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USER'S MANUAL FOR THE ALAMO DEMOGRAPHIC
REPORT GENERATOR PROGRAM (DEMCON)



SEPTEMBER 1981

U.S. ENVIRONMENTAL PROTECTION AGENCY
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16. Abstract (Limit: 200 words) This report presents a discussion of the user requirements and procedures for executing the Demographic Report Generator Program. DEMCOM, a computer program written in FORTRAN IV programming language, uses as input the Aircraft Noise Levels and Annoyance Model (ALAMO) demographic profile reports which are generated for each octant of specified day-night sound level (L_{dn}) contour band and computes the same variables for the all-octant case. The program also projects selected demographic variables to future years based on historical growth rates for population, households, and per capita income.			
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PREPARED UNDER:
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FOR THE
OFFICE OF NOISE ABATEMENT AND CONTROL
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I. INTRODUCTION

The computer program DEMCON is written in the FORTRAN IV programming language and is currently operational on the NASA Langley Research Center's (LRC) CDC computer complex. It uses as input the Aircraft Noise-Levels and Annoyance Model (ALAMO) demographic profile reports which are generated for each octant of specified Day-Night Sound Level (L_{dn}) contour band. DEMCON computes and outputs the same demographic variables for the all-octant case (i.e., a summation of all eight octants) for each of the following noise level contour bands (L_{dn} in dB): 55-60, 60-65, 65-70, 70-75, 75-80, 80-85, 85+, 65-75, and 75+.

The output format of DEMCON is similar to the standard demographic profile reports provided by CACI, Inc. The output consists of a variety of demographic information based on 1970 Bureau of Census statistics (with some 1977 updates) which describe the socio-economic environment in the surrounding airport community.* Projections for selected demographic variables may be

*ALAMO contains a large demographic data base management program developed by CACI, Inc. called SITE II. SITE II is capable of generating a demographic profile report for closed contours (size and shape essentially arbitrary) located anywhere in the United States.

determined for the years 1979 and later. The projections are performed based on annual compound growth rates computed from the Population, Household and Per Capita Income data available in the standard demographic profile reports for both the year of the basic census data (1970) and for 1977.

To generate projection reports, assumptions are developed concerning aircraft fleet mixes, for number of departures, runway use, etc. for a given projection year. These data are then used to execute Integrated Noise Model (INM) runs which in turn generate ALAMO output reports reflecting census data for 1979 and 1977. To the extent the INM runs represent fleet mixes, etc. for a given forecast year, the projection procedures may be used to estimate demographic data comparable to that forecast year.

The following sections present a detailed discussion of the user requirements and procedures for executing the computer program, DEMCON. The computational algorithms used to determine demographic data projections are discussed in Appendix A.

II. INPUTS AND OUTPUTS

Program DEMCON uses two ALAMO input files and one ALAMO output file. A description of these files is presented below:

<u>LOGICAL UNIT</u>	<u>FILE TYPE</u>	<u>Description</u>
1	INPUT	Airport Location/Description Deck (file H of the ALAMO procedure, optionally modified to include projection data)
5	INPUT	Demographic Profile Reports (file G of the ALAMO procedure)
6	OUTPUT	Demographic variables for all-octant case of each L_{dn} band, for the base-line year plus dn projection years, if requested.

The Airport Location/Description Deck file on Unit 1 is the H file used in the ALAMO procedure. The first 3 records of this card format file are skipped by DEMCON; these contain data used by the ALAMO procedure. Records 4 and 5 contain the airport name and address, respectively. Record 6 (optional) contains demographic projection data. The format of the inputs on Unit 1 are shown on Table 1. A sample listing of the Airport Location/Description Deck file is shown on Figure 1.

The Demographic Profile Report file input on Unit 5 is the SITE II output file generated by the ALAMO runs. The data contained on Unit 5 are used to prepare the ALAMO demographic reports. The assumptions made concerning

TABLE 1
 FORMATS OF THE INPUT DATA ON UNIT 1 FOR PROGRAM DEMCON

<u>Record</u>	<u>Format</u>	<u>Column</u>	<u>Description</u>
1			Records 1, 2, and 3 skipped by DEMCON Airport Latitude, Longitude, Displacement:
	I2	1-2	Latitude degrees
	I2	4-5	minutes
	I2	7-8	seconds
	I2	11-13	Longitude degrees
	I2	15-16	minutes
	I2	18-19	seconds
	A1	25	Displacement Direction (N or S)
	F5.2	26-30	Unsigned N/S displacement amount
	A1	32	Displacement Direction (E or W)
	F5.2	33-37	Unsigned E/W displacement amount
2	2F10.2	1-20	X and Y translation constants
3	F5.2	1-5	Scale factor for contour graphic, length of positive axis
4	8A10	1-80	80 character Airport Name (suggest 70 or less) placed on output.
5	8A10	1-80	80 character Airport Address (suggest 70 or less) placed in output.
6			Projection data (optional):
	4A10	1-40	40 character contour identifier, used on output report.
	8I5	41-80	Years for which projections are desired.

38 51 08 077 02 15
0.0 0.c
4.0
DCA NATIONAL AIRPORT
WASHINGTON, DC
1981 AIRPORT PROCEDURES

1979 1985 1990 1995 2000

FIGURE 1. A SAMPLE LISTING OF THE AIRPORT
LOCATION/DESCRIPTION DECK FILE (ON UNIT 1)

this report file are:

1. There is (at least) one report for each octant (1-8) for each L_{dn} contour. The contours are in order of increasing L_{dn} value over the range from 55 dB to 85 dB in 5 dB steps. If contours are missing, they are missing from the ends of the range, not the middle.
2. The absence of reported demographic data for a particular octant (i.e., the polygonal area was empty, as would occur if the area encompassed undeveloped land or if the L_{dn} contour did not extend beyond the airport boundary) may be determined by examining the first lines of the Demographic Profile Report containing the latest (1977) population data (see box, upper right corner of Figure 2). This situation occurs when the baseline population (as computed from the "LATEST" and "CHANGE FROM" data) is zero.
3. Column 1 contains carriage control characters. A sample listing of the Demographic Profile Report file is shown on Figure 2.

In addition to the two input files described above, there is one more piece of information which must be provided to program DEMCON. This information is the starting index to the seven possible contours available in the Demographic Profile Report file. This is provided via the R2 Job Control Register and is set and displayed by the ALAMO procedures during execution. If there are 5 contours found (out of the possible 7), this register must be set to 3, i.e., R2 is equal to eight (8) minus the number of contours found.

For the year of the input census data, the demographic variables output on Unit 6 are essentially in the same format as the standard demographic profile report. One report is output for each of the following L_{dn} contour bands (in dB), if these data are available: 55-60, 60-65, 65-70, 70-75, 75-80, 80-85, 85+ 65-75, and 75+. The only differences between the output formats of the standard Demographic Profile Report and the format used with the DEMCON program are:

LON 55.0 OCTANT 1: 6.64 * * * * *
 * * * * * LATEST CHANGE *
 * * * * * FROM 70 *
 DEG MIN SEC * 1977 POPULATION 80721 -3355 *
 LATITUDE 38 51 8 * 1977 HOUSEHOLDS 26425 2444 *
 LONGITUDE 77- 2 15 * 1977 PER CAP INCOME \$ 5688 \$ 2929 *
 * * * * * ANNUAL COMPOUND GROWTH -.6 *
 * * * * *
 7 POINT POLYGON * * * * *
 WEIGHTING PCT 100 * * * * *

1970 CENSUS DATA

POPULATION		AGE AND SEX				
TOTAL		MALE		FEMALE		TOTAL
TOTAL	84076 103.0	0-5	6426 15.9	6270 14.4	15.1	
WHITE	25037 29.8	6-13	7787 19.3	7713 17.7	18.4	
NEGRO	57860 68.8	14-17	2856 7.1	2753 6.3	6.7	
OTHER	1129 1.3	18-20	1713 4.2	2953 6.8	5.5	
SPAN	1516 1.8	21-29	8304 20.6	10001 22.9	21.8	
		30-39	5827 14.4	5733 13.1	13.7	
		40-49	3424 8.5	3388 7.6	8.1	
		50-54	2710 6.7	3068 7.0	6.9	
		65 +	1364 3.4	1800 4.1	3.8	
		TOTAL	47427	43649	22.8	
		MEDIAN (AGE)	22.6	22.9	22.8	
FAMILY INCOME (\$000)		HOME VALUE (\$000)		OCCUPATION		
\$0-5	3638 19.3	\$0-10	33 .9	MGR/PROF	5078 18.6	
\$5-7	2870 15.2	\$10-15	159 10.1	SALES	1114 4.1	
\$7-10	4197 22.3	\$15-20	1244 35.1	CLERICAL	10350 37.9	
\$10-15	5025 26.7	\$20-25	993 29.3	CRAFT	2420 8.9	
\$15-25	2671 14.2	\$25-35	732 20.7	OPERATVS	2579 9.4	
\$25-50	412 2.2	\$35-50	157 4.4	LABORER	1118 4.1	
\$50 +	34 .2	\$50 +	27 .8	FARM	46 .2	
TOTAL	18847	TOTAL	3542	SERVICE	4249 15.6	
AVERAGE	\$ 9834			PRIVATE	344 1.3	
MEDIAN	\$ 9084					
RENT		AVERAGE *22444		EDUCATION ADULTS > 25		
\$0-100	6100 32.8	MEDIAN 120662 <td></td> <td>1-8</td> <td>7904 21.6</td>		1-8	7904 21.6	
\$100-150	10538 53.1	OWNER 15.2 <td></td> <td>9-11</td> <td>8745 23.9</td>		9-11	8745 23.9	
\$150-200	1046 15.4			12	13707 36.4	
\$200-250	117 .6			13-15	3821 10.4	
\$250 +	14 .1			16 +	3923 7.7	
TOTAL	19785					
AVERAGE \$ 116		AUTOMOBILES		HOUSEHOLD PARAMETERS		
MEDIAN \$ 118 <td></td> <td>NONE</td> <td>7842 32.7</td> <td>FAM POP</td> <td>70916 84.3</td>		NONE	7842 32.7	FAM POP	70916 84.3	
RENTER 44.8 <td></td> <td>ONE</td> <td>12561 52.4</td> <td>INDIVIDIS</td> <td>7504 8.9</td>		ONE	12561 52.4	INDIVIDIS	7504 8.9	
		TWO	3266 12.8	TRP GTRC	5634 6.7	
		THREE+	461 2.0	TOT POP	84774	
				NO OF HH'S	23961	
				NO OF FAM'S	18770	
				AVG HH SIZE	3.3	
				AVG FAM SIZE	3.8	
UNITS IN STRUCTURE		HOUSEHOLDS WITH:				
1	6113 25.5	TV	22121 72.2			
2	557 2.3	WASHER	8733 36.4			
3-4	1793 7.3	DRYER	4312 19.0			
5-9	1632 14.6	DISHWASH	2488 10.4			
10-49	13731 41.9	AIRCOND	11532 48.1			
50 +	1000 7.7	FREEZER	1184 12.9			
MORILE	92 .2	2 HOMES	440 1.8			

FIGURE 2. A SAMPLE LISTING OF THE DEMOGRAPHIC PROFILE REPORT FILE (ON UNIT 5)

<u>LINE</u>	<u>DESCRIPTION OF DIFFERENCE IN OUTPUT</u>
1	Contour band sequence number is output instead of page number
2	Airport name is output (first 79 characters in columns 2-80)
3	Airport address is output (first 79 characters in columns 2-80)
4	L_{dn} value, AREA, and OCTANT number are NOT output
10	L_{dn} contour band limits are output instead of the number of points in the polygon.

The format of the remainder of the report is unchanged from the standard demographic report. A sample listing of the output report for program DEMCON is shown on Figure 3.

If the user chooses, there is also a brief output report for up to 8 projection years for each of the L_{dn} contour bands. The projections are made from the census data year to 1979 based on annual compound growth rates in population, households, and per capita income, as well as on national trends in housing and rental values. The projections are based on constant (1979) dollars. Accordingly, variables reflecting dollar values are not indexed beyond the year 1979 to account for inflationary increases. These growth rates are computed from the census data and the updated values found in the standard demographic profile reports. Based on these same data, projections are then made to years beyond 1979 using the annual compound growth rate in households. A sample listing of the output for projected demographic variables is shown on Figure 4.

OCA NATIONAL AIRPORT
WASHINGTON, DC

DEMOGRAPHIC PROFILE REPORT CONTOUR 2

DEG MIN SEC
LATITUDE 38 51 A
LONGITUDE 77 2 15
LDM 55-60 DB
WEIGHTING PCT 100

```

* * * * *
* * * * * LATEST CHANGE *
* * * * * FROM 70 *
* 1977 POPULATION      403811      -6612 *
* 1977 HOUSEHOLDS      152750      6681 *
* 1977 PER CAP INCOME $ 7534      $ 2577 *
* * * * *
* ANNUAL COMPOUND GROWTH      -.3 *
* * * * *

```

1970 CENSUS DATA

POPULATION		AGE AND SEX		MALE		FEMALE		TOTAL
TOTAL	412423	100.0						
WHITE	272651	66.1	0-5	19754	13.1	19395	9.9	9.5
NEGRO	133914	32.5	6-13	33988	15.9	30750	14.1	15.0
OTHER	5958	1.4	14-17	14743	7.6	14704	6.8	7.1
			18-20	8514	4.4	11650	5.4	4.9
SPAN	12072	2.9	21-29	35684	15.8	34637	15.9	15.8
			30-39	25264	13.0	25721	11.8	13.4
			40-49	25134	12.9	28530	13.1	13.0
			50-54	27723	14.2	32254	14.8	14.5
			65 +	11888	6.1	20078	9.2	7.8
			TOTAL	194692		217719		
			MEDIAN(AGE)		27.8		29.4	28.7

FAMILY INCOME (000)		HOME VALUE (000)		OCCUPATION				
\$0-5	13747	14.0	\$0-10	622	1.2	MGR/PROF	56041	14.6
\$5-7	8674	8.8	\$10-15	2771	5.5	SALES	9184	5.7
\$7-10	14595	14.9	\$15-20	7524	15.3	CLERICAL	45831	20.5
\$10-15	22634	23.0	\$20-25	7321	14.4	CRAFT	13968	8.0
\$15-25	24665	25.1	\$25-35	11691	23.3	OPERATVS	9753	6.1
\$25-50	12302	12.2	\$35-50	11685	21.7	LABORER	4514	2.8
\$50 +	1468	1.9	\$50 +	8539	17.0	FARM	260	.2
TOTAL	98245		TOTAL	50233		SERVICE	18859	11.7
AVERAGE	\$15080					PRIVATE	3535	2.2
MEDIAN	\$12666							

RENT		AVERAGE		OWNER	
\$0-100	25676	28.3	\$33912	35.7	
\$100-150	37077	42.9	MEDIAN	330986	
\$150-200	18674	20.6			
\$200-250	4336	4.8			
\$250 +	4902	5.4			
TOTAL	99665				

AVERAGE		MOTORCARS		
\$	133	NONE	44208	30.3
MEDIAN	\$ 137	ONE	61702	42.3
RENTER	64.3	TWO	33968	21.3
		THREE+	6155	4.2

EDUCATION		ADULTS > 25	
0-8	39955	17.3	
9-11	37776	16.4	
12	61695	27.6	
13-15	32541	14.1	
16 +	56314	24.4	

HOUSEHOLD PARAMETERS		
FAM POP	342142	83.0
INDIVIDIS	67447	15.4
GRP QTRS	6874	1.7
TOT POP	412423	

UNITS IN STRUCTURE		HOUSEHOLDS WITH:			
1	66251	45.4	TV	131105	33.1
2	3187	2.2	WASHER	71207	18.0
3-4	6837	4.7	DRYER	46855	11.8
5-9	9993	6.8	DISHWASH	41255	10.4
10-49	28421	19.5	AIRCOND	74516	18.8
50 +	30751	21.1	FREEZER	24927	6.8
MORTLE	637	.4	2 HOMES	3958	1.0

FIGURE 3. SAMPLE LISTING OF THE OUTPUT FOR PROGRAM DEMCON (ON UNIT 6)

DEMOGRAPHIC REPORT

MIAMI INTERNATIONAL
MIAMI, FLORIDA

PROJECTION YEAR 1979 FROM 1970 CENSUS DATA WITH 1977 UPDATES

LDN 70-75 CB , CONTOUR 4 MIACBL441

POPULATION (ANNUAL COMPOUND GROWTH 2.2%)

RACE	%	AGE	%
WHITE	66.5	0-5	7.5
NEGRO	30.4	6-11	12.4
OTHER	3.1	12-17	8.9
TOTAL	71892	18-23	4.4
		24-29	11.4
SPANISH	43312	30-35	12.4
		36-40	14.4
		41-45	14.7
		46-50	17.3
		TOTAL	71892
		MEDIAN	36.5 YRS

PER CAPITA INCOME \$ 5922 (ANNUAL COMPOUND GROWTH 0.4%)

HOUSEHOLDS (ANNUAL COMPOUND GROWTH 2.6%)

NUMBER OF HOUSEHOLDS	TOTAL	AVERAGE SIZE	2.4
OWNED (39.5%)	11143	RENTAL (60.5%)	17034
NUMBER	11143	NUMBER	17034
AVERAGE \$	31903	AVERAGE \$	171
MEDIAN \$	29493	MEDIAN \$	174
		FAMILY INCOME	
		AVERAGE \$	15341
		MEDIAN \$	12449

UNITS/STR	UNITS	STRUCT	HOUSEHOLDS WITH:	%
1	17154	17154	TV	44.7
2	3776	7552	WASHER	27.0
3-4	1780	5340	DRYER	5.0
5-7	2320	6960	DISHWASH	26.7
8-99	456	1368	AIR COND	21.7
10+	89	267	FREEZER	7.0
TOTAL	17746	33106	REFRIG	1.0
MOBILE	114			

FIGURE 4. SAMPLE LISTING OF THE OUTPUT FOR PROJECTED DEMOGRAPHIC VARIABLES

III. PROGRAM EXECUTION

The source code for program DEMCON has been stored on the NASA LRC computer system under the name DEMCONS. The compiled binary object module has been stored under the name DEMCONB. The OPL library module is needed for compilation of the CDC Compass routine. To re-compile DEMCON the following procedure is used:

```
ATTACH,OPL/UN=LIBRARY.
```

```
FTN,I=DEMCONS,B=DEMCONB,L=DEMCONL,R=3.
```

```
REPLACE,DEMCONB,DEMCONL.
```

This procedure will compile the source code DEMCONS and place the binary output in DEMCONB, replacing the existing binary on that file. The listing of the compilation will be placed on DEMCONL, replacing any existing listing on that file.

To make an executable load module of DEMCON, the following commands are performed:

```
LDSET,MAP=SBEX/DEMCONM.
```

```
LOAD,DEMCONB.
```

```
NOGO,DEMCONA.
```

```
REPLACE,DEMCONA,DEMCONM.
```


These commands will create an absolute, executable load module on the file DEMCONA, and will put the load map on file DEMCONM. Any existing files by those names will be replaced.

To execute the DEMCON report generator program, the user must first set the R2 control register to the starting index of the L_{dn} contours. DEMCON assumes that the seven possible contours (55+, 60+, 65+, 70+, 75+, 80+, 85+) are available in order of increasing L_{dn} value in file 5. If there are N contours to be found, R2 must be set to 8-N (e.g., start with 2 if there are 6 contours). R2 is set and displayed by the ALAMO procedure.

To execute DEMCON, the following commands are given:

```
SET (R2 = n)
```

```
DEMCONA,file-G,line-printer,,file-H.
```

where n is the proper value of the R2 register.

line-printer is the name of the file to contain

the line printer output (default name is OUTPUT)

file-G is the name of Unit 5 input file

file-H is the name of the Unit 1 input file.

APPENDIX A

COMPUTATIONAL ALGORITHMS

APPENDIX A
COMPUTATIONAL ALGORITHMS

ALL-OCTANT SUMMATION

The variables presented in the demographic profile reports are read in octant-by-octant for each contour noise level and summed over all octants. They are then differenced to compute the aggregate data for the contour bands. The percentages and medians are then computed for the all-octant case for each contour band. In cases where the total of a particular variable is zero, the category percentages will also be given a value of zero. The median of a set of variable categories may fall in the final, open-ended category; in this case the median cannot be computed and is given a value of zero. An example of this would be the following set of home value counts:

HOME VALUE (000)	
\$0-10	0
\$10-15	0
\$15-20	0
\$20-25	3
\$25-35	9
\$25-50	9
\$50+	34

The averages for family income, home value, and rent, as well as the per capita income data, are computed from the average of each octant weighted by the summation of each variable's values over all octants.

UPDATING PROCEDURE

The procedure for updating selected demographic variables proceeds in two steps. The first step begins with computation of annual compound growth rates for those variables for which two data points are available -- total population, number of households and per capita income. The growth rate is computed as:

$$r_x = \left(\frac{x_{1970}}{x_y} \right)^{y-1970} - 1 \quad (A-1)$$

where: X = variable of interest, either population (P), households (H) or per capita income (K)
 y = year for which updated ALAMO data is available, normally 1977 (see box, upper right corner of Figure 3).

Based on these compound growth rates, selected variables are updated to the base-line year 1979, as follows:

$$x_{1979} = x_{1970}(1 + r_x)^9 \quad (A-2)$$

where: X = variable of interest (P, H or K)
 r = annual compound growth rate

Other variables (e.g., number of renters, number of homeowners, number of housing units, etc.) are updated to 1979 values based on the annual compound growth rates for households using equation A-2.

For average/median rent and home values, the update to 1979 values is based on national trends in rental and housing values, indexed to 1970 values. The computation is:

$$RV_{1979} = 1.60 RV_{1970} \quad (A-3)$$

$$HV_{1979} = 1.89 HV_{1970} \quad (A-4)$$

where: RV = monthly rental value

HV = home value.

The second step of the process involves projections to the post-1979 period, normally 1985, 1990, 1995 and 2000. Here, all variables associated with a monetized value, such as average rent or home value, remain constant so that projections are presented in constant (1979) dollars. For other variables, the projections are based on the same annual compound growth rate as follows:

$$Z_T = Z_{1979} (1 + r_H)^{T-1979} \quad (A-5)$$

where: T = the post-1979 year for which updates are desired

Z = variable of interest, either population (P), total households (H), number of renters (R), number of homeowners (HO) and number of housing units (U)

r_H = annual compound growth rate for households.

For a more complete explanation of the updating procedure, see ORI letter report dated July 1981, entitled Procedures to Update Selected Demographic Variables.