U.S. Department
of Transportation

Federal Aviation Administration
Office of Aviation
Policy and Plans

IFR AIRCRAFT HANDLED

Forecast by
Air Route Traffic Control Center
Fiscal Years 1990–2005

FAA-APO-90-3

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FAA-APO-90-3		

4. Title and Subtitle	5. Report Date
IFR AIRCRAFT HANDLED FORECAST BY AIR ROUTE TRAFFIC CONTROL CENTER FISCAL YEARS 1990-2005	February 1990
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No. FAA-APO-90-3
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Office of Aviation Policy and Plans Washington, DC 20591	10. Work Unit No. (TRAIS)
	11. Contract or Grant No.
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered Forecast of Air Route Traffic Control Center Activity FY 1990-2005
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report provides forecasts of Instrument Flight Rule (IFR) aircraft handled by Federal Aviation Administration (FAA) Air Route Traffic Control Centers (ARTCC). The current study is an update to FAA-AVP 80-4, IFR AIRCRAFT HANDLED Forecast by Air Route Traffic Control Center, Fiscal Years 1980-1991. The forecasts serve as a base for the FAA planning and budget process in determining future requirements for facilities, equipment, and manpower.

The forecasts show that total aircraft handled will increase from 37.0 million in FY 1989 to 50.6 million in FY 2005. These national total numbers along with the intervening years are broken down by FAA region and for each air route traffic control center in this report.

This appendix contains a technical description of the data sources, methodology, and regression models used in the Instrument Flight Rule (IFR) aircraft activity forecasts for each Air Route Traffic Control Center (ARTCC). Section 2.0 presents an overview of the forecasting model for IFR aircraft activity. Section 3.0 provides a detailed description of the various data bases used in the forecasts. Section 4.0 allocating county data to the various ARTCCs, and estimating models to forecast IFR aviation activity. The final section presents the forecasting models for IFR departures and overs at each ARTCC.

17. Key Words	18. Distribution Statement
Air Route Traffic Control Centers Aviation Activity Forecasts, Federal Aviation Administration, Air Carriers, General Aviation, Military Aviation, Aircraft Operations	Document is available to the public through the National Technical Information Service Springfield, VA 22152

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED		

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Forecast of IFR Aircraft Handled By Air Route Traffic Control Center: Fiscal Years 1990-2005

Task III: Final Methodology Report

Contract No. DTFA01-88-C-00059
Work Order 12

Submitted to:

Office of Aviation Policy and Plans
The Federal Aviation Administration
800 Independence Avenue SW
Washington, DC 20591

ASI 1361

February 12, 1990

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INTRODUCTION

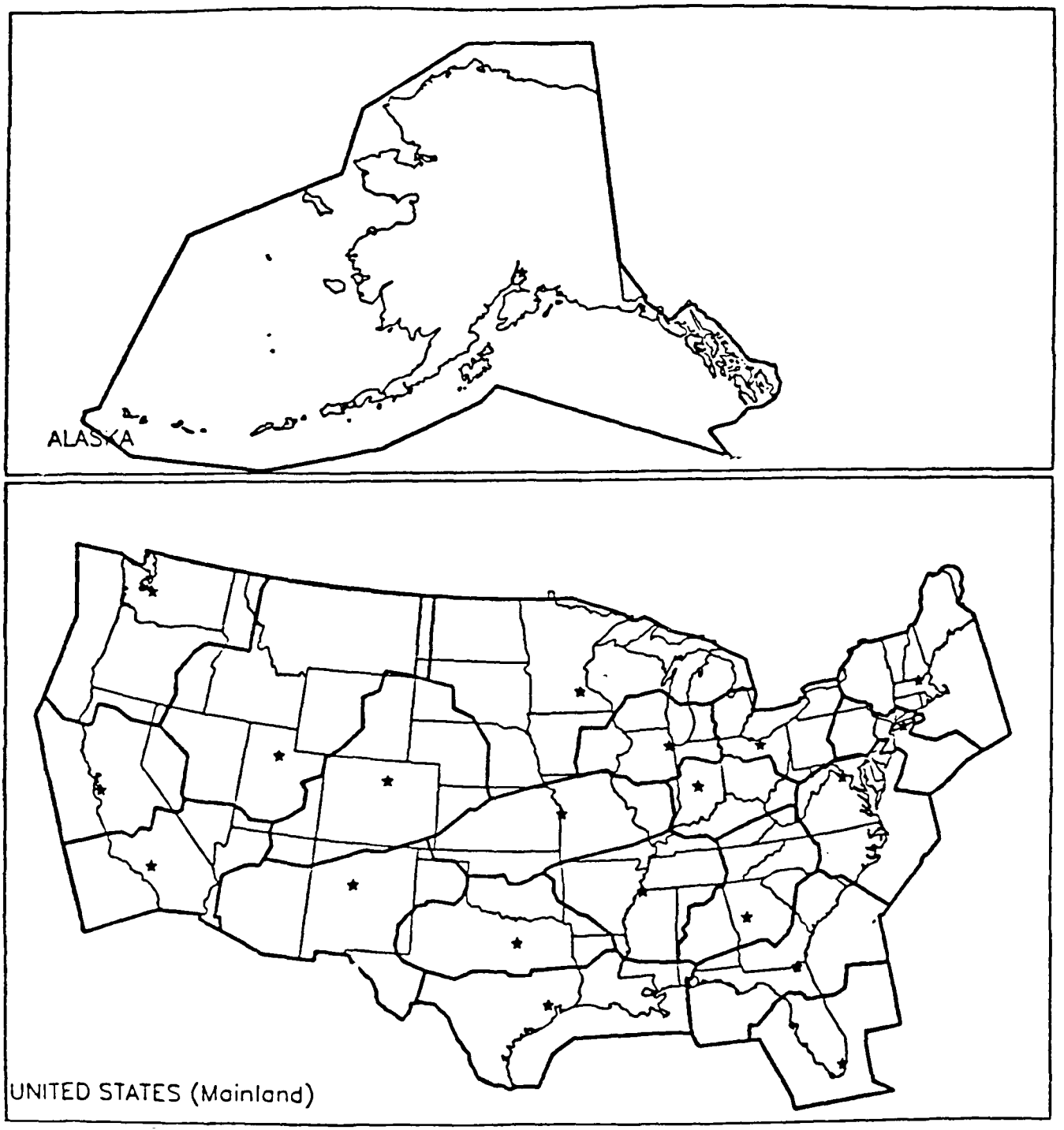
This report provides forecasts of Instrument Flight Rule (IFR) aircraft handled by Federal Aviation Administration (FAA) Air Route Traffic Control Centers (ARTCC). The current study is an update to FAA-AVP 80-4, *IFR AIRCRAFT HANDLED Forecast by Air Route Traffic Control Center, Fiscal Years 1980-1991.* Figure 1 depicts the boundaries of each ARTCC in the continental United States as of April, 1989. The forecasts serve as a base for the FAA planning and budget process in determining future requirements for facilities, equipment, and manpower.

Forecasts of IFR departures and overs by air carrier, air taxi, general aviation, and military aircraft are presented for fiscal years 1990 through 2005 for each operating ARTCC. Historical data are also shown for the years 1985 through 1989. The forecasts presented in this report agree with the national IFR aircraft handled forecasts.

The national forecasts call for modest annual growth in air carrier and general aviation activity over the forecast period, approximately 2.5 percent and 2.3 percent, respectively. Air taxi activity is projected to increase somewhat more rapidly, about 3.2 percent per year. Military activity is expected to remain at 1989 levels, with small declines occurring in some centers.

An index to FAA regions and ARTCCs is presented below in order to facilitate the use of this report. Although regional and center boundaries do not coincide, the regional totals reported herein include all aircraft handled by centers headquartered within the region.

Figure 1:
Air Route Traffic Control Center Boundaries



INDEX TO FAA REGIONS AND AIR ROUTE TRAFFIC CONTROL CENTERS

Region	Centers
ALASKAN	Anchorage
CENTRAL	Kansas City
EASTERN	New York Washington
GREAT LAKES	Chicago Cleveland Indianapolis Minneapolis
NEW ENGLAND	Boston
NORTHWEST-MOUNTAIN	Denver Salt Lake City Seattle
SOUTHERN	Atlanta Jacksonville Memphis Miami
SOUTHWEST	Albuquerque Fort Worth Houston
WESTERN-PACIFIC	Guam (CERAP) Los Angeles Oakland

AVIATION ACTIVITY FORECASTS

The following pages contain tables of IFR aircraft handled by user category for the United States, each FAA region, and each ARTCC. "IFR aircraft handled" is defined as the number of IFR departures multiplied by two, plus the number of IFR overs. Figures are presented on a fiscal year basis for both historical (1985-1989) and forecast (1990-2005) years.

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
National Total					
1985	14308	4777	8322	4902	32309
1986	15660	5006	8053	5041	33760
1987	16694	5275	8095	5238	35302
1988	17471	5752	7988	4514	35725
1989	17862	5196	8195	5704	36957
1990	18237	5508	8400	5714	37860
1991	18938	5709	8800	5715	39162
1992	19440	6009	9000	5715	40164
1993	19941	6209	9200	5716	41066
1994	20442	6409	9400	5716	41968
1995	20944	6610	9600	5717	42870
1996	21445	6810	9800	5717	43772
1997	21946	7010	9800	5718	44475
1998	22348	7211	10100	5719	45377
1999	22649	7411	10300	5719	46080
2000	23051	7711	10500	5720	46982
2001	23353	7912	10700	5720	47685
2002	23697	8112	10860	5721	48390
2003	24046	8318	11022	5722	49107
2004	24400	8529	11187	5723	49838
2005	24759	8745	11354	5723	50581

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Alaskan Region					
1985	179	102	60	56	397
1986	187	94	66	51	398
1987	196	110	64	57	427
1988	205	106	68	51	430
1989	222	98	72	58	450
1990	225	115	73	58	471
1991	229	121	79	56	485
1992	233	125	81	56	495
1993	235	128	84	54	501
1994	237	132	88	54	511
1995	239	138	89	52	518
1996	242	142	93	52	529
1997	243	146	95	50	534
1998	243	151	97	50	541
1999	241	155	101	50	546
2000	240	160	103	50	553
2001	237	164	107	47	555
2002	234	168	110	47	559
2003	231	173	112	47	563
2004	226	178	115	47	566
2005	222	183	119	47	571

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Anchorage					
1985	179	102	60	56	397
1986	187	94	66	51	398
1987	196	110	64	57	427
1988	205	106	68	51	430
1989	222	98	72	58	450
1990	225	115	73	58	471
1991	229	121	79	56	485
1992	233	125	81	56	495
1993	235	128	84	54	501
1994	237	132	88	54	511
1995	239	138	89	52	518
1996	242	142	93	52	529
1997	243	146	95	50	534
1998	243	151	97	50	541
1999	241	155	101	50	546
2000	240	160	103	50	553
2001	237	164	107	47	555
2002	234	168	110	47	559
2003	231	173	112	47	563
2004	226	178	115	47	566
2005	222	183	119	47	571

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Central Region					
1985	674	298	506	192	1670
1986	759	327	468	188	1742
1987	769	295	484	200	1748
1988	791	283	467	181	1722
1989	793	247	492	262	1794
1990	850	299	524	245	1918
1991	867	304	549	245	1964
1992	879	313	560	246	1998
1993	885	319	573	246	2023
1994	892	326	585	245	2048
1995	894	329	596	246	2065
1996	879	327	606	245	2058
1997	862	327	603	245	2037
1998	838	324	620	246	2028
1999	810	321	628	245	2005
2000	784	324	635	245	1988
2001	756	320	640	246	1961
2002	724	317	645	245	1932
2003	693	313	647	245	1898
2004	662	310	649	246	1867
2005	630	305	650	245	1830

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Kansas City					
1985	674	298	506	192	1670
1986	759	327	468	188	1742
1987	769	295	484	200	1748
1988	791	283	467	181	1722
1989	793	247	492	262	1794
1990	850	299	524	245	1918
1991	867	304	549	245	1964
1992	879	313	560	246	1998
1993	885	319	573	246	2023
1994	892	326	585	245	2048
1995	894	329	596	246	2065
1996	879	327	606	245	2058
1997	862	327	603	245	2037
1998	838	324	620	246	2028
1999	810	321	628	245	2005
2000	784	324	635	245	1988
2001	756	320	640	246	1961
2002	724	317	645	245	1932
2003	693	313	647	245	1898
2004	662	310	649	246	1867
2005	630	305	650	245	1830

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Eastern Region					
1985	2144	429	921	414	3908
1986	2251	478	890	449	4068
1987	2233	427	858	511	4029
1988	2259	526	799	344	3928
1989	2590	412	838	583	4423
1990	2402	457	746	506	4111
1991	2479	489	767	508	4242
1992	2529	534	772	507	4342
1993	2577	564	777	507	4424
1994	2616	596	781	506	4500
1995	2655	635	785	505	4580
1996	2721	675	806	499	4703
1997	2790	717	811	505	4822
1998	2847	760	842	501	4949
1999	2900	807	864	500	5071
2000	2962	864	889	499	5214
2001	3021	913	909	498	5340
2002	3085	966	929	497	5477
2003	3156	1019	948	498	5620
2004	3226	1074	970	497	5767
2005	3302	1135	992	498	5928

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
New York					
1985	1099	252	422	123	1896
1986	1164	239	402	122	1927
1987	1088	178	367	130	1763
1988	1037	220	331	89	1677
1989	1482	217	364	178	2241
1990	1241	243	324	161	1970
1991	1280	259	335	161	2035
1992	1307	285	339	160	2090
1993	1333	301	342	160	2136
1994	1359	317	346	160	2181
1995	1385	337	349	160	2231
1996	1420	361	363	156	2301
1997	1460	385	370	159	2374
1998	1492	410	391	156	2449
1999	1529	439	407	156	2531
2000	1566	476	425	155	2622
2001	1613	507	440	155	2715
2002	1663	542	457	155	2817
2003	1719	578	472	154	2924
2004	1776	616	490	154	3037
2005	1838	659	509	156	3162
Washington					
1985	1045	177	499	291	2012
1986	1087	239	488	327	2141
1987	1145	249	491	381	2266
1988	1222	306	468	255	2251
1989	1108	195	474	405	2182
1990	1161	214	422	345	2142
1991	1199	230	432	347	2208
1992	1222	249	434	346	2251
1993	1244	263	435	346	2288
1994	1258	280	435	346	2319
1995	1271	298	435	345	2349
1996	1301	315	443	343	2401
1997	1330	332	441	346	2448
1998	1355	349	451	345	2500
1999	1371	368	457	344	2540
2000	1396	389	464	343	2591
2001	1408	406	469	343	2626
2002	1422	424	473	342	2661
2003	1436	441	476	343	2696
2004	1450	458	480	343	2730
2005	1465	476	484	342	2766

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Great Lakes Region					
1985	3216	1383	2130	513	7242
1986	3528	1433	2144	587	7692
1987	3703	1432	2210	621	7966
1988	4157	1495	2246	418	8316
1989	4264	1336	2335	650	8585
1990	4016	1545	2279	536	8376
1991	4105	1613	2362	541	8620
1992	4143	1713	2395	542	8793
1993	4178	1773	2424	542	8916
1994	4207	1835	2454	546	9043
1995	4219	1909	2489	549	9166
1996	4221	1977	2513	550	9261
1997	4226	2048	2485	550	9309
1998	4189	2118	2540	555	9401
1999	4148	2188	2562	555	9453
2000	4113	2291	2581	555	9541
2001	4059	2360	2600	557	9576
2002	4014	2430	2609	559	9612
2003	3958	2503	2621	560	9642
2004	3904	2574	2631	562	9671
2005	3847	2648	2639	566	9700

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

	FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Chicago						
	1985	956	451	597	84	2088
	1986	1032	463	615	130	2240
	1987	1063	493	647	143	2346
	1988	1254	420	638	76	2388
	1989	1344	383	666	117	2510
	1990	1111	478	591	110	2291
	1991	1147	503	604	108	2362
	1992	1162	534	603	108	2408
	1993	1180	556	602	106	2444
	1994	1193	579	599	106	2477
	1995	1203	606	599	105	2513
	1996	1223	630	604	105	2561
	1997	1239	655	597	103	2595
	1998	1249	680	607	103	2639
	1999	1248	704	611	102	2665
	2000	1253	736	613	101	2702
	2001	1246	761	614	101	2722
	2002	1242	786	613	98	2739
	2003	1232	810	612	98	2752
	2004	1224	835	610	98	2767
	2005	1214	861	608	96	2779
Cleveland						
	1985	1011	418	582	100	2111
	1986	1113	395	585	118	2211
	1987	1194	350	597	125	2266
	1988	1303	358	606	91	2358
	1989	1300	321	604	156	2381
	1990	1200	410	581	118	2309
	1991	1210	431	607	120	2368
	1992	1208	469	621	120	2418
	1993	1205	489	635	119	2448
	1994	1197	510	649	122	2478
	1995	1187	536	666	121	2509
	1996	1189	558	671	121	2539
	1997	1191	582	666	121	2559
	1998	1181	605	686	122	2594
	1999	1169	629	695	121	2614
	2000	1157	671	704	121	2652
	2001	1140	695	715	123	2673
	2002	1123	720	727	123	2694
	2003	1104	747	741	123	2715
	2004	1084	773	756	122	2736
	2005	1064	800	772	124	2761

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Indianapolis					
1985	665	237	499	161	1562
1986	732	266	493	167	1658
1987	811	269	486	184	1750
1988	973	349	517	106	1945
1989	992	307	548	171	2018
1990	1017	315	628	100	2061
1991	1035	320	650	100	2105
1992	1046	333	658	100	2137
1993	1048	335	666	100	2149
1994	1056	338	675	99	2168
1995	1052	341	683	99	2175
1996	1012	340	686	99	2137
1997	978	337	674	99	2089
1998	926	335	687	99	2046
1999	886	331	688	99	2003
2000	846	336	688	98	1969
2001	804	332	688	98	1923
2002	766	328	686	98	1879
2003	728	326	688	98	1840
2004	688	323	685	98	1795
2005	650	319	682	100	1752
Minneapolis					
1985	584	277	452	168	1481
1986	651	309	451	172	1583
1987	635	320	480	169	1604
1988	627	368	485	145	1625
1989	628	325	517	206	1676
1990	688	341	478	209	1716
1991	712	359	501	213	1786
1992	726	377	512	215	1830
1993	744	393	522	217	1876
1994	761	409	531	219	1920
1995	778	426	541	223	1968
1996	798	449	552	225	2023
1997	817	473	548	227	2066
1998	833	497	560	232	2122
1999	845	523	569	233	2170
2000	858	548	577	235	2217
2001	869	573	582	236	2259
2002	883	596	581	239	2300
2003	895	620	580	242	2336
2004	908	643	579	244	2373
2005	919	667	577	245	2409

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
New England Region					
1985	444	302	281	228	1255
1986	518	338	330	220	1406
1987	699	353	387	228	1667
1988	736	398	356	153	1643
1989	765	338	335	228	1666
1990	733	357	331	212	1633
1991	743	371	355	210	1678
1992	746	390	372	209	1716
1993	745	401	388	208	1742
1994	745	411	408	205	1769
1995	740	424	430	205	1799
1996	729	441	457	204	1831
1997	715	458	478	202	1853
1998	700	473	511	202	1885
1999	676	487	547	199	1909
2000	657	506	587	198	1948
2001	629	516	628	198	1971
2002	602	524	668	194	1988
2003	577	531	715	194	2017
2004	549	536	765	191	2041
2005	521	538	817	191	2067

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Boston					
1985	444	302	281	228	1255
1986	518	338	330	220	1406
1987	699	353	387	228	1667
1988	736	398	356	153	1643
1989	765	338	335	228	1666
1990	733	357	331	212	1633
1991	743	371	355	210	1678
1992	746	390	372	209	1716
1993	745	401	388	208	1742
1994	745	411	408	205	1769
1995	740	424	430	205	1799
1996	729	441	457	204	1831
1997	715	458	478	202	1853
1998	700	473	511	202	1885
1999	676	487	547	199	1909
2000	657	506	587	198	1948
2001	629	516	628	198	1971
2002	602	524	668	194	1988
2003	577	531	715	194	2017
2004	549	536	765	191	2041
2005	521	538	817	191	2067

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Northwest-Mountain Region					
1985	1323	537	656	701	3217
1986	1508	613	627	618	3366
1987	1589	708	627	640	3564
1988	1647	906	647	648	3848
1989	1662	870	679	928	4139
1990	1813	838	627	688	3966
1991	1886	886	674	687	4133
1992	1942	943	703	691	4278
1993	2004	989	735	695	4422
1994	2062	1037	763	696	4557
1995	2128	1087	793	699	4706
1996	2203	1145	820	706	4873
1997	2282	1203	831	709	5024
1998	2350	1263	867	710	5190
1999	2409	1322	895	721	5347
2000	2474	1387	929	724	5515
2001	2540	1450	959	727	5676
2002	2604	1508	984	731	5827
2003	2669	1568	1013	739	5989
2004	2735	1629	1042	740	6145
2005	2799	1691	1077	740	6307

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Denver					
1985	634	155	235	165	1189
1986	719	144	212	172	1247
1987	755	148	211	165	1279
1988	766	184	211	211	1372
1989	709	199	222	334	1464
1990	847	178	264	217	1506
1991	901	183	285	213	1582
1992	946	193	298	212	1649
1993	999	200	313	212	1724
1994	1054	204	327	212	1797
1995	1116	208	341	211	1877
1996	1183	212	347	214	1957
1997	1255	215	347	214	2031
1998	1325	217	357	214	2113
1999	1393	219	363	215	2190
2000	1467	224	370	215	2274
2001	1542	227	375	214	2357
2002	1622	227	377	214	2440
2003	1705	229	379	216	2529
2004	1791	231	381	215	2619
2005	1880	233	384	212	2709
Salt Lake City					
1985	395	110	166	326	997
1986	443	171	153	270	1037
1987	467	195	146	266	1074
1988	499	229	151	241	1120
1989	503	236	162	395	1296
1990	506	228	151	290	1175
1991	514	248	165	294	1221
1992	522	272	174	298	1266
1993	528	293	183	303	1307
1994	531	315	192	305	1343
1995	536	340	202	308	1386
1996	533	369	214	312	1428
1997	528	401	223	316	1468
1998	518	435	240	318	1512
1999	508	470	255	328	1560
2000	494	510	273	332	1609
2001	483	552	290	336	1662
2002	469	595	308	340	1711
2003	453	640	329	344	1765
2004	438	689	351	345	1823
2005	421	740	377	349	1887

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Seattle					
1985	294	272	255	210	1031
1986	346	298	262	176	1082
1987	367	365	270	209	1211
1988	382	493	285	196	1356
1989	450	435	295	199	1379
1990	460	432	212	181	1284
1991	470	455	225	180	1330
1992	474	478	231	180	1363
1993	476	496	239	180	1391
1994	477	517	243	180	1417
1995	476	538	250	179	1443
1996	487	563	258	180	1488
1997	499	587	261	179	1525
1998	507	611	269	178	1565
1999	509	633	277	178	1597
2000	514	653	287	177	1631
2001	515	672	294	177	1657
2002	513	686	299	177	1676
2003	[illegible]	699	305	179	1694
2004	506	710	310	179	1704
2005	498	718	316	178	1710

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Southern Region					
1985	2897	976	2009	892	6774
1986	3231	992	1956	938	7117
1987	3479	1091	1971	945	7486
1988	3581	982	1970	883	7416
1989	3495	873	1995	1001	7364
1990	3781	931	2169	1176	8057
1991	3930	950	2275	1175	8330
1992	4038	995	2338	1171	8542
1993	4140	1027	2397	1170	8735
1994	4243	1057	2461	1171	8933
1995	4348	1067	2522	1168	9104
1996	4434	1094	2584	1163	9275
1997	4514	1118	2593	1162	9386
1998	4565	1145	2683	1160	9553
1999	4599	1170	2744	1156	9670
2000	4645	1226	2799	1154	9824
2001	4675	1254	2862	1152	9943
2002	4715	1285	2908	1152	10061
2003	4750	1317	2957	1145	10169
2004	4787	1351	3002	1144	10284
2005	4823	1387	3044	1144	10399

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

	FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Atlanta						
	1985	1080	329	718	159	2286
	1986	1127	376	673	161	2337
	1987	1131	397	655	167	2350
	1988	1160	377	619	153	2309
	1989	1104	347	612	159	2222
	1990	1202	333	700	231	2465
	1991	1248	333	734	230	2545
	1992	1280	346	756	229	2611
	1993	1309	345	775	229	2658
	1994	1333	343	797	229	2702
	1995	1359	343	817	228	2747
	1996	1378	348	835	227	2789
	1997	1390	351	839	226	2805
	1998	1391	354	870	226	2841
	1999	1385	357	888	225	2854
	2000	1378	375	905	224	2882
	2001	1364	378	924	222	2888
	2002	1349	384	938	221	2892
	2003	1330	389	953	219	2892
	2004	1312	393	967	219	2891
	2005	1292	397	979	218	2887
Jacksonville						
	1985	578	184	465	335	1562
	1986	670	155	454	350	1629
	1987	753	209	419	364	1745
	1988	780	146	446	324	1696
	1989	768	147	474	312	1701
	1990	838	194	565	405	2002
	1991	882	206	592	405	2085
	1992	920	222	609	402	2152
	1993	959	234	624	399	2216
	1994	1005	247	640	399	2292
	1995	1056	260	655	395	2367
	1996	1114	279	674	392	2460
	1997	1179	299	678	390	2546
	1998	1244	320	701	389	2654
	1999	1303	342	719	386	2750
	2000	1375	367	735	383	2860
	2001	1443	391	752	382	2968
	2002	1520	415	764	380	3080
	2003	1599	441	778	376	3195
	2004	1681	468	791	374	3314
	2005	1767	497	801	373	3437

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

	FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Memphis						
	1985	610	230	485	238	1563
	1986	697	287	486	236	1706
	1987	783	295	536	231	1845
	1988	804	242	516	232	1794
	1989	798	145	535	351	1829
	1990	922	203	542	338	2005
	1991	967	207	569	340	2083
	1992	1004	216	584	340	2143
	1993	1035	235	600	342	2213
	1994	1072	253	617	344	2285
	1995	1103	249	634	345	2331
	1996	1118	248	647	346	2360
	1997	1131	247	647	347	2372
	1998	1130	247	668	348	2392
	1999	1133	245	680	349	2407
	2000	1132	250	691	351	2424
	2001	1133	250	705	353	2441
	2002	1136	249	717	355	2457
	2003	1136	248	727	354	2465
	2004	1136	249	737	356	2477
	2005	1133	251	747	357	2488
Miami						
	1985	629	233	341	160	1363
	1986	737	174	343	191	1445
	1987	812	190	361	183	1546
	1988	837	217	389	174	1617
	1989	825	234	374	179	1612
	1990	820	201	362	201	1584
	1991	833	204	379	201	1617
	1992	835	212	389	200	1636
	1993	836	213	398	200	1648
	1994	833	214	407	200	1654
	1995	829	215	415	200	1659
	1996	823	219	427	198	1667
	1997	814	221	429	199	1664
	1998	800	224	445	197	1666
	1999	778	226	457	197	1658
	2000	760	233	469	196	1658
	2001	734	235	481	196	1646
	2002	710	237	489	196	1632
	2003	684	239	498	195	1617
	2004	658	241	507	195	1602
	2005	631	243	517	196	1587

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Southwest Region					
1985	1978	369	1247	1218	4812
1986	2042	384	1099	1273	4798
1987	2192	429	1002	1293	4916
1988	2222	526	946	1192	4886
1989	2230	517	956	1306	5009
1990	2449	457	1134	1550	5590
1991	2590	449	1186	1553	5778
1992	2703	449	1207	1553	5911
1993	2818	442	1231	1556	6047
1994	2935	436	1247	1556	6174
1995	3056	428	1266	1556	6306
1996	3184	417	1280	1558	6439
1997	3304	407	1266	1560	6537
1998	3416	397	1289	1560	6662
1999	3497	387	1299	1559	6742
2000	3600	380	1307	1561	6849
2001	3669	369	1320	1561	6920
2002	3743	358	1327	1563	6991
2003	3814	349	1329	1561	7053
2004	3879	339	1333	1563	7113
2005	3939	330	1332	1560	7161

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Albuquerque					
1985	614	35	212	527	1388
1986	636	54	191	514	1395
1987	694	67	187	510	1458
1988	681	87	181	483	1432
1989	673	79	180	498	1430
1990	770	75	223	574	1641
1991	812	74	237	580	1703
1992	848	76	246	581	1751
1993	883	75	255	585	1798
1994	916	75	263	587	1841
1995	949	75	272	589	1885
1996	978	75	280	592	1925
1997	1002	76	282	597	1956
1998	1018	76	294	600	1989
1999	1028	76	303	602	2009
2000	1038	78	311	605	2032
2001	1041	78	317	608	2044
2002	1041	76	324	612	2054
2003	1041	76	329	614	2061
2004	1038	76	336	616	2065
2005	1031	75	340	617	2063
Fort Worth					
1985	755	198	493	334	1780
1986	776	212	431	341	1760
1987	808	256	388	342	1794
1988	849	293	366	332	1840
1989	873	271	377	388	1909
1990	930	241	375	458	2005
1991	985	235	387	458	2064
1992	1030	233	387	457	2107
1993	1077	228	387	457	2148
1994	1126	222	385	454	2186
1995	1177	217	381	453	2228
1996	1234	209	382	451	2275
1997	1287	201	373	452	2313
1998	1340	193	374	449	2357
1999	1382	186	369	448	2385
2000	1433	180	365	447	2426
2001	1471	173	364	445	2453
2002	1514	166	361	443	2485
2003	1555	160	358	442	2515
2004	1595	154	353	441	2544
2005	1634	148	350	440	2572

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Houston					
1985	609	136	542	357	1644
1986	630	118	477	418	1643
1987	690	106	427	441	1664
1988	692	146	399	377	1614
1989	684	167	399	420	1670
1990	749	141	536	518	1944
1991	793	140	562	516	2011
1992	825	139	575	515	2054
1993	859	139	588	515	2101
1994	893	138	600	515	2146
1995	930	136	612	514	2192
1996	973	134	618	514	2238
1997	1015	131	611	512	2268
1998	1057	128	621	511	2317
1999	1087	125	627	509	2349
2000	1129	121	631	510	2391
2001	1157	119	638	509	2423
2002	1188	115	642	508	2453
2003	1218	112	642	505	2477
2004	1246	110	644	506	2504
2005	1274	107	643	503	2526

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Western-Pacific Region					
1985	1453	381	512	688	3034
1986	1636	347	473	717	3173
1987	1834	430	492	743	3499
1988	1873	530	489	644	3536
1989	1841	505	493	688	3527
1990	1969	509	518	742	3738
1991	2110	526	554	740	3931
1992	2229	547	572	741	4089
1993	2360	565	592	739	4256
1994	2504	579	612	737	4433
1995	2663	593	631	737	4624
1996	2833	591	640	740	4803
1997	3012	587	639	735	4972
1998	3201	581	650	735	5167
1999	3369	575	659	734	5337
2000	3575	573	668	734	5551
2001	3767	565	676	734	5742
2002	3976	556	678	733	5943
2003	4198	545	679	734	6156
2004	4433	538	680	734	6384
2005	4676	528	683	733	6619

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Guam CERAP					
1985	19	6	0	20	45
1986	20	10	0	19	49
1987	23	10	0	19	52
1988	29	8	2	14	53
1989	36	8	0	14	58
1990	37	8	0	14	60
1991	38	9	0	15	62
1992	40	9	0	15	64
1993	41	9	0	16	66
1994	42	9	0	16	68
1995	44	10	0	17	70
1996	45	10	0	17	72
1997	46	10	0	18	75
1998	48	11	0	19	77
1999	49	11	0	19	80
2000	51	11	0	20	82
2001	53	12	0	20	85
2002	54	12	0	21	88
2003	56	12	0	22	90
2004	58	13	0	23	93
2005	60	13	0	23	96
Los Angeles					
1985	776	227	267	299	1569
1986	868	203	251	328	1650
1987	993	245	271	348	1857
1988	1032	296	270	279	1877
1989	1007	275	267	304	1853
1990	1085	283	296	323	1987
1991	1170	291	320	318	2099
1992	1243	300	334	317	2193
1993	1324	308	351	315	2299
1994	1413	315	366	313	2406
1995	1514	321	381	311	2527
1996	1620	319	386	308	2634
1997	1736	316	384	305	2741
1998	1859	312	390	303	2865
1999	1968	309	395	300	2972
2000	2107	306	399	298	3110
2001	2233	301	403	297	3234
2002	2371	295	402	293	3362
2003	2519	289	402	291	3501
2004	2676	283	401	290	3649
2005	2840	277	401	287	3805

IFR AIRCRAFT HANDLED BY USER CATEGORY (Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Oakland					
1985	658	148	245	369	1420
1986	748	134	222	370	1474
1987	818	175	221	376	1590
1988	812	226	217	351	1606
1989	798	222	226	370	1616
1990	846	218	222	405	1691
1991	903	227	234	407	1770
1992	947	239	237	409	1832
1993	994	247	242	408	1891
1994	1049	255	247	408	1959
1995	1106	262	250	410	2028
1996	1168	262	254	414	2097
1997	1230	261	255	412	2157
1998	1294	258	260	413	2225
1999	1351	255	264	415	2285
2000	1417	256	270	416	2359
2001	1481	252	273	417	2424
2002	1550	249	276	418	2493
2003	1623	244	277	421	2565
2004	1700	242	279	421	2641
2005	1777	237	281	423	2718

APPENDIX

REGRESSION MODEL FOR FORECASTING
INSTRUMENT FLIGHT RULE AIRCRAFT ACTIVITY
AT FEDERAL AVIATION ADMINISTRATION
AIR ROUTE TRAFFIC CONTROL CENTERS

Table of Contents--Appendix

1.0 Introduction

This appendix contains a technical description of the data sources, methodology, and regression models used in the Instrument Flight Rule (IFR) aircraft activity forecasts for each Air Route Traffic Control Center (ARTCC). The models have been utilized to generate projections of aircraft activity by air carrier, air taxi, general aviation, and military aircraft for the period 1990 through 2005. These activity forecasts will serve as a basis for Federal Aviation Administration (FAA) decisions regarding manpower, facilities, and equipment requirements at each ARTCC.

Section 2.0 presents an overview of the forecasting model for IFR aircraft activity. Section 3.0 provides a detailed description of the various data bases used in the forecasts, including demographic and economic data as well as information on ARTCC boundary changes. Section 4.0 describes the methodology employed in projecting the independent variables by county, allocating county data to the various ARTCCs, and estimating models to forecast IFR aviation activity. The final section presents the forecasting models for IFR departures and overs at each ARTCC.

2.0 Overview of Model

Aviation activity in a given geographic region is dependent upon a wide array of socioeconomic, demographic, and technological factors. In constructing models to accurately forecast such activity it is necessary to limit the number of variables used in order to make the models manageable and practicable. Thus, our working hypothesis for constructing the forecasting models has been that departures (by user category) from a given ARTCC are dependent on certain economic and demographic variables. These variables, which include income and employment in particular industrial sectors, as well as population, contribute to the demand for aircraft departures. The number of seats per aircraft was included in the model construction process, in order to account for the effect of supply considerations upon IFR departures. Because overs are defined as flights over a given ARTCC when the aircraft does not land in or take off from that center, it is assumed that overs for each ARTCC (by user category) are related to departures from *other* ARTCCs, rather than being a function of local economic conditions or departures. Thus, information on departures from all ARTCCs, by user category, is used as a basis for forecasting overs.

The boundaries for each ARTCC are determined by a combination of air traffic conditions and technological factors, and do not usually coincide with state or county boundaries. Thus the best way to assemble ARTCC-wide data sets is to begin with the smallest geographic units for *which data are available, and allocate* each unit to the appropriate ARTCC. At the present time, counties are the smallest geographic units for which detailed economic and demographic data are available on a nationwide basis. These data are currently available for the years 1969 through 1987. Estimates for the years 1988 and 1989 as well as forecasts for 1990 through 2005 were made for each county individually (see section 4.1). The next step was to allocate each county's data to the appropriate ARTCC.

Before the aggregation process could begin, however, an additional factor had to be considered. Due to changing air traffic conditions, ARTCC boundaries have been changed numerous times over the last twenty years. It was therefore necessary to aggregate data for each set of historical ARTCC boundaries. Section 4.2 discusses the methodology for allocating county data by ARTCC.

Once the independent variables were properly projected and allocated, the process of forecasting aviation activity began (see section 4.3). This was a three-step process. First, the stepwise regression technique, which identifies models with the maximum R^2 and statistically significant independent variables, was utilized to find the five or six "best" models for projecting each ARTCC's departures by user category. The next step was to examine the equations generated by the stepwise regression technique and to select the most plausible and reasonable models. Finally, ordinary least squares (OLS) regressions were run for the selected models. The equations generated by the OLS procedure were used to generate forecasts for each Center's

departures, by user category, for the period 1990 through 2005. The departure forecasts were adjusted to conform to national projections published by FAA. The adjusted departure forecasts were used as independent variables in running stepwise regressions for domestic and oceanic overs. Again, the stepwise regression output was examined to ensure that reasonable models were selected, and the latter were employed in a final round of OLS regressions. The OLS regressions were used to generate overs forecasts, which were adjusted to conform to the national control totals. Section 5.0 lists the estimated equations for departures and overs for each ARTCC.

3.0 Data Bases

3.1 Industry Employment by County, 1969-1987

Industry employment is estimated annually by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. The latest year for which data are currently available is 1987. Estimates for 1988 and 1989 as well as projections for 1990 through 2005 were prepared by constructing forecasts of employment by county for each industry (see section 4.1). Historical employment data were obtained from BEA at the two-digit Standard Industrial Classification (SIC) level, for the following sectors:

SIC Code	Sector Name
010	Total Employment
020	Wage and Salary Employment
040	Proprietor Employment
050	Farm Proprietor Employment
060	Nonfarm Proprietor Employment
070	Farm Employment
080	Nonfarm Employment
090	Total Private Employment
100	Agricultural Services, Forestry, Fisheries, Other Employment
130	Mining Employment
180	Construction Employment
190	Manufacturing Employment
440	Transportation, Utilities, Communications Employment
510	Wholesale Trade Employment
520	Retail Trade Employment
530	Finance, Insurance, Real Estate Employment
560	Services Employment
630	Total Government/Government Enterprises Employment
640	Federal Civilian Employment
650	Federal Military Employment
660	State and Local Government Employment

3.2 Personal Income by County, 1969-1987

Personal income and earnings by county, for each SIC sector, are also estimated annually by BEA. The data set obtained from BEA also included information on population for each county. As with the employment data, the latest year for which BEA estimates are available is 1987. Estimates for 1988 and 1989 as well as projections for 1990 through 2005 were made at the county level for each sector (see Section 4.1). Historical data for the following sectors were obtained from BEA:

SIC Code	Sector Name
010	Total Personal Income
011	Nonfarm Personal Income
012	Farm Personal Income
020	Population
030	Per Capita Personal Income
040	Earnings by Place of Work
041	Minus: Personal Contributions for Social Insurance
042	Plus: Adjustment for Residence
045	Equals: Earnings by Residence
046	Plus: Dividends, Interest, Rent
047	Plus: Transfer Payments
050	Wage and Salary Income
060	Other Labor Income
070	Proprietor Income
071	Farm Proprietor Income
072	Nonfarm Proprietor Income
081	Farm Income
082	Nonfarm Income
090	Total Private Income
100	Agricultural Services, Forestry, Fisheries, Other Income
130	Mining Income
180	Construction Income
190	Manufacturing Income
440	Transportation, Utilities, Communications Income
510	Wholesale Trade Income
520	Retail Trade Income
530	Finance, Insurance, Real Estate Income
560	Services Income

(Continued)

630	Total Government/Government Enterprises Income
640	Federal Civilian Income
650	Federal Military Income
660	State and Local Government Income

3.3 ARTCC Boundaries, with Changes

For the prior study, county assignments for the four different sets of ARTCC boundaries in use between 1969 and 1981 were compiled on a computer printout. Information on boundary changes during the period 1981 to 1989 was obtained from the Office of Charting and Geodetic Services of the National Ocean Service, an agency of the U.S. National Oceanic and Atmospheric Administration, in the form of maps depicting all changes to ARTCC boundaries. These maps were carefully examined, and all boundary changes were noted on a single reference map. The latter map was then overlaid by a transparent map of U.S. counties, with changes in the ARTCC designation of each county being noted in a text file. The text file containing boundary change information for each county was then used to construct six additional sets of ARTCC county assignments. The ten ARTCC boundary sets were allocated as follows:

ARTCC Boundary Set	Year(s)
ARTCC1	1969 1970 1971 1972
AF TCC2	1973 1974 1975 1976
ARTCC3	1977 1978 1979 1980
ARTCC4	1981 1982
ARTCC5	1983
ARTCC6	1984
ARTCC7	1985
ARTCC8	1986 1987
ARTCC9	1988
ARTCC10	1989 and later

3.4 IFR Aircraft Activity, by ARTCC

Data on IFR aircraft activity were obtained from FAA sources for fiscal years 1969 through 1989. The data were assembled into a SAS data set, which was later merged with the economic and demographic data to conduct the aviation activity forecasts. The types of IFR data collected for each ARTCC include:

- Departures
  1. Air Carrier
  2. Air Taxi
  3. General Aviation
  4. Military

- Domestic Overs
  1. Air Carrier
  2. Air Taxi
  3. General Aviation
  4. Military

- Oceanic Overs
  1. Air Carrier
  2. Air Taxi
  3. General Aviation
  4. Military

3.5 Other Variables

Three other variables were utilized during the aviation activity forecasts: seats per aircraft, PATCODUM, and DEREGDUM[1]. Information on historical and projected seats per aircraft for air carriers (on a national average basis) was obtained directly from FAA for the years 1969 through 2000. Seats per aircraft were computed for the years 2001 through 2005 by extrapolating the previous years' data.

PATCODUM, a dummy variable used to capture the effects of the air traffic controllers strike, was set at 1 for each year between 1980 and 1983 inclusive, with other years receiving a 0. Similarly, DEREGDUM, a dummy variable used to capture the effects of airline deregulation, was set at 1 for all years prior to 1980, and at 0 for all later years. (See section 4.3 for more information on the aviation activity forecasts.)

[1]CHIDUM, a dummy variable set to 1 for years prior to 1982, was used only in the model for IFR air carrier departures at the Chicago ARTCC.

4.0 Procedures Used in Model Estimation and Projection

4.1 Projection of Independent Variables

4.1.1 Industry Employment by County

The following steps describe the projection of industry employment by county for the years 1988 through 2005. Briefly, national forecasts for each sector were obtained from FAA (based on forecasts by outside consultants), and assembled into data sets. Then regional forecasts were constructed for each "building block" sector[2], using the national forecasts as control area totals. Next, state forecasts were projected, based on the regional forecasts. Finally, county forecasts were derived from the state projections.

The first step was to forecast employment in "basic" industries, including:

- Farm Employment
- Agricultural Services, Forestry, Fisheries, Other Employment
- Mining Employment
- Manufacturing Employment
- Federal Civilian Employment

These sectors were estimated based on the changing share of the "forecast area" (i.e., regional, state, or county) with respect to the relevant "control area" (i.e., national, regional, or state, respectively). Share was computed by :

$$S_{I,t} = RE_{I,t} / USE_{I,t}$$

where: $S_{I,t}$ is the relative share of the forecast area in industry *I* in year *t*.
$RE_{I,t}$ is the corresponding regional (forecast area) employment.
$USE_{I,t}$ is the corresponding U.S. (control area) employment.

Then, $S_{I,t}$ was regressed on time:

$$S_{I,t} = \alpha + \beta Time$$

in order to generate predicted shares for future years. Employment for the years 1988 through

[2]As defined here, "building block" sectors are those SIC classifications which are not subtotals of other sectors, at the two-digit level. "Derived" sectors, such as "Total Private Employment" are computed as sums of certain building block sectors, according to BEA definitions.

2005 was computed by

$$RE_{I,t} = S_{I,t} * USE_{I,t}$$

Other sectors were assumed to depend upon the basic industries, and include:

- o Construction Employment
- o Transportation, Communications, Public Utilities Employment
- o Wholesale Trade Employment
- o Retail Trade Employment
- o Finance, Insurance, Real Estate Employment
- o Services Employment
- o State & Local Government Employment

The methodology for estimating employment for the above industries (referred to as "residential" industries) was to first compute regional and U.S. subtotals of Basic Industries, ΣB_t and ΣUS_t, respectively, and then to compute the Relative Multiplier:

$$RM_{I,t} = \frac{RE_{I,t}/\Sigma B_t}{USE_{I,t}/\Sigma US_t}$$

Then $RM_{I,t}$ was regressed on Time:

$$RM_{I,t} = \alpha + \beta Time$$

and predicted multipliers were generated for the period 1988 through 2005. Finally, employment for future years was computed by

$$RE_{I,t} = RM_{I,t} * \frac{USE_{I,t}}{\Sigma US_{I,t}} * \Sigma B_{I,t}$$

These steps produced forecasts of employment at the regional level in each building block sector. Forecasts for derived employment sectors, were computed based upon BEA definitions. After the regional forecasts were complete, state forecasts were generated from regional data using the same procedures listed above. Finally, county forecasts were produced from the state projections.

4.1.2 Population and Personal Income by County

The general methodology for forecasting county personal income was the same as that for the employment projections. National forecasts were used as a basis for projecting regional data, with state and finally county data being forecast in succession. The following steps describe the projection of personal income by county for the years 1988 through 2005.

First, population was forecast by calculating the "population multiplier" for year t, PM_t, as

$$PM_t = \frac{RE_{T,t}/RP_t}{USE_{T,t}/USP_t}$$

where: $RE_{T,t}$ is the *total* Regional (forecast area) Employment in year t.
RP_t is the Regional (forecast area) Population in year t.
$USE_{T,t}$ is the *total* U.S. (control area) Employment in year t.
USP_t is the U.S. (control area) Population in year t.

Next, PM_t was regressed on time:

$$PM_t = \alpha + \beta Time$$

and predicted population multipliers for the forecast period were generated. Then regional (forecast area) population for the years 1988 through 2005 was calculated by

$$RP_t = \frac{RE_t * USP_t}{USE_t * PM_t}$$

Personal income by county in building block sectors was forecast in three groups: population-related sectors, employment-related sectors, and other sectors (see below).

Population-related sectors included:

- Personal Contributions for Social Insurance
- Adjustment for Residence
- Dividends, Interest, Rent
- Transfer Payments

A multiplier for each industry, $M_{I,t}$, was computed by

$$M_{I,t} = \frac{RI_{I,t}/RP_t}{USI_{I,t}/USP_t}$$

where: $RI_{I,t}$ is the Regional (forecast area) Income in sector *I* in year *t*.
RP_t is the Regional (forecast area) Population in year *t*.
$USI_{I,t}$ is the U.S. (control area) Income in sector *I* in year *t*.
USP_t is the U.S. (control area) Population in year *t*.

Again, the multiplier was regressed on time:

$$M_{I,t} = \alpha + \beta Time$$

and generated the predicted multiplier for future years. Income for the years 1988 through 2005 was estimated in population-related sectors as follows:

$$RI_{I,t} = M_{I,t} * \frac{USI_{I,t}}{USP_t} * RP_t$$

Regional (forecast area) income in certain sectors was assumed to depend upon employment in the given forecast area. The "employment-related" income sectors included:

- Farm Income
- Agricultural Services, Forestry, Fisheries, Other Income
- Mining Income
- Construction Income
- Manufacturing Income
- Transportation, Communications, Public Utilities Income
- Wholesale Trade Income
- Retail Trade Income
- Finance, Insurance, Real Estate Income
- Services Income
- Federal Civilian Income
- Federal Military Income
- State & Local Government Income

The multiplier, $M_{I,t}$, was calculated by

$$M_{I,t} = \frac{RI_{I,t}/RE_{I,t}}{USI_{I,t}/USE_{I,t}}$$

where: $RI_{I,t}$ is the Regional (forecast area) Income in sector *I* in year *t*.
$RE_{I,t}$ is the Regional (forecast area) Employment sector *I* in year *t*.
$USI_{I,t}$ is the U.S. (control area) Income in sector *I* in year *t*.
$USE_{I,t}$ is the U.S. (forecast area) Employment sector *I* in year *t*.

Predicted multipliers were generated using the same methods as those explained above. Regional (forecast area) income for future years in employment-related sectors was calculated by

$$RI_{I,t} = M_{I,t} * \frac{USI_{I,t}}{USE_{I,t}} * RI_{I,t}$$

Forecasts for the remaining building block income sectors, including

- o Wage and Salary Income
- o Other Labor Income
- o Farm Proprietor Income
- o Nonfarm Proprietor Income

were calculated using the following multiplier:

$$M_{I,t} = \frac{RI_{I,t}/RRI_{I,t}}{USI_{I,t}/RUSI_{I,t}}$$

where:

$RRI_{I,t}$ is the relevant[3] Regional (forecast area) Income in sector *I* in year *t*.
$RUSI_{I,t}$ is the relevant U.S. (control area) Income in sector *I* in year *t*.

Predicted multipliers were generated using the same methods as those explained above. Regional

[3]The "relevant" sector is Farm Income for Farm Proprietor Income, and Nonfarm Income for Wage and Salary, Other Labor, and Nonfarm Proprietor Income.

(forecast area) income for future years in this last group of sectors was calculated by

$$RI_{I,t} = M_{I,t} * \frac{USI_{I,t}}{RUSI_{I,t}} * RRI_t$$

Finally, forecasts for the derived sectors were calculated according to BEA definitions from the building block components estimated previously. After the regional forecasts were complete, state forecasts were generated from regional data using the same procedures listed above. Finally, county forecasts were produced from the state projections.

4.2 Allocation of Counties to ARTCCs

As mentioned previously, ARTCC boundaries do not usually coincide with established political boundaries. Furthermore, the ARTCC boundaries are not static; they are altered over time to reflect changes in air traffic and to account for changes in technology. There have been approximately ten major changes to ARTCC boundaries over the last twenty years, a fact which must be taken into account when allocating county data to ARTCCs. For the prior study, four sets of such boundary changes were compiled up to 1981. The task remaining for the current study, therefore, was to gather information on all changes occurring since 1981. (See Section 3.3)

Once the data on different ARTCC boundary sets was obtained, the aggregation process was implemented by assigning county level data for each year to the relevant ARTCC, and constructing subtotals of each economic and demographic variable by ARTCC. All personal income variables were deflated using national forecasts of the consumer expenditure deflator to convert income data to constant dollars. The deflated income data, along with employment and population data for each ARTCC, were then merged into a data set with the IFR aviation activity data obtained from FAA.

4.3 Model Estimation and Projection of IFR Departures

The basic model used in projecting IFR departures by user category for each ARTCC[4] was as follows:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + \epsilon$$

where:

Y represents the dependent variable (i.e., IFR departures for a given user category).
$x_1, x_2, \ldots, x_n$ represent the independent variables (i.e., economic and demographic variables, seats per aircraft, or one of the dummy variables).
α is the intercept.
$\beta_1, \beta_2, \ldots, \beta_n$ represent the regression coefficients for independent variables with corresponding subscripts.
ϵ represents the random error term, whose expected value is assumed to be zero.

Due to both the large number of independent variables and the lack of studies regarding the relationship between IFR departures and independent variables at the ARTCC level, the *stepwise* regression technique was used to suggest possible forecasting models. This technique evaluates each independent variable in the model, entering those variables that meet certain statistical criteria. The selection method employed chose variables based on their contribution to R-Square, or fit, between the predicted values given by the model and the actual (historical) data. Due to the extensive computations required by this technique, a subset of the independent variables was chosen, from which models for forecasting IFR departures were selected. The subset included the following variables:

Total Income and Employment
Population
Wage and Salary Income
Nonfarm Income and Employment
Total Private Income and Employment
Manufacturing Income and Employment
Transportation, Utilities, Communications Income and Employment
Retail Trade Income and Employment
Services Income and Employment

[4]Because of the relative scarcity of economic data for Guam, and due to the fact that it is not a true ARTCC, forecasts for the Guam CERAP were computed independently by extrapolating the 1988-89 total aircraft handled growth rate to future years. The Guam forecasts were not included in either the adjustment process or the national totals.

Government/Government Enterprises Income and Employment
Federal Military Income and Employment
State and Local Government Income and Employment
Seats per Aircraft
PATCODUM
DEREGDUM

The output of the stepwise regression procedure was then examined in order to choose models that were both statistically significant and theoretically reasonable. It was assumed that military departures for an ARTCC were related to military employment or income. Once the models had been selected, an OLS procedure was used to generate equations and forecasts for IFR departures by user category for each ARTCC. At this point, the sum of all ARTCCs was compared with national forecasts independently derived and supplied by FAA. The ARTCC forecasts derived from the estimated equations were adjusted to the national totals by use of the following formula:

$$AD_{i,j} = \frac{FAA_j}{RT_j} * RD_{i,j}$$

where:

$AD_{i,j}$ is the adjusted departures forecast for ARTCC *i* in user category *j* in a given year.

FAA_j is the FAA national forecast for user category *j* in a given year.

$RD_{i,j}$ is the raw IFR departures forecast for ARTCC *i* in user category *j* in a given year.

RT_j is $\Sigma RD_{i,j}$ over all ARTCCs in user category *j* in a given year.

The estimated equations for IFR departures are presented in Section 5.1.

4.4 Model Estimation and Projection of IFR Overs

As mentioned in section 2.0, it was assumed that overs for a particular ARTCC (by user category) are dependent upon departures from *other* centers. To prepare forecasts of IFR overs, therefore, the adjusted IFR departures forecasts for *every* ARTCC were merged with the historical data on overs for *each* ARTCC. Then the following model was estimated:

$$Y_{ij} = \alpha_j + \beta_{jk}X_{jk} + \beta_{jl}X_{jl} + \ldots + \beta_{jn}X_{jn} + \epsilon$$

where:

Y_{ij} represents the dependent variable (i.e., IFR overs for ARTCC *i* of user type *j*).
α_j is the intercept in the equation related to user type *j*.
$X_{jk}, X_{jl}, \ldots X_{jn}$ represent independent variables (i.e., departures of user type *j* from ARTCCs *k*, *l*, ..., *n*).
$\beta_{jk}, \beta_{jl}, \ldots, \beta_{jn}$ represent the regression coefficients for independent variables with corresponding subscripts.
ϵ represents the random error term, whose expected value is assumed to be zero.

The stepwise regression procedure was again used to generate sets of potential models for each user category in each ARTCC. The results of the stepwise procedure were analyzed to eliminate illogical equations (i.e., overs for Miami showed a strong correlation with departures from Anchorage). After a lengthy evaluation process, models were selected that were plausible and statistically significant.

As with the departure forecasts, the sum of overs in each user category for all ARTCCs was compared with national forecasts independently derived and supplied by FAA. The ARTCC forecasts derived from the estimated equations were adjusted to the national totals by use of the following formula:

$$AO_{i,j} = \frac{FAA_j}{RT_j} * RO_{i,j}$$

where:

$AO_{i,j}$ is the adjusted overs forecast for ARTCC *i* in user category *j* in a given year.
FAA_j is the FAA national forecast for user category *j* in a given year.
$RO_{i,j}$ is the raw IFR overs forecast for ARTCC *i* in user category *j* in a given year.
RT_j is $\Sigma RO_{i,j}$ over all ARTCCs in user category *j* in a given year.

The estimated equations for IFR overs are presented in Section 5.2.

5.0 Estimated Equations for IFR Departures and Overs

This section lists the model equations for IFR departures and overs forecasts. The models for departures are presented first in general form, followed by the actual departures models for each ARTCC. Section 5.2 first describes the general form of the overs forecasting models, followed by the actual overs models for each ARTCC.

5.1 Estimated Equations for IFR Departures

The general form of the IFR departures equations is as follows:

$$\begin{aligned}
ACDEP &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
ATDEP &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
GADEP &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
MILDEP &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon
\end{aligned}$$

where:

ACDEP represents IFR Air Carrier Departures.
ATDEP represents Air Taxi Departures.
GADEP represents General Aviation Departures.
MILDEP represents military departures.
$X_1, \ldots, X_n$ represents significant socioeconomic variables, PATCODUM, DEREGDUM, or Seats per Aircraft.
$\beta_1, \beta_2, \ldots, \beta_n$ represent the regression coefficients for independent variables with corresponding subscripts.
ϵ represents the random error term, whose expected value is assumed to be zero.

Listed below are the estimated equations for IFR Departures, by ARTCC:

ANCHORAGE

ACDEP = 44.26523864 + (.00009744096) Total Employment

ATDEP = -12.1236 + (0.0008373072) Services Employment

GADEP = 0.81591680 + (0.001428552) Trans, Utils., Comm. Employment

MILDEP = -4.76816 + (0.0009413634) Federal Military Employment

LOS ANGELES

ACDEP = 287.21575785 + (.00000180272) Services Income

ATDEP = -263.992 + (0.001009074) Trans, Utils., Comm Employment

GADEP = -187.402 + (0.0002183137) Manufacturing Employment

MILDEP = 180.50647173 + (0.000202073) Federal Military Employment

OAKLAND

ACDEP = 210.26283661 + (.00000162317) Services Income

ATDEP = -181.823 + (0.0003838674) Manufacturing Employment

GADEP = 313.48512767 - (0.00163565) Federal Military Employment

MILDEP = 86.91125801 - (0.0001578088) Federal Military Employment

DENVER

ACDEP = 126.33851811 + (.00001958785) Trans., Utils., Comm. Income

ATDEP = -49.1371 + (0.000225786) Services Employment

GADEP = -85.6666 + (0.0009046739) Manufacturing Employment

MILDEP = 26.34459340 + (0.0001023988) Federal Military Employment

WASHINGTON

ACDEP = 244.35142306 + (.00001475668) Retail Trade Income

ATDEP = -9.79293 + (.00001292878) Manufacturing Income

GADEP = 29.27645610 + (0.0001923996) Services Employment

MILDEP = 142.70496565 - (0.000195183) Federal Military Employment

JACKSONVILLE

ACDEP = 77.91474069 + (.00001403101) State/Local Govt Income

ATDEP = -5.45279 + (.00002388076) Federal Military Income

GADEP = -91.82 + (0.0008241125) State/Local Govt Employment

MILDEP = 181.14543502 - (0.000304545) Federal Military Employment

MIAMI

ACDEP = 199.85841742 + (0.0002530468) State/Local Govt Employment

ATDEP = -43.5538 + (0.0001022293) Services Employment

GADEP = -75.7148 + (0.0006092551) State/Local Govt Employment

MILDEP = 59.53207068 - (.0000573675) Federal Military Employment

ATLANTA

ACDEP = 149.80449964 + (.00006975307) Total Employment

ATDEP = -287.386 + (0.0009360353) State/Local Govt Employment

GADEP = -183.791 + (0.001039776) State/Local Govt Employment

MILDEP = 56.12576122 - (.0000508307) Federal Military Employment

CHICAGO

ACDEP = 346.67096357 + (.00000452523) Trans., Utils., Comm. Income
+ (82.08840590) CHIDUM

ATDEP = 3.27133996 + (.00000372068) Manufacturing Income

GADEP = 538.35791876 - (0.00351857) Federal Military Employment

MILDEP = -7.90239 + (0.0004146367) Federal Military Employment

INDIANAPOLIS

ACDEP = 291.97836525 + (0.0006244373) Services Employment
-(29.5028) PATCODUM - (3.06786) Seats/Aircraft

ATDEP = 173.248 + (0.0004314368) Services Employment

GADEP = -385.219 + (0.00006916795) Total Employment
+ (0.0007854752) Government/Govt. Ents. Employment

MILDEP = 68.83663237 - (0.000409873) Federal Military Employment

BOSTON

ACDEP = -479.887 + (0.008174277) Population

ATDEP = -6.91046 + (0.0001366507) Federal Military Income

GADEP = 87.57113447 + (.00000406508) State/Local Govt Income

MILDEP = 46.80451509 + (0.000168264) Federal Military Employment

MINNEAPOLIS

ACDEP = 164.20945914 + (.00000512048) Trans., Utils., Comm. Income

ATDEP = -26.126 + (0.0004273493) Federal Military Income

GADEP = -150.263 + (0.0005783467) Retail Trade Employment

MILDEP = 108.80689846 - (0.00145564) Federal Military Employment

KANSAS CITY

ACDEP = 59.18974007 + (0.0001303244) Total Nonfarm Employment
- (20.2236) PATCODUM - (2.08123) Seats/Aircraft

ATDEP = -118.884 + (0.0002362425) Services Employment

GADEP = -124.143 + (.00009801806) Total Private Employment

MILDEP = 43.90323025 + (0.0002017528) Federal Military Employment

ALBUQUERQUE

ACDEP = 41.14550896 + (0.0003987757) Services Employment

ATDEP = -38.9422 + (0.0002540739) Government/Govt. Ents. Employment

GADEP = -25.0969 + (0.0006016111) State/Local Govt Employment

MILDEP = 143.66916769 + (0.0003325639) Federal Military Employment

NEW YORK

ACDEP = 849.32263473 + (.00001139218) Services Income
- (56.4849) PATCODUM - (3.17103) Seats/Aircraft

ATDEP = 7.80527990 + (.00004203675) State/Local Govt Income

GADEP = -10.7323 + (0.0003938344) Services Employment
+ (0.000462241) Government/Govt. Ents. Employment

MILDEP = 31.21695413 + (0.0002423069) Federal Military Employment

CLEVELAND

ACDEP = 1035.76830 - (0.0110166) Population

ATDEP = 8.53718659 + (.00000460308) Manufacturing Income

GADEP = -505.389 + (0.0001073609) Manufacturing Employment
+ (0.001555412) Government/Govt. Ents. Employment

MILDEP = 44.55393685 - (0.00120797) Federal Military Employment

MEMPHIS

ACDEP = -129.268 + (0.001417158) Government/Govt. Ents. Employment
- (2.27666) Seats/Aircraft

ATDEP = -411.049 + (0.006142361) Population
+ (0.0003286034) Services Employment

GADEP = -245.545 + (0.001376355) State/Local Govt Employment

MILDEP = -10.4908 + (0.00125i153) Federal Military Employment

FORT WORTH

ACDEP = 221.37832056 + (.00004333844) Manufacturing Income

ATDEP = -330.205 + (0.0009875515) Total Nonfarm Employment

GADEP = -869.968 + (0.09841478) Population

MILDEP = -23.1968 + (0.01401604) Federal Military Employment

HOUSTON

ACDEP = 179.14898042 + (0.0001051422) Federal Military Income

ATDEP = -119.512 + (0.0001086555) Total Private Employment

GADEP = -261.855 + (0.0002405311) Total Nonfarm Employment

MILDEP = 104.87921892 + (0.0009074615) Federal Military Employment

SALT LAKE CITY

ACDEP = -74.6509 + (0.002664354) Government/Govt. Ents. Employment

ATDEP = -10.8002 + (0.0001007932) State/Local Govt Income

GADEP = -147.713 + (0.02849358) Population

MILDEP = 238.12821408 - (0.0181475) Federal Military Employment

SEATTLE

ACDEP = 139.58597805 + (.00004119752) Services Income

ATDEP = 3.08069456 + (.00006044514) Total Private Income

GADEP = 259.10573591 - (0.0673198) Federal Military Employment

MILDEP = 63.49197977 - (0.00217593) Federal Military Employment

5.2 Estimated Equations for IFR Domestic and Oceanic Overs

The general form of the IFR Domestic Overs equations is as follows:

$$\begin{aligned}
ACDOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
ATDOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
GADOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
MILDOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon
\end{aligned}$$

where:

ACDOV represents IFR Air Carrier domestic overs.
ATDOV represents Air Taxi domestic overs.
GADOV represents General Aviation domestic overs.
MILDOV represents Military domestic overs.
$X_1, \ldots, X_n$ represents the significant departures from relevant ARTCCs.
$\beta_1, \beta_2, \ldots, \beta_n$ represent the regression coefficients for independent variables with corresponding subscripts.
ϵ represents the random error term, whose expected value is assumed to be zero.

The general form of the IFR Oceanic Overs equations is as follows:

$$\begin{aligned}
ACOOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
ATOOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
GAOOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon \\
MILOOV &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon
\end{aligned}$$

where:

ACOOV represents IFR Air Carrier Oceanic Overs.
ATOOV represents Air Taxi Oceanic Overs.
GAOOV represents General Aviation Oceanic Overs.
MILOOV represents Military Oceanic Overs.
$X_1, \ldots, X_n$ represents the significant departures from relevant ARTCCs.
$\beta_1, \beta_2, \ldots, \beta_n$ represent the regression coefficients for independent variables with corresponding subscripts.
ϵ represents the random error term, whose expected value is assumed to be zero.

Listed below are the estimated equations for IFR Domestic and Oceanic Overs, by ARTCC:

ANCHORAGE

ACDOV = -13.7608 + (0.10224054) OAKLAND air carrier departures

GADOV = 1.65598473 - (0.00808444) MINNEAPOLIS GA departures

MILDOV = 15.44594595 - (0.190284) MINNEAPOLIS military departures

ACOOV = -1.5982 + (0.18945851) SEATTLE air carrier departures

MILOOV = 24.50333390 - (0.310583) SEATTLE military departures

LOS ANGELES

ACDOV = 10.00777781 + (0.36540106) SALT LAKE CITY air carrier departures

ATDOV = -0.0509617 + (0.01709659) DENVER air taxi departures

GADOV = 2.19321339 + (0.11084371) SALT LAKE CITY GA departures

MILDOV = 53.04828979 - (0.416596) SALT LAKE CITY military departures

OAKLAND

ACDOV = -28.2623 + (0.19568323) LOS ANGELES air carrier departures

ATDOV = -0.571359 + (0.0418918) LOS ANGELES air taxi departures

GADOV = -3.31808 + (0.11752141) LOS ANGELES GA departures

MILDOV = 19.07541156 + (1.20308737) SALT LAKE CITY military departures

ACOOV = -124.72 + (0.56781845) LOS ANGELES air carrier departures

ATOOV = -0.085059 + (0.01073964) SALT LAKE CITY air taxi departures

GAOOV = -0.0379421 + (0.01527223) LOS ANGELES GA departures

MILOOV = -22.7084 + (1.99359886) ANCHORAGE military departures

DENVER

ACDOV = -31.9316 + (0.75107782) LOS ANGELES air carrier departures

ATDOV = -2.0133 + (0.09802852) KANSAS CITY air taxi departures

GADOV = -4.23959 + (0.29300254) LOS ANGELES GA departures

MILDOV = -66.9135 + (2.49974355) SEATTLE military departures

WASHINGTON

ACDOV = -242.85 + (1.44714003) ATLANTA air carrier departures

ATDOV = -0.956371 + (0.06677728) CLEVELAND air taxi departures

GADOV = 10.47005016 + (0.30424410) CLEVELAND GA departures

MILDOV = 15.81912016 + (0.55255196) CHICAGO military departures

JACKSONVILLE

ACDOV = -111.862 + (1.53665139) MIAMI air carrier departures

ATDOV = -0.361639 + (0.07088765) ATLANTA air taxi departures

GADOV = 13.38606172 + (0.52331086) MIAMI GA departures

MILDOV = 53.54492199 + (0.67463686) NEW YORK military departures

MIAMI

ACDOV = 10.65526723 + (0.12257341) JACKSONVILLE air carrier departures

ATDOV = 0.003931597 + (0.003065287) ATLANTA air taxi departures

GADOV = 1.94253617 + (0.01291295) FORT WORTH GA departures

MILDOV = -9.65291 + (0.77336526) INDIANAPOLIS military departures

ACOOV = -129.318 + (0.69559906) ATLANTA air carrier departures

ATOOV = 5.82735522 + (0.14848686) JACKSONVILLE air taxi departures

GAOOV = 3.97380401 + (0.20631215) JACKSONVILLE GA departures

MILOOV = -6.217 + (0.19010902) WASHINGTON military departures

ATLANTA

ACDOV = -261.158 + (1.57657680) FORT WORTH air carrier departures

ATDOV = -1.76011 + (0.42540738) JACKSONVILLE air taxi departures

GADOV = 2.10335531 + (0.66096045) JACKSONVILLE GA departures

MILDOV = 11.06882700 + (0.39152651) HOUSTON military departures

CHICAGO

ACDOV = -107.19 + (0.90023968) WASHINGTON air carrier departures

ATDOV = -0.736072 + (0.18511414) KANSAS CITY air taxi departures

GADOV = 4.85976756 + (0.41936742) MINNEAPOLIS GA departures

MILDOV = -26.8669 + (0.41321123) FORT WORTH military departures

INDIANAPOLIS

ACDOV = -41.3481 + (2.36019914) MEMPHIS air carrier departures

ATDOV = -1.06922 + (0.11180386) CHICAGO air taxi departures

GADOV = 8.96604658 + (0.68600571) KANSAS CITY GA departures

BOSTON

ACDOV = 58.02479896 + (0.34521401) INDIANAPOLIS air carrier departures

ATDOV = -2.01459 + (0.16846413) WASHINGTON air taxi departures

GADOV = 0.41397051 + (0.14307799) WASHINGTON GA departures

MILDOV = 45.66215831 + (0.39980780) CHICAGO military departures

MINNEAPOLIS

ACDOV = -12.3877 + (1.16724081) DENVER air carrier departures

ATDOV = -0.169878 + (0.08154027) DENVER air taxi departures

GADOV = -12.8321 + (0.22423350) KANSAS CITY GA departures

MILDOV = 24.35413349 + (0.13464086) ALBUQUERQUE military departures

KANSAS CITY

ACDOV = 36.42530337 + (1.04718567) ALBUQUERQUE air carrier departures

ATDOV = -0.434779 + (0.19088011) MEMPHIS air taxi departures

GADOV = 9.51353965 + (0.99190039) ALBUQUERQUE GA departures

MILDOV = 54.31081081 + (0.25649253) MINNEAPOLIS military departures

ALBUQUERQUE

ACDOV = -121.727 + (1.01227742) FORT WORTH air carrier departures

ATDOV = -1.43039 + (0.07321609) KANSAS CITY air taxi departures

GADOV = -0.831363 + (0.41171665) DENVER GA departures

MILDOV = 71.27520806 + (1.48026677) SALT LAKE CITY military departures

NEW YORK

ACDOV = -34.3582 + (1.48353614) JACKSONVILLE air carrier departures

ATDOV = -2.25607 + (0.23918161) WASHINGTON air taxi departures

GADOV = -39.2435 + (0.72394044) BOSTON GA departures

MILDOV = -2.2238 + (0.79598745) INDIANAPOLIS military departures

ACOOV = 44.70012748 + (0.32375865) JACKSONVILLE air carrier departures

ATOOV = -0.44972 + (0.0402429) WASHINGTON air taxi departures

GAOOV = -2.57455 + (0.04267511) WASHINGTON GA departures

MILOOV = -7.24692 + (0.62673382) INDIANAPOLIS military departures

CLEVELAND

ACDOV = 62.46310501 + (1.01443242) WASHINGTON air carrier departures

ATDOV = 0.11814275 + (0.47016816) WASHINGTON air taxi departures

GADOV = 3.84683358 + (0.85681558) BOSTON GA departures

MILDOV = 10.77807511 + (0.59148222) ATLANTA military departures

MEMPHIS

ACDOV = -300.188 + (2.06113746) FORT WORTH air carrier departures

ATDOV = 0.93237221 + (0.17482017) ATLANTA air taxi departures

GADOV = 16.66770188 + (0.37913065) HOUSTON GA departures

MILDOV = 52.48281291 + (0.39989504) KANSAS CITY military departures

FORT WORTH

ACDOV = -33.0765 + (0.61789377) HOUSTON air carrier departures

ATDOV = 0.04777943 + (0.12499627) HOUSTON air taxi departures

GADOV = 3.16237571 + (0.24642337) HOUSTON GA departures

MILDOV = 48.95296626 + (0.85926161) ATLANTA military departures

HOUSTON

ACDOV = -16.8626 + (0.20424779) FORT WORTH air carrier departures

ATDOV = 1.43211159 + (0.04589324) FORT WORTH air taxi departures
- (0.0441801) LOS ANGELES air taxi departures

GADOV = -2.89822 + (0.07454565) ATLANTA GA departures

MILDOV = 37.54785695 + (0.43331194) MEMPHIS military departures

ACOOV = -4.98687 + (0.07123065) FORT WORTH air carrier departures

ATOOV = -0.111688 + (0.005747606) ATLANTA air taxi departures

GAOOV = -0.287301 + (0.04886864) ALBUQUERQUE GA departures

MILOOV = -4.47143 + (0.09422085) FORT WORTH military departures

SALT LAKE CITY

ACDOV = 3.52961611 + (1.11245317) ALBUQUERQUE air carrier departures

ATDOV = -0.835624 + (0.05802749) SEATTLE air taxi departures

GADOV = -4.16898 + (0.22648824) LOS ANGELES GA departures

MILDOV = -84.524 + (5.58493861) DENVER military departures

SEATTLE

ACDOV = -10.1275 + (0.15663763) DENVER air carrier departures

ATDOV = -0.125608 + (0.007776246) SALT LAKE CITY air taxi departures

GADOV = 0.61715118 + (0.02307388) LOS ANGELES GA departures

MILDOV = 15.01153189 + (0.65101794) CHICAGO military departures