AMENDMENT TO PART IV (AIRCRAFT NOISE) OF TRANSPORT CANADA'S GUIDELINES "LAND USE IN THE VICINITY OF AIRPORTS"

Thomas Kelly, ing. (P. Eng.)
Aviation Environmental Engineer
Transport Canada Aviation[1]
Ottawa, K1A ON8

ABSTRACT

In May 1996, Transport Canada (TC) issued an amendment to Part IV (Aircraft Noise) of its TP 1247 guidelines entitled "Land Use in the Vicinity of Airports". TP 1247 is published by TC to familiarize planners and legislators with the operational characteristics of airports which may influence land use outside the airport property boundary. Its purpose is to recommend, where applicable, guidelines to ensure that land use is compatible with airport operations. Land zoning is a provincial responsibility which is delegated to local authorities. Consequently, local planning authorities are not bound by TP 1247. This paper will describe this amendment which clarifies TC's opposition to the construction of new residential development between Noise Exposure Forecast (NEF) 30 and 35. TC has clarified the Land Use Table and the text of Part IV of TP 1247 to recommend that construction of new residential development between NEF 30 and 35 not be undertaken and has emphasized the decision making role of local authorities. In 1992, TC commissioned the National Research Council of Canada (NRC) to assess the validity of the NEF measure and the results of the NRC study support this amendment. This clarification will help protect both the public and airports without making TP 1247 overly restrictive.

SOMMAIRE

En mai 1996, Transports Canada (TC) a publié une modification à la Partie IV (Bruit des aéronefs) des lignes directrices de son TP 1247 intitulé "Utilisation des terrains au voisinage des aéroports". Le TP 1247 est publié par TC pour familiariser les planificateurs et les législateurs avec les caractéristiques opérationnelles d'aéroport qui peuvent influer sur l'utilisation des terrains hors des limites des propriétés aéroportuaires. Le but est de recommander, le cas échéant, des lignes directrices permettant de s'assurer que l'utilisation des terrains est compatible avec l'exploitation des aéroports. Le zonage d'aéroport est une responsabilité provinciale déléguée aux autorités locales. En conséquence, les autorités locales de planification ne sont pas obligés au TP 1247. Ce document décrira cette modification qui clarifie l'opposition de TC à la construction des nouvelles constructions ou les nouveaux développements résidentiels donnant lieu à la prévision d'ambiance sonore entre les NEF 30 et 35. Particulièrement, TC a clarifié le tableau d'utilisation des terrains et le texte de la Partie IV du TP 1247, pour recommander de ne pas entreprendre de construction de nouveaux développements résidentiels entre les NEF 30 et 35, et a souligner le rôle de prise de décision des autorités locales. En 1992, TC a fait appel au Conseil national de recherches (CNR) du Canada pour évaluer la validité de la mesure NEF, et les résultats de l'étude du CNR soutiennent cette modification. Cette clarification aidera à protéger à la fois le public et les aéroports, sans que le TP 1247 soit trop restrictif.

---

1 The author is now employed by NAV CANADA as an Environmental Specialist.

1. INTRODUCTION

Transport Canada (TC) is responsible for maintaining the currency of TP 1247 [1] and the Noise Exposure Forecast computer program. The NEF measure is the heart of Part IV (Aircraft Noise) of TP 1247.

An accurate assessment of the annoyance resulting from exposure to aircraft noise is essential to both aviation planners and those responsible for directing the nature of development of lands adjacent to airports.

Part IV of TP 1247, discusses noise measurement, annoyance prediction, the Noise Exposure Forecast (NEF) and the Noise Exposure Projection (NEP). It also contains an assessment of various land uses in terms of their compatibility with aircraft noise. TC has been using TP 1247 and the NEF measure since the mid 1970s.

In the early 1990s TC realized that its recommendations relating to residential construction between NEF 30 to 35 required clarification. This was due to gradual residential encroachment towards airports which could result in subjecting the public to negative aircraft effects and adversely effecting the operational integrity of airports, e.g. operational restrictions resulting from noise complaints.

At around the same time TC also realized that its land use planning tool, the NEF measure, required re-validation. This was based on knowledge of the NEF's derivation (almost half a century ago) a changing aeronautical acoustical climate, more recent scientific information [2], sociological studies on the effects of modern aircraft noise on humans and how to forecast it, and knowledge of the NEF's practical limits. Consequently TC decided that it was timely to examine the NEF measure and, its interpretation, in terms of community response in today's Canadian aeronautical and acoustical climates.

The Institute for Research in Construction (IRC), of the National Research Council of Canada (NRC), was requested to submit a project proposal to undertake this study. The NRC had previously participated with TC and Canada Mortgage and Housing Corporation (CMHC) in the original development of TP 1247. Thus, the NRC was already intimately familiar with the history of the NEF and its development in Canada and has resident expertise in this area.

In April 1992, a contract was awarded to the NRC to perform the NEF Validation Study. The work was carried out by NRC over a two year period. NRC has provided TC with three reports and a Bibliography over the duration of the project [3, 4, 5].

It became evident that the results from the NEF Validation Study would have an impact on the decision to amend TP 1247. Therefore, TC decided to consider the results of this study before making this amendment [6].

A brief account of the NEF Validation Study's results, as they pertain to making the TP 1247 amendment, is given below; followed by a description of the amendment.

2. NEF VALIDATION STUDY: AIRCRAFT NOISE LEVEL CRITERIA

The work carried out by the NRC assessed the validity of the NEF model in the present and future Canadian context. The issues evaluated included the details of the forecast method, the basis for relating the forecasts to community response, and practical changes to the current strategy.

More specifically, the NRC examined the historical development of the NEF; evaluated the details of the NEF calculation procedure, e.g. the equal energy principle, the EPNL metric, night-time annoyance weighting, forecasting aircraft events, technical accuracy and comparisons with methods used in other countries; evaluated user's experiences and requirements and evaluated the effects of changes and special cases. The NRC finally proposed aircraft noise level criteria.

The NRC performed a synthesis of results, based on all information gathered from all sources, and provided TC with a reading on the following: how well the NEF measure performs; its weaknesses and strong points; how well the NEF procedure is expected to perform in the future, and recommendations for changes and future work to solve identified problems.

The NRC study underlined the fact that the basic NEF concepts did not come from systematic studies and there was never any thorough attempt to calibrate the NEF measure in terms of negative human response. Early estimates of acceptable noise levels of aircraft noise were determined from experiences with consulting case studies of various types of community noise. Acceptable limits can be set in terms of the onset of various unavoidable negative effects of aircraft noise, for example speech interference and annoyance responses. Therefore, based on the results of its study, the NRC proposed acceptable aircraft noise level criteria which included limits in terms of NEF values.

NRC proposed that the following noise level criteria thresholds be adopted in terms of NEF values: NEF 25, the onset of negative effects of aircraft noise; NEF 30, homes should include additional sound insulation; NEF 35, no new homes should be built. (These NEF values refer to those

calculated by the Transport Canada NEF computer program which can be approximately equated to the American Day Night Sound Level (L_{dn}) using the relationship L_{dn} = NEF + 31, and not L_{dn} = NEF + 35 which is derived using the American Integrated Noise Model (INM). Intrinsic computer program calculations such as the ground attenuation and peak planning day calculations account for this difference. These different calculation methods result in the Canadian computer program producing larger contours than the American INM.

These thresholds of acceptability are based on the very extensive analyses of current knowledge on the effects of aircraft noise on people. NRC states that while the limits recommended are thought to represent a balanced interpretation of the available data, other conclusions are possible. Two particular weaknesses in the arguments used in establishing these limits might lead to more restrictive land use planning limits. First, the calculations that led to these thresholds were based on the assumption of a well insulated northern home with sealed windows. Areas where windows are typically open could support an argument for more restrictive limits for acceptable aviation noise levels. Second, the assumed long term benefits of added insulation have not been proven and clearly do not influence outdoor response. There is no reliable evidence that added sound insulation improves the more general acceptability of aviation noise. Thus, NRC states that a cautious approach might be to accept more restrictive limits until it can be demonstrated that added sound insulation does improve the acceptability of aviation noise.

3. AMENDMENT TO PART IV OF TP 1247

In addition to the problems associated with gradual residential encroachment towards airports other issues that influenced TC in making this amendment included:

1. Air carriers and airports have had difficulty appealing to some provincial municipal boards to prevent residential development applications in NEF 30 to 35 areas because, although responsibility for land use is a provincial jurisdiction, some provincial policies on land use near airports are indecisive and the municipal boards rely on the guidelines contained in TP 1247.

2. TP 1247 does not address the issue of outdoor noise climate and municipalities are not always vigilant in ensuring that sound insulation is provided by developers.

3. The gains made in reducing the size of noise contours due to the gradual phase-in of quieter aircraft (a considerable investment in new technology), producing a land buffer zone around airports, will not be realized if these lands are allowed to be developed for residential use. (At the time of writing, TC is examining the role of noise exposure contours play as a land use planning tool).

4. It is possible that noise contours will expand again in the future due to an increase in air traffic movements. Lands presently situated between NEF 30 to 35, will then be exposed to higher noise doses which would be clearly incompatible for residential development. It is important that municipalities realize that airports require adequate protection from encroachment of non-compatible development in this eventuality.

While recognizing these issues TC understands that TP 1247 are guidelines only because land zoning is a provincial responsibility which is delegated to local authorities.

Cognizant of the NRC's findings and wanting to maintain the operational integrity of airports, as well as protecting the public from negative effects of aircraft noise, TC decided to clarify its opposition to new residential construction between NEF 30 and 35. However, TC continues to emphasize the role of local authorities in approving land use planning applications in its guidelines.

Accordingly, in May 1996 TC issued a third amendment to the seventh edition of TP 1247 stating the following: "Transport Canada does not support or advocate incompatible land use (especially residential housing) in areas affected by aircraft noise. These areas may begin as low as NEF 25. At NEF 30, speech interference and annoyance caused by aircraft noise are, on average, established and growing. By NEF 35 these effects are very significant. New residential development is therefore not compatible with NEF 30 and above and should not be undertaken".

Previous to this amendment, the Land Use Table of Part IV indicated that residential construction between NEF 30 and 35 may be acceptable in accordance with the appropriate note and subject to the limitation indicated therein. Now, the Land Use Table of Part IV says NO to the construction of new residential construction or development between NEF 30 to 35 and refers the user to Explanatory Note B.

The Explanatory Note B has now been changed to read:

"This Explanatory Note applies to residential construction between NEF 30 and 35 only. New residential construction or development should not be undertaken.

If the responsible authority chooses to proceed contrary to Transport Canada's recommendation, residential development between NEF 30 and 35 should not be permitted to proceed until the responsible authority is satisfied that: 1) appropriate acoustic insulation features have been considered

in the building design[1] and 2) a noise impact assessment study has been completed and shows that this development is not incompatible with aircraft noise. Notwithstanding point 2, the developer should still be required to inform all prospective tenants or purchasers of residential units that speech interference and annoyance caused by aircraft noise are, on average, established and growing at NEF 30 and are very significant by NEF 35."

The reference in this text refers to the CMHC publication entitled "New Housing and Airport Noise", NHA 5185/05. Authorities are referred to this document for assistance in determining appropriate noise insulation features for a particular residential development. The NRC, CMHC and TC developed this technique for selecting residential building components based on NEF values. The information contained in this document requires updating.

The "responsible authority" is the province or municipality.

4. CONCLUSION

In May 1996 Transport Canada amended Part IV (Aircraft Noise) of its land use planning guidelines (TP 1247) to discourage residential encroachment towards airports which could result in subjecting the public to negative aircraft effects and adversely effecting the operational integrity of airports. TC hopes that this initiative, which is supported by the NRC's NEF Validation Study, will provide clear guidance to users of TP 1247.

REFERENCES

1. Transport Canada., "Land Use in the Vicinity of Airports", TP 1247 Seventh Edition (1989) .

2. Kelly, T and Nitschke, D., "Noise Exposure Forecast Model: Revision of the Ground Attenuation and Directivity Algorithms", Internal Transport Canada Report (1990).

3. Bradley, J.S., "NEF Validation Study: (1) Issues Related to the Calculation of Airport Noise Contours", NRC Contract Report to Transport Canada, A 15054.3 (1993).

4. Bradley, J.S., "NEF Validation Study: (2) Review of Aircraft Noise and its Effects", NRC Contract Report to Transport Canada, A 15054.5 (1994).

5. Bradley, J.S., "NEF Validation Study: (3) Final Report", NRC Contract Report to Transport Canada, A 15056.5 (1994).

6. Transport Canada., "Land Use in the Vicinity of Airports", TP 1247 Seventh Edition, Amendment No. 3 (May, 1996).