



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Jamey Tesler, MassDOT Secretary and CEO and MPO Chair
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WORK PROGRAM

EVALUATION OF PROOF-OF-PAYMENT FARE INSPECTION STRATEGIES II

JANUARY 5, 2023

Proposed Motion

The Boston Region Metropolitan Planning Organization (MPO) votes to approve this work program.

Project Identification

Unified Planning Work Program (UPWP) Classification

Boston Region MPO Planning Studies and Technical Analyses

Project Number 13815

Client

Massachusetts Department of Transportation (MassDOT) Office of Transportation Planning

Client Supervisor: Derek Krevat

Massachusetts Bay Transportation Authority (MBTA)

Client Supervisor: Sefira Bell-Masterson

Project Supervisors

Principal: Steven Andrews

Manager: Emily Domanico

Funding Source

MassDOT-Directed PL Funds

Schedule and Budget

Schedule: 9 months after work commences

Budget: \$75,015

Schedule and budget details are shown in Exhibits 1 and 2, respectively.

Relationship to MPO Goals

This study is supported in full with non-MPO funding. Committing MPO staff to this project will not impinge on the quality or timeliness of MPO-funded work.

Background

The MBTA, under its Fare Transformation program, plans to implement a new generation of automated fare collection (AFC) technologies. As part of this new AFC system, the MBTA will implement a proof-of-payment system that allows riders to board at any door of surface light rail vehicles and buses, including doors that are not staffed by an operator. The MBTA will employ teams of fare inspectors who will randomly validate that riders have paid the proper fare. If a rider cannot show proof of payment, the fare inspector may issue a warning or a citation. The fare inspection program should be regionally equitable while still producing a sufficient deterrent effect.

Previously in 2020, Central Transportation Planning Staff (CTPS) developed a program to model and evaluate different inspection strategies in Project 14368, Evaluation of Proof-of-Payment Fare Inspection Strategies for AFC 2.0. In the previous project, CTPS analyzed how two inspection strategies, Ride Along and Stationary,¹ impacted four metrics:

- the number of total fares inspected (productivity and efficiency)
- the percentage of trips inspected (productivity and efficiency)
- the percentage of distinct riders who had their fares inspected (deterrence)
- the variability of the deterrence metric between routes (equity)

Previous work identified that with more inspectors focusing attention at higher ridership areas of the system, more fares get inspected. However, with increased focus on specific areas of the system a less diverse group of riders gets inspected impacting deterrence and equity elements of the fare inspection strategy.

Objectives

The MBTA requests that CTPS perform an update to the prior analysis of alternative fare inspector routing strategies to determine the most efficient and equitable strategy of deployment and to inform staffing level decisions and hours of inspection. This update will use new ridership projections for 2024 and current thinking regarding inspection policies and procedures. Specifically, CTPS will assume that

- only Hybrid and Ride Along inspection strategies will be considered;
- all bus (including Silver Line) and light rail routes will be inspected; and
- inspection team sizes will consist of 24 persons (12 teams), 32 persons (16 teams), and 48 persons (24 teams).

¹ Previous analysis focused on two inspection strategies: **Ride Along** and **Stationary**. In **Ride Along** fare inspection, a team of inspectors board a vehicle and remain on that vehicle for the remainder of the shift and inspect all riders who board the bus. In **Stationary** fare inspection, fare inspectors inspect all riders on each vehicle that passes by or uses a stop.

Work Description

CTPS will coordinate with the MBTA to update and adapt existing fare inspection models, evaluate the impacts and efficiencies of different strategies, and assess the sensitivity of relevant metrics.

Task 1 Update and Adapt Fare Inspection Models

CTPS will coordinate with the MBTA to determine the appropriate updates to fare inspection model assumptions and inputs so that analysis outputs reflect anticipated conditions. Inputs to the analysis will include updated ridership and more precise fare inspector assignments. Outputs from the fare inspection model will identify the trade-off between efficiency and evenness of fare inspection coverage throughout inspected modes using the four metrics defined in the previous work:

- the number of total fares inspected (productivity and efficiency)
- the percentage of trips inspected (productivity and efficiency)
- the percentage of distinct riders who had their fares inspected (deterrence)
- the variability of the deterrence metric between routes (equity)

Subtask 1.1 Update Ridership Data

CTPS will update the ridership data from 2019 to reflect projections of anticipated 2024 ridership. The ridership update will also expand the data utilized to include Green Line Extension ridership.

Subtask 1.2 Develop a Hybrid Inspection Strategy

Previous work analyzed Stationary and Ride Along inspection strategies and identified the potential for a Hybrid strategy. CTPS will work with the MBTA to define a Hybrid strategy and develop a process to analyze the new Hybrid inspection strategy and compare it to the Ride Along strategy.

Subtask 1.3 Update Key Variables in the Models

CTPS will update key variables in the modeled scenarios including the representation of transit modes and inspection team sizes. The analysis will focus on one set of mode combinations (Green Line, Silver Line, and bus) and three inspection team sizes.

Additionally, CTPS will refine model assumptions to reflect more current conditions where appropriate. These refinements could include more detail about ridership by day of week, inclusion of weekends, and more detailed representation of inspection strategies on Green Line branches.

Product of Task 1

An updated modeling process that tracks how changes in ridership and inspection team deployment affect reporting metrics.

Task 2 Evaluate the Effect of Inspector Schedules

The original model presumed inspections would occur during all weekday hours of MBTA revenue service. The MBTA and CTPS will determine as many as five inspection shift scenarios (hours and days of week), and CTPS will evaluate their impact on inspection efficiency and equity using the metrics identified in Task 1.

Product of Task 2

An evaluation of how defined inspector schedules impact efficiency and equity of rider inspection in the updated model across the Hybrid and the Ride Along scenarios

Task 3 Evaluate the Effect of Allocating Inspectors to Different Modes

The rate at which inspection teams are distributed throughout the system will impact both inspection efficiency and equity. CTPS and the MBTA will determine as many as 10 inspection allocation scenarios that consider inspector assignments on different modes and coverage at high, medium, and low ridership routes and stops. CTPS will evaluate how allocating inspectors throughout the system at varying rates will affect efficiency and equity of ridership inspections.

Product of Task 3

A sensitivity analysis of differing inspector allocation rates in the updated model across the Hybrid and the Ride Along scenarios using the inspector schedules identified in Task 2, including draft results to be shared with clients

Task 4 Document Results

Staff will document the methodology and the results of this study. Results will identify how different applications of inspection assignments will impact the quantity estimated inspections, inspection rates per rider, the anticipated percent of riders in the system inspected, and how evenly inspections occurred throughout high, medium, and low ridership areas of the network.

Product of Task 4

A memorandum detailing the methodology and the results of the work completed under this work program.

Exhibit 1
ESTIMATED SCHEDULE
Evaluation of Proof-of-Payment Fare Inspection Strategies II

Task	Month									
	1	2	3	4	5	6	7	8	9	
1. Update and adapt fare inspection models	█									
2. Evaluate the effect of inspector schedules		█								
3. Evaluate the effect of allocating inspectors to different modes			█				A			
4. Document results					█				B	

Products/Milestones

- A: Draft results shared with client
- B: Technical memorandum

Exhibit 2
ESTIMATED COST
Evaluation of Proof-of-Payment Fare Inspection Strategies II

Direct Salary and Overhead **\$75,015**

Task	Person-Weeks				Direct Salary	Overhead (119.34%)	Total Cost
	M-1	P-5	P-2	Total			
1. Update and adapt fare inspection models	0.0	1.5	5.4	6.9	\$9,428	\$11,251	\$20,679
2. Evaluate the effect of inspector schedules	0.0	0.8	5.5	6.2	\$8,109	\$9,677	\$17,786
3. Evaluate the effect of allocating inspectors to different modes	0.0	0.8	5.5	6.2	\$8,109	\$9,677	\$17,786
4. Document results	1.9	0.7	3.0	5.6	\$8,555	\$10,209	\$18,764
Total	1.9	3.7	19.4	25.0	\$34,200	\$40,814	\$75,015

Other Direct Costs **\$0**

TOTAL COST **\$75,015**

Funding

MassDOT-Directed PL Funds

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