COMPUTERIZED URBAN TRANSPORTATION SYSTEMS IN THE U.S.A.

- A Trip Report -

Horst Strobel

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1. THE AIM OF THE U.S. TRIP.

The U.S. trip was undertaken with the following aims:

- To provide one essential part of the information needed for the preparation of the volume on COMPUTERIZED URBAN TRAFFIC CONTROL AND GUIDANCE SYSTEMS (CUTC) of IIASA's state-of-the-art series. This CUTC volume will contain several case descriptions dealing with advanced computer applications operational in the U.S. Therefore, an essential concern of the trip was to meet with possible authors of these case descriptions and to visit the corresponding advanced systems.

- To meet with possible participants for a planning conference on future transportation research work at IIASA. This conference will take place during the week of February 16-20, 1976, in connection with the IFAC workshop on "Optimization Applied to Transportation" sponsored by IIASA.

- To take part in the IFAC (International Federation on Automatic Control) World Congress in Boston, August 24-30, 1975; presentation of a paper and serving as vice-chairman of session 4, "Transportation Systems."

2. SUMMARY OF THE WORKING PROGRAM.

2.1 Appointments in the Boston Area, and at Yorktown Heights, N.Y., August 24-30, 1975.

- Attendance of the sessions of the IFAC-Congress which took place at the MIT campus; presentation of a paper and serving as vice-chairman of session 4 on August 24.

- Several meetings at the MIT campus with Dr. John J. Fearnsides, Chief, R & D Policy Division, Office of the Secretary, U.S. Department of Transportation, 400 7th Street S.W., Washington, who is an essential person in the development of D.O.T.'s research strategies in the field of computerized urban transportation systems; discussions on possibilities for future cooperation between D.O.T. and IIASA, e.g., with respect to the planning conference in February 1976.

- Meeting with Dr. Arthur S. Priver of the Transportation System Center of D.O.T. in Cambridge, Mass., who presented a survey on on-going work in the field of Dial-a-Ride and Automated Guideway Systems. He mentioned that D.O.T. will not further

support research work for the development of Dual-Mode Systems.

- o Meeting with Dr. Denos C. Gazis, Director of the General Sciences Department, IBM; Thomas J. Watson Research Center at Yorktown Heights, N.Y., a leading American scientist in the field of computer control of area and tunnel traffic; discussion of the state-of-the-art in this field in the U.S. resulting in the conclusion that adaptive route guidance systems are representing the most promising area of future research work for the improvement of automobile traffic flows in large urban areas (c.f. corresponding proposal in the Butrimenko/ Strobel Working Paper, WP-74-14). Dr. Gazis is now guiding some work on "Environmental Dispatch" dealing mainly with the objectives to adjust the loads and fuel allocations in an electric energy generation system in order to minimize the environmental disturbances to the communities in the area of the power systems and also conserve scarce fuel.

  Dr. Gazis will visit IIASA on October 2, 1975. He would like to meet with Prof. W. Hafele and other members of our Energy project as well as scientists of the Computer Science group.

2.2 Appointments in Washington, D.C., September 1-3, 1975.

(1) Department of Transportation

- o Office of the Secretary: meeting with W.E. Stoney, (Acting) Assistant Secretary for Systems Development and Technology;
- o UMTA (Urban Mass Transportation Administration): Comprehensive discussions on DOT-supported projects for the development of new transportation systems with:
  - Dr. Duncan MacKinnon, Chief, Advanced Development Branch (Automated Guideway Systems);
  - Dr. Eldon Ziegler, Bus and Para Transit Division (Dial-a-Ride Experiences)
- o Office of Research and Development:
  - James B. Winn, responsible for Systems Test of Morgantown Systems in the office of Steven Barsony, Director, Morgantown Division
- o Federal Highway Administration:

  Dr. William Wolman, Chief of the Traffic Systems Division presented a survey on the latest activities in the field of freeway and area traffic control in the U.S. as well as concerning the cooperation between the U.S. and the O.E.C.D. (There will be an international OECD study on traffic corridor control using the Dallas Freeway Corridor as the U.S. example.) Wolman is the chairman of the OECD study group T-13, "Integrated Urban Traffic Management" which will prepare a report on this subject in 1977.

(2) Traffic Control Center of Washington, D.C.

Discussion of operational experience obtained in the Control Center which is considered as a test system for the UTCS (Urban Traffic Control Systems) - software containing three different traffic light control concepts (generations) characterized, e.g., by different installation costs (number of needed traffic detectors).
One objective of the Washington Test System is to obtain experience, for selecting that generation (concept) with best cost-benefit features. The 1. generation of UTCS is applied in 19 cities.

(3) U.S. Environmental Protection Agency (EPA)

Round table discussion with Dr. Edward Bentz (Policy planning Division) and members of the Transportation Group in the Office of Planning and Evaluation. EPA is dealing with the development of an Air Quality Management Plan. One main feature of this plan is concerned with air pollution control by creating changes in the transportation system. EPA is going to put together an "Air Data Base" for the U.S. as a contribution to a world wide comparative analysis which shall consider institutional, economic and transportation aspects. This activity seems to be very interesting for several projects at IIASA.

(4) National Academy of Sciences, National Research Council

- o Commission on International Relations
  Meetings with Augustus Nasmith and (several times) with Miss Sandra Stacks, Office of the Foreign Secretary.

- o Transportation Research Board (TRB)
  Round table discussion with K.B. Johns, R.E. Spicher and WM. C. Graeub on Research Work supported by TRB. Recommendations concerning case descriptions and suitable authors have been given. The author of this report got some very valuable reports, e.g., an assessment of Automated Guideway Transit prepared for the U.S. Congress, Office of Technology Assessment.

2.3 Appointments in the San Fransisco area and in Los Angeles, September 4-10.

- o University of California in Berkeley, Institute of Transportation and Traffic Engineering

  Discussions with Prof. A. May (Freeway and Area Traffic Control), Prof. W.S. Homburger (BART - Impact Study) and Prof. G.F. Newell (Traffic Theory) and visiting the Institute, e.g. the very comprehensive transportation oriented library.
  Meeting with Prof. Jewell the former Methodology Project Leader at IIASA.

o Stanford Research Institute, Menlo Park, and Gulf and Western Industry, Applied Transportation Systems, Palo Alto.

- Meeting with Dr. J.L. Schlaefli, (Applied Transportation Systems); comprehensive discussions on the implementation of an advanced traffic simulation program in IIASA's program library, and U.S. Area Traffic Control Experience in general.
- Meeting with Dr. Dale Masher at SRI who just finished a very comprehensive NCHRP - Report (3-22) on "Guidelines for design and operation of ramp control systems"; discussion on the application of mini-computers and micro-processor in area and freeway traffic control systems. SRI is testing a new local traffic controller which includes a micro-processor.

o Cities of Oakland and San Jose.

- Visiting an innovative real-time traffic control system which uses a mini-computer installed in a roadside equipment (discussions with Ronald L. Hurlbut).
- Visiting the computer control center of San Jose representing one of the first traffic computer applications in the U.S. (discussion with G. Mahoney)

o BART - Headquarters in Oakland

Visiting the control center for the new Bay Area Rapid Transit (BART) - system and comprehensive discussions with K.V. Hari, representative of the director of engineering, W.J. Rhine. BART uses about 130 computers, most of them are mini-computers. It has a sophisticated fare collection and traffic control system.

o Freeway-Control Center of Los Angeles

Visiting the center and comprehensive discussions with R.H. Green, Department of Transportation, State of California. The Los Angeles Freeway Control System belongs to the four most advanced systems in operation in the U.S. (Chicago, Dallas, Houston); extensive use of ramp metering and changeable message signs; remarkable results concerning the decrease of numbers of accidents and fatalities.

o California Institute of Technology (CALTECH), Pasedena

Meetings with Prof. Dr. Robert H. Cannon, Chairman, Division of Engineering and Applied Science, the former Assistant Secretary in U.S. DOT in Washington D.C., and with Dr. Edward C. Posner. CALTECH has prepared during the last year, a comprehensive report on "Energy Consumption in Private Transportation" edited by Prof. J.R. Pierce which was made available for the author of this report.

2.4 Appointments in Houston and Dallas, September 11-13, 1975.

- o The AIRTRANS - System of the Dallas-Fort-Worth Airport

  The AIRTRANS - System is the first operational GRT (Group Rapid Transit) system, comprehensive discussion on operational experiences with David A. Slaboda, AIRTRANS Maintenance Administrator, visits to the control center, Maintenance station etc.

- o The Gulf Freeway Surveillance and Control Systems and the Texas Transportation Institute of A & M University in Houston.

  Visiting the control center and discussions with R.G. Biggs, Project Supervisor, Texas State Department of Highways and Public Transportation on the Gulf Freeway Control System. G.P. Ritch of the Texas Transportation Institute presented a survey on the Dallas corridor control project.

- o Tour of Nasa Space Flight Center, Houston

2.5 Appointments in Morgantown, West Virginia, Sept. 14-15, 1975

- o The Morgantown Project

  Meetings with C.J. Adriance, Base Manager of the Morgantown PRT Project, presenting a detailed survey on the history and the present status of the Morgantown Project; visiting the control center and the control computers located in the stations; the author of this report was allowed to use the system which was put into operation for the students of the University of West Virginia on September 22, 1975. The University will be the owner of the System. The Boeing Aerospace Company as the main contractor of DOT has developed the vehicles and the control system.

2.6 Return to IIASA, September 15,16, 1975

3. SUMMARY OF ESSENTIAL RESULTS

3.1 Case Descriptions

It was possible to get oral commitments for all intended case descriptions. These commitments were given by the prospective co-authors personally or -- if it was not possible to meet them -- by experts working very closely with these possible co-authors. Great emphasis was given for identifying those authors who are really involved in practical applications with respect to the case of interest.

The following U.S. case descriptions are now planned:

8.3 U.S. Area Traffic Control Systems Experiences: San Jose and UTCS (Urban Traffic Control Systems) by Dr. J.L. Schlaefli, Applied Transportation Systems, Palo Alto.

8.4 Freeway surveillance and control experiences in the U.S.A.: Los Angeles and Dallas

8.4.1 The Los Angeles Freeway control system by R.H. Green, DOT of the State of California, L.A.

8.4.2 The Dallas Freeway Corridor Computer Project by Dr. W.R. Mc Casland, Texas Transportation Institute, Houston.

9.2 The BART System of San Fransisco by Dr. Krishna V. Hari, BART Headquarters, Oakland.

10.1 Test-runs with Dial-a-Ride Systems in the U.S.A. by Dr. Eldon Ziegler, U.S. DOT, UMTA, Washington, D.C. and Prof. Dr. Nigel Wilson, MIT, Cambridge, Mass.

10.2 U.S. Experiences in Automated Guideway Transit (AGT): AIRTRANS and MORGANTOWN

10.2.1 The AIRTRANS-system of the Dallas-Fort-Worth Airport by Dennis Elliott, Dallas Fort-Worth International Airport

10.2.2 The MORGANTOWN AGT-system by Steven Barsony, U.S. DOT, Office of Research and Development, Washington, D.C.

All prospective authors or their representatives, respectively agreed to prepare the case descriptions by April 1976. The author of this report promised that all experts mentioned above will get official IIASA letters by October 1975 asking for their cooperation in a formal way.

3.2 FUTURE COOPERATION

Several scientists that the author of this report could visit are very interested in the transportation research work started at IIASA, (Fearnsides, Bentz, May, Schlaefli, Gazis, Posner, Wolman, Hari) By some of them (Gazis, May, Schlaefli) the proposal for a "case study Vienna" dealing with an advanced route guidance systems (c.f., Urban Status Report, SR-75-1, URB, P. 54 and Butrimenko/Strobel WP-74-14) was considered as highly interesting. Dr. Schlaefli will send an advanced Traffic Simulation Program, the so-called Dynamic Highway Transportation Model (DHTM), for this and other purposes to IIASA by the beginning of October 1975. He promised to assist in implementing the software package in IIASA's computing facilities. Prof. Adolf May, one of the leading U.S. scientist in freeway and area traffic control, mentioned that he would like to contribute to such a case study by spending some time at IIASA during his sabbatical leave in 1976 or later. For planning purposes he needs information by the end of this year. Of special interest is the future cooperation with Dr.Fearnsides of the U.S. DOT concerning general research policies and Dr. E. Bentz of the U.S. EPA with respect to the environmental impact of transportation.

3.2 IFAC-Workshop and Transportation Planning Conference

The following experts promised to attend the IFAC workshop as well as the Transportation Planning Conference during the week of February 16-20, 1976.

Dr. Fearnsides,U.S. DOT, Dr. Bentz, U.S. EPA, Dr. Schlaefli, Appl. Transp. S., Palo Alto.

4. ADDRESSES OF VISITED AND RECOMMEDED (c.f.*) TRANSPORTATION EXPERTS.

4.1 Transportation Research and Development Policy in general including environmental and energy aspects.

o U.S. DOT: Gerry Ward*
Office of the Secretary
US Department of Transportation
Washington, D.C.

Dr. John J. Fearnsides, TST-13
Chief,
R & D Policy Division
Office of the Secretary
U.S. Department of Transportation
400th St. S.W.
Washington, D.C. 20590 Tel: (202) 426-4347

o U.S. EPA: Dr. E. J. Bentz, Jr.,
Policy Planning Divison (PM-221)
Office of Planning and Evaluation
U.S. Environmental Protection Agency,
Washington, D.C. 20460 Tel: (202)755-2893

o CALTECH: Prof. Dr. Robert H. Cannon, Jr.
Chairman
Division of Engineering and Applied Science
California Institute of Technology
1201 East California Blvd.
Pasadena
California 91125 Tel: (213) 795-6811

o NAS,TRB: Dr. K.B. Johns
Engineer of Traffic and Operations
National Research Council
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Dr. Robert E. Spicher, P.E.
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Dr. WM. Campbell Graeub, P.E.
Engineer for Urban Mass Transportation
Transportation Research Board,
National Research Council
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4.2 Freeway and area traffic control:

o U.S. DOT: Dr. William Wolman
Chief, Traffic Systems Division
Federal Highway Administration
Office of Research,
Washington D.C. 20590 Tel: (703) 557 5221

o IBM: Dr. Denos C. Gazis, Director, General Services Dept.
International Business Machines Corporation
Thomas J. Watson Research Center
P.O.Box 218
Yorktown Heights, N.Y. 10598 Tel (914) 945 3000

o Polytechnic Institute of New York:
Prof. Dr. Leonard G. Shaw
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o Sperry: Dr. Charles R. Berger
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o University of California:
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o Applied Transportation Systems Inc.:
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Applied Transportation Systems, Inc.
505 Hamilton Avenue
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o Stanford Research Institute:
Dr. Dale Masher
Stanford Research Institute
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California

o City of Oakland:
Mr. Ronald L. Hurlbut, P.E.
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Oakland, California Tel: (415) 273-3466

o City of San Jose:
Mr. Gene Mahoney
Department of Public Works
San Jose, California

o Los Angeles Freeways:
Mr. Richard H. Green, P.E.
Senior Engineer - Freeway Operation
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Department of Transportation
Freeway Operation Branch
550 S. Vermont Avenue
Los Angeles, Calif. 90020

o CALTECH: Dr. Edward C. Posner
Electrical Engineering, Steele LAB
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o Texas A & M University:
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o Freeway Control in General:
Mr. Robert S. Foote*
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One World Trade Center, Room 56 North
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Mr. Charles Pinnell*
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4.3 Urban railway systems:

o BART: Mr. William J. Rhine*
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Mr. Krishna V. Hari
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800 Madison St.
Oakland, California 94607

o University of California:
Prof. W. Homburger
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109 McLaughlin Hall
Berkeley, Calif. 94720

4.4 New modes of urban transportation:

4.4.1 Dial-a-Ride

o U.S. DOT: Dr. Eldon Ziegler
U.S. Dept. of Transportation
UMTA, Trans-Point Building
2100 Second Street, S.W.
Washington, D. C. 20590

o MIT: Prof. Dr. Nigel Wilson*
Mass. Institute of Technology
Dept. of Civil Engineering, R 1-77
Cambridge, Mass.

4.4.2 Automated Guideway Transit

o U.S. DOT: Mr. Steven Barsony*
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o Dallas/Fort Worth APT:
Mr. Dennis Elliott*
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5. Acknowledgements

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Many thanks are devoted to Prof. William Bossert, Harvard University, Boston and Dr. J. L. Schlaefli, Palo Alto, for organizing the visits in Cambridge/Boston and the San Francisco Bay area respectively, as well as to Prof. Adolf May for arranging the meetings at the University of California in Berkeley.

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