INTRODUCTION

I am submitting the following comments on the Draft Environmental Impact Statement for the EA-18G "Growler" Airfield Operations at Naval Air Station Whidbey Island Complex on behalf of myself and the Citizen's of the Ebey's Reserve. Analyses and conclusions concerning aircraft noise exposure and its impacts that are contained in the Navy's Draft Environmental Impact Statement (DEIS) entitled "EA-18G 'Growler' Airfield Operations at Naval Air Station (NAS) Whidbey Island Complex" (noticed in the Federal Register on Thursday, November 10, 2016) are defective in my professional opinion[1] because, *inter alia*:

1) The DEIS's disclosure of anticipated aircraft noise exposure understates actual aircraft noise exposure levels on days when Field Carrier Landing Practice (FCLP) operations are to be conducted at Coupeville Outlying Field (OLFC); and

2) The Navy's criterion of the "significance" of noise impacts fails to reflect modern scientific information about the effects of aircraft noise on residential populations. This failure causes the DEIS to further underestimate the size of the residential population significantly impacted by the proposed action.

More specifically, contrary to the Navy's claim in §A.3.1 of the Draft EIS, its definition of a value of 65 dB of the Day-Night Average Sound Level as a threshold of "significance" of noise impact is *not* based on "the updated Schultz curve" of the 1992 report of the Federal Interagency Committee on Noise (FICON). (The implications of this erroneous claim are discussed at length below.)

These flaws in the Navy's disclosure of actual aircraft noise exposure, and of the impacts of increased noise exposure associated with an increase in Growler flight operations, mislead readers of the DEIS about the consequences of the Navy's proposed action.

To comply with NEPA, the DEIS must be revised to disclose actual noise exposure levels in the vicinity of Outlying Field Coupeveille ("OLFC") on days when FCLP operations are conducted, not merely on an entirely fictitious annual average day. The revised document must[2] also apply a contemporary and technically supportable criterion of significance of noise impacts to appropriately disclose the size of the population affected by actual aircraft noise exposure. Additionally, to avoid misleading readers of the DEIS, the revised document must correct its

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[1] My qualifications for forming these opinions are summarized in Appendix A.

[2] The U.S. Data Quality Act (Section 515 of the Consolidated Appropriations Act, 2001, Public Law 106-554) requires that information disseminated by federal agencies must be accurate, reliable and unbiased. ISO Standard 1996-1, published in March of 2016, is an international technical consensus standard that contradicts and supplants information contained in the 1992 report of the U.S. Federal Interagency Committee on Noise, on which the Navy claims to rely. Supposed reliance on an outdated document for a now obsolete and technically inaccurate dosage-response function to characterize the extent of noise impacts produced by predicted noise exposure is capricious and illogical.

erroneous account of the provenance of the Navy's definition of the significance of aircraft noise impacts.

TECHNICAL DISCUSSION

The following subsections explain why the disclosures of predicted aircraft noise exposure levels in the DEIS are unjustifiable on technical grounds, and why the Navy's interpretations of the significance of predicted aircraft noise exposure levels are misleading. The subsections address:

1) NEPA requirements for environmental impact disclosure documents;

2) faults in the DEIS related to characterization of aircraft noise exposure that varies over time; and

3) the Navy's approach to converting its misleading estimates of aircraft noise exposure into mistaken predictionss of aircraft noise impacts.

Nature of Navy's Disclosures

The Navy calculates and discloses anticipated environmental impacts in two steps. First, the Navy predicts how much noise exposure it expects its future flight operations to create. These predictions are typically displayed in the form of noise exposure contours. Next, the Navy compares the predicted quantity of noise exposure with its (obsolete, as explained below) policy on the "significance" of the predicted exposure levels. Note that disclosure of aircraft noise exposure alone (the first part of the two step process) does not directly disclose aircraft noise impacts in residential neighborhoods.

Quantification of aircraft noise exposure is an arcane process that is only poorly understood by the general public. Contrary to reasonable expectations, for example, the Navy does not make *in situ* measurements of the noise exposure that its aircraft produce at specific facilities. (Noise contours published by commercial airports as part of routine FAR Part 150 studies often validate predicted contours by empirical measurement.)

Instead, the Navy's DEIS relies entirely on software modeling to predict how much noise it expects its aircraft operations to produce during a supposedly "typical" time period: a hypothetical annual average day. For purposes of disclosing noise impacts, annual averaging is tantamount to assuming that people fully forgive or forget the annoyance created by recurring episodes of extreme aircraft noise exposure throughout the year.

Since there are no facts about the future, the Navy's prospective estimates of noise exposure in future time periods must necessarily be based on assumptions. The resulting noise exposure estimates can be no more credible than these computational assumptions. The substantive issues in interpreting the noise exposure contours shown in the DEIS are thus not the locations of the contours *per se*, but the great many assumptions that the Navy had to make to generate the contours.

One unwarranted assumption that the Navy makes concerns modeling of noise created by intermittent FCLP operations. The assumption, discussed next, leads to systematic underestimation of both aircraft noise exposure and the size of the population significantly affected by it.

Accounting for variability in aircraft noise exposure

Flight operations at U.S. Department of Defense (DOD) airfields often vary notably over the course of a week. In particular, flight activity on weekdays is often considerably greater than on weekends and federal holidays. In the past, DOD (and particularly U.S. Air Force) practice in NEPA-mandated environmental impact disclosure documents has been to predict future aircraft noise exposure on an "average busy day" basis, rather than on an annual average day basis. (See, for example, Wyle Laboratories, 2013, or the Navy's own 1993 DEIS for Proposed Modification of Air Operations Management at Naval Air Station Whidbey.) The practice of computing noise contours on an average busy day basis reduces under-estimation of prospective noise exposure that would result from averaging noise exposure created on busy weekdays with lower noise exposure created on weekend days.

Annual averaging is intended to characterize noise exposure in the vicinity of airfields with reasonably stable operations. An annual average exposure level is a reasonable concept, for example, at large commercial airports whose pace of operations varies only little from day to day, and which have a predominant direction of air traffic flow. Annual averaging is unwarranted when day-to-day variability in operations is extreme. The assumption is arbitrary when disclosing only annual average noise exposure obscures large, *bona fide* differences in noise exposure associated with a particular operational mode of an airfield. The assumption is frankly disingenuous when it permits a project proponent to avoid disclosing substantial episodic increases in noise exposure that recur throughout the year.

The arbitrary nature of the Navy's decision to neither calculate nor disclose actual aircraft noise exposure created on days when FCLP operations are conducted at OLFC is evident when viewed in the context of noise regulatory policies of other U.S. Federal agencies. For example, the Federal Highway Administration (FHWA, 1997) Noise Abatement Criteria disclose and interpret *hourly*, not daily, equivalent (energy-average) sound levels (*cf*. Table 1, 23 CFR Part 772). FHWA's criterion of the significance of noise impacts in residential neighborhoods is exceeded when actual A-weighted traffic noise levels during any *hour* of the day exceeds 67 dB.

As another example of the arbitrariness of basing environmental impact disclosures solely on annual average day noise exposure predictions, the Federal Rail Administration (FRA, 2012) considers simple *increases* in existing sound levels, not just absolute sound levels, as indicative of noise impacts, as shown in Figure 1. FRA considers increases of 5 dB (or less, at higher noise exposure levels) as indicative of noise impacts requiring mitigation in residential ("Category 2") areas near rail lines.

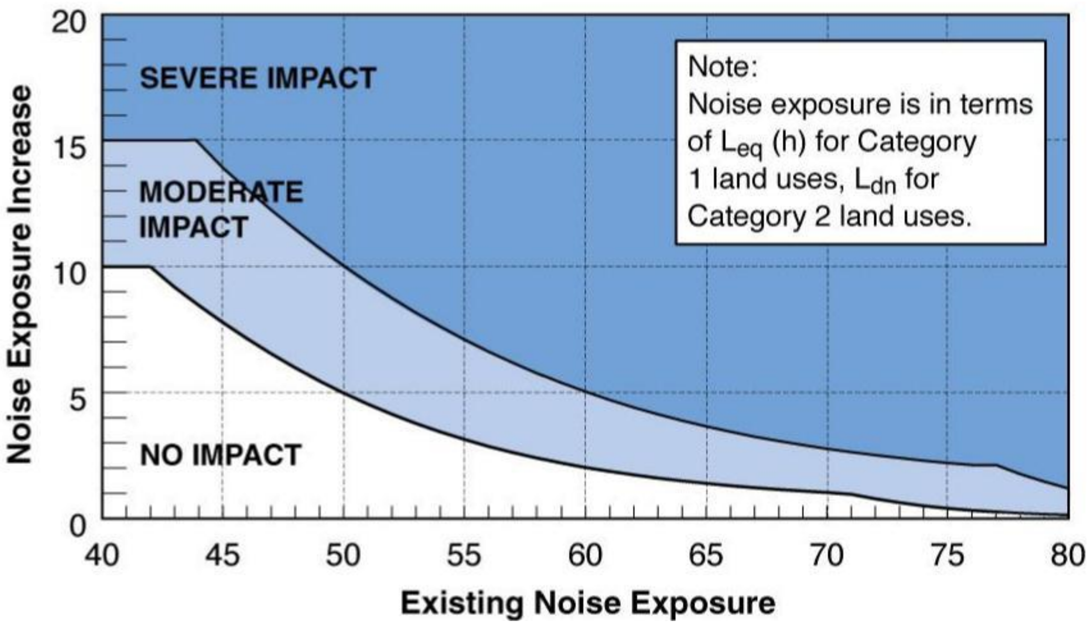

Figure 1: FRA policy on magnitude of an increase in cumulative noise exposure levels permissible under its policy in residential ("Category 2") areas (U.S. Federal Railroad Administration, 2012)

Direct vs. indirect characterization of noise impacts

The fundamental purpose of a DEIS is to disclose environmental effects of proposed federal actions. For NEPA-related purposes, aircraft noise therefore is not measured for measurement's sake, but to predict its effects on people. The unit in which the Navy's aircraft noise contours depict noise exposure is a decibel-denominated noise metric, DNL. As a physical measure of an acoustic quantity, DNL is *not* a direct measure of noise impact.

Although the concept of annoyance with aircraft noise intrusions is universally understood, few members of the public understand the logarithmic basis of decibel-denominated quantities such as DNL (Mestre *et al.*, 2011.) For many readers of the DEIS, the practice of inferring noise impacts from noise exposure contours confuses cause and effect. It is akin to gauging the effectiveness of a vaccine for a communicable disease by citing the number of people vaccinated, rather than by any change in the incidence of new cases of the disease.

The aircraft noise contours of the DEIS would more directly inform readers if they were labeled in units of noise *effect* rather than in units of noise *exposure*. Given that the Navy relies on the 1992 FICON report as its authority for disclosure of environmental noise impacts; and that

FICON identifies the prevalence of annoyance in communities as its preferred unit of adverse effects of noise exposure, the noise contours of the DEIS would be more directly understandable by the general public if labeled as percentages of the population highly annoyed, rather than as decibels of a poorly understood noise metric. Instead of illustrating how much aircraft noise is produced in geographic areas, the re-labeled contours would directly reveal the percentage of people residing within a contour who are expected to be highly annoyed by aircraft noise. A set of such contours would then directly communicate to readers of the DEIS the geographic bounds of areas in which, for example, 5%, 10%, 15%, 20%, and 25% of residents would be highly annoyed by predicted aircraft noise exposure.

Conversion of noise exposure into noise impact

The DEIS contends that the Navy relies on a 1992 report published by a Federal Interagency Committee on Noise (FICON) to predict impacts of aircraft noise on exposed residential populations. This report unequivocally states that:

> "…the percent of the exposed population expected to be highly annoyed (%HA) [is] the most useful metric for characterizing or assessing noise impact on people"; and

> "…the 'updated Schultz curve' remains the best available source of empirical dosage-effect information to predict community response to noise"

The "updated Schultz curve" (Fidell *et al.*, 1989, 1991) thus provides the link needed to convert the Navy's predicted noise dose (expressed in units of decibels) into the environmental impact of noise doses (expressed in units of percentages of the exposed population expected to be "highly annoyed"), as FICON (1992) recommends. As explained below, however, the "updated" Schultz curve of a quarter century ago is no longer a scientifically defensible method for converting noise dosages into expected community response to aircraft noise exposure.

The Navy's definition of "significant" noise impact

NEPA requires full disclosure of "significant" environmental impacts of federally proposed projects. The FICON report, however, is silent on exactly how the updated Schultz curve supports a definition of the significance of noise exposure in units other than annoyance. Further, no DoD publication subsequent to FICON's 1992 report explains how FICON-recommended dosage-response analysis supports definition of L_{dn} = 65 dB as a threshold of significance of noise impacts.[3] If, as FICON asserts, "the percent of the exposed population expected to be highly annoyed (%HA) [is] the most useful metric for characterizing or assessing noise impact on

[3] Two other documents – FICUN (1980), and FAR Part 150 (1985) – sometimes cited as authorities for selection of a 65 dB value of DNL as a threshold of significant noise impact are also silent on the rationale for defining a DNL value of 65 dB as a threshold of the significance of aircraft noise exposure.

people," then no useful purpose is served by expressing a definition of the significance of noise exposure in other units.

The FICON report is silent on the definition of "significant" noise impact because, in reality, there is no objective or "scientific" technical justification for inferring a definition of significance of noise exposure from a curvilinear dosage-response relationship. The DNL = 65 dB definition of a threshold of significance is simply an unsupportable value judgment based on obsolete information. This opinion is improperly based on nothing more than uninformed repetition of long outdated information, and at root, on nothing more than the opinions of a few 1950s-era researchers. (The actual provenance of the Navy's DNL = 65 dB definition of the significance of noise exposure is described later.)

It is helpful to clearly understand the nature of the updated Schultz curve of the 1992 FICON report. As shown in Figure 2, at a DNL value of 65 dB, the updated Schultz curve indicates that 12.3% of the residential population is highly annoyed by aircraft noise. While a DNL value of 65 dB may be a "round" quantity of noise exposure, the associated measure of noise impact identified (incorrectly, as it turns out) by FICON (1992) – 12.3% of the noise exposed population highly annoyed – is an utterly arbitrary criterion of significant noise impact. An annoyance prevalence rate of 12.3% is neither a round number, nor a value judgment based on any formal analysis, nor even a recognized definition of significance of noise impact.

Instead, the Navy's opinion that a value of DNL of 65 dB can serve as a threshold of significance of noise exposure intentionally sidesteps its duty under NEPA to disclose noise impacts in the DEIS. Readers of the DEIS would have to be fully conversant with decades of technical literature on transportation noise effects to understand that the Navy's definition of "significance" of noise impacts effectively defines aircraft noise exposure that annoys at least 12.3% of the population as a significant noise impact.

Note also that the FICON (1992) curve purports to pertain to all transportation noise, and is not specific to aircraft noise, but improperly includes information about community reaction to road and rail noise as well. Since decibel-for-decibel, aircraft noise is more annoying than rail or road noise (Miedema and Vos, 1998; Miedema and Oudschoorn, 2001), the updated Schultz curve is another source of the Navy's underestimation of the annoyance of its aircraft noise.

Figure 3 shows the dosage-response relationship between aircraft noise exposure and the prevalence of high annoyance in communities contained in the most recent international technical consensus standard (ISO 1996-1, 2016: "Acoustics – Description, Measurement and Assessment of Environmental Noise - Part 1: Basic Quantities and Assessment Procedures"). ISO 1996-1 specifies the measurement procedures and units in which 160+ nations world-wide have agreed represent the most scientifically defensible means for quantifying environmental noise exposure and its impacts. The United States is a member of ISO, participated actively in the analyses conducted to revise this standard, and subscribes fully and without exception to it. The U.S.

Department of Transportation even provided contractual support for research leading to the interpretive methods for noise impacts identified in ISO 1996-1 (Fidell *et al.*, 2011)

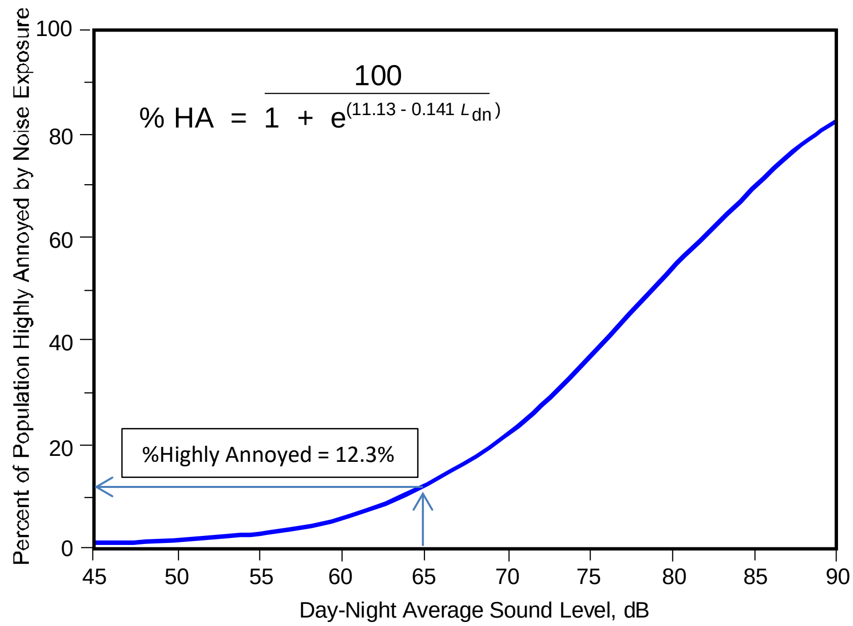

Figure 2: Updated Schultz curve of the 1992 FICON report, relating noise exposure (measured in decibels) to noise effect (measured in the percent of the population highly annoyed). The curve erroneously shows that 12.3 percent of the population is highly annoyed by noise exposure of DNL = 65 dB.

ISO's 2016 dosage-response relationship is based on much more social survey information than was available in 1992, is specific to aircraft noise, and indicates that considerably greater percentages of the population are highly annoyed by aircraft noise than the 1992 "updated Schultz curve." Figure 4 compares FICON's 1992 dosage-response relationship with ISO's 2016 relationship for aircraft noise. At a DNL value of 65 dB, the FICON relationship underpredicts the prevalence of annoyance created by aircraft noise exposure by more than a factor of two. The now-superseded FICON relationship is plainly an incorrect and technically indefensible basis for any policy judgments purporting to define the significance of aircraft noise impacts.

If the Navy's definition of the significance of noise exposure were, as claimed in the DEIS, truly based on FICON's 1992 dosage-response relationship, it is apparent from Figure 4 that to maintain consistency with the current international standard, the Navy would have to re-define the threshold of significance of aircraft noise exposure as 55.5 dB. It follows that this would require the DEIS to display noise exposure contours for DNL values 5 to 10 dB lower than those depicted in Figures 6-1 *et seq.* of Volume 2 (Appendix A) of the DEIS.

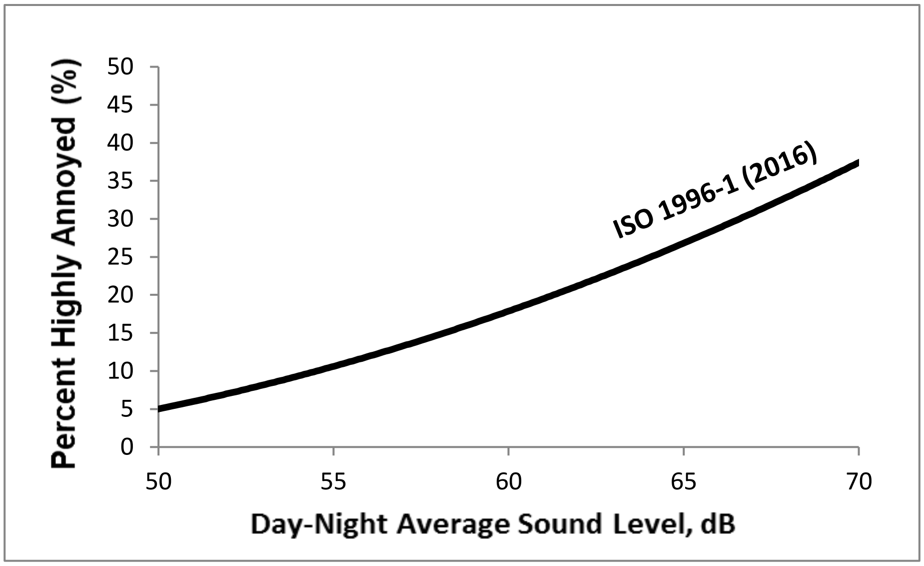

Figure 3: Dosage-response relationship of ISO 1996-1 (2016), showing ~27% of the population highly annoyed by noise exposure of DNL = 65 dB.

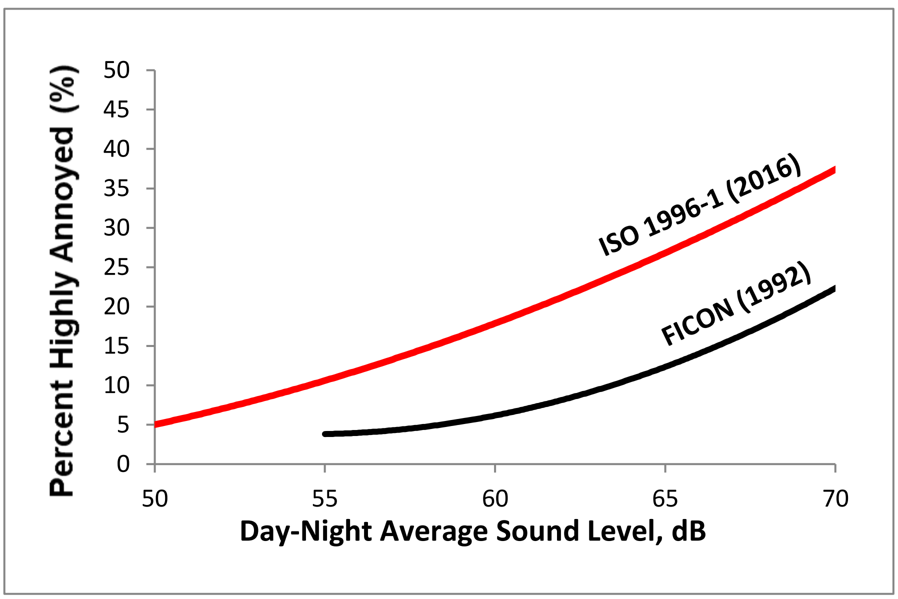

Figure 4: Comparison of 1992 FICON dosage-response relationship with that of ISO 1996-1 (2016), showing an *under*estimation of more than a factor of two in the percentage of the population highly annoyed by aircraft noise at a DNL value of 65 dB.

It also follows that the Navy must re-analyze and disclose the size of the residential population exposed to significant noise impacts due to the proposed action. The DEIS shows that the 60 dB DNL contour from OLFC for the various alternatives already extends into portions of downtown Coupeville, but the DEIS does not consider aircraft noise exposure of this magnitude as creating "significant" impact. The 55 dB DNL contour would very likely encompasses all of downtown Coupeville for the various alternatives considered, and would hence classify a greater number of residences as significantly impacted by FCLP operations.

Actual provenance of DNL = 65 dB as a definition of a threshold of "significance" of noise exposure

The Navy's opinion that a DNL value of 65 dB represents a threshold of significant noise impact is not directly connected to any body of empirical information about noise-induced annoyance, nor does it follow from any dosage-response analysis, nor is it based on any documented analysis. In fact, designation of a DNL value of 65 dB as a threshold of "significant" noise impact has never had an objective rationale. It is merely an arbitrary, non-technical policy preference of some, but not all, U.S. Government agencies with noise regulatory responsibilities.

In reality, the DNL value of 65 dB is simply a vestige of a purely formulaic series of conversions of a 1950s-era "Community Noise Rating" (CNR) value of 100. The original CNR value was simply mathematically transformed over the last six decades: first into a 1970s-era "Noise Exposure Forecast" (NEF) value of 30 dB, and then later, into a 1980s-era DNL value of 65 dB. Rosenblith and Stevens (1953) and a few of their professional colleagues (including Stevens and Pietrasanta, 1957; Stevens, Rosenblith, and Bolt, 1955; and Galloway and Pietrasanta, 1963) first identified CNR = 100 as a quantity of aircraft noise exposure corresponding to a manageable level of complaints about military aircraft noise and threats of litigation in military base housing.

Thus, even in the 1950s, the value of CNR = 100 represented nothing more than the opinions of a few acoustical consultants. It was never intended as a value of noise exposure distinguishing residentially acceptable from intolerable noise-induced annoyance, nor as a measure of noise exposure compatible with comfortably habitable residential neighborhoods. In fact, this value of CNR had nothing at all to do with annoyance, as FICON recommends.

A CNR value of 100 was simply an expedient recommendation of a quantity of cumulative noise exposure that seemed to keep a lid on aircraft noise complaints and threats of litigation in military base housing during the early years of the Cold War era. The CNR noise metric was developed long before the start of commercial jet operations in the United States. A DNL value of 65 dB (corresponding mathematically to a CNR value of 100) preceded by two decades the passage of the 1972 federal Noise Control Act (Public Law 92-574), the National Environmental Policy Act (Public Law 91-190), and the heightened environmental awareness of recent decades. Since the FICON report provides no rationale for deriving a DNL value of 65 dB from the updated

Schutz curve, the Navy cannot plausibly attribute this DNL value to anything contained in the 1992 FICON report.

This value of CNR, mathematically transformed into a DNL value, also preceded a shift from complaints and litigation (behaviors) to the attitude of annoyance as a generalized measure of adverse impact of aircraft noise, per direction provided by Congress to the U.S. Secretary of Transportation under Public Law 96-193, the Aircraft Safety and Noise Abatement Act (ASNA) of 1979.

In light of the contemporary technical consensus (ISO, 2016), the Navy's opinion that a DNL value of 65 dB defines a threshold of "significant" noise impact implies that the Navy believes that more than a quarter of the residential population must be highly annoyed to qualify a noise impact as "significant." Such a belief is simply untenable in light of the latest revision of ISO Standard 1994-1 (2016):

> 1) The updated Schultz curve of the FICON report, on which the Navy claims to rely for its definition of significant noise impact, erroneously predicts that only 12.3% of the population is highly annoyed by noise at a DNL value of 65 dB. It is now known, *per* ISO 1996-1 (2016) that the prevalence of annoyance with aircraft noise exposure is more than twice as great as that predicted by the updated Schultz curve.
>
> 2) The Navy's opinion is technically obsolete and indefensible because it fails to distinguish between the annoyance created by exposure to aircraft noise and that created by road and rail traffic.
>
> 3) The Navy's opinion is arbitrary because, contrary to the recommendation of the FICON report, it is not based on the annoyance created by its aircraft operations. The criterion of CNR = 100, subsequently transformed mathematically into a DNL value of 65 dB, was based on analyses of complaint behavior and threats of litigation, not on the attitude of annoyance.
>
> 4) The Navy's policy is unsupported by its claim that the policy is based on the 1992 FICON report. This claim is self-evidently erroneous for two principal reasons. First, the 1992 FICON report nowhere prescribes how or why the "updated Schultz Curve" in the report compels the Navy to define a DNL value of 65 dB as a threshold of significant noise impact. Second, the FICON report merely reiterates prior claims, based on nothing other than informal recommendations made by consultants in the early 1950s, about quantities of noise exposure that were adequate to suppress complaints and litigation 40-odd years before publication of the FICON report. Such outdated recommendations fail to take into consideration the subsequent adoption of federal and state legislation such as NEPA; development of a half-century of improved understanding of the environmental

consequences of transportation noise exposure; and a heightened national concern for minimizing environmental impacts of government actions.

Failure to disclose actual noise exposure

The noise exposure estimates contained in the DEIS are a convenient computational fiction, not a meaningful indication of noise levels actually heard by people living near OLFC when FCLP operations are conducted. Many readers of the DEIS are unlikely to appreciate that on no actual day of the year will the aircraft noise exposure experienced by people who live near OLFC equal the exposure that the Navy predicts for a notional "annual average" day. The hypothetical annual average day noise exposure can include six or more times as many days when *no* FCLP operations are conducted at OLFC as days when FCLP operations are actually conducted at the outlying field.

As a result of averaging the noise exposure created on the relatively few days when FCLP operations are conducted with a greater number of days when FCLP operations are not conducted, the noise exposure contours contained in the DEIS do not accurately represent the aircraft noise exposure that Navy's aircraft actually create on any real day of FCLP operations. The DEIS thus does not inform decision makers for whom the document is prepared about actual amounts of noise experienced by anybody on days when FCLP operations are conducted.

The DEIS lacks simple statements about the actual numbers of days per year when OLFC is used for FCLP operations. The no action alternative, for example, assumes about 6120 FCLP operations per year, which in 2016 were accomplished in less than 30 days of flying. In 2012, however, 9668 flight operations were conducted at OLFC in 79 days. The lack of clarity in the DEIS about numbers of days of use of OLFC for FCLP operations precludes exact estimates of the degree to which the Navy's annual average noise modeling underestimates noise exposure created at OLFC on days when it is used for FCLP exercises. The failure of the DEIS to specify numbers of days of FCLP operations for the various noise modeling alternatives is also at odds with the Navy's assertion that its noise modeling represents aircraft noise exposure for a nominal 24 hour time period.

FCLP operations are a regular part of the training syllabus for Navy pilots. If the Navy is not able to accurately predict the pace of pilot training at NAS Whidbey Island in future years, the DEIS should acknowledge as much, and provide readers with information about likely errors of estimate of its noise exposure estimates for OLFC. Table 1 shows a range of plausible estimates of the magnitude of the underestimation of actual noise exposure on days when FCLP operations are conducted at OLFC, based on varying assumptions about numbers of days of use of OLFC for FCLP training.

Number of Actual Days of Year of FCLP Operations at OLFC	Ratio of FCLP Days to 365 Days	Decibel-Equivalent Underestimation of Actual Exposure on FCLP Days Due to Annual Averaging of Exposure
30	.082	-10.9 dB
50	.137	-8.6 dB
70	.192	-7.2 dB
100	.274	-5.6 dB
200	.548	- 2.6 dB

Table 1: Range of underestimation due to annual averaging of noise exposure estimates of actual noise exposure at OLFC on days when FCLP operations are conducted.

Misleading Discussion of the Annoyance of Aircraft Noise

Section A.3.1 of the Navy's DEIS concerning the annoyance of aircraft noise exposure misinforms readers with mis-statements about the Navy's criterion for gauging the significance of aircraft noise exposure. The errors of omission and commission in this text mislead readers of the DEIS by failing to disclose the wholly arbitrary and *ad hoc* nature of the "threshold criteria" which the Navy relies upon to gauge the significance of aircraft noise exposure.

The Navy's boilerplate language is as follows:

"A.3.1 Annoyance

With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith *et al.* (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its "Levels Document" (USEPA 1974) that reviewed the factors that affected communities. DNL (still known as Ldn at the time)[4] was identified as an appropriate noise metric, and threshold criteria were recommended. Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents."

This above boilerplate text from the DEIS is no more than truth by assertion. The Navy's language makes artful use of the passive voice (*e.g.*, "considerable research was performed"; "threshold criteria were recommended") to disguise the agent and lack of logical rationale for the Navy's recommended threshold criteria, but does not correspond to reality. In truth, the Navy's definition of the significance of noise exposure is NOT derived from any analysis of social survey

[4] DNL, an abbreviation for "Day-Night Average Sound Level", is *still* known as L_{dn} when it is used as a symbol in mathematical expressions rather than in text. The Navy's implication that the name of the noise metric has changed is simply uninformed.

data, but dates back to decades prior to Shultz's original (1978) synthesis of the first widely-accepted dosage-response relationship derived from social survey data. The text carefully avoids defining "significant" noise impact, and provides the reader with no understanding of the utter lack of a systematic technical basis for evaluating the significance of noise impacts throughout the DEIS.

REFERENCES

We need to attach all the materials cited to the letter to ensure that they will be included within the administrative record. **JAKE: SOME OF THE MATERIAL IS COPYRIGHTED (FOR EXAMPLE, THE ISO STANDARD); SOME IS MASSIVELY LONG; SOME CITATIONS ARE TO READILY-AVAILABLE GOVERNMENT-PUBLISHED REPORTS – WHAT DO YOU THINK ABOUT SIMPLY PROVIDING url LINKS TO WEBSITES FROM WHICH CERTAIN OF THE PUBLICATIONS CAN BE DOWNLOADED?**

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APPENDIX A: PROFESSIONAL RÉSUMÉ OF SANFORD FIDELL

EDUCATION:

Ph.D., Experimental Psychology, The University of Michigan, 1969
M.S., Experimental Psychology, The University of Michigan, 1966
B.A., Psychology, Trinity College, Hartford, Connecticut, 1964

PROFESSIONAL POSITIONS:

President, Fidell Associates, 2001 - present; positions held at Bolt Beranek and Newman and successor organizations: Director, Environmental Technologies Department, 1995-2001; Manager, Environmental Research and Data Systems Department, 1992-1995; Senior Manager, 1991-1992; Lead Scientist, 1989-1991; Senior Scientist, 1968-1988; Manager, Los Angeles Computer Laboratory, 1970-1982.

Lecturer, California State University, Northridge, 1969-1971; Member of the Technical Staff, Bell Telephone Laboratories, 1966; Research Assistant and Teaching Fellow, The University of Michigan, 1964-1968; Broadcast Announcing, Engineering, and Production, 1960-1968.

HONORS, PROFESSIONAL SOCIETIES, AND ADVISORY POSITONS:

Acoustical Society of America (Fellow); Associate Editor, Journal of the Acoustical Society of America; U.S. Representative to International Standards Organization Technical Advisory Group on Community Response Questionnaire Standardization (ISO/TC43/SC1/WG49), and to ISO Working Group 45 on Community Response to Noise; Acoustical Society of America Representative to I-INCE Technical Study Group 9, "Metrics for Environmental Noise Assessment and Control"; Acoustical Society of America, Technical Committee on Noise (1993-1996; 1999-2002); National Research Council Committee on Hearing, Bioacoustics and Biomechanics (CHABA); Current or past member of the American National Standards Institute, Committee on Bioacoustics, Working Groups S12-15 (Environmental Noise Measurement and Assessment), S3-51 (Auditory Magnitudes), S3-70 (Community Response to Noise Levels); American Helicopter Society, Committee on Acoustics; IEEE Power Engineering Society, Audible Sound and Vibration Subcommittee; Design Review Group for FAA's Integrated Noise Model software; BBN Outstanding Publications Awards (1989, 1991, 1996).

PROFESSIONAL RESPONSIBILITIES AND PROJECTS:

Dr. Fidell's technical career has focused on psychoacoustic research, community noise impact analysis, and aircraft noise consulting. He has directed theoretical, laboratory and field research in many areas of psychoacoustics and environmental acoustics. This research includes NASA, FAA and military-sponsored laboratory studies of the noisiness of impulsive sounds; the detectability, noticeability, warning effectiveness, and design of emergency egress signals; and the annoyance of impulsive and other high- and low-level sounds. It also includes studies of low-frequency critical bandwidths and annoyance; speech quality, intelligibility, and vocal stress; the aversiveness and hearing damage risk of extremely high-level acoustic signals; and epidemiologic analyses of aircraft noise effects on health.

His field studies include social surveys of community and classroom response to steady-state and impulsive environmental noise; measurement and assessment of highway and rail noise and vibration, and low-frequency runway sideline noise and its effects. He has also conducted electrophysiological and behavioral studies of noise-induced sleep disturbance; real-time studies of in-home annoyance; study of effects of aircraft noise on property values; and on-site and telephone interviews of outdoor recreationists' response to aircraft overflights. He has published statistical models to account for contributions of highway noise to community and indoor noise environments, and developed theory-based methods for discriminating acoustic and non-acoustic contributions to the prevalence of annoyance due to transportation noise.

Dr. Fidell has provided consulting services to community, airport and government agencies involved in civil and military aircraft noise controversies, as well as assessments and disclosures of aircraft noise impacts. He has advised airport and community groups in airport noise controversies in Atlanta, Chicago, Denver, Los Angeles, Minneapolis, Phoenix, San Francisco, St. Louis, Seatttle, Vancouver, and Washington, D.C., among others. He has also consulted both domestically and abroad on land use planning related to aircraft noise regulation.

Dr. Fidell's human factors research has included studies of the variability of reaction time, effectiveness of computer generated auditory, visual, and tactile displays, attentional demands of warning signals, sensory scaling, signal localization and detectability, and construction of human performance test batteries. He has also assessed stress effects on performance, anthropometric and biomechanical models, and effects of vibration and g-forces on aircraft flight control.

His other consulting and development efforts have included design and execution of acoustic field measurement programs, independent audit of noise monitoring systems and contouring exercises, analysis of environmental assessment documents, production of training materials (film, video, manuals, lectures, demonstration recordings) and design of miniaturized signal processing instrumentation. He built computer-based laboratories for psychophysical experimentation and acoustic data reduction at BBN, developed novel psychophysical data collection methods, and consulted on the design of automated laboratories and data reduction systems elsewhere.

He has also provided commentary to public agencies, expert testimony in legal proceedings, and litigation support on a range of acoustical issues. These include enhancement, transcription, and speaker identification of poor quality recorded materials, analysis of evidence and documentation in environmental regulatory actions, and effects of noise exposure on communities. He is active in international standardization efforts for prediction of aircraft, rail and road noise impacts.

Dr. Fidell's software experience includes real-time programming in assembly language and creation of computer-based models of acoustic detection phenomena. Other computing experience includes technical oversight of weapons system and other software development, management of embedded microsystem projects, and design, management, marketing and application of acoustic detection, environmental assessment (geoinformation system), decision support and time series analysis programs.

Dr. Fidell's other professional activities include committee work for professional organizations, contributions to standards and criteria, and review of grant proposals, journal manuscripts, and other technical documents. He has taught statistics at California State University at Northridge, lectured on human factors engineering and environmental noise topics at the University of Michigan and the University of California at Berkeley, and (while associated with Bell Telephone Laboratories and the University of Michigan) performed research in sensory and physiological psychology.

PAPERS AND PUBLICATIONS:

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ORAL PRESENTATIONS (REPRESENTATIVE LIST):

“Some implications for aircraft noise regulatory policy of the 2016 revision of ISO 1996-1” S. Fidell,
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"How many meta-analyses fit on the head of a pin?" Fidell, S., presented at 140th meeting of the Acoustical Society of America, Newport Beach, December, 2000.

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