

1.258J/11.541J/ESD.226J
Public Transportation Service and Operations Planning
Fall 2003

1.258 Problem Set #2

Fall 2003

Due: October 9, 2003

As an operations planner at the MBTA, you have primary responsibility for the design of data collection programs. In the past, data collection has been based on rules of thumb, and not directly concerned with statistical issues. However a major data collection effort was recently completed and this provides a comprehensive picture of performance at the individual route level. The task at hand is to design a monitoring program. This must provide adequate data for ongoing decision making, and identify any major changes which might have occurred since the last round of data collection.

Data collection at the MBTA is constrained by the inability to use operators to gather any reliable data, the limited availability of funds, and the fact that, at present, the electronic fareboxes cannot be used to count passengers reliably. Your goal is to obtain data adequate for decision-making at minimum cost.

Your task here is to design a data collection program to monitor the Silver Line. You have data covering weekday operations from approximately 5am to midnight from 2002 provided in the Excel file "SilverSumF02.xls". The public timetable and route description are available at <http://www.mbta.com/>.

Attached are the following:

1. A printout of the file format for SilverSumF02.xls (including the load at the East Berkeley Street Station terminal, which is the peak load point along the route), and the one-page WkdySilvF02.
2. The operator headway sheet for the Silver Line showing the departure times of each trip (by direction) and the run number.
3. Stop lists (by direction) indicating stop location, numbers and daily load profile.

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Two data items are of interest in the monitoring program: passenger boardings per trip, maximum passenger load per trip. Note that a new AVL system will provide virtually complete data on trip running times and on-time performance, so this does not have to be gathered in your manual data collection program.

Making use of the data that are available, the lecture material and the readings, as well as your own judgment as appropriate:

- 1) Select and justify accuracy levels for each data item and time period. As part of this process you should consider whether the existing time periods are well-defined.
- 2) Define the alternative data collection techniques you would consider using.
- 3) Define the sampling plan (techniques, quantity, and time of data collection) you would use, and defend the choices.
- 4) Estimate the annual person hours of data collection for this route assuming four seasons (timetables) per year.
- 5) Discuss other issues which might affect your data collection program.
- 6) Assess the cost-effectiveness of installing APCs on the Silver Line bus fleet. Make whatever (reasonable) assumptions you believe are necessary for your analysis, state them clearly and justify them. One way to think of this is what would be the annual APC cost per bus to justify their purchase.
- 7) If you want to make a one-time estimate of the percentage of elderly riders on the route to an absolute tolerance of $\pm 5\%$, and assuming a response rate of 25%, on how many trips would you need to distribute questionnaires? How would you structure the sampling plan; when would you sample, and for how long? Please justify your response.