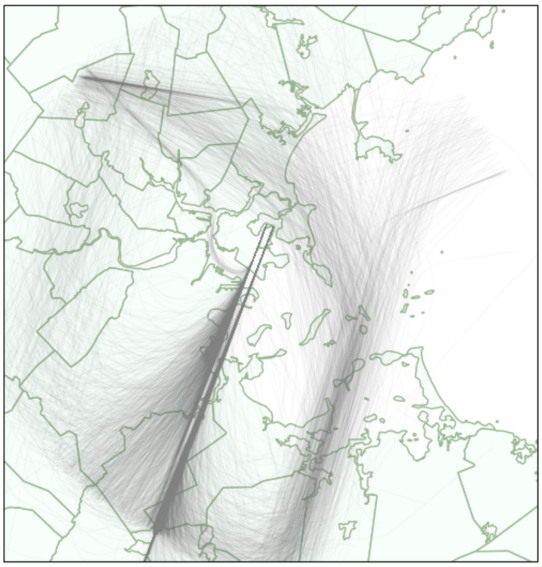
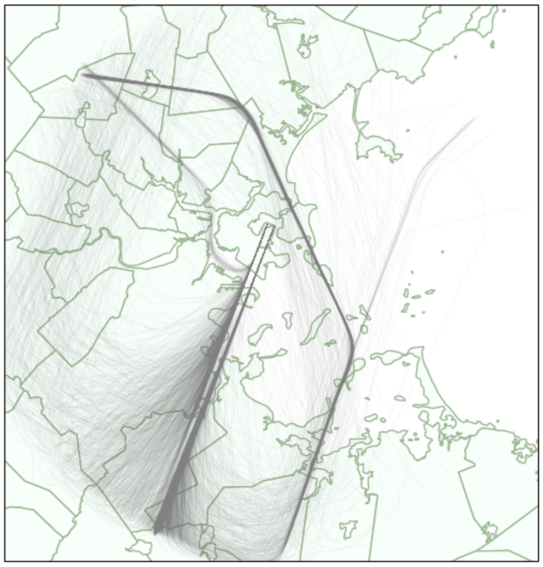
RWY 4R Supplemental Study Analyses

1) Please present, side by side, the attached Massport 2009 4R/4L flight tracks Slide and the attached FAA November 2020 Slide of 4L/4R RNAV path CSPRs over Milton. Thereby, allow visual a comparison of pre-RNAV 4R arrival flight tracks dispersion over Quincy and Milton with the present post-RNAV concentration over Milton of the 4R RNAV path and its proposed 4L counterpart.



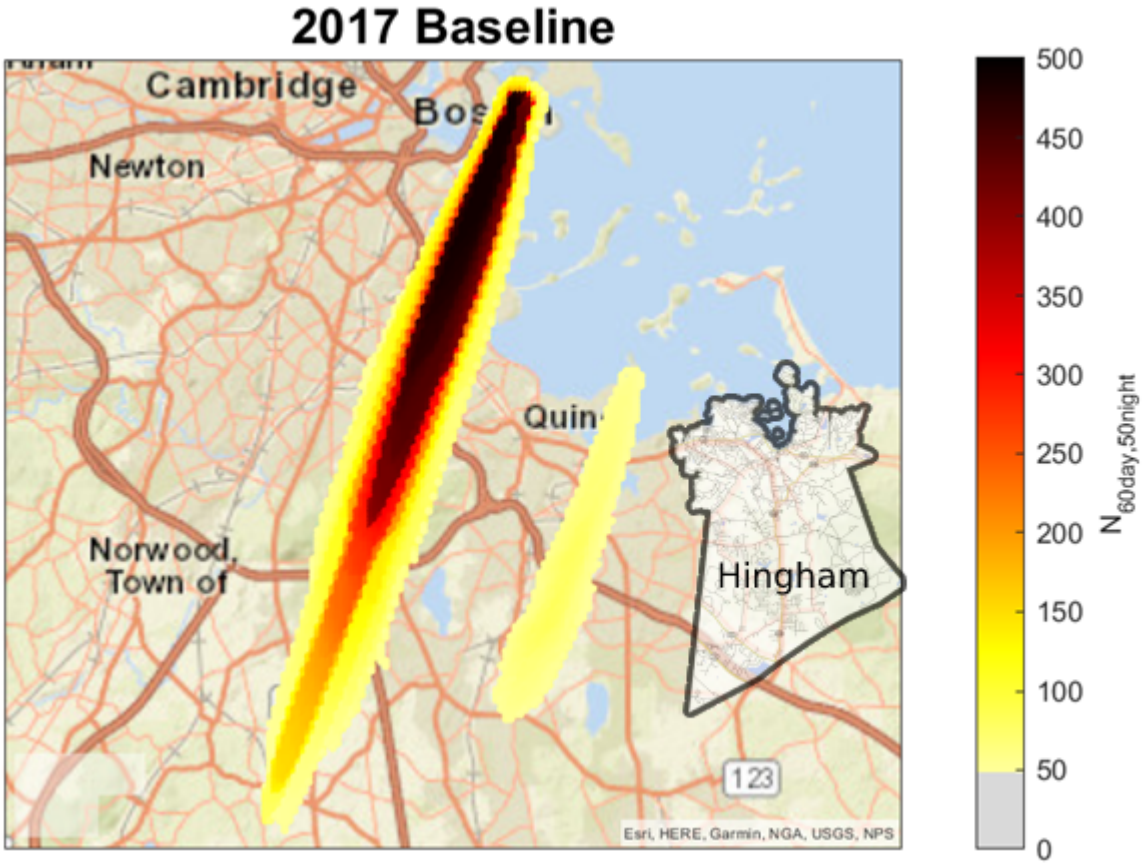
KBOS 4L/4R Arrivals May 2011



KBOS 4L/4R Arrivals May 2016

2) Please present the N60 peak day overflight numbers for the existing 4R RNAV over Milton, over Braintree, over Quincy and over Hingham, respectively, in order to allow comparison.

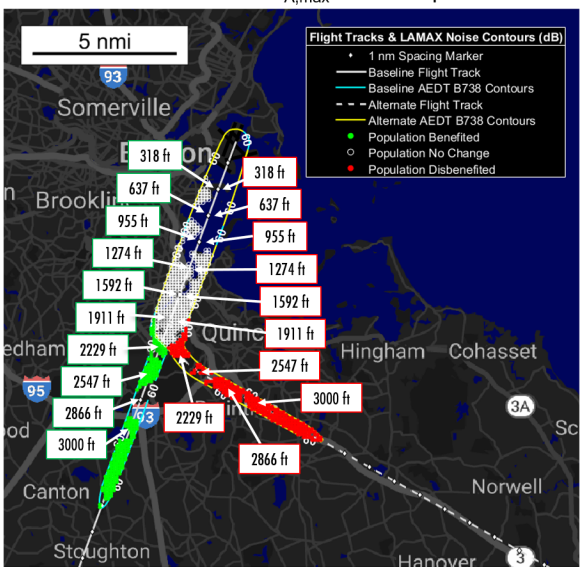
3) For Hingham, show any other applicable present N60 peak day numbers and identify the associated flight path(s) and altitudes.



4) At Milton's request, MIT provided each of the attached three RNP Altitude charts compared with the Altitude chart for the 4R RNAV path. Please present those comparisons as part of the supplement.

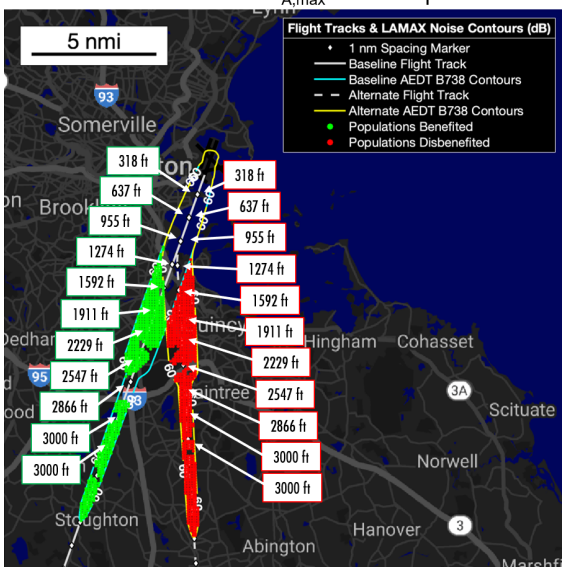
RNAV Route 3 Initial

B737-800 60dB $L_{A,max}$ Noise Exposure



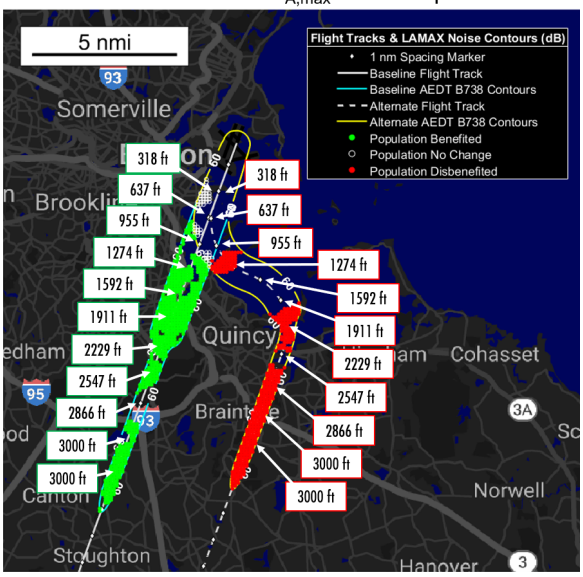
RNP 24-degree Final Approach Intercept

B737-800 60dB $L_{A,max}$ Noise Exposure



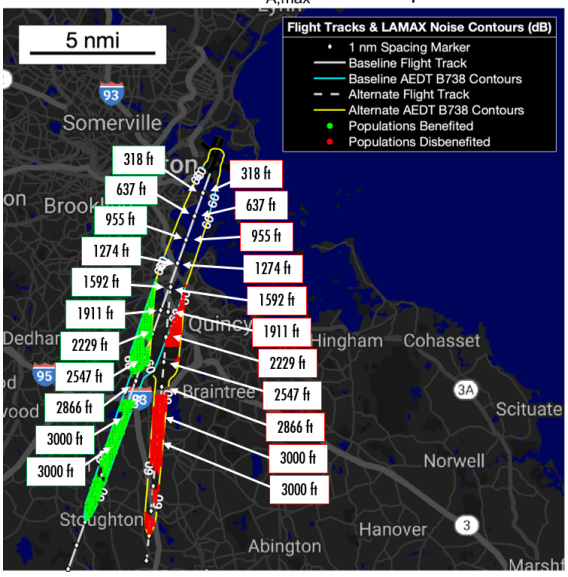
RNP 4-Mile Initial Offset

B737-800 60dB $L_{A,max}$ Noise Exposure



RNAV 15-degree Final Approach Intercept

B737-800 60dB $L_{A,max}$ Noise Exposure



5) Show the respective comparative noise effects of 3000 ft altitude, 1911ft altitude and 1592 ft altitude overflights represented in the RNP/RNAV Altitude charts.

Undertrack $L_{A,MAX}$:

Aircraft Type	3000 ft Altitude	1911 ft Altitude	1592 ft Altitude
B777 (widebody)	66 dB	72 dB	74 dB
B738 (narrowbody)	61 dB	70 dB	72 dB

6) Each of the 4R RNP arrival path presentation slides contains the following remark: “air traffic control concerns with merging with straight-in flight track.”

Please address the use of Relative Position Indicator (RPI) technology as a means of assisting RNAV/RNP path merging as used at Reagan National, Atlanta, Chicago and Houston airports and described in the attached MITRE Corporation releases. Address further RPI use and developments since the dates of those releases. Please address the feasibility and implementation cost of such technologies for the 4R RNP paths depicted on the MIT slides.

This is out of scope. We may make some general comments on the benefit of merging and spacing tools to enable mixed RNAV/RNP/ILS operations but this does not obviate the ATC concerns.

7) With regard to that same statement in the April 8 4R RNP arrival path presentation slides: “air traffic control concerns with merging with straight-in flight track”:

Please address the various means by which merging straight-in 4R RNAV flights with each of the curved approach RNP path flights can be minimized or avoided, including but not limited to use of the following alternatives:

A. Concurrently with use of the 4R RNP path, use of the 4L path by aircraft not RNP enabled such that they land on runway 4L rather than 4R, including monthly estimates of such use. Note that FAA states that planned use of 4L, should it be qualified as an RNAV path, would be limited in that regard to certain IMC periods. Accordingly, for Study purposes, please assume that 4L capacity would be sufficient to receive the aircraft that are not RNP equipped;

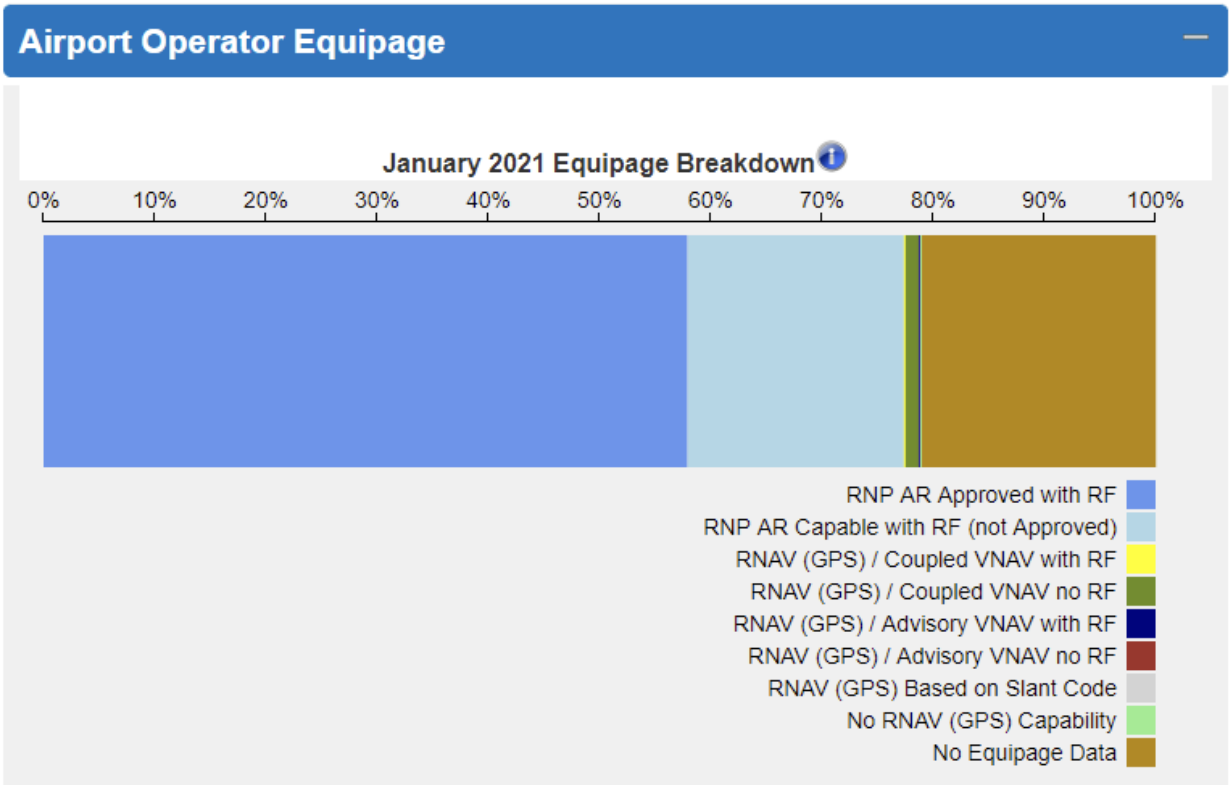
This is an implementation detail beyond the scope of the study but would not obviate ATC concerns regarding mixed equipage.

B. Concurrently with use of the 4R RNP path, use of a side-step from the 4R RNAV approach to the 4L path sufficiently prior to the RNP intercept with the straight-in 4R path. A side-step from 4R approach to 4L was used from May 15 to September 1, 2017 during runway construction, described by the FAA as follows:

“BOS RNAV (GPS) RWY 4R Amendment: The proposed BOS RNAV (GPS) RWY 4R Amendment will add a side-step maneuver, which will allow aircraft to land on RWY 4L during the runway construction period. This is a typical procedure used at airports throughout the National Airspace System (NAS) that provides both air traffic controllers and pilots an additional option in landing aircraft.” (FAA CATEX Announcement March 2017).

Side step maneuver is at the discretion of controllers and pilots and cannot be assumed to resolve mixed equipage merging issues.

Please also describe the projected increase in RNP equipage over each of the next several years.



Source: [Performance Based Navigation (PBN) Implementation and Usage (faa.gov)]

8) Rotation: Please show how each RPN path could be used on certain days a month in combination with the item 7A side-step or item 7B 4L procedure in lieu of use of only the present 4R RNAV path.

For example, given that the 4L/4R CSPRs are used approximately 34% of the year (e.g. ~120 days) please address RNP path use x days/month with 4R RNAV, side-step to 4L or 4L alternate, and during the other 10-x days/month use of the 4R RNAV or 4R Visual paths only.

Beyond the scope of the study.

9) Show MIT's 33L, 27 and 4R total population impacts side by side using each of the three RNP alternatives with the merging avoidance or minimized and rotation in use, as suggested in Items 7 and 8 respectively.

Population impacts for each recommended procedure will be included in the Block 2 report

10) Please provide for MIT's 4R ILS “minimal change” arrival path, exemplar noise contours for large jets. For the westward contour toward the 4L proposed RNAV approach path show also the 4L proposed RNAV path’s eastward contour towards the “minimal change” 4R ILS path. Compare that to the present 4R RNAV and 4L proposed RNAV paths’ contour areas, including their overlap or juxtaposition if not overlapping.

B777 (widebody) $L_{A,MAX}$ contours on the ILS 4R approach.