

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

-----X

FRIENDS OF THE EAST HAMPTON AIRPORT, INC.,
ANALAR CORPORATION, ASSOCIATED AIRCRAFT
GROUP, INC., ELEVENTH STREET AVIATION LLC,
HELICOPTER ASSOCIATION INTERNATIONAL, INC.,
HELIFLITE SHARES LLC, LIBERTY HELICOPTERS
INC., SOUND AIRCRAFT SERVICES, INC., and
NATIONAL BUSINESS AVIATION ASSOCIATION INC.,

No. 15 Civ. 2246 (SJF) (ARL)

Plaintiffs,

-against-

THE TOWN OF EAST HAMPTON,

Defendant.

-----X

EXPERT DECLARATION OF TED BALDWIN

I, TED BALDWIN, make the following declaration pursuant to 28 U.S.C. § 1746:

1. I was retained by Defendant Town of East Hampton to conduct analyses to define noise problems related to operations at East Hampton Airport (“HTO” or “Airport”), identify potential approaches to address those problems, estimate the operations that would be affected by restrictive alternatives, estimate the noise complaints associated with the restricted operations, report on the results, and prepare implementation-related materials for the restrictions that the Town Board selected for adoption.

2. I have been retained by Defendant’s counsel to provide expert testimony in support of Defendants’ response to Plaintiff’s motion for a temporary restraining order.

EDUCATION AND EXPERIENCE

3. I received a Bachelor of Science in Engineering degree from Cornell University in 1975 and a Master of City and Regional Planning degree from Harvard University in 1977.

4. I currently am a Senior Vice President and Supervisory Consultant with Harris Miller Miller & Hanson Inc. d/b/a HMMH. I joined the firm in April 1984. I specialize in aviation noise projects.

5. From 1981 to 1984, I was employed by Bolt Beranek and Newman Inc. (“BBN”) as an environmental noise consultant, specializing in aviation-related noise assessment, abatement analyses, and compatible land use planning.

6. From 1977 to 1981, I was employed the Massachusetts Port Authority (“Massport”), including a number of positions in the Noise Abatement Office and culminating in the position of “Airport Planner” in the Massport Aviation Division. My primary responsibilities at Massport related to aviation-related noise assessment; implementation of Massport’s extensive noise abatement program; and identification, analysis, recommendation, and implementation of potential program enhancements.

7. Over the course of my career, I have assisted over 75 airports on a diverse range of aviation noise assignments, including 14 Code of Federal Regulations (“CFR”) Part 150 noise compatibility planning studies, 14 CFR Part 161 use restriction studies, state and federal environmental impact studies and assessments, noise elements of airport master plans, aircraft noise abatement and compatible land use planning and implementation, noise and operations monitoring system design and implementation, noise measurement, noise modeling, aviation noise stakeholder outreach programs, professional training, and expert testimony.

ASSIGNMENT

8. In an October 30, 2014 Special Meeting, the East Hampton Town Board heard a joint citizen and consultant presentation on disturbance from operations at East Hampton Airport. The presentation proposed a “preliminary draft problem definition” and a “list of potential alternatives to address that definition.” HMMH was not involved in preparing or making that presentation. At that meeting, the Town Board reached consensus to proceed with development of: (1) a final problem definition and (2) a refined list of alternatives that offer the best promise for addressing that problem.

9. I was retained by Defendant in November 2014 to lead HMMH assistance in: (1) development of the final problem definition, (2) identification and refinement of potential restrictions to address that problem definition, (3) refining activity categories that fall under the problem definition, including aircraft type, operation type, and temporal aspects, (4) conducting research into helicopter noise characteristics and effects, (5) estimation of the operations affected by potential use restrictions, (6) estimation of the noise complaints associated with those affected operations, (7) coordinating with airport operators to assess voluntary approaches to addressing the problem definition, (8) making public presentations on study results, (9) developing a definition of “noisy aircraft” and identifying the aircraft types that would fall under it, (10) documenting HMMH’s data collection and analyses, and (11) preparation of implementation-related materials for restrictions that the Town Board selected for adoption. HMMH’s analyses were based on complaint and operations data for the 12 months from November 1, 2013 through October 30, 2014, in order to evaluate the most current feedback on aircraft operations and compare that feedback to the varying levels of activity at the airport over the same time period.

The complaint data were obtained from the HTO PlaneNoise complaint system. The operations data were obtained from the HTO Vector operations-monitoring system.

10. The April 10, 2015 memorandum that I coauthored with my colleague Sean Doyle, titled “Documentation of HMMH Noise Analyses,” (attached as **Exhibit 1**) presents a detailed description of the data sources, assumptions, citations, analytical processes, etc., that HMMH used in preparing information the Town Board took into account in making decisions that led to the use restrictions implemented by the Town on April 16, 2015. That memorandum and other HMMH-prepared materials to which it refers are posted on the Town’s website or on a project-specific website (www.htoplanning.com) that presents the administrative record for the legislative process.

11. Based on the data I analyzed (operations and complaint data from November 1, 2013 to October 31, 2014), I concluded that if the three use restrictions enacted by the Town (the curfew, extended curfew and two operations per week limit in Season) had been in place over that 12-month period, they would have affected under 23% of total operations, while addressing the cause of over 60% of the complaints, with individual effects on operations as follow:

Proposed Restriction(s)	Estimated Operations Affected November 1, 2013 – October 31, 2014		
	Helicopter	Fixed- Wing	All Aircraft
1) 11 pm – 7 am curfew on all operations	199	382	581
2) 8 pm – 9 am curfew on all noisy operations	973	270	1,243
3) Noisy aircraft limited to two operations per week in season	3,715	283	3,998
TOTAL OUTCOME OF RESTRICTIONS 1 - 3	4,887	935	5,822

To put this into perspective for the pending motion seeking a temporary restraining order, I reviewed the data from just May 2014. In May alone, the restrictions would have affected far fewer operations:

Proposed Restriction(s)	Estimated Operations Affected in May 2014		
	Helicopter	Fixed- Wing	All Aircraft
1) 11 pm – 7 am curfew on all operations	11	26	37
2) 8 pm – 9 am curfew on all noisy operations	66	12	78
3) Noisy aircraft limited to two operations per week in season	285	15	300
TOTAL OUTCOME OF RESTRICTIONS 1 - 3	295	51	346

12. I have been requested to review and comment on the Plaintiffs’ motion for a temporary restraining order and the expert declarations of Mr. Andrew S. Harris and Mr. D. Kirk Shaffer, which were filed in support of the motion, and to provide opinions regarding the reasonableness of the Town’s approach and appropriateness of the data on which it relied.

Comments on Expert Declaration of Mr. Andrew S. Harris

13. Mr. Harris states in ¶15 of his declaration that the Town relied on “solicited, self-reported complaints to a Town website or a telephone hotline.” He repeats that assertion in ¶19, where he states: “It is my understanding that the complaints called in to the hotline were solicited.” The term “solicited” is inaccurate. Similar to airports across the county, the Town *accepts*, not solicits, noise complaints submitted via webform, telephone, and email, to use in obtaining community input on general issues of concern, and on specific operations that citizens consider unusually low, loud or otherwise worthy of feedback or about which they request further information. The Town has contracted with PlaneNoise to provide an efficient, easily accessible, user-friendly means for any affected party to file noise complaints with the Town, for the Town to compile information on community concerns, and to identify individual operations or categories of operations meriting investigation. As appropriate, the Airport staff members communicate with individual pilots, aircraft operators, the Airport Traffic Control Tower staff, or other entities to alert them to the operations of concern, to obtain information about those

operations, and to identify corrective actions. As appropriate and requested, the Airport staff also provides responses to complainants on information the Town is able to obtain regarding the operations of concern and any actions taken. The acceptance of complaints for investigation and response, and the assembly of complaint data into a database for long-term trend analyses is standard operating procedure for a responsive airport noise abatement program. Many airports use third-party services to improve the efficiency of complaint processing. PlaneNoise is applied at airports on a stand-alone basis or integrated into a monitoring system. The acceptance of PlaneNoise as a state-of-the-art tool is reflected by its application at a broad range of airports other than HTO, including the five operated by the Port Authority of New York and New Jersey, Massport's Boston-Logan International (Massachusetts), Naples Municipal (Florida), Charlotte-Douglas International (North Carolina), Destin-Ft. Walton Beach (Florida), and others. PlaneNoise is just one such type of tool; most modern airport noise and operations monitoring systems include similar capabilities; *e.g.* the Brüel and Kjær ANOMS™ and the Exelis EnvironmentalVue™ products. Complaint data collection using these tools or manual data collection processes is a generally accepted practice for a broad range of airport noise abatement and community liaison purposes, including studies of restrictive and non-restrictive noise abatement approaches.

14. Mr. Harris states in ¶15 of his declaration that “FAA regulations mandate that airport noise studies be conducted under different procedures that were not followed [at East Hampton].” That is not correct. First, airport noise studies are only mandated under specific circumstances that apply only to the FAA itself; *i.e.*, noise studies conducted by the FAA to ensure agency compliance with the requirements set forth in the Council on Environmental Quality (“CEQ”) regulations for implementing the provisions of the National Environmental

Policy Act of 1969 (“NEPA”), 40 CFR Parts 1500-1508; Department of Transportation Order DOT 5610.1C, “Procedures for Considering Environmental Impacts;” and other related statutes and directives. While mandatory procedures apply to those studies, the study requirements apply to the FAA, not to individual airports.

15. Second, airport proprietors may *voluntarily* opt to conduct noise studies under 14 CFR Part 150, “Airport Noise Compatibility Planning,” or under 14 CFR Part 161, “Notice and Approval of Airport Noise and Access Restrictions,” which does include mandatory procedures. Airport proprietors also may opt to conduct independent noise studies outside of 14 C.F.R Parts 150 or 161 for a variety of locally relevant purposes, as in this instance. In those situations, airport proprietors may choose the techniques that they determine are most applicable to local needs; mandatory Part 150 and 161 procedures do not apply.

16. Mr. Harris further states in ¶15 of his declaration that “past studies conducted by the Town in accordance with the procedures mandated by the FAA have confirmed that noise generated by aircraft using HTO is below acceptable thresholds defined in the FAA’s regulations.” The only FAA regulation that defines “acceptable thresholds” of aircraft-generated noise is 14 CFR Part 36, “Noise Standards: Aircraft Type and Airworthiness Certification.” That regulation only applies to FAA certification of aircraft designs to receive new or revised “type certificates” for production or modification of aircraft to operate in the U.S. Those thresholds do not apply to airport noise abatement or land use compatibility studies of the type that the Town has conducted in the past or as part of the process leading to its recent adoption of three use restrictions

17. The FAA has explicitly delegated to local authorities the responsibility for determining acceptable thresholds of noise exposure for land use compatibility purposes when

conducting noise abatement studies under federal regulations. 14 CFR Part 150 §A150.101, “Noise contours and land usages,” includes a table (Table 1) titled, “Land Use Compatibility With Yearly Day-Night Average Sound Levels.” Footnote 1 to that table states: “The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.” 14 CFR Part 161 §161.11 states that “[f]or purposes of this part, uses of land that are compatible or noncompatible with various noise-exposure levels to individuals around airports must be identified in accordance with criteria described under appendix A of 14 CFR part 150.” Even for purposes of 14 C.F.R Part 150 or 161 studies, there are no FAA-defined “acceptable thresholds” of noise exposure.

18. In ¶23 of his declaration, Mr. Harris states that “the Town’s methodology of using a telephone hotline to solicit complaints from residents is not a valid or generally accepted industry method for determining overall community attitudes about residential noise exposure, let alone for imposing airport access restrictions. As discussed in ¶17 of this declaration, the FAA clearly states that airport proprietors should consider “locally determined needs and values” when considering restrictive or non-restrictive abatement alternatives, under 14 CFR Part 150 or 161. Clearly the same local determination applies to studies conducted outside of federal processes. In this instance, the Town chose to consider unsolicited noise complaint statistics in developing a problem definition and assessing the potential effect of alternative restrictions.

19. Noise complaints are a valid basis for cataloguing noise concerns, developing noise problem statements, identifying noise abatement alternatives for consideration, and assessing the effectiveness of implemented measures. In my professional experience, use of noise complaints for these purposes is an industry-standard practice in all types of noise studies, including Part 150 and 161 studies, and studies that are more explicitly tailored to specific local needs and conditions.

20. In my professional experience, noise complaints reflect concerns and reactions of larger numbers of stakeholders with similar exposure to aircraft operations and noise, and actions taken to address complaints will address the concerns those larger numbers of individuals.

21. In ¶23 – 24 of his declaration, Mr. Harris raises the concepts of “annoyance” with noise, “response” to noise, and “impact” of noise. He quotes from page 13 of the April 10, 2014 HMMH memorandum titled “Review of Studies that Address Effects of Helicopter Noise,” where it states: “Surveyed reaction is a formal measure that is collected through mail, telephone, or in-person surveys which are carefully designed to produce unbiased responses.” That quote must be considered in its original context, including the two preceding sentences: “However, in considering the studies, the distinction between complaints and annoyance should be kept in mind. Complaints are reactions to annoyance, while annoyance, as defined by legislation for the FAA, is a surveyed reaction to noise.” The Town’s express purpose in using complaint statistics was to gauge community reaction to aircraft operations; *i.e.*, actual behavioral response induced by the operations and associated annoyance.

22. In ¶25 – 34 of his declaration, Mr. Harris further elaborates on application of the 14 C.F.R Part 150 and 161 regulations and their specific requirements, including the use of the “Day-Night Average Sound Level” (“DNL”) metric, which he cites as “the standard mandated

by the FAA in determining the existence of airport noise problems under Part 150.” However, those requirements regarding the use of DNL are not relevant in this instance, because the Town was not conducting either of these types of studies.

23. It should be noted that the Town did consider DNL at several stages in the process that led to the restrictions it selected for implementation, including work conducted by HMMH itself in 2003, the 2010 Generic Environmental Impact Statement, and the “Phase 1” noise analyses presented at the October 30, 2014 Special Meeting of the Town Board. The Town Board reached the appropriate conclusion that DNL was insensitive to local issues of concern and was not an appropriate metric to use in assessing noise abatement options. This conclusion was an appropriate basis for the Town to design and follow a locally sensitive noise analysis process other than Part 150 or 161, which rely on the DNL metric.

24. In ¶35 – 38 of his declaration, Mr. Harris asserts that “the complaints relied upon by the Town are unreliable.” He goes on to cite complaint statistics that the Town Board used in arriving at a noise problem definition. The statistics he cites are facts. At no point does he provide actual evidence that the complaints are unreliable. The Town Board carefully considered these same factual complaint statistics in arriving at their conclusions about the existence and nature of a noise problem, and the appropriate approach to take in addressing that problem. That process is the responsibility of the Town Board and no other party.

25. In ¶39 – 50 of his declaration, Mr. Harris asserts that the restrictions’ reliance on EPNdB approach levels to classify “noisy” aircraft is inappropriate. That statement conflicts with FAA regulation of aircraft noise emissions under 14 CFR Part 36, “Noise Standards: Aircraft Type and Airworthiness Certification.” Since 1969, FAA has employed EPNdB to classify the noisiest and largest aircraft under that regulation.

26. Specifically, the Aircraft Noise Abatement Act of 1968 (Public Law 90-411) directed the FAA Administrator to “prescribe and amend standards for the measurement of aircraft noise and sonic boom and shall prescribe and amend such rules and regulations as he may find necessary to provide for the control and abatement of aircraft noise and sonic boom, including the application of such standards, rules, and regulations in the issuance, amendment, modification, suspension, or revocation of any certificate authorized by this title.” The FAA created Part 36 to address this requirement, by setting standards for FAA approval of aircraft designs to receive new or revised “type certificates” for production or modification to operate in the U.S. When first promulgated in 1969, Part 36 only applied to transport-category large and turbojet-powered airplanes, the loudest aircraft types operating at that time. The transport category includes jets with takeoff weights over 12,500 pounds, and propeller-driven airplanes over 19,000 pounds. The rule set separate measurement requirements and limits for takeoff, sideline, and approach locations, in terms of “Effective Perceived Noise Level” (“EPNL”), a metric that takes noise level, duration, and pure tones into account. Amendments to Part 36 have increased the stringency of EPNdB standards for these aircraft categories and extended it to apply to a broader range of aircraft, including propeller-driven small aircraft, propeller-driven commuter category aircraft, civil-supersonic jets, helicopters, and tiltrotor aircraft. The amendments prescribe or allow use of metrics other than EPNdB for some aircraft types. However, EPNdB continues to be the prescribed standard for noise-certification of all jets, all transport-category large aircraft, and helicopters with maximum gross takeoff weights of 7,000 pounds or more. Only light-weight propeller-driven aircraft and light-weight helicopters must or may be certified using other metrics.

27. In ¶51 – 54 of his declaration, Mr. Harris addresses voluntary noise abatement efforts at HTO. ¶51 – 52 summarize background. In ¶53 Mr. Harris states his opinion that the Town failed to undertake “robust analysis of less restrictive measures, including voluntary noise abatement procedures.” In fact, the Town has pursued voluntary, non-restrictive noise abatement efforts for well over a decade. HMMH has been involved with such voluntary, non-restrictive efforts since 2003, as documented in the April 2015 East Hampton staff report titled “Development of Proposed Access Restrictions at East Hampton Airport, A Staff Compilation for the Town Board” (see pages 3 and 4). (I understand that this document is provided as Exhibit 1 to Supervisor Cantwell’s Declaration). Since at least 2003, the Town has worked continuously and cooperatively with airport pilots and operators to develop voluntary procedures, share feedback on their effectiveness, and refine them accordingly.

28. Mr. Harris notes in ¶53 that the Town amended the voluntary helicopter abatement procedures in 2014, including original publication on April 30, 2014 and revision on June 2, 2014. However, despite even those adjustments in the early part of the season, the Town received a record number of noise complaints in 2014. The Town Board reached the legitimate conclusion that voluntary, non-restrictive noise abatement measures were insufficiently effective.

29. To ensure that airport users had every opportunity to propose new non-restrictive alternatives, HMMH, Town Board, and airport staff representatives consulted and met with representatives of major helicopter and fixed-wing operator constituencies, and fixed-base operator, fuel provider, ground-support businesses on January 21, 2015. The meeting addressed the Town’s interest in feedback on voluntary abatement procedures pursued in the 2014 summer season, as amended; approaches taken to monitor, assess, and report on compliance; special circumstances meriting consideration in assessing compliance, such as weather, traffic levels,

etc.; the most effective means for communicating with operators and pilots to promote compliance; the most valuable feedback to provide operators and pilots to enhance compliance; and ideas for building on “lessons learned” in the 2014 season. At the conclusion of the meeting and in a follow-up email, the Town representatives followed up with a request for feedback on these topics. The Town did not receive any response.

Comments on Expert Declaration of Mr. D. Kirk Shaffer

30. In Section A.2 of his declaration, “Noise Mitigation Under the Federal Regulatory Scheme,” Mr. Shaffer summarizes steps and requirements of the Part 150 and Part 161 regulations. However, as noted in the preceding response to Mr. Harris’s declaration, those steps and requirements do not apply to noise studies that an airport proprietor chooses to take outside of those regulations.

31. In Section B.1 of his declaration, “The Restrictions are Unprecedented,” Mr. Shaffer states his opinion that “because the Town did not comply with Part 150 and Part 161, the FAA’s established policy and practice would require rejection of the Restrictions.” FAA policy and practice do not govern airport noise abatement efforts conducted outside of Part 150 and Part 161. Many airports with comprehensive noise abatement programs developed those programs outside of Part 150 and Part 161, and have continued to refine them after the FAA promulgation of those regulations.

32. My first professional positions in the Massport Noise Abatement Office are a highly relevant example of formal, mandatory noise abatement measures developed outside of any federal program. I was initially hired to assist in the implementation of a number of voluntary and restrictive noise abatement measures at Boston-Logan International Airport, which

were effective on January 1, 1977. Those measures included a formal restriction of the percentage of operations that any operator could conduct in aircraft that did not meet the FAA's most stringent Part 36 certification standards in effect at the time. This rule applied only to jet or turboprop aircraft with maximum certificated gross takeoff weights of 75,000 pounds or greater. The measures also included a mandatory ban on maintenance runups between midnight and 6 a.m., a mandatory ban on flight training operations between 11 p.m. and 7 a.m., a mandatory 24-hour ban on intersection takeoffs, and a mandatory 24-hour ban on operations on and off one sensitive runway end that applied to all jets and all propeller-driven aircraft with maximum certificated gross takeoff weights over 12,500 pounds.

33. Between 1977 and 1981, I assisted in the development of a late-night aircraft restriction that became effective on January 1, 1981. That restriction was a mandatory ban on operations between 10:30 p.m. and 7:00 a.m. in jet or turboprop aircraft that did not meet at least the minimum Part 36 certification standards in effect at that time.

Opinions Regarding the Town's Actions

34. Based on my professional experience in the field of aircraft noise, my personal involvement in the Town's processes to address noise issues arising from operations at HTO, and my review of analyses and input provided by other consultants and citizens, I have reached the following conclusions regarding the reasonableness of the Town's approach, the appropriateness of the data on which it relied, and the reasonableness of actions it has taken.

35. The Town followed an appropriately comprehensive, methodical, and meticulous approach to defining noise problems associated with aircraft operations at HTO.

36. The Town made unusually extensive efforts to ensure that its approach was open, transparent, and well-documented.

37. The Town offered unusually extensive opportunity for all stakeholders to provide input to the definition of the noise problem, to identify potential actions to take to address the problem, to review other stakeholder input, to review analyses conducted by citizen and consultant advisors, and to comment on every step in the process.

38. The Town turned to consideration of use restrictions only after spending more than a decade conducting an exhaustive effort to identify and implement non-restrictive options, and providing ample attention to all input received.

39. The Town Board reached the reasonable conclusion that non-restrictive options were insufficient to address the noise problems in a manner that addressed local needs and values.

40. The Town invested significant time, effort, and expense in identifying the data it required for its analyses and deliberations, in identifying the best means of collecting those data, and in implementing appropriate data-collection mechanisms, to ensure the data were sufficiently comprehensive and reliable.

41. The Town undertook data collection and analyses that reflect best industry practices tailored to the local East Hampton situation, needs, and values, with respect to both aviation and community interests.

42. The Town Board selected and implemented restrictions that address the noise problem in a manner that is appropriately tailored to local needs and values.

43. Published EPNdB approach levels are an appropriate basis for categorizing “noisy” aircraft for the Town’s specific purposes. The FAA itself, and its international noise-certification equivalent, the International Civil Aviation Organization (ICAO), both use EPNdB to regulate allowable noise levels for the aircraft types operating at HTO that are of primary concern; *i.e.*, jets, larger propeller-driven aircraft, and heavier helicopters. Similar to the Town’s classification of aircraft as “noisy” or “not noisy,” FAA and ICAO use EPNdB to define noisiness categories; *i.e.*, FAA’s Part 36 “Stages” and ICAO’s Annex 16 “Chapters.” FAA and ICAO use a consistent altitude – 394’ – for setting approach noise limits for jets, larger propeller-driven aircraft, and heavier helicopters, which provides a consistent distance reference.

44. The use of FAA Part 36 Stages or ICAO Chapters would be an *inappropriate* basis for addressing the Town’s problem definition. The FAA and ICAO categories take aircraft weight into account. Heavier aircraft are permitted to produce more noise. The Town’s purpose in the two restrictions that apply the 91.0 EPNdB cutoff is to apply more restrictive limits on operations in noisier aircraft, based on a locally tailored criterion. That purpose is different than the FAA’s and the ICAO’s, which are to certify broad classes of aircraft for operation on national and international bases.

45. The declaration of Eric Jungck, the Director of Operations of Eleventh Street Aviation LLC, stated that one of the primary reasons the firm had purchased a Falcon 7x is because it is a Stage 4 aircraft. He also states that the Falcon 7x is “one of the quietest jets in operation.” He is correct that the FAA has certified the Falcon 7x as a Stage 4 aircraft. FAA Advisory Circular (“AC”) 36-1H (Change 1), “Noise Levels for U.S. Certificated and Foreign Aircraft,” lists an approach level of 92.6 EPNdB for this aircraft type, with a maximum certificated takeoff weight of 69,000 to 70,000 pounds and a maximum certificated landing

weight of 62,400 pounds. However, the Stage 4 classification takes into account the aircraft's weight, which allows heavier aircraft to make more noise. The Falcon 7x is quiet *relative to its weight*; but it is *not* quiet on an *absolute basis relative to other aircraft operating at HTO*, even in some cases relative to other, heavier Stage 4 jets. For example, the significantly heavier Gulfstream V, with a maximum certificated takeoff weight of 90,500 pounds and a maximum certificated landing weight of 75,300 pounds – both well above the Falcon 7x – has a published approach level of only 90.8 EPNdB, 1.8 EPNdB less than the Falcon 7x.

46. The Boeing 747-8F freighter provides an extreme example of how the Part 36 weight-based certification process can lead to a very noisy aircraft – relative to those operating at HTO – being classified as Stage 4. The heaviest 747-8F model listed in AC 36-1H (Change 1) has a maximum certificated takeoff weight of 975,000 pounds and a maximum certificated landing weight of 761,000 pounds, more than ten times the weight of the Falcon 7x, and a published approach level of 100.9 EPNdB, 8.3 EPNdB more than the Falcon 7x and 10.1 EPNdB more than the GV, yet it is still certificated as a Stage 4 aircraft.

47. The Town Board selected the 91.0 EPNdB cutoff based on extensive deliberations and analyses undertaken by the HTO Airport Planning Committee, Noise Subcommittee. The selection of a noisiness definition based on local needs and values is the appropriate approach for an airport proprietor to take.

48. I declare under penalty of perjury that the foregoing is true and correct.



Ted Baldwin

Executed this 8th day of May, 2015 in Burlington, Massachusetts

EXHIBIT 1

HMMH

77 South Bedford Street
Burlington, MA 01803
Tel. (781) 229-0707
Fax (781) 229-7939
W www.hmmh.com

MEMORANDUM

To: Councilwoman Kathee Burke-Gonzalez, East Hampton Town Board
Copy: E. Vail, East Hampton Town Attorney
P. Kirsch, C. Van Heuven, and W. E. Pilsk, Kaplan Kirsch & Rockwell
From: Ted Baldwin and Sean Doyle
Date: April 10, 2015
Subject: Documentation of HMMH Noise Analyses
Reference: HMMH Project 307162.002

In response to the East Hampton Town Board's request, HMMH is pleased to provide this memorandum that documents HMMH roles in the process that led to proposed legislation (and associated implementation-related materials) to address disturbance from operations at East Hampton Airport (HTO).



1. BACKGROUND

The study process included three noise-analysis "phases." HMMH assisted on the second and third phases, and provided follow-up assistance related to implementation of the proposed legislation, in a "fourth" step.

- 1) In an October 30, 2014 Special Meeting, the Town Board heard a joint citizen and consultant presentation of a "Phase 1 Noise Analysis Interim Report," which proposed a "preliminary draft problem definition" and a "list of potential alternatives to address that definition." *HMMH was not involved in this phase.* The Town Board reached consensus to proceed with the next study phase, to recommend: (1) a final problem definition and (2) a refined list of alternatives that offer the best promise for addressing that problem. The Town subsequently retained HMMH to assist with the "Phase 2" effort.
- 2) On December 2, 2014, Ms. van Heuven of Kaplan Kirsch & Rockwell LLP (KKR) and I presented the "Phase 2 Noise Analysis" results, which culminated in recommendation of: (1) a final problem definition, and (2) a short list of the most promising alternatives for addressing that problem. The Town Board subsequently directed HMMH and KKR to undertake a third study phase to evaluate those alternatives.
- 3) On February 4, 2014, I assisted Ms. van Heuven and Mr. Kirsch of KKR in presenting the Phase 3 results, titled "Regulations to Address Noise and Disturbance from Operations at East Hampton Airport." The results included estimates of the affected operations and associated noise complaints for a four-element solution to the problem definition, based on a November 1, 2013 – October 31, 2014 analysis year.
The Town Board considered verbal public input made at the February 4 meeting, a subsequent March 3 work session, and a March 12 public hearing; and written input received via mail, and via email through a link on the Town's website. Based on this input, the Board requested that HMMH assist in assessing additional restriction alternatives, again in terms of estimates of the affected operations and associated noise complaints. Those analyses led the Town Board to propose legislation for a revised three-element solution to the problem definition.

- 4) The Town Board then requested that HMMH provide implementation-related materials.

This memorandum responds to a final request by the Town that we document our technical assistance, including data sources, assumptions, citations, analytical process, etc., to describe the steps we undertook in preparing information the Board took into account in making decisions regarding the proposed legislation. We understand this documentation will be posted on the Town's website¹ or on a project-specific website ("htoplanning.com")² that the Town and KKR have established to present the "administrative record" for the legislative process.

The following three sections address HMMH's assistance related to the Phase 2 analyses (Section 2), the Phase 3 analyses (Section 3), and preparation of implementation materials (Section 4). Supporting materials are either incorporated into this document, provided electronically for posting on the Town or project website (with hypertext links in this document), or already are posted on one of the websites (again, with hypertext links). The relevant location is noted in each case.

¹ <http://ehamptonny.gov/HtmlPages/AirportInterimNoiseAnalysis.html>

² <http://www.htoplanning.com/>



2. HMMH ASSISTANCE WITH PHASE 2

HMMH assistance with Phase 2 addressed four task areas:

- Task 1 – Review Phase 1 Interim Report and Analysis
- Task 2 – Collect and Analyze Most Recent 12 Months of Complaint and Operations Data
- Task 3 – Refine Problem Definition and Identify Most Relevant Alternative(s)
- Task 4 – Prepare for and Participate in December 2, 2014 Town Board Presentation

2.1 Task 1 – Review Phase 1 Interim Report and Analysis

Under this task, HMMH reviewed the summary Phase 1 documentation presented at the October 30, 2014 meeting and related technical background.

2.1.1 Work Product(s)

There is no product for this task; its purpose was assisting HMMH to come up to speed on issues, prior work completed, and other background.

2.1.2 Specific HMMH Activities

HMMH reviewed the summary Phase 1 documentation provided on the Town website under the heading “OCTOBER 30, 2014 PRESENTATIONS,” including:

- Phase I Noise Analysis Interim Report
(<http://ehamptonny.gov/DocumentsPDF/Airport/AirportNoiseInterim/PhaseNoiseAnalysisInterimReportFINAL.pdf>)
- Analysis of 2014 YTD Noise Complaints
(<http://ehamptonny.gov/DocumentsPDF/Airport/AirportNoiseInterim/Analysis2014YTDNoiseComplaintsFINAL.pdf>)
- Update on Disturbance from Operations
(<http://ehamptonny.gov/DocumentsPDF/Airport/AirportNoiseInterim/UpdateDisturbanceOperationsFINAL.pdf>)
- October 30, 2014 Handout
(<http://ehamptonny.gov/DocumentsPDF/Airport/AirportNoiseInterim/October30Handout.pdf>)

Ted Baldwin viewed the online video of the October 30th presentations, via the East Hampton LTV website, <http://www.ltveh.org/>.

HMMH reviewed technical material used in preparing the interim reports. The material is provided on the “<http://www.htoplanning.com/>” website, including:

- <http://www.htoplanning.com/.docs/Town Documents\141105 INM Case Echo Report Annual Average Helicopters 2013.PDF>
- <http://www.htoplanning.com/.docs/Town Documents\141105 INM Case Echo Report Busy Day Fixed Wing Plus Helicopters.PDF>
- <http://www.htoplanning.com/.docs/Town Documents\141105 INM Case Echo Report Busy Day Helicopters 2013.PDF>
- <http://www.htoplanning.com/.docs/Town Documents\141105 INM Case Echo Reports Annual Average 2013.PDF>
- <http://www.htoplanning.com/docs/Town Documents/150105 Young Environmental Sciences Technical Memorandum, INM Noise Contour Development for 2013 Input Data.PDF>

HMMH provided guidance to the Town Board and staff regarding the sufficiency of this documentation.

HMMH reviewed other background materials that were available prior to December 2014. Those materials currently are provided on the “[htoplanning.com](http://www.htoplanning.com/)” website. HMMH did not fully review all of these materials. We focused on the following, and briefly reviewed others:

- Town “Noise Subcommittee” meeting minutes and findings currently presented under the “[Town - Appointed Committee Documents](#)” heading.
- Documentation of noise abatement procedures and aircraft operations, presented under the “[Other](#)” heading.
- Documentation of the “New York North Shore Helicopter Route” under the “[FAA Documents](#)” heading.

2.2 Task 2 – Collect, Analyze, and Compare Most Recent 12 Months of Complaint and Operations Data

Under this task, HMMH obtained and analyzed complaint and operations data for the 12 months from November 1, 2013 through October 30, 2014, in order to evaluate the most current feedback on aircraft operations and compare that feedback to the varying levels of activity at the airport over the same time period.

The complaint data were obtained from the HTO PlaneNoise complaint system. The operations data were obtained from the HTO Vector operations-monitoring system. The information from these two sources provided valuable bases for refining the problem definition in Phase 2 and for estimating the numbers of operations that would have been affected by alternative restrictions considered in Phase 3 (if those restrictions had been in place over that period), and also for estimating the associated numbers of complaints.

The PlaneNoise system is a web-based aircraft noise-complaint-management application that automates and simplifies the labor- and cost-intensive tasks of noise complaint collection, response, database-management, and reporting. The HTO installation accepts complaints submitted via webform, telephone, and email.

The PlaneNoise complaint database has many advantages, including:

- It is highly statistically significant, since it represents a complete set of the noise complaints registered with the Town over the time period of interest, in this case covering an 12 months of airport operations.
- It contains a broad range of data regarding complaint time, location, source, etc.
- It was current, in that it covered the most recent 12 months of information at the start of HMMH's assistance.

The Town installed the Vector operations-monitoring system to serve the primary purpose of automatically collecting the most accurate and complete information feasible on aircraft landings, in order to assess landing fees. In practice it has been determined that the installation also captures a majority of departures.

The system uses cameras placed at strategic locations on the airfield to detect and photograph aircraft operations. The system then "reads" aircraft registration numbers and Vector uses that information to identify the aircraft, owner/operator, aircraft type, etc., as feasible. Since any automatic data-collection system has limitations compared to human observers, Vector staff manually review difficult images to improve accuracy. When possible, HTO staff members also monitor operations visually and manually log them. Those manual logs are provided to Vector for cross-referencing with the automatically collected data in order to fill in manually logged operations that the automatic system may have missed.

The Vector operations database has many advantages, including:

- It represents the best available source of information on actual operations at the airport.
- It contains a broad range of data regarding operation type, time, aircraft type, powerplant type, etc.
- It was current, in that it covered the most recent 12 months of information at the start of HMMH's assistance.
- It represents a large, statistically significant data sample.

2.2.1 Work Products

Under this task, HMMH analyzed complaint data to seek out patterns that reveal issues of greatest concern to the greatest numbers of residents. We looked for patterns related to combinations of factors (such as geographic distribution, season, day of week, time of day, aircraft-type category, etc.) that elicited the greatest community reaction. We used the citizen-provided information on the operations of concern; i.e., the aircraft-type category about which they were registering a complaint. The PlaneNoise options include: jet, helicopter, prop, seaplane, unknown, and multiple.

The primary work products of this task were:

- Elements of the December 2, 2014 PowerPoint presentation titled "East Hampton Airport Phase II Noise Analysis." That presentation is available on the "htoplanning.com" website, at <http://www.htoplanning.com/docs/Town Documents\141202 Phase II Noise Analysis Presentation, HMMH.PPTX>. Sections 2.2.2 through 2.2.7 discuss the development of the specific elements of that presentation related to this task.
- The PlaneNoise data file used in preparing elements of the December 2, 2014 presentation, with HMMH addition of geographic information. Section 2.2.2 discusses the development of the file. It is available at: <http://www.htoplanning.com/docs/Town Documents\150410 PLANE NOISE COMPLAINTS DATA names and addresses redacted.xlsx>.



- The Vector operations data file used in elements of the December 2, 2014 presentation, with HMMH addition of geographic information. Section 2.2.3 discusses the development of the file. It is available at: <http://www.htoplanning.com/.docs/TownDocuments\150410 VECTOR OPERATIONS data reg num redacted.xlsx>
- A spreadsheet used to prepare to prepare the fifth page of the December 2, 2014 PowerPoint presentation cited above, at: http://www.htoplanning.com/.docs/Town Documents\150410 1_HTO_complaint_distribution.xlsx. Section 2.2.4 discusses the file.
- A spreadsheet used to prepare the 14th – 18th pages of the December 2, 2014 PowerPoint presentation, at: http://www.htoplanning.com/.docs/Town Documents\150410 2_HTO_daily_operations_statistics.xlsx. Section 2.2.6 discusses the file.
- A spreadsheet used to prepare the 20th, 21st, and 24th pages of the December 2, 2014 PowerPoint presentation, at: http://www.htoplanning.com/.docs/TownDocuments\150410 3_HTO_operations_complaints_comparison.xlsx. Section 2.2.7 discusses the file.



2.2.2 Specific HMMH Activities – PlaneNoise Complaints Data File

With HTO staff assistance, HMMH downloaded the 12 months of PlaneNoise records in “CSV” (comma- or character-separated variable) data-file format.

HMMH edited this file in three ways:

- It was saved in Microsoft Excel “.xlsx” format.
- The PlaneNoise data included complainant address information. To plot those locations on a map and look for geographic patterns, HMMH “geocoded” each address to obtain its latitude and longitude, through the use of the “GPS Visualizer’s Address Locator” utility available at <http://www.gpsvisualizer.com/geocoder/>. The PlaneNoise CSV file was opened in the utility and the data were processed using the option of Bing Maps to be the source of latitude and longitude data.³
- Annotation was added at the top of the file (to the right of the first rows of data) to describe the contents of each column. That annotation is reproduced below:

PLANE_NOISE_COMPLAINTS_data.xlsx Column Descriptions	
ID:	Discrete complaint identification number assigned by PlaneNoise.
Address:	Complainant-reported street address.
Aircraft_Type:	Complainant-chosen aircraft-type description (of aircraft responsible for complaint).
City:	Complainant-reported jurisdiction.
Email_Body:	Complainant-provided comments. PlaneNoise automatic voice-to-text transcription from voicemails. "NULL" if none provided.
Filing_Method:	Method via which complainant entered submitted complaint. “Hotline” & “Webform” submitted automatically; “Email” & “Manual” entered by PlaneNoise.
First_Name:	Complainant-provided first name.
Hamlet:	Complainant’s hamlet; identified from address by PlaneNoise.
Last_Name:	Complainant-provided last name.
State:	Complainant’s state; identified from address by PlaneNoise.
Town:	Complainant’s town; identified from address by PlaneNoise.
ZipCode:	Complainant-identified zip code
EVENTDATETIME:	Date and time complaint received via Hotline; Complainant-identified on Webform.
Latitude:	Complainant address’s latitude derived through geocoding by HMMH
Longitude:	Complainant address’s longitude derived through geocoding by HMMH

As noted previously, a redacted version of this file, with complainants’ first and last names, street addresses, and latitude/longitude removed for privacy purposes, is posted on the “htoplanning.com” website, at:

http://www.htoplanning.com/.docs/TownDocuments\150410 PLANE_NOISE_COMPLAINTS_DATA_names_and_addresses_redacted.xlsx.

³ Other choices were Google Maps and MapQuest. Address geocoding processes of this type are a readily available commodity-type service at this time. There is no reason to believe any of the three data sources is more or less accurate.



2.2.3 Specific HMMH Activities – Vector Operations Data File

With HTO staff assistance, HMMH downloaded the 12 months of Vector operations records, also in CSV data file format. HMMH edited this file in four ways:

- It was saved in Microsoft Excel “.xlsx” format.
- Seaplane-configured Cessna 208 aircraft operating at the airport were identified through online research into their registration numbers.
- Twelve operations were removed. Nine of these were aircraft identified as large airline-type aircraft that do not operate at the airport, and in several cases further research indicated the aircraft type was inconsistent with the registration number. Three were identified as helicopters, without models identified, so no noise classification was possible. This small number of removed operations was statistically insignificant, given that it represents less than 0.05% of the remaining 25,823 operations.
- Annotation was added at the top of the file (to the right of the first rows of data) to describe the contents of each column. That annotation is reproduced below:



VECTOR_OPERATIONS_data.xlsx Column Descriptions	
Airport	Airport Code For associated operations
DateTime	Date and Time of the aircraft operation
Registration	Aircraft registration number of
CallSign	Flight number call sign for scheduled operations
Activity_Type	Notes whether the operation was an Arrival (A) or Departure (D)
ModelType	ICAO aircraft type identified by system
MaxLandingWeight	Maximum registered landing weight for the identified model type in lbs
Runway	Recorded runway the aircraft is operating from
AcftType	Aircraft Category Jet (J), Turboprop (T), Turboprop Seaplane* ⁴ (TS), Piston Prop (P), Helicopter (H)
EngType	Aircraft Engine Type Jet, Turboprop, Piston
EngNum	Count of the number of engines on identified aircraft.

A redacted version of this file is posted on the “htoplanning.com” website under “Town Documents,” at: <http://www.htoplanning.com/docs/TownDocuments\150410 VECTOR OPERATIONS data registration redacted.xlsx>. The redactions remove the aircraft registration numbers (and occasionally reported any call signs), for privacy purposes.

2.2.4 Specific HMMH Activities – Complaint Statistics

HMMH used the data from the PlaneNoise complaints data file to prepare the fifth page of the December 2, 2014 PowerPoint presentation cited above. That slide is labelled “Some overall complaint statistics (11/1/13 – 10/31/14).” In order to prepare that slide, HMMH imported data from the PlaneNoise data file into a spreadsheet posted on the “htoplanning.com” website, at:

<http://www.htoplanning.com/docs/Town Documents\150410 1 HTO complaint distribution.xlsx>.

The spreadsheet contains the data extracted from the PlaneNoise data file and the figure that was imported into the PowerPoint.

2.2.5 Specific HMMH Activities – Complaint Density Plots

HMMH’s geographic information system specialist imported the location data from the PlaneNoise complaints data file into ESRI ArcGIS Version 10.1 to produce plots of “complaint density,” in terms of complaints per square mile, as presented in pages 6-11 of the December 2, 2014 PowerPoint presentation cited above, titled:

- Complaint Density - Helicopters (11/1/13 – 10/31/14)
- Complaint Density – Jets
- Complaint Density – Seaplanes
- Complaint Density - Non-Seaplane Propeller
- Complaint Density - Multiple Aircraft
- Complaint Density - Unknown Aircraft

⁴ TS designation made by HMMH from additional evaluation of through online research into C208 registration numbers.



2.2.6 Specific HMMH Activities – Daily Operations Statistics

HMMH used the data from the PlaneNoise complaints data file to prepare pages 14-18 of the December 2, 2014 PowerPoint presentation cited above, titled:

- When do operations occur? All Aircraft Operations by Day, 11/1/2013 - 10/31/2014
- When do operations occur? Helicopter Operations by Day, 11/1/2013 - 10/31/2014
- When do operations occur? Jet Operations by Day, 11/1/2013 - 10/31/2014
- When do operations occur? Turbopropeller Operations by Day, 11/1/2013 - 10/31/2014
- When do operations occur? Piston Prop Operations by Day, 11/1/2013 - 10/31/2014

In order to prepare those slides, HMMH imported data from the PlaneNoise data file into a spreadsheet posted on the “htoplanning.com” website, at:

<http://www.htoplanning.com/.docs\Town Documents\150410 2 HTO daily operations statistics.xlsx>.



The spreadsheet contains the data extracted from the PlaneNoise data file and the figures that were imported into the PowerPoint.

2.2.7 Specific HMMH Activities – Complaints versus Operations Plots

HMMH used the data from the PlaneNoise complaints data file to prepare the 20th, 21st, and 24th pages of the December 2, 2014 PowerPoint presentation cited above, titled:

- Annual complaints versus operations 11/1/13 - 10/31/14
- Seasonal complaints versus operations 5/1 - 10/31/14
- Complaints per operation (all aircraft types) versus activity across the average annual week, 11/1/13-10/31/14

In order to prepare those slides, HMMH imported data from the PlaneNoise data file into a spreadsheet posted on the “htoplanning.com” website, at:

<http://www.htoplanning.com/.docs\Town Documents\150410 3 HTO operations complaints comparison.xlsx>.

The spreadsheet contains the data extracted from the PlaneNoise complaint data file the Vector and the figures that were imported into the PowerPoint.

2.3 Task 3 – Refine Problem Definition and Identify Most Relevant Alternative(s)

Under this task, HMMH collaborated with KKR in preparing:

- The refined problem definition presented on page 26 of the December 2, 2014 PowerPoint presentation.
- The list of possible alternatives presented on page 27 of the December 2, 2014 PowerPoint presentation, and further reviewed on pages 28-34.
- The conclusion and recommendation presented on page 35 of the December 2, 2014 PowerPoint presentation.

2.4 Task 4 – Prepare for and Participate in December 2, 2014 Town Board Presentation

Under this task, HMMH collaborated with KKR in finalizing and making the December 2 PowerPoint presentation.

3. HMMH ASSISTANCE WITH PHASE 3

HMMH assistance with Phase 3 addressed six task areas:

- Task 1 – Summarize Research into Helicopter Noise Characteristics and Effects
- Task 2 – Research Whether Other Categories Elicit Strong Complaint Response
- Task 3 – Further Refine Temporal Dimensions of the Problem Definition
- Task 4 – Estimate Reductions in Noise Complaints from Abatement Alternatives
- Task 5 – Coordinate with Helicopter Operators to Assess Voluntary Approaches
- Task 6 – Prepare for and Participate in February 3, 2015 Town Board Presentation

3.1 Task 1 – Summarize Research into Helicopter Noise Characteristics and Effects

The Phase 2 analysis of HTO complaint and operations data revealed that helicopters elicit much stronger response from residents than fixed-wing aircraft types. To assist the Town in understanding this response, HMMH identified and summarized research that has been conducted into: (1) the extent to which response to helicopter noise differs from that due to fixed-wing aircraft, (2) the aspects of helicopter noise that make it more disturbing, (3) possible means for quantifying the differences, and (4) other available results that might assist the Town in understanding the issue and crafting the most appropriate noise-abatement approach.

The HMMH report titled “Review of Studies that Address Effects of Helicopter Noise” describes the research conducted under this task and the associated results and conclusions. The report is provided on the “www.htoplanning.com” website at: [/docs/Town Documents/150203 HMMH Memorandum re Review of Studies that Address Effects of Helicopter Noise.PDF](#).

These results were summarized and presented on page 16 of the February 4 and 10, 2015 PowerPoint presentations, discussed in Sections 3.4.1 and 3.4.2.

**3.2 Task 2 – Research Whether Other Categories Elicit Strong Complaint Response**

Under this task, HMMH undertook two primary activities.

- Refine Activity Categories that Fall under Problem Definition
- Review and Comment on Proposed Noisy Aircraft Definitions

Sections 3.2.1 and 3.2.2 discuss these two activities.

3.2.1 Refine Activity Categories that Fall under Problem Definition

HMMH conducted additional research into the available HTO complaint and operations data to identify specific categories of aircraft that fit within the problem definition of “frequent” and “disturbing” operations. The primary focus was on seaplane models. HMMH used the online research discussed in Section 2.2.3 to distinguish which operations were undertaken in seaplane-configured Cessna 208 aircraft. The research did not reveal a stronger response to seaplane-configured aircraft compared to aircraft with conventional landing gear.

The Vector data indicate that the Cessna 208 Caravan with floats was the only recognizable seaplane model operating at HTO in the analysis year in any substantial numbers. For example, page 13 of the December 2, 2014 “Phase II Noise Analysis” presentation referenced in Section 2.2.1 notes that approximately 25% of all annual operations were conducted by 25 specific aircraft, of which five were turbopropeller seaplanes. All five of those seaplanes were Cessna 208s. Review of aircraft certification data presented in the European Aviation Safety Agency (EASA) “Noise Type Certificates - Approved Noise Levels” data files discussed in Section 4.2.1, show that Cessna 208 variants with floats can be quieter than variants with conventional landing gear.

To supplement this information, HMMH analyzed FAA noise-modeling estimates of the noise levels produced by land and seaplane (“float”) variants of the Cessna 182 (the only such land and seaplane comparison available in the model) to assess differences in noise level. The analysis was conducted using the FAA’s Integrated Noise Model (INM) version 7.0d. HMMH calculated the average arrival and departure noise levels for straight-in and out arrivals and departures of each aircraft type, at two locations. The locations were one runway length off of each end of Runway 10/28, on centerline, as shown on the following figure:

Analysis Locations for Comparing INM-Based Estimates of Relative Aircraft Noisiness

Source: HMMH



The following table presents the average arrival and departure levels for each aircraft at the two locations, and also the overall arrival/departure average. The float-equipped aircraft is quieter on departure and overall, although noisier on arrival.⁵

Comparison of INM-Based SEL Values for Cessna 182 Conventional and Float-Equipped Variants
Source: HMMH

Operation / Aircraft Type	Average SEL Calculated at the Two Analysis Locations for Each Aircraft Type:		Difference (Negative means Float Plane is Quieter)
	CNA182 Land	CNA182FLT Sea	
Arrival	79.5	89.7	10.2
Departure	94.6	90.6	-4.0
Arrival / Departure Average	91.7	90.2	-1.5



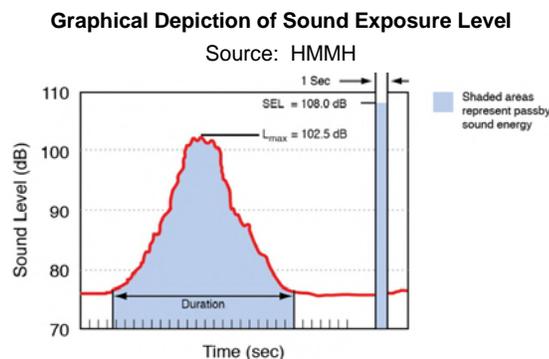
3.2.2 Review and Comment on Proposed Noisy Aircraft Definitions

HMMH reviewed the draft aircraft noise-rating approach proposed by the HTO Airport Planning Committee, Noise Subcommittee in its October 28, 2014 memorandum to Councilwoman Kathee Burke-Gonzalez titled “Eighth Preliminary Findings and Recommendations – Alternatives for Noise Control for Town Board Considerations.” That report is available at: <http://www.htoplanning.com/docs/Town - Appointed Committee Documents/141028 Noise sub-committee 8th Findings - Alternatives for Noise Control.PDF>.

That report recommended establishing noise ratings based on FAA-published “Part 36” aircraft noise-certification levels. Appendix A of this report provides an introduction to Part 36. That appendix notes that noise limits and metrics, and measurement locations and procedures vary according to aircraft classifications. Specifically, some Part 36 ratings are in terms of SEL and some are L_{max}, both of which are in terms of the A-weighted decibel.⁶ Others are in terms of Effective Perceived Noise Level (“EPNL” or “EPNdB”).⁷

In somewhat more detailed terms, noise metrics used in certification are as follow:

⁵ HMMH undertook this analysis in terms of Sound Exposure Level (“SEL”), the metric the INM uses to take into account the total noise energy over the course of an entire noise event. By summing the sound energy over the entire event, SEL generally matches our impression of the relative overall “noisiness” of individual events, including the effects of both duration and level. In simple terms, SEL “compresses” the energy for the noise event into a single second. The following figure depicts this compression, for a hypothetical noise event.



The compression of energy into one second means that a given noise event’s SEL will almost always will be a higher value than its L_{max}, as shown on the figure. For most aircraft flyovers, SEL is roughly five to 12 dB higher than L_{max}. Adjustment for duration means that relatively slow and quiet helicopter or propeller aircraft can have the same or higher SEL than faster, louder jets, which produce shorter-duration events.

⁶ An important characteristic of sound is its frequency, or “pitch.” Most people respond to sound most readily when the predominant frequency is in the range of normal conversation. The acoustical community has defined “filters” to approximate our response to sounds made up of many different frequencies. The “A weighting” filter generally does the best job of matching human response to environmental noise sources, including common transportation sources. “A-weighted decibels” are abbreviated “dBA.” The U. S. Environmental Protection Agency (EPA) and nearly every other federal, state, and international agency have adopted A-weighting for use in describing environmental and transportation noise.

⁷ EPNL is a measure of noise dose similar to SEL. It includes a frequency weighting correction similar to – but not exactly the same as – dBA. It also includes a correction for distinct “pure tones,” which are most often significant in aircraft noise sources in the form of high-pitched “whines.”



- Light propeller-driven aircraft (12,500 pounds or less maximum gross takeoff weight, MGTOW) are certificated in terms of overflight maximum A-weighted decibels (i.e., Lmax dBA).
- Heavy propeller-driven aircraft (over 12,500 lbs. MGTOW) and all jets are certificated in terms of approach, departure, and sideline EPNdB measurements.
- Heavy helicopters (7,000 lbs. or less MGTOW) are certificated in terms of approach, departure, and overflight (not sideline) EPNdB measurements.
- Light helicopters (under 7,000 lbs. MGTOW) may be certificated the same as heavy helicopters or in terms of overflight SEL measurements alone.

On pages 11 and 12 of their report, the Noise Subcommittee recommended using FAA-published EPNdB and dBA (including both SEL and Lmax) levels to identify multiple aircraft noise classifications:

Most aircraft are classified by the FAA based on the noise they produce, either with a dBA rating or an EPNdB rating in decibels. The dBA rating is approximately equivalent to EPNdB less 13 decibels. However, EPNdB has three separate ratings, approach (AP), take-off (TO), and flyover (FO). For EPNdB, it is proposed that the highest of the three ratings, AP, TO, and FO be used, converted to its dBA equivalent.

Subject to more specific professional advice, the committee preliminarily proposes that aircraft rated at 80 dBA (or EPNdB equivalent) be classified as “most noisy,” (most helicopters and many jets), aircraft rated below 75 dBA be classified as “least noisy,” (most light aircraft and some very quiet jets), and aircraft rated at 75 dBA and above but less than 80 dBA be classified as “noisy” (a few helicopters, some quieter jets, and noisier piston aircraft). The most noisy aircraft class should be subject to the most stringent regulation or to outright prohibition. Least noisy aircraft should be accorded the greatest freedom and least regulation. Noisy aircraft can either be treated separately, with regulation less stringent than for the noisiest class, or grouped with either least noisy or most noisy aircraft for regulatory purposes, depending on the regulation. Alternatively, a level between 75 dBA and 80 dBA could be established as the dividing line for a given regulation, effectively creating only two noise classes for that purpose.

The Noise Subcommittee provided the following summary proposal on page 13 of their report:

We propose that all noise control measures considered by the Town Board ... be evaluated by application to each of three separate noise classes by aircraft type: noisiest, noisy, and least noisy, to be defined by FAA dBA rating or equivalent maximum EPNdB rating with the aid of professional assistance. We tentatively propose the classes be defined by FAA noise ratings of 80 dBA (or EPNdB equivalent) and above for the noisiest, 75 dBA up to but less than 80 dBA for the noisy, and below 75 dBA for the least noisy.

This proposal raised several concerns:

- Multiple noise classifications would require regulations that would be difficult to evaluate, explain, and administer.
- Using the same decibel-level cutoff for aircraft certified using Lmax, SEL, and EPNL could lead to inconsistent ratings, since the same Lmax, SEL, and EPNL decibel levels would reflect different perceived noisiness, and the relative order of the noisiness could vary from operation to operation.
- There is no precise method of translating or equating Lmax, SEL, and EPNL values, nor even any industry-recognized “rules of thumb” for making rough approximations.
- FAA publishes Lmax, SEL, and EPNL certification values for a variety of locations relative to distance from start-of-takeoff roll, distance from landing threshold, and perpendicular offset from the runway sideline. In addition, some data are for level flyover, rather than approach, departure or sideline.

After reviewing the Noise Subcommittee recommendation in light of the Phase 2 noise analysis results and the final problem definition, HMMH recommended that the Town consider ranking aircraft based on published EPNL approach data, which the FAA and the International Civil Aviation Organization (ICAO) use to regulate the allowable noise levels of the aircraft types of primary concern at HTO; i.e., jets, larger propeller-driven aircraft, and heavier helicopters. In addition, FAA and ICAO use a consistent altitude – 394’ – for setting approach noise limits for these three aircraft categories, providing a consistent distance reference.⁸

⁸ ICAO noise certification standards are set forth in Annex 16 to the Convention on International Civil Aviation, “Environmental Protection,” Volume II, “Aircraft Engine Emissions.” FAA regularly amends Part 36 to “harmonize” U.S. regulations with any revisions made to ICAO Annex 16.



The Noise Subcommittee's January 20, 2015 memorandum to the Town Board titled "Final Report and Recommendations," recommended a three-part definition of "noisiest" aircraft:⁹

- For aircraft with published EPNL values, "noisiest" would be those with published levels of 91 EPNdB or greater.
- For aircraft without published EPNL values, but with published SEL values, "noisiest" would be those with published SEL values of 84 dBA or greater.
- For aircraft with only published Lmax values, "noisiest" would be those with published levels of 80 dBA Lmax or greater.

After considering this input, the Town Board requested that HMMH evaluate alternatives that considered two categories of "noisy" aircraft:

- If EPNL ratings are published by U.S. or international regulatory bodies, noisy aircraft are those with approach levels ≥ 91.0 EPNdB (consistent with the subcommittee's proposal).
- For aircraft with no published EPNL rating, noisy aircraft are those with published flyover levels ≥ 81.0 SEL or Lmax (a simplification of the subcommittee's proposal for separate 84 dB SEL and 80 dB Lmax cutoffs).

Section 3.4 presents analysis results for alternatives that applied: (1) both of these definitions and (2) only the EPNL definition.

3.3 Task 3 – Further Refine Temporal Dimensions of the Problem Definition

Under this task, HMMH and Town representatives reviewed the temporal distributions and relationships of noise and complaints prepared in the Phase 2 analyses, as discussed in Section 2.2 (in particular the Section 2.2.7 plots of complaints versus operations).

To assist in their deliberations related to definition of nighttime restrictions, the Town Board requested that HMMH provide additional detail on operations and noise complaints in the October 1, 2014 – September 30, 2015 analysis period that occurred under a number of specific time intervals, as shown in the following table:

Operations and Noise Complaints October 1, 2014 – September 30, 2015 for Various Time Intervals

Source: HMMH

Time Interval	Affected Operations			Associated Complaints		
	All Helos	All Fixed	All Aircraft	All Helos	All Fixed	All Aircraft
8 - 9 pm	257	452	709	703	167	870
9 - 10 pm	134	260	394	433	93	526
10 - 11 pm	90	145	235	289	52	341
Existing voluntary curfew (11 pm – 7 am)	199	382	581	747	141	888
7 - 8 am	241	579	820	867	217	1,084
8 - 9 am	330	856	1,186	946	294	1,240
9- 10 am	316	1,173	1,489	809	386	1,195
8 pm – 8 am	1,567	3,847	5,414	4,794	1,350	6,144
24-Hour Total	7,047	18,670	25,717	16,152	6,316	22,468

Based on the review of the Phase 2 results and this supplemental information, the Town Board made the following policy determinations associated to time-related definitions for consideration in the evaluation of potential access restrictions:

- Season: *May 1 – September 30*
- Weekend: *Thursday noon – Monday noon*
- Holidays: *Memorial Day, Independence Day and Labor Day, also including the days before and after*
- Basic curfew hours: *11 p.m. – 7 a.m.*
- Extended curfew hours: *8 – 11 p.m. and 7 – 9 a.m.*

⁹ That report is available at: <http://www.htoplanning.com/docs/Town - Appointed Committee Documents/150120 Final Report and Recommendations of the Noise Subcommittee.PDF>. Pages 40-41 present these three "noisy aircraft" definitions.



3.4 Task 4 – Estimate Reductions in Noise Complaints from Abatement Alternatives

Under this task, HMMH evaluated the numbers of operations that would have been affected and the associated noise complaints in the October 1, 2014 – September 30, 2015 analysis period for a range of potential use restrictions, including:

1. Prohibit all aircraft operations year-round from 11 pm – 7 am
2. Prohibit noisy aircraft year-round during 8 pm – 9 am evening, night, and early morning hours (extends curfew into “shoulder hours”)
3. Prohibit all helicopter operations on weekends and holidays in the summer season (May 1 – September 30)
4. Prohibit all noisy aircraft from conducting more than one take-off and one landing in any calendar week in the summer season
- 5a. Prohibit noisy helicopters from conducting more than two take-offs and two landings in any calendar week in the summer season
- 5b. Prohibit noisy helicopters from conducting more than one take-off and one landing in any calendar week in the summer season

HMMH analyses addressed various combinations of these alternatives and “noisy aircraft” definitions, as discussed in Section 3.2.2. The following five overall combinations were considered:

3.4.1 Evaluation of Alternative Restrictions 1 – 4, including EPNL, Lmax, and SEL Definitions of “Noisy Aircraft”

This assessment evaluated alternatives 1 – 4 listed above, with a noisy aircraft definition that generally followed the Noise Subcommittee’s recommendation (discussed in Section 3.2.2) for considering noisy aircraft cutoffs based on EPNL, Lmax, and SEL, using the following cutoffs:

- If EPNL ratings are published by U.S. or international regulatory bodies, noisy aircraft are those with approach levels ≥ 91.0 EPNdB.
- For aircraft with no published EPNdB rating, noisy aircraft are those with published flyover levels ≥ 81.0 SEL or Lmax (a simplification of the subcommittee’s proposal for separate 84 dB SEL and 80 dB Lmax cutoffs).

The results are presented in the February 4, 2015 PowerPoint titled “Regulations to Address Noise and Disturbance from Operations at East Hampton Airport,” which is available on the “htoplanning.com” website, at <http://www.htoplanning.com/docs/Town Documents/150204 HMMH and KKR presentation on Regulations to Address Noise and Disturbance from Operations at East Hampton Airport.PDF>.

3.4.2 Evaluation of Alternative Restrictions 1 – 4, including only an EPNL Definition of “Noisy Aircraft”

This assessment evaluated alternatives 1 – 4 listed above, with a noisy aircraft definition based solely on EPNL:

- If EPNL ratings are published by U.S. or international regulatory bodies, noisy aircraft are those with approach levels ≥ 91.0 EPNdB

The results are presented in the February 10, 2015 PowerPoint titled “Regulations to Address Noise and Disturbance from Operations at East Hampton Airport,” which is available on the “htoplanning.com” website, at [http://www.htoplanning.com/docs/Town Documents/150210 Regulations to Address Noise and Disturbance from Operations at East Hampton Airport \(Updated PowerPoint\).PDF](http://www.htoplanning.com/docs/Town Documents/150210 Regulations to Address Noise and Disturbance from Operations at East Hampton Airport (Updated PowerPoint).PDF).

3.4.3 Evaluation of Alternative Restrictions 1, 2, and 4, including only an EPNL Definition of “Noisy Aircraft”

This assessment evaluated alternatives 1, 2, and 4 listed above, with a noisy aircraft definition based solely on EPNL; i.e., if EPNL ratings are published by U.S. or international regulatory bodies, noisy aircraft are those with approach levels ≥ 91.0 EPNdB. The results are presented in the April 7, 2015 PowerPoint titled “Regulations to Address Noise and Disturbance from Operations at East Hampton Airport,” which is available on the “htoplanning.com” website, at <http://www.htoplanning.com/docs/Town Documents/150407 HMMH Powerpoint Presentation, Regulations to Address Noise and Disturbance from Operations at East Hampton Airport.PDF>.



3.4.4 Evaluation of Alternative Restrictions 1, 2, and 5a, including only an EPNL Definition of "Noisy Aircraft"

This assessment evaluated alternatives 1, 2, and 5a listed above, with a noisy aircraft definition based solely on the EPNL; i.e., if EPNL ratings are published by U.S. or international regulatory bodies, noisy aircraft are those with approach levels ≥ 91.0 EPNdB. No PowerPoint presentation was prepared for this combination of alternatives. The results were shared with the Town Board for internal deliberative purposes. The following table summarizes the cumulative results.

Combined Outcomes of Restrictions 1 (Prohibit all aircraft operations year-round from 11 pm – 7 am), 2 (Prohibit noisy aircraft year-round during 8 pm – 9 am), and 3 (Prohibit noisy helicopters from conducting more than two take-offs and two landings in any calendar week in the summer season)

Source: HMMH

	May 1 – September 30, 2015			October 1, 2014 – September 30, 2015		
	Helicopters	Fixed-Wing	All Aircraft	Helicopters	Fixed-Wing	All Aircraft
Estimated Number of Operations Affected	3,597	552	4,149	3,756	652	4,408
Total Existing Operations in Category	5,855	14,004	19,859	7,044	18,670	25,714
% Total Operations Affected by Restrictions 1, 2, and 5a	61.4%	3.9%	20.9%	53.3%	3.5%	17.1%
Estimated Associated Complaints	9,588	704	10,291	9,782	740	10,523
Total Existing Complaints in Category	14,935	5,999	20,934	16,152	6,316	22,468
% Total Complaints Associated with Restrictions 1, 2, and 5a	64.2%	11.7%	49.2%	60.6%	11.7%	46.8%

3.4.5 Evaluation of Alternative Restrictions 1, 2, and 5b, including only an EPNL Definition of "Noisy Aircraft"

This assessment evaluated alternatives 1, 2, and 5b listed above, listed above, with a noisy aircraft definition based solely on the EPNL; i.e., if EPNL ratings are published by U.S. or international regulatory bodies, noisy aircraft are those with approach levels ≥ 91.0 EPNdB. No PowerPoint presentation was prepared for this combination of alternatives. The results were shared with the Town Board for internal deliberative purposes. The following table summarizes the cumulative results.

Combined Outcomes of Restrictions 1 (Prohibit all aircraft operations year-round from 11 pm – 7 am), 2 (Prohibit noisy aircraft year-round during 8 pm – 9 am), and 3 (Prohibit noisy helicopters from conducting more than one take-off and one landing in any calendar week in the summer season)

Source: HMMH

	May 1 – September 30, 2015			October 1, 2014 – September 30, 2015		
	Helicopters	Fixed-Wing	All Aircraft	Helicopters	Fixed-Wing	All Aircraft
Estimated Number of Operations Affected	4,728	552	5,280	4,887	652	5,539
Total Existing Operations in Category	5,855	14,004	19,859	7,044	18,670	25,714
% Total Operations Affected by Restrictions 1, 2, and 5b	80.8%	3.9%	26.6%	69.4%	3.5%	21.5%
Estimated Associated Complaints	12,230	704	12,934	12,425	740	13,166
Total Existing Complaints in Category	14,935	5,999	20,934	16,152	6,316	22,468
% Total Complaints Associated with Restrictions 1, 2, and 5b	81.9%	11.7%	61.8%	76.9%	11.7%	58.6%

3.5 Details of Analyses

The HMMH analyses of affected operations and associated noise complaints were performed using Excel spreadsheets that incorporated operations and complaint data assembled, analyzed, and enhanced through the steps discussed in Section 2.2.

The HMMH analyses are embodied in three spreadsheets:



- **4_HTO_preliminary_restriction_analyses.xlsx:** This spreadsheet provided the results discussed in Section 3.3. It is available at http://www.htoplanning.com/#Town_Documents/150410_4_HTO_preliminary_restriction_analyses.xlsx.
- **5_HTO_feb04_restriction_analyses.xlsx:** This spreadsheet provided the results discussed in Section 3.4.1. It is available at http://www.htoplanning.com/#Town_Documents/150410_5_HTO_feb04_restriction_analyses.xlsx.
- **6_HTO_post_feb04_restriction_analyses.xlsx:** This spreadsheet provided the results discussed in Sections 3.4.2, 3.4.3, 3.4.4, and 3.4.5. It is available at http://www.htoplanning.com/#Town_Documents/150410_6_HTO_post_feb04_restriction_analyses.xlsx.

3.6 Task 5 – Coordinate with Helicopter Operators to Assess Voluntary Approaches

Under this task, HMMH, Town Board, and airport staff representatives consulted and met with representatives of major helicopter and fixed-wing operator constituencies, and fixed-base operator, fuel provider, ground-support businesses. The group met on January 21, 2015. The meeting addressed the Town’s interest in feedback on:

- Voluntary abatement procedures pursued in the 2014 summer season, including mid-season adjustments.
- Approaches taken to monitor, assess, and report on compliance.
- Special circumstances meriting consideration in assessing compliance, such as weather, traffic levels, etc.
- The most effective means for communicating with operators and pilots to promote compliance.
- The most valuable feedback to provide operators and pilots to enhance compliance.
- Ideas for building on “lessons learned” in the 2014 season.

At the conclusion of the meeting and in a follow-up email, the Town representatives followed up with a request for feedback on these topics.

3.7 Task 6 – Prepare for and Participate in February 3, 2015 Town Board Presentation

Under this task, HMMH prepared the presentations discussed in Sections 3.4.1, 3.4.2, and 3.4.3, and participated in making the Section 3.4.1 presentation (delayed due to weather until February 4, 2015).

4. DOCUMENTATION ASSISTANCE

At the conclusion of Phase 3, the Town Board requested HMMH assistance in two additional tasks:

- Documentation of the assistance we provided Phases 2 and 3, to recount the data sources, analytical steps, and other actions HMMH undertook in preparing information the Board took into account in making decisions regarding the proposed legislation.
- Preparation of information for aircraft owners/operators and other interested parties to use to determine the status of specific aircraft vis-à-vis the defined criterion for being categorized as a “noisy.”

4.1 Complete Documentation of Phase 2 and 3 Noise-Related Elements

This memorandum and the referenced material posted on the Town and “htoplanning” websites represent the product of this task.

4.2 Guidance and Information on Noisy Aircraft Identification

HMMH prepared information for aircraft owners/operators and other interested parties to use to determine the status of specific aircraft vis-à-vis the defined criterion for being categorized as a “noisy” aircraft under two of the proposed laws. The information includes:

4.2.1 Expanded list of potentially noisy aircraft

HMMH identified aircraft classified as “noisy” types in the legislation, using the final 91.0 and higher EPNdB definition, using data from twelve (12) online FAA and European Aviation Safety Agency (EASA) data files, all of which are available at http://www.htoplanning.com/#Town_Documents:



- Eight (8) FAA Advisory Circular 36-1H (Change 1), “Noise Levels for U.S. Certificated and Foreign Aircraft,” 05/25/2012 data files, downloaded February 23, 2015:
 1. http://www.htoplanning.com/#Town_Documents/150410_uscert_appendix_01_20120424.xls
 2. http://www.htoplanning.com/#Town_Documents/150410_nonuscert_appendix_02.xls
 3. http://www.htoplanning.com/#Town_Documents/150410_uscert_appendix_06.xls
 4. http://www.htoplanning.com/#Town_Documents/150410_uscert_appendix_07.xls
 5. http://www.htoplanning.com/#Town_Documents/150410_uscert_appendix_08_20120424.xls
 6. http://www.htoplanning.com/#Town_Documents/150410_nonuscert_appendix_09.xls
 7. http://www.htoplanning.com/#Town_Documents/150410_helicopter_appendix_10.xls
 8. http://www.htoplanning.com/#Town_Documents/150410_helicopter_appendix_11.xls
- Four (4) EASA “Noise Type Certificates - Approved noise levels” data files, downloaded February 18, 2015:
 9. [http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Jets_\(141203\).xlsx](http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Jets_(141203).xlsx)
 10. [http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Heavy_Props_\(141203\).xlsx](http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Heavy_Props_(141203).xlsx)
 11. [http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Light_Props_\(141203\).xlsx](http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Light_Props_(141203).xlsx)
 12. [http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Helicopters_\(141203\).xlsx](http://www.htoplanning.com/#Town_Documents/150410_TCDSN_Helicopters_(141203).xlsx)



HMMH provided a list of “noisy aircraft types” that is available at: [http://www.htoplanning.com/docs/Town Documents/150303 List of Noisy Aircraft Types.PDF](http://www.htoplanning.com/docs/Town_Documents/150303_List_of_Noisy_Aircraft_Types.PDF).

4.2.2 Summary of steps that individual aircraft owners/operators can use to investigate their specific aircraft

HMMH prepared concise guidance of the steps that individual owners/operators, the Town, or other interested parties can use to conduct further research into the status of a specific aircraft vis-à-vis the definition of a “noisy” aircraft. It is available at: [http://www.htoplanning.com/docs/Town Documents/150224 How Do I Tell if an Aircraft is Noisy.PDF](http://www.htoplanning.com/docs/Town_Documents/150224_How_Do_I_Tell_if_an_Aircraft_is_Noisy.PDF).



APPENDIX A: OVERVIEW OF PART 36 AIRCRAFT CERTIFICATION

The Federal Aviation Administration (FAA) has set limits on allowable aircraft noise levels under Title 14, Part 36, of the Code of Federal Regulations, “Noise Standards: Aircraft Type and Airworthiness Certification.” Aircraft designs must meet these standards to receive new or revised “type certificates” for production of aircraft to operate in the U.S. (The final section of this overview summarizes a separate regulation related to the phaseout of older, noisier types.)

Part 36 noise limits, noise metrics, measurement locations, and measurement procedures vary according to aircraft classifications established under other FAA regulations, including, but not limited to:

- Subsonic versus supersonic speed capabilities
- Type of propulsion (e.g. turbojet- or propeller-driven)
- Type of lifting mechanism (e.g., fixed-wing, helicopter, and tilt-rotor)
- Weight (e.g., different criteria for “small” versus “large” fixed-wing aircraft with maximum gross takeoff weights less than 12,500 pounds versus 12,500 pounds or more; and different criteria for helicopters up to and equal to 7,000 pounds versus over 7,000 pounds.
- Operating category (e.g., “acrobatic,” “agricultural,” “commuter,” “normal,” “restricted,” “transport,” and “utility”) and use (e.g., “firefighting” or “carrying external loads”)
- Date of initial flight or of application for type certificate
- Engine manufacturer and model

Because Part 36 “stage classifications” (e.g., “Stage 1” or “Stage 2”) vary with these characteristics, references to a specific stage should be used with care. This ambiguity largely relates to the manner in which Part 36 (and the term “stage”) evolved and became more complex over time, as summarized in the following timeline:

Initial Rule: 1969 - Establishment of Initial Noise Certification Standards

When first promulgated in 1969, Part 36 only applied to transport-category large and turbojet-powered airplanes. The transport category includes jets with takeoff weights over 12,500 pounds, and propeller-driven airplanes over 19,000 pounds. The rule sets separate measurement requirements and limits for takeoff, sideline, and approach locations, in terms of “Effective Perceived Noise Level” (“EPNL”), which is a metric that takes noise level, duration, and pure tones into account. The original regulation simply categorized aircraft as “certificated” or “uncertificated,” with no reference to the term stage.

1974 Amendment: Part 36 Application to Propeller-Driven Small Aircraft

The FAA added noise standards for “propeller-driven small aircraft” and “propeller-driven commuter category aircraft” in 1974, prior to the creation of the stage terminology. They continue to be termed certificated or uncertificated, with no reference to stage. The noise standards for these aircraft are in terms of “A-weighted decibel” (“dBA”) limits for level flyovers 1,000’ above ground level.

1977 Amendment: Introduction of Stage Classifications

In 1977, the FAA amended Part 36 to define more stringent noise limits for transport-category large and turbojet-powered aircraft, and introduced the concept of certification stages, to differentiate between the original and revised standards. For these categories, the amendment created three stages:

- “Stage 1” aircraft have never been shown to meet any noise standards, either because they have never been tested, or because they have been tested and failed.
- “Stage 2” aircraft meet original noise limits, set in 1969.
- “Stage 3” aircraft meet more stringent limits, established in 1977.

1978 Amendment: Extension of Part 36 to Civil Supersonic Aircraft

The FAA amended Part 36 to apply the same noise standards to civil supersonic jets as to civil subsonic jets. Concorde with flight time before 1980 were exempted – 16 aircraft in 1978; these aircraft comprised the entire fleet, since no further aircraft were produced.





1988 Amendment: Addition of Stage 1 and 2 Standards for Helicopters

The FAA amended Part 36 to incorporate helicopter standards after the creation of stage terminology. As a result, helicopter noise standards are similar in some aspects to those for propeller-driven small aircraft and in other aspects to those for transport-category large and turbojet-powered airplanes. The helicopter standards involve a particularly complex array of noise certification characteristics, including multiple noise metrics, measurement locations, weight classes, aircraft operating categories, etc.

The 1988 amendment established two helicopter certification classes. Stage 1 helicopters are uncertificated. Stage 2 helicopters are certificated under the original noise standards, which were the most stringent until 2014, when a Stage 3 helicopter class was added (see 2014 amendment discussion).

Helicopter measurement locations and other testing requirements differ significantly from fixed-wing airplane categories. Most helicopter noise standards are in terms of EPNL for three measurement locations, which include takeoff and approach, like transport-category large and turbojet airplanes (but not sideline as for those types), and level-flyover, like propeller-driven small airplanes.

For some helicopter categories with maximum gross takeoff weights not over 7,000 pounds, alternate certification standards may be used that are based on the “Sound Exposure Level” (“SEL”), which is a noise metric based on the A-weighted decibel that takes level and duration into account, but does not include a tone correction as in EPNL. These alternate standards only consider the level-flyover measurement location

2005 Amendment: Addition of Stage 4 Fixed-Wing Certification Standards

In 2005, FAA amended Part 36 to adopt a Stage 4 classification. The Stage 4 noise limits are a cumulative 10 EPNL less than those for Stage 3. All subsonic turbojet-powered and transport-category airplanes with maximum gross takeoff weights of 12,500 pounds or more for which application of a new type design is submitted on or after January 1, 2006, must meet new noise certification levels.

It should be noted that the Stage 4 standard applies only to application for type certification on and after January 1, 2006.

2013 Amendment: Addition of Tiltrotor Certification Standards

In 2013, FAA amended Part 36 to set tiltrotor standards in EPNL for takeoff, approach, and flyover measurement locations, like the basic helicopter standards. Tiltrotors are either certificated or uncertificated; the term “stage” is not used.

2014 Amendment: Addition of Stage 3 Helicopter Certification Standards

In 2014, FAA amended Part 36 to adopt a Stage 3 helicopter classification, which established more stringent noise limits for helicopters for type certification in the U.S., so as to “harmonize” the U.S. regulations with international standards.

Other Amendments to Part 36

The preceding timeline focuses only on evolution of noise classifications and use of the term stage. It should be noted that the regulation has been amended over 20 times to address a broad range of certification-related matters, such as revisions to noise limits, measurement procedures, measurement locations, meteorological reference conditions, data corrections, flight procedures, applicability to specific aircraft, and more.

Phaseout of Older, Noisier Aircraft Classes

Another federal regulation – “Part 91” (Subpart I) – prohibits regular operation of Stage 1 and 2 civil subsonic jet airplanes over 75,000 pounds, and extends that prohibition to all Stage 1 and 2 civil subsonic jets on January 1, 2016. It should be noted that most, if not all, jet airplanes in production today meet Stage 4 standards. Part 91 does not set phaseout dates for non-jet airplanes or Stage 3 jets.