kept in mind), they come up with forecasts that are always phenomenal. Everytime I look at some of these forecasts (and some of the cities that I didn't study in my book seem to bear it out), they sort of take the next 20 years, and they double the downtown employment for you. It doesn't seem to matter where you go, this happens. It definitely was the sort of problem that we faced in Atlanta where we had a forecast that was made from 1961 to 1983. The methodology was never published. It turned out that two individuals were in charge of doing this, and I explored with them their methodology. And, basically, they took a wish list for the future, produced a color-coded map for 1983, and then used some rules of thumb to assign jobs and residence in that year, making the future fit the map. They did predict for that period a rough doubling of downtown employment in Atlanta. Unfortunately, as of this point in time, 1977, the jobs in downtown Atlanta have actually declined. So we're quite a ways from getting the doubling between now and 1983.

In Washington, the same type of crude methodology has also created problems, both in terms of inflated forecasts and in terms of rapidly changing forecasts. They simply don't hold to one forecast for very long. And I sympathize with the consultants in that they have to stick to something and so they usually get some forecast, which four or five years later has been displaced by two or three other forecasts.

Occasionally, the problem gets very sticky. For example, both Atlanta and Washington adopted the so-called EMPIRIC model of forecasting which appears to supplement their earlier work using rules of thumb and intuition. It's a fairly complex mathematical model which is meant to replicate the simultaneous interaction of factors affecting location, based on the behavior observed at two points in the past. For example, if there are two metropolitan zones that have certain population and employment characteristics broadly defined, then the model attempts to estimate the impact of, say, better transportation on future behavior, on future growth patterns.

There are many problems with the model, itself, which you can check up on. But the real problem, the real interesting thing, is that just as everybody thought, "Well, we're rid of the problem of crazy forecasts," the EMPIRIC results push rail. When they're ground out, they tend, for a variety of reasons, to be rather pessimistic about things like downtown employment which

are so crucial, the growth of which is so crucial. So what's happened in those cities is that the public's not told this, but they hand-alter the computer results before they issue them to the public. So the losses that occur from a switch from an intuitive approach to the EMPIRIC approach are never seen by the public. The numbers get resurrected. The growth that was lost by going from intuition to an apparently scientific approach are restored in due course. The thing that's really bothersome there is that the general public is simply not told. It takes someone who is idiotic enough like me to spend ages interviewing people and reading every little line to figure out that these things are going on.

In the interest of conserving time, I'll bypass most of my objectives to the models used in Atlanta and Washington to transform small-area population and employment forecasts into transit riders for 1995 or thereafter. There are just a few things I'd like to mention. People's reactions are modeled in these studies based on detailed surveys of actual behavior. And these surveys are known as origin and destination studies. One of the problems that I found in other cities (and in spite of reassurances to the contrary, I suspect may be a problem here) is that these surveys are not undertaken very often. So that, for example, much of Washington's decision to go for rail in the late '60's and early '70's was based on a survey of people's behavior in 1955. In Atlanta, the survey was in 1961. And, unless I'm mistaken, the survey on which things are based here is also from around 1961.

Now, I've been told that there's a feeling of checking the reliability of those origin and destination studies. I've also been told that some of those reliability tests run on this island have been tortured before the numbers come out right, which suggests that you'd better have a much better handle on who exactly is going where and why before you judge the stuff that's being cranked out of these models. These models are very simple, and they are very susceptible to problems of the type that I've just mentioned. There are many, many other issues in this area, but I really can't go into them in the short time that we have.

Let me also sort of mention that population and employment forecasts change when they're cranked through these models, will also change patronages. So the earlier discussion about the unreliability of population and employment forecasts is bound to have an impact on how well you trust the numbers that are being given to you about patronage at some future point in time.

Another point that I'd like to leave you with—and this is a rather difficult one to deal with because, again, it sort of implies that I'm trying to be a "bad guy" here. But in reading things in a historical sequence, I have an uncanny feeling, especially when I look at rush-hour transit numbers—not daily patronage but the thing that really counts—how many people are going to go in 1995 during the rush hour into downtown, wherever—the rush-hour transit patronage.

The thing that's really amazing is that for any number of circumstances including revised population and employment forecasts and changes that come from new origin and destination studies, modeling upgradings, those peak-hour volumes seem to go down for 1995 the closer you get to the day you're going to open service. In particular, there seems to be quite a divergence between the forecasts that are made before the voter votes in the referendum and the forecasts that become operative after you really don't have much of a choice. As I said, it's probably a very complicated thing that just sort of turns out that way, but the numbers are quite significant. For example, in Atlanta, the forecasts that were made in 1969, that was the last ones that really would have had an impact on the public before a vote came, predicted system ridership during the rush-hour 1983 which in fact is now expected no sooner than the year 2000, even though what has in part happened is that we're not building the system as fast as before. But even the new 2000-year forecast assumes that the system will be in operation for about 15

or more years, that is, completed by the mid-'80's. And so it turns out now that what we were led to believe was that the crucial congestion constraint in 1983 can be postponed 15 to 20 years. And that sort of bothers me.

When I was writing some work on Washington, in the early '70's, people kept telling me, "Look, the real problem in this area, aside from the fact that if you give one group of people a rail line, you've got to give them all a rail line because it's a matter of equity." You see, we've so brain-washed people about the fact that buses are just so second-class that if one area, especially if it's a different jurisdiction, gets rail, then everybody's going to get rail. And, in Washington, by the way, you can count if you want the number of miles that Maryland has. It's exactly the same as the number of miles that Virginia has. And within those two areas, if you look at the different counties, they each get exactly the same amount of rail. It's really uncanny.

Well, I kept being told, "Look, there's this area in Maryland, from Rockville into the downtown, they're going to be carrying 22,000 people during the rush-hour into downtown Washington. You're crazy to think that anything but rail will do." And that was a really strong argument, at least for that corridor, even if I didn't buy the other part. I thought, you know, that has perhaps some value. Well, they worked on their numbers after the system had been approved. And in 1974, they revised it down to 12,000.

That's again a sort of variation which is very bothersome for people that are asked to take these numbers and sort of treat them like articles of faith. So I would simply leave you with the idea in this particular section that, when you deal with things that are as important as you're going to have to decide here, I really wonder if you don't have the same sort of situation that you face when you have major surgery recommended to you. You know, get a second opinion. And I really mean get a second opinion from someone or some group that really has no vested interest in the sort of thing that comes up. I'll give you one short example of this in spite of the fact that I know it's going to get me into trouble.

I'm not going to mention any names, but since L. A. came up yesterday and was being really pushed as a place wherein people know how to do good planning, when I was studying L. A., it turned out that in the early '70's, some consultants, fairly well-known consultants around here as well as there, put together a report. Now, this report was a technical document of limited circulation. And one of your consultants said, in essence, "Look, the numbers for patronage are on a regionwide basis, that is, for the size of L. A. County, and along particular corridors is, really, you know, an 'iffy' thing when it comes to rail." The other consultants were infuriated and wrote the following sort of memorandum—which I will just quote very quickly. They noted that the result of this sudden drop in patronage that the other consultants they were cooperating with resulted in "the required system capacity is to be substantially reduced. Rather than needing a large line haul solution, it now appears that an intermediate solution would suffice. However, all the results are contrary to common sense and ignore the realistics of everyday life in the Los Angeles area at a minimum." And then they go on to say, they want the numbers doubled. And so, they did. And the next point that you hear in this report, "For the purposes of systemsizing cost estimating, the minimum capture potential of patrons twice the amount recommended by the other consultants will be used as a lower limit. Such a daily level of ridership is well beyond the practical, comfortable, and safe capacity of all but a large line haul system," that is, a rail system.

Now, when I read that, that seemed to say to me something that my study of the five cities had suggested, which is, I'd want to call a doctor really fast.

Let me finish up with just a couple more remarks because we've got to leave you some time to shoot us down.

There are many, many other issues. Another issue which always fascinates me is the alternatives analysis because I would swear (not here in Honolulu, I know, but in other cities where nobody's feelings would be hurt) that the bus alternatives analysis is put in the hands of people who just hate buses because they find the most incredible things to do to buses. And I'll just give you a couple of examples.

In Washington, for example, they were looking at using buses downtown. And they found pretty much what you find here. That is, they could not get express buses going very fast in downtown Washington without doing something about the automobile. And the consultants flatly said or were told, "Don't you dare so much as take a lane out of any street away from cars. It's politically unfeasible." So, in that situation, they went for rail downtown. Then they had to get rid of the buses outside of the downtown–that is, connecting to the rail line because they wanted to keep the number of transfers down. So what they did is they chose one corridor in Washington, running from Rosslyn to Fairfax, Virginia. This was going to be only a test of whether buses could make it. And what they did was, they developed it so that as you approached the rail end of this long busway, it went into a mammoth underground busrail interchange built through solid rock. This thing is sort of cavernous, its cost was so high that it made it equal to a rail line that wasn't going to be required to do quite the same thing. And on that, the sort of the next line is, "Well, if this is the result for Rosslyn to Fairfax, Virginia, why bother looking at buses anywhere else." And that was the extent of the amount of thought that went into buses in D. C.

In Atlanta, it was even worse because the consultants there, at least had the guts, as far as I can tell (and again to throw bouquets this time, it happenes to involve one of the consultants that worked here), to say a couple of things. One is, "Boy, your population employment forecasts look awfully high." And the second thing they said is, "We don't really think you need an all-rail system." They were put in a position of recommending a rail system, a small spur, in the downtown because they were told of this extraordinary growth in employment that was going to take place in Atlanta and because they were told that cars were not to be touched. But, elsewhere, they just couldn't bring themselves to recommend a rail line. I then traced this thing through and found internal memoranda within the supervisory metropolitan organization in charge of transit decisions where they said in writing to the consultants, "Your report is politically unacceptable. Go back and change it." Unfortunately, by then, the draft report was available, and several of us had our own copies of the draft report. But the final report is fascinating because the body of the report is very much the same. But then at the end of a series of rhetorical questions that are supposed to lead you to the recommended system, the questions remain the same, the answers have been changed. Again, you're sort of left with the feeling something is really odd here.

Now, the consultant can't really be blamed in this, I think, in the sense that, if the people in the political jurisdiction are that dumb, then they deserve bad results in the future. And I'll be watching Atlanta very closely in that respect.

I also would sort of recommend to you another thought that somebody expressed yesterday and has been repeated before to you, that the federal government will take care of good work. They won't approve bad work, suspicious work, or shoddy work. Well, let me assure you, the federal government does it repeatedly. Very few times has the federal government turned anybody down. Somebody said that Denver got turned down. Denver got turned down because they came before the federal government with a frankly experimental people–mover system, and that was just a little too much for even the UMTA [Urban Mass Transportation Administration] people to take. But, usually, that's not really a problem, and I wouldn't trust them to make the decisions for you. Don't take their stamp of approval as an indication that the work is worth going by, because they don't have to live with it. You do.

The very final question—and I can see we're going to run considerably late, but we'll extend the question period for those who want to stay on a little bit—happens to do with reliability of those capital and operating costs. I'll just throw out some sort of very quick numbers here because the idea usually is that, "Look, these numbers are put together, and the only reason they sort of really change if you do your work well is inflation."

Well, a couple of comments. First, it's very hard to get hold of some of the revised numbers in these cities. It's also much harder to find out why they change. Documents just don't sort of surface for you every time you walk into one of these offices, especially, I might add, in my own case where they sort of see the plague coming through the door.

In 1971, Atlanta had a proposed 53-mile system with a small busway appendage that was to be built by 1980 at a cost of about $1.3 billion. One year later, the schedule having been set behind by 12 months, a new estimate was released after pressure from MARTOC, which is a legislative watchdog body, which for a couple of years really put the heat on them. The revised cost total went up to $1.7 billion of which 38 percent was attributable to inflation, the rest was the result of better understanding of the difficulties of building the proposed system.

Once again, in the fall of 1974, the state legislature insisted on a new estimate and now, the total was raised to $2.1 billion, even though the completion date remained 1980. Fifty-seven percent of the increase this time was attributed to inflation; the rest was due to on-the-job training. After 1974, no further revisions have been released though they exist in hand-written form in the hands of the general manager and a couple of other officials. The price tag now is $3.2 billion. And because of the way I got the information, which was basically from some of the people involved in doing the work in technical lower levels, I never did find out what percentage is attributable to inflation. I think it's rather sad (by the way, it's no problem of your own), but my own state legislature at this very moment is considering future commitments of the state to this system without having been told that a detailed, revised price tag exists. And yet, they are considering making commitments for the very system that we're talking about, that is, the enlarged system.

Meanwhile, though, turning to something else, the federal government reneged on an earlier promise that it was going to fund the whole system which also makes you wonder about, those administrators. MARTA got money to build a 13.7-mile system for a little over a billion dollars in 1975 prices. Remember, that because of inflation and problems, they were going to spend that much originally to build 53 miles plus a busway.

The cost estimates were made in 1975 after years of engineering work, work not usually done until funding of a system is assured. I was a bit worried yesterday when I heard the detail here was so much better than for other cities until we got to the Kahala Mall question, and now, I'm not so sure that you don't have a little extra stuff to do yourself. In any case, they really had their job done by 1975. The engineers to build a full system had been sitting there for four years with no approval to go ahead with construction. So in four years, you figure they got most of the rock formations and things like that straightened out.

The second thing is that the initial bids were taken during a period of unanticipated deflation in terms of the construction industry. The construction industry was going through a recession, and they got some good bargains, they really did. And that accounts for the fact that, as things stand now, they probably will come close to completing this system in 1981, not too far from their original estimate. But the thing to remember is, it's not quite out of the woods yet. They've still got quite a lot of underground work to do. Just before coming out here, I found that the hundred trains that are going to be operating in this system will have to go through some previously unplanned retooling to correct mistakes because the people who built

the trains went too fast. They tried to meet an unrealistic deadline. And we don't really know how much that retooling will cost.

The METRO evidence started out in 1969 with a $2.5 billion system. They've spent $4.5 billion so far and built 65 percent of the system, and they want enough additional money to take them up to about the $6 billion range. They never did detail how much of this was on-the-job training, how much was inflation. So, in all honesty, it could all be inflation, but most likely it probably isn't. The reason why, I'll give you in a second.

We can discuss operating costs, and I'll skip over the Atlanta example and go straight to Washington. In Washington, they assumed that in 1969 the operating expenses per vehicle mile would be $.60. By 1974, they had updated this to $2.50. I figured out that about two thirds of that increase was due to errors in judgment and not inflation. Let me give you a couple of reasons. This is operating costs for 1995. In that time period, they tripled the annual energy requirements for the operation of the full system, and they increased the estimated number of employees required from 1800 to 2900. Now, you know, this was done by reputable people. But reputable people can make mistakes—and this goes back to my introduction this morning. I might add, by the way, that, if you're curious about what their operating costs are at the moment with the 17- to 18-mile system, they're $6.05.

As for the results of the building of these systems, obviously, in Atlanta and Washington, we just don't know. I can tell you a little thing about Washington that has me a bit worried. And, that is, they're getting the bulk of their patronage out of buses. We'll know more about this in a few days when some survey results are released. They're getting them out of buses by cancelling the bus service, under considerable protest, I understand, from reading things like the Washington Post.

Now if, in fact, that's the direction we're going, simply switching people from buses to rail and not doing a hell of a lot about the people who are driving cars, then you'd better think long and hard about all the social benefits that are supposed to be coming out of these things in terms of energy savings and land use changes and pollution and all that, because those types of changes may be slow in coming. I wouldn't even dream of telling you anything about what you should do. I think between you and me and everybody else in the room, that approach was tried previously by another group of people and didn't sit too well. And, you know, it's your business.

My only concern (something of coming back to being an academic, since that's what we're being accused of being), my only vested interest in your decision is that I want to come back some day and study the consequences of your action.

Dr. Hamer: Our next speaker is Dr. John Kain who has a Ph.D., again, from the conspiracy of Berkeley, University of California, Berkeley. He has worked at the Rand Corporation. He is a professor of economics at Harvard. He's also head of the City and Regional Planning Department there; a staff member of the National Bureau of Economic Research—it goes on and on—one of the top men in urban economics. And if I sound somewhat adulating the point, it's because he's one of my former professors, but in any case someone I think who should give us a pretty good talk. Dr. Kain.

SOME LESSONS FOR HONOLULU—A CRITICAL SUMMATION

John Kain

I'm beginning to feel a little bit like one of the bad news bears, for those of you who are movie goers.

Now, as you can see from the program, I've been given the nearly impossible task of summarizing the past two days of presentation, in attempting to draw from the lessons for Honolulu. Now, this task is made especially difficult by the contradictory nature of the two-day presentation, by my limited familiarity with Honolulu, by the relatively small amount of time that I've been able to spend evaluating the literally mountain of technical studies, and by, finally, critical gaps in the information about travel in Honolulu. At the same time, I feel strongly that I would be abusing your hospitality if I did not share with you my candid reactions to the past two days and to the transit proposal that you are being urged to support. I wish I could claim greater certainty for my conclusions, but I offer them to you, all the same, without further apology.

In brief, I find that I must express serious reservations about the HART proposal and about the studies that purport to justify it. Now, time will not permit me to fully document the sources of my reservations, but I'll, nonetheless, attempt to outline the nature of these concerns. Some of these points were developed more fully by earlier speakers, and the question-and-answer period may permit us to discuss some of the others more fully. I propose, first, to list my principal conclusions and then provide a further discussion of several of the most important of these.

First, my examination of the patronage projections for HART causes me to suspect that they're unreasonably high and perhaps by a very large amount. This assessment, of course, directly contradicts Mr. Bouchard's presentation here yesterday morning.

A second and closely related observation is that I find the small-area employment and population projections that are so critical to the HART projections unconvincing. Dr. Hamer, of course, has spoken in some detail about these in other situations. The HART projections make no effort to explain or justify these crucial forecasts, and they do not correspond well, to either my limited understanding of Honolulu and its history or to my knowledge of urban development patterns in other cities.

Third, the HART patronage projections are based on seriously dated and possibly obsolete travel data. At minimum, these data should be carefully evaluated, and serious consideration should be given to collecting and analyzing up-to-date information on travel in Honolulu. These data and analyses would be valuable not only for assessing the HART proposals but in evaluating a number of other transport proposals that I understand you have to deal with as well.

Fourth, the potential overestimates of HART patronage and revenues appear to be aggravated by a probable understatement of HART capital and operating costs. Now, I'm less certain about this proposition, than I am about the overprediction of patronage. But the experience of other rail systems, which a number of the previous speakers have discussed, in comparative system cost, strongly suggests this possibility. I am more confident from my reading of the HART reports and Professor Keeler's evaluation of them, that the projected costs of the bus alternatives are overstated relative to those of the fixed guideway proposal.

Fifth, serious question can be raised about HART's design and as to whether it will effectively serve Honolulu's current and probable future travel market.

Finally, the most serious deficiency of analyses done to date is the failure to devise and evaluate meaningful alternatives to HART. The so-called "alternative analysis" is seriously deficient and the bus alternative considered in them can only be considered as "straw men."

Now, let me turn to a more detailed discussion of some of the points that I've outlined above. I regret that I have been unable to carry out a detailed evaluation of the patronage forecast for the HART system. Without such a detailed re-examination, it's impossible for me to be very specific about the probable causes of what appear to be exceedingly optimistic projections of HART patronage or to provide you with alternative projections. In this regard, however, it is perhaps worthwhile to describe the results of such a detailed re-evaluation of another rail transit proposal. In a sense, this is the only instance I know of where the officials followed Dr. Hamer's advice and got another opinion.

Three years ago, Gary Fauth and I completed a detailed reanalysis of travel and transit projections for Tehran in 1991, that's Tehran, Iran. As I say, this is, in my knowledge, the only instance that I'm aware of where there was a kind of detailed, careful re-examination of travel forecasts of the type that we're dealing with here, in the case of the HART proposal. The Tehran metro proposals and the travel analyses that were used to justify them were prepared by a team of internationally prestigious consultants with reputations that are at least as impeccable as those of the consultants who developed and evaluated the HART proposals. Our reanalysis produced projections of total travel for Tehran in 1991 that were half as large as the consultants' projections of transit, and metro ridership and that were one fourth as large as those that were used to justify the metro proposal.

Now, I should emphasize that in making these projections, we used most of the forecast of the important kinds of variables that you might expect that consultants use. We used the consultants' forecast of income, consultants' forecast of automobile ownership, the consultants' forecast of total population, the consultants' forecast of the location of population and employment within the metropolitan area. Our reanalysis produced forecasts that were one fourth as large as the consultants' forecast for the metro system. In addition, our projections, at least as we saw them, were much more consistent with the experience in other cities than what struck us as the implausibly high projections of the consultants. What we essentially did was we compared the projections for Tehran in 1991 with other metropolitan areas that at that time had characteristics (income levels, population, transit systems and so on) that were comparable to those projected by the consultants for Tehran for 1991. Our projections were highly consistent with the experience of these other metropolitan areas. The transit projections were wildly optimistic, wildly higher than our projections.

I've shared this story with you, both to indicate the uncertainty inherent in such forecasts (a point that several other speakers have made today), and to point out that proponents of such systems such as HART seem to have a tendency towards optimism in predicting the likely success of their proposed systems. Now, I didn't think this was particularly surprising. People who design these systems come to believe in them as they rightfully should. They sort of invest themselves in them. Typically, they're engineers who like to build things. I think that's a very important characteristic to keep in mind. The BART experience and those of other computer systems, as a number of speakers have indicated, reveal the same tendency towards overprediction in both employment levels in central areas and in terms of patronage. As I say, such optimism by the proponents of these systems may be understandable. But there's a serious question in my mind as to whether they provide an appropriate basis to commit large amounts of public monies and to ask communities to make irreversible decisions that will affect their entire lifestyle.

Now, there's still other reasons for my pessimism about the HART patronage projections. First, the several aspects of projection seem simply unreasonable on their face, given experience elsewhere and the implied changes in behavior they suggest. For example, the projections for the HART 12-mile system indicate that 60 percent of all work trips to the central business district, 30 percent of all work trips in the entire metropolitan area in 1995, will be made by transit.

Now, these projected modal splits, that's a proportion of trips by transit, not only seem high in comparison with the experience of other metropolitan areas but, in addition, they would require more than a three-fold increase in the share of work trips to the CBD area in transits and more than a five-fold increase in the transit share of work trips for the entire metropolitan area. Now, this is during the period when incomes are expected to grow at a considerable rate, and a number of other trends that other studies have indicated are adverse to transit ridership are likely to occur. Projected increases of this magnitude are both unprecedented and exceedingly difficult for me to even imagine.

I should add that Gary Fauth and I have just completed a study sponsored by the DOT [U.S. Department of Transportation] of differences in auto ownership and mode choice among the 125 largest metropolitan areas. And this study is designed to evaluate the effects of a lot of the kinds of metropolitan area characteristics that people of this conference have suggested make Honolulu a particularly ideal place for the construction of a rail system. It's designed to evaluate the effects of differences in metropolitan spatial structure, differences in metropolitan densities, and differences in the characteristics of urban transit systems in these metropolitan areas and their effects on auto ownership and their effects on mode choice—in particular, transit use.

The projection model which we developed for this study, which I indicated emphasized the effects of inter-metropolitan differences in urban spatial structure and transport systems, does a highly credible job of predicting Honolulu's transit use in 1970. This is transit use for the journey to work because that's the only information that we have on a highly consistent basis across large numbers of metropolitan areas. Indeed, while we slightly overpredict transit use for Honolulu's CBD, our predictions for the central city and for the entire metropolitan area are right on the target.

As part of the same study, we also prepared national projections of transit use for 1991. Now, when we combine the proposed transit improvements for Honolulu, the results of our 1970 projections for Honolulu and the findings of our 1991 projections for the entire nation, I'm simply unable to find any support for the very large projected increase in transit work trips proposed by the consultants, not that I can't find some support for some increase, but for the very, very large increase that is proposed for the HART study.

On one of the other findings of our study, which is also pertinent to the current discussion which tends to support one of the important findings of the BART impact study as was mentioned by Mel Webber, is that we could find no evidence that rail transit capacity was any more successful in attracting commuters than the equivalent amounts of bus transit capacity. Now, this finding, to be very honest, surprised us, because we expected that grade-separated rail systems would be more effective in attracting commuters than relatively low-performance bus systems such as are found in most metropolitan areas. At the same time, as I say, it tends to confirm the BART impact study's result.

Now, my critique of the HART projections to this point is dealt with a reasonableness of the projected modal splits—that is, projections of the percentage of commuters who will use transit to travel to work. Now, there's another equally important aspect of the projections that needs to be mentioned and, as I indicated, it's been discussed to some extent by Andy Hamer. The total number of transit users who will use the proposed system are obtained by multiplying

the fraction of workers using transit times the number of work trips made between each pair of origins and destination. Now, since the expected transit mode split varies widely, total transit users are strongly influenced by the small-area projections of employment and population which are used in the forecast.

Once again, my evaluation of this aspect of the HART projections has been hampered by the very small amount of time I've had to investigate them. The employment and population projections used in the HART study were not done by the consultants. The consultants make no effort to evaluate or justify them in presenting their 1980 and 1995 projections of transit ridership, in spite of their obvious impact on these projections.

Even though I have not been able to evaluate these land use projections in any detail, it is only proper for me to report that they are not in accord with my admittedly limited knowledge of the Honolulu economy or my more extensive knowledge of urban development trends in other U.S. cities and world cities. And again, that's very much in the spirit of Dr. Hamer's discussion about the projections of this kind in other metropolitan areas.

Now, as I indicated in my introductory remarks, I also have reservations about the proposed design of HART, it's probable effectiveness in serving Honolulu's existing and future transit markets. The proposed HART guideway is a single line that appears to do a good job of linking central Honolulu's major employment centers. The difficulty with this concept is that the principal justification for the system is to serve the growing number of commuters during peak periods when the transport capacity is best expected to become increasingly strained. These journeys to work are made between residences and workplaces and not between workplaces.

A motor trip along the guideway and ground surveillance for the proposed station sites that we made two days ago make it clear that the proposed facility will have to depend on feeder buses and auto for access. It is possible, of course, the completion of the guideway will foster high density development around HART stations. But I would not want to stake large sums of money on this eventuality. All but a fraction of Honolulu's recent high-rise developments are located several blocks north of the proposed HART alignment and well beyond walking distance to the stations. The HART proposal obviously envisions large numbers of L-shaped trips from residential areas north of the guideway to the guideway and east or west along the guideway to workplaces. Now, one of the few theorums that I can still remember from my high school geometry classes is that the hypotenuse of a right-angle triangle is shorter than the sum of its two sides.

Of course, congestion in the advantages of reserved right-of-ways may modify this conclusion somewhat but, nonetheless, raises the question that many commuters may find it cheaper and quicker to drive a more direct route to work, although an alternative system or line of buses in various priority measures might be able to provide superior service for many users. Now, examination of the characteristics of current bus users raises further questions about the HART concept. In commenting on this aspect of the proposals, I should reiterate John Meyer's comments that we really haven't been able to find out very much that's important about this and that, in many respects, the questions we've asked have just caused us to want to ask more questions in our own minds. So we're really looking at very limited information in this sense. Unfortunately, I'm afraid that it may be, in many areas, as much information as exists in making these decisions.

I've been unable to obtain, say, only limited information about the characteristics of current bus users. These data indicate, however, that out of the current 53 million annual users of the existing system, approximately 15 million ride for a ten-cent fare, I understand these are elementary and high school children; and 7.5 million are persons who pay zero fares, and I

understand these are either completely or predominantly senior citizens. I've seen no analysis of how the proposed guideways would serve these passengers who account for more than 40 percent of current transit users. I doubt, however, if many of them are making trips that are destined to the employment centers served by the guideway. Of the remaining 32 million annual full-fare passengers, an apparently unknown, but by most accounts a very large fraction, are tourists. I've been told that the system's largest line which serves nearly a third of the system's passengers runs between Waikiki and the Ala Moana Shopping Center. The proposed guideway, of course, provides no improvement in service for these users.

My most serious objection to the HART proposal and the analyses that purport to justify it, however, is the so-called alternatives analysis. The principal weakness of the alternatives analysis, in the benefit-cost analyses associated with it, is that they provide no assurance that the best alternative has been considered at all. In my introductory remarks, I described the bus transit alternatives included in the alternative analyses as "straw men." I see no reason to recant. In this regard, there's more than a little significance that the most serious bus proposal advanced—the so-called "CERT plan" was not even considered by the alternatives analysis. Now, I've been unable to assess in any meaningful way the CERT proposals. But it appears to have been crafted by persons who believe in the potential of bus rapid transit and who are attempting to devise a feasible and workable alternative. The bus alternatives included in the alternative analyses in constrast appear to have been devised by persons completely unsympathetic to bus rapid transit and whose principal objective was to discredit the concept for Honolulu.

In conclusion, I feel strongly that, before the HART proposal can be properly evaluated, there's a need to compare it to a serious bus rapid transit alternative designed by competent professionals who are committed to developing a bus rapid transit system that would serve Honolulu's current and probable future needs.

Now, I appreciate that many of you will be impatient with the suggestion of still another study but for the reasons I have outlined, the information required for a rational and prudent decision about HART simply does not exist currently. Thank you very much.

QUESTION AND ANSWER SESSION

Moderator: Okay, I guess the grilling can begin. There's no royal road of figuring how to do questions. Somebody had earlier asked whether we could do this by writing the questions, and then somebody else said, "No, that would be unduly unfair to the way it was done yesterday." So, I guess we'll just take them at random.

Question: Except for Dr. Meyer, I wonder if you people would take a suggestion before I give you a short question, and that is, immediately at 4:00, we should adjourn at 4:00, take the bus ride from here, get to Ala Moana and get to the express bus, go to Pearl City, go all the way back to Hawaii Kai, and you'll notice that we haven't got any more room for roads, and you'll see the admiral's double-decker at the airport, which might be a suggestion for our freeways—double-decker freeways. My question is this—so much has been said about BART—is the bus system or bus systems integrated to the BART system?

Panel responses: 1. There is a big effort to improve the quality of the feeder bus services in the Bay Area feeding into the BART system. The BART agency has contracted with the bus agency and is paying for buses in the outlying suburbs. They are not good enough yet, and both AC transit and the BART District are continuing to work at it, particularly out in the outlying areas. In some other areas the buses have been diverted from their normal routes; diverted into

the BART stations. In other places, the BART stations are so far off the main track that the bus agency has refused to deviate its bus routes that much because it delays the other passengers' going to other destinations. Yes, in part, they are coordinated and they're certainly not well enough coordinated. People are continuing to work at it.

2. I might add just very hastily that in Washington they're doing a really bang-up job of coordinating buses and transit and you might want to check on their experience.

Question: Fellows, you ought to know that my name is Dick Bouchard and I'm from DMJM. Let me say that I think, really, based on today's comments that I heard and the two or three days that you fellows have been here, you've really been able to grasp the issues that exist here on the Island. I think you've been able to articulate them extremely well. At the same time, I'd have to say that I think each of you expressed the desire to have had additional information on the existing proposals here. I think it's a shame you didn't ask the City for that additional information. It's available, and maybe we could have helped clear up some of the dichotomy and the basic assumptions that exist here. I have the feeling that the underlying concern that all of you have rest on a question of patronage, and all of you seem to express a common theme that those patronage forecasts were severely overestimated and there were a number of jokes made at the process of estimating patronage of a number of systems around the country. You may have a point, and I think, rather than my taking a lot of time and asking a lot of questions, maybe if we concentrated on the question of patronage and tried to explore some of your feelings on patronage estimates here, how they may differ from ours, that might demonstrate that really there is a difference in common language between the people who talked yesterday and the people who talked today. So I'd simply ask anybody on the panel, but preferably the gentleman who spoke first this morning–that, in essence, I thought described a very technically complicated process in very simple language, the BART process–to ask him, in his analysis of the patronage forecast methods here in Honolulu whether he had any quarrel with the basic assumptions that were made. Then after I get an answer to that, I have two or three other sub-questions that I'd like to ask.

Panel response: I'd like to just maybe correct the impression that we didn't ask and therefore that's why we didn't know. This thing has been going on for several months, and in my introduction today for example, I mentioned no matter how many times we asked for operating maintenance cost methodology we never got it. I mean it's not your responsibility, but I as someone who has been with this since about October–I have aged many years trying to get information–and it's hard.

Question: Well, you have to as yet ask the City Department of Transportation Services.

Panel response: That is exactly where the request went through. I'm not that naive.

Question: Does somebody care to answer the question?

Panel response: I just want to make sure you didn't score a point on that, if it's going to be a debate.

Question: I really wasn't trying to score a point. I took it as a serious point this morning that you felt that you didn't have the information you wanted, and I think that's a shame.

Panel response: Okay, but the information that we wanted is either not available or was not made available to us, I'm sorry. I'm just trying to set people straight. I'm sure there is a hell of a lot more to see that we didn't see, but I'm just saying that we made a reasonable attempt to get hold of just about everything that we could.

Question: I think that we had several meetings arranged but I never got to see you. I always said to whoever—was that Mike Leach from your organization—that was the contact man that he can have any information that's available in the office. There was no really serious attempt to come through me to get that information. One other thing, Dr. Hamer. I hope that you'll one day come back here and find a successful thing. One other statement I wanted to make is that we're not trying to encourage bus patronage to come into our system, our bus people will go into the system. So you know that's a difference.

Panel response: I'm not trying to get into a debate. I was simply saying that if the implication was that, you know, we sort of didn't go after information, we really did go after information. We obviously do not have the information—every bit of information that we needed, and that's just the nature of this system. I'm sure the people who spoke yesterday, many of them also were not as acquainted with things as they'd like to be. I guess we should get back to the substantive matter which came up about the patronage.

Question: You know first I'd like to clear up this question about information. I think the record is fairly clear that both the House and the Senate and the Legislature through the Auditor's Office have requested information from the City and have been very slow in coming. For example, they requested information from the City for operating and maintenance cost, and we told them they were not available because they were being updated. Okay, that sets the record clear. This forum, as far as I'm concerned, is for the people to ask questions and this is what it's for, so some of you in the audience who don't have any vested interest or axe to grind will ask these people questions.

Panel response: As I understand, there's a question asked of me and as I understand the question, it was what assumptions within the forecasting methodology that was used for HART do I consider to be overestimated. First of all, I want to emphasize that I am not criticizing the HART forecast for being incorrect. In my speech, I was trying to emphasize problems that we had with BART, and that the same problems could come up with HART. The four things that I mentioned are all assumptions that were relevant to the HART forecast. And all four assumptions seemed to be problem areas within the HART forecast. So my answer, in a sense, is just a repetition of what I said in my talk.

Question: I said that, in all deference to what Ben said and I too believe it ought to be members of the legislature and the citizens that ought to ask the question, but I was really struck by that talk this morning on that subject, and particularly the first of the four points where you talked about the feeder bus system and particularly when I related it to the point that the moderator just made where he said, "Go to Washington, D.C., and take a look at how great the bus system is in Washington." Well, the fundamental point here is that the feeder bus system in BART was run by a different agency than the BART people. And we all know that the basic issue there was, "Who gets the patronage money from the feeder bus system and how does it compare with the revenues that come from the bus system before the bus system was asked to be reconstituted to feed the BART system. That was a very serious argument and related to basic economics as to who got the cash out of that. It wasn't a case of a planner sitting down and saying this is what the feeder bus system ought to look like and it was implemented overnight. It is a very serious question of who got that revenue. That same thing does not exist here in Honolulu. The City and County of Honolulu operates the basic bus system and presumably would operate the HART system; and that's the situation that exactly parallel to the situation which exists in Washington, D.C., and the system in Washington, D.C., is a damn good feeder system as the moderator just pointed out. Now, I'm really not going to ask any more questions, but my basic point is, there have been several things that have been brought up here in the sense today that says, "Look what happened over there and the same thing is likely to happen here in Honolulu." Well, maybe the thing is very likely to happen here in Honolulu, but I don't think

it's necessarily predestined to happen here in Honolulu; and I think that's just one small illustration of that kind of a point.

Panel responses: 1. I actually did take exception to projections and I took exception to the projections in two areas. There are really two ways to look at projections of this kind. One of them is that you can essentially re-do the analysis. That's what we did in Tehran. And when we took essentially the same data that were available to consultants and re-did the analysis there, we, as I indicated, got patronage projections for 1991 that were one fourth as high as the consultants obtained. Why it turns out like that is incredibly complex. That's the reason why it's almost impossible without a major investigation that really reworks all the detailed arithmetic to say exactly why it is that the Honolulu patronage, the modal split forecast seems to be so unreasonably high. There's another way to look at this, and that's the way I look at it; that is, you look at the experience in Honolulu, or the projected experience in Honolulu with two kinds of experience. One of them you can say, "How does it compare to today, and what has to be accomplished to reach the projections?" Well, in that case I say, what's needed to reach 1995 HART projections is a three-fold increase in the percentage of persons who commute by car to work to the CBD, taking transit. That is, it goes up to approximately 20 percent in 1970 to a projected 60 percent in 1995. So the question is, what is it that produces that kind of effect. And when I look at that and I say, "Well, I don't see this system, as wonderful as it might be, producing those kinds of effects." Similarly, the projections called for a six-fold increase in the percentage of people in the metropolitan area who commute to work going by transit. Again, it's hard to see how a 12-mile system, even with much improved feeder bus lines and that kind of thing, is going to produce that kind of effect. Now, the other way to look at it is to, in fact, compare the experience in other metropolitan areas who have similar kinds of characteristics. And that's what, in essence Gary Fauth and I have been doing for the last two or three years for DOT. We've been trying to understand what it is that's different about metropolitan areas, about their populations, about their geography, about the characteristics of the transit system that explains the differences in transit ridership. Again, if you look at the problem that way, the answers seem unreasonable. Now, I indicated that I wished that we had been able to have had the time and resources to do the kind of careful re-analysis that we did in Tehran. That wasn't part of this arrangement. We had a few days to read incomplete documentation in Cambridge and a few more days here in Honolulu to try to familiarize ourselves with the situation. Now, that's nobody's fault. That says that these are complex circumstances, complex situations, and that it takes a lot of work to figure them out. What we're saying is that when we looked at this experience, looked at these projections, they just don't strike us as right on the basis of either what's expected to happen, or the experience elsewhere.

2. There's one point that should be made on this since it's brought up. In theory, Mr. Bouchard, there was supposed to be, as I understand it, coordinated fully, the bus and the rail system in Greater San Francisco. What happened is that some of the realities pushed to the fore. Realities in this case as reviewed from a distance appeared to be perhaps on the one hand that the public didn't want some of those services to disappear so they insisted on their being perpetuated because they provided them with the superior service, some of the express services and there was a lack of coordination, if you wish, which certainly then did reduce the demand for the BART system. But of course it meant the people, the customers, got the better service they wanted. A second consideration, I suspect, is that you had some union people. There were different unions involved, and there may have been some job protection involved, they wanting to keep it going. So you can have, in theory, this sort of perfect coordination, but there may be a few slips betwixt the cup and the lip.

Question: I'm here simply as a private citizen, as a resident of the Windward area. Now, I am president of a nonprofit group that tries to bring some public awareness back and we lobby in the public interest. I think from the last two sessions, there has been a lot of overkill today.

I have been a resident of a San Francisco area and I grew up in Philadelphia; used the subway, walked five blocks to get one; used the New York subways; traveled abroad a couple of times in the last five years; and I am acquainted with those areas. I have one question and I also have a comment about BART. But, I would like to ask this one question. I would like to know why 43 countries are now involved in planning, 18 under construction for railway, transit, etc. Are they all stupid? Are they dumb in your estimates, or what? Would you please comment. Please tell me why 43 countries are involved in planning this kind of rapid transit system?

Panel response: Let me give you the explanation for one of the 43—I can't speak for all 43 because I don't have intimate experience. The case of Tehran—it clearly turned up two considerations. One of them was, there was a sort of great feeling of this as a prestige thing. The feeling was that every national capital in the world has a rail rapid transit system, and Tehran is a great national capital and it needs one too. So that, if you know anything about the Shah and about Iran and so on, I think that will sound a little bit plausible to you. I find it's equally hard to figure out why he wants to buy all of those high-cost jets and so on, but that clearly was a very important thing. The second consideration in Tehran was the fact that there was the fact that there was a high-level deal made between Pompidou and the Shah, where Pompidou made a swap with the Shah for two or three nuclear reactors, a few Mirage jets, and a rail rapid transit system. Now, that's the way those decisions were made. Now, I don't know what your interests are in nuclear reactors, I don't know what your interests are in Mirage jets, and I don't know the extent that you feel a need to have that kind of prestige item, the kind of pyramid-building kind of thing. Those were the reasons in Tehran. Other places, I'm fairly sure rail rapid transit makes a lot of sense. In very large high-density, low-income metropolitan areas in developing countries rail rapid transit makes a great deal of sense. There probably are some European countries just like there are some American cities where extensions to existing rail rapid transit systems in high-density areas with high concentration, lower income makes sense. There are a lot of reasons why the experience elsewhere might not be applicable to Honolulu.

Question: Sir, granted—if we can have some dialogue for a second—that may be true, whether it would be applicable or not applicable. And we invite you gentlemen here today and the gentlemen who were here yesterday to try to listen to hear the pros and cons, and we have people in this State that will have to make the final judgment along with the taxpayers. Now, they may opt for a different reason, environmental reasons, whatever reasons. Costs, I don't think that service to the community is supposed to be really measured in how much money you're going to make. It's a service to the people like getting the trash, garbage, medical facilities, everything else. In other words, we may have a deficit. I don't think any of us are that stupid. It's not going to be all frosting on the ice cream. There are going to be problems. But in terms of BART, one of the things is I have an apartment on Nob Hill and also built a home in Marin County, and as you know women, I'll take the fall this time, we've been said to change our minds all the time; but what went on in BART and the way they ran it around in circles and made changes must certainly have something to do with the escalation in costs. Because anybody who's ever had a small contractor and going to build a house and make a lot of changes in the middle, when it's supposed to be costing $20,000, can end up to be $100,000, and this is true what happened in BART. It was really a mess in the beginning. It isn't all the technical thing of whether GE should have done it, or whether Westinghouse should have done it. A lot of it were the problems, and it was new and we are supposed to be learning by some of these errors, rather than feeling because this failed everything will fail. The other thing is that today, as you know, a lot of people come in from the outer areas, park in the San Francisco area and then use public transportation. Some of them are Marin County people. I pay almost $2000 a year in taxes as opposed to what you were talking about. Marin County did not get into the act, but they seem to be very sorry that they didn't get into the act; at least some of the neighbors that I talked to. So now they drive in across the bridge, park their cars in the marina and the outlying district, get all the people in that community upset because

they park it and take public transportation to get downtown to their jobs, where perhaps if BART had been extended out there, it would be used. You know there are a great many people coming into that city. And Philadelphia is another. There's about 17,000 parking places in downtown Philadelphia and people come from all over and pour into that city, and they come in on the transit system. There's got to be something good about it. I don't say it's the all answer, but it's not as bad as you people put forth, and I think it was just a little bit of an overkill.

Panel response: I would perhaps add a couple points just very quickly, but I certainly don't want to get into a debate. But Marin County doesn't have BART because Marin County was forced out of BART. If you read the details, Marin County could not come up with enough property tax money as far as the BART board of directors were concerned for it to pay its share, and they were pulled out. You can check the record on that.

Question: Just one thing. That isn't what I said. I agree that there were reasons but what I say is they would want to come in if they had been able to come up with the money.

Panel responses: 1. Okay, in the wisdom of the decision of the BART directors, they were not allowed in. That was a decision of the BART board, and I don't really know what we can do about that. The other thing I would like to say is, you know I've heard that argument before and as I said, we're talking about a particular metropolitan area, but if you really want to carry your argument, and I don't want to be antagonistic, I think that you voiced a point of view that is very, very important in all of these communities. But, there was a time when people were building expressways everywhere, and some people said, "Hey, you know there's something wrong with that," and I could imagine somebody saying, "What do you mean there's something wrong with that? They're building expressways in every major city in the United States. And even if they are plowing through low-income neighborhoods in the city, other places are doing it. If they're doing it, it can't be wrong." This sort of majority behavior does not necessarily imply a blank check and one should maybe ask some questions. On top of that, the experience of other countries, especially developing countries, or countries with very different residential and employment densities or countries where automobiles are deliberately discouraged from the start as in some of the Communist countries, circumstances are quite different, and I don't think any of us would be foolish enough to say that some of those decisions don't make a hell of a lot of sense.

2. Could I speak to an earlier issue that was raised? I think Randy Pozdena spoke very well for me and I strongly suspect for most of the other members on the issue of public subsidies that I certainly do not feel that the calculation of profit and loss in urban transit is the accurate way to make a decision on how to go. I believe there are many reasons why public transit should be subsidized. That does not mean that I am unwilling to look at the extent of the subsidy, the extent of the total cost, and try to weigh that against the total benefits.

Question: I'm one of these confused League of Women Voters types you heard about yesterday. To get unconfused, we've done a little study and in particular the ridership figures. Comparing other cities we find that transit ridership in those that have a well established system, Lindenwold, BART, a few others, runs 40, 50, 60, 70,000 persons per million population. On page 35 of *PEEP II,* ours run 323,000 per million population in 1995. Now, even accepting that, which is five times, six times the proportion in existing cities, only 9 percent, and I quote from the figures in *PEEP II,* of all the trips, of all the person trips in 1995 would be on the guideway at all. Ninety-one percent of the trips wouldn't even touch the guideway. If, as I think Dr. Kain quite properly pointed out, these figures are exaggerated, that instead of 9 percent it turns out that only 4 or 5 percent, or only about one out of every 20 people on the entire island would use the guideway, I, too, agree that if a public facility serves the people it should be subsidized, and

the cost is worth it. Is it worth for 3 percent or 4 percent or 5 percent of the people? That, I'd like to have someone answer.

Panel responses: 1. I think the problem there becomes, of course, that given the previous question and our philosophy, that's your decision to make. I think that the stuff that we raise today is basically in terms of some of the uncertainties that you have to take into account when you make your decision.

2. I think it's worthwhile to emphasize one aspect of what we're trying to say or at least some of us are trying to say. That is, it's not a question as to whether there is subsidy. I don't think any of us have any real problem with the decision to subsidize transit. We may be somewhat concerned about how much subsidy. The question is how to get the most money, the most for your money. Our suspicion is that it is no more than that at this time, and until this thing is examined much more carefully, I don't think any of us are really ready to assert what the right answer is. Our suspicion is that there are alternatives, particularly some kind of bus alternative that, for any amount of money, any amount of subsidy, capital operating cost that you want to provide, will provide better service for Honolulu. We think that's the crucial issue—and as I said, the thing which I find most disturbing about the evaluation to date is that I don't perceive a very serious imaginative kind of bus transit proposal. And if there is an imaginative serious bus transit proposal developed, careful estimates of patronage are made for both it and the existing HART system, and, if in fact, cars are looked at, you can conclude, and I can conclude, and everybody else can conclude, that the right thing to do is build the proposed guideway system. That's fine. There's no problem with that at all. The problem is the development of more promising—possibly more promising—alternatives could be done. The alternatives analysis does not provide that kind of comparison. There's a very, very substantial chance that great opportunities for Honolulu are being lost, opportunities to provide Honolulu with a vastly better rapid transit system than is described in the HART proposal. That's what we're talking about. And the question as to whether the patronage forecasts are high or low is just part of that technical issue.

Question: Most of the people here who live within hearing distance of traffic can tell without looking when a bus goes by. I wondered where Dr. Small got his conclusion that one bus was probably quieter than the number of cars it would take to transport an equivalent number of people?

Panel response: I'm sorry if I mistakingly gave that impression. What I tried to say was that noise was the one area where I really couldn't judge between a bus and the equivalent number of cars that it would displace. That's talking about a diesel bus. A couple of alternatives, which I think I indicated, are electric buses for one, and one that I didn't mention is propane-powered gasoline buses, which would be somewhat quieter than diesel, although, as you know, gasoline engines still make a good deal of noise. I don't know if anyone else on the panel has more information about noise of different vehicles than I have, but that's essentially the only evaluation I could give you.

Question: Our experience here is that it's the intrusive noise that's disturbing and that buses are quite definitely, unmistakingly noisier than the cars. I have one brief question. I wondered, in the BART projections, whether you considered reductions of fare as a way of increasing ridership?

Panel response: In the BART forecast that I presented in the talk today, I tried to present the fares that were in existence when BART was built. That, of course, is an appropriate procedure. We have done studies of what would happen to BART patronage if fares were changed. In particular, in the Bay Area of San Francisco, there was a proposal to make a flat fare system for the BART system. Presently, you pay more money to ride farther distances on BART and

the proposal was to just make one fare applicable to the whole system. We, using our methodology, determined what the change in patronage would be as a a result of that. It turned out that for most reasonable flat fares that were being considered at the time, the increase in patronage would be quite small. And, moreover, the economic effects of that in terms of distribution of benefits would be to help the rich people who live farther away from the city—and they have high fares—and hurt those that live inside the center city that have presently low fares. On the basis of those two considerations, the patronage would go up very little, and that it would be, in essence, a subsidy of the people who live far away from the central city. Hence, the proposal to institute flat fares was rejected. Other than that study, there's been just random small studies to estimate the effect of increased patronage as a result of fare reductions.

If you want them at the end of this seminar, I can give you a couple of references, where there have been studies in other cities. It depends, to some extent, on how much service already exists. The range is quite wide. For example, a study was done on the fare changes in Atlanta, which went from about 45cents plus a transfer to 15 cents without a transfer. The increase as estimated by the researchers at the Urban Institute suggested that for every percentage decrease in the fare, from 45 cents to 15 cents, there was about a 15/100 to 20/100 increase in patronage. I can give you further references on that if you are interested.

Question: I have two questions, the first of which I hope somebody can answer with either a yes or a no, and I'll get details later; and that is, were any behavioral scientists consulted on the probability or the possibility of people changing their preference from the automobile to an attractive metropolitan rapid transit system, a rail transit system?

Panel response: Yes, there were studies made by psychologists.

Question: The second question is, I would like to know if there have been any safety record comparisons between rail transit and bus transit and what are the insurance cost comparison.

Panel response: Unfortunately, I can't, from my memory, tell you what the specific numbers are as they relate to insurance costs. I can tell you that the comparative cost study that I referred to very definitely did take account of accident costs. The insurance costs of both the bus and the BART system, the fixed rail system were included. In the case of auto transportation, the insurance costs didn't cover everything, that is, if you're out of work as a result of an auto accident and the like. Actually Ken Small is the one who deserves most of the credit and he should be answering this. The place where we did the most work was in the case of the private automobile. There, we found in 1972 prices, an accident cost approximately 3 cents per vehicle mile, something very high, but the bus and the rail were more or less dwarfed by that. All I can say is that the insurance costs were indeed included in the numbers that we have. I can look up what they are, unless perhaps Ken can remember. We can find out; they most certainly are in our comparisons.

Question: There have been safety record comparisons between the two modes of transit then?

Panel response: Most certainly. There are insurance records for the company as to what accidents have occurred and what damages were awarded for those purposes. We accounted for the accident costs of both of those modes through the insurance costs that they paid, since, in general, the company is liable for just about everything for which it is found responsible, at least as I understand it.

Question: I represent the Makiki, Tantalus, Punchbowl Neighborhood Board No. 10, and presently we are trying to come up with a development plan for Oahu, and one of the criteria we are looking at is aesthetics. I just realized today that part of the HART route will be elevated 12 to 20 feet above the surface of the streets. I believe the route will be on Kapiolani Boulevard and I find this disturbing. If it is to extend beyond Kahala Mall to Hawaii Kai, imagine how the people out there are going to feel looking at this. Representative Cobb brought it to my attention that there is also a safety factor involved and that a wall will have to be built around the structure to keep children away from it. Would you like to comment on it please?

Panel response: I think that probably spoke for itself. I have a feeling at this point that we have to minimize our antagonisms, and if we dare to make a remark on that, there would probably be a raid up the platform. So we'll just leave it at that.

Question: I'm speaking on behalf of the Council of Presidents, which is an umbrella organization for community groups. I'd like to express deep appreciation to the Legislature for sponsoring this seminar. I want to express very deep appreciation to the panel of experts yesterday and very deep appreciation to the panel today. I think, speaking for myself and for a number of these community groups, you have, for the first time, revealed to us some of the problems that we have to face. I think both panels have done a tremendous job. My question is really directed to the Legislature, and I'd like to ask, perhaps Representative Cobb, whether we can follow up on this seminar of yesterday and today with a subsequent seminar–if not with all the members of the two panels, one or two representatives from each, and I'm thinking particularly of Dr. Keeler and Professor Webber, and Mr. Hill and Mr. Bouchard, in order to have a kind of dialogue, particularly now that we have had the opportunity to analyze some of the marvelous points that were made today and yesterday. The question is whether we can follow up with a second seminar which would, instead of merely giving positions, really debate or question the points that have been made yesterday and today.

Response by Rep. Cobb: I can't speak for Ben who is chairman of the committee, but as one of the committee members, I can personally say I would be very much in favor of that idea. I think one of the problems that we faced in the Legislature was that we had a lot of information that was coming to us that had gaps in it or was for a particular point of view. This is one of the reasons why we asked for opposite points of view, because we found you get a lot more information in a dialogue than you do in a monologue. As the years have gone by, more and more questions have been raised at the legislative level. This is the reason we've looked to get some of the answers–if we can't get them here–by looking at other transit sites on the mainland and talking to people on both sides of the issue. So, in response to the question, I would be very much in favor of that idea, not only in a seminar process but at a committee hearing, whenever possible so that the legislators and others interested would have an ample opportunity for follow-up questions. I think that would be the most productive way of getting information.

Question: I have three observations and a question. My already high estimation of the urban American electorate has been raised by both the obvious participation and reaction of this audience today. I'm intrigued by the participants today who all began with caveats, lack of knowledge, questionable analogies, and the like, and then followed it with a 50-minute lecture on the other side. I'm intrigued by the man who would attempt to summarize saying he was speaking for the pros and cons and then used all his time on the cons. I'm intrigued by a group of people who preached the values of the express bus and the bus alone, who use the BART impact studies and then not mention that one social scientist in that study found that a lot of people do not like the bus. My question very simply is, if I understand Professor Keeler's estimates of underpricing of the urban expressways, if the H–1 Freeway had a 40-cent or maybe a 35-cent per vehicle mile toll, do you think the estimates of ridership would be high or low for HART?

Panel response: 1. That question is a more complicated one than it might sound. In the case of the San Francisco Bay Area first, the 35-cent to 40-cent numbers are for the central business districts of San Francisco and Oakland or at least within the city limits. It turns out that there are a lot of things like elevated freeways, access roads to the Bay Bridge, and rather expensive roads there. It's the cost calculations. They traded off the cost of expanding the road capacity against the value of the traveler's time, and then a toll is set up which just turns out that the investment is correct to recover the cost of the road over the peak- and off-peak periods. Well, in other words, those high tolls are a direct result of the very high road construction costs at the very center of San Francisco and Oakland. I certainly can't claim to know that the specific local freeways to which you refer would have construction costs that high. In the San Francisco Bay Area, the more typical urban number would be 6 cents to 8 cents per vehicle mile, such as the East Shore Freeway or the Nimitz Freeway, the one on the East Bay and the number of other roads like that. If you look at it from that angle, especially for these less expensive roads, the radials that are suburban or at least in less densely populated areas of the central city, it turns out that there are two effects there. The traffic on those roads is oftentimes called the backward bending part of a speed flow curve where bottlenecks occur, and as a result of that the road is used quite inefficiently. The speeds there tend to be anywhere from 25 to 35 miles an hour on the average. Now, it turns out that with the value of travel time as high as many Bay Area residents have, in fact perhaps even the average one, it turns out that being able to go even 55 miles an hour or 60, a very high speed there, those tolls are consistent with the typical rider. In many cases the typical rider would consider himself better off, not worse off, because of the fact that these roads are operating in their backward bending stems of the speed flow curves. In fact, it depends very much on the discount rate and the value of time whether these tolls would make the commuter better off or worse off. Because I tend to like high discount rates and high values of time, like 12 percent interest and $3 per hour in vehicle, I think that the typical person would indeed be made worse off by this particular outcome. It's not the high value of time, though, it would be the low value of time that would hit the hardest there. So, anyway, it's a very ambiguous answer and I couldn't claim to be able to answer it in the case of Honolulu. I think that very high road user tolls on urban freeways are an extremely desirable thing. Unfortunately, for most people the reasons I've given are not going to change the result. In fact, for the intermodal cost comparisons we made, we included those user tolls as a part of the automobile costs and the auto came out cheaper than BART in many cases up to and beyond 20,000 passengers per hour, even including pollution and accident cost of the car. So I think these tolls should be charged, and I think the people who want premium quality service should be able to get it at an extremely premium price. So I think it should happen, but I'm a little bit pessimistic that it could actually reduce the auto usage by all that much. There is also a very interesting question and that is, if the buses are so good, why don't they do much better relative to the auto in many cities? There are a number of thoughts on that and I won't go into them, and it's an interesting area of endeavor and of research.

2. One more bit of evidence on that. In San Francisco, there is the Bay Bridge going between East Bay and the City of San Francisco itself and that has quite a bit of traffic congestion. A proposal was recently made to raise the toll from 50 cents to $1, which is equivalent to the same idea of what you are proposing for the highways here. What this would do is to add 50 cents to the toll that currently exists. We studied that also, and using the model that we have been using at the project, we found that it would have a negative effect on BART usage and that most of the people are going to continue taking their cars across the bridge and pay the extra toll. This, of course, is based on the model I showed you earlier today.

Question: I'm sorry to be up again, but I had one- possibly a two-part question. I was responding to the gentleman's earlier question in terms of the desirability of having another such seminar. I'd like to add one observation before addressing the questions and that is, a number of my colleagues and I have felt that because we get a, quote, "one-sided picture," we felt it neces-

sary to go beyond our role as policymakers and we tried to get the other side of the story. This has been the case for several years and we have found gaps in the information even when the questions were being posed, and thus we have embarked on our own to get this information—which is contrary to what our role should have been, being a judge, hopefully an impartial judge, of factual information that would be presented on both sides. It's through the opportunity of a seminar like this that we will be able to get some information. My question relates to ridership projections. I'd like to relate it to the San Francisco area because during our tour of BART it was explained to us that the area south of Daly City, which is roughly comparable to the Kahala to Hawaii Kai area in many respects, had a total of 3 percent ridership on BART, and there apparently are a number of hills there where bus service is not available. So my first question is, do you have any ridership figures for communities that are on hillsides too steep for bus service relative to BART or other guideway systems in other cities? And the second question relates to yesterday's slide presentation that was put on where 60-plus buses were put on Hotel Street which was one lane each way instead of being routed through Beretania Street and King Street, which have five or six lanes each way, or at least four; whether or not you would consider that bus experiment on Hotel Street to be a valid experiment or a straw-man approach to the bus problem. I'd open it up for anyone on the panel to respond.

Panel response: I'm not really familiar with the rationale and assumptions that went into the test on Hotel Street. As I indicated in my talk, there was a lot of potential for altering the TSM alternatives analysis in DMJM's report by diverting some of the bus traffic, the 180-some buses per hour that were projected to these other streets that you mentioned. I also indicated some possibilities about improving the traffic flow on Hotel Street, itself, and of course eliminating autos would be a part of that as it was in the DMJM's alternatives analysis. I don't think any of us knows about the number of riders originating in the areas mentioned.

Moderator: I'd like to thank you very much, those of you who stayed this long. Thank you very much.