BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Stephanie Pollack, MassDOT Secretary and CEO and MPO Chair
Tegin L. Teich, Executive Director, MPO Staff

WORK PROGRAM

EVALUATION OF PROOF-OF-PAYMENT FARE INSPECTION STRATEGIES FOR AFC 2.0

NOVEMBER 7, 2019

Proposed Motion

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

Project Identification

Unified Planning Work Program (UPWP) Classification

Agency and Other Client Transportation Planning Studies and Technical Analyses

Project Number 14368

Client

MassDOT Office of Transportation Planning
Client Supervisor: Doug Johnson

Project Supervisors

Principal: Katie Stetner
Manager: Steven Andrews

Funding Source

MassDOT §5303 Contract #108217

Schedule and Budget

Schedule: 7 months from notice to proceed

Budget: $71,260

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

Relationship to MPO Work

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 Massachusetts Bay Transportation Authority (MBTA) is developing a new automated fare collection (AFC) system, known as AFC 2.0, to replace its existing fare payment system. AFC 2.0 will enable new ways to pay transit fares. Some of the expected benefits of the new fare payment system include the ability for customers to

- Board and pay at any door on light rail vehicles and buses, which should decrease dwell times for all riders;
- Board and pay on all modes using a unified fare payment system;
- Pay with a contactless fare card or by tapping a contactless credit card or smartphone; and
- Check the available balance, reload value, and replace lost cards via a website or phone.

The most relevant improvement for this study is the implementation of a proof-of-payment system, which will allow riders to board at any door of surface light rail vehicles and buses, including doors that are not staffed by an operator. In a proof-of-payment fare payment system, a transit agency employs roving fare inspectors to verify that riders have paid their fare. If a rider cannot show proof of payment, the fare inspector may issue a warning or a citation. When deciding when and where to deploy fare inspectors, the MBTA would like to consider both efficiency and equity, which could be measured by the inspection rate and differences in inspection rates among riders at the route level, respectively.

Objectives

The MBTA has requested that Central Transportation Planning Staff (CTPS) perform an analysis of alternative fare inspector routing strategies to determine the most equitable strategy, and to provide estimates about the sensitivity of fare inspection rates and inspection equity based on the inspection strategy selected and the number of fare inspectors deployed.

Work Description

This work will be completed in four tasks. First, CTPS will work with the MBTA to develop inspection strategies, then staff will evaluate the efficiency of the inspection strategies and the sensitivity of relevant metrics to the choice of strategy and the number of fare inspectors. Finally, staff will document the methodology and findings in a memorandum.

Task 1 Create Inspection Strategies

The MBTA must provide its fare inspectors with operating procedures that indicate how many inspectors will work together and where and when specific inspectors will verify payment. The MBTA has established the following general procedures, which are subject to change.

- Fare inspectors will travel in pairs to inspect riders' fares.
- The inspectors will likely be assigned to inspect fares for trips originating out of each bus district or the light rail system.
- Inspectors will start and end their shifts at their respective bus or light rail reporting location, typically a bus garage or light rail facility.
- Inspectors will work approximately 40 hours per week including time to prepare for their work, to debrief at the end of the day, and to complete paperwork. The number of shifts and temporal coverage will vary based on the number of fare inspectors.

Given these general parameters, information collected by the MBTA about fare inspection procedures used by peer agencies, and discussions with MBTA personnel, staff will create up to three potential fare inspection strategies. Examples of inspection strategies include assigning inspectors to remain onboard a specific vehicle to inspect fares on the trips made by that vehicle or assigning inspectors to high-ridership terminals to inspect riders of many bus routes at once. The strategies evaluated may include hybrids of these two examples, with variations for different service levels (frequent vs. infrequent service) or different times of day (peak vs. off-peak periods).

Products of Task 1

Descriptions of up to three inspection strategies

Task 2 Evaluate Inspection Strategies

Staff will evaluate the inspection rate and systemwide equity of the different fare inspection strategies developed in Task 1. In order to evaluate different inspection strategies, staff will create a model of MBTA service on a typical day using available service and ridership data. This model will assign riders to trips and vehicles to blocks of work allowing staff to know where riders are and ridership levels at all times. The model could also use automatic passenger counter data to estimate travel time between bus terminals. This information may be used to estimate the time it takes inspectors to travel from route to route using nonrevenue vehicles. Using this information, staff will be able to: 1) assign fare inspectors to buses or stations to inspect fares, and 2) calculate the number of inspections per rider on each route. Using this method, the identified inspection strategies will be evaluated

for efficiency using relevant metrics such as inspection rates per route and inspections per rider. Staff will also evaluate systemwide equity by comparing the inspection rate metrics across the system.

Products of Task 2

Evaluation of inspection strategies developed in Task 1

Task 3 Perform a Sensitivity Analysis

The number of fare inspectors employed by the MBTA may affect the results of the evaluation of inspection strategies in Task 2. In Task 3, staff will rerun the evaluation process developed in Task 2 with up to two additional fare inspectors. The specific number of fare inspectors will be provided by the MBTA. CTPS will calculate the fare inspection rates for the number of fare inspectors and the systemwide equity measures for all of the inspection strategies.

Products of Task 3

Sensitivity analysis of the number of fare inspectors for the inspection strategies from Task 1

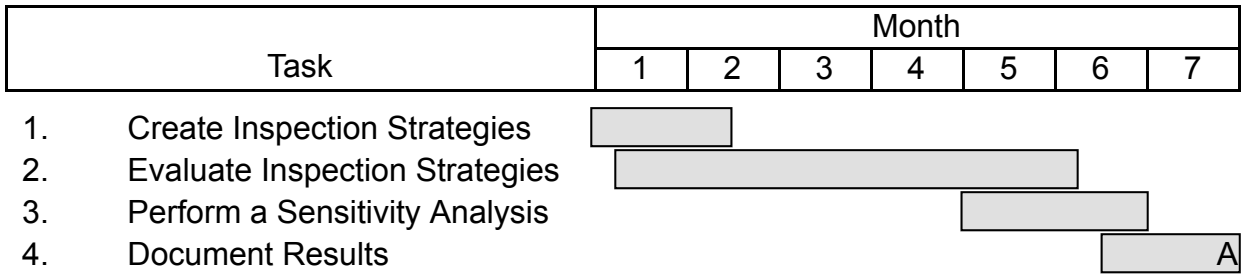
Task 4 Document Results

Staff will document the methodology and the results of this study.

Products of Task 4

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

Exhibit 1
ESTIMATED SCHEDULE
Evaluation of Proof-of-Payment Fare Inspection Strategies for AFC 2.0



Products/Milestones

A: Technical memorandum

Exhibit 2
ESTIMATED COST
Evaluation of Proof-of-Payment Fare Inspection Strategies for AFC 2.0

Direct Salary and Overhead	**$71,260**

	Task	Person-Weeks M-1	Person-Weeks P-5	Person-Weeks Total	Direct Salary	Overhead (102.11%)	Total Cost
1.	Create Inspection Strategies	0.5	0.8	1.3	$2,519	$2,572	$5,091
2.	Evaluate Inspection Strategies	2.0	6.8	8.8	$17,228	$17,591	$34,819
3.	Perform a Sensitivity Analysis	1.0	2.0	3.0	$5,833	$5,956	$11,788
4.	Document Results	2.0	3.0	5.0	$9,679	$9,883	$19,562
	Total	5.5	12.6	18.1	$35,258	$36,002	$71,260

Other Direct Costs	**$0**

TOTAL COST	**$71,260**

Funding

MassDOT §5303 Contract #108217