

ICAO-ACI/LAC Seminar for the Americas

Aircraft Noise Exposure and its Impact on Land Use at Airports

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Good morning and thank you for inviting me to speak regarding an issue that has shaped our industry for decades and will continue to do so in the years to come – the impact of aircraft noise exposure on land use planning at airports. Wherever you look at our airports, be it in Latin America, the Caribbean, the United States, Europe or Asia, one of the most dominant criteria shaping future growth is how that growth will take into account the almost certain increase in aircraft noise and its adverse impacts. Each airport operator present here today has, in all likelihood, faced this issue at your own facilities and developed ways to help manage it. What I will be speaking to this morning is a model employed in the United States to help airport operators deal with this issue in a systematic and “inclusive” fashion. I will mention some of the measure employed in the United States to help mitigate noise impacts on non-compatible land uses. Not all of these measures will work at every airport – whether in the United States or not – but the overall approach can serve as a guide for the development of noise mitigation programs that address the specific needs of every airport community.

Background

The problem with aircraft noise exposure in the United States dates back over 40 years to the introduction of commercial jet service. As communities were subjected to increasing numbers of jet flights and their unwelcome noise, they turned to the courts for some measure of relief. Suing airport operators on grounds that the aircraft noise represented a nuisance and that it diminished the value of their homes, a number of communities found success in the courts and were able to force airports to impose noise restrictions. With the increasing threat of an aviation industry that would be severely constrained by inconsistent and conflicting noise restrictions throughout the country, the Federal Government established the Noise Abatement Policy Act in 1976. This Federal law established the responsibilities for aircraft noise impacts among the FAA, airlines, the airport operators, and the affected communities. Over the years, additional modifications have been made in the responsibility that each of these entities bears for aircraft noise impacts, including the Aircraft Safety and Noise Abatement Act of 1979 and the Airport Noise and Capacity Act of 1990. These Federal laws form the basis for the aircraft noise

control and land use compatibility program set forth in Federal Aviation Regulation (FAR) Part 150.

Part 150 Overview

The Part 150 Program establishes a methodology for conducting airport noise compatibility and land use planning studies. The program is based on a five-year planning horizon, is voluntary, and – because it is established pursuant to the aforementioned Federal laws – the program is regulatory. The approach employed in conducting Part 150 Planning Studies is set forth in FAA Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports.

Part 150 Elements

The Part 150 Program requires the development of maps indicating noise impacts generated by airport traffic - superimposed on existing land use maps (Noise Exposure Maps, or NEMs) - and the establishment of a program for mitigating non-compatible land uses (Noise Compatibility Program, or NCP). NEMs are generated for the existing traffic and for five-year forecast traffic, with and without the benefits of the Noise Compatibility Program.

Noise Exposure Maps (NEMs)

Noise exposure maps bring together maps representing existing land uses with noise contours indicating lines of equal noise exposure, using a given noise metric. Noise contours are typically generated through the use of the Integrated Noise Model (INM), although this is not the only model accepted by the FAA. For most NEMs, the noise metric used is DNL, a metric that assigns a 10 decibel penalty to noise generated between 10 PM and 7 AM to take into account the more disruptive nature of noise at those hours. Comparing these noise levels to the existing land uses, one determine whether the use is compatible or not, as indicated in this matrix which is reproduced in the handout in Appendix 1.

Noise Compatibility Programs (NCPs)

Having established those land uses which are not compatible with the existing aircraft noise, alternatives are reviewed for mitigating the impact. Options suggested by the FAA include:

- ➔ Acquisition of land or easements
- ➔ Sound-proofing and sound attenuation barriers
- ➔ Preferential runway use system by the FAA
- ➔ Noise abatement flight procedures by the FAA
- ➔ Noise-based restrictions on the use of the airport, such as:
 - Limitations based on noise levels
 - Use of noise abatement takeoff or approach procedures
 - Landing fees based on FAA certificated noise levels or on time of day
 - Nighttime use limitations

A matrix of noise control actions for various noise-related problems is shown here and included in the handout in Appendix 2.

The costs and benefits of each alternative being considered are identified and assessed to form a logical basis for decision-making. At this point, alternatives are selected for inclusion in the NCP, which provides a detailed discussion of each element recommended for adoption. The completed NCP and documentation are then submitted to the FAA for approval.

NCP Finalization

Once the FAA accepts the NCP as being complete, a 180 day review period commences for comments by the public. After comments are received and addressed, the FAA issues a determination approving or disapproving each measure in the NCP. Once approved, the operator can apply for Federal financial assistance to implement the approved measures. A couple of examples of Part 150 Studies follow.

Kansas City International Airport Part 150 Noise Compatibility Study

At Kansas City International Airport, a Part 150 study was undertaken in conjunction with a master plan study. The noise-mitigation elements generated in the Part 150 Program helped complete the airport's program for its future development.

Shown here are the Noise Exposure Maps for the Airport, along with an indication of the number of people that would be impacted at different noise levels with and without the planned improvements. The areas shaded in pink are expected to see increases in noise; those in blue are expected to see decreases. One of the approved elements of this Part 150 Program was the use of a preferential runway system. So while the overall noise contours are not diminishing in size, the shift in runway use takes traffic away from residential communities and over areas where the land use is compatible with the noise, such as manufacturing. Thus the total number of people residing in a noise contour of 60 DNL or greater would drop from 1,176 to 1,053 in the year the study was performed, and from 3,475 to 2,605 some five years later. Other recommendations included re-zoning areas and here we see a recommended land use plan for the areas surrounding the airport, emphasizing non-residential uses. Residential uses are shown in yellow. Finally, the plan called for the acquisition of land, shown here in the areas to the south of the airport.

Tampa International Airport Master Plan and FAR Part 150 Update.

Again as part of a Master Plan, Tampa International Airport also conducted an update of their Part 150 program to ensure that the improvements recommended in the Master Plan were compatible with their NCP. Shown here are forecasts for passengers, aircraft operations, and cargo, as well as a projection of the delays that might be experienced at the airport absent physical improvements. The Master Plan recommended the construction of a new parallel runway as well as other improvements aimed at providing a high level of services at Tampa. Shown here is the recommended ultimate development plan for Tampa for the year 2020, including the new runway, new taxiways, additional parking areas, and cargo development. The Part 150 Program recommended:

- Priority for daytime south-flow departures over the bay.

- Daytime runway use priorities to limit jet operations over residential areas immediately south of the Airport.
- Nighttime preference for all arrivals from the north and departures to the south over the bay.
- Initial jet departure headings of all runways to lead aircraft over least-populated areas.
- Reduce close-in propeller aircraft departures over residential areas northeast and northwest of the Airport.
- Reduce close-in arrival turns over residential areas south of the Airport.
- Continue use of existing helipad location of the east side of the Airport designated to facilitate preferential routes.
- Request jet pilots use FAA-developed noise abatement departure profiles.
- Construct noise-reduction enclosure for high-power jet engine maintenance runups.

Shown here are the existing and future 65 DNL noise contours for Tampa with the Recommended Noise Compatibility Program. The green contour represents the 1998 Base condition; the red contour shows the forecast 2003 condition.

Conclusion

There are distinct advantages to a program such as the one I've just described. These include:

- Improved Public Relations
- Intra- and Inter-governmental Coordination
- Airport Facilities Development
- Improved land Use Planning
- Noise Abatement

However, there are also some distinct disadvantages, including:

- Heightened Controversy
- Unrealistic Expectations

- ➔ Uncooperative Participants in the Process
- ➔ Possible Litigation

The approach taken in the United States is but one model of how this critical issue can be addressed and I hope this overview to that approach was of benefit. If you have any questions, I will be happy to answer them.

Appendix 1

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Appendix 1

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LAND USES NORMALLY COMPATIBLE WITH VARIOUS NOISE LEVELS

Land Use	Yearly Day-Night Average Sound Level (L _{dn}) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL:						
Residential, other than mobile homes and transient lodgings	Y	N ¹	N ¹	N	N	N
Household units: (11)						
Single units - detached (11.11)						
Single units - semidetached (11.12)						
Single units - attached row (11.13)						
Two units - side-by-side (11.21)						
Two units - one above the other (11.22)						
Apartments - walk up (11.31)						
Apartments - elevator (11.32)						
Group quarters (12)						
Residential hotels (13)						
Other residential (19)						
Mobile home parks (14)	Y	N	N	N	N	N
Transient lodgings (15)	Y	N ¹	N ¹	N ¹	N	N
PUBLIC USE:						
Schools, hospitals, and nursing homes	Y	25	30	N	N	N
Educational services (48)						
Hospitals, nursing homes (45.13, 45.14)						
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Cultural activities (including churches) (71)						
Auditoriums, concert halls (72.1)						
Governmental services (47)	Y	Y	25	30	N	N
Transportation	Y	Y	25	30	N	N
Railroad, rapid rail transit and street railway transportation (41)						
Motor vehicle transportation (42)						
Aircraft transportation (43)						
Marine craft transport (44)						
Highway and street right-of-way (45)						
Parking (46)	Y	Y	Y ²	Y ³	Y ⁴	N
COMMERCIAL USE:						
Offices, business, and professional	Y	Y	25	30	N	N
Finance, insurance and real estate services (61)						
Personal services (62)						
Business services (63)						
Professional services (65)						
Other medical facilities (65.1)						
Miscellaneous services (69)						
Wholesale and retail - building materials, hardware and farm equipment	Y	Y	Y ²	Y ³	Y ⁴	N
Wholesale trade (51)						
Retail trade - building materials, hardware and farm equipment (52)						
Repair services (54)						
Contract construction services (64)						
Retail Trade - general	Y	Y	25	30	N	N
Retail trade - general merchandise (53)						
Retail trade - food (54)						
Retail trade - automotive, marine craft, aircraft and accessories (55)						
Retail trade - apparel and accessories (56)						
Retail trade - furniture, home furnishings and equipments (57)						
Retail trade - eating and drinking establishments (58)						
Other retail trade (59)						
Visitor (48)	Y	Y	Y ²	Y ³	Y ⁴	N
Communication (47)	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION:						
Manufacturing, General	Y	Y	Y ²	Y ³	Y ⁴	N
Food and kindred products - manufacturing (21)						
Textile mill products - manufacturing (22)						
Apparel and other finished products made from fabrics, leather, and similar materials - manufacturing (23)						
Lumber and wood products (except furniture) - manufacturing (24)						
Furniture and fixtures - manufacturing (25)						
Paper and allied products - manufacturing (26)						
Printing, publishing, and allied industries (27)						
Chemicals and allied products - manufacturing (28)						
Petroleum refining and related industries (29)						
Rubber and misc. plastic products - manufacturing (31)						
Stone, clay and glass products - manufacturing (32)						
Primary metal industries (33)						
Fabricated metal products - manufacturing (34)						
Miscellaneous manufacturing (39)						
Photographic and optical	Y	Y	25	30	N	N
Professional, scientific, and controlling instruments, photographic and optical goods, watches and clocks - manufacturing (35)						
Agriculture (except livestock) and forestry	Y	Y ⁶	Y ⁷	Y ⁸	Y ⁸	Y ⁸
Agriculture (except livestock) (81)						
Agricultural related activities (82)						
Forestry activities and related services (83)						
Livestock farming and breeding (81.5 to 81.7)	Y	Y ⁶	Y ⁷	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Fishing activities and related services (84)						
Mining activities and related services (85)						
Other resource production and extraction (89)						
RECREATIONAL:						
Outdoor sports arenas and spectator sports (72.2)	Y	Y ⁵	Y ⁵	N	N	N
Outdoor music shells, amphitheaters (72.11)						
Nature exhibits and zoos (71.2)	Y	N	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	N	N	N	N
Amusements (73)						
Parks (74)	Y	Y	Y	N	N	N
Public assembly (72)						
Resorts and group camps (75)						
Other cultural, entertainment and recreation (79)						
Golf courses, riding stables and water recreation (74)	Y	Y	25	30	N	N

Numbers in parentheses refer to Standard Land Use Coding Manual (SLUCM)

Appendix 2

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FIGURE 2

MATRIX OF NOISE CONTROL ACTIONS

			IF YOU HAVE THIS PROBLEM						
			NOISE FROM TAXIING	DEPARTURE	APPROACH	LANDING ROLL	TRAINING FLIGHTS	MAINTENANCE	GROUND EQUIPMENT
AIRPORT PLAN	Changes in Runway Location, Length or Strength	1	•	•	•	•	•		
	Displaced Thresholds	2			•	•			
	High-Speed Exit Taxiways	3	•		•				
	Relocated Terminals	4	•					•	•
	Isolating Maintenance Runups or Use of Test Stand Noise Suppressors and Barriers	5	•					•	•
AIRPORT AND AIRSPACE USE	Preferential or Rotational Runway Use *	6	•	•	•	•	•		
	Preferential Flight Track Use or Modification to Approach and Departure Procedures *	7		•	•		•		
	Restrictions on Ground Movement of Aircraft *	8	•						
	Restrictions on Engine Runups or Use of Ground Equipment	9						•	•
	Limitations on Number or Types of Operations or Types of Aircraft	10	•	•	•	•	•	•	•
	Use Restrictions Rescheduling Move Flights to Another Airport	11	•	•	•	•	•	•	•
	Raise Glide Slope Angle or Intercept *	12			•		•		
AIRCRAFT OPERATION	Power and Flap Management *	13		•	•		•		
	Limited Use of Reverse Thrust *	14				•			
LAND USE	Land or Easement Acquisition	15	•	•	•	•	•	•	•
	Joint Development of Airport Property	16	•	•	•	•	•	•	•
	Compatible Use Zoning	17	•	•	•	•	•	•	•
	Building Code Provisions and Sound Insulation of Buildings	18	•	•	•	•	•	•	•
	Real Property Noise Notices	19		•	•	•	•	•	•
	Purchase Assurance	20		•	•	•	•	•	•
NOISE PROGRAM MANAGEMENT	Noise-Related Landing Fees	21	•	•	•	•	•		
	Noise Monitoring	22		•	•		•	•	
	Establish Citizen Complaint Mechanism Establish Community Participation Program	23	•	•	•	•	•	•	•

* These are examples of restrictions that involve FAA's responsibility for safe implementation. They should not be accomplished unilaterally by the airport operator.