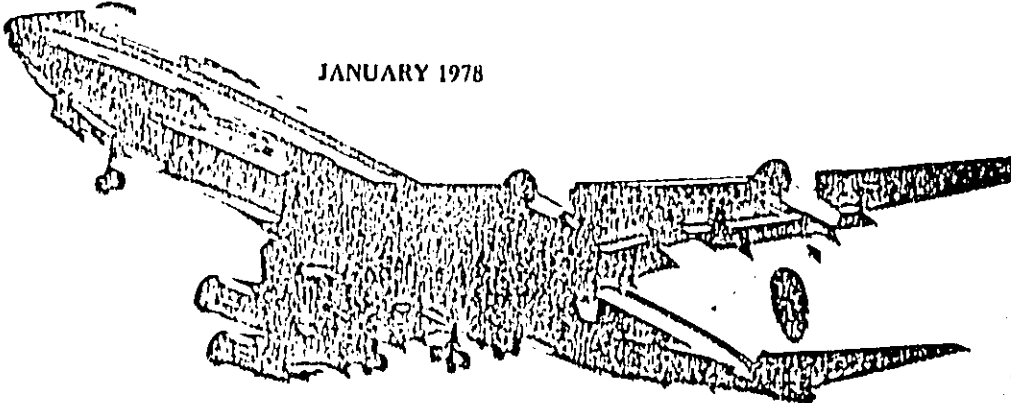


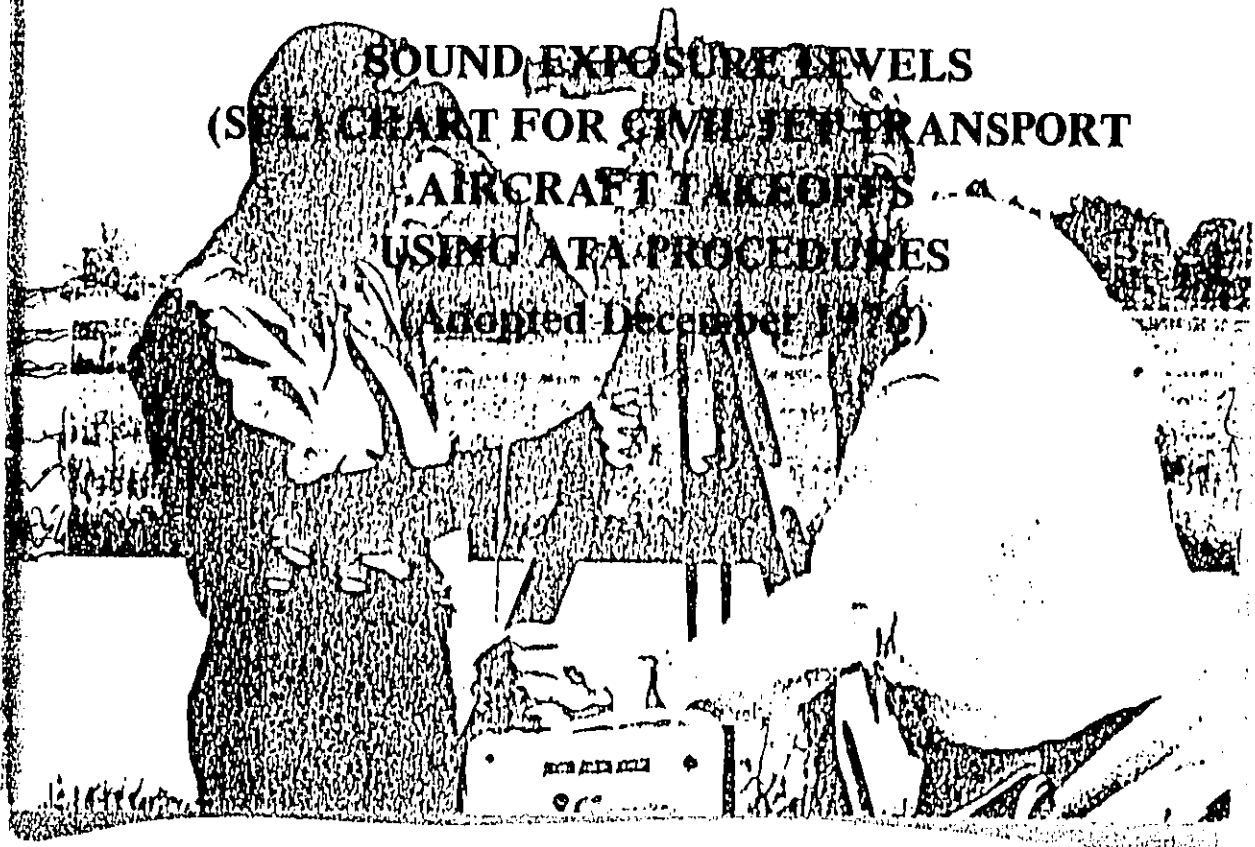
U.S. Environmental Protection Agency  
Office of Noise Abatement and Control  
Washington, D.C. 20460

*N-96-01*  
*II-A-70a*  
EPA 550/9-77-450  
ADDENDUM 1

JANUARY 1978



**SOUND EXPOSURE LEVELS**  
**(SEE CHART FOR CIVIL JET TRANSPORT**  
**AIRCRAFT TAKEOFFS**  
**USING ATA PROCEDURES**  
**(Adopted December 1977)**



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TECHNICAL REPORT DATA		
<i>(Please read instructions on the reverse before completing)</i>		
1. REPORT NO. EPA 550/9-77-450 ADDENDUM 1	3. RECIPIENT'S ACCESSION NO.	
4. TITLE AND SUBTITLE Sound Exposure Levels (SEL) Chart for Civil Jet Transport Aircraft Takeoffs Using ATA Procedures (Adopted December 1976)	5. REPORT DATE January 1978	6. PERFORMING ORGANIZATION CODE Bolt, Beranek & Newman
	8. PERFORMING ORGANIZATION REPORT NO. 10357	
7. AUTHOR(S) Bishop, D.E., Siedman, H., and Walker, D.Q.	9. PERFORMING ORGANIZATION NAME AND ADDRESS Bolt, Beranek & Newman, Inc. P.O. Box 633 Canoga Park, California 91305	
12. SPONSORING AGENCY NAME AND ADDRESS Office of Noise Abatement and Control U.S. Environmental Protection Agency Washington, D.C. 20460	10. PROGRAM ELEMENT NO.	11. CONTRACT/GRANT NO. EPA G8-01-4308
	12. TYPE OF REPORT AND PERIOD COVERED Final	
16. SUPPLEMENTARY NOTES	14. SPONSORING AGENCY CODE EPA/ONAC	
	18. ABSTRACT  EPA 550/9-77-450, presented a method for the manual calculation of day-night average sound levels ( $L_{dn}$ ) due to aircraft operations. Information was presented for different aircraft and different operational procedures. Addendum I presents the additional information needed to predict the Noise levels produced by aircraft which utilize the Air Transport Association (ATA) procedures which were adopted December 1976.	
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS Noise levels, aircraft noise levels, day-night average noise levels, noise level prediction, airport noise levels	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
19. DISTRIBUTION STATEMENT Release Unlimited	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 76
	20. SECURITY CLASS (This page) Unclassified	22. PRICE

**SOUND EXPOSURE LEVELS (SEL) CHARTS FOR  
CIVIL JET TRANSPORT AIRCRAFT TAKEOFFS  
USING ATA PROCEDURES  
(Adopted December 1976)**

**January 1978**

**Prepared for:**

**U.S. Environmental Protection Agency  
Office of Noise Abatement and Control**

**Under Contract No. 68-01-4388**

This report has been approved for general availability. The contents of this report reflect the views of the contractor, who is responsible for the facts and the accuracy of the data presented herein, and do not necessarily reflect the official views of policy of EPA. This report does not constitute a standard, specification, or regulation.

DEPT. AT&T, APR 78

ADDENDUM I  
 SOUND EXPOSURE LEVEL (SEL) CHARTS FOR  
 CIVIL JET TRANSPORT AIRCRAFT TAKEOFFS USING  
 ATA PROCEDURES ADOPTED DECEMBER 1976

This addendum presents sound exposure level (SEL) charts for civil jet transport takeoffs based on the revised air transport association (ATA) procedures adopted in December 1976. For studies of current and forecast operations involving air transport aircraft using ATA procedures, these charts (as shown in the table below) should replace the takeoff charts given in Attachment 1, Calculations of Day-Night Levels ( $L_{dn}$ ) Resulting From Civil Aircraft Operations, EPA Report 550/9-77-450.

Aircraft Types	Aircraft Code	Replace Rept. 550/9-77-450 Attachment 1 Pages	With Addendum Pages
4-Engine LBPR turbofan	4-T-TFL	80-88	10-18
4-Engine LBPR turbofan (quiet nacelle)	4-T-TFL(Q)	111-119	19-27
3-Engine LBPR turbofan	3-T-TFL	142-147	28-33
3-Engine LBPR turbofan (quiet nacelle)	3-T-TFL(Q)	164-169	34-39
2-Engine LBPR	2-T-TFL	186-191	40-45
2-Engine LBPR turbofan (quiet nacelle)	2-T-TFL(Q)	208-213	46-51
4-Engine HBPR turbofan	4-T-TFH	229-237	52-60
4-Engine HBPR turbofan (quiet nacelle)	4-T-TFH(Q)	260-268	61-69
3-Engine HBPR turbofan	3-T-TFH	291-299	70-78

The ATA procedures adopted in December 1976 differ in some details from those used previously. A comparison of procedures is given in Table 1. A comparison of takeoff profiles for a

Boeing 727 aircraft is given in Figure 1.\* Note that as in the examples shown in Figure 1, the cutback to climb thrust is usually initiated at a lower altitude in the current ATA procedures than in the previous ATA procedures. Hence, aircraft taking off under the current procedures generally require a longer distance from the start of takeoff roll to reach a height of 3,000 feet.

Figures 2 through 6 show the takeoff profiles for the revised ATA procedures which were utilized to develop the SEL charts given in this addendum. These takeoff profiles may be compared with those given in Figures 2-3 through 2-7 of EPA Report 550/9-77-450.\*\*

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\*Detailed differences in the procedures will occur with aircraft type.

\*\*EPA Report 550/9-77-450 "Calculation of Day-Night Levels ( $L_{dn}$ ) Resulting from Civil Aircraft Operations," January 1977.

TABLE I - COMPARISON OF ATA TAKEOFF PROCEDURES FOR CIVIL TURBOFAN TRANSPORT AIRCRAFT

	<u>Procedures Adopted August 1972</u>	<u>Procedures Adopted December 1976</u>
First Phase	<u>Takeoff to 1500 ft.</u> Takeoff (TO) thrust $V_2 + 10$ airspeed TO flaps	<u>Takeoff to 1000 ft.</u> Takeoff (TO) thrust $V_2 + 10$ airspeed TO flaps
Second Phase	<u>1500 to 3000 ft.</u> Reduce thrust to maximum climb thrust Maintain $V_2 + 10$ airspeed and TO flaps	<u>1000 to 3000 ft.</u> Reduce aircraft pitch to maintain 500 to 1000 rpm climb rate. Accelerate and initiate flap retraction at appropriate minimum speeds. Reduce engine power to climb thrust during/following* cleanup of flaps and slats. Climb to 3000 ft. at zero flap speed.
Third Phase	<u>3000 ft. and Above</u> Accelerate to 250 kt, retract flaps on schedule while main- taining 500 FPM climb, then climb at 250 Kt.	<u>3000 ft. and Above</u> Accelerate to 250 Kt. Maintain rate of climb of 500 to 1000 rpm during acceleration, then continue climb at 250 Kt.

\* Procedure varies with aircraft model.

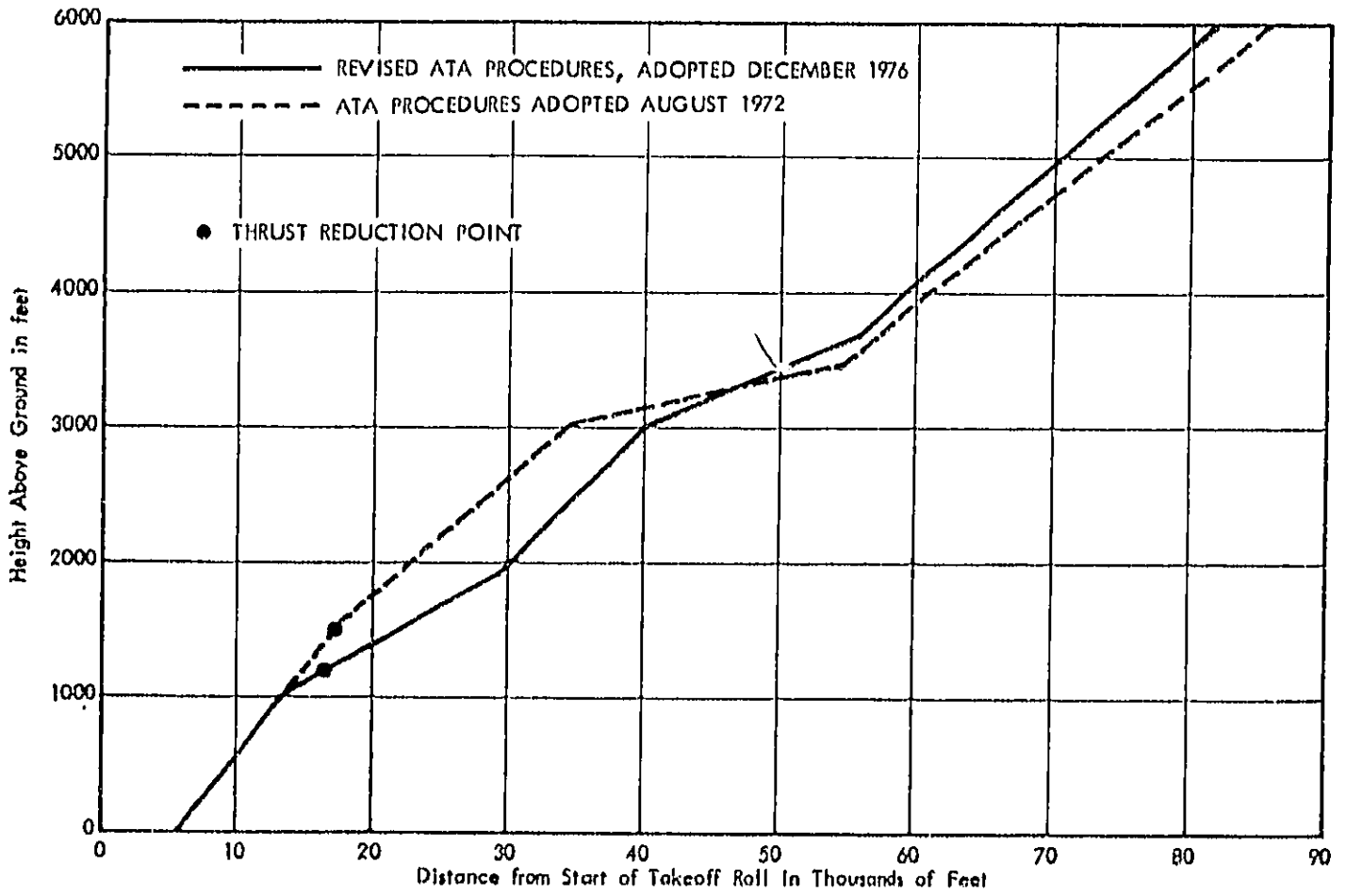


FIGURE 1. COMPARISON OF ATA PROCEDURES FOR 3-ENGINE LBPR TURBOFAN TRANSPORT AIRCRAFT - 727 SERIES (3-T-TFL) - PROFILE 1

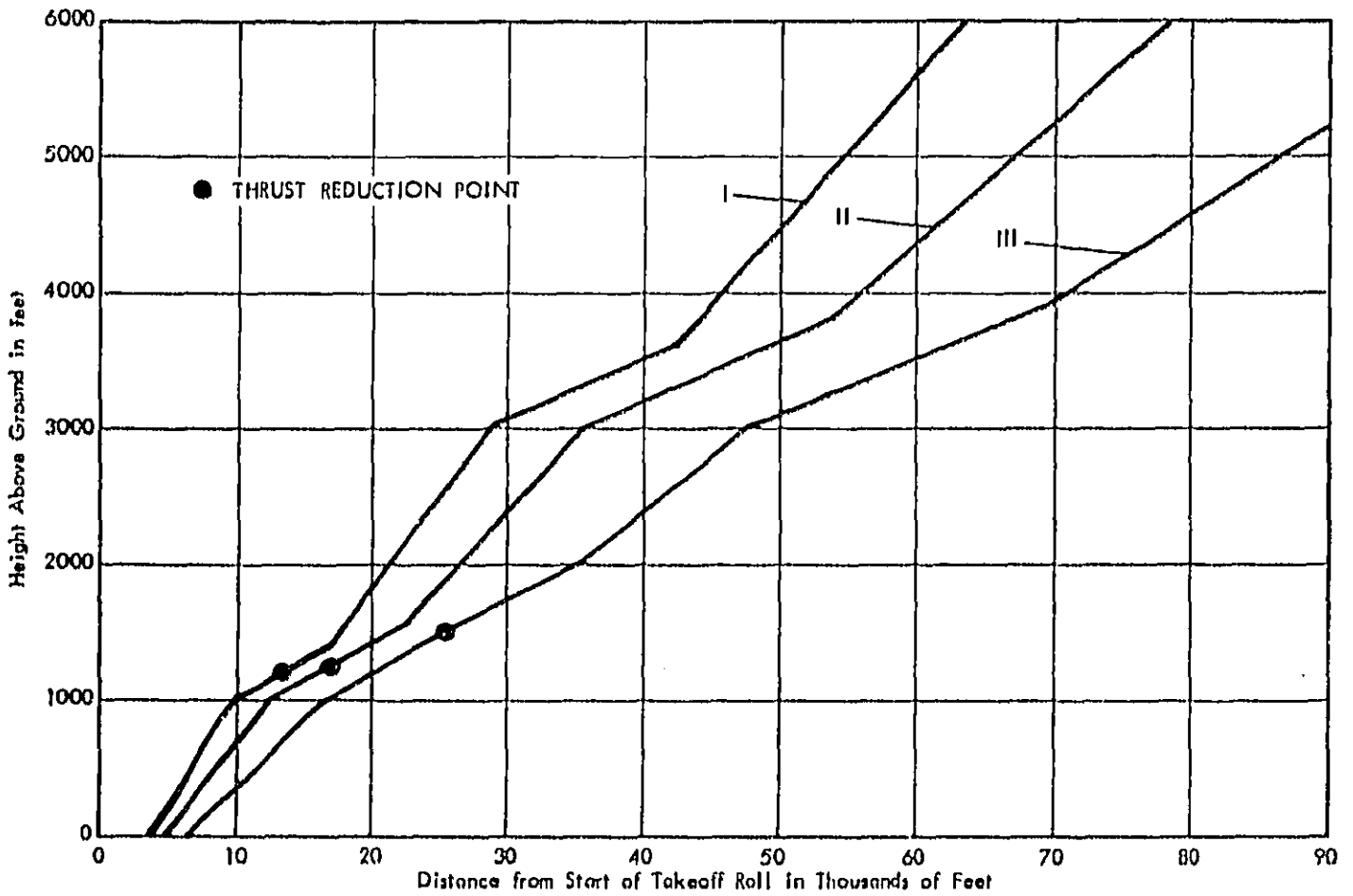


FIGURE 2. ATA TAKEOFF PROFILES FOR 4-ENGINE LBPR TURBOFAN TRANSPORT AIRCRAFT - DC-8, 707 SERIES (4-T-TFL) - REVISED PROCEDURES ADOPTED DECEMBER 1976



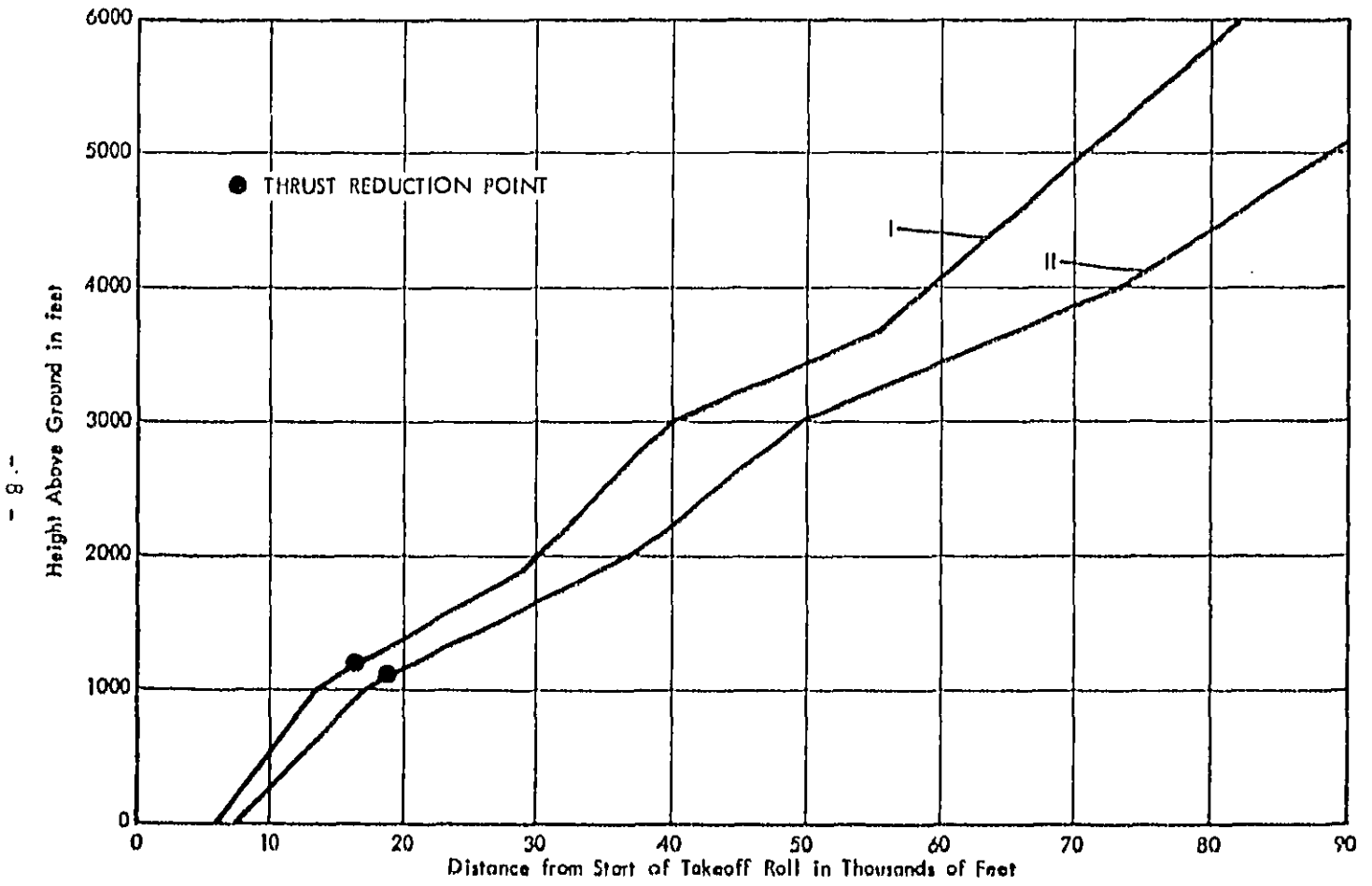


FIGURE 3. ATA TAKEOFF PROFILES FOR 3-ENGINE LBPR TURBOFAN TRANSPORT AIRCRAFT - 727 SERIES (3-T-TFL) - REVISED PROCEDURES ADOPTED DECEMBER 1976

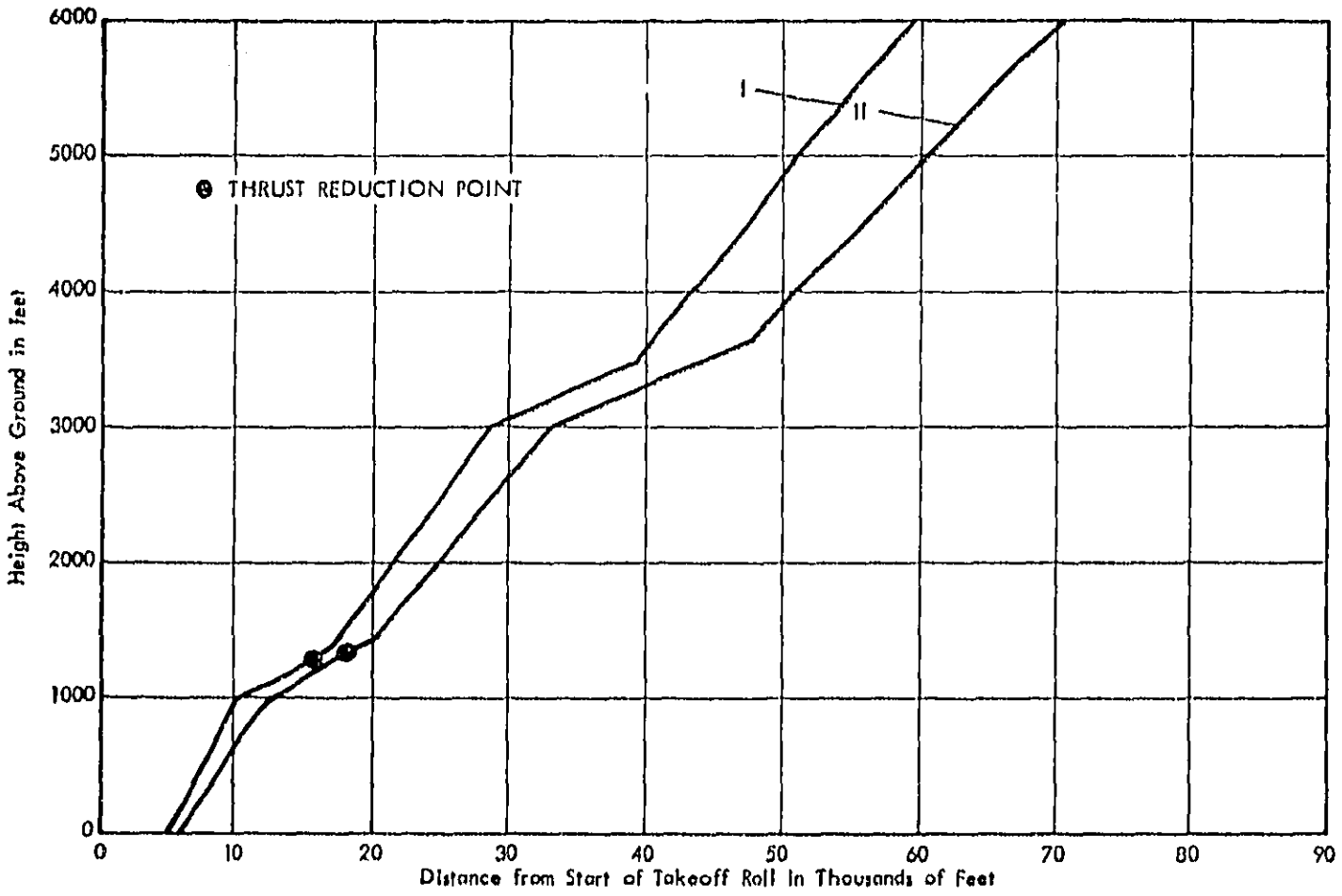


FIGURE 4. ATA TAKEOFF PROFILES FOR 2-ENGINE LBPR TURBOFAN TRANSPORT AIRCRAFT - DC-9, 737 SERIES (2-T-TFL) - REVISED PROCEDURES ADOPTED DECEMBER 1976

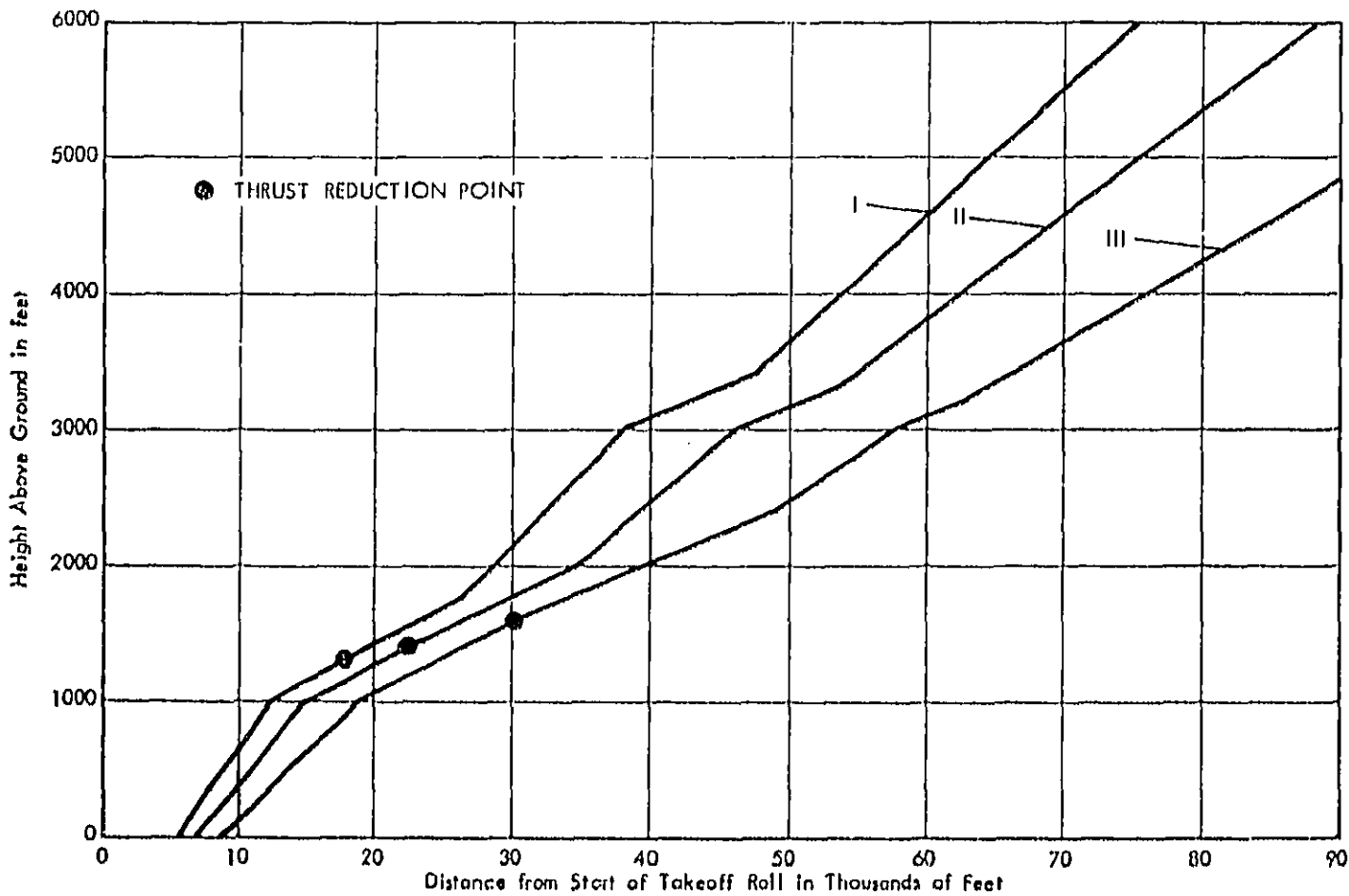


FIGURE 5. ATA TAKEOFF PROFILES FOR 4-ENGINE HPR TURBOFAN TRANSPORT AIRCRAFT - 747 SERIES (4-T-TFH) - REVISED PROCEDURES ADOPTED DECEMBER 1976

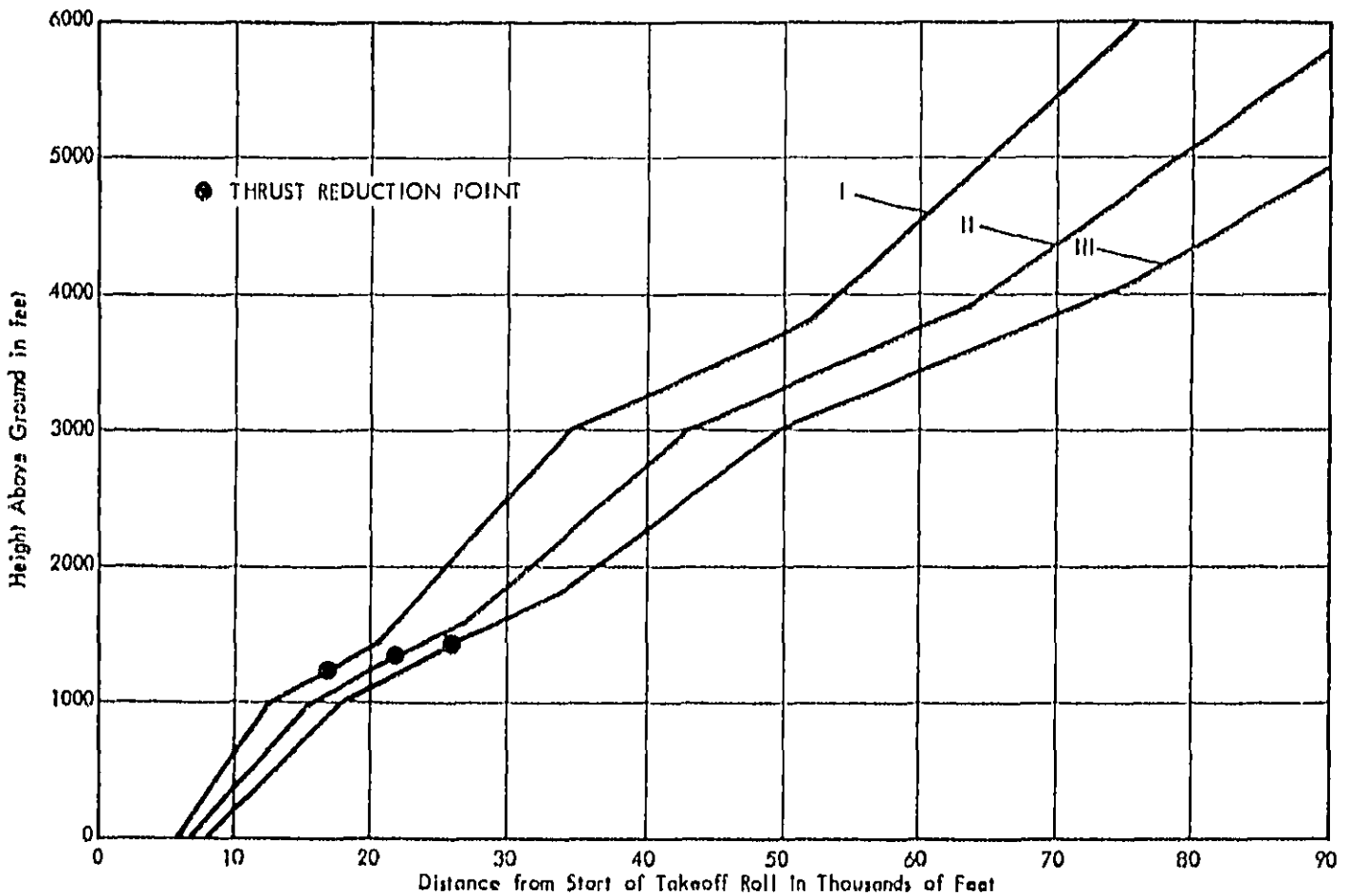
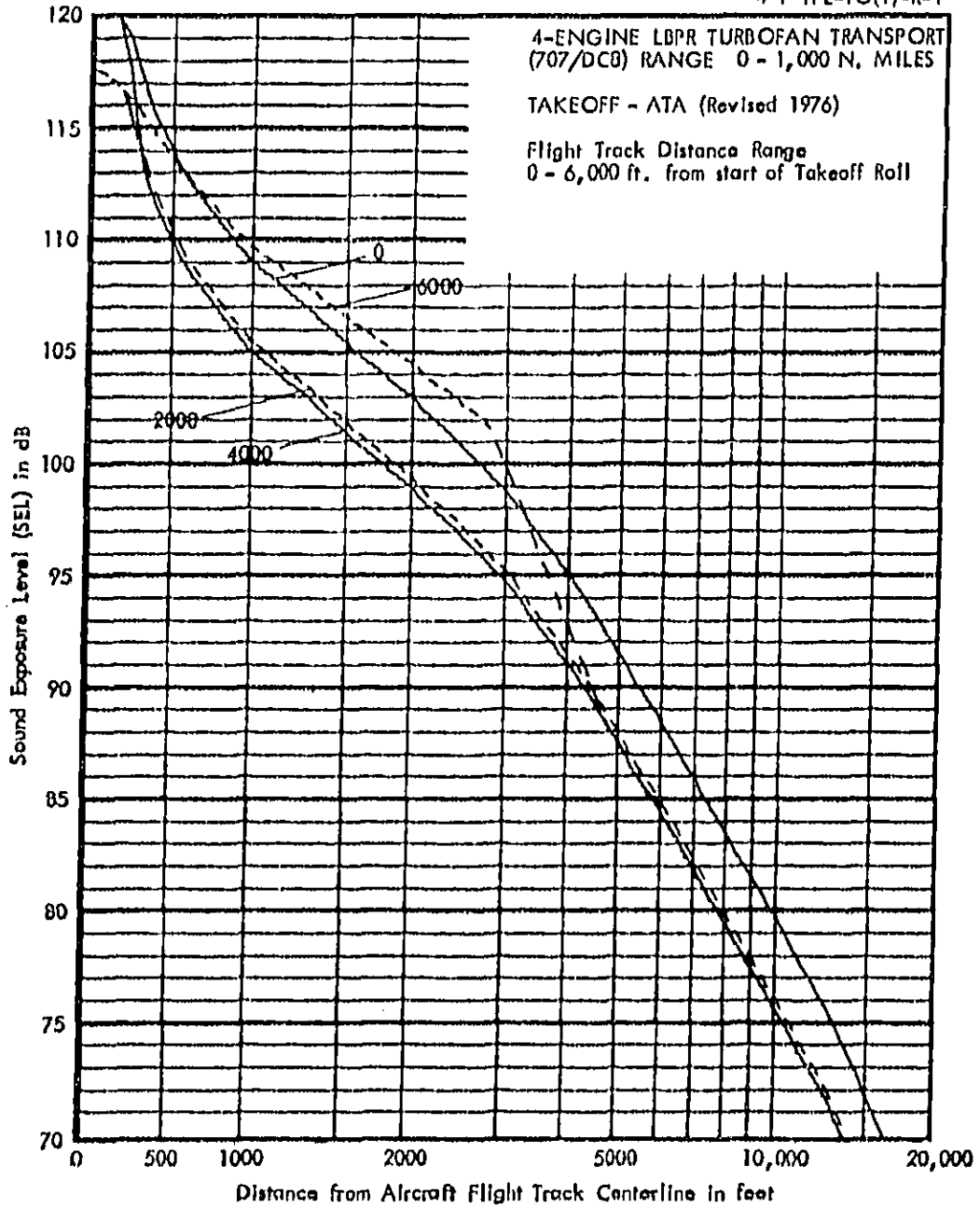
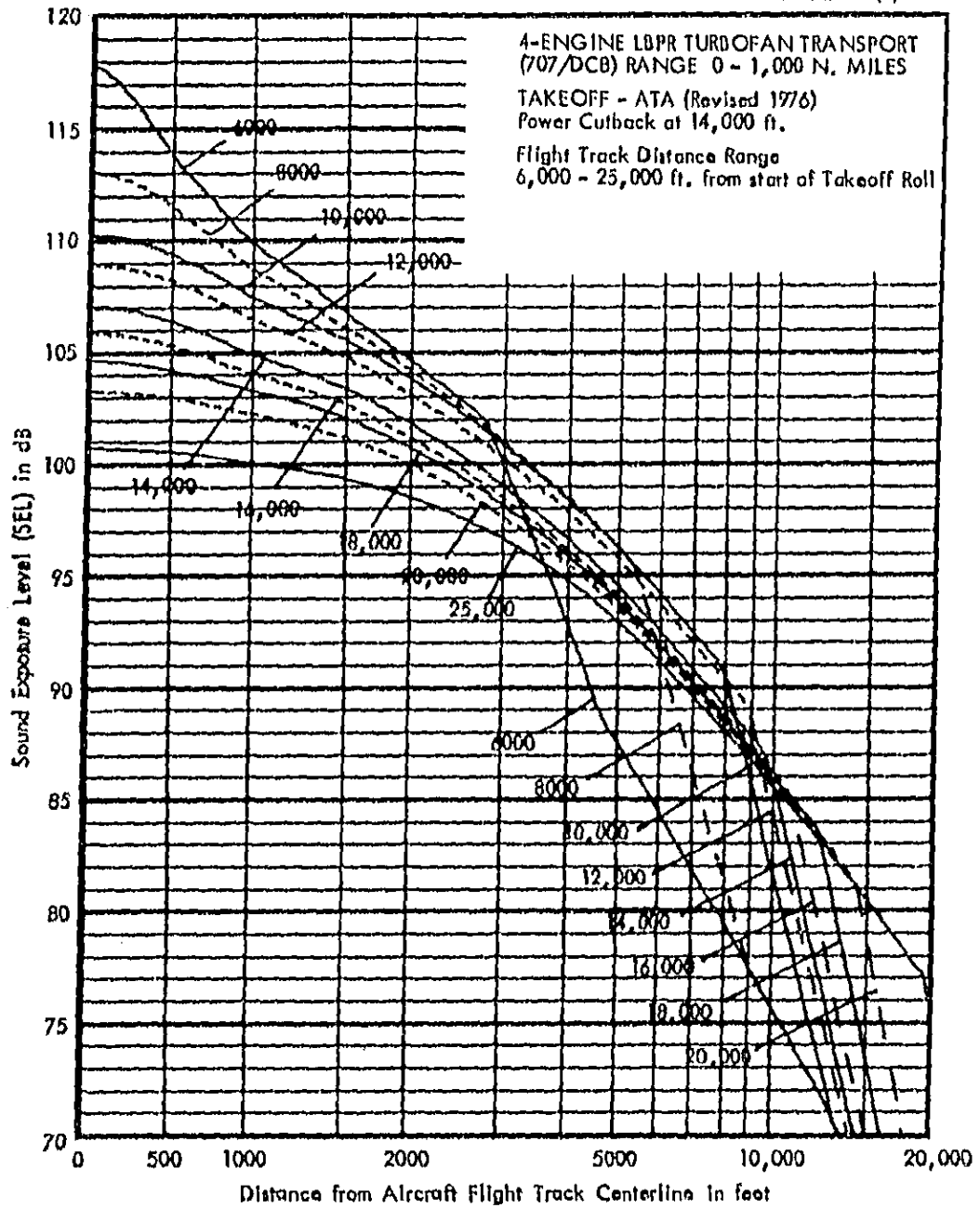
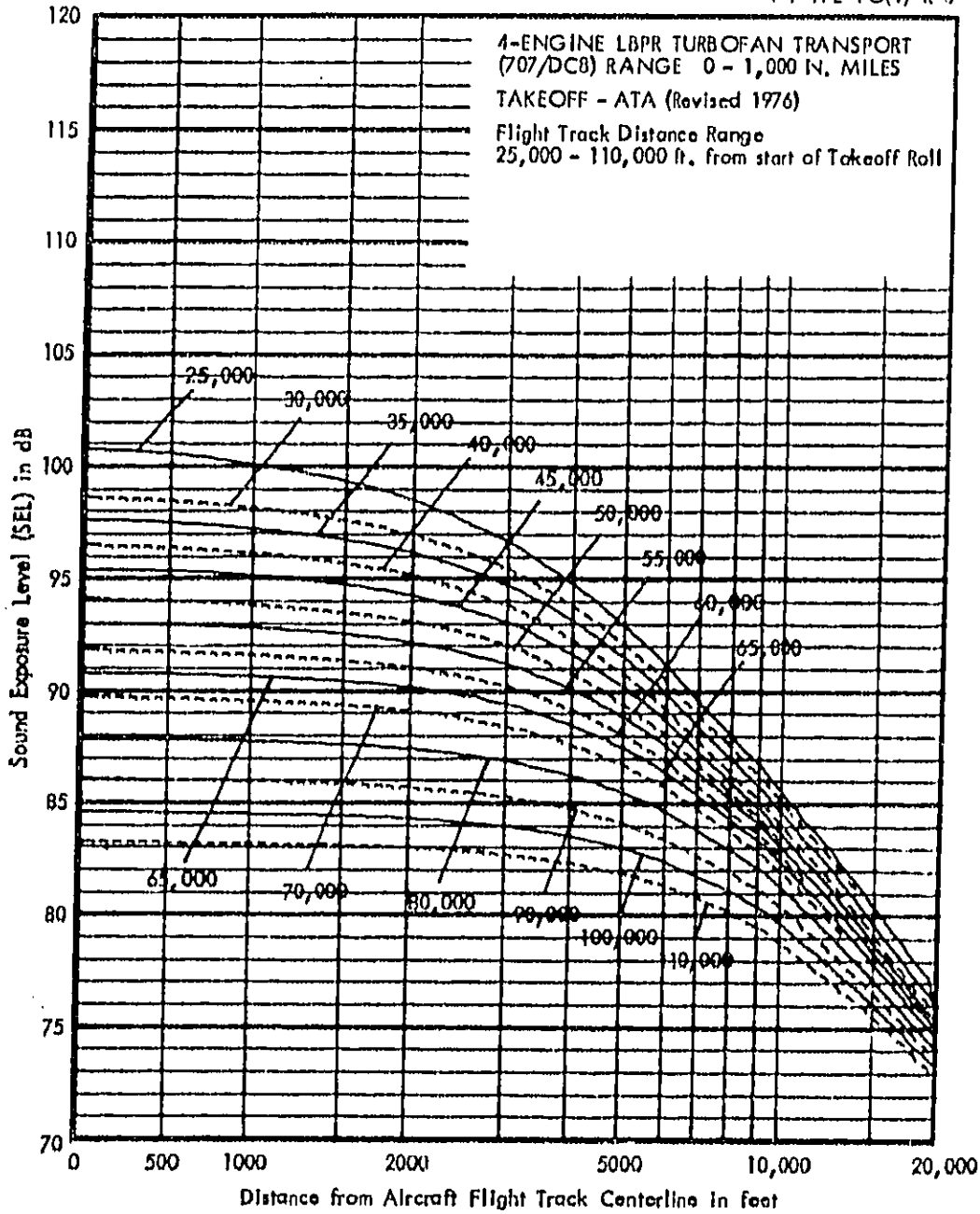


FIGURE 6. ATA TAKEOFF PROFILES FOR 3-ENGINE HBPR TURBOFAN TRANSPORT - DC-10, L-1011 SERIES (3-T-TFH) - REVISED PROCEDURES ADOPTED DECEMBER 1976

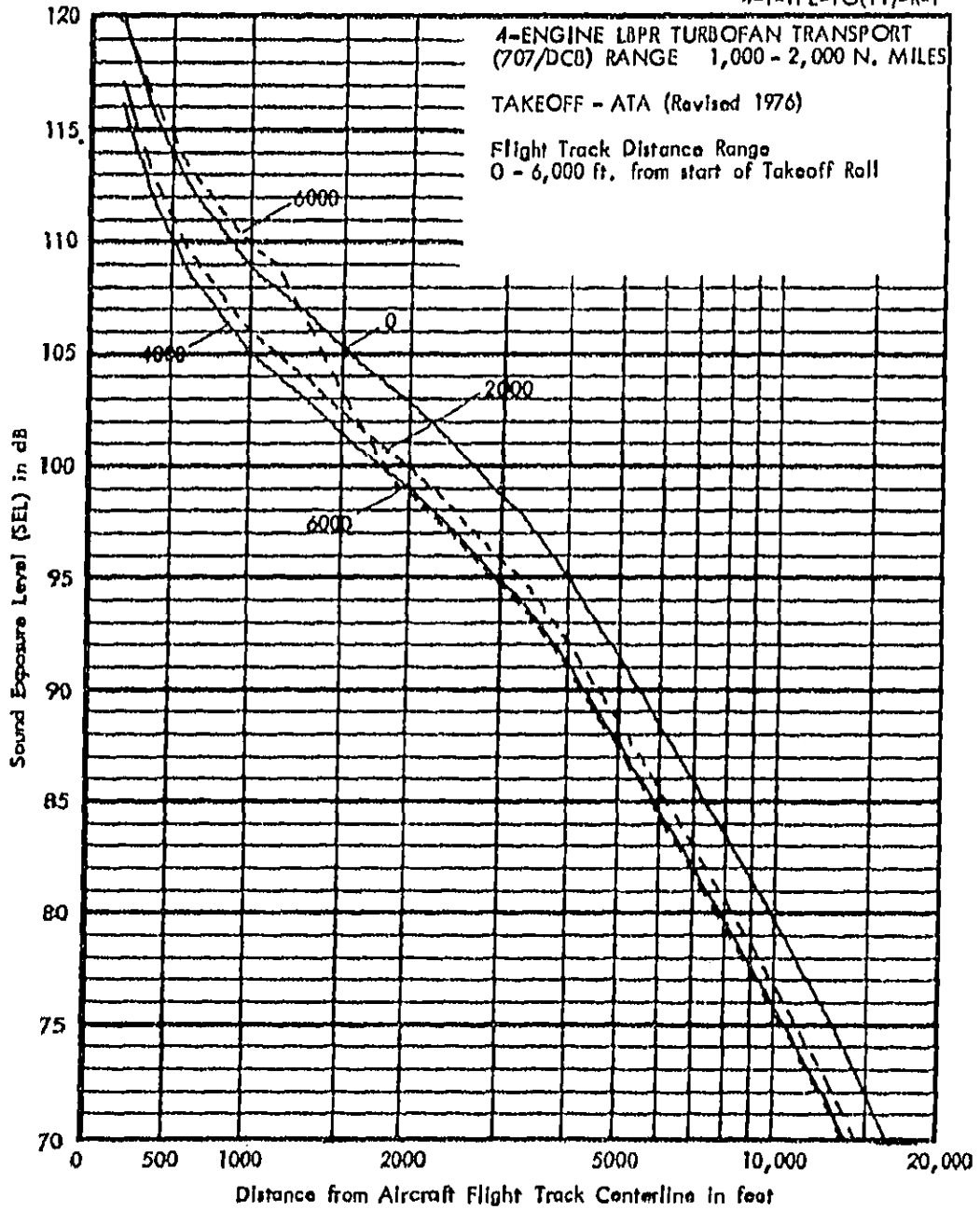
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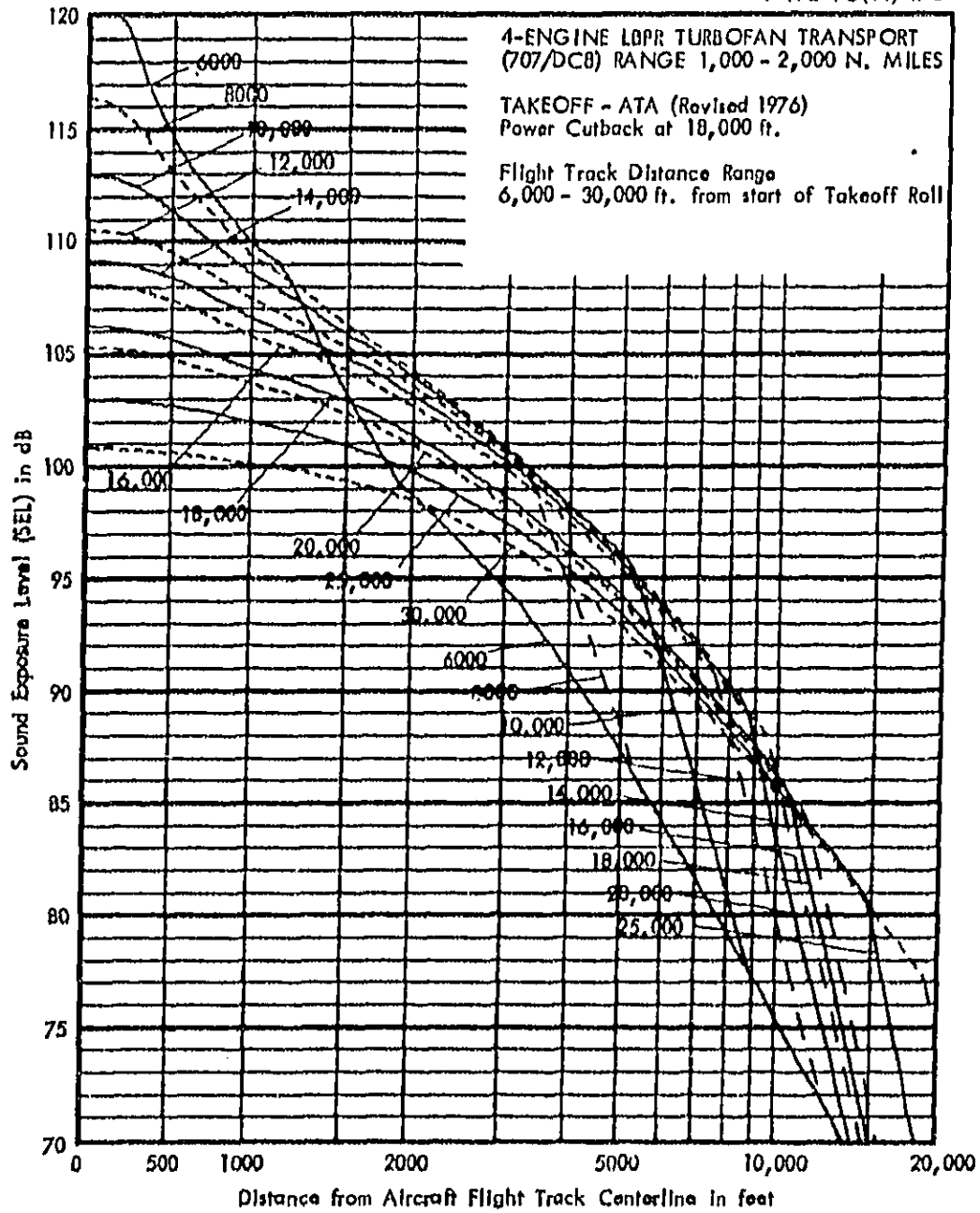


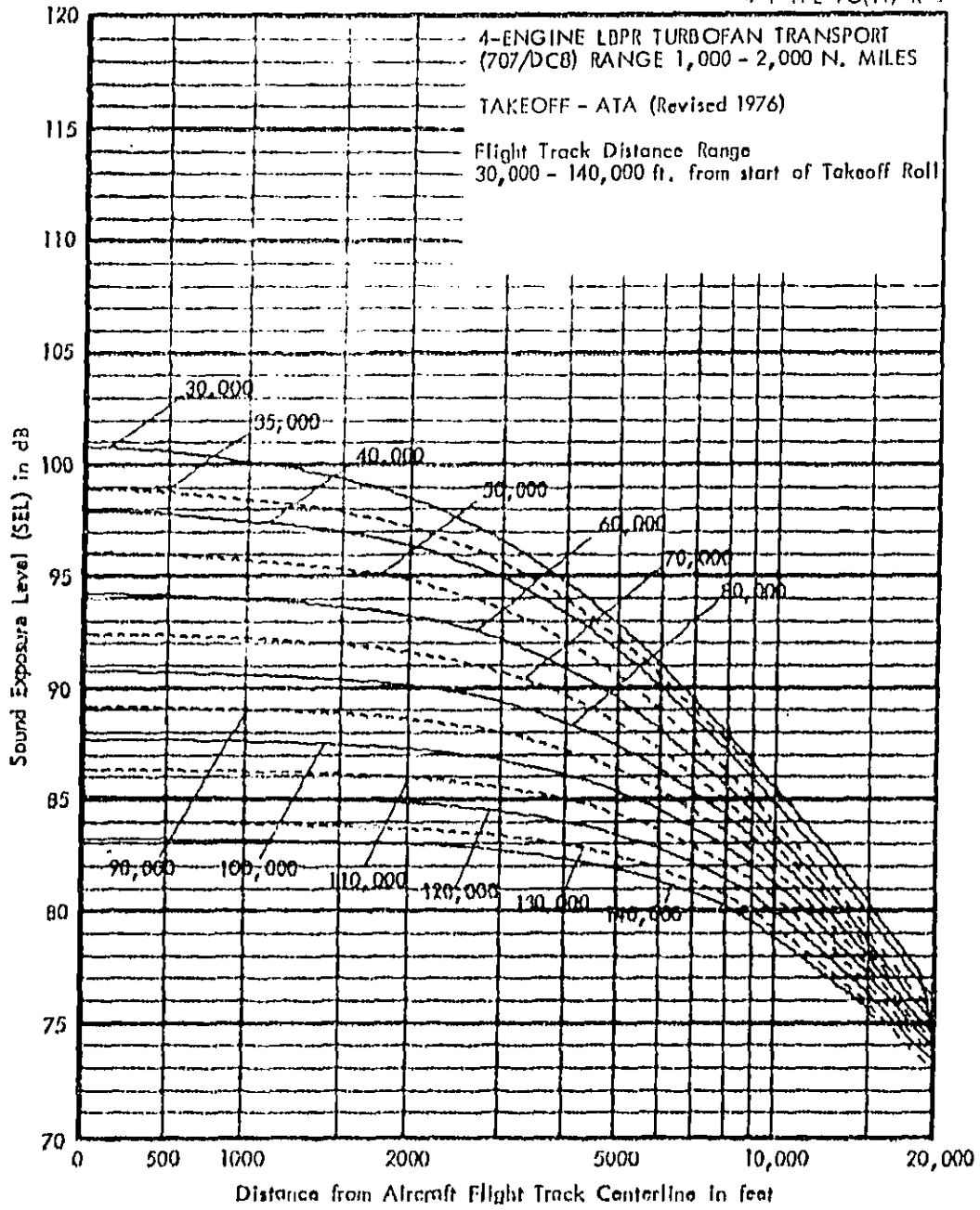


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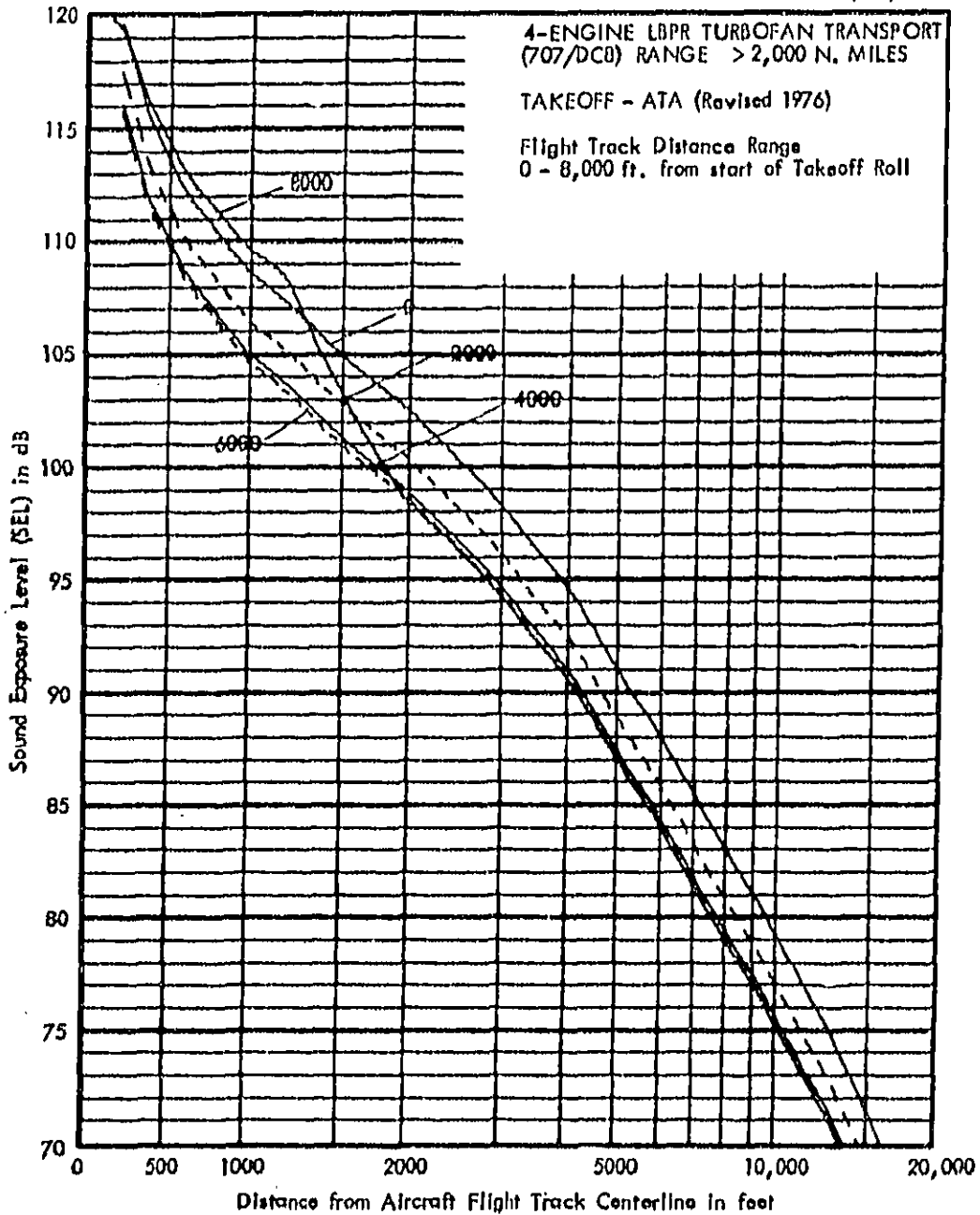


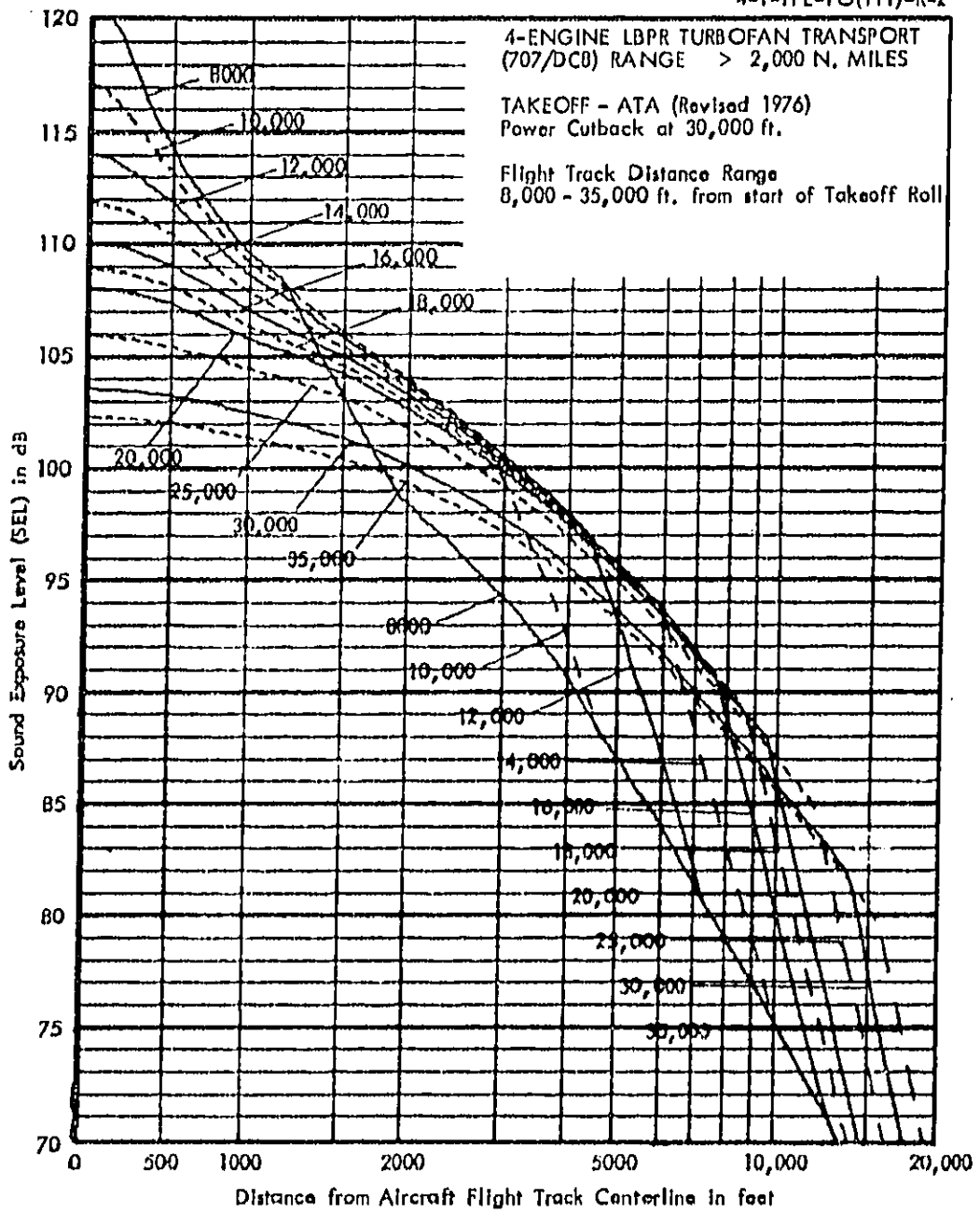


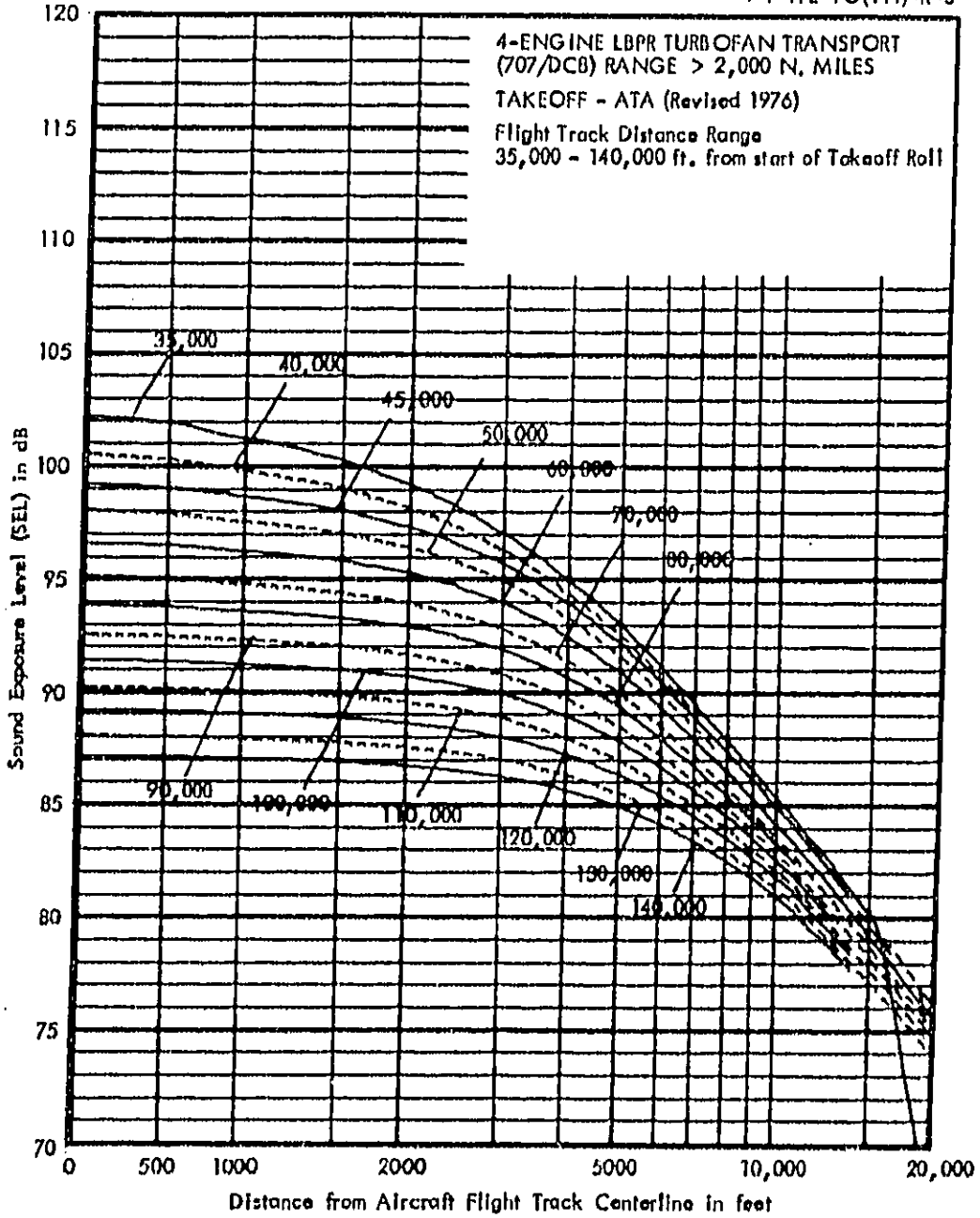


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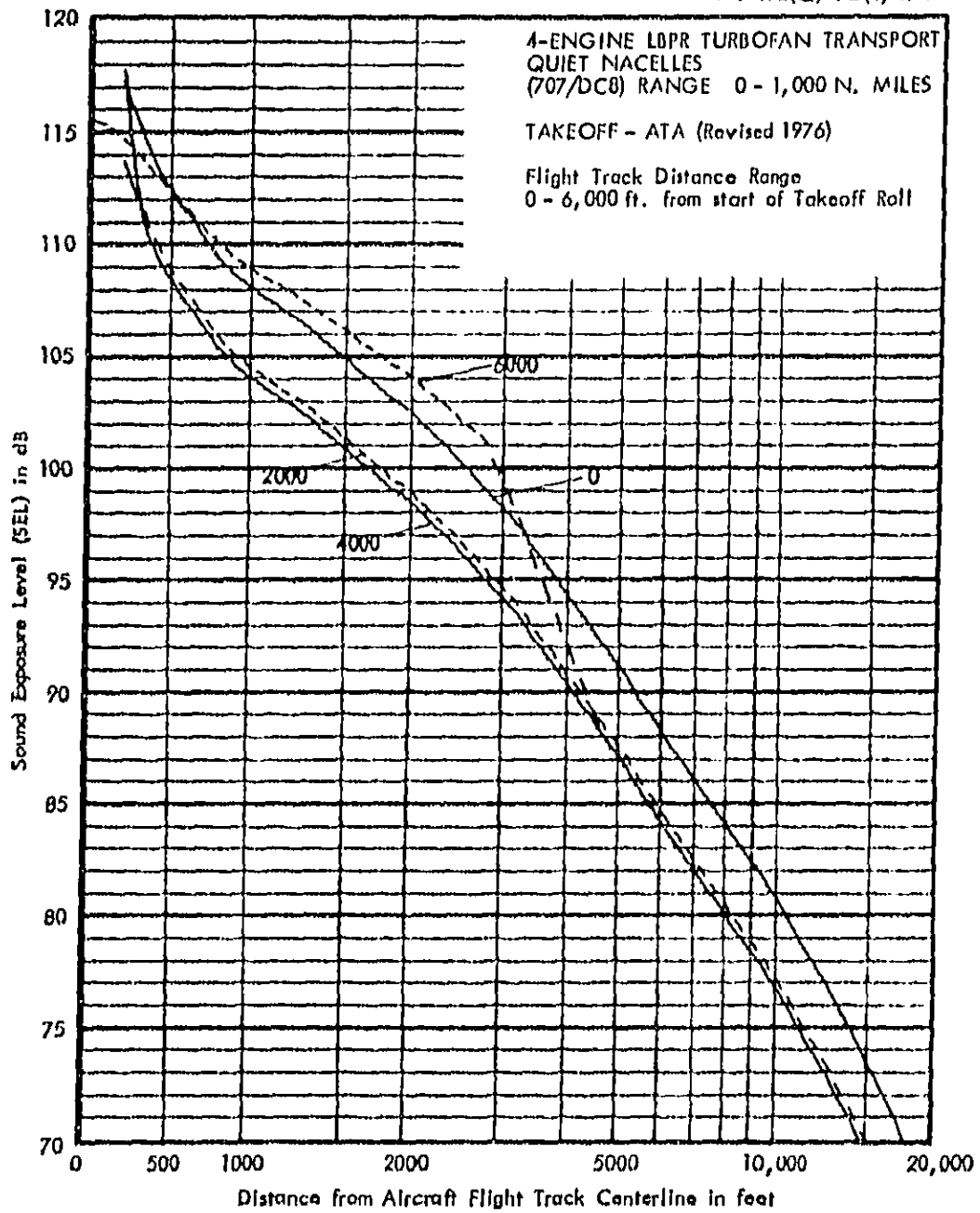




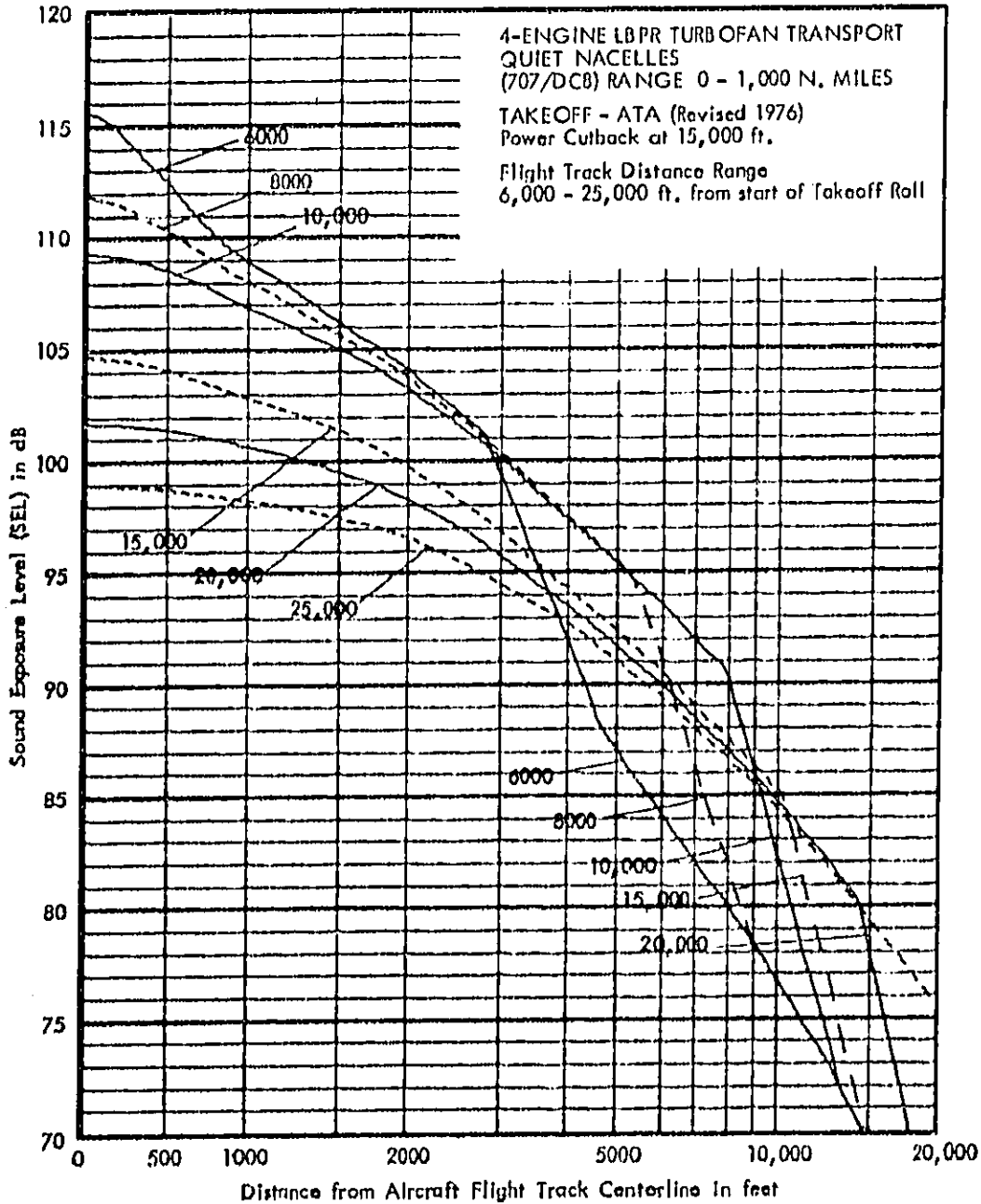


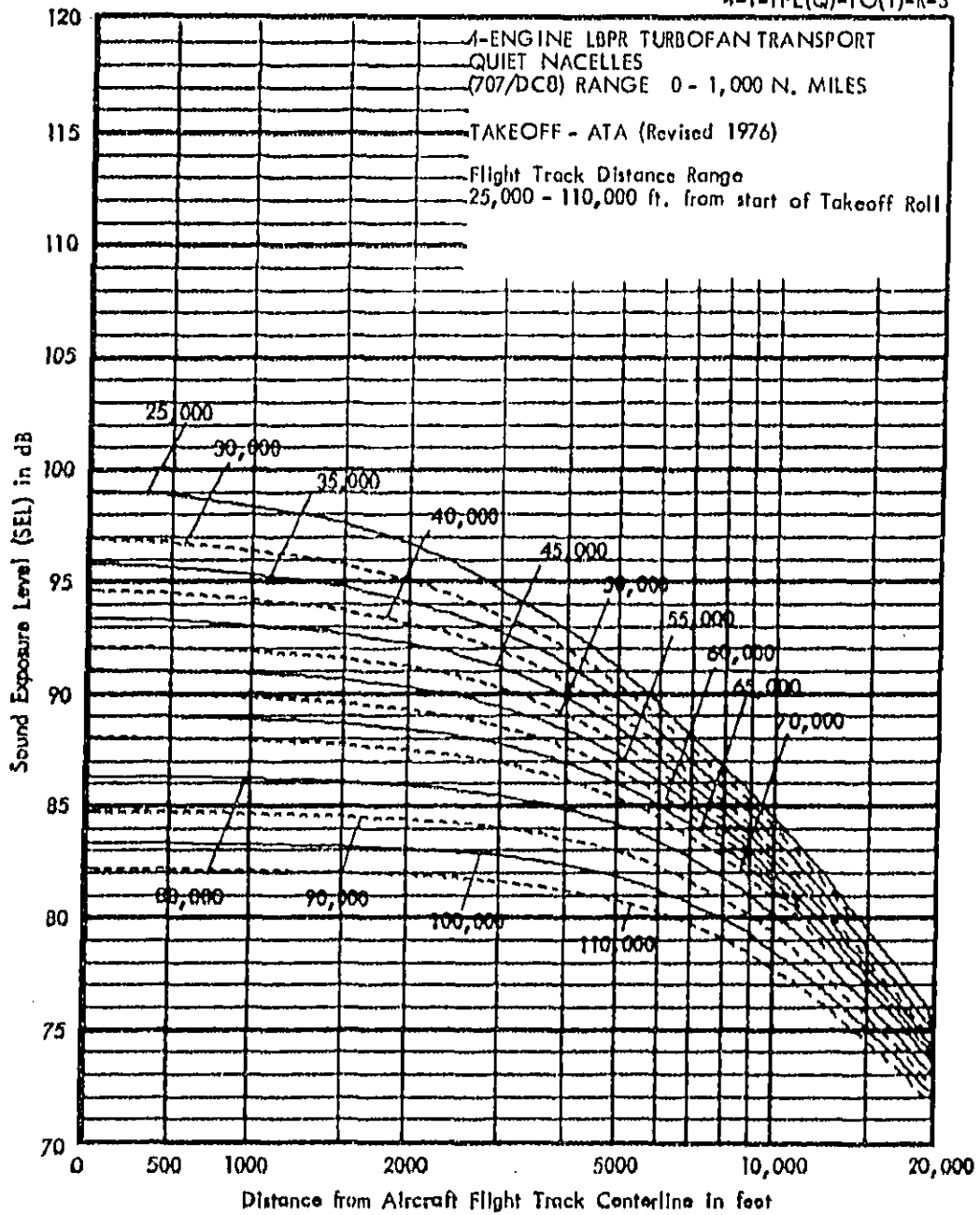
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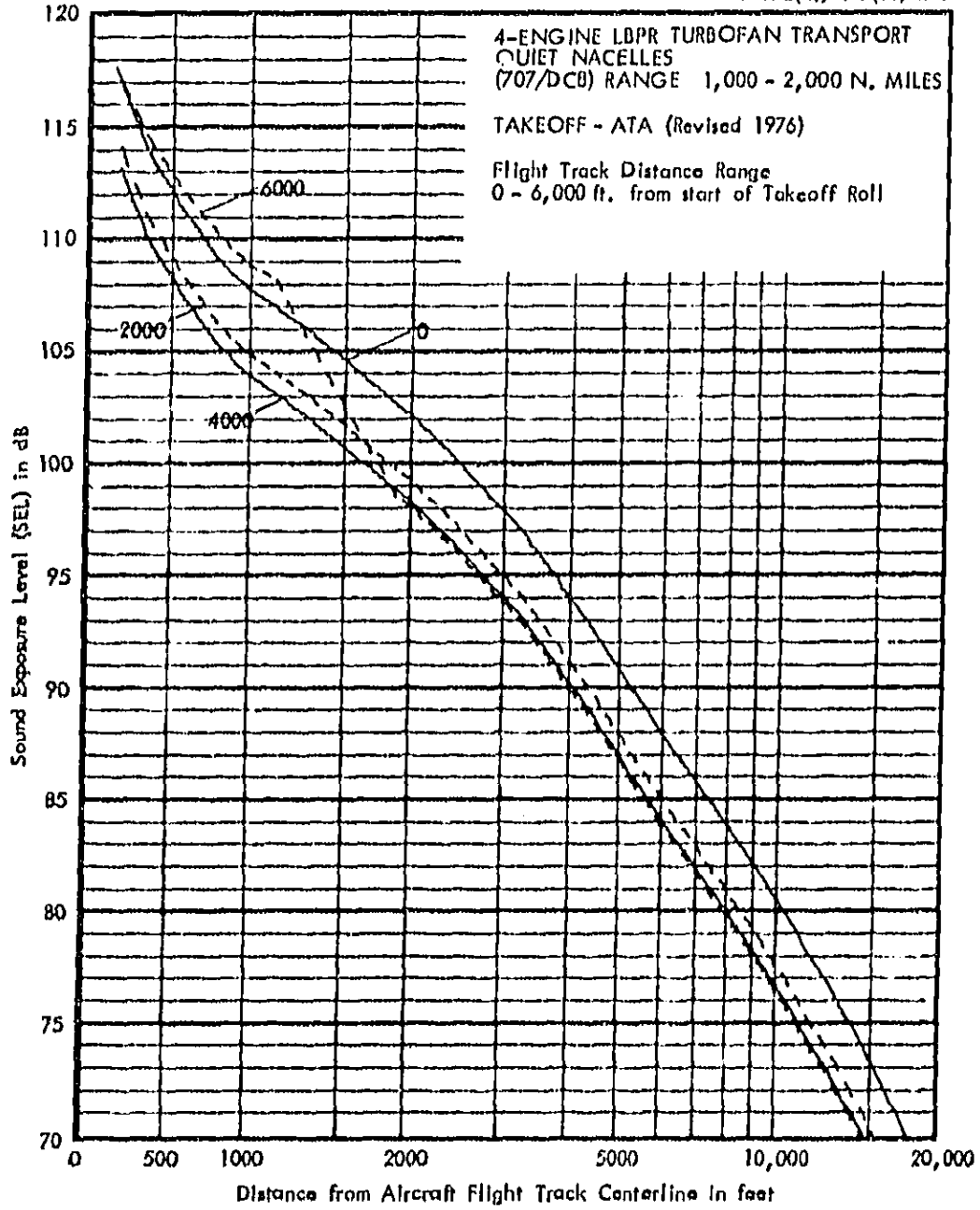
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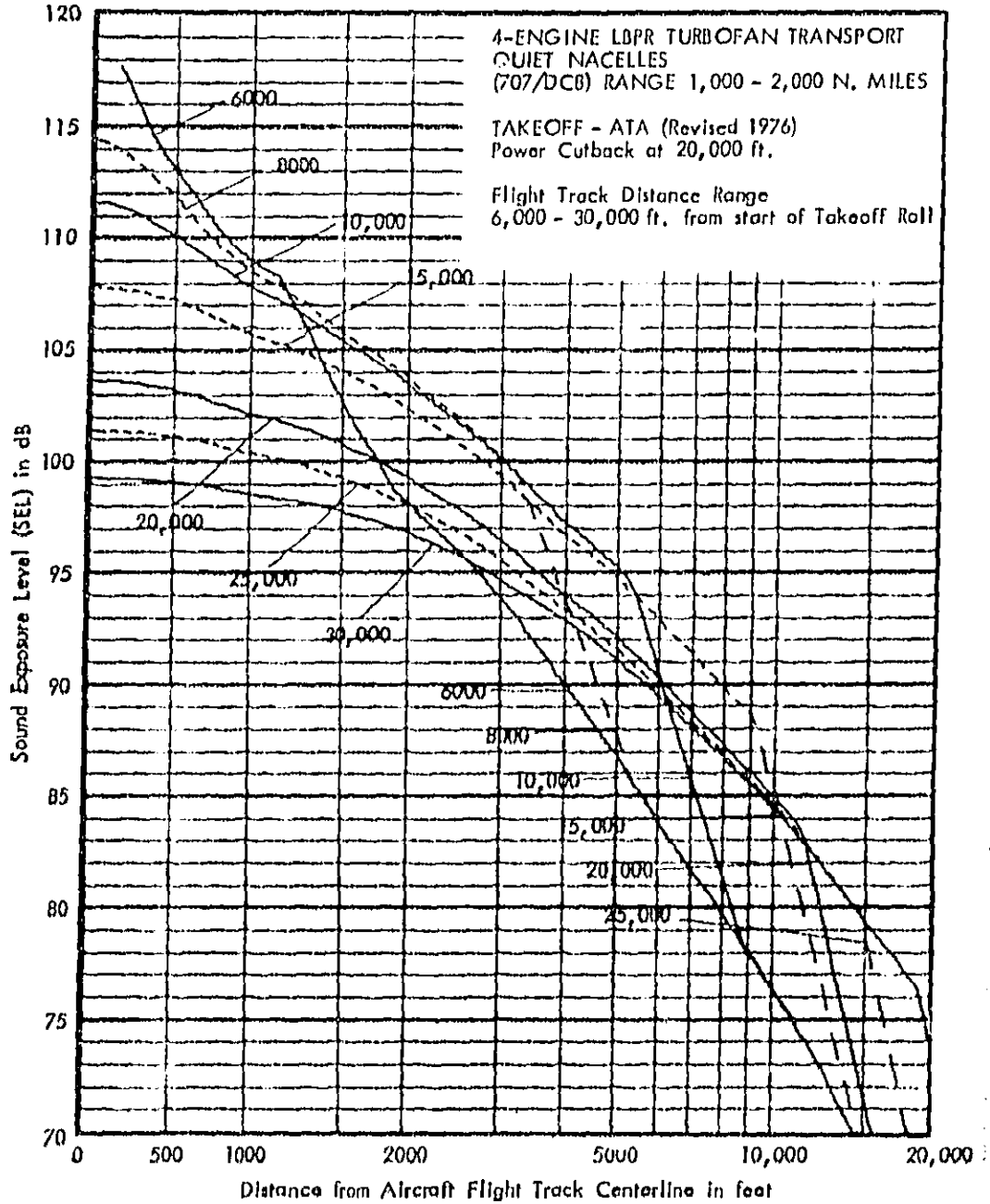


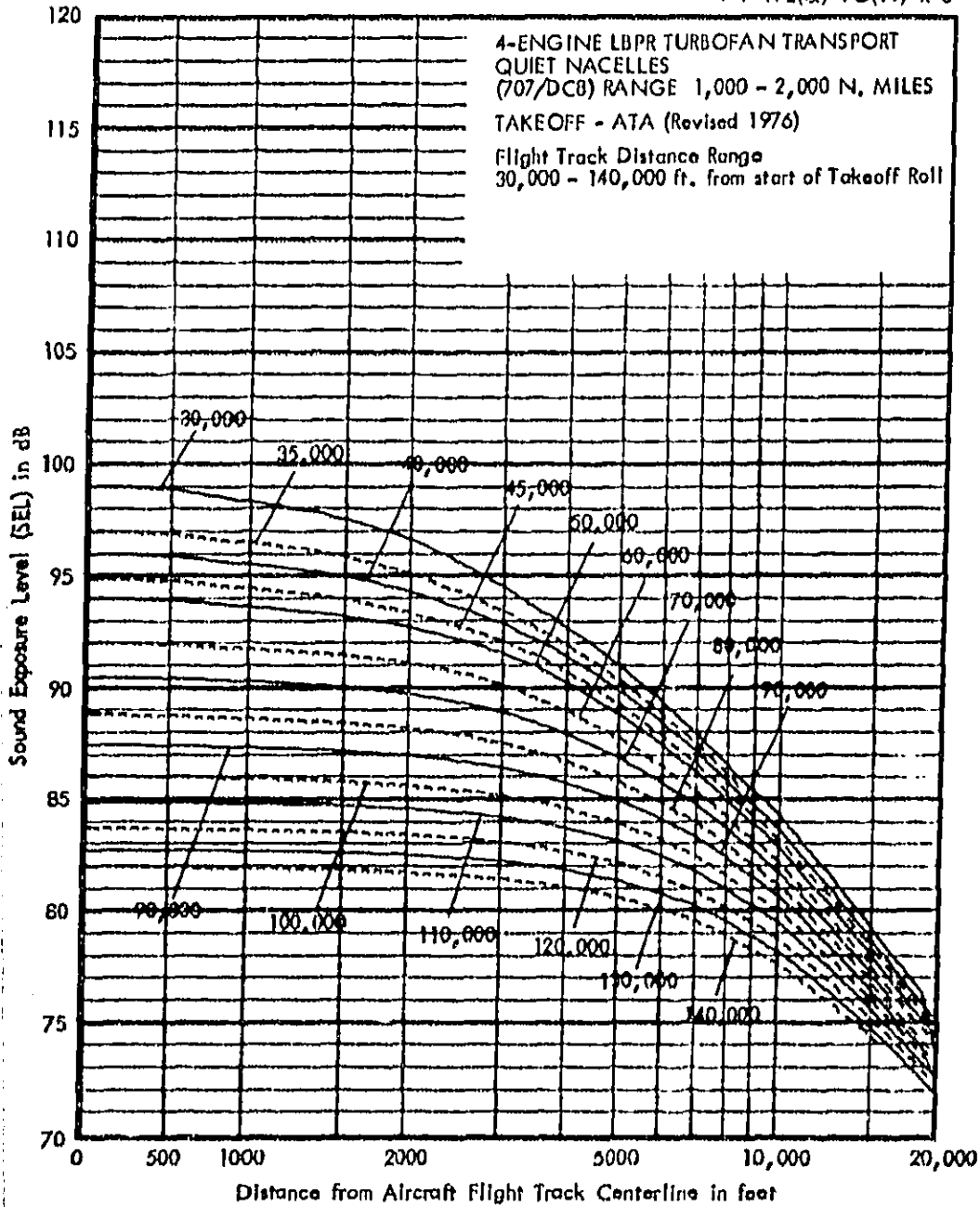


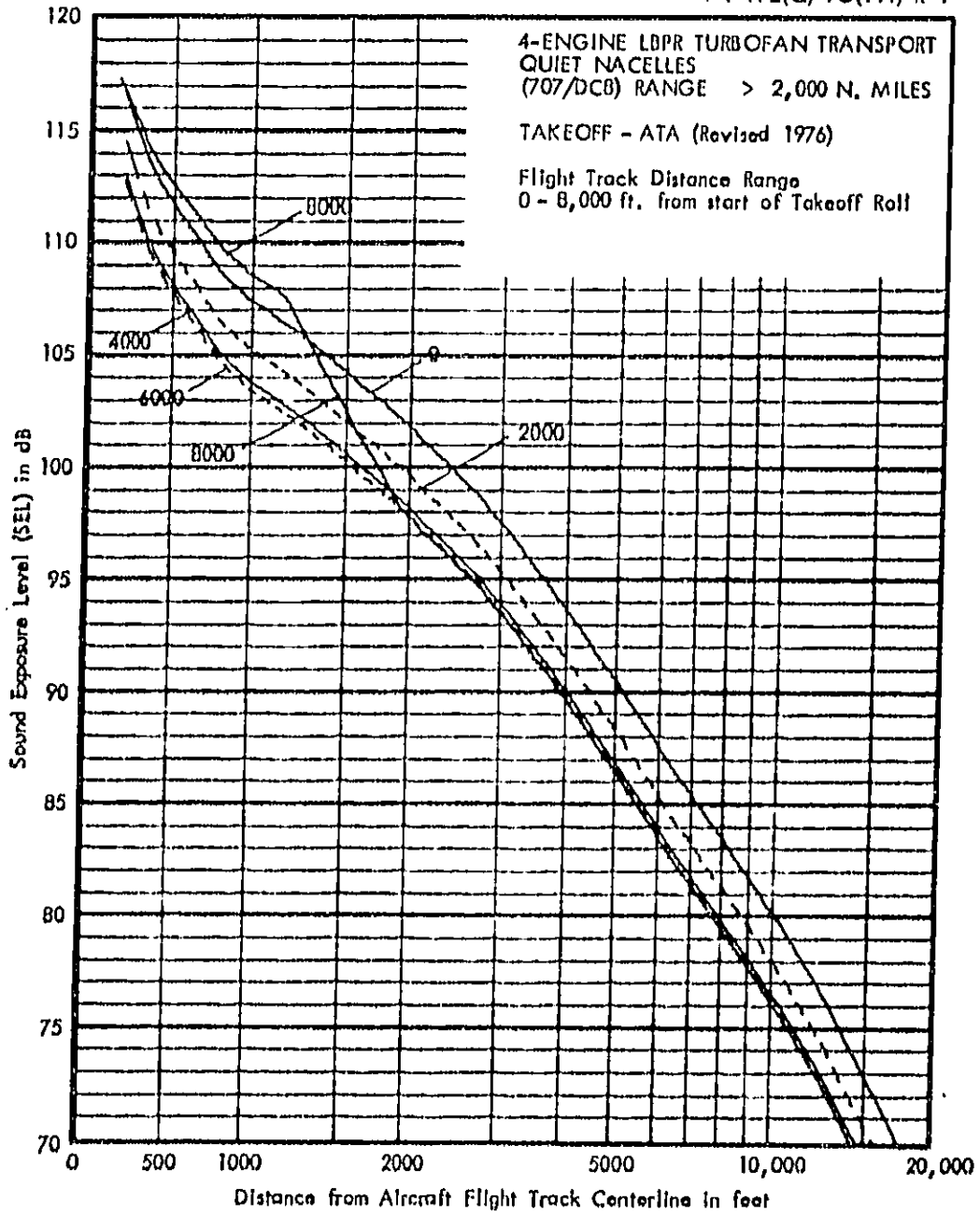


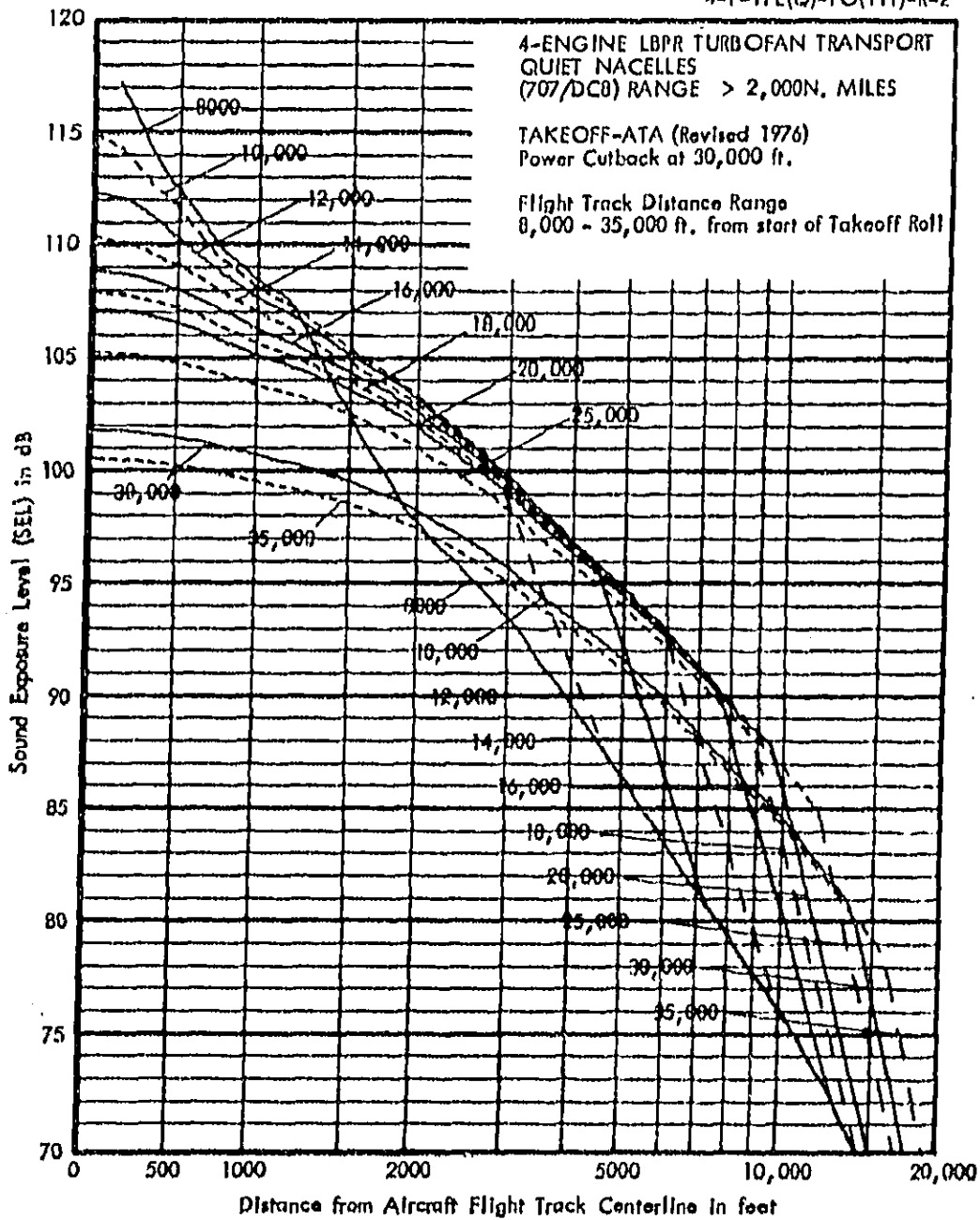
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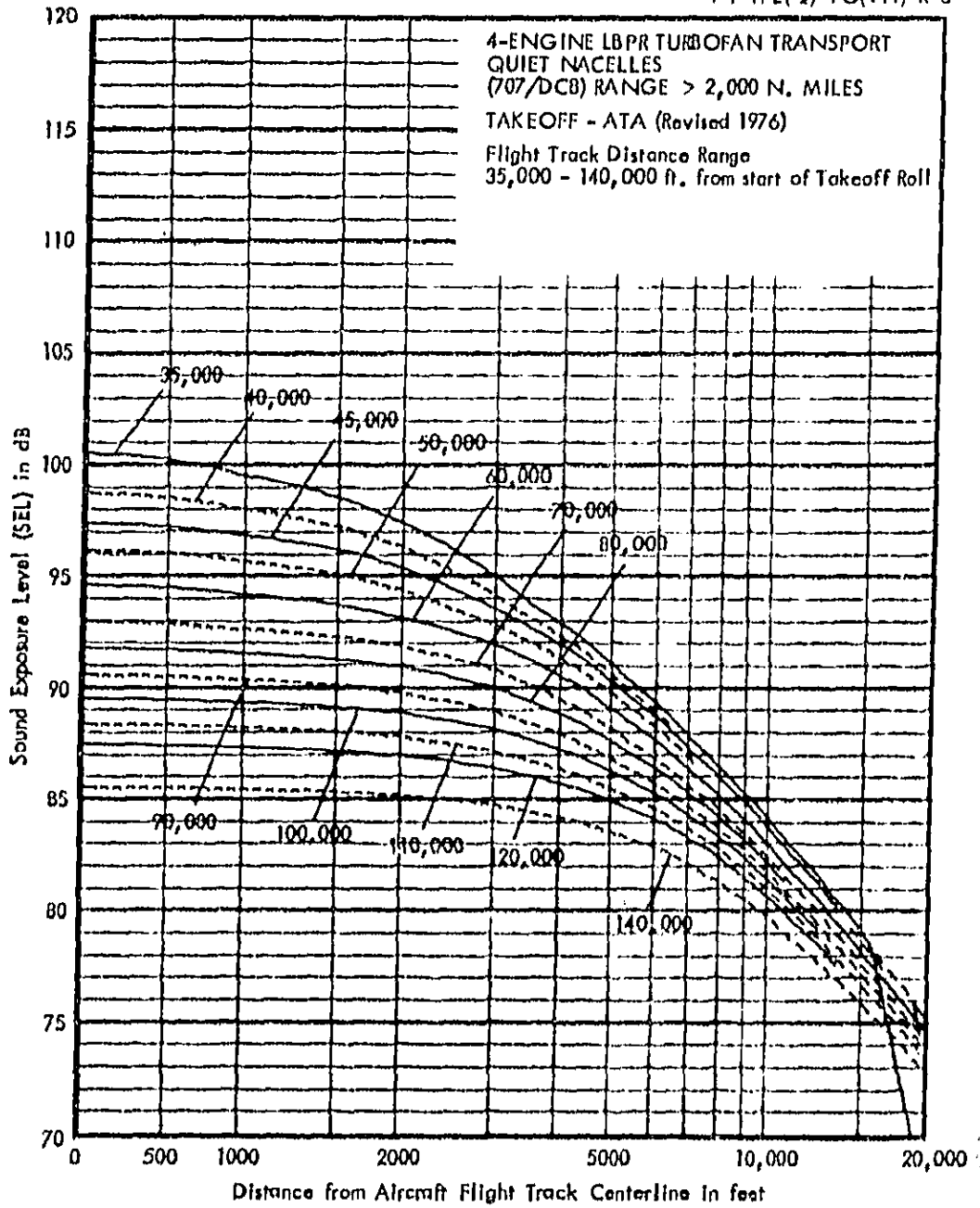


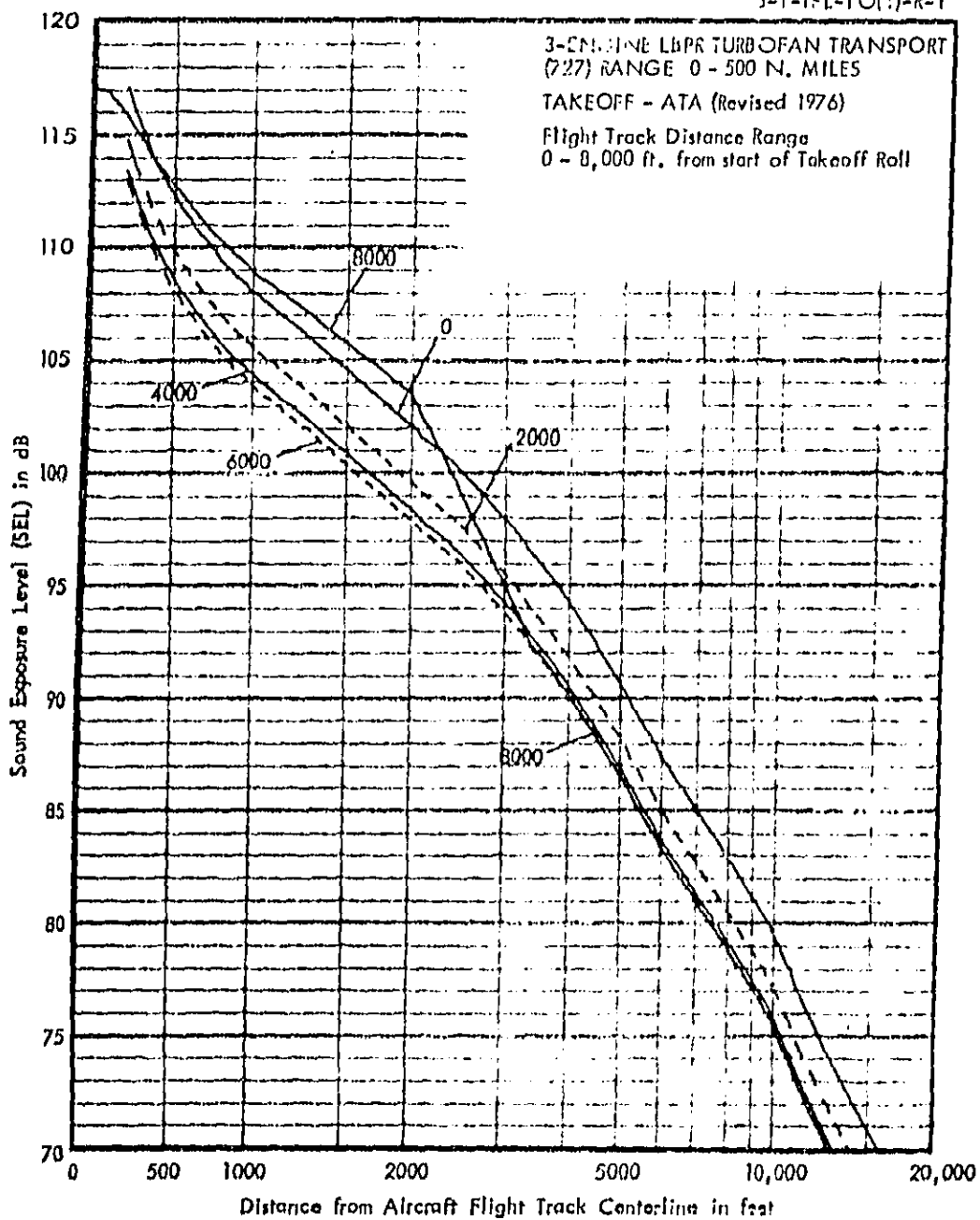


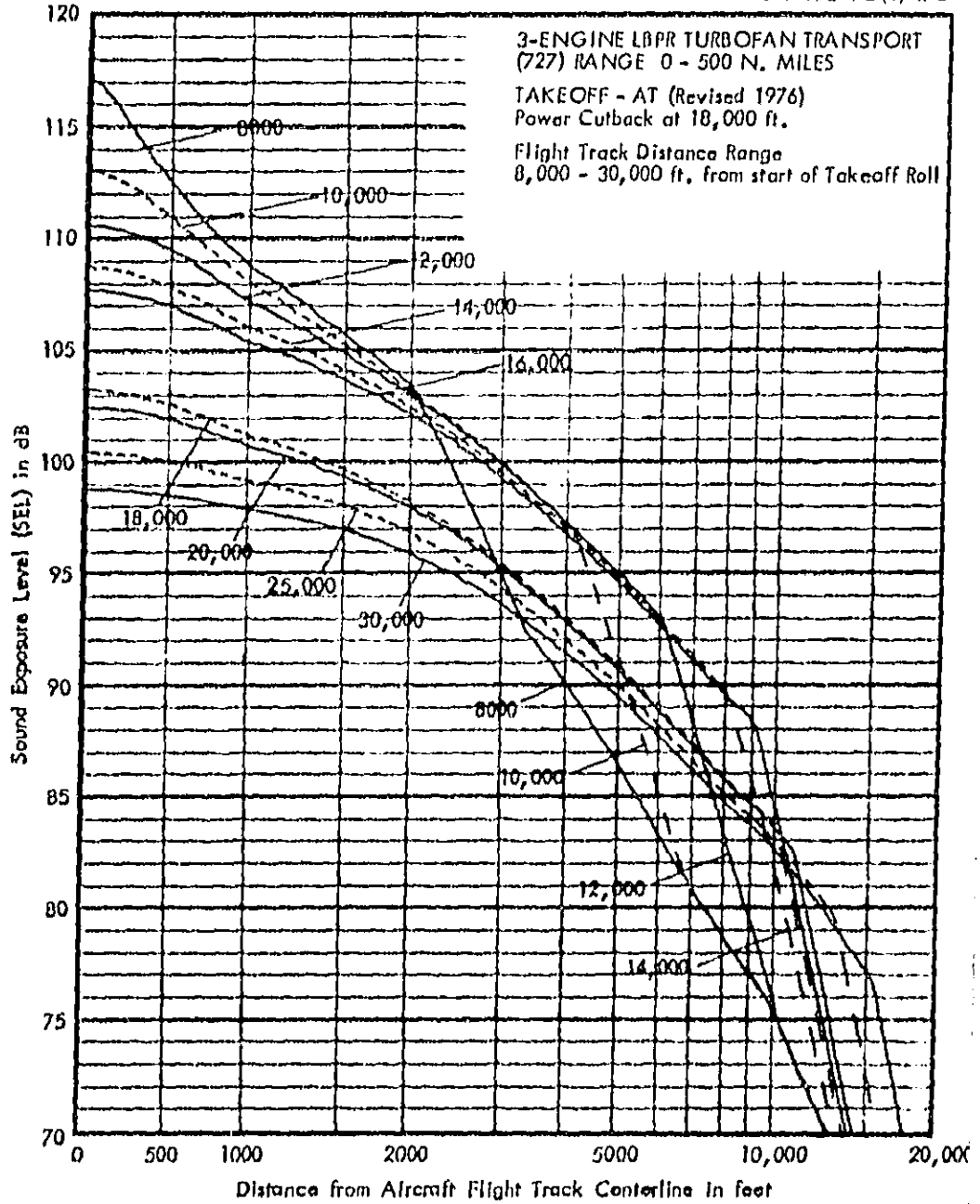




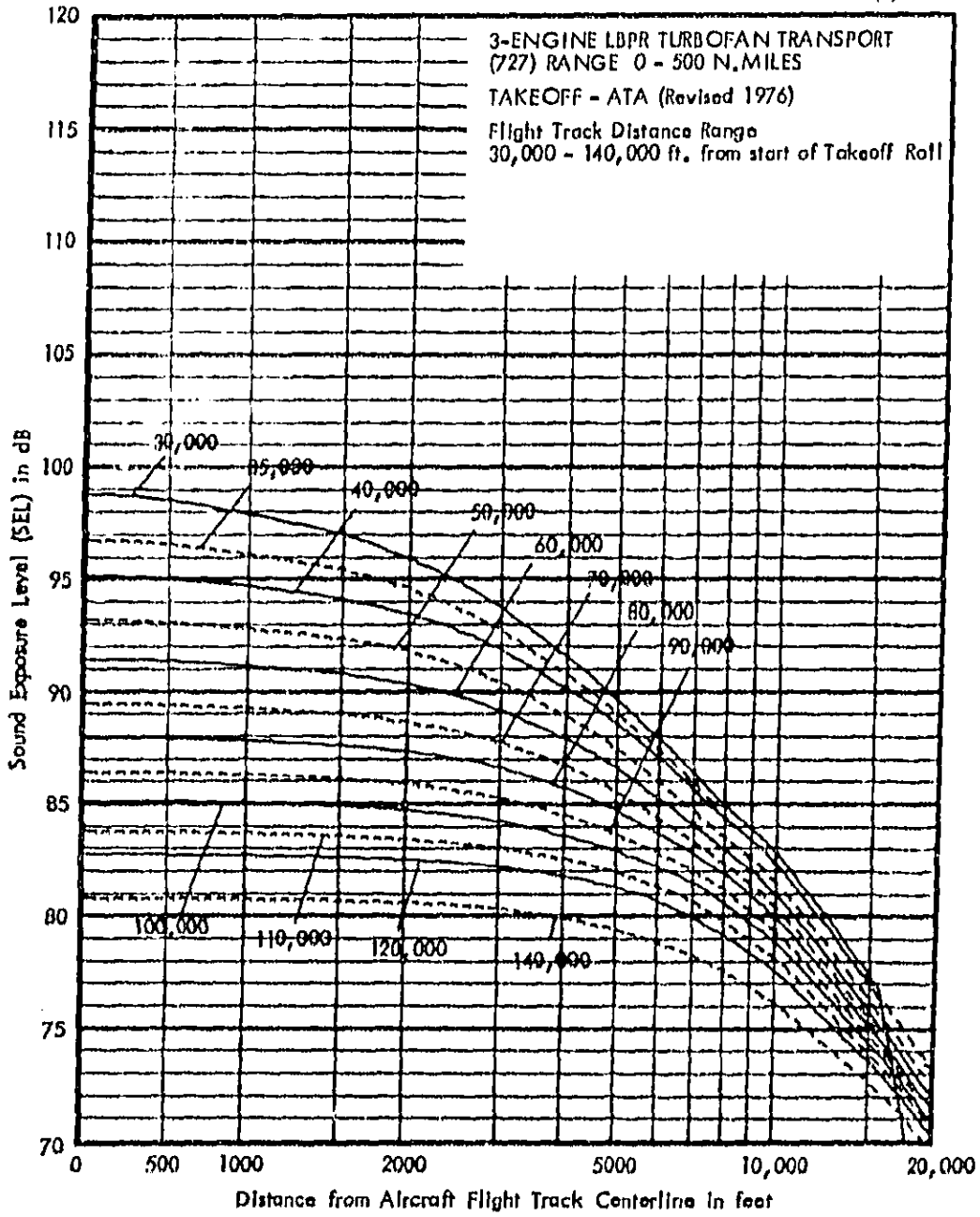


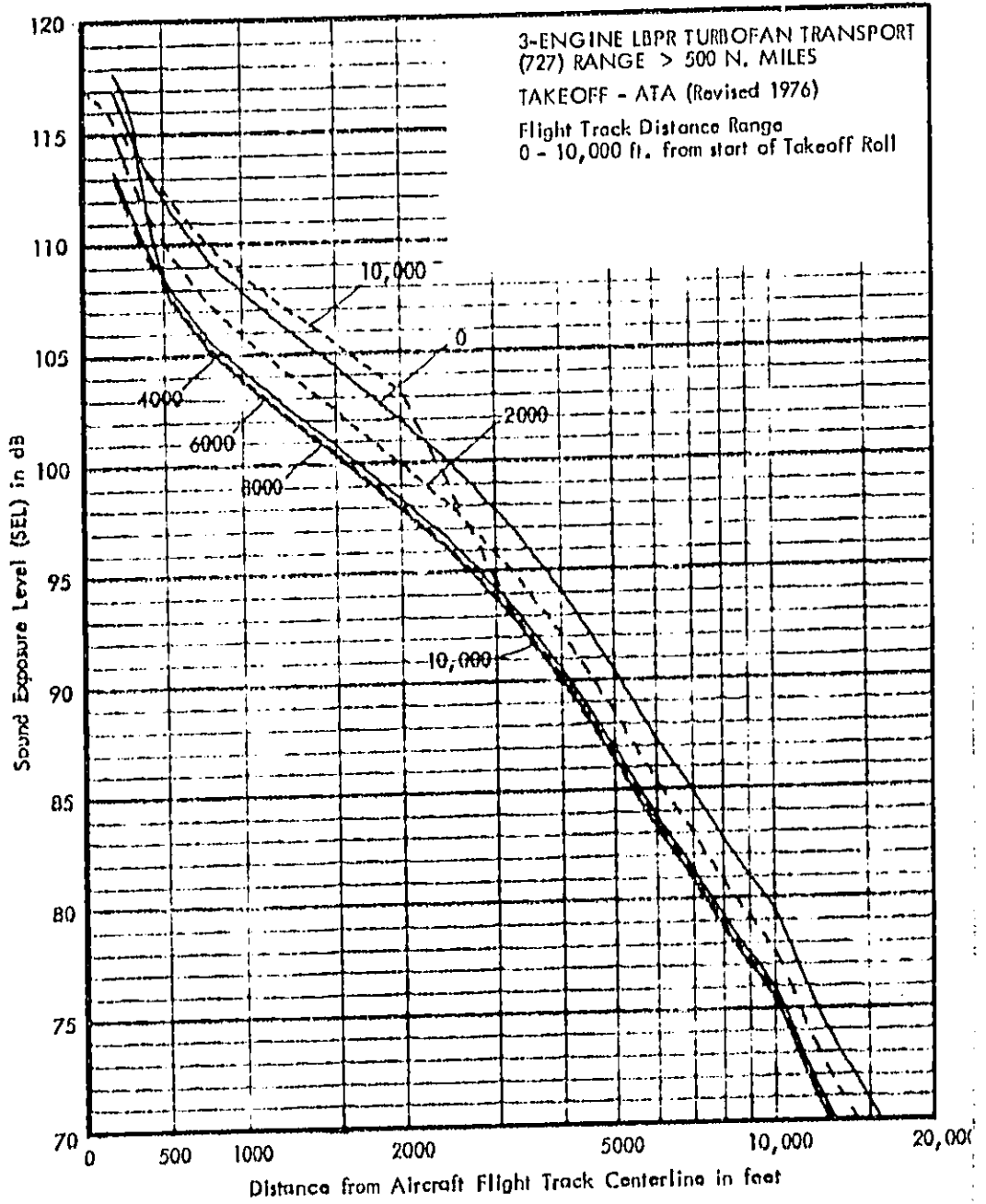




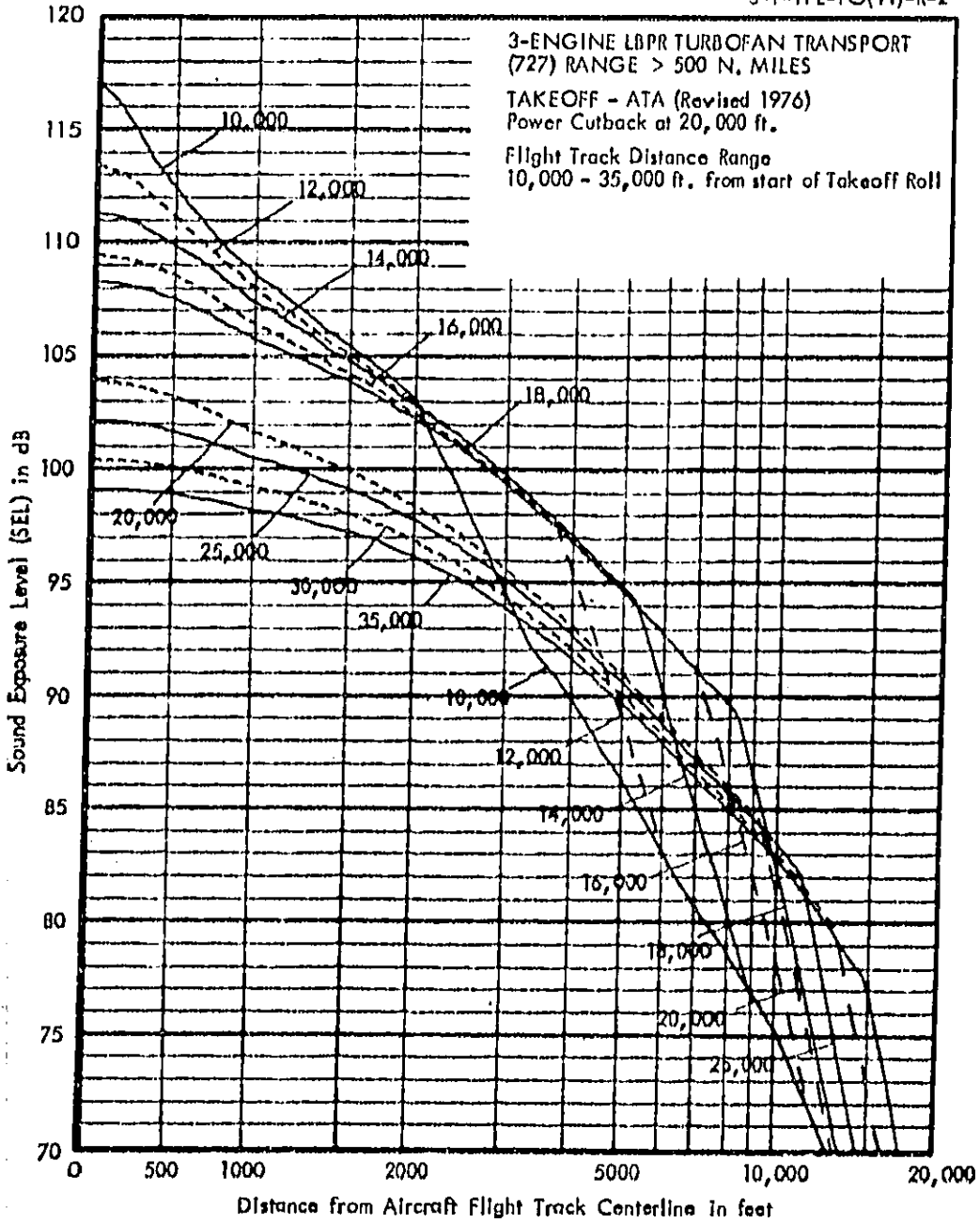




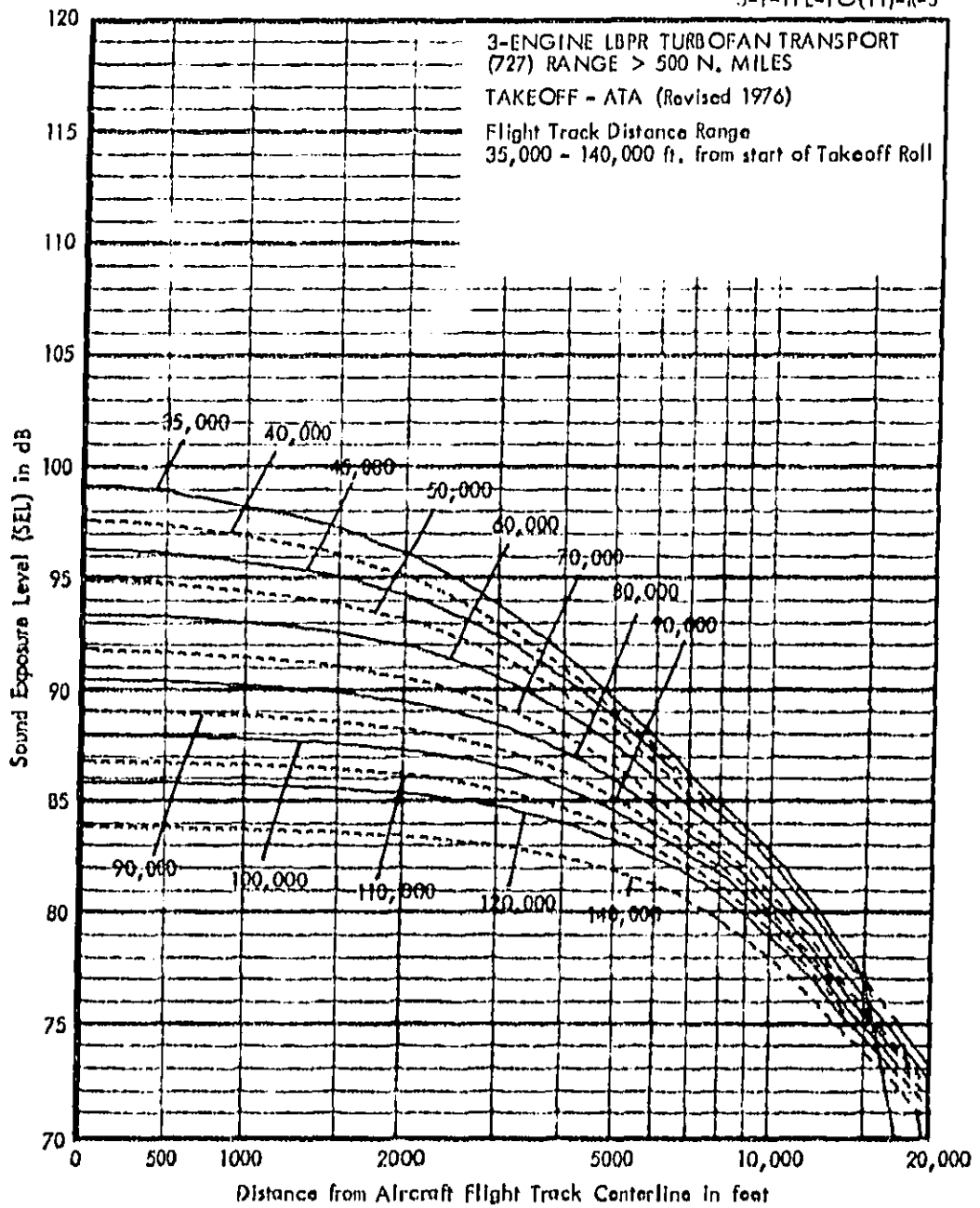




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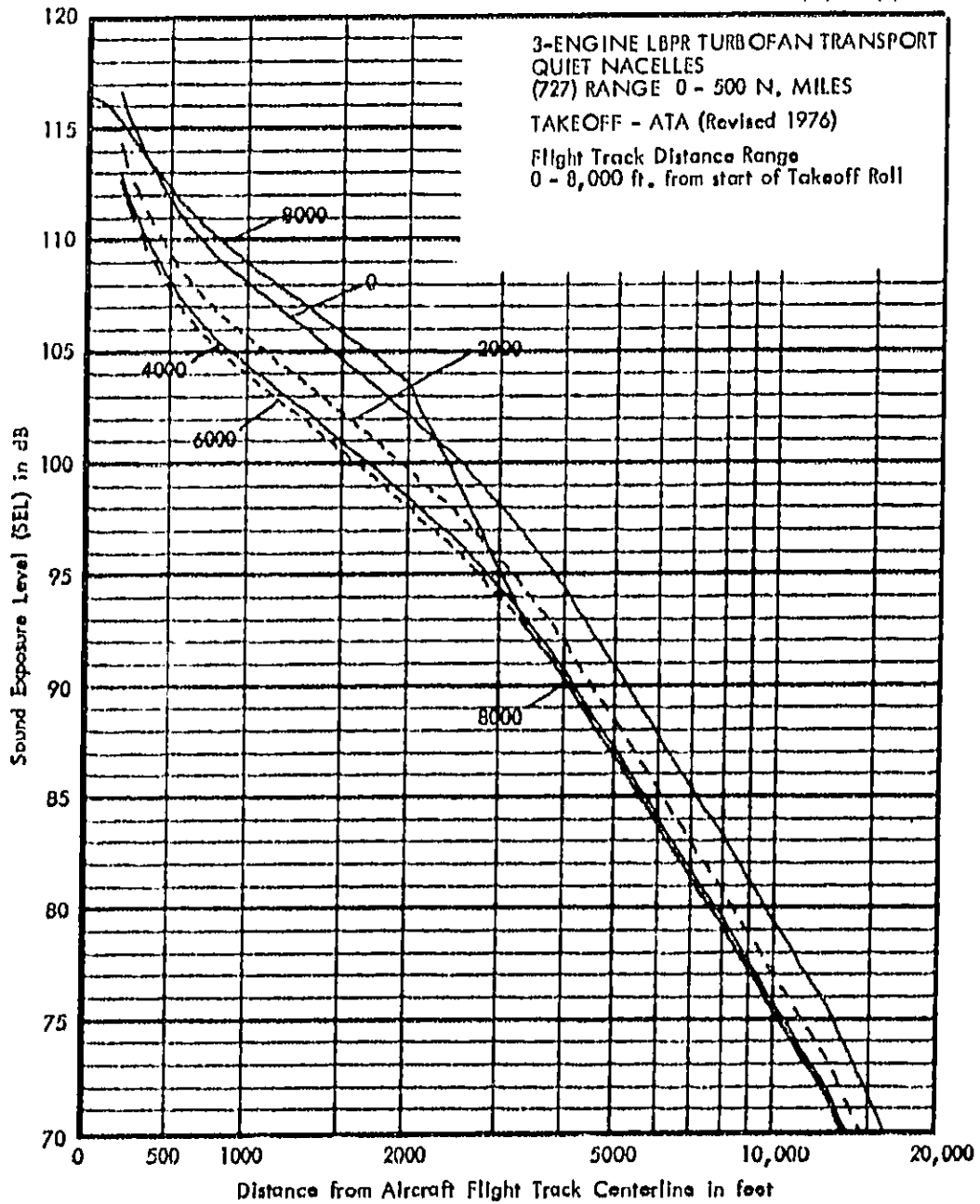


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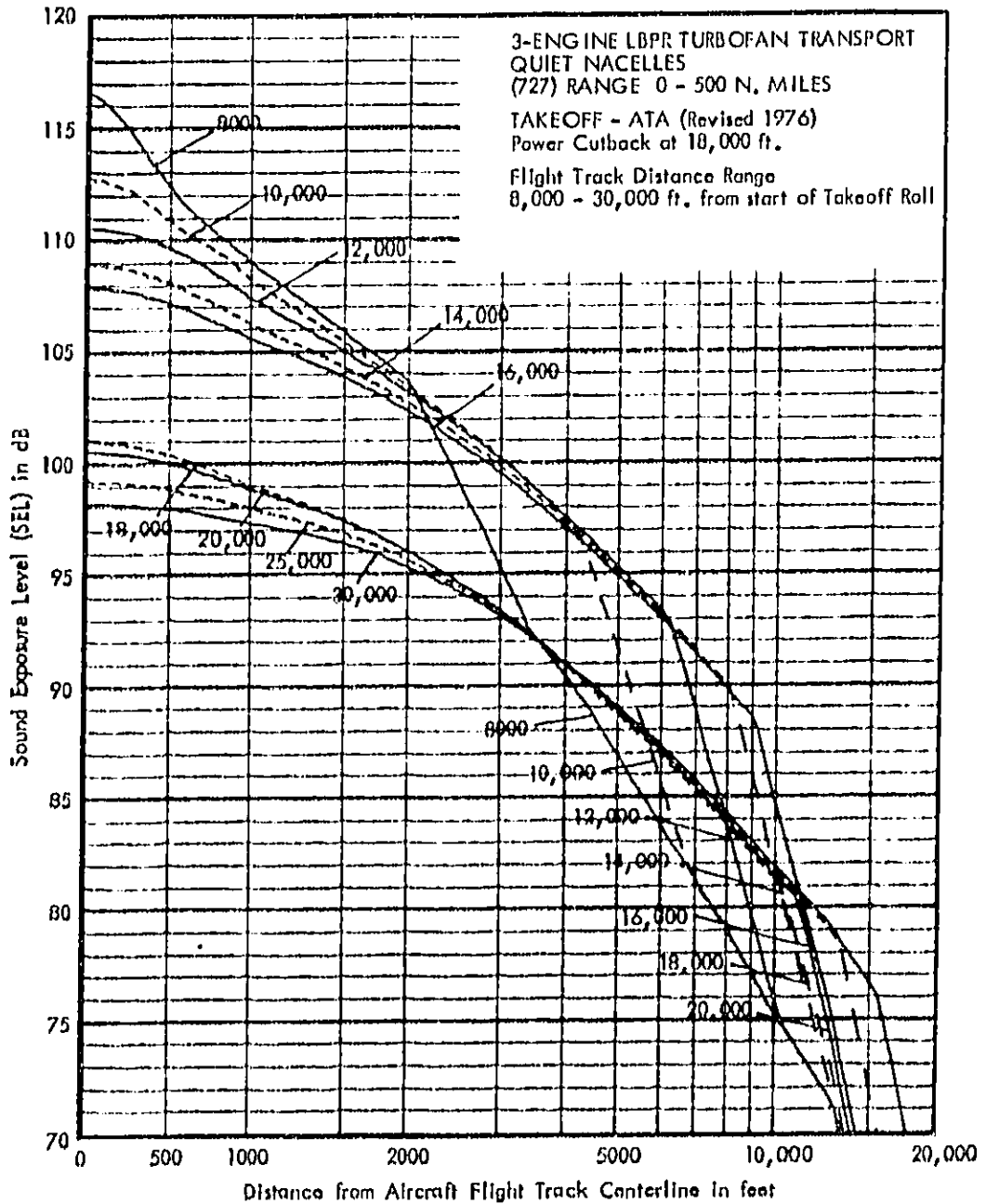


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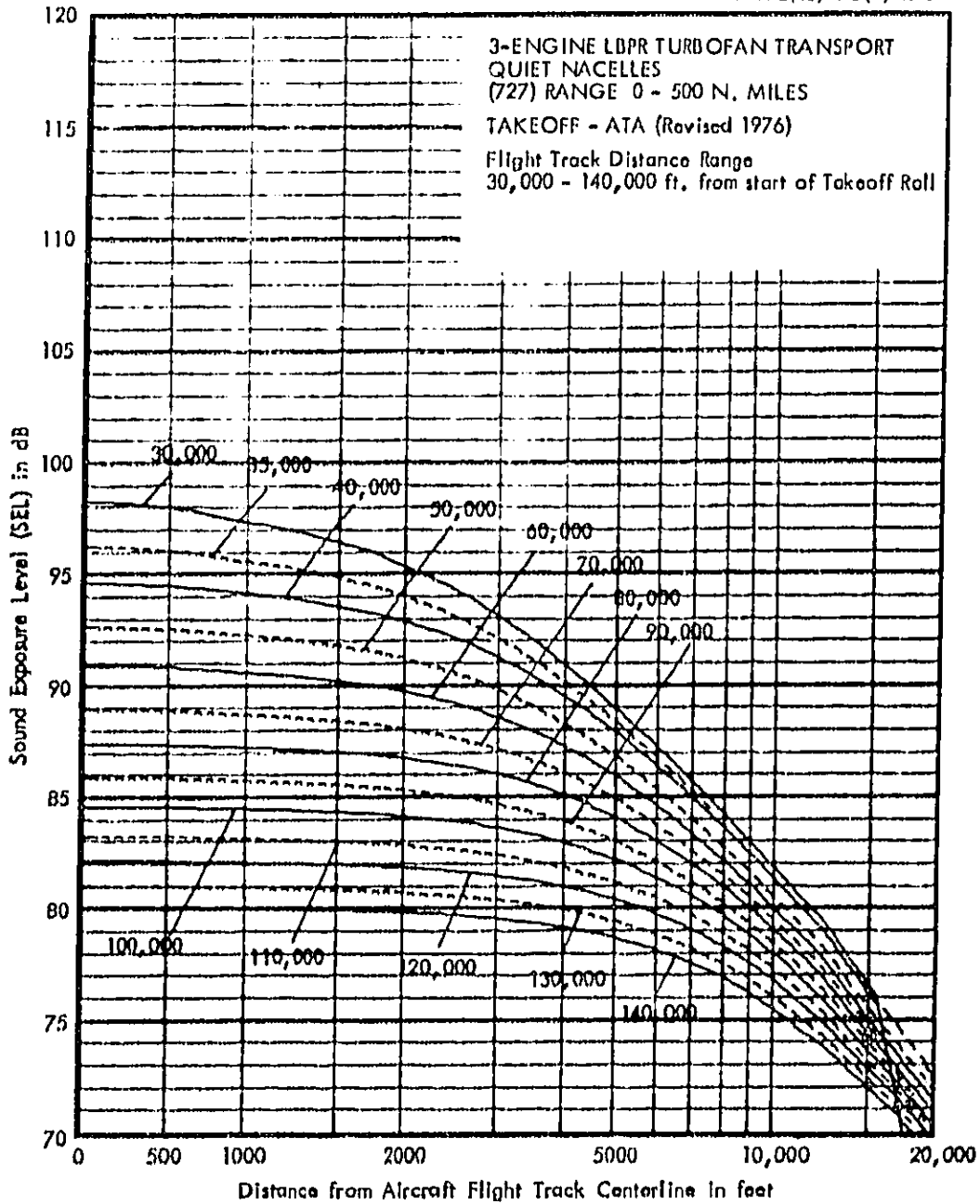
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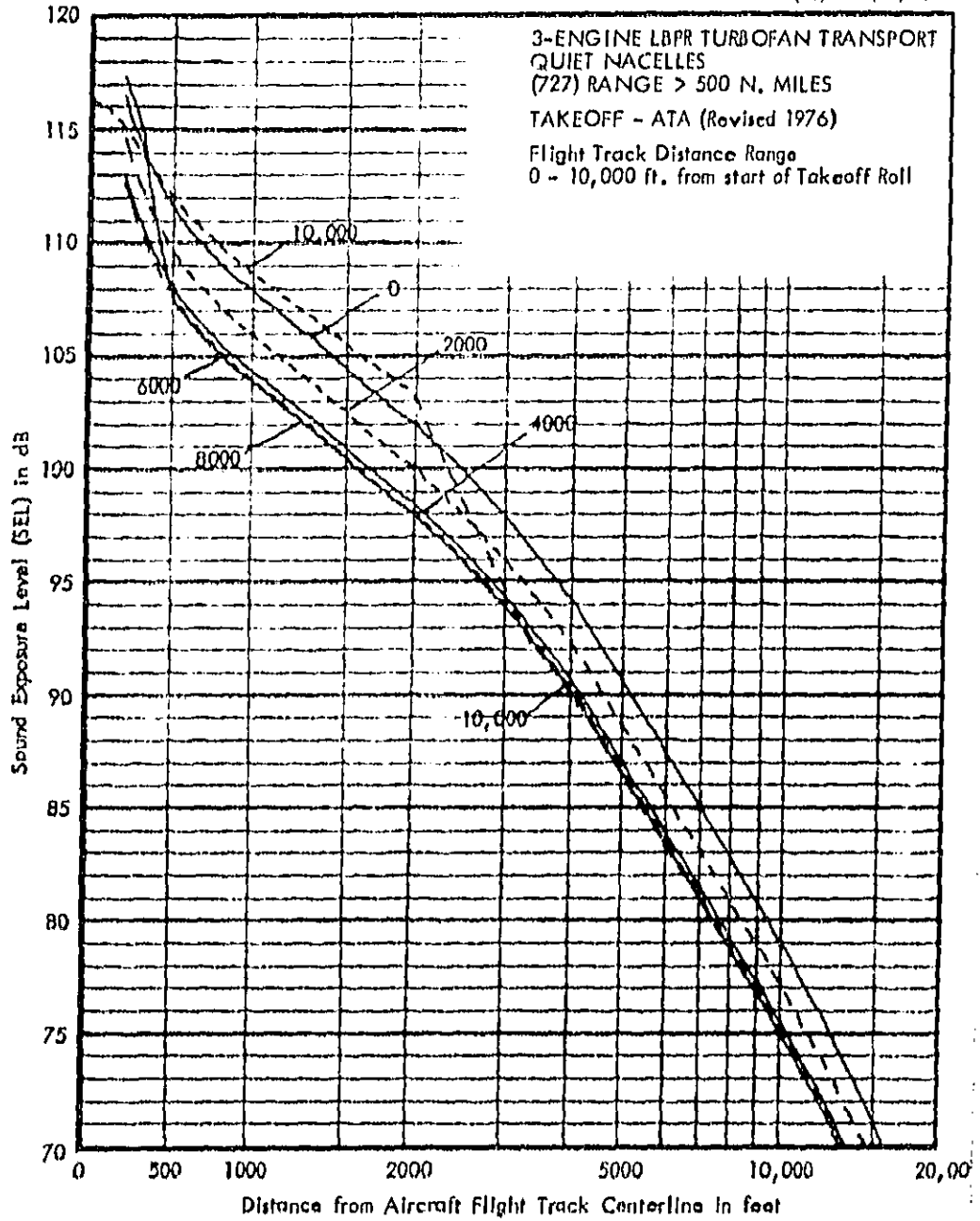
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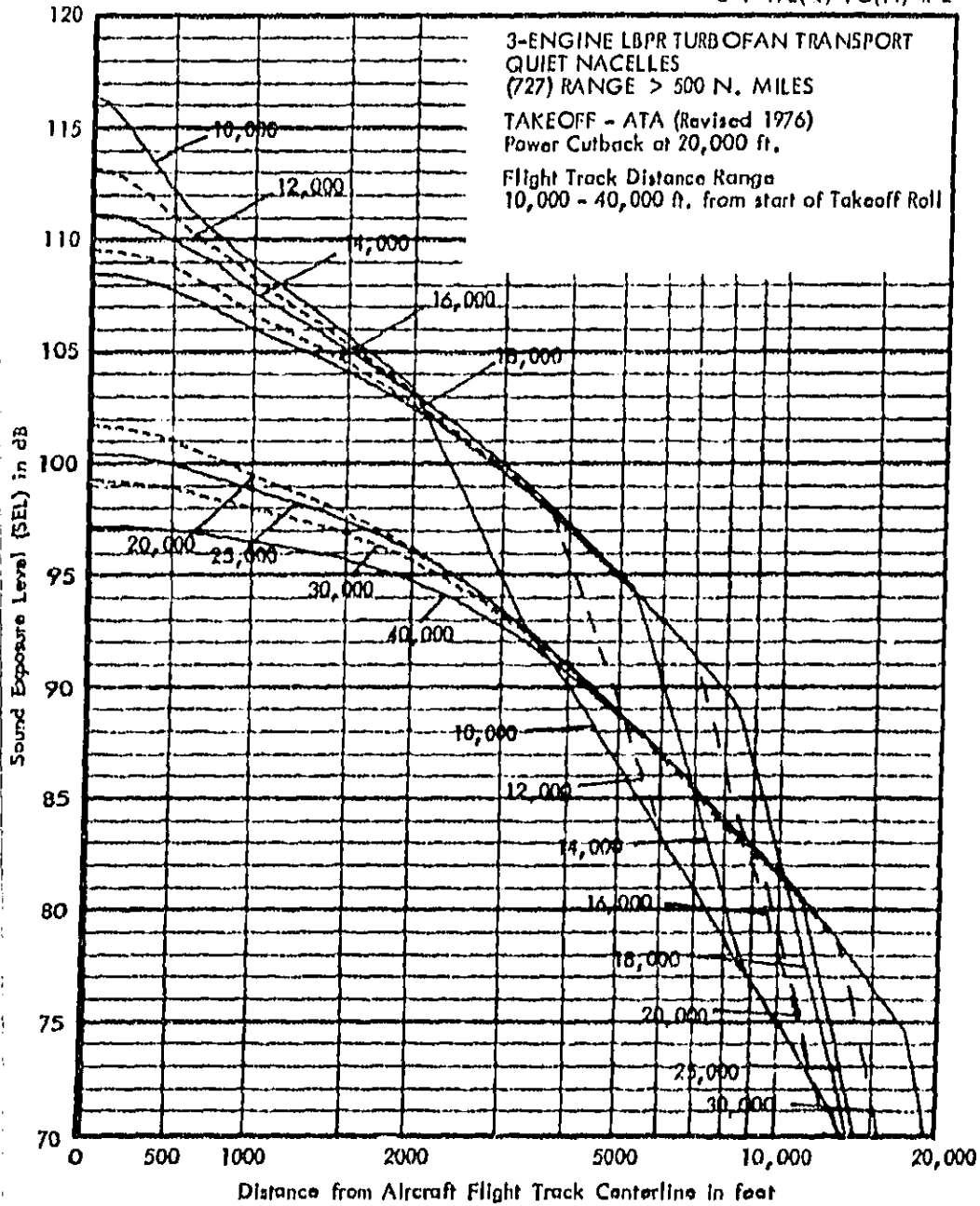
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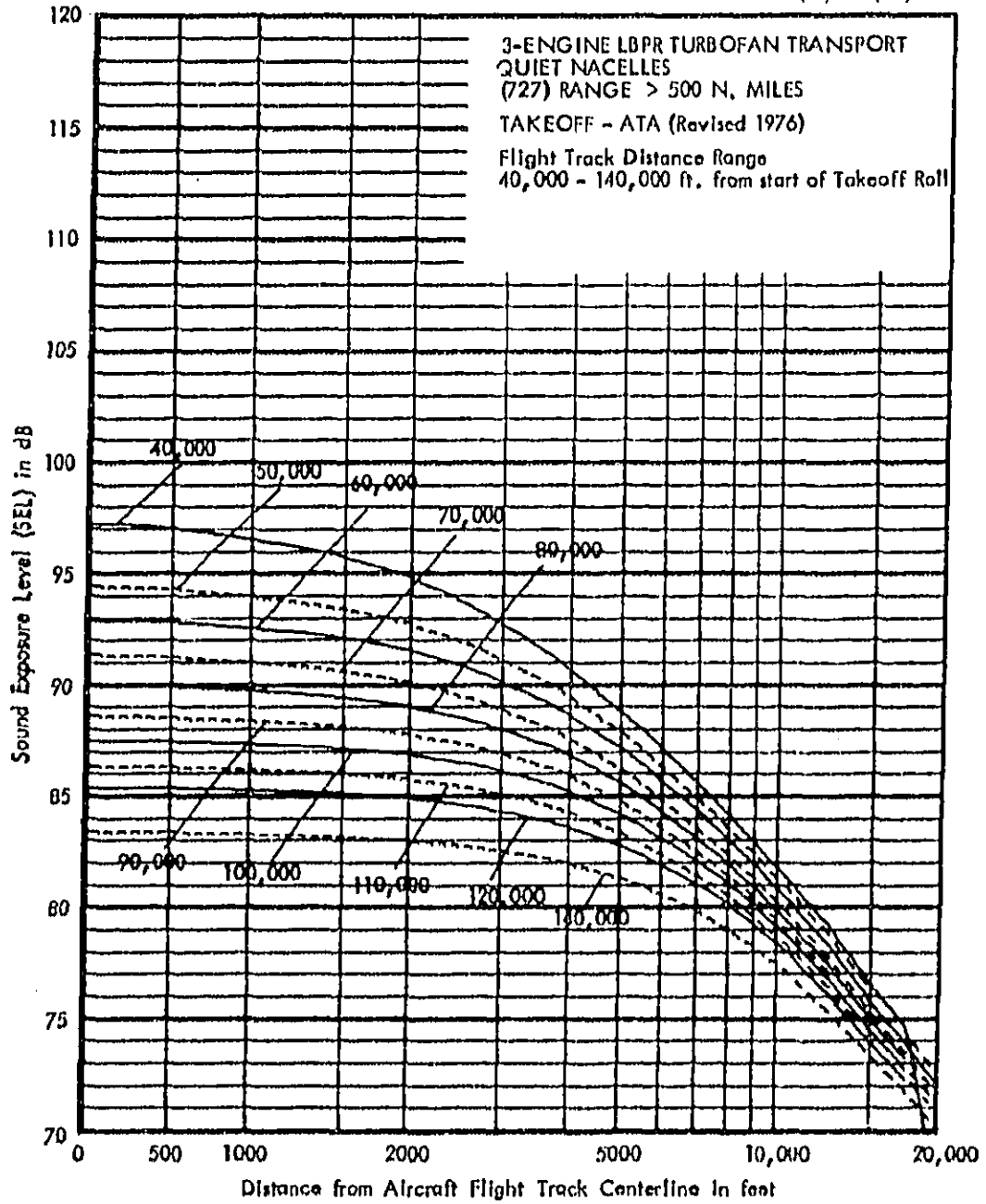


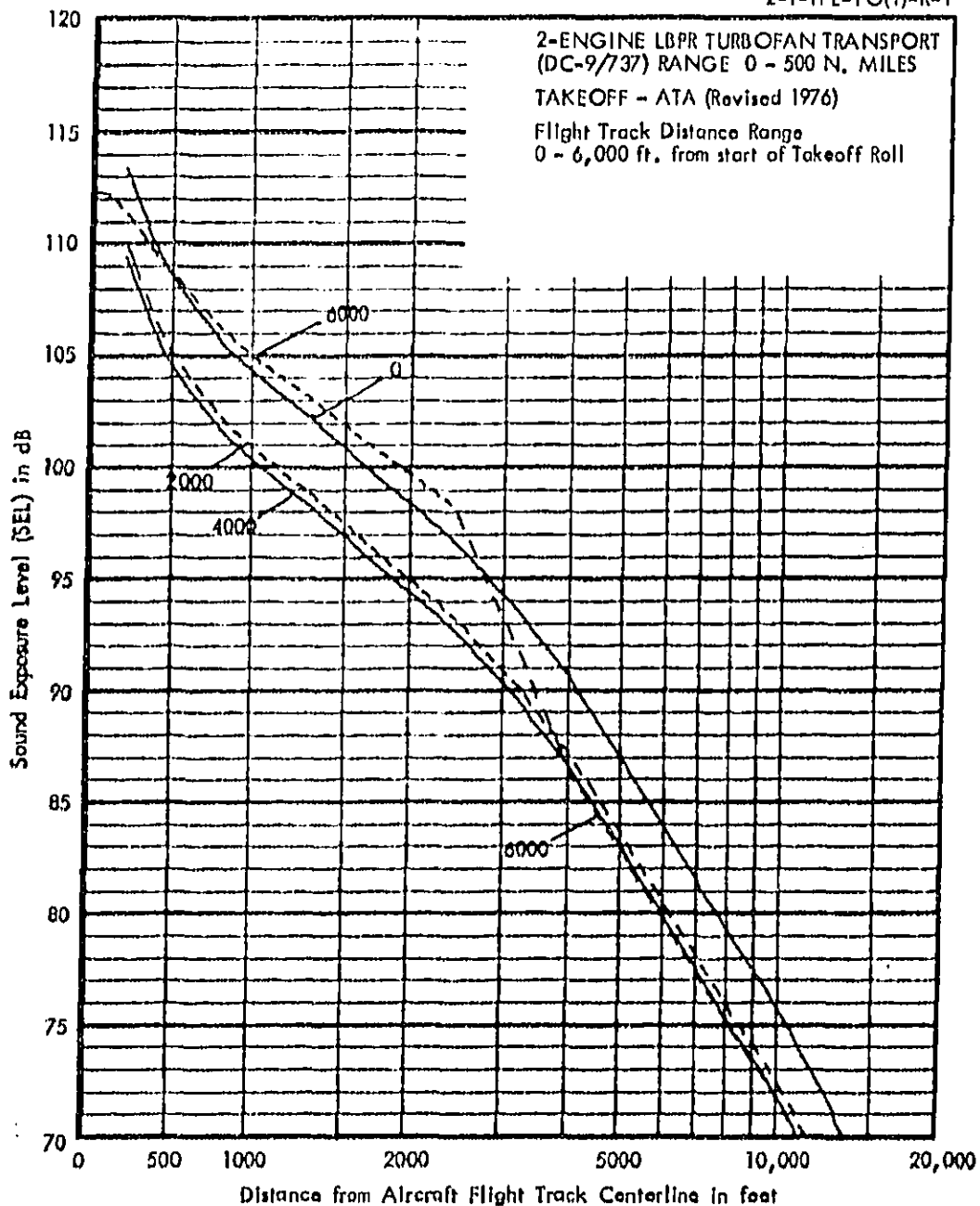
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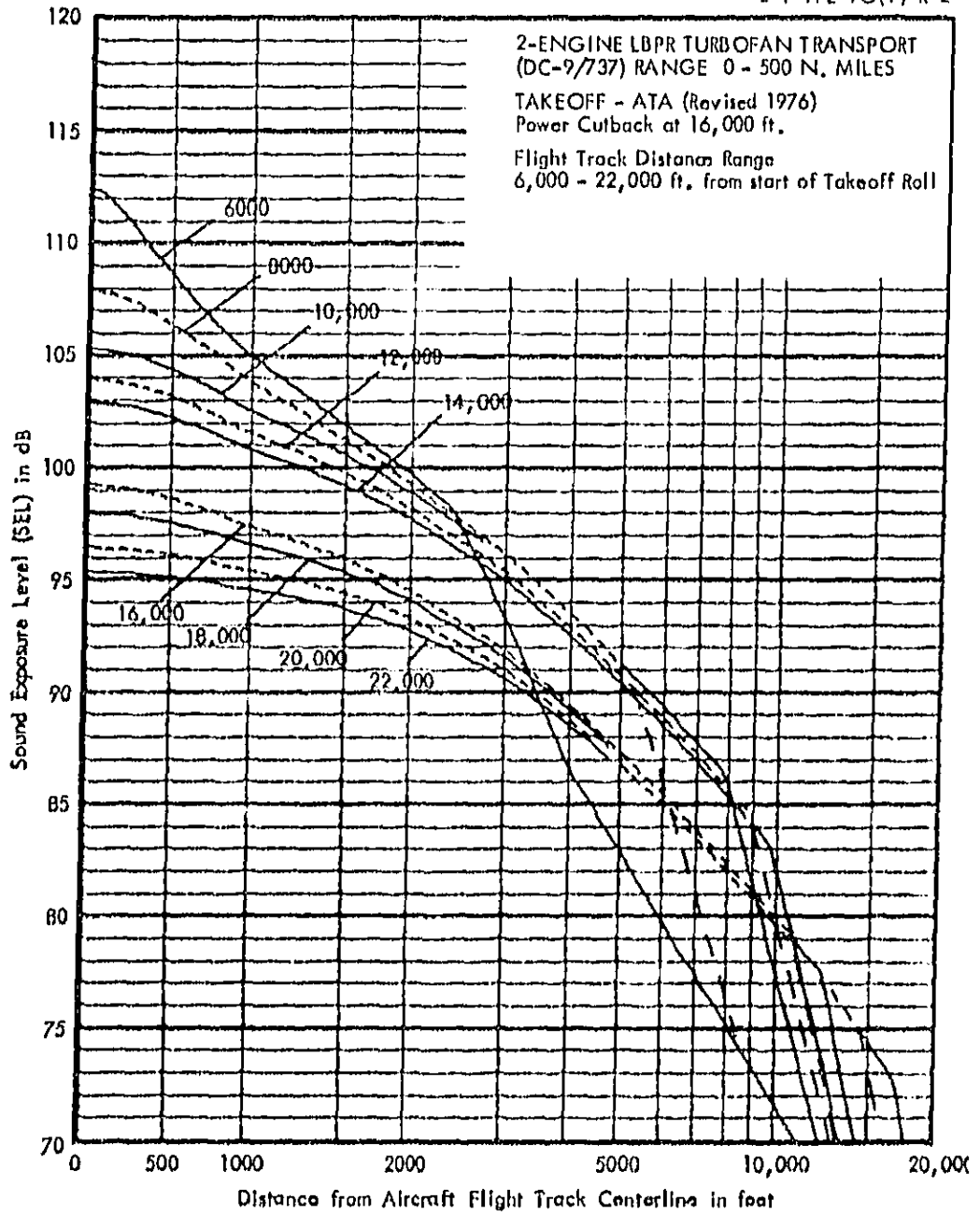




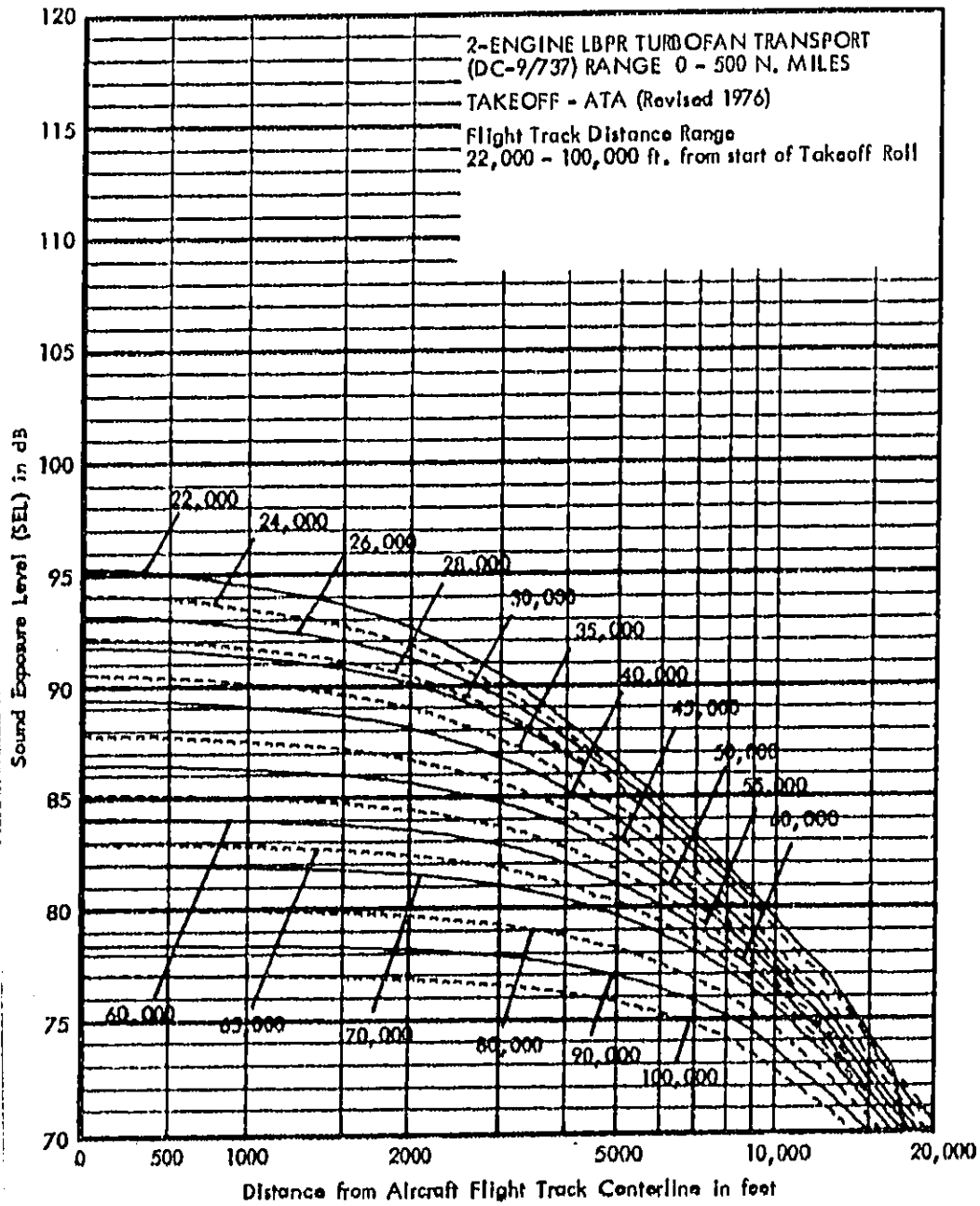




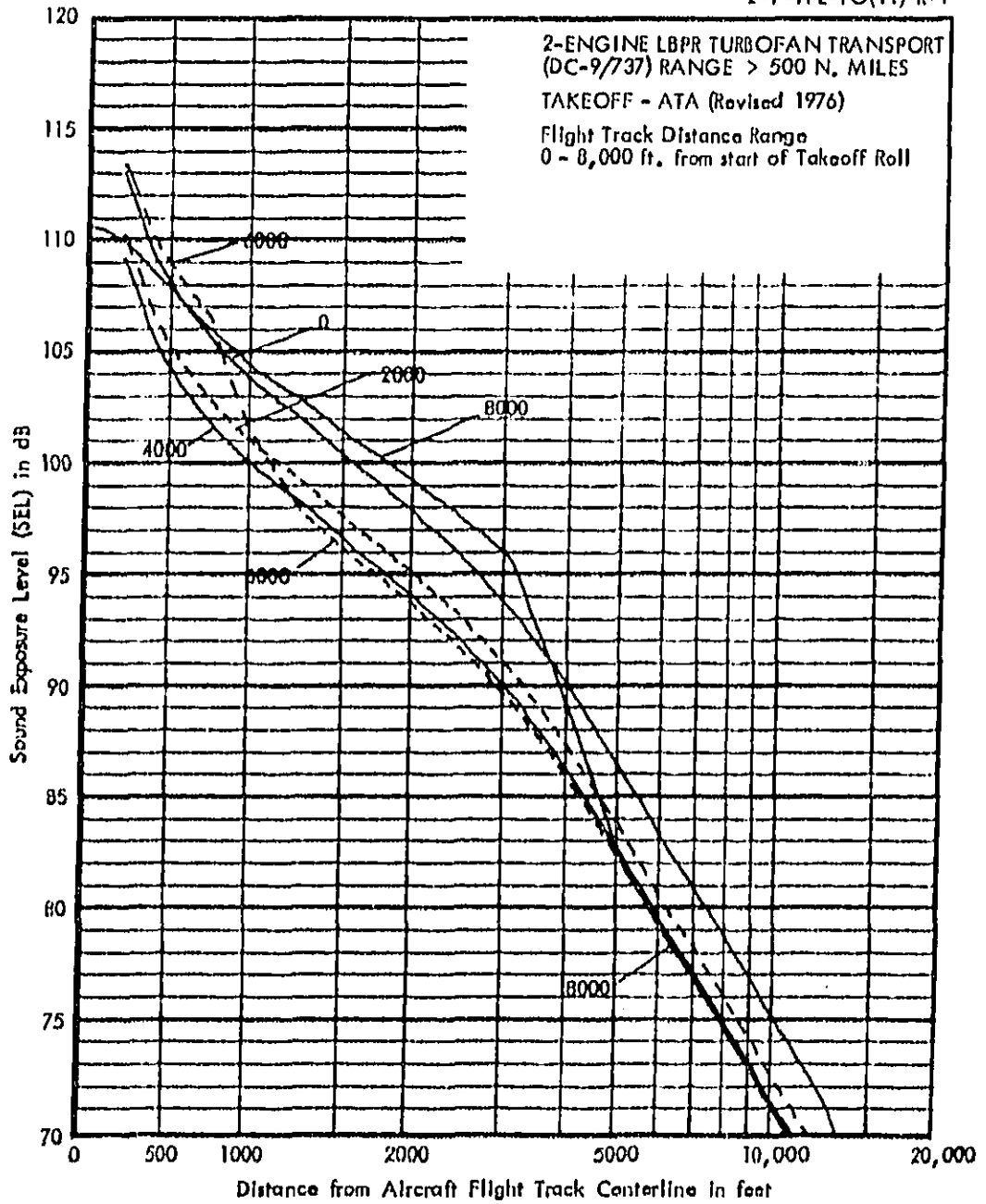
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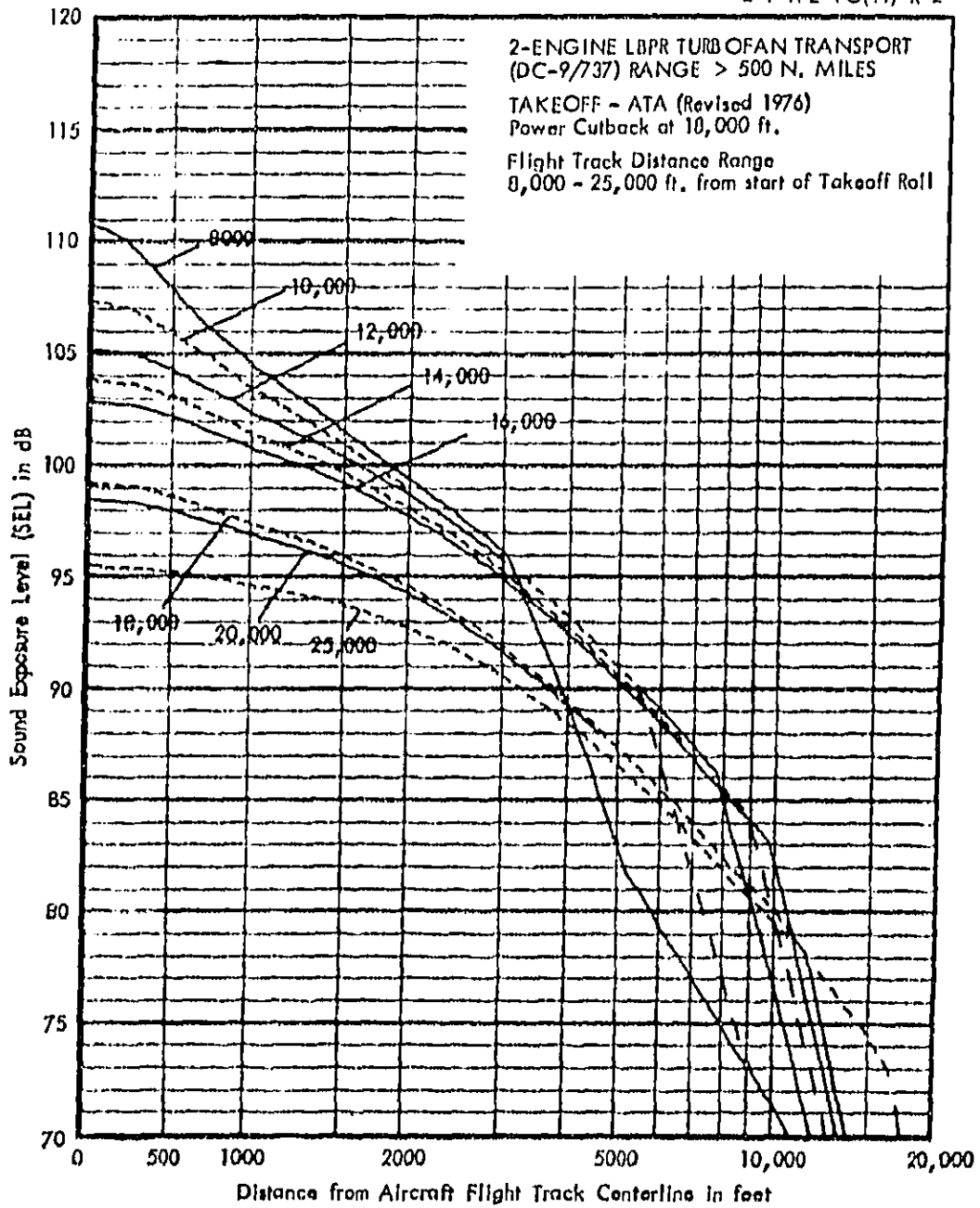


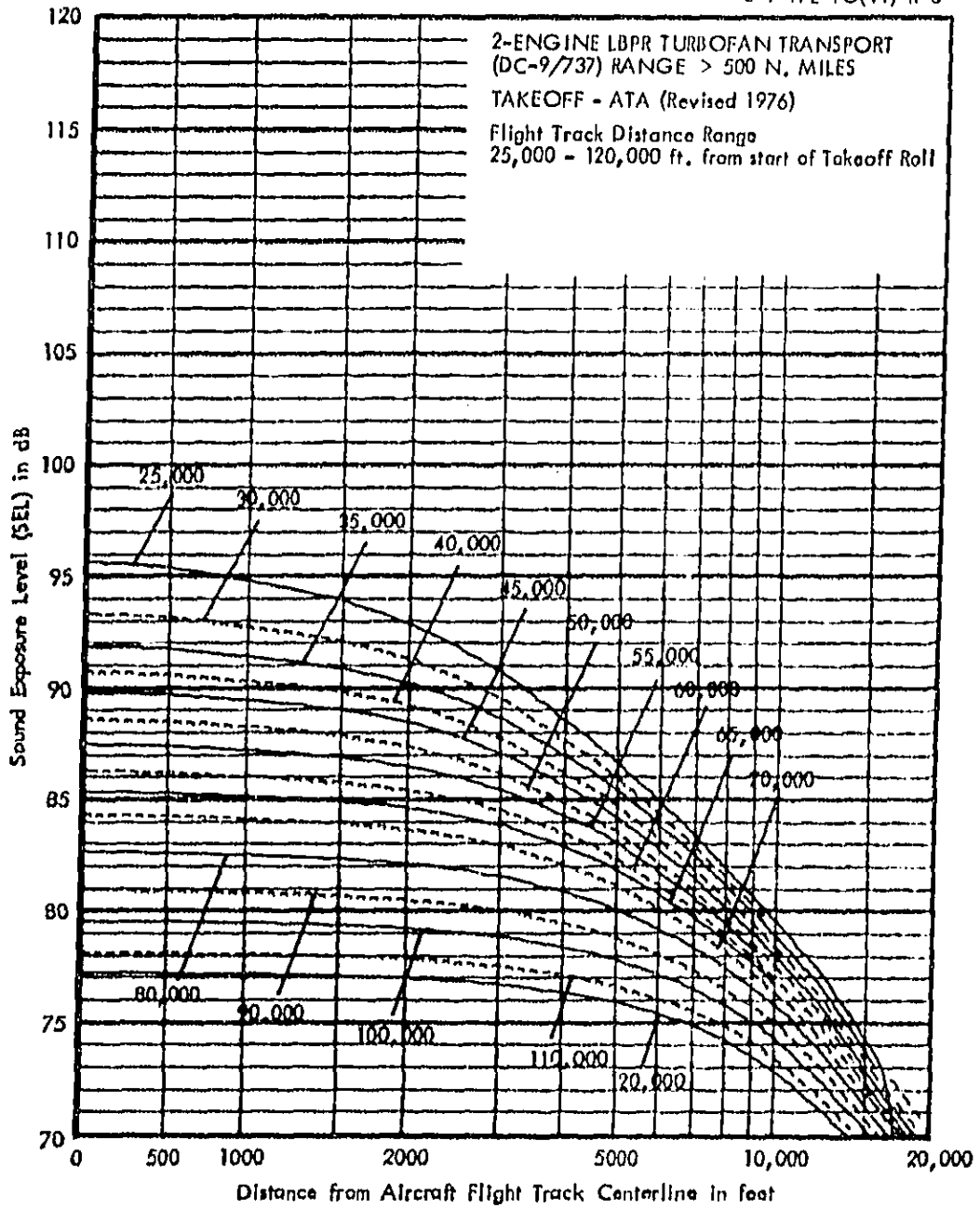
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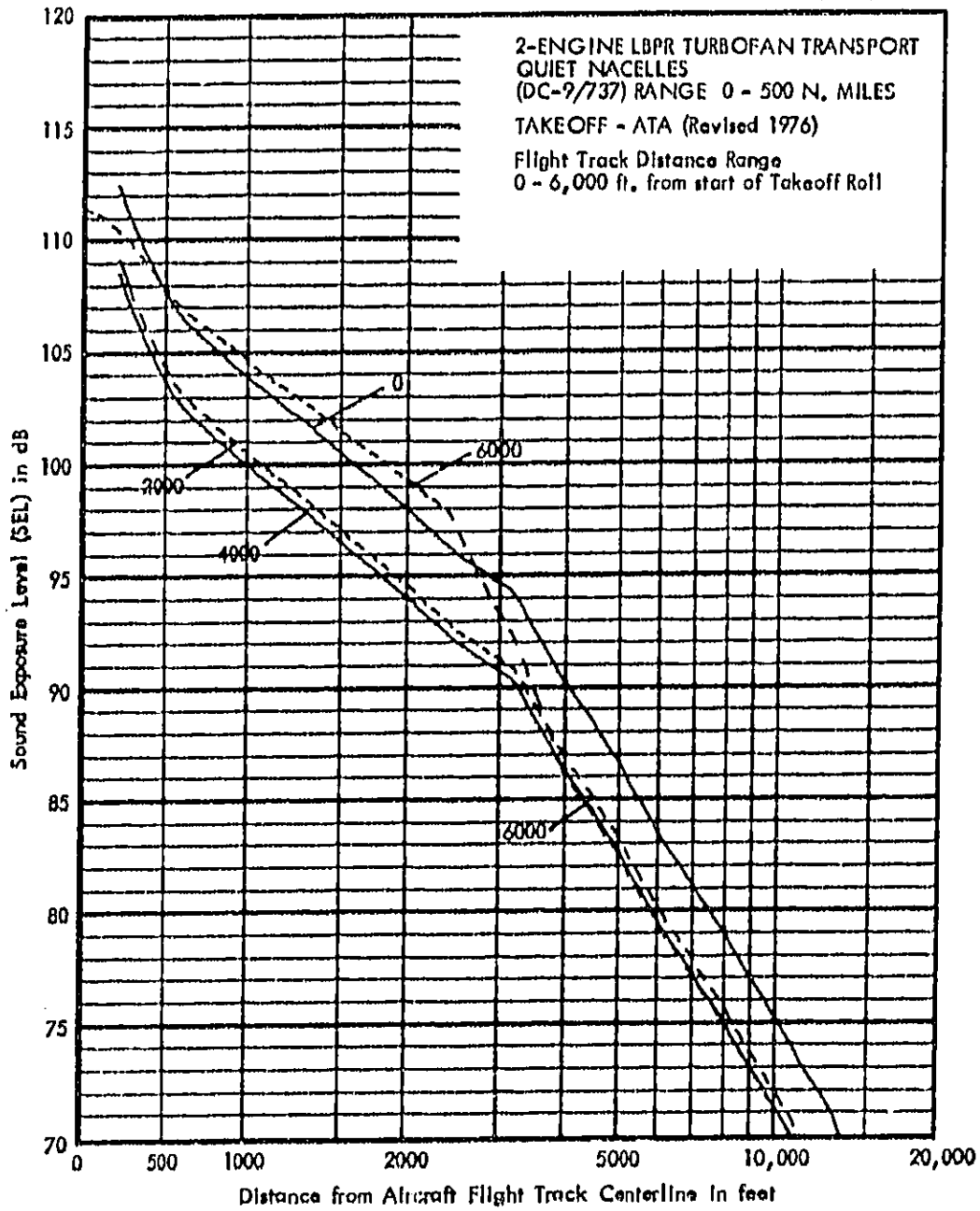




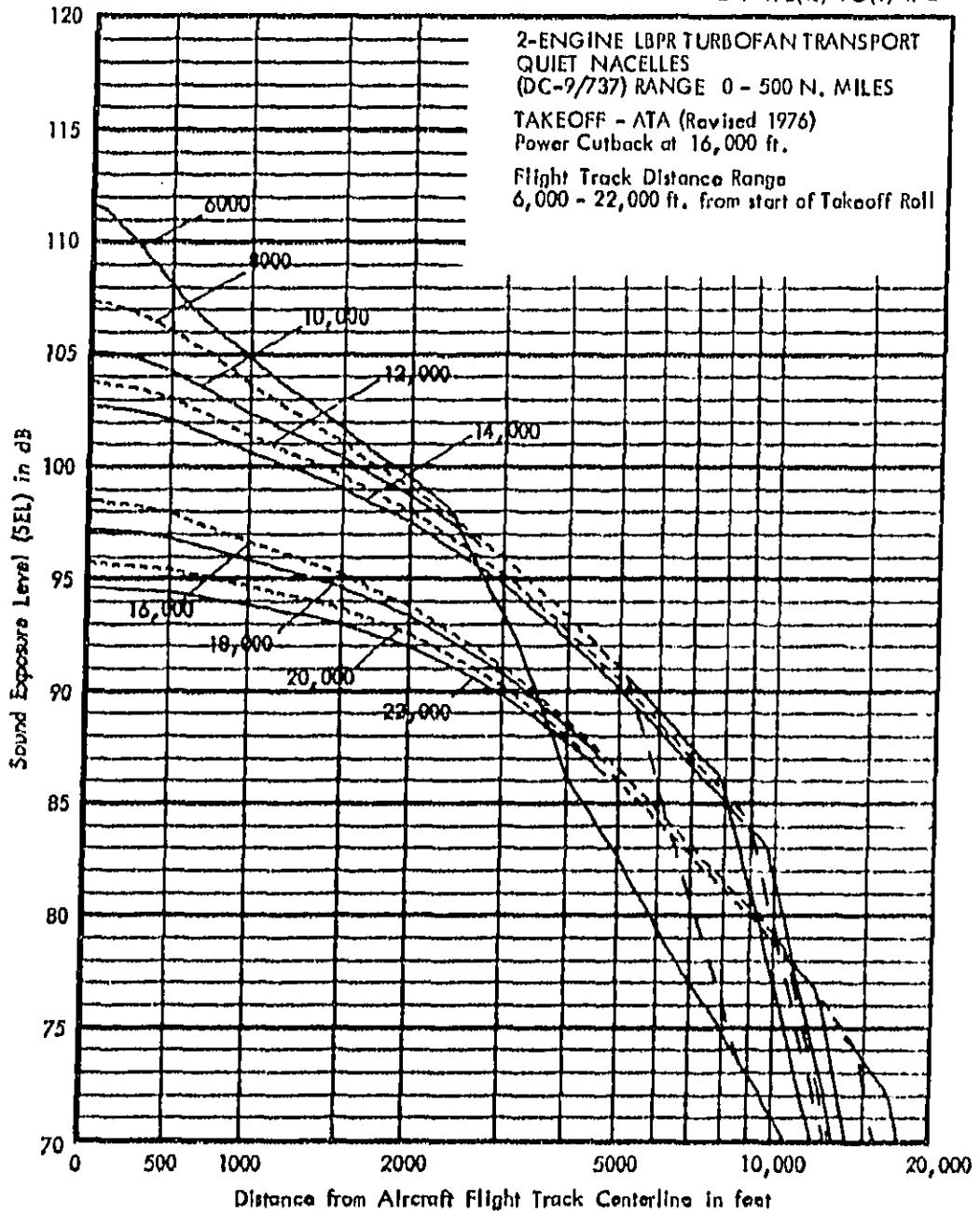




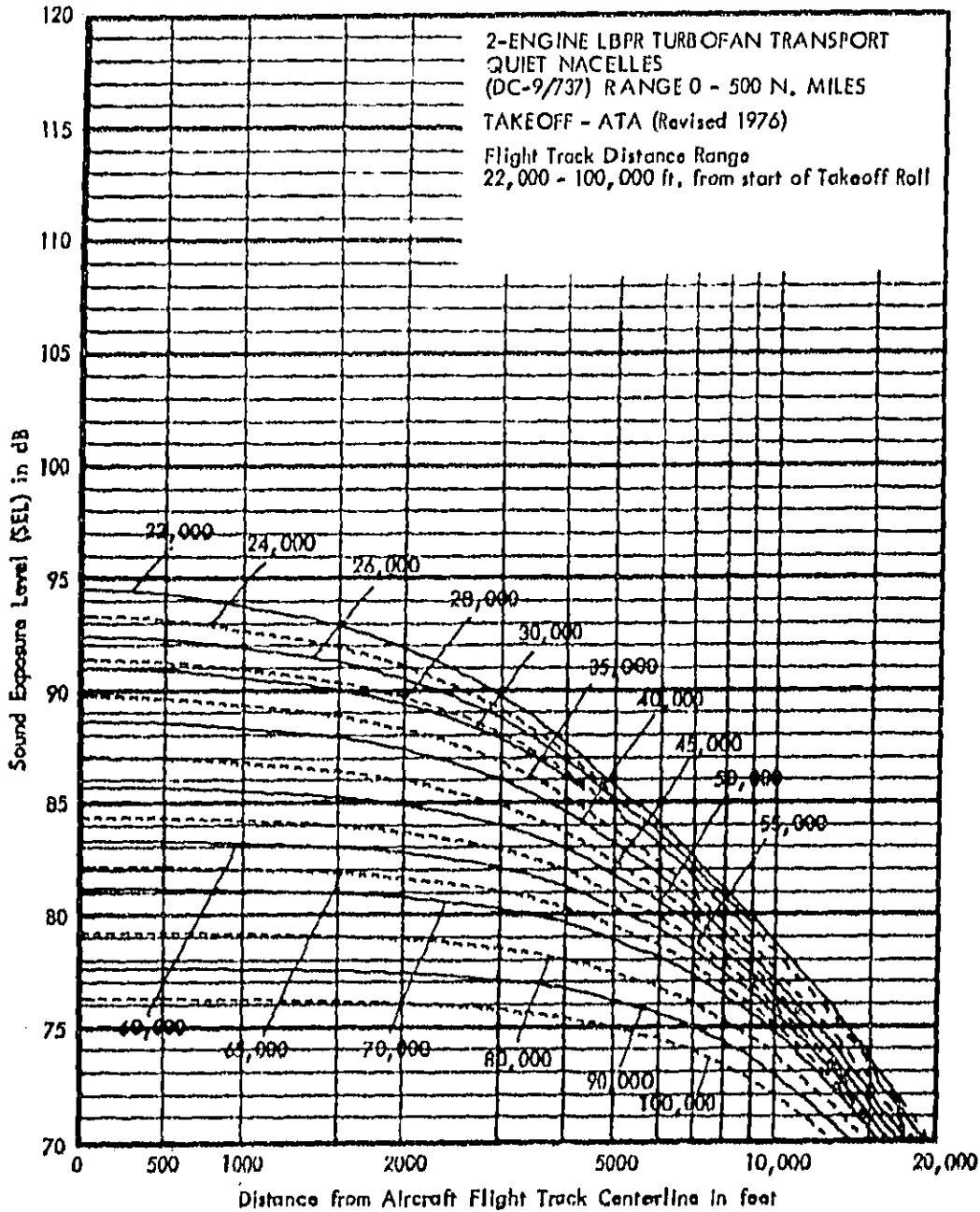
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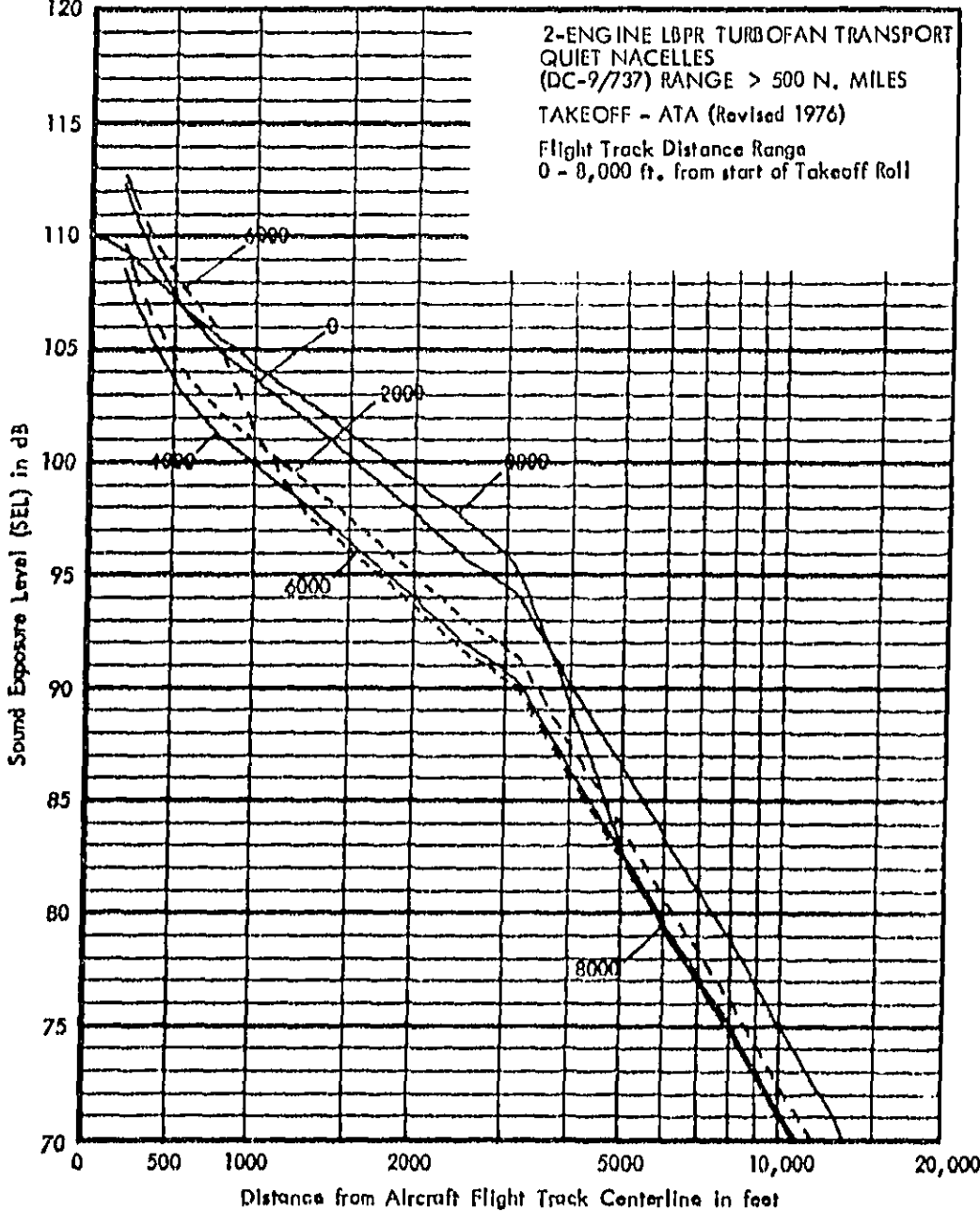
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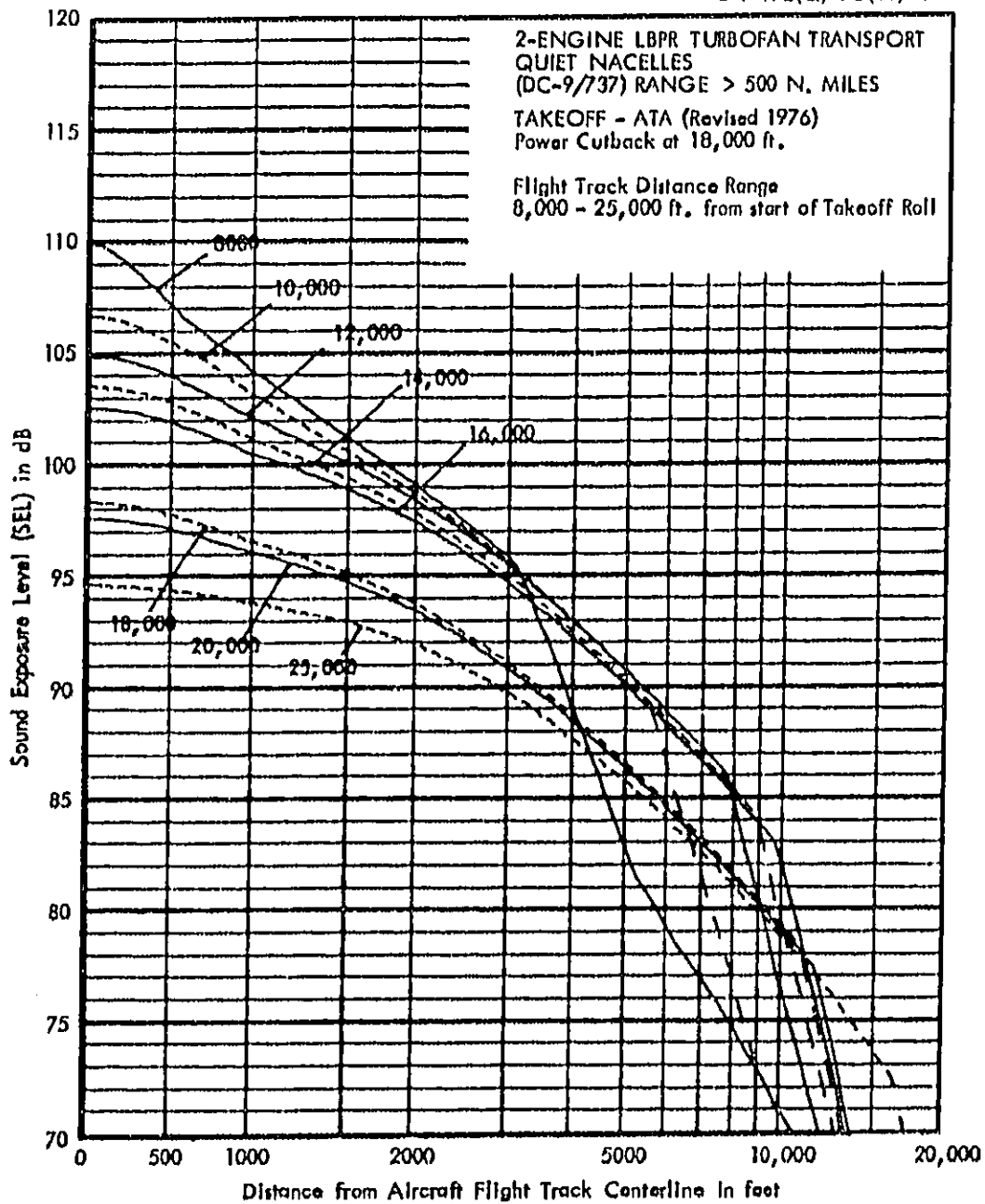
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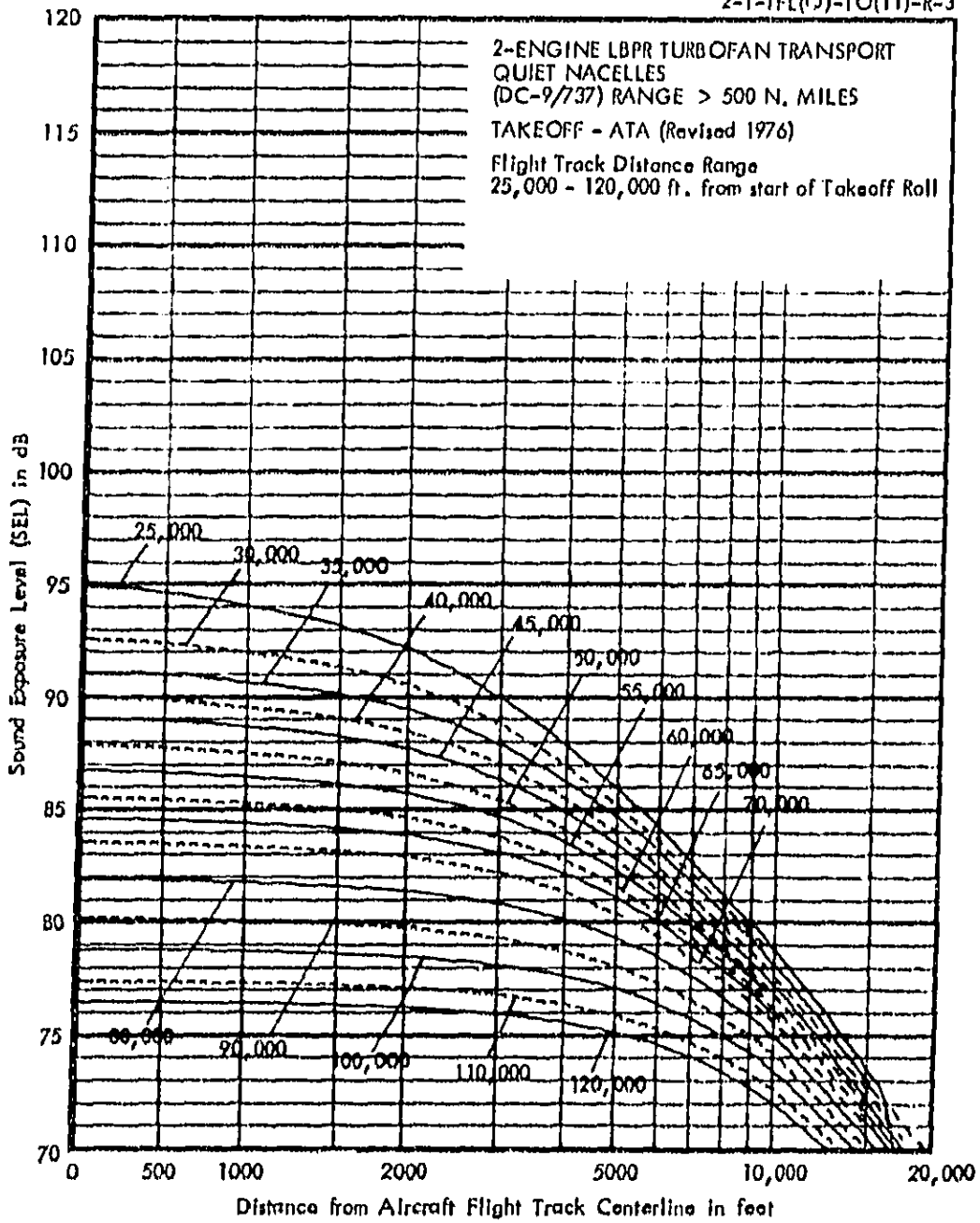


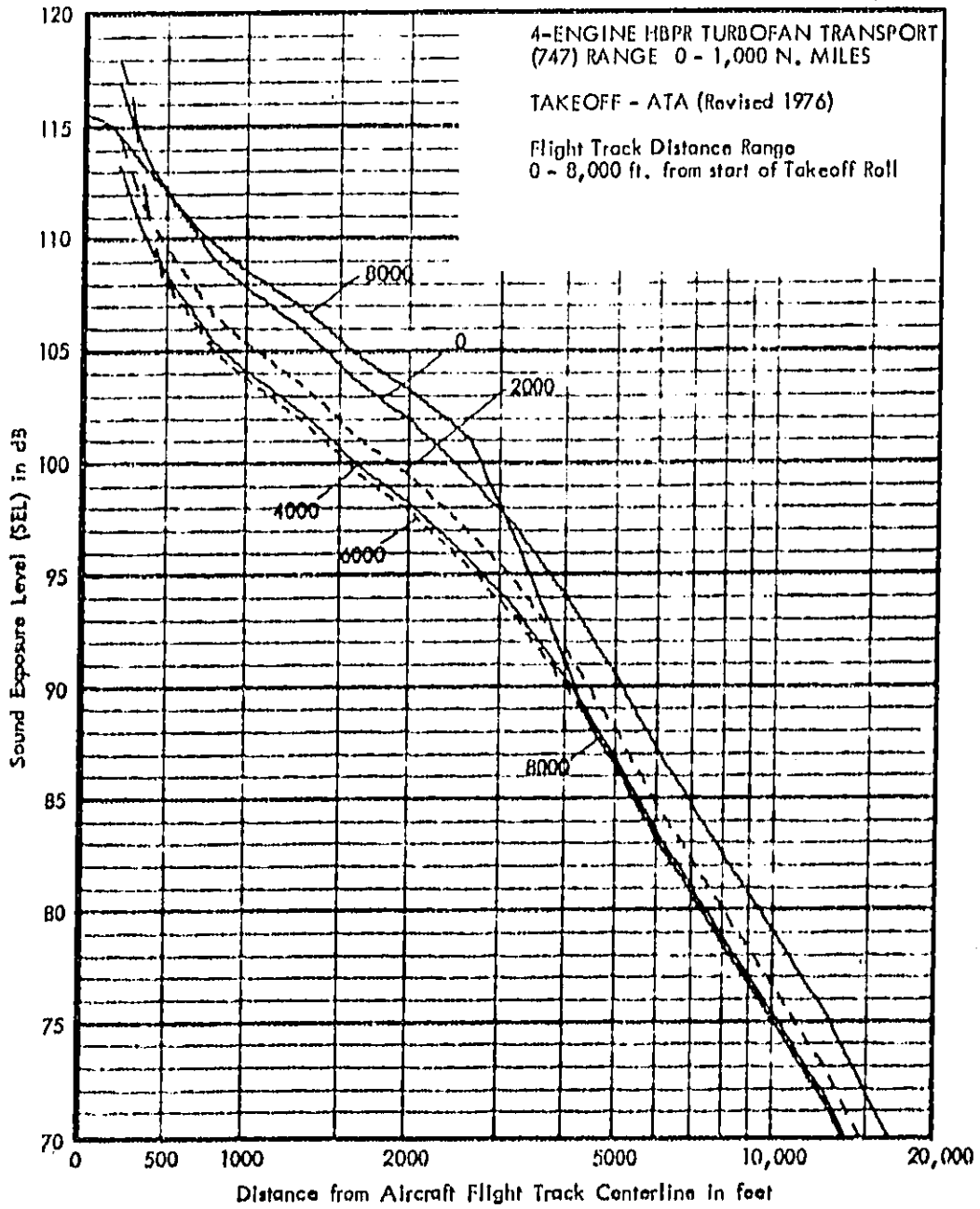
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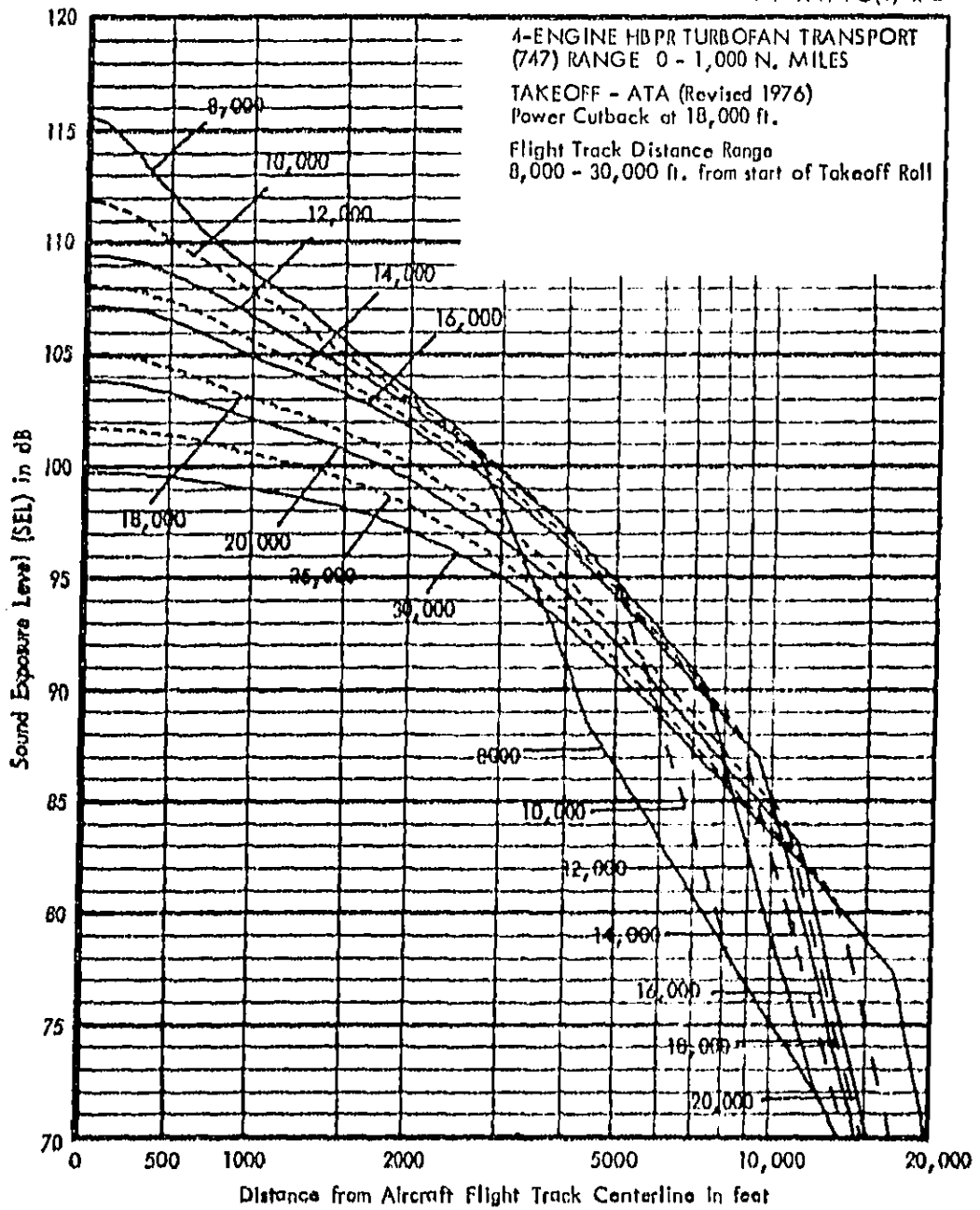


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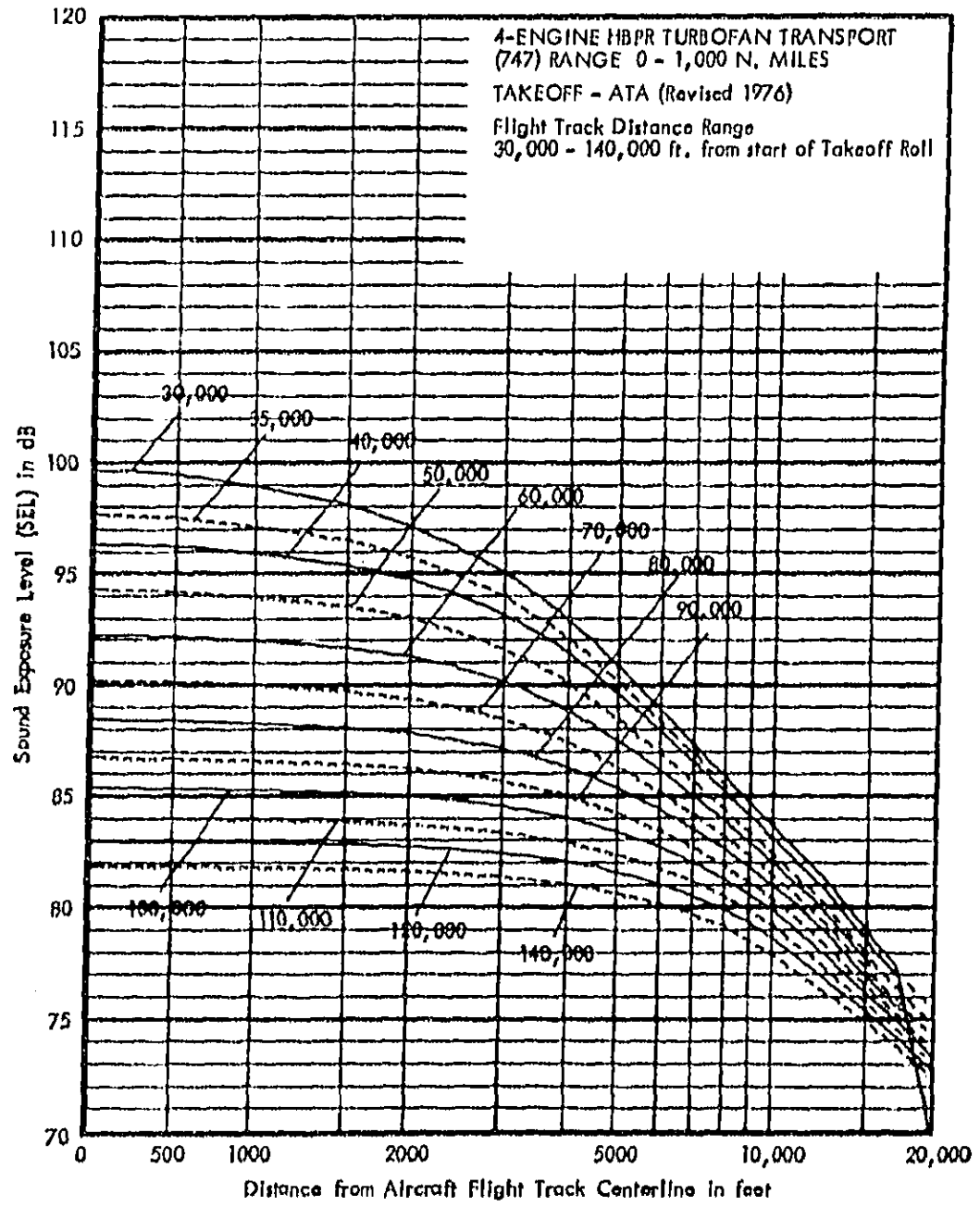




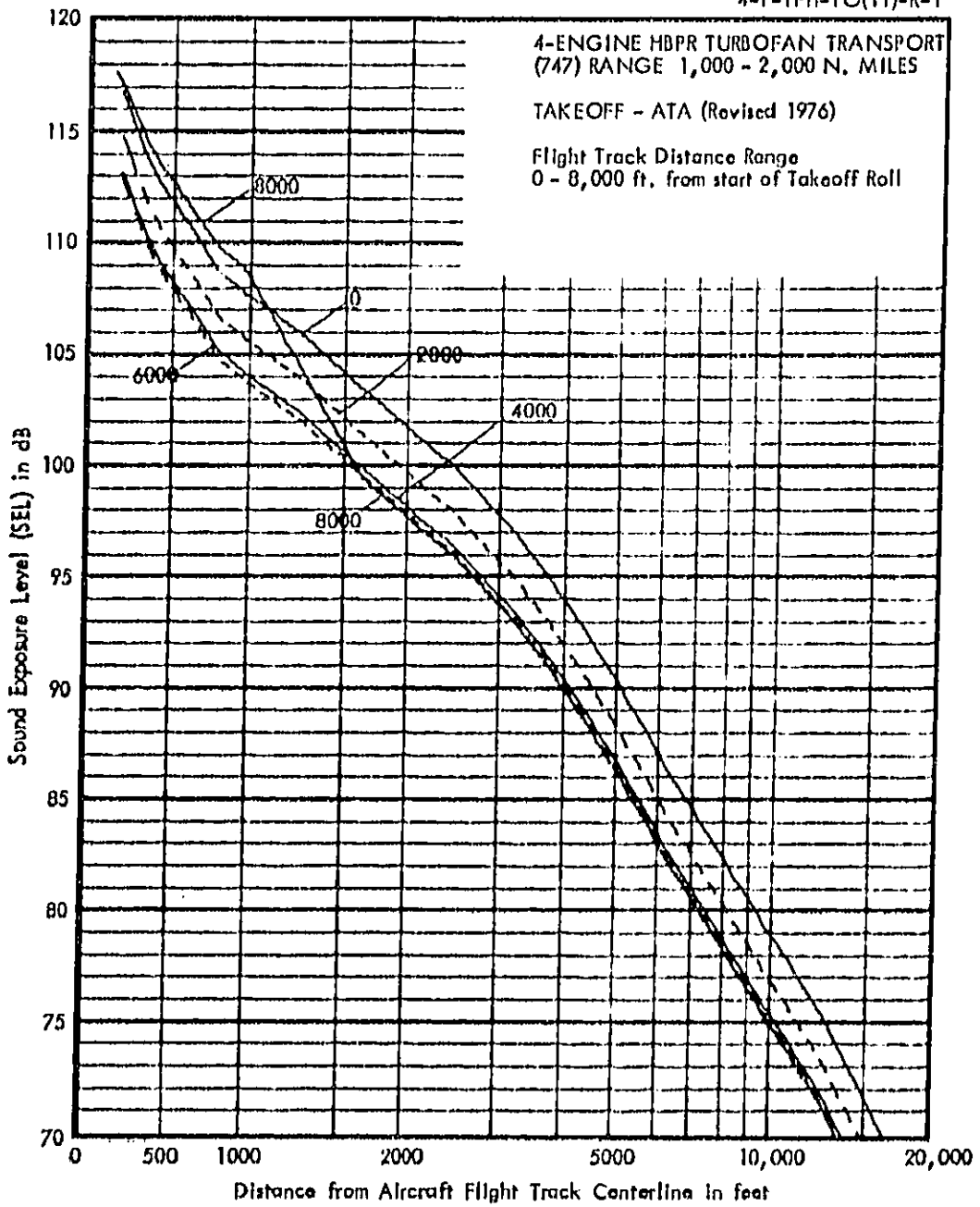


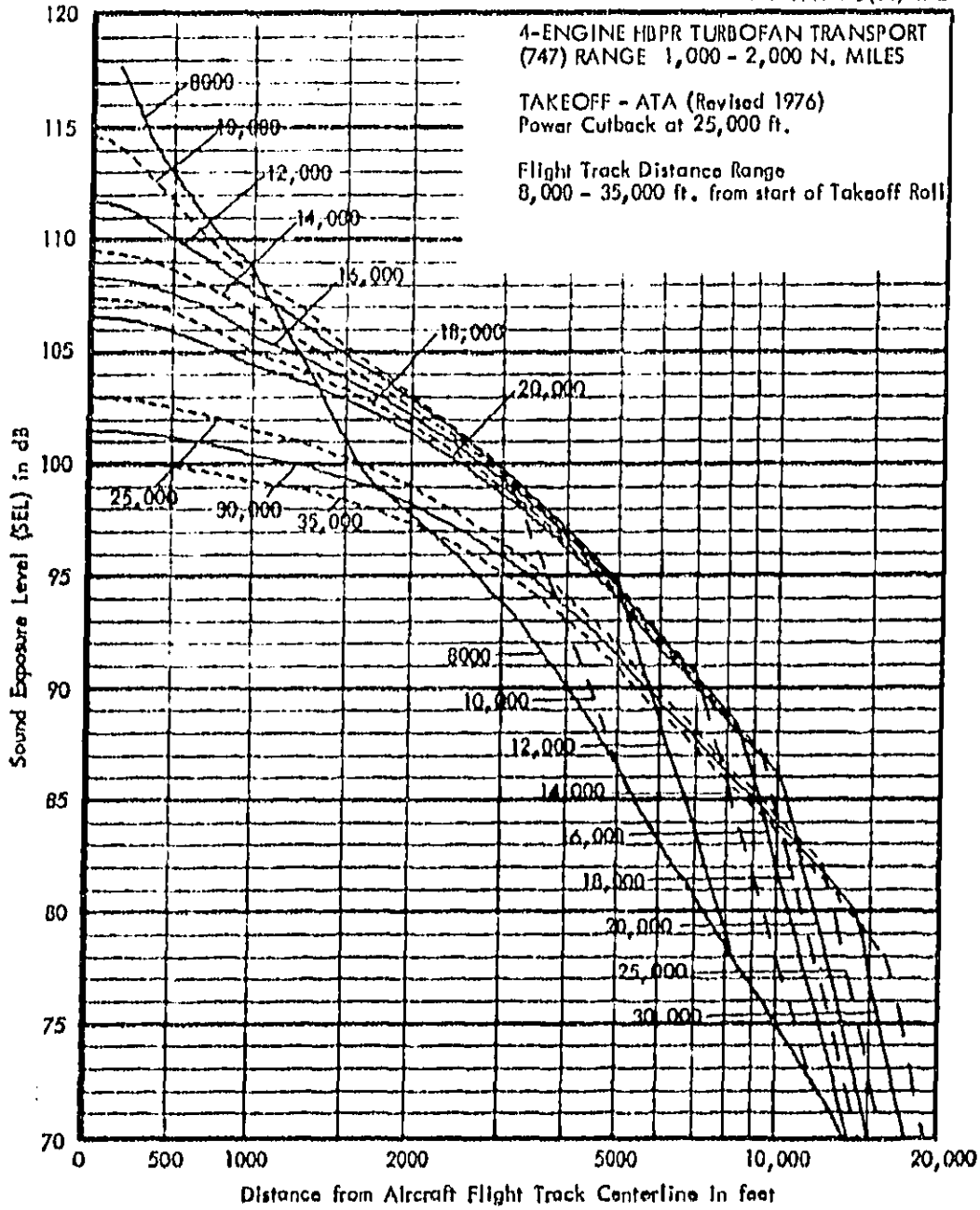


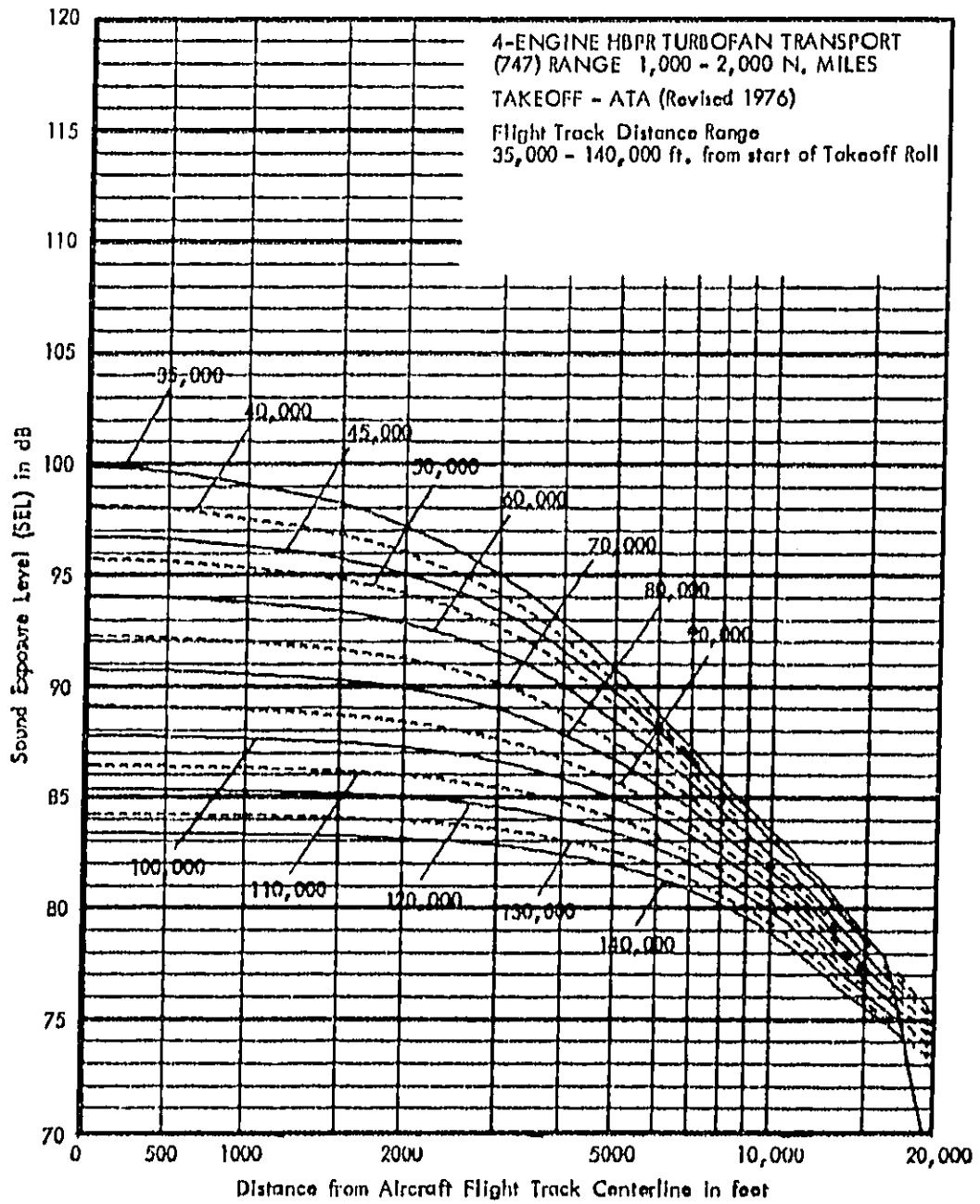


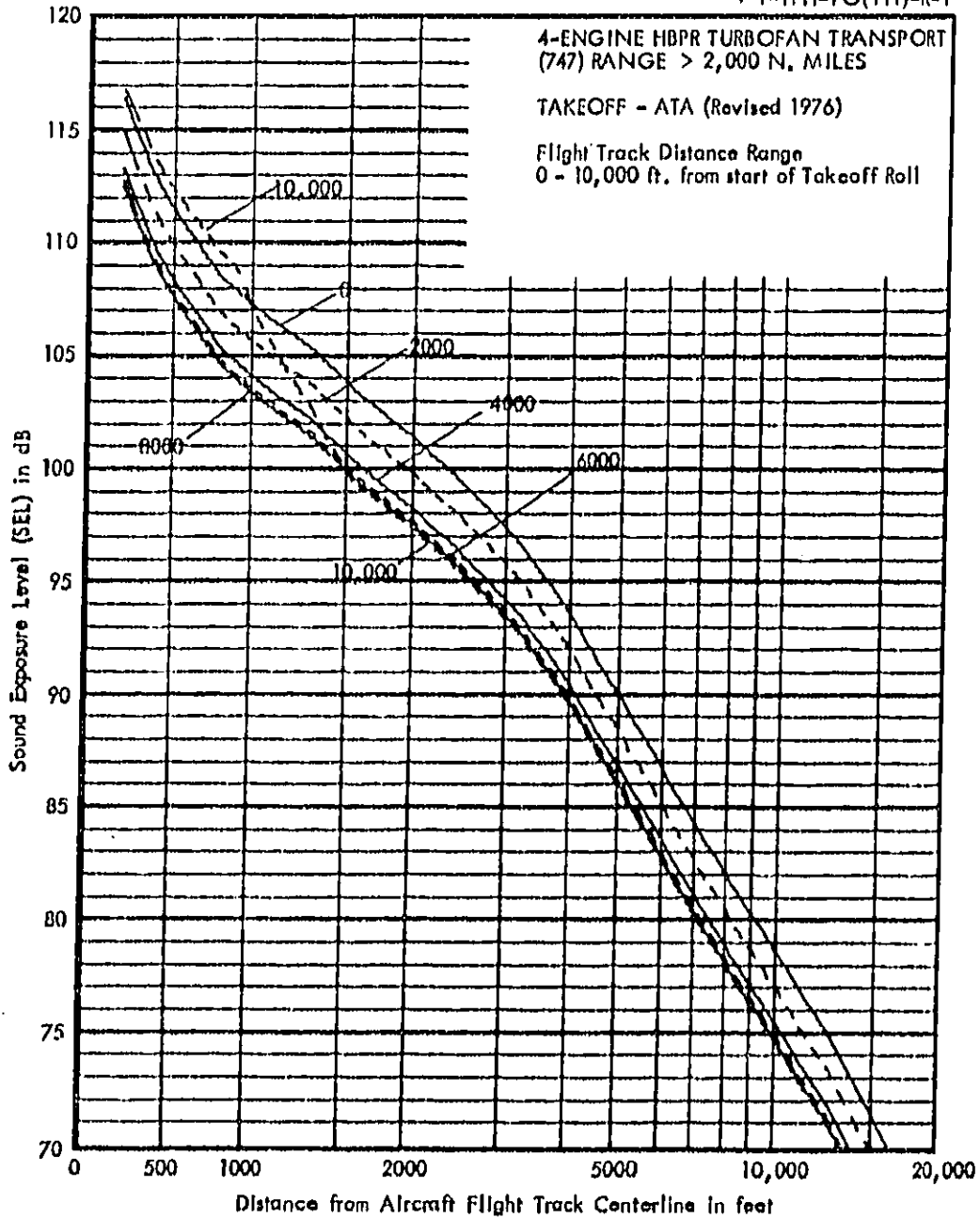


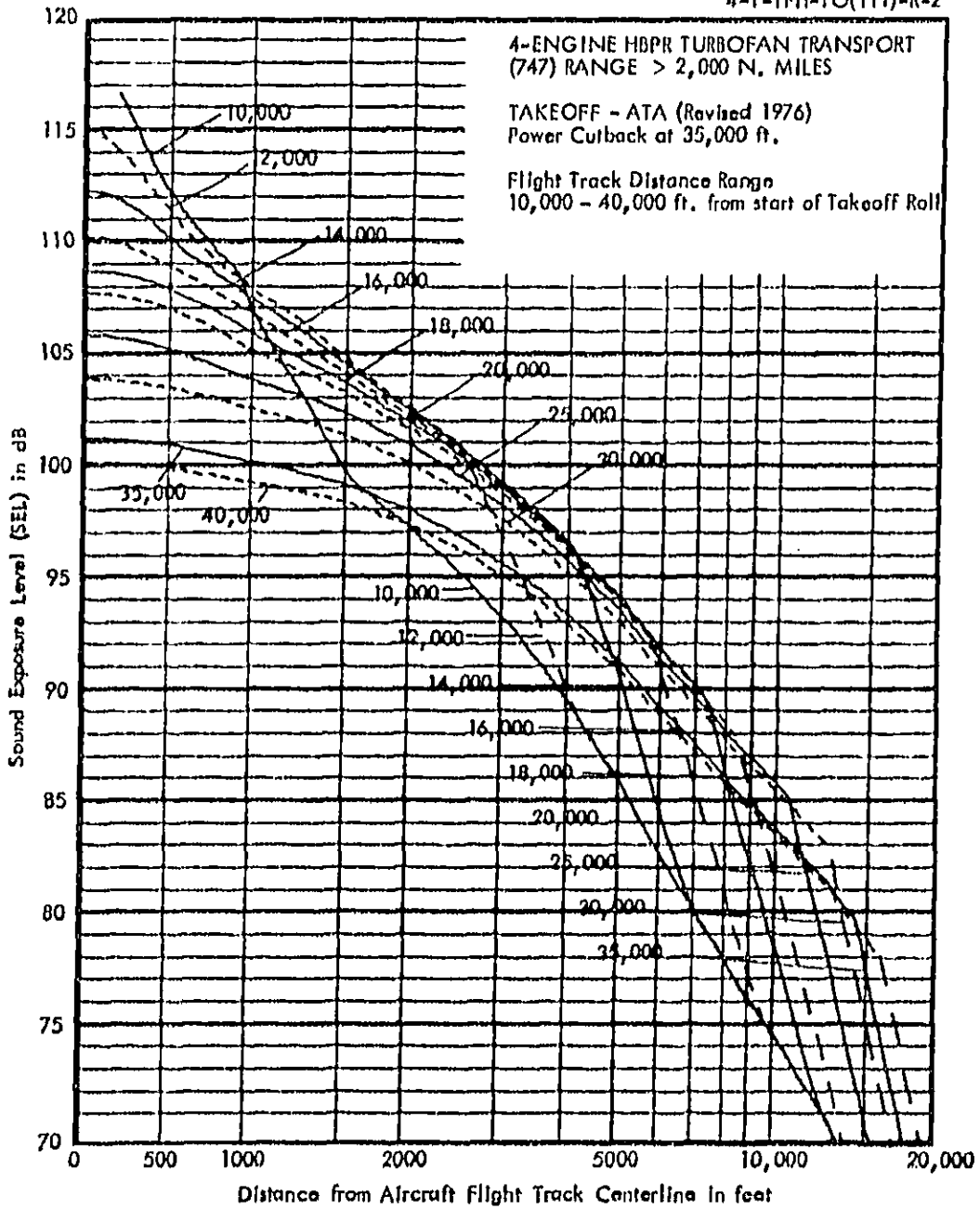
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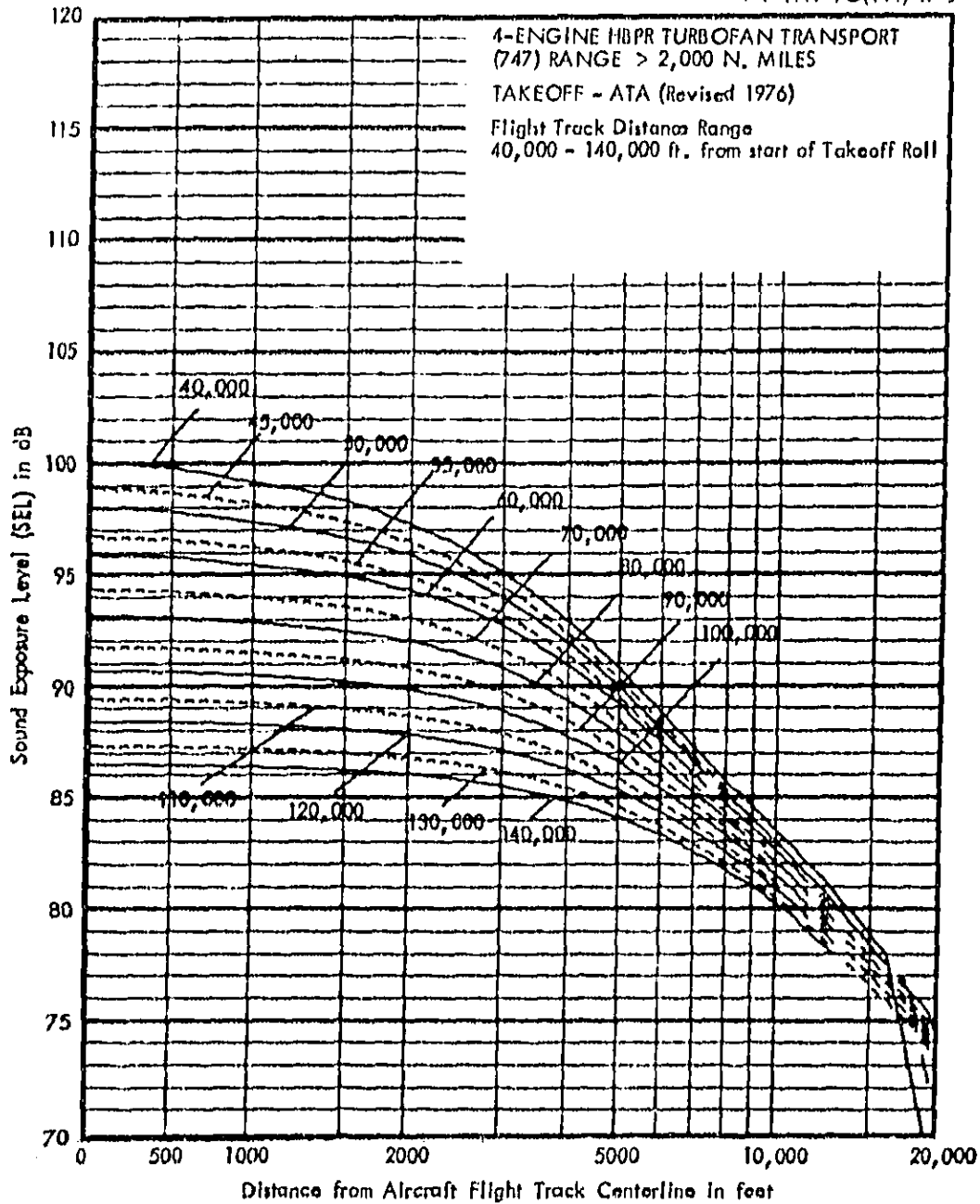




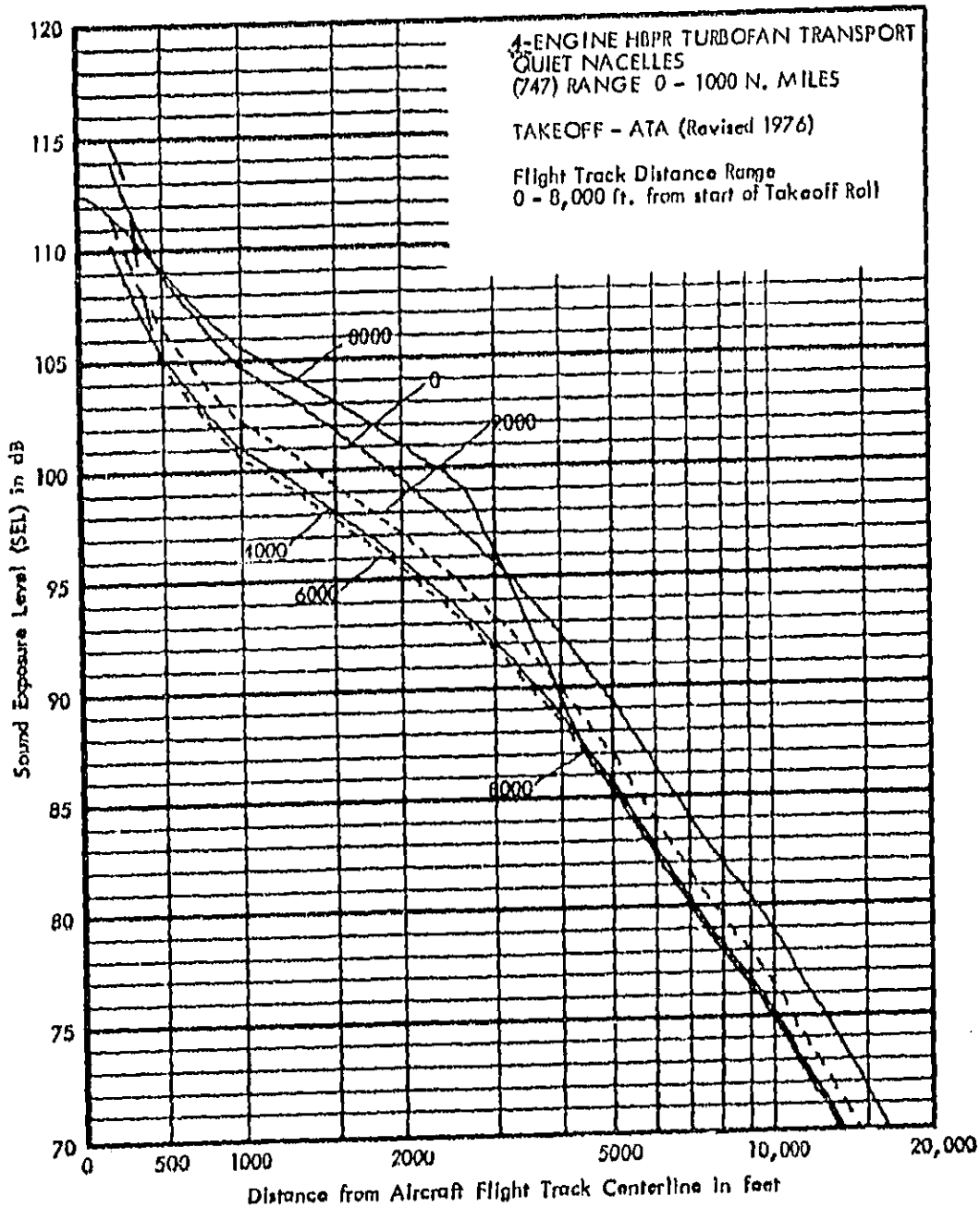




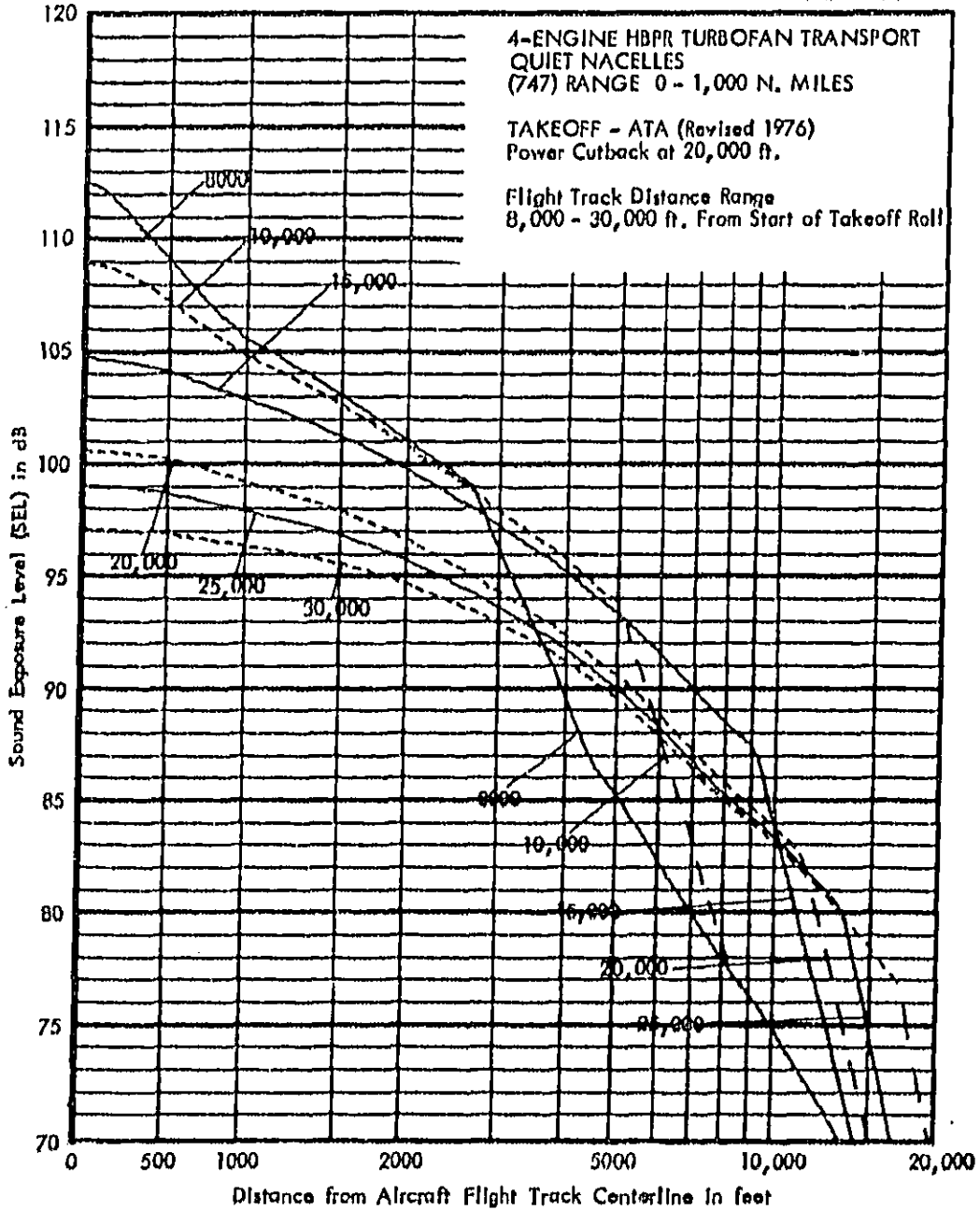




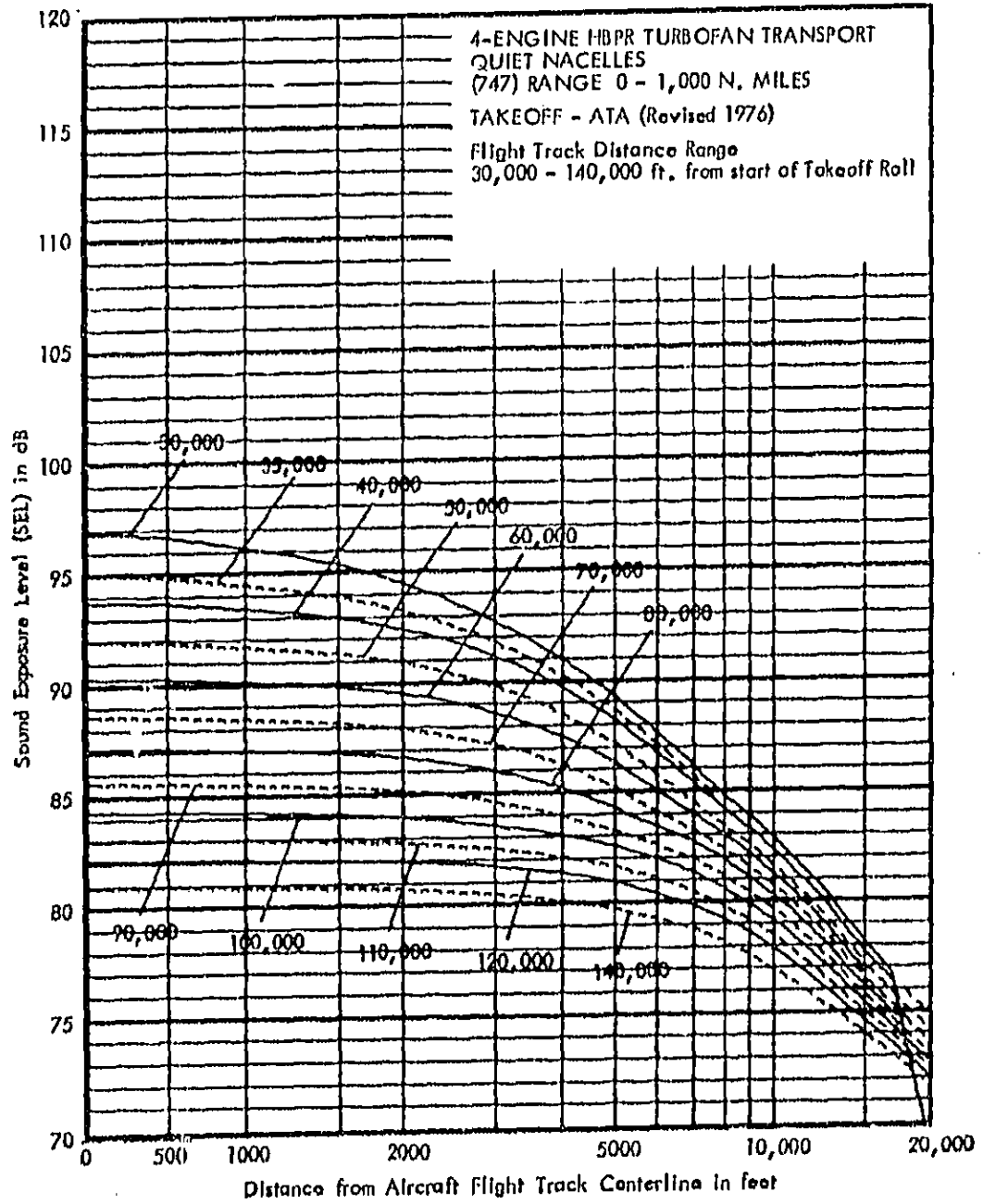
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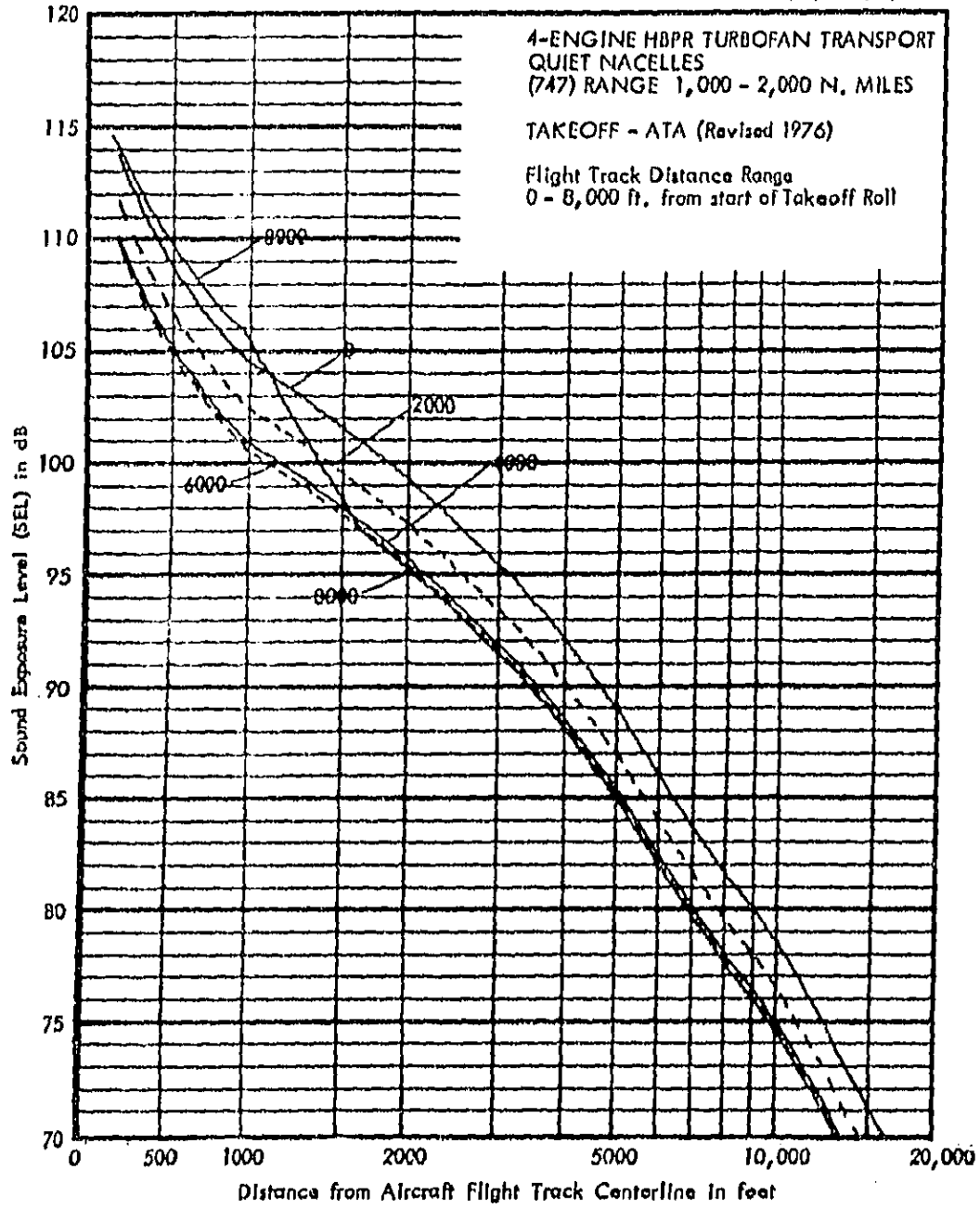




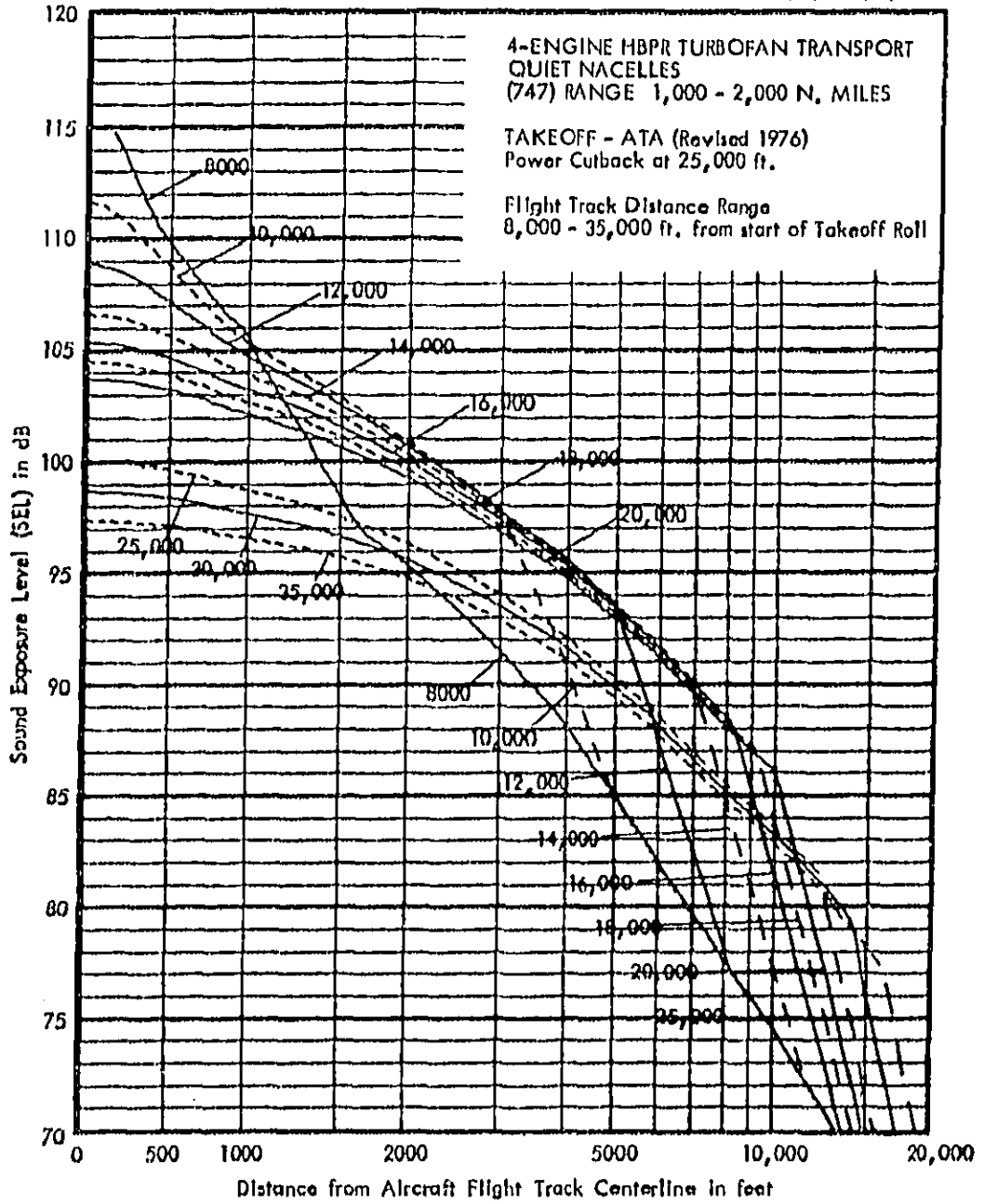
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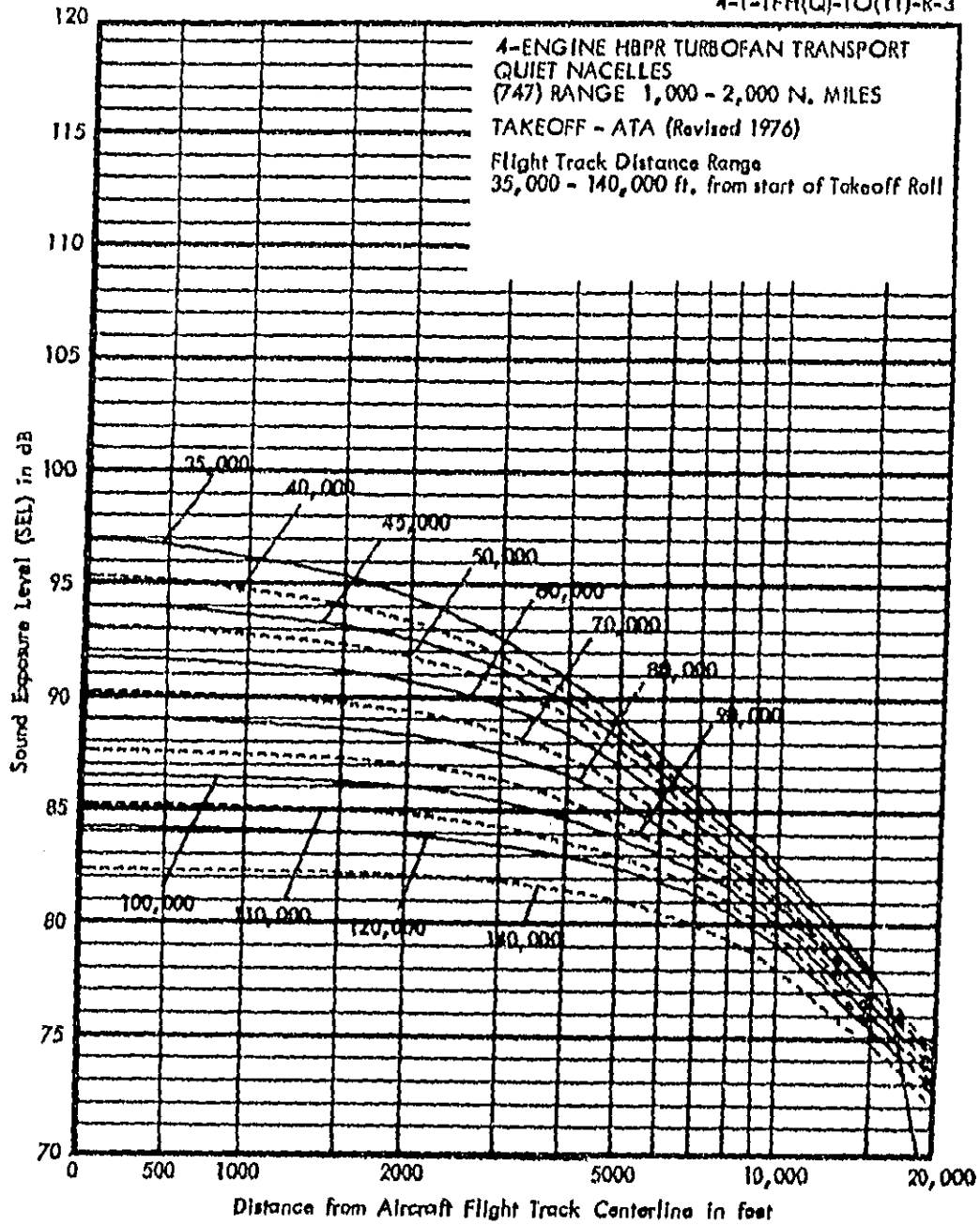


4-T-TFH(Q)-TO(11)-R-2

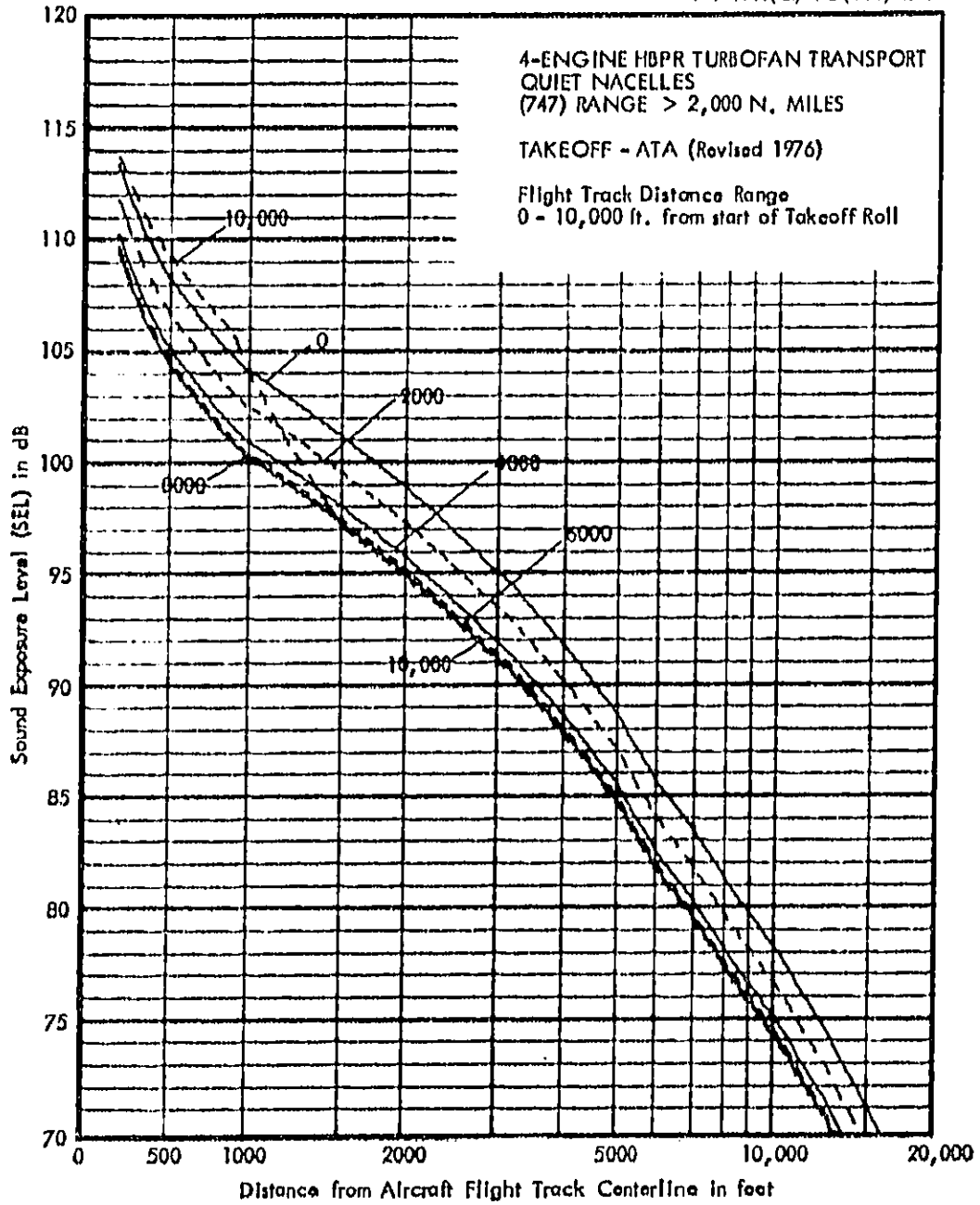


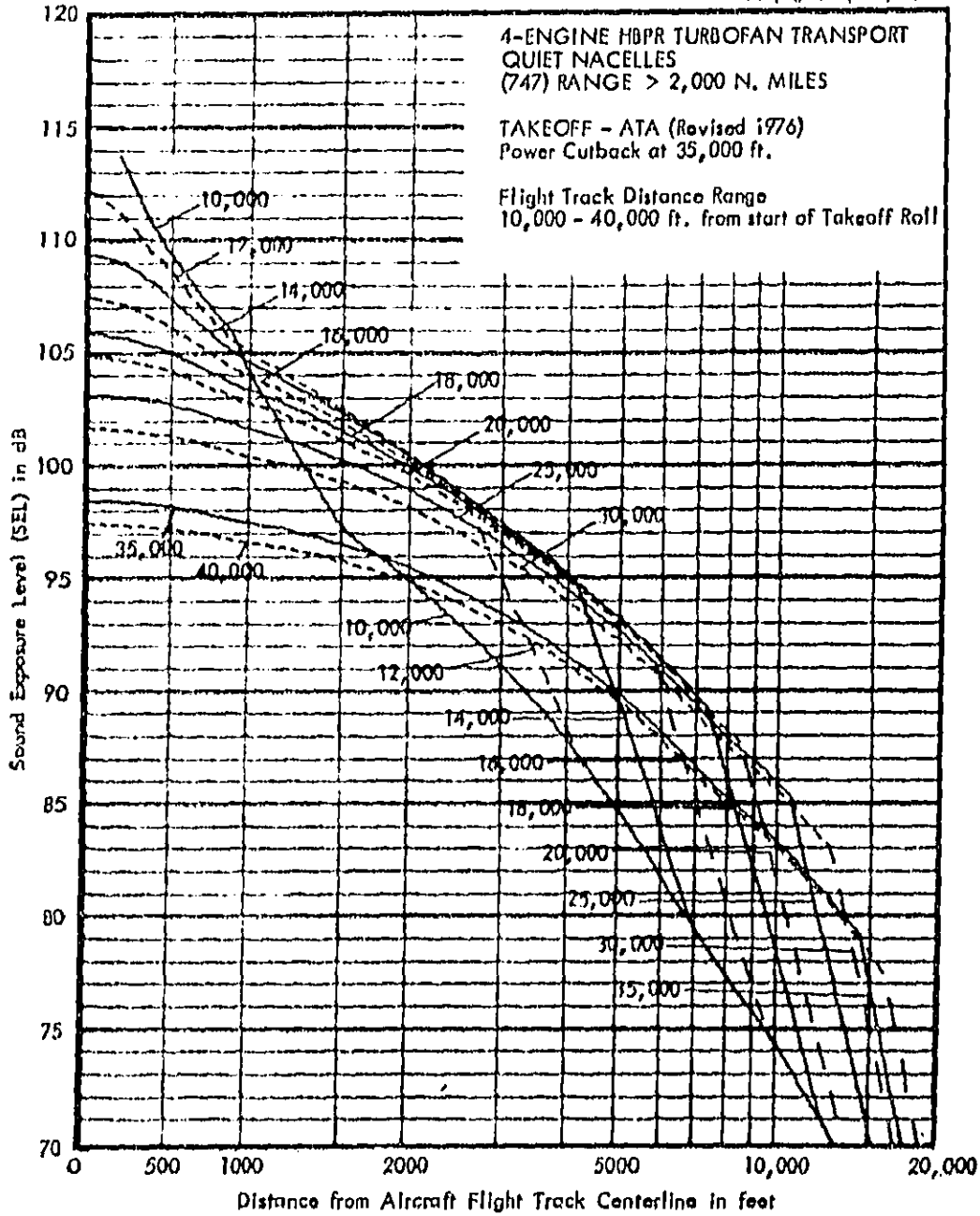
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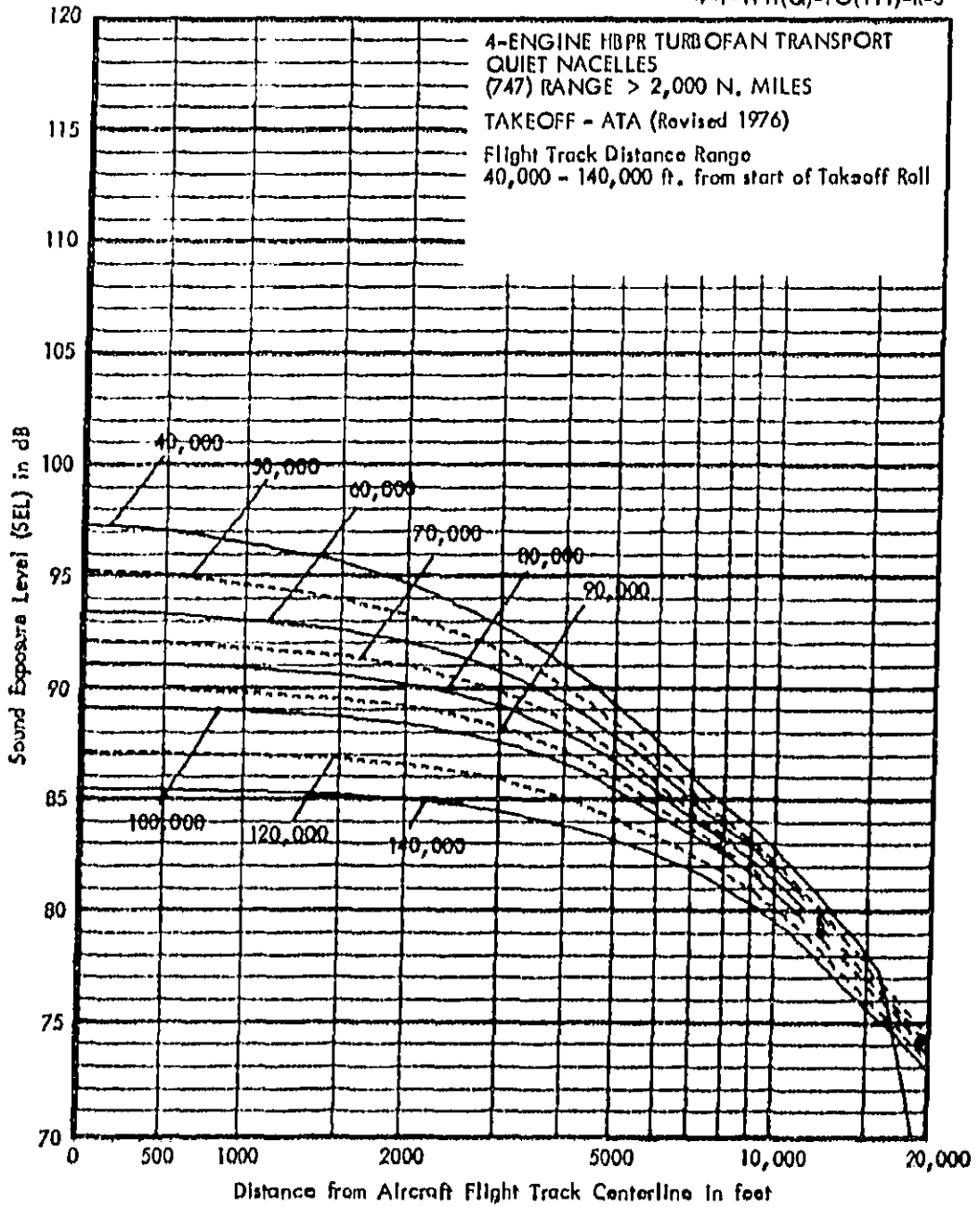
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4-T-TFH(Q)-TO(111)-R-1



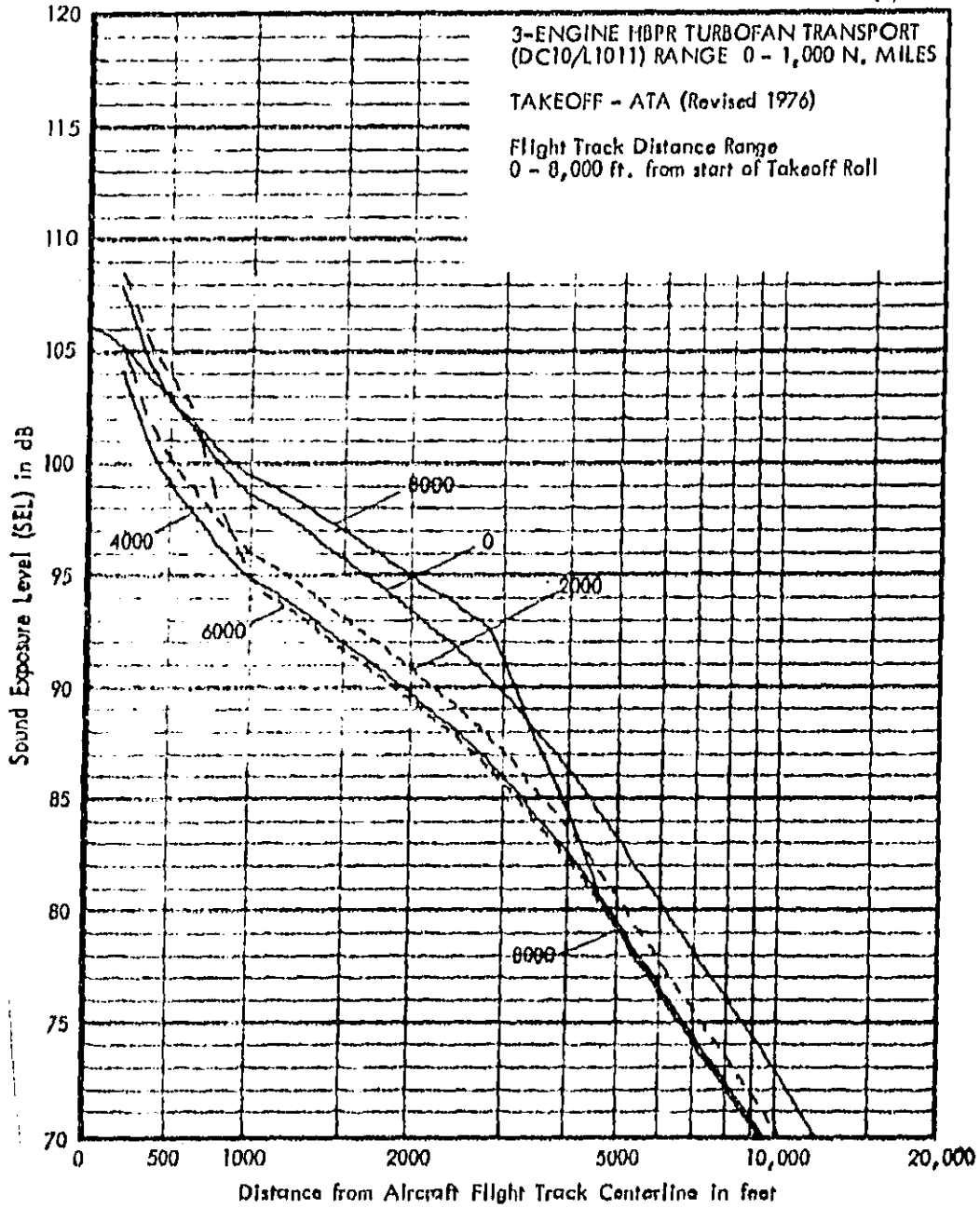


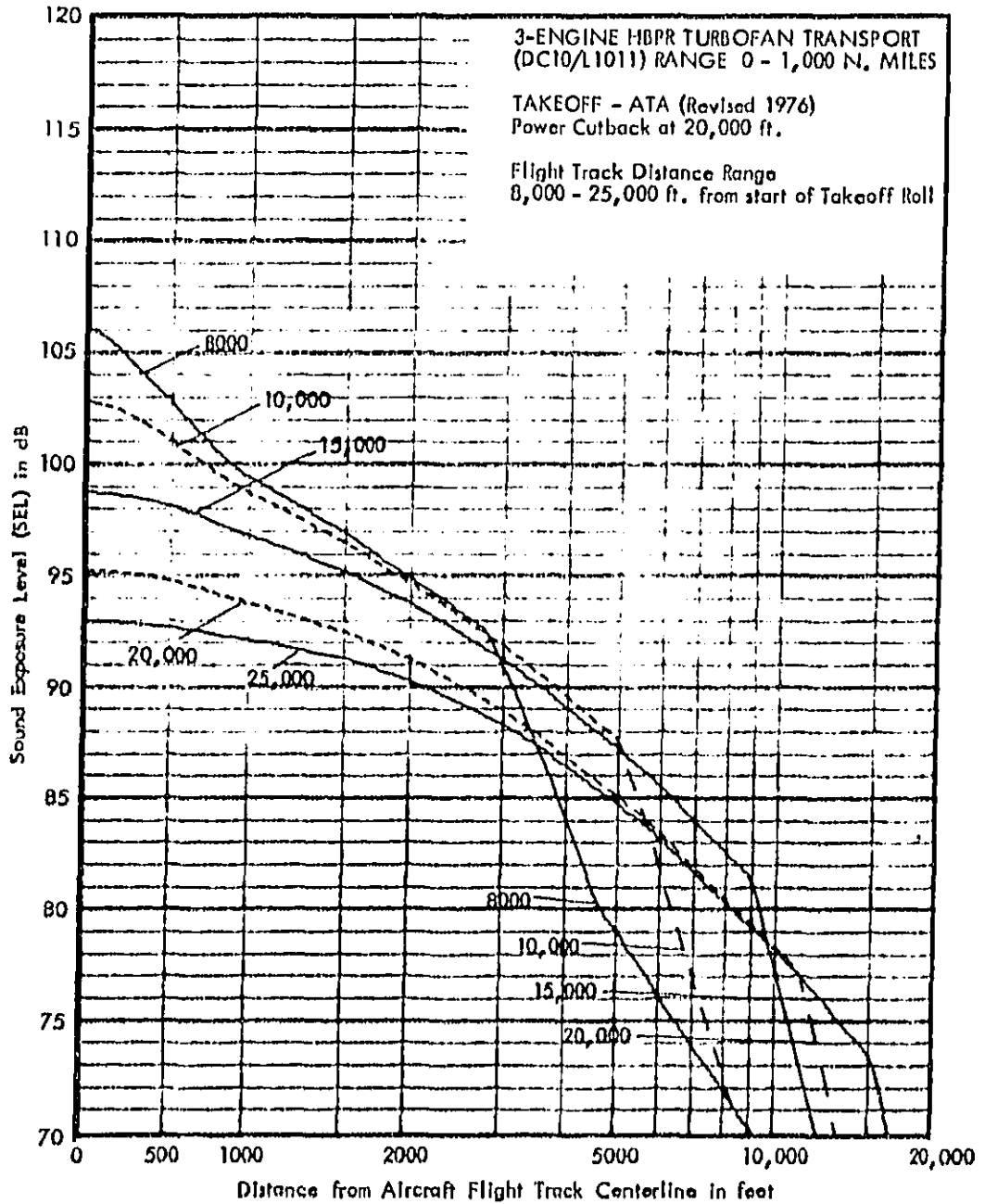


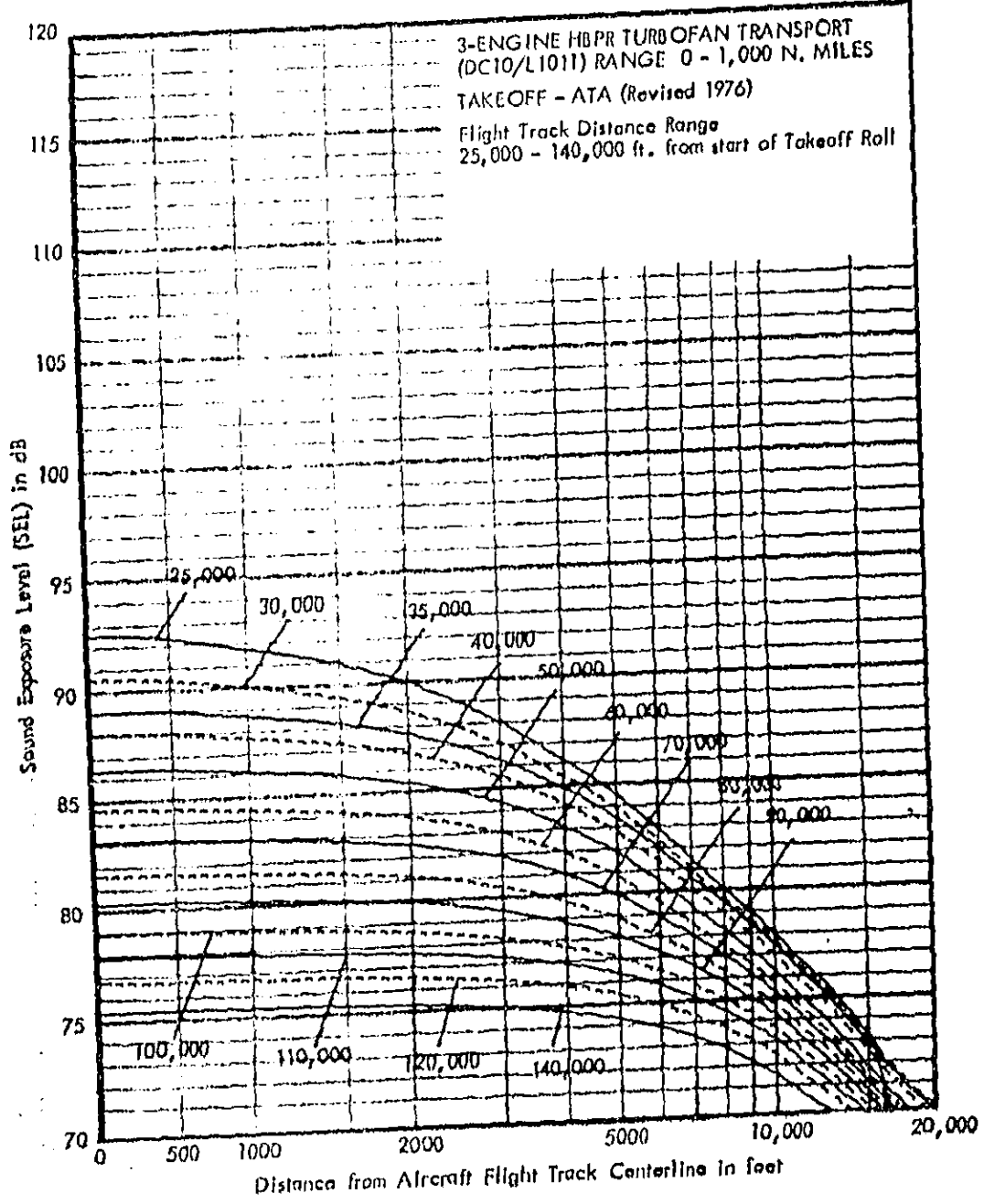
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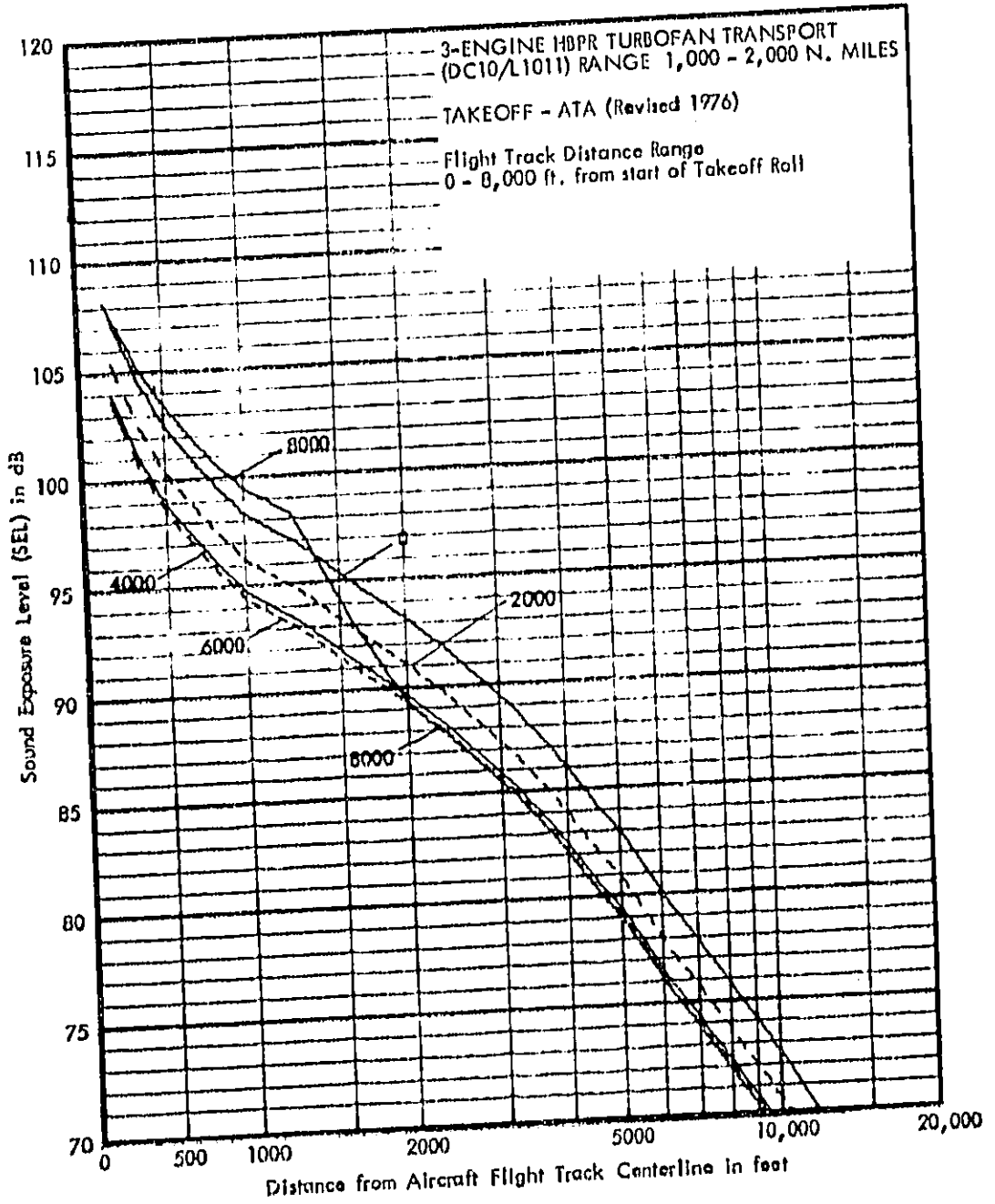


3-T-TFH-TO(1)-R-1

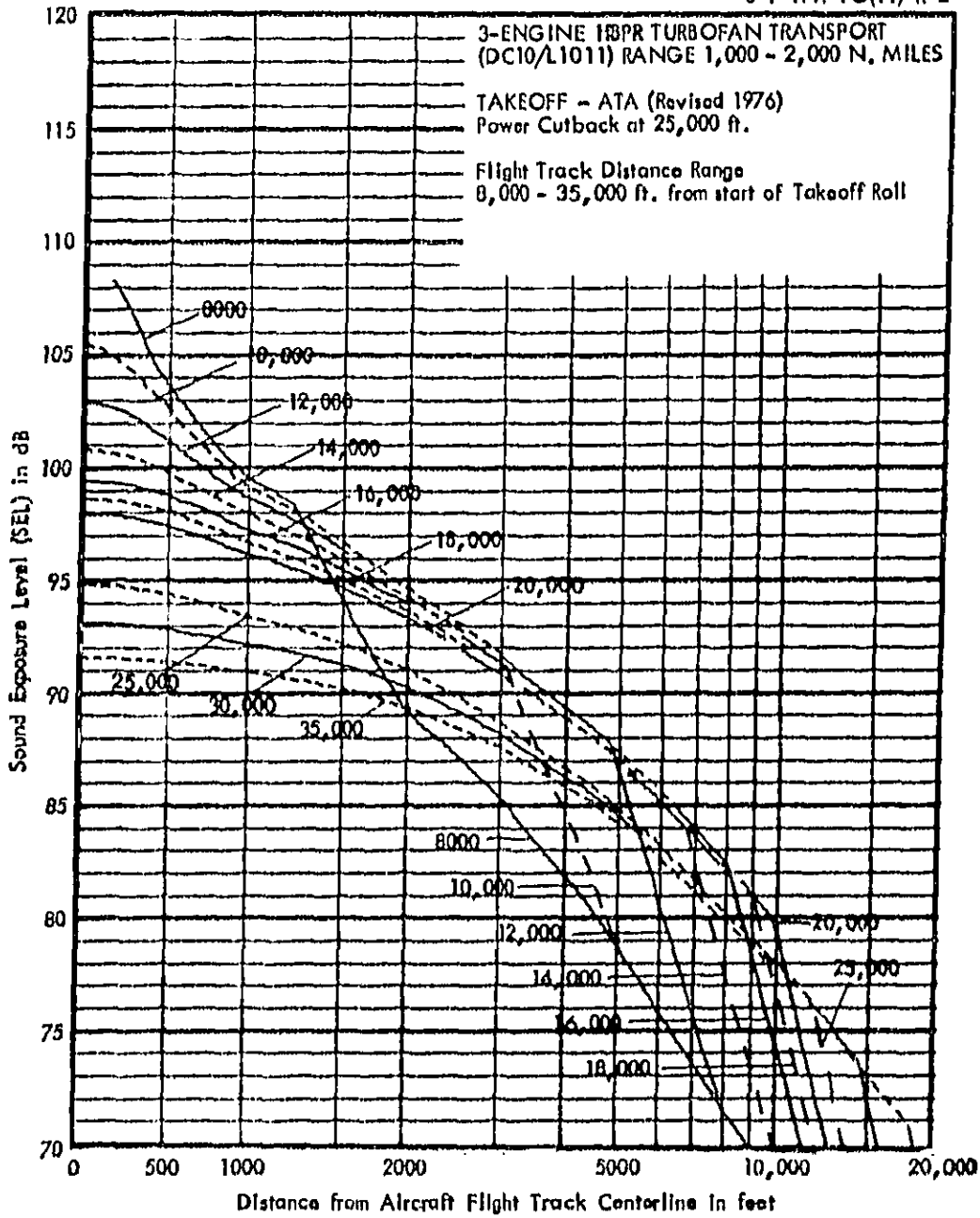


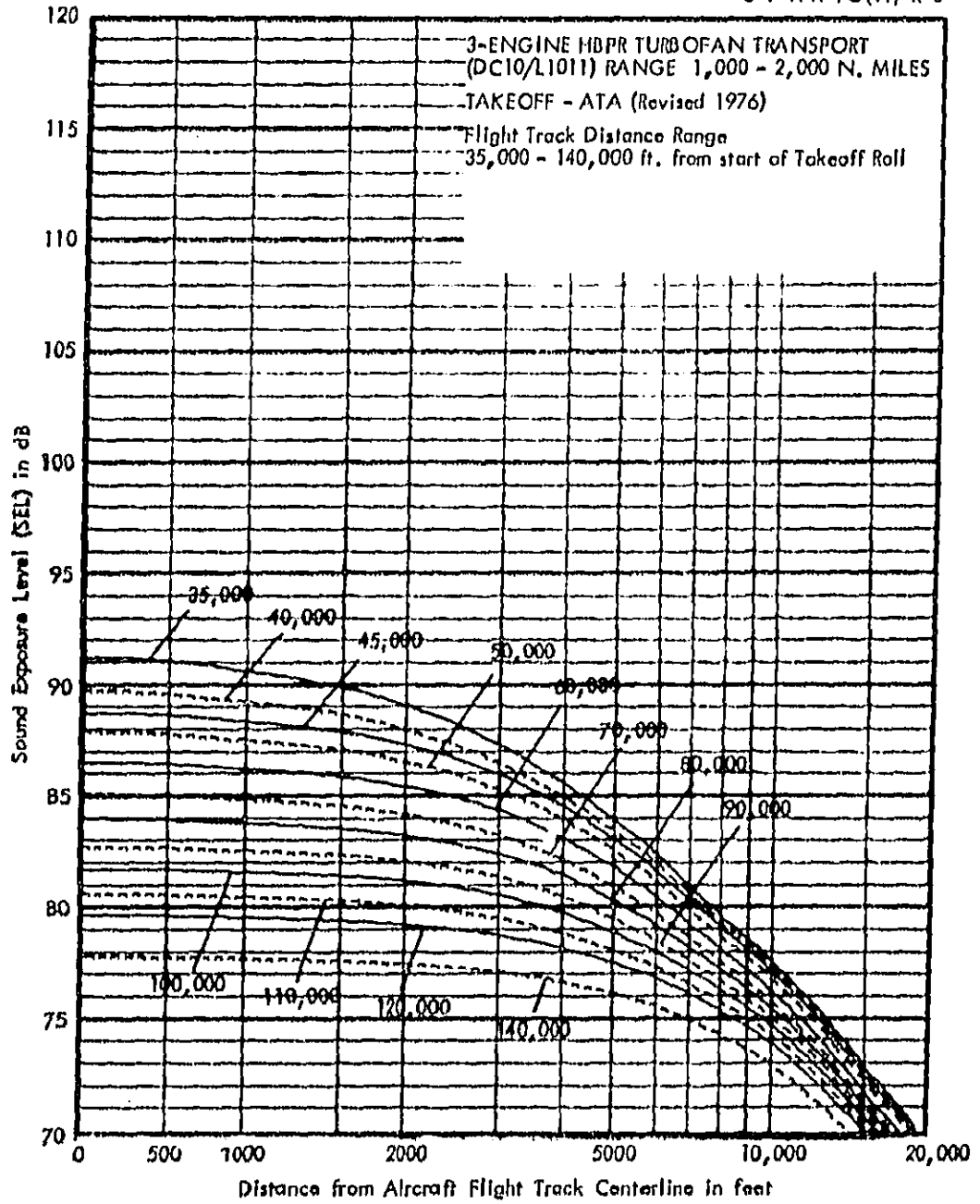




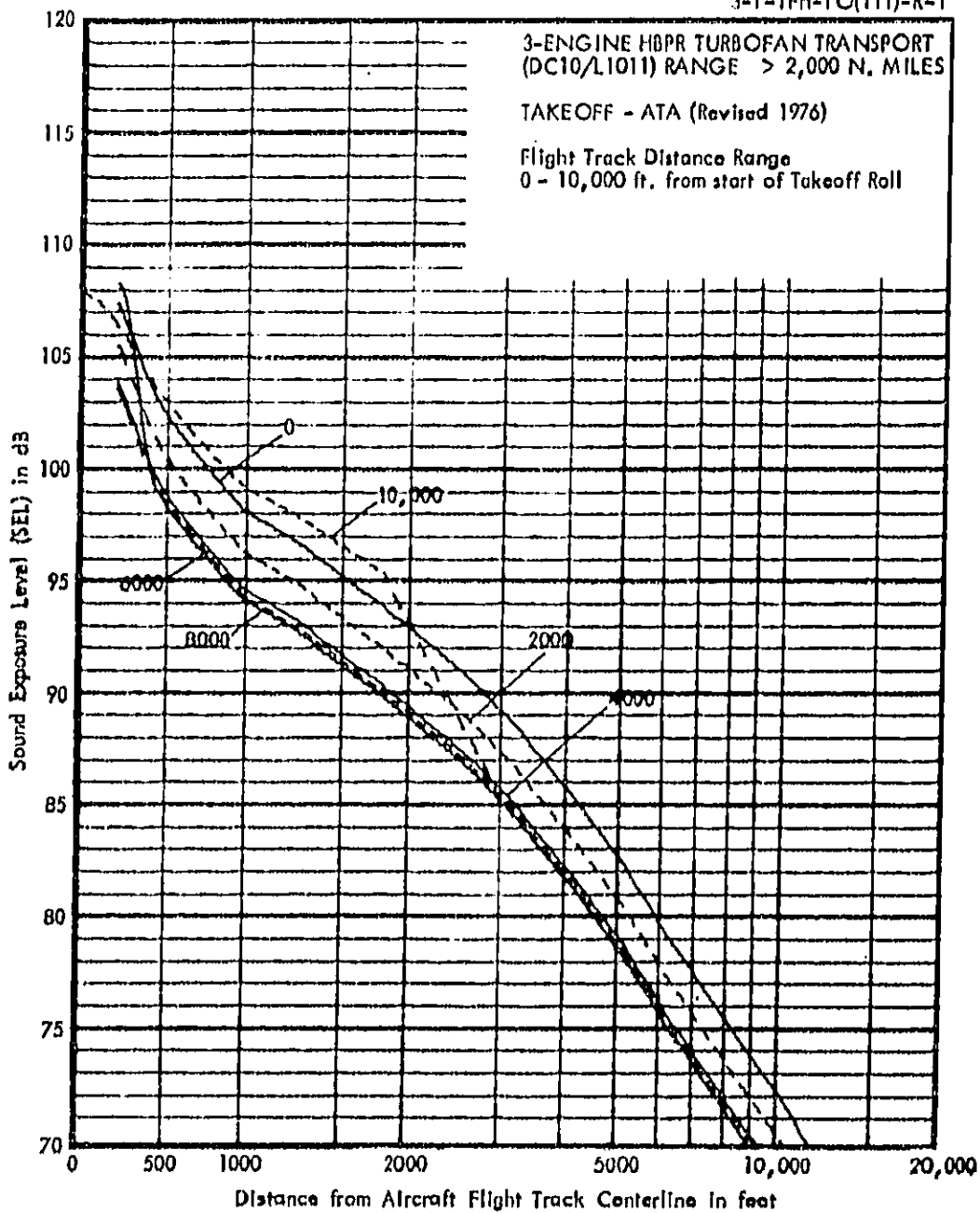


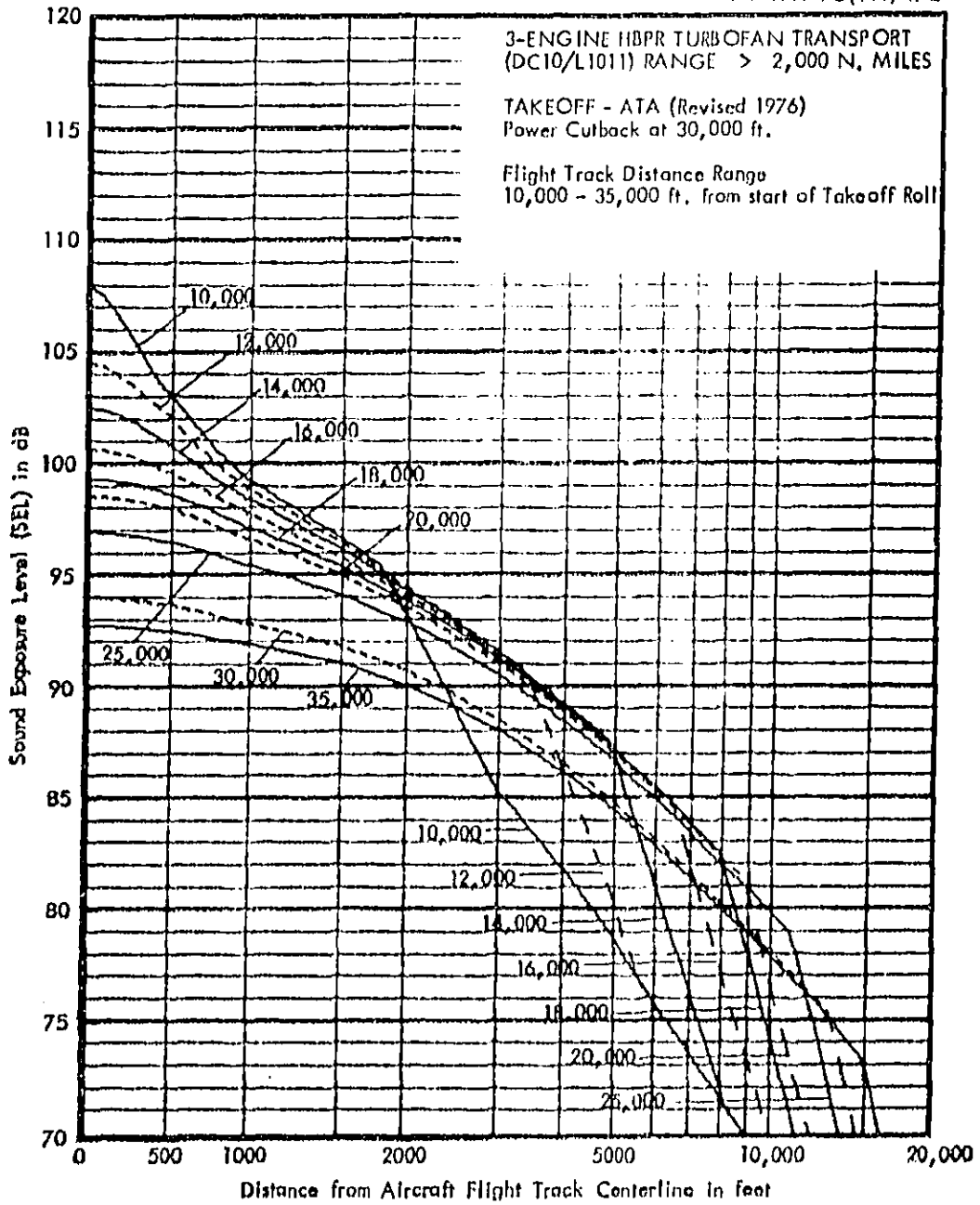
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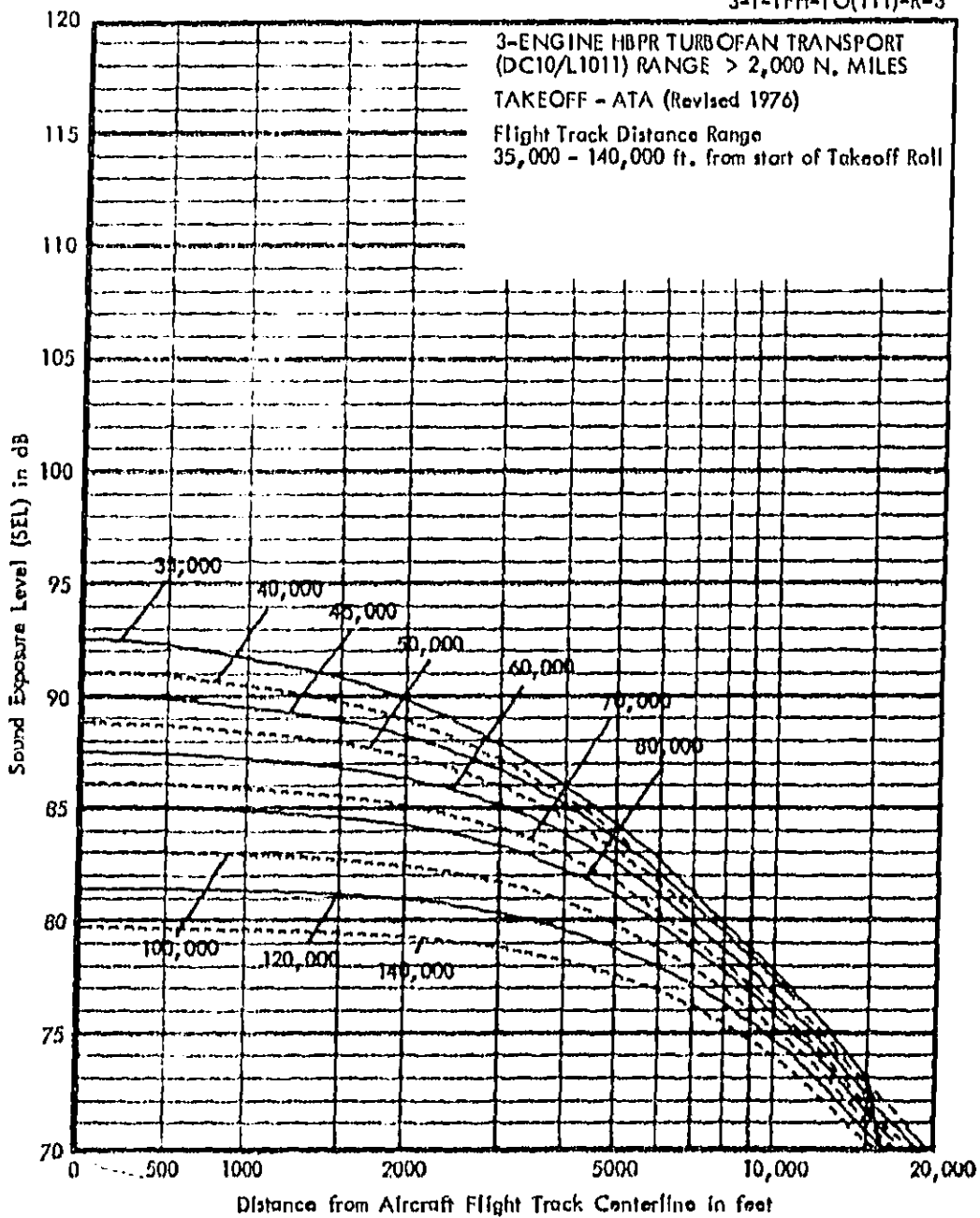


3-T-TFH-TO(111)-R-1









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