



**SUBURBAN O'HARE COMMISSION**

**CHICAGO O'HARE INTERNATIONAL AIRPORT  
SUMMARY REPORT**

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## 1. Introduction

In March of 2015, the Suburban O'Hare Commission (SOC) retained JDA Aviation Technology Solutions (JDA) to conduct a study of a number of technical issues relating to community concerns over noise generated by operations at O'Hare International Airport (ORD). SOC asked JDA to assemble a team of aviation experts who could provide SOC with information and recommendations on a variety of O'Hare related noise issues.

SOC's commission to the JDA team focused on three major areas relating to O'Hare noise.

**First**, SOC contracted with JDA to analyze the history, data, derivation and rationale for the FAA's adoption of:

- a) DNL as its preferred measure of aircraft noise exposure
- b)  $L_{dn} = 65$  dB value as the FAA's threshold of significant noise impact.

SOC asked JDA to investigate FAA's use of the "DNL" (Day Night Level) noise criterion as well as the selection of the value of "65 DNL" as the metric that was used define the areas and population adversely affected by O'Hare noise. Residents of SOC communities and federal, state and local public officials have raised questions as to whether FAA's use of the 65 DNL metric understates both the size of the geographic area and the size of the population adversely impacted by noise.

In response to SOC's request, JDA retained Dr. Sanford Fidell, a nationally recognized expert on measuring aircraft noise impact, to conduct the investigation and prepare a report on his findings.

**Second**, SOC asked JDA to investigate a widespread community perception that the noise "contour" maps generated by Chicago and the FAA through the FAA's Integrated Noise Model (INM) did not accurately depict the full and actual extent of the area adversely impacted by O'Hare noise.

In response, JDA retained Dr. Antonio Trani, a Civil Engineering professor at Virginia Tech University – who has extensive experience in INM and related modeling issues, including experience as an expert retained by FAA – to conduct an investigation:

- a) To evaluate and document the differences between O'Hare Modernization Program EIS modeled contours and actual noise experiences and identify specific model inputs that should be verified to ensure accuracy with current operations.
- b) To produce a number of noise maps using the latest version of INM (version 7.0d) to verify EIS contours and FAA Re-evaluation contours, to model current and future contours and to quantify extent of geographic and population impacts.

- c) To evaluate using the INM model the potential noise impact of various operational alternatives which the JDA and others may recommend to reduce adverse noise impact from O'Hare.

In addition, SOC asked JDA as part of this second effort to investigate the practices of other major airports in the United States and elsewhere to provide noise impact information to the O'Hare area communities on a real time basis.

**Third**, SOC asked JDA to assemble a team of air traffic experts to recommend possible operational changes at O'Hare to reduce the noise impact of O'Hare operations without impacting safety or significantly reducing airport/airspace capacity.

In response to SOC's request, JDA assembled a team of air traffic experts with significant experience – both at O'Hare and the FAA's Elgin Regional Air Traffic Center (TRACON) to conduct the analysis and provide recommendations as to potential remedial measures. The JDA team of air traffic experts consists of Rob Voss, Jim Krieger and Craig Burzych. Jim Krieger and Craig Burzych have over four decades of hands on operational experience in air traffic control at the O'Hare tower. Rob Voss has extensive experience with systems operations and the Air Traffic System Command Center and based at the FAA's Great Lakes Regional Office in Des Plaines, IL.

## 2. Summary of Noise Metrics Findings

Dr. Sanford Fidell's report on noise metrics, "*Analysis of the Technical Basis of FAA's Noise Regulatory Framework and its Application to the O'Hare Modernization Program*" includes the following findings:

### ***Basis for FAA selection of $L_{dn} = 65$ dB as a criterion of "significant" noise impact***

- 1) FAA's 1985 adoption of  $L_{dn} = 65$  dB as a definition of "significant" noise impact was not based on objective analysis or systematic scientific research.
- 2) The 65 dB level is based on outdated analysis of the relationship between noise exposure levels and the percentage of community residents adversely affected by noise. FAA's current adherence to the 65 dB level is predicated on a 1992 report by Federal Interagency Committee on Noise (FICON), which updates and accepts earlier statistical analysis methods. Since the 1992 FICON report, many subsequent statistical studies of the annoyance of aircraft noise show that the 65 dB value significantly *understates* both geographic extent, and hence the size of the population adversely impacted by aircraft noise. As explained further in Dr. Fidell's report, FAA's use of an annualized average DNL value of 65 dB has other flaws which render its definition of the significance of noise impact technically inaccurate.

- 3) To remain consistent with the current international scientific consensus (per ISO 1996-1, “Description, measurement and assessment of environmental noise — Part 1: basic quantities and assessment procedures”), FAA must reduce its definition of “significant” noise impact by about an order of magnitude, to  $L_{dn} \approx 55$  dB. Failure to do so will deprive populations of communities of *average* sensitivity to aircraft noise protection from exposure to highly annoying noise.
- 4) The noise exposure contours of the EIS for the OMP considerably understate the geographic extent of areas in communities and neighborhoods around ORD that are adversely impacted by aircraft noise. Full disclosure in the EIS of the extent of these greater impacts could have conceivably changed the relative comparison of runway alternative alignments in the EIS. Full disclosure might also change ongoing decision-making about continuing operations at O’Hare. Failure to acknowledge these greater impacts can exclude thousands of residents from eligibility for impact mitigation measures such as acoustic insulation.

***Varying tolerances of different communities for aircraft noise exposure***

- 5) FAA’s interpretive criterion for the significance of aircraft noise exposure applies only to a hypothetical community of average tolerance for aircraft noise. In reality, communities differ considerably from one another in the prevalence of annoyance induced by the same levels of noise exposure. If FAA wishes its criterion of significant noise impact to apply with uniform effect in different communities, the criterion must reflect community-specific differences in tolerance for noise exposure.
- 6) O’Hare area communities newly exposed to high levels of aircraft overflights may be less tolerant than average of aircraft noise exposure. Numbers of unique noise complainant addresses lodged from O’Hare area communities have increased greatly since the latest runway opening at O’Hare in 2013. Even an  $L_{dn} = 55$  dB criterion for significant noise impact underestimates the extent of significantly noise impacted population in a community of lesser than average tolerance for noise exposure.

***Improved estimates of aircraft noise annoyance in ORD-vicinity communities***

- 7) The actual tolerance of a particular community for exposure to aircraft noise can be empirically quantified by means of a social survey. Such a social survey would permit estimation of a Community Tolerance Level (CTL) value for ORD-vicinity communities that would permit better-informed decisions to be made about the significance of noise impacts resulting from ORD’s runway reconfiguration project. It would also permit systematic and specific application of policy-based decisions about the percentage of a community that deserves protection from exposure to highly annoying aircraft noise to ORD-vicinity communities.
- 8) Absent performance of an ORD community-specific CTL study, the appropriate DNL criterion to delineate the geographic impact of adverse noise impact from O’Hare operations should be  $L_{dn} = 55$ dB.

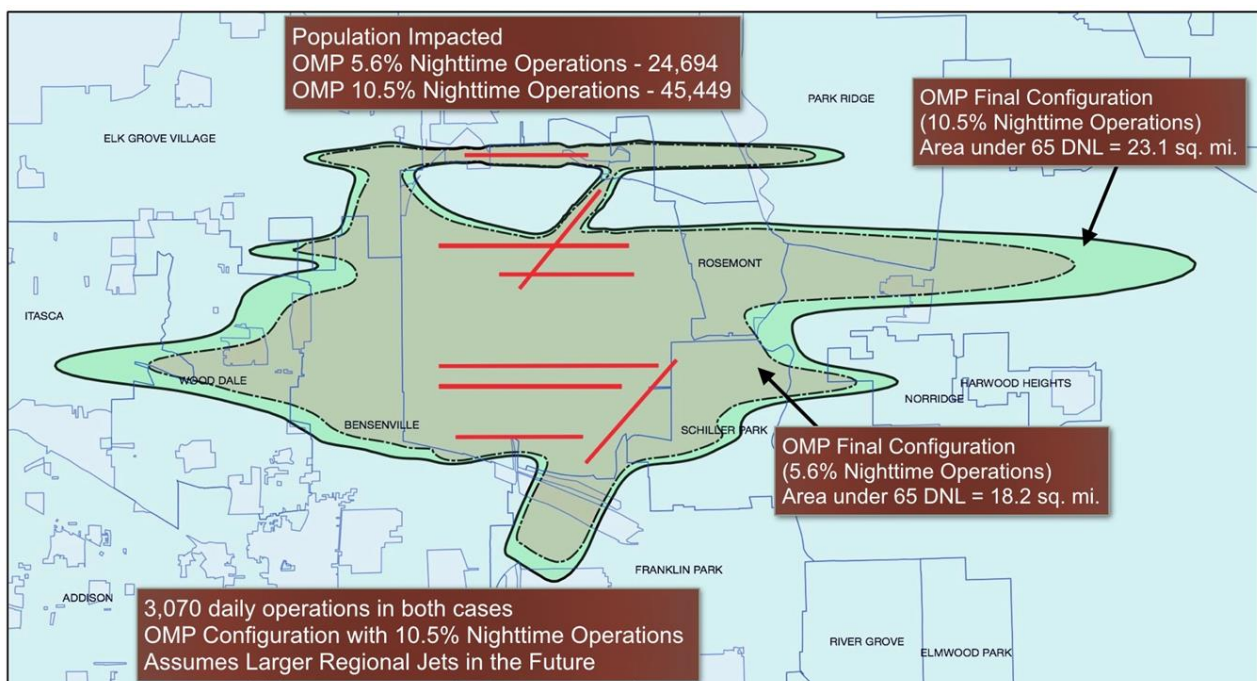
- 9) The FAA has recently acknowledged and the United States Court of Appeals for the District of Columbia Circuit has confirmed that the FAA has both statutory authority and responsibility to address and ameliorate noise impacts and complaints in areas outside any DNL contour.

### 3. Summary of INM Analysis Findings

**The OMP Full Build EIS and the FAA’s 2015 “Re-Evaluation” significantly understate both the geographic extent of adverse noise impact and the size of the population adversely impacted by O’Hare Noise.**

The INM analysis found that two factors resulted in EIS contours that significantly understate the noise impact that will occur under the full build conditions. First, the actual number of nighttime flights at O’Hare is 10.5%, which is almost double the 5.6% that was assumed in the EIS modeling of the 65 DNL contour. Second, the EIS assumed that a significant proportion of small quieter regional jets made up the fleet mix at O’Hare whereas more recent data indicates that the airlines are moving to larger regional jets resulting in a noisier fleet mix at O’Hare.

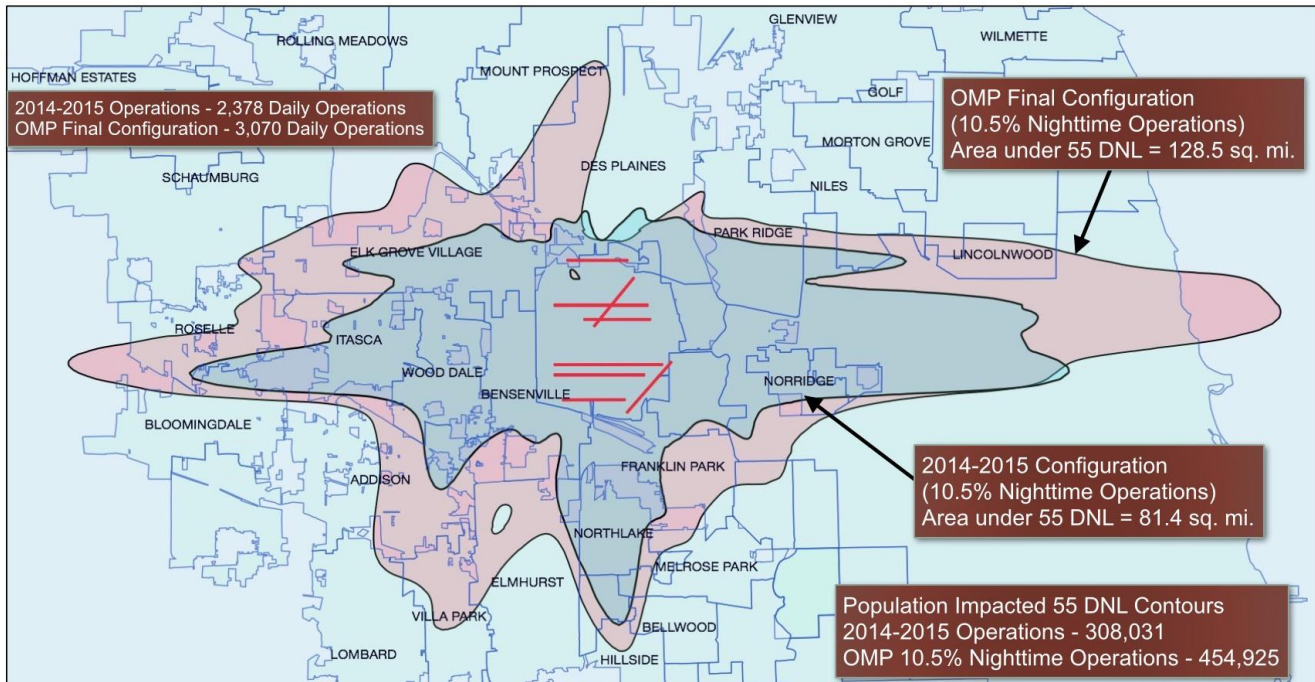
When corrections are made for these two factors, the size of the population within the 65 DNL contour rose from 24,694 to 45,449 (an 84% increase in number of people adversely affected).



**Figure 1: Comparison of ORD EIS OMP Full Build to JDA ORD OMP Full Build Contour.**



The actual impacts could be better or worse depending on advances in quieter aircraft, improved methods to reduce noise and levels of flight activity.



**Figure 2: Comparison of JDA ORD OMP Full Build to Today's 2014-2015 55 DNL Contour.**

**SOC communities can expect a significant increase in noise impact from today's 2014-2015 contour to the corrected JDA OMP Full Build contour.**

The 65 DNL impact increases 85% in area from 12.5 to 23.1 square miles and increases 233% in estimated population impact from 13,636 to 45,449. The same degree of significance is true if Dr. Fidell's recommendation for significant impact at 55 DNL is adopted. Figure 2 shows the predicted expansion of the 55 DNL contour from the contour modeled for 2,378 operations in 2014-2015 as compared to the 55 DNL contour with the full OMP at the level of 3,070 operations used to justify the full build OMP. Population estimated in area within the 55 DNL increases 48% from 308,031 to 454,925 and Area impacted increases 58% from 81.4 to 128.5 square miles.

**The prospective growth in nighttime operations.**

If additional cargo operations occur nighttime operations will likely increase. This increase in nighttime operations will necessarily increase the geographic extent of adverse noise impact as well as the size of the adversely impacted population beyond that modeled here.

## Variable noise experience

A brief mention is warranted here as to a variable that affects the size, geographic extent, and population impact of the daily INM contour versus the average annual INM contours. The annual average INM contour is predicated on a hypothetical single day based on average annual operating conditions. But on any given day, actual operating conditions may be dramatically different than the average annual conditions resulting in DNL contours for those days far different than portrayed by the annual average contour.

The noise contour on a day with predominantly “east flow” would encompass an area to the east of O’Hare which is larger and adversely affects a larger population than reflected by the average annual contour. Similarly, the area adversely affected by a contour based on a “west flow” day would extend further west than reflected by the average annual contour.

## 4. Real Time Sharing of Noise Data with Community Members

JDA’s research found a very broad range of noise impact information sharing globally. It should be no surprise that best noise management practices recognized in the industry maximize information available to and collaboration with the public.

Two software systems stood out in the research – Casper’s Noise Lab and Bruel and Kjaer’s WebTrak. Noise Lab was unique in both quantity and quality of information and WebTrak appears to be dominant in the market with approximately 63 major airports globally utilizing the system to share noise information including the Port Authority of New York and New Jersey, Los Angeles International Airport, and Denver International Airport. Both systems have similar capabilities. They combine noise data collected through traditional noise monitoring systems with flight track data. The technology enables near real time display of noise monitor levels associated with each flight track. This data can be further compiled and analyzed to produce noise reporting tailored to specific needs and metrics.

Airports differ in their use of the systems with some showing flight tracks, some showing flight tracks and noise monitor measurements and some going as far as to display flight tracks, noise monitor measurements and current noise contours. Quality and quantity of noise information is key to productive dialogue with communities to address and manage noise impacts.

Since JDA’s initial recommendation to SOC to explore WebTrak on April 1st of this year, Chicago O’Hare has implemented WebTrak and is now displaying flight tracks in near real time for public viewing. However, after implementing flight tracking on WebTrak, CDA personnel reported to the ONCC technical committee that CDA does not support providing a wide variety of noise monitor information via WebTrak even though many other major airports as the Port Authority of New York and New Jersey do provide such information.



SOC, other impacted O'Hare communities and neighborhoods, and the City of Chicago can benefit by expanding the use of ANOMS with WebTrak to collaborate on best management of ORD's current and future noise environment. Noise impacts from current plans for infrastructure changes can be predicted, optimized to minimize noise impacts and monitored for accountability. The system can be utilized to improve transparency. Data that JDA believes can and should be provided include but are not limited to:

- Historic and current flight track data identifying aircraft type, airline, flight number XY coordinates, altitude and speed
- Map changing values of noise monitor measurements as aircraft fly over changing color with noise level
- Map gate locations relative to flight tracks to monitor aircraft to determine if aircraft followed various noise abatement procedures such as the Fly Quiet program
- Map INM annual DNL contours as compared to predicted contours for 55, 60, 65 and 70 DNL
- Map daily DNL contours for the purpose of understanding peak and off peak impacts
- Alternate metrics such as CNEL, N70, N60 and Time Above as determined necessary to tailor noise information to community concerns
- Map noise complaint locations relative to flight track data and current noise contours

With Chicago having taken the first step to empower community collaboration with WebTrak, JDA recommends that the City of Chicago reconsider expanding the use of WebTrak to further inform the surrounding communities and improve collaborative noise management.

## 5. Fly Quiet Analysis and Operational Changes at ORD

The JDA team's investigation included:

- An operational review of the City of Chicago's current "Fly Quiet" program at O'Hare
- A review of the noise abatement programs at 15 major U.S. airports and several overseas airports for possible initiatives that might be used at O'Hare
- Development of recommendations for operational changes at O'Hare that could provide potentially significant noise relief for O'Hare area communities – particularly at night
- Three interim reports addressing visual approaches, crosswind/diagonal runway usage and the need for additional runways at O'Hare

In early June of 2015, the JDA Air Traffic team released four interim reports containing important findings and recommendations including:

- 1) Use of Visual Approach During Fly Quiet (June 3, 2015)
- 2) O'Hare Crosswind/Diagonal Runway Layout and Usage (June 3, 2015)
- 3) Assessment of Need for New O'Hare Runway(s) (June 3, 2015)
- 4) Best Practices and Tools to Provide Noise Information to Communities (June 3, 2015)

These reports can be examined at the JDA website [www.jdasolutions.aero](http://www.jdasolutions.aero).

The Air Traffic Team identified 20 Recommendations:

**JDA FQ-1:** The CDA should develop a more comprehensive, aggressive Fly Quiet program, with a strong mission statement demonstrating its commitment to the highest level of resources to establish and maintain the quietest environment practical for all nearby communities.

**JDA FQ-2:** The CDA should leave a third runway open during Fly Quiet hours, including at least one diagonal runway, to disperse airport noise effects and to reduce flying distances over communities.

**JDA FQ-3:** The FAA should encourage operational decision-making personnel to avoid terminating Fly Quiet departure procedures prematurely.

**JDA FQ-4:** The CDA should continue encouraging ATC compliance with recommended procedures, through on-going recurrent controller education efforts, timely compliance reporting and follow-up activity.

**JDA FQ-5:** A Continuous Descent Approach should be developed by the FAA for each arrival runway and used during Fly Quiet hours.

**JDA FQ-6:** The CDA should conduct a review of Noise Abatement Departure Procedures (NADPs), revise as appropriate, coordinate with users and advertise the NADP policy within the Fly Quiet Program Manual.

**JDA FQ-7:** The SOC, CDA and FAA coordinate to assess departure flight paths from ORD's newest runways and preferred runway usage, to determine the best runway configurations and departure headings for noise abatement and include these within the Fly Quiet Program Manual.

**JDA FQ-8:** All of the current recommended departure headings should be assessed to determine whether they are actually achieving the goal of directing flights over less-populated areas and revised as required to minimize population impacted by noise on a rotating basis every evening to the extent practical. The CDA should utilize a computer driven model to best determine how to distribute flights over the region on an objective bases to minimize the impact on any particular community. Take-offs should be evenly disbursed over the entire population.

**JDA FQ-9:** Enact a mechanism to facilitate the periodic review of the Fly Quiet Program Manual, to ensure that it is up-to-date and continues to reflect changes to the airfield and surrounding communities.

**JDA FQ-10:** The FAA should reevaluate RNAV arrival and departure procedures to determine whether amendments or new procedures could be designed and implemented to provide additional noise benefits.

**JDA FQ-11:** The areas in which over flights create the least disturbance should be specifically identified by the SOC and nearby communities by correlating noise complaint numbers with population density and flight track analysis. The SOC, CDA and FAA should then collaborate and review whether higher altitudes for initial turns, compound procedures or extended distances on initial headings will reduce noise impacts during Fly Quiet hours.

**JDA FQ-12:** Throughout each day, during light traffic periods, or during weather events where departures are restricted to a single heading, controllers should use the published Fly Quiet noise headings as “default” departure headings, even outside of normal Fly Quiet hours.

**JDA FQ-13:** The CDA should continue advocating the use of minimal reverse thrust and for pilots to avoid use of early runway exits during Fly Quiet hours, unless operationally necessary.

**JDA FQ-14:** The CDA should encourage airlines to avoid using old generation aircraft such as the MD80 and DC10 during Fly Quiet hours.

**JDA FQ-15:** The CDA should coordinate with other major airport operators to encourage airlines using A320 aircraft to retrofit their fleets with vortex generator modifications for reducing airframe noise.

**JDA FQ-16:** The CDA should enhance the report card program to measure and publicly report on airlines and cargo operator’s noise mitigation performance metrics and the CDA, FAA and airlines collaborate to minimize scheduled operations during Fly Quiet hours.

**JDA FQ-17:** Utilize two or more departure runways during Fly Quiet hours, along with a wider range of departure headings, allowing air traffic control to expedite traffic and draw overall aircraft operations per impacted area down to lower traffic levels more quickly in the busier shoulder hours.

**JDA FQ-18:** The CDA should implement a Runway Rotation Plan to avoid concentrating flights over the same communities and equitably distribute noise during the Fly Quiet hours.

**JDA FQ-19:** The FAA (O’Hare Tower) should refrain from using intersection departures during Fly Quiet hours.

**JDA FQ-20:** FAA should consider eliminating visual approaches during fly quiet hours.

Dr. Trani analyzed several of the ATC teams Fly Quiet recommendations and found that several of the Fly Quiet recommendations offered the O’Hare area communities the potential for modest to significant partial nighttime noise relief. Which communities benefit will depend on which of the Fly Quiet options are implemented and which of the suggested operating configurations are adopted and implemented.

For example, depending on which runways are operated at night for departures and arrivals, some communities may see major reductions in overflights for some nights while experiencing more overflights when runway rotation shifts operations to runways impacting those communities.

The exact quantitative degree of relief will depend on which of the ATC teams Fly Quiet recommendations are adopted. Further, even some or all of these recommendations are adopted, there will inevitably be a period of trial and error to evaluate the real world impacts of these recommendations.

## 6. Opportunities and Needs Going Forward

The noise abatement initiatives described in the JDA Fly Quiet recommendations and in the reports by Dr. Fidell and Dr. Trani should be evaluated by FAA Air Traffic officials in coordination with the Chicago Department of Aviation, the airlines, and community stakeholders such as SOC, ONCC, state and local officials and community organizations such as FAIR. INM modeling should be used to validate and target the best combination of operational parameters to minimize noise impacts.

The JDA team stands ready to provide expert technical assistance to SOC communities and other stakeholders in conducting such evaluations.