Revised March 20, 1970

Time	Place
April 3 - 10:00 a.m. - 5:00 p.m. April 4 - 9:00 a.m. - 3:00 p.m.	State Bar Building 601 McAllister Street San Francisco, California 94102

FINAL AGENDA

for meeting of

CALIFORNIA LAW REVISION COMMISSION

San Francisco April 3-4, 1970

1. Minutes of March 6-7 meeting (sent 3/12/70)

1A. Senate Bills 91, 94 (amended 3/19/70); AB 126 (amended 2/19/70) discussed at meeting

2. Administrative Matters

3. 1970 Legislative Program

4. Study 65.40 - Inverse Condemnation (Aircraft Noise Damage)

   Presentation by Dr. Garbell, Mr. Rogers, and Mr. Clark
   Memorandum 69-133 (sent 11/26/69)(page 14 and following)
   Memorandum 70-31 (to be sent)

   Special order of business at 1:30 p.m. on April 3

5. Study 36.20(1) - Condemnation (The Right to Take--The Legislatively Declared "Public Uses" Generally)

   Memorandum 70-8 (sent 3/12/70)

6. Study 36.202 - Condemnation (The Declared Public Uses--Condemnation by Special Districts)

   Memorandum 70-16 (sent 3/12/70)
   First Supplement to Memorandum 70-16 (sent 3/18/70)

7. Study 36.203 - Condemnation (The Declared Public Uses--Condemnation by Cities and Counties)

   Memorandum 70-26 (to be sent)

8. Study 36.204 - Condemnation (The Declared Public Uses--Condemnation for State Purposes)

   Memorandum 70-27 (sent 3/18/70)
   First Supplement to Memorandum 70-27 (to be sent)

9. Study 36.205 - Condemnation (The Declared Public Uses--Condemnation for Federal Purposes)

   Memorandum 70-18 (sent 3/18/70)

10. Study 36.206 - Condemnation (The Declared Public Uses--Condemnation by "Private" Persons Generally)

    Memorandum 70-25 (enclosed)

11. Study 36.25 - Condemnation (The Declared Public Uses--Byroads)

    Memorandum 70-30 (enclosed)

12. Study 36.21 - Condemnation (The Right to Take--The Right to Take a Fee or Any Lesser Interest)

    Memorandum 70-14 (sent 3/18/70)
    Research Study (attached to Memorandum)
    First Supplement to Memorandum 70-14 (to be sent)

13. Study 36 - Condemnation (General Status of Work on This Topic)

    Memorandum 70-29 (enclosed)

14. Study 52.40 - Sovereign Immunity (The Collateral Source Rule)

    Memorandum 70-28 (enclosed)

15. Study 76 - Trial Preferences

    Memorandum 70-21 (sent 3/18/70)
    Tentative Recommendation (attached to Memorandum)

MINUTES OF MEETING

of

CALIFORNIA LAW REVISION COMMISSION

APRIL 3 AND 4, 1970

San Francisco

A meeting of the California Law Revision Commission was held in San Francisco on April 3 and 4, 1970.

Present: Thomas E. Stanton, Jr., Chairman
John D. Miller, Vice Chairman
G. Bruce Gourley
Noble K. Gregory
Joseph T. Sneed
Lewis K. Uhler

Absent: Alfred H. Song, Member of the Senate
Carlos J. Moorhead, Member of the Assembly
George H. Murphy, ex officio

Messrs. John H. DeMoully and Jack I.Horton, members of the Commission's staff, also were present.

The following observers were present on April 3:

William Bitting, Hill, Farrer & Burrill
Donald L. Clark, San Diego County Counsel
Norval Fairman, Department of Public Works, San Francisco
Maurice A. Garbell, Aeronautical Consultant, San Francisco
David Ingram, Jr., Consultant - Appraiser
John N. McLaurin, Hill, Farrer & Burrill
E. E. McTaggart, Calif. Department of Aeronautics
John M. Morrisson, Attorney Generals Office, Sacramento
John E. Nolan, Deputy Port Attorney, Oakland
John D. Rogers, Rogers, Vizzard & Tallett
J. Kerwin Rooney, Port Attorney, Oakland
M. N. Sherman, Department of Airports, Los Angeles
Terry C. Smith, Los Angeles County Counsel
Charles E. Spencer, Department of Public Works, Los Angeles
Gerald J. Thompson, Santa Clara County Counsel

The following observers were present on April 4:

Norval Fairman, Department of Public Works, San Francisco
John M. Morrison, Attorney Generals Office, Sacramento
Terry C. Smith, Los Angeles County Counsel
Charles E. Spencer, Department of Public Works, Los Angeles

ADMINISTRATIVE MATTERS

Approval of Minutes of March 6 and 7, 1970, Meeting. The Minutes of the March 6 and 7, 1970, meeting were approved as submitted.

Schedule for future meetings. The following schedule was adopted for future meetings:

Date	Time	Place
May 8 May 9	7:00 p.m. - 10:00 p.m. 9:00 a.m. - 3:00 p.m.	State Bar Building 1230 W. Third Street Los Angeles 90017
June 5 June 6	10:00 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 601 McAllister Street San Francisco 94102
July 10	10:00 a.m. - 12:00 noon (Commission meeting)	Bahia Motor Hotel 998 Mission Bay Drive San Diego 92109
	12:00 noon - 2:00 p.m. (Joint meeting with representatives of San Diego Bar Association)	Place to be determined
	2:00 p.m. - 4:00 p.m. (Commission meeting)	Bahia Motor Hotel
July 11	9:00 a.m. - 1:00 p.m.	Bahia Motor Hotel
August	No meeting (vacations)	
September 3 September 4 September 5	10:00 a.m. - 5:00 p.m. 9:00 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 601 McAllister Street San Francisco 94102
October 9 October 10	10:00 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 1230 W. Third Street Los Angeles 90017
November 6 November 7	10:00 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 601 McAllister Street San Francisco 94102
December 4 December 5	10:00 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 1230 W. Third Street Los Angeles 90017

Personnel. The Executive Secretary reported that he had selected Mr. Emil Craig Smay, Note editor of the Utah Law Review, to fill the staff vacancy created by the resignation of Mr. Taylor, the Assistant Executive Secretary.

Meeting with members of San Diego Bar Association. Commissioner Uhler was designated to work out the details of the program for the joint meeting with the members of the San Diego Bar Association to be held on July 10.

Research contracts. Sufficient money should be transferred from salaries to research in order to finance research contracts to be made during the 1969-70 fiscal year. The following contracts were discussed and the decisions indicated made:

(1) Attachment, garnishment, and exemptions from execution. The Commission determined that the study on attachment, garnishment, and execution should be given a high priority and that work on a background research study should be commenced as soon as possible. The Commission directed the Executive Secretary to execute contracts with Professor Riesenfeld and Professor Warren to provide payment to cover necessary travel expenses they must incur in conferring on the study and attending Commission meetings to discuss the scope of the study with a view to determining the nature of the study needed. The amount provided for travel expenses shall not exceed $250. Such contracts should be made as soon as possible so that the Commission can determine the scope of the background study, the compensation to be paid for the study, the procedures under which the study will be conducted, and so that the consultants can

commence work on the study as soon as possible. It is anticipated that the consultants will meet with the Commission at its May meeting if possible.

(2) Nonprofit Corporations. The Commission noted that the Senate Concurrent Resolution to authorize the study of the law relating to nonprofit corporations has been approved by the Ways and Means Committee and sent to the floor. The Commission determined that a research consultant should be obtained for this study and that the compensation for the study should be $5,000. Professor Sneed was asked to suggest persons suitable to prepare the background study and to determine who prepared the New York nonprofit corporations law.

(3) Sovereign Immunity (The Collateral Source Rule). The Commission considered Memorandum 70-28 and the impact of the recent Helfend v. Southern Cal. Rapid Transit Dist. case on the scope of this study. The Commission authorized the Executive Secretary to terminate the contract with Professor Cole and to pay the professor $250 for his services to date. The Commission further directed the staff to prepare a request for authority to examine the collateral source rule generally as it applies to both tort and contract actions.

New topics--Interest on unliquidated claims for damages. The Comission indicated that it believed that the subject of interest on unliquidated claims for damages would be a topic suitable for Commission study and that the Commission would be willing to study this topic. This view is to be forwarded to Mr. Elmore, special counsel to the State Bar.

1970 Legislative Program. The Commission discussed the progress of its 1970 legislative program. Various amendments to bills were approved and are set out in these Minutes under the particular study.

65 - INVERSE CONDEMNATION

STUDY ~~36 - CONDEMNATION~~ (SENATE BILL 91--ENTRY FOR SURVEY)

The Commission considered a suggestion that this bill be amended to make clear the extent of the right of condemnation by common carriers on waterways to acquire terminal facilities. The Commission approved the following amendment to Senate Bill 91:

AMENDMENT TO SENATE BILL 91

Add amendment to Section 1238 of Code of Civil Procedure to bill.

Section 1. Section 1238 of the Code of Civil Procedure is amended to read:

1238. Subject to the provisions of this title, the right of eminent domain may be exercised in behalf of the following public uses:

* * * * *

22. Terminal facilities, lands, or structures for the receipt, transfer or delivery of passengers or property by any common carrier operating over any public highway or waterway in this state between fixed termini or over a regular route, or for other terminal facilities of any such carrier.

STUDY 36.10 - CONDEMNATION GENERALLY

The Commission considered Memorandum 70-29 and the attached compilation of statutory provisions dealing with eminent domain. The Commission approved the staff suggestion that a running compilation be maintained and tentatively approved the comprehensive statute attached to Memorandum 70-29 with the following changes or corrections:

Comprehensive Statute § 100

In the first line, "of" should read "or."

Comprehensive Statute § 107

Revised to read:

> 107. "Person" includes any public entity, individual, firm, association, organization, partnership, trust, corporation, or company.

Comprehensive Statute § 108

In line 3, "municipal" was changed to "public." However, a caveat should be added indicating that the term "public corporation" should be reviewed further at a later time.

Comprehensive Statute § 110

Revised to read:

> 110. "Statute" means a constitutional provision or statute, but shall not include a charter provision or ordinance.

Comprehensive Statute § 360

In line 6, the word "real" was deleted.

Education Code § 1047

The introductory phrase "Subject to any limitations specifically imposed by statute" was considered superfluous and was deleted. Conforming changes should be made in the Comment. (The same policy decision is to apply to similar grants of condemnation authority.) The second paragraph on the second page of the Comment to Section 1047 should be revised to include a parenthetical describing the import of Education Code Section 6726.

Education Code § 23151

In lines 10 through 12, the phrase "or interest therein" was deleted.

Education Code § 23619

In the next to last line of the Comment, "buildings and grounds" was changed to "property."

Public Utilities Code § 620

The plural "common carriers" was changed to the singular with appropriate conforming changes.

Minutes
April 3 and 4, 1970

STUDY 36.20(1) - CONDEMNATION (THE RIGHT TO TAKE--THE LEGISLATIVELY DECLARED "PUBLIC USES" GENERALLY)

The Commission considered Memorandum 70-8 and the staff recommendations contained therein pertaining to the right to take. The Commission tentatively determined that Government Code Section 184, Civil Code Section 1001, and Code of Civil Procedure Section 1238 and related sections that declare particular uses to be public uses should be repealed. However, any provisions of Section 1238 and related sections that clarify the extent of the right to take should be recodified in the appropriate place and a general policy to codify existing law with regard to the right to take was adopted. Section 300 should be added to the Comprehensive Statute to provide as follows:

§ 300. Eminent domain may be exercised only where authorized by statute

300. The power of eminent domain may be exercised to acquire property for a public use only by a person authorized by statute to exercise the power of eminent domain to acquire such property for that use.

STUDY 36.21 - CONDEMNATION (THE RIGHT TO TAKE--THE RIGHT TO TAKE A FEE OR ANY LESSER INTEREST)

The Commission considered Memorandum 70-14 and the attached background study. The Commission tentatively approved for inclusion in the comprehensive compilation the following sections:

§ 101. Property

101. "Property" includes real and personal property and any right or interest therein and, by way of illustration and not by way of limitation, includes rights of any nature in water, subsurface rights, airspace rights, flowage or flooding easements, aircraft noise or operation easements, rights to limit the use or development of property, public utility franchises, and franchises to collect tolls on a bridge or highway.

Comment. Section 101 is intended to provide the broadest possible definition of property and to include any type of interest in property that may be required for public use. It is expected that this definition will be improved as the Commission's work on condemnation law progresses.

§ 102. Nonprofit college

102. "Nonprofit college" means an educational institution that is authorized to exercise the power of eminent domain under Section 30051 of the Education Code.

Comment. Section 30051 is a new section to be added to the Education Code in the legislation relating to the right to take.

§ 350. Right to acquire a fee or any lesser interest

350. Except to the extent limited by statute, a public entity, public utility, or nonprofit college that is authorized to acquire property for a particular use by eminent domain may exercise the power of eminent domain to acquire the fee or such other right or interest in property that is necessary for that use.

Comment. Section 350 supersedes Section 1239 of the Code of Civil Procedure insofar as that section specified the type of interest--whether a fee or lesser interest--that might be acquired by eminent domain.

Section 350 generally codifies the former law that permitted a public entity to take whatever interest it determined to be necessary. See Code Civ. Proc. § 1239(4)(local public entities). However, under former law, most privately owned public utilities were permitted to acquire only an easement unless the taking was for "permanent buildings." See Code Civ. Proc. § 1239(1).

"Property" is broadly defined in Section 101 of the Comprehensive Statute to include the fee or any interest or right in property.

Note. Only the interest that is necessary for a particular use may be taken. The decision of what interest is necessary and the procedures for making such decision and the related decisions concerning the issues of "necessity" are a separate subject.

STUDY 36.25 - CONDEMNATION (THE DECLARED PUBLIC USES--BYROADS)

The Commission considered Memorandum 70-30, the attached Tentative Recommendation (revised 3/19/70), and the background study. Section 4120.1, to be added to the Streets and Highways Code (page 14 of the Tentative Recommendation), was revised to provide that a property owner's request for a byroad is not to be denied without a public hearing. The Comment to this section was revised to indicate that the board of supervisors, in reviewing such request, should consider the necessity for the improvement to provide access and the relative hardship to the party against whom the easement is established and the one seeking the improvement.

STUDY 36.202 - CONDEMNATION (THE DECLARED PUBLIC USES--
CONDEMNATION BY SPECIAL DISTRICTS)

The Commission considered Memorandum 70-16, Tables I, II, and IIA attached thereto, and the First Supplement to Memorandum 70-16. The Commission approved the staff recommendations to amend Health and Safety Code Section 8961 and to add Section 13070.1 to the Public Resources Code in the form set forth in the First Supplement to Memorandum 70-16. The Commission directed the staff to review Memorandum 70-16 and to identify those special districts which might possibly be affected by the repeal of Code of Civil Procedure Section 1238, and, when the tentative recommendation relating to the right to take is distributed, to direct attention to this aspect of the recommendation.

STUDY 36.203 - CONDEMNATION (THE DECLARED PUBLIC USES--
CONDEMNATION BY CITIES AND COUNTIES)

The Commission considered Memorandum 70-26 and approved the staff recommendations to add Sections 25350.5 and 37350.5 to the Government Code in the form set forth in the exhibits to the Memorandum subject to the deletion of the introductory phrase in each section.

STUDY 36.204 - CONDEMNATION (THE DECLARED PUBLIC USES--
CONDEMNATION FOR STATE PURPOSES)

The Commission considered Memorandum 70-27 and the First Supplement to Memorandum 70-27. The staff was directed to contact the Department of General Services and request their review of the statutes authorizing condemnation for state purposes to determine what, if any, changes are needed to reflect current practices and provide desirable procedures for that Department. The Commission tentatively approved the Comment to the repeal of subdivision 2 of Section 1238 of the Code of Civil Procedure.

STUDY 36.205 - CONDEMNATION (THE DECLARED PUBLIC USES--
CONDEMNATION FOR FEDERAL PURPOSES)

The Commission considered Memorandum 70-18 and tentatively approved the Comment to the repeal of subdivision 1 of Section 1238 of the Code of Civil Procedure.

STUDY 36.206 - CONDEMNATION (THE DECLARED PUBLIC USES--
CONDEMNATION BY "PRIVATE" PERSONS GENERALLY)

The Commission considered Memorandum 70-25 and the attached background materials. The Commission directed the staff to contact Mr. Wallace S. Myers, the attorney of record for Melchior Linggi, and attempt to discover the complete factual background and eventual outcome of the Linggi case. The Commission tentatively determined that no "private" person should have condemnation authority for a purpose other than to make sewer connections and deferred its decision whether even such limited authority should exist. However, the Commission directed the staff to prepare for future consideration an appropriate section recodifying the substance of Section 1238.3 of the Code of Civil Procedure, which provides condemnation authority for nonprofit hospitals.

STUDY 39 - ATTACHMENT, GARNISHMENT, AND EXEMPTIONS FROM EXECUTION

The Commission determined that the study on attachment, garnishment, and execution should be given a high priority and that work on a background research study should be commenced as soon as possible. The Commission directed the Executive Secretary to execute contracts with Professor Riesenfeld and Professor Warren to provide payment to cover necessary travel expenses they must incur in conferring on the study and attending Commission meetings to discuss the scope of the study with a view to determining the nature of the study needed. The amount provided for travel expenses shall not exceed $250. Such contracts should be made as soon as possible so that the Commission can determine the scope of the background study, the compensation to be paid for the study, the procedures under which the study will be conducted, and so that the consultants can commence work on the study as soon as possible. It is anticipated that the consultants will meet with the Commission at its May meeting if possible.

STUDY 52 - SOVEREIGN IMMUNITY (SENATE BILL 94)

The Commission discussed the plan or design immunity provision of Senate Bill 94. After considerable discussion, the Commission approved the following amendment to the bill and revised Comment to the plan or design immunity provision of the bill:

Amendment: On page 3, line 12, of the printed bill as amended in the Senate March 19, insert a period after "property" and delete "or the condition had become" in line 12 and all of lines 13, 14, 15, and 16.

Revised Comment:

Comment. Section 830.6 has been amended to modify the holding in Cabell v. State, 67 Cal.2d 150, 430 P.2d 34, 60 Cal. Rptr. 476 (1967). Under Cabell, the "plan or design immunity" provided by Section 830.6 allows a public entity to permit the continued existence or operation of an improvement merely because there was some justification for its plan or design at the time it was originally approved even though subsequent to the construction of the improvement a condition arises that results in the property's being in a dangerous condition. Such a condition might arise, for example, by an increase in the number of persons using the improvement, by a change in the nature of the use made of the improvement, or by a change in the conditions in the general area of the improvement.

Subdivision (b), of course, operates only in cases where the immunity conferred by subdivision (a) otherwise would preclude recovery. If the action is not one to recover "for an injury caused by the plan or design" of a public improvement, if the plan or design did not receive discretionary approval (see, e.g., Johnston v. County of Yolo, 274 Adv. Cal. App. 51, 79 Cal. Rptr. 33 (1969)), or if there is no substantial evidence to support the reasonableness of the planning decision (see subdivision (a)), the additional factors mentioned in subdivision (b) need not be considered by the court. However, if the trial judge determines that subdivision (a) would apply to the case, he must also determine whether the factors mentioned in subdivision (b) have been established. The immunity is not overcome unless the trial judge is persuaded by a preponderance of the evidence that a "dangerous condition" existed at the time of the accident in question. Thus, he must be persuaded that the condition created "a substantial (as distinguished from a minor, trivial or insignificant) risk of injury when such property or adjacent property is used with due care in a manner in which it is reasonably foreseeable that it will be used." See Section 830(a). Similarly, he

must be persuaded by a preponderance of the evidence that the defendant public entity had knowledge of the dangerouse condition for a sufficient period of time to take remedial measures and that action or inaction of the public entity was unreasonable.

Subdivision (d) has been added to permit the court or any party to the action to require that the issue presented when the special defense provided by this section is pleaded be tried separately and prior to the trial of any other issues in the case. If the factors specified in subdivision (b) are established to the satisfaction of the court, neither Section 830.6 nor the determinations made by the court pursuant to either subdivision of this section have any further bearing in the case. Specifically, elimination of the plan or design immunity by operation of subdivision (b) does not relieve the plaintiff of the basic evidentiary burden of proving to the satisfaction of the trier of fact that the several conditions necessary to establish liability--including the fact that the property was in a dangerous condition--existed. Nor does it preclude the public entity from establishing (under Section 835.4) the immunizing reasonableness of its action or inaction (see Cabell v. State, supra) or affect any other immunity or defense that might be available to the public entity under the circumstances of the particular case.

STUDY 52 - SOVEREIGN IMMUNITY (ASSEMBLY BILL 126)

The Commission approved amending AB 126 to make its operative date January 1, 1970, and to make various provisions of the bill not applicable to claims presented prior to that date.

STUDY 52.40 - SOVEREIGN IMMUNITY (THE COLLATERAL SOURCE RULE)

The Commission considered Memorandum 70-28 and the impact of the recent Helfend v. Southern Cal. Rapid Transit Dist. case on the scope of this study. The Commission authorized the Executive Secretary to terminate the contract with Professor Cole and to pay the professor $250 for his services to date. The Commission further directed the staff to prepare a request for authority to examine the collateral source rule generally as it applies to both tort and contract actions involving both private and public parties.

Minutes
April 3 and 4, 1970

STUDY 60 - REPRESENTATIONS AS TO CREDIT OF THIRD PERSON

The Commission considered a suggestion of the Executive Secretary that the proposed legislation be revised as indicated below, and after discussing the suggestion, the revision set out below was approved.

Section 1. Section 1974 of the Code of Civil Procedure is amended to read:

1974. No ~~person is liable~~ evidence is admissible to charge a person upon a representation as to the credit of a third person, unless such representation, or some memorandum thereof, be in writing, and either subscribed by or in the handwriting of the party to be ~~held liable~~ charged. This section is a Statute of Frauds provision and is to be applied in a manner that is consistent with the manner in which subdivision 2 of Section 1624 of the Civil Code is applied.

Comment. Section 1974 is amended to make clear that it is a Statute of Frauds provision and is to be applied as such. The amendment revises the first sentence so that it reads the same as it read prior to its amendment in 1965. This will make clear that the section is a rule of evidence, not a substantive provision. See Bank of America v. Hutchinson, 212 Cal. App.2d 142, 27 Cal. Rptr. 787 (1963). The second sentence is added to make clear that the section is to be interpreted in a manner consistent with the "suretyship" clause of the Statute of Frauds which requires a writing to charge a person with a "special promise to answer for the debt, default, or miscarriage of another." The most significant effect of the second sentence is to make constructions of the general Statute of Frauds applicable in cases where the representation is made under circumstances where there is an estoppel to assert the Statute of Frauds, where a fiduciary acting in a confidential relationship to his principal and owing him a duty to deal honestly with him nevertheless defrauds him, or where the defendant receives a benefit to himself. See Monarco v. Lo Greco, 35 Cal.2d 621, 220 P.2d 737 (1950)(estoppel); Gerhardt v. Weiss, 247 Cal. App.2d 114, 55 Cal. Rptr. 425 (1966)(confidential fiduciary relationship); Michael Distrib. Co. v. Tobin, 225 Cal. App.2d 655, 37 Cal. Rptr. 518 (1964)(benefit to defendant). See Civil Code Section 2794(1), (4)(benefit to defendant). See also Sunset-Sternau Food Co. v. Bonzi, 60 Cal.2d 834, 389 P.2d 133, 36 Cal. Rptr. 741 (1964).

STUDY 65.40 - INVERSE CONDEMNATION (AIRCRAFT NOISE DAMAGE)

The Commission heard and considered presentations by Mr. John D. Rogers, San Francisco attorney, and by Dr. Maurice A. Garbell, aeronautical engineering consultant, as well as helpful and enlightening commentary from the other observers present.

The Commission determined that it would be impossible at this time to provide satisfactory statutory standards or presumptions based on noise or distance that would aid in the determination of liability for aircraft noise damage. The changing technology for measuring noise and the tremendous number of variables with respect to both use of the "damaged" property and aircraft operations make it both impracticable and undesirable to fix specific statutory criteria.

The Commission directed the staff to prepare a statutory statement that there is a taking or damaging within the meaning of Section 14 of Article I of the California Constitution for significant--as contrasted with trivial or de minimis--damage to property measured by loss of market value which is caused by aircraft noise. With this principle in mind, the staff was further directed to prepare a memorandum identifying the remaining issues and problems associated with inverse liability for aircraft noise damage.

Minutes
April 3 and 4, 1970

STUDY 76 - TRIAL PREFERENCES

The Commission considered Memorandum 70-21 and the attached tentative recommendation and determined that this topic should be dropped from the Commission's agenda. The request to drop this topic should indicate that the Commission has solicited the view of the presiding judge of the superior court in each county, and the overwhelming consensus of these judges is that the statutory preference provisions create no significant problems of judicial administration.

TENTATIVELY ADOPTED

SCHEDULE FOR FUTURE MEETINGS

Date	Time	Place
April 3 April 4	10:00 a.m. - 5:00 p.m. 9:00 a.m. - 3:00 p.m.	State Bar Building 601 McAllister Street San Francisco 94102
May 8 May 9	9:30 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 1230 West Third Street Los Angeles 90017
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July 10	10:00 a.m. - 12:00 noon (Commission meeting)	Bahia Motor Hotel 998 Mission Bay Drive San Diego 92109
	12:00 noon - 2:00 p.m. (Joint meeting with representatives of San Diego Bar Association)	Place to be determined
	2:00 p.m. - 4:00 p.m. (Commission meeting)	Bahia Motor Hotel
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August	No meeting (vacations)	
September 3 September 4 September 5	9:30 a.m. - 5:00 p.m. 9:00 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 601 McAllister Street San Francisco 94102
October 9 October 10	9:30 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 1230 West Thrid Street Los Angeles 90017
November 6 November 7	9:30 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 601 McAllister Street San Francisco 94102
December 4 November 5	9:30 a.m. - 5:00 p.m. 9:00 a.m. - 4:00 p.m.	State Bar Building 1230 West Third Street Los Angeles 90017

March 18, 1970

1970 LEGISLATIVE PROGRAM--CALIFORNIA LAW REVISION COMMISSION

Measures Approved by Committee and Sent to Floor in Second House

SCR 7 (inverse condemnation authorization)
SCR 8 (authority to study existing topics)
SB 266 (proof of foreign official records)
AB 123 (rule against perpetuities)

Measures That Have Passed One House

AB 126 (statute of limitations in actions against public entities)
(hearing by Senate Judiciary Committee scheduled for March 31)

AB 171 (real property leases)
(hearing by Senate Judiciary Committee scheduled for March 31)

SB 91 (entry for survey, tests, etc.)
(not scheduled for hearing in Assembly)

SB 95 (general evidence bill)
(hearing by Assembly Judiciary Committee scheduled for March 30)

SB 98 (fictitious business names)
(hearing by Assembly Judiciary Committee scheduled for March 30)

SB 129 (res ipsa loquitur)
(hearing by Assembly Judiciary Committee scheduled for March 30)

SCR 6 (new topic--permits study of nonprofit corporation law)
(to be heard by Ways and Means Committee, probably on March 31)

Measure on Third Reading in First House

AB 124 (quasi-community property)

Measures Still in Committee in First House

AB 125 (arbitration in condemnation cases)
(Approved by Assembly Judiciary Committee; scheduled for hearing by Assembly Ways and Means Committee on March 31. Various state departments have persuaded the Department of Finance to oppose the bill on the ground that it would substantially increase property acquisition costs. We have asked the Legislative Analyst and the Department of Finance to review their cost analysis of this bill.)

SB 90 (representations as to credit)
(Hearing by Senate Judiciary Committee scheduled for March 31. Bill is opposed by California Real Estate Association and California Bankers Association.)

SB 92 (plan or design immunity)
(Hearing by Senate Judiciary Committee scheduled for March 31. We are amending bill in an attempt to obtain something acceptable to the committee.)

Measure "Held" in Committee

SB 94 (general governmental liability recommendation)
(This bill is held in committee because a motion to report out the bill failed. We need approval of a majority of the members of the committee (7) before the committee will consider the bill again. The primary reason why the bill was defeated in the committee is that the recommendation on the plan or design immunity was not acceptable. We are attempting to work out a compromise on this bill and may be able to save it.)

1970 LEGISLATIVE PROGRAM--CALIFORNIA LAW REVISION COMMISSION

Measures That Have Passed One House

AB 123 (rule against perpetuities)

AB 171 (leases)

SB 95 (general evidence bill)

SB 98 (fictitious business names)

SB 129 (res ipsa loquitur)

SB 266 (proof of foreign official records)

SCR 6 (one new topic--civil procedure was deleted by amendment in Assembly Judiciary Committee)

SCR 7 (inverse condemnation)

SCR 8 (existing topics)

Measures on Third Reading in First House

AB 124 (quasi-community property)

AB 126 (statute of limitations in actions against public entities)

SB 91 (entry for survey, tests, etc.)

Measures Still in Committee in First House

AB 125 (arbitration in condemnation cases)(approved by Assembly Judiciary Committee, to be heard by Assembly Ways and Means Committee)

SB 90 (representations as to credit)(to be heard by Senate Judiciary Committee)

SB 92 (plan or design immunity)(to be heard by Senate Judiciary Committee)

Measures "Held" in Committee

SB 94 (general governmental liability recommendation) (This bill is held in committee because a motion to report out the bill failed. A primary reason why the bill was defeated in committee is that the exception for the plan or design immunity includes streets and highways. We are attempting to work out a compromise on this bill and may be able to save it.)

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April 3, 1970.

California Law Revision Commission,
School of Law - Stanford University,
Stanford, California 94305

Working Paper CLRC 70-2

Supplementary Information and Exhibits
To Working Paper CLRC 70-1, March 4, 1970

At a meeting of the California Law Revision Commission (CLRC) held on March 6, 1970, initial suggestions were presented to arrive at technical criteria for a presumption as an aid in establishing causation of claimed diminution in property value by noise emanating from aircraft operations. The courtesy extended by the CLRC to the writer in hearing and discussing his suggestions at the afore-mentioned meeting, and a further invitation to him by the Commission to make an additional presentation at the forthcoming meeting on April 3, 1970, is greatly appreciated.

To facilitate an examination by the Members of the CLRC of supplementary technical documentation, we take pleasure in presenting herein a concise outline of additional information on the technical and scientific background which, in our opinion, could serve as a foundation for a statutory presumption that should be fair, competent, useful, and reasonably immune from successful rebuttal. The attached Exhibits provide ready reference to pertinent documents.

I. RUNWAY LENGTH AND DISTANCE AS PRESUMPTIVE CRITERIA.

There can be little doubt that both the runway length and the distance from a specified reference point to a property can be measured readily and accurately at a relatively low cost, and that presentation of evidence thereon in court should require but a short span of trial time by experienced and capable counsel.

However, there are cardinal problems which must be recognized and considered in any endeavor to fix specific values for a suggested "runway-length and distance" criterion. The writer respectfully submits the following:

1. Runway Length.

a. In current operation, the 6,000-foot runway length suggested as a threshold value by John D. Rogers, Esq., is in fact a conservative "low" value of the length of runways usable for presumably noise jet transport airplanes.

b. Developments currently in the field-test stage of industrial experimentation are directed toward STOL (steep take-off and landing) operations on 4,000-foot runways. Exhibit A, comprising copies of pages 40, 41, 43, 46, 51, and 52 of "Aviation Week and Space Technology," dated May 19, 1969, illustrates the effort currently being pursued by The Boeing Company. Elsewhere, Eastern Air Lines and American Airlines have, for some time now, carried out experimental STOL operations in the New York Area with a four-engine Breguet turboprop airplane under the sponsorship of the McDonnell-Douglas Corporation.

c. Future STOL programs currently outlined by the FAA in Exhibit B (a portion of page 46 of "INTERAVIA Review of World Aviation," January 1970) and by major United States airframe manufacturers (Exhibit A, page 43) are aiming toward runway lengths of 1,500 feet and 500-to-1,000-foot turning radii on approach and climbout.

2. Distance.

Since "distance" relates to the geometry of a presumably typical flight path, which flight path the writer understands is in compliance with federal requirements and not subject to control by the airport, it would appear necessary to establish a close and statistically significant correlation between "distance" and "noise level" at a specified location and time. The writer has found that such a correlation does exist, but that it is extremely complex and may be overwhelmingly affected by other factors, such as:

a. The orientation and motion of an aircraft relative to the respective point of observation.

b. The configuration of the terrain and man-made structures in the vicinity of the runway and of the point of observation.

c. Weather conditions prevailing at the time and place of observation.

For example, properties located at a relatively short distance directly aft of the threshold of a take-off runway (see the location marked with a triangle on page 23 of Exhibit D) may not experience exorbitant noise level during the initial period of a take-off roll, yet, as related on page 24 and in Fig. 6 of Exhibit C, intense noise may be experienced by such a location up to 120 seconds – from 3-4 miles away – after the beginning of the take-off roll, when the departed aircraft makes a turn underneath a sharp temperature inversion and/or in front of a mountainous obstacle.

Resuming the subject of the currently proposed STOL developments, the greater mobility and maneuverability of STOL aircraft foreshadowed by the FAA (Exhibit B) is expected to expand the area of noise-making potential from a relatively narrow band centered on the runway centerline to a pattern of horseshoe-shaped slices of terrain oriented at various, generically unpredictable, angles to the runway centerline. Therefore, it is anticipated that little correlation might be had in future operations between noise and distance measured along or normal to the runway centerline. However, distance may remain a useful criteria for other purposes, as explained in Section III.

As a corollary of the foregoing considerations it is submitted that presumptive criteria limited to runway length and distance alone would not necessarily provide any identifiable indication of a change in the nature and burdensomeness of aircraft operations with respect to a specified property. This problem is mentioned here with reference to the beginning date of a claimed worsening or lessening of a noise burden attributed to aircraft operations.

II. NOISE CRITERIA.

The exhibits attached hereto illustrate the limitations of "average" aircraft noise surveys and forecasting methods in defining any specific, actually existing, aircraft noise situation that might be the subject of an inverse-condemnation action.

The exhibits and our accompanying discussions are not intended in any way to minimize the value of the survey and forecasting methods employed in setting forth data for community-planning purposes, or to criticize the technical or scientific foundations of the more recent noise-measurement concepts and energy-summation concepts employed therein; the same basic concepts are used by us also in the formulation of the total noise exposure (TNE) actually measured at a specific location and at a specific time.

Exhibit D, appended hereto, which comprises the front cover, the inside of the front cover, and pages 1, 23, and 25 of the Report "Land Use Planning Relative to Aircraft Noise," by Bolt Beranek & Newman, Inc., October 1964, contains in the above-noted pages statements (which we have underscored) defining the scope and purpose of that report.

Exhibit E, appended hereto, which comprises the title page and pages 1-2, 3-4, 21, 27, 44, and 45, of FAA Report DS-67-10, contains statements (underscored by the writer for emphasis) relative to the scope and purposes of that report, the limitations of the earlier report (Exhibit D hereof), and the justification of the sound-pressure-level measurement through an N-filter (expressed in "dBN" and, more recently, in "dBD") as a short-cut substitute for the more accurately determined "perceived noise level," expressed in PNdB.

Exhibit F, appended hereto, comprises the front cover page, page i, and pages 1 through 5, of the court transcript of the testimony of Mr. Dwight E. Bishop, on January 9, 1969, in the record of Civil Action No. 343860, in

the Superior Court of the State of California, in and for the County of Alameda. The transcript sets forth the qualifications of Mr. Bishop as an acoustical engineer in the firm of Bolt Beranek & Newman, Inc., and identifies Exhibit 5 in that Action as a copy of the document from which pages were copied and appended hereto as Exhibit D.

Exhibit G, appended hereto, comprises the front cover page, page i, and pages 9 through 40 of the court transcript of the cross-examination of Mr. Bishop in the same Action on January 16, 1969. The document on the "CNR concept" mentioned in Exhibit G is the same document from which pages have been abstracted and copied to form Exhibit D hereof. The "TNE" concept mentioned in the testimony of Mr. Bishop is the same as that outlined in our Working Paper "CLRC 70-1", dated March 4, 1970, except that we have now replaced the use of the quantity "A-scale decibel plus 14," desired by Mr. Bishop, with the use of the quantity "N or D-scale decibel plus 7" as a more representative shortcut measure for the simplified determination of the perceived noise level and its duration correction (if any). FAA document "DS-67-10" mentioned on page 22 of Exhibit G is the document partly copied in Exhibit E.

In order to facilitate perusal of the relatively voluminous Exhibit G, we have set up a brief topical index for ready guidance to pertinent pages and lines, at the beginning of Exhibit G.

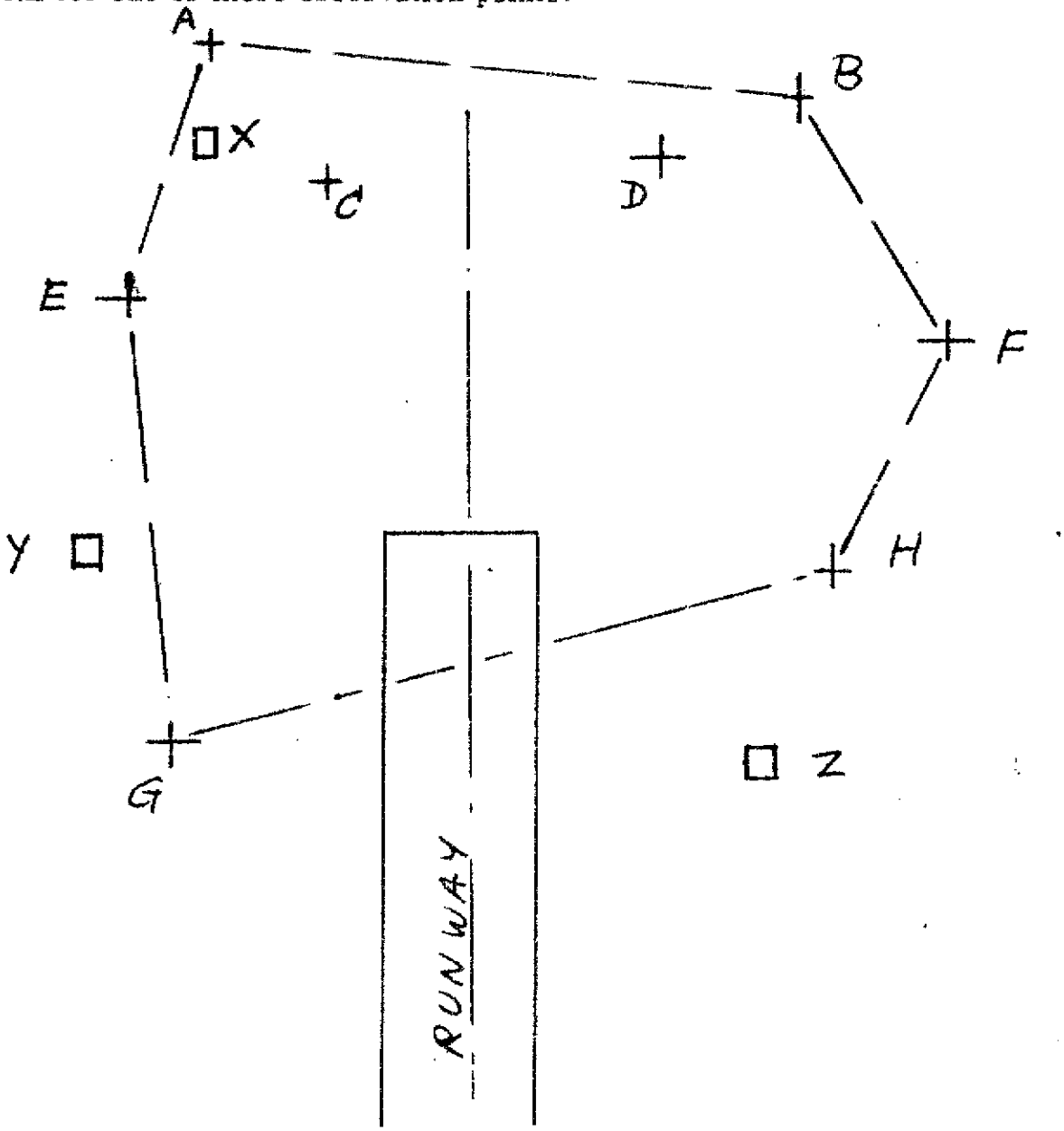
Exhibit H comprises a news release dated 24 December 1969, issued by the International Civil Aviation Organization (ICAO), of which the United States Government is a member. The Chief Information Officer has informed us, in a letter dated 11 March 1970, that the full Report of the ICAO Noise Meeting in Montreal, December 1969, will be available in the near future. We have placed an order with the ICAO Distribution Unit for a copy of that Report and shall be glad, upon its receipt, to advise the California Law Revision Commission of its contents.

III. A DISTANCE PARAMETER FOR USE WITH THE TNE/PNL CRITERION.

It is submitted that an ancillary distance criterion could be usefully included in a proposed statute based on the TNE criterion to minimize the complexity of both the establishment of evidence by plaintiffs and the verification and possible rebuttal thereof by defendant. A hypothetical example for consideration is a consolidated action by a number of individual plaintiffs against a common defendant. The problem is a presumable requirement that overburdening of the stated TNE and PNL criteria be proved for each individual plaintiff property. The suggested solution is a statutory presumption that if straight lines are drawn on a map comprising the depiction of all properties involved in a consolidated action between all points at which an overburdening of the TNE/PNL criterion has occured, all properties wholly or partly covered by the enveloping closed polygon be deemed to have satisfied the proposed presumption of claimed diminution in property value by noise emanating from aircraft operations. The following sketch is an illustration of the suggested procedure, in which the criterial closed polygon is A-B-E-F-G-H, assuming

that all points shown, namely, A-B-C-D-E-F-G are monitoring points with noise records and can be proved to have overburdened the TNE/PNL criterion within the legally applicable time period. Points X, Y, and Z represent properties for which no instrumental noise measurements and TNE calculations are available. In accordance with our suggestion, property X would be deemed to have an overburdened TNE/PNL criterion. Properties Y and Z would not.

An 8-page brochure on a monitoring system, currently in an advanced stage of development and recently tested at the Stuttgart International Airport in Germany, is appended as Exhibit I. The equipment described in the brochure provides a permanent record of N-filter or A-filter noise-level readings, second by second, and is capable of computing and printing the cumulative value of TNE for one or more observation points.



The foregoing comments and Exhibits are respectfully submitted to the Commission for its consideration. We offer our renewed gratitude to the Commission for its courtesy and patience in considering this unavoidably extensive, yet necessary, reference material.

Respectfully submitted,

Maurice A. Garbell

Maurice A. Garbell
President
MAURICE A. GARBELL, INC.

Appended Exhibits:

A Excerpts from "Aviation Week and Space Technology".

B Excerpt from "INTERAVIA Review of World Aviation".

C Excerpts from Garbell Report, "The Jet-Noise Problem at Bayside Manor and Means for Its Alleviation".

D Excerpts from BBN Report No. 821, "Land Use Planning Relating to Aircraft Noise".

E Excerpts from FAA Report DS-67-10.

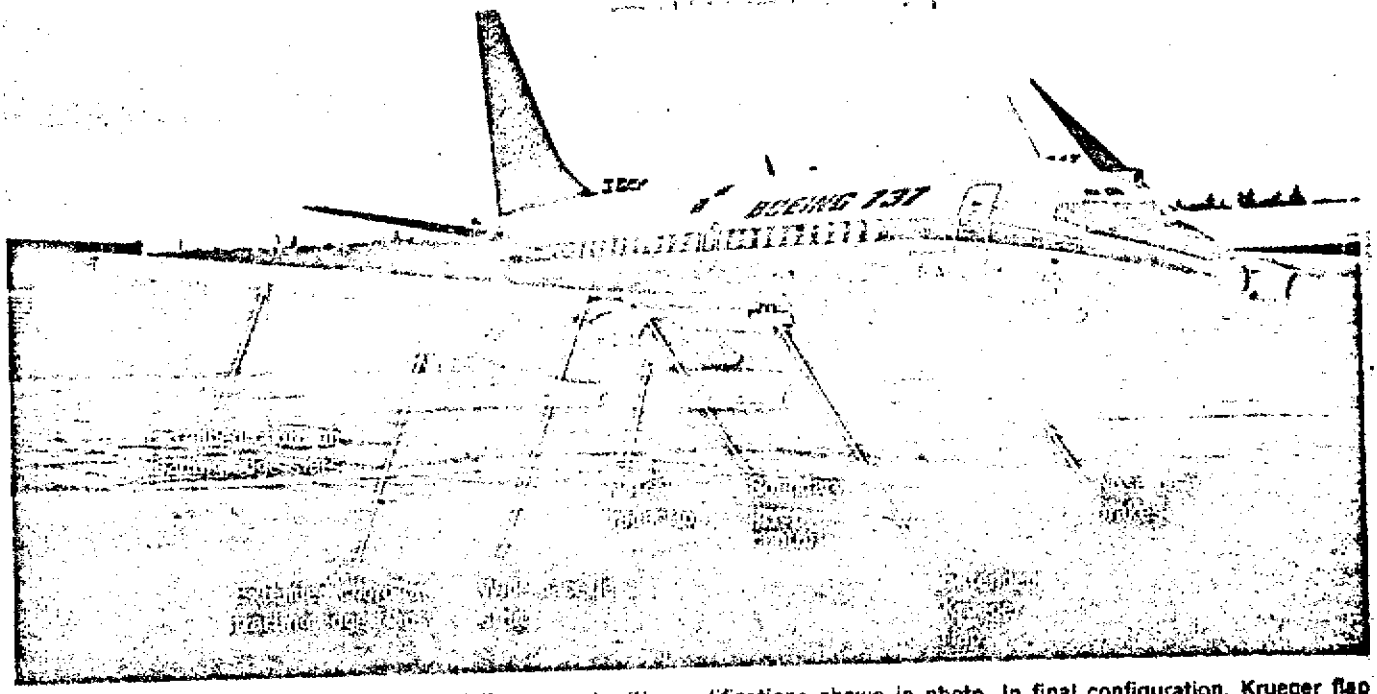
F Excerpt from record of Civil Action No. 343860, Superior Court, State of California, County of Alameda.

G INDEX to Exhibit G.
Excerpts from record of Civil Action No. 343860, Superior Court, State of California, County of Alameda.

H News Release "Major Progress Made Towards Solution to Aircraft Noise Problems" by ICAO.

I Hewlett-Packard Aircraft Noise Monitoring System Brochure.

EXHIBIT A



Boeing achieved short-field capability in 737 transport with modifications shown in photo. In final configuration, Krueger flap was extended all the way to fuselage. Note protrusion of engine nacelle, incorporated as a sound reduction measure.

Aviation Week pilot report:

Boeing Modifies 737 for Operations fron

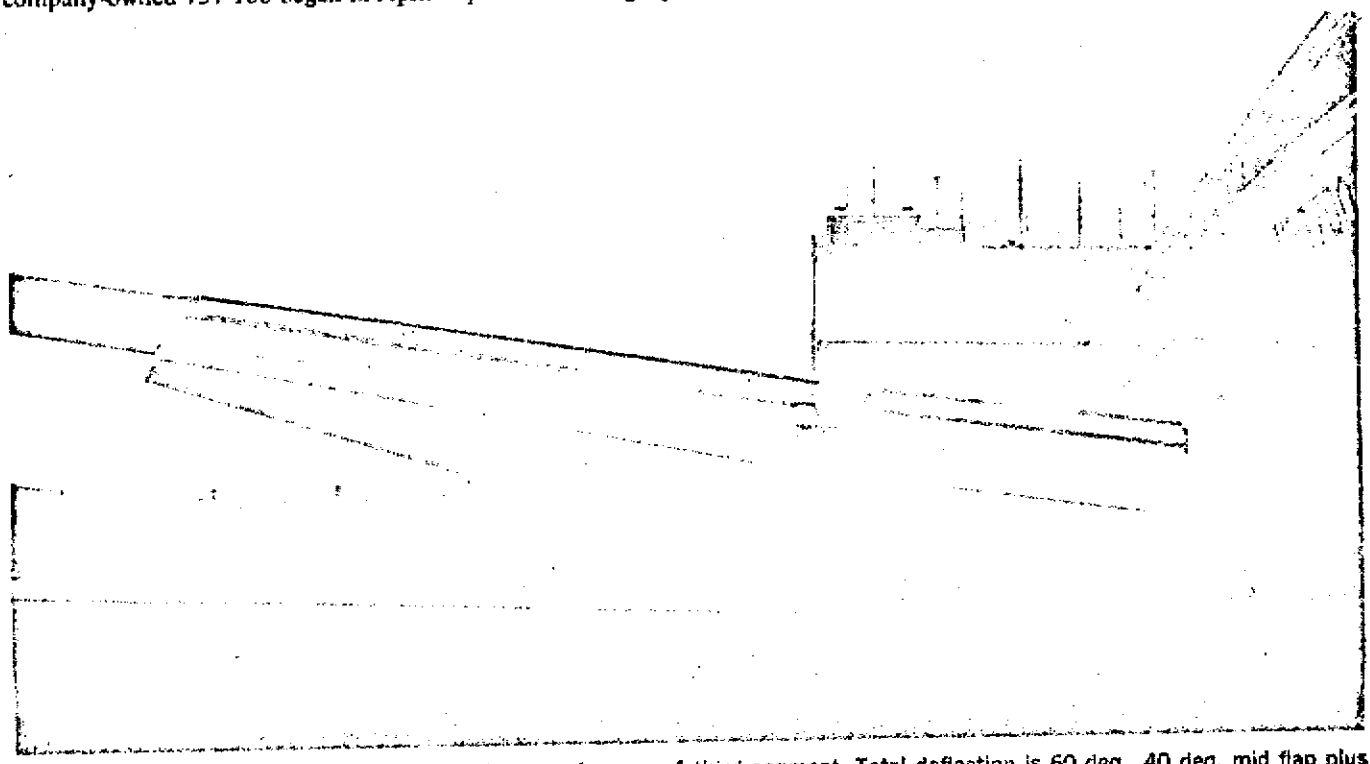
By C. M. Plattner

Seattle—Boeing Co. has demonstrated to the airlines a short-field version of its twin-engine 737 transport capable of operating into 4,000-ft. runways to determine the demand for a jet transport of this type.

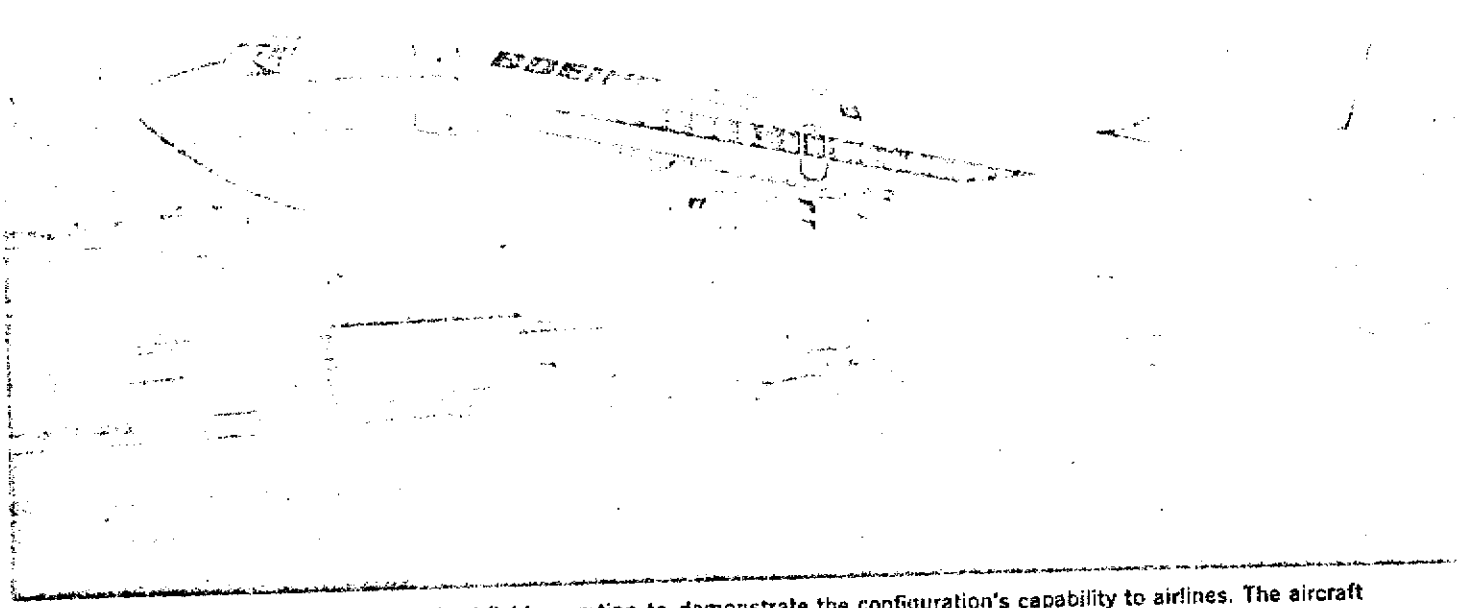
Airline evaluation of the modified company-owned 737-100 began in April and was nearing completion early this month. Representatives of 25 U.S. and foreign carriers were invited to evaluate the aircraft.

The modified 737, fitted with leading-edge boundary-layer control, high-lift devices of increased power and an improved braking system was flown by this AVIATION WEEK & SPACE TECHNOLOGY pilot Apr. 24.

The 737 retained the same good handling qualities as the production version despite reduced takeoff and landing speeds. The improvements in deceleration on both wet and dry runways stemming from increased braking and new



Trailing edge flaps of 737 were enlarged by increase in area of third segment. Total deflection is 60 deg., 40 deg. mid flap plus 20 deg. added deflection of trailing flap. Settings are in terms of mid flap, which is set at 40 deg. for landing.



Boeing has used this 737 modified for short-field operation to demonstrate the configuration's capability to airlines. The aircraft can operate from 4,000 ft. runways. Modifications include nosewheel brakes and improved thrust reversers.

hort Airfields

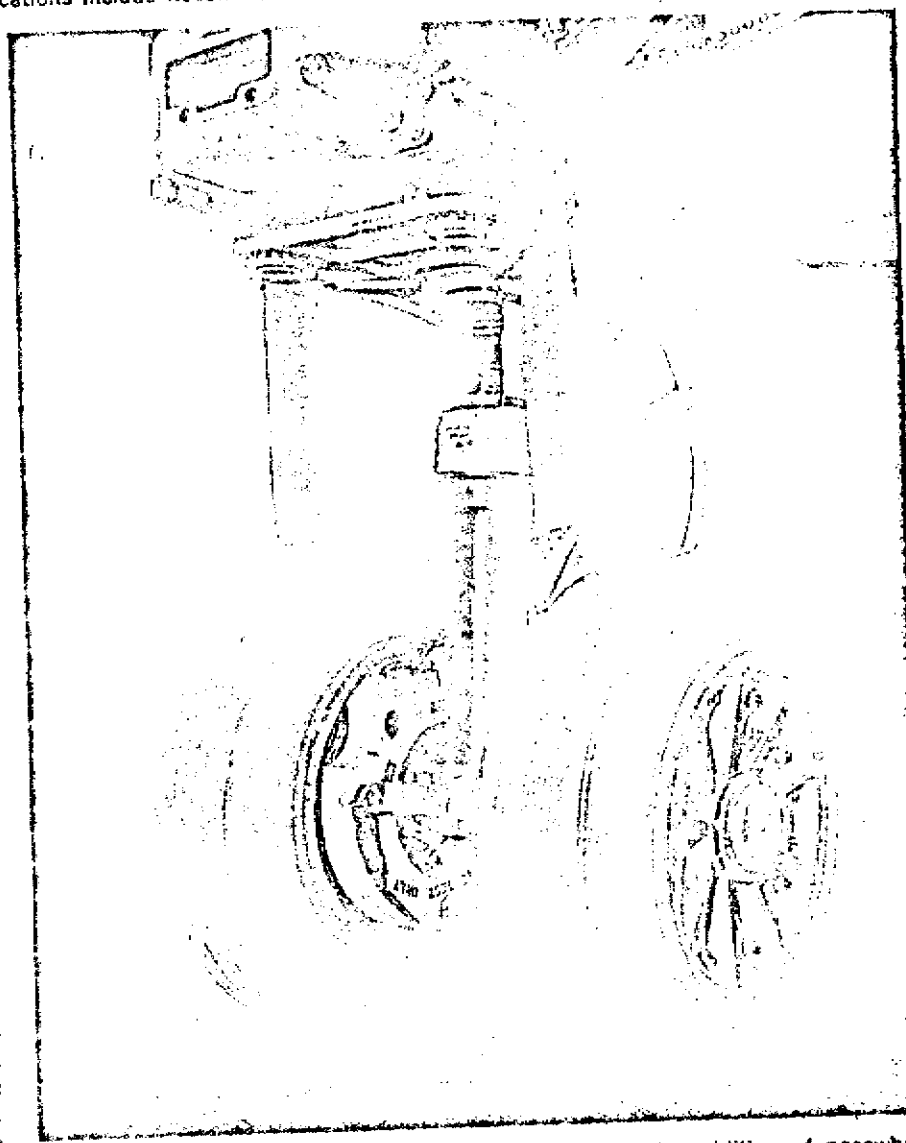
thrust reversers were especially impressive.

The airline evaluation phase of the short-field 737 development program followed a flight research program begun last fall. Boeing officials said there was a general expression of enthusiasm by the airlines for this first step toward a STOL aircraft.

In the next several months, Boeing will assess airline reaction and the economics of phasing the modifications into production hardware. Decision on which of the modifications will be incorporated into production hardware is expected before mid-summer.

If the company decides to proceed with a short-field modification package it would be available in early 1971. Possible options are:

■ Offering a short-field 737-200 for operation into runways as short as 4,000 ft. Such an aircraft probably would incorporate the bulk of the aerodynamic and braking modifications tested. If short field lengths weren't critical for some customers, the performance improvement could be translated into increased payload. In operations from a 4,000-ft. strip, takeoff weight could be increased from 88,500 to 98,500 lb. with a standard 737-200, presuming a new Pratt & Whitney 15,500-lb.-thrust JT8D would be used. A 9-kt. reduction in approach speed and improved braking would allow substantially greater payloads to be landed although the pre-



Stopping distance of short-field 737 was decreased by the addition of nosewheel braking. Brakes used in demonstration aircraft (above) were modified main gear brakes of a Lockheed F-104 fighter. The braking system incorporates automatic operation, which in one landing brought the aircraft to a halt in 1,600 ft. from touchdown at a weight of 85,850 lb. Deceleration level was about ¼g.

cise increment remains to be determined.

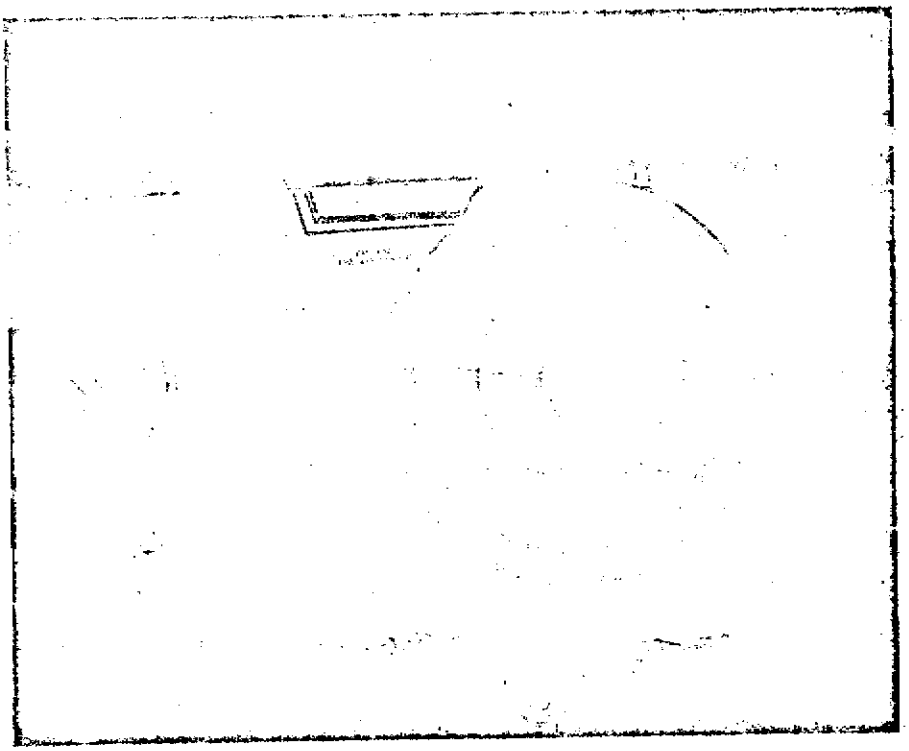
■ Offering a stretched 737 and incorporating the lift and braking improvements to obtain the same field length performance as the present 737-200 but with a larger payload.

■ Offering as optional equipment only selected elements of the product improvement package such as nose-wheel brakes. This fragmentary approach would be the minimum that would be done, an official said.

Whatever the choice in terms of future 737 developments, the research has direct application to new aircraft designs a Boeing official said. These include the 767 and 751 study efforts (see box).

One benefit of the 737 research program is the flight test experience in noise reduction. Although noise reduction is not necessarily linked to the short-field aspects, the company took advantage of the opportunity to experiment with acoustic inlet treatment. The results have not yet been analyzed, although the glass fiber and metal sandwich materials used appeared to be effective.

The flight evaluation included basic air work at slow-speeds, stalls at different flap settings, with and without boundary layer control, and landings at Paine and Boeing Fields. Boeing test pilot, Raymond L. McPherson, flew in the right seat as host pilot during the 1:19 min. flight originating from and terminating at the Boeing Field flight line.



Engine inlet of Boeing short-field 737 has been modified to provide noise attenuation. Changes include single ring, visible as white circle within inlet, which has been treated with sound suppression material. In addition, the inlet has been extended forward 27¼ in. by the insertion of a constant-section plug.

The leading edge slats of the Boeing-owned 737, serial number N73700, were fixed in the full-down position. This resulted in a maximum placard speed of 230 kt. The fixed leading edge slats, had a longer chord length than the standard 737 slat. Trailing edge flaps, however, were adjustable to takeoff setting of 5 deg. or landing approach setting of 40 deg.

Calculated takeoff speeds were 14 kt. slower than would be used in a standard 737-200 aircraft at the same 90,000 lb. weight. Speeds were, V_R and V_1, 114 kt. and V_2, 119 kt., assuming boundary layer control was working.

Boundary layer control is applied only to a short section of each wing leading edge through a 30-in. slot inboard of the engine plyon. Air is blown over the wing at this point to maintain attached airflow at slow speed because of a tendancy for the wing to stall early in this area.

Air was supplied to the slots by the auxiliary power unit, but in a production configuration both the auxiliary power unit and engine compressors would be used as sources.

After rotation speed was reached on takeoff, the nose was raised to a 20-deg. attitude and the twinjet lifted smoothly from the runway.

A climb was established to dodge numerous clouds in the vicinity, and the aircraft was leveled out at 6,500 ft. for a check of handling qualities. With 5-deg. takeoff flaps and a speed of 118-120 kt., V_2, banked turns of 30 and 45 deg. were flown with boundary layer air on.

Even in the steep banks, the 737 handled well, with ample reserve of pitch and roll control. There was no detectable difference in control effectiveness at these speeds when the boundary layer air was shut off.

In a descending turn and in a 60 deg. bank with boundary layer off, light buffeting was encountered when the nose was pulled up but the wing reattached immediately after back pressure was relaxed.

Flying at 100 kt. using power to maintain airspeed, roll, yaw and pitch control remained effective. Banked turns up to 30 deg. were made. The powerful influence of the spoilers at these slow speeds was apparent however. Spoilers raise past a given wheel throw to assist in roll control and the asymmetric drag and lift situation between wings makes it difficult to keep control inputs in phase with the reaction of the aircraft. McPherson's advice to utilize rudders more helped solve this pilot-induced oscillating tendancy particularly in the stalling maneuvers.

Both rapid entry and 1-kt. stall entries were done with 5-deg. flaps. With boundary layer control off, the 737 began shuddering just under 100 kt. in a rapid entry and stalled with the control column aft at 93 kt. With boundary layer air on, stall speed was 88 kt.

Using full 40-deg. landing flaps and

Boeing STOL Program

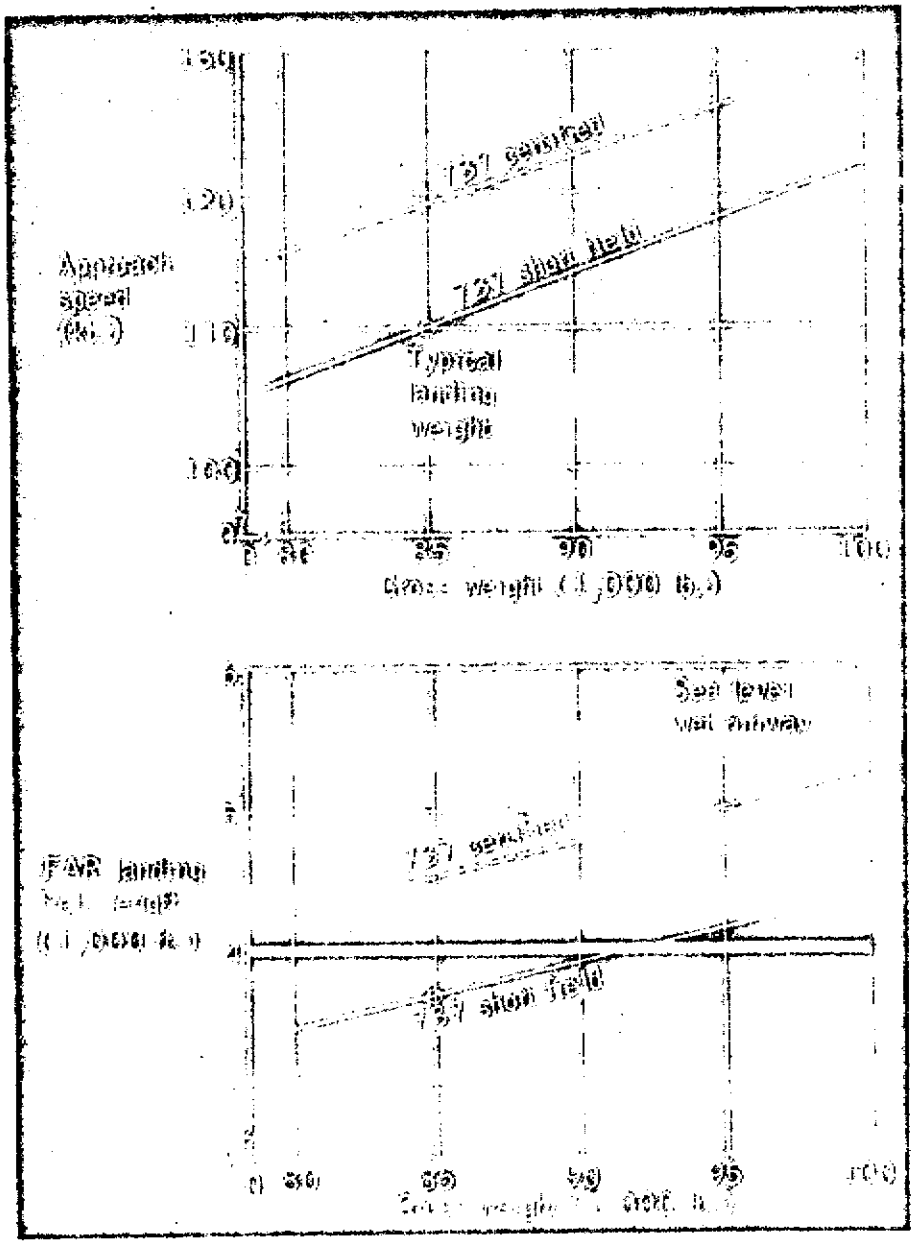
Renton, Wash.—Boeing Co. is discussing with airlines an advanced short takeoff and landing STOL passenger aircraft, designated model 751, which would be capable of operating into a 1,500-ft. field with a 150-passenger payload.

The 751 design is part of a broad STOL research effort headed by Richard D. FitzSimmons, director of product research at Boeing's Commercial Airplane Div. (AW&ST Oct. 7, p. 43).

The 751 would be powered by four lift engines swung out from the side of the fuselage. They would be retracted into the fuselage for cruise flight. Two different types of lift engine are under consideration—high-bypass-ratio turbofans and turbojet engines with sound suppressors.

Wing-mounted powerplants would be high-bypass-ratio turbofans in a thrust category approximately half as large as the 43,500-lb.-thrust Pratt & Whitney JT9D powering the 747. No such engine exists at this time, however.

The 751 is based on the 737 configuration, although the fuselage would be stretched to accommodate 150 passengers.



Landing performance characteristics of the short-field 737 and the standard 737-200 are compared above. Approach speed (upper chart) and landing field length (lower chart) are plotted against landing weight. The short-field version exhibits a 9-kt. average reduction in landing approach speed with no increase in approach thrust. Landing field length requirements are for wet runway conditions.

boundary layer control, a stall speed of 83 kt. was noted.

Boundary layer control with full flaps provided such gentle stall characteristics that a nose-down mushing better describes the point at which the aircraft stops flying. Even at these slow speeds, rudder control remained powerful and roll control effectiveness was good.

With bounary layer air off, the stall was preceded by buffeting and a more positive fall-through of the nose at the stall.

Generally, it seemed as if the aerodynamic improvements made to the 737, exceeded the goal of retaining the same handling qualities at reduced speeds based on the handling qualities in the unmodified 737 (AWAST Sept. 18, 1967, p. 56).

Following the air work, the 737 was flown to Paine Field, adjacent to the 747 plant at Everett, for a series of landings on runway 29, a 4,300-ft. strip 75 ft. wide with a hump-like contour. Approximately 2,000 ft. of the approach end of the runway had been watered down by tanker trucks to create a wet runway situation.

Reference speed for the first landing approach was 110 kt.—9 kt. below normal—and touchdown was made approximately 800 ft. from the end. The automatic braking system decelerated the aircraft to a stop 1,600 ft. from touchdown. Weight was 85,850 lb.

The idea of a black box doing the braking is a difficult concept to accept at first, but the system worked smoothly and effectively. The anti-skid system recycled several times, providing a temporary relaxation of the otherwise constant ¼ g deceleration force. At one point the nose-wheel brakes stopped working when too much rudder correction was applied to steer the aircraft down the narrow runway. This is a safety feature to ensure nose wheel turning capability. After the rudder correction was removed, the nose wheel brakes again began working.

The automatic brake system was armed prior to landing with a toggle switch. The idea is similar to the 737 automatic spoilers which raise to spoil lift on a wheel spin-up signal. The same signal actuates the automatic brakes.

During the taxi back to the head of the runway, the flight engineer provided new speeds of 109 kt. V_R and 115 kt. V_2. Soon after liftoff McPherson unexpectedly idled the No. 2 engine as a simulated engine failure. The resulting yaw was surprisingly mild and easily corrected with rudder. The 737 flew well at the V_2 speed of 115 kt. with an acceptable rate of climb until McPherson restored equal engine thrust.

The new 737 thrust reversers (AWAST Mar. 3, p. 28) used during the second landing at Paine—without automatic brakes—proved noticeably more effective than the earlier design. While taxiing back to takeoff, the reversers were used to halt the aircraft on the taxi strip and back it up.

The final landing at Paine Field was done with automatic brakes and thrust reversers in an estimated 1,400-1,500 ft. The final landing at Boeing Field was made after an ILS approach using a V_{REF} speed of 106 kt. plus a gust factor of 6 kt. The final descent speed of 112 kt. proved slower than that of a Beech Bonanza that passed by on the port wing on its way to land on the east side of Boeing Field.

The automatic brakes and reversers were used again after touchdown at Boeing Field, but obtaining a smooth release of the brake system remained a problem. Ideally, a pilot would put his feet on the brakes, press evenly until the automatic system cut out and then release the brakes gradually to prevent a sudden change in longitudinal g-force, but this proved too difficult to master in three attempts; a jerky release was made each time.

When Boeing began studying means of improving its 737 short-field performance, the first step was to reduce vortex flow in two different parts of the 737 wing. One area where a vortex was causing premature separation was just aft of the engine strut; the other was in the wing root area. In the latter case a vortex was generated by the inboard edge of the exposed Krueger flap.

Boeing engineers long had been confident that there was considerably more lift potential in the 737 wing than had been demonstrated in flight. To counter-

act the early flow separation to the wing root, the Krueger flap was extended inboard to fare against the fuselage. Boundary layer control slots were installed to rectify the early flow separation aft of the engine pylons.

Additionally a rounded fairing was added between engine nacelle and wing leading edge to bridge the former discontinuity between outboard leading edge slats and inboard Krueger flaps.

The net effect of these changes was a better balance of the already excellent outboard wing stall characteristics with those of the inboard wing.

Lift Improvements

With the wing flow characteristics balanced spanwise, Boeing then went to work on the leading edge slats and trailing edge flaps to gain an improvement in lift.

The leading edge slat was extended forward by lengthening the chord approximately 40%.

Trailing edge flap area was increased by modifying the third segment of the triple-slotted 737 flaps. The inboard trailing edge vane was extended aft 20 in. next to the engine nacelle and 10 in. next to the fuselage. The area of the outboard trailing edge flap segment was increased by adding a triangular section, 20-in. long nearest the engine nacelle and tapering to a point at the outboard side facing the aileron.

In testing the flaps at various deflections, Boeing settled on an optimum 40-deg. setting for the second segment which raised maximum lift coefficient approximately 20% above the basic 737 wing CL_{max} of about 3.0. This improvement is significant, a Boeing engineer says, because it was obtained with no loss in lift/drag ratio.

Extension of the slats provided a very powerful leading edge which raised the question of whether the chord extension would be necessary in a production configuration.

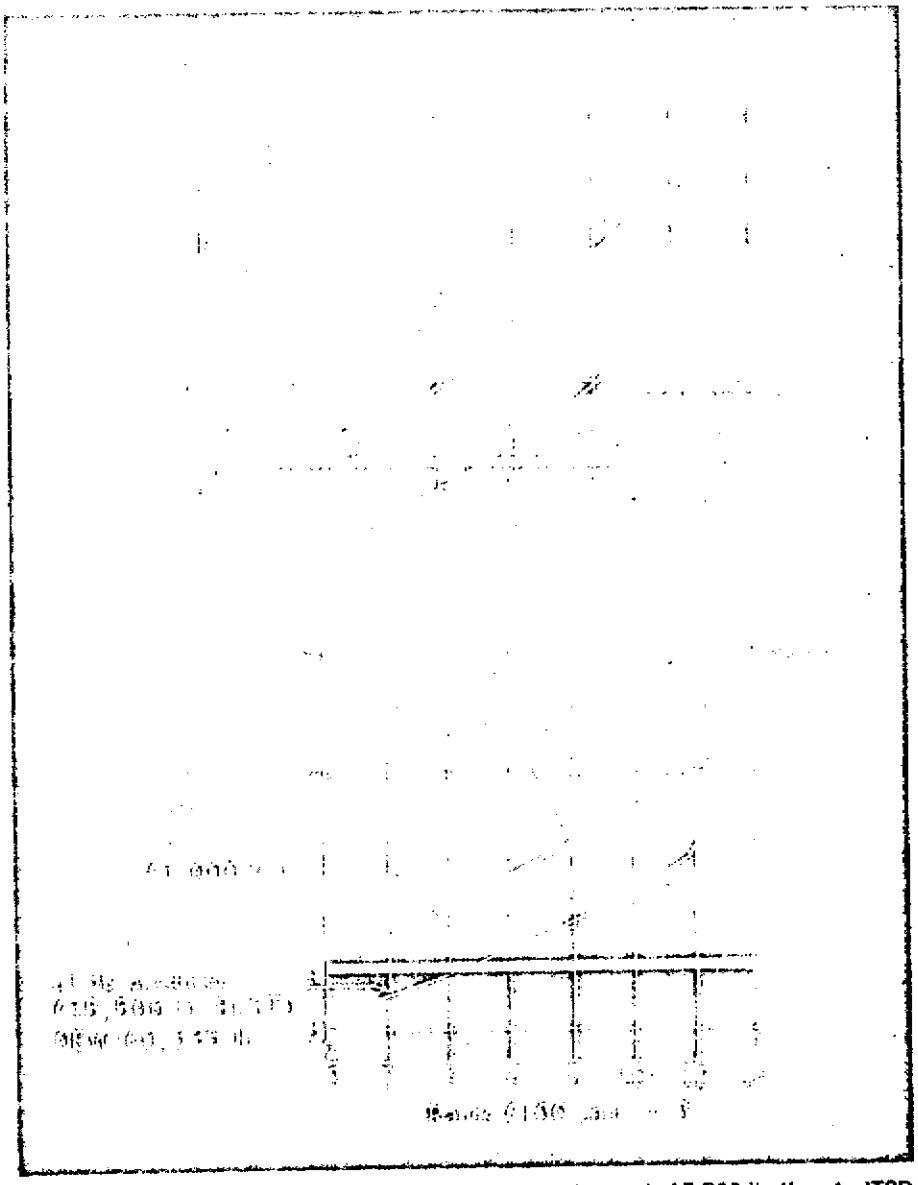
Late in the flight test program a decision was made to see if the same results could be obtained by changing the contour of the leading edge exposed by lowering the slat.

Contour Change

The change in contour amounted mainly to fairing over the step where the slat trailing edge nestled when retracted. Putty-like material used to smooth the contour proved effective and tuft tests showed that the airflow had been smoothed considerably.

In a production design this smooth contour could be accomplished in several ways, possibly with an inflatable boot between slat and wing or a knife-edge slat trailing edge.

The end result of the aerodynamic refinements was a 9-kt. reduction in stall speed with no degradation in handling qualities and no change in L/D, according to Boeing. Holding L/D constant was important in that no additional power is required and hence no more noise is produced.



Incorporation of short-field equipment and an advanced 15,500-lb.-thrust JT8D engine would raise takeoff weight (upper chart) of 737-200 from a 4,000-ft. field from 88,500 lb. to 98,500 lb., an increase of 49 passengers. Lower chart compares takeoff field length vs. range for a standard and a short-field 737-200. Short-field version could fly from a 4,000-ft. field at full load for a range exceeding 400 mi.

To gain the maximum overall use of the reduced stall speeds, which lower both takeoff and landing field length calculations, Boeing sought to improve ground roll deceleration characteristics. These modifications included installation of nose-wheel brakes, an improved anti-skid system and an automatic braking system. The nose-wheel brakes were the most important from the standpoint of runway field length calculations.

Nose-wheel brakes had a precedent in the Boeing 727. But automatic brakes —like boundary layer control—were a new concept in Boeing commercial aircraft. The automatic brake feature encountered some skepticism among airline pilots.

After flying with this braking feature, however, pilot opposition dwindled and in many cases dissolved, Boeing engineers said. The chief advantage of automatically braking the 737 is not so much in shorter stopping distances—although some small gain is anticipated—but in a smoother, more consistent deceleration. Passenger acceptance of a short-field 737 is viewed as particularly important because hard landings and jerky or high-acceleration stops would discourage repeat customers.

In line with this thinking, Boeing also changed the landing gear oleo metering pin to soften the effect of a hard landing. The 737 already is equipped with a no-rebound gear but the revised design substantially reduces the initial peak shock transmitted to the airframe.

The effectiveness of the new oleo was well demonstrated during the flight when a 9-fps. touchdown was made at

Paine Field after a late flare. The hard touchdown produced no bounce whatsoever and while recognized as a solid confrontation with the runway, it was not judged any more than a 5- to 7-fps. touchdown by seat-of-the-pants estimation.

McPherson believes that to operate successfully into short 4,000-ft. strips on a routine basis, pilots will have to spot their landings, that is shoot for a consistent touchdown point rather than trying to "grease it on" every time. This probably will require some variation from optimum speed and occasionally, harder than usual touchdowns.

Noise Studies

The noise research conducted with the 737 largely was an add-on task in the short-field program. Noise attenuation is not directly linked to a short-field aircraft in Boeing's opinion, but there is a company-wide concern with the problem and substantial research is devoted to it.

Noise reduction could be of interest to airlines planning to operate a short-field 737 into small urban community airports but it is of probably greater interest to engineers designing new Boeing aircraft such as the 751 (see box, p. 43).

The noise attenuation modifications on the 737 are representative of the basic approach to engine quieting being explored elsewhere in the industry. On the 737 they include:

- Extension of the inlet 27¼ in. forward by insertion of a constant-section plug forward of the engine face. This provided additional area for installation of sound-suppression material.

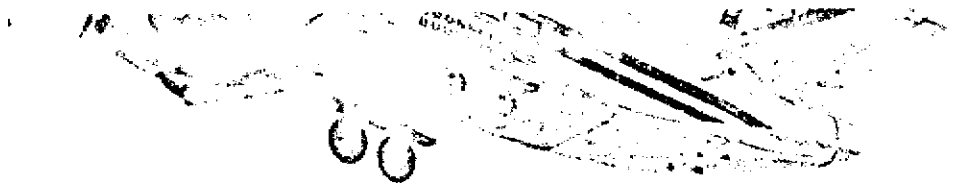
The noise-attenuation material used on the 737 was ½-in.-thick polyimide glass fiber sandwich. The exposed face sheet was a porous loose-weave glass fiber cloth. The solid outside face sheet was also of glass fiber. The solid face sheet is a backstop for the waves of acoustic energy which enters the sandwich through the porous weave and subsequently is attenuated inside the individual honeycomb cells.

- Ring supported by five struts was installed in the constant plug section just forward of the fan. Both sides of the outer and inner surfaces of the ring were treated with the same material used to line the inlet. More than 40 sq. ft. of polyimide-treated honeycomb sandwich was used to line both the ring and inlet.
- Metal honeycomb sandwich sound attenuation material was added to the inside of the tailpipe extension aft of the engine exhaust duct. The 45-in.-long tailpipe extension is part of the recent 737 thrust reverser modification and ducts the exhaust gases aft of the trailing edge flaps. The ¼-in.-thick metal sandwich installed in the 36-in.-dia. tailpipe extension is a welded honeycomb sandwich made by Stresskin Products, Costa Mesa, Calif. The inner face sheet is perforated with tiny holes to provide porosity.
- Pratt & Whitney-supplied kit consisting of perforated metal sheets was installed in the fan air duct in the vicinity of the JT8D turbine wheels. The sheets, held in place by stringers, were placed so that the fan air had to pass between them. Purpose of these sheets is to reduce fan noise.

Weight Factor

Boeing engineers estimated that if this particular noise suppression package were refined for production, it would add approximately 300 lb. to each engine. Test hardware of boilerplate construction weighed substantially more than this, however. Boeing is continuing to evaluate several other possible sound attenuation materials such as steel wool pads, polyurethane foam and Feltmetal.

Although results of the noise reduction in terms of decibels still is not determined, the engine performance degradation stemming from placing the ring in the inlet and the extra weight involved in the modification would reduce design range by approximately 150 naut. mi. in a production 737.



Following Eastern Airlines' STOL evaluation programme in 1968, American Airlines took over the McDonnell Douglas 188 (Breguet 941) and operated the aircraft for three months in the St. Louis, Chicago and New York areas.

machines with swivelling engines, with thrust deflection arrangements, with separate lift and cruise engines, with gas generator lift fans in wings and fuselage, with swivelling turboprops or swivelling shrouded propellers, and finally with tilt-wings in which the complete propeller/turbine installation can be tilted vertically together with the wings.

The trials results obtained from this comprehensive range of aircraft have provided not only the American manufacturers, but also the National Aeronautics and Space Administration with its associated laboratories, the Federal Aviation Administration and branches of the armed forces who had financed individual models, with a wealth of experience, which is not at present possessed by any other country. Besides this, the British trials results obtained with the first prototypes and pre-series models of the P.1127 vertical take-off aircraft, nearly all results of German vertical take-off development (VJ 101C, Do 31 and AVS), as well as the technology of the British lift and swivelling nozzle jet engines have been made fully available to the United States. Finally it must be remembered that the American industry in continually evaluating and making comparative analyses of new projects within a framework of study contracts issued by both the military and civil authorities. The Federal Aviation Administration, the National Aeronautics and Space Administration and the Pentagon have also issued design study contracts on the various fringe problems of vertical take-off technology and on vertical or short take-off aircraft operations. These studies go far beyond anything yet done in this field in Europe.

A number of these design studies were undertaken as part of the Light Intra-Theater Transport (LIT) programme for the United States Air Force, which is however, still awaiting a final decision from the American Defence Department. If this combat area transport specification is finalised, not only as a short take-off, but as a V/STOL aircraft, then this decision could well influence future planning of the American air transport industry, particularly since the manufacturing consortium which is succesful in winning the contract will be able to count on $300 to $400 million finance for development, and probably an order for the manufacture of at least 250 military version aircraft.

Problems of certification

At the moment it seems unlikely that the Light Intra-Theater Transport will be a vertical take-off aircraft, and the American air transport industry seems to believe less and less in the early introduction of VTOL aircraft into scheduled service. Nevertheless the Flight Standards Service of the Federal Aviation Administration recently published its proposals for certification requirements for vertical take-off aircraft under the title "Tentative Airworthiness Standards for Verticraft/Powered Lift Transport Category Aircraft" and which dealt in particular with performance criteria after failure of one or more engines. Similar specifications are also in preparation by the British Air Registration Board and a review of the requirements of this British certification authority on operation of

FAA criteria for STOL operations

Both the FAA and American aircraft industry circles have for some time been studying the question of defining more closely the field length required for STOL operations and simultaneously fixing the related runway size, so that one can speak of a STOL runway. In this connection, the following first universally accepted definition of a STOL shorthaul airliner was evolved:

- A civil STOL transport must be integrated into the existing terminal ATC procedures, especially at the large central airports. In such a way that conventional takeoff and landing operations are in no way hampered. To this end, STOL aircraft should approach their special runways at an angle of 7.5–9° (compared with the 2.5–3° of conventional transports). Additionally, STOL transports should be substantially more manoeuvrable, during the approach and climb-out phases, than conventional aircraft.

- Approach and climb-out procedures for STOL transports should be so selected that unproductive flight time be cut to a minimum; this presupposes high manoeuvrability with a small turning radius at low speeds. The desired targets are turning radii of 500 feet on the approach and 1,000 feet on climb-out.

The aforementioned criteria automatically lead to the parameter which is of crucial importance in STOL operations, namely the minimum flying speed (Vmc) at which the aircraft remains largely controllable after a critical engine failure. Various industry studies in the USA have shown that a minimum speed of about 65 knots is necessary if STOL aircraft are to operate from urban STOL ports with runway lengths of only 1,500 feet and at approach angles of more than 7.5 degrees, so that a turning radius of 500 feet remains attainable with the guarantee of required performance and lift reserves.

This minimum speed requirement, which is unusually severe by today's standards, will remain the decisive criterion for any future STOL transports provided that the FAA and local authorities in the USA are agreed that the minimum runway length for STOL operations should be 1,500 feet. Shorter runway lengths for these operations seem fairly unlikely, because the costs of terminal buildings, maintenance facilities and car parking space exceed the land procurement costs by such a wide margin that economies in land purchase are not worthwhile. The minimum speed requirement thus promises to become a basic STOL criterion and, in conjunction with the maximum lift coefficient of a given configuration, determines the wing loading and also, for a given runway length, the total thrust/weight ratio for safe take-off.

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EXHIBIT C

The Jet-Noise Problem at Bayside Manor and Means for Its Alleviation

Prepared for

The City of Millbrae

July 29, 1960

Maurice A. Garbell, Inc.

Aeronautical Engineers and Consultants

1714 Lake Street San Francisco 21, California

90 db. Upon release of the brakes the noise-level readings either remained stationary or rose for some 10 to 15 seconds up to a peak of approximately 96 db while the "loudest sector" of the sound-level distribution about the aircraft swept over the test point; thereafter, the sound level decreased at a rate of somewhat less than 1 db per second; it passed through the 80-db level approximately 20 seconds after the passing of the peak, approximately 35-40 seconds after the release of the brakes.

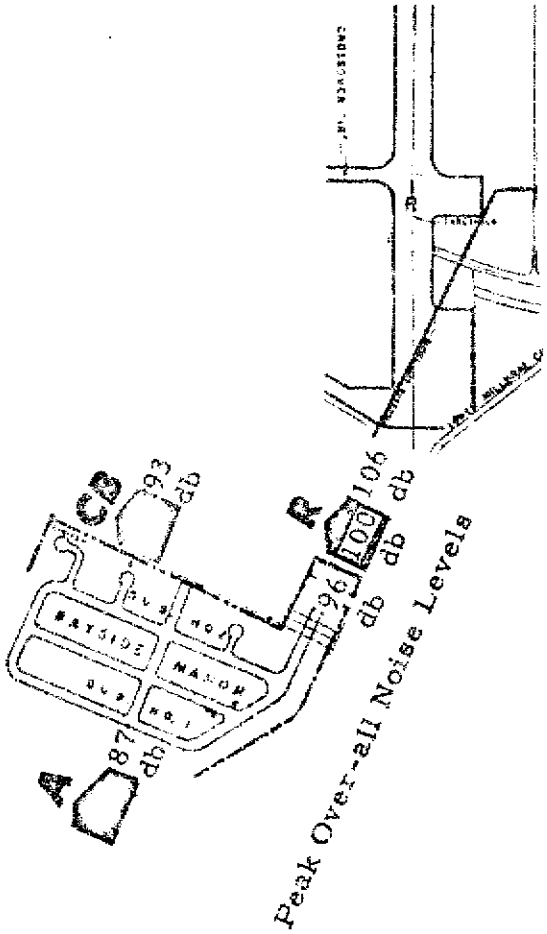
After being merged with the prevailing background noise of Bayshore Freeway for some 120 seconds, clearly identifiable fluctuating surges of jet-engine noise, of the order of 90 decibels, could be heard again for 10 to 30 seconds. These surges were particularly intense when the departed aircraft initiated a left-hand (westward) turn after reaching an elevation of some 1000 to 1500 feet, (i.e., the 09:16 departure of a Pan American Boeing 707). At point CB, a passing train produced approximately 80 db, the train whistle 90 db.

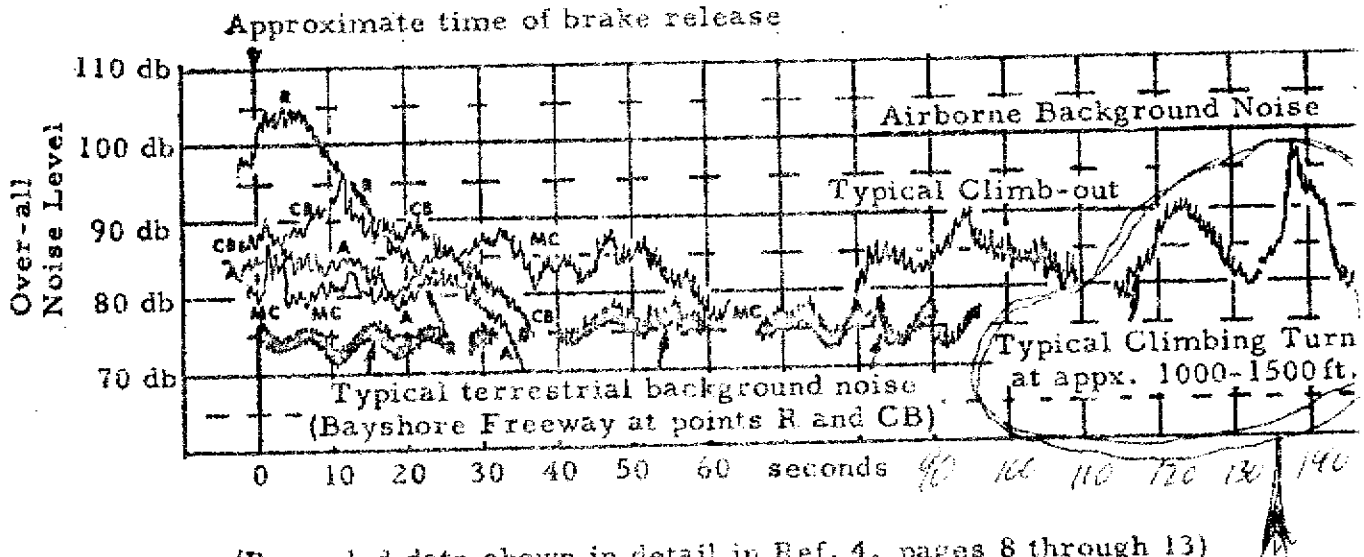
Point A:

The readings were all taken on the airport side of the house. In general, the sound-level history at that point resembled that previously observed at point CB, except that the full-power noise level was observed to average 87 db (against 93 db at Point CB). Climb-out sound-level surges attained approximately the same value.

Summary of Sound-Level Observations at Bayside Manor
(See Fig. 6)

Point R is characterized by an extremely intense sound-level peak (106 db) at the outset, with sound-level readings dropping off





(Recorded data shown in detail in Ref. 4, pages 8 through 13)

Fig. 6. Comparative Noise-Time Histories at Various Points in Bayside Manor and at point "MC" in upper Millbrae.

from 3-4 mi away

EXHIBIT D

LAND USE PLANNING RELATING

TO

AIRCRAFT NOISE

TECHNICAL REPORT OF

BOLT, BERANEK & NEWMAN, INC.

OCTOBER 1964

FOREWORD

The FAA does not have definitive standards for land use planning relating to aircraft noise. However, it is continuing to support research in this area.

FAA Planning Series Item Number 3, "Aircraft Noise Abatement," dated September 1960 has been canceled because it has been found to be outdated. It was based on takeoff noise characteristics of a single type aircraft with no consideration being given to variables such as frequency of operations, percent of runway utilization, landing operations, stage lengths, type of engines and other factors that contribute to composite noise exposures in a particular area.

Compatible land use planning in the vicinity of airports is encouraged to ensure that airports are in an environment that maximizes their usefulness as a facility to meet local requirements for air commerce. Guidelines that may be useful to land use planners have been developed by the firm of Bolt, Beranek and Newman, Incorporated, pursuant to a contract jointly supported by the USAF and the FAA. The FAA is reproducing this report in order that the latest state-of-the-art in calculating composite noise ratings can be made available to parties interested in future planning.

This report is interim in nature and the FAA makes no representations and assumes no responsibility regarding the matters and opinions contained therein.

1 October 1964

SECTION A—INTRODUCTION TO THE PLANNING PROCEDURE

1. General. This manual presents a procedure for estimating exposure to engine noise from ground and flight operation of military and civil jet and propeller aircraft, and for relating the estimated exposure to the expected response of residential communities. It does not establish noise standards for purposes of enforcement; nor does it define noise levels that are tolerable or intolerable. This procedure is intended as a *guide* in planning land use in the vicinity of airports. The procedure can be used to estimate responses to the engine noise associated with present aircraft operations as well as to forecast the general effect of changes in operations, equipment, or facilities. Sonic booms are a separate problem and are not included in this procedure.

The manual supersedes *WADC Technical Note* 57-10 [1] and *ATC Manual* 86-1 [2] which were designed as guides for estimating community response to noise from Air Force operations. Other documents on this subject were also considered, such as the Federal Aviation Agency *Planning Series* No. 3 [3] which applied to civil aircraft operations and the delineation of areas for "nonresidential development and the exclusion of places of public assembly". The material in these publications has been updated, their range of application considerably extended, and their best features incorporated in this guide. Recent data on the noise output of civil and military aircraft are included. The total document reflects the research results of many years of Government-sponsored programs and private studies. The manual therefore provides the best technical guidance available considering the complexity of the problem and the desired straightforwardness of the procedure.

2. Needs for Uniform Action. A tri-service publication appears desirable at this time because of the urgent need for uniform practices in assessing aircraft noise problems. The principal basis for this urgency is the increasing number of land areas both within the United States and abroad over which aircraft of the several military services as well as civil aircraft operate. In addition it is hoped that the knowledge and experience derived from the dissemination and use of this manual will aid present national and international efforts to standardize procedures for evaluating community responses to aircraft noise. In spite of the undeniable need for regional and national variations, a generally accepted framework for dealing with this problem should be agreed on soon.

The public interest requires all responsible agencies to take such steps as they can to prevent urban development from encroaching on air bases and airports, particularly in those areas which lie under the takeoff and landing paths of dominant jet runways. This is necessary not only to protect the enormous investment of public funds in the development of our major air bases and airports, but for the well-being and protection of persons and property in the airfield environment.

The problem faced by local planning and zoning authorities who are considering land use compatibility in relation to airports is exceedingly complex and difficult. Residential development has already been allowed in many areas subject to high noise levels from aircraft operations; in such areas, it is doubtful that zoning action will be of more benefit than to prevent further incompatible development. On the other hand, there are still many communities with airports that do not face an incompatible encroachment problem today; these communities can make maximum use of this manual.

3. Brief of the Procedure. The new procedure is a streamlined version of the one presented in the original Air Force document [1] but the range of application has been extended to include landing noise and civilian as well as military operations. Generalized noise contours are included in attachment 2 which permit one to estimate the noise produced during takeoff, landing, and runup operations by any of several *classes* of aircraft. They do not describe in detail the noise generated by a particular aircraft type. These

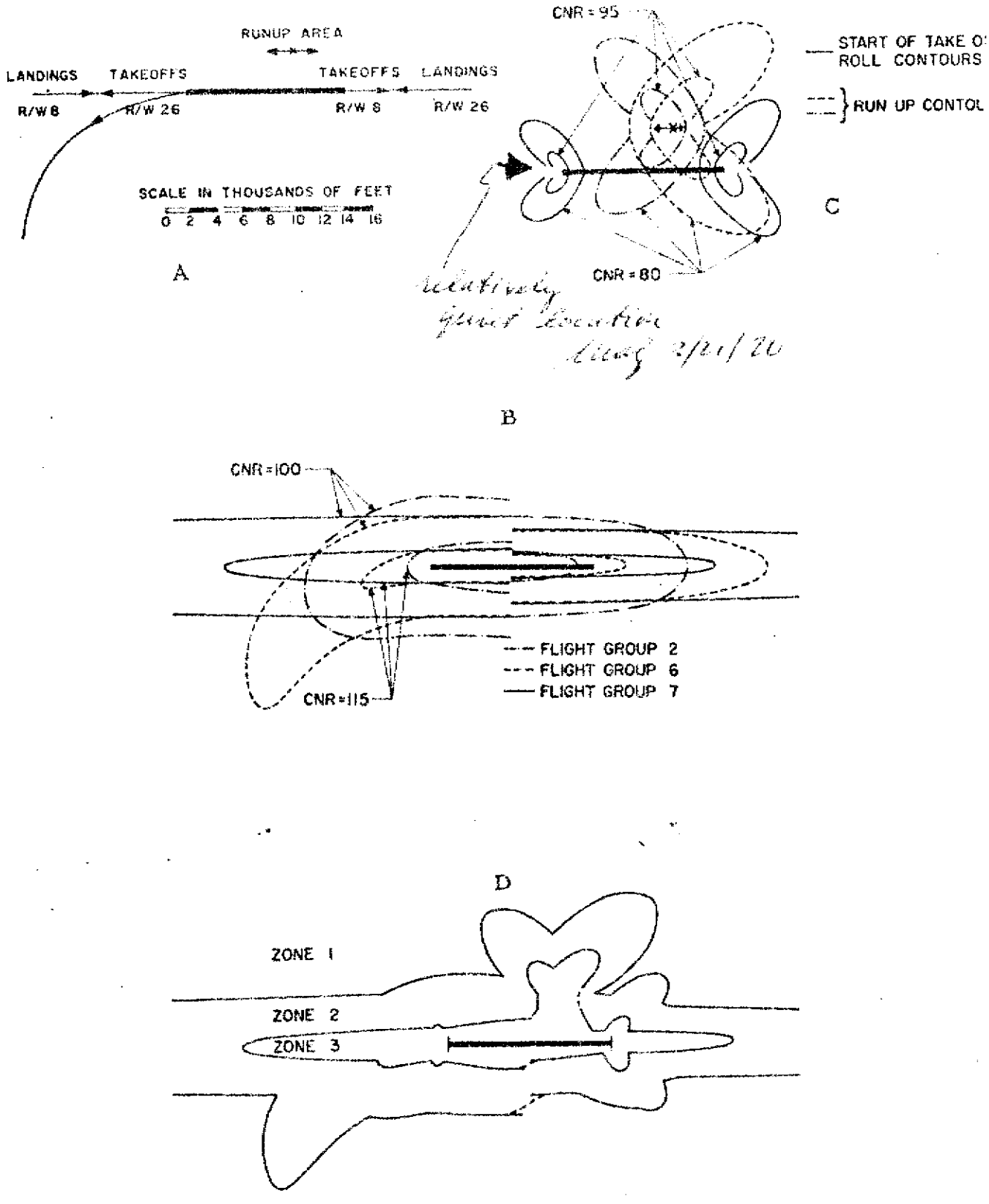


Figure 4. Hypothetical Air Base and Contours of Equal Composite Noise Rating—Example 4.

SECTION D—CAUTIONS IN APPLYING THE RESULTS

Two points in particular must receive thorough consideration in land use planning decisions based on the results of this procedure. *First* the contours of Composite Noise Rating are derived from average noise levels and flight paths, and they assume average atmospheric conditions. These facts alone dictate the recommendation that the zones defined be used as *guides* to compatible land use planning and not as absolute geographical limits. Consider, for example, the narrow wedge of land on Figure 4D that lies between the contours for runups parallel to Runway 26 and those for beginning takeoff roll on the same runway. Plans for use of this land should reflect the knowledge that both practice operations and normal deviations from typical flight paths or noise propagation characteristics can be such that the area is actually in Zone 2 rather than Zone 1.

Second, the reactions described in Table 6 are based on the average responses to given Composite Noise Ratings of those communities that have been studied extensively. The actual reaction in a particular situation may be milder or stronger, depending on a number of factors relating to personal attitudes and community characteristics. Such factors include the economic importance of the airport or air-base activity to the community, the perceived and actual concern of the responsible authorities in controlling aircraft noise, the presence or absence of well-organized protest groups, the degree of change associated with the introduction of a new operation, and the interaction between a noise problem and other problems such as zoning or political jurisdiction. The ways in which these and other related factors modify the patterns of reactions on an issue as important as airport-community noise problems are not fully predictable in the present state of the art.

The above points together with the *existing terrain variables* and *land uses* must receive full consideration to insure the most sensible and practical application of the detailed contours derived from this procedure. Planners must always bear in mind that the reactions described apply to *residents* of the three zones. Use of the same land for such purposes as business, industry or agriculture would not yield so severe a response and is recommended wherever practicable.

FAA DS-67-10

PROCEDURES FOR DEVELOPING NOISE EXPOSURE FORECAST AREAS FOR AIRCRAFT FLIGHT OPERATIONS

TECHNICAL REPORT

August 1967

by

Dwight E. Bishop
Richard D. Horonjeff

Bolt Beranek and Newman Inc.
15808 Wyandotte Street
Van Nuys, California 91406

Under Contract FA67-WA-1705

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Aircraft Development Service
Washington, D.C.

EXHIBIT E

TECHNICAL REPORT

DS-67-10

Contract No. FA67WA-1705

PROCEDURES FOR DEVELOPING NOISE EXPOSURE FORECAST AREAS FOR AIRCRAFT FLIGHT OPERATIONS

By

Dwight E. Bishop
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ABSTRACT

This report outlines procedures and supporting technical data for determining Noise Exposure Forecast (NEF) area, resulting from takeoff and landing operations in the vicinity of airports. In companion reports, these procedures have been applied to determine NEF areas in the vicinity of J. F. Kennedy, O'Hare and Los Angeles International Airports for 1965, 1970 and 1975.

The NEF areas have differing land use compatibility with respect to aircraft noise; hence, the NEF areas may be used as a guide to land use planning and zoning. The NEF areas are based upon the aircraft noise described in terms of the effective perceived noise levels (which includes corrections for duration and presence of discrete frequencies) plus adjustments for the number of operations for daytime and nighttime periods.

Noise and takeoff and landing profile information is given for estimating effective perceived noise levels for the takeoff and landings of current large jet aircraft and for future large aircraft expected to be in operation within the forecast periods. Computer-aided procedures employed in determining NEF contours are also outlined.

I. INTRODUCTION

This report presents the procedures and supporting technical information for the development of Noise Exposure Forecast (NEF) areas in the vicinity of airports. The Noise Exposure Forecast areas depict land areas having different degrees of noise exposures which influence the land use and the reactions of people residing in the given land areas. The NEF procedures can be used as a guide in planning land use in the vicinity of airports. In companion reports, [Ref. 1,2,3] these procedures are applied to depict the NEF areas in the vicinity of three major airports, J. F. Kennedy in New York, O'Hare in Chicago and Los Angeles International Airport for the periods of 1965, 1970 and 1975.

This study was undertaken under Federal Aviation Administration Contract FA67WA-1705 as one step in fulfilling Recommendation 2 of the Office of Science and Technology Ad Hoc Jet Aircraft Noise Panel, [Ref. 4]. This recommendation urged, on an urgent basis, "an overall 'systems' type of analysis of the developing jet aircraft noise problems in the vicinity of the J. F. Kennedy, O'Hare and Los Angeles airports in order to formulate practicable programs which might be undertaken to improve greatly the capabilities of these communities to cope with their respective difficulties in jet aircraft noise abatement and control". This recommendation also called for later extension of the systems analysis study to 20 or so other major metropolitan areas where civil or military aircraft noise is, or promises to become, a difficult community problem.

The NEF procedures discussed in this report may be utilized to describe the noise environment at any airport. The procedures are based upon descriptions of the aircraft noise in terms of the effective perceived noise level. A major portion of our study has been devoted to gathering necessary data for estimating the effective perceived noise level for current and anticipated future aircraft. The noise level information gathered was largely confined to those types of large aircraft which are important in determining the noise exposure in the three major airports under study.

The procedures for determining NEF areas represent an updating and modification of the analysis procedures previously developed for describing and interpreting aircraft noise, described in Refs. 5 and 6. These predecessor procedures are briefly compared and reviewed in Section II in relation to the NEF procedures.

Section III outlines the basic steps in calculating NEF values in mathematical form and provides several examples of NEF computations. The selection of NEF values to define NEF area boundaries is also discussed in Section II.

Section IV describes the aircraft noise level and operational information used in determining effective perceived noise levels. Separate subsections present information for current aircraft and for future aircraft expected to be in operation within the forecast periods.

Section V summarizes the computer-aided computational procedures used to determine the NEF area boundaries for the three airports studied under this contract.

II. PREDECESSOR PROCEDURES

The predecessor procedure of Ref. 5 provided a means for estimating noise levels in land areas near aircraft flight paths and a procedure for estimating the expected response in residential areas. To assist in estimating noise levels, Ref. 5 provided generalized perceived noise level contours for different aircraft classifications. These contours provided estimates of the perceived noise levels for ground runups and for takeoff and landing operations of different types of civil and military aircraft. Corrections were then applied to the perceived noise levels to take into account such factors as the number of operations, time of day, and runway utilization. The result was a quantity called the Composite Noise Rating (CNR). The expected community response could be estimated from the CNR values on the basis of an empirical relationship based on numerous case histories involving aircraft noise problems at both civil and military airports.

Reference 6 extended this procedure to provide estimates of the expected impact of aircraft noise for a large number of land uses other than residential.

In Reference 6, CNR values were used to define boundaries of four Noise Sensitivity Zones. For each zone, the compatibility of land usage for a number of major land use categories was assessed. For other than residential use, the assessment was based upon consideration of the typical range of activities involved and the importance of speech communication for these activities.

The corrections for number of operations, etc., used in determining the Composite Noise Ratings in Ref. 5 and 6 were applied in 5-unit steps. Therefore, a small group of generalized noise contours (depicting contours at 5 PNdB intervals) permitted the construction of CNR contours for a wide range of aircraft operations by relatively simple graphical and hand calculation procedures.

Since the development and initial application of these procedures, several developments have suggested a need for review, modification and updating of these procedures. References 5 and 6 both made use of the perceived noise level as a measure of aircraft noise. It is a quantity calculated from measured noise levels in frequency bands that correlates well with subjective response to various types of broadband aircraft noise. However, continued psychoacoustic judgment tests have suggested that the perceived noise level should be modified to include explicit adjustments for the relative

duration of the flyover signal and the presence of discrete frequency components. [7,8,9,10] The judged noisiness of a flyover signal has been found to increase with the duration of the sound. The presence of discrete frequency components has also been found to increase the judged noisiness compared to a broadband sound signal of equivalent noise levels. These studies have led to the development of the effective perceived values in this current study.*

Another modification introduced in the NEF procedures is the use of continous rather than step adjustments for number of operations. The use of step corrections involved a succession of 5-unit corrections, each covering roughly a range of 3 to 1 in number of operations. These steps introduced discontinuities and, in some cases, either obscured or magnified differences in operations depending upon whether or not the number of operations fell near the middle or near the boundaries of a particular step.** For example, with strict interpretation of the CNR procedure, a change from 9 to 10 in number of operations during daytime called for a 5-unit change in the CNR, while an increase from 10 to 30 operations resulted in no change in CNR values.

The predecessor procedure also provided only a relatively crude step method of summing the contributions of noise produced by either different classes of aircraft or by differing operations and flight paths. The NEF procedures in this report add the noise contributions on a continuous "energy summation" basis.

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* The additivity, without interaction, of duration and discrete frequency correction is undergoing laboratory study. Other factors which may influence the judged noisiness of a complex flyover signal (changes in spectrum shape with time, modulation of discrete frequency components, Doppler shifts) are also being investigated. Results of such studies may indicate further refinements in methods for evaluating aircraft noise.

** Step corrections were introduced in Ref. 5 to simplify calculations and to make possible the convenient use of standardized contours to determine Composite Noise Rating contours. It was felt that these advantages outweighed the occasional error introduced by the step discontinuities. Earlier procedures, from which Ref. 5 evolved, permitted step or continuous corrections. [11]

2. Perceived Noise Level Comparisons

Figures 3, 4, and 5 show a comparison of the perceived noise level variation with distance for the current data used in computing NEF contours and the perceived noise level curves of Ref. 5. Separate figures are shown for each of the three major classifications; curves are shown in each figure for takeoff and for landing operations. The variation in perceived noise levels with distance based on the data in this report is close to that of the previous procedure except for large turbofan aircraft where the perceived noise levels are somewhat higher than had been assumed in the earlier reports. The current perceived noise level estimate for large turbofan aircraft is based on many more noise measurements than were available at the time of the early study; they also include measurements of turbofan aircraft having higher thrust engines.

A comparison of the perceived noise levels based on the octave band spectra of Table IV with field data measured under a variety of conditions is shown in Figs. 6 and 7. Figure 6 shows measured perceived noise level for four-engine turbofan takeoffs, based on measurements at J. F. Kennedy Airport in New York[21] and Los Angeles International Airport. The takeoff data plotted in Fig. 6 represents, in many cases, particularly for the New York data, field observations for aircraft operating at varying degrees of power cutback. Thus, the PNL curve representing takeoff thrust should be expected to fall near the upper boundary depicted by the field values.

Figure 7 presents data for four-engine turbofan approaches based largely on data obtained at the Los Angeles International Airport. There is considerable scatter in the data reflecting variations in power settings as well as differences among the aircraft.

3. Time Duration Corrections

In calculating effective perceived noise levels in accordance with Eq. 1, the time durations for each aircraft classification were specified by means of an empirical formula giving the time duration as a function of distance. Basic time duration information was first determined from graphic level charts of recorded flyover time histories. The recorded signals were first filtered through an N-weighting network,* since

* The N-weighting network is a frequency weighting network having characteristics which are the inverse of the 40-noy noisiness contour.

recent studies have shown that the time duration determined from the N-level time history yields values close to that which would be calculated from the time histories of the perceived noise level calculated at discrete time intervals.[18] The duration data was then plotted on log/log coordinate paper as a function of distance. Linear regression lines were then fitted to the plotted data to yield the empirical formula. Table V shows some of the time durations determined from the regression lines for distances of 500, 1000 and 2000 ft.

Typical plots of the time duration information for field measurements are shown in Figs. 8, 9, and 10. Figure 8 shows the time duration plotted versus distance for takeoffs of large four-engine turbojet aircraft with JT3C and JT4A series engines. Figure 9 shows similar time duration information for the takeoffs of large four-engine turbofan aircraft fitted with JT3D series engines. Figures 10A and 10B show the more limited time duration information for the approaches of four-engine turbofan aircraft and for Boeing 727 turbofan aircraft.

There is considerable scatter in the time duration data when duration is plotted as a function of the distance from the aircraft. It is possible that the scatter in the data might be somewhat reduced if aircraft speed information were available. However, on the basis of previous studies, we would expect that the variation in aircraft speed would not be large when interpreted on a logarithmic basis, and would account for only a small proportion of the observed scatter.[21,22]

During the takeoff roll, the time duration of the sideline noise signal was assumed to vary with distance from the aircraft and inversely with the speed of the aircraft. The maximum time duration for a given distance was assumed to occur at the start of the takeoff roll, with durations based upon values derived from field measurements as reported in Appendix C. The time duration was then assumed to decrease with increasing aircraft speed (assuming uniform aircraft acceleration along the runway) until it reached the airborne duration value at the point where the aircraft became airborne.

4. Discrete Frequency Corrections

Discrete frequency corrections for the aircraft classifications are listed in Table III. They are based upon study of one-third octave band noise spectra obtained from flyover and sideline noise recordings of representative types

REFERENCES

1 FAA DS-67-13, "1965, 1970 and 1975 Noise Exposure Forecast Areas for Los Angeles International Airport," August 1967.

2 FAA DS-67-12, "1965, 1970 and 1975 Noise Exposure Forecast Areas for Chicago, O'Hare International Airport," August 1967.

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EXHIBIT F

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA, IN AND FOR TH

COUNTY OF ALAMEDA

BEFORE HONORABLE THOMAS W. CALDECOTT, JUDGE

DEPARTMENT NO. 9

CITY OF OAKLAND, a municipal corporation acting by and through its Board of Port Commissioners,

Plaintiff,

vs

UTAH CONSTRUCTION AND MINING CO., a Delaware corporation, D. J. HAWLEY, SHORE LINE PROPERTIES, INC., a California corporation, and DOES ONE through TEN, inclusive,

Defendants.

No. 343860

REPORTER'S TRANSCRIPT

TESTIMONY OF DWIGHT E. BISHOP

TAKEN ON

THURSDAY, JANUARY 9, 1969 - 2:50 P.M.

COURTHOUSE, OAKLAND, CALIFORNIA

APPEARANCES

J. KERWIN ROONEY, Port Attorney, 66 Jack London Square, Oakland, California, and BREED, ROBINSON & STEWART, Special Counsel, by NED ROBINSON, Esq., Suite 1215, Financial Center Building, Oakland, California, appeared as counsel for plaintiff.

HILL, FARRER & BURRILL, Attorneys, by WILLIAM S. SCULLY, JR., Esq., and JOHN McLAURIN, Esq., Thirty-fourth Floor, 445 South Figueroa Street, Los Angeles, California, appeared as counsel for defendant.

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WITNESS

	DIRECT	CROSS	REDIRECT	RECROSS
For the Plaintiff:				
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EXHIBITS

	IDENT	EVID
For the Plaintiff:		
4 - Report, "Analysis of Community and Airport Relationships/Noise Abatement"		4
5 - Report, "Land Use Planning Relating to Aircraft Noise"		5
6 - Report, "Appendix 'A' to Land Use Planning Relating to Aircraft Noise"		5
7 - Definition of the Bounds of the Noise Easement Sought by the Port of Oakland in Civil Action No. 343860		18
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THURSDAY, JANUARY 9, 1969

2:50 P.M.

MR. ROBINSON: Mr. Dwight Bishop, please.

Whereupon,

DWIGHT E. BISHOP,

called as a witness on behalf of plaintiff, first being duly sworn, was examined and testified as follows:

THE CLERK: State your name, please.

THE WITNESS: My name is Dwight Bishop.

THE CLERK: Will you spell your last name for the record, please?

THE WITNESS: B-i-s-h-o-p.

THE CLERK: Thank you. Take the chair, please.

DIRECT EXAMINATION

Q. (By Mr. Robinson) Mr. Bishop, your busines or occupatio sir?

A. I am an acoustical engineer.

Q. And what is an acoustical engineer?

A. I am concerned with applied acoustics problems which wou involve noise measurement, noise evaluation and recommendations regarding the noise control and measurement for evaluation of various acoustical materials or equipment.

Q. For this kind of work, what kind of a background in term of engineering have you got?

A. I have a bachelor's degree in engineering physics and a master's degree in physics; and I have had approximately 19 year of experience in applied acoustics problems.

Q. Would you tell us what kind of work you have done in this 19 years, and with whom you have been associated?

A. Let's see. Following graduation, I worked for approximately five years at the Armour Research Foundation in Chicago and was concerned with noise measurement and the evaluation of acoustical materials.

I spent about -- Following that, I spent approximately fi years with the Convair Division of General Dynamics in the acoust designs of the Convair 880 and 990 jet transport aircraft.

And for the last five years, I have been employed as a senior consultant with the firm of Bolt, Beranek and Newman in their Los Angeles offices.

Q. Do you reside in the Los Angeles area, sir?

A. Yes, I do.

Q. What kind of work does Bolt, Beranek and Newman undertake or do with which you are associated?

A. We are doing, primarily, acoustical consulting work and also rese rch and develo ment work.

Much of my work has been concerned with measurement of aircraft noise in projects for private clients and for the Federal government, including the Federal Aviation Administration and NASA.

The work also includes the studies to determine the effect of noise on people and structures.

Q. Now, Mr. Bishop, first of all, have you and/or your firm, or your firm with your help, prepared any documents relating to

land use planning and its relation to aircraft noise?

Does that sentence make sense?

A. Well, our firm has been active in the field of aircraft noise and concerned with the problem of the interpretation of noi for a number of years.

And during that time, it has developed for the Air Force, the Department of Defense and for the Federal Aviation Administration several reports, engineering reports, providing procedures for evaluating aircraft noise and interpreting the effects of aircraft noise on people.

Q. To your knowledge, have those reports and recommendations that have been prepared by your company and submitted to the FAA been adopted or accepted by that agency?

A. Several of the reports, and, in particular, a report that was -- I think, our Report 821 was prepared for the Federal Aviation Administration and the Department of Defense.

It was published later by the FAA as our -- as a BB&N, Bolt, Beranek and Newman, Technical Report.

It was adopted as a technical manual by the Department of Defense and distributed both to the Air Force, the Army and the Navy.

Q. Do you know whether or not the methods of sound evaluation that are used by your company and recommended by your company are used as a standard in the industry?

A. Some of the procedures that we have developed have been widely adopted and used in this country in many areas.

Some of the procedures for evaluating aircraft noise that members of our firm developed are widely used both in this country and abroad, and have been adopted in some international standards.

Q. Mr. Bishop, I will show you three documents.

One entitled, "Land Use Planning Relating to Aircraft Noise," a technical report of Bolt, Beranek and Newman, of October 1964.

An appendix to that same document.

And a technical report of BB&N, which, I assume stands for "Bolt, Beranek and Newman," No. 1093.

And ask you if these are two of the reports and the appendix to one of them to which you refer?

A. Yes, these are reports, each report, that members of our firm had prepared.

MR. ROBINSON: Because they may be referred to at a later date, we will offer these into evidence at this time, Your Honor.

MR. SCULLY: No objection, Your Honor.

THE COURT: All right, let me see the reports.

MR. ROBINSON: Excuse me, sir.

(Counsel hands reports to the Court.)

THE COURT: The "Analysis of Community and Airport Relationship Noise Abatement," would be Exhibit 4 in evidence.

(Whereupon, the aforementioned report, "Analysis of Community and Airport Relationships/Noise Abatement," was received in evidence, marked Plaintiff's Exhibit No. 4, and became a part of the record.)

THE COURT: "Land Use Planning Relating to Aircraft Noise" would be Exhibit 5.

(Whereupon, the aforementioned report, "Land Use Planning Relating to Aircraft Noise," was received in evidence, marked Plaintiff's Exhibit No. 5, and became a part of the record.)

THE COURT: And "Appendix 'A' to Land Use Planning Relating to Aircraft Noise" would be Exhibit 6.

(Whereupon, the aforementioned report, "Appendix 'A' to Land Use Planning Relating to Aircraft Noise," was received in evidence, marked Plaintiff's Exhibit No. 6, and became a part of the record.)

Q. (By Mr. Robinson) Now, Mr. Bishop, in connection with this case, are you familiar with the document that now is Defendants' "A" in evidence?

A. Yes, I have seen this drawing.

Q. And have you checked the figures against your -- those set forth in your manual with respect to the designation of the 115 CNR's projected for 1975?

A. This report and the contours drawn on it were prepared by the Port of Oakland.

Q. Yes. A. And following that preparation, we had the opportunity to review the procedures and the steps and the calculations that the Port had used.

We compared these with the procedures given in our report, and found that these were in accordance with the procedures that we had given in our report.

Topical Index to Exhibit G

For ready reference in locating source material used in Exhibit G
(All listings hereunder are for guidance only and are not verbatim quotations.)

Definitions:

CNR	Composite Noise Rating.
TNE	Total Noise Exposure.
NEF	Noise Exposure Forecast.

1. The CNR Report (cf. Exhibit D) is a land use planning guide, not an enforcement tool.	p. 9 lines 18-2
2. TNE (cf. our Working Paper CLRC 70-1) is a measurement adequate and appropriate for enforcement, based upon actual perceived noise levels.	p. 8, line 2 through p. 10, line
3. How TNE is determined from noise-pressure levels; conversion to PNdB; summation for the noise intrusions observed.	p. 10, line through p. 12, line
4. When TNE reaches a specified value, it would just go "Bing", and you are over the side.	p. 12, lines 10-1
5. CNR versus TNE	beginning p. 12, line
6. CNR does not include a factor for the duration of flyover noise. TNE does.	p. 14 lines 20-23
7. The CNR report provided contours because it was assumed that one did not have perceived noise level measurements or extensive sets of measurements, and that, generally, one wanted to estimate or calculate – or estimate the CNR based on other than field measurements.	p. 16 lines 16-20 p. 17 lines 22-26
8. The CNR Report (cf. Exhibit D) is the basic description of the work in the fieid that has been done in the development of CNR.	p. 19 lines 23-25
9. Definitions of the intended use of CNR (cf. Exhibit D, pages 1 and 25) and its limitations.	p. 20, line through p. 22, line
10. The NEF concept (cf. Exhibit E).	beginning p. 22, line
11. Mr. Bishop's critique (Exhibit E, page 4) of the CNR concept.	p. 22, line through p. 23, line

Topical Index to Exhibit G (cont.)

12. A CNR measure can be reduced by increasing the noise level produced by some flights.	p. 23, line 17 through p. 26, line 7
13. You may increase the total noise by 5 PNdB, and the CNR would drop by 5.	p. 37, line 17 through p. 38, line 4
14. CNR is not determined by utilizing direct measurements.	p. 26, lines 14 p. 31, lines 17
15. If flights attaining 130 PNdB (at a specified location) occurred 364 days out of a 365-day year, their inclusion would be a matter of engineering judgment.	p. 32, line 5 through p. 35, line 20
16. According to the CNR Report (cf. Exhibit D), a twice-weekly jumbo jet would be excluded from the computation of composite-noise-rating contours.	p. 34, line 26 through p. 35, line 20
17. CNR is based on average atmospheric conditions, "about as well as we can define 'average'."	p. 35, lines 21- p. 36, lines 1-
18. CNR is based on average characteristics of classes of aircraft.	p. 35, lines 25-
19. There would be a fair amount of variation, yes.	p. 36, lines 10-
20. The CNR Manual (cf. Exhibit D) does not base the contours on the actual noise imposed on the property, but on an estimate of the perceived noise level that is likely to occur.	p. 36 lines 14-18
21. There is no standard or norm in any document relative to agreement as to (noise) intervals and groupings for the calculation of the CNR contours.	p. 36, line 19 through p. 37, line 12
22. The NEF (cf. Exhibit E) is not intended directly as an enforcement tool. The intent of the NEF contours, the intended use, is for land use planning. FAA Report DS-67-10 provides estimates of expected noise levels for current and expected future aircraft.	p. 38 lines 8-26
23. TNE does not have any funny fluctuations such as those of CNR, when CNR can go down when the noise goes up. TNE readings and calculations do not require engineering judgment, other than the skills involved in getting the correct measurements.	p. 39 lines 3-24
24. The TNE (the result of an endeavor to arrive at commonly accepted rules for calculating the noise exposure) ... is one that would provide a means of measurement that was quite clear and would yield unambiguous results; yes, sir.	p. 40 lines 1-13

end

EXHIBIT G

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA, IN AND FOR THE COUNTY OF ALAMEDA

BEFORE HONORABLE THOMAS W. CALDECOTT, JUDGE

DEPARTMENT NO. 9

CITY OF OAKLAND, a municipal corporation acting by and through its Board of Port Commissioners,

Plaintiff,

vs

UTAH CONSTRUCTION AND MINING CO., a Delaware corporation, D. J. HAWLEY, SHORE LINE PROPERTIES, INC., a California corporation, and DOES ONE through TEN, inclusive,

Defendants.

No. 343860

REPORTER'S TRANSCRIPT

TESTIMONY OF DWIGHT E. BISHOP

TAKEN ON

THURSDAY, JANUARY 16, 1969

COURTHOUSE, OAKLAND, CALIFORNIA

APPEARANCES

J. KERWIN ROONEY, Port Attorney, 66 Jack London Square, Oakland, California, and BREED, ROBINSON & STEWART, Special Counsel, by NED ROBINSON, Esq., Suite 1215, Financial Center Building, Oakland, California, appeared as counsel for plaintiff.

HILL, FARRER & BURRILL, Attorneys, by WILLIAM S. SCULLY, JR., Esq., and JOHN McLAURIN, Esq., Thirty-fourth Floor, 445 South Figueroa Street, Los Angeles, California appeared as counsel for defendants.

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WITNESSES

	DIRECT	CROSS	REDIRECT	RECROSS
For the Plaintiff:				
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A. Yes. The report has been printed and distributed by the FAA as a guide in land use planning. It has been rather widely distributed by both the FAA and the Department of Defense.

Q. To your knowledge, what use is made of the document by the Department of Defense? A. It is used by that department, again, as a guide in land use planning and in some particular applications of, that I have been involved in, that has been used to help select the location of dependent housing and military personnel housing on an off airbases.

MR. ROBINSON: I have nothing further.

THE COURT: All right, Mr. Scully.

CROSS-EXAMINATION

Q. (By Mr. Scully) Mr. Bishop, you participated, did you not, in the development of the CNR concept?

A. Well, actually, I didn't. I joined the firm, I believe, right after the draft of this report had been prepared.

Q. All right, my question, nevertheless, is:

Was CNR, to your knowledge, developed as a limiting or enforcing device?

A. It was developed, primarily, as a land use planning guide.

Q. Well, then, your answer is, "No"; is that right?

A. All right, no.

Q. In other words, it wasn't developed for the purposes of an enforcement tool either to regular airlines, air traffic, airports or otherwise? A. No.

Q. Now, TNE that we have discussed was the product of the

joint efforts of yourself, Dr. Garbell and Dariell Fitzroy; is that correct?

A. That is correct.

Q. And the purpose of your efforts and the hours spent was to arrive at a measurement that would be adequate and appropriate for enforcement; is that right?

A. It was designed to help define the noise exposure in this land area.

Q. Right. And the purpose of the extensive efforts of that definition was communicated to you, was it not, and that being to have something that could be enforced and policed?

A. Something that could be measured and checked.

Q. Exactly. And specifically measured and checked; is that right?

A. That is correct.

Q. Now, when we were talking about TNE, would it be a fair general statement to say that it is based upon actual perceived noise levels; and with your mathematical calculations, they are merely summed up?

A. It is based on the summation of the noise levels, yes.

Q. All right, sir. Now, what I understand that to mean is -- and I have drawn a little chart up here.

0700 to 2200 is the day period that is assumed for all these purposes?

A. That is right.

Q. And night is 2200 to 0700, the other side?

A. That's right.

Q. This scale, on the left-hand side, I have PNdB ranging from

a low of 85 up to 130, just to have a scale.

A. Yes.

Q. Now, I would like you to assume, sir, that we have a maximum CNR ---

No. Let's say a maximum TNE, and that we are trying to determine whether it has been exceeded.

A. Yes.

Q. And you, as an acoustician or engineer, go out on the property. A. Yes.

Q. And you observe that during this day's period flights occurred, one at 90 PNdB.

This PNdB could be measured right immediately on the machine, can it not, sir?

A. Perceived noise level normally has to be calculated from a set of measurements.

Q. In other words, you merely perceived the noise sound, the sound pressure, and then compute your PNdB? A. Yes.

Q. And it can be done for each event; is that right?

A. Yes.

Q. I would like you to assume that we had flights during the day, that each "X" denoting the flight and all the information you have is that it occurred during the day's period.

A. Yes.

Q. And your meter reads a given level, and for each one you can compute the PNdB; is that right, sir?

A. Yes, sir.

Q. And these flights just occurred. I have no significance as to the number. I am just trying to describe a day.

A. Yes.

Q. Okay. Just a day's period. You have made a chart, and y have read these noise intrusions on the subject property.

A. Yes.

Q. Now, with just that information, in other words, the time of day and the sound level reading and the conversion to PNdB, can you arrive at TNE? A. Yes, I can.

Q. In other words, you just take your readings, compute them and add them up; and, so to speak, you could, if you had the right equipment on the property, you could emplace a permanent installation that converted your dB's to PNdB's.

And as it added up, when it reached the 132, or otherwise it would just go "Bing," and you are over the side; is that right

A. To do the calculations, you need a computer of some sort, but this could be done.

Q. There would be no problem with that? A. No.

Q. So, we can determine the TNE.

Now, sir, with that information, can you do the same thin for CNR? A. Essentially, yes.

Q. All right. A. I would probably base my measurements on observations over a longer period.

Since I am concerned with the CNR, generally, over the average number of intrusions, I would have to make observations over more than one day.

Q. You understand, sir, that I am telling you that all the information you have is the PNdB level and the time of day.

A. Well, if I only have records for one day, the TNE then be calculated, either.

Because I think the document specifies you have to use the average calculations or measurements on two days, a week apart.

Q. Two days, seven days apart? A. Yes.

Q. All right. But other than that factor, you could compute your TNE from this data? A. Yes.

Q. And are you telling me that you could compute CNR from this data without knowing the make, engine type, fuel capacity and range of each one of those aircraft that flew?

A. Yes, I can.

Q. You can? A. Yes.

Q. All right, sir, you need not categorize the airplanes; is that right? A. No, you need not.

Q. And this is the CNR that is based upon your book, not annual energy summation CNR, but the procedures you have described in your book of October, 1964? A. Yes.

THE COURT: This is the book here?

MR. SCULLY: Yes.

Q. Can you tell us how you can do that without categorizing or knowing what the type of airplane it is?

A. Yes. I would use basic engineering procedure similar to the TNE.

I would group the noise, or group the perceived noise levels

and intervals, and denote the number of occurrences within that interval and then add the CNR, the partial CNR values together, using the summation method given in that report.

Q. All right, sir. Now, as given in this report, as I understand it, you must apply -- In order to determine the CNR, you must refer to one of your contours.

A. No, I need not for calculating the CNR.

Q. All right. A. It is based on -- The contours were provided in this book as means of providing estimates of the perceived noise level.

There was never any intention that if you had exact measurements that you should not use the exact measurements.

Q. In other words, your CNR is not dependent upon categorizing types of aircraft? A. No.

Q. All right. A. It was categorized here for the purpose of providing in a single document a means for estimating the CNR.

Q. For your CNR, you need not refer to any contours?

A. That is correct.

Q. Does your CNR include a factor for the duration of the sound? A. For flyover noise, no.

Q. Does the TNE? A. It has an adjustment for duration, yes.

Q. Now, Mr. Bishop, in the event that you had this experience in a day and you were computing CNR at one point on the easement, would you be able to determine what the CNR then would be for the

rest of the property as it decreased or increased going one direction or the other?

A. Not necessarily, unless I had good knowledge of the operations of the aircraft that contributed to the measurement.

Q. And you would have to refer to your contours; is that right?

A. Again, not necessarily. If I had observed and taken photographs of the aircraft and had known of their flight tracks, then I could probably estimate the CNR for other positions without recourse to the contours.

The contours might be useful, but I wouldn't be dependent upon them.

Q. In other words, you are telling me that you can just move from step to step on the subject property and accomplish the actual noise measurement and compute your CNR without knowledge of the type of aircraft or use of the contours; is that correct?

A. That is correct.

Q. Is that procedure set forth in your book?

A. It is spelled out how to calculate the CNR from perceived noise level. This is very thoroughly set out in the book.

Q. I would like to see it, if you will.

A. Calculation of CNR?

Q. From direct noise level without categorizing or referring to contours.

A. Okay. I would like to take a minute or two, then.

MR. SCULLY: Certainly.

Q. Mr. Bishop, how many kinds of CNR are there, or ways of

arriving at it?

Yesterday we talked about Krieter's CNR, Dr. Krieter's CNR.

I have been reading your booklet, and I thought I learned how to compute CNR by the steps that you set forth.

And now I think we have another different type of energy summation CNR, don't we?

A. Where?

Q. That you are talking about without reference to categories or to contours. A. No, we are talking about -- The CNR that I am talking about here is the same that we had been talking about in previous discussions and questions.

Q. Well, I don't want to interrupt you.

Go ahead and look, because I read your book and I thought I learned how to compute CNR; and it says nothing about what you are now talking about, but I could be wrong.

A. Well, the use of this -- This guide provided contours because it was assumed that one did not have perceived noise level measurements or extensive sets of measurements, and that, generally, one wanted to estimate or calculate -- or estimate the CNR based on other than field measurements.

And so that is why the field measurement calculations were not given in any detail in these reports.

Q. Mr. Bishop, referring to Page 2 of your October, 1964, report, and the last sentence, it says:

"The composite noise rating is a calculated quantity; it cannot be measured with a sound level meter or any other indicating

device."

The "calculated quantity," what do you mean by that?

A. Yes, and so is the TNE; it is a calculated quantity.

Both are calculated from measurements of the noise level and some method of taking into account the number of noise intrusions per period.

So, both can't be measured directly.

Q. Would you continue to find anything in your book that tells us that a CNR can be calculated the way you are now indicating; and, if so, how we go about doing it and how we select the categories.

(No response.)

MR. SCULLY: The detailed description of the procedure for calculation, sir, is contained starting on Page 3 of your book.

Q. Mr. Bishop, isn't it the fact that the reason you can't find it is CNR was never intended to be used in this way, but was an estimate for purposes of land use planning?

A. No, that is not correct.

Q. That is not correct? A. No, sir.

Q. That is not correct. All right, sir.

A. I would like to amplify on that statement.

Q. Please do. A. The guides, such as this and these, both presume that one did not have general detailed perceived noise level measurements available, and that, therefore, one relied on either standardized perceived noise level contours and instructions.

And detailed methods were given for construction of new perceived noise level contours for new aircraft.

And the purpose of describing these in terms of contours was that for many land use planning purposes, one generally wanted to estimate the CNR values over a large land area.

So, therefore, point measurements of perceived noise level would not necessarily be useful in predicting the CNR over a large period unless you had recourse to a method such as contours.

And for that reason, detailed measurements and calculation techniques based on direct field measurements were not stressed in these reports, but they have been applied by ourselves and others and in calculating CNR from field measurements by using relative routine engineering procedures.

Q. Mr. Bishop, if I were to calculate the CNR of this day that we have placed on the board in accordance with your book and referred to contours and referred to categories, you know, in the procedure you have outlined in your book, would you, as an acoustician, or whatever, an acoustical engineer, would you say that I had done it incorrectly?

A. Well, if you were estimating the CNR's from the contours in the number of operations and follow the procedures, this would be the correct way of estimating.

Q. I see.

A. If I, on the other hand, had direct measurements and observations so that I could calculate the CNR directly from observations and measurements, I would prefer to use that rather than standardized contours.

Q. For purposes of enforcement of this easement, sir, in the level that the Port of Oakland is taking, I suppose, under the procedures outlined in your testimony, the airport would have the right to either use the actual data or to use the procedures set forth in your book to determine whether they had exceeded 115 CNR, wouldn't they?

A. No. I think it would be implied that they had -- Whoever it was, if one was trying to show whether the CNR rating was met or exceeded, or something else, one would go to direct field -- would base it on field operations.

Q. Mr. Bishop, is there any other book that you have that describes CNR and how you calculate it, other than the exhibits in evidence, 4, 5 and 6?

A. Let's see. I believe there are methods -- The methods of calculating CNR are repeated or amplified in several other documents, yes.

Q. What are they? Do you have them with you?

A. I would have to check. I think I may have one, but I am not sure of the detail it provides.

Q. But this is the basic work, is it not, on how to compute CNR, and what it is? A. This is probably one of the most widely distributed, yes, reports outlining it.

Q. I asked you: That is the basic description of the work in the field that has been done in the development of CNR; is that right? A. The method or outline, yes.

Q. This one? Is that the basic work on CNR?

A. I guess it was the major work on it, yes.

Q. All right. Now, in this book, I refer you to Page 1, and I want to ask you, if you will, to explain this sentence:

"This manual presents a procedure for estimating exposure to engine noise from ground and flight operation of military and civil jet and propeller aircraft, and for relating the estimated exposure to the expected response of residential communities.

"It does not establish noise standards for purposes of enforcement; nor does it define noise levels that are tolerable or intolerable.

"This procedure is intended as a guide," your emphasis, "in planning land use in the vicinity of airports."

And then on Page 25, I am sure you are familiar with both of these, you state that there should be caution applied in applying the results.

You say:

"First, the contours of composite noise rating are derived from average noise levels and flight paths, and they assume average atmospheric conditions.

"These facts alone dictate the recommendation that the zones defined be used as guides to compatible land use planning and not as absolutely geographical limits."

Would you explain those, sir?

A. Okay. Perhaps, I can start, first, with the cautions that you read from Page 25, first.

Q. If you would like to.

A. Yes. As it is clearly stated, these are generalized contours based on what might be the expected performance of a certain class of aircraft.

And they are based on, I assume, average atmospheric conditions so that under specific circumstances -- and, in fact, the noise levels that you would measure in the field -- under repeated observations will show variations in levels above and below that which are predicted by this contour.

And, so, that is the reason for the first caution.

The second thing is because of these facts and the fact that these contours do not take into account certain topographical features which may be important in some airports, they certainly should be used.

That is, the contours you draw, based on the procedures and the contours here, certainly should be used as guides to compatible land use planning, and may be modified dependent on local conditions and the judgment of the person applying the contours.

In the first page, we referred to Page 1, remember this is a -- This is a report that has been prepared for and circulated by the FAA, and at this time the FAA, and still is, the FAA has no noise standard for purposes of enforcement, and has no intention, as far as I know, to establish noise levels that were tolerable or intolerable.

So, these statements were placed in there to clearly restrict the interpretation of this in terms of the FAA's scope

and interest.

Q. All right. Mr. Bishop, you have since the development of CNR worked on the development of a concept known as NEF; is that right? A. That is correct.

Q. And NEF stands for Noise Exposure Forecast?

A. Yes, sir; it does.

Q. And I refer your attention to your Technical Report, No. DS 6710. Are you famliar with that on the subject of NEF?

A. Yes, I am.

Q. That is the one you wrote, is it, with Mr. Richard Hornunjef? A. Yes.

Q. Now, on Page 1 -- Excuse me -- on Page 4 in the first paragraph of that work, you stated:

"Another modification introduced in the NEF procedure is the use of continuous rather than extended adjustments for number of operations.

"The use of step corrections involved a succession of five unit corrections, each covering, roughly, a range of three to one in number of operations.

"These steps introduced discontinuities, and in some cases either obscured or magnified differences in operations depending upon whether or not the number of operations fell near the middle or near the boundaries of a particular step."

Are you there describing an inadequacy or obscurity of the CNR?

A. It describes one of the problems, yes.

Q. You stated:

"The predecessor procedure," I believe referring to CNR, "also provided only a relatively crude step method of summing the contributions of noise produced by either different classes of aircraft or by differing operations and flight paths."

Do you recall that, sir?

A. Yes.

Q. Do you still feel that CNR is only a crude step method of summing the contributions of noise?

A. The summation method is relatively crude, yes.

Q. The NEF is intended to be more exact, is that right, and more definable? A. Part of the purpose was to provide, yes, a more accurate means of describing total noise exposure around an airport.

Q. Isn't it a fact that TNE is substantially computed as in NEF? A. Substantially, yes.

Q. Now, Mr. Bishop, I believe that you are familiar with this point, and I will try to short cut our time by asking it in this fashion.

Is it possible to have certain numbers of flights and operations that produce, let's say, 118 CNR, and to reduce that 118 CNR down to the permissible 115 by increasing the noise level of the flights? A. I believe you are referring to an example that Dr. Garbell pointed out, and that under certain combinations of noise levels, this could occur, yes.

Q. So, in other words, if the flights were going over, and

they computed over the permissible limits, the airport could go to the pilot and say:

"Make more noise so that we can be within the 115 CNR."

Is that right?

A. I have no comment about what the airport can tell the pilot to do. That is beyond my knowledge.

But the example that Dr. Garbell pointed out follows the rules there and does show an inconsistency.

Q. All right, now I --

THE COURT: Just a minute.

Mr. Bishop, are you saying that it is possible to reduce the CNR by the plane making more noise?

MR. McLAURIN: That's right.

THE WITNESS: There are particular sets of combinations of noise levels of partial CNR values that if you apply the step addition here, you get some inconsistencies, yes.

So, the example was shown, I think, that if you change the noise level, I think by one, I think you had three classes of aircraft or three noise levels or three partial CNR values, and if one went up by one unit, then the CNR value, I think, went down.

In one case, you added a five unit correction, and in the next case you didn't; and, so --

Q. (By Mr. Scully) All right, sir, you say, "add one decibel."

Isn't it a fact you added a total of five PNdB to the operation and still have a reduction from 118 to 115 CNR in the example?

A. I would like to refresh myself

with the example.

Q. All right, sir, I wish you would.

Because the increase of 5 PNdB means increasing the noise by 5 percent, doesn't it?

A. Not quite.

Q. I thought your earlier testimony was ten was a doubling.

A. Yes, but you don't cut this in half. It is a logarithmic function.

THE COURT: What are you referring to?

MR. SCULLY: I was going to give an example, Your Honor. I am referring to my own document.

THE COURT: Oh, all right. It is one of the best authorities you can get.

MR. ROBINSON: Is that approved by the FAA?

Q. (By Mr. Scully) Mr. Bishop, do you want to look at it?

We are assuming that during the daytime period, from 0700 to 2200, there are 30 airplane operations which yield a PNdB of 113 -- You can look at my notes if you will -- 100 airplane operations which yield a perceived noise level of 110 and 100 at 107 and 105.

And it describes how you go through the process. Here it is, also.

A. 113 for the first category?

Q. Yes. A. 110 for the second and 107 for the third.

Q. Yes, sir. A. So, your total CNR value, I believe, by the rules given in this guide, will be 118.

Q. All right, sir. Now, that is an increase?

A. This is a CNR value of 118 and TNE of about 116. So, the CNR is larger than the TNE in this case.

Q. All right. A. Or the summation on the energy basis is less than -- is about 116, which is less than the calculated CNR of 118.

Q. That's right. A. Then there was a --

MR. SCULLY: I am going to give you the increase as soon as I find it.

THE COURT: Why don't we take the morning recess?

MR. SCULLY: All right, Your Honor, thank you.

(Morning recess taken.)

THE COURT: All right, fine, we will continue.

Q. (By Mr. Scully) Mr. Bishop, during the recess I noticed that you were going through your books and pamphlets there.

I wonder whether you found any place in there where it indicated the rules and steps for this procedure that you say is possible without the use of contours or average information?

A. In my looking through, I did not find a specific procedure for utilizing direct measurements to calculate the CNR.

Q. So, the only procedure that we have in evidence in these pamphlets and in the basic work on CNR is based upon the use of contours and the categories of aircraft; is that right?

And there is nothing in there about any other method of doing it? A. No.

Q. Now, Mr. Bishop, referring to these categories and the

contours, based upon this data that I have just put up here and an example, what information would you have to know in order to compute the CNR for that day's experience?

A. As I was saying, there are engineering procedures that we can calculate, from the perceived noise level and the number of operations, the CNR.

Q. No. I think you are talking about another CNR now.

The one I am talking about is the one that you described in the basic book on CNR.

A. It is described, but not confined to that calculation method

Q. Would you permit me to ask you with reference to that method what information you would have to have to compute the CNR?

A. You mean, from --

Q. Assume we are talking about the method of computation of CNR that is defined in Land Use Planning Relating to Aircraft Noise, which you testified is the basic work on CNR and which sets forth the steps of computation.

I want to know what information you would need to compute CNR in addition to what I have put on the board.

A. This procedure provides a means for estimating the perceived noise level, and from that, and a knowledge of the number of operations, the CNR, when you do not have direct measurements to determine the perceived noise level.

Q. What information would you need now from this?

A. All right. If I have the perceived noise level information, then I can calculate the CNR.

Now, if you wish, if it is desired to draw contours from information such as this, I would need some identification of the aircraft so I can estimate the perceived noise levels at points other than that which I measured.

Q. Mr. Bishop, I would like you to assume that we are going to compute CNR exactly in accordance with the specific steps outlined in the exhibits.

And you have been on the property now during 0700 to 2200, and you have observed these aircraft attaining these sound levels.

Can you tell me, with those assumptions, what other information you would need to compute CNR, sir?

A. Yes, I can.

THE COURT: I think you have got two questions here.

By the question, "Could you compute CNR," do you mean by the method you have just stated?

MR. SCULLY: Right.

Q. In other words, in accordance with the steps set forth in this book, can you compute CNR with this data?

A. Well, reading from Page 3, there are basic steps.

And Step 1 is, "Obtain data on aircraft operations."

"Select noise contours." That is Step 2.

Step 3 is, "Determine perceived noise levels."

Step 4 is, "Determine proper corrections for operational factors."

And then, Step 5, "Determine composite noise rating."

The purposes of Steps 1 and 2 were to enable you to estima

the perceived noise level. Since you then have direct measurements of the perceived noise levels, you can start with Step 3.

Q. All right. Mr. Bishop, excuse me, I don't mean to be contentious with you, but I do want to establish this.

If we follow and use the procedures set forth to compute CNR as set forth in the exhibits and in the basic works on CNR, isn't it a fact that we would just take all the actual experiences that I have described up here, discard them, go to the airport and determine the types of airplanes and use average data for those airplanes?

A. If I was asked to determine the composite noise rating based on direct observations, I would not do that.

Q. Mr. Bishop -- A. I will outline -- If you wish me to classify these noise levels in terms of aircraft classifications, then I would have to have some observation of the type of aircraft.

Then if it was appropriate, I would separate the noise levels for the given classes and types of operations and, perhaps, get an average perceived noise level to apply to that class.

I would then determine the average number of operations of that type of aircraft and then summate the noise level. There are several ways.

Q. In other words, you would disregard the noise levels measured on the property and go to the --

A. No, I would not. If I was given the --

Q. Go ahead. A. If I am given the actual

information of perceived noise level, I will use that to determine the composite noise rating rather than rely on standardized contours.

Q. All right, sir; and let's just take that for a minute.

Let's assume you were given the data such as one would perceive and obtain from the property, and you discarded the procedures set forth in your manual to compute CNR, and you just compute it directly from the empirical data obtained from the property.

Isn't that NEF and TNE?

A. No, I would summate the level. If I wished to correct the CNR or calculate the CNR, I would use the rules for summating levels that are given by the CNR procedure.

If from the same data I wish to calculate the TNE, I would use the rules given for summating the noise levels for calculating the TNE.

Q. All right. Now to put this in the right perspective, we are talking about an easement here where the proposed limitation is 115 CNR? A. That is correct.

Q. We have in evidence the book on how to calculate 115 CNR.

So, you would assume, would you not, that the airport under this easement would be permitted to use those procedures set forth in the book, even if they have read data from the property?

MR. ROBINSON: Well, I am going to object. It calls for opinions and conclusions beyond his expertise; and, also, it is argumentative.

MR. SCULLY: All right, I will withdraw the question.

THE COURT: All right.

Q. (By Mr. Scully) Mr. Bishop, I want to give you an example.

In one column I have the number of flights and in the right-hand column I have the attained PNdB. A. Yes, sir.

Q. And assume that is a one day period. Would you calculate the CNR, sir?

A. Okay. Let's see, I would get a composite noise rating, by my calculations of the daytime operations, this is, for 120.

Now, I may have made an error in my arithmetic here.

Q. All right, sir, I notice that to arrive at that, you made a grouping identified by the numbers "85" and "225," and then have a number after it.

A. Yes. I grouped them in five PNdb intervals which is consistent with the contour groupings, as I say, of the steps that are used throughout the CNR document.

Q. Where in the CNR document does it set forth this procedure and indicate the method of grouping?

A. It doesn't specifically spell it out.

Q. All right, sir. In other words, if we were to change the grouping and make more or less groupings, would the CNR change?

A. In this case, it probably wouldn't change substantially because it is dominated by the one operation at 130.

Q. All right. But in the -- Let's just take that 130 operation out.

Would it then be -- The result would then depend upon the

method of categorizing? A. It probably would. I would have to -- It probably would vary slightly.

Q. All right, you see the one operation at 130 that you said dominated it? A. Yes.

Q. I would like to ask you to assume that that flight attaining a PNdB of 130 occurred 26 days out of a 28 day month. Would you still count it? A. I would, yes.

Q. And if it occurred six days out of a seven day week, would you still count it? A. I would, yes.

Q. If it occurred 364 days out of a 365 day year, would you still count it? A. I would, yes.

Q. All right, sir, I would like to refer you to page 10 of your manual and of the basic work on CNR.

And the asterisk, the single asterisk footnote says:

"If the average number of operations for an aircraft type is less than one per time period, that aircraft type should not be considered in the analysis."

Now, what does that mean?

A. It means that if the average, as it says -- I would like to point out that there are paragraphs in this document that describe how to provide some guidelines, in this document and in this document here, provide guidelines for determining the average number of operations.

Q. I am not talking about average.

MR. ROBINSON: Will you let him finish his answer?

A. And these point out -- and I would like to take a minute to

find that reference, if I may.

Q. (By Mr. Scully) May I point it out to you, sir?

On Page 3 of, "Detailed Description of the Procedure," it says:

"The average values should be computed from long term data (i.e., annual movements)."

And it also says on Page 3:

"If the number of daily movements shows pronounced variations according to a weekly or seasonal pattern, use the average number of movements over the period of maximum activity.

"For example, at a military base where activity is heavy on week days but very light on weekends, use the average over the five week days."

All right, sir, then your interpretation of that language is that if the 130 PNdB flights occurred 364 days out of 365, that would be a pronounced variation, according to a weekly or seasonal pattern?

A. The intent here was to determine the number of operations over the periods of maximum or most representative activity.

And if an operation occurred 364 times out of 365 per year, I would think the activity during the 364 times is more representative than during the one time in which the operation did not occur.

Q. All right, sir. Now, you would interject your judgment into the computation of CNR and disregard the language of your procedure?

A. In the application of this, yes. In planning and determining land uses, judgment is required.

Q. All right. You would use your judgment to choose how you are going to compute the CNR?

A. In selecting the noise levels and number of operations to use, I certainly would.

Q. Mr. Bishop, strictly applying the rules and procedures set forth in your book, you could, strictly applying the procedures and not using judgment to change them, ignore a flight that occurred 364 days out of 365 and attain a level of 130, is that right, strictly applying the language?

A. I think my interpretation of the information given on Page 3 would lead you to include the number of -- base my average number of operations on that occurring during 364 times out of 365.

The sentence here says, ". . . use the average number of movements over the period of maximum activity."

Q. Where is that sentence?

A. It was giving an example of a military base. Let's see, I will read the sentence.

Q. It starts out:

"If the number of daily movements show pronounced variations according to a weekly or seasonal pattern," such as heavy operations to a military base that doesn't operate on Saturday and Sunday.

Is that right? A. Yes.

Q. All right, and you are likening my example to that?

A. Yes, sir.

THE COURT: Mr. Bishop, maybe a little more practical example

would be:

If an airport has one of these jumbo jets that takes off twice a week for Europe, perhaps, only one carrier using it, or maybe Japan, now, would that jumbo jet be figured in, assuming it is the only jumbo jet that takes off from that airport, one fligh three times a week?

THE WITNESS: If I were determining the noise exposure in and around that airport, I would include it, yes.

Since it is -- It is one of the probable or extreme cases it is probably one of the aircraft making the highest noise level so I would not neglect it.

Q. (By Mr. Scully) That would be the exercise of your own judgment, wouldn't it? A. That is correct, sir.

Q. Not in applying the rules and the definitions and detailed steps of computing CNR? A. Yes, I would exercise engineering judgment, yes.

Q. Yes. Mr. Bishop, if you applied just the rules set forth in the BB&N Manual without the exercise of any judgment, that jum jet would be excluded from the computation, wouldn't it?

A. That is correct.

Q. All right. Mr. Bishop, on the average figures and the contours set forth in the BB&N Manual, they are based upon average atmospheric conditions; is that correct?

A. Yes, about as well as we can define "average"; yes, sir.

Q. And they are based upon the average characteristics of classes of aircraft; is that right? A. That is correct.

Q. Mr. Bishop, do changes in atmospheric conditions, such as wind, temperature, humidity and the other elements, affect the operation of the flights and the level of noise that will be imposed upon and adjacent to the property?

A. Yes, they do.

Q. And in applying these steps and procedures as contained in BB&N 821, which, I think, is Exhibit 5, you make no correction, do you, for the change in atmospheric conditions and deviation from the norm and increase in actual noise on the property?

A. The contours are based on the average conditions, and we would expect, in practice, to measure variations above and below those contour values, yes; and the variations would change, there would be a fair amount of variation, yes.

Q. In other words, in applying the actual steps set forth in the BB&N Manual, you don't base them on the actual noise imposed on the property, but upon averages as previously determined?

A. The contours provide an estimate of the perceived noise level that is likely to occur.

Q. On your direct examination, you stated in response to Mr. Robinson's question that if there were two people standing on our property and they experienced this flight pattern or frequency of flights in the attaining of these levels of PNdB, and they have got their back turned to each other and they can't talk or see what the other person is writing, is it your answer that they will, without any question or deviation, arrive at the same CNR?

A. They would have to be familiar with the engineering

procedures in adding and b 'ling noise levels and have some -- possibly some common agreement on intervals; other than that, they would arrive at the same value.

Q. They would have to have the same engineering training, wouldn't they, so they would exercise the same engineering judgment as they went along? A. Not necessarily.

Q. In other words, these people, in order to come out with the same answer, would have to enter into some sort of an agreement as to intervals, is that what you said, and groupings?

A. Yes, sir; that's right.

Q. It isn't available as a standard or norm in any document or book? A. No.

MR. McLAURIN: Would you excuse us a minute, Your Honor?

MR. SCULLY: With the Court's indulgence, Your Honor.

THE COURT: Yes.

(Discussion off the record.)

Q. (By Mr. Scully) Mr. Bishop, at the recess you had an opportunity -- I gave you my example of increasing the PNdB's by an aggregate of five. A. Yes.

Q. Which caused the CNR to drop by five; is that right? Were my figures correct? A. My calculations agree with yours; yes, sir.

Q. All right, sir. So, under this example, if you were to increase the total noise by five PNdB under these circumstances, the CNR would drop by five?

A. In that particular example, yes.

Q. You are not saying that that is the only example when such a thing can occur, are you, sir? A. No, I am not.

MR. SCULLY: All right, then, I won't go into other examples.

We have no further questions, Your Honor.

THE COURT: All right, Mr. Robinson.

MR. ROBINSON: Mr. Bishop, just a very few questions.

REDIRECT EXAMINATION

Q. (By Mr. Robinson) Under cross-examination, you referred to a document -- reference was made to the document that you and Mr. Hornunjef prepared with respect to -- What is called -- NEF.

A. Yes.

Q. Now, sir, with respect to that document, does it contain the same cautions to which reference has been made in the CNR document? A. I don't know if it has explicitly the same language. The intent of the NEF contours, the intended use, is the same as this, as the CNR document.

I think this is discussed in the foreword and first section of that report.

Q. And what do you mean by, "intended use"?

A. Primarily, intended for land use, for land use planning.

Similar to the CNR, it provides estimates of expected noise levels for current and expected future aircraft and a procedure for deriving an NEF value.

Q. Is it intended, say, as an enforcement tool in the same sense as CNR is? A. It is not intended directly as an enforcement.

MR. ROBINSON: I have nothing further.

RECROSS-EXAMINATION

Q. (By Mr. Scully) Mr. Bishop, we found that CNR can have some funny fluctuations. It can down when the noise goes up.

Could that happen with TNE?

A. Let's see. I don't believe so.

Q. We observed that CNR requires prior agreement on engineering judgment in some instances? A. That is correct.

Q. Does TNE require any such thing?

A. Very little, I think.

Q. Any at all, sir, once you have our Exhibit 7?

A. Well, there are certain engineering skills involved in getting the correct measurements, and these are implied.

Q. Sir, I am talking about judgment decisions that are made during the readings and calculations.

A. There is no high degree, no.

Q. I notice that we have some characteristics that result in CNR from averaging, from grouping.

Is there any such averaging or grouping in TNE, other than readings two days, seven days apart?

A. There is a grouping of noise levels that is specified in the document.

Q. But they are in there in a group; is that right?

A. Yes, sir.

Q. And so far as TNE is concerned, I notice that at the beginning of the document, on Page 2, you state:

"The term 'TNE' constitutes a development of the concept of the composite noise rating or CNR."

Would you say that that was a refinement of CNR to remove its defects and problems for noise measurement?

A. I guess -- It seems to me the major purpose of the TNE, as outlined in that document, was to agree upon a method of measuring and interpreting the noise levels that would be, you know --

We tried to arrive at commonly accepted and specified rules for calculating the noise exposure.

Q. And one that could be easily and directly and simply enforced? A. One that would provide a means of measurement that was quite clear and would yield unambiguous result: yes, sir.

MR. SCULLY: Thank you. No further questions.

MR. ROBINSON: I have nothing further.

THE COURT: That is all, Mr. Bishop; thank you.

(Witness excused.)

MR. McLAURIN: Would you excuse us a minute, Your Honor?

THE COURT: Surely.

(Discussion off the record.)

MR. SCULLY: Your Honor, we don't feel that we need anything further.

THE COURT: All right, Mr. Robinson, do you have anything further to offer?

MR. ROBINSON: No, Your Honor, I do not.

THE COURT: And you have nothing further to offer?

EXHIBIT #

FOR IMMEDIATE RELEASE

MAJOR PROGRESS MADE TOWARDS SOLUTION TO AIRCRAFT NOISE PROBLEMS

MONTREAL, 24 December, 1969 - Delegates from 29 nations and 9 international organizations attending a worldwide meeting on "Aircraft Noise in the Vicinity of Airports", have brought to conclusion what is generally regarded as an unusually co-operative and decisive meeting, marked for its progress in obtaining international interest and agreement. Sponsored by the International Civil Aviation Organization (ICAO), headquartered in Montreal, the meeting has accomplished the following:

1. Description and Measurement of Aircraft Noise

The Meeting agreed upon internationally standardized procedures for describing and measuring aircraft noise on, and in, the vicinity of airports. For all aircraft design and similar scientific purposes (including aircraft noise certification purposes) the highly accurate "Effective Perceived Noise" in decibels (EPNdB) method will be used. For monitoring purposes, a simpler decibel unit - dB(D) or dB(A) - will be used. The Meeting also developed and agreed upon what is termed the "International Noise Exposure Reference Index" to serve as a guide in all States interested in determining means of measuring, describing and predicting a realistic indication of the total noise exposure arising from all aircraft movement around an aerodrome within a given period of time.

2. Human Tolerance to Aircraft Noise in the Vicinity of Airports

The Meeting produced agreement that there is presently no evidence to suggest that human exposure to aircraft noise in the vicinity of airports has had any significant effect on physical or mental health or on hearing. It was recommended, however, that some ICAO Member States and international organizations should promote research to identify any possible long-term effects on humans.

Cont'd...

5. Land Use Control in the Vicinity of Airports

The Meeting developed guidance on land use planning in the vicinity of airports. Typical examples are given of the use which can be made of land in various zones around airports which will cause the least disturbance to the population. The chief value of land use planning is in the development and planning of new airport sites, rather than existing airports where the cost of changing the situation would be prohibitive. The Meeting recommended that States should introduce land use planning to the extent practicable at all airports.

6. Ground Run-up Noise Abatement Procedures

The Meeting agreed that countries which had developed new or improved methods of reducing ground run-up (or engine-testing) noise at airports should provide such information to other ICAO Member States. It also reviewed common measures taken to reduce noise, i.e.: selecting appropriate areas of airport property for run-up noise where it will cause least disturbance, use of physical barriers to cut noise, restricting hours when engines can be tested, etc. These and similar procedures were recommended to improve the reduction of noise.

Delegates to the ICAO Noise Meeting were unanimous in their concern that aircraft noise in the vicinity of airports was becoming a major problem which required special attention. While the Meeting itself has ended, the interest and work will continue through further activities of ICAO and its Member States in the continuing co-operative effort to solve the noise problem - now and in the future as new generations of aircraft and engines are developed.

- END -