REQUESTS AND RECOMMENDATIONS FOR BLOCK 2

DISPERSED RUNWAY 4L AND 4R ARRIVAL PATH TESTS

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3.0 PRIOR REQUESTS AND FAA RESPONSES
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8.0 DWELL AND PERSISTENCE REQUIRE SIMILAR ACTION
FAA LAW 101
The federal government has exclusive jurisdiction over the national airspace.

(49 U.S.C. § 40103 (the United States government has exclusive authority of airspace of the United States))

1. Airport sponsors and state or local governments cannot modify or restrict flight procedures.

2. The Airport Noise and Capacity Act of 1990 requires prior approval either from FAA or from all affected air carriers in order to restrict commercial jet aircraft flight paths.
3. That statute has never been challenged successfully to restrict airport operations or flight paths.

4. FAA has plenary authority to adopt regulations governing the national airspace, including flight rules, procedures and Orders. 

49 U.S.C. §§ 47521 et seq.

5. And so, under the Federal Administrative Procedure Act, when RNAV was proposed, airports and/or residents had only 60 days to challenge its adoption, yet its implementation and effects post-dated that 60-day time limit.
6. NextGen GPS-based paths now number more than 9300.

7. FAA may adopt new paths or procedures that have environmental impact (noise or pollution) without National Environmental Policy Review (so-called categorical exclusion) if:

- > 3000 feet above ground, or

- < below 3000 feet but not routinely passing over "noise sensitive areas", or
increased altitudes or landing minima.

8. Also, **no** NEPA review is needed for new ATC procedures that do not fundamentally change a track, altitude or flight concentration on the track -- or place flights over non-noise sensitive areas.

A noise sensitive area, as defined in Paragraph 11-5.b(8) of FAA Order 1050.1F, is: ... Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites.

9. Therefore, an Environmental Assessment is required for new paths over residential areas.
But NEPA is deemed complied with if there is a “Finding of No Significant Impact.” (FONSI)

10. Otherwise a full environmental impact statement (EIS) is needed, which can take year(s).

11. Unfortunately, FAA is permitted by Congress to measure noise by the Yearly Day-Night Average Sound Level (DNL), the FAA's principal noise metric. DNL cannot capture multiple, serial continual, enduring overflight noise impacts.
And a path change that does not itself increase the number of aircraft operations can be deemed to have no air quality impact.

12. Challenges to new paths must be made in the Federal Court of Appeals under those standards but only AFTER administrative challenge at the FAA itself, again, within 60 days of the FAA order approving the new path.
AMENDMENT NO. _____        Calendar No. _____

Purpose: To restore dispersion and altitude of arriving and departing aircraft.


H.R. 4

To reauthorize programs of the Federal Aviation Administration, and for other purposes.

Referred to the Committee on ________ and ordered to be printed

Ordered to lie on the table and to be printed

AMENDMENT intended to be proposed by ________

Viz:

1        At the end of subtitle A of title IV, add the following:

2 SEC. __. RESTORING DISPERSION AND ALTITUDE OF ARRIVING AND DEPARTING AIRCRAFT.

3        (a) IN GENERAL.—Notwithstanding any other provision of law, it shall be the purpose and policy of the Administrator to ensure that it protects the safety of aircraft and efficiency of air traffic operations for the benefit of passengers and crew, while also protecting the public from overflight noise, pollution, and other detrimental effects.

4        In order to comply with the preceding sentence, the Administrator shall take the following actions:
(1) **Restoring Dispersion of Arriving, Approaching, and Departing Aircraft Over Residential Areas Within 25 Miles of Airports.**

(A) **In General.**—Not later than 18 months after the date of enactment of this Act, the Administrator shall implement measures that restore dispersion of aircraft flying within 25 miles of each airport and over, or in the proximate vicinity of residential areas while arriving at, approaching, or departing from such airport to the same level of dispersion existing at such airport during the year commencing on the dispersion equivalent date.

(B) **Definition of Dispersion Equivalent Date.**—For purposes of subparagraph (A), the term "dispersion equivalent date" means the earlier of—

(i) January 1 of the year prior to the year in which the earlier of first testing or first use of Wide Area Augmentation System (WAAS) enabled Area Navigation (RNAV) Global Positioning System (GPS) guidance, including Required Navigation Performance guidance, technologies occurred in connection with the adoption of
one or more new Performance Based Navigation procedures or routes for arriving or departing flights at an airport runway; or

(ii) January 1, 2010, if then applicable procedures and routes produced greater dispersion of flights arriving on or departing from such runway than the year defined under clause (i).

(C) REQUIREMENTS.—In carrying out subparagraph (A), the Administrator shall—

(i) use both the full range of currently and historically available solutions (including, but not limited to, instrument approach procedures and air traffic control vectoring procedures in effect during the year commencing with the dispersion equivalent date);

(ii) if necessary to carry out subparagraph (A), develop and implement additional geographic dispersion procedures (including, but not limited to, serial and sequential alternative paths to a given runway at an affected airport);

(iii) require airport operators and airlines to install new systems and tech-
Dear Senators Markey and Warren:

We write to express our support for including the enclosed draft amendment as part of the U.S. Senate's upcoming Federal Aviation Administration (FAA) Budget Reauthorization Bill deliberations. In short, this draft amendment would mandate that flights over residential areas within 25 miles of U.S. commercial airports return to the dispersion of flight paths and altitude levels that prevailed prior to FAA's Next Generation Air Transportation System (NextGen) Area Navigation (RNAV) current system implementation.

Hour after hour, day after day, week after week, many Boston residents suffer through the ear-splitting noise, annoying vibrations, and polluting dangers of constant low-flying aircraft coming from and going to Logan Airport. The cause of this torment is the lack of dispersion of flights under the current RNAV system, which has the effect of sending a disproportionate number of planes on narrow flight paths over certain Boston neighborhoods. Directly under those narrow flight paths are schools, parks and playgrounds.

The approach of the enclosed draft amendment is not to undo the NextGen technology or any of its benefits, but rather to use that technology to restore the dispersion of flight paths in effect prior to the current RNAV system by creating a family of RNAV paths. Our understanding is that Maryland Senators Cardin and Van Hollen have informed residents affected by the RNAV flight paths around Baltimore/Washington International Thurgood Marshall Airport that they support this approach and are discussing introducing it in the Senate as well.

We view this approach as the best hope to save Boston residents, and especially their children, from the polluting effects of the narrow dispersion of flight paths under the current RNAV system. We hope that you will sponsor this amendment as part of the U.S. Senate's upcoming Federal Aviation Administration (FAA) Budget Reauthorization Bill deliberations and support its adoption.
Thank you for your consideration, and please contact us if you have any questions or need any additional information.

Sincerely,
The Boston City Council

Andrea J. Campbell
Boston City Councilor, President

Michelle Wu
Boston City Councilor, At-Large

Michael Flaherty
Boston City Councilor, At-Large

Annissa Essaibi-George
Boston City Councilor, At-Large

Lydia Edwards
Boston City Councilor, District 1

Ayanne Pressley
Boston City Councilor, At-Large

Frank Baker
Boston City Councilor, District 3

Edward M. Flynn
Boston City Councilor, District 2

Matt O’Malley
Boston City Councilor, District 6

Timothy McCarthy
Boston City Councilor, District 5

Josh Zakim
Boston City Councilor, District 8

Kim Janey
Boston City Councilor, District 7

Mark Ciommo
Boston City Councilor, District 9
A FAMILY OF RNAV AND CONTROLLER-BASED PATHS

FAA developed two 4L RNAV paths as shown. Equivalent paths to the east of 4R are possible to restore the dispersion of flights to pre-RNAV levels.

4L visual path meets 4L(GPS) at 3 NM from runway end. A mirrored angle for 4R (GPS or controller-based) would provide dispersion. Paths use could be rotated.
BOS N Above Thresholds

- 50 $N_{Above}$ 60dB $L_{A,max}$ day, 50dB $L_{A,max}$ night on a peak day appears to capture complaint threshold in dispersion analysis

<table>
<thead>
<tr>
<th>Peak Day N Above</th>
<th>Complaints Captured</th>
</tr>
</thead>
<tbody>
<tr>
<td>25x</td>
<td>90.0%</td>
</tr>
<tr>
<td>50x</td>
<td>83.8%</td>
</tr>
<tr>
<td>100x</td>
<td>59.9%</td>
</tr>
</tbody>
</table>

2017 Data
# Comparative Noise Levels

## Common Outdoor Sound Levels

<table>
<thead>
<tr>
<th>Noise Level (dBA)</th>
<th>Sound Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>B747-400 Takeoff at 2 mi</td>
</tr>
<tr>
<td>100</td>
<td>Gas Lawn Mower at 3 ft.</td>
</tr>
<tr>
<td>90</td>
<td>Diesel Truck at 150 ft.</td>
</tr>
<tr>
<td>80</td>
<td>DC-9-30 Takeoff at 2 mi.</td>
</tr>
<tr>
<td>70</td>
<td>Noisy Urban Daytime</td>
</tr>
<tr>
<td>60</td>
<td>B737-800 Takeoff at 2 mi.</td>
</tr>
<tr>
<td>50</td>
<td>Commercial Area</td>
</tr>
<tr>
<td>40</td>
<td>Quiet Urban Daytime</td>
</tr>
<tr>
<td>30</td>
<td>Quiet Urban Nighttime</td>
</tr>
<tr>
<td>20</td>
<td>Quiet Rural Nighttime</td>
</tr>
<tr>
<td>10</td>
<td>60 dBLmax Day Threshold</td>
</tr>
<tr>
<td>0</td>
<td>50 dBLmax Night Threshold</td>
</tr>
</tbody>
</table>

## Common Indoor Sound Levels

<table>
<thead>
<tr>
<th>Noise Level (dBA)</th>
<th>Sound Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>Rock Band</td>
</tr>
<tr>
<td>100</td>
<td>Inside Subway Train (New York)</td>
</tr>
<tr>
<td>90</td>
<td>Food Blender at 3 ft.</td>
</tr>
<tr>
<td>80</td>
<td>Garbage Disposal at 3 ft.</td>
</tr>
<tr>
<td>70</td>
<td>Shouting at 3 ft.</td>
</tr>
<tr>
<td>60</td>
<td>Vacuum Cleaner at 10 ft.</td>
</tr>
<tr>
<td>60</td>
<td>Normal Speech at 3 ft.</td>
</tr>
<tr>
<td>50</td>
<td>Large Business Office</td>
</tr>
<tr>
<td>50</td>
<td>Dishwasher Next Room</td>
</tr>
<tr>
<td>40</td>
<td>Small Theatre, Large Conference Room (Background)</td>
</tr>
<tr>
<td>30</td>
<td>Library</td>
</tr>
<tr>
<td>30</td>
<td>Bedroom at Night</td>
</tr>
<tr>
<td>20</td>
<td>Concert Hall (Background)</td>
</tr>
<tr>
<td>10</td>
<td>Broadcast &amp; Recording Studio</td>
</tr>
<tr>
<td>10</td>
<td>Threshold of Hearing</td>
</tr>
</tbody>
</table>

[https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/](https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/)
Example 4R RNAV and RNP Approaches

- Several approaches to 4R shown as examples

- RNP technology allows approach to be kept overwater near final approach

Preliminary examples for consideration only. May be modified or eliminated.
4R RNAV Approach – Route 3 Initial

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

Flight Tracks & LAMAX Noise Contours (dB)
- 1 nm Spacing Marker
- Baseline Flight Track
- Baseline AEDT B738 Contours
- Alternate Flight Track
- Alternate AEDT B738 Contours
- Population Benefited
- Population No Change
- Population Disbenefited

B737-800 Population Exposure ($L_{A,\text{MAX}}$)

<table>
<thead>
<tr>
<th></th>
<th>60dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight In</td>
<td>32,232</td>
</tr>
<tr>
<td>RNP</td>
<td>38,353</td>
</tr>
<tr>
<td>Difference (Straight In – RNP)</td>
<td>-6,121</td>
</tr>
</tbody>
</table>

5.5nmi final segment
80° 2nmi radius-to-fix turn

Population exposure calculations do not take advantage of noise masking

- Preliminary example for consideration only. May be modified or eliminated.
- Procedure within RNAV criteria.
- Air traffic control concerns with merging with straight-in flight track.
- Community support unclear.
4R RNAV Approach – Minimum Population Exposure From South

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

- Procedure within RNAV criteria.
- Community support unclear.

Preliminary example for consideration only. May be modified or eliminated.
4R RNP Approach – Offset Initial

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

Flight Tracks & LAMAX Noise Contours (dB)
- 1 nm Spacing Marker
- Baseline Flight Track
- Baseline AEDT B738 Contours
- Alternate Flight Track
- Alternate AEDT B738 Contours
- Population Benefited
- Population No Change
- Population Disbenefited

B737-800 Population Exposure ($L_{A,MAX}$)

<table>
<thead>
<tr>
<th>Method</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight In</td>
<td>32,232</td>
</tr>
<tr>
<td>RNP</td>
<td>25,106</td>
</tr>
<tr>
<td>Difference (Straight In – RNP)</td>
<td>7,126</td>
</tr>
</tbody>
</table>

1.5nmi final segment
90° 2nmi radius-to-fix turn
90° 2nmi radius-to-fix turn

- Procedure within RNP criteria.
- Community support unclear.

Preliminary example for consideration only. May be modified or eliminated.
4R RNP Approach – Min Population Exposure from South

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

![Map showing flight tracks and noise contours]

**Flight Tracks & LAMAX Noise Contours (dB)**
- ± 1 nm Spacing Marker
- Baseline Flight Track
- Alternate Flight Track
- Baseline AEDT B738 Contours
- Alternate AEDT B738 Contours
- Population Benefited
- Population No Change
- Population Disbenefited

**B737-800 Population Exposure ($L_{A,\text{MAX}}$)**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight In</td>
<td>32,232</td>
</tr>
<tr>
<td>RNP</td>
<td>11,682</td>
</tr>
<tr>
<td>Difference (Straight In – RNP)</td>
<td>20,550</td>
</tr>
</tbody>
</table>

1.5 nmi final segment
90° 2 nmi radius-to-fix turn
5 nmi straight segment
45° 2 nmi radius-to-fix turn

- Procedure within RNP criteria.
- Community support unclear.
- Possible flyability issues need to be tested.
- Air traffic merging concern with straight-in traffic.

*Preliminary example for consideration only. May be modified or eliminated.*
4R Arrival RNP – Maximum Overwater

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

Flight Tracks & LAMAX Noise Contours (dB)
- 1 nm Spacing Marker
- Baseline Flight Track
- Baseline AEDT B738 Contours
- Alternate Flight Track
- Alternate AEDT B738 Contours
- Population Benefited
- Population No Change
- Population Disbenefited

B737-800
Population Exposure ($L_{A,\text{max}}$)

<table>
<thead>
<tr>
<th></th>
<th>60dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight In</td>
<td>32,144</td>
</tr>
<tr>
<td>RNP</td>
<td>20,754</td>
</tr>
<tr>
<td>Difference (Straight In – RNP)</td>
<td>11,390</td>
</tr>
</tbody>
</table>

Different routes for 4R arrivals still under analysis

Preliminary example to evaluate methodology only. Should not be considered representative case.
Example of Deterministic 4R Arrival Dispersion Change in N Above

N Above Levels:
- 60dB $L_{A,max}$ Day
- 50dB $L_{A,max}$ Night

Population Exposure

<table>
<thead>
<tr>
<th>Change In N Above</th>
<th>Population Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>+50x</td>
<td>46,562</td>
</tr>
<tr>
<td>+25x</td>
<td>79,528</td>
</tr>
<tr>
<td>-25x</td>
<td>47,964</td>
</tr>
<tr>
<td>-50x</td>
<td>20,180</td>
</tr>
</tbody>
</table>

Change in Number of Overflights

Dispersion Flight Tracks
- Areas Affected
- Areas No Change

4.6 nmi

Preliminary example to evaluate methodology only. Should not be considered representative case.
Example of Deterministic 4R Arrival Dispersion
N Above Exposure

Population Exposure

<table>
<thead>
<tr>
<th>N Above Levels:</th>
<th>60dB $L_{A,\text{max}}$ Day</th>
<th>50dB $L_{A,\text{max}}$ Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Above</td>
<td>25x</td>
<td>50x</td>
</tr>
<tr>
<td>Baseline</td>
<td>104,460</td>
<td>56,419</td>
</tr>
<tr>
<td>Dispersion</td>
<td>138,826</td>
<td>91,372</td>
</tr>
<tr>
<td>Baseline - Dispersion</td>
<td>-34,366</td>
<td>-34,953</td>
</tr>
</tbody>
</table>

25 N Above

50 N Above

100 N Above

Preliminary example to evaluate methodology only. Should not be considered representative case.
Example Impact of Vortex Generators for A320s on 4R

Population Exposure

<table>
<thead>
<tr>
<th>LAMAX Reduction</th>
<th>Population Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4dB</td>
<td>6,916</td>
</tr>
<tr>
<td>3dB</td>
<td>8,482</td>
</tr>
<tr>
<td>2dB</td>
<td>9,964</td>
</tr>
<tr>
<td>1dB</td>
<td>11,723</td>
</tr>
</tbody>
</table>

Preliminary example to evaluate methodology only. Should not be considered representative case.
If all airlines at an airport agree, a procedure may be adopted:

Lower Landing Gear at FAF: MILTT (5.1 nm)

*******
Landing Gear accounts for about 40% of the total noise emissions of long range aircraft in approach conditions

Landing gear are required to be in lowered position at the FAF (final approach fix) which for 4L and 4R is the MILTT fix located at the Granite Ave entrance to the Expressway heading north. MILTT is 5.1 nm from 4L/4R.

Yet, aircraft landing gear are often lowered well before MILTT. We see it as flights pass overhead. This is an operational issue that airlines and pilots could address. Lowered landing gear increase fuel burn, so associated operational cost savings to airlines would accrue if early gear lowering were avoided or reduced. Right-time-landing-gear-lowering should be an element of any fly quiet initiative. See the short discussion excerpt and graphics below:

Source: Airbus Engineering 2015 White Paper Published by American Institute of Aeronautics and Astronautics

Landing Gear accounts for about 40% of the total noise emissions of long range aircraft in approach conditions

. **EU's ACARE** (Advisory Council for Aviation Research in Europe) is aiming to reduce noise emission of flying aircraft by 65% in 2050 relative to the capabilities of typical new aircraft in 2000.

In terms of noise impact for the residential areas surrounding airports, takeoff and landing are the most critical phases of the flight. While noise emissions at takeoff are mainly dominated by engines, contributions of all other noise sources are evenly balanced during landing. For a typical long-range airplane during the approach phase, around 54% of the noise stems from the
airframe. Out of these 54%, 76% originate from the landing gear alone (see Figure 2 and Figure 3).

In total, the landing gear accounts for about 40% of the total noise emissions of a long-range airplane in approach conditions.
Delayed Deceleration Approaches

- Reduce noise by delaying extension of flaps
- Potential concerns from ATC and pilots regarding different deceleration rates and managing traffic
- Must decelerate early enough to assure stable approach criteria

Example Noise Component Breakdown Under the Flight Track
Effect of RNAV Concentration on 27 Departures

2010 to 2017

Population Exposure

\[ N_{60} \]

Dispersion: 407,001

RNAV: 407,357

RNAV Benefit: -356

Analysis updated Dec 6 2018 to correct for discretization differences

N\text{ Above 60dB L}_{A,\text{max}} \text{ Day, 50dB L}_{A,\text{max}} \text{ Night}

Analysis based on peak day operations; only includes 33L departures

\[ N_{60} \text{ Thresholds:} \]
\[ 60dB \text{ L}_{A,\text{max}} \text{ Day, 50dB L}_{A,\text{max}} \text{ Night} \]
Effect of RNAV Concentration on 27 Departures
2010 to 2017
Effect of RNAV Concentration on 33L Departures 2010 to 2017
COVER PAGE STATEMENT RE MIT SLIDES

We strongly urge the Massport CAC and its members to avoid drawing any specific conclusions from this preliminary material or using the material to advocate for or against any specific idea.

The material is identified by MIT as "preliminary examples to evaluate methodology only and should not be considered a representative case." We look forward to feedback and further suggestions for evaluation as Block 2 progresses.

PRELIMINARY EXAMPLE TO EVALUATE METHODOLOGY ONLY

SHOULD NOT BE CONSIDERED A REPRESENTATIVE CASE
27 Departures RNAV Waypoint Relocation
Change in $N_{60}$ Compared to 2017

Preliminary example for consideration only. May be modified or eliminated.

Population Exposure
$N_{60}$
Baseline 2017 407,357
Dispersion 388,449
Baseline - Dispersion 18,908

Modification to existing RNAV procedure

Analysis based on peak day operations; only includes 27 departures

$N_{60}$ Thresholds:
60dB $L_{A_{max}}$ Day, 50dB $L_{A_{max}}$ Night
TEXT OF THE 27 ROD
"THE FAA HAS SELECTED THE FINAL ALTERNATIVE (PREFERRED PROCEDURE) OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT.
THIS ALTERNATIVE IS EXPRESSED IN LAND USE AS FOLLOWS:
MAINTAIN RUNWAY HEADING UNTIL REACHING THE WORLD TRADE CENTER, THEN LEFT TO OVERFLY:
THE SOUTHERN END OF FT. POINT CHANNEL,
THE MASSACHUSETTS AVENUE INTERSECTION OF THE SOUTHEAST EXPRESSWAY,
AREAS OF ROXBURY,
THE CENTER OF FRANKLIN PARK, AND FOREST HILLS CEMETERY,
AND THEN TURN NORTHERLY, WESTERLY, OR SOUTHERLY IN ACCORDANCE WITH THE DESTINATION AIRPORT."
COVER PAGE STATEMENT RE MIT SLIDES

We strongly urge the Massport CAC and its members to avoid drawing any specific conclusions from this preliminary material or using the material to advocate for or against any specific idea.

The material is identified by MIT as "preliminary examples to evaluate methodology only and should not be considered a representative case." We look forward to feedback and further suggestions for evaluation as Block 2 progresses.

PRELIMINARY EXAMPLE
TO EVALUATE METHODOLOGY ONLY

SHOULD NOT BE CONSIDERED A REPRESENTATIVE CASE

MAY BE MODIFIED OR ELIMINATED
27 Departures RNAV Waypoint Relocation
Change in $N_{60}$ Compared to 2017

Preliminary example for consideration only. May be modified or eliminated.

Population Exposure

<table>
<thead>
<tr>
<th></th>
<th>$N_{60}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>407,357</td>
</tr>
<tr>
<td>2017</td>
<td>388,449</td>
</tr>
<tr>
<td>Dispersion</td>
<td>18,908</td>
</tr>
</tbody>
</table>

Analysis updated Dec 4, 2018 to correct for discretization differences

- Modification to existing RNAV procedure

N$_{60}$ Thresholds:
60dB $L_{A_{max}}$ Day, 50dB $L_{A_{max}}$ Night

Analysis based on peak day operations; only includes 27 departures
Title VI of the Civil Rights Act of 1964 and Executive Order 12898:

Require Federal agencies to achieve Environmental Justice: by identifying and addressing disproportionately high and adverse human health and environmental effects, including interrelated social and economic effects, of FAA programs, policies, and activities on minority populations and low-income populations.
BLOCK 2 RUNWAY 27 TESTS MUST NOT FURTHER BURDEN MATTapanese FOR THE BENEFIT OF OTHERS.

THAT IS A NON-STARTER.

A CIVIL RIGHTS VIOLATION.
27 Departures RNAV Waypoint Relocation
Change in $N_{60}$ Compared to 2017

Preliminary example for consideration only. May be modified or eliminated.

Population Exposure

<table>
<thead>
<tr>
<th>$N_{60}$</th>
<th>50x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 2017</td>
<td>407,357</td>
</tr>
<tr>
<td>Dispersion</td>
<td>388,449</td>
</tr>
<tr>
<td>Baseline - Dispersion</td>
<td>18,908</td>
</tr>
</tbody>
</table>

Analysis updated Dec 4 2018 to correct for discretization differences

Modification to existing RNAV procedure

Revised Methodology
For Consideration Only
Prepared by T. Dougherty

N Above 60dB LAmax Day, 50dB LAmax Night

--- Revised Path Segment

2.7 nmi

Analysis based on peak day operations; only includes 27 departures

$N_{60}$ Thresholds:
60dB $L_{A,max}$ Day, 50dB $L_{A,max}$ Night