APPENDIX F

LONG-TERM NOISE ASSUMPTIONS

Craig Noise Contour Development Long Term Noise Assumptions

This section outlines assumptions used in determining the long term noise exposure levels for areas surrounding CRG including those associated with both the existing airfield and a proposed runway extension included in the LPA Master Plan's capital improvement program. In addition to the extension of Runway 14-32 1,600 to the southeast, the latter includes a 600 foot displacement of the landing thresholds at both ends of the runway. Runway use, flight track use, and nighttime use percentages are consistent with those used in the long term noise analysis outlined in the recent FAR Part 150 Noise and Land Use Compatibility Study. The forecast and fleet mix differed from those outlined in the Part 150 and reflect the results of the detailed forecast and fleet analysis conducted during the LPA Master Plan Update.

F.1 Integrated Noise Model (INM)

The FAA has approved two models for use in determining noise exposure -- NOISEMAP and the INM. NOISEMAP is used most often at military airports, while the INM is most commonly used at civilian airports and therefore was used for CRG. The model is designed as a conservative planning tool, and is periodically updated based on the philosophy that each version should present a conservative approach to noise prediction. To allow for direct comparison to the noise exposure maps outlined in the recent Part 150 Noise and Compatible Land Use Study, Version 6.1 was used for the long term analysis at the airport

F.1.1 Methodology

The INM works by defining a network of grid points at ground level around an airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure generated by each aircraft operation, by aircraft type and engine thrust level, along each flight track. Corrections are applied for atmospheric acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location. The cumulative noise exposure levels at all grid points are then used to develop noise exposure contours for selected values (e.g. 60, 65, 70, and 75 DNL). DNL noise contours of equal noise exposure can then be plotted.

F.1.2 INM Input Data

In order to develop DNL noise contours, the INM uses a series of input factors. Some of these factors are included in the database for the model (such as engine noise levels, thrust settings, aircraft profiles and aircraft speeds) and others are Airport-specific and need to be determined for each condition analyzed. This Airport-specific data includes the airport elevation, average annual temperature, runway layout, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific aircraft with specific engine types at specific takeoff weights to individual flight tracks. Other INM input factors specific to CRG for this analysis include:

- Time of day/night of operations
- Stage lengths of aircraft
- Future aircraft operations and fleet mix
- Runway orientation and use

For GA airports, the split of itinerant and local activity are key factors that must be considered in the noise modeling effort. Local activity is generally described as an aircraft that remains in the local airspace within sight of the local air traffic control tower or within the tower's immediate area of control. These flights are often associated with training activities. Itinerant operations encompass the remainder of the flight activities at an airport and include transient aircraft activities.

F.1.3 Noise Curve Data

In addition to the mathematical procedures defined in the model, the INM has another very important element. This is a database containing tables correlating noise, thrust settings, and flight profiles for most of the civilian aircraft, and many common military aircraft, operating in the United States. This database, often referred to as the noise curve data, has been developed under FAA guidance based on thousands of actual noise measurements in controlled settings for each aircraft type.

The database also includes performance data for each aircraft type. This data allows the model to compute airport-specific flight profiles (rates of climb and descent) for each aircraft type, providing an accurate representation of actual procedures. The model also includes a number of FAA approved substitute aircraft. The tables contained in this chapter identify the actual aircraft type operating at CRG and, when necessary, the FAA approved INM substitute aircraft type.

F.2 Time of Day

For the purposes of noise modeling, the percentages of aircraft that operate during the daytime (7a.m.-10p.m.) and nighttime (10p.m.-7a.m.) are required. The separation of aircraft activity into daytime and nighttime activities is important because the Integrated Noise Model (INM) includes a 10 decibel penalty for aircraft noise during the nighttime hours.

Currently, the day night split is estimated to be 92 percent during the daytime and 8 percent during the nighttime. This same split was used for 2020.

F.3 Stage Length

An aircraft's "stage length" (or trip length) refers to the distance an aircraft flies to its next destination after departing an airport. The stage length is important in noise modeling, since the longer the distance an aircraft will travel to its next destination the greater its fuel load and overall weight and, as a result, the lower its departure profile will be. Stage lengths used in the INM for commercial service aircraft include the following ranges:

Stage length 1 – 0 to 500 miles
Stage length 3 – 1000 to 1500 miles
Stage length 5 – 2500 to 3500 miles
Stage length 2 – 500 to 1000 miles
Stage length 4 – 1500 to 2500 miles
Stage length 6 – 3500 to 4500 miles

There are no commercial aircraft at CRG. For GA aircraft, the INM automatically defaults to the maximum takeoff weight which was used for modeling future noise conditions.

F.4 Unconstrained and Constrained Fleet Assumptions

As outlined in Chapter 3, the LPA forecast (which was approved by the FAA) is an unconstrained forecast of future demand at the airport. That is, considering a variety of local, regional and national factors, the total operational level is what is anticipated at the airport without constraining factors. It was determined during the forecast analysis that some level of larger general aviation activity was already operating at the airport regardless of the extension. Therefore, the anticipated difference between the fleet with the extension versus without the extension is expected to be less than determined during the previous master plan update. The change in fleet is an important consideration in assessing the future noise implications of the runway extension to the communities surrounding CRG. Since the extension of the runway will allow general aviation aircraft to operate with improved payload capabilities, it is referred to as the "unconstrained" fleet scenario for the purpose of this analysis. Noise analysis related to the future activity conditions with the existing runway is referred to as the "constrained" fleet scenario. Activity for each major category of the fleet was analyzed for modeling.

F.4.1 Military Operations

Table F-1 presents the operations and fleet mix of military aircraft for 2020 as it was modeled for both the unconstrained and constrained scenarios.

TABLE F-1
2020 MILITARY OPERATIONS AND FLEET MIX

Aircraft	INM Aircraft	Operations	Operations/ Day	Percent of Fleet
Coast Guard	S70	740	2.0	50.1
Navy	A109	736	2.0	49.9
Total		***1,476***	***4.0***	***100.0***

Source: ESA Airports

F.4.2 General Aviation Operations

Tables F-2 and **F-3** present the 2020 itinerant fleet for the unconstrained and constrained scenarios respectively. Local general aviation operations and fleet mix for both the unconstrained and constrained scenarios are outlined in **Table F-4**.

TABLE F-2
2020 ITINERANT GENERAL AVIATION OPERATIONS AND FLEET MIX - UNCONSTRAINED

Aircraft Category	INM Aircraft	Aircraft Type	Operations	Operations / Day	Percent of Fleet
Single-Engine	CNA172	Cessna 150/152/172/177	26,550	72.74	20.7%
Piston	CNA206	Cessna 182/185/205/206	12,170	33.34	9.5%
	CNA20T	Cessna 207	1,575	4.32	1.2%
	GASEPF	Beechcraft 23/24	8,243	22.58	6.4%
	GASEPV	Piper 28R/32R/46	12,191	33.40	9.5%
Multi-Engine Piston	BEC58P	Beechcraft 55/58/65/76/95	30,071	82.39	23.4%
Turboprop	CNA441	Cessna 421/425/441	7,712	21.13	6.0%
	DHC6	Beech Super King Air 200/300	7,233	19.82	5.6%
	EMB120	Embraer 120	46	.13	0.0%
	HS748A	Fairchild Merlin	639	1.75	0.5%
Jet	CNA500	Cessna Citation I	4,105	11.25	3.2%
	CL601	Canadair Challenger	86	.24	0.1%
	CNA750	Cessna Citation V, VLJ	380	1.04	0.3%
	CIT3	Cessna Citation VII	103	.28	0.1%
	CL600	Falcon 2000	27	.07	0.0%
	LEAR35	Lear 31/35/36	3,355	9.19	2.6%
	MU3001	Cessna 550/560/56X	6,719	18.41	5.2%
	IA1125	Astra 1125	88	.24	0.1%
Helicopter	EC130	Eurocopter EC130	2,173	5.95	1.7%
	B206L	Bell 206L	4,844	13.27	3.8%
Total			***128,308***	***351.53***	***100.00***

Source:ESA Airports

TABLE F-3
2020 ITINERANT GENERAL AVIATION OPERATIONS AND FLEET MIX - CONSTRAINED

Aircraft Category	INM Aircraft	Aircraft Type	Operations	Operations / Day	Percent of Fleet
Single-Engine	CNA172	Cessna 150/152/172/177	26,550	72.74	20.9%
Piston	CNA206	Cessna 182/185/205/206	12,170	33.34	9.6%
	CNA20T	Cessna 207	1,575	4.32	1.2%
	GASEPF	Beechcraft 23/24	8,243	22.58	6.5%
	GASEPV	Piper 28R/32R/46	12,191	33.40	9.6%
Multi-Engine Piston	BEC58P	Beechcraft 55/58/65/76/95	30,071	82.39	23.7%
Turboprop	CNA441	Cessna 421/425/441	7,712	21.13	6.1%
	DHC6	Beech Super King Air 200/300	7,233	19.82	5.7%
	EMB120	Embraer 120	46	0.13	0.0%
	HS748A	Fairchild Merlin	639	1.75	0.5%
Jet	CNA500	Cessna Citation I	4,105	11.25	3.2%
	CL601	Canadair Challenger	46	0.13	0.0%
	CNA750	Cessna Citation V, VLJ	335	0.92	0.3%
	CIT3	Cessna Citation VII	55	0.15	0.0%
	CL600	Falcon 2000	27	0.07	0.0%
	LEAR35	Lear 31/35/36	2,495	6.84	2.0%
	MU3001	Cessna 550/560/56X	6,434	17.63	5.1%
	IA1125	Astra 1125	59	0.16	0.0%
Helicopter	EC130	Eurocopter EC130	2,173	5.95	1.7%
	B206L	Bell 206L	4,844	13.27	3.8%
Total			***127,003***	***347.95***	***100.00%***

Source:ESA Airports

TABLE F-4
2020 LOCAL GENERAL AVIATION OPERATIONS AND FLEET MIX

Aircraft Category	INM Aircraft	Aircraft Type	Operations	Operations/ Day	Percent of Fleet
Single-Engine	CNA172	Cessna 150/152/172/177	28,219	77.31	34.2%
Piston	CNA206	Cessna 182/185/205/206	12,936	35.44	15.7%
	CNA20T	Cessna 207	1,674	4.59	2.0%
	GASEPF	Beechcraft 23/24	8,761	24.00	10.6%
	GASEPV	Piper 28R/32R/46	12,957	35.50	15.7%
Multi-Engine Piston	BEC58P	Beechcraft 55/58/65/76/95	11,844	32.45	14.3%
Turboprop	CNA441	Cessna 421/425/441	3,037	8.32	3.7%
	DHC6	Beech Super King Air 200/300	2,849	7.80	3.5%
	EMB120	Embraer 120	18	0.05	0.0%
	HS748A	Fairchild Merlin	252	0.69	0.3%
Total			***82,547***	***226.16***	***100.00***

Source: ESA Airports

F.5 Flight Tracks

The location of flight tracks and corridors is an important factor in determining the geographic distribution of noise contours on the ground. Flight corridors utilized by arriving and departing aircraft in all flow conditions were reviewed and a series of centerlines of flight corridors (flight tracks) were established for each condition. These flight tracks were splayed within the INM in order to distribute the aircraft within each of the primary flight corridors. The flight tracks used for the 2020 analysis were assumed to be identical to those outlined in the Part 150 Study

The runway and flight track use percentages for propeller aircraft and training aircraft were assumed to be the same for the unconstrained and constrained fleet scenarios since these aircraft categories are more sensitive to wind conditions. Runway use and track use information for these aircraft are presented in **Tables F-5** and **F-6**. .

TABLE F-5
2020 PROPELLER AIRCRAFT FLIGHT TRACK USAGE

Runway	Departure Runway Use %	Departure Track	% of Flight Activity	Arrival Runway Use %	Arrival Track	Percentage of Flight Activity
Runway 5	20%	D1	40%	22%	A1	60%
		D2	5%		A2	20%
		D3	35%		A3	20%
		D3A	20%			
Runway 14	22%	D4	25%	28%		
		D5	50%		A4	40%
		D6	5%		A5	45%
		D7	15%		A6	15%
		D8	5%			
Runway 23	28%	D9	60%	20%	A7	20%
		D10	5%		A8	20%
		D11	35%		A9	60%
Runway 32	30%	D12	40%	30%	A10	15%
		D13	18%		A11	60%
		D14	2%		A12	25%
		D15	40%			

Source: FAA Air Traffic Control and ESA Airports

TABLE F-6
2020 LOCAL PATTERN FLIGHT TRACK USAGE

Runway	Touch and Go use Percentage	Track	Prop / Turboprop GA Jet Military
5	22	T1	95%
		T2	5%
14	28	T3	5%
		T4	95%

TABLE F-6
2020 LOCAL PATTERN FLIGHT TRACK USAGE

23	20	T5	95%
		T6	5%
32	30	T7	95%
		T8	5%

Source: FAA Air Traffic Control and ESA Airports

For jet aircraft, runway and flight track utilization is expected to change if the runway is extended. It is anticipated that most jet aircraft will request use of the longer runway to improve the payload capabilities and safety margin for their operations at CRG. **Table F-7** represents the current runway and flight track utilization if the runway is not extended (constrained scenario) and **Table F-8** shows the modeled track utilization if the runway is extended.

TABLE F-7
2020 JET AIRCRAFT FLIGHT TRACK USAGE (NO EXTENSION)

Runway	Departure Runway Use %	Departure Track	% of Flight Activity	Arrival Runway Use %	Arrival Track	Percentage of Flight Activity
Runway 5	20%	D2	100%	22%	A2	100%
Runway 14	22%	D5	60%	28%	A5	100%
		D7	40%			
Runway 23	28%	D10	50%	20%	A8	100%
		D11	50%			
Runway 32	30%	D13	10%	30%	A11	100%
		D14	60%			
		D15	30%			

Source: FAA Air Traffic Control and ESA Airports

TABLE F-8
2020 JET AIRCRAFT FLIGHT TRACK USAGE (WITH EXTENSION)

Runway	Departure Runway Use %	Departure Track	% of Flight Activity	Arrival Runway Use %	Arrival Track	Percentage of Flight Activity
Runway 5	5%	D2	100%	5%	A2	100%
Runway 14	30%	D5	60%	30%	A5	100%
		D7	40%			
Runway 23	5%	D10	50%	5%	A8	100%
		D11	50%			
Runway 32	60%	D13	10%	60%	A11	100%
		D14	60%			
		D15	30%			

Source: FAA Air Traffic Control and ESA Airports