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NOISE LEVELS FOR AIRCRAFT USED FOR COMMERCIAL OPERATIONS IN GRAND CANYON NATIONAL PARK SPECIAL FLIGHT RULES AREA

1. Purpose. This circular contains the measured or estimated noise levels for aircraft used for commercial sightseeing operations in Grand Canyon National Park (GCNP) special flight rules area, ranked in alphabetical order for the conditions and assumptions described below. This information is provided both for aircraft that have been noise type certificated under 14 CFR part 36, and for aircraft for which no such requirements existed at the time of type certification. The noise level data presented in the appendices are provided to support noise limitations for aircraft operations in the vicinity of GCNP.

2. Cancellation.

3. Background. On Month Day, 2002, Federal Aviation Administration (FAA) published a supplemental notice of proposed rulemaking (SNPRM) "Noise Limitations for Aircraft Operations in the Vicinity of Grand Canyon National Park". The SNPRM proposed standards for quiet technology that are reasonably achievable. The standards for quiet technology proposed in the SNPRM will be used to assist the National Park Service (NPS) achieve its statutory mandate to provide for the substantial restoration of natural quiet and experience in the GCNP.

4. Aircraft Noise Limits for Quiet Technology. Noise levels of propeller-driven small airplanes and helicopters that operate at GCNP at the time of preparation of this circular are presented in Appendices 1 and 2. The data has been obtained by the methodology described in Section 5 of this circular. The sources of the data as it relates to hierarchy of Section 5 of this circular are designated in the "NOTES" column. The quiet technology status for GCNP operations of each aircraft is provided in the "QUIET TECHNOLOGY" column.

Appendix 1 provides noise levels of propeller driven small airplanes covered under Appendices F and G of 14 CFR part 36. This appendix includes tabulations of maximum takeoff weights, landing weights, engine type, horsepower, propeller type and diameter.

Appendix 2 contains noise levels of helicopters covered under Appendices H and J of 14 CFR part 36. This appendix includes tabulations of maximum takeoff weights, landing weights, engine type, rotor type and diameter.

The information is listed in alphabetical order of the aircraft make and model for the conditions and assumptions described below.

For the purpose of significantly reducing noise impact in GCNP, the noise technology status of propeller-driven small airplanes and helicopters were determined according to their noise nuisance at a

common noise sensitive reference point in GCNP. The aircraft noise limits, based on aircraft certification noise levels, for quiet technology are shown in Figure 1 through 4.

The noise limits can be expressed for propeller-driven small airplanes and helicopters as follows:

(a) For helicopters with a flyover noise level obtained in accordance with the measurement procedures prescribed in Appendix H of part 36, the limit is 80 dB for helicopters having 2 or fewer passenger seats, increasing at 3 decibels per doubling of the number of passenger seats for helicopters having 3 or more passenger seats. The limit at number of passenger seats of 3 or more can be calculated by the formula:

EPNL(H) = 80 +10log(# PAX seats/2) dB

(b) For helicopters with a flyover noise level obtained in accordance with the measurement procedures prescribed in Appendix J of part 36, the limit is 77 dB for helicopters having 2 or fewer passenger seats, increasing at 3 decibels per doubling of the number of passenger seats for helicopters having 3 or more passenger seats. The limit at number of passenger seats of 3 or more can be calculated by the formula:

SEL(J) = 77 +10log(# PAX seats/2) dB

(c) For propeller-driven airplanes with a measured flyover noise level obtained in accordance with the measurement procedures prescribed in Appendix F of part 36 without the performance correction defined in Sec. F35.201(c), the limit is 69 dB for airplanes having 2 or fewer passenger seats, increasing at 3 decibels per doubling of the number of passenger seats for airplanes having 3 or more passenger seats. The limit at number of passenger seats of 3 or more can be calculated by the formula:

Lamax(F) = 69 +10log(# PAX seats/2) dB

(d) In the event that a flyover noise level is not available in accordance with Appendix F of part 36, the noise limit for propeller-driven airplanes with a takeoff noise level obtained in accordance with the measurement procedures prescribed in Appendix G is 74 dB for airplanes having 2 or fewer passenger seats, increasing at 3 decibels per doubling of the number of passenger seats for airplanes having 3 or more passenger seats. The limit at number of passenger seats of 3 or more can be calculated by the formula:

Lamax(G) = 74 +10log(# PAX seats/2) dB

5. Methodology to Categorize Noise Efficiency. The GCNP noise incentive plan is based on certificated noise levels under 14 CFR part 36. These levels are typically provided in FAA AC 36-1G or aircraft flight manuals. In other cases where noise certification under 14 CFR part 36 was not required due to applicability, the noise level could be provided to the FAA by the operator or owner and considered to be an estimated noise certification level, provided that the noise level was sufficiently substantiated to the FAA as being representative for the subject aircraft. Some aircraft depending on the date of type certification were not subject to the noise certification provisions of 14 CFR part 36. Thus noise certification levels do not exist. For those aircraft, either measured noise levels from non certification tests or estimates by approved methods were used. All estimated noise certification levels

provided in this circular are for the sole and specific purpose of determining compliance with GCNP noise efficiency criteria.

The following hierarchy of noise level data sources was used for all aircraft in Appendices 1 and 2. The same hierarchy will be used for future additions to the appendices.

1. US certifications under 14 CFR part 36 with noise certification levels obtained from the FAA approved flight manuals or FAA AC 36-1.
   a) For propeller driven small airplanes the applicable hierarchy of regulations is:
      1) 14 CFR part 36 Appendix F
      2) 14 CFR part 36 Appendix G
   b) For helicopters the applicable hierarchy of regulations is:
      3) 14 CFR part 36 Appendix J
      4) 14 CFR part 36 Appendix H

2. Foreign certifications under ICAO Annex 16, Volume I with noise certification levels obtained from the approved flight manuals, data approved by the foreign civil aviation authority, or FAA AC 36-1.
   a) For propeller driven small airplanes the applicable hierarchy of regulations is:
      1) ICAO Annex 16, Volume I Chapter 6
      2) ICAO Annex 16, Volume I Chapter 10
   b) For helicopters the applicable hierarchy of regulations is:
      3) ICAO Annex 16, Volume I Chapter 11
      4) ICAO Annex 16, Volume I Chapter 8

3. Research or other measurement test data obtained under controlled conditions, documented and corrected to the certification conditions of Appendix F for small propeller driven airplanes and Appendix J for helicopters. Preference would be placed on those data obtained under certification-like conditions or those data collected under an FAA sponsored noise research test.

4. FAA approved noise estimation methods that can estimate Appendix F noise levels for small propeller driven airplanes and Appendix J noise levels for helicopters. Currently the following methods may be suitable for use pending FAA approval on a case by case basis.
   a) For propeller driven small airplanes: Method in Section 2.2 of DOT/FAA/AEE-82-1
   b) For helicopters: SAE/AIR 1989

5. FAA approved noise level estimation method using FAA's Integrated Noise Model (INM) or an FAA-approved equivalent.

As one moves down in the hierarchy the expected level of substantiation (as the representative noise certification level-estimated) by the operator or owner would increase, and the level of FAA scrutiny should be expected to increase.

The resulting noise levels will vary depending upon an operator's or owner's situation related to the above hierarchy. In the case of helicopters, the noise levels must be the flyover noise certification level in the noise metric of Effective Perceived Noise Level (14 CFR part 36, Appendix H) or Sound Exposure Level (14 CFR part 36, Appendix J). In the case of small propeller-driven airplanes the noise

levels must be the flyover (14 CFR part 36, Appendix F) or takeoff (14 CFR part 36, Appendix G) noise certification level in the noise metric of maximum A-weighted sound level.

6. Distribution.

7. Revisions.

4/9/02

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GCNP Aircaft Noise Limits for Quiet Technology Helicopters Measured Under Appendix H

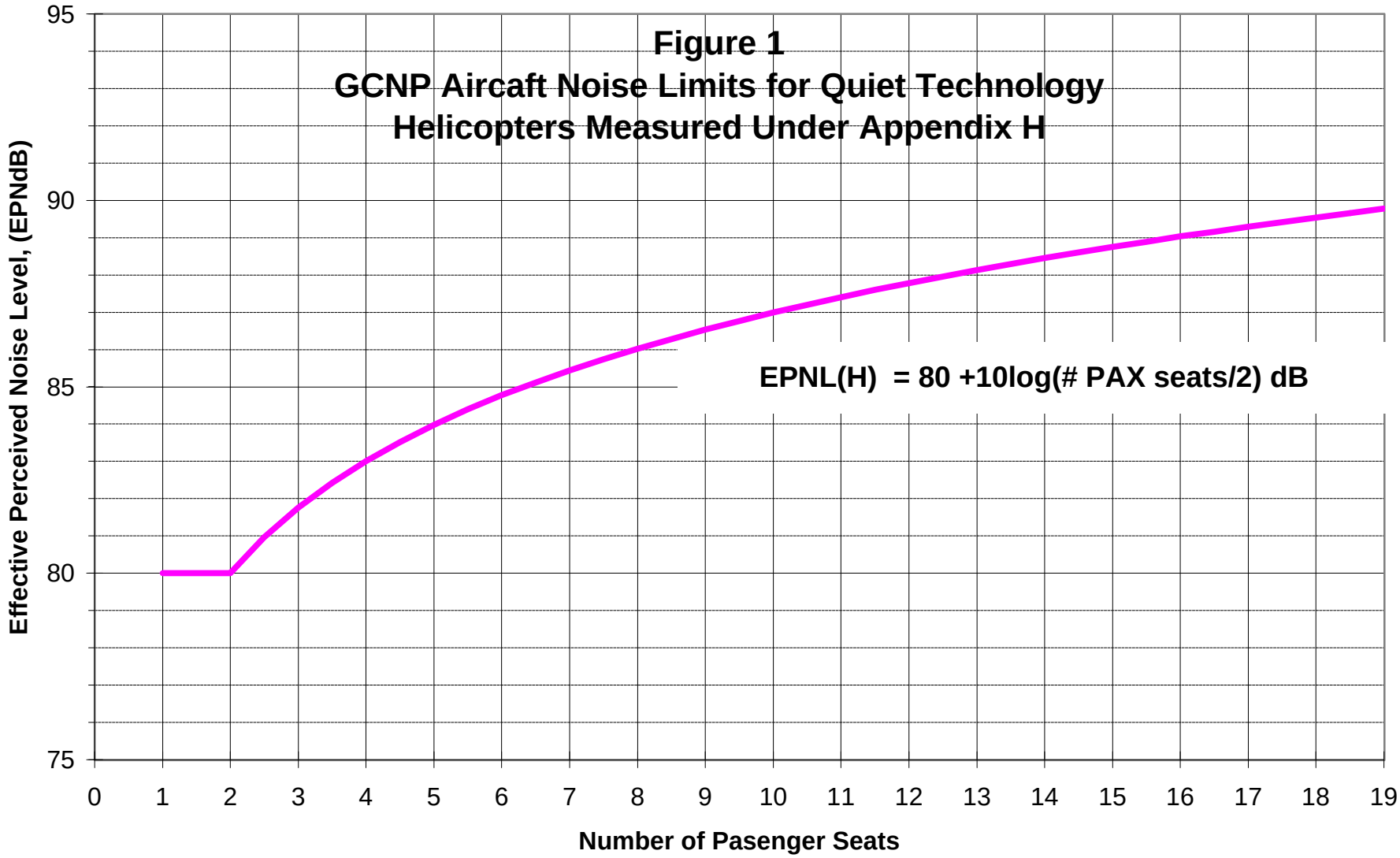

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Figure 2
GCNP Aircaft Noise Limits for Quiet Technology Helicopters Measured Under Appendix J

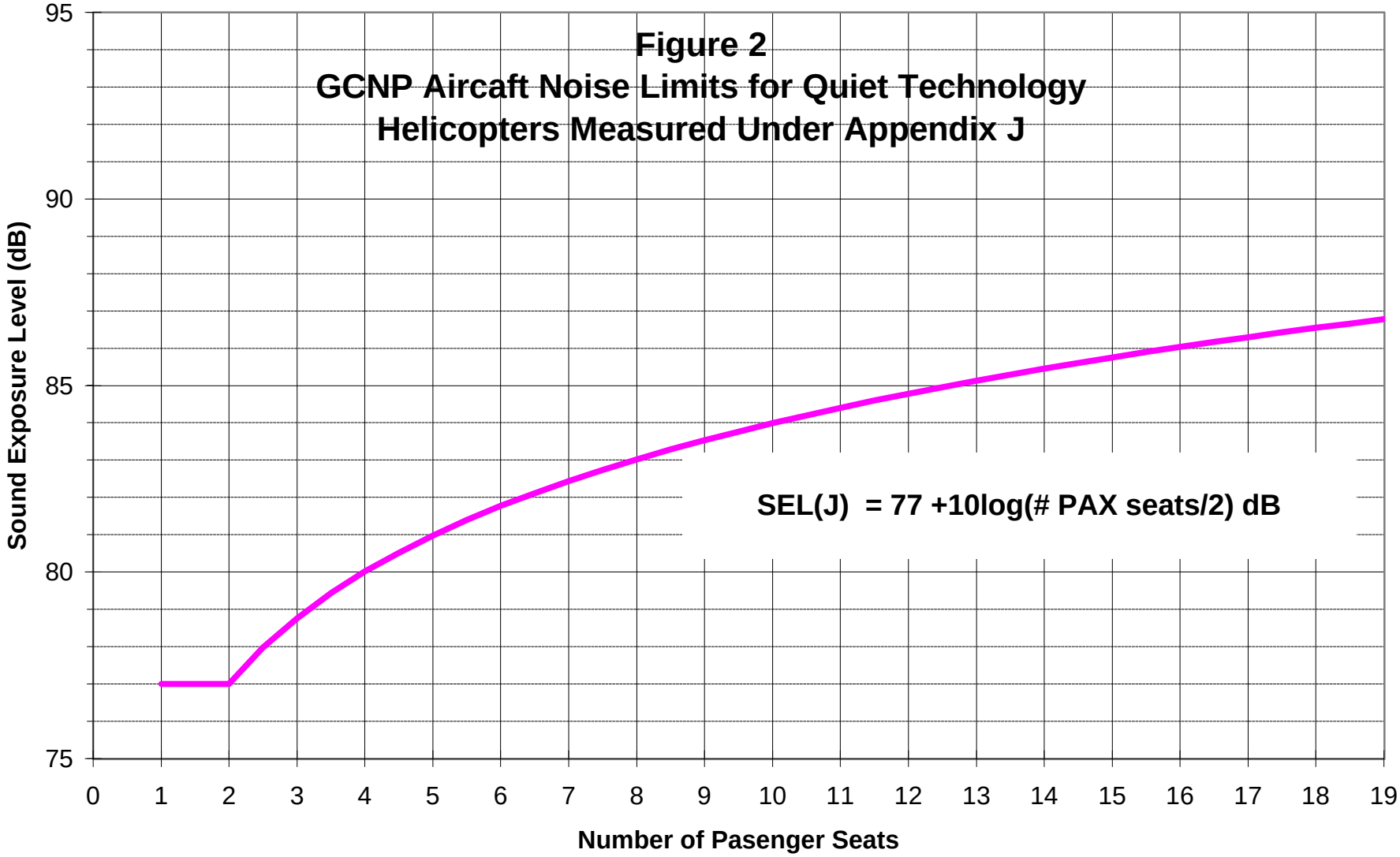

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Figure 3
GCNP Aircaft Noise Limits for Quiet Technology
Propeller-Driven Small Airplanes Measured Under Appendix F

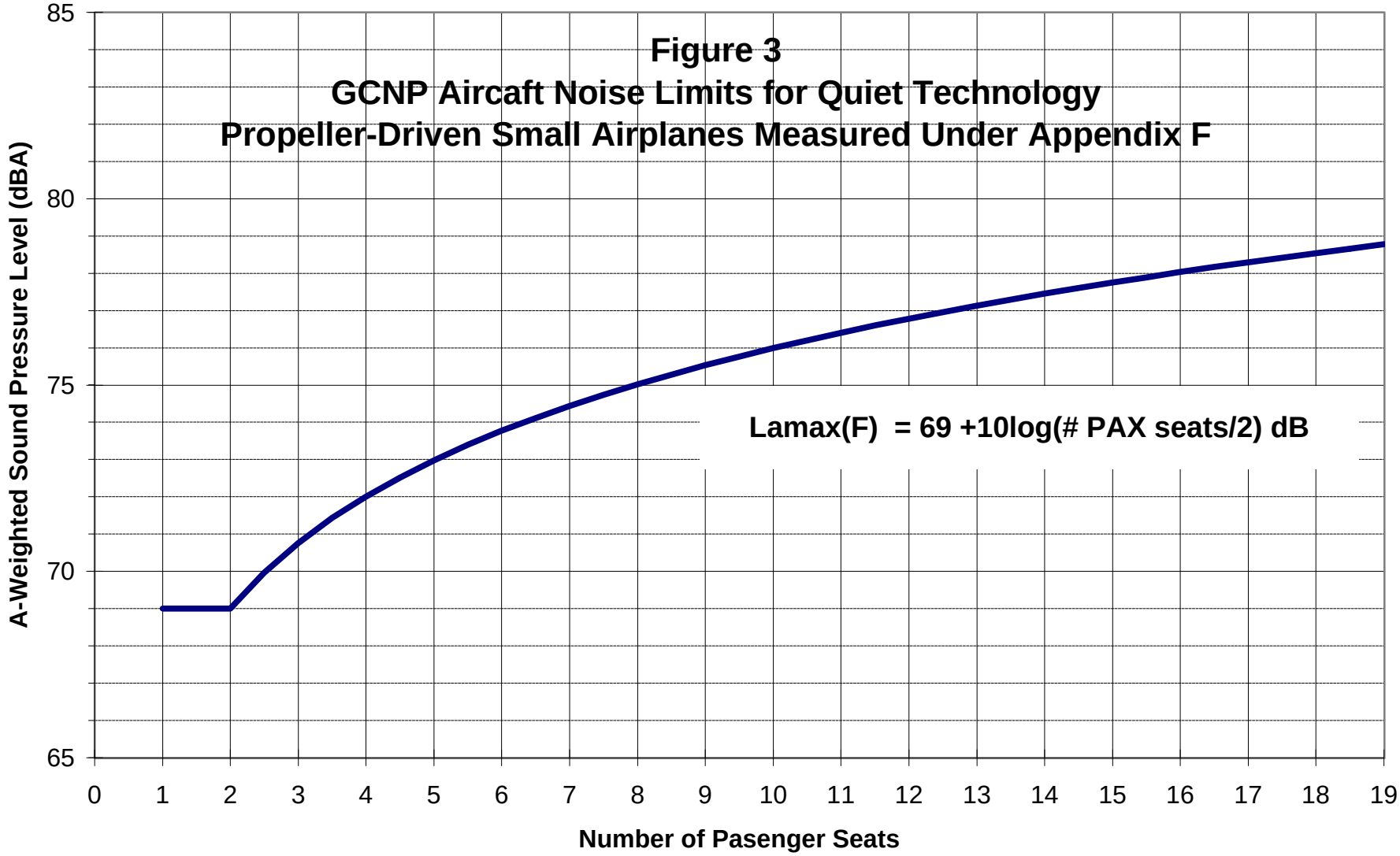

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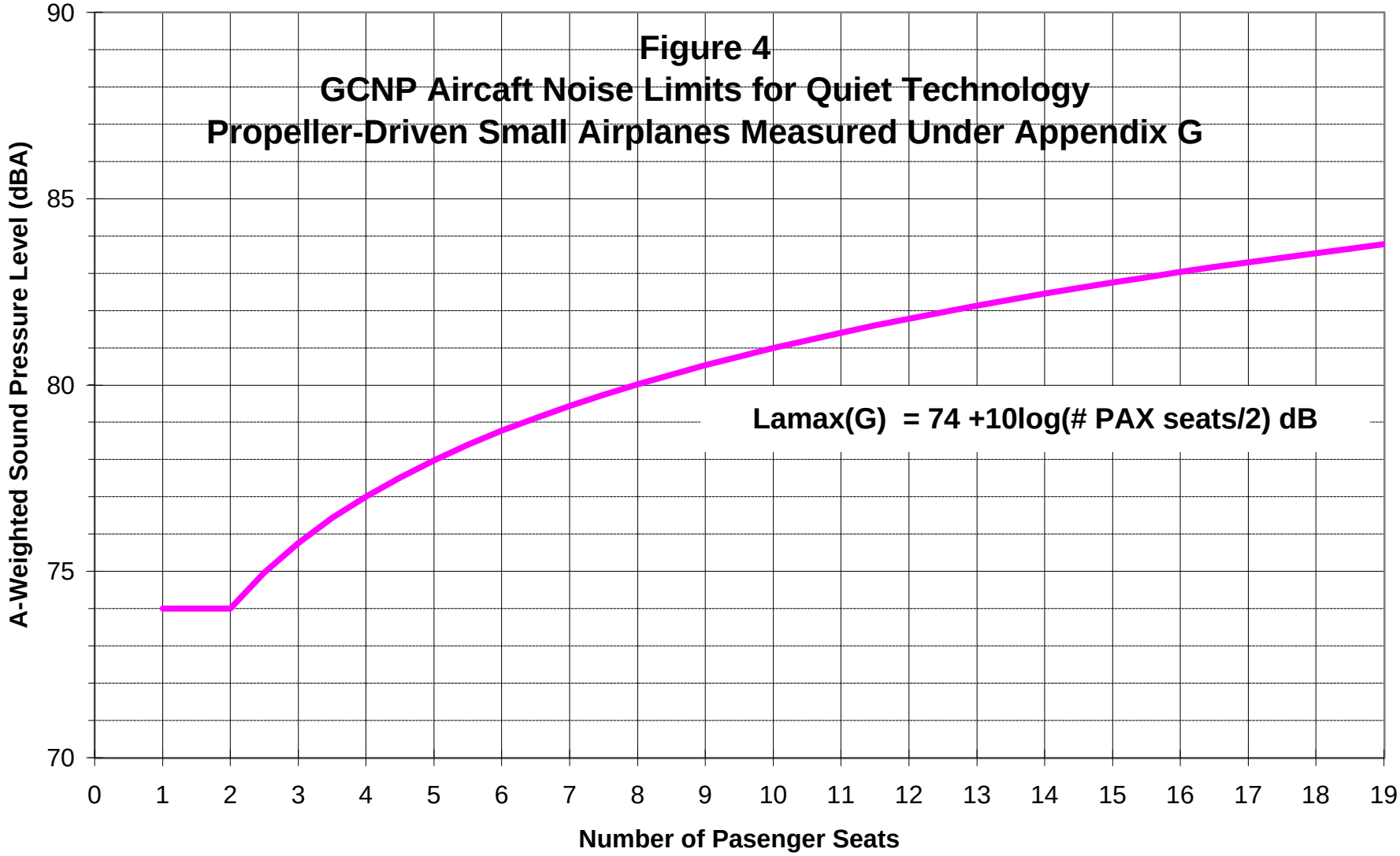
Figure 4
GCNP Aircaft Noise Limits for Quiet Technology
Propeller-Driven Small Airplanes Measured Under Appendix G



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APPENDIX I
GCNP INCENTIVE PLAN NOISE LEVELS
PROPELLER-DRIVEN SMALL AIRPLANES

MAKE MODEL	MTOW MLW	# OF ENGINES MAKE MODEL	ENG. PWR RPM	EXHAUST	# OF PROP BLADES MAKE MODEL	PROP DIA RPM PITCH	NOISE LEVEL APP. F (dBA)	 APP. G (dBA)	# OF PAX	NOTES	QUIET TECHNOLOGY
BEECH **36,** A36	3.6 3.6	1 TCM I0-520-B**(A)**	2**85** 2700	5	3 MCCAULEY 3A32C76	80 2700 V	78.8		5	F	NO
BEECH **36,** A36	3.6 3.6	1 TCM I0-520-B**B**	2**75** 2550	5	2 MCCAULEY 2A36C23	84 2550 V	78.0		5	F	NO
BEECH V35	3.4 3.4	1 TCM I0-520-BA	285 2700	5	3 MCCAULEY 3A32C406	78 2700 V	78.1		4	F	NO
BEECH **36,** A36	3.65 3.7	1 TCM IO-550-B	300 2700	5	3 MCCAULEY 3A32C406	80 **2700** V	78.2		5	F	NO
BEECH 65A90	9.3 8.8	2 P&W PT6A-20	500 2200	9	3 HARTZELL HC-B3TN-2B/M	93 **2200** V	78.7		8	F	NO
BEECH 76	3.9 3.9	2 LYC O-360-A1G6D	165 2700	2	2 HARTZELL HC-M2YR-2CEUF	76 2700 V	80.2		5	F	NO
BEECH 76	3.98 3.98	2 LYC O-360-A1G6D	165 2700	5	2 HARTZELL HC-M2YR-2CLUF	76 2700 V	79.5		5	F	NO
CESSNA 206	**3.3** **3.3**	**1** **TCM** **IO-520-A**	**285** **2700**	5	**2** **MCCAULEY** **D2A34C58**	**82** **2700** **V**	78.5		5	**F**	NO

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CESSNA TU206G	3.6 3.6	1 TCM TSIO-520-M	285 2600	4	3 MCCAULEY D3A34C402	80 2600 V	78.5		5	F	NO
CESSNA TU206G (AMPHIB)	3.6 3.6	1 TCM TSIO-520-M	285 2600	4	3 MCCAULEY D3A34C402	80 2600 V	78.0		5	F	NO
CESSNA T207A	3.8 3.8	1 TCM TSIO-520-G-1A	285 2600	4	3 MCCAULEY 3A32C401	80 2600 V	77.9		6	F	NO
CESSNA 402C	6.85 6.9	2 TCM TSIO-520-UB	325 2700	4	3 MCCAULEY 3AF32C92N	76 2700 V	80.8		9	F	NO
CESSNA 402C	6.85 6.9	2 TCM TSIO-520-VB	310 2600	4	3 MCCAULEY 3AF32C93	77 2600 V	77.2		9	F	NO
PIPER PA-34-200T	4.57 4.3**4**	2 **TCM** TSI0-360-E**/EB**	200 2575	4	2 HARTZELL **BHC-C2YF-2( )F/UF**	76 2575 V	75.7		5	F	NO
PIPER PA-34-200T	**4.57** **4.34**	1 LYC **I**0-360-C1C/6	200 2575	5	3 MCCAULEY **3AF34C502/3**	76 2575 V	78.6		5	F	NO
PIPER 28-R200	**2.65** **2.65**	2 **TCM** TSI0-360-E/EB	200 2700	5	2 HARTZELL HC-C2YK-1( )/F	74 2700 V	75.5		3	F	NO

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MAKE MODEL	MTOW MLW	# OF ENGINES MAKE MODEL	ENG. PWR RPM	EXHAUST	# OF PROP BLADES MAKE MODEL	PROP DIA RPM PITCH	NOISE LEVEL APP. F (dBA)	 APP. G (dBA)	# OF PAX	NOTES	QUIET TECHNOLOGY
PIPER 32-300	**3.4** **3.4**	1 LYC I0-540-K1A/G5	300 2700	5	2 HARTZELL HC-C2YK-1( )/F	80 2700 V	80.5		6	F	NO
PIPER 32RT-300T	**3.6** **3.6**	1 LYC TI0-540-S1AD	270 2575	4	2 HARTZELL HCE2YR-1( )/F	80 2575 V	75.7		6	F	NO
BEECH C99	11.3 11.**3**	2 **P&W** PT6A-3**6**	715 2200	9	3 HARTZELL HC-B3TN-3**B/M**	93 2200 V	79.3		15	F	NO
CESSNA TR182	3.1 3.1	1 **LYC** O-540-L3C5D	235 2400	5	2 MCCAULEY B2D34C217	82 2400 V	73.8		3	F	NO
CESSNA TR182	3.1 3.1	1 **LYC** O-540-L3C5D	235 2400	5	3 MCCAULEY B3D32C407	79 2400 V	70.6		3	F	YES
PIPER PA-31-350	7.01 7	2 **LYC** TIO-540-J2BD	315 2400	4	3 HARTZELL HC-E3YR-2ATF	80 2400 V	78.0		9	F	NO
CESSNA 208 **(LAND)**	**8** 7.**8**	1 **P&W** PT6A-114	600	9	3 HARTZELL HC-B3MN-3	100 1900 V	72.8		9	F	YES
CESSNA 208 **(AMPHIB)**	**7.6** **7.3**	1 **P&W** PT6A-114	600	9	3 HARTZELL HC-B3MN-3	100 1900 V	72.8		9	F	YES

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MAKE MODEL	MTOW MLW	# OF ENGINES MAKE MODEL	ENG. PWR RPM	EXHAUST	# OF PROP BLADES MAKE MODEL	PROP DIA RPM PITCH	NOISE LEVEL		# OF PAX	NOTES	QUIET TECHNOLOGY
							APP. F (dBA)	APP. G (dBA)			
DE HAVILLAND DHC-6-300	**12.5** **12.3**	**2** **P&W** **PT6A-27**	**680**	9	**3** **HARTZELL** **HC-B3TN-3D**	**102** **2110** **V**	77.2		19	F	YES
DE HAVILLAND **DHC-6-300**	**12.5** **12.3**	**2** **P&W** **PT6A-27**	**680**	9	**4** **MCCAULEY** **C750**	**102** **2110** **V**	77.2		19	F	YES
CESSNA **TU206C / TU206F**	**3.6** **3.6**	**1** **TCM** **TSIO-520-C**	**285** **2700**	4	**3** **MCCAULEY** **D2A34C78**	**82** **2700** **V**	78.5		5	F	NO
CESSNA **T207**	**3.8** **3.8**	**1** **TCM** **TSIO-520-G**	**285** **2600**	**4**	**3** **MCCAULEY** **D3A32C90**	**80** **2600** **V**	77.9		6	F	NO
CESSNA **182**	**2.55** **2.55**	**1** **TCM** **0-470-L**	**230** **2600**	**5**	**2** **HARTZELL** **HC-82XF-1**	**82** **2600** **V**	72.0		3	F	NO
CESSNA **182H**	**2.8** **2.8**	**1** **TCM** **0-470-R**	**230** **2600**	5	**2** **MCCAULEY** **2A34C66**	**82** **2600** **V**	72.0		3	F	NO
CESSNA **421C**	**7.2** **7.45**	**2** **TCM** **GTSIO-520-L/N**	**375** **2235**	4	**3** **MCCAULEY** **3FF32C501**	**90** **2235** **V**	80.3		9	F	NO
CESSNA **T210L**	**3.8** **3.8**	**1** **TCM** **IO-520-L**	285 2700	5	**3** **MCCAULEY** **D3A34C402-C**	**80** **2700** **V**	80.2		5	F	NO

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							APP. F (dBA)	APP. G (dBA)			
CESSNA T210M	**3.8 3.8**	**1 TCM IO-520-L**	285 2700	5	**3 MCCAULEY D3A32C88**	**80 2700 V**	77.4		5	F	NO
CESSNA T210N	**3.8 3.8**	**1 TCM IO-520-L**	285 2700	5	**3 MCCAULEY D3A34C404**	**80 2700 V**	77.4		5	F	NO
CESSNA 402 / 402B	**6.3 6.2**	**2 TCM TSIO-520-E/B**	300 2700	4	**3 MCCAULEY 3AF32C504**	**76.5 2700 V**	81.6		8	F	NO
CESSNA 402A	**6.3 6.2**	**2 TCM TSIO-520E**	300 2700	4	**3 MCCAULEY 3AF32C87NR**	**76.5 2700 V**	81.6		8	F	NO
CESSNA U206B/D/F/G	**3.6 3.6**	**1 TCM IO-520-F**	285 2700	5	**3 HARTZELL HC-C3YF-IRF**	**78 2700 V**	77.9		5	F	NO
CESSNA U206B/D/F	**3.6 3.6**	**1 TCM IO-520-F**	285 2700	5	**3 MCCAULEY D2A34C58**	**82 2700 V**	77.9		5	F	NO
CESSNA 207A	**3.8 3.8**	**1 TCM IO-520-F**	**285 2700**	**5**	**3 MCCAULEY D3A34C404**	**80 2700 V**	79.0		6	F	NO
CESSNA 207	**3.8 3.8**	**1 TCM IO-520-F**	**285 2700**	**5**	**3 MCCAULEY D3A32C90**	**80 2700 V**	77.8		6	F	NO

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							APP. F (dBA)	APP. G (dBA)			
CESSNA 172M	**2.3 2.3**	**1 LYC 0-320-E2D**	**150 2700**	**6**	**2 MCCAULEY 1C160/CTM/DTM**	**75 2700 F**	74.3		3	F	NO
CESSNA 172P	**2.4 2.4**	**1 LYC 0-320-D2J**	**150 2700**	**6**	**2 MCCAULEY 1C160/DTM**	**75 2700 F**	74.3		3	F	NO
CESSNA 182Q	**2.95 2.95**	**1 LYC 0-470-U**	**230 2400**	**5**	**2 MCCAULEY C2A34C204**	**82 2400 V**	72.0		3	F	NO
CESSNA 182P	**2.95 2.95**	**1 LYC 0-470-R/S**	**230 2600**	**5**	**2 MCCAULEY 2A34C-201/66**	**82 2600 V**	72.0		3	F	NO
PARTENAVIA 68CTC	**4.38 4.38**	**2 LYC TIO/T0-360-C1A6D**	**210 2575**	**4**	**2 HARTZELL HC-C2YK-2CUF**	**76 2575 V**	75.4		6	F	NO
CESSNA 425	**8.2 8.0**	**2 P&W PT6A-112**	**500**	9	**3 HARTZELL HC-B3TN-3D**	**102 2110 V**	75.7		19	F	YES
PIPER PA-18-150	17.5 17.5	1 LYC O-320-A2B	150 2700	7	2 SENSENICH M74DM6-0-56	74 2700 F	69.0		3	F	YES
CESSNA CE-402-B	6.85 6.85	2 TCM TSIO-520-E	150 2700	3	3 MCCAULEY 3AF32C87M	76 2700 V	81.6		9	F	NO

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MAKE MODEL	MTOW MLW	# OF ENGINES MAKE MODEL	ENG. PWR RPM	EXHAUST	# OF PROP BLADES MAKE MODEL	PROP DIA RPM PITCH	NOISE LEVEL APP. F (dBA)	 APP. G (dBA)	# OF PAX	NOTES	QUIET TECHNOLOGY
PIPER PA-31-T3	9.0	2 PWC PT6A-11	455 3810	1	3 HARTZELL HC-B3TN-3B/T	93 V	76.6		3	F	NO
DORNIER DO-228-202	13.15	2 ALLIED SIGNAL TPE-331-5-252D	455 3810	1	4 HARTZELL HC-B4TN-5ML	107 V	78.3		4	6	NO
CESSNA CE-195		1 JACOBS R755 A2			3 HAMILTON STANDARD 2B20-24				3		
CESSNA CE-210	3.8	**1** **TCM** **TSIO-520-R**		3	3 MCCAULEY D3A34C402	**82** **2400** **V**			5		
CESSNA CE-182R	3.10	1 TCM O-470-V	230 2400	8	2 MCCAULEY D2A34C203	82 2400 V	72.0		3	F	NO
CESSNA CE-182-R182	3.10 3.10	1 TCM O-540-J3C5D	235 2400	8	2 MCCAULEY B3D34C214	82 2400 V	72.7		3	F	NO
FOKKER F27	45.0 42.0	2 ROLLS ROYCE DART 532-7R	2307	8	2 DOWTY ROTOL R193-4-30-4	138 V	85.0		42	I	YES

APPENDIX II
GCNP INCENTIVE PLAN NOISE LEVELS
HELICOPTERS

HELICOPTER MAKE MODEL	MGW MLW	# OF ENGINES MAKE MODEL	MAIN ROTOR #OF BLADES MAKE MODEL	MAIN ROTOR DIA.	TAIL ROTOR #OF BLADES MAKE MODEL	TAIL ROTOR DIA	NOISE LEVEL		# OF PAX	NOTES	QUIET TECHNOLOGY
							APP. H (EPNdB)	APP. J (SEL)			
BELL - Long Ranger II BHT-206-L1	4.05	1 Allison 250-C28B	2 BHT-206	37'	2 BHT-206	5' 6"	85.8		6	8	NO
AEROSPATIALE AS-350-B ASTAR	4.63	1 Turbomeca Arriel 1B	3 AEROSPATIALE/ EUROCOPTER	35'	2 AERO/EURO	6'10"	86.8		6	H	NO
BELL Jet Ranger II BHT-206-BII	3.2	1 Allison 250-C20	2 BHT-206	33' 4"	2 BHT-206	5' 5"	84.6		4	8	NO
BELL Long Ranger BHT-206-L	4	1 Allison 250-C20B/J	2 BHT-206	37'	2 BHT-206	5' 6"	85.8		6	8	NO
BELL - Long Ranger BHT-206-L4	4.45	1 Allison 250-C30P	2 BHT-206	37'	2 BHT-206	5' 6"	85.2		6	H	NO
BELL - Long Ranger III BHT-206-L3	4.15	1 Allison 250-C30P	2 BHT-206	37'	2 BHT-206	5' 6"	87.8		6	8	NO
AEROSPATIALE AS-350-B2 ASTAR	4.96	1 TURBOMECA ARRIEL 1D1	3 AEROSPATIALE/ EUROCOPTER	35'	2 AERO/EURO	6'10"	87.6		6	H	NO
MDHI - MD900 Explorer	6.25	1 PW206A 1C	5 MDHI	33.83'	NOTAR System	-	83.0		8	H	YES
[illegible] (Sikorsky S-55 modified)	7.7	1 Allied Signal TSE 331-10-591 SW	5 S-55	53'	2 S-55	8' 9"	80.0		9	H	YES
BELL BHT-407	5	1 Allison 250-C47	4 BHT-407	35'	2 BHT-407	5' 5"		85.1	6	J	NO

NOTES COLUMN INDICATE THE HIERARCHY USED IN OBTAINING THE NOISE LEVEL
FOR THE EXPLANATION OF THE HIERARCHY SEE SECTION 6.

H = 14 CFR part 36 Appendix H
J = 14 CFR part 36 Appendix J
8 = ICAO Annex 16, Volume I Chapter 8
11 = ICAO Annex 16, Volume I Chapter 11
R = Research or other measurement test data
E = FAA approved noise estimation method as defined in the fourth hieraracy in Section 5
I = FAA approved noise estimation using the Integrated Noise Model

FOR DEFINITION OF CATEGORIES SEE SECTION 4 AND FIGURE 1-4.

APPENDIX II
GCNP INCENTIVE PLAN NOISE LEVELS
HELICOPTERS

NOMENCLATURE

#	Number
APP. H NOISE LEVEL	Measured/Estimated App. H level in EPNdB by method described in column labeled NOTES
APP. J NOISE LEVEL	Measured/Estimated App. J level in SEL by method described in column labeled NOTES
DIA	Diameter in feet
MAKE, MODEL	Manufacturer and model designation
MTOW, MLW (1000 LBS)	Maximum Takeoff Weight, Maximum Landing Weight
PAX	Passenger seats