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16. Abstract

This is a compilation of material that was presented at the Third UMTA R&D Priorities Conference Workshops on Transit Management. Part I deals with management systems developments and includes discussions of transit operations and maintenance management support, automated scheduling of transit services, and development of the skills and techniques required by the transit operating industry. Part II, human resources development, includes discussions of human resources development programs, the national study for the validation of a selection test battery for bus operators, and a report by the AFL-CIO Appalachian Council on their transit employee training project. This volume contains six resource papers which can be found summarized in Volume I of this report along with summaries of other workshop sessions. Volume I also includes the proceedings of the general sessions and a listing of conference participants.

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PREFACE

This report contains proceedings of workshop sessions of the Third Urban Mass Transportation Administration R&D Priorities Conference which was held at the U. S. Department of Transportation's Transportation Systems Center in Cambridge, Massachusetts, November 16 and 17, 1978. This volume contains the following:

Transit Management Workshops

Part I : Management Systems Developments
Part II: Human Resources Development

These conferences are sponsored periodically by UMTA to enable them to communicate directly with those who represent the views of transit users, operators of public transportation systems, suppliers of equipment and services, the research community, and governments at the State, local, and Federal levels. The purpose of the Third Conference was to provide a current review of UMTA's research and development plans and to solicit recommendations for improving the direction and effectiveness of its program. The conference included general sessions on research and development policy and a total of fifteen half-day workshops on research, development, and demonstrations in urban transportation systems, technologies, planning, management, and services.

The volume containing proceedings of the general sessions and summarized reports of the workshops has been published by the Urban Mass Transportation Administration. However, because of the volume of papers, presentations, and discussions, detailed proceedings of the workshops have been compiled into separate reports by subject area. All of these documents are available from:

National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

When ordering copies of these reports from NTIS, please refer to the list of reports numbers and titles which follows.

1. Third UMTA R&D Priorities Conference, November 1978, Volume I: Proceedings of General Sessions and Summarized Reports of Workshops, DC-06-0157-79-1.

2. Third UMTA R&D Priorities Conference, November 1978, Volume II: Proceedings of Bus and Paratransit Technology Workshops, DC-06-0157-79-2.

   Part I : Paratransit Integration
   Part II: Bus Technology, Paratransit Vehicle Development, Flywheel Energy Storage System

3. Third UMTA R&D Priorities Conference, November 1978, Volume III: Proceedings of AGT and Advanced Systems Workshops, DC-06-0157-79-3.

   Part I : AGT Socio-Economic Research and AGT Applications
   Part II: AGT and Advanced Systems and Technologies

4. Third UMTA R&D Priorities Conference, November 1978, Volume IV: Proceedings of Service and Methods Demonstrations Workshops, DC-06-0157-79-4.

   Part I : Pricing Policy Innovations
   Part II: Conventional Transit and Paratransit Service Innovations

5. Third UMTA R&D Priorities Conference, November 1978, Volume V: Proceedings of UMTA Special Technology Programs Workshops, DC-06-0157-79-5.

   Part I : Safety, Qualification, and Life-Cycle Costing
   Part II: Consumer Inquiry Technology, National Cooperative Transit R&D Program, and Technology Sharing

6. Third UMTA R&D Priorities Conference, November 1978, Volume VI: Proceedings of Rail and Construction Technology Workshops, DC-06-0157-79-6.

   Part I : Railcars and Equipment
   Part II: Construction Technologies

7. Third UMTA R&D Priorities Conference, November 1978, Volume VII: Proceedings of Transit Management Workshops, DC-06-0157-79-7.

   Part I : Management Systems Developments
   Part II: Human Resources Development

8. Third UMTA R&D Priorities Conference, November 1978, Volume VIII: Proceedings of the Access for Elderly and Handicapped Persons Workshops, DC-06-0157-79-8.

   Part I : Planning and Regulation
   Part II: Demonstrations and Hardware

9. Third UMTA R&D Priorities Conference, November 1978, Volume IX: Proceedings of the Urban Transportation Planning Workshop, DC-06-0157-79-9.

TRANSIT MANAGEMENT I

Chairperson: A. B. *Hallman*, Chief, Operations and Maintenance Division, UMTA

PRESENT ACTIVITIES IN THE OFFICE OF TRANSPORTATION MANAGEMENT: *Mr. Hallman*

TSC SUPPORT: *Mary Roos*, Transit Systems Branch, Transportation Systems Center, and *Dennis Goeddel*, Traffic Management Branch, Transportation Systems Center

FUTURE PLANS: *Brian J. Cudahy*, Director, Office of Transportation Management, UMTA

Panel: *Richard E. Ward*, Associate Professor, Industrial Engineering Department, University of West Viginia

Houston P. Ishmael, Executive Director, Memphis, Tenn., Area Transit Authority and President, American Public Transit Association

Reporter: *Gwendolyn R. Cooper*, Office of Transportation Management, UMTA

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TRANSIT MANAGEMENT I

MARY ROOS
TRANSIT SYSTEMS BRANCH, TRANSPORTATION SYSTEMS CENTER

Our project, Transit Operations and Maintenance Management Support has three active tasks: operations analysis, information systems and maintenance management alternatives. Our goal could be summarized as an effort to assist transit managers in assembling information systems needed to streamline current operations and plan ahead.

Activities in the area of operations analysis include an operational model. A flow chart of the model appears in Chart 1. When complete, this software will allow a transit manager to assess the effect of changes in policy and exogenous factors on the performance of a typical light rail line. The software for an automated route scheduler, in the upper left hand corner of the chart, is complete. It accepts actual timing data for a route, with variance; and estimates of passenger demand. Combined with these are policy variables such as maximum headway by time of day. The result is a minimum-vehicle, demand-driven schedule that meets the headway and loading constraints. The network model and a separable maintenance activity model will be added next, under contract.

In the course of developing data collection methods for this analysis, a device containing an accelerometer, gyro, timer and a data cassette writer was packaged into a portable dynamic motion recorder to capture physical characteristics of the route, which has not been perfected to date. Much work has been done to prove that sampling techniques produce a credible estimate of passenger demand. The most notable results of the demand analysis are the finding that Monday through Friday can be lumped for sampling purposes, homogeneity being 95% probable; and that stations along the route have a predictable market share of each trip's total patronage when data are divided into a.m. and p.m. periods. Chart 2 shows the actual passenger flow at Park Street Station versus that predicted by the statistical model.

Task II of our project concentrates on information systems, especially for maintenance management. In these days of ever-increasing costs of labor and materials, rapid turn-around of data can help improve productivity. Chart 3 shows how a data base management system (DBMS) could form the heart of such a system. Inputs, from operations and the maintenance shop, flow directly through the data base into required reports such as TRIP, and into other products such as the operational model. At present, we are conducting a survey of software being used to provide maintenance management support. During visits to several western cities, we have observed three different approaches to establishing data-managed systems. Portland, Oregon is going into a mini-computer dedicated to maintenance,

with a limited, special purpose data management system written in extended BASIC. Seattle is using RAMIS, a full-blown DBMS on the King County IBM 370. Santa Clara County is turning to a distributed data processing system capable of communication with the main-county computers.

One product, now available to assist in scheduling preventive maintenance, is the interactive inspection scheduling program. It was written to support the warranty-required 45 day inspection period for the light rail vehicle, but is applicable to any vehicle. It works to even-off the preventive maintenance work-load by assigning each new requirement to the day in a "work window" with the lowest labor-hour commitment. Copies of the user's guide are available from TSC.

A conference on Information Systems for Maintenance Workload Planning will be held later this fiscal year to allow an exchange of software solutions and system designs. Future plans also include a demonstration/evaluation of a DBMS for transit maintenance.

Further study of maintenance management alternatives will be provided through a contracted study of the problems of introducing advanced technology vehicles to an ongoing transit operation. The report will be based on case studies of five properties, including three light rail cities: Boston, San Francisco, and Toronto. The report will summarize lessons learned in the entire process from specification to day-to-day maintenance and operations.

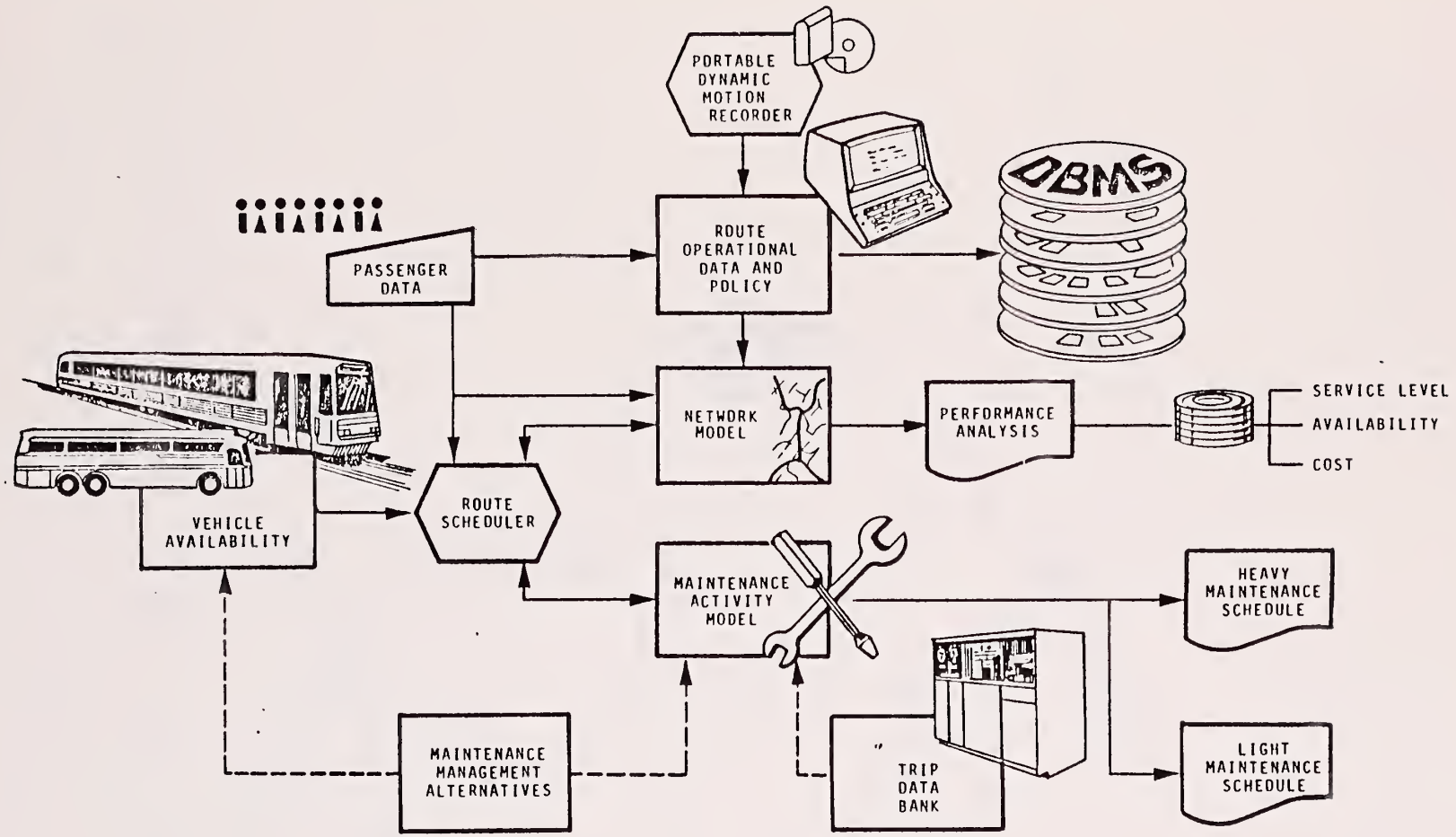


CHART 1. OPERATIONAL MODEL

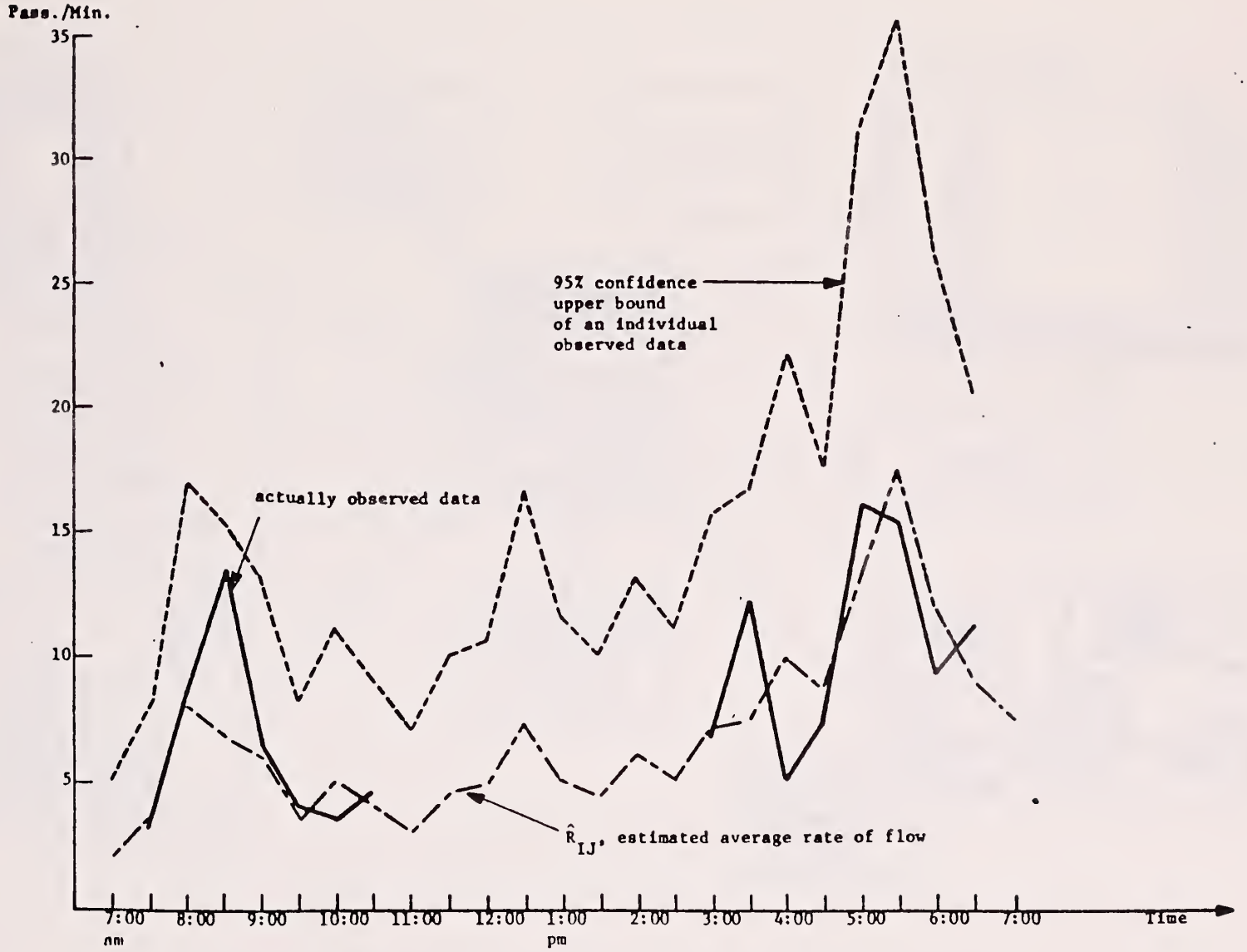


CHART 2. PROFILE OF LOADING PASSENGERS AT PARK STREET STATION, 1978 (TO RIVERSIDE)

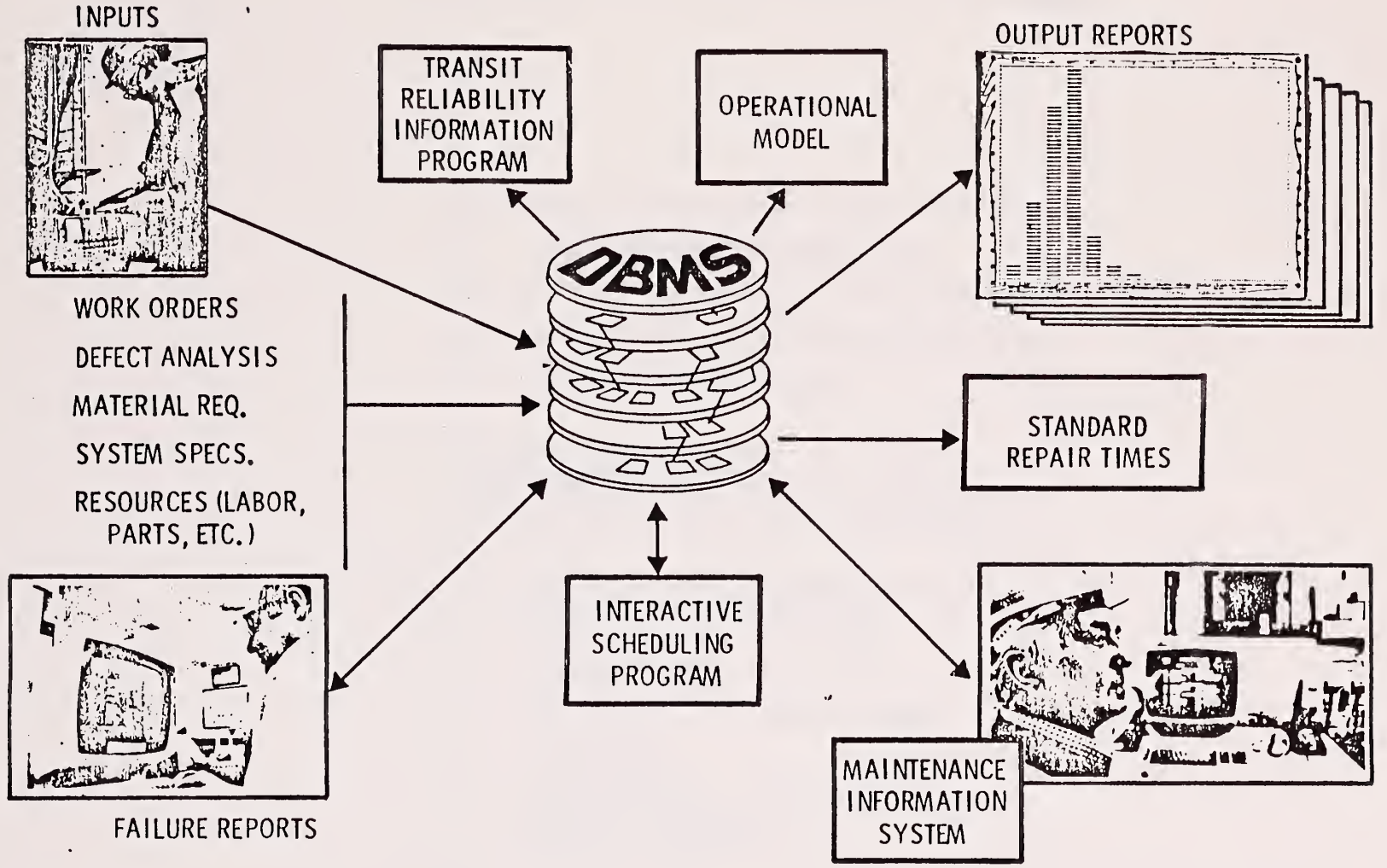


CHART 3. INTEGRATED MANAGEMENT INFORMATION SYSTEM

ASSESSMENT GOALS OF OPERATIONAL MODEL

PERFORMANCE ANALYSIS

FIGURE-OF-MERIT $\approx$

$$\frac{\text{PASSENGER MILES}}{\text{PASSENGER TRIP TIME}} * \frac{K}{\Sigma \text{PSGR.'S}}$$

- REDUCE PASSENGER WAIT TIME
- RELIABLE AND EFFICIENT SCHEDULES
- REDUCTION IN EMPTY SEAT MILEAGE
- MAINTENANCE COST SAVINGS
- POWER SAVINGS

7/13/78

TIME	KEN	AUD	COLLEY	ARL	BOYL	PARK	GOVCT	HAY	NORST.	SCPPAK	LSCH
700	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
730	0.00	0.00	0.73	0.00	0.00	3.22	0.00	2.24	0.00	0.00	0.00
800	1.00	0.00	0.82	3.11	0.00	8.53	1.35	4.07	11.60	0.30	0.00
830	0.19	0.00	1.14	2.39	0.00	13.41	5.75	2.06	13.19	0.28	0.00
900	0.53	0.00	0.00	0.84	0.00	6.33	2.81	5.22	3.90	0.21	0.00
930	0.10	0.00	0.00	0.78	0.00	4.18	4.73	0.00	4.80	0.16	0.00
1000	0.57	1.00	0.00	0.00	0.54	3.50	1.58	3.73	3.90	0.00	0.00
1030	0.36	0.38	0.00	1.15	0.60	4.57	1.71	2.22	0.00	0.00	0.00
1100	0.39	0.26	0.00	0.20	0.63	0.00	0.00	2.87	0.00	0.00	0.00
1130	0.48	0.52	0.00	0.47	1.11	0.00	0.00	0.00	0.00	0.00	0.00
1200	0.54	0.36	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1230	0.58	0.00	3.50	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1300	0.00	0.00	1.71	0.00	0.00	0.00	0.00	0.00	2.94	0.00	3.71
1330	1.05	0.00	1.57	0.00	0.00	0.00	0.00	0.00	1.00	0.00	3.58
1400	1.58	0.00	3.46	0.00	0.94	5.24	0.00	1.00	1.75	0.00	6.16
1430	0.69	0.00	2.00	0.00	0.77	4.55	0.00	1.93	2.77	0.00	3.47
1500	0.92	0.00	0.00	0.00	1.21	6.90	0.00	2.45	0.00	0.00	4.52
1530	0.83	0.00	0.00	0.00	0.00	12.33	0.00	1.69	0.00	0.00	5.70
1600	1.21	0.00	0.00	0.00	1.80	5.14	8.57	3.84	0.00	0.00	0.00
1630	1.06	0.00	0.00	0.00	1.20	7.11	6.25	1.65	0.00	0.00	0.00
1700	2.15	0.00	0.00	0.00	2.10	15.56	9.18	2.15	0.00	0.00	0.00
1730	2.96	0.00	0.00	0.00	1.52	15.23	2.87	0.00	0.00	0.00	0.00
1800	1.65	0.00	0.00	0.00	1.50	9.23	7.17	5.55	0.00	0.00	0.00
1830	0.61	0.00	0.00	0.00	0.00	10.80	5.63	0.00	0.00	0.00	0.00
1900	0.00	0.00	0.00	0.00	0.00	0.00	4.36	0.00	0.00	0.00	0.00
1930	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2030	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OUTBOUND (TO RIVERSIDE) PASSENGER LOADING RATE (PASSENGER/MIN.)

TIME	KEN	AND	COLLEY	AVE	DOYLE	PARK	GOUCH	HWY	1ST
700	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00
730	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00
800	0.00	0.00	2.69	0.00	0.00	22.07	20.43	0.00	5.15
830	0.50	0.00	3.96	3.90	0.00	10.69	11.65	0.00	1.09
900	0.38	0.00	0.00	4.67	0.00	13.07	16.97	0.00	3.53
930	0.59	0.00	0.00	2.96	0.00	5.56	7.15	0.47	1.09
1000	0.35	2.67	0.00	0.00	0.89	8.66	6.88	0.94	0.00
1030	0.47	1.45	0.00	1.46	0.52	5.11	2.93	2.22	0.00
1100	0.43	1.45	1.44	1.57	0.61	7.19	3.97	0.49	0.00
1130	0.00	0.68	0.85	0.62	1.12	0.00	1.14	0.00	0.00
1200	0.32	0.00	1.19	0.96	0.00	0.00	5.10	0.00	0.00
1230	0.88	0.00	1.15	0.00	0.00	0.00	4.92	0.00	0.00
1300	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.56
1330	0.50	0.00	0.68	0.00	0.00	0.00	0.00	0.50	2.14
1400	1.09	0.00	2.00	0.00	0.00	0.00	0.00	2.39	1.82
1430	1.04	0.00	0.72	0.00	0.00	0.00	0.00	2.26	2.36
1500	0.00	0.00	0.86	0.00	0.00	0.00	0.00	3.69	0.00
1530	0.00	0.00	0.00	0.00	0.00	10.33	0.00	0.00	0.00
1600	0.29	0.00	0.00	0.00	0.00	8.17	5.52	0.00	0.00
1630	0.39	0.85	0.00	0.00	0.38	16.22	4.79	3.96	0.00
1700	0.23	0.71	0.00	0.50	0.74	10.30	4.67	9.04	0.00
1730	0.39	0.90	0.00	0.94	0.41	12.33	5.34	9.05	0.00
1800	0.50	0.77	0.00	0.88	0.46	7.76	3.62	3.41	0.00
1830	1.37	0.00	0.00	0.85	0.25	3.66	2.39	0.00	0.00
1900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1930	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2030	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

INBOUND PASSENGER UNLOADING RATE (PASSENGER PER MIN.)

Data collected by 8 surveyors over 5 days - zeroes appear where no data was collected. Flows per minute derived from samples in loops.

5 variable regression analysis - each station + each time period is a variable.

REGRESSION MODEL TO ESTIMATE PASSENGER PROFILE

$$RATE_{LM} = \sum_I A_I \, STATION_I + \sum_J B_J \, TIME_I + \text{Grand Average Rate} + \text{ERROR TERM}$$

where $STATION_I = 1$ if $I = L$

$= 0$ otherwise

$TIME_J = 1$ if $J = M$

$= 0$ otherwise

A_I, B_J are the regression coefficients.

Basic Assumption of model:

At each time interval, each station assumes a constant market share of the total passenger demand. I.e. No interaction between station & time.

Result: Regression highly significant, and explains 70-75% of the variation in the data.

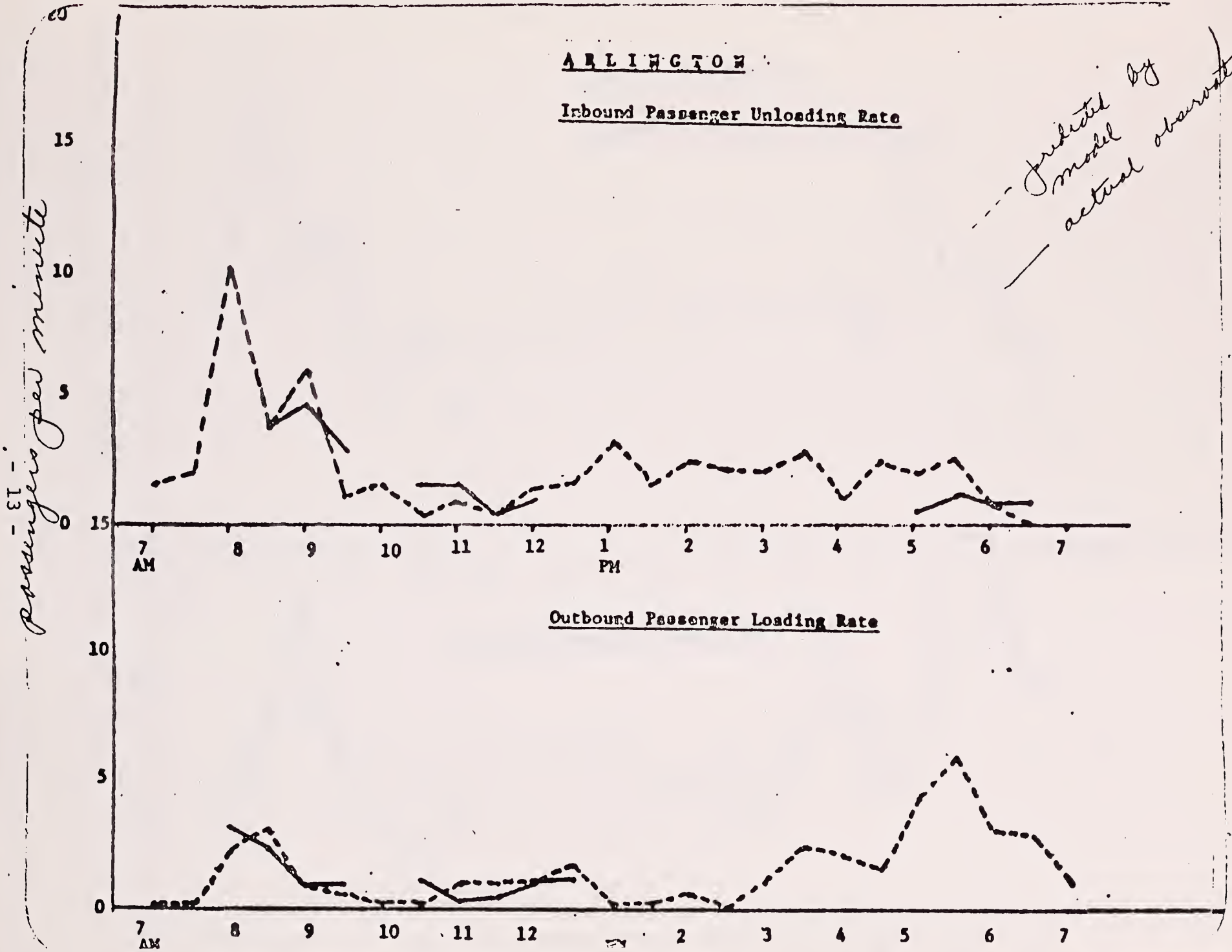
ESTIMATED UNLOADING RATE - ALL N.STATION TRAINS

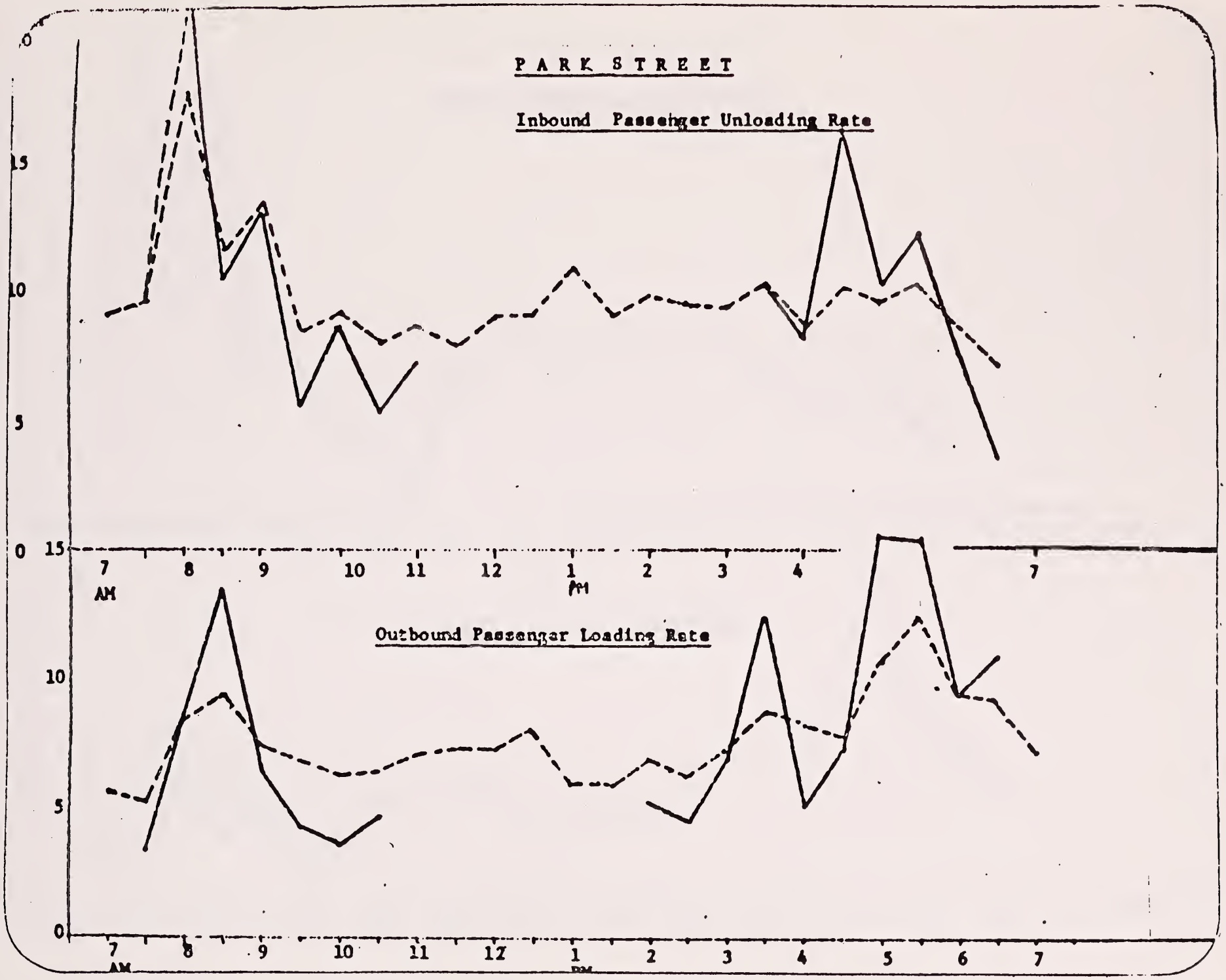
TIME	KENMORE	AUDIT.	COPLEY	APLING	BOYLST.	PK.ST.	GOV.CTR	HAYMKT	NOR.STA
700	0.17	1.33	0.47	1.56	0.93	9.09	6.01	3.08	0.37
730	0.65	1.81	0.95	2.04	1.41	9.57	6.49	3.56	0.85
800	8.78	9.93	2.69	10.16	9.53	22.07	20.43	11.68	5.15
830	0.50	3.68	3.96	3.90	3.28	10.69	11.65	5.43	1.09
900	0.38	5.61	4.75	4.67	5.21	13.07	16.97	7.37	3.53
930	0.59	0.92	0.06	2.96	0.52	5.56	7.15	0.47	1.09
1000	0.35	2.67	0.43	1.53	0.89	8.66	6.88	0.94	0.33
1030	0.47	1.45	0.10	1.46	0.52	5.11	2.93	2.22	0.10
1100	0.43	1.45	1.44	1.57	0.61	7.19	3.97	0.49	0.10
1130	0.10	0.68	0.85	0.62	1.12	7.91	1.14	1.90	0.10
1200	0.32	1.16	1.19	0.96	0.77	8.93	5.10	2.92	0.21
1230	0.88	1.43	1.15	1.66	1.03	9.19	4.92	3.18	0.47
1300	0.33	3.00	2.15	3.24	2.60	10.77	7.68	4.76	3.56
1330	0.50	1.26	0.68	1.49	0.86	9.02	5.94	0.50	2.14
1400	1.09	2.13	2.00	2.36	1.73	9.89	6.81	2.39	1.82
1430	1.04	1.90	0.72	2.13	1.50	9.66	6.58	2.26	2.36
1500	0.67	1.82	0.86	2.06	1.43	9.59	6.51	3.69	0.87
1530	1.41	2.56	1.71	2.80	2.17	10.33	7.25	4.32	1.60
1600	0.29	0.89	0.04	1.13	0.50	8.17	5.52	2.65	0.10
1630	0.39	0.85	1.47	2.56	0.38	16.22	4.79	3.96	1.36
1700	0.23	0.71	1.04	0.50	0.74	10.30	4.67	9.04	0.94
1730	0.39	0.90	1.50	0.94	0.41	12.33	5.34	9.05	1.39
1800	0.50	0.77	0.10	0.88	0.46	7.76	3.62	3.41	0.10
1830	1.37	0.10	0.10	0.85	0.25	3.66	2.39	1.23	0.10

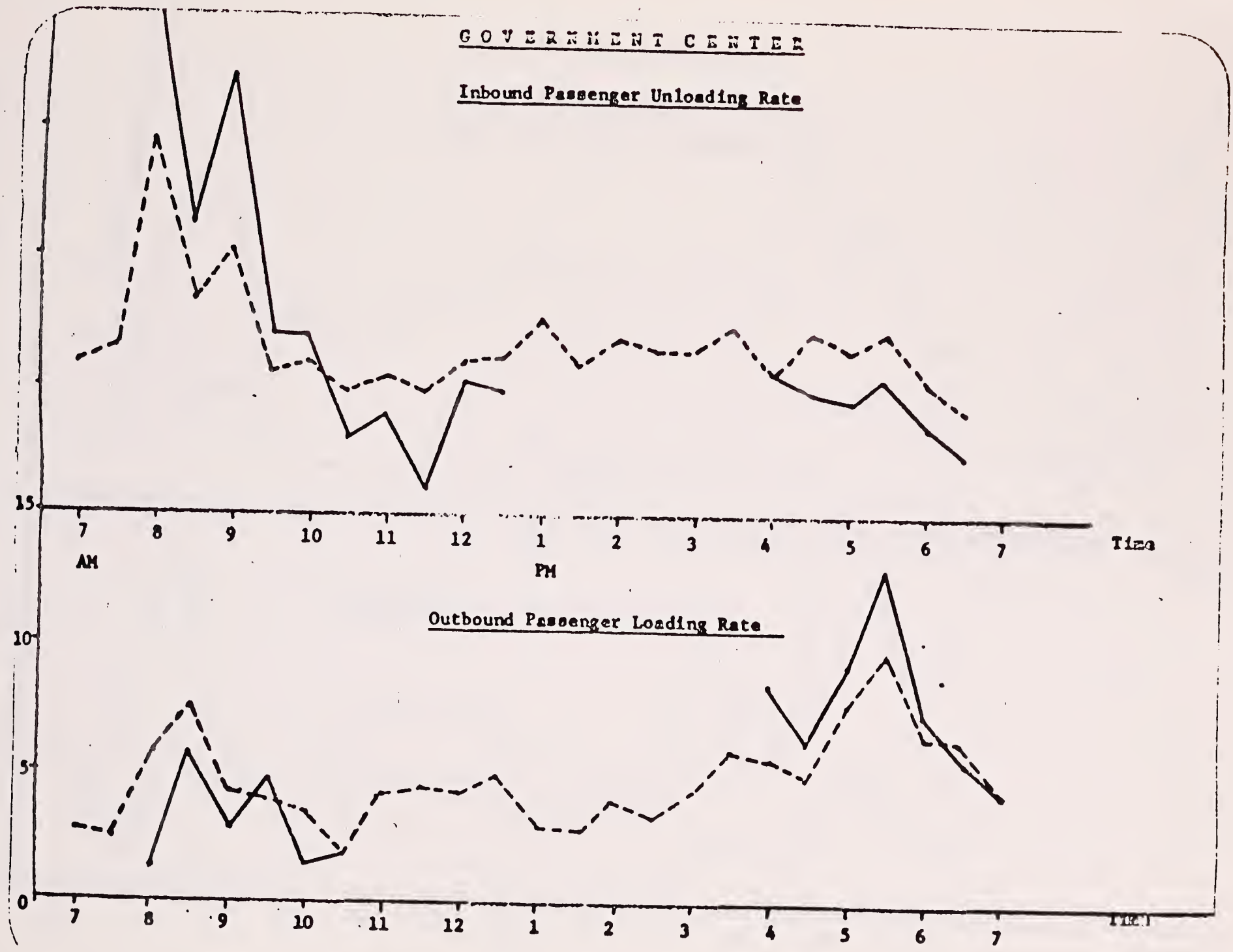
Sample of the hourly flow of passengers per minute

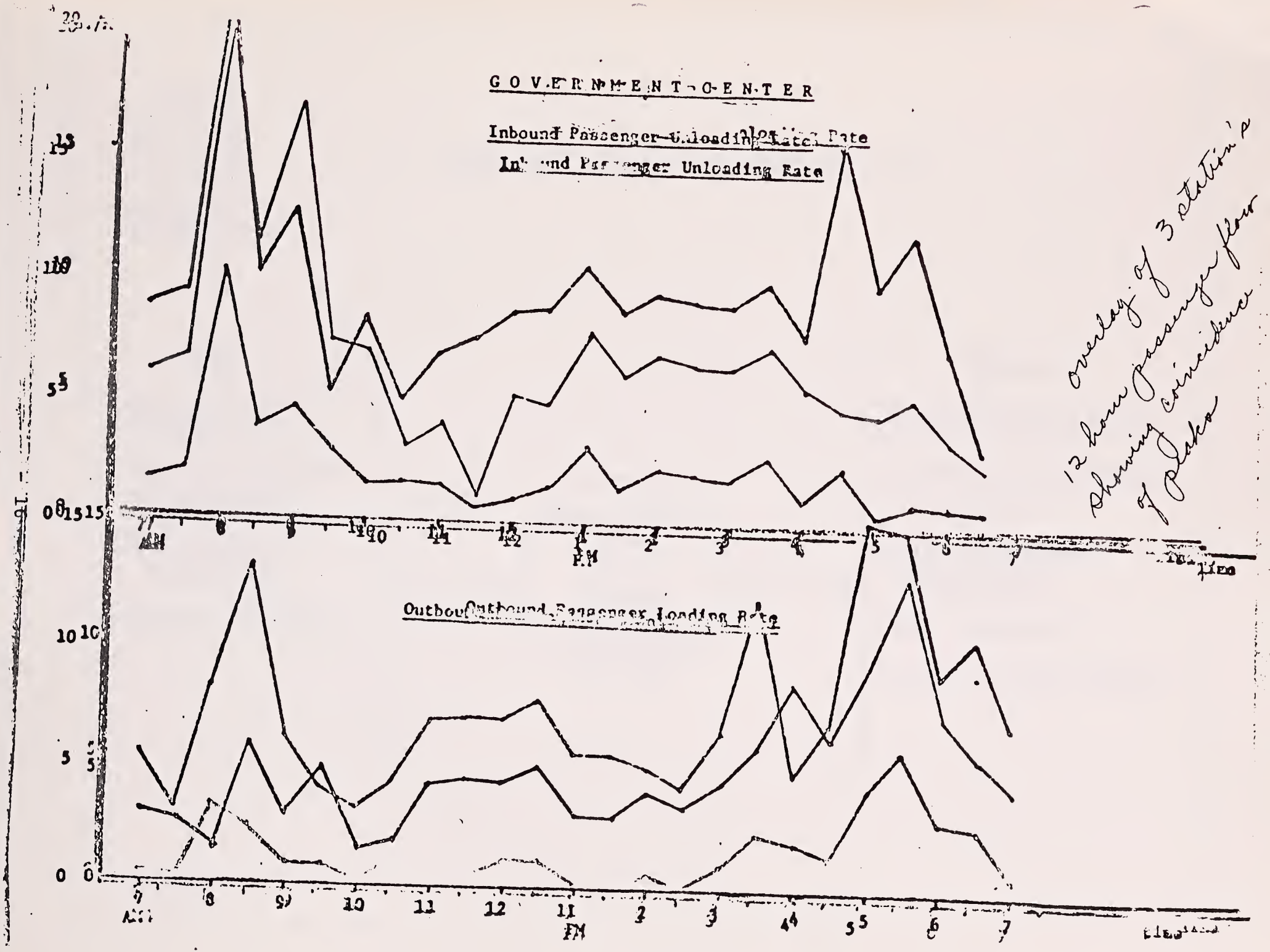
ESTIMATED LOADING RATE - ALL RIVERSIDE TRAINS

TIME	KENMORE	AUDIT.	COPLEY	ARLING	BOYLST.	PK.ST.	GOV.CTR	HAYMKT	NOR.STA	SC.PK.	LECHMERE
700	0.10	0.10	0.57	0.10	0.10	5.65	2.83	0.88	3.80	0.10	3.37
730	0.10	0.10	0.73	0.10	0.10	3.22	2.53	2.24	3.49	0.10	3.07
800	1.00	2.02	0.82	3.11	1.56	8.53	1.35	4.87	11.68	0.30	6.09
830	0.19	2.86	1.14	2.39	2.40	13.41	5.75	2.06	13.19	0.28	6.94
900	0.53	0.80	2.07	0.84	0.34	6.33	2.81	5.22	3.90	0.21	4.87
930	0.10	0.35	1.62	0.78	0.10	4.18	4.73	1.94	4.80	0.16	4.42
1000	0.57	1.00	1.26	0.12	0.54	3.50	1.58	3.73	3.90	0.10	4.06
1030	0.36	0.38	1.34	1.15	0.60	4.57	1.71	2.22	4.56	0.10	4.14
1100	0.39	0.26	2.01	0.20	0.63	7.09	4.27	2.87	5.24	0.10	4.81
1130	0.48	0.52	2.15	0.47	1.11	7.23	4.41	2.46	5.38	0.10	4.95
1200	0.54	0.36	2.12	1.17	0.38	7.20	4.38	2.43	5.35	0.10	4.92
1230	0.58	1.47	3.50	1.12	1.00	7.82	5.00	3.05	5.97	0.19	5.54
1300	0.10	0.10	1.71	0.10	0.10	5.85	3.04	1.09	2.94	0.10	3.71
1330	1.05	0.10	1.57	0.10	0.10	5.84	3.02	1.08	1.00	0.10	3.58
1400	1.58	0.49	3.46	0.62	0.94	5.24	4.02	1.00	1.75	0.10	6.16
1430	0.69	0.10	2.00	0.06	0.77	4.55	3.46	1.93	2.77	0.10	3.47
1500	0.92	1.01	2.28	1.14	1.21	6.90	4.55	2.45	5.51	0.10	4.52
1530	0.83	2.29	3.56	2.42	1.92	12.33	5.82	1.69	6.79	1.01	5.70
1600	1.21	2.03	3.30	2.16	1.80	5.14	8.57	3.84	6.53	0.76	6.10
1630	1.06	1.39	2.66	1.52	1.28	7.11	6.25	1.65	5.89	0.12	5.46
1700	2.15	4.15	5.42	4.28	2.10	15.56	9.18	2.15	8.65	2.88	8.22
1730	2.96	5.94	7.21	6.07	1.52	15.23	12.87	7.53	10.44	4.67	10.01
1800	1.65	2.94	4.21	3.07	1.50	9.23	7.17	5.55	7.44	1.67	7.01
1830	0.81	2.65	3.93	2.79	2.19	10.80	5.63	4.24	7.15	1.38	6.73
1900	0.22	0.83	2.10	0.96	0.36	7.18	4.36	2.41	5.33	0.10	4.90


ARLINGTON
Inbound Passenger Unloading Rate
Outbound Passenger Loading Rate
Predicted by model
actual observations
passengers per minute
20
15
10
5
0
15
10
5
0
7 AM
8
9
10
11
12
1 PM
2
3
4
5
6
7

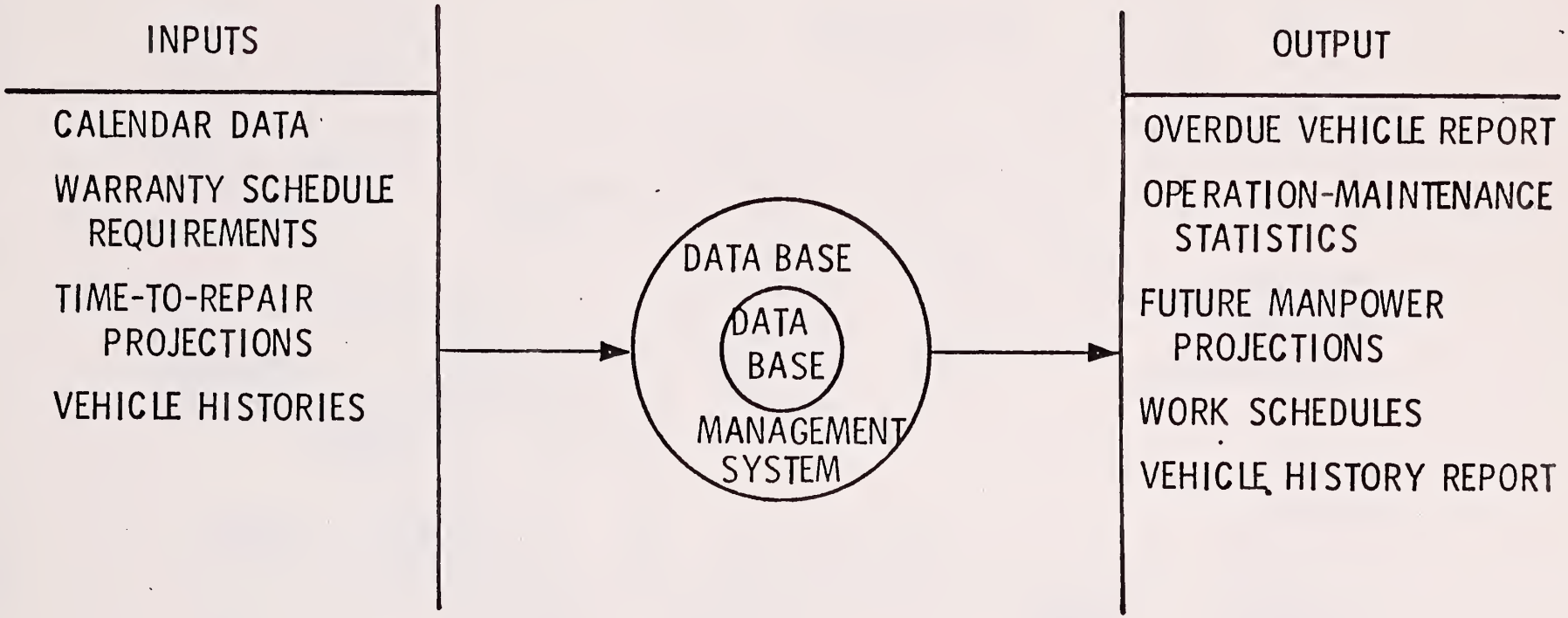

PARK STREET
Inbound Passenger Unloading Rate
0
15
10
5
0
7 AM
8
9
10
11
12
1 PM
2
3
4
7
Outbound Passenger Loading Rate
10
5
0
7 AM
8
9
10
11
12
1 PM
2
3
4
5
6
7


GOVERNMENT CENTER
Inbound Passenger Unloading Rate
15
7 8 9 10 11 12 1 2 3 4 5 6 7
AM
PM
Time
Outbound Passenger Loading Rate
10
5
0
7 8 9 10 11 12 1 2 3 4 5 6 7


GOVERNMENT CENTER
Inbound Passenger Unloading Rate
Inbound Passenger Unloading Rate
Outbound Passenger Loading Rate
Outbound Passenger Loading Rate
AM
PM
Time
overlay of 3 station's 12 hour passenger flow showing coincidence of peaks

TSC

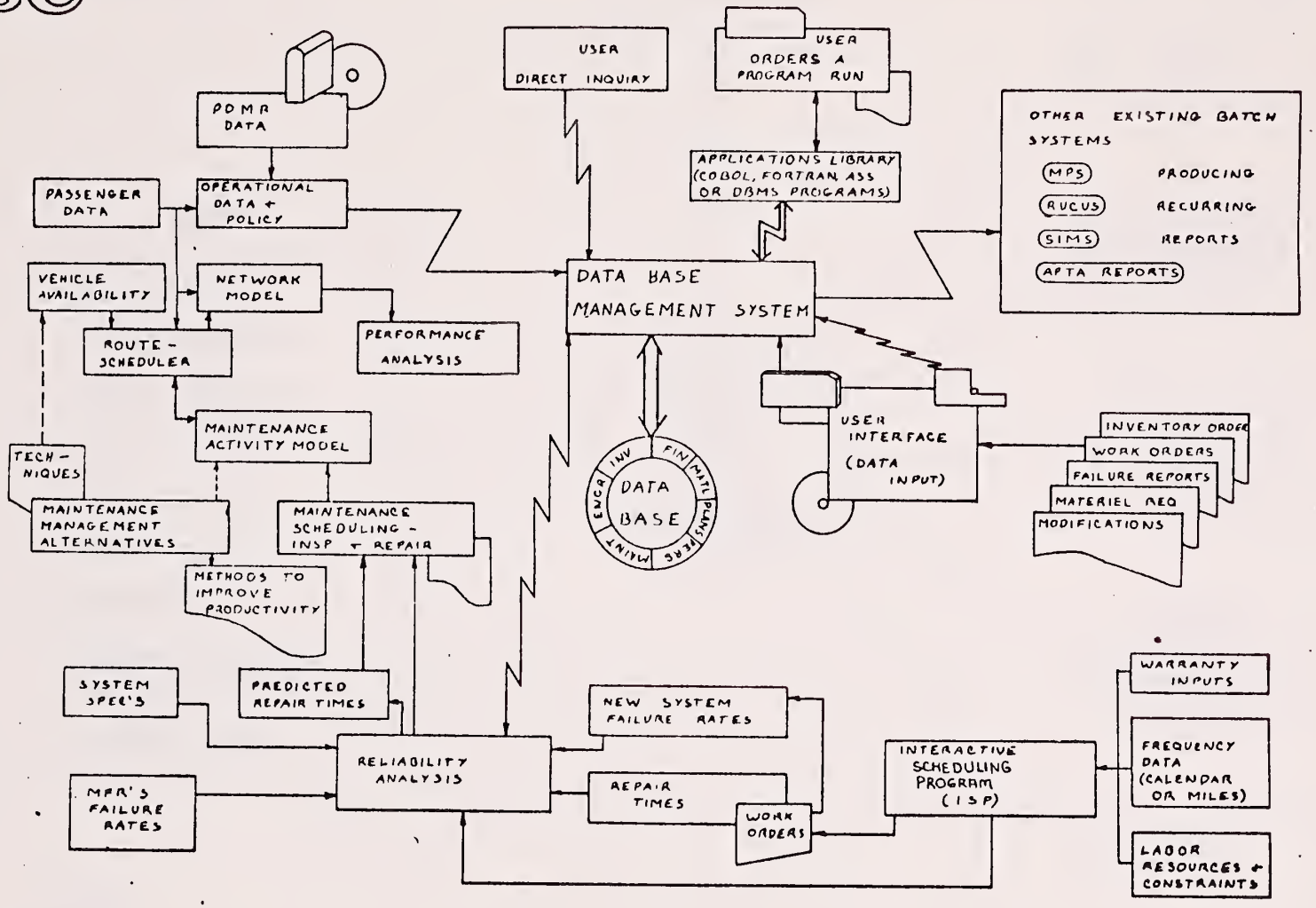
INTERACTIVE SCHEDULING PROGRAM (ISP)



7/13/78

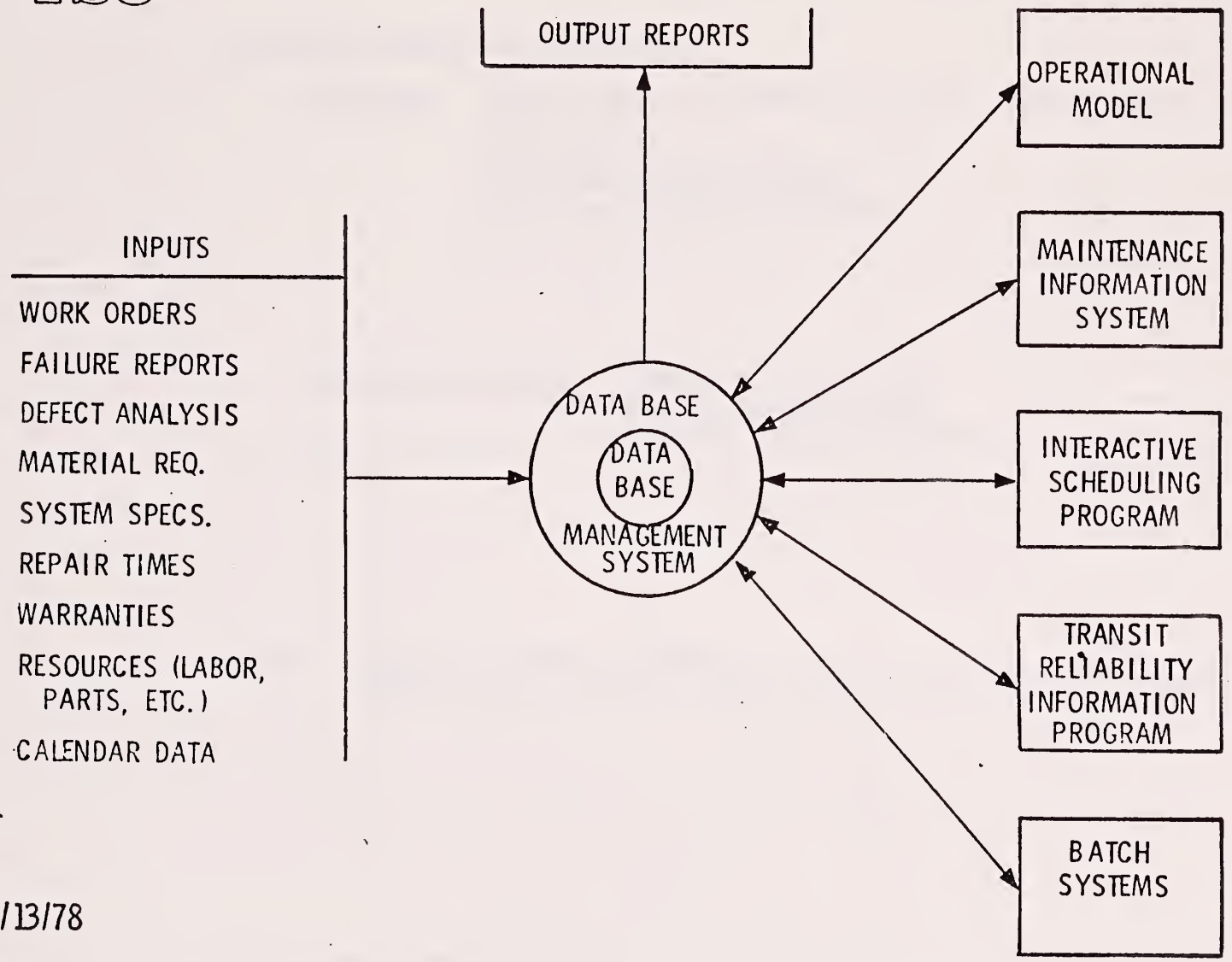
TSC

INTEGRATED MAINTENANCE INFORMATION SYSTEM



7/12/78

INTEGRATED MANAGEMENT INFORMATION SYSTEM



7/13/78

TRANSIT PROPERTY: TRI-MET, PORTLAND, OREGON

CONTACT: H. LANDIS

MANAGEMENT INFORMATION ACTIVITIES:

OPERATIONS: LARGE BUCUS IMPLEMENTATION WITH TRIP MILEAGE DATA
PERSONNEL MIS
INTERESTED IN PASSENGER COUNTERS
PEAK LOAD CHECKING SYSTEMS
PASSENGER INFORMATION DISPLAYS

MAINTENANCE PLANNING: CURRENT MANUAL SYSTEMS
PLANNED IN-HOUSE MINI
INVENTORY CONTROL SYSTEM

OTHER: RECENT MANAGEMENT CHANGES
MEETING WITH SEATTLE TO SHARE SYSTEM FOR FINANCIAL ACCOUNTING

TRANSIT PROPERTY: SEATTLE METRO

CONTACT: C. GOVERN
(RAMIS)

MANAGEMENT INFORMATION ACTIVITIES:

OPERATIONS: PASSENGER COUNTERS
LABOR PERFORMANCE MONITORING
PART TIME OPERATORS
ACCIDENT/INCIDENT SYSTEM
ARMS ACCOUNTING SYSTEM

MAINTENANCE PLANNING: CORS - COACH OPERATING REPORTING SYSTEM
SIMS - HEAVY RELIANCE ON PM
MANUAL FLEET ANALYSIS
BASE MANAGEMENT SYSTEMS (O&M)

OTHER: USES KING COUNTY 370 + IN-HOUSE TIME PRIDE

SELECTION CRITERIA FOR DATA BASE MANAGEMENT SYSTEM

TRANSIT PROPERTY: SANTA CLARA TRANSIT, SAN JOSE, CA

CONTACT: A. DIVINCENZI

(1.1 PEAK TO BASE RATIO)

MANAGEMENT INFORMATION ACTIVITIES:

OPERATIONS:
- RUCUS IMPLEMENTATION
- TRAFFIC TRIP DATA
- TRAFFIC VEHICLE MOTOR SYSTEM
- OPERATOR PAY SYSTEM (DUE IN MARCH)
- FINANCIAL SYSTEM - MULTI MODAL ACCOUNTING

MAINTENANCE PLANNING:
- CURRENT PREVENTATIVE MAINTENANCE - BATCH PROGRAM
- INVENTORY CONTROL - PUSH SYSTEM AT GARAGES
- ROAD CALL REPORTING SYSTEM
- RELIABILITY ANALYSIS
- WORK ORDER SYSTEM

OTHER:
- TWO MINI COMPUTERS IN-HOUSE, SHARE TWO 370 WITH COUNTY
- USES FORTRAN, COBOL, SPSS, GPSS, DIAL, ASSIST, FORWARD AND VISION
- PLANNING DISTRIBUTED PROCESSING SYSTEM

TRANSIT PROPERTY: MUNI, San Francisco, CA

CONTACT: C. D. COLLINS

MANAGEMENT INFORMATION ACTIVITIES:

OPERATIONS: IMPLEMENTING MICUS

FINANCIAL AID ACCOUNTING SYSTEM

MAINTENANCE PLANNING: ON-LINE WORK ORDER SYSTEM
VEHICLE HISTORY
PLANNED YEAR RECYCLING SYSTEM TIED TO WORK ORDERS
INVENTORY CONTROL SYS
ROAD CALL ANALYSIS

OTHER: CONSTRUCTING DESIGN MASK FOR A DATA BASE MANAGEMENT SYSTEM

Contract will be let to conduct LRV Maintenance Planning Case Studies in 5 Cities - Boston, S.F., Toronto, Cleveland and Chicago

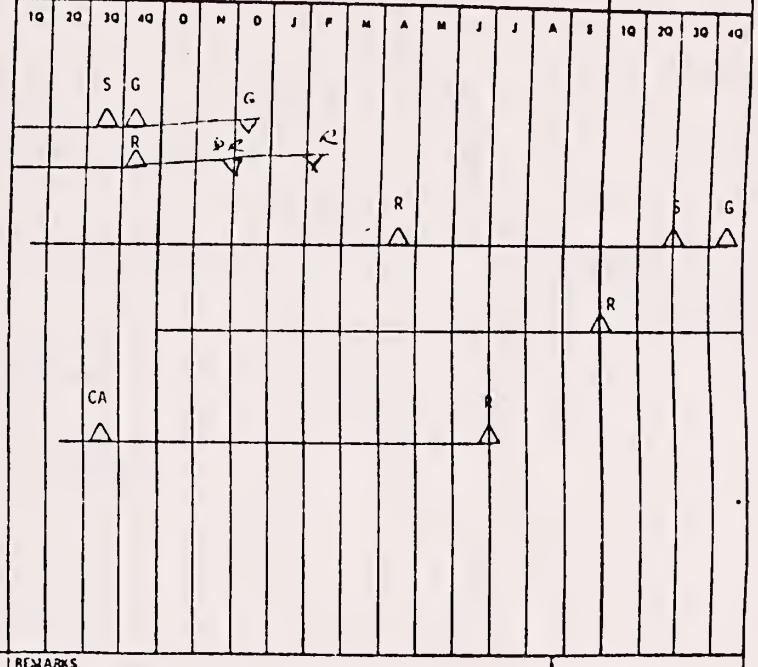
OPERATIONS AND MAINTENANCE MANAGEMENT SUPPORT

TRANSPORTATION SYSTEMS CENTER
MILESTONE SCHEDULE
(Read Instructions on Reverse)

PPA:

TITLE:

NUMBER	TASK TITLE
	TASK I - Operations Analysis
1.	Operation Scheduling
2.	Operational Improvements
	TASK II - Information Systems
3.	Integrated Data Base System
4.	Maintenance Workload Planning System (design/software, report, demo)
	TASK III - Maintenance Management Alternatives
5.	LRV Maintenance Management Alternatives



LEGEND
- △ SCHEDULED EVENT
- ▲ COMPLETED ON SCHEDULE
- ▽ SLIPPAGE (PROJECTED)
- ▼ LATE COMPLETION (ACTUAL DATE)

REMARKS
S - Software
G - User's Guide
R - Report
CA - Contract Award

REVISION NO.:
REVISION DATE:
REVIEW:

PAGE ___ OF ___ PAGES

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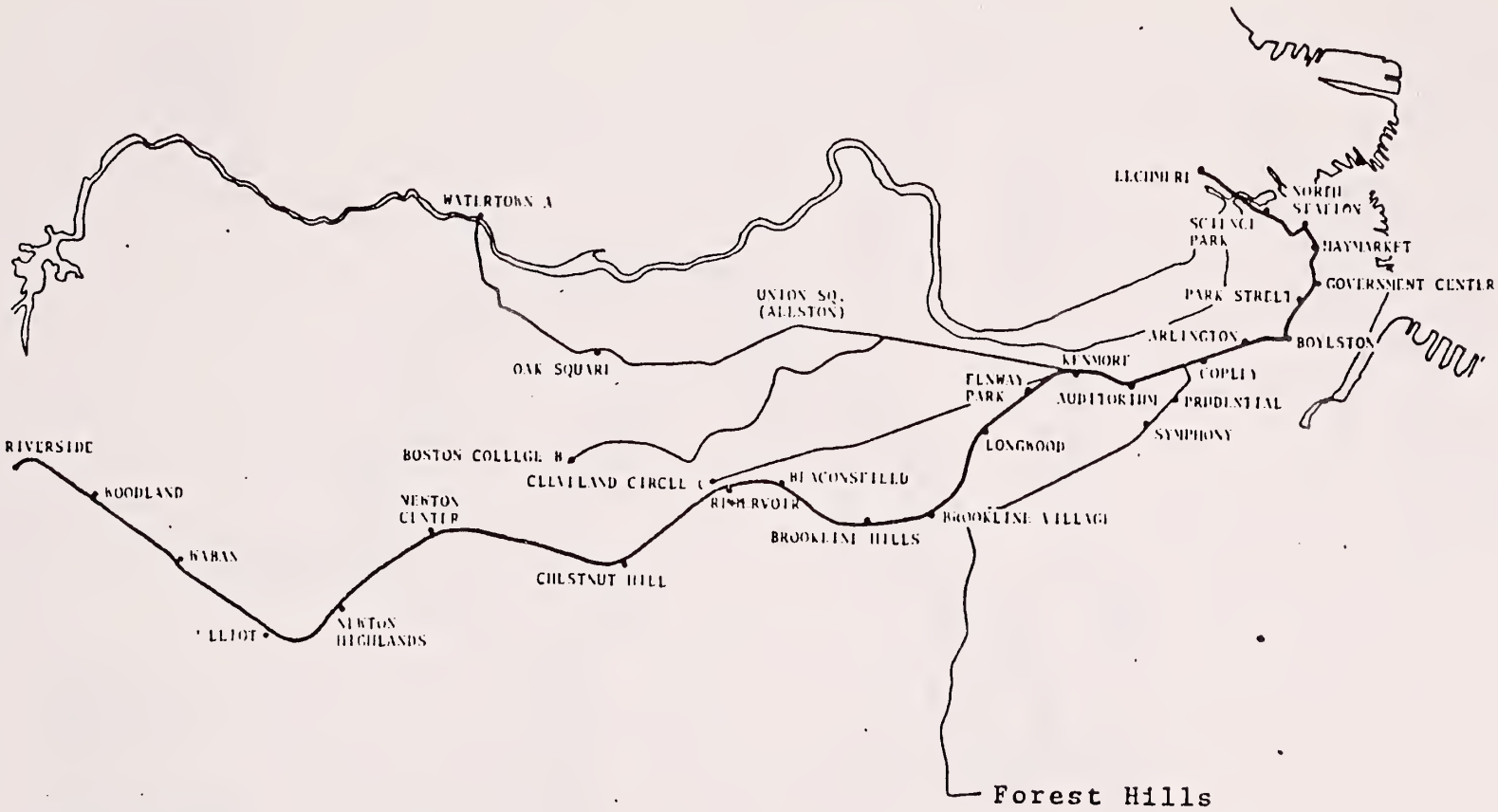
MAP OF MBTA GREEN LINE



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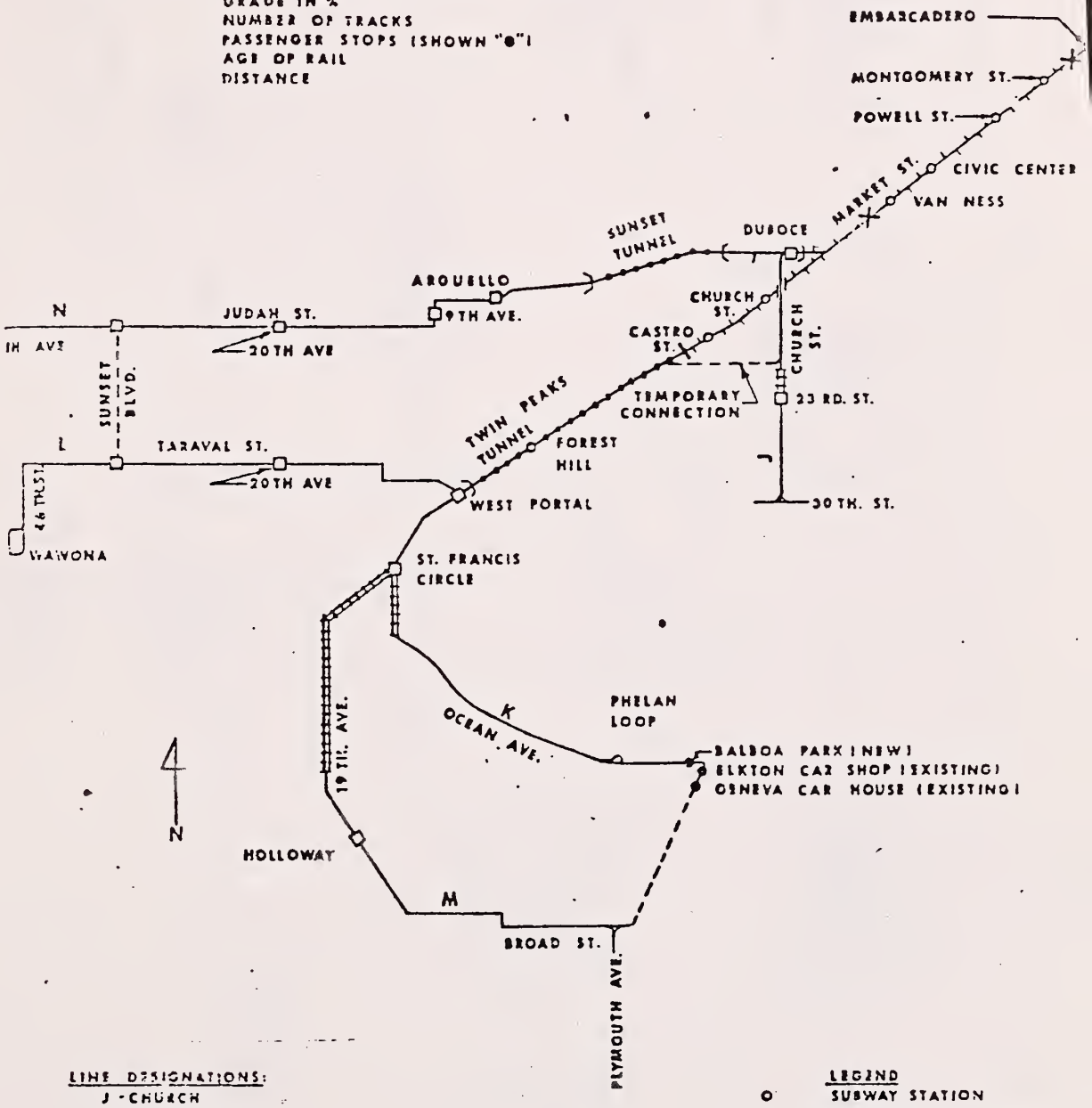
SAN FRANCISCO MUNICIPAL RAILWAY
MUNI METRO RAIL SYSTEM SUMMARY
(SHOWING NEW SUBWAY PORTION AND EXISTING TUNNEL & SURFACE PORTIONS)

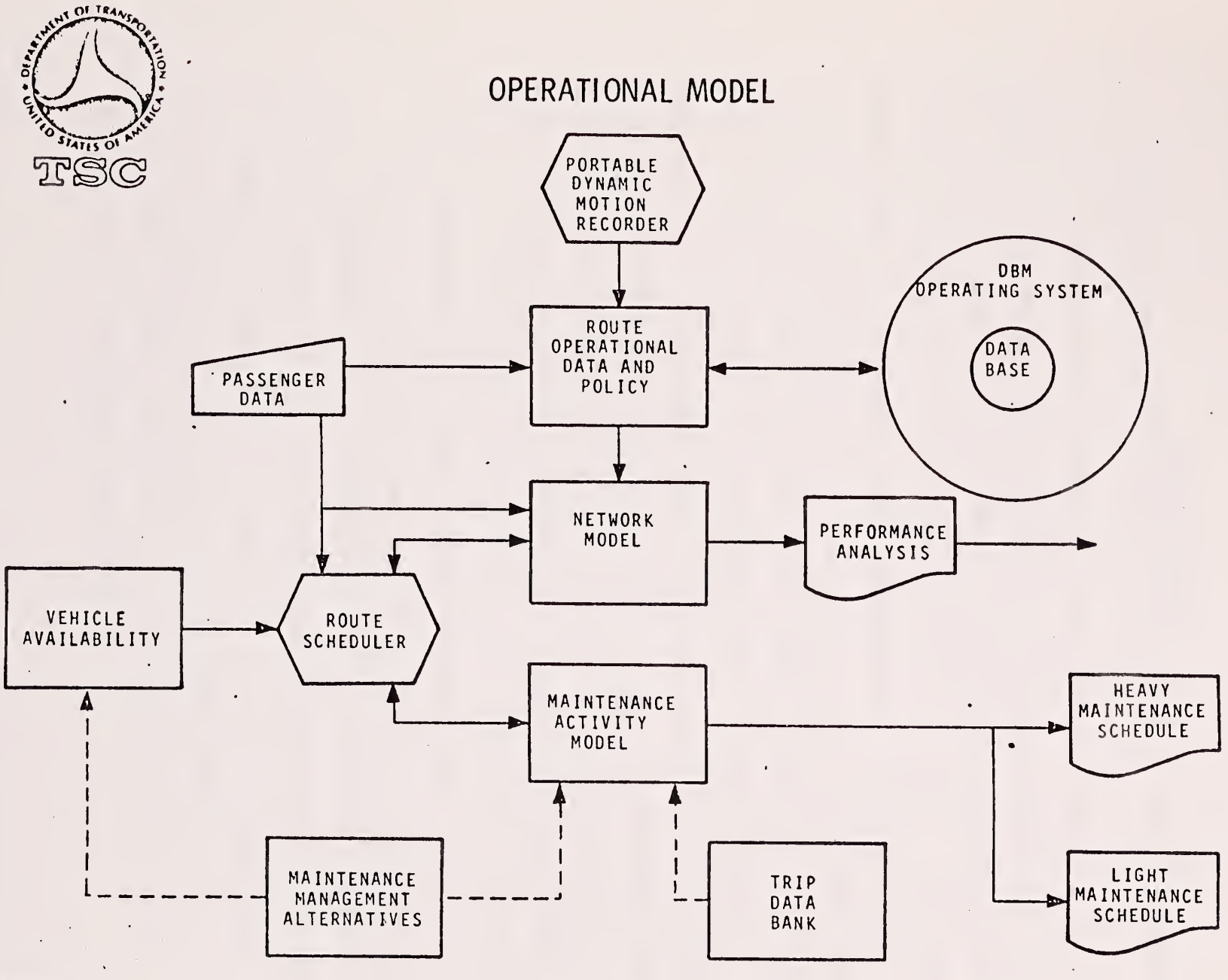
DETAILS OF EACH LINE SHOWN ON FOLLOWING PAGES AND INCLUDE : CURVATURE IN FEET RADIUS
GRADE IN %
NUMBER OF TRACKS
PASSENGER STOPS (SHOWN "●")
AGE OF RAIL
DISTANCE



LINE DESIGNATIONS:
- J - CHURCH
- K - INGLESIDE
- L - TARAVAL
- M - OCEAN VIEW
- N - JUDAH

LEGEND
- ○ SUBWAY STATION
- □ CUTBACK POINT - PROPOSED
- EXISTING TRACK
- PROPOSED TRACK
- SUBWAY
- CROSS OVER - SUBWAY
- TUNNEL
- PRIVATE RIGHT OF WAY

LRV-9


OPERATIONAL MODEL
PORTABLE DYNAMIC MOTION RECORDER
DBM OPERATING SYSTEM
DATA BASE
ROUTE OPERATIONAL DATA AND POLICY
PASSENGER DATA
NETWORK MODEL
PERFORMANCE ANALYSIS
VEHICLE AVAILABILITY
ROUTE SCHEDULER
MAINTENANCE ACTIVITY MODEL
HEAVY MAINTENANCE SCHEDULE
LIGHT MAINTENANCE SCHEDULE
MAINTENANCE MANAGEMENT ALTERNATIVES
TRIP DATA BANK
7/13/78

DENNIS GOEDDEL
TRAFFIC MANAGEMENT BRANCH, TRANSPORTATION SYSTEMS CENTER

In recent years the concept of automated scheduling of transit services has been receiving increasing attention within the transit industry as one means of improving the efficiency of operations and reducing transit operating costs. Under the sponsorship of the Urban Mass Transportation Administration (UMTA), a computerized Vehicle Scheduling and Driver Run-Cutting System (RUCUS) was developed by the Mitre Corporation, to assist urban transit systems in the preparation of their service, vehicle, and driver schedules. Principal elements of the RUCUS system are a scheduling algorithm that produces optimized vehicle schedules by minimizing vehicle layover and deadhead travel time and a driver run-cutting procedure that minimizes the number of driver run assignments, driver pay hours, overtime, etc. subject to the constraints of labor union contract rules.

Since 1974 when RUCUS was initially made available to state/local transportation agencies and transit consultant groups, it has been established as the predominent system for automated scheduling of buses in North America. At the present time, the RUCUS system is operational or in the process of being implemented in over thirty-five transit authorities in the United States and Canada (see Table 1).

UNITED STATES:

- AKRON
- ANN ARBOR
- BALTIMORE
- BOSTON
- CHARLOTTE
- CHICAGO
- CLEVELAND
- DENVER
- DETROIT
- FT. WORTH
- JACKSONVILLE
- LONG BEACH
- LOS ANGELES
- LOUISVILLE
- MEMPHIS
- MINN/ST. PAUL
- NASHVILLE
- ORANGE COUNTY
- PHEONIX
- PORTLAND
- ROCHESTER
- SALT LAKE CITY
- SANTA CLARA
- SAN DIEGO
- SAN FRANCISCO
- SAN JUAN
- SEATTLE
- SYRACUSE

CANADA:

- CALGARY
- EDMONTON
- HALIFAX
- KITCHENER
- OTTAWA
- TORONTO
- VANCOUVER
- WINNEPEG

RUCUS IMPLEMENTATION SITES

TABLE 1

Results from the initial RUCUS program implementations have provided direct system benefits to transit authorities in the form of more efficient vehicle schedules, increased driver productivity, and in improved scheduling data and management system reports. Reported savings in total system annual operating costs, due to reductions in vehicle fleet requirements, vehicle mileage, driver runs and driver pay hours, have ranged from 0% - 3%.

Since 1974, UMTA and the Transportation Systems Center (TSC) have been actively involved in promoting the implementation of the RUCUS system within the transit industry. Financial support in the from of capital and operating assistance grants have been provided by UMTA to transit authorities for RUCUS implementation projects. TSC has provided technical support to transit systems and state/local transportation agencies in the implementation and application of the RUCUS programs.

During the latter part of FY-78, TSC has initiated a contract for conducting a RUCUS System Software Improvement Study. The objectives of this study are to collect, organize, and document the status, results, and experiences of the current RUCUS implementations and to develop specific improvements to the RUCUS program software. The planned areas of work under the contract are:

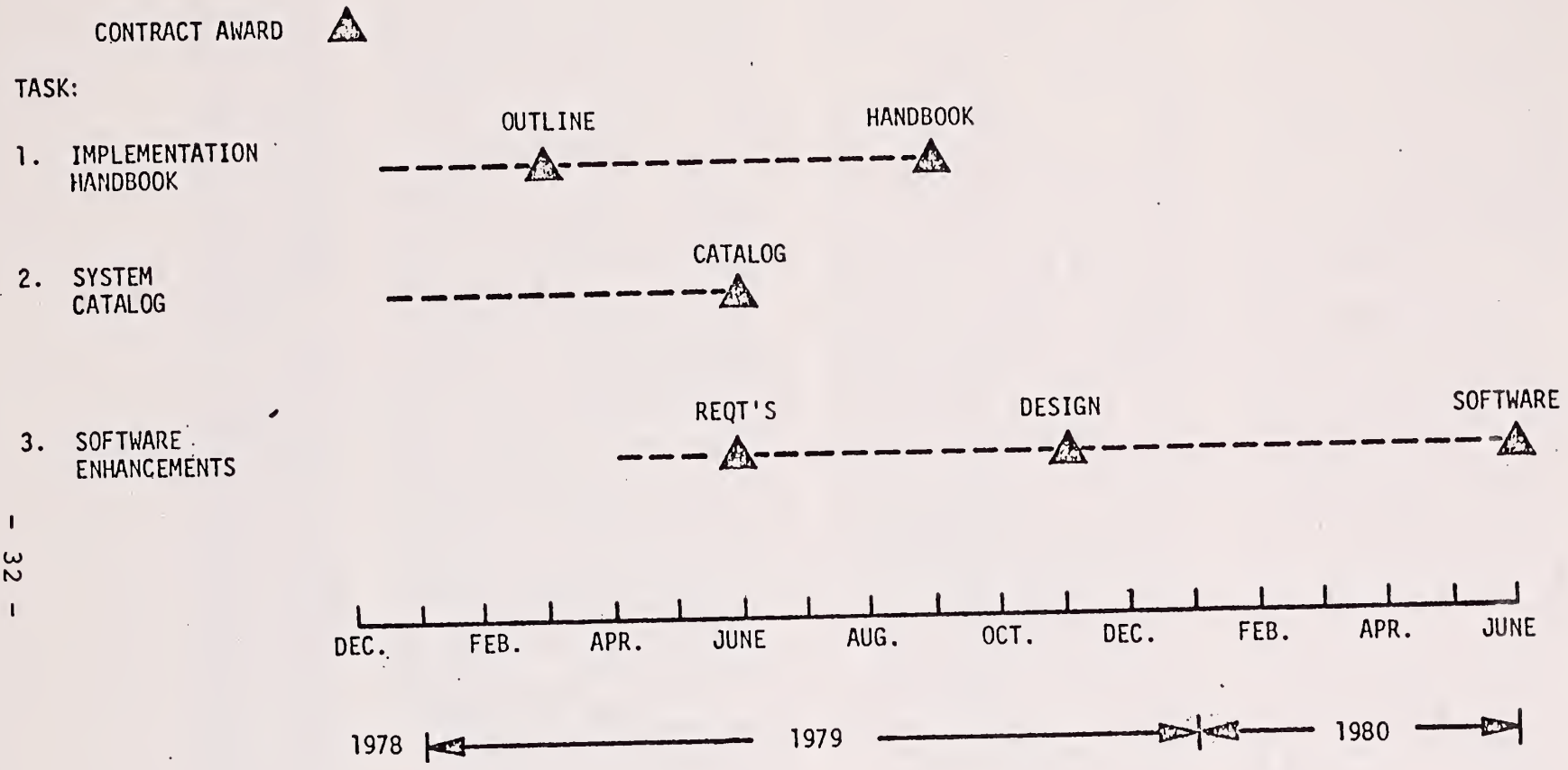
- o Development of RUCUS Implementation Handbook - which would document the status of current RUCUS applications and develop guidelines and procedures associated with

the planning and implementation of the RUCUS system. Information addressing alternative implementation approaches, data requirements, evaluation procedures, implementation and operating costs, etc. would be documented in the handbook.

- o Development of a RUCUS System Catalog - which would document the existing program modifications that have been made to the RUCUS system, and
- o RUCUS System Software Enhancements - which would involve the development of new software programs and extensions to improve the structure and processing of the RUCUS system. Improvements in the service planning/trip scheduling, vehicle scheduling, driver run-cutting, and data management/reporting functions would be considered as part of this effort.

Figure 1 illustrates the planned schedule for completing the study.

Also planned in FY'79 are a series of workshops that would serve as a forum for exchanging information and presenting the results of the RUCUS Improvement Study to representatives of APTA and state/local transportation agencies. It is expected that these workshops would be scheduled consistent with the delivery of the RUCUS System Catalog and Implementation Handbook.



RUCUS SYSTEM SOFTWARE IMPROVEMENT STUDY

FIGURE 1

BRIAN J. CUDAHY
DIRECTOR, OFFICE OF TRANSPORTATION MANAGEMENT, UMTA

General Introduction: - The Office of Transportation Management (UPM-40) has a distinctive role to play in UMTA's overall program of research, development and technical assistance. UPM-40 is charged with developing skills and techniques for the U.S. public transportation industry, and assisting operators in adopting these skills and techniques for their own purposes. Specifically, these skills and techniques fall within the broad category of "management" ... or "management improvement." Their implementation can be regarded as part of an overall effort toward understanding and improving the productivity of urban transportation. While primary emphasis will be with conventional mass transit services, UPM-40"s attention will also be directed toward improving management techniques in the emerging areas of para-transit operations.

As a preliminary distinction, emphasis must be placed on the difference between the development and demonstration of a new or refined management technique or procedure, and its subsequent adoption and implementation by transportation operators. Funds to accomplish the former task are available under Section 6 and form a key element in the UPM-40 program plan. Such demonstrations are needed, as transit management lacks many ordinary tools for carrying out its mission. But in the immediate future, UPM-40's principal emphasis will involve the implementation of already developed techniques into the ordinary operations of transit properties. In terms of specific activities this will involve increased emphasis on workshops, seminars and other "outreach" programs to inform transit operators about successful innovations that can improve their daily tasks. Also it will involve development of definitive information programs that transit operators may consult when seeking assistance.

At the property level, of course, funds will still be needed to implement these innovations. Sometimes these costs are or a one-time or start-up nature; sometimes they involve a permanent dollar commitment; sometimes both. The outreach function of the UPM-40 program is not an activity that supplies, or even seeks, such funds for transit operators. But as much as practical and possible, advice will be given to individual operators about potential sources of implementation funds for management innovations. Now that the "Section 5 set-aside" is a reality in the form of Section 4(i) of the new UMT act, UPM-40 will have a role to play in its management, a role that will be consistent with the general theme of assisting transit managers in implementing proven innovations into their daily operations. In addition, technical assistance from UPM-40 will always be available to assist operators in the implementation of improved management techniques. Such technical assistance might typically involve help in drawing up RFP's, scope of work statements, and so forth.

Functional Divisions: - The Office of Transportation Management is constituted by four division. Each of these has a distinctive history and orientation; each also has its own internal program plan for the current fiscal year, and beyond.

The four units are these: Human Resources Division; Marketing Division; Operations and Maintenance Division; Information Services Division.

A. Human Resources. Emphasis on human resources is one of the final frontiers in American public transportation. Nothing is more worthy of intense management effort than that entire area which is involved with finding qualified personnel, and providing them with adequate opportunities for improving their skills. Little need be said of the increased importance this subject takes on in the light of affirmative action responsibilities. Nor is any demonstration really necessary in such a labor intensive industry as transit to prove that a marketing effort to increase ridership is doomed to failure if it is not accompanied by an equally emphatic effort to encourage effective passenger relations by bus drivers.

The gambit of activities in this area includes the development of testing instruments for the recruitment of blue-collar candidates for transit employment, as well as the development of curricular materials for their subsequent training. Also, research is planned to explore how automated teaching and testing techniques might be adapted to a transit environment. Demonstrations of various programs to control absenteeism will also be conducted. A major effort to identify areas where work rule reform can be translated into productivity improvements will also be initiated, in conjunction with representatives of organized labor.

Courses, fellowships and training workshops for the professional advancement of transit personnel have long constituted an important aspect of UMTA's activity.. and will continue at increased levels. It should be noted that UPM-40's Human Resources Division manages the Section 10 fellowship program. Unlike other division activities, this is not a research and development program, but an on-going training activity for the transit industry. The new UMT Act provides increased flexibility for the Section 10 program; FY '79 will see experimentation beyond the program's current scope.

B. Marketing. The goal of any marketing program is to increase sales of the company's product. UMTA's carrier assistance effort here must be aimed at increasing the use of public transportation facilities. However, marketing cannot be carried out -- and can never hope to succeed -- in a corporate vacuum. The standard text-book approach specifies a four "p" approach to marketing -- product, packaging, pricing and promotion. While UPM-40 is not UMTA's chief arm in all of these areas, it is important to emphasize that effective marketing involves far more than mere promotion.

Transit marketing is a somewhat different discipline than is the marketing of, say, soap powder. Its difference is largely built around the fact it is an activity that has only recently been accorded a position of importance by transit management. Its immediate needs are a function of this novelty.

UMTA's program here will involve several dynamics: organized and formal training sessions for newcomers to the field; workshops and publications whereby more experienced professionals can profit from each others' ideas; site specific demonstrations of marketing concepts and ideas; critiques and evaluations of actual programs and projects. Throughout all these activities, the specialized marketing requirements of para-transit services will receive increasing attention. Also, an activity which APTA has afforded a very high priority will form part of UPM-40's program in marketing -- the design of a national "transit awareness" campaign, an effort designed to educate the general population about transit and its over-all advantages ... advantages not restricted to transit users.

C. Operations and Maintenance. If marketing's goal is to increase sales, the Operations and Maintenance end of UPM-40 has as its specific mandate the reduction of costs. While there is no aspect of transit management than cannot be explored --- (and a wide variety of important accomplishments have already been achieved by this section) --- there is an important priority in today's work program: increased efficiency through automated management information systems. The transit industry's well-documented history of neglect has caused the industry to fail to take maximum advantage of the cost-saving efficiencies which computers can provide. As a second major theme, the general matters of "productivity" and "efficiency" --- also long ignored in transit --- must be brought into convenient and measurable terms for transit operators.

Information Services: This unit has long been known as the Transit Research Information Center (TRIC), and it is UMTA's contact with the National Technical Information Center, in Springfield, Virginia. TRIC reviews and prepares abstracts for all major UMTA research projects and publishes these abstracts periodically. In the months ahead, TRIC will also become the repository, at UMTA, of national operating data reported under the provisions of Section 15. Further, as planned staffing takes place, this unit will be developed into a general outreach arm for all UMTA offices, thereby assisting in the overall theme of making the results of past research and demonstrations available to potential users.

TRANSIT MANAGEMENT II

Chairperson: *Frank Enty*, Office of Human Resources, UMTA

TRANSIT INDUSTRY HUMAN RESOURCES PROGRAM DEVELOPMENT: *Mr. Enty*

VALIDATED TEST BATTERY PROGRAM: RESEARCH EFFORT AND INDUSTRY PARTICIPATION: *Chester W. Higgins*, Senior Personnel Administrator, Massachusetts Bay Transportation Authority, Boston

BLUE COLLAR TRAINING PROGRAM: DESIGN AND IMPLEMENTATION: *John R. Spears*, Research Director, AFL-CIO Appalachian Council

Reporter: *Gwendolyn R. Cooper*, Office of Transportation Management, UMTA

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TRANSIT MANAGEMENT II

FRANK ENTY
OFFICE OF HUMAN RESOURCES, UMTA

The purpose of the Human Resources Development Division is to increase the efficiency of mass transit operations through: 1) a program of activities specifically designed to enhance and upgrade industry personnel skills and abilities; 2) initiation of efforts to increase industry organization and management effectiveness; and 3) approaches to gain a better understanding and appreciation of transit industry labor-management practices. It is anticipated that the activities conducted within this area will serve to encourage and promote the expansion of opportunities for recruitment, training, education and career development to enable the industry to gain the expertise necessary to establish and maintain standards of job performance.

The fundamental issues underlying the Human Resources Development function may be found in the present status of the transit industry workforce with regard to age and capability. According to the latest data available, almost 160,000 persons are employed in the urban mass transit industry. As a labor intensive industry, worker compensation accounts for 65 percent of total operating costs. While the management component comprises about 15 percent of this workforce, only seven percent of the managers, supervisors and administrators that constitute this group possess a college education. This suggests a severe shortage of the skills necessary to run a major industry. In addition, available evidence would suggest that the number of managers and supervisors is inadequate for both present and future industry needs.

For purpose of clarification, the term "management" includes all levels of transit management from the general manager down to the first line supervisor.

Furthermore, the average age of incumbent transit managers is relatively high. Over half (53 per cent) of all managerial personnel are 50 years of age or older, with a vast majority of those with 20 or more years of service. When the normal retirement age of 65 is

coupled with the accelerating acceptance of early retirement options, a substantial increase in transit's aggregate annual need for managerial manpower will occur. The problem is additionally aggravated in that the average age of industry middle management in the transportation (operating) area is 51.5 years. All of which indicates that urban transit lacks an adequate base for the replacement of present top-level operating officials as they reach retirement age; in other words, the retirement dates for both middle-and-top level management will occur at approximately the same time.

A similar situation exists with respect to technicians, operators and maintenance repairmen. It is estimated that 40 per cent of all mechanics are between 51 and 65 years of age, and while operators are more evenly distributed age-wise, all transit properties are confronted with the prospect of accelerating turn over rates in the workforce. The attached table reflects the nature of the problem in clear cut terms. (See Table I).

In summary, the status of transit industry human resources may be described as follows:

1. There is an inadequate number of managerial, supervisory and technical personnel in the transit industry.

2. The level and extent of formal training/education of managerial, technical and supervisory personnel is exceptionally low for the type of duties and responsibilities normally associated with such positions.

3. Age relationships between top, middle, and lower level transit industry managerial positions will create serious voids in the leadership ranks.

4. The age distribution of operators and maintenance repairmen when combined with normal attrition and new job opportunities will create a replacement rate projected at some 15,000 jobs annually.

The foregoing is brought out to underscore the need for well thought out, properly planned programs to meet current and anticipated training/education requirements of the transit industry. The role of the Human Resources and Training activity is to encourage and promote the process by which the industry will broaden and strengthen training efforts at national, State and local levels. It is in this context that specific objectives were formulated around which this functional area would assist in the creation and development of educational and training program for transit industry personnel.

Expected outcomes for proposed program activity level of effort are as follows:

1. Establish an array of training courses and materials.

TABLE I

BUS MASS TRANSIT PERSONNEL STATISTICS

Parameters	Operators	Repairmen
Employees	61,300–64,600	15,000–15,800
Percentage of Bus Mass Transit Employment	65.9%	16.1%
Annual Turnover Rate	14.0%	13.0%
Annual Retirement Rate	2.2%	2.6%
Annual Resignation Rate	11.8%	10.4%
Number of Employees who Retire	1,350–1,430	390–410
Number of Employees who Resign	7,230–7,620	1,560–1,640
Number of Employees Leaving the Industry	8,580–9,050	1,950–2,050

that are internally consistent as to subject matter covered, manner of development and suitability for presentation on an industry wide basis.

2. Identification and development of standards and qualifications for selected industry occupations as elements upon which training program activities will be structured.

3. Clarification of organization and management procedures and practices as they relate to:

   - Personnel management
   - Delegation of authority and decision-making
   - Labor-management relations
   - Corporate policy making procedures
   - Productivity and the work environment

The Human Resources Development Division's activities, current and planned will focus on and seek to establish methods and approaches for industry adoption of a training rationale oriented towards improvement of the quality, effectiveness and utilization of human resources in the transit community. The Division's approach is illustrated in Chart 1. Specific objectives for the program are as follows:

A. Enhance and upgrade skills and capabilities of transit industry personnel.

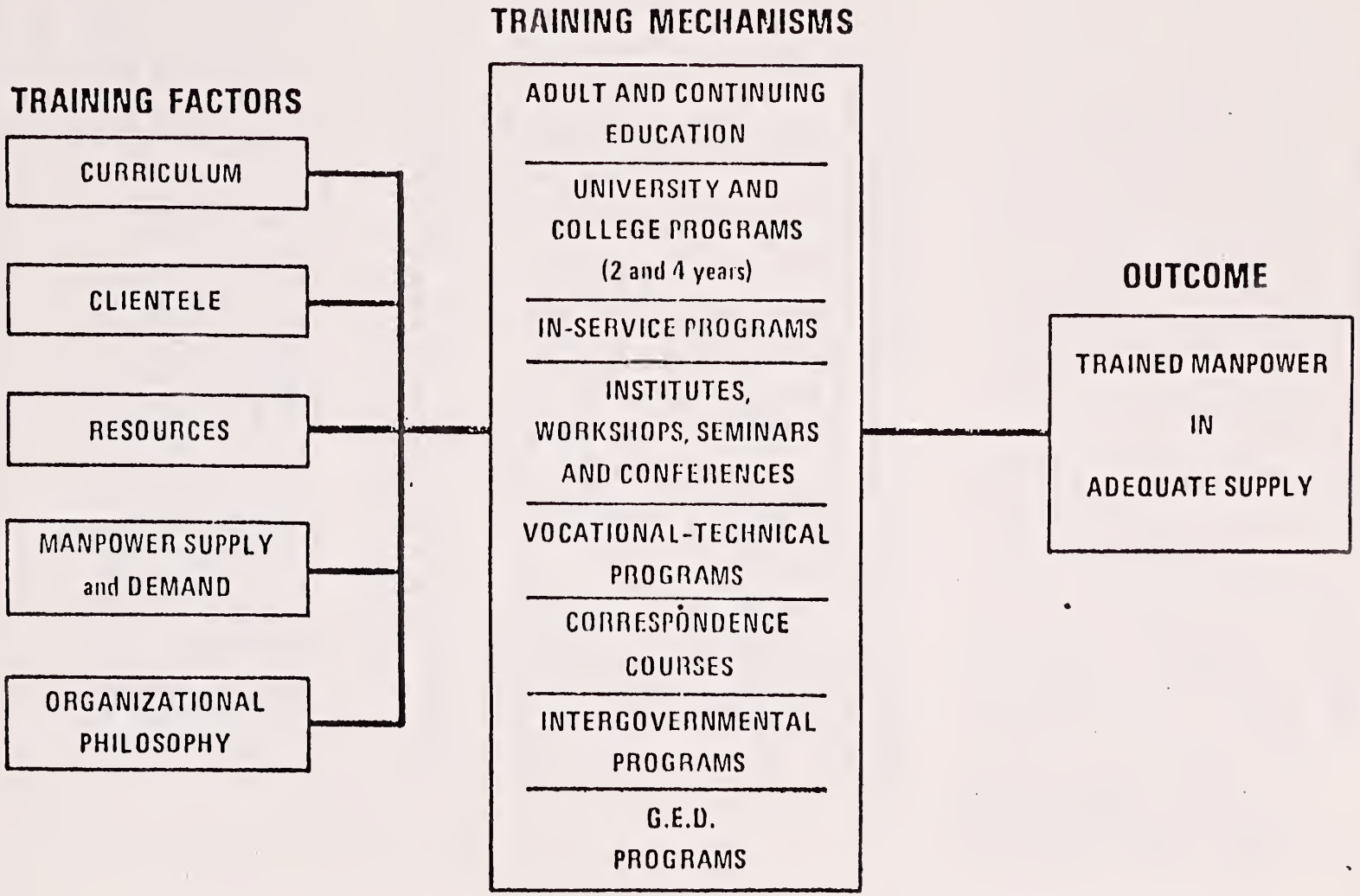
As new and innovative technology is introduced into the transit industry in the form of methods, techniques, equipment or facilities, the availability of trained, competent workers is a matter of growing concern. In recognition of this development, UMTA will continue to identify and develop programs and activities specifically designed to train operators, mechanics, technicians, and supervisory personnel in the latest skills and techniques. Maximum use will be made of learning packages already developed and proven in other industry applications, such as mobile training vans, self-pacing training programs, computer assisted instructional programs, etc.

B. Increase industry effectiveness and productivity

The promotion and conduct of selected activities to increase the effectiveness (success of the organization in accomplishing goals and objectives) and efficiency (performing the mission of the agency as inexpensively as possible) is essential to the ultimate viability of mass transit as a meaningful alternative in attempting to resolve the transportation issues of today and tomorrow.

Identification of measures of productivity is at best a complex and most difficult problem; however, planned and coordinated efforts must be undertaken if a better perspective of industry operations and activities is to be gained.

CHART I - TRANSIT INDUSTRY TRAINING/EDUCATION APPROACH



C. Improve organizational development and management techniques

Organizational change is an often times unrecognized, unprepared for event that occurs as part of the ongoing evolution of an organization. Many administrative, managerial or organizational, managerial or organizational problems that arise within the organization stem from poor organization design, lack of clear cut objectives, tradition or other not readily acceptable causes. The modern organization is more than a collection of individuals, it involves the problems of team building, inter-group coordination and cooperation, organizational goal setting and planning. Training and employee development are essential elements of planned organizational change and attention must be given to clarification and elimination of the ambiguities and uncertainties that presently exist in the organizational development process of the transit industry.

An area of major significance and great concern to transit management is the field of labor-management relations. The change in industry ownership from private to public has cast the process of collective bargaining and union negotiations into an entirely new construct. Additionally, certain provisions of The Urban Mass Transportation Act of 1964 which substantially increased Federal funding of transit projects and operations, assured bargaining rights, compensation, and working conditions of employees would be protected. Section 13(C) of The Act provides this protection; however, there is considerable controversy over its impact or potential impact for labor, state and local government, and management of transit systems. As an indirect party to the 13(C) issue (UMTA subsidizes industry operating deficits-including labor costs), UMTA has a responsibility to address, clearly define and assess the implications of the matter for ongoing Federal support.

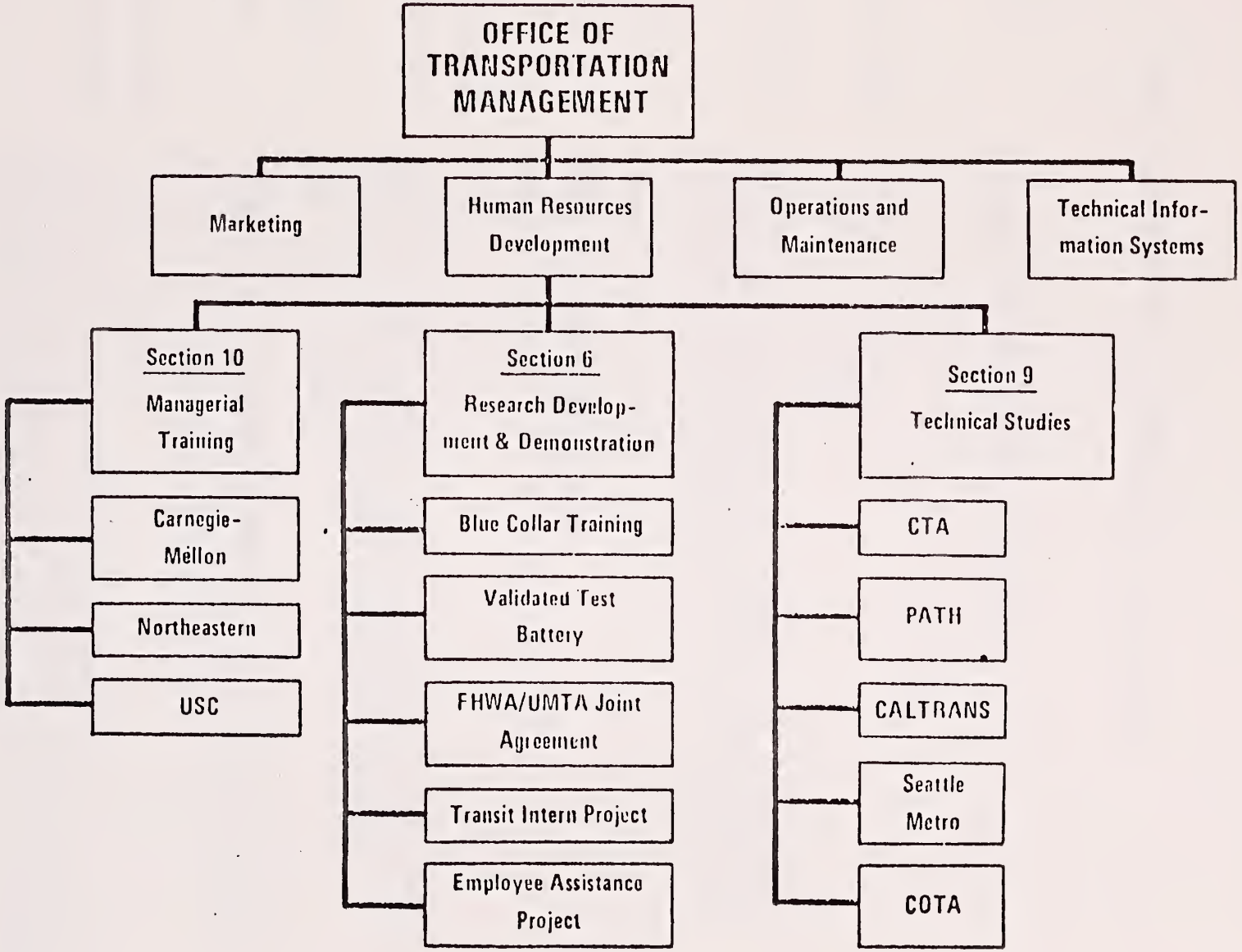
Another dimension of change in the conduct of industry operations is the emergence of the private management company hired by the public transit authority to run the transit system. There are

many unanswered questions associated with such an arrangement that require review and clarification. An example is given in the legal status of collective bargaining for employees retained either by the management firm (which is private) or the public agency which often time does not recognize a bargaining agent or permit work stoppages. Also cited is the matter of cost benefit/effectiveness of the private management firm. Taken one step further, this introduces a question of transit management performance on an industrywide basis that will require future attention.

Program Activities

Chart 2 lists Human Resources Development Division activities to date. Brief descriptions of each of the projects are as follows:

CHART 2 HUMAN RESOURCES DEVELOPMENT ACTIVITIES



A. Research, Development and Demonstration Activities

I. Project Title: Bus Operator Validated Test Battery

Grantee: Massachusetts Bay Area Transit Authority

Year Awarded & Cost: FY '72 - $381,716
'76 - 65,000
'77 - 137,902

Project Description: Develop and establish valid procedures for the selection of male and female applicants from all racial groups who would have the most potential for successful performance as public transit bus operators.

Contact Person: Chester Higgins, MBTA

II. Project Title: SCRTD Training Demonstration

Grantee: Southern California Rapid Transit District

Year Awarded & Cost: FY '75 - $65,000

Project Description: Examine in-house capability for maintenance skills development as a mechanism for improving the effectiveness and efficiency of transit industry blue collar workers.

Contact Person: Byron Lewis , SCRTD

III. Project Title: State DOT Role in Urban Transportation Training & Education

Grantee: California Department of Transportation

Year Awarded & Cost: FY '76 - $99,276

Project Description: CAL DOT will analyze, develop, and demonstrate the state role in providing training for selected groups at the State and local level. Such groups will include elected and appointed Government officials as-well-as transportation professionals with past experience in highway related activities.

Contact Person: George Gray, CAL DOT

IV. Project Title: Joint FHWA/UMTA Training Agreement

Interagency Agreement: FHWA/UMTA

Year Awarded & Cost:
FY '75 - $25,000
76 - 75,000
77 - 50,000
78 - 50,000

Project Description: This project will identify and develop training programs responsive to the needs of professionals having responsibilities relating to urban transportation. Special attention is given to those professionals transitioning from careers in highway related activities.

Contact Person: Chuck Morison, - UMTA; Gary Hamby, - FHWA

V. Project Title: APTA Affirmative Action Series

Grantee: American Public Transit Association

Year Awarded & Cost:
FY '76 - $74,653
77 - 31,488

Project Description: Conducted six (6) affirmative action seminars for transit management personnel and transit contractors. The seminars were intended to integrate civil rights precepts into ongoing transit operations.

Contact Person: Jim Davis, APTA

VI. Project Title: Transportation Safety Institute Transit Training Program

Interagency Agreement: Transportation Safety Institute

Year Awarded & Cost:
FY '76 - $62,100
77 - 90,000

Project Description: The purpose of the project is to utilize the services, facilities and resources of the Transportation Safety Institute (TSI) to promote, develop and improve transit industry organization and operational procedures by designing and conducting training programs and activities in response to industry and UMTA needs.

Contact Person: Ed Foshee, TSI

VII. Project Title: National Transit Intern Project, Phase I

Grantee: National Center for Public Service Internships Programs

Year Awarded & Cost FY ' 77 - $92,371

Project Description: A comprehensive pilot project to develop and establish a public transit industry university related intern program to attract and recruit college graduates for placement in entry level administrative and professional positions.

Contact Person: Richard Ungerer , NCPSIP

III. Project Title: Transit Industry Employee Training Program

Grantee: AFL-CIO Appalachian Council

Year Awarded & Cost: FY '77 - $764,651
FY '78 - 600,000

Project Description: This project will develop and test basic training programs involving the recruitment, skills development and up-grading of transit industry blue collar workers. The project will also demonstrate the ability of labor and management to work cooperatively in the area of training program development.

Contact Person: Richard Wilkes, AFL/CIO Appalachian Council

IX. Project Title: National Transit Intern Project, Phase II

Contractor: American Public Transit Association (Anticipated)

Year Awarded & Cost: FY ' 78 - $180,000

Project Description: Phase II of the National Transit Intern Project (NTIP) will seek to refine the approaches and techniques developed during Phase I of the NTIP. This phase will seek to institutionalize the intern concept within the industry through a number of industry based activities.

Contact Person: Jim Davis, APTA

X. Project Title: Employee Absenteeism and Workmen's Compensation Claims in Transit Industry

Year Awarded & Cost: FY '78 - $176,000

Project Description: This project is designed to establish a baseline of transit industry experiences with employee absenteeism and workman's compensation and to develop a series of recommendations on ways to deal with excessive absenteeism and workman's compensation claims

Contact Person: Herbert O. Eby, PAT

XI. Project Title: Case Histories in Human Resources Management in Public Transportation

Grantee: University of Pennsylvania

Year Awarded & Cost: FY '78 - $30,150

Project Description: The purpose of this project is to increase the knowledge and awareness of public transit officials, educators and researchers about transit industry human resources management practices and procedures. A set of case studies will be developed that is expected to provide greater insight and understanding of the ways in which transit industry personnel as an industry resource, is being utilized.

Contact Person: Dr. Howard E. Mitchell, U. of PA

II. Project Title: Comprehensive Employee Assistance Program

Grantee: Detroit Department of Transportation

Year Awarded & Cost: FY '78 - $155,000

Project Description: This project is designed to establish a framework of policies and procedures to enable public transit employees to address and resolve personal problems that impact upon worker productivity. The effort will also involve a review of current industry programs extant in this area.

Contact Person: Conrad L. Mallett, DDOT

I. Project Title: Evaluation of the Feasibility of Developing a Bus Operator Training Simulator

Year Awarded & Cost: FY '78 - $75,000

Project Description: This project is being developed to examine the feasibility of utilizing a simulator as a means of teaching safe driving and other operating techniques in training bus operators. The value of simulator use in fuel conservation and minimization of accident risk and equipment damage in training will also be evaluated.

Contact Person: Chuck Morison, UMTA

B. Technical Studies

The following projects are cited as being indicative of the types and kinds of activities local transit agencies may undertake on thier own initiative under Section 9 of the Urban Mass Transportation Act of 1964 (As Amended). Each of the below listed projects involves some aspect of human resources or organizational

analysis and the planned assessment or development of same.

Project Title	Grantee	Year	Amount
Human Resources Analysis	PATH	75	$ 80,000
Management Education Program	CTA	75	135,000
Salary Classification Study	COTA	75	30,000
MBO Analysis	Seattle	76	31,500
Human Resources Development Study	SEPTA	76	80,000

C. Managerial, Supervisory and Technical Training

Seven hundred fellowships awarded over a seven year period for the program and a total of three and one-half million ($3,500,000) dollars. Schools involved and program thrusts are as follows:

I. Carnegie-Mellon University: Course designed to improve the technical skills of urban transportation managerial, professional and technical personnel involved in the operation, planning and administration of urban mass transportation systems.

Contact Person: Jerry Kokalis, C-M U

II. Northeastern University: Management trainingseminars provide new and mid-level managers with experience to impact upon practical day-to-day responsibilities and duties encountered on the job site. This course is designed to improve managerial and supervisory skills of those individuals within the industry who have not had benefit of formal training in this regard.

Contact Person: Dean Malcolm Campbell, NU

III. University of Southern California: This effort was undertaken to improve the technical skills of those transit industry professionals with responsibility for marketing programs and activities at the property level. It is expected that increased communications and information exchange will have a positive effect upon the level and quality of transit services offered to the public.

Contact Person: Laura Susman, USC

MELANIE BAEHR

UNIVERSITY OF CHICAGO

Late in 1970, the Urban Mass Transportation Administration of the Department of Transportation funded a national or multi-unit study for the validation of a selection test battery for bus operators. The five transportation systems which participated in the study were the Atlanta Transit System, the Chicago Transit Authority, the Cleveland Transit System, the Alameda-Contra Costa Transit District (Oakland) and the Massachusetts Bay Transportation Authority. The latter authority was the grant recipient and has managed the project throughout, first under the direction of Mr. William Fitzsimmons and thereafter under the direction of Dr. Chester Higgins. The professional services for the validation were provided by the Industrial Relations Center of the University of Chicago under the direction of Dr. Melany E. Baehr. A board comprised of three laymen with interests in minority employment plus six professionally trained psychologists served in an advisory capacity throughout the study.

While many individual transit authorities had made extended efforts to develop equitable hiring procedures, this was a pioneering study not only for the Department of Transportation but I believe for the private sector in general in terms of its size and geograpnic representation of participating units, its scientific scope with strict adherence to the 1970 EEOC Guidelines on Employee Testing Procedures, and the degree of expertise represented in its project and management staff and its advisory board. Since the completion of this study, other multi-unit studies of national scope have been initiated in the public sector such as test validation studies for municipal patrolmen and state police presently being implemented by Industrial Relations Staff.

for th

The bus operator validation study was successfully completed across location racial groups (white, black and Spanish-surnamed) both singly and in combination for male bus operators. At that time there was not a sufficiently large sample of female bus operators to make validation feasible. A separate study for female operators is in process and preliminary results from this study will be discussed later. The major findings of the original study are summarized below.

1. The concurrent and predictive validation models (which will be described presently) both yielded essentially similar results.
2. It was possible to use identical tests, procedures, and selection equations for all three racial groups. This race-common selection equation was the first achieved by the Center for a racially mixed applicant population since the Guideline requirements of differential validity were introduced.
3. Perhaps one of the most important results with respect to battery implementation was that use of the race-common selection equation produced little or no adverse impact. In other words, the procedure selected essentially similar numbers of candidates from the three racial groups. Under these circumstances the procedure does not discriminate against any racial group.
4. The demonstrated validity and cross-validity of the final selection equation were far in excess of Guideline requirements. The Guidelines require that the probability that the study results were obtained by chance should be no greater than 1 in 20. In the present study the probability of chance occurrence of the cross-validity coefficient was less than 1 in 1,000.

RESEARCH DESIGN

A brief description of the experimental design follows in order to acquaint you with the validation procedures which were implemented. Thereafter some of the pioneering procedures and significant project results will be described for the various steps in the validation process.

The major objective of the study was to establish valid procedures for the selection of applicants who would have most potential for successful performance as bus operators in an urban transportation authority. This was done through a criterion-related validation required by the 1970 Guidelines. The objective of a criterion-related validation study is to determine empirically the extent to which selected tests or test variables are related to, or can predict, independently obtained measures of performance. There are two models for achieving this objective. In the concurrent validation model, the trial selection tests or procedures are administered to current employees, and the criterion measures or measures of performance are obtained at about the same time, but preferably before the administration of the tests. In the predictive validation model, the trial test battery is administered to applicants for the position, but the test scores are not used in the hiring decision. The performance measures are collected after applicants have been on the job for some time, usually a year. Although not required by the Guidelines, it is desirable to implement both models, as was done in the present study. All five of the participating transit authorities contributed to the concurrent model, but only Boston and Chicago had a sufficiently high rate of hiring to ensure that an adequate sample could be collected for the predictive study in a reasonable period of time. The successive steps in implementing the validation are shown on the overhead.

[SLIDE OF RESEARCH DESIGN]

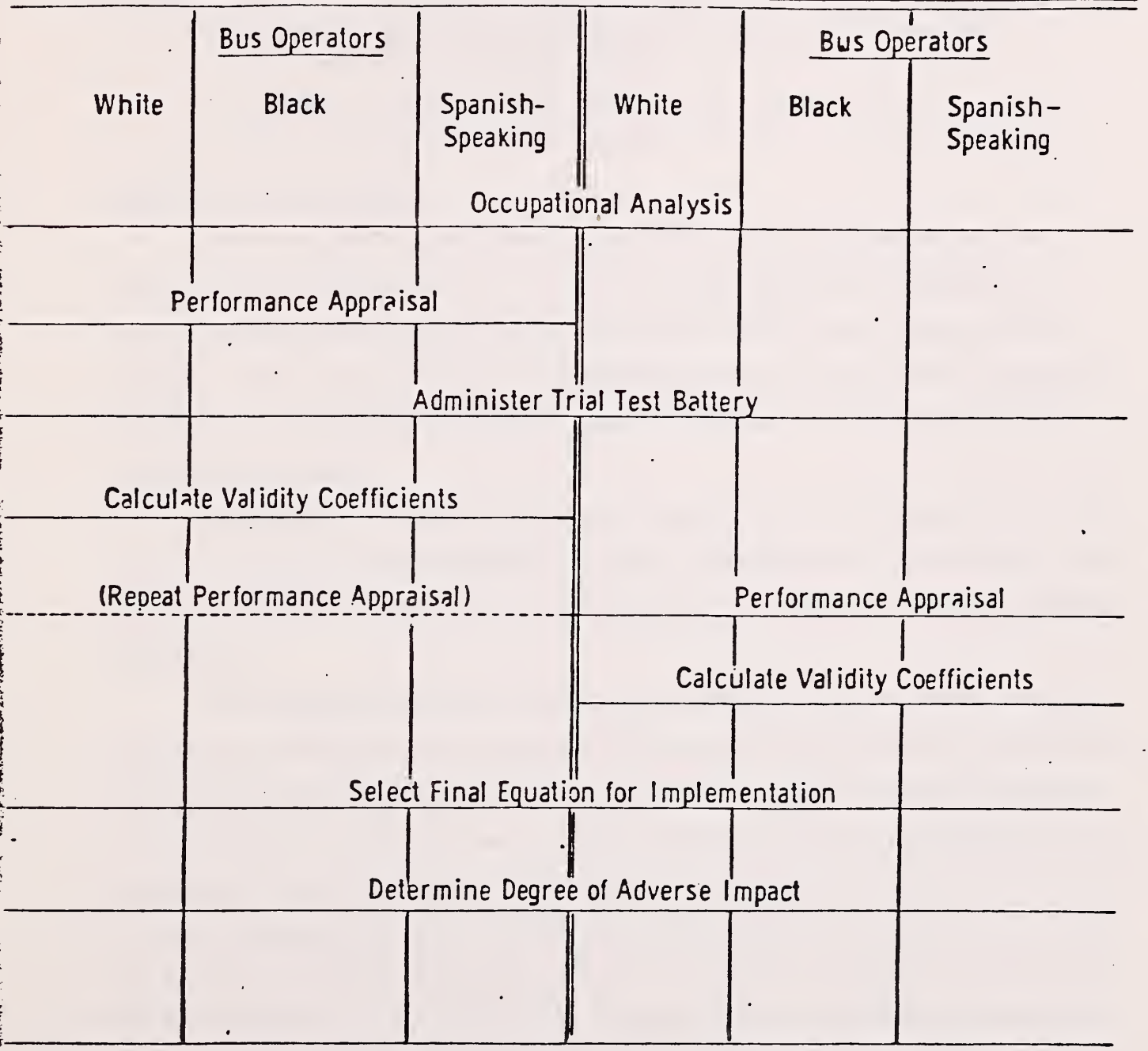
RESEARCH DESIGN
FOR
CRITERION RELATED VALIDATION STUDY

Concurrent Model

Chicago, Atlanta, Cleveland
Boston, Oakland

Predictive Model

Boston, Chicago



A thorough analysis of any occupation or job for which selection or promotion procedures are to be developed has always been a basic professional requirement for personnel specialists. However, the necessity for this preparatory step has received increasing emphasis from regulatory agencies. Essentially, the occupational analysis is undertaken to determine the major functions of a job and their relative importance for overall performance. Results of the analysis then provide a basis to:

--determine what skills and behavior attributes are needed for good performance on the job.

--develop realistic measures of performance to serve as criterion measures in the study.

Performance Appraisal

The next step--performance appraisal--is, in many ways, the "heart" of a criterion-related validation study, since the measures of performance chosen are the standards against which test results will be judged. All criteria used to measure performance must reflect the skills and behavior attributes revealed in the occupational analysis as crucial elements of the job.

Both objective and subjective performance indices were used. The objective indices were taken from company records and included such measures as tenure, chargeable and nonchargeable accidents, misses and sick-day record.

The subjective indices consisted of specially implemented multiple supervisory assessments of performance made through use of a forced technique known as the paired comparison technique. This technique requires the supervisor to compare each employee in the group he is qualified to rate with every other one and make the judgment as to which member of each pair he feels is doing the better overall job. The result is a comparative ranking on all individuals in the group. On the basis of this ranking a "performance index" is assigned to each individual. Several raters' results for each person are averaged to provide the final index of that individual's performance. This final index is known as the "PC rating".

This appraisal procedure has been used for many years by the Center as a criterion measure in validation studies with uniformly good results This is probably due to the fact that the procedure minimizes the effects of personal bias of the supervisor.

Development of the Trial Selection Test Battery

Test batteries developed by the Industrial Relations Center have traditionally covered a wide span of human potential. The particular measurement instruments used in each battery are determined by the occupational analysis and selected from the areas outlined on the screen.

[SLIDE--AREAS OF THE TEST BATTERY]

I. MOTIVATIONAL MEASURES
   1. Background and Experience
   2. Work Interests and Aspirations

II. INTELLECTUAL MEASURES
   3. Mental Abilities
   4. Special Aptitudes

III. BEHAVIORAL MEASURES
   5. Temperament and Personality
   6. Social Interaction
   7. Personal-Emotional Adjustment

The trial selection test battery consisted of 11 multi-score tests, with a total of 79 subscores. All the tests were paper-and-pencil instruments which could be administered individually or to groups and which could be hand-scored by trained clerical personnel.

Calculation of Validity Coefficients

The ultimate objective of the statistical analysis step in the validation process is to determine the relationship between the test scores and the performance measures and to answer the question, "To what extent do

test results predict, or correlate with, actual performance on the job?" The degree of association between predictors and criteria is represented statistically in the form of the validity coefficient. This association or relationship must be shown to have both statistical and practical significance.

Selection of Final Equation and Determination of the Degree of Adverse Impact

Since a total of 10 objective, and 4 subjective performance measures were used in the analysis, the final step in the validation process is to identify the particular selection equation which will maximize validity and still maintain a low degree of adverse impact.

SIGNIFICANT STUDY RESULTS FOR RESEARCH AND PRACTICE

Innovative procedures were developed for almost every step in the selection process. The results of some of these have had a significant impact on both research and practice.

Identification of the Requirements of the Bus Operator Position

One such innovative procedure occurred at the first step in the validation process, that of occupational analysis. At the outset it was foreseen that the occupational analysis in this study would have to perform additional functions to those already described under the procedures for criterion-related validation.

Since this was a multi-unit study, one requirement would be that the occupational analysis provide some simple but reliable means for comparing the requirements of the bus operators job in the five participating authorities in order to determine whether they were similar enough to combine in one validation study. Furthermore, in order to implement the validated test battery on the national scale for which it was intended, there would have to be a means for determining whether or not the requirements of the job in non-participating authorities who wished to use

the validated battery were sufficiently similar to the requirements of the job in the authorities who had participated in the validation.

With these purposes in mind, we developed a standardized and quantified procedure for defining the relative importance of the various skills and attributes required for successful performance as a transit bus operator. The procedure is essentially a forced, normal distribution card-sort which can be done by job incumbents or their supervisors without professional supervision. Results are presented in the form of "requirements" profiles.

The first step in testing efficiency of this specially developed instrument was to determine whether it could differentiate between the requirements of different occupations. The requirement profiles for the bus operator, police patrolmen and firemen positions based on card sorts made by their supervisors are shown on the screen.

[OVERHEAD SAI PROFILES - Across Occupations]

A visual inspection shows considerable differentiation between the requirements for these three occupations and statistical analysis indicated significant differentiations on 8 of the 13 dimensions.

The next step was to develop composite profiles for the bus operators job, based on ratings made by supervisory personnel, at each of five geographically separate transit authorities which participated in the study. These are shown on the screen.

[OVERHEAD SAI PROFILES - Five Transit Authorities]

Although there is some variation in these profiles, the results of a statistical analysis indicated that only one of the 13 SAI dimensions showed differences between the five authorities. On the basis of this finding and of other information obtained in the course of the job analysis, the five authorities were combined for purposes of the validation study. The composite profile for the five authorities became the "standard" against which the similarity

of the bus operator's job would be judged for other authorities which had not participated in the validation but which wished to use validated selection test battery.

The "standard" profile and the profile for the first transit authority which asked to use the validated battery are shown on the screen.

[OVERHEAD SAI PROFILES - Standard & PAT]

The profiles are similar in shape, although the profile for the new transit authority is at a slightly lower level than the "standard" profile. However, the results of the statistical analysis indicated that the differences were not significant on any of the dimensions. Since the completion of this study, a special computer program has been developed to test profile similarity between the standard and non-participating companies. This procedure paved the way for the implementation of the battery across the Country.

Correction for Effects of Racial Bias on Supervisory Ratings of Bus Operator Performance

In the course of the performance appraisal step in the validation project, procedures were developed for identifying and for eliminating the effects of racial bias in supervisory assessments of performance which substantially improved the validation results obtained in this study, andwhich should have applications in any situation where supervisory assessments of performance are used.

The subjective performance measures used in this study were supervisory ratings made by means of the paired-comparison (PC) technique. Sixty-six white supervisors and two black ones provided ratings on various members of the racially mixed smaple of operators. An initial comparison of total performance indices across the three racial groups revealed a complicated set of realtionships among the objective performance criterion of tenure, the race of the operator, and the subjective supervisory performance ratings.

Working from this initial comparison, we observed that both the black and the Spanish-surnamed operators, as groups, received lower PC ratings than did white operators as a group. We also noted that operators from the minority groups had significantly lower job tenure than did the white group as a whole. These observations prompted a statistical examination of the joint effects of race and of tenure on the PC rating. This examination led eventually to the use of four PC-derived performance measures in the statistical-analysis stage of the study. These were: raw PC rating (PC), PC rating corrected for tenure (PC/T), PC corrected for racial bias (PC/B), and PC corrected for both tenure and racial bias (PC/T&B). The procedures for doing this and the results achieved are detailed in a published technical report.[1]

As a summary, the major findings derived from use of the four PC-derived measures were as follows:

1. The vast majority of assessing supervisors, including both of the blacks, showed no racial bias. However, a few supervisors were extremely biased, and their bias would have seriously affected the validation results had appropriate corrections not been applied to the ratings.
2. The corrections could be applied in such a way that all the supervisory assessments and all four variants of the PC rating could be used in the study without any loss of cases.
3. Correcting the PC rating only for racial bias eliminated the criterion differences across the racial groups, while correcting it only for tenure did not.
4. PC corrected only for racial bias was the best-predicted of the four PC measures and was selected as the major performance criterion for the study.

---

[1] Saunders, David R., Baehr, Melany E., and Froemel, Ernest C., "Identification of, and Correction for, Effects of Racial Bias and Job Tenure on Supervisory Ratins of Bus Operator Performance," Psychological Reports, 1977, 40, 859-865.

Use of Self-Report Questionnaires to Predict Peformance

One of the most significant findings of this study relates to a possible procedure for reducing the adverse impact on minorities which very frequently results from the use of traditional tests of mental abilities and aptitudes. The trial test battery used in this study consisted of 11 measurement instruments, including traditional psychological tests of mental abilities, aptitudes, and behavior, as well as some specially constructed, scoreable, self-report forms. Three instruments survived validation, and they were all self-report forms, covering, respectively, the applicant's background, perceived skills and behavior attributes, and emotional health status. Not only did these self-report forms demonstrate the greatest validity among 11 instruments in both the concurrent and predictive validation models but, in addition, they showed least adverse impact on minority group applicants.

[OVERHEAD (OPTIONAL) P-Values for Traditional]
[Tests and Self-Reports]

It is considered that the minimization of adverse impact for the tests used in the final validated bus operator battery is one of the major reasons for the feasibility of a race-common selection equation. Preliminary results from the validation study for female bus operators presently underway indicates that these results are likely to be replicated. If this should prove to be the case we may well have opened up new avenues for equitable selection from racially mixed applicant populations.

PRESENT STATUS OF THE PROJECT

The present status of the project can be summarized as follows:

1. Validation Study for Male Bus Operators

   A validated selection test battery for white, black and Spanish male bus operators has been available to the industry since 1974.

2. Training Workshops for Battery Implementation

   According to the requirements set by UMTA, training workshops have

been held for representatives of authorities who wished to use the validated battery.

The major objectives of the workshops were to ensure, as far as possible that:

> The battery would be implemented in a way which satisfied both professional standards and legal requirements.
>
> The battery would be inserted in each authority's own selection process where it could be used most effectively and that the steps which preceeded it and followed it would be reviewed for legal compliance.

As of August, 1977 the statistics on the workshops are as follows.

Total Number of Participants	108
Number of Authorities Represented	80
Number of Authorities Implementing the Test Battery	47

3. Validation Study for Female Operators

It is expected that the validation study for female operators will be completed by January, 1979.

Preliminary results indicate that the same or comparable instruments used in the test battery for males will produce a validity coefficient in the female validation which will be well in excess of EEOC Guideline requirements.

4. Concluding Statements

The indications, based on communications with authorities throughout the Country, are that there will be a greatly increased use of the validated batteries when they are available for both male and female applicants.

The most urgent need at the completion of the female validation project will be to ensure that the transportation industry in general,

and the relevant representatives in the authorities are aware of the availability of the validated battery and understand its objectives and the validation research which led to its development. Thereafter it will be necessary to ensure that training workshops or other procedures to insure that the test battery is implemented in a professional and legal manner are readily available to authorities which wish to use it.

SUPERVISORY ASSESSMENTS
OF JOB SKILL REQUIREMENTS

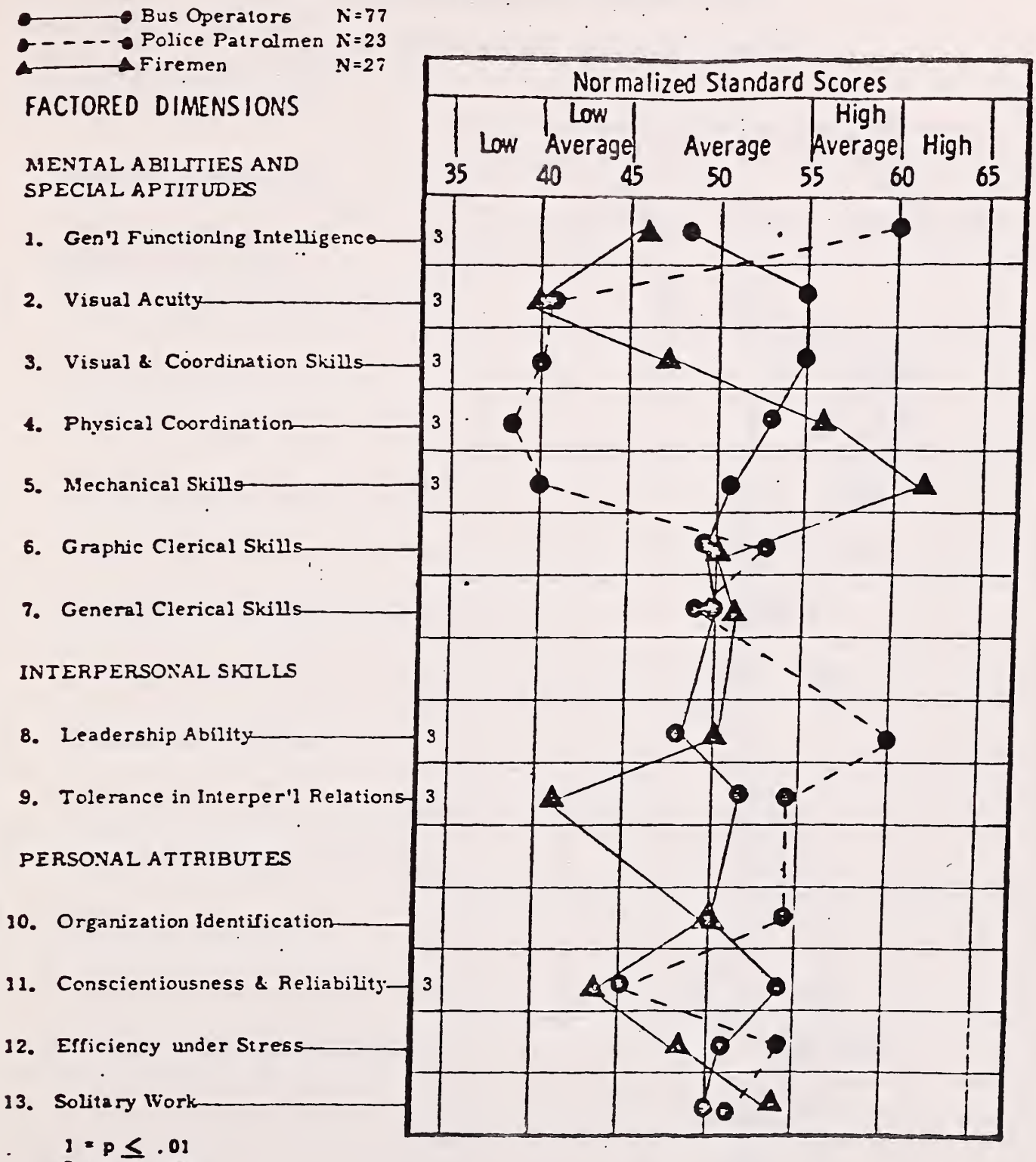
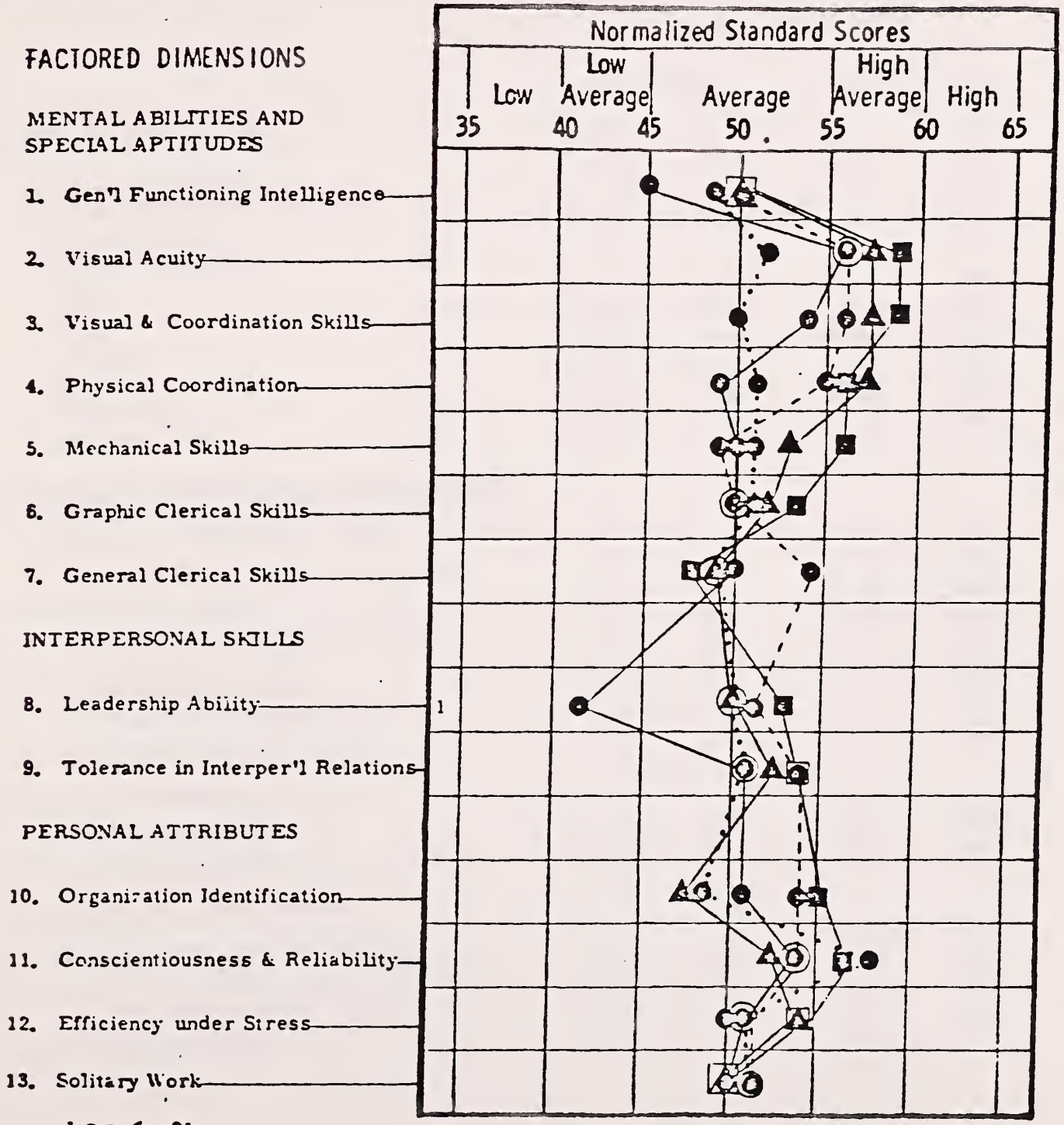


FIGURE III-3

Bus 1 N=17 (CTA)
Bus 2 N=15 (CTS)
Bus 3 N= 8 (AC)
Bus 4 N=20 (MBTA)
Bus 5 N= 7 (ATS)

SUPERVISORY ASSESSMENTS OF JOB SKILL REQUIREMENTS



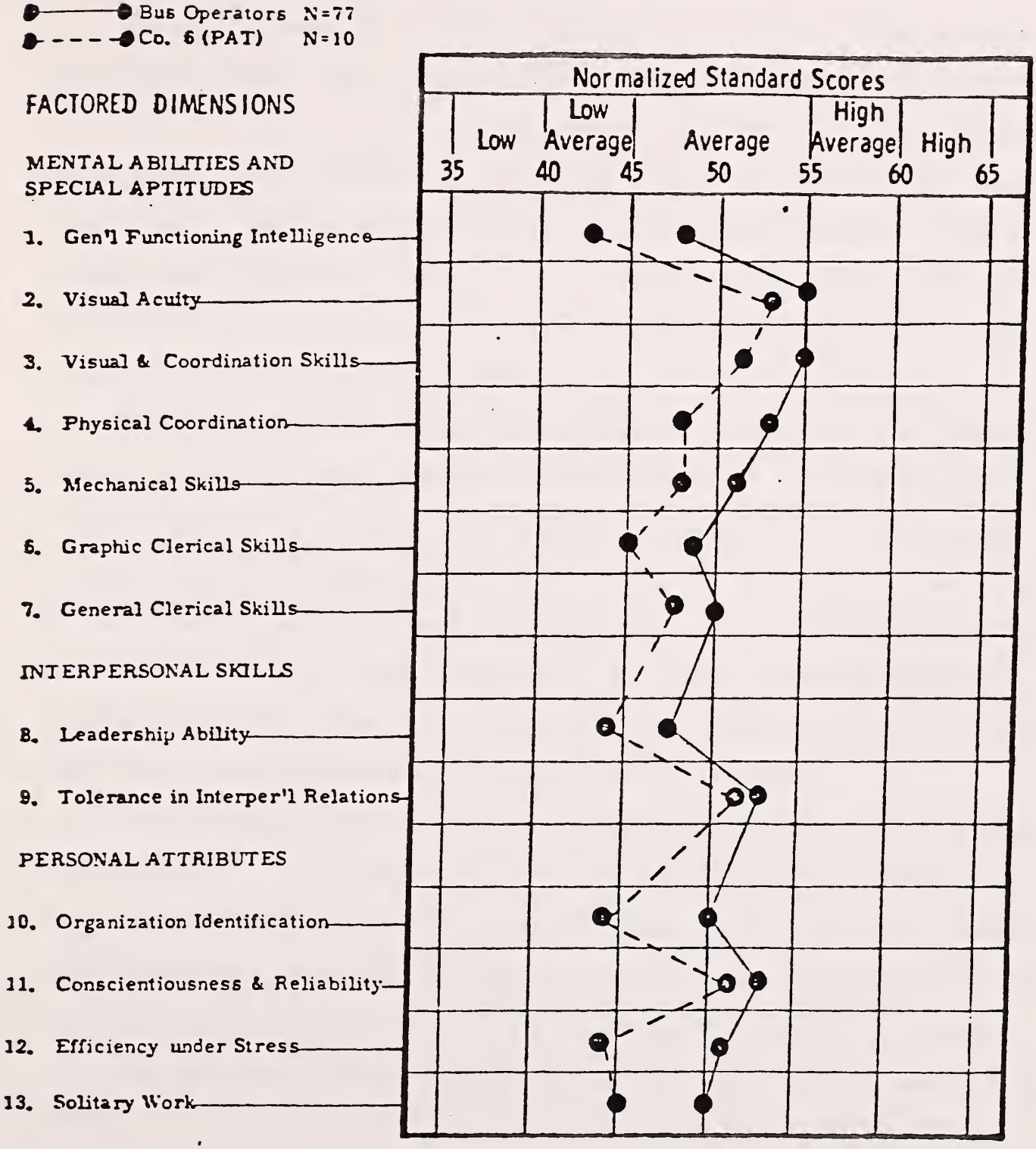
1 = $p \leq .01$
2 = $p \leq .001$
3 = $p \leq .0001$

TABLE 14

ANALYSIS OF VARIANCE (F RATIOS) FOR SCORES ON CONVENTIONAL TESTS AND A SELF-REPORT FORM FOR THREE RACIAL GROUPS

	Univariate F and p			
	White-Black		White-Spanish	
CONVENTIONAL TESTS	F	p	F	p
Closure Flexibility	18.51	.000	0.08	.781
Understanding Communication	41.70	.000	102.04	.000
Nonverbal Reasoning	17.85	.000	0.47	.491
Numerical Ability				
Add	41.73	.000	5.42	.020
Subtract	69.88	.000	5.13	.024
Multiply	41.36	.000	9.96	.002
Divide	34.08	.000	5.86	.016
Add Time	52.37	.000	9.58	.002
Subtract Time	61.40	.000	21.61	.000
SKILLS & ATTRIBUTES (SELF-REPORT)				
MENTAL ABILITIES & SPEC. APT.				
1. Gen'l Functioning Intelligence	2.16	.141	7.29	.007
2. Visual Acuity	0.52	.474	3.96	.047
3. Visual & Coordination Skills	0.01	.906	3.29	.070
4. Physical Coordination	1.66	.198	6.18	.013
5. Mechanical Skills	0.16	.691	1.15	.283
6. Graphic Clerical Skills	3.69	.055	9.16	.003
7. General Clerical Skills	3.10	.078	1.17	.278
INTERPERSONAL SKILLS				
8. Leadership Ability	17.82	.000	2.31	.128
9. Tolerance in Interper'l Relations	8.79	.003	7.28	.007
PERSONAL ATTRIBUTES				
10. Organization Identification	13.11	.000	3.58	.058
11. Conscientiousness & Reliability	2.33	.127	6.65	.010
12. Efficiency under Stress	2.08	.148	4.92	.027
13. Solitary Work	0.22	.637	0.02	.880

SUPERVISORY ASSESSMENTS
OF JOB SKILL REQUIREMENTS



CHESTER W. HIGGINS, PROJECT MANAGER
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

There are some 950 transit systems in the U.S., of which about 925 operate buses only. Some of the remainder operate multi-modal services -- rail, trolley or other mode, plus bus.(1) Over 50,000 motor buses are in service, generating annual revenues of 1½ billions of dollars. These vehicles annually carry over 5 billion riders and travel over 2 billion miles.(2) It follows that safe movement of people in this volume requires careful selection, training and supervision of those driving the buses.

When UMTA Project MA-06-0011, research to develop a validated test or tests for use in selecting bus operators, was begun in 1970, the average driver of the five companies taking part in the study was earning $4.165 per hour, $166.60 per week, or $8,663. per year. Updating these figures shows a present day rate of $7.4625 which translates to $298.50 per week or $15,522. per year. The percentage increase is 79.2%. The job of bus driver is thus an attractive one, especially to minorities and, increasingly, to women.

In the Greater Boston area, the consumer price index on January 1, 1970 was 136.1. On January 1, 1978, it was 224.6, an increase of 88.5 points, which represents a percentage increase of 65%. Using this percentage increase and updating some of the data used in 1970 to justify the need for the research shows the following changes.

New operators hired annually - 10,700 - probably no significant change.

Cost of training a new operator: In 1970 - $1,165; in 1978 - $1,922. (Average cost higher in large urban properties)

(1) APTA Transit Fact Book
(2) Ibid

Cost to the industry to train 10,700 new operators per year: In 1970 - $12,465,500; in 1978 - $20,565,400.

Turnover of new operators in 1970 showed a first-year loss of 28% or 3,070 people. These should be little change in this rate. The economic loss from turnover in 1970 was 3,070 x $1,165. (turnover x training cost) or $3,576,550. In 1978, the same volume represents a loss of $5,900,540. One of the projected values of improved selection should be reduced turnover because people will find the job of driver personally satisfying. A reduction in turnover of only 2% would have saved $71,531. in 1970. Today that saving comes to $118,011.

Better selection should give the industry better drivers who should have fewer accidents. Data developed in 1970 showed that the average first year operator was involved in 3.36 accidents at a cost of over $71,000,000. to the industry (and ultimately, to the riders-taxpayers). At 1978 levels, that cost has risen to $117,150,000. A reduction of only 2% as a result of hiring better drivers will mean an annual saving of $2,343,000.

Accidents cause damage to equipment. The 1970 figures placed the annual cost of damaged buses at $8,400,000. The 1978 update brings the figure to $13,860,000. If, through improved selection and placement a reduction of only 2% can be made in this amount, it will mean an annual saving of $277,200.

Safer operation and fewer accidents will increase the number of vehicles available for use. Putting this another way, a reduction in reserve fleet requirements can be made because fewer buses will be laid up for repairs. The average reserve fleet is about 10% of

the total. Publicly supported systems account for about 80% of all buses in use, or some 40,000 units. Cost of a 46-passenger bus in 1970 was $35,000. Today it is $57,750. or more. If improved selection of operators resulted in a 2% reduction in reserve fleet requirements, it could mean an industry-wide investment saving of $5,775,000. in 1978 dollars.

Taking into account only the examples in the foregoing, an estimated annual potential saving exists for the industry of $8,513,211. While these figures are substantial they are probably unrealistic since they assume across-the-board adoption and use of the test devices. However, the potential for savings is great. Of equal weight are the work's civil rights implications. The test devices validated to date (for WM, BM, HM) have little or no disparate impact on protected groups, thus assuring them of equality of opportunity. With UMTA's continuing support, the project is now in the last stages of its Phase II, comprising validation for women and refinement of the present battery.

From the beginning, the research has been in the hands of Dr. Melany Baehr and her team from the University of Chicago's Industrial Relations Center. During Phase I, participating properties were Boston, Chicago, Cleveland, Oakland and Atlanta. Participating in Phase II are Boston, Chicago, Cleveland, Pittsburgh and Washington, D.C. The project has been monitored by an Advisory Board appointed by UMTA's Office of Civil Rights, representing EEO/AA civil rights interests, psychologists, and experts in the field of employee selection.

Plans call for completion of the work in January 1979, at which time announcement will be made of how transit properties may obtain and use the devices.

The study was undertaken to develop a test or battery of tests which would reliably, and without disparate rejection of minorities, predict the probability of success on the job for applicants seeking work as bus operators. The tests were also to be useable for urban and suburban, large and small transit properties, on a national basis.

II. Organization and Financing:

The Mass. Bay Transportation Authority, Boston, (MBTA), was the project's sponsor. Four other transit systems participated: Oakland, California (AC Transit), Cleveland, Ohio, (CTS), Chicago, Ill., (CTA), and Atlanta, Georgia (MARTA). The study was funded by a grant of $381,716.00 from the Urban Mass Transportation Administration (UMTA), supplemented by local shares of $58,178.00, making the project's total cost $440,434.00. The participating properties were chosen to provide a broad geographic and demographic spectrum as well as a mix of racial and ethnic groups adequate for statistical sampling.

Dr. Melany E. Baehr of the University of Chicago's Industrial Relations Center was appointed to handle the professional aspects of the work. As Project Director, she was assisted by an Advisory Board comprising three laymen with interests in minority employment plus six professionally trained psychologists, all of whom were appointed by UMTA's Office of Civil Rights.

III. Research Design:

The first step was to make an intensive study of the operator's job at all five locations to establish the needed skills and attributes. Next, an experimental battery comprising eleven tests was selected to measure those attributes. Later the battery was refined to focus on factorially determined categories of performance criteria.

Both the concurrent and the predictive models of validation were utilized. In the former, the trial tests were administered to some 1,500 current operators. Criterion measures of performance were obtained and correlated with the test results. In the predictive phase, the tests were administered to some 600 applicants but the results were not used in reaching hiring decisions. Performance measures were collected later, after the applicants had been on the job for some time, and comparisons made then. Because of inadequate samples, it was not found possible to validate for women.

IV. Performance Appraisal:

Both objective measures and supervisory assessments were utilized. The former comprised seven elements: tenure, earnings, chargeable and non-chargeable accidents, misses, sick-day incidents and sick record.

The supervisory assessments were made by the Paired-Comparison (PC) method, in which each operator was compared with every other operator in his barn.

Because minority operators tended to receive lower ratings than did white operators and because minorities generally had less tenure, the ratings were adjusted to remove the effects of bias, of tenure, and of bias and tenure combined. Since EEO guidelines require a comparison between test scores and performance measures between or among subsamples, a multivariate analysis of variance, with and without covariance for tenure, was completed between racial groups across locations and between locations within each racial group, in both the concurrent and predictive models.

V. The Trial Test Battery:

The eleven psychological tests or questionnaires selected for the experimental battery yielded 73 predictor variables, spanning a wide range of human behavior. They focused primarily on motivations, mental abilities, and special aptitudes, including numerical, clerical, motor skills, and personal-social behavior attributes. After the tests had been completed by the existing operators, and later by applicants in the predictive phase, the significance of the mean scores for the subsamples was examined through a multivariate analysis of variance between racial groups across locations and between locations within each racial group. Ultimately, three tests emerged from both the concurrent and predictive models without showing significant differences between racial groups.

In the process, multiple regressions were calculated separately for white, black and Spanish operators and for the whole group, revealing that all performance criteria could be predicted beyond the .05 probability level as required by the guidelines and that (with only one exception) all criteria could be predicted beyond the .001 level of confidence. This means that there would be only one chance in 1,000 that these relationships could have occurred by chance. Since some criteria were better predicted than others, each test's separate contribution was analyzed. Both in the concurrent and predictive aspects, certain tests were shown to be the best predictors. In investigating their validity and cross validity as a function of racial composition of the samples, each group of white, black and Spanish operators was divided into random half samples. The battery was regressed separately against 9 performance criteria. Cross validities were developed, both race-specific and race-undifferentiated

The results showed no need for race-specific equations. The PC index corrected for bias was best predicted, followed by misses. Tenure was dropped because it could not be used in the predictive study

VI. Comparison of Race-Specific and Race Common Predictions:

When predictors were plotted against performance they yielded linear relationships although slopes varied. The point of intersection, or cutting score, was interpreted as a 50% probability of successful performance. Since the use of race-specific probability tables for minorities would have set unjustifiably stringent standards and result in higher rejection rates than for white applicants, it was found that the total (race-common) equation could be used for selection from all three racial groups, using the same scoring dimensions and weights. Table I shows the probability of successful performance developed in the concurrent model.

In the predictive model, forced multiple regressions were done for each racial group and for both the PC/Bias and Misses criteria, using the race-common equation developed in the concurrent model. This equation was also experimentally implemented at four of the transit properties. The results showed minimal, if any, adverse effect for any racial group. This led to adoption of the concurrent equation, since the adverse impact of the predictive equation was unknown.

VII. Conclusions:

The final battery consists of three untimed, self-report questionnaires. These were validated in accordance with the EEOC Guidelines. The battery has no significant adverse impact on any racial group, can be administered in about 90 minutes, is machine or hand scorable and can be applied to white, black or Spanish surnamed male applicants. (While female applicants have taken the battery, it has not been used in selecting or rejecting them. However, the test data are being retained for possible use in a project to follow, where an attempt will be made to validate for females.)

Table 2 shows the rejection rates for all cases tested through July 1974. Although rejection rates varied by location for any given score, approximately equal percentages of racial group members were rejected at each location. At the recommended cutoff score of 46.5 (use row for the 46 test-battery score) the battery would have rejected 67% white, 74% black and 62% of Spanish applicants. For the lowest recommended acceptance score of 42.5, the rejection rates would have been 31% white, 25% black and 11% Spanish.

In order to qualify to use the battery, transit properties must send persons with responsibility for employment to an intensive, two-day training program conducted by Dr. Baehr at the University of Chicago. To be certified as test administrators, those completing the program must agree to use the battery in accordance with stringent procedural, professional and ethical standards.

Table 1

PROBABILITY OF SUCCESSFUL PERFORMANCE

(Probability that the True Criterion Score for the PC Index Corrected for Bias Exceeds 46.5)

Predicted Criterion Score		Probability of Successful Performance: Race-Common: Total Equation	Race-Common: White Equation	Race-Specific: White Equation	Race-Specific: Black Equation	Race-Specific: Spanish Equation
35	34.5 -35.49	.05	.04	.02		
36	35.50-36.49	.07	.05	.03	.00	
37	36.50-37.49	.09	.07	.05	.01	
38	37.50-38.49	.11	.10	.07	.02	
39	38.50-39.49	.15	.13	.10	.03	.00
40	39.50-40.49	.17	.16	.13	.05	.01
41	40.50-41.49	.22	.20	.17	.08	.02
42	41.50-42.49	.26	.24	.22	.13	.04
43	42.50-43.49	.31	.30	.26	.19	.09
44	43.50-44.49	.36	.35	.32	.26	.16
45	44.50-45.49	.42	.42	.38	.34	.28
46	45.50-46.49	.47	.46	.44	.44	.42
47	46.50-47.49	.52	.52	.52	.54	.58
48	47.50-48.49	.58	.58	.58	.62	.72
49	48.50-49.49	.64	.64	.65	.72	.83
50	49.50-50.49	.69	.70	.70	.80	.91
51	50.50-51.49	.74	.76	.76	.86	.96
52	51.50-52.49	.78	.78	.82	.90	.98
53	52.50-53.49	.82	.84	.85	.94	.99
54	53.50-54.59	.86	.87	.89	.96	1.00
55	54.50-55.49	.89	.90	.92	.98	
56	55.50-56.49	.91	.93	.94	.99	
57	56.50-57.49	.93	.94	.96	.99	
58	57.50-58.49	.95	.96	.97	1.00	
59	58.50-59.49	.96	.97	.98		
60	59.50-60.49	.97	.98	.99		
61	60.50-61.49	.98	.99	.99		
62	61.50-62.49	.99	.99	.99		
63	62.50-63.49	.99	.99	1.00		
64	63.50-64.49	.99	1.00			
65	64.50-65.49	1.00				

Table 2

BUS OPERATOR BATTERY REJECTION RATES - MALE

attery Score	Cleveland W	Cleveland B	Cleveland T	Oakland W	Oakland B	Oakland T	Chicago W	Chicago B	Chicago S	Chicago T	Atlanta W	Atlanta B	Atlanta T	All Applicants W	All Applicants B	All Applicants S	All Applicants T
35																	
36		0	0												0		0
37		0	0									0	0		0		0
38		1	1	3	1	2					2	1	1	2	1		1
39	2	4	4	7	4	5	5	1		1	2	2	2	5	3		3
40	12	11	11	12	7	9	7	5	2	4	10	5	6	11	8	2	8
41	25	22	22	21	14	17	15	10	5	8	12	8	9	20	14	5	14
42	41	36	36	31	23	26	22	22	11	17	27	16	17	31	25	11	24
43	51	49	49	37	39	38	40	42	20	32	31	27	28	39	39	20	37
44	57	65	64	48	55	52	55	59	33	47	37	40	40	49	54	32	51
45	72	76	76	55	67	62	65	71	48	61	52	52	53	58	66	48	63
46	80	85	85	65	74	71	70	78	62	70	56	62	62	67	74	62	72
47	88	90	90	75	81	79	75	85	70	77	64	71	70	75	81	69	79
48	88	91	91	81	85	84	80	91	80	85	73	77	77	81	85	79	84
49	88	94	93	86	88	87	82	94	84	89	81	85	85	85	90	84	88
50	96	98	97	90	90	90	87	96	90	92	83	91	90	90	93	89	9.
51	98	99	99	92	92	92	92	97	93	95	90	94	93	93	95	93	94
[illegible]	100	99	99	96	96	96	97	98	95	96	92	96	95	96	97	94	97
53		100	100	97	98	98	97	98	96	97	96	97	97	97	98	96	98
54		100	100	98	100	99	97	98	97	98	96	98	98	98	99	97	98
55				99	100	99	100	99	99	99	100	99	100	99	100	99	100
56				99	100	100		100	99	99		100	100	99	100	99	100
57				99		100			100	100		100	100	99	100	100	100
58				99		100						100	100	99	100		100
59				99		100								99			100
60				99		100								99			100
61				100		100								100			100
N	51	409	460	209	361	573*	40	208	186	434	48	436	485**	348	1414	190	1

*3 Spanish
**1 Spanish

AFL-CIO APPALACHIAN COUNCIL

TRANSIT EMPLOYEE TRAINING PROJECT

PROJECT TECHNICAL REPORT

Respectfully Submitted to

Urban Mass Transportation Administration,
United States Department of Transportation

by

Joseph W. Powell, Chairman
Richard L. Wilkes, Principal Investigator
James Williams, Project Director
Dr. John R. Spears, Director of Research

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Introduction

This report covers the first eighteen months of the AFL-CIO Appalachian Council's Transit Employee Training Project -- the period from project's starting date, April 1, 1977, to September 30, 1978.

The project was funded by the Urban Mass Transportation Administration (UMTA), United States Department of Transportation, for approximately $3.5 million. Its purpose is to develop standardized, tested training programs for blue-collar workers in the transit industry.

During the past 18 months the Council has:

--prepared and administered a comprehensive Training Needs Assessment Survey, covering bus properties in the thirteen southeastern states in which the project operates[1/];

--developed complete training program packages of manuals, slides, movies, posters and handouts for bus operators covering Passenger Relations and Accident and Emergency Procedures;

--trained 31 instructors and 175 operators in a program of field tests at 16 bus properties;

--monitored and evaluated the field tests, and modified the programs as necessary in the light of test experience;

--begun a program to provide the completed programs to bus properties wanting to use them;

--started work on a third training program materials package, to

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1/ Alabama, Florida, Georgia, Kentucky, Maryland-D.C., Mississippi, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia.

cover Bus Maneuvers and Defensive Driving, including the development of specifically-made movies; and

--begun to consider how best to undertake the development of maintenance training.

This has been a formidable set of tasks, which the Council could only have achieved as a result of the extremely helpful cooperation it has received from the grant sponsor (UMTA) and from labor and management throughout the transit industry. It has also been fortunate in the dedication and high caliber of its own staff.

The remaining sections of this report cover the highlights of the past 18 months. The documentation in the Briefing Book prepared for the March 1978 meeting of the project's Advisory Committee has not been recopied for this report, but still forms the basic background to the project as a whole.

Too many individuals have contributed to the success of this project for it to be possible to express the Council's thanks to each of them here. Our special gratitude, however, is owed to Dr. Frank Enty and Mr. Chuck Morison of UMTA's Office of Transit Management for their unfailing enthusiasm and assistance; to the members of the project's Advisory Committee, with its two Co-Chairmen, Mr. B. R. Stokes, Executive Director of APTA, and Mr. Dan Maroney, President of the ATU, and of the Technical Group, who have given generously of their time and expertise; and to the men and women at bus properties in the Appalachian states and round the nation who have shared with us the

excitement and hard work of what has been a rewarding learning experience for us all.

1. THE EARLY MONTHS: LAYING THE FOUNDATIONS.

The project became operational on April 1, 1977. Mr. Richard Wilkes, Executive Director of the Council's Operation Manpower Project, was named Principal Investigator. Under the overall guidance of the Council's Chairman, Mr. Joseph Powell, Mr. Wilkes and Mr. James Williams (who was appointed Project Director in May with special responsibilities for field activities) began the process of hiring the project's Field Coordinators.

Mr. Wilkes and Mr. Williams--together with Dr. Tufan Kolan, Director of the Council's Research Department, and Mr. Peter Bocock, who had joined the Research Department in April as Project Coordinator--also began to develop an initial operational plan for the project. After intensive discussion both within the Council and between the Council and Dr. Enty and Mr. Morison of UMTA, a Project Statement of Work and Milestone Chart/Timetable of Project Tasks were drawn up and submitted to UMTA in June.

Meanwhile, the Council was also, during the project's first months, deepening its knowledge of the industry and its problems. Using the helpful advice of Dr. Enty and Mr. Morison, a program of site visits to properties and training materials procurement and review was implemented. Throughout the project, the Council has taken the view that a great fund

of knowledge and expertise about training exists in the industry, and that the Council's work can be made both better and more useful if it fully reflects this expertise.

The site visits gave project staff a most useful preliminary overview of the industry's training needs and capabilities. It was clear, however, that the Council needed the advice of experts in the industry on an ongoing basis, and could not rely simply on ad hoc visits to individual properties. It was therefore decided to set up two panels of experts -- a Project Advisory Committee and a Technical Group. The Advisory Committee was seen as a top-level steering group which could provide the project with authoritative counsel and backing as necessary; the Technical Group was envisaged as a looser body, which might never in fact meet as a group, but which represented a cross-section of transit industry experts upon whose specialized knowledge the Council could draw as necessary. The Council was very fortunate in being able to persuade Mr. B.R. Stokes and Mr. Dan Maroney to serve as Co-Chairmen of the Advisory Committee, and to obtain the agreement of a number of other distinguished leaders from the industry to serve on it or the Technical Group. It took some months for these two bodies to be set up (in fact, the membership of the Technical Group is not fixed and new

individuals can be coopted onto it at any time); both were essentially complete, however, by the end of August 1977.

2. THE NEEDS ASSESSMENT SURVEY

The process of familiarization with properties' training concerns through site visits, literature research and discussions with industry experts was an important preliminary step towards the fulfilment of a major project task -- the development of a Needs Assessment Survey to be administered to bus properties throughout the 13-state area covered by the project.

The Survey was an integral part of the Council's concept of the project as a whole. The Council had realized when drawing up its proposal for the project that what was needed was a comprehensive, systematic approach to the development of blue-collar training in the industry. It therefore proposed an approach which combined (i) development of standardized programs made up of self-contained modules with (ii) assessment of individual properties' training requirements and a program of test training in different modules at the properties which showed a need for them.

The Needs Assessment Survey was the instrument the Council used to prioritize both the organization of its program of training materials development and the implementation of materials field tests at specific properties. Without the Survey, the Council would have had to develop and implement training programs either in the light of whatever requests might be made to it by individual properties, or on the basis of its own

intituive decisions. Neither of these methods is systematic or cost effective, and neither could, except by chance, maximize the benefits to be derived by properties from the project. The Survey is, therefore, a crucial action tool for the project as well as a basic reference and planning instrument. It also has a wider significance; it is by far the most comprehensive survey ever undertaken in the transit industry, and as such it provides a unique reference point for government and industry alike. It is both the cornerstone of the Council's project and a potential starting point for other projects

Survey Coverage and Content

The project was designed to cover the 12 states in which the Council generally operates, Alabama, Georgia, Kentucky, Maryland-D.C., Mississippi, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia, together with Florida. The Council's Research Department drew up, on the basis of listings of properties published by UMTA, a complete list of all bus properties in these thirteen states. There were 146 properties in the list. Nearly half of the group had bus fleets totaling under 20 vehicles on UMTA's definition (number of buses required for peak service plus 15%). With the agreement of UMTA, it was decided to exclude from the survey the properties with under 20 buses, on the grounds they would find it burdensome to respond to anything other than a very brief questionnaire, and that formal training of the kind that UMTA wished to see developed would in any case be too sophisticated and time-consuming for them to implement, and therefore irrelevant to their needs. A structural analysis confirmed the very

small size of the properties excluded from the survey; most of them turned out to have ten or fewer buses.

The final Survey population was, therefore, 73 properties -- all those in the project area with more than 20 buses. Of these, the Council was able to obtain agreement to participate in the Survey from 62; this represents a very high response rate of 85 percent, which gives extremely comprehensive coverage. The Council's information collection process of literature research, visits to transit properties, and meetings with industry experts quickly led to the conclusion that the Survey would have to cover a very wide range of issues in order to get a clear and comprehensive picture of the industry's training needs. At the same time, however, a large and complex survey instrument might well defeat its own information gathering purpose by appearing to be too impossibly voluminous for busy transit property personnel to answer.

The Department solved this dilemma, familiar to survey researchers in many fields, by making a number of decisions. First, it was decided, as noted above, to exclude from the Survey all properties with less than 20 buses. By eliminating these very small properties who could not be expected to answer anything but the simplest questionnaire, the designers of the Survey were able to begin work with a group of respondents who might reasonably be expected to answer a document of some length.

Second, it was decided to subdivide the proposed Survey instrument into five separate interviews, of which only the first three would be administered, to all participating properties; the other two, which were extremely long and detailed, would be answered by larger properties only.

Third, it was decided to administer the instruments through personal interviews. Council field staff would contact properties, arrange for appointments with relevant property personnel and ask them the questions in the instruments face-to-face. Although this system was extremely time-consuming for Council staff, it was felt that it would ensure better coverage and more accurate responses than could possibly be obtained if the instruments were mailed to properties.

The Survey's five interviews were as follows:

#1 General Information on Property

#2 Property Training Programs: General Evaluation of Strengths and Needs

#3 Staff, Turnover and Hiring.

#4 Operator Training

#5 Maintenance Worker Training

Interview 1 consisted of basic descriptive questions about the property (number of buses, number of operators, types of operating facilities), together with a number of general attitudinal questions. about the property's perceptions of the adequacy of its own training and the industry's interest in training, etc. Interview 2 asked a range of questions about properties' training activities and their effectiveness, and examined properties' perceptions of operational areas in which they faced problems. Interview 3 asked about numbers of staff and procedures for hiring, etc. Interviews 4 and 5, as noted above,went into specific detail about the nature and content of properties' operator and maintenance training respectively.

Survey Development and Administration

The interviews were drafted in June and July 1977, and were submitted for comment to a small review group, consisting of the following individuals:

--Mr. Walter Bierwagen, International Vice President, Amalgamated Transit Union.

--Mr. Al Savage, former Director of Maintenance, WMATA.

--Mr. Herb Scheuer, Executive Director for Administration, APTA.

--Dr. Ed Seguin, Senior Research Scientist, Institute for Research, State College, Pennsylvania.

--Mr. Peter Wood, Assoc. Department Head, the MITRE Corporation.

After receiving the review group's comments and revising the instruments accordingly, a new draft was sent to the Council's Field Coordinators for their comments which were incorporated into the draft.

The final version of the survey was presented and explained to the field staff at a Training Conference in Charleston, W. Va., in August; at this Conference, the four Field Coordinators who had already joined the Council were briefed on survey administration techniques and were provided with extensive briefing notes on each of the five interviews. It was agreed at the Conference that the Transit Director from the Regional Office and the Project Coordinator from the Research Department would accompany each Field Coordinator on his first visit. In addition, in order to ensure that all instruments were properly completed, the Research

Department undertook to review the completed Surveys as they were mailed in and to brief each new Field Coordinator individually on Survey administration as he was hired.

Clearly, the Council was taking a calculated risk in using interviewers who were not trained professionals in interview techniques and in subjecting its Survey instruments to full-scale pretesting. It was felt, however, that the time factor was too important to make it sensible to delay the interviewing process for the months a full pretest and revision would take, and that the special qualifications of the Council's field staff, in particular their long-term service in the transit industry, were of greater value in getting useful answers from properties than prior expertise in survey administration. In the end, both these judgements proved correct; even with initiation of interviewing in September 1977, it took a full year to complete the process of administering, tabulating, analyzing and reporting on the instruments; and the incidence of confused or irrelevant responses by properties to interview questions has been very low indeed.

At the time the Survey work began, four of the eight Field Coordinators had been appointed. The other four joined the Council in the later months of 1977. During the initial period, the first four Field Coordinators covered very wide territories, because, pending the appointment of the remaining four, they divided up all thirteen states between them. The start-up period also presented difficulties because some properties tended to be less than wholly enthusiastic about spending time answering a long series of interviews. Also, although they had

all been assured in an explanatory letter that the data obtained from interviews would be kept entirely confidential, some properties were understandably reluctant to provide candid responses to questions which delved deeply into areas which they felt were--or might be--sensitive in one way or another. Finally, the careful selection process the Council imposed upon itself in choosing the best individuals to fill the Field Coordinator positions, together with the fact that much of the surveying work took place during the worst months of an exceptionally hard winter, also affected the speed with which the whole exercise could reasonably be expected to be completed.

In the event, the administration process was completed by the end of March 1978; tabulation was completed in May.

The 62 properties' responses to the large number of questions in the interviews had produced a very substantial amount of data, which required computer analysis. Since the Council did not have the in-house capability to computerize the data, it was decided with UMTA's agreement in June 1978 to ask the Office of Educational Research and Field Services of West Virginia University to undertake the computer analysis. The resulting report has been submitted in draft to the Project's Advisory Committee.

The Key Questions Analysis

Because the Survey data were needed as inputs to operational decisions by project management (what kind of training to develop first, what properties to target for priority), it became clear that it would be necessary to devise an interim method of analysis of available data in advance of completion of the whole survey process. The Council's Research Department

therefore developed late in 1977 an analytical model known as the Key Questions Analysis (KQA), which scored properties' responses as they were completed, using a range of 14 selected key questions from the Survey. The weighted scores of properties were summarized, for all those whose completed Surveys were available, at four separate points in time, as follows:

KQA Summary #1: November 1977 (9 properties)

KQA Summary #2: February 1978 (30 properties)

KQA Summary #3: March 1978 (52 properties)

KQA Summary #4: April 19, 1978 (62 properties)

Basically, successive KQA's did three things: they established an overall property-by-property ranking in terms of general intensity of training need; they established training priorities for all properties for which data were available at the time of the analysis, in terms of different types of operator or maintenance worker activities; and they established delivery system priorities, in terms of the kinds of materials and methods most needed for effective training.

From KQA data, the Council was thus able to establish, on the basis of available data, where training could most usefully take place, in what subject, and how it could most usefully be delivered (for example, at Busville, in operator courtesy, using written materials). Although it was a selective and short term tool, the KQA was an essential interim device to provide direction to the project's materials development and field training activities-- and its principal conclusions are generally supported by the detailed analysis of the consultants' report, which the reader will find in the "Analytical Report on the AFL-CIO Appalachian Council's Transit Employee Training Project Needs Survey".

3. MATERIALS DEVELOPMENT AND FIELD TESTING

After developing and initiating the Needs Assessment Survey, attention was turned to the next critical step--development of the training programs. A materials development specialist, Ms. Lucy McEligot, was hired in August 1977 to assist the Project Coordinator with this component.

It was decided that the Bus Operator Training Program would be developed before the Maintenance Training Program. Successful training of bus operators would impact more immediately and intensively on the public than maintenance training. Further, the complexity and multiplicity of approaches to the wide range of occupational training covered within the category of "maintenance" would require far more research and decision making than design of training for just one transit occupation, that of the bus operator. Starting with bus operator training would provide the time and added expertise to tackle maintenance training more effectively.

Once this decision was made, the Council conferred with experts both from the industry and the human resources development field to create a standardized program design which would apply to all components of the Bus Operator Training Program.

The design would need to yield training programs which were:

--comprehensive, so that any property would be sure to find all topic areas of concern to it covered;

--flexible, so that any property could modify it to reflect its own property policy as necessary;

--adaptable, so that any property, regardless of size or location could use it (with the exception that the assumption was made that a property with fewer than 20 buses would lack the resources to conduct a standardized training program effectively, and would therefore not be covered);

--technically accurate, so that the procedures taught were those generally agreed upon as the best ones by transit experts.

--interesting to and appropriate for use with blue-collar adult trainees.

--capable of effective implementation by inexperienced as well as experienced instructors. (Initial investigation had revealed that a significant proportion of properties used the "buddy system" for training, and could not be expected to possess experienced instructors.)

A modular approach was believed able to accommodate these elements most effectively and comprehensively. The program would be made up of a series of separate modules, each covering a major skills area (eg., passenger relations). These modules would comprise various submodules covering specific topics within each skills area, such as fire procedures or the passenger relations needs of elderly and handicapped passengers. Such an approach would provide a comprehensive program, while still enabling properties to tailor programs to their specific training needs by eliminating submodules which they felt to be irrelevant or duplicative of training in areas where the properties might already be strong.

Accordingly, the Bus Operator Training Program was divided into six modules:

Orientation to the Property and the Bus,

Fares, Routes, and Schedules,

Bus Maneuvers,

Defensive Driving,

Passenger Relations, and

Emergency and Accident Procedures.

These were reduced to five modules when the integral nature of "Bus Maneuvers" and "Defensive Driving" as a skills area became clear.

A basic research and development procedure to ensure the comprehensiveness and accuracy of each module was then developed, consisting of the following steps:

(1) Preliminary consultations with transit and training experts;

(2) Drafting of a full Instructor's Manual;

(3) Review of the Instructor's Manual by those individuals in the transit industry considered most expert in the module's topic area. The advice of the project's Advisory Committee, of UMTA, and of other transit experts was sought when establishing a module's Review Group. In general members were drawn from the project's Technical Group with individuals possessing specific relevant expertise also included.

(4) Analysis of the Review Group's comments and subsequent revision of the Manual;

(5) Preparation of all ancillary materials (Operator's Manuals, slides, movies, handouts, etc.);

(6) Field tests, with accompanying monitoring and evaluation procedures, at eight properties (one in each Field Coordinator's area of responsibility). The properties would be selected on the basis of priority training needs as shown in the Needs Survey;

(7) Compilation and analysis of the data from the field test monitoring and from the subjective observations of trained observers;

(8) Revision of the module materials in light of the field test monitoring;

(9) Release of the completed module to UMTA for dissemination.

This procedure was basically followed for each module, although some steps were conducted simultaneously.

Since it was clear that the general level of new hires by bus properties in the region was quite insufficient to support eight field tests, the further decision was made to prepare the first modules as programs to retrain experienced bus operators. This approach ensured that all topics of interest to both new and experienced bus operators would be covered.

Module Methodology

At this point the problem of the best methods and materials to train bus operators was taken under consideration. Research indicates that adult blue-collar learners have certain characteristics in common which have clear implications for program design. These include a fear of classroom situations and resentment of authority figures lecturing them in areas where they may have real expertise of their own. In the case of the Bus Operator Training Program, the Council knew it would also have to overcome the negative connotation of retraining in an industry which often reserves it for those who have encountered problems on the job; in some cases it may be seen as the first step towards dismissal.

Fortunately, research has also shown that, if these negative elements are eliminated and an effective training program is presented, adult learners can achieve high learning and motivation levels. Drawing on the expertise of vocational educators, the following principles were established as best suited to motivate the bus operator population to learn:

--Sessions would be as informal as possible to eliminate the traditional classroom atmosphere.

--A variety of instructional techniques would be used to keep the operators interested. These techniques would revolve around discussion devices with the instructors serving as facilitators/ discussion leaders rather than teacher/authority figures.

This approach respects the expertise of the operators themselves by creating a constructive forum for them to share this expertise and assist each other in developing new approaches to problems encountered while driving a bus. It was hoped that the newer operators would learn from the experience of their older colleagues and that the older operators would in turn learn fresh approaches from the newer ones.

--The discussion devices would comprise small and general group discussions and audiovisuals (slides and films). General points would be arrived at through the small and general group discussions. The audiovisuals would then be used to present a representative sample of problems relevant to the topic for analysis and solution by the operators.

--To allow all operators to participate actively, a maximum of twelve operators per training session would be recommended.

--To provide the less experienced instructors with backup, a team approach of two instructors would be recommended.

--Written materials (handouts, posters, Operator's Manuals, etc.) would be used extensively but only to reinforce learning points made in discussion. The responsibility for program learning would thus rely to the greatest extent on oral and visual methodologies.

--The instructors would make clear to the operators that the daily quizzes were only to assess the program's effectiveness, not to test their classroom performance. The operators would be further assured that their scores would be kept confidential so they could not be used for disciplinary action.

--To provide a change of pace and to reinforce learning through discussion, practice exercises would comprise a portion of each training session where appropriate. These practice exercises would consist of role plays of the most typical operator problems to be enacted by the operators. (Although some vocational educators maintain that role plays are too threatening a technique to use with blue-collar workers, it was decided to include them on the recommendation of several transit instructors, who had found them effective for bus operators; the Council agreed with the latter's premise that bus operators--who choose to enter a people-oriented profession--were a relatively gregarious population and thus could handle these exercises.)

--For the "Bus Maneuvers and Defensive Driving" module, practice would consist of afternoon non-revenue bus operation to supplement the morning's classroom learning. Additional non-revenue road training would be recommended.

--No more than four hours a day would be alloted to classroom sessions since the operators' tolerance for the unfamiliar classroom situation could be expected to have peaked by then.

--Properties would be asked to select as participants operators with varying levels of experience and competence. This would make it clear to the operators that they were not selected on the basis of poor work performance and therefore that the training program was not punitive action.

--Properties would be asked to respond to operator concerns and questions expressed in the classroom, to demonstrate that management interest in operator problems was genuine. It was felt that a negative learning effect would result if the operators sensed any lack of management support for the training program and its goals.

With the methodology established, curriculum and materials development could be addressed.

Materials

Certain principles were established for the design of all module materials. To be effective motivational and instructional tools, materials would have to be easy to understand and use language appropriate for the bus operator target group--i.e., simple, clear, straightforward, and with no hint of either condescension or "talking down"; illustrative of the most correct operating procedures; interesting, attractive and professional in appearance; flexible enough to be adapted to variations in property policies and in instructor competency levels; and capable of stimulating productive discussions.

The Council's research activities and its contacts with industry experts were designed to determine the highest standards of operating procedures for presentation to the operators and to find out the levels, styles of language, and types of materials to which the operators would respond most positively. The project's field staff, all coming from the transit industry, were also valuable resources in this respect. Artists, editors, and

audiovisual experts would be used as consultants to supplement the expertise of the Research Department staff in preparing materials of high professional quality.

Because the Instructor's Manual would contain all information relevant to content and methodology of each module, it would have to be the first program material prepared and the component submitted to the Review Group for comments. Using the Instructor's Manual as the core material, the ancillary materials described above could then be developed around it.

Of prime importance for all materials was ease of use. The less experienced property instructors would lack the confidence and ability to implement the program correctly if the materials appeared too complex, or if there were not clear directions for their use. For this reason the core tool, the Instructor's Manual, would be made as clear and comprehensive as possible in terms of both content and methodology. The left side of each page would contain the complete course content; the instructors could read verbatim from it in the training session if necessary, although they were encouraged to put the content in their own words and use illustrative examples from their own experience. The right side of each page would contain a detailed course outline and directions as to when and how all training materials were to be used. This format would meet the needs of experienced instructors, who were expected to rely mainly on the outline side of the page.

In order to elicit operator opinions, the Instructor's Manual would depend heavily on a question-answer structure. Multimedia and tapesync techniques for the slide presentations used in conjunction with the Instructor's Manual were therefore rejected as too complex and as distracting from the instructor-operator interaction. The films, the other major instructional tool, would not be simple demonstration films but would likewise present operator problems for discussion and solution.

Since many different reinforcement tools would be needed for the operators, who might have been away from a learning environment for many years, additional written materials in the forms of handouts, posters, quizzes, practice exercises, and an Operator's Manual for each Module would also be needed. These would be kept as streamlined and short as possible.

Even with simple, clear and easy-to-use materials, the comprehensiveness of the content, along with the newness of formal, structured, standardized programs, and of many of the instructional techniques to most property instructors, made it necessary to develop an Instructor Orientation Course for each module. These Courses came to represent an especially important step towards the goal of upgrading training at the smaller properties.

Passenger Relations Module

Upon completion of the model program design, the Research Department began to develop the first module of the Bus Operator

Training Program. Preliminary analysis of the Needs Survey data demonstrated that "accident avoidance" and "passenger relations" were the top priority training needs at Appalachian properties. Much time and effort was already given by properties to accident avoidance training because of the high costs of accidents; therefore, the Council considered that it could have the most immediate impact both on property training and on the public by approaching the more neglected area of passenger relations first.

A draft Passenger Relations Instructor's Manual was prepared in September 1977, submitted to a Review Group,[2/] and finalized with Review Group suggestions incorporated by November 1977.

The next month several West Coast properties were visited to see if they had audiovisuals which could be incorporated in Council modules and to become acquainted with their areas of training expertise.

The slides for the Passenger Relations module were shot in Charleston, West Virginia,in January 1978. Handouts, an Operator's Manual, practice exercises, a poster, and quizzes were prepared with the aid of consultants during February and March. Two films, "Salesman at the Wheel,"produced by General Motors Corp., and

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[2/] The Review Group consisted of: Jenny Laster, Supervisor of Training, Bi-State Development Agency; Byron Lewis, Director of Personnel, and Joann Bowman, Director of Training, Southern California Rapid Transit District; Stuart Maginnis, Director, Training/Development Programs, Chicago Transit Authority; Chester W. Higgins, Senior Personnel Administrator, Massachusetts Bay Transportation Authority; and John Lyons, Manager of Education and Training, Southeastern Pennsylvania Transportation Authority.

"How Would You Handle Them?," produced by the Southern California Rapid Transit District, were procured for incorporation into the module. Monitoring instruments, which would be used for all modules, were also prepared at this time.

During the February 1978 staff conference in Columbia, South Carolina, the module was demonstrated to field staff, who had been requested to review the Manuals prior to attending the meeting. The staff conference also gave the field staff training in the procedures involved in negotiating contracts for field tests with properties, and in techniques for monitoring field tests of the module at properties selected on the basis of the KQA.

An experienced "trainer of trainers," Martha Lowenfeld, was hired as a consultant to prepare and conduct a two-day Instructor Orientation Course for the property instructors using the module at field tests,with the assistance of Research Department staff under the direction of Dr. John Spears who had succeeded Dr. Kolan as Research Director in January 1978. The first course was conducted in Richmond, Va., for that property alone at the end of March; the following week the first field test was conducted there. Wallace Barry, the Field Coordinator for that area, attended the full four-day course--as all Field Coordinators would do during the field tests--to handle monitoring and evaluation, and to assist the instructors if any problems should arise. Ms. McEligot also attended the complete Richmond training program since this was considered the first and crucial test of the basic

program design. At later field tests, a representative of the Research Department attended only the first day's session at each property to clear up any misunderstanding about use of the materials and to gain information about the module's strengths and weaknesses which would be useful for the ongoing materials refinement process.

The Richmond experience confirmed the rationale of the program design. Monitoring showed that the methods/materials mix changed a skeptical group of operators into a group enthusiastic about training. The property's management was so impressed that it requested the city to provide funds for a better training room and changed certain of its property rules to match the module's standards for passenger relations.

Some necessary programmatic adjustments were to be expected and quickly became evident. Specifically, it was clear that the first day would have to be shortened to fit the alloted time frame; instructors would have to be more adequately prepared in the use of materials; more time for instructor practice would have to be inserted between the Instructor Orientation Course and the field test; the slides would have to be remade because of various technical inaccuracies and poor photographic quality; and reaction to the film, "Salesman at the Wheel," would have to be carefully reviewed before inclusion in the completed module because it had been made in the early 1960s and reflected attitudes with which younger operators found it hard to identify. (The

Research Department had been aware of this potential problem, but unfortunately no other non-property specific film on passenger relations was available.)

Before the second round of field tests, the Research Department therefore eliminated two of the discussion groups from the first day's session; Ms. Lowenfeld was asked to focus on opportunities for materials practice in the Instructor Orientation Course; a week was added to the time between the Instructor Orientation Course and the field tests; and the use of the film, "Salesman At the Wheel," was made optional. Remaking the slides was not feasible at that point because of the time it would involve and because it was anticipated that more inaccuracies might be discovered in the course of the other field tests.

The second Instructor Orientation Course was held in late April in Atlanta, Ga., with instructors from properties in Montogomery, Ala.; Miami, Fla.; Chapel Hill, N.C.; and Memphis, Tenn., attending. No major changes were indicated by these field tests except for the need for the Instructor Orientation Course to include more practice time. Accordingly, the Instructor Orientation Course was again redesigned in this direction.

The second round of field tests did reveal an ancillary problem which needed addressing. The Field Coordinators felt that they required more guidelines if they were to make judgements and recommendations to the Research Department as to the merit

of the module's materials, techniques, and structure. Simultaneously the Research Department realized that the monitoring instruments achieved their goal of determining instructor and trainee attitudinal changes towards the program, but that supplementary instruments were needed to determine specific program modifications to be undertaken within each submodule. To conduct the ongoing refinement process the Research Department needed to know, for example, whether the material for each training hour could be accommodated within that hour.

To respond to these needs the Research Department designed a set of observation instruments with guidelines for their use. One afternoon of the Instructor Orientation (IO) Course was set aside for a separate Field Coordinators' session to explain these instruments. This period also provided an opportunity to discuss other concerns specific to the roles and the responsibilities of the field staff, such as the ways in which they could assist the instructors without affecting the validity of the field tests.

Analysis of the pre- and post-tests for the third IO, held in May in Cleveland, Ohio, indicated that, with the above modifications, the Course better met the participants' expectations.

Following the Cleveland IO, field tests were held in Cleveland; Baltimore, Md.; and Lexington, Ky. These field tests were particularly significant in indicating that adherence to program

guidelines was essential. At one of the field tests one training session had 15 operators, three more than the maximum of 12 recommended; as a result the discussions were difficult to control and some operators participated far less than others. At another test site, the operators were not informed of the program's goals before it began; an hour and a half of the first morning thus had to be spent in answering their concerns. In a third test, a property compacted the program into two eight-hour days; the operators there became too tired and restless in the afternoon to learn well.

Emergency and Accident Procedures

Emergency and Accident Procedures was chosen for the second operator's training module since its focus on meeting passenger needs in emergency situations was a logical extension of the Passenger Relations module's focus on meeting passenger needs in more common, day-to-day situations.

The materials development process for the Emergency and Accident Procedures module went smoothly; the basic program design was adhered to, and materials were created to concur with that design. Learning from the Passenger Relations field test monitoring, the Research Department did, however, make a few structural revisions in this module.

Most instructors had indicated discomfort with the chalkboard technique and used it as little as possible. Therefore, for

Emergency and Accident Procedures, the information that would otherwise have been written on a chalkboard by the instructors was put into the form of slide graphics used to summarize discussions.

To correct the lack of a motivational technique in the Passenger Relations module to encourage the use of the Operator's Manual, the handout information for Emergency and Accident Procedures was repeated verbatim in the Operator's Manual so instructors could refer the operators directly to the Manual. In turn this enabled the handouts to be made optional; it was found that some instructors were comfortable using them while others were not.

A major change was made in the IO Course design. The first IO Courses for Passenger Relations had focused on teaching materials usage. The assumption was made that the instructors would learn the course content themselves by reading the Manual and practicing its use in preparation for the training sessions. In some cases, however, the instructors appeared not to have realized how important it was thoroughly to understand the Manual until they were actually conducting the module. Likewise it became evident that even two instructors from the same property might frequently not agree on correct operating procedures. This was to be expected from properties where there was no formal training structure. These observations meant that the instructors needed to learn the Manual content and the module itself before they could be expected to teach it, and this could best be done by putting them through it as actual trainees.

The IO Course was therefore extended to three days with the morning of each day demonstrating the actual training program and the afternoon spent in practicing training techniques; this fit well with Emergency and Accident Procedures, which was only a three-day program. To gain the benefit of another expert trainer's input, a new consultant, Howard Schuman of CTM Associates, was hired to design and conduct the IO for this module.

One of the most important decisions was made with respect to the slides. In order to improve the technical accuracy and photographic quality of the slides, a professional film company was hired for this module. It was also arranged that a larger bus property, Washington Metropolitan Rapid Transit Authority,be used as the resource for buses and operators since it could make instructors available for technical advice. Additionally, one of the Field Coordinators, Eugene O'Neill, was assigned as technical consultant to the slide production; Mr. O'Neill was already familiar with the program's goals, having advised the Research Department on the preparation of the Manuals.

Work on the Emergency and Accident Procedures Module, including submission to a Review Group,[3/] was conducted simultaneously

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[3/]The Review Group consisted of: Byron Lewis, Director of Personnel, and Joann Bowman, Director of Training, Southern California Rapid Transit District; Stuart Maginnis, Director, Training/Development Programs, Chicago Transit Authority; Chester W. Higgins, Senior Personnel Administrator, Massachusetts Bay Transportation Authority; and John Lyons, Manager of Education and Training, Southeastern Pennsylvania Transportation Authority.

with preparation of the Passenger Relations ancillary materials and field tests so that field operations would not have to wait until the Emergency and Accident Procedures field tests could be conducted. The module was presented and discussed among the staff at a Staff Conference held at Jekyll Island, Ga., early in July, 1978. At this Conference two other issues related to materials development and field tests were discussed.

First, it was agreed that the feeling of professionalism among both trainee operators and instructors, and their perceptions of training under the project as an important way of increasing their professional skills would be enhanced if the Council were to develop Certificates for both groups. These were prepared and are now given out to all successful participants.

Second, the staff examined in detail a revised contract document for the field tests and a set of contract negotiation guidelines for field staff. The first round of contract negotiations for the Passenger Relations module had demonstrated that the contract could be improved, and that the Field Coordinators' negotiating task would be eased considerably by the establishment of standardized guidelines for conducting future negotiations; the revised contract and guidelines accomplished this.

The first Emergency and Accident Procedures IO Course was given in Daytona Beach, Fla., in mid-July, followed by field tests at Daytona Beach; Chattanooga, Tenn.; Charlotte, N.C.; and Montgomery, Ala. The second IO Course was given in Huntington, W. Va., in

August, followed by field tests at Huntington; Euclid, Ohio; Harrisburg, Pa.; and Newport, Ky.

The design modifications described above definitely improved the effectiveness of the IO Course and the module. This was demonstrated immediately by the comparative smoothness of the first round of Emergency and Accident Procedures field tests as compared to the first two rounds of Passenger Relations field tests. Monitoring showed that only minor revisions were needed in the materials. A contributing factor to this module's efficacy was the straightforwardness of the content as compared to the more complex nature of passenger relations.

Perhaps of most critical importance for future training modules, and indeed for the future of training in Appalachia, was the fact that most of the instructors supplied for field tests required extensive training, not only to orient them to the materials, as originally conceived, but also to train them to be instructors. Many instructors had little or no formal training experience; even the Council's expanded IO Course seemed barely able to supply some of them with the tools and techniques they needed to conduct the module. In the event, all the instructors did conduct the Course satisfactorily and Council observers felt that with continued practice in actually conducting the program almost all of them had the ability to become good instructors. It remains clear,

however, that if the properties in Appalachia are to have good training, no matter how effective their training materials and programs become, they will have to address collectively or individually the need to upgrade the pool of instructional talent.

Refinement of Training Modules in Light of Field Test Monitoring

Because of the widespread interest in the Council's efforts, it rapidly became clear that there would be pressure for UMTA to release the standardized training modules as they were completed rather than as part of a total training program at the end of the grant period. With this in mind the Council began to modify the Passenger Relations Module as soon as the field tests were completed. Staff observations during the field tests suggested that a number of revisions would be necessary. The following modifications were made as soon as they could be arranged:

1. The slides were remade because of the flaws noted earlier. The same film company that produced the Emergency and Accident Procedures slides was hired to do this job.

2. The Instructor's Manual needed extensive re-editing to make it easier to read and to make the first day easier for instructors to conduct. Two professional editors were hired to undertake this task under the Research Department's direction. Their revisions consisted mainly of:

   a. Adding a "Materials" column to the left side of each page so that directions for their use stood out more clearly for the instructors;

   b. Simplifying the language where necessary;

c. Reducing lecture time and developing more discussion time in the first and second submodules;

d. Adding slide graphics to the first day's session to provide the instructors with an additional learning reinforcement tool and a more structured instructional format;

e. Removing the use of the chalkboard, about which the instructors had almost all felt uncomfortable; (information that would otherwise have been written on a chalkboard was instead put on slides or added to the Operators's Manual.)

f. Adding each slide's number onto its description in the Manual; and

g. Eliminating use of the film, "Salesman at the Wheel." The negative effect of its outdatedness was found to outweigh the positive effect of the principles demonstrated.

During the materials revision process, a consultant, Dr. Lee Balliet, prepared an analytical report on the monitoring data which the Field Coordinators had collected at each field test. His report confirmed the validity of the above modifications. In terms of more general conclusions, it also indicated that:

(1) The Passenger Relations modules method/material mix was effective in motivating the trainees.

(2) Reaction to the program was overwhelmingly positive, both from instructors and trainees.

(3) The positive attitude of cooperation between labor and management not only facilitated the Module's success but yielded improved relations between the two groups.

(4) The materials were capable of use by both experienced and inexperienced instructors after they attended the IO Course.

This last conclusion, coupled with the findings of internal evaluations of the expanded Emergency and Accident Procedures IO Course, led the Council to request that UMTA not release the module for dissemination unless properties agreed to put their instructors through a four-day IO Course, patterned after the Emergency and Accident Procedures IO design model.

4. RECENT DEVELOPMENTS

New Policy Directions

By mid 1978 it became clear to the Council that project tasks were becoming increasingly numerous and complex as new modules were prepared for field testing and as various activities associated with disseminating the completed modules--a role which had not even been discussed in the grant proposal--fell to project staff. The Council's Board therefore approved in July 1978 the following steps to promote greater project efficiency and effectiveness:

(1) In order to give existing staff the time they needed to research and develop new Modules at a satisfactory pace, a Training Development Unit comprised of a Senior Training Specialist and a Training Specialist would be established to implement the IO Courses for field tests and the monitoring and evaluation of field tests. (This Unit will be under the Research Department but located in Charleston, W. Va.;: its staffing will be announced shortly);

(2) To further assist the speed of module development, an additional staff position would be created for this purpose in the Research Department (David Judd was hired as Program Development Specialist in August) and an additional $40,000 would be moved to the Research Department budget for the purpose of acquiring consultant expertise;

(3) To handle the logistics of materials dissemination for completed modules and the coordination of Instructor Orientation Courses for properties interested in those modules, Mr. Eugene O'Neill, Field Coordinator in Baltimore, Md., would move to the Research Department to assume the role of Transit Liaison Specialist (Mr. O'Neill transferred in September, and was replaced as Field Coordinator by Mr. Hogan McGill);

(4) To work with Mr. O'Neill in conducting the IO courses for completed modules, three Field Coordinators--Messrs. Jim Cummins, Ellis Cunningham, and Forrest Hulan-- would be designated Field Coordinator/Instructors. Their instructional duties would be additional to their Field Coordinator duties. (The Field Coordinator/Instructors have already held two special staff conferences to develop plans for handling their new function);

With these modifications in project structure, it is hoped that the Council can accomplish the task of finishing the Bus Operator Training Program by the end of the second grant year in April 1979 and the Maintenance Training Program by the end of the grant period in April 1980.

For the next few months the Council will concentrate on completing the Bus Operator Training Program, starting the Maintenance Training Program, and establishing the structure for dissemination of completed modules. These projected tasks are discussed in more detail below.

Bus Operator Training Program

The current Bus Operator training module being developed is Bus Maneuvers and Defensive Driving. The first of three defensive driving films for the module was completed in September; the other two are scheduled for filming in October and November. These will comprise the first set of defensive driving films prepared specifically for bus operators.

Field testing of this module, which will include a student workbook and guidelines for road training, in addition to the usual module materials,is expected to begin in January 1979.

The remaining two modules, Orientation and Fares, Routes, and Schedules will be prepared in January and February 1979 and field tested in March 1979. Because of their property-specific nature, it is anticipated that these modules will consist of detailed training program outlines with complete guidelines for their implementation.

Maintenance Training Program

Since the project's inception, the Council has been establishing contacts with property maintenance experts and exploring the different approaches recommended to the complex area of maintenance training.

As a first stage in organizing its maintenance program development effort, the Council plans to bring together a "think tank" of experts in this area and present them with various options. Are resource centers feasible? Would mobile training units be the answer to the need for training in tasks which require short training periods? Should the Council concentrate on basic maintenance skills or on specialized occupations such as those of welding, air conditioning repair, and

two-way radio technicians? Should the approach be to train in skills, or in occupations? How can the Council best use and build on the resources and expertise already developed at bus properties? With the goals and tasks involved clearly defined, the Council will then be able to address development of maintenance training programs before the end of this project year.

Release of Completed Modules

As preparation for the release of the completed Passenger Relations module to interested properties by UMTA in November 1978, a letter was sent out by the Principal Investigator to all properties in the region in October to determine the level of property interest in the module. The letter explained that the materials would be supplied free of charge to properties, but with the stipulation that they send two instructors to an IO Course, and that they pay the instructors' expenses at that Course. All costs of conducting the training at the property will also be born by the property. At this point IO Courses are being designed. One will be a four-day IO Course to be held in November for properties which have not participated in any Council field tests. The other will be a two and a half day IO Course to be held in December for properties which have already participated in Council field tests. Subsequent IOs will be planned when responses to the letters are received.

These IO Courses will be conducted by two-member teams, drawn from among the Transit Liaison Specialist and the Field Coordinator/Instructors To prepare them for this role, Mr. Howard Schuman held a special two-day training session in September, focusing on the skills which comprise training instructors in teaching techniques. In October, the Field Coordinator/Instructors met for another two-day course planning session.

Budgetary Matters

The project budget over its full three-year life is approximately $3.5 million. As of September 30, 1978, the authorized budget totaled approximately $1.365 million, of which just over $715,000 had been disbursed. Of this amount, nearly $40,000 had been committed for direct training costs; these funds had provided training for 31 instructors and 175 operators; and the resulting average direct cost per trainee for the 206 individuals trained was $191.88. Given the project's large impact on properties and trainees, this represents an impressively modest level of expenditure.

Publicity for the Project

During recent months the publicity given to the project has grown significantly. As a result of the field tests of the operator training modules, there have been a number of news stories in local media and union newsletters.

Project staff have taken a number of steps to assist the development of positive publicity about the project, including:

--making a videotape of excerpts from the Huntington, W. Va., IO and field tests of the Emergencies and Accident Procedures module.

--preparing a brief informational brochure on the project; and

--making two workshop presentations at the Annual Meeting of APTA in Toronto.