NOISE REMEDIES

I. Introduction

In keeping with the goal of achieving a compatible relationship between the airport and the surrounding community, the noise exposure study has conducted a thorough measurement and analysis of Sea-Tac's problems. Details of this study are described under ENVIRONMENT. Objectives have been to (1) minimize noise at the source directly through local programs where possible, (2) to accurately identify and use source reduction programs that are occurring nationwide, and (3) to apply a complete set of community-based remedies directly in the neighborhoods affected significantly by noise exposure. Such programs are designed to deal with the residual problem not resolvable at the source.

As indicated in the noise exposure studies, time is an important factor. Noise exposure is presently at a peak level and will be decreasing through source changes (engine retro-fitting, increasing use of new aircraft, modified operating procedures, etc.). Thus, programs must be applied that deal with anticipated long-term duration of exposure. In addition, as the exposure studies indicate, reaction to noise is a highly subjective matter. Annoyance is a complex mix of factors attributable both to the noise itself as a primary component and to "secondary components" that are also present. These "secondary components" include difficulty in selling property, concern over property value, fear of increasing noise, fear of neighborhood deterioration, uncertainty in planning for home improvements and repairs and many other similar concerns.

The following noise programs have been derived from the Sea-Tac Communities Plan effort and are divided into two categories.

The first is a listing of all programs either adoptable locally or identifiable nationally which will reduce noise at the source. Special emphasis has been placed on the source reduction programs most likely to occur in projected future noise exposure. Although currently proposed Federal regulations on aircraft engines indicate a relatively rapid decrease in noise levels, more conservative assumptions for forecasts of exposure have been used. A more conservative margin is desirable inasmuch as community remedy programs must be based in part on these future exposure values.

The second category of noise remedy programs is represented by recommendations for change or support within noise affected residential neighborhoods in the airport vicinity. Such programs address not just the noise itself but the secondary annoyance factors that contribute to the total problem. They deal, not with the source, but with the area receiving the noise impact.

To date, the most direct kind of program applied in impacted areas has been total acquisition through condemnation. This method removes the impacted neighborhood entirely. It is an appropriate solution in areas where noise impact is extremely severe and likely to remain so. Often, however, total acquisition may be so drastic and disruptive to existing neighborhoods that it should not apply unless no possibility remains of relieving otherwise suitable residential areas. Therefore,

where noise is not quite so severe and prolonged the program emphasis is on stabilizing and strengthening neighborhoods. These programs apply in many cases to the "secondary" aspect of noise exposure that result in annoyance and concern among residents. Even with the application of special programs to impacted areas many people will choose to live elsewhere. The desired result would be areas in which noise is decreasing gradually, where those that desire to leave have greater opportunity to do so and those who remain or moved in will be willingly committed to their community with a positive view toward their homes and their neighborhoods.

6.2.2 AIRCRAFT NOISE REDUCTION

Source improvement in aircraft noise exposure patterns can result from several abatement strategies. Modification of the aircraft itself will cause the most improvement. Changes in landing, take off and over-flight procedures will produce additional benefits to the communities surrounding airports by further separating the source and the receiving areas.

Changes in Aircraft

Aircraft engine changes and air frame technology will reduce noise levels. A program in effect and regulated by the Federal Aviation Administration is FAR Part 36 requirements for subsonic jets, (specified noise limits that must be met by current jet aircraft). Extension of this regulation to include previously produced aircraft through a modification or "retrofit" program is proposed for rapid implementation. Retrofit can be accomplished by two methods: "SAM" (Sound Absorbent Material) and "REFAN". The SAM procedure involves applying new sound reducing nacelles to existing engines. REFAN is the conversion of engines through the introduction of new front fans which significantly lower noise emissions. Although SAM retrofit does not gain the noise reduction available through REFAN programs, it can be implemented immediately on the JT8D engine, the most prevalent engine on B727, 737 and DC-9's. SAM achieves a 3 EPNdB take-off noise reduction and a 10 to 15 EDNdB reduction on approach over the present "noisy" engines. SAM "kits" for the JT3D engine (DC-8, B707) are still under development, and present directions indicate they, too, will allow reduction to current FAR Part 36 standards.

The greatest reduction available for current JT8D involves "refanning" the engine to approximate the high bypass ratio-type engines powering the 747 and DC-10. This phase of aircraft noise reduction would attain levels significantly below present FAR Part 36, but will take a longer development and installation period. REFAN is more costly than SAM retrofit, and would probably not apply to the older 707, DC-8 models, but should be required when available on all new production models of the 707 (DC-8's are no longer produced).

The Federal Aviation Administration and Environmental Protection Agency indicate that a better than a 50% retrofit program could be accomplished by 1978. At that time the majority of the United States' jet fleet would meet FAR Part 36 performance standards. By 1981, full compliance is expected of the aircraft industry. To provide a more conservative margin, the future exposure patterns utilized for the Sea-Tac/Communities Plan Study Area are based on a 1983 full compliance year. Foreign registered aircraft operating in the United States would also be required to comply to these regulations. Further extension of FAR 36 noise standards was also implemented in this time frame--a possible FAR 36+10 noise reduction objective, along with restrictions on corporate jet and propeller aircraft, helicopters and supersonic transports are included.

In addition to the modification of present-day aircraft, new models will be introduced to fulfill the demands of the air transport industry. These new planes are required to meet FAR 36 regulations and any additional noise stipulations imposed at a federal level. The early noisiest pure turboject 707 and DC-8 models will be replaced by these new aircraft, helping the noise picture

by directly substituting the most noisy with the least. Such "Fleet mix" changes have been reflected in the Sea-Tac/Community Plan projected noise calculations.

Support through local programs of advocacy rapid implementation of all federal aircraft source noise reduction efforts.

Operational Measures

Operational changes can provide considerable noise impact reduction. Flight procedures on approach/landing and takeoff are controlled by the Federal Aviation Administration while on-airport operations (taxiing, runways) are the responsibility of the airport operator. Technical inputs are received from the Air Transport Association, Airline Pilots Association, Environmental Protection Agency and other interested groups affected by any proposed actions. Specific actions may be adopted at specific airports for a variety of reasons (examples are a 5° approach slope at San Diego and Sea-Tac's Elliott Bay Departure), but generally, standardized national operational procedures are recommended. Such procedures try to achieve the lowest practical noise exposure commensurate with safety and economy.

Noise reductions of from two to ten decibels have been achieved by use of one or more of the operational changes instituted over the last few years. Three FAA programs, "Keep 'Em High," reduced flap angles on approach, and "Get 'Em High Earlier" have reduced impact areas considerably since being introduced. In accord with FAA directives, sonic booms are also regulated, and special air traffic rules and patterns are enforced.

A mandatory order is now being prepared to require a further modification to take-off procedures. Compliance with the ATA recommended "Get 'Em High Earlier" has been voluntary; changes have been suggested and after extensive testing, two procedures are emerging. . . one recommended by the ATA and one being flown by Northwest Airlines. Both procedures have been utilized with the projected Sea-Tac fleet mix and some differences in exposure appear; however, with new aircraft types and advanced guidance systems in the offing, more intensive research must be completed assessing the comparative effectiveness of these takeoff procedures. Both contribute to an improved exposure pattern.

On landing, increased approach angles would reduce noise over a greater distance. The two-segment approach has been evaluated by many pilots in different aircraft under (CAT I) instrument approach conditions; a Notice of Proposed Rule Making (ANPRM) was introduced by the FAA on March 20, 1974. Steeper and curved approach paths are also in the experimental stage and a microwave landing system offers considerable potential for noise reduction.

A standardization of the Instrument Land System (ILS) to a 3° glide slope was adopted in 1971, however, the south glide slope at Sea-Tac remains at 2.75° because of topographic and electronic difficulties. Technological problems also limit the use of "exclusive" runways at Sea-Tac as depicted as the West Approach NEF predictions in the noise analysis, Element 5.5 reference numbers 9, 10 and 11).

Special departure and arrival routing is in evidence at Sea-Tac Airport. The effect of the Elliott Bay routing is dramatic, but not within the Sea-Tac/Communities Plan Study area. Aircraft are given special headings

and minimum altitudes for directional change over heavily populated areas. Over-flights of industrial land and Puget Sound reduce noise exposure to many people. To the south, aircraft are directed to fly at runway heading to a minimum altitude (3,000 ft.) before initiating a change of direction. These procedures are being constantly surveyed in context of safety and economy.

Support through local advocacy programs the rapid development and adoption federal of all operational measures effective in reducing noise exposure.

Local Programs

In order to assure compliance with the recommended flight and operational procedures at Sea-Tac, a noise monitoring system can be useful. The ability of the Airport to assess the change in composite aircraft noise exposure will enable the Port of Seattle to gauge its progress toward solving the noise problems generated by single aircraft operations as well as overall industry improvement. Geneva, Osaka, New York and Taipei have all had noise monitoring equipment in operation and all report significant improvement in dealing with noise exposure patterns.

On-Airport operations are part of the Port of Seattle responsibility as operator of Sea-Tac. Engine maintenance has incurred unfavorable comment throughout the years, such that modifications of the procedures, locations and time restrictions have been required. A recommendation (already implemented) has been to move the engine run-up locations to positions allowing better patterns of noise impact. Possible use of special run-up devices can

be evaluated in terms of the new locations. The tremendous expense of such equipment will not be justified if the run-up noise falls mostly on airport property and generates few complaints. Future monitoring programs will help in this evaluation. Nighttime curfews also apply to maintenance activities. From 10 p.m. to 6 a.m. there currently can be no full power engine run-ups except for emergency situations. These provisions can be further restricted to allow no run-ups whatsoever.

Adopt an ongoing noise monitoring program to continuously determine compliance with operational procedures and general trends in community exposure levels.

Utilize new locations for engine maintenance run-ups to minimize exposure patterns off airport property.

Further restrict nighttime curfews on maintenance run-ups to allow none during sleep hours. — The people are not asking for blood — "except for emergency situations" should be sufficient!