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February 15, 2008

Dr. Barbara Lichman
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Dear Dr. Lichman,

You requested additional information on two items related to the Federal Aviation Administration's (FAA's) New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign (hereafter referred to simply as the Airspace Redesign). First, you asked whether the fuel burn analysis conducted for the Airspace Redesign is adequately documented given the materials provided in the Administrative Record for the Airspace Redesign. Second, you requested a delineation of what materials would constitute adequate documentation of the air quality impacts associated with the Airspace Redesign. My responses follow.

Adequacy of Fuel Burn Analysis Documentation.

The fuel burn analysis was performed between the December 2005 release of the Draft Environmental Impact Statement (DEIS) for the Airspace Redesign and the July 2007 release of the Final Environmental Impact Statement (FEIS).[1] As stated in the FEIS:[2]

> *"Several dozen of the comments received on the Draft EIS raised the issue of aircraft emissions. Concern about emissions came from local elected officials, special interest groups, and other agencies of the federal government. In response to these comments, The MITRE Corporation's Center for Advanced Aviation System Development (CAASD) undertook a re-run of its operational efficiency simulations to obtain estimates of the impact on fuel consumption of the Preferred Alternative and the Mitigated Preferred Alternative."*

The FAA assumes that air quality and fuel burn impacts are directly related, so that the fuel burn analysis is treated as a surrogate for an explicit air quality impact evaluation.

To investigate the adequacy of the fuel burn analysis documentation, I relied on searches of the Index to the Administrative Record performed by both staff of Chevalier, Allen & Lichman and myself.[3] Unfortunately, it is not practical to physically examine each of the thousands of

[1] Appendix R, "Effect of the New York/New Jersey/Philadelphia Airspace Redesign on Aircraft Fuel Consumption," which constitutes the only documentation of the fuel burn analysis included in the FEIS, is dated June 2007.

[2] FEIS, Appendix R, Page 1.

[3] FAA, "Index to the Administrative Record, For the Record of Decision, For the NY/NJ/PHL Metropolitan Airspace Redesign Project," December 18, 2007.

documents referenced in the Index -- so it is necessary to rely on a review of the synopsis provided for each document to determine its associated subject matter. By searching a wide range of terms, including: *fuel, burn, consumption, air quality, emission, dispersion, TAAM, Total Airspace and Airport Modeller, model, flow, integrator, Total Energy Model, MITRE, EDMS, presumed, conform,* and *delay*, I am confident that I isolated and reviewed all documents that were represented by a proper synoptic description.

With regard to air quality issues exclusive of the fuel burn analysis per se, the Administrative Record contains numerous references to air quality concerns expressed by the general public and their representatives during the FAA's public comment process, as well as various FAA materials and guidance documents related to air quality analysis. However, with the exception of the following two items, I found no record of the FAA having considered air quality impacts independent of the post-DEIS performance of the fuel burn analysis.

- In document 1747, which is a record of an EIS planning meeting held on January 16-17, 2002 at the offices of Howard, Needles, Tammen & Bergendoff (HNTB) in Alexandria, Virginia, item 11 states:

  > *"11. Air Quality: Mike Sammartino/Mo will find out from the airspace team what proposed areas of change will be below 3000 ft. Once this information is obtained then it will be decided how Air Quality is handled. Also, it is advisable to contact the EPA to find out how they would like the Air Quality measurements to be handled."*

  Unfortunately, I was unable to find any follow-up documentation in the Administrative Record that indicates whether this information was ever gathered. At a minimum, one would expect some record of conversations with the U.S. EPA.

- In document 7544, which is a comment from a public noise mitigation meeting related to the Airspace Redesign held in Woodcliff Lakes, New Jersey,[4] the commenter states:

  > *"(we) I was advised during the q&A that a study on the environmental impact in the PASCACK VALLEY AREA has not & is not needed to pass the proposal.*
  >
  > *We were told several times that "overall" emissions would be reduced (ex. less fuel used in the next x # of years) but now that we will have 600+ additional flights overhead a day. I can't believe that this proposal could take effect without advising residents of the health effects that would result with such a large increase to one specific area ~ the pascack valley" [syntax and emphasis as in original].*

  The claims referenced in the comment come at a time just prior to the release of the FEIS and are consistent with the FAA's FEIS assertions and fuel burn analysis conclusions. With the exception of the fuel burn analysis itself, which is discussed next, any other air quality considerations that took place in the intervening five year period are not documented in the Administrative Record. This is particularly troubling given that the FEIS itself cites discussions with the U.S. EPA regarding the propriety of using language

[4] Document 7544 is undated, but other forms in the Administrative Record with the same public meeting topic and location indicate a date of June 28, 2007. This would be just prior to the July 2007 release of the FEIS.

> in the preamble to the final rule for Determining Conformity of General Federal Actions to State and Federal Implementation Plans to justify a de minimis air quality impact status for the Airspace Redesign.[5] It would seem that all such discussion, along with any other agency discussions related to air quality assessment, should be included in the Administrative Record.

With regard to the fuel burn analysis, other than Appendix R of the FEIS, which constitutes the analysis report, the Administrative Record contains only two additional items of documentation specific to the analysis. The first, document 9910, is an e-mail exchange between Kim Hughes of HNTB and Joe Hoffman of Mitre. On February 9, 2007, Hoffman provides Hughes with a list of aircraft used in the 2011 Airspace Redesign study. On February 15, 2007, Hughes responds to Hoffman by providing fuel flow rates from the FAA EDMS model and indicating that she had confirmed the use of the rates (presumably within the context of the fuel burn analysis) with the FAA.

The second item, document 9911, is a bit cryptic. It also is an e-mail exchange. In the first e-mail dated February 14, 2007, between Kim Hughes of HNTB and Ralph Iovinelli of the FAA, Hughes asks for the FAA's approval to use EDMS fuel burn rates for taxi operations in the larger fuel burn analysis. The second e-mail is between Hughes and Barbara Kulvelis of HNTB confirming the FAA's approval. The February 14, 2007 e-mail is consistent with the timeline of document 9910, but the second e-mail is dated December 12, 2007 -- six months after the fuel burn analysis was complete and three months after the Record of Decision was released. I can only assume that the December 12, 2007 e-mail was sent as a means to document what was previously an undocumented oral approval.

In addition to these items, there are a number of documents in the Record that are specific to the use of the Total Airspace and Airport Modeller (TAAM), a computer model used to simulate aircraft operations under the various Airspace Redesign project options. Although these documents have some significance with regard to the fuel burn analysis, the primary focus during the time of their development was to evaluate the airspace alternatives in terms of their ability to:

> *reduce complexity, reduce voice communications, reduce aircraft delay, balance controller workload, meet system demands and improve user access, expedite arrivals and departures, provide routing flexibility, and maintain airport throughput.*[6]

Any reference to fuel burn or fuel consumption in these documents is made simply in passing, or in the context of formal modeling guides that document general model functionality and the ability of the TAAM to estimate aircraft fuel consumption. This ability, however, was not used in the operational analysis related to the Airspace Redesign until very late in the FEIS process

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[5] See, for example, §ES.6 of the FEIS (page ES-10).

[6] See, for example, §2.6 of the FEIS or the supporting technical report included as FEIS Appendix C. Both of these documents describe the use of the TAAM to evaluate the operational efficiency of the Airspace Redesign alternatives and neither mention fuel consumption impacts.

(presumably beginning in early February of 2007 given the dates of the e-mail discussions referenced above). Thus, while these TAAM documents are significant to the fuel burn analysis, they contain no discussion of how the analysis was performed for the Airspace Redesign. In effect, TAAM outputs became inputs into the fuel burn analysis and in that regard, all TAAM-related documents support the fuel burn analysis. The ability of these TAAM documents to support the FAA's fuel burn analysis conclusions is discussed in more detail below.

As with the general air quality documentation, what's missing from the Administrative Record with regard to the fuel burn analysis is perhaps as, or more, informative than what's included. There are no materials related to the decision to perform the analysis; what, if any, other options were considered; any discussion of how to perform the analysis, etc. Moreover, since, nothing in either document 9910 or 9911 adds any substantive information regarding the actual analysis performed to estimate the fuel consumption associated with the Airspace Redesign study, the entire corpus of substantive information related to the fuel burn analysis is reflected in Appendix R of the FEIS and the TAAM outputs which serve as the basis for the analysis. So the formal response to your question on the sufficiency of fuel burn analysis documentation hinges solely on the adequacy of these materials.

To determine the adequacy of the Appendix R (and related TAAM) documentation, I will address the relevant components of the fuel burn analysis in the order in which they arise in Appendix R.

(1) Section 2.1 of Appendix R describes the use of annual average day TAAM simulations as the basis for the fuel burn analysis. Appendix R does not provide the specific TAAM input or output files utilized. I was only able to identify a single document in the Administrative Record that included specific TAAM output files, that being document 9285. Document 9285 contains 494 TAAM output files dated between November 19, 2003 and November 23, 2004. These files are applicable to airspace configurations under six difference alternatives (the five in the FEIS, plus an alternative Plan A that was rejected earlier in the redesign process). Unfortunately, there is no way of knowing whether these are the exact files used to support the fuel burn analysis. TAAM was used in the Airspace Redesign study to support both peak day and average day simulations, so there should be at least two complete sets of TAAM files in the Administrative Record. Since there appears to be only this single set of files, and since they contain no descriptive data that allows easy identification of their scope, I cannot say with certainty to which set of simulations the files in document 9285 apply. As they are the only files available, I used them to support the comparative estimates described below, but there is no assurance that they are the same files used in the FAA's fuel burn analysis. This is obviously a documentation deficiency.

Of additional concern with regard to the TAAM files contained in document 9285 is the fact that a number of files are empty and many more appear to be missing. There are 70 empty files in document 9285, so that the document really consists of 106 sets of TAAM output files (each set consists of four files: a history file, a message file, a report file, and a summary file). Document 9154 provides a listing of TAAM output files.[7] Based on document 9154, Table 1 presents a list

[7] "NY/NJ/PHL Airspace Redesign Analysis Simulation Study Data Inventory," undated draft, but the list of output files includes an "as complete" date of March 30, 2004.

of the TAAM output files missing from document 9285. As indicated, there are 54 sets, or 216, missing files, some of which (No Action 2011 and IA with ICC 2011) are used in the fuel burn analysis. The omission of these files constitutes a documentation deficiency that effectively prohibits replication of the fuel burn analysis.

Table 1. TAAM Output Files Missing from Administrative Record Document 9285

Scenario	Year	Runway Configuration	Airport(s)
No Action	2006	A4	Internals, ISP, JFK, LGA, and TEB
No Action	2006	E/NE	Internals and ISP
No Action	2006	W/SW	Internals and ISP
No Action	2011	A4	Internals, ISP, JFK, LGA, and TEB
No Action	2011	E/NE	Internals and ISP
No Action	2011	W/SW	Internals and ISP
IA without ICC	2006	A4	JFK, LGA, and TEB
IA without ICC	2006	E/NE	Internals and ISP
IA without ICC	2006	W/SW	Internals
IA without ICC	2011	A4	JFK, LGA, and TEB
IA without ICC	2011	E/NE	Internals and ISP
IA without ICC	2011	W/SW	Internals
IA with ICC	2011	A4	Internals, ISP, JFK, LGA, and TEB
IA with ICC	2011	E/NE	Internals and ISP
IA with ICC	2011	W/SW	Internals
Mods to Existing	2006	A4	JFK, LGA, and TEB
Mods to Existing	2006	E/NE	HPN, JFK, and LGA
Mods to Existing	2006	W/SW	JFK and LGA
Mods to Existing	2011	A4	JFK, LGA, and TEB
Mods to Existing	2011	E/NE	HPN, JFK, and LGA
Mods to Existing	2011	W/SW	JFK and LGA

There are four output files for each TAAM scenario, so there are 54 × 4, or 216, missing files in total.

(2) Section 2.2.1 of Appendix R describes the use of a secondary fuel burn analysis tool, the so-called "fuel-flow integrator." This tool is not documented in the Administrative Record and is not a publically available resource, deficiencies that prohibit not only replication, but informed evaluation of the fuel burn analysis.

(3) Section 2.3.1 of Appendix R states that the TAAM modeling for the Airspace Redesign did not include aircraft taxi time, and that fuel consumed during such operation was therefore independently estimated using the FAA's EDMS model. EDMS is a widely used airport emissions model available for a modest fee. The EDMS fuel consumption rates for taxi

operation by aircraft were included in Administrative Record document 9910 (described above), but the associated taxi times assumed for each airspace alternative, airport, and aircraft are not documented. This is a deficiency that prohibits both replication and informed evaluation of the fuel burn analysis.

Of additional note is the fact that although the taxi operation fuel consumption rates identified in document 9910 accurately reflect the "unadjusted" fuel flow rates used in the EDMS model, the model uses "adjusted" fuel flow rates to estimate impacts. For example, taxi fuel flow rates for the application of EDMS to JFK airport (using default EDMS assumptions) are about 15 percent higher than the unadjusted rates. Neither Appendix R nor any other document in the Administrative Record describes whether similar adjustments were applied to the extracted EDMS fuel consumption rates tabulated in document 9910. This is another deficiency that prohibits both replication and informed evaluation of the fuel burn analysis.

(4) Section 2.3.2 of Appendix R states that:

> *"TAAM delays aircraft for sequencing to the runway or for spacing along a jet airway first by speed control. If the aircraft can not absorb enough time by slowing down, vectoring is the second choice. As the aircraft is flying under air traffic control instructions combining vectoring and speed control, TAAM does not change the fuel consumption. A real aircraft, when instructed to absorb delay, slows down to its minimum-fuel speed, so TAAM will overestimate fuel consumption when the aircraft is being sequenced."*

The Appendix then describes how the fuel-flow integrator (see item 2 above) was used to overcome this shortcoming. There are areas of concern with this approach that are not adequately resolved in the documentation.

First, the "TAAM Functional and Conceptual Overview" (Administrative Record document 9148) produced by the developers of TAAM states (on page 32):

> *"Calculation of the rate of aircraft fuel consumption takes into account aircraft type, weight, <u>current speed</u>, altitude and other relevant characteristics." [emphasis added]*

This would seemingly imply that TAAM is designed to adjust fuel consumption rates as aircraft are vectored or subjected to speed control. Unfortunately, because TAAM is a proprietary model developed by a wholly-owned subsidiary of Boeing, I do not have access to the source code or more detailed documentation that would allow for further exploration of the extent to which TAAM does or does not properly reflect aircraft fuel consumption. Given that TAAM is designed to allow users to accurately evaluate the efficiency and economic impacts of aviation scenarios, it seems questionable that the model would not adjust fuel consumption and fuel cost to reflect changes in the parameters that affect overall efficiency. Nevertheless, it is possible that the Appendix R adjustments are appropriate, it is simply not possible to confirm this given the apparently conflicting documentation in the Administrative Record.

Of additional and more specific concern is the lack of documentation for the developed speed correction factors. While Table 1 of Appendix R presents the basic correction data for the three aircraft that were evaluated in the fuel-flow integrator, there is no associated documentation of the fuel-flow integrator itself, the inputs used in the associated evaluation scenarios, and the

model outputs from which the correction data were derived. Moreover, although one of the three corrections was applied to each of the aircraft evaluated in the Airspace Redesign, there is no documentation of these assignments. Nor is there any documentation of the amount of time each aircraft was subjected to fuel flow adjustment or the overall magnitude of the adjustment for either individual aircraft or the overall Airspace Redesign alternatives. Finally, the basic correction data presented in Table 1 of Appendix R are presented in absolute mass terms (e.g., 22.7 kg for two minutes of delay). It is not clear whether the associated corrections were applied in absolute terms to all assigned aircraft (e.g., 11.35 kg per minute of delay), or whether a relative correction (e.g., percent change in fuel consumption during delay) was applied. This is potentially a quite significant issue since the application of absolute corrections implies the assignment of fuel consumption rates for one aircraft to those of another. Unfortunately, there is simply no way to determine what was actually done in the case of the Airspace Redesign since the documentation of this adjustment procedure is woefully inadequate.

(5) Section 2.3.3 of Appendix R describes the application of the same fuel flow correction factors described in item 4 above to aircraft hold delays. This adjustment is subject to the same lack of documentation as described in item 4.

(6) Section 2.3.4 of Appendix R describes the application of the same fuel flow correction factors described in item 4 above to aircraft departure delays. This adjustment is also subject to the same lack of documentation as described in item 4.

(7) Section 3.1 of Appendix R describes the results of the fuel burn analysis. Table 2 of the Appendix presents fuel consumption estimates for the no action and unmitigated preferred alternatives. Additionally, the associated narrative indicates that the adjustments to TAAM fuel flows generally resulted in about a 3 percent increase in fuel consumption due to departure delays and a 1-2 percent decrease in fuel consumption due to speed corrections. Unfortunately, because the corrections are not adequately documented, as described in items 3-6 above, it is not possible to determine either the magnitude of individual corrections or variation across Airspace Redesign alternatives.

Nevertheless, in an effort to determine the potential significance of the corrections, I analyzed the TAAM output files included in Administrative Record document 9285 (see item 1 above). As indicated in item 1 above, there is no way to know whether these files are associated with an average demand day (consistent with the Appendix R fuel burn analysis) or a high demand day (consistent with the Airspace Redesign operational analysis). I assume that they reflect the latter, but they are still useful for evaluating the potential significance of the fuel burn corrections. Additionally, since most of the modeling scenarios reflected in the TAAM output files represent simulations of greater than 24 hours duration (some cover a period as long as 48 hours), I extracted TAAM fuel burn data for only the first 24 hours of each simulation. Table 2 presents the resulting data.

Table 2. Estimated Aircraft Fuel Consumption (kg/day, unless otherwise specified)

	FEIS Appendix R Table 2.1 (Corrected)			24 Hour TAAM Output (High Capacity)			24 Hour TAAM Output (Low Capacity)		
	No Action 2011	IA w/ICC 2011	Benefit 2011	No Action 2011	IA w/ICC 2011	Benefit 2011	No Action 2011	IA w/ICC 2011	Benefit 2011
EWR	6,640,480	6,583,252	57,229	8,231,348	8,433,572	-202,224	8,270,887	8,584,092	-313,205
PHL	4,743,119	4,686,764	56,355	5,059,038	5,093,444	-34,406	5,100,858	5,107,540	-6,682
JFK	8,328,735	8,287,755	40,980	7,192,802	7,199,415	-6,613	7,254,175	7,264,835	-10,660
LGA+HPN	2,874,567	2,841,432	33,135	4,119,612	4,150,003	-30,391	4,157,711	4,216,465	-58,754
Internals	57,175	42,943	14,232	0	0	0	0	0	0
ISP	278,473	265,729	12,745	0	0	0	0	0	0
TEB+MMU	527,269	537,024	-9,755	1,122,974	1,137,327	-14,353	1,162,440	1,149,415	13,024
Total	23,449,818	23,244,898	204,920	25,725,774	26,013,761	-287,987	25,946,071	26,322,348	-376,277
Pct. Change			0.9%			-1.1%			-1.5%
Gallons/day			66,436			-93,367			-121,991

1. The total fuel consumption in FEIS Appendix R Table 2.1 is reported to be 16,809,338 for the no action alternative and 16,661,646 for the IA with ICC alternative. These values erroneously exclude EWR and have been corrected for this table. The total reported benefits in FEIS Appendix R Table 2.1 were correct and are, therefore, unchanged in this table.
2. The gallons per day benefit reported in FEIS Appendix R is 66,840. The value reported in this table is marginally lower and the difference is undoubtedly the result of differing conversion factors. For this table, it was assumed that the density of aviation fuel was 6.8 pounds per gallon and that there are 2.2046 pounds per kilogram. The specific assumptions employed in FEIS Appendix R are not reported.
3. The TAAM data reported in this table are based on the only TAAM output files included in the Administrative Record. It is suspected that the files are for high demand scenarios (as opposed to average demand scenarios). The only adjustment made to the TAAM output is that only fuel consumption data for the first 24 hours of each TAAM scenario are considered. Since the context of these data in this evaluation are solely to demonstrate basic fuel consumption relationships and not absolute values, the use of high demand scenarios should be irrelevant.
4. Negative benefits signify a net increase in fuel consumption.

The first three data columns of Table 2 simply reproduce the fuel burn data presented in Table 2 of Appendix R. As indicated, Appendix R estimates a modest fuel consumption decrease of just under 1 percent for the preferred IA w/ICC (Integrated Airspace with Integrated Control Center) alternative. This impact derives from the basic fuel consumption estimates of TAAM combined with EDMS and fuel-flow integrator adjustments. The next three data columns depict corresponding data derived from the high capacity runway configuration TAAM output files of Administrative Record document 9285. The rightmost three data columns depict corresponding data derived from the low capacity runway configuration TAAM output files of Administrative Record document 9285.

The results indicate that the adjustments to the basic TAAM-estimated fuel consumption may provide the *entire* rationale for concluding that fuel consumption will be reduced under the preferred alternative. As indicated, the basic TAAM scenarios predict fuel consumption *increases* of 1.1 percent under the high capacity runway configurations and 1.5 percent under the low capacity configurations. The predictions are directly consistent across all airports (i.e., all

show increases), but are most pronounced at EWR, which accounts for 70-85 percent of the total change.

Whether the TAAM runs from Administrative Record document 9285 reflect the TAAM runs used to support the Appendix R fuel burn analysis is uncertain. This in and of itself constitutes a serious documentation deficiency. Nevertheless, these runs show that it is critical that the TAAM fuel burn adjustments be fully documented so that a proper and complete evaluation can be conducted. In the absence of the adjustments, TAAM seemingly implies a fuel burn increase under the preferred alternative. The reasons for this and the propriety of subsequent adjustments, which in and of themselves *completely alter this conclusion*, need to be fully understood before the validity of the Appendix R fuel burn analysis can be confirmed. Unfortunately, this is not possible given the documentation available in the Administrative Record.

Since the comparative estimates are in direct opposition to the impacts presented in Appendix R, it would also be appropriate to include consideration of the other Airspace Redesign alternatives in the fuel burn analysis (Appendix R only considers the no action and preferred alternatives). Based on the TAAM output files included in Administrative Record document 9285, only the ocean routing alternative generates fuel savings relative to the no action baseline. However, because of the above described uncertainty in the validity of the TAAM files included in document 9285, I have chosen not to present estimates for each alternative. Suffice it to say, that with the exception of alternative Plan A, which was rejected prior to the development of the FEIS, *all* Airspace Redesign options demonstrated TAAM-specific fuel consumption estimates that were less than the preferred alternative.

I hope that this discussion has adequately demonstrated why I believe the Administrative Record documentation is significantly inadequate with regard to the ability of a reviewer to fully evaluate and confirm the conclusions of the Airspace Redesign Record of Decision. This is especially true given the absence of any materials describing the process leading up to the decision to undertake a fuel burn analysis (such as e-mail or other correspondence describing background discussions, option presentations, analysis methodologies, contracts, etc.).

Materials Required to Adequately Document an Air Quality Impact Determination.

While a listing of the materials that would be required to adequately document an air quality impact determination might seem a straightforward request, I will, unfortunately, have to provide a "menu" of responses. This is necessitated because the air quality impact analysis for the Airspace Redesign is an unconventional analysis. Therefore, I will first delineate what would be necessary to bolster the documentation that currently exists in the Administrative Record for the Airspace Redesign to the point where it is complete and fully reviewable. I will then provide a second option that addresses a more typical air quality analysis. It is, of course, possible to generally describe the items that should be included as an integral component of adequate documentation for any analysis. Such items include a complete description of the data and methodologies employed, and the inclusions of all materials and data necessary to allow an informed reviewer to fully evaluate, and replicate if necessary, the subject analysis.

(1) To demonstrate the adequacy and fully document the fuel burn analysis conducted for the Airspace Redesign, the FAA would need to produce the following materials:

- Background materials related to the consideration of performing a fuel burn analysis in lieu of a more conventional air quality analysis. This would especially include any materials related to communications between the FAA and the U.S. EPA.
- All materials supporting a contention that changes in the associated airspace design do not negatively impact operations below the meteorological mixing height either in terms of the number of aircraft operations or time or distance flown. If such a demonstration cannot be shown, then a conventional ground level air quality analysis will also be required as per item 2 below. A fuel burn analysis will not suffice for this purpose since the emission rates for some emission species are inversely related to fuel consumption across aircraft operating modes (e.g., HC and CO emissions are highest during low fuel consumption taxi operations). A fuel burn analysis will only correlate with emissions in cases where all emissions differentials accrue during aircraft operating modes that are constant across alternatives.

  As stated in FEIS Appendix R describing the fuel burn analysis:

  > *"This study did not attempt to distinguish fuel burned below the mixing layer at each airport from fuel burned above. Over such a large study area, the total fuel consumed was a more appropriate metric.*
  >
  > *Fuel burned by service vehicles on the airport surface is typically part of an airport emissions analysis. It is not included here. Service vehicle emissions are assumed constant over all alternatives in this study because the flight schedules do not change." [emphasis added]*

  Without additional support, these are subjective statements. That FAA has, of course, routinely used the unsupported (and counter-economic) argument that the volume of aircraft operations are unaffected by airport throughput -- one of the primary efficiency indicators of the preferred Airspace Redesign alternative. Even if one accepts this erroneous assertion, it in no way provides support for ignoring fuel burned below the meteorological mixing height simply because the study area is so large. For example, changes in airport taxi times or changes in either approach or climbout procedures can affect aircraft operations and associated emissions below the mixing height.
- All materials supporting a contention that changes in the associated airspace design do not negatively impact ambient air quality concentrations due to modifications in the geographic distribution of aircraft below the meteorological mixing height. If such a demonstration cannot be shown, then a conventional ground level air quality analysis will also be required as per item 2 below
- TAAM documentation sufficient to determine the fuel burn algorithms employed and any associated sensitivity (or insensitivity) to changes in operations induced by Airspace Redesign. Only with such materials can the propriety of TAAM adjustments be determined.
- All TAAM input and output files used to support fuel consumption estimates.

- Documentation of how daily emissions were estimates from TAAM simulations that varied in length from less than one day to two days or more.
- Documentation for the Mitre fuel-flow integrator sufficient to determine the fuel burn algorithms employed.
- All fuel-flow integrator input and output files used to support fuel consumption estimates.
- Documentation of how the fuel-flow integrator fuel consumption estimates were used to produce TAAM adjustments, including a detailed description of what adjustments were applied to specific aircraft and a detailed description of the magnitude of delays subjected to adjustment by aircraft and Airspace Redesign alternative.
- A description of which version of the EDMS model was used to estimate taxi operation fuel consumption.
- Documentation of the aircraft and engine assignments used for the Airspace Redesign evaluation. This material is currently included in the Administrative Record.
- Documentation of whether EDMS-based fuel consumption rates were adjusted in accordance with Fuel Flow Method 2 (as per EDMS function) and, if so, the magnitude of those adjustments at the level of resolution applied.
- Aircraft taxi and idle times by Airspace Redesign alternative, at the level of resolution used to estimate EDMS-based fuel burn corrections.
- Documentation of the process used to estimate and adjust the basic TAAM fuel burn estimates, with all associated data provided at the level of resolution used to produce the overall fuel consumption estimate for each Airspace Redesign alternative.
- Analysis results presented in detail sufficient to determine the unadjusted TAAM fuel burn estimates and the individual impacts of *each* adjustment to those estimates. The magnitudes of the individual adjustments are necessary to determine the sensitivity of overall impact estimates to each adjustment procedure.

(2) To demonstrate the adequacy and fully document a conventional air quality analysis for the Airspace Redesign, the FAA would need to collect additional data and perform substantial additional analysis. To some extent, it seems somewhat incongruous to delineate these requirements here as the federal government and the FAA itself has an extensive array of legislation, regulations, executive orders, departmental orders, and directives -- which in total describe the requirements for and methodologies available to demonstrate compliance with air quality evaluation requirements. The following is but an abbreviated description of the various materials that should be included as documentation for a conventional air quality analysis, as more fully described in the formal procedural guidance for the associated federal requirements:

- Background materials related to the consideration of performing an air quality analysis. This would especially include any materials related to communications between the FAA and the U.S. EPA.
- Materials related to the detailed geographic description of the affected study area, including any changes to the area as a result of the implementation of Airspace Redesign

alternatives. Generally, this would include the location and configuration of runways and taxiways, the location and design of terminal facilities and aircraft gates, the location of roadways, the location and size of parking facilities, and the location and characteristics of ancillary support facilities (e.g., rental car operations, cargo handling areas, etc.). For a project such as the Airspace Redesign, it is likely that most of these descriptions will be constant across the evaluated alternatives, but operations may shift across runways or between airport facilities in response to airspace changes.

- All materials related to the operation of aircraft below the meteorological mixing height. Generally speaking, the meteorological mixing height is assumed to be approximately 3000 feet, but, due to significant geographic variability, locality-specific data should be substituted when available (local data can usually be derived from nearby climatology stations, which are typically located at airports). This would include the number of operations, the type of aircraft and associated engines performing those operations, the associated engine taxi and idle time, the timing of operations, etc. This would also include any change in operational activity due to the implementation of the Airspace Redesign alternatives. Impacts above the mixing height are generally considered to be "categorically excluded" from air quality analysis requirements due to their minimal impacts on ground level air quality.[8] It is possible that such exclusions will be revisited in the near future in the context of non-local emissions impacts (e.g., global warming emissions), but current procedures generally assume the exclusion of such impacts.
- All materials related to the operation of non-aircraft airport-related sources such as terminal operations, vehicle movement, ground support equipment operation, construction-related emissions, etc. Generally, these materials should describe the volume, frequency, timing, and data required to determine the emission rates of such operations. This would also include any change in operational activity due to the implementation of the Airspace Redesign alternatives.
- All materials related to the selection of the analysis years in which to evaluate air quality impacts. Generally speaking, such analysis years must include milestone years defined under local air quality attainment efforts as well as years of maximum emissions or maximum expected impact.
- All materials related to the development of emissions inventories for the affected aircraft and non-aircraft sources. This would include a description of the models or approaches employed (e.g., EDMS for aircraft, MOBILE6.2 for motor vehicles, etc.), a fully detailed set of assumptions and input data used to evaluate the models or conduct the analysis, and fully detailed sets of output data produced by the emissions model(s) or generated by the emissions analysis.
- Materials related to the collection of baseline air quality concentration data, necessary to establish a baseline estimate of the background air quality conditions within and around the affected area. Generally, this consists of the collection and analysis of data from

[8] See, for example, "Consideration of Air Quality Impacts By Airplane Operations at or Above 3000 feet AGL," Final Report, FAA-AEE-00-01, DTS-34, September 2000 (document 9809 of the Administrative Record).

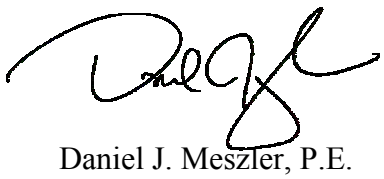
nearby permanent or temporary (often established specifically for the air quality evaluation) air quality monitoring stations.

- Materials related to the extrapolation of baseline background air quality concentration data to future evaluation years.
- Materials related to the performance of detailed air quality dispersion modeling designed to estimate air quality concentrations throughout the affected area when the impacts due to the estimated emissions from sources in the affected area are combined with estimated background concentrations. Such materials would include detailed descriptions of the meteorology and topography of the affected area, descriptions of the placement of air quality receptors, a detailed description of the model(s) employed, documentation of associated input and output data, and a detailed discussion of analysis results.
- Materials related to the determination of whether the estimated air quality impacts cause or contribute to new or exacerbated violations of an ambient air quality standard.
- Documentation of whether the estimated emission impacts exceed federal conformity determination thresholds and, if so, documentation of a detailed conformity analysis.
- Materials related to the development, consideration, and impacts of potential air quality (or other impact) mitigation measures. To the extent that these measures affect air quality, their impact will need to be evaluated though adjustments to the affected emissions estimates and re-evaluation of the associated ambient air quality impacts using the basic methods, and necessitating the same documentation, as described above.

Since the Airspace Redesign did not include a conventional air quality analysis, virtually none of these materials are included in the Administrative Record for the Airspace Redesign. The only obvious exception involves documentation related to the volume and type of aircraft operations and associated engine assignments, as such materials are also required for aircraft noise analysis (and such analysis was included in the Airspace Redesign evaluation).

I hope that this information adequately addresses your questions. If you have any additional questions or require any additional information related to the discussion above, please do not hesitate to call or e-mail.

Respectfully,



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