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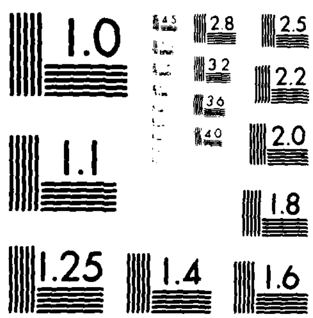

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Final Regulatory Evaluation: Metropolitan Washington Airports Policy

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16. Abstract

This final regulatory evaluation examines the potential impacts of rules to be applied to aircraft operations at Washington National Airport. These rules are part of the overall policy toward the development of Washington National Airport and Dulles International Airport. The alternative economic impacts on airlines, passengers, communities and the FAA of imposing passenger ceilings, operations quotas, landing fees, perimeter rules, curfews, and noise restrictions under various scenarios are assessed in this evaluation, and the final rule is specifically addressed in the final Chapter. The quantifiable impacts of this rule are estimated at a $27 million net cost to society, but this net cost is believed to be outweighed by benefits which cannot be measured.

17. Key Words

Washington National Airport, Dulles International Airport, Regulatory Evaluation, Congestion, Noise, Delay, Quota

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FINAL REGULATORY EVALUATION

WASHINGTON NATIONAL AIRPORT POLICY

SUMMARY

This final regulatory evaluation examines the potential impacts of proposed rules to be applied to aircraft operations at Washington National Airport (DCA) that are considered necessary to implement the DOT/FAA policy regarding the future operation and development of Washington National and Dulles International Airports and that incorporate measures to improve the quality of the environment in the Washington Metropolitan area. The proposed new rules specify the hours of operation and scheduling, the perimeter for nonstop service, aircraft equipment restrictions, the hourly limits on operations by different classes of users at Washington National Airport, limits on the noise that aircraft can produce at DCA, and the annual limit on the number of passengers using National Airport. The proposed rules would amend several of the rules issued on September 15, 1980, but which have not yet become effective. Nonetheless, this evaluation addresses all measures that must be incorporated in the [illegible] Aviation Regulations in order to implement the proposed policy. Accordingly, the assessment of impacts examines the effects of expected change from conditions under the currently effective rules and operating procedures.

This evaluation examines the potental impacts of:

1. alternative levels of air carrier activity, using alternative measures (quotas and landing fees), to achieve specified limits;

2. no limits on operations at National Airport;

3. an annual ceiling on the number of passengers using National;

4. alternative means of achieving noise reductions (curfew vs. single event limits);

5. alternative flight perimeter distances;

6. constrained vs. unlimited commuter service; and

7. the composite of selected policy measures that constitutes the proposed rules.

In each area the analysis includes a discussion, as appropriate and to the extent possible, of the expected impacts on air carriers, commuter carriers, airport neighbors, passengers, other communities and the FAA.

As explained in Chapter VIII of the following evaluation and summarized in the table below, the proposed rules would result in quantifiable costs and benefits during the period 1981 through 1990 that, discounted to 1981 present value, yield a net cost to society of $27.0 million. As can be seen from the annual data in the Summary Table below, the expected economic impacts of the proposed rules do not approach the standards established by Executive Order 12291 to identify "major" regulatory actions. Given the estimating techniques used and the costs and benefits which cannot be quantified, the net cost is essentially negligible.

SUMMARY TABLE

Impact of Proposed DCA Policy
($1980 millions)

Impacted Parties	Net Present Value	Annual Net Impacts 1981	1982	1983	1984	1985	1986
Air Carriers	+154.0	+14.0 1/					
Commuters	+ 7.7	+ 0.7 1/					
Passengers	-218.4 2/	- 0.6 increasing linearly to - 30.8 1/ by 1990					
Local Community	+ 29.7 3/						
	- 27.0						

1/ In perpetuity.
2/ Does not include benefits of significantly higher quality of service offered at IAD/BWI relative to DCA.
3/ Discounted present value of gradually increasing noise benefits due to reductions in air carrier slots.

TABLE OF CONTENTS

I. INTRODUCTION

The proposed policy for Washington National and Dulles International Airports (October 1981), contains 6 elements:

- Operating perimeter
- Number of operations (takeoffs or landings)
- Hours of airport operation - curfew
- Limits on noise levels of individual aircraft
- Types of aircraft allowed to use each airport
- Annual limit on number of passengers

Each of these elements has undergone extensive consideration over the past ten years. On January 21, 1980, a proposed policy was announced by the Department of Transportation (Notice No. 80-2). Subsequently, a series of rulemaking actions were promulgated (September 18, 1980) to implement those policy proposals effective January 5, 1981. Congressional action deferred the effective date of the regulations until April 26, 1981. A new Secretary of Transportation was appointed on January 20, 1981, and pursuant to Executive Order 12291 (February 19, 1981) a review of all regulations not yet in effect was undertaken. As a result of this review the Secretary and the Administrator of the Federal Aviation Administration (FAA) developed a revised policy for National and Dulles Airports. This proposed policy was announced in July 1981 (Notice No. 81-8). After consideration of the comments received on that proposal, this final policy proposal has been developed. Elements of the proposed policy and a comparison with existing practices and the changes scheduled to go into effect if not changed are set forth in Table I-1.

TABLE I-1

Comparison of Policy Elements

Policy Parameters

Policy Element	Existing Practices	Regulations Due to go Into Effect if not Changed	Current Proposal
Perimeter	650 mile limit on all non-stop flights except to Minneapolis/St. Paul, St. Louis, Memphis, Orlando, Tampa, West Palm Beach, and Miami	1000 miles, no exceptions	1000 miles, no exceptions
Number of Takeoffs or Landings	40 per hour-scheduled air carriers 8 per hour commuter 12 per hour general aviation Extra sections allowed. VFR flights in excess of quota allowed if delays are not excessive. Limits apply 7 a.m. to 10 p.m.	36 per hour for scheduled operators of aircraft with 56 seats or more. 12 per hour for scheduled operators of aircraft with less than 56 seats. Extra section allowed. VFR flights in excess of quota allowed if delays are not excessive. 12 per hour for general aviation. Limits apply 7 a.m. to 8:59 p.m., 18/6/6 operations allowed 9:00 p.m. to 9:30 p.m.	37 per hour for scheduled operators with 56 seats or more. 11 per hour for scheduled operators of aircraft with 55 seats or less. No VFR flights in excess of quota for scheduled operators. Extra sections allowed. 12 per hour for general aviation.
Hours of Operations	24 hours per day, voluntary ban on scheduled jet aircraft operations between 2200 and 0700, and on general aviation operations between 2300 and 0700.	No scheduled operations between 2130 and 0700. No departures between 2230 and 0700 or arrivals between 2300 and 0700.	24 hours per day (see noise limits)

TABLE I-1 (Continuation)

Comparison of Policy Elements

Policy Parameters

Policy Element	Existing Practices	Regulations Due to go Into Effect if not Changed	Current Proposal
Limits on Noise Levels	No direct limit (preferential flight tracks and 4 engine jet prohibition)	No direct limit (preferential flight tracks and 4 engine jet prohibitions)	Single Event Noise Limits during 2200-0659 takeoff: 72 dBA approach: 85 dBA
Types of Aircraft not Allowed to Use Airport	No wide bodies or 4 engine jets	No 4 engine jets wide bodies must be approved by the Manager, MWA airports.	No aircraft types not operating at DCA will be allowed to operate there until approved by the Administrator and the Manager, Metropolitan Washington Airports.
Passenger Ceiling	No direct limit (slot limits and exclusion of wide bodies)	No more than 17 million per year, achieved by semi-annual adjustment of air carrier slots	No more than 16 million per year, achieved by annual adjustment of air carrier slots

II. STATEMENT OF THE PROBLEM

The Metropolitan Washington Airport policy initiatives outlined above focus on several divergent goals--protecting (improving) the environment, minimizing congestion, promoting the efficient use of resources, and fostering air transportation between Washington and a wide range of communities. These objectives are not always compatible. Also, there are several options which may be employed to achieve individual goals. Alternatives which promote one objective may be detrimental to others. The problem is to institute or revise existing Federal regulations governing the operation of Metropolitan Washington Airports to provide the best balance of actions to meet environmental, efficiency, and adequacy of service objectives.

III. ALTERNATIVES

There are at least six types of regulatory actions which can be used singly or in combination to achieve Metropolitan Washington Airports policy goals--quotas, landing fees, aircraft restrictions, noise limits, curfews, and market restrictions.

Table III -1 lists policy areas of concern and the current and potential regulatory actions at DCA. In addition, the table indicates the probable nature of the impact--favorable or detrimental--with respect to any policy objective.

DCA operation quotas (on either operations or passengers, or on both) and airport landing fees (based on pollution, congestion, or weighted to increase the relative cost of using DCA) have similar effects on all policy objective areas. Lower quotas and higher fees tend to improve DCA environmental and congestion/delay attributes, reduce competition among carriers, improve the traffic split among metropolitan airports and reduce service to small communities (low density routes) from DCA. Aircraft restrictions, noise limits, and curfews at DCA improve environmental attributes, may be neutral with respect to congestion and delay, reduce competition among carriers, and improve the traffic split among metropolitan area airports. The impact of market restrictions in the form of perimeter rules appears limited to the division of traffic among metropolitan airports and the quality of service provided to other communities classified by hub size.

TABLE III - 1

DCA Policy Objectives
and Attainment Options

Actions at DCA / Policy areas of Concern	Quotas: A/C Operations 20/hr	Quotas: A/C Operations 37/hr	Quotas: A/C Operations 40/hr	Quotas: A/C Operations none	Quotas: Commuter Operations 8/hr	Quotas: Commuter Operations 11/hr	Quotas: Commuter Operations none	Quotas: GA Operations 12/hr	Quotas: GA Operations none	Quotas: Passengers 16 million	Quotas: Passengers none	Landing Fees: Pollution Noise or Air	Landing Fees: Congestion	Landing Fees: Airport Different	Aircraft Restrictions: Noisy Aircraft	Aircraft Restrictions: Wide Bodies	Noise Limits 86/72 80/72	Noise Limits none	Curfew (on schedule Operations) 2130-0700	Curfew (on schedule Operations) none	Perimeter Rule 650	Perimeter Rule 1000	Perimeter Rule none
Environment																							
DCA																							
Noise	+	+	B	-	B			B		+	B	+	+	B	+	B	+	B	+	B	B	-	-
Emissions	+	+	B	-	B		-	B		+	B	+	+	B		B		B		B	B		
BWI & IAD																							
Noise	-	-	B	+	B			B			B	-	-	B		B		B	-	B	B	+	+
Emissions	-	-	B	+	B			B		-	B	-	-	B		B		B		B	B		
Congestion/Delay																							
DCA																							
Airside	+	+	B	-	B		-	B		+	B		+	B		B		B		B	B		
Landside	+	+	B	-	B		-	B		+	B		+	B		B		B		B	B		
BWI & IAD																							
Airside	-	-	B	+	B			B		-	B		-	B		B		B		B	B		
Landside	-	-	B	+	B			B		-	B		-	B		B		B		B	B		
Efficiency																							
Competition among carriers	-	-	B	+	B	+	+	B		-	B		-	B	-	B	-	B		B	B		
Traffic split among airports	+	+	B	-	B			B		+	B		+	B	+	B	+	B	+	B	B	-	-
Service to other communities																							
Hubs within 650 mi.			B	+	B	+	+	B			B			B		B		B		B	B		
Hubs within 1000 mi.			B	+	B			B			B			B		B	-	B		B	B	+	+
Distant Hubs (> 1000 mi)			B	+	B			B			B			B		B	-	B		B	B		+
Small Communities	-	-	B	+	B	+	+	B		-	B		-	B		B		B		B	B	-	-

Key - B = No impact, baseline or current rule in effect
+ = Favorable impact with respect to policy objective
- = Detrimental impact with respect to policy objective
Blank = A priori, no predictable effect

Policy objectives and options listed in Table III-1 contain the components of all recent policy proposals and in several cases provide additional options relevant to specific objectives.

IV. APPROACH

The approach taken in this regulatory analysis is estimation of multiyear benefits and costs of reducing airport noise and congestion at DCA by means of quotas, landing fees, single event noise restrictions, and/or curfews either singly or in combination. In addition, the effect of perimeter rules and commuter airline quotas on community service alternatives is also assessed. The efficiency effects of each option are discussed within the context of the other policy goals. The net change in social well being associated with the current policy proposal is then evaluated by comparing potential benefits and costs of component actions.

Benefits and costs of each option are defined as the change in values from those that exist under the baseline scenario. Reduced operations achieved by means of either quotas or user fees may have two quantifiable benefits. Fewer operations may lower the noise exposure of area residents. It has been demonstrated that noise reductions increase the sales value of residential properties, all other things being equal.[1/] Thus, one potential benefit of reduced operations

1/ Fromme, William R., Conceptual Framework for Trade-Off Analysis of Multiple Airport Operation: Case Study of the Metropolitan Washington Airports, University of Maryland, PH.D., 1978. While this analysis provides an efficient method of estimating the general impacts of noise exposure on areawide property and rental values, it cannot be used to establish changes in values for specific properties due to the other unique features that also influence property values.

is increased property values. A second potential benefit of reduced operations is lower levels of aircraft and passenger delay. Less delay can be translated into value to airline passengers and reduced aircraft operating costs.

Both quotas and landing fees impose costs upon airlines using DCA, their passengers, and communities served from DCA. Airline profits may be reduced (or increased) due to the net impact of fewer revenue flights or higher landing fees, or may be increased due to higher load factors on remaining flights and reduced aircraft delay costs. Passengers may experience higher costs. Those utilizing the remaining flights at DCA may pay higher fares due to higher landing fees and reduced competition. Those former DCA passengers displaced to other metropolitan airports may experience additional ground access costs, which could be offset by lower fares resulting from lower landing fees and increased competition.

The benefits associated with noise restrictions due to single event limits or a curfew are confined to increased residential property values caused by reduced noise exposure. Noise restrictions may impose costs on airlines in the form of lower net profits and increased capital costs due to the lower utility of airline fleets. If airline profits fall or costs go up, airline fares may rise causing increased passenger costs. Finally, if airline operations are reduced, some communities that are served by flights to and from DCA may experience adverse economic effects.

Changes in levels of DCA service to other communities may impose costs or convey benefits to air travellers and/or the community experiencing changes in service. These impacts may be relatively more important with respect to small communities with low levels of DCA service. To the extent that service changes are the result of increases in DCA quotas for commuter carriers, individual airlines may realize increased profits.

A profile of DCA is presented in Chapter V. Economic analyses of regulatory alternatives impacting airport congestion and the environment are discussed in Chapter VI. Regulatory alternatives affecting community service are evaluated in Chapter VII. The report is concluded by an assessment of the economic effect of the present policy proposal. Several appendices present data and describe estimating methods.

V. PROFILE OF WASHINGTON NATIONAL AIRPORT

This chapter presents a profile of Washington National Airport (DCA) operations, operating conditions and associated aviation activity.

A. Total Enplanements and Operations

In Fiscal Year 1979, DCA was ranked the 11th busiest airport in the country on the basis of passenger enplanements and 26th on the basis of total aircraft operations. Table V-1 lists aircraft operations at DCA during FY1980 by major classes of users. Total aircraft operations increased by 12 percent from FY1976 through FY1979, with most of the growth in FY1976 and FY1977, then declined almost 2 percent to 345,717 in FY1980. Over that same period, general aviation activity grew by 34 percent while commuter activity increased 28 percent. Air carrier operations increased only 5 percent, from FY1976 through FY1978, had essentially no growth between FY1978 and FY1979, then declined about 1.5 percent in FY1980.

Passenger enplanements grew more steadily and faster than operations, increasing by 25 percent between FY1976 and FY1979, but then dropped by 2 percent in FY1980. Commuter carriers paced the growth in passengers with an 84 percent increase over the period, but by the end of the period, commuter passengers still amounted to only 5 percent of passengers using DCA. Air carrier passengers, despite the low growth in operations,

TABLE V-1

OVERALL ACTIVITY

WASHINGTON NATIONAL AIRPORT

FISCAL YEAR 1980

Carrier Type / Airport Statistic	Itinerant Operations: Air Carriers	Air Taxi	General Aviation	Military	Total
Daily Average	560	139	271	1	972
Weekly Average	3,934	979	1,900	8	6,821
Monthly Average	17,047	4,242	8,235	36	29,560
Annual Totals	204,560	50,909	98,821	427	345,717
Annual Enplanements (Estimated) (000)	6,758	358	281	N/A	7,397

Source: FAA Air Traffic Activity, Fiscal Year 1980.

increased by 24 percent between FY1976 and FY1979, with 7 percent growth in FY1979 when air carrier operations were essentially unchanged, but declined by 3 percent in FY1980. Table V-2 lists passenger forecasts for the metropolitan area airports through 1990.

The analyses of policy alternatives discussed in Chapters VI, VII and VIII are based on tailored forecasts of air carrier operations. These forecasts embody consideration of economically derived potential growth in demand for air transportation in the metropolitan area, demonstrated airport preferences and trade offs and the increasing availability of advanced technology aircraft, as well as the particular policy option being examined. These forecasts are described in the context of each analysis.

TABLE V-2

Forecast of Annual Passengers
(Millions)

Year	National	Percent Market	Dulles	Percent Market	Baltimore	Percent Market
1980	14.8	69	2.7	13	3.9	18
1985	19.1	60	6.3	20	6.2	20
1990	19.6	53	8.8	24	8.3	23

B. Airport Finance

Tables V-3 and V-4 present partial operating statements for DCA for fiscal years 1979 and 1980. In both years DCA received over 50 percent of its revenue from concession income. The second largest source of revenue at DCA has been landing fees, averaging about 19 percent over the two years. Landing fees are calculated annually to recover prior year costs allocable to the landing area plus or minus any shortfall or overrecovery in the prior year. 1/ For this reason, landing fees are characteristically low at DCA and do not serve an allocation function as is traditionally expected of prices. The landing fee for a typical aircraft, Boeing 727-200, is $45 in 1981.

1/ Landing fees are set so as to recover combined direct and allocated maintenance and operation, depreciation and interest charges on the landing field areas of Washington National and Dulles International Airports. To derive the landing fees, these costs for the preceding year are totaled. Then other revenues, such as general aviation landing fees and fixed base operator commissions, and excesses of revenues over cost in preceding years are deducted from the costs. The result is than divided by forecasted landing weight at the two airports to arrive at the common landing fee. Then for each one percent increase in landed weight at Dulles in the previous fiscal year, compared to 1975, the landing fee for DCA is reduced 0.1¢ and, finally, to offset the revenue loss, the Dulles landing fee is raised a corresponding amount. The waiver of landing fees and mobile lounge fees at Dulles, announced in January 1981, has not changed the calculation or the continued application of the common landing fee at DCA.

TABLE V-3

WASHINGTON NATIONAL AIRPORT

SOURCES OF REVENUE

YEAR ENDING SEPTEMBER 30, 1979

Revenue Sources	Terminal Area	Landing Area	Aviation Leased	Other Leases	Total Revenue	Revenue Per Passenger
Rent:						
Concessionaires	$ [illegible],911	$94,795	$ 101,685	$114,783	$ 355,174	$0.024
Carriers	[illegible],535	59,251	1,168,842	838	2,335,466	0.156
Tenants	[illegible]99,076	8,400	246,577	57,634	511,687	0.034
Total Rent	[illegible]349,522	162,446	1,517,104	173,255	3,202,327	0.214
Landing Fees:						
Air Carrier & Commuters	-	3,954,340	-	-	3,954,340	0.263
General Aviation	-	246,857	-	-	246,857	0.016
Total-Landing Fees	-	4,201,197	-	-	4,201,197	0.279
Concessions	5,524,139	627,501	1,021,569	5,894,172	13,067,381	0.871
Utilities	528,898	37,280	1,297,910	54,166	1,918,254	0.128
Miscellaneous	1,291,789	-	-	125,978	1,418,161	0.094
Total Revenue	8,694,348	5,028,424	3,836,583	6,247,571	23,807,320	1.586
Total Expenses	$5,309,256	$2,751,516	$2,799,159	$773,256	$11,613,187	$0.774

TABLE V-4

WASHINGTON NATIONAL AIRPORT

SOURCES OF REVENUE

YEAR ENDING SEPTEMBER 30, 1980

Revenue Sources	Terminal Area	Landing Area	Aviation Leased	Other Leases	Total Revenue	Revenue Per Passenger
Rent:						
Concessionaires	$ 56,080	$77,192	$ 154,093	$106,451	$ 393,816	$0.027
Carriers	1,192,799	792	1,211,090	801	2,405,482	0.164
Tenants	223,956	8,400	290,353	63,956	586,665	0.040
Triturator	-	82,144	-	-	82,144	0.006
Total Rent	1,472,835	168,528	1,655,536	171,208	3,468,107	0.236
Landing Fees:						
Air Carrier & Commuters	-	4,668,047	-	-	4,668,047	0.318
General Aviation	-	257,143	-	-	257,143	0.018
Total-Landing Fees	-	4,925,190	-	-	4,925,190	0.336
Concessions	5,301,919	664,128	1,285,306	5,805,017	13,056,370	0.890
Utilities	684,241	40,577	1,387,599	72,527	2,184,944	0.149
Miscellaneous	1,366,022	-	-	347,898	1,713,920	0.117
Operating Revenue	8,825,017	5,798,423	4,328,441	6,396,650	25,348,531	1.73
Operating Expenses	$5,968,570	$3,132,778	$3,429,458	$931,197	$13,462,003	$0.92

Revenues increased 6.5 percent in 1980 totaling $25.3 million, which equates to $1.73 per passenger handled. At the same time, cost increased 16 percent over the year. In each year, the annual operating profit was about $12 million. 1/

C. Runway Capacity/Delay and Frequency of Weather Conditions

The operating capacity at DCA varies widely accordingly to, especially, the weather and the mix of arriving and departing aircraft. Estimates of the range of capacity under various conditions prior to the August 3, 1981 controller strike at DCA are contained in Table V-5. IFR conditions prevail about 10.8 percent of the time.

TABLE V-5

CAPACITY OF DCA USING INTERSECTING RUNWAYS

Percent Arrivals	VFR Capacity	IFR Capacity
40	90 to 102	83 to 90
50	84 to 90	74 to 78
60	70 to 75	62 to 65

The controller strike has reduced current DCA capacity to approximately 80 percent of the normal capacities indicated in Table V-5. Delay data reported by three major airlines to the FAA indicate that in 1980 the average air carrier delay at DCA was 6.4 minutes per operation. Since the average for all reported airports was 6.1 minutes per operation and the range among the busiest 23 reported airports was 3.3 to 9.5 minutes per operation, DCA air carrier delay may be described as average among major U.S. airports.

1/ By contract, part of this profit offsets the cost of operating Dulles International Airport and contributes to accelerated recovery of prior year losses at Dulles.

D. Allocation of Operating Slot Reservations

Since 1969, when Subpart K of FAR Part 93 was adopted (High Density Rule), operations under Instrument Flight Rule (IFR) conditions at DCA have been limited by hourly quotas for each category of user. Air carriers, except air taxis, are limited to 40 operations per hour, air taxis have 8 operating slots and general aviation can use up to 12 slots per hour under IFR conditions. To use DCA during IFR conditions (either arrival or departure) an operator must obtain a reservation in advance and schedule the flight for the hour in which the reservation is held. During Visual Flight Rule (VFR) conditions, additional reservations/operations may be authorized in excess of user category quotas. However, this flexibility under VFR conditions is of little value to scheduled carriers who must have assurance that they can perform according to published schedules. Accordingly, scheduling committees have been established by the certificated carriers and the commuter carriers to award by unanimous agreement the full hourly quota of IFR reservations at DCA.

The air carrier scheduling committee, operating under a grant of antitrust immunity from the Civil Aeronautics Board, meets several times each year to review and, as appropriate, to reallocate the reservations awarded to individual air carriers. The commuter scheduling committee follows a seniority rule for admitting airlines which do not now serve National Airport; there are now 18 airlines on the commuter committee's waiting list. The DCA air carrier scheduling committee has accommodated the growth of carriers from 10 in June, 1978 (see Table V-6), to 24 in

Table V-6

AIRLINES WITH AIR CARRIER SLOT ALLOCATION

AT WASHINGTON NATIONAL AIRPORT

June 1978	April 1979	July 1980	June 1981
American	American	American	American
Allegheny	Allegheny	U.S. Air	U.S. Air
Braniff	Braniff	Braniff	Braniff
Delta	Delta	Delta	Delta
Eastern	Eastern	Eastern	Eastern
National	National	National	Pan American
Northwest	Northwest	Northwest	Northwest
Piedmont	Piedmont	Piedmont	Piedmont
Trans World	Trans World	Trans World	Trans World
United	United	United	United
	Texas Int'l	Texas Int'l	Air North
	Air Florida	Air Florida	Air Florida
	Altair	Altair	Altair
	New Haven	New Haven	Newair
	Empire	Empire	Empire
		Aeromech	Aeromech
		Ozark	Ozark
		Republic	Republic
		Western	Western
		Midway	Midway
		Midsouth	Midsouth
			Colgan
			New York Air
			Pilgrim

TABLE V-7

Air Carrier Scheduling Committee Slot Allocations for DCA, Weekdays, June 1 through October 24, 1981, and Large Aircraft Operation, May 6, 1981

DCA

PLANNED AIRCRAFT MOVEMENTS

MONTH June 1-Season '81 DAY Monday-Friday

	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TT	
AMERICAN		2	2	5	2	4	6	4	2	4	3	3	4	4	3	5			54	AA
ALTAIR		1	1		2		1	1	1	2	1		1		1	1	3		16	AK
USAIR		7	7	4	5	5	3	5	7	4	4	4	6	6	5	6	4		82	AL
BRANIFF		2	1		1	1	2		1	2	2	2	1		1	2	1		19	BN
DELTA		3	2	2	2	2	2	3	2	1	2	4	2	1	1	2	1		32	DL
EASTERN		8	7	8	11	8	9	7	10	8	8	7	7	7	7	7	5		[illegible]	EA
[illegible]			1	1				2						2					6	[illegible]
MIDWAY		1				2			2			1	1			1			8	ML
NEWAIR			2				1	1				1	1				1		7	NC
AIR NORTH			2									1	1						4	NO
NORTHWEST		3	2	3	2	1	4	3	1	4	2	2	2	2	4	2	1		38	NW
NEW YORK AIR		1	1	2	1	1	2	1	2		1	1	1	1	1	1	1		18	NY
OZARK						1	1				1	1							4	OZ
PAN AMERICAN		2	1	2	4	2		2	1	3	3	1	3	3	3	3	3		36	PA
PIEDMONT	1	1	4	6	4	3	5	5	4	2	4	4	4	5	4	2	4		62	PI
PILGRIM			2								1	1							4	PM
AIR FLORIDA		1	1	1		2		1	1	1	1		1	1	1		2		14	QH
REPUBLIC						1	1								2				4	RC
TRANS WORLD		2	1	2	3	2	1	2	2	5	3	3	2	3	2	3	2		38	TW
UNITED		4	1	1	2	4	2	1	3	3	2	2	3	3	4	3	2		40	UA
EMPIRE			1	1				1	1					2					6	[illegible]
MID-SOUTH			1	1	1	1					1	1				1	1		8	VL
WESTERN		1									1	1				1			4	WA
COLGAN				1				1		1					1				4	C[illegible]
	1	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	31		632	
Large Aircraft Operations, May 6, 1981*	1	38	32	37	39	39	38	32	36	38	43	37	39	43	38	40	18		588	

* Note: Although these operations correspond to a different set of slot allocations, the differences are minor, and the general relationship between air carrier slots and large aircraft operations is accurately reflected.

June, 1981. The committee has experienced increasing difficulty in reaching unanimous agreement on reservation allocations and in October, 1980, failed to reach accord on the winter, 1981, schedule of reservations. To break the deadlock the Department of Transportation issued a Special Federal Aviation Regulation (SFAR 43, November 3, 1980) to assign reservations according to the most nearly agreed upon allocation considered by the committee. Again in January through March, 1981, the committee had great difficulty reaching a consensus on the summer, 1981, schedule, which was to take effect on April 25, 1981. The committee was finally able to resolve its impasse and adopted the schedule given in Table V-7.

On August 3, a strike by air traffic controllers reduced the capacity of the airport and airway system. In order to maintain aviation safety, the FAA limited air carrier operation at DCA and 21 other airports. The current procedure, described in Special Federal Air Regulation 44-2, requires airlines to submit proposed schedules for approval and permits the FAA to require prorata reductions of flights proposed by airlines to meet capacity limits. Airlines schedule proposals are subject to a limit based on a specified prior period of operation.

E. Service Availability

Tables V-8 and V-9 present a detailed summary of certificated and commuter carrier service available at DCA. In addition to showing what cities are linked via direct air service with Washington, D.C., the tables also indicate the specific carriers offering service, the type of

TABLE V-8

Air Carrier Service Availability Originating at DCA

Weekday Activity

City	Types of Equipment	Number of Airlines Serving	Number of Flights from DCA	Air Miles from DCA	Ticket Prices
Albany	B11 DC9	1	3	314	37.00
Allentown	ND2 72S	2	5	147	56.00
Asbury Park	BE9	1	1	178	62.22
Atlanta	DC9 72S	2	16	550	91.00
Atlantic City	BE9	1	3	136	48.62
Baltimore	BE9 SH3 DH6 DC9 73S 72S	3	14	26	37.00
Binghamton	GRS PAN SWM ND2	3	8	235	88.00
Boston	DC9 727 72S	5	24	396	79.00
Bridgeport	BE9	1	2	310	69.00
Buffalo	B11 DC9	1	4	293	87.00
Charleston	73S	1	3	251	85.00
Charlotte	DC9 727	1	4	334	77.00
Charlottesville	YS1	1	3	94	64.00
Chicago	DC9 727 72S	4	24	597	132.00
Cincinnati	DC9 B11 727	2	4	412	110.00
Cleveland	737 72S	2	8	310	89.00
Columbus	B11 727 72S	2	5	323	94.00
Dayton	B11 72S	2	3	392	110.00
Detroit	DC9 72S	2	8	405	110.00
Elkins	EMB	1	1	153	51.00
Fayetteville	YS1	1	2	288	85.00
Greensboro	73S DC9 727	2	4	252	80.00
Hangerstown	BE9	1	2	67	55.00
Hartford	B11 DC9	1	6	310	90.00
Harrisburg	ND2 SH3 BE9	1	10	89	57.00
Hot Springs	BE9	1	2	231	70.00
Huntsville	737	1	1	616	142.00
Indianapolis	727 72S	1	2	500	132.00
Islip	DC9	1	2	246	78.00
Ithaca	SWM	1	3	249	96.00
Jacksonville, Fla.	DC9 727	2	3	641	138.00
Jacksonville, N.C.	73S	1	3	289	90.00
Kinston	73S	1	1	248	84.00
Knoxville	737	1	2	439	122.00

NOTE: See Appendix D for detailed information on frequency of city-pair service by carrier by equipment type.

TABLE V-8

Air Carrier Service Availability Originating at DCA

Weekday Activity

City	Types of Equipment				Number of Airlines serving	Number of Flights from DCA	Air Miles from DCA	Ticket Prices
Lexington				73S	1	2	416	106.00
Louisville			73S	DC9	2	3	475	115.00
Lynchburg			73S	YS1	1	2	161	80.00
Memphis			727	72S	2	5	763	138.00
Miami	737	DC9	727	72S	3	11	922	143.00
Milwaukee				72S	1	1	634	145.00
Minneapolis			DC9	72S	3	8	930	160.00
Morgantown				EMB	1	1	164	53.00
Myrtle Beach					0	0	363	118.00
Nashville			727	72S	2	5	564	120.00
New Bern					0	0	264	83.00
New Haven				EMB	1	3	273	79.00
New York		DC9	727	72S	5	37	205	59.00
Newark	EMB	F28	727	72S	5	13	205	59.00
Newport News			SH3	DH6	1	5	125	67.00
Norfolk		B11	DC9	73S	2	5	145	72.00
Orlando		DC9	727	72S	3	5	762	144.00
Philadelphia			DH6	ND2	1	19	117	51.00
Pittsburgh		DC9	727	72S	3	9	204	62.00
Providence						4	353	103.00
Raleigh-Durham	72S	727	DC9	73S	2	7	231	68.00
Richmond	DH6	F28	ND2	EMB	3	10	98	55.00
Roanoke				73S	1	4	195	82.00
Rochester				DC9	1	3	293	92.00
Salisbury			SH3	BE9	1	4	90	60.00
Savannah				72S	1	1	523	132.00
State College Pa.					0	0	137	70.00
Staunton			BE9	DH6	1	2	111	64.00
St. Louis			72S	DC9	3	10	720	161.00
Syracuse			B11	DC9	1	3	295	96.00
Tampa			727	DC9	4	6	818	150.00
West Palm Beach			72S	DC9	3	3	861	163.00
Wilkes-Barre			DC9	SWM	2	3	181	76.00
Clarksburg				EMB	1	2	176	56.00
White Plains				737	1	3	231	69.00
						385		

TABLE V-9

Air Carrier Service Availability Terminating at DCA

Weekday Activity

City	Types of Equipment					Number of Airlines Serving	Number of Flights to DCA	Air Miles from DCA	Ticket Prices
Albany				B11	DC9	1	4	314	37.00
Allentown				ND2	72S	2	5	147	56.00
Asbury Park					BE9	1	1	178	62.22
Atlanta			DC9	727	72S	2	15	550	91.00
Atlantic City					BE9	1	3	136	48.62
Baltimore	SH3	DH6	BE9	73S	DC9	3	10	26	37.00
Binghamton		GRS	SWM	PAN	ND2	3	8	235	88.00
Boston			DC9	727	72S	5	24	396	79.00
Bridgeport					BE9	1	2	310	69.00
Buffalo					DC9	1	4	293	87.00
Charleston				YS1	73S	1	4	251	85.00
Charlotte				DC9	72S	1	4	334	77.00
Charlottesville				YS1	73S	1	3	94	64.00
Chicago			DC9	727	72S	4	26	597	132.00
Cincinnati		B11		DC9	727	2	4	412	110.00
Cleveland				727	72S	2	9	310	89.00
Columbus			B11	727	72S	2	5	323	94.00
Dayton				727	72S	1	2	392	110.00
Detroit				DC9	72S	2	8	405	110.00
Elkins					EMB	1	1	153	51.00
Fayetteville					73S	1	2	288	85.00
Greensboro			DC9	73S	72S	2	4	252	80.00
Hangerstown				SH3	BE9	1	4	67	55.00
Hartford				DC9	B11	1	4	310	90.00
Harrisburg				ND2	SH3	1	8	89	57.00
Hot Springs					BE9	1	2	231	70.00
Huntsville					737	1	1	616	142.00
Indianapolis					72S	1	2	500	132.00
Islip				DC9	B11	1	2	246	78.00
Ithaca					SWM	1	2	249	96.00
Jacksonville, Fla.				DC9	72S	2	3	641	138.00
Jacksonville, N.C.				73S	YS1	1	2	289	90.00
Kinston					73S	1	1	248	84.00
Knoxville					737	1	2	430	122.00

NOTE: See Appendix D for detailed information on frequency of city-pair service by carrier by equipment type.

TABLE V-9

Air Carrier Service Availability Terminating at DCA

Weekday Activity

City	Types of Equipment				Number of Airlines serving	Number of Flights to DCA	Air Miles from DCA	Ticket Prices
Lexington				73S	1	1	416	106.00
Louisville		73S	DC9	727	2	3	475	115.00
Lynchburg			YS1	73S	1	3	161	80.00
Memphis			727	72S	2	4	763	138.00
Miami	737	DC9	727	72S	3	10	922	143.00
Milwaukee				72S	1	1	634	145.00
Minneapolis			DC9	72S	3	8	930	160.00
Morgantown				EMB	1	1	164	53.00
Myrtle Beach				73S	1	1	363	118.00
Nashville			727	72S	2	6	564	120.00
New Bern				EMB	1	1	264	83.00
New Haven				EMB	1	3	273	79.00
New York		DC9	727	72S	5	38	205	59.00
Newark	EMB	F28	727	72S	5	13	205	59.00
Newport News			SH3	DH6	1	4	125	67.00
Norfolk	B11	DC9	73S	727	2	7	145	72.00
Orlando		DC9	727	72S	3	5	762	144.00
Philadelphia			ND2	DH6	1	19	117	51.00
Pittsburgh	B11	DC9	727	72S	3	9	204	62.00
Providence				DC9	1	5	353	103.00
Raleigh-Durham		73S	DC9	727	2	6	231	68.00
Richmond	ND2	DH6	F28	EMB	3	10	98	55.00
Roanoke			YS1	73S	1	4	195	82.00
Rochester				B11	1	2	293	92.00
Salisbury			SH3	BE9	1	5	90	60.00
Savannah				727	1	1	523	132.00
State College Pa.				BE9	1	1	137	70.00
Staunton			DH6	BE9	1	2	111	64.00
St. Louis		DC9	727	72S	3	10	720	161.00
Syracuse			B11	727	1	3	295	96.00
Tampa	737	DC9	727	72S	4	6	818	150.00
West Palm Beach			737	727	3	3	861	163.00
Wilkes-Barre			SWM	72S	2	3	181	76.00
Clarksburg				EMB	1	2	176	56.00
White Plains				737	1	3	231	69.00
						385		

INDEX: Equipment Listed on

Tables V-8 and V-9

B11	BAC 111 (all series)
BE9	Beechcraft 99
727	Boeing 727 (all series)
72S	Boeing 727-200
737	Boeing 737 (all series)
73S	Boeing 737-200
DC9	McDonnel Douglas DC9 (all series)
DH6	DeHavilland DHC-6-300
EMB	Bandeirante
F28	Fokker F-28
GRS	Grumman Gulfstream
NDS	Nord 262
PAN	Piper Navajo
SH3	Short Bros. and Harland SD3-30
SWM	Swearingen Metro
YS1	Namco YS-11

aircraft used, the cost of service 1/ and the distance flown. These tables show a strong relationship between size of population center and the amount of service offered. For example, while each of the heavily populated east coast cities of New York, Philadelphia, Atlanta and Boston is served by more than 30 operations per day, to and from DCA, smaller cities such as Ithaca, Kinston and Roanoke are served by less than 10 operations per day. The tables also indicate that population density is strongly related to the amount of competition on various routes. For example, Boston, New York, and Chicago are served by at least three major carriers while smaller cities are served from DCA by a single carrier. Service is also provided to the larger cities through Dulles and/or Baltimore/Washington.

During an average day at DCA, some 71 cities are served by over 770 operations (includes commuters). Because of regulations regarding the size of aircraft permitted to operate at DCA, medium capacity DC-9 and B-727 jet aircraft provide most of the available jet service. In May of this year, 60 percent, or more than 460 daily operations were made with these types of aircraft. Although jet service predominates at DCA, there is also a wide range of service using turboprop and non-turbine aircraft. Almost 18 percent of the total operations performed at DCA in May were carried out using aircraft with less than 30 seats. These aircraft were used to provide service to some 16 communities.

1/ Scheduling data as well as ticket fares were extracted from the Official Airline Guide, May, 1981.

F. Flight Financial Estimates

Tables V-10 through V-14 present estimates of airline financial statistics for the third quarter of CY-1979. The data represent per flight averages of airline direct operating costs, total revenues, total costs, operating profit, and net profit. 2/ The estimates, as indicated in the tables, are airline specific for each hour of scheduled operations at DCA. Over the intervening two years, both fares and costs have risen appreciably. Use of these data in this evaluation reflects the assumption that the internal relationships have not altered significantly and that profit data may therefore be fairly representative.

Data for calculation of direct operating costs were taken from monthly airline reports (Form 441) submitted to the Civil Aeronautics Board (CAB). Included in these reports are cost information for flying operations, aircraft maintenance and depreciation/amortization, on a block hour basis. From this information, knowledge of the type of aircraft providing service, and the travel time required for a flight, (both available from the Official Airline Guide (OAG)) total per flight direct operating costs can be reasonably estimated.

Revenue information was derived by using service segment data (Form 586) provided by the CAB and fare information from the OAG. Service segment data provide information on the number of passengers for each segment of

2/ Revenue from sources other than passenger ticket revenues, i.e., cargo, etc., is not included in the revenue and profit estimates. Revenue from these "other" sources is traditionally a very small percentages of total per flight revenue.

TABLE V-10

THIRD QUARTER 1979 AIRLINE REVENUE/OPERATION
(Average)

A/L	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	AVE
AA	0.	4366.	4443.	6139.	7072.	6313.	6075.	7054.	6352.	6602.	7731.	5227.	8318.	6564.	5292.	5587.	5218.	6106.
BN	0.	2641.	3625.	4265.	0.	2847.	4766.	5534.	3439.	6293.	4473.	5228.	4644.	5920.	5665.	3065.	0.	4636.
DL	0.	6655.	5211.	4465.	6206.	6354.	6530.	7073.	6836.	6021.	7783.	7770.	6167.	6556.	5744.	0.	6904.	6567.
EA	0.	2917.	4474.	5508.	6366.	4679.	4465.	4878.	5954.	5153.	5439.	5952.	5630.	4274.	5051.	4547.	4202.	5026.
NA	0.	0.	2567.	5621.	6342.	9213.	8922.	5944.	7387.	5275.	7185.	5154.	7022.	3829.	7752.	4010.	0.	6321.
NW	0.	2696.	2201.	3442.	3371.	4147.	4807.	2415.	3555.	5236.	5852.	5282.	5851.	4545.	5427.	3145.	[illegible]	4194.
TW	0.	5609.	4465.	9129.	5770.	4920.	5291.	4342.	7283.	7672.	5927.	6775.	5360.	7260.	4896.	4578.	5517.	5698.
UA	0.	1575.	4584.	4950.	3330.	5180.	2290.	3253.	6751.	5327.	6664.	5834.	5153.	5315.	4973.	3943.	5608.	4732.
WA	0.	4099.	0.	0.	0.	0.	0.	0.	0.	0.	8386.	0.	7404.	0.	0.	6467.	0.	6605.
AL	0.	2908.	2930.	3205.	4160.	2987.	3562.	2527.	3674.	4088.	3502.	3542.	3316.	3854.	2749.	2986.	2159.	3265.
PI	1371.	1025.	3446.	2458.	2424.	2064.	2017.	2801.	3582.	2429.	2578.	1978.	3366.	2743.	2803.	2307.	1394.	2441.
NC	0.	0.	0.	0.	0.	6571.	6757.	0.	0.	0.	0.	0.	0.	0.	6336.	0.	0.	6500.
AVG	1371.	3445.	3986.	4572.	4732.	4567.	4497.	4233.	5428.	5389.	5128.	5216.	5303.	4913.	4655.	4003.	3735.	4665.

TABLE V-11

THIRD QUARTER 1979 AIRLINE DOC/OPERATION
(Average)

A/L	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	AVG
AA	0.	1759.	1783.	1949.	2153.	2457.	1625.	1650.	1867.	2106.	2507.	1190.	2591.	1931.	1820.	2246.	1901.	1968.
BN	0.	824.	2327.	2215.	0.	2049.	2360.	2780.	892.	2664.	2047.	2360.	1675.	3200.	2018.	1576.	0.	2096.
DL	0.	2473.	2356.	1993.	1993.	2325.	2687.	2321.	2319.	2321.	2687.	2324.	1960.	2687.	2199.	0.	2667.	2353.
EA	0.	750.	1493.	1824.	2240.	1357.	1020.	1421.	2038.	1640.	1632.	2044.	1764.	1406.	1594.	1434.	1456.	1661.
NA	0.	0.	718.	2625.	2322.	2751.	3376.	3041.	2920.	1403.	2954.	1933.	2847.	796.	2757.	1659.	0.	2390.
NW	0.	1884.	1180.	1452.	2393.	1502.	2214.	927.	1600.	2143.	2259.	3014.	2354.	1992.	2439.	2239.	1235.	1999.
TW	0.	2721.	2027.	2680.	2174.	2219.	2043.	2107.	2608.	2826.	2357.	3020.	2334.	2681.	2115.	2313.	2912.	2510.
UA	0.	1559.	1526.	2030.	1494.	1718.	732.	1217.	2044.	2114.	1077.	1706.	2033.	179[illegible].	2009.	2175.	2413.	1754.
WA	0.	3758.	0.	0.	0.	0.	0.	0.	0.	0.	3758.	0.	3758.	0.	0.	3758.	0.	3756.
AL	0.	1222.	1360.	1508.	1480.	1386.	1151.	1260.	1650.	1384.	1257.	1307.	1216.	1329.	1125.	1292.	1316.	1327.
PI	597.	344.	1228.	1464.	732.	737.	616.	878.	1052.	714.	776.	551.	1308.	756.	871.	909.	546.	833.
NC	0.	0.	0.	0.	0.	3960.	3960.	0.	0.	0.	0.	0.	0.	0.	3960.	0.	0.	3960.
AVG	597.	1461.	1547.	1910.	1769.	1647.	1586.	1490.	1878.	1865.	1767.	1843.	1945.	1693.	1821.	1756.	1627.	1732.

TABLE V-12

THIRD QUARTER 1979 AIRLINE DOC & IOC /OPERATION
(Average)

A/L	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	AVG
AA	0.	3473.	3522.	3850.	4252.	4853.	3210.	3259.	3688.	4160.	4951.	2350.	5118.	3813.	3595.	4435.	3754.	3888.
BN	0.	1590.	4492.	4276.	0.	3955.	4554.	5365.	1721.	5142.	3951.	4554.	3234.	6175.	3894.	3041.	0.	4049.
DL	0.	4730.	4507.	3812.	3812.	4448.	5140.	4441.	4437.	4441.	5140.	4447.	3749.	5140.	4206.	0.	5140.	4502.
EA	0.	1435.	2856.	3489.	4380.	2595.	1952.	2719.	3898.	3137.	3122.	3910.	3374.	2690.	3050.	2743.	2785.	3062.
NA	0.	0.	1445.	5282.	4672.	5534.	6793.	6119.	5875.	2984.	5943.	3890.	5729.	1601.	5548.	3337.	0.	4808.
NW	0.	3250.	2050.	2504.	4129.	2591.	3819.	1599.	2760.	3696.	3896.	5198.	4061.	3436.	4206.	3862.	2130.	3448.
TW	0.	5204.	3877.	5126.	4159.	4244.	5439.	4184.	4989.	5406.	4509.	5777.	4464.	5129.	4045.	4426.	5572.	4801.
UA	0.	2812.	2812.	3738.	2752.	3165.	1348.	2243.	3765.	3893.	3458.	3144.	3745.	3308.	3701.	4006.	4444.	3230.
WA	0.	7252.	0.	0.	0.	0.	0.	0.	0.	0.	7252.	0.	7252.	0.	0.	7252.	0.	7252.
AL	0.	2338.	2602.	2884.	2831.	2652.	2202.	2410.	3156.	2647.	2405.	2500.	2326.	2542.	2152.	2472.	2517.	2538.
PI	1035.	596.	2131.	2540.	1270.	1279.	1068.	1524.	1826.	1239.	1346.	956.	2408.	1311.	1510.	1578.	947.	1445.
NC	0.	0.	0.	0.	0.	7576.	7576.	0.	0.	0.	0.	0.	0.	0.	7576.	0.	0.	7576.
AVG	1035.	2775.	2937.	3638.	3339.	3117.	2991.	2825.	3556.	3534.	3348.	3485.	3471.	3196.	3445.	3315.	3067.	3278.

TABLE V-13

THIRD QUARTER 1979 AIRLINE REV - DOC & IOC / OPERATION
(Average)

A/L	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	AVG
AA	0.	892.	920.	2289.	2820.	1460.	2865.	3795.	2703.	2443.	2780.	2877.	3200.	2750.	1697.	1152.	1464.	2219.
BN	0.	1051.	-862.	-11.	0.	-1108.	152.	569.	1719.	1151.	522.	673.	1410.	-256.	1771.	28.	0.	581.
DL	0.	1925.	704.	597.	2394.	1945.	1740.	2632.	2399.	2380.	2643.	3324.	2418.	1416.	1538.	0.	1764.	2065.
EA	0.	1482.	1617.	2019.	1986.	2084.	2514.	2159.	2097.	2016.	2317.	2042.	2256.	1584.	2001.	1805.	1417.	1964.
NA	0.	0.	1122.	538.	1670.	3679.	2129.	-175.	1512.	2292.	1241.	1265.	1293.	2227.	2244.	672.	0.	1513.
NW	0.	-554.	152.	938.	-758.	1556.	988.	816.	795.	1540.	1956.	84.	1790.	1109.	1221.	-717.	260.	746.
TW	0.	404.	588.	-2.	1611.	676.	-149.	158.	2294.	2266.	1418.	998.	895.	2131.	850.	152.	-54.	897.
UA	0.	-1297.	1772.	1212.	578.	2014.	942.	1051.	3026.	1434.	3226.	2688.	1408.	2007.	1272.	-63.	1164.	1502.
WA	0.	-3153.	0.	0.	0.	0.	0.	0.	0.	0.	1134.	0.	152.	0.	0.	-785.	0.	-647.
AL	0.	570.	328.	321.	1329.	335.	1360.	518.	518.	1441.	1097.	1043.	990.	1313.	597.	514.	-362.	731.
PI	336.	429.	1516.	-82.	1154.	786.	949.	1277.	1757.	1190.	1232.	1021.	958.	1432.	1292.	729.	446.	996.
NC	0.	0.	0.	0.	0.	-1005.	-819.	0.	0.	0.	0.	0.	0.	0.	-1240.	0.	0.	-1076.
AVG	336.	674.	1049.	934.	1394.	1450.	1506.	1408.	1872.	1855.	1779.	1730.	1632.	1717.	1415.	688.	672.	1391.

TABLE V-14

THIRD QUARTER 1979 AIRLINE OPERATING PROFITS/OPERATION
(Average)

A/L	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	AVG
AA	0.	2607.	2657.	4190.	4919.	3856.	4450.	5404.	4524.	4496.	5224.	4037.	5727.	4633.	3472.	3342.	3317.	4138.
BN	0.	1817.	1302.	2050.	0.	798.	2346.	3154.	2540.	3629.	2426.	2860.	2968.	2720.	3650.	1494.	0.	2532.
DL	0.	4187.	2855.	2417.	4213.	4060.	4243.	4751.	4517.	4500.	5096.	5446.	4207.	3870.	3545.	0.	4217.	4214.
EA	0.	2167.	2980.	3684.	4076.	3322.	3445.	3457.	3950.	3513.	3807.	3908.	3867.	2868.	3457.	3114.	2746.	3476.
NA	0.	0.	1849.	3195.	4020.	6462.	5545.	2903.	4467.	3793.	4231.	3221.	4174.	3033.	5035.	2351.	0.	3932.
NW	0.	817.	1013.	1991.	978.	2645.	2593.	1488.	1955.	3093.	3593.	2249.	3497.	2553.	2949.	906.	1155.	2195.
TW	0.	2808.	2438.	2445.	3596.	2702.	2447.	2155.	4675.	4846.	3570.	3755.	3026.	4579.	2781.	2264.	2605.	3186.
UA	0.	16.	3058.	2921.	1836.	3461.	1558.	2076.	4747.	3213.	4807.	4126.	3120.	3519.	2964.	1768.	3195.	2978.
WA	0.	342.	0.	0.	0.	0.	0.	0.	0.	0.	4628.	0.	3647.	0.	0.	2710.	0.	2848.
AL	0.	1686.	1570.	1698.	2680.	1600.	2411.	1660.	2024.	2704.	2245.	2236.	2100.	2526.	1624.	1694.	839.	1947.
PI	774.	682.	2418.	994.	1692.	1327.	1401.	1923.	2530.	1715.	1802.	1427.	1970.	1987.	1932.	1398.	848.	1609.
NC	0.	0.	0.	0.	0.	2611.	2796.	0.	0.	0.	0.	0.	0.	0.	2375.	0.	0.	2540.
AVG	774.	1989.	2439.	2662.	2963.	2919.	2911.	2743.	3550.	3524.	3361.	3372.	3358.	3221.	3038.	2246.	2112.	2937.

an airline flight. Total revenue for any flight was calculated as the product of the coach fare times the number of passengers. This assumes that the effect of discount fares (lower than coach fares) is offset by the first class fares plus non-passenger revenues—belly freight, air express, U.S. mail, and excess baggage.[1/] Estimates of total revenue and aircraft direct operating costs were made for individual flights over a three-month period. Results were then averaged by hour of the day for each airline to produce the profiles of Tables V-10 and V-11.

Estimates of average total costs require the estimation of indirect operating costs on a per flight basis. This was accomplished by establishing, from airline annual reports, the relationship between total indirect and direct operating costs for each airline. These ratios were than applied to the previously derived direct operating cost information of individual flights to ascertain indirect cost per flight per airline.

1/ While discount fares accounted for 50 percent of nationwide traffic during the third quarter of 1979, much of the discounting can be attributed to the "coupon war" between American and United which existed until December 15, 1979. Theses carriers accounted for only about 20 percent of DCA scheduled, certificated operations. Eastern, Delta, and Piedmont, which accounted for almost 40 percent of DCA operations, tended to engage in much less discounting than the national average. Also, for total domestic trunk operations during the year ending June 1979, first class passenger revenues contributed 11 percent of total passenger revenues and non-passenger revenues constituted 9 percent of total revenues from scheduled services. For Eastern, Delta, Allegheny, and Piedmont Airlines which were major users of Washington National Airport that did not operate any all-freight (freighter) service, non-passenger revenues constituted between 6 and 8 percent of total airline revenues from scheduled services. Thus, it is difficult to assess the inaccuracy associated with the coach fare estimation assumption. If the procedure results in an overstatement of revenues, the error is likely to be small—perhaps only 5 percent or less.

Finally, estimates pertaining to per flight operating and net profits were calculated by subtracting relevant cost estimates from estimates of total revenue. Profit estimates are approximations from the best data available. Overestimates of revenue (see footnote on previous page) may result in overestimates of average operating and net profits by 9 and 20 percent, respectively.

In Table V-10, as would be expected, average per flight revenue varies greatly. Differences result from load factors, aircraft unit cost differences, and the distance traveled. Average revenue per flight per airline for the third quarter ranges from a high of about $9,200 for National Airlines flights taking place at 11:00 a.m. to a low of just over $1,000 for Piedmont flights at 7:00 a.m. The profile of average revenue levels in the table is consistent with the two peak distribution of time preference for air travel. Average revenue peaks per flight occur at 10:00 a.m. and again from 2:00 to 6:00 p.m. Average revenue per flight is greatest at 2:00 p.m.

Table V-11, average per flight direct operating costs (DOC's), exhibits many of the same distributional aspects that are present in the revenue information. This is expected as airlines respond to the greater demand for air travel by using larger capacity aircraft which are more expensive to operate. Piedmont's 7:00 a.m. flights (those that exhibited the lowest average per flight revenue in Table V-10), also show the lowest average DOC level per flight. At the upper end of the range, Republic's operations at 11:00, 12:00 and 8:00 o'clock, exhibit the highest average direct operating costs.

Table V-12 reflects estimates of average total operating costs per flight. The range of average per flight total cost estimates shows the same patterns as the direct operating costs.

Estimates of average net profits per flight by hour of the day are derived by subtracting total cost from total revenues and are summarized in Table V-13. The estimates indicate that approximately 10 percent of flights operating at DCA in the third quarter of 1979 were operated at an apparent financial loss.[1/] Because these estimates represent quarterly averages, it is important to stress that the losses evident from the table are not aberrations but indicate operating conditions that have been encountered for several months. There could, of course, be a number of reasons for continuing financially unprofitable segments. One potential explanation is logistics. Airlines may need an aircraft at DCA to operate an early morning profitable flight and, therefore, must incur a small loss the night before in order to assure availability of that aircraft.

1/ This does not imply that the entire flight is operated at a financial loss, but rather only that "leg" of the flight in which DCA is the city of origin or termination appears to be unprofitable.

VI. ECONOMIC ANALYSIS OF CONGESTION/ENVIRONMENTAL ALTERNATIVES

The effects of the reduction in the air traffic controller work force are assumed to be temporary and not appropriate for consideration in the evaluation of policy alternatives. References to "base case" and alternative scenarios are relative to the pre-strike situation.

A. Economic Analysis of the Use of Quotas or Landing Fees to Limit Operations at Washington National Airport.

1. Description of Base Case

Operations at Washington National Airport (DCA) are currently subject to several rules and standard procedures. Relevant to this analysis are those which:

a) limit IFR activity to 40 air carrier operations per hour, 8 commuter operations per hour, and 12 general aviation operations per hour;

b) define air carrier and commuter operations according to the certification of the airline and allow certain airlines to conduct both air carrier and commuter operations;

c) award the hourly IFR reservations (slots) according to the decisions of air carrier and commuter scheduling committees; [1] and

d) charge a relatively low landing fee which has very little effect on the profitability of airline operations.

1/ During the current circumstances of reduced airport and airway capacity at DCA as well as at other congested hubs, capacity is allocated by the FAA according to procedures described in Special Federal Air Regulation 44-2. Allocation of capacity by the FAA is, however, considered a temporary procedure.

One of the proposed modifications to the DCA policy is a redefinition of air carrier according to aircraft seating capacity. Air carrier operations will be those operations involving aircraft certificated with 56 or more seats; operations using smaller aircraft will be commuter operations. Because most of the alternatives which are analyzed in this chapter are based on this proposed definition, it is relevant to know the current mix of air carrier and commuter operations based on this proposed definition. Based on scheduling data for a week in May 1981, as listed in Appendix B, hourly scheduled air carrier and commuter operations currently average 38 and 12, respectively, using the proposed definition of air carrier relating to aircraft seating capacity. Thus, if the proposed definition were in effect today, we would have to conclude that an average of two air carrier slots per hour are filled with aircraft of less than 56 seats and that some commuter quota violations are now occurring.

The profitability of current air carrier operations is illustrated by the data contained in Tables V-10 through V-14. Specifically, during the third quarter of 1979, DCA air carrier operations averaged revenues, costs, and profits per operation of $4669, $3278, and $1391, respectively. Financial data for commuter airlines are not as accessible as for air carriers. Income and operations data for a small sample of commuter airlines indicate that a range of $40 to $60 per operation may be representative of net profits for commuters operating in the general area of DCA. Many commuters operate at a financial loss at this time, so this is a rough approximation of average overall profits. Therefore, for the purposes of this analysis, it is assumed that $50 per operation is representative of current average commuter airline net profits.

The assignment of costs and revenues to specific operations at DCA is necessary for the present analysis, but the nature of airline operations prevents accurate measurement of such items. An operation at DCA may be only one leg of a flight with many stops, both before and after the stop at DCA, and the role of the stop at DCA in generating costs and revenues may be impossible to assess. Also, some operations at DCA may be conducted solely to position an aircraft where it is needed the following day. Thus, there are significant constraints on the ability to quantify the profitability of DCA operations.

The imprecision in the current definitions of air carrier and commuter affects the usefulness of the available data on current DCA operations and enplanements. These data are obtained from separate sources which use different definitions. One specific problem is that the Civil Aeronautics Board began including enplanement data for many airlines previously classified as commuters with its air carrier enplanement data in 1980. In addition, enplanements for 1980 can only be estimated at this time. A better picture of the air carrier/commuter traffic mix relative to the definition by aircraft seating capacity may be obtained, therefore, from 1979 data, as follows:

DCA Air Carrier Operations	208,301
DCA Air Carrier Enplanements	6,971,325
DCA Commuter Operations	47,658
DCA Commuter Enplanements	282,241

Multiplying 1979 air carrier enplanements by two yields an estimated 13,942,650 enplaning/deplaning passengers at DCA. There is also an unknown number of through passengers who fly into and out of DCA without deplaning. Assuming an average of 124 seats per air carrier aircraft at DCA, the 1979 enplaning/deplaning load factor at DCA was about 54 percent, meaning that 54 percent of all seats (excluding those used by through passengers) were taken by passengers arriving at or departing from DCA and, thus, requiring terminal service. Similar data are not available for commuters, nor are data available on the load factor of through passengers at DCA. It is assumed that, should no changes be implemented, total DCA enplanements and deplanements would reach an estimated 19,500,000 in 1990.

2. Description of Alternatives

The current DCA policy proposal includes a provision that the quota be modified to limit air carrier operations to 37 per hour with no exceptions for VFR operations, limit commuter operations to 11 per hour, and limit general aviation operations to 12 per hour. At the same time, it is proposed that air carrier operations be defined according to aircraft seating capacity. Air carrier operations will be those involving aircraft of 56 or more seats. Finally, it is proposed that the number of passengers serviced at DCA be limited to 16 million annually. This ceiling will be implemented by reducing the air carrier quota appropriately whenever the annual DCA forecast predicts that passengers will exceed the limit in the coming year. The commuter quota will be increased by the amount the air carrier quota is decreased.

In order to analyze these and other potential policy changes, the following eight alternatives to the base case are analyzed:

a) the proposed 37/11/12 quota and the definition of air carrier by seating capacity, with retention of the scheduling committees;

b) institution of landing fees which essentially restrict air carrier operations, as defined by aircraft seating capacity, to 37 per hour and commuter operations to 11 per hour, thereby eliminating the need for scheduling committees. General aviation operations remain subject to a quota of 12 operations per hour;

c) the proposed 37/11/12 quota and the definition of air carrier by seating capacity, plus the imposition of a 16 million passenger ceiling as described above, with retention of the scheduling committees;

d) an hourly quota of 37 air carrier operations (defined by aircraft seating capacity) allocated by scheduling committee, and the removal of quotas on commuter and general aviation operations, thereby eliminating the need for the commuter scheduling committee;

e) an hourly quota of 37 air carrier operations (defined by aircraft seating capacity) allocated by scheduling committee, but reduced annually as required to meet a 16 million passenger ceiling, plus the removal of quotas on commuter and general aviation operations, thereby eliminating the need for the commuter scheduling committee;

f) a quota of 20/8/12 on hourly air carrier, commuter, and general aviation operations, respectively, with air carrier operations defined by aircraft seating capacity, and with retention of scheduling committees;

g) institution of landing fees which essentially restrict air carrier operations, as defined by aircraft seating capacity, to 20 per hour and commuter operations to 8 per hour, thereby eliminating the need for scheduling committees. General aviation operations remain subject to a quota of 12 operations per hour; and

h) the removal of all quotas, thus eliminating the need for scheduling committees.

For each alternative analyzed in this section, it is assumed that the base case perimeter rule, restricting flights to 650 miles except for "grandfather" cities, is retained. Also, no change to noise policy at DCA is considered in this section. Perimeter rule and noise policy changes are discussed in Chapter VII and Section B of this chapter.

It is assumed throughout the analysis of all alternatives that the effect on general aviation is negligible. Although there is a quota on IFR general aviation operations at DCA, most general aviation operations are VFR and are not subject to any restrictions on the number of operations. Delays normally occur during hours of peak operations or bad weather, and general aviation operators normally avoid these hours. Even a significant increase in air carrier delays may not impact general aviation to a significant extent.

3. Methodology

a. Estimation of Delays

The methodology for estimating changes in aircraft delays is described in Appendix A. Using this methodology, it may be concluded that both IAD and BWI are now operating so far under capacity that significant changes in aircraft delays at these airports are not expected under any alternative. Changes in delays at DCA are expected, however, in every case.

b. Estimation of Noise and Value of Noise Impact

The impact of a change in the general level of aircraft noise may be quantified through the estimated change it causes in residential property values. Yearly Average Day-Night Sound Level (LDN) is a means of quantifying the noise suffered in the airport area and along flight paths. Consistent with general convention, 65 dB is considered the threshold for noise problems; any change above the 65 dB level affects property values, but any change below the 65 dB level does not. Based on the results of an earlier study,[1/] a change of one decibel (above the 65 dB level) is estimated to result in a 1.5 percent change in property values in the opposite direction of the noise change. Changes in owner-occupied home values are assumed to occur in total immediately upon perception of the noise change. Changes in rent values are also assumed to occur upon perception of the noise change and are discounted to present value at a 10 percent rate in perpetuity. The total property value change is then expressed as a single value in 1980 dollars. (See Appendix C for additional detail on method used to estimate the change in property and rental values).

c. Estimation of Impact on Passengers

All but one of the eight alternatives result in fewer air carrier operations than under the base case. To some extent, the reduction in operations will make some of the remaining operations more profitable, as

1/ Fromme, William R. "Conceptual Framework for Trade-off Analysis of Multiple Airport Operation: A Case Study of the Metropolitan Washington Airports," University of Maryland, Ph. D., 1978.

the percentage of filled seats will rise on those flights which are still available to the destinations of cancelled flights. Some of the passenger demand which cannot be met at DCA will be transferred to Dulles International Airport (IAD) or Baltimore-Washington International Airport (BWI), and some of the demand simply will not be met at all. Whether demand is transferred to IAD/BWI or is not met at all depends, for each passenger who cannot use DCA, on that passenger's inherent net value of a trip to/from Washington, D.C. in excess of the present cost of a DCA flight (consumer's surplus) and on that passenger's cost of using DCA relative to the cost of using IAD/BWI.

Consumer's surplus refers to the value which accrues to a consumer who pays less for a commodity than that consumer would be willing to pay. In the present case, consumers' surplus is the collective value accruing to DCA passengers as the result of fares being lower than some passengers would be willing to pay. If a flight were cancelled and, consequently, some passengers were forced to cancel trips, those passengers would not lose that portion of the value of their trips represented by the market value of their tickets, for they would still have that money available for alternative purposes. However, they would lose any consumers' surplus in excess of that market value. Therefore, in assessing the impact of policy alternatives on passengers, estimates must be made of lost consumers' surplus due to forgone trips as well as added airport access costs for passengers switching to IAD/BWI. In the present analysis, such estimates are based on these assumptions:

1) It is assumed that, on average, passengers now using DCA will require about 11.4 minutes extra time per operation to access IAD/BWI. This is based on the results of the only reliable survey which could be found in the literature. 1/ The survey results and the assumptions and calculations used to derive the 11.4 minute estimate are contained in Appendix E. (The assumption used in the PRE was 30 minutes.)

Using $17.50 as the average value of an airline passenger's time,[2/] this results in $3.33 added cost per passenger per operation. In addition, it is similarly assumed that, on average, passengers now using DCA will pay an added out-of-pocket expense in the range of $4.50 to $8.00 per aircraft operation to access IAD/BWI.[3/] The average passenger, therefore, is assumed to incur a total added cost of $9.58 per aircraft operation when accessing IAD/BWI instead of DCA. [4/]

1/ "Washington-Baltimore Airport Access Study," May 1968, ABT Associates, Inc.

2/ "Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs," Report No. FAA-APO-81-3, DOT/FAA, May 1981.

3/ The cost of driving to IAD from Washington, parking at IAD for one day, and driving back to Washington is about $16.00 more than a subway round trip between Washington and DCA. Thus, this set of alternatives yields an added cost of $8.00 per aircraft operation in accessing IAD instead of DCA. Limousine service from Washington to IAD is $4.50 more than limousine service from Washington to DCA.

4/ $9.58 is equal to $3.33 (cost of time) added to one-half of $4.50 plus $8.00 (the range of out-of-pocket expense).

2) The average fare for DCA operations, based on the data contained in Table V-9, is $88; and

3) The price elasticity of demand at the average fare level is -1.0.[1/]

Price elasticity of demand refers to the percentage change in the quantity of a commodity demanded given a certain percentage change in the price of that commodity. Essentially, an elasticity of -1.0 means that a given percentage change in price yields the same percentage change in demand in the opposite direction. For example, a doubling of price halves demand.

Using these assumptions, passenger impacts may be estimated as follows. If the average DCA fare is $88 and the added cost of accessing IAD/BWI is $9.58, then the real IAD/BWI fare is a total of $97.58, about an 11 percent increase over the DCA fare. If price elasticity of demand is -1.0, then this fare increase will yield an 11 percent decrease in demand. That is, 11 percent of the passengers who cannot access DCA will forego air travel rather than access BWI/IAD. Such passengers may, for example, use alternative modes of travel to reach relatively nearby destinations rather than make a relatively long trip to an airport.

1/ See, for example: DeVaney, Arthur S. "The Revealed Value of Time in Air Travel, "Review of Economics and Statistics, Feb. 1974, pp. 77-82; and Brown, S.L. and Watkins, W. S. "Measuring Elasticities of Air Travel from New Cross-Sectional Data," paper presented at American Statistical Association, 1971.

The economic loss to passengers who forego air travel may be estimated by the consumers' surplus from their denied DCA flights. These passengers apparently value their consumer surplus at $9.58 or less, since they refuse to pay that much more for a IAD/BWI flight. Assuming their individual surplus ranges from $0 to $9.58, an average of $4.79 per passenger is used in estimating consumers' surplus. The economic loss to passengers who access IAD/BWI, assumed to be 89 percent of the passengers denied access to DCA, may be estimated using the $9.58 per passenger added airport access cost.

Passengers will also be affected by changes in delays, both airside and groundside. Calculated changes in airside delays are valued at $17.50 per hour per passenger, as cited in "Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs," Report No. FAA-APO-81-3, DOT/FAA, May 1981.

The estimation of changes in groundside delays involves a large amount of uncertainty. There are, undeniably, increasing delay costs to passengers as the number of passengers using an airport increases towards that airport's capacity. However, the lack of an adequate method of quantifying these costs prevents their being estimated in this analysis.

An alternative to estimating the impact of groundside delays on passengers is estimating the cost of providing an adequate level of service to airport users. The present analysis involves only two options for levels of airport use. One is the imposition of a 16 million passenger ceiling at DCA. The other is to allow unrestricted use of DCA.

If unrestricted use of DCA is allowed, about 19.5 million annual passengers are expected to use DCA by 1990. About 8.8 million passengers are expected to use IAD in this case. In this scenario, expansion and renovation of DCA facilities must be accomplished, and development of IAD would be required also.

If a 16 million passenger ceiling is imposed at DCA, about 11.3 million annual passengers are expected to use IAD by 1990. In this scenario, relative to the first scenario, additional development of IAD is required, and less development of DCA is required.

The range of estimates of the costs of developing IAD and DCA in these two scenarios yields a total cost for both airports on the order of $200 million in each scenario. Thus, there appears to be no strictly financial incentive to select one option over the other. From the standpoint of passenger convenience, the level of service which is provided at IAD now and which would be provided at IAD under either future option is significantly higher than the level of service which is and would be provided at DCA. The level of service at IAD is and would be close to design standards, while the level of service at DCA is and would be well below design standards. This difference in level of service is a distinct advantage of the option which includes a 16 million passenger ceiling at DCA. However, the techniques for estimating the benefits to passengers are not sufficiently developed to permit including such an estimate in the present analysis.

d. Estimation of Impact on Airline Operations and Profits

As noted in the preceding section, seven of the eight alternatives, as well as the actual policy proposal, involve a reduction in air carrier operations at DCA. The expected results of such a reduction are an increase in the average DCA load factor, an increase in the number of IAD/BWI operations, and a loss of some passengers. Many of the alternatives include a reduction in the air carrier quota to 37 operations per hour, so it is relevant to discuss the methodology used in estimating the impact of this specific quota reduction.

According to the May 1981 schedule listed in Appendix B, DCA operations involving aircraft with 56 or more seats number 37 or more during 12 of the 15 full hours of operation. Thus, there is little opportunity for shifting operations among hours, and most DCA flights in excess of 37 per hour must be transferred to IAD/BWI or cancelled. The operations which must be cancelled or transferred number 20 for Sunday through Friday and none on Saturday. This totals 6,240 annual operations.

The number of passengers who can simply access remaining DCA flights can be only roughly approximated. The number will depend on the specific schedule changes and the current availability of seats to destinations affected by the changes. For example, some cancelled operations may be expected to eliminate service to communities currently providing relatively low demand and receiving minimum service. Passengers losing this service may find no alternative at DCA. It is assumed in this analysis that the current 54 percent enplanement/deplanement DCA load factor will rise to 55 percent. This means that about 251,000 passengers would be accommodated on remaining DCA flights.

Using an average of 124 seats per aircraft and a 54 percent load factor, the loss of 6,240 DCA operations would affect about 418,000 passengers. Assuming 251,000 of them use remaining DCA flights, 167,000 must choose IAD/BWI service or no service at all. According to the methodology of the preceding section, 11 percent or 18,000 would choose no service, and 89 percent or 149,000 would choose IAD/BWI service.

It is assumed that new service must be provided to serve the added 149,000 IAD/BWI passengers. At the average IAD/BWI enplanement/deplanement load factor of 43 percent, and assuming a national average of 140 seats per aircraft, a total of 2,475 added operations would be required. Thus, there is a net reduction of 3,765 air carrier operations required at the three area airports.

The impact on airline profits from a reduction in the DCA quota to 37 air carrier operations per hour is, therefore, the sum of lost revenues from passengers who forgo trips and reduced costs from reduced operations. Lost revenues for 18,000 passengers at an average $88 fare are $1.6 million per year. Reduced costs for 3,765 operations at $3278 per operation are $12.3 million per year. (This assumes that indirect costs are covered by alternative use of the aircraft made available by these reduced operations.) Therefore, air carriers on the whole receive a benefit of $10.7 million per year.

The alternatives which incorporate a 16 million passenger ceiling involve a gradual decrease in the air carrier quota to about 30 operations per hour by 1990. Although accurate quantification of the implications of this change is impossible, it is possible to speculate on the general effects. As fewer operations are permitted at DCA, more operations may be expected at BWI/IAD. Those operations remaining at DCA should be the most profitable ones possible, implying that they will be flights to relatively large hubs and that load factors will be very high. The reduced competition at DCA on routes which are available may lead to higher fares, but there will be competition from commuters and IAD/BWI air carriers. As the market for air transportation gradually moves toward IAD/BWI, it is reasonable to expect air carriers to develop strategies which make use of IAD/BWI more attractive to passengers and more efficient for air carriers. The only financial forecast in which any confidence may be placed is that the remaining operations at DCA will be highly profitable. It is not possible to predict the fares which will prevail as air carrier activity at DCA is reduced, but the inauguration of discount fare service, such as between BWI and Newark, indicates that there are realistic opportunities for competition with the service that would remain at DCA.

For those alternatives in which air carrier operations are reduced below 37, the estimate of added profits from the reduction to 37 will be used as a lower bound of annual benefits for air carriers. For the alternatives in which air carrier operations are reduced immediately to 20, it is assumed that a relatively dramatic change occurs in DCA activity, and that only highly demanded routes are flown out of DCA with high load factors.

Due to the scarcity of data on commuter operations, the impacts on commuter airlines are approximated by estimating the number of operations added or deleted and assuming the average profit for one operation is $50.

An additional impact on airline profits will be caused by changes in aircraft delays. Airborne delay costs are contained in "Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs," Report No. FAA-APO-81-3, DOT/FAA, May 1981. Data reported to the FAA by three major airlines indicate that the ratio of airborne delay hours to ground delay hours is .61 to 1, and the ratio of airborne delay cost to ground delay cost is 1.43 to 1. These ratios were used to calculate the overall aircraft delay costs used in this analysis, namely $24.40 per minute for air carriers and $9.76 per minute for commuters.

4. Analysis of Alternatives

a. Alternative 1: Hourly quota of 37 air carrier operations (as defined by aircraft seating capacity), 11 commuter operations, and 12 general aviation operations, with retention of the scheduling committees.

(1) Impact on Airlines

The reduction in the air carrier quota, excluding the effects of delays, yields an estimated annual benefit of $10.7 million for air carriers (See Methodology). For commuter airlines, about 12 currently scheduled operations may be denied access to DCA on Monday through Friday, while weekend operations should be unaffected. Therefore, an annual total of 3,120 operations may be affected. At the assumed profit rate of $50 per commuter operation, the loss to commuters is $156,000 per year.

The decrease in both air carrier and commuter operations should result in reduced delay costs. Assuming a 6,240 decrease in air carrier operations and a 3,120 decrease in commuter operations, this alternative would result in a decease in total annual operations from about 355,000 to about 345,000. According to the methodology of Appendix A, this would result in a decrease of 0.2 minutes in average delay per operation. Assuming an air carrier delay cost of $24.40 per minute, the decrease in delay cost to air carriers is about $1.0 million per year. Assuming a commuter airline delay cost of $9.76 per minute, the decrease in delay cost to commuter airlines is about $0.1 million per year.

The net impact on air carriers is estimated to be an $11.7 million annual benefit. The net impact on commuters is estimated to be negligible.

(2) Impact on Passengers

As described in the Methodology section, 18,000 passengers may forgo air transportation due to higher airport access costs, thereby forfeiting an average $4.79 per passenger in consumer surplus. Also, 149,000 passengers may pay average added costs of $9.58 per passenger in accessing IAD/BWI. Thus, passengers may suffer annual losses of $1.5 million from the reduction in DCA operations, excluding the effects of delays.

An additional impact on passengers is the benefit from reduced delays at DCA. As estimated above, airside delays will decrease an average of 0.2 minutes per operation. Although this average may appear insignificant, it can represent significant delay reductions for a few passengers. The 0.2 average is the result of statistically spreading these reductions among all passengers. Using a passenger delay cost of $17.50 per hour and assuming an average of 17.5 million passengers over the entire period, the reduced delay cost to passengers is about $1.0 million per year. This reduces the overall cost to passengers to about $0.5 million per year.

Finally, passengers will experience a reduction in service due to decreased air carrier and commuter operations.

(3) Impact on Local Community

Analysis of the change in noise reveals that the effect on the environment will be negligible. Thus, no significant impact is expected.

(4) Impact on other Communities

Some communities must suffer a reduction in service at DCA. About 20 air carrier operations and about 12 commuter operations per day must be dropped to meet the new quota.

(5) Impact on FAA

Negligible.

(6) Conclusion

Ceteris paribus, a change in the hourly quota for air carrier, commuter, and general aviation operations from 40/8/12 to 37/11/12, coupled with the redefinition of air carrier operations, is expected to have the following effects. Air carriers may experience a net benefit of $11.7 million annually and commuters may experience a negligible impact, because of reduced delay costs and higher load factors on remaining operations. Passengers will suffer added airport access costs and lost consumers' suplus, but reduced delays will cut their overall costs to about $0.5 million per year. Passengers and some communities will suffer reductions in DCA service.

b. Alternative 2: Institution of landing fees which essentially restrict air carrier operations, as defined by aircraft size, to 37 per hour and commuter operations to 11 per hour, thereby eliminating the need for scheduling committees. General aviation operations remain subject to a quota of 12 operations per hour.

This alternative proposes an economic means of limiting airline operations. Landing fees are established which increase the cost of DCA operations to a point where less profitable operations are voluntarily eliminated by airlines, the goal being a maximum of 37 air carrier operations per hour and 11 commuter operations per hour. Initial landing fees would be established through analysis of airline profit data, and fees would be periodically modified according to the response of airlines. Fees might have to be set for each hour, because profits vary by hour.

The impacts of these landing fees are very difficult to predict. It is uncertain what the fees would be and how much of the added cost would be passed on to passengers through higher ticket prices. The availability of flights at IAD/BWI gives passengers a substitute for DCA service and some degree of market power, thus limiting to some extent the airlines' opportunity to raise fares at DCA. Therefore, substantial increases in landing fees will, to a large degree, be an added cost to airlines which cannot be totally passed on to passengers. This will likely result in lower profits for airlines.

One indicator of potential air carrier landing fees under this alternative is the excess of current air carrier profit over an estimate of "acceptable" profit. Third quarter 1979 air carrier net profit by hour reveals that the first and last hours of the day contain many unprofitable operations, perhaps due to positioning of aircraft for optimum systemwide profitability. Ignoring these hours, the average net profit by hour was:

8 a.m.	$1049
9	934
10	1394
11	1450
12 p.m.	1506
1	1408
2	1872
3	1855
4	1779
5	1730
6	1632
7	1717
8	1415

The hours of 8 a.m. and 9 a.m. may be assumed to be periods of lower demand, with net profit relatively low but still sufficient to warrant a large number of operations. If the average net profit for these two hours, $992, is assumed to represent a minimum "acceptable" profit which air carriers would be willing to earn on all operations, then air carriers may be willing to pay an additional fee per operation of $0 to $880, with a mean of $457. Since fees are actually paid for landing only, landing fees could range from $0 to $1760, with a mean of $914. The total added fees for a year's air carrier operations might be about $88 million. The benefits to air carriers resulting from the new operations limits, per se, are estimated at $11.7 million per year (see

Alternative 1). Therefore, air carriers must pass on at least 87 percent of the added fees or suffer a reduction in profit derived from DCA operations.

There will be demand for commuter slots well in excess of the predetermined supply of 11 slots per hour, so it may be assumed that, on average, landing fees will be bid up to higher levels than exist now. Given the relatively low profit generated by commuter flights, even a small addition to landing fees could have a significant, detrimental effect on commuter operations. Relatively better established and larger commuter serving larger airports will be favored by a landing fee bidding system.

Depending on the amount of added landing fees which are passed on to fares, passengers will bear costs in addition to the $0.5 million loss from the new operations limits, per se (see Alternative 1). These additional costs may result in passengers either forgoing air travel or accessing IAD/BWI instead of simply paying higher DCA fares.

The impacts of these landing fees are assumed to be in addition to the effects of the operations limit, per se, described under Alternative 1. The U.S. government, recipient of all landing fees, could receive annual benefits of about $88 million, less relatively insignificant costs of administering the landing fee system.

C. Alternative 3: Hourly quota of 37 air carrier operations (as defined by aircraft seating capacity), 11 commuter operations, and 12 general aviation operations, with retention of the scheduling committees; plus imposition of a 16 million passenger ceiling, which will be implemented by appropriate reductions in the air carrier quota whenever the annual DCA forecast predicts that passengers will exceed that limit in the coming year; the commuter quota will be increased by the amount of the decrease in the air carrier quota.

The 16 million passenger ceiling imposed under this alternative might be reached as soon as 1982 (in the absence of reduced DCA activity due to the air traffic controller strike); thus, the quota for 1982 may be decreased for air carriers and increased for commuters. Because air carrier load factors and commuter operations may be expected to increase as the air carrier quota decreases, and because larger air carrier aircraft will be introduced in the middle of this decade, there may be sufficient annual passenger increases at DCA to require frequent decreases in the air carrier quota. In order to quantify the impacts of the passenger ceiling, and to facilitate the reader's grasp of the passenger ceiling concept, the following hourly air carrier and commuter quotas are used in this analysis as approximations of future quotas:

	Air Carrier	Commuter
1981	37	11
1982	36	12
1983	35	13
1984	34	14
1985	33	15
1986	32	16
1987	31	17
1988	30	18
1989	29	19
1990	29	19

(1) Impact on Airlines

The general effect of this alternative will be a gradual decrease in air carrier operations and a gradual increase in commuter operations throughout the decade. The impact on air carriers is described in the Methodology section, and $10.7 million is used as a lower bound estimate of the annual benefit to air carriers, excluding the effects of delays. Weekday commuter operations may average 15 per hour over the decade, compared to the base case 12. This represents an average of about 11,700 added annual operations which, assuming a $50 profit per operation, yield an average added profit of $585,000 per year, excluding the effects of delays.

It is uncertain what the effect on delay will be when commuter operations replace air carrier operations. The methodology of Appendix A is not applicable to changes in aircraft mix. As estimated under Alternative 1, the proposed quota may result in a reduction of 0.2 minutes in average delay per operation. This yields an annual saving of $0.9 million for air carriers and $0.1 million for commuters, given the trend in slot allocation assumed above.

(2) Impact on Passengers

Passengers will experience a mixture of gradually decreasing air carrier service and gradually increasing commuter service throughout the decade. (See Chapter VII for a discussion of the impact of improved commuter service.) Also, the 16 million passenger ceiling means that an increasing number of passengers will have to access IAD/BWI or not use air transportation. Under Alternative 1, it is estimated that the change in the quota rule would cost passengers about $1.5 million in forgone consumers' surplus and added airport access costs. By 1990, as many as 3.5 million annual passengers may be denied access to DCA. Those passengers would suffer losses of about $1.8 million in forgone consumers' surplus and about $29.8 million in added airport access costs, totalling a $31.7 million loss in 1990. It is assumed that passenger costs increase linearly from $1.5 million in the first year of the policy to $31.7 million in 1990.

The 0.2 minute reduction in average delay per operation, assuming an average of 16 million annual passengers, yields benefits of about $0.9 million per year.

(3) Impact on Local Community

Relative to the base case, the impact of gradually decreasing air carrier quotas on noise levels will increase from a negligible impact in the first year to a decrease in 1990 of, at most, 2dB over the current 65dB contour area. The methodology of Appendix C is not designed to measure property value impacts of a stream of noise reductions, and the noise reductions in any one year can be only roughly estimated. Thus, approximation is necessary and can be obtained by estimating the impact of a 1dB noise reduction in 1985 as a representative average. The approximation results in an increase in home values in 1985 and an increase in annual rents beginning in 1985, which may all be discounted to a 1981 present value of about $29.7 million.

(4) Impact on Other Communities

The gradually decreasing air carrier quota dictates that an increasing number of communities must suffer a reduction in or loss of air carrier service to DCA. The potential for replacement of such service exists at IAD/BWI, however. In addition, commuter operations may provide some replacement service to these communities or new service to previously unserved communities.

(5) Impact on FAA

It will be increasingly possible that the air carrier scheduling committee will be unable to reach a slot allocation agreement as the quota falls throughout the decade. Thus, the FAA may have to bear the relatively small cost of assigning slots.

(6) Conclusion

Ceteris paribus, the institution of a 37/11/12 quota on hourly air carrier, commuter, and general aviation operations, the institution of a 16 million passenger ceiling, plus the definition of air carrier by aircraft seating capacity, is expected to have the following results. Air carrier operations are expected to gradually decrease at DCA and increase at BWI/IAD, with hourly DCA air carrier slots falling from 37 to about 29 by 1990. Commuter operations are expected to increase steadily, with hourly slots increasing from 11 to about 19. The average gain in air carrier profits over the decade may be about $11.6 million per year, while the average profits gain to commuters may be about $0.7 million per year.

Passengers are expected to experience significant added costs, primarily because of increased airport access costs; including the effect of reduced delays, total added costs may increase from about $0.6 million in the first year to about $30.8 million in 1990. The present value of increases in home values and rents due to decreased noise near DCA is estimated at $29.7 million. There is also expected to be a gradually changing mix of service offered at all area airports. Some relatively less profitable operations may be eliminated without replacement, but there may also be new or expanded commuter service.

d. Alternative 4: Quota of 37 air carrier operations per hour as defined by aircraft capacity and as allocated by scheduling committee; removal of quotas on commuter and general aviation operations, thereby eliminating the need for a commuter scheduling committee.

(1) Impact on Airlines

The impact on air carriers, as described in the Methodology section, is an estimated $10.7 million annual benefit, excluding the effects of delays. Weekday commuter operations, currently averaging about 12 per hour using the seating capacity definition, may increase to as many as 20 per hour under this alternative. This may mean about 31,200 more operations annually. At an assumed average profit of $50 per operation, this yields an average added profit of $1.6 million per year, excluding the effects of delays.

Another factor which will affect the profitability of all airline operations is the change in average delay per operation. Assuming a 6,240 decrease in air carrier operations, a 10 percent increase in general aviation operations, and a 31,200 increase in commuter operations, the immediate effect of the policy would be to increase DCA annual operations to about 390,000 from about 355,000. According to the methodology of Appendix A, this would result in an increase of 0.8 minutes in average delay per operation. Assuming an air carrier delay cost of $24.40 per minute, the added delay cost to air carriers is about $3.9 million per year. Assuming a commuter airline delay cost of $9.76 per minute, the added delay cost to commuter airlines is about $0.6 million per year. Further increases in commuter and general aviation operations through 1990 are not expected to be sufficient to have a significant further impact on delay for airlines.

The net impact on air carriers is estimated to be a $6.8 million annual benefit. The net impact on commuters is estimated to be a $1.0 million annual benefit.

(2) Impact on Passengers

One qualitative benefit for passengers is the expected increase in commuter operations, which will broaden the list of cities served through DCA and increase the frequency of service to some cities already served. (See Chapter VII for further discussion of the impacts of unrestricted commuter operations on quality of service.)

As estimated under Alternative 1, air carrier passengers denied access to DCA may suffer losses of about $1.5 million annually in forgone consumers' surplus and added airport access costs.

An additional impact on passengers is the cost of added delays at DCA. As estimated above, delays will increase an average of 0.8 minutes per operation, so that every passenger will suffer this added cost. Using a passenger delay cost of $17.50 per hour and an average of 17.5 million annual passengers, the total added delay cost to passengers is about $4.1 million per year.

(3) Impact on Local Community

Analysis of the change in noise reveals that the effect on the environment will be negligible. Thus, no significant impact is expected.

(4) Impact on other Communities

Although some communities must suffer at least a qualitative decrease in their DCA air carrier service, increased commuter activity will provide new or better service to many communities. (See Chapter VII for further discussion of the impacts of unrestricted commuter operations on quality of service.)

(5) Impact on FAA

A minor benefit accruing to the FAA is elimination of the need to monitor commuter and general aviation IFR reservations and the commuter scheduling committee.

(6) Conclusion

Ceteris paribus, a change in air carrier operations from 40 to 37 per hour, coupled with the redefinition of air carrier, plus elimination of commuter and general aviation quotas, is expected to have the following results. Air carriers may gain as much as $6.8 million in annual profits, and commuter profits may increase about $1.0 million per year.

Passengers will experience a mixture of less air carrier service and significantly greater commuter service. Passengers may lose $1.5 million per year in forgone consumers' surplus and added airport access costs. Added DCA passenger delay costs are estimated at $4.1 million per year.

Some communities will experience reduced air carrier service. These and other communities may benefit from newly added or improved commuter service. The altered quotas *per se* are not, on a net basis, expected to change the noise exposure forecast experienced in residential areas including the airport or along the flight paths. Consequently, there is no expected change in residential property values.

e. Alternative 5: Quota of 37 air carrier operations per hour as defined by aircraft capacity; ceiling of 16 million annual enplaning/deplaning passengers; no limit on commuter and general aviation operations. This alternative is similar to Alternative 4, except that the annual number of enplaning/deplaning DCA passengers is capped at 16 million. This ceiling would be implemented through an appropriate reduction in the air carrier hourly operations quota whenever the annual DCA forecast indicates that the 16 million limit will be exceeded in the coming year.

The removal of the limit on commuter operations implies a significant, immediate increase in commuter passengers. As the number of commuter passengers increases each year, the limit on air carrier passengers will decrease each year. It is forecast that the 16 million limit on total passengers will be reached in 1982, and the quota on air carrier operations would thus be lowered for that year. Load factors may be expected to increase on the remaining flights, and commuter airlines may be expected to attract some of the demand, also. These forces may offset some of the effect of the reduced air carrier quota, and annual quota decreases may be required. In the late 1980's, when a significant number of the new, larger air carrier aircraft are expected to be in the fleet, the 16 million passenger limit may continue to require annual decreases in the quota.

In order to quantify the impacts of the passenger ceiling, and to facilitate the reader's grasp of the passenger ceiling concept, the following hourly air carrier quotas are used in the following analysis as approximations of future quotas:

1981	37
1982	36
1983	35
1984	34
1985	33
1986	32
1987	31
1988	30
1989	29
1990	28

(1) Impact on Airlines

As described in the Methodology section, the impact on air carriers, excluding the effects of delays, may be estimated using $10.7 million as a lower bound of the annual benefit. The average DCA delay over the entire period may fall by about 0.2 minutes, yielding an annual benefit of about $0.9 million for air carriers. The increased commuter operations, as estimated under Alternative 4, may result in added profits of $1.6 million, plus delay cost savings of $0.1 million. The net impact on all airlines, therefore, is estimated to be an average annual benefit of $13.3 million.

(2) Impact on Passengers

Passengers will experience a mixture of gradually decreasing quality of air carrier service and a much quicker increase in quality of commuter service. (See Chapter 7 for a discussion of the impact of improved commuter service.) As discussed under Alternative 3, it may be assumed that passenger costs (forgone consumers' surplus and added airport access costs) increase linearly from $1.5 million in the first year of the policy to $31.7 million in 1990. The average reduction in airside delay of 0.2 minutes, with an average of 16 million passengers, yields an annual saving of $0.9 million.

(3) Impact on Local Community

The impact of gradually decreasing air carrier quotas on noise levels is assumed to be as estimated under Alternative 3. The increase in home values and rents may be discounted to a 1981 present value of $29.7 million.

(4) Impact on Other Communities

Commuter airlines are expected to provide service to new communities and increase service to previously served communities. A gradually increasing number of communities may lose DCA air carrier service, especially communities within a relatively short distance of DCA.

(5) Impact on FAA

It will be increasingly possible that the air carrier scheduling committee will be unable to reach a slot allocation agreement as the quota falls from 37 to about 28. Thus, the FAA may have to bear the relatively small cost of assigning slots. The FAA will also have a minor saving from not having to monitor commuter reservations and the commuter scheduling committee.

(6) Conclusion

Ceteris paribus, the combination of a quota of 37 air carrier operations, a ceiling of 16 million passengers imposed through air carrier quota reductions, and the removal of commuter and general aviation quotas, is expected to have the following results. The net impact on all airlines is estimated at an average annual benefit of $13.3 million. Passengers are expected to experience significant added costs, primarily because of increased airport access costs; total added costs may increase from about $0.6 million in the first year to about $30.8 million in 1990. A benefit of $29.7 million in 1981 present value is estimated to accrue in the form of increased property values resulting from decreased noise levels. Other communities, notably those within a relatively short distance of DCA, are expected to experience decreases in air carrier service, but substantial increases in commuter service.

f. Alternative 6: Quota of 20 operations per hour for air carriers as defined by aircraft size, 8 per hour for commuters, and 12 per hour for general aviation. Scheduling committees are retained.

The relatively severe restrictions on operations proposed under this alternative are designed to give environmental benefits to DCA's neighbors.

(1) Impact on Airlines

Airlines would be faced with a major restructuring of activities under this alternative. Greatly expanded use of IAD/BWI is likely under this alternative, but the specific strategies which may be employed by air carriers and commuters under this scenario cannot be predicted.

An important uncertainty is whether scheduling committees can, in fact, reach a solution to the problem of assigning slots to airlines. Judging by the experience of recent meetings, the air carrier scheduling committee is more likely than not to fail to find a solution under this alternative. In such a case, the FAA will be forced, through some mechanism, to allocate individual slots to carriers.

The impact on airlines depends on the number of passengers who forgo air travel as a result of the change, the increase in load factors on flights remaining at DCA, and the changes in delay costs at the area's airports. The first two factors imply a decrease in the total number of operations required at the area's airports; there will be less passengers and more crowded flights. Airlines will thus benefit from more efficient use of their aircraft. A major question, however, is how large a loss in passengers will be suffered.

About 14,000,000 air carrier passengers enplaned or deplaned at DCA in 1979, and there were about 208,000 air carrier operations, an average of 67 passengers per operation, while seats per aircraft averaged about 124. If passengers per operation increase to 100 with the lower quota (resulting in an 81 percent load factor), and there are 20 air carrier operations during each of 15 hours every day of the year, then about 11,000,000 passengers can be accommodated. [1/] This leaves 3,000,000 passengers having to decide on the use of IAD/BWI, and 11 percent (as described in the Methodology section) may choose to forego the trip due to added airport access costs. Thus, the air carriers at the area's airports may lose about 0.3 million of their twenty million passengers.

The assumption of an 81 percent load factor under this scenario is a distinct departure from the lower load factors assumed for alternatives in which air carrier slots are reduced to 37 and below. The 81 percent load factor may be expected to occur in a situation where most or all DCA flights are directed to highly demanded destinations, those which are of

1/ Further analysis must be conducted to determine the average load factor by hour for current DCA flights. DCA load factors are affected by through passengers who remain on board flights arriving at DCA.

special attraction to business passengers and which offer easy flight connections. It may be expected that the scheduling and pricing of flights would be arranged to route most through passengers through IAD/BWI and make DCA more accessible to passengers who desire easier access to Washington, D.C.

Assuming a 50 percent load factor and an average 140 seats per aircraft on the flights added to IAD/BWI to carry the 2.7 million displaced DCA passengers, about 38,600 operations must be added annually. Since about 100,000 operations will be dropped at DCA, there is a net loss of about 61,400 air carrier operations in the area. Using 1979 flight cost and revenue data, this results in a cost saving of about $201 million in direct and indirect costs, while the loss in fares from the 0.3 million passengers would be only about $26 million. Thus, air carriers may receive a net benefit of $175 million per year. Delays at DCA, according to the methodology of Appendix A, will decrease 1.6 minutes per air carrier operation due to the decrease in total operations. This will mean a further saving of $4.3 million per year.

If the quota of eight operations per hour is enforced, daily commuter operations will decrease from the present weekday average of 186 to 128. Commuter airlines will not only have to cut back sharply in number of operations, but they will have more difficulty arranging convenient schedules for connections, and they will meet greater difficulty than will air carriers in attracting passengers to IAD/BWI. Airport access costs will have far greater impact on the relatively low-fare commuters.

Using $50 per operation as an estimate of average net profit, commuters may lose about $0.8 million in profits. They may save about $0.7 million in delay costs.

In summary, air carriers as a whole may benefit on the order of $179.3 million per year from this alternative. This reflects a move away from the relatively competitive situation of the base case, and it implies that some air carriers will lose the chance to compete while others will reap relatively handsome profits. Commuter airlines may not be affected financially as a group. Again, there will be less competition than under the base case.

(2) Impact on Passengers

Passengers will suffer from a sharp decrease in quality of service. Fewer cities will be served, because of both decreased commuter service and the need for air carriers to direct many of their flights into major hubs to facilitate connections. Competition and its attendant benefits to passengers will decrease. It is possible that fares may increase at DCA, although this specific potential impact is not quantified in this section or in the preceding section on airline impacts.

Most of the quantifiable impacts can be inferred from the analysis of airline impacts. About 0.3 million passengers will forego trips, losing an average net worth per trip (consumer surplus) of $4.79, for a total loss of $1.4 million per year. About 2.7 million passengers will assume an additional $9.58 cost, for a total cost of $25.9 million per year. The decrease in delays at DCA will yield a benefit of $5.1 million per year. The cost to DCA passengers of added time having to make connections cannot be quantified, but if it is very large it would lead some passengers to prefer service out of IAD/BWI.

(3) Impact on Local Community

There should be a significant easing of environmental problems due to the decreased numbers of DCA operations and passengers. An immediate noise decrease of two NEF will be experienced on average. The 1981 present value of increases in home values and rents, as described in Appendix C, is estimated at $82.9 million.

(4) Impact on Other Communities

Non-stop service to DCA and service to relatively small communities may be expected to become much rarer commodities. Load factors will be the dominant factor for DCA flights and service may be centralized to relatively large hubs and major connecting hubs. Airport access costs may make IAD/BWI flights to small nearby communities too expensive to replace most of the lost DCA service.

(5) Impact on FAA

Because of the likelihood that the air carrier scheduling committee will fail to find a solution to the DCA slot assignment problem, the FAA may be required to allocate DCA slots. There would be limited out-of-pocket costs of administering the solution.

(6) Conclusion

There are substantial benefits to airlines as a group, since this alternative tends to make individual operations more profitable at the expense of convenience and service to passengers. The gain for some airlines, however, will come at substantial expense to other airlines. Passengers will experience added costs from the transfer of operations to IAD/BWI, but reduced delays and congestion may provide benefits which outweigh these costs. There are gains in local property values estimated at $82.9 million. In general, benefits may outweigh costs, but the benefits and costs are distributed among the affected parties in such a fashion that closer analysis is required before judging the merits of this alternative.

g. Alternative 7: Imposition of landing fees to essentially restrict hourly operations to 20 air carrier, 8 commuter, and 12 general aviaton.

The severe reduction in operations proposed under this and the previous alternative may very likely result in serious problems of slot allocation. As noted under Alternative 6, the benefits of the intended operations limits are in large profit gains for some air carriers and local property holders, but there are major costs in terms of poorer passenger service, poorer community service, losses to commuters, losses to some air carriers, and a general degradation of competition in the industry. A landing fee system will add substantially to the costs of both airlines and passengers, essentially transferring the potentially large profit gains realized by some air carriers under the quota system of Alternative 6 to the public (Federal Government). Under Alternative 2, a nominal average landing fee was estimated to be $914, assuming 37 air carrier slots per hour. With 20 slots, there would be much more profitable operations, and average air carrier landing fees might approach the upper end of the range mentioned under Alternative 2, about $1760.

The operations limits of Alternative 6 and 7 impose substantial constraints on scheduling committees, and agreement on slot allocations may prove impossible. A landing fee system is a means of dealing with this particular problem, but at a high cost to airlines and passengers.

h. Alternative 8: No limit on operations at DCA.

The removal of all limits on DCA operations will lead to increases in air carrier and commuter operations. This is clear from the demand for slots expressed at recent scheduling committee meetings. It is assumed that general aviation operations remain constant over the relevant period. (It might be argued, however, that general aviation operations, facing higher delays and a more complex operating environment, may actually decrease despite having no quota.)

(1) Impact on Airlines

Air carriers and commuter airlines both wish to expand their operations at DCA. The amount of expansion, given the lifting of quotas, involves several factors which cloud predictions of total operations. The availability of aircraft is an important consideration, for example. Short-term decisions on aircraft use depend on marketing strategies and system route structures as well as opportunity costs of operations at other airports. Long-term decisions depend on the financing capability and the goals of airlines.

It is estimated that air carrier operations will, in the short-term, increase to a weekday average of 45 to 48 operations per hour, and commuter operations will increase to a weekday average of 18 to 20 operations per hour. This will yield total annual operations on the order of 415,000. Passenger increases during the 1980's will be met largely by the introduction of larger aircraft, and 1990 total operations are forecast to increase to only 425,000.

The increased profits due to increased air carrier flights can be estimated only by order of magnitude. Assuming an increase of about 40,000 operations per year, and using the third quarter 1979 average net profit of $1391 per operation, the estimated increase is about $55.6 million per year. This will be offset by increased delay costs. Using the methodology of Appendix A and an average of 420,000 annual operations, average delay per operation will increase 1.6 minutes from the base case. At $24.40 per minute, the annual added delay cost to air carrier operations is about $9.6 million, reducing the estimated profit increase to $46.0 million. This may be further offset by fare reductions caused by increased competition. An average fare reduction of $3 per passenger, for example, would eliminate the $46.0 million estimated profit increase. Commuter airlines may experience about the same increase in profits, excluding the effects of delays, as estimated above under Alternative 4, an estimated $1.6 million per year. At $9.76 per minute, the annual added delay cost to commuter airlines is $1.2 million. The net impact on commuter airlines, therefore, may be an annual benefit of $0.4 million. Competition from increased air carrier and commuter operations may reduce load factors and fares and worsen this impact.

(2) Impact on Passengers

The removal of quotas is expected to cause both commuter and air carrier airlines to increase the number of destinations served and the frequency of service. Passengers would benefit from this increased competition, receiving a wider selection of service and, very likely, receiving some service at lower prices than offered currently. It has been the pattern since deregulation for increased competition to yield lower fares, and these lower fares represent increases in consumers' surplus for passengers. These increases may be a significant impact of this policy alternative, but techniques are not available to make reasonable estimates.

Passengers will also suffer the burden of added delays. Assuming an average of 17,500,000 annual passengers between 1981 and 1990, the average 1.6 minutes of additional delay will cost a total of $8.2 million annually. There may be significant, added groundside delays also. Such delay costs may be expected to surpass some passengers' consumer surplus, possibly causing the loss of some passenger demand.

(3) Impact on Local Community

The environmental impact on the DCA area will be significant--added traffic congestion, added vehicular pollution, and added noise. The increase in noise is estimated as an average 1.0 dB increase over the 65 dB area throughout the relevant period, which results in a present value of $45.7 million in property value decreases. (Appendix C describes the method used to estimate property value changes resulting from noise level changes.)

(4) Impact on Other Communities

Many communities will receive new or improved service, generated by the creation of new routes and increased competition on present routes. (See Chapter VII for further discussion of the impact of unrestricted commuter operations on quality of service.)

(5) Impact on FAA

There will be minor savings to the FAA from not having to monitor IFR reservations and scheduling committees.

(6) Conclusion

The removal of all limits on DCA operations would have substantial impacts. Air carriers may have increased profits from increased passenger demand, but added delay costs and reduced fares from added competition may result in lower profits overall. Commuter airlines may experience a minor net benefit, but may actually suffer losses from added competition.

Passengers would face longer delays, but would receive more competitive service to more destinations. The added cost of aircraft delays to passengers is estimated at $8.2 million per year. Other communities would similarly receive better service to Washington, D.C. The local community would suffer a loss in property values estimated at $45.7 million.

TABLE VI-1

SUMMARY OF ALTERNATIVES

Alternative Number	Description of Alternative	Net Impact on Air Carriers	Net Impact on Commuters	Net Impact On Passengers	Net Impact On FAA	Net Impact on Local Property Values
1	37/11/12 quota	+$11.7 million annually	0	-$0.5 million annually	Negligible	0
2	37/11/12 via landing fees	Substantial reduction in DCA related profits	Substantial reduction in DCA related profits	Substantial annual loss	+$88 million annually;	0
3	37/11/12 quota adjusted to meet 16 million passenger ceiling	+$11.6 million annually	+$0.7 million annually	-$0.6 million in first year up to -$30.8 million by 1990	Negligible	+$29.7 million (1981 present value)
4	37 quota for air carriers, no quota for others	+$6.8 million annually	+$1.0 million annually	-$5.6 million annually	Negligible	0
5	37 quota for air carriers, no quota for others, quota adjusted to meet 16 million passenger ceiling	+$11.6 million annually	+$1.7 million annually	-$0.6 million in first year up to -$30.8 million by 1990	Negligible	+$29.7 million (1981 present value)

TABLE VI-1 (continuation)

SUMMARY OF ALTERNATIVES

Alternative Number	Description of Alternative	Net Impact on Air Carriers	Net Impact on Commuters	Net Impact On Passengers	Net Impact On FAA	Net Impact on Local Property Value
6	20/8/12 quota	+$179.3 million annually	-$0.1 million annually	-$20.8 million annually	0	+$82.9 million (1981 present value)
7	20/8/12 via landing fees	Unknown, but substantially less than profits under Alternative 6	Substantial annual loss	Substantial annual loss	Substantial annual gain from landing fees	+$82.9 million (1981 present value)
8	No limits on operations	Unknown (significant added costs and benefits)		-$8.2 million annually; offset by lower fares	Negligible	-$45.7 million (1981 present value)

B. Economic Analysis of Noise Restrictions (Single-Event Noise Limits and Curfew)

1. Description of Alternatives

The existing base case is a voluntary ban on scheduling of jet operations between 10:00 p.m. and 6:59 a.m. This means some operations have occurred between 10:00 and 10:30 p.m., because of delays, but usually no operations have occurred after 10:30 p.m. The policy adopted in the final rule is a formalization of the voluntary action through regulation of the noise relief that the voluntary ban was intended to provide. The following alternatives are analyzed:

a. No noise limits during 7:00 a.m.-9:30 p.m.; ban on scheduling of jet operations, 9:30-10:30 p.m., permitting occasional delayed operations until 10:00; complete shutdown, 10:00 p.m.-7:00 a.m. (former proposed policy).

b. Limits on noise generated by single event (takeoffs or landings), phased downward over five years (new proposed policy):

Maximum takeoff noise (dBA)

Year

Hours	1981-85	1986 & thereafter
7:00 a.m.-9:59 p.m.	86	80
10:00 p.m.-6:59 .a.m	72	72

2. Methodology

Benefits of noise reduction are quantifiable increases in residential property values and rents that are expected to result from improved environment adjacent the airport and along the arrival and departures flight paths. Costs to airlines consist of forgone profits from curtailed operations; reduced load factors and/or stage lengths to meet noise limits with older equipment (such as Boeing 727 jets); and capital costs to accelerate replacement of older equipment by new equipment to meet noise standards. Loss of service to communities is estimated by assuming that the most marginal service (usually short-haul, small community service) is what would be dropped if air carriers are forced to curtail service by curfew or noise limits; the exception to this is that some long-haul service might be dropped if no carrier has equipment which could fly the long-haul route and meet the noise limit. Both the value of service to communities and the net value of service to passengers are considered to be reasonably estimated by airline profits for the flight(s) in question, plus the consumer surplus realized by the passengers on those flights. Annual profits and consumer surplus are estimated as 300 times the daily (weekday) figures, taking into account reduced passenger volumes and operations on weekends.

Estimates of noise impacts for each case analyzed were derived from the noise exposure predictions generated from aircraft traffic forecasts by the Office of Energy and Environment Integrated Noise Model using the methodology described in Appendix C. In the analysis of the curfew, the formula $Ldn = SEL + 10 \log (N_D + 10 N_N) - 49.4dB$ is used, where SEL is the mean single-event noise exposure level, N_D is the number of day operations, and N_N is the number of night operations (10:00 p.m. to 6:59 a.m.) Elimination of the N_N night operations produces a difference of $Ldn_{old} - Ldn_{new} = 10\ (\log\ (N_D + 10\ N_N) - \log\ N_D) = 10\ \log\ ((N_D + 10\ N_N)/N_D)$ since the other elements in the two equations are unchanged.

3. Analysis of Alternatives

a. Curfew

The curfew proposed in the previous policy would eliminate jet operations after 10:00 p.m. Elimination of the 32 operations scheduled between 10:00 p.m. and 6:59 a.m. under the base case (from Table V-7) is estimated to reduce the Ldn total by 1.97, which would produce a 3.0 percent increase in rents and property values. The value of single-family residential property affected by the curfew is estimated, using the methodology described in Appendix C, as $950.6 million, and rental income for the area is estimated at $190.5 million per year. Applying the 3.0 percent increase in value to this area yields a $28.2 million increase in residential property values and a $5.7 million increase annually ($62.7 million in perpetuity, 1981 discounted present value) in rents. Thus the 1981 discounted present value of the noise benefits resulting from the curfew is $90.9 million.

32 air carrier operations per day, with an average estimated profit of $1391 per flight, would be cancelled, for a loss of $44,512 per day or $13.4 million per year, assuming the current pattern of fewer operations

on weekends. This perpetual stream of annual costs (in 1980 constant dollars) has a 1981 discounted present value of $147.4 million. In addition, commuter airlines would lose an unknown amount of revenues because they could not schedule outbound flights to connect with the last air carrier operations of the day.

Assuming the cancelled operations had the current DCA enplanement load factor of 54 percent and 124 seats per operation, an estimated 640,000 passengers per year would be affected. However, 10 p.m. flights typically operate with lower than average load factors, and some passengers could be accommodated on earlier operations if the 10 p.m. operations were not available. If 60 passengers per flight could not be accommodated on other air carrier flights, an estimated 576,000 passengers per year (60 passengers times 32 flights times 300) would have to seek alternative service. It is unlikely that commuter carriers, even with unrestricted operations, could accommodate more than a small fraction of these passengers. Using the average May, 1981, fare of $88, assuming an added ground access cost of $9.58 to use another airport, and a price elasticity of demand of -1.0, the 11 percent increase in average cost to the passenger would cause 63,000 passengers to take no service and 513,000 to use IAD or BWI. The 63,000 would lose $4.79 average consumer surplus for a total of $0.3 million and the 513,000 would incur $9.58 average additional costs of travel for a total of $4.9 million. Hence, in the worst case, passengers' loss would be an estimated $5.2 million per year, or a 1981 discounted present value of the loss in perpetuity of $57.4 million.

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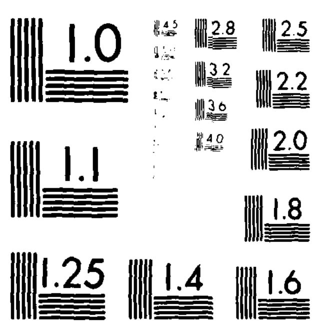

1.0
4.5
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

The impacts of the curfew, considered in perpetuity and discounted to 1981 present value, are therefore estimated to have a net present value cost of $204.8 million, not counting the unknown costs to commuter airlines. Thus, the $90.9 million present value of the noise benefits of the curfew, balanced against these costs, yields a net present value loss to society of $113.9 million.

b. Single Event Noise Limits

As can be seen from Table VI-2, the change in noise exposure from the base case to the 1981 proposed single event noise limits appears negligible. 1986 benefits are estimated as a 10.8 dB reduction, relative to the base case, for the area within the 65-dB contour in the base case. 65 dB is generally taken as the minimum level at which noise impacts are considered to be meaningful, so any benefits of further noise reduction, below 65 dB, are not included here. Therefore, the full 10.8-dB benefit is considered to be realized only within the current 75-dB contour, and an average of 5-dB reduction is applied to the area between the current 65-dB and 75-dB contours (see Appendix C).

The effect of the 86-dBA limit in October, 1981 appears to be negligible upon examination of the Ldn contours for this case (see Table VI-2), and the effect is less than 1dB according to the Ldn formula. The 1986 limits would generate a 10.8 dB reduction relative to the base case. This 10.8 dB reduction, applied within the base case 65-dB contour as described above, would generate a $76.5 million (up to 16.2 percent)

TABLE VI-2

Noise Level Changes (Ldn)

With and Without

Single-Event Noise Limits

	Noise Limits As Proposed	No Noise Limits
1981	+0.3 dB	+0.3 dB
1986	*	-1.5
1990	-10.8	-2.2

* - Not calculated; estimated same as 1990. All scenarios assume quota of 38 air carrier operations per hour.

Figure VI-2a

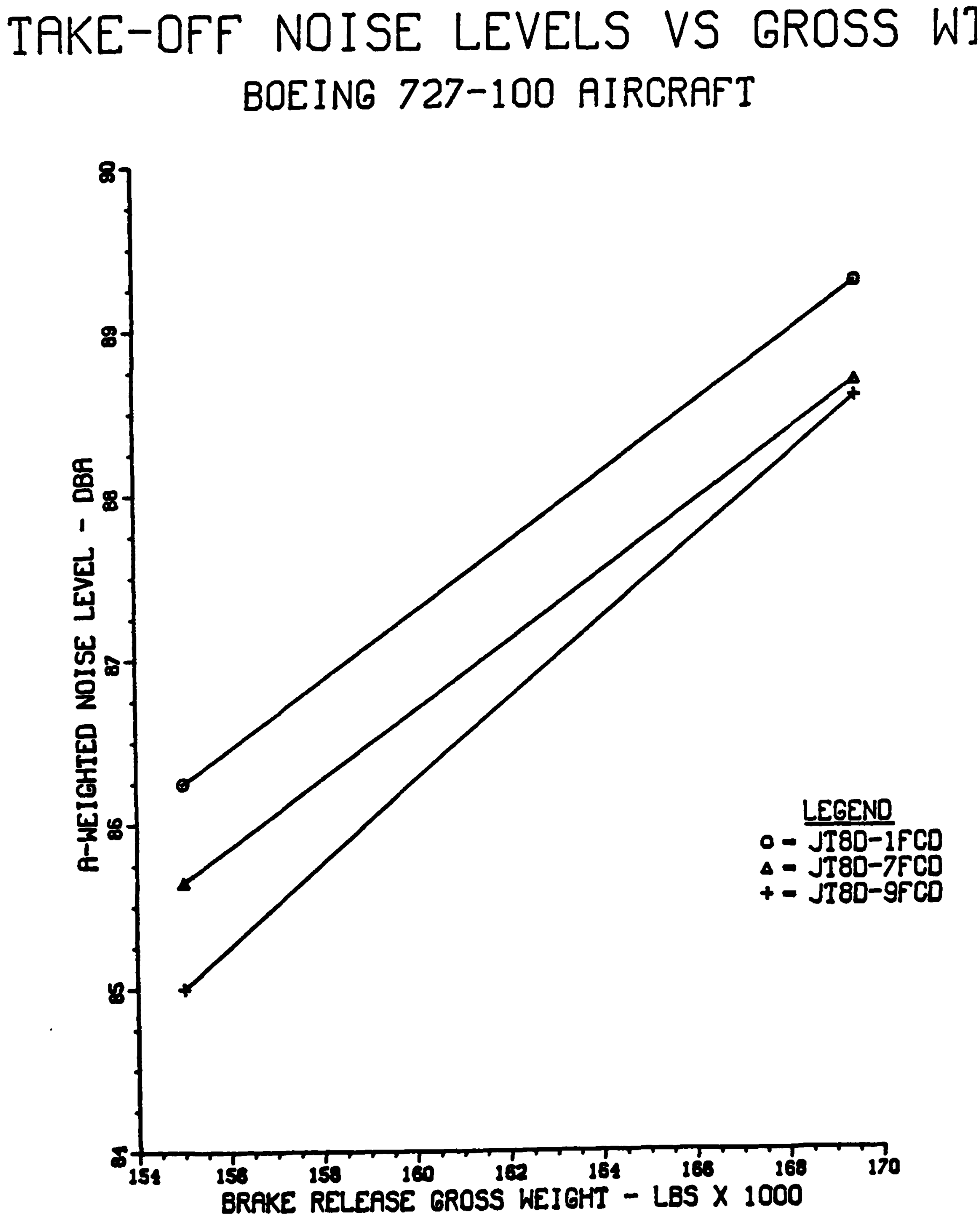

TAKE-OFF NOISE LEVELS VS GROSS WT
BOEING 727-100 AIRCRAFT
A-WEIGHTED NOISE LEVEL - DBA
84
85
86
87
88
89
90
154
156
158
160
162
164
166
168
170
BRAKE RELEASE GROSS WEIGHT - LBS X 1000
LEGEND
o - JT8D-1FCD
Δ - JT8D-7FCD
+ - JT8D-9FCD

Figure VI-2b

TAKE-OFF NOISE LEVELS VS GROSS WT

BOEING 727-200 AIRCRAFT

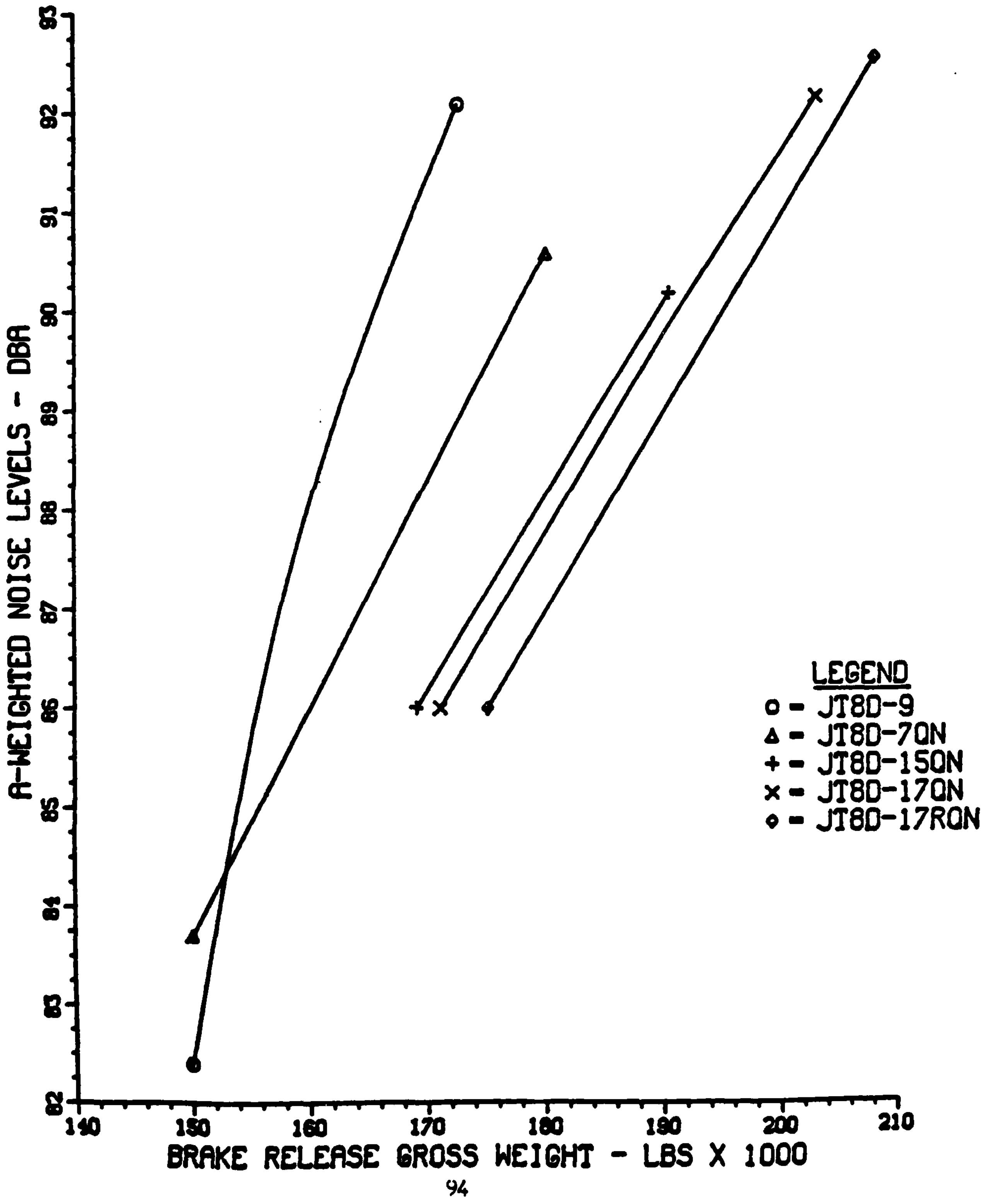


Figure VI-2c

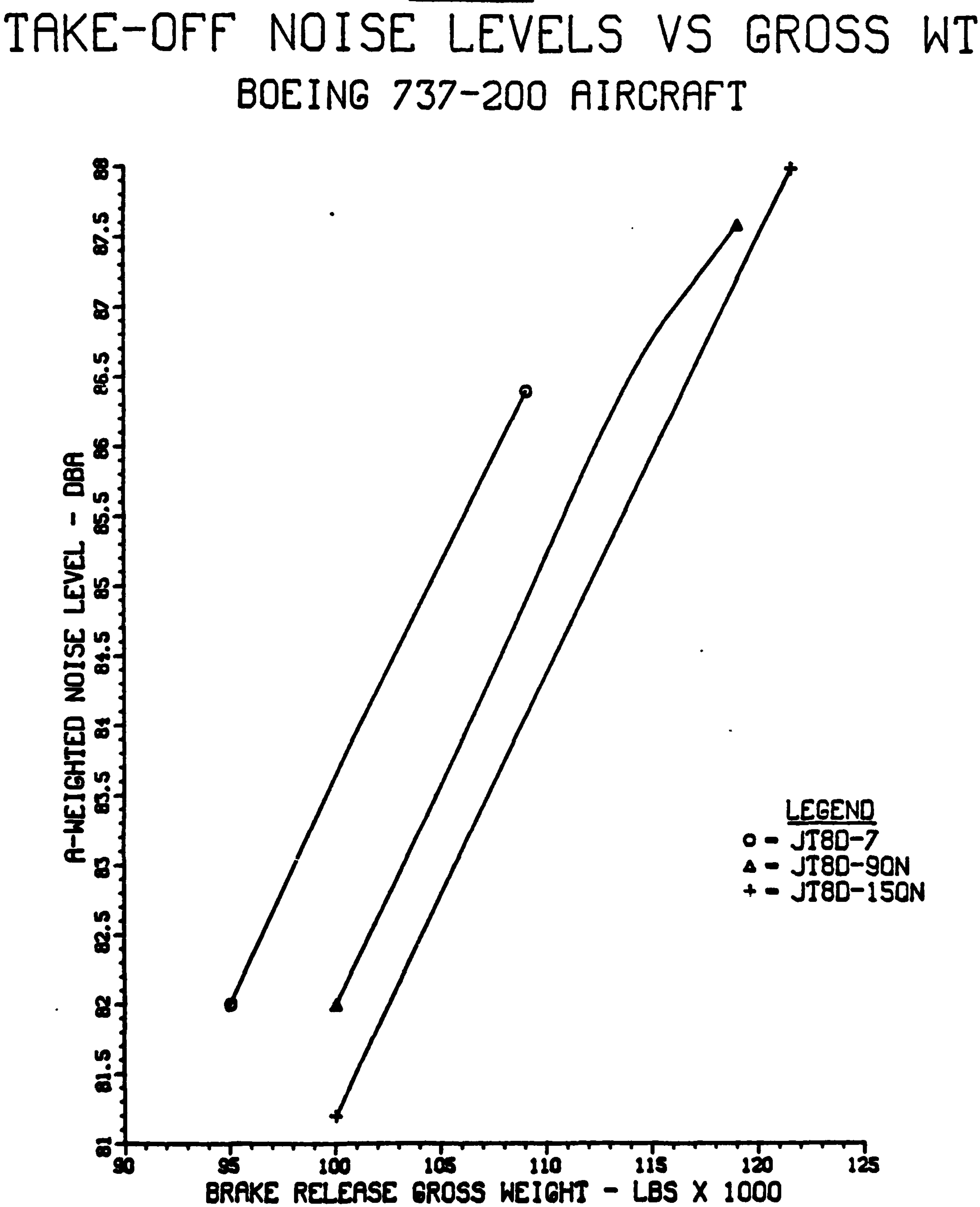
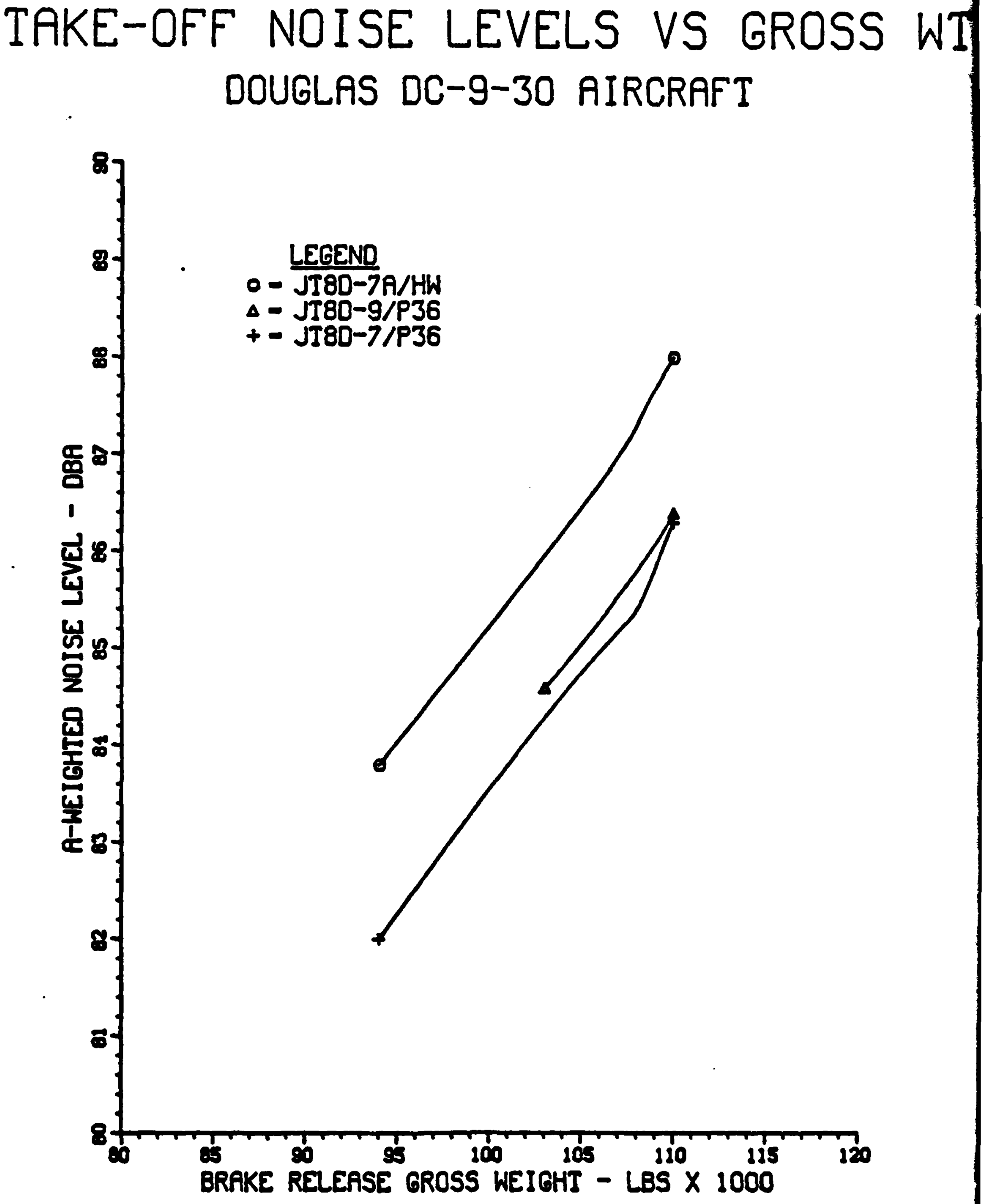

TAKE-OFF NOISE LEVELS VS GROSS WT
BOEING 737-200 AIRCRAFT
A-WEIGHTED NOISE LEVEL - DBA
81
81.5
82
82.5
83
83.5
84
84.5
85
85.5
86
86.5
87
87.5
88
BRAKE RELEASE GROSS WEIGHT - LBS X 1000
90
95
100
105
110
115
120
125
LEGEND
o - JT8D-7
▲ - JT8D-9ON
+ - JT8D-15ON

Figure VI-2d



TAKE-OFF NOISE LEVELS VS GROSS WT
DOUGLAS DC-9-30 AIRCRAFT
LEGEND
o - JT8D-7A/HW
△ - JT8D-9/P36
+ - JT8D-7/P36
A-WEIGHTED NOISE LEVEL - DBA
80
81
82
83
84
85
86
87
88
89
90
80
85
90
95
100
105
110
115
120
BRAKE RELEASE GROSS WEIGHT - LBS X 1000

Figure VI-2e

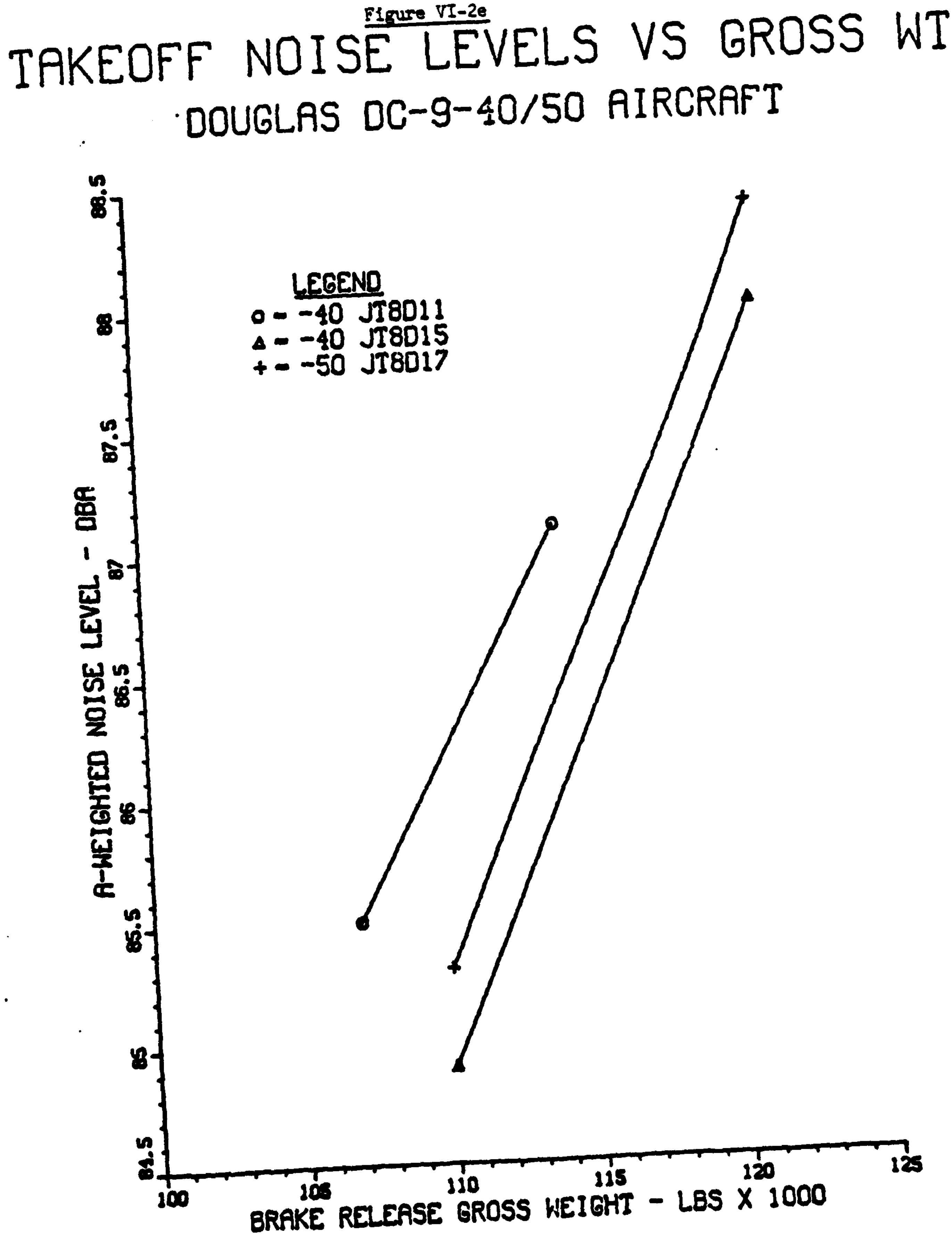

TAKEOFF NOISE LEVELS VS GROSS WT
DOUGLAS DC-9-40/50 AIRCRAFT
LEGEND
o = -40 JT8D11
▲ = -40 JT8D15
+ = -50 JT8D17
A-WEIGHTED NOISE LEVEL - DBA
84.5
85
85.5
86
86.5
87
87.5
88
88.5
100
105
110
115
120
125
BRAKE RELEASE GROSS WEIGHT - LBS X 1000

TABLE VI-3

Selected Jet Aircraft On Hand/On Order as of 1/1/81

	Cannot Meet 1986 Noise Limits			Can Meet 1986 Noise Limits *					Total Meeting 1986 Noise Limits	
	DC9-10 & 10F	DC9-30 & 30F	DC9-50	DC9-80	737-200	A300	757	767	On Hand	On Order
American								0/30		30
Braniff										
Delta		42/0					0/60	0/20		80
Eastern		58/0	18/0			19/6			19	6
Midway	10/0			0/2						2
Northwest										
New York Air		3/0								
Ozark		31/0								
Pan Am										
Piedmont					36/5				36*	5*
Republic	28/0	27/0								
TWA										
United					37/0				37*	
Western					15/0				15*	
TOTAL	38/0	161/0	18/0	0/2	88/5	19/6	0/60	0/50	107*	123*

Source: Pratt and Whitney Aircraft, "U.S. & International Commercial Fleets," March, 1981.

* Assumes re-engining of B-737-200.

increase in residential property values when the new limits take effect in October, 1986, plus a $15.3 million increase in annual rents. The 1981 discounted present value of these benefits (increased property values and rents) is $152.0 million. Some additional benefits, not included here, will result from phased introduction during the 1981-1986 period, of aircraft which meet the 1986 limits.

The cost of the noise limits depends on availability and financial viability of new, quiet aircraft which can meet the 1986 noise limits. The 1981 limits can be met by reductions in stage length for older, noisier aircraft, such as 727's; in most cases, a reduction of 15,000 to 20,000 pounds from maximum gross weight (see Figure VI-2a through VI-2e) will reduce the noise to acceptable levels. Since the 727 has a maximum range of 2600 miles, and consumes about 9000 pounds of fuel per hour at an average speed of 550 miles per hour, this means the necessary reduction can generally be accomplished, for flights within a 1000-mile perimeter, with little or no loss of passenger revenue. Some cargo shipments may be delayed a day or less, but this appears to have negligible impact on revenues.

The phase-down to 1986 limits is a different matter. As Table VI-3 shows, some airlines have already ordered equipment, for delivery before 1986, which will most likely meet the standards (Boeing 757 and 767, McDonnell Douglas DC9-80.)[1/] Others clearly will do so, as the 737-300, DC-XX (if produced) and other proposed new aircraft come into production. For the purposes of this analysis, it appears that total capital impacts will be negligible, as many carriers already have plans to acquire aircraft which will meet the 1986 standards. Further, other carriers own and operate B-727-200 equipment which may be re-engined to meet the 1986 standards. Many of these aircraft may be due for major overhaul or modification over the next five years, hence there is no estimated incremental capital cost associated with the 1986 noise standards. It therefore appears that the industry as a whole will be able to meet the new limits, although some individual air carriers may have to alter future fleet plans in order to continue operating at DCA.

In this case, cost in operations can be assumed to be negligible if commuters are able to expand to provide replacement service, since commuter airlines have or can acquire sufficient equipment which meets the noise limits to replace service which would be dropped by the air carriers. Therefore, adverse impacts on passengers and communities would be negligible as well. This means the overall net benefit of the proposed single-event noise limits is $152 million.

1/ At least five types of aircraft--DC-9-80, B-737-300, B-727-200 re-engined, B-757 and B-767--are assumed capable of complying with the 80 dBA standards for 1986 and beyond. See Supplement, Environmental Impact Statement, Metropolitan Washington Airports Policy, June 1981. Note, however, that any such aircraft would have to be approved by the Administrator and the Metropolitan Washington Airports Manager before entering service at DCA.

VII. COMMUNITY SERVICE

A. Perimeter Rule

1. Description of Alternatives

At present there is a 650-mile limit on nonstop service to or from Washington National Airport, with exemptions for seven cities which had nonstop service before the perimeter was established: Miami, Tampa, West Palm Beach, and Orlando, Florida; Memphis, Tennessee; St. Louis, Missouri; and Minneapolis, Minnesota. Until May, 1981, the current limit was not a formal DOT/FAA regulation but an informal agreement among the air carriers. This agreement has been in effect since 1966. In May, 1981, the agreement was formalized as a regulation to preserve the status quo pending finalization of a new policy.

The Metropolitan Washington Airports Policy adopted in 1980, but not yet implemented, extends the perimeter to 1000 miles, sufficient to include the seven exempted cities plus all others at comparable distance. Major markets within 1000 miles but beyond 650, and not exempted under the current limit, are Fort Lauderdale, Florida; New Orleans, Louisiana; Birmingham, Ala.; and Kansas City. Major markets between 1000 and 1500 miles from Washington National are Tulsa, Oklahoma (1100 miles); Dallas/Fort Worth, Texas (1190 miles); Houston, Texas (1210 miles), San Antonio, Texas, (1375 miles); and Denver, Colorado (1480 miles).

Alternatives considered are:

(1) the existing 650-mile perimeter with seven exemptions;
(2) the 1000-mile perimeter as proposed in the 1980 policy;
(3) a 1250-mile perimeter; and
(4) no perimeter limit.

Because four-engine and widebody aircraft are not permitted to use National Airport, and since the maximum takeoff weight of Boeing 727 aircraft is limited due to safety considerations, the removal of the perimeter is essentially equivalent, for this generation of aircraft, to a 1500-mile perimeter: no air carrier aircraft which can now operate at the airport can reach West Coast destinations nonstop. It is assumed that air carriers will not wish to operate nonstop into the airport from any point to which they cannot return nonstop.

2. Methodology

Passenger volumes on current one-stop service between other cities and Washington National Airport are used to estimate the demand for nonstop service if the perimeter rule were changed. From airlines' public statements and comments, it appears the Dallas-Fort Worth and Houston are the most attractive markets outside the current perimeter, followed by New Orleans, Fort Lauderdale, San Antonio, and Tulsa. Table VII-1 shows one-stop and through service volumes on flights to these cities from National Airport for August, 1980. Passenger volumes for each segment shown in Table VII-1 are origin and destination passengers for that segment. For example, for American Airlines Flight 113, 1652 passengers enplaned at National Airport and deplaned at Memphis in August, 1980;

TABLE VII-1

Origin & Destination Passengers on Segments of Selected Flights

August 1980

Key to Abbreviations

- ATL - Atlanta, GA
- AUS - Austin, TX
- BNA - Nashville, TN
- CVG - Cincinnati, OH
- DCA - Washington National Airport
- DFW - Dallas/Fort Worth, TX
- GSO - Greensboro, N.C.
- HOU - Houston, TX (Hobby)
- IAH - Houston, TX (International)
- MEM - Memphis, TN
- MSY - New Orleans, LA (Moisant)
- ORD - Chicago, IL (O'Hare)
- SAT - San Antonio, TX
- STL - St. Louis, MO
- TUL - Tulsa, OK

- O - Origin
- D - Destination
- PAX - Passengers Carried
- S - Flight Segment

Flight	Segment 1 SO-SD	Segment 1 SPAX	Segment 2 SO-SD	Segment 2 SPAX	Segment 3 SO-SD	Segment 3 SPAX	Through O-D	Through PAX
AA 113	DCA-MEM	1652	MEM-DFW	1637			DCA-DFW	901
AA 119	DCA-ORD	1537	ORD-TUL	2472			DCA-TUL	509
AA 275	DCA-BNA	850	BNA-MEM	188	MEM-DFW	1974	DCA-DFW	107
AA 359	DCA-BNA	1586	BNA-DFW	885			DCA-DFW	621
AA 363	DCA-ORD	1875	ORD-SAT	2169			DCA-SAT	251
AA 393	DCA-MEM	2061	MEM-DFW	1781			DCA-DFW	1213
AA 407	DCA-ORD	2001	ORD-IAH	2156			DCA-IAH	324
AA 483	DCA-CVG	804	CVG-DFW	1934			DCA-DFW	330
AA 497	DCA-CVG	2441	CVG-IAH	741			DCA-IAH	499
BN 105	DCA-MEM	1310	MEM-DFW	1691			DCA-DFW	739
BN 111	DCA-BNA	1095	BNA-DFW	1351			DCA-DFW	710
BN 117	DCA-MEM	1126	MEM-DFW	802			DCA-DFW	596
BN 205	DCA-BNA	801	BNA-DFW	670			DCA-DFW	483
BN 211	DCA-BNA	1737	BNA-DFW	1314			DCA-DFW	1001
BN 711	DCA-MEM	1371	MEM-DFW	1630			DCA-DFW	937
BN 751	DCA-MEM	1025	MEM-DFW	602			DCA-DFW	439
DL 321	DCA-ATL	3141	ATL-SAT	2698			DCA-SAT	441
DL 439	DCA-ATL	2655	ATL-AUS	1829			DCA-AUS	157
DL 593	DCA-ATL	3037	ATL-MSY	3233			DCA-MSY	431
EA 139	DCA-ATL	2220	ATL-MSY	1374			DCA-MSY	815
EA 589	DCA-GSO	1861	GSO-ATL	1436	ATL-AUS	1985	DCA-AUS	55
EA 663	DCA-ATL	3280	ATL-IAH	2007			DCA-IAH	516
NA 67	DCA-TPA	1378	TPA-IAH	1153			DCA-IAH	285
NA 709	DCA-TPA	1636	TPA-IAH	966			DCA-IAH	469
NA 915	DCA-PBI	1863	PBI-MSY	317			DCA-MSY	370
NA 991	DCA-JAX	1335	JAX-IAH	1156			DCA-IAH	553
OZ 557	DCA-STL	983	STL-TUL	1134			DCA-TUL	189
OZ 587	DCA-STL	732	STL-HOU	1831			DCA-HOU	68
TW 233	DCA-STL	2985	STL-IAH	4102			DCA-IAH	266
		50378		45249		3959		14275

Source: Economic Rule 586 Data Base, I. P. Sharp Computer Company (From CAB forms)

1637 enplaned at Memphis and deplaned at Dallas-Fort Worth; and only 901 enplaned at National Airport and deplaned at Dallas-Fort Worth. Dallas-Fort Worth had the largest number of through passengers, 8077 for the month; Houston (IAH plus HOU) was second with 2980. New Orleans had 1616 through passengers from National Airport, and no other destination not currently served nonstop had more than 1000 passengers for the month. These data and the estimate that approximately 2000 passengers per month are necessary to sustain one flight per day at profitable load factors are used to forecast likely demand.

Noise impacts are estimated by assuming the aircraft used for long-haul operations will be Boeing 727's and that these aircraft burn 9000 pounds of fuel per hour, plus 12,000 pounds to reach cruising altitude and 3000 pounds to land. It is further assumed that these aircraft fly at 550 miles per hour, so that the extra takeoff weight is (9000/550) times the added distance. Figures VI-2a and VI-2b (previous chapter) show the relationship between gross takeoff weight and noise for Boeing 727 aircraft. In general, a rough estimate of the relationship between weight and noise is that each 5000 pounds adds 1 dBA of takeoff noise. This means the relationship between noise and distance, other factors remaining equal, is roughly 1 dBA per 300 miles. This relationship and the Ldn formula (Appendix C) are used to derive noise impacts: average perceived noise per operation is increased by the expected number of added long-haul takeoffs times expected noise increase per long-haul takeoff divided by total number of operations.

Noise impacts are translated into economic cost using the methods of Chapter VI.

If single-event noise limits were imposed as set forth in the alternative policy proposal analyzed in Chapter VI-B (86 dBA maximum for takeoffs during the day), Boeing 727 aircraft would be effectively prohibited from use in the longer-haul service. Therefore, such service would have to be provided with the Boeing 737 and McDonnell Douglas DC9 aircraft, whose operating ranges are 1300 and 2200 miles respectively. Figures VI-2c through VI-2e (previous chapter) show the relationship between gross takeoff weight and noise for these aircraft. To remain within the noise limits at these distances, these aircraft would have to take off at a gross weight more than 25,000 pounds less than their maximum gross weight. Thus it would apparently be impossible for air carriers to serve high-density markets beyond 1000 miles within the proposed single-event noise limits with equipment currently available. In fact, under the hypothetical 1986 noise limits, as discussed in Section VI B, even maintaining existing nonstop service to destinations more than 500 miles distant from the airport would be dependent on the air carriers' ability to acquire new aircraft by then, since current air carrier aircraft, unless re-engined, would be effectively barred from National Airport by the proposed 80-dBA noise limit on each operation.

Based on data contained in a recent study,[1/] air carrier profits for long-haul service (beyond the current perimeter limit at National) are

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1/ Simat, Hellisen & Eichner, Inc., "Analysis of the Impact of Competitive Bidding Slot Allocation on Short-Haul and Small Aircraft Operations," January 9, 1980. A regression on the Boeing 727 flights listed in Attachment 1 of the report (operations at Chicago O'Hare, 5:00-5:59 p.m., average day in March, 1979) yields the equation P = 716 + 1.71D, where P is profit per flight and D is distance. These estimates are also roughly consistent with more recent, but less detailed financial data from DCA.

estimated to be $2500 to $3000 per operation, and short-haul service that may be dropped in favor of new long-haul nonstop service is estimated to average $1000 profit per operation. Since the average profit per flight at National in 1979 was about $1391, as noted in Chapter V, these estimates seem reasonable.

The least profitable one-stop flights, that is, those most likely to be converted to nonstop, are assumed to generate $1000 profit per segment, or $2000 per flight. The nonstop operations from Dulles to Dallas and Houston operated at 49 percent load factors - below the industry average - for summer, 1980, so these flights are estimated to generate $2000 profit per flight.

If the additional travel cost and time between Dulles and downtown Washington is $9.58 more than the cost and time for National per passenger, then the $9.58 difference would represent a 4.8 percent difference in total cost per trip, based on an average fare of $200. If the price elasticity of demand for these flights is -1.0, which is widely used as an average, then this change would result in 3 more passengers per flight, adding $600 revenue per flight. Presumably, the better connections to other flights at National would also have some stimulating effect on demand. Therefore, each nonstop flight shifted from Dulles to DCA is estimated to generate as much profit as the discontinued Dulles operation plus the short-haul operation it displaced at National, resulting in no net change in profit. Each one-stop flight converted to nonstop is estimated to generate $500 additional profit.

Annual profits are estimated as 300 times daily (weekday) profits, taking into account the reduced demand on weekends, as in VI-B. This method neglects the possible effects on profit of passengers switching from one-stop to nonstop service and of changes in demand and scheduling. Therefore, these profit estimates are, at best, uncertain approximations.

3. Analysis of Alternatives

For the flights shown in Table VII-1, 78 percent of the passengers transported from National Airport deplaned at the intermediate destination and 76 percent of the passengers from the intermediate destination to the final destination boarded at the intermediate destination. Therefore, it is unlikely that the airlines would respond to a perimeter extension by abandoning these intermediate markets to convert most of these flights to nonstop service. Since the air carriers are limited in the total number of operations per day at National Airport, it is much more likely that less profitable short-haul and small community service would be dropped in favor of continuing current service at intermediate hubs plus adding nonstop service to such markets as New Orleans, Dallas and Houston. In addition, competitive pressure would force many nonstop flights now operating through Dulles or BWI to shift to National Airport.

Given the passenger volumes at present, it seems most likely that a 1000-mile perimeter rule would add only 3 to 5 nonstop round trips (6 to 10 operations) per day: two or three to New Orleans, one or two to Fort

Lauderdale, and perhaps one to Birmingham, Alabama or Kansas City, depending on airlines' scheduling considerations as well as demand. As of March, 1981, there were two daily nonstop flights to New Orleans from BWI and one nonstop flight from Dulles to Kansas City, so the impact on IAD/BWI would be minimal.

Using the profit estimates stated earlier, and taking into account the relatively limited demand for these markets, it is estimated that each of these new operations would generate $1000 additional profit, so these 6 to 10 operations per day would generate additional air carrier profits of $1.8 to $3.0 million per year, in constant 1980 dollars. The 1981 discounted present value of this benefit in perpetuity is $19.8 to $33.0 million. There would be no significant noise-related costs, and there would be no significant impact on small community and short-haul service.

A perimeter of 1250 miles would permit service to Houston and Dallas, which currently receive 12 nonstop round trips from Dulles and BWI Airports plus the one-stop service shown in Table VII-1. Of the cities shown in Table VII-1, only Dallas and Houston had more than 2000 through passengers for the month, roughly 2000 passengers per month would be needed to sustain profitable load factors on one nonstop flight per weekday. No other city outside the current 650-mile perimeter and not shown in Table VII-1 had more than 1000 through passengers for the month shown. In addition, Dallas and Houston are the only cities between 1000 and 1250-mile from Washington which are hubs for major airlines.

Therefore, it is estimated that the 1250-mile perimeter would result in 10 to 12 round trips (24 to 30 operations) in addition to the expected flights within the 1000-mile perimeter. Of these flights, 8 to 10 round trips (16 to 20 operations) would be shifted from Dulles or BWI replacing other service at DCA, and 2 to 4 one-stop flights in each direction would be converted to nonstop (4 to 8 operations). As stated earlier, the one-stop flights changed to nonstop are estimated to generate $500 additional profit per operation, and gain from higher load factors on flights switched from Dulles to National is estimated to offset the forgone profits on dropped service, resulting in no net change in profits for these flights. By this reasoning, the 1250-mile perimeter would result in additional profits of $2000 to $4000 per day, or $0.6 to $1.2 million per year.

Therefore, adding these profits to those estimated earlier for the 1000-mile perimeter this policy would result in profits of $2.4 to $4.2 million per year relative to the base case. The discounted present value of these profits in perpetuity is $26.4 to $46.2 million. The 0.1 dB added noise impact would impose a discounted present value of $4.5 million in noise-related costs, in the absence of single-event noise limits, so the net present value of the benefit from the policy would be $21.9 to $41.7 million, less costs of lost service to small communities.

The effect of perimeter extension on small community service is interrelated with the policy on commuter service. If the current limit on commuter operations is retained, extending the perimeter will result in some net loss of short-haul and small community service. The value of this service cannot be estimated; it includes lost consumers' surplus plus whatever public benefit is considered to result f om such service. If the extension of the perimeter is coupled with a more liberal rule concerning commuter operations, the commuter airlines may be able to provide replacement service for most or all of the short-haul and small community markets affected.

The transfer of Texas flights from Dulles to National would generate additional consumer surplus for Texas-Washington passengers by reducing their ground transportation costs and travel time, but passengers affected by reductions in service to other cities would lose consumer surplus. While the added consumer surplus for shifted Texas flights can be estimated, the lost consumer surplus for discontinued service is virtually impossible to determine, even if the flights to be dropped could be precisely identified. In addition, it could be argued that maintaining good short-haul and small community service and supporting utilization of Dulles Airport have public good benefits in addition, but the very existence of such benefits, let alone the amount, is open to question.

With an unlimited perimeter, 2 to 3 daily nonstop round trips to Denver (4 to 6 operations), each replacing a short-haul flight at a net increase of $1500 profit, would be the most likely difference from the 1250-mile perimeter. These flights would generate $1.8 to $2.7 million per year in additional profits. Therefore, adding these profits to those estimated earlier for the the 1250-mile perimeter, the unlimited perimeter would result in 30 to 40 new long-haul nonstop operations per day, generating $4.2 to $6.9 million additional profits per year, relative to the base case, in 1980 constant dollars. This profit in perpetuity has a 1981 discounted present value of $46.2 to $75.9 million. The 0.1 dB added noise impact would impose a discounted present value of $4.5 million in noise-related costs, again assuming that no single-event noise limits were in effect.

Thus this policy would have a net present value benefit of $41.9 to $71.4 million, minus the costs of lost short-haul and small community service.

If single-event noise limits were imposed, and assuming flights over 1000 miles would be impossible with current aircraft within the proposed limits, the 1250-mile or the unlimited perimeter would generate the same profit as the 1000-mile perimeter, $1.8 to $3.0 million per year in additional profits relative to the base case, until 1986, at which point most of the longer flights would have to use new or re-engined aircraft because current technology aircraft could not operate long-haul service within lower noise limits. Since the DC9-80 and B-757 would both be able to fly 1500 miles within the noise limits, profits from 1986 on would be the same as for the case with no noise limits, not counting the capital costs of the new aircraft.*

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* It is reasonable to disregard these capital costs since many air carriers have ordered the new aircraft already, and others have announced plans to do so. See Section VI B, particularly Table VI-2.

Further analysis would be needed to determine whether even longer flights, such as nonstop service to West Coast cities, would be possible with the new equipment. As a rough estimate, assuming that the noise limits would prevent service beyond 1000 miles until 1986, and that the service described above would begin all at once in 1986 (with profits of $2.4 to $6.9 million per year for the 1250-mile or unlimited perimeter), total profits (1981 present value) would be $19.8 to $33.0 million for the 1000-mile perimeter and $23.9 to $59.6 million for the 1250-mile or unlimited perimeter. Noise impacts would be negligible because of the single-event limits. The value of lost service to small communities cannot be estimated but would increase with the number of new long-haul operations.

Therefore, the 1000-mile perimeter would have net benefits in perpetuity (1981 discounted present value) of $19.8 million to $33.0 million with the hypothetical single-event noise limits in effect. The 1250-mile or unlimited perimeter would have net benefits of $23.9 to $59.6 million with the noise limits in effect, less the costs (if any) of lost short-haul and small community service.

B. Commuter Operations

1. Description of Alternatives

At present the commuter carriers are limited to eight operations per hour at Washington National, plus whatever unused slots are released by the air carriers. Taking advantage of unused slots, and possibly aided by loose enforcement as well, the commuter carriers at present conduct approximately 140 operations per day. In addition, approximately 50 operations now conducted with air carrier slots would become commuter operations if the definition of air carrier versus commuter operations is change as proposed (size of aircraft rather than certification.) For the purpose of this analysis, it is assumed that this change of definition will occur. Therefore, the continuation of the status quo would require more commuter slots than the eight they now have. The policy proposed in 1980 reflected this by increasing commuters' allotment to twelve slots per hour.

The commuter airlines' scheduling committee now has 12 carriers serving the airport and 18 more on the waiting list, and estimates that complete removal of the commuters' operating quota would result in a maximum of 18 to 20 operations per hour, or 300 per day. This does not include the potential operations redefined from the air carrier to the commuter category under the proposed policy.

Alternatives considered are:

a. Raise the commuter quota to eleven per hour, with the new definition (size of aircraft greater than or less than 56 seats) determining which operations are commuter operations and which are air carrier operations; and

b. Remove the commuter quota entirely.

2. Methodology

Since more than half the operations which would be conducted if the quota were lifted involve commuter airlines which do not serve National Airport now, financial data are not available for most proposed commuter operations under the unconstrained case. Even for those operations which are now conducted, the financial data are poor. Therefore, for this analysis, it is simply assumed that each commuter operation will generate a $50 profit. This estimate is consistent with recent financial data.

Commuter operations are considered to have a negligible noise impact, as all of them, under the new definition, would utilize quiet propeller-driven aircraft. Especially if single-event noise limits are imposed, the commuters would have no significant noise impact if the quota were removed. In addition, gate capacity, aircraft parking space at the terminal, availability of equipment, and market considerations may limit commuter operations to fewer than the commuter carriers predict. Therefore, although these possible constraints on expansion of commuters' operations are not explicitly taken into account, they serve to support the contention that the methods used here are much more likely to overstate than to understate the adverse impacts of unlimited commuter operations.

3. Analysis of Alternatives

Raising the commuters' quota to eleven slots per hour, in conjunction with the redefinition of categories of operations, would be essentially equivalent to the current situation. It would also be essentially equivalent to the proposed 1980 policy, since commuter operations would be possible from 6:00 to 6:59 a.m. and from 10:00 to 11:59 p.m. providing the noise limits were met. Under the 1980 proposed policy, the 10:00 p.m. to 7:00 a.m. curfew would have prohibited commuter operations during those hours.

Removing the commuter quota would generate an estimated $5000 to $6500 per day, or $1.5 to $2.0 million per year in additional profits and provide the flexibility for commuters to replace dropped air carrier service to small communities, which will occur if other policy provisions are adopted. The cost of this alternative relative to the continued quota would be negligible, since the noise and delay impacts would be insignificant. If constraints on air carrier operations cause dropping of short-haul and small community service, removal of the commuter quota could provide substantial benefits by allowing commuters to supply replacement service.

While it is difficult to determine what service commuters might provide given unlimited slots, their current service may indicate which markets they would most likely serve from Washington. Table VII-2 shows current service patterns of commuters now serving or on the waiting list to serve National Airport.

The removal of limits on commuter operations could increase airside delays at Washington Airport. However, the net increase of 160 flights per day, or 10 flights per hour, would still be well within the capacity of the airport, and the commuter aircraft can generally use the shorter runways at the airport. If delays do become significant, the high cost of airborne delay relative to commuters' profits per operation should force adjustments in schedules fairly quickly. Therefore, it appears that the overall impact of unlimited commuter operations on airside delays would be negligible, although it could become more significant at peak hours.

TABLE VII-2

Commuter Airlines Serving or Waiting to Serve Washington National Airport (in order of seniority on scheduling list)

Airline Name	Airline Symbol	Equipment	Home Base	Cities Served
Commuter Airlines	CB	4 Swearingen Metro 7 Piper Chieftains	Binghamton, NY	Binghamton, NY Boston, MA Ithaca, NY New York (JFK, LGA, Newark) White Plains, NY Elmira, NY Wilkes-Barre/Scranton, PA
* Altair Airlines	AK	6 Beech 99 7 Nord 262 3 Fokker F-28	Philadelphia, PA	Allentown/Bethlehem, PA Binghamton, NY Baltimore, MD Elmira, NY White Plains, NY Newark, NJ Richmond, VA Greensboro, NC Raleigh/Durham, NC
* Aero Mech	KC	3 Beech 99 5 Embraer Banderante	Clarksburg, WV	Beckley, WV Bluefield, WV Charleston, WV Elkins, WV Akron/Canton, OH Pittsburgh, PA Roanoke, VA Parkersburg, WV Clarksburg, WV
Henson Airlines	(AL)**	5 Beech 99 4 Shorts SD3-30 1 DeHavilland DH-7	Hagerstown, MD	Baltimore, MD Richmond, VA Phila., PA Hagerstown, MD Staunton, VA Salisbury, MD Newport News, VA

TABLE VII-2 (Continuation)

Airline Name	Airline Symbol	Equipment	Home Base	Cities Served
Pennsylvania Airlines	(AL)**	4 Nord 262 6 Beech 99 1 Shorts SD3-30 3 DeHavilland Twin Otter	Harrisburg, PA	Harrisburg, PA Middletown, PA State College, PA
Ransome Airlines	(AL)**	12 Nord 262 3 DeHavilland DHC-7	No. Philadelphia	Philadelphia, PA New London, CT New York (JFK, LGA, Newark) Trenton, NJ
* Empire Airlines	UR	3 Piper Chieftain 5 Swearingen Metro 2 Fokker F-28	Utica, NY	Hartford, CT Boston, MA New York (JFK, LGA, Newark) Ithaca, NY White Plains, NY Rochester, NY Syracuse, NY Utica, NY Montreal, Quebec
* Colgan Airways	CJ	2 Beech 99	Manassas, VA	Atlantic City, NJ Asbury Park, NJ Binghamton, NY Manassas, VA Hot Springs, VA
* New Air	NC	3 Embraer Banderante 4 Piper Navajo	New Haven, CT	New Haven, CT Islip, NY Newark, NJ Baltimore, MD Phila., PA Catskills, NY
Pilgrim Airlines	PM	1 Beech 99 6 DeHavilland Twin Otter 2 Fokker F-27	New London, CT	Bridgeport, CT Hartford, CT Montreal, Quebec Boston, MA New York, (JFK, LGA) New Haven, CT New London, CT Providence, RI Islip, NY Manchester, NH

TABLE VII-2 (Continuation)

Airline Name	Airline Symbol	Equipment	Home Base	Cities Served
Southern Jersey	(AL)**	5 DeHavilland Twin Otter	Atlantic City, NJ	New Airline - to start 9/1
Air Virginia	CE	3 Piper Chieftain 3 Swearingen Metro	Lynchburg, VA	Lynchburg, VA Roanoke, VA Charlottesville, VA Washington (Dulles) Baltimore, MD Charlotte, NC Greensboro, NC Phila., PA Pittsburgh, PA Richmond, VA Newark, NJ
Executive Airlines	***			
Sunbird Airlines	ED	7 Cessna 402 2 Cessna Titan	Denver, NC	Columbia, SC Florence, SC Atlanta, GA Norfolk, VA Fayetteville, NC Tri-City, TN Wilmington, NC Kinston, NC Greenville, NC Hickory, NC Charlotte, NC Rocky Mount, NC Raleigh/Durham, NC
DHL	***			
* Air North	NO	4 Shorts SD3-30 2 DeHavilland Twin Otter	Burlington, VT	Binghamton, NY White Plains, NY Elmira, NY Syracuse, NY Boston, MA Burlington, VT Albany, NY Ogdensburg, NY Massena, NY Watertown, NY Poughkeepsie, NY Saranac Lake, NY Plattsburgh, NY New York (LGA) Rochester, NY

TABLE VII-2 (Continuation)

Airline Name	Airline Symbol	Equipment	Home Base	Cities Served
Pinehurst Airlines	--	5 YS-11	Greenville, SC	CARGO ONLY
Pocono Airlines	(AL)**	2 Swearingen Metro 3 Beech 99	Wilkes-Barre/ Scranton, PA	Scranton, PA Philadelphia, PA New York, NY (JFK) Newark, NJ Williamsport, PA
* Mid-South Airlines	VL	3 Piper Chieftain 1 Embraer Banderante	Southern Pines, NC	Pinehurst, NC Richmond, VA Danville, VA New Bern, NC Raleigh/Durham, NC
Cosmopolitan Airlines	HX	2 Convair 440 2 Cessna 310	Farmingdale, NY	?
Astec Air East	JJ	?	Farmingdale, NY	Hartford, CT Farmingdale, NY Albany, NY New Haven, CT Bridgeport, CT
Princeton Airways	PN	3 Britten-Norman Islander 1 Piper Chieftain	Princeton, NJ	Boston, MA Newark, NJ Princeton, NJ
Suburban Airlines	(AL)**	4 Shorts SD3-30	Reading, PA	Reading, PA Lancaster, PA Philadelphia, PA Allentown, PA
Business Aircraft	***	3 Piper Chieftain	Stratford, CT	?
Somerset Air Service	***	?	?	?
Jack Young	***	?	?	?

TABLE VII-2 (Continuation)

Airline Name	Airline Symbol	Equipment	Home Base	Cities Served
Freedom Airlines (Linked to CB)	DN	5 Convair 580	Cleveland, OH	Cleveland, OH Grand Rapids, MI Saginaw, MI Flint, MI Lancaster, PA
Miller Aviation	***	?	?	?
Hunter Samuels	***	?	?	?
Vee Neal Aviation	TF	1 Cessna 402	Latrobe, PA	Indiana, PA Pittsburgh, PA Latrobe, PA Harrisburg, PA

* Now using air carrier slots.
** Part of Allegheny Commuter System.
*** Not currently conducting scheduled operations; status uncertain.

VIII. ANALYSIS OF PROPOSED POLICY FOR WASHINGTON NATIONAL AIRPORT

The proposed DCA Policy contains the following elements.

1) A quota will limit air carrier operations to 37 per hour, commuter operations to 11 per hour, and general aviation operations to 12 per hour.

2) An annual enplaning/deplaning passenger limit at DCA of 16 million passengers will be enforced. The means of enforcement will be an appropriate reduction in the air carrier quota whenever the annual DCA forecast indicates that the 16 million passenger limit will be exceeded during the coming year. The commuter quota will be increased by the amount of the decrease in the air carrier quota.

3) Air carrier operations will be defined as those operations involving aircraft containing 56 or more seats.

4) Non-stop DCA operations will be limited to 1000 miles.

5) DCA operations will be subject to the following single event noise limits:

   for departures from 10:00 p.m. through 6:59 a.m, a limit of 72 dBA, as generated on takeoff; for arrivals from 10:00 p.m. through 6:59 a.m., a limit of 85 dBA, as generated on approach.

The implementation of daytime noise limits, discussed in Chapter VI, will be postponed pending further study, in response to comments by several air carriers questioning the estimated financial effects of the 1986 limits.

The combination of these initiatives is expected to have a series of changing impacts. When the air traffic control system capacity is restored, air carrier and commuter operations at DCA, because of the new quota, are expected to be at a somewhat lower level than the period preceding August, 1981. Under the proposed definition of air carrier according to aircraft seating capacity, scheduled air carrier and commuter operations now average 38 and 12 per hour, respectively. The proposed quota reduces these averages to 37 and 11. Relatively minor reductions in delay, airline revenue, airline cost, and service are expected to occur as a result. A second expected effect is the replacement of some current DCA air carrier operations with longer, non-stop flights to cities added by the expanded perimeter rule. These longer flights will tend to be noisier than the replaced flights, but the reduction of late evening noise under the proposed policy is expected to balance the increases during the day and early evening hours so that the net effect of the proposed policy will be to preclude a worsening of noise impacts at DCA. These longer flights are also expected to modify further the distribution of service offered at DCA and increase air carrier profits.

The first change in the quota, which is dependent on the 16 million passenger ceiling being forecast to be exceeded, may occur as soon as 1982. Throughout this decade, it is expected that the air carrier quota will steadily decrease, perhaps reaching 29 operations per hour by 1990, implying that the commuter quota may increase to about 19 operations per hour by 1990. These quota changes are expected to cause a gradual shift in air carrier operations to Dulles International Airport (IAD) and Baltimore-Washington International Airport (BWI), as well as a gradual increase in the relatively short-haul commuter operations at DCA. The passenger ceiling is expected to reduce gradually the noise generated by DCA operations and preclude a worsening of congestion and delay at DCA.

Passengers are expected to face higher airport access costs and, to a much smaller extent, forego some air travel due to the restricted access to DCA. They will, however, enjoy the benefits of reduced congestion at DCA and the higher quality of service and comfort offered at IAD/BWI. It is also expected that increasing passenger volumes at IAD/BWI will stimulate improved ground access to IAD/BWI, although no estimate of this benefit to passengers is included in this analysis. The Department is currently working on improving ground transportation to Dulles Airport.

Passengers, as well as communities within the 1000 mile perimeter of DCA, will face a changing distribution of service to/from Washington, D.C. Service may be reduced by air carriers to relatively nearby communities, especially those with relatively low traffic density, because the profitability of operations will most likely dictate which service must be reduced, and because passengers travelling to/from such communities may not be willing to pay the higher costs of accessing BWI/IAD.

Expanding commuter service at DCA is expected to replace some of the lost air carrier service and provide service to previously unserved communities.

By 1990, the substantial effects of the proposed policy are expected to be a shift in air carrier traffic towards IAD/BWI, an increase in commuter traffic at DCA, a preclusion of worsening congestion at DCA, and, as the number of large aircraft operations declines, a reduction in the noise generated by DCA operations.

Based on the analysis contained in earlier chapters, the following are the specific impacts expected to result from the proposed policy relative to the base case.

(1) Impact on Airlines

It is expected that air carrier slots may decrease from 37 to about 29 by 1990. Most passengers who are displaced by this reduction in DCA service are expected to use replacement service at BWI/IAD. Some passengers may use commuter service, and many will find space on increasingly crowded DCA flights. There will be some loss of revenue, however, for at least two reasons: some passengers may not be willing to use IAD/BWI due to higher airport access costs; and some relatively short distance flights may be cancelled because they do not make economic sense unless they are able to use DCA. This loss of revenue should be more than offset by the increased profitability of DCA flights with increasingly higher load factors. These higher load factors also mean that some cancelled DCA flights need not be replaced with IAD/BWI flights, thus reducing costs.

Delays are expected to be reduced because of reduced DCA operations, providing savings to air carriers which may exceed the initial lost profits and dampen future losses. In addition, the expected substitution of longer flights for shorter flights resulting from the expanded perimeter rule may provide further profit increases.

Therefore, combining the effects of the 37/11/12 quota (Table VI-1, alternative 3) $11.6 million, and of the perimeter rule (Chapter VII, p. 108) $2.4 million (mid point of $1.8 - $3.0 million), the net impact on air carriers is expected to be at least a $14.0 million annual benefit; the net impact on commuter airlines is expected to be at least a $0.7 million annual benefit. Air carrier benefits may increase over the period if, as might be expected, load factors increase as the number of operations is decreased.

(2) Impact on Passengers

Passengers will experience a mixture of gradually decreasing DCA air carrier service, gradually increasing DCA commuter service, and gradually increasing IAD/BWI air carrier service. The cost to passengers who lose air service altogether as a result of these changes may be estimated by the loss of consumers' surplus, and the cost to passengers who are required to use IAD/BWI instead of DCA may be estimated through added airport access costs. The annual cost of these two factors may be assumed to increase linearly from $1.5 million in the first year to $31.7 million by 1990.

Passengers will receive an annual benefit of about $0.9 million from the delay reduction caused by the decrease in operations. In addition, passengers will benefit from the preclusion of worsening congestion at DCA and from the higher quality of service and comfort offered at BWI/IAD. Thus, the net annual effect on passengers would be a cost increasing linearly from $0.6 million in the first year to $30.8 million by 1990. (See Table VI-1, alternative 3, p. 85.)

(3) Impact on Local Community

Reduced noise levels should result from increasingly lower air carrier quotas. The actual noise reduction should increase from 0 dB in 1981 to about 2 dB in 1990. Estimation of a stream of noise reductions is not possible using the methodology of Appendix C, because demographic data are not available in sufficient detail to describe the gradually decreasing noise contour. An approximation of the impacts can be obtained by estimating the impact of a 1 dB reduction in 1985, which may represent the average impact of noise reductions. This average 1dB reduction in 1985 would result in home value increases in 1985 and annual rent increases beginning in 1985, the present value of which may be expressed as about $29.7 million in 1980 dollars. (See Table VI-1, alternative 3, p. 85.)

(4) Impact on Other Communities

The increase in commuter operations at DCA is expected to provide higher quality or new service to some relatively nearby communities. These and other communities, however, may experience a loss of or lower quality air carrier service to the Washington, D.C. area as DCA air carrier operations become more limited. Flights newly permitted by the expanded perimeter may also eliminate some shorter distance operations. The availability of IAD and BWI and the increase in commuter operations are expected to keep the loss of service to other communities at an acceptable level.

(5) Impact on FAA

Because the air carrier scheduling committee is expected to face increasing difficulty in reaching a slot allocation agreement, the FAA may have to bear the relatively minor cost of assigning air carrier slots. However, a future net benefit is expected from completion of the slot allocation rulemaking.

(6) Conclusion

The net impact on airlines is expected to be beneficial, due to higher load factors at DCA and reduced aircraft delays. Passengers will suffer increasing costs as access to DCA air carrier flights becomes more restricted. The local community is expected to experience substantial property value increases from noise reductions.

The quantifiable costs and benefits estimated in this analysis are presented in the following Summary Table. As can be seen in the annual data the expected economic impacts of the proposed rules do not approach the standards established in Executive Order 12291 to identify "major" regulatory actions. The quantified net cost, as presented in the table below, is $27.0 million. However, the Department of Transportation believes that when benefits and costs that have not been quantified are taken into account, the policy overall will produce net benefits.

SUMMARY TABLE

Impact of Proposed DCA Policy
($1980 millions)

Impacted Parties	Net Present Value	Annual Net Impacts 1981	1982	1983	1984	1985	1986
Air Carriers	+154.0	+14.0 1/					
Commuters	+ 7.7	+ 0.7 1/					
Passengers	-218.4 2/	- 0.6 increasing linearly to - 30.8 1/ by 1990					
Local Community	+ 29.7 3/						
	- 27.0						

1/ In perpetuity.
2/ Does not include benefits of significantly higher quality of service offered at IAD/BWI relative to DCA.
3/ Discounted present value of gradually increasing noise benefits due to reductions in air carrier slots.

APPENDIX A

DELAY ESTIMATION METHODOLOGY

Appendix A

DELAY ESTIMATION METHODOLOGY

The FAA collects delay data for major U.S. airports from three airlines. Within the relevant range of capacity utilization ratios, a nonlinear relationship has been estimated between average delay per operation and capacity utilization at these airports. The relationship, which conforms to conventional theory and is statistically appealing, is presented graphically in Figure 1 for the range of utilization ratios relevant to major airports.

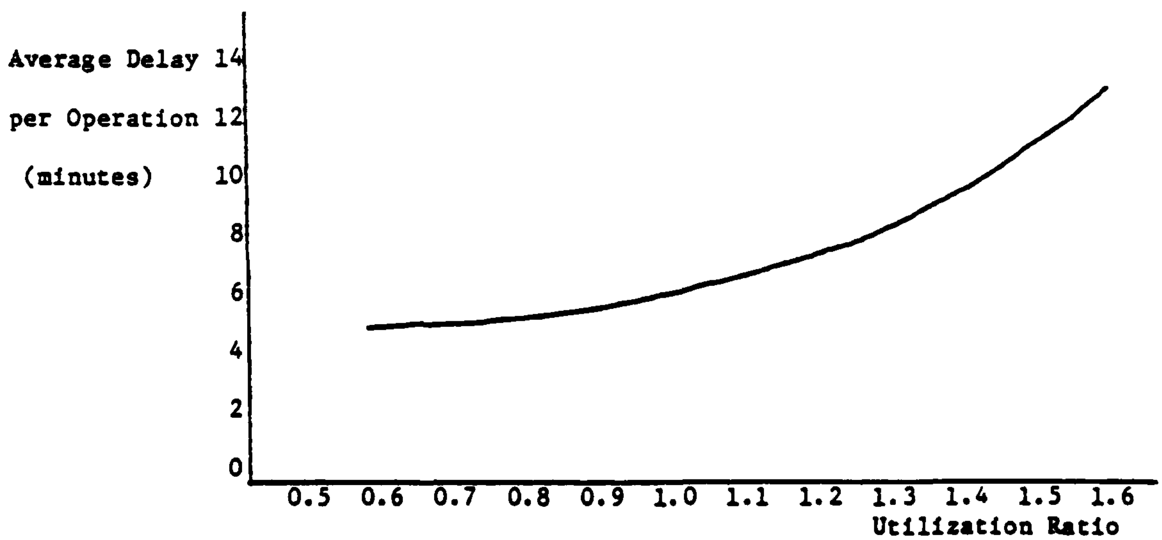

Figure 1

Relationship Between Airport Capacity Utilization and Average Aircraft Delay

The relationship can be expressed as: 1/

$$D = \frac{8.88}{2.45 - O/C}$$

where: D = average delay per operation
O = total annual operations
C = PANCAP, an estimate of practical annual capacity

Since this relationship has been estimated for annual data from major airports, it is a generalization. Nonetheless, it may be used in the present analysis to estimate the percentage change in average delay per operation which will result from a given change in total annual operations at an airport. Specifically, using the most recent delay (D) of 6.4 minutes at DCA, the associated O of 355,000 operations, and C of 275,000 operations (which is known to underestimate true capacity, but is useful for estimating trends and other relative relationships), the percentage changes in D resulting from changes in O may be estimated.

For IAD, C is estimated at 390,000 operations. In 1980, there were 170,173 operations at IAD, but only 116,577 itinerant operations.

For BWI, C is estimated at 310,000 operations. In 1980, there were 222,673 operations, but 104,995 were general aviation operations.

1/ The relationship has been revised from that presented in the PRE to reflect 1980 delay data.

APPENDIX B

ANALYSIS OF FLIGHTS BY HOUR AT DCA

FROM MAY 1981 OAG

ANALYSIS OF FLIGHTS BY HOUR AT DCA
DATA FROM MAY 1981 OAG
REPORT PREPARED BY APO-130 -- QUERY #345

ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
HGR	DCA	06	0610	0640	AL 0627*	BE99	0	1	1	1	1	1	0	5
DCA	BWI	06	0659	0719	AL 0627*	BE99	0	1	1	1	1	1	0	5
PHL	DCA	06	0600	0640	AL 0958*	DH6	0	1	1	1	0	0	0	3
DCA	PHL	06	0659	0749	AL 0971*	DH6	0	1	1	1	0	0	0	3
SBY	DCA	06	0605	0645	AL 0601*	SHD3	0	1	1	1	1	1	0	5
DCA	PHF	06	0659	0750	AL 0601*	SHD3	0	1	1	1	1	1	0	5
DCA	LYH	06	0650	0744	PI 00951	YS11	0	1	1	1	1	1	1	6
HOURLY TOTAL							0	7	7	7	5	5	1	32
DCA	ORF	07	0700	0743	AL 00372	BA11	0	1	1	1	1	1	1	6
SYR	DCA	07	0705	0759	AL 00385	BA11	0	1	1	1	1	1	1	6
NJ97	DCA	07	0700	0759	OCN00032	BE99	0	1	1	1	1	1	0	5
DCA	ATL	07	0700	0833	DL 00423	B725	1	1	1	1	1	1	1	7
DCA	STL	07	0700	0806	TW 00111	B725	0	1	1	1	1	1	1	6
DCA	LGA	07	0700	0752	EA 0240<	B725	0	1	1	1	1	1	0	5
DCA	ORD	07	0705	0753	AA 00053	B725	0	0	1	0	0	0	0	1
DCA	MSP	07	0725	0844	NW 00305	B725	0	1	1	1	1	1	0	5
DCA	BOS	07	0730	0845	DL 00408	B725	1	1	1	1	1	1	1	7
DCA	MSP	07	0735	0905	WA 00501	B725	0	1	1	1	1	1	1	6
CLE	DCA	07	0645	0743	UA 00066	B725	1	1	1	1	1	1	1	7
ATL	DCA	07	0614	0745	DL 00288	B725	1	1	1	1	1	1	1	7
DCA	BOS	07	0745	0905	AA 00516	B725	0	1	0	1	1	1	0	4
DCA	ATL	07	0745	0924	EA 00905	B725	1	1	1	1	1	1	1	7
DCA	DTW	07	0750	0906	NW 00317	B725	0	1	1	1	1	1	0	5
LGA	DCA	07	0700	0751	EA 0140<	B725	0	1	1	1	1	1	0	5
ABE	DCA	07	0715	0755	EA 00195	B725	1	1	1	1	1	1	1	7
GSO	DCA	07	0709	0755	EA 00396	B725	1	1	1	1	1	1	1	7
DCA	CLE	07	0759	0905	NW 00307	B725	1	1	1	1	1	1	1	7
DCA	ORD	07	0759	0851	TW 00117	B725	0	1	1	1	1	1	1	6
DCA	ORD	07	0759	0852	UA 00141	B725	1	1	1	1	1	1	1	7
DCA	STL	07	0700	0802	AA 00241	B727	0	1	1	0	1	1	1	5
DCA	ORD	07	0700	0746	UA 00267	B727	0	1	1	1	1	1	1	6
DCA	ORD	07	0705	0753	AA 00053	B727	0	1	0	1	1	1	1	5
DCA	EWR	07	0730	0824	PA 00890	B727	0	1	1	1	1	1	1	6
DCA	ATL	07	0730	0909	EA 00801	B727	0	0	0	0	0	0	1	1
DCA	BOS	07	0745	0905	AA 00516	B727	0	0	1	0	0	0	0	1
DCA	CLT	07	0750	0854	EA 00331	B727	1	1	1	1	1	1	1	7
EWR	DCA	07	0700	0759	PA 00349	B727	0	1	1	1	1	1	1	6
DCA	BWI	07	0700	0725	PI 00201	B737	0	1	1	1	1	1	1	6
DCA	CLE	07	0705	0813	UA 00661	B737	1	1	1	1	1	1	1	7
DCA	HPN	07	0755	0845	FLA00130	B737	0	1	1	1	1	1	0	5
DCA	LGA	07	0700	0759	NYA00006	DC9	0	0	0	0	0	0	1	1
DCA	LGA	07	0700	0759	NYA00006	DC9	0	1	1	1	1	1	0	5
DCA	ISP	07	0715	0809	AL 00193	DC9	0	1	1	1	1	1	1	6
ORF	DCA	07	0650	0729	AL 00249	DC9	0	1	1	1	1	1	1	6
PVD	DCA	07	0635	0742	AL 00261	DC9	0	1	1	1	1	1	1	6
DCA	BWI	07	0754	0818	EA 00171	DC9	1	1	1	1	1	1	1	7
DCA	MDW	07	0755	0835	MID00057	DC9	0	0	0	0	0	0	1	1
DCA	MDW	07	0755	0535	MID00057	DC9	0	1	1	1	1	1	0	5
RDU	DCA	07	0710	0755	EA 00506	DC9	1	1	1	1	1	1	1	7

APPENDIX B

ANALYSIS OF FLIGHTS BY HOUR AT DCA
DATA FROM MAY 1981 OAG
REPORT PREPARED BY APO-130 -- QUERY 8345

ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
BDL	DCA	07	0700	0759	AL 00217	DC9	0	1	1	1	1	1	1	6
BOS	DCA	07	0640	0759	EA 00377	DC9	1	1	1	1	1	1	1	7
DCA	PIT	07	0759	0849	AL 00249	DC9	0	1	1	1	1	1	1	6
PHL	DCA	07	0700	0745	AL 0907*	DH6	0	1	1	1	1	1	1	6
DCA	PHL	07	0759	0850	AL 0908*	DH6	0	1	1	1	1	1	0	5
PNE	DCA	07	0640	0735	AL 0978*	ND26	0	1	1	1	1	1	0	5
DCA	PHL	07	0755	0845	AL 0951*	ND26	0	1	1	1	1	1	0	5
PHF	DCA	07	0640	0730	AL 0604*	SHD3	0	1	1	1	1	1	1	6
DCA	BWI	07	0750	0810	AL 0604*	SHD3	0	1	1	1	1	1	1	6
MDT	DCA	07	0710	0755	AL 0715*	SHD3	1	1	1	1	1	1	1	7
HOURLY	TOTAL						15	46	46	45	46	46	37	281
DCA	SYR	08	0834	0933	AL 00493	BA11	0	1	1	1	1	1	1	6
ISP	DCA	08	0735	0835	AL 00450	BA11	0	1	1	1	1	1	1	6
CMH	DCA	08	0800	0855	AL 00382	BA11	0	1	1	1	1	1	1	6
BDR	DCA	08	0700	0820	PMT00021	BE99	0	1	1	1	1	1	0	5
DCA	ACY	08	0820	0910	DCN00033	BE99	0	1	1	1	1	1	0	5
SCE	DCA	08	0740	0830	AL 0774*	BE99	1	1	1	1	1	1	1	7
DCA	BDR	08	0845	1005	PMT00022	BE99	0	1	1	1	1	1	0	5
DCA	BNA	08	0800	0830	BN 00111	B725	1	0	0	0	0	0	0	1
DCA	LGA	08	0800	0857	EA 0241<	B725	0	1	1	1	1	1	1	6
EWR	DCA	08	0721	0812	EA 00641	B725	1	1	1	1	1	1	1	7
CLE	DCA	08	0730	0830	NW 00302	B725	0	1	1	1	1	1	1	6
CMH	DCA	08	0730	0832	TW 00324	B725	0	1	1	1	1	1	0	5
DCA	PIT	08	0835	0927	UA 00341	B725	1	1	1	1	1	1	1	7
ATL	DCA	08	0710	0838	EA 00138	B725	1	1	1	1	1	1	0	6
BOS	DCA	08	0720	0840	AA 00415	B725	0	1	1	1	1	1	0	5
DCA	MIA	08	0841	1056	EA 00195	B725	1	1	1	1	1	1	1	7
DCA	ATL	08	0845	1018	DL 00205	B725	0	1	1	1	1	1	0	5
ATL	DCA	08	0719	0850	DL 00214	B725	0	1	1	1	1	1	0	5
DCA	MCO	08	0855	1048	EA 00875	B725	1	1	1	1	1	1	1	7
DCA	BNA	08	0800	0830	BN 00111	B727	0	1	1	1	1	1	1	6
DCA	PIT	08	0815	0906	NW 00323	B727	0	1	1	1	1	1	1	6
DCA	MIA	08	0840	1103	PA 00349	B727	1	1	1	1	1	1	1	7
ATL	DCA	08	0730	0858	EA 00800	B727	1	0	0	0	0	0	0	1
HPN	DCA	08	0745	0835	FLA00092	B737	0	1	1	1	1	1	0	5
GSO	DCA	08	0800	0850	PI 00220	B737	0	1	1	1	1	1	1	6
LEX	DCA	08	0745	0854	PI 00276	B737	1	1	1	1	1	1	1	7
FAY	DCA	08	0805	0855	PI 00248	B737	1	1	1	1	1	1	1	7
DCA	LGA	08	0800	0900	NYA00008	DC9	0	0	0	0	0	0	1	1
DCA	LGA	08	0800	0900	NYA00008	DC9	0	1	1	1	1	1	0	5
DCA	DTW	08	0810	0927	AL 00261	DC9	0	1	1	1	1	1	1	6
DCA	BOS	08	0825	0940	EA 00506	DC9	1	1	1	1	1	1	1	7
DCA	RDU	08	0830	0919	EA 00377	DC9	1	1	1	1	1	1	1	7
DCA	CVG	08	0830	0946	AL 00217	DC9	0	1	1	1	1	1	1	6
LGA	DCA	08	0730	0830	NYA00001	DC9	0	0	0	0	0	0	1	1
LGA	DCA	08	0730	0830	NYA00001	DC9	0	1	1	1	1	1	0	5
BOS	DCA	08	0715	0840	NYA00051	DC9	0	1	1	1	1	1	1	6
PIT	DCA	08	0755	0843	AL 00284	DC9	0	1	1	1	1	1	1	6
DCA	BOS	08	0845	1000	NYA00050	DC9	0	1	1	1	1	1	1	6

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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
BUF	DCA	08	0800	0858	AL 00081	DC9	1	1	1	1	1	1	1	7
PHL	DCA	08	0735	0820	AL 0900*	DH6	0	1	1	1	1	1	0	5
DCA	PHL	08	0855	0940	AL 0991*	DH6	0	0	0	0	0	0	1	1
DCA	PHL	08	0855	0940	AL 0901*	DH6	1	1	1	1	1	1	0	6
MGW	DCA	08	0715	0805	KCI00401	E110	0	1	1	1	1	1	1	6
HVN	DCA	08	0700	0828	HVA00031	E110	0	1	1	1	1	1	0	5
DCA	HVN	08	0850	1013	HVA00032	E110	0	1	1	1	1	1	0	5
RIC	DCA	08	0819	0859	MSA00171	E110	0	1	1	1	1	1	0	5
BGM	DCA	08	0710	0820	AN000100	G159	0	1	1	1	1	1	0	5
DCA	BGM	08	0840	0950	AN000101	G159	0	1	1	1	1	1	0	5
ABE	DCA	08	0710	0805	AAR00217	ND26	0	1	1	1	1	1	0	5
PHL	DCA	08	0735	0820	AL 0992*	ND26	1	0	0	0	0	0	0	1
DCA	RIC	08	0830	0910	AAR00217	ND26	0	1	1	1	1	1	0	5
RIC	DCA	08	0755	0835	AAR00230	ND26	0	1	1	1	1	1	1	6
PHL	DCA	08	0755	0845	AL 0953*	ND26	0	1	1	1	1	1	1	6
DCA	MDT	08	0815	0900	AL 0715*	SHD3	1	1	1	1	1	1	1	7
HGR	DCA	08	0800	0830	AL 0640*	SHD3	1	1	1	1	1	1	1	7
AVP	DCA	08	0740	0840	FDM00100	SW4	0	1	1	1	1	1	0	5
ITH	DCA	08	0745	0855	EMP00141	SW4	0	1	1	1	1	1	1	6
CHO	DCA	08	0820	0858	PI 00926	YS11	0	1	1	1	1	1	1	6
HOURLY TOTAL							18	52	52	52	52	52	34	312
DCA	DAY	09	0900	1018	AL 00450	BA11	0	1	1	1	1	1	1	6
DCA	PVD	09	0925	1029	AL 00382	BA11	0	1	1	1	1	1	1	6
DCA	BOS	09	0900	1018	AA 00400	B725	1	1	0	0	1	1	1	5
DCA	CMH	09	0900	1012	TW 00395	B725	0	1	1	1	1	1	0	5
DCA	LGA	09	0900	0957	EA 0242<	B725	1	1	1	1	1	1	1	7
LGA	DCA	09	0800	0900	EA 0141<	B725	0	1	1	1	1	1	1	6
ORD	DCA	09	0620	0900	UA 00448	B725	0	1	1	1	1	1	0	5
DCA	EWR	09	0905	0959	EA 00840	B725	1	1	1	1	1	1	1	7
CLT	DCA	09	0810	0912	EA 00370	B725	1	1	1	1	1	1	1	7
DCA	BOS	09	0920	1035	DL 00214	B725	1	1	1	1	1	1	1	7
DCA	PIT	09	0930	1021	NW 00311	B725	1	1	1	1	1	1	0	6
DTW	DCA	09	0820	0931	NW 00316	B725	0	1	1	1	1	1	1	6
PIT	DCA	09	0840	0932	NW 00300	B725	0	1	1	1	1	1	1	6
STL	DCA	09	0645	0932	TW 00266	B725	1	1	1	1	1	1	1	7
DCA	STL	09	0935	1034	AA 00303	B725	1	1	1	1	1	1	1	7
ORD	DCA	09	0655	0937	AA 00026	B725	0	1	1	1	1	1	1	6
BOS	DCA	09	0825	0942	EA 00869	B725	1	1	1	1	1	1	1	7
BOS	DCA	09	0830	0945	DL 00257	B725	1	1	1	1	1	1	1	7
BOS	DCA	09	0840	0958	AA 00127	B725	0	1	1	1	1	1	1	6
JFK	DCA	09	0805	0907	PA 00025	B727	1	1	1	1	1	1	1	7
JFK	DCA	09	0805	0907	PA 00539	B727	1	1	1	1	1	1	1	7
ORF	DCA	09	0830	0907	PI 00617	B727	1	1	1	1	1	1	1	7
DCA	SAV	09	0935	1100	PA 00539	B727	1	1	1	1	1	1	1	7
DCA	SDF	09	0940	1104	PI 00617	B727	1	1	1	1	1	1	1	7
DCA	ORD	09	0950	1045	AA 00363	B727	1	1	1	1	1	1	1	7
DCA	MIA	09	0910	1125	FLA00092	B737	0	1	1	1	1	1	0	5
DCA	MIA	09	0910	1125	FLA00092	B737	1	0	0	0	0	0	1	2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA
DATA FROM MAY 1981 OAG
REPORT PREPARED BY APO-130 -- QUERY 0345

ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	LEX	09	0940	1100	PI 00231	B737	1	1	1	1	1	1	1	7
CRW	DCA	09	0855	0945	PI 00200	B737	1	1	1	1	1	1	1	7
DCA	LGA	09	0900	1000	NYA00010	DC9	0	1	1	1	1	1	0	5
DCA	LGA	09	0900	1000	NYA00010	DC9	1	0	0	0	0	0	1	2
SDF	DCA	09	0755	0910	EA 00139	DC9	1	1	1	1	1	1	1	7
DCA	BUF	09	0915	1019	AL 00299	DC9	1	1	1	1	1	1	1	7
CVG	DCA	09	0815	0922	AL 00252	DC9	0	1	1	1	1	1	1	6
DCA	MCO	09	0930	1130	AL 00081	DC9	1	1	1	1	1	1	1	7
LGA	DCA	09	0830	0930	NYA00003	DC9	0	0	0	0	0	0	1	1
LGA	DCA	09	0830	0930	NYA00003	DC9	0	1	1	1	1	1	0	5
DCA	SYR	09	0945	1045	AL 00317	DC9	1	0	0	0	0	0	0	1
BWI	DCA	09	0840	0900	AL 0603M	DH6	1	1	1	1	1	1	1	7
DCA	PHF	09	0930	1015	AL 0603M	DH6	1	1	1	1	1	1	1	7
DCA	CKB	09	0900	1005	KCI00402	E110	0	1	1	1	1	1	1	6
DCA	RIC	09	0930	1010	MSA00173	E110	0	1	1	1	1	1	0	5
EWR	DCA	09	0845	0940	AAR00373	FA28	0	1	1	1	1	1	1	6
DCA	ABE	09	0905	1000	AAR00230	ND26	0	1	1	1	1	1	1	6
DCA	PHL	09	0935	1025	AL 0954M	ND26	0	1	1	1	1	1	0	5
DCA	PHL	09	0935	1025	AL 0995M	ND26	0	0	0	0	0	0	1	1
BGM	DCA	09	0830	0959	FDM00150	PA31	0	1	1	1	1	1	0	5
DCA	BWI	09	0900	0920	AL 0640M	SHD3	1	1	1	1	1	1	1	7
MDT	DCA	09	0915	0959	AL 0716M	SHD3	1	1	1	1	1	1	1	7
DCA	ITH	09	0925	1030	EMP00241	SW4	0	1	1	1	1	1	1	6
ROA	DCA	09	0830	0928	PI 00930	YS11	1	1	1	1	1	1	1	7
HOURLY	TOTAL						38	47	46	46	47	47	42	305
ROC	DCA	10	0950	1049	AL 00401	BA11	0	1	1	1	1	1	1	6
SHD	DCA	10	0915	1000	AL 00642	BE99	0	0	0	0	0	0	1	1
SHD	DCA	10	0915	1000	AL 01638	BE99	0	1	1	1	1	1	0	5
DCA	BWI	10	1020	1040	AL 0642M	BE99	0	0	0	0	0	0	1	1
ACY	DCA	10	1025	1059	OCN00034	BE99	0	1	1	1	1	1	0	5
DCA	MCO	10	1000	1156	PA 00581	B725	1	1	1	1	1	1	1	7
DCA	BWI	10	1000	1022	EA 00147	B725	1	1	1	1	1	1	0	6
DCA	BWI	10	1000	1022	EA 00370	B725	1	1	1	1	1	1	0	6
DCA	ORD	10	1000	1050	UA 00327	B725	0	1	1	1	1	1	0	5
DCA	LGA	10	1000	1057	EA 0243<	B725	1	1	1	1	1	1	1	7
ORD	DCA	10	0722	1000	UA 00272	B725	1	1	1	1	1	1	1	7
LGA	DCA	10	0900	1004	EA 0142<	B725	1	1	1	1	1	1	1	7
DCA	MIA	10	1010	1227	EA 00175	B725	1	1	1	1	1	1	1	7
DCA	STL	10	1010	1116	TW 00221	B725	1	1	1	1	1	1	1	7
MIA	DCA	10	0800	1012	PA 00346	B725	1	1	1	1	1	1	1	7
DCA	ATL	10	1015	1148	DL 00257	B725	1	1	1	1	1	1	1	7
IND	DCA	10	0755	1015	TW 00426	B725	0	1	1	1	1	1	1	6
BOS	DCA	10	0910	1025	DL 00723	B725	0	1	1	1	1	1	1	6
DCA	MEM	10	1025	1122	AA 00127	B725	1	1	1	1	1	1	1	7
DCA	BNA	10	1030	1102	AA 00603	B725	0	1	1	1	1	1	1	6
DCA	JAX	10	1030	1205	EA 00869	B725	1	1	1	1	1	1	1	7
EWR	DCA	10	0935	1030	BN 00105	B725	1	1	1	1	1	1	1	7
DCA	DTW	10	1335	1150	NW 00319	B725	1	1	1	1	1	1	1	7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NW [illegible]	B72[illegible]	0	1	1	1	1	1	0	5

ANALYSIS OF FLIGHTS BY HOUR AT DCA
DATA FROM MAY 1981 OAG
REPORT PREPARED BY APO-130 -- QUERY #345

ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DAY	DCA	10	0850	1000	TW 00530	B727	0	1	1	1	1	1	1	6
DCA	JFK	10	1000	1100	PA 00801	B727	1	1	1	1	1	1	1	7
MCO	DCA	10	0815	1008	PA 00580	B727	1	1	1	1	1	1	1	7
TPA	DCA	10	0830	1025	EA 00180	B727	1	1	1	1	1	1	1	7
DCA	CRW	10	1000	1055	PI 00275	B737	1	1	1	1	1	1	1	7
ALB	DCA	10	0858	1000	AL 00052	DC9	1	1	1	1	1	1	1	7
DCA	BDL	10	1000	1100	AL 00252	DC9	1	1	1	1	1	1	1	7
DCA	LGA	10	1000	1100	NYA00012	DC9	0	1	1	1	1	1	0	5
DCA	LGA	10	1000	1100	NYA00012	DC9	1	0	0	0	0	0	1	2
DCA	ATL	10	1000	1135	EA 00139	DC9	1	1	1	1	1	1	1	7
RDU	DCA	10	0910	1000	EA 00614	DC9	1	1	1	1	1	1	1	7
MIA	DCA	10	0800	1012	EA 00158	DC9	1	1	1	1	1	1	1	7
DCA	ALB	10	1030	1131	AL 00062	DC9	1	1	1	1	1	1	1	7
LGA	DCA	10	0930	1030	NYA00005	DC9	0	1	1	1	1	1	0	5
LGA	DCA	10	0930	1030	NYA00005	DC9	1	0	0	0	0	0	1	2
JAX	DCA	10	0900	1035	EA 00878	DC9	1	1	1	1	1	1	1	7
DCA	GSO	10	1040	1131	EA 00589	DC9	1	1	1	1	1	1	1	7
PHL	DCA	10	0915	1000	AL 0908M	DH6	1	1	1	1	1	1	0	6
DCA	PHL	10	1020	1105	AL 0909M	DH6	1	1	1	1	1	1	0	6
EWN	DCA	10	0855	1015	MSA00151	E110	0	1	1	1	1	1	0	5
EWN	DCA	10	0855	1015	MSA00471	E110	1	0	0	0	0	0	0	1
DCA	EWR	10	1010	1056	AAR00370	FA28	0	1	1	1	1	1	1	6
RIC	DCA	10	0935	1015	AAR00270	ND26	0	1	1	1	1	1	0	5
PHL	DCA	10	0945	1035	AL 0964M	ND26	0	1	1	1	1	1	0	5
PHL	DCA	10	0945	1035	AL 0997M	ND26	0	0	0	0	0	0	1	1
DCA	BGM	10	1045	1155	AAR00270	ND26	0	1	1	1	1	1	0	5
DCA	PHL	10	1055	1145	AL 0947M	ND26	0	0	0	0	0	0	1	1
DCA	PHL	10	1055	1145	AL 0902M	ND26	0	1	1	1	1	1	0	5
HVN	DCA	10	0900	1028	HVA00037	PA31	0	0	0	0	0	0	1	1
DCA	MDT	10	1015	1100	AL 0717M	SHD3	1	1	1	1	1	1	1	7
DCA	AVP	10	1000	1100	FDM00101	SW4	0	1	1	1	1	1	0	5
CHO	DCA	10	0922	1000	PI 00923	YS11	1	0	0	0	0	0	0	1
DCA	FAY	10	1010	1137	PI 00907	YS11	1	1	1	1	1	1	1	7
LYH	DCA	10	0925	1014	PI 00920	YS11	0	1	1	1	1	1	1	6
DCA	CHO	10	1035	1112	PI 00905	YS11	1	1	1	1	1	1	1	7
HOURLY TOTAL							35	50	50	50	50	50	41	326
DCA	CVG	11	1119	1235	AL 00357	BA11	0	1	1	1	1	1	0	5
DCA	PIT	11	1120	1210	AL 00300	BA11	1	0	0	0	0	0	1	2
DCA	HSP	11	1100	1150	CJC00100	BE99	1	1	1	1	1	1	1	7
DCA	MDT	11	1100	1145	AL 0775M	BE99	1	1	1	1	1	1	1	7
SBY	DCA	11	1030	1110	AL 0633M	BE99	1	1	1	1	1	1	1	7
DCA	HGR	11	1130	1200	AL 0633M	BE99	1	1	1	1	1	1	1	7
DCA	BWI	11	1140	1200	AL 01638	BE99	0	1	1	1	1	1	0	5
DCA	BOS	11	1100	1215	AA 00420	B725	1	1	1	1	1	1	1	7
DCA	MEM	11	1100	1200	RN 00105	B725	1	1	1	1	1	1	1	7
DCA	PBI	11	1100	1307	PA 00915	B725	1	1	1	1	1	1	1	7
DCA	LGA	11	1100	1155	EA 0244<	B725	1	1	1	1	1	1	1	7
LGA	DCA	11	[illegible]	1100	EA 0143<	B725	1	1	1	1	1	1	1	7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA

DATA FROM MAY 1981 OAG

REPORT PREPARED BY APO-130 -- QUERY 0345

ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	BOS	11	1110	1225	DL 00204	B725	1	1	1	1	1	1	1	7
ATL	DCA	11	0949	1120	DL 00528	B725	1	1	1	1	1	1	1	7
MEM	DCA	11	0835	1123	AA 00520	B725	0	1	1	1	1	1	1	6
BNA	DCA	11	0900	1127	AA 00258	B725	0	0	0	0	0	0	1	1
DCA	PIT	11	1130	1221	NW 00321	B725	0	1	1	1	1	1	0	5
ORD	DCA	11	0850	1130	UA 00836	B725	1	1	1	1	1	1	1	7
EWR	DCA	11	1045	1134	EA 00837	B725	1	1	1	1	1	1	1	7
LGA	DCA	11	1100	1157	EA 0144<	B725	1	1	1	1	1	1	1	7
DCA	MIA	11	1110	1320	EA 00143	B727	1	1	1	1	1	1	1	7
MEM	DCA	11	0835	1123	AA 00520	B727	1	0	0	0	0	0	0	1
BNA	DCA	11	0900	1127	AA 00258	B727	1	1	1	1	1	1	0	6
DCA	MIA	11	1135	1357	PA 00331	B727	1	1	1	1	1	1	1	7
DCA	OAJ	11	1100	1200	PI 00211	B737	1	1	1	1	1	1	1	7
HPN	DCA	11	1010	1100	FLA00098	B737	0	1	1	1	1	1	0	5
HPN	DCA	11	1010	1100	FLA00098	B737	1	0	0	0	0	0	1	2
TYS	DCA	11	0959	1111	UA 00550	B737	1	1	1	1	1	1	1	7
DCA	PBI	11	1140	1345	FLA00098	B737	1	1	1	1	1	1	1	7
DCA	CLE	11	1140	1246	UA 00349	B737	0	1	1	1	1	1	0	5
ROA	DCA	11	1115	1157	PI 00251	B737	1	1	1	1	1	1	1	7
ATL	DCA	11	0930	1100	EA 00130	DC9	1	1	1	1	1	1	1	7
DCA	LGA	11	1100	1200	NYA00014	DC9	0	1	1	1	1	1	0	5
DCA	LGA	11	1100	1200	NYA00014	DC9	1	0	0	0	0	0	1	2
PVD	DCA	11	0953	1100	AL 00116	DC9	0	1	1	1	1	1	0	5
PVD	DCA	11	0953	1100	AL 00132	DC9	0	0	0	0	0	0	1	1
DTW	DCA	11	1000	1107	AL 00262	DC9	1	1	1	1	1	1	1	7
DCA	BOS	11	1110	1226	EA 00878	DC9	1	1	1	1	1	1	1	7
MDW	DCA	11	0840	1110	MID00058	DC9	0	0	0	0	0	0	1	1
MDW	DCA	11	0840	1110	MID00058	DC9	0	1	1	1	1	1	0	5
DCA	TPA	11	1120	1319	EA 00185	DC9	1	1	1	1	1	1	1	7
DCA	ROC	11	1130	1230	AL 00241	DC9	0	1	1	1	1	1	1	6
LGA	DCA	11	1030	1130	NYA00007	DC9	0	1	1	1	1	1	0	5
LGA	DCA	11	1030	1130	NYA00007	DC9	1	0	0	0	0	0	1	2
DCA	MDW	11	1135	1220	MID00055	DC9	1	1	1	1	1	1	1	7
RDU	DCA	11	1050	1137	EA 00390	DC9	1	1	1	1	1	1	1	7
DCA	ORF	11	1140	1221	AL 00262	DC9	1	1	1	1	1	1	1	7
MSP	DCA	11	0835	1141	RC 00670	DC9	1	1	1	1	1	1	1	7
STL	DCA	11	0910	1155	OZ 00684	DC9	0	1	1	1	1	1	1	6
DCA	RDU	11	1159	1248	EA 00250	DC9	1	1	1	1	1	1	1	7
PHF	DCA	11	1035	1120	AL 0628*	DH6	1	1	1	1	1	1	1	7
PHL	DCA	11	1040	1125	AL 0972*	DH6	1	1	1	1	1	1	1	7
DCA	PHL	11	1145	1230	AL 0973*	DH6	1	1	1	1	1	1	1	7
DCA	SHD	11	1145	1225	AL 00628	DH6	1	1	1	1	1	1	1	7
RIC	DCA	11	1115	1145	AL 00638	DH6	1	1	1	1	1	1	1	7
DCA	RIC	11	1115	1155	MSA00153	E110	0	1	1	1	1	1	0	5
DCA	EWN	11	1115	1235	MSA00472	E110	1	0	0	0	0	0	0	1
ABE	DCA	11	1030	1125	AAR00215	ND26	1	1	1	1	1	1	1	7
DCA	RIC	11	1155	1235	AAR00215	ND26	1	1	1	1	1	1	1	7
DCA	HVN	11	1100	1223	HVA00038	PA31	0	0	0	0	0	0	1	1
DCA	BGM	11	1145	1315	FDM00151	PA31	0	1	1	1	1	1	0	5
[illegible]	[illegible]	11	1100	1207	FI 00955	Y511	0	1	1	1	1	1	1	6
								[illegible]	[illegible]	51	53	53	49	358

ANALYSIS OF FLIGHTS BY HOUR AT DCA
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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
CMH	DCA	12	1131	1226	AL 00451	BA11	1	1	1	1	1	1	1	7
DCA	BDL	12	1255	1355	AL 00451	BA11	1	1	1	1	1	1	1	7
MSP	DCA	12	1205	1255	CJC00200	BE99	1	1	1	1	1	1	1	7
DCA	DAY	12	1200	1316	TW 00553	B72S	1	1	1	1	1	1	0	6
DCA	LGA	12	1200	1300	EA 0245<	B72S	1	1	1	1	1	1	1	7
DCA	BOS	12	1205	1318	AA 00520	B72S	0	1	1	1	1	1	1	6
DCA	ATL	12	1210	1343	DL 00365	B72S	1	1	1	1	1	1	1	7
DTW	DCA	12	1100	1210	NW 00322	B72S	1	1	1	1	1	1	1	7
BOS	DCA	12	1105	1222	AA 00319	B72S	1	1	0	0	1	1	1	5
STL	DCA	12	0940	1229	TW 00410	B72S	1	1	1	1	1	1	1	7
DCA	EWR	12	1230	1323	EA 00846	B72S	1	1	1	1	1	1	1	7
ORD	DCA	12	0955	1233	AA 00552	B72S	1	1	0	1	1	1	0	5
ATL	DCA	12	1104	1235	DL 00210	B72S	1	1	1	1	1	1	1	7
DCA	MSP	12	1245	1404	NW 00069	B72S	1	1	1	1	1	1	1	7
DCA	DTW	12	1255	1410	NW 00325	B72S	1	1	1	1	1	1	0	6
DCA	ORD	12	1255	1346	UA 00247	B72S	1	1	1	1	1	1	1	7
LGA	DCA	12	1200	1255	EA 0145<	B72S	1	1	1	1	1	1	1	7
CLE	DCA	12	1200	1259	NW 00306	B72S	1	1	1	1	1	1	1	7
DCA	BOS	12	1205	1318	AA 00520	B727	1	0	0	0	0	0	0	1
ORF	DCA	12	1130	1207	PI 00604	B727	1	1	1	1	1	1	1	7
DCA	IND	12	1215	1244	TW 00555	B727	1	1	1	1	1	1	1	7
BNA	DCA	12	0955	1220	BN 00114	B727	1	1	1	1	1	1	1	7
DCA	CVG	12	1230	1346	PI 00604	B727	1	1	1	1	1	1	1	7
STL	DCA	12	0940	1232	AA 00232	B727	1	1	1	1	1	1	1	7
ORD	DCA	12	0955	1233	AA 00552	B727	0	0	1	0	0	0	1	2
DCA	JFK	12	1250	1350	BN 00114	B727	1	1	1	1	1	1	1	7
FAY	DCA	12	1130	1220	PI 00252	B737	1	1	1	1	1	1	1	7
OAJ	DCA	12	1135	1225	PI 00208	B737	1	1	1	1	1	1	1	7
DCA	ISO	12	1255	1348	PI 00291	B737	1	1	1	1	1	1	1	7
DCA	TYS	12	1259	1417	UA 00270	B737	1	1	1	1	1	1	1	7
DCA	LGA	12	1200	1300	NYA00016	DC9	1	1	1	1	1	1	1	7
BOS	DCA	12	1045	1202	EA 00375	DC9	1	1	1	1	1	1	1	7
BOS	DCA	12	1040	1205	NYA00053	DC9	1	1	1	1	1	1	1	7
DCA	MSP	12	1215	1342	RC 00677	DC9	1	1	1	1	1	1	1	7
DCA	BOS	12	1230	1345	NYA00052	DC9	1	1	1	1	1	1	1	7
LGA	DCA	12	1130	1230	NYA00009	DC9	0	1	1	1	1	1	0	5
LGA	DCA	12	1130	1230	NYA00009	DC9	1	0	0	0	0	0	1	2
BDL	DCA	12	1133	1233	AL 00136	DC9	1	1	1	1	1	1	0	6
DCA	CLT	12	1236	1340	EA 00375	DC9	1	1	1	1	1	1	1	7
DCA	STL	12	1240	1339	OZ 00687	DC9	0	1	1	1	1	1	1	6
DCA	ATL	12	1254	1427	EA 00133	DC9	1	1	1	1	1	1	1	7
CLT	DCA	12	1200	1259	EA 00372	DC9	1	1	1	1	1	1	1	7
DCA	BWI	12	1200	1220	AL 0638*	DH6	1	1	1	1	1	1	1	7
PHL	DCA	12	1140	1225	AL 0999*	DH6	1	1	1	1	1	1	1	7
HVN	DCA	12	1045	1213	HVA00023	E110	0	1	1	1	1	1	0	5
EKN	DCA	12	1120	1225	KCI00405	E110	1	1	1	1	1	1	1	7
DCA	EKN	12	1245	1350	KCI00406	E110	1	1	1	1	1	1	1	7
BGM	DCA	12	1140	1245	AAR00271	ND26	0	1	1	1	1	1	0	5
BGM	DCA	12	1100	1230	FDM00160	PA31	0	1	1	1	1	1	0	5
MDT	DCA	12	1120	1200	AL 0717*	SHD3	1	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA
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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	MDT	12	1240	1325	AL 0718*	SHD3	1	1	1	1	1	1	1	7
HOURLY TOTAL							44	48	47	47	48	48	42	324
ORF	DCA	13	1246	1327	AL 00421	BA11	1	1	1	1	1	1	1	7
DCA	PVD	13	1359	1503	AL 00421	BA11	1	1	1	1	1	1	1	7
HGR	DCA	13	1225	1300	AL 0606*	BE99	1	1	1	1	1	1	1	7
DCA	SBY	13	1310	1350	AL 0606*	BE99	1	1	1	1	1	1	1	7
DCA	LGA	13	1300	1354	EA 0246<	B725	1	1	1	1	1	1	1	7
AVP	DCA	13	1225	1305	EA 00177	B725	1	1	1	1	1	1	1	7
DCA	ORD	13	1305	1402	AA 00319	B725	1	1	1	1	1	1	1	7
ORD	DCA	13	1030	1309	TW 00376	B725	0	1	1	1	1	1	1	6
PIT	DCA	13	1220	1309	NW 00320	B725	0	1	1	1	1	1	0	5
BOS	DCA	13	1210	1325	DL 00323	B725	1	1	1	1	1	1	1	7
EWR	DCA	13	1230	1330	PA 00815	B725	1	1	1	1	1	1	0	6
DCA	MIA	13	1335	1552	EA 00177	B725	1	1	1	1	1	1	1	7
DCA	CMH	13	1335	1445	TW 00229	B725	1	1	1	1	1	1	1	7
MCO	DCA	13	1140	1339	EA 00874	B725	1	1	1	1	1	1	1	7
DCA	CLE	13	1340	1445	NW 00353	B725	1	1	1	1	1	1	1	7
DCA	ATL	13	1345	1518	DL 00305	B725	1	1	1	1	1	1	1	7
ATL	DCA	13	1220	1348	EA 00146	B725	1	1	1	1	1	1	1	7
DCA	JAX	13	1355	1535	PA 00815	B725	1	1	1	1	1	1	0	6
DCA	ORD	13	1355	1446	UA 00285	B725	1	1	1	1	1	1	1	7
LGA	DCA	13	1300	1355	EA 0146<	B725	1	1	1	1	1	1	1	7
DTW	DCA	13	1245	1356	NW 00324	B725	1	1	1	1	1	1	0	6
ATL	DCA	13	1229	1359	DL 00564	B725	1	1	1	1	1	1	1	7
DCA	ORD	13	1335	1428	AA 00119	B727	1	1	1	1	1	1	0	6
DCA	GSO	13	1300	1355	PI 00237	B737	1	1	1	1	1	1	1	7
SDF	DCA	13	1200	1310	PI 00231	B737	1	1	1	1	1	1	1	7
DCA	CRW	13	1320	1415	PI 00235	B737	1	1	1	1	1	1	1	7
CHO	DCA	13	1320	1350	PI 00202	B737	1	1	1	1	1	1	1	7
DCA	RDU	13	1355	1448	PI 00232	B737	1	1	1	1	1	1	1	7
DCA	LGA	13	1300	1400	NYA00018	DC9	0	1	1	1	1	1	0	5
DCA	LGA	13	1300	1400	NYA00018	DC9	1	0	0	0	0	0	1	2
DCA	ROC	13	1305	1405	AL 00293	DC9	1	1	1	1	1	1	0	6
ROC	DCA	13	1210	1305	AL 00317	DC9	1	0	0	0	0	0	0	1
ALB	DCA	13	1207	1309	AL 00218	DC9	0	1	1	1	1	1	1	6
DCA	BOS	13	1330	1445	EA 00372	DC9	1	1	1	1	1	1	1	7
LGA	DCA	13	1230	1330	NYA00011	DC9	1	1	1	1	1	1	1	7
DCA	BDL	13	1342	1442	AL 00031	DC9	1	1	1	1	1	1	0	6
DCA	PHL	13	1300	1345	AL 0903*	DH6	1	1	1	1	1	1	1	7
PHL	DCA	13	1235	1320	AL 0979*	DH6	1	1	1	1	1	1	1	7
SHD	DCA	13	1245	1325	AL 01619	DH6	1	1	1	1	1	1	0	6
SHD	DCA	13	1245	1325	AL 00549	DH6	0	0	0	0	0	0	1	1
DCA	BWI	13	1340	1400	AL 0549*	DH6	0	0	0	0	0	0	1	1
DCA	BWI	13	1340	1400	AL 01619	DH6	1	1	1	1	1	1	0	6
CKB	DCA	13	1255	1345	KC100403	E110	1	1	1	1	1	1	1	7
DCA	HVN	13	1359	1522	HVA00024	E110	0	1	1	1	1	1	0	5
DCA	RIC	13	1320	1400	AAR00271	ND26	0	1	1	1	1	1	0	5
RIC	DCA	13	1305	1345	AAR00284	ND26	1	1	1	1	1	1	1	7
MDT	DCA	13	1319	1359	AL 0746*	NORD	1	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA
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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
SBY	DCA	13	1220	1300	AL 0619M	SHD3	1	1	1	1	1	1	1	7
DCA	BWI	13	1325	1345	AL 0619M	SHD3	1	1	1	1	1	1	1	7
ITH	DCA	13	1245	1355	EMP00541	SW4	0	1	1	1	1	1	0	5
HOURLY TOTAL							41	46	46	46	46	46	36	307
CVG	DCA	14	1303	1410	AL 00477	BA11	1	1	1	1	1	1	0	6
DCA	ALB	14	1445	1548	AL 00477	BA11	1	1	1	1	1	1	0	6
DCA	MSP	14	1400	1450	CJC00300	BE99	1	1	1	1	1	1	1	7
DCA	ACY	14	1400	1450	DCH00035	BE99	0	1	1	1	1	1	0	5
SBY	DCA	14	1405	1445	AL 0620M	BE99	1	1	1	1	1	1	1	7
DCA	SBY	14	1459	1539	AL 0620M	BE99	1	1	1	1	1	1	1	7
DCA	LGA	14	1400	1500	EA 0247<	B725	1	1	1	1	1	1	1	7
DCA	BOS	14	1410	1525	DL 00468	B725	1	1	1	1	1	1	1	7
DCA	STL	14	1415	1519	TW 00273	B725	1	1	1	1	1	1	1	7
ORD	DCA	14	1140	1418	UA 00428	B725	1	1	1	1	1	1	1	7
BOS	DCA	14	1315	1433	AA 00117	B725	1	1	1	1	1	1	1	7
DCA	ATL	14	1438	1611	EA 00663	B725	1	1	1	1	1	1	1	7
DCA	RDU	14	1450	1537	EA 00549	B725	1	1	1	1	1	1	1	7
MEM	DCA	14	1205	1450	BN 00204	B725	1	1	1	1	1	1	1	7
LGA	DCA	14	1400	1455	EA 0147<	B725	1	1	1	1	1	1	1	7
DCA	MEM	14	1458	1558	AA 00351	B725	1	1	0	1	1	1	0	5
EWR	DCA	14	1409	1458	EA 00851	B725	1	1	1	1	1	1	1	7
DCA	ATL	14	1459	1632	DL 00321	B725	1	1	1	1	1	1	1	7
ORD	DCA	14	1220	1459	TW 00168	B725	1	1	1	1	1	1	1	7
MIA	DCA	14	1200	1411	EA 00190	B727	1	1	1	1	1	1	1	7
DCA	AVP	14	1441	1527	EA 00190	B727	1	1	1	1	1	1	1	7
RDU	DCA	14	1410	1457	EA 00530	B727	1	1	1	1	1	1	1	7
DCA	MEM	14	1458	1558	AA 00351	B727	0	0	1	0	0	0	1	2
PBI	DCA	14	1255	1459	PA 00322	B727	1	1	1	1	1	1	1	7
MYR	DCA	14	1310	1415	PI 00266	B737	1	1	1	1	1	1	1	7
TPA	DCA	14	1215	1415	FLA00091	B737	1	1	1	1	1	1	0	6
CLE	DCA	14	1335	1434	UA 00306	B737	1	1	1	1	1	1	0	6
DCA	OAJ	14	1455	1555	PI 00209	B737	1	1	1	1	1	1	1	7
DCA	TPA	14	1455	1655	FLA00090	B737	1	1	1	1	1	1	0	6
DCA	LEX	14	1459	1619	PI 00225	B737	1	1	1	1	1	1	1	7
DCA	LGA	14	1400	1500	NYA00020	DC9	0	1	1	1	1	1	0	5
DCA	LGA	14	1400	1500	NYA00020	DC9	1	0	0	0	0	0	1	2
PVD	DCA	14	1305	1412	AL 00172	DC9	1	1	1	1	1	1	1	7
BUF	DCA	14	1323	1421	AL 00075	DC9	1	1	1	1	1	1	1	7
LGA	DCA	14	1330	1430	NYA00015	DC9	0	1	1	1	1	1	0	5
LGA	DCA	14	1330	1430	NYA00015	DC9	1	0	0	0	0	0	1	2
MDW	DCA	14	1205	1435	MID00056	DC9	1	1	1	1	1	1	1	7
DCA	ORF	14	1440	1521	AL 00172	DC9	1	1	1	1	1	1	1	7
PIT	DCA	14	1355	1443	AL 00118	DC9	1	1	1	1	1	1	1	7
DCA	TPA	14	1450	1655	AL 00075	DC9	1	1	1	1	1	1	1	7
DCA	MDW	14	1459	1545	MID00053	DC9	0	0	0	0	0	0	1	1
DCA	MDW	14	1459	1545	MID00053	DC9	1	1	1	1	1	1	0	6
DCA	PHL	14	1400	1445	AL 0980M	DH6	1	1	1	1	1	1	1	7
BWI	DCA	14	1420	1440	AL 0647M	DH6	1	1	1	1	1	1	0	6
[illegible]	DCA	14	1[illegible]30	1445	AL 0618>	DH6	1	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA
DATA FROM MAY 1981 OAG
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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	CKB	14	1425	1530	KCI00404	E110	1	1	1	1	1	1	1	7
HVN	DCA	14	1300	1428	HVA00029	E110	1	0	0	0	0	0	0	1
DCA	HVN	14	1459	1622	HVA00030	E110	1	0	0	0	0	0	0	1
EWR	DCA	14	1400	1455	AAR00375	FA28	1	1	1	1	1	1	0	6
DCA	ABE	14	1415	1510	AAR00284	ND26	1	1	1	1	1	1	1	7
DCA	BGM	14	1400	1530	FDM00161	PA31	0	1	1	1	1	1	0	5
DCA	ITH	14	1430	1535	EMP00841	SW4	0	1	1	1	1	1	0	5
CRW	DCA	14	1327	1437	PI 00955	YS11	1	1	1	1	1	1	1	7
HOURLY TOTAL							46	47	47	47	47	47	37	318
MSP	DCA	15	1505	1555	CJC00400	BE99	1	1	1	1	1	1	1	7
DCA	LGA	15	1500	1558	EA 0248<	B725	1	1	1	1	1	1	1	7
DCA	ORD	15	1515	1606	UA 00981	B725	1	1	1	1	1	1	0	6
MSP	DCA	15	1210	1518	NW 00336	B725	1	1	1	1	1	1	1	7
DCA	BNA	15	1519	1551	AA 00117	B725	1	1	1	1	1	1	1	7
DCA	MEM	15	1520	1620	BN 00115	B725	1	1	1	1	1	1	1	7
DAY	DCA	15	1420	1527	TW 00556	B725	1	1	1	1	1	1	0	6
DCA	DTW	15	1530	1649	NW 00375	B725	1	1	1	1	1	1	1	7
DCA	CMH	15	1530	1640	TW 00543	B725	1	1	1	1	1	1	1	7
DCA	PIT	15	1540	1633	NW 00351	B725	1	1	1	1	1	1	1	7
ORD	DCA	15	1305	1544	UA 00864	B725	1	1	1	1	1	1	0	6
DCA	EWR	15	1545	1642	EA 00850	B725	1	1	1	1	1	1	1	7
PIT	DCA	15	1500	1549	NW 00294	B725	1	1	1	1	1	1	0	6
BOS	DCA	15	1440	1555	DL 00659	B725	1	1	1	1	1	1	1	7
CLE	DCA	15	1455	1555	NW 00344	B725	0	1	1	1	1	1	0	5
DCA	JFK	15	1555	1705	TW 00556	B725	1	1	1	1	1	1	1	7
LGA	DCA	15	1500	1557	EA 0148<	B725	1	1	1	1	1	1	1	7
JFK	DCA	15	1500	1559	PA 00067	B725	1	1	1	1	1	1	1	7
ATL	DCA	15	1355	1524	EA 00380	B727	1	1	1	1	1	1	1	7
BOS	DCA	15	1410	1526	AA 00219	B727	1	1	1	1	1	1	0	6
MIA	DCA	15	1305	1527	PA 00330	B727	1	1	1	1	1	1	1	7
CMH	DCA	15	1435	1535	TW 00434	B727	1	1	1	1	1	1	1	7
DCA	BOS	15	1535	1650	EA 00530	B727	1	1	1	1	1	1	1	7
DCA	JFK	15	1545	1653	PA 00110	B727	1	1	1	1	1	1	1	7
JFK	DCA	15	1450	1555	BN 00117	B727	1	1	1	1	1	1	1	7
DCA	CLE	15	1520	1631	UA 00657	B737	1	1	1	1	1	1	1	7
RDU	DCA	15	1500	1546	PI 00258	B737	1	1	1	1	1	1	1	7
PBI	DCA	15	1340	1550	FLA00097	B737	1	1	1	1	1	1	1	7
DCA	LGA	15	1500	1559	NYA00022	DC9	0	1	1	1	1	1	0	5
DCA	LGA	15	1500	1559	NYA00022	DC9	1	0	0	0	0	0	1	2
DCA	PIT	15	1515	1605	AL 00325	DC9	0	0	0	0	0	0	1	1
DCA	PIT	15	1515	1605	AL 00115	DC9	1	1	1	1	1	1	0	6
SYR	DCA	15	1420	1519	AL 00240	DC9	1	1	1	1	1	1	1	7
BWI	DCA	15	1500	1522	EA 00197	DC9	1	1	1	1	1	1	1	7
LGA	DCA	15	1430	1530	NYA00017	DC9	1	0	0	0	0	0	1	2
LGA	DCA	15	1430	1530	NYA00017	DC9	0	1	1	1	1	1	0	5
MIA	DCA	15	1330	1554	EA 00192	DC9	1	1	1	1	1	1	1	7
BUF	DCA	15	1500	1558	AL 00196	DC9	1	1	1	1	1	1	0	6
DCA	MIA	15	1559	1820	EA 00197	DC9	1	1	1	1	1	1	1	7
DCA	BUF	15	1559	1703	AL 00181	DC9	1	1	1	1	1	1	0	6

ANALYSIS OF FLIGHTS BY HOUR AT DCA
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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
PHL	DCA	15	1415	1500	AL 0903*	DH6	1	1	1	1	1	1	0	6
DCA	PHF	15	1515	1600	AL 0616*	DH6	1	1	1	1	1	1	0	6
DCA	RIC	15	1520	1555	AL 00647	DH6	1	1	1	1	1	1	1	7
DCA	PHL	15	1540	1625	AL 0904*	DH6	1	1	1	1	1	1	0	6
DCA	EWR	15	1525	1611	AAR00374	FA28	1	1	1	1	1	1	0	6
RIC	DCA	15	1430	1510	AAR00374	ND26	0	1	1	1	1	1	0	5
PHL	DCA	15	1430	1515	AAR00253	ND26	1	0	0	0	0	0	0	1
PHL	DCA	15	1445	1535	AL 0955*	ND26	1	1	1	1	1	1	0	6
DCA	RIC	15	1540	1620	AAR00375	ND26	1	1	1	1	1	1	0	6
DCA	MDT	15	1500	1545	AL 0749*	NORD	1	1	1	1	1	1	1	7
BGM	DCA	15	1330	1500	FDM00300	SW4	0	1	1	1	1	1	0	5
DCA	BGM	15	1515	1635	FDM00301	SW4	0	1	1	1	1	1	0	5
DCA	ROA	15	1520	1627	PI 00975	YS11	1	1	1	1	1	1	1	7
HOURLY TOTAL							46	49	49	49	49	49	32	323
SBY	DCA	16	1610	1650	AL 0609*	BE99	1	1	1	1	1	1	0	6
BDR	DCA	16	1530	1655	PMT00025	BE99	0	1	1	1	1	1	0	5
ACY	DCA	16	1615	1659	OCN00036	BE99	1	1	1	1	1	1	0	6
DCA	LGA	16	1600	1659	EA 0249<	B725	1	1	1	1	1	1	1	7
ORD	DCA	16	1340	1617	AA 00340	B725	1	1	1	1	1	1	1	7
ATL	DCA	16	1449	1620	DL 00320	B725	1	1	1	1	1	1	1	7
DCA	BOS	16	1620	1732	NW 00294	B725	1	1	1	1	1	1	1	7
JAX	DCA	16	1448	1620	EA 00866	B725	1	1	1	1	1	1	1	7
DCA	STL	16	1629	1738	TW 00141	B725	1	1	1	1	1	1	1	7
DCA	MSP	16	1630	1752	NW 00369	B725	1	1	1	1	1	1	1	7
DCA	MIA	16	1635	1903	PA 00405	B725	1	1	1	1	1	1	1	7
DCA	ORD	16	1640	1736	UA 00383	B725	1	1	1	1	1	1	1	7
DCA	BOS	16	1644	1800	AA 00340	B725	1	1	1	1	1	1	0	6
TPA	DCA	16	1448	1645	EA 00186	B725	1	1	1	1	1	1	1	7
DCA	ATL	16	1650	1823	DL 00767	B725	1	1	1	1	1	1	1	7
DCA	BOS	16	1650	1808	EA 00866	B725	1	1	1	1	1	1	1	7
MCO	DCA	16	1505	1658	PA 00584	B725	1	1	1	1	1	1	1	7
BNA	DCA	16	1437	1659	BN 00116	B725	1	1	1	1	1	1	1	7
MSP	DCA	16	1355	1659	WA 00508	B725	1	1	1	1	1	1	1	7
ORD	DCA	16	1420	1659	UA 00764	B725	1	1	1	1	1	1	1	7
STL	DCA	16	1405	1659	TW 00536	B725	1	1	1	1	1	1	1	7
DCA	ORD	16	1600	1659	AA 00433	B727	1	1	1	1	1	1	1	7
DCA	TPA	16	1615	1820	PA 00461	B727	1	1	1	1	1	1	1	7
DCA	STL	16	1620	1730	AA 00219	B727	1	1	1	1	1	1	0	6
DCA	CLT	16	1625	1727	EA 00657	B727	1	1	1	1	1	1	1	7
DCA	MEM	16	1630	1730	BN 00117	B727	1	1	1	1	1	1	1	7
DCA	ORD	16	1655	1801	TW 00449	B727	1	1	1	1	1	1	1	7
CLE	DCA	16	1530	1628	UA 00886	B737	1	1	1	1	1	1	0	6
DCA	HPN	16	1635	1725	FLA00097	B737	1	0	0	0	0	0	1	2
DCA	LYH	16	1635	1718	PI 00261	B737	1	1	1	1	1	1	1	7
DCA	HPN	16	1635	1725	FLA00097	B737	0	1	1	1	1	1	0	5
LYH	DCA	16	1600	1638	PI 00242	B737	1	1	1	1	1	1	1	7
BWI	DCA	16	1634	1659	PI 00204	B737	1	1	1	1	1	1	1	7
BOS	DCA	16	1435	1600	NYA00055	DC9	1	1	1	1	1	1	1	7
[illegible]		16	[illegible]	1659	NYA00024	DC9	0	1	1	1	1	1	0	5

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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	LGA	16	1600	1659	NYA00024	DC9	1	0	0	0	0	0	1	2
DCA	CVG	16	1630	1746	AL 00237	DC9	1	1	1	1	1	1	0	6
DCA	BDS	16	1630	1745	NYA00054	DC9	1	1	1	1	1	1	1	7
LGA	DCA	16	1530	1630	NYA00019	DC9	0	1	1	1	1	1	0	5
LGA	DCA	16	1530	1630	NYA00019	DC9	1	0	0	0	0	0	1	2
MCO	DCA	16	1440	1630	AL 00082	DC9	1	1	1	1	1	1	1	7
ORF	DCA	16	1605	1644	AL 00207	DC9	1	1	1	1	1	1	1	7
BOS	DCA	16	1540	1659	EA 00889	DC9	1	1	1	1	1	1	1	7
DCA	SYR	16	1659	1759	AL 00082	DC9	1	1	1	1	1	1	1	7
DCA	GSO	16	1659	1753	EA 00371	DC9	1	1	1	1	1	1	1	7
STL	DCA	16	1415	1659	OZ 00556	DC9	1	1	1	1	1	1	0	6
PHL	DCA	16	1550	1635	AL 0911H	DH6	1	1	1	1	1	1	0	6
EWN	DCA	16	1539	1659	MSA00484	E110	1	0	0	0	0	0	0	1
RIC	DCA	16	1619	1659	MSA00174	E110	0	1	1	1	1	1	0	5
RIC	DCA	16	1555	1626	AAR00378	FA28	1	1	1	1	1	1	0	6
DCA	EWR	16	1655	1741	AAR00378	FA28	1	1	1	1	1	1	0	6
DCA	PHL	16	1600	1650	AL 0999H	ND26	1	0	0	0	0	0	0	1
PHL	DCA	16	1510	1600	AL 0930H	ND26	0	1	1	1	1	1	0	5
PHL	DCA	16	1510	1600	AL 0996H	ND26	1	0	0	0	0	0	1	2
DCA	PNE	16	1620	1715	AL 0956H	ND26	0	1	1	1	1	1	0	5
DCA	PHL	16	1625	1715	AL 0975H	ND26	1	1	1	1	1	1	1	7
ABE	DCA	16	1540	1635	AAR00219	ND26	1	1	1	1	1	1	1	7
PHL	DCA	16	1550	1635	AL 0948H	ND26	0	0	0	0	0	0	1	1
SBY	DCA	16	1610	1650	AL 0609H	SHD3	0	0	0	0	0	0	1	1
ROA	DCA	16	1515	1613	PI 00954	YS11	1	0	0	0	0	0	0	1
ROA	DCA	16	1515	1613	PI 00952	YS11	0	1	1	1	1	1	1	6
HOURLY TOTAL							51	52	52	52	52	52	41	352
CVG	DCA	17	1600	1707	AL 00446	BA11	1	1	1	1	1	1	0	6
ALB	DCA	17	1625	1730	AL 00474	BA11	1	1	1	1	1	1	1	7
DCA	BDL	17	1735	1835	AL 00446	BA11	1	1	1	1	1	1	0	6
BDL	DCA	17	1647	1752	AL 00395	BA11	1	1	1	1	1	1	0	6
BWI	DCA	17	1645	1705	AL 01612	BE99	0	0	0	0	0	0	1	1
DCA	BWI	17	1705	1725	AL 0609H	BE99	1	1	1	1	1	1	0	6
DCA	SHD	17	1720	1805	AL 01612	BE99	0	0	0	0	0	0	1	1
DCA	BDR	17	1730	1855	PMT00026	BE99	0	1	1	1	1	1	0	5
DCA	ACY	17	1730	1820	OCN00037	BE99	1	0	0	0	0	0	0	1
DCA	NJ97	17	1730	1830	OCN00037	BE99	0	1	1	1	1	1	0	5
DCA	MDT	17	1750	1825	AL 01720	BE99	1	1	1	1	1	1	0	6
DCA	BOS	17	1700	1815	DL 00320	B725	1	1	1	1	1	1	1	7
DCA	LGA	17	1700	1759	EA 0250<	B725	1	1	1	1	1	1	1	7
LGA	DCA	17	1600	1701	EA 0149<	B725	1	1	1	1	1	1	1	7
DTW	DCA	17	1605	1716	NW 00362	B725	1	1	1	1	1	1	1	7
BOS	DCA	17	1604	1719	DL 00301	B725	1	1	1	1	1	1	1	7
STL	DCA	17	1425	1720	AA 00102	B725	1	1	1	1	1	1	1	7
DCA	EWR	17	1730	1828	PA 00584	B725	1	1	1	1	1	1	1	7
DCA	JFK	17	1730	1830	BN 00116	B725	1	1	1	1	1	1	0	6
ATL	DCA	17	1609	1740	DL 00222	B725	1	1	1	1	1	1	1	7
DCA	JFK	17	1740	1852	TW 00536	B725	1	1	1	1	1	1	1	7
DCA	ATL	17	1745	1922	EA 00137	B725	1	1	1	1	1	1	1	7

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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	MSP	17	1750	1920	WA 00505	B725	1	1	1	1	1	1	1	7
ORD	DCA	17	1515	1754	UA 00332	B725	1	1	1	1	1	1	1	7
DCA	MSP	17	1755	1916	NW 00085	B725	1	1	1	1	1	1	1	7
DCA	BOS	17	1759	1914	DL 00316	B725	1	1	1	1	1	1	1	7
JFK	DCA	17	1615	1722	TW 00407	B727	1	1	1	1	1	1	1	7
JFK	DCA	17	1625	1730	BN 00205	B727	1	1	1	1	1	1	0	6
DCA	STL	17	1750	1901	TW 00407	B727	1	1	1	1	1	1	0	6
JFK	DCA	17	1655	1759	PA 00111	B727	1	1	1	1	1	1	1	7
DCA	TYS	17	1705	1825	UA 00886	B737	1	1	1	1	1	1	0	6
DCA	ROA	17	1725	1815	PI 00223	B737	1	1	1	1	1	1	1	7
CRW	DCA	17	1650	1740	PI 00364	B737	1	1	1	1	1	1	1	7
DCA	SDF	17	1740	1906	PI 00204	B737	1	1	1	1	1	1	1	7
DCA	LGA	17	1700	1759	NYA00026	DC9	0	1	1	1	1	1	0	5
DCA	LGA	17	1700	1759	NYA00026	DC9	1	0	0	0	0	0	1	2
DCA	DTW	17	1712	1829	AL 00207	DC9	1	1	1	1	1	1	1	7
DCA	PBI	17	1730	1938	EA 00889	DC9	1	1	1	1	1	1	1	7
LGA	DCA	17	1630	1730	NYA00021	DC9	0	1	1	1	1	1	0	5
LGA	DCA	17	1630	1730	NYA00021	DC9	1	0	0	0	0	0	1	2
GSO	DCA	17	1650	1739	EA 00340	DC9	1	1	1	1	1	1	1	7
CLT	DCA	17	1640	1741	EA 00388	DC9	1	1	1	1	1	1	1	7
MDW	DCA	17	1515	1745	MID00054	DC9	1	1	1	1	1	1	0	6
MDW	DCA	17	1515	1745	MID00054	DC9	0	0	0	0	0	0	1	1
DCA	STL	17	1750	1849	OZ 00557	DC9	1	1	1	1	1	1	0	6
DCA	PHL	17	1700	1745	AL 0912M	DH6	1	1	1	1	1	1	0	6
BWI	DCA	17	1735	1755	AL 0610M	DH6	1	1	1	1	1	1	0	6
HVN	DCA	17	1625	1753	HVA00035	E110	0	1	1	1	1	1	0	5
DCA	RIC	17	1759	1839	MSA00175	E110	0	1	1	1	1	1	0	5
DCA	EWN	17	1759	1919	MSA00485	E110	1	0	0	0	0	0	0	1
EWR	DCA	17	1645	1740	AAR00377	FA28	1	1	1	1	1	1	0	6
BGM	DCA	17	1635	1745	AN000106	G159	0	1	1	1	1	1	0	5
DCA	PHL	17	1700	1745	AL 0998M	ND26	0	0	0	0	0	0	1	1
DCA	ABE	17	1705	1800	AAR00220	ND26	1	1	1	1	1	1	1	7
RIC	DCA	17	1700	1740	AAR00376	ND26	1	1	1	1	1	1	0	6
DCA	BWI	17	1705	1725	AL 0609M	SHD3	0	0	0	0	0	0	1	1
MDT	DCA	17	1630	1715	AL 0719M	SHD3	1	1	1	1	1	1	1	7
DCA	MDT	17	1730	1815	AL 0720M	SHD3	1	1	1	1	1	1	1	7
AVP	DCA	17	1700	1759	FDM00500	SW4	1	1	1	1	1	1	1	7
DCA	CHO	17	1730	1807	PI 00941	YS11	1	1	1	1	1	1	1	7
HOURLY TOTAL							48	51	51	51	51	51	36	339
DCA	BUF	18	1800	1904	AL 00441	BA11	1	1	1	1	1	1	0	6
DCA	BDL	18	1825	1925	AL 00396	BA11	1	1	1	1	1	1	1	7
DCA	LGA	18	1800	1902	EA 0251<	B725	1	1	1	1	1	1	1	7
LGA	DCA	18	1700	1801	EA 0150<	B725	1	1	1	1	1	1	1	7
DCA	ORD	18	1805	1911	AA 00149	B725	1	1	1	1	1	1	0	6
BNA	DCA	18	1540	1808	AA 00374	B725	1	1	1	1	1	1	0	6
DCA	DTW	18	1815	1931	NW 00367	B725	1	1	1	1	1	1	1	7
MKE	DCA	18	1540	1815	NW 00378	B725	1	1	1	1	1	1	1	7
EWR	DCA	18	1730	1823	EA 00853	B725	1	1	1	1	1	1	1	7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	PI 00311	B725	[illegible]	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA
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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	ATL	18	1835	2008	DL 00211	B725	1	1	1	1	1	1	1	7
DCA	BOS	18	1835	1950	AA 00374	B725	1	1	1	1	1	1	0	6
ORD	DCA	18	1553	1835	AA 00152	B725	1	1	1	1	1	1	1	7
DCA	BNA	18	1800	1835	BN 00205	B727	1	1	1	1	1	1	0	6
ORD	DCA	18	1520	1801	TW 00290	B727	1	1	1	1	1	1	1	7
BOS	DCA	18	1650	1807	EA 00199	B727	1	1	1	1	1	1	1	7
EWR	DCA	18	1720	1826	PA 00587	B727	1	1	1	1	1	1	1	7
DCA	JFK	18	1840	1945	PA 00024	B727	1	1	1	1	1	1	1	7
DCA	JAX	18	1844	2022	EA 00199	B727	1	1	1	1	1	1	1	7
TPA	DCA	18	1645	1844	PA 00462	B727	1	1	1	1	1	1	1	7
SDF	DCA	18	1740	1853	PI 00618	B727	1	1	1	1	1	1	1	7
DCA	MCO	18	1855	2056	PA 00587	B727	1	1	1	1	1	1	1	7
GSO	DCA	18	1710	1800	PI 00288	B737	1	1	1	1	1	1	1	7
HSV	DCA	18	1530	1802	UA 00722	B737	1	1	1	1	1	1	0	6
CLE	DCA	18	1715	1816	UA 00898	B737	1	1	1	1	1	1	1	7
DCA	ORF	18	1840	1927	PI 00315	B737	1	1	1	1	1	1	1	7
DCA	CLE	18	1840	1951	UA 00722	B737	1	1	1	1	1	1	0	6
DCA	RDU	18	1850	1943	PI 00289	B737	1	1	1	1	1	1	1	7
HPN	DCA	18	1810	1859	FLA00131	B737	0	1	1	1	1	1	0	5
HPN	DCA	18	1810	1859	FLA00131	B737	1	0	0	0	0	0	0	1
DCA	LGA	18	1800	1900	NYA00028	DC9	1	0	0	0	0	0	1	2
DCA	LGA	18	1800	1900	NYA00028	DC9	0	1	1	1	1	1	0	5
DTW	DCA	18	1700	1807	AL 00184	DC9	1	1	1	1	1	1	0	6
DCA	MDW	18	1810	1855	MID00051	DC9	1	1	1	1	1	1	0	6
DCA	TPA	18	1830	2031	EA 00189	DC9	1	1	1	1	1	1	1	7
LGA	DCA	18	1730	1830	NYA00023	DC9	0	1	1	1	1	1	0	5
LGA	DCA	18	1730	1830	NYA00023	DC9	1	0	0	0	0	0	1	2
DCA	MCO	18	1835	2030	EA 00865	DC9	1	1	1	1	1	1	1	7
DCA	ORF	18	1835	1916	AL 00184	DC9	1	1	1	1	1	1	0	6
ATL	DCA	18	1710	1840	EA 00660	DC9	1	1	1	1	1	1	1	7
PIT	DCA	18	1755	1843	AL 00246	DC9	1	1	1	1	1	1	0	6
PHL	DCA	18	1720	1805	AL 0925M	DH6	1	1	1	1	1	1	1	7
DCA	PHF	18	1815	1900	AL 0610M	DH6	1	1	1	1	1	1	0	6
DCA	PHL	18	1835	1920	AL 0926M	DH6	1	1	1	1	1	1	1	7
HVN	DCA	18	1650	1817	HVA00039	E110	1	0	0	0	0	0	0	1
DCA	HVN	18	1820	1943	HVA00036	E110	0	1	1	1	1	1	0	5
DCA	HVN	18	1845	2007	HVA00040	E110	1	0	0	0	0	0	0	1
DCA	EWR	18	1810	1856	AAR00376	FA28	1	1	1	1	1	1	0	6
DCA	BGM	18	1805	1915	ANO00107	G159	0	1	1	1	1	1	0	5
DCA	ABE	18	1810	1855	AAR00222	ND26	1	1	1	1	1	1	0	6
PHL	DCA	18	1750	1840	AL 0920M	ND26	1	1	1	1	1	1	0	6
DCA	PHL	18	1859	1949	AL 0921M	ND26	1	1	1	1	1	1	0	6
MDT	DCA	18	1810	1850	AL 0735M	NORD	1	1	1	1	1	1	0	6
DCA	AVP	18	1830	1930	FDM00501	SW4	1	1	1	1	1	1	1	7
ITH	DCA	18	1745	1855	EMP00931	SW4	0	1	1	1	1	1	0	5
HOURLY TOTAL							49	50	50	50	50	50	29	328
ALB	DCA	19	1825	1930	AL 00465	BA11	1	1	1	1	1	1	0	6
BWI	DCA	19	1935	1955	AL 0614M	BE99	1	1	1	1	1	1	0	6
DCA	LGA	19	1900	2000	EA 0252[illegible]	B725	1	1	1	1	1	1	1	7

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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	MKE	19	1900	1946	NW 00379	B725	1	1	1	1	1	1	0	6
DCA	ORD	19	1908	1954	UA 00835	B725	1	1	1	1	1	1	1	7
CLE	DCA	19	1800	1902	NW 00352	B725	1	1	1	1	1	1	1	7
LGA	DCA	19	1800	1905	EA 0151<	B725	1	1	1	1	1	1	1	7
DCA	EWR	19	1915	2008	EA 00852	B725	1	1	1	1	1	1	1	7
JFK	DCA	19	1800	1915	TW 00187	B725	1	1	1	1	1	1	1	7
STL	DCA	19	1625	1918	TW 00440	B725	1	1	1	1	1	1	1	7
ATL	DCA	19	1749	1920	DL 00432	B725	1	1	1	1	1	1	1	7
DCA	ORD	19	1920	2020	AA 00435	B725	1	1	1	1	1	1	1	7
DCA	ORD	19	1920	2014	UA 00229	B725	1	1	1	1	1	1	1	7
ORD	DCA	19	1645	1922	AA 00562	B725	1	1	1	1	1	1	0	6
BOS	DCA	19	1805	1924	AA 00275	B725	1	1	1	1	1	1	0	6
BOS	DCA	19	1810	1926	NW 00293	B725	1	1	1	1	1	1	1	7
BNA	DCA	19	1715	1943	AA 00132	B725	1	1	1	1	1	1	1	7
ORD	DCA	19	1705	1944	UA 00488	B725	1	1	1	1	1	1	1	7
DCA	CLE	19	1950	2057	NW 00345	B725	1	1	1	1	1	1	0	6
MEM	DCA	19	1705	1954	AA 00140	B728	1	1	1	1	1	1	0	6
DCA	DAY	19	1955	2114	TW 00187	B725	1	1	1	1	1	1	0	6
PBI	DCA	19	1655	1900	EA 00790	B727	1	1	1	1	1	1	1	7
MIA	DCA	19	1650	1902	EA 00176	B727	1	1	1	1	1	1	1	7
DCA	CMH	19	1910	2019	TW 00417	B727	1	1	1	1	1	1	1	7
RDU	DCA	19	1835	1922	EA 00334	B727	1	1	1	1	1	1	1	7
DCA	GSO	19	1925	2018	PI 00618	B727	1	1	1	1	1	1	1	7
DCA	BOS	19	1930	2045	EA 00790	B727	1	1	1	1	1	1	1	7
SAV	DCA	19	1810	1935	PA 00066	B727	1	1	1	1	1	1	1	7
DCA	HSV	19	1900	1944	UA 00898	B737	1	1	1	1	1	1	0	6
ROA	DCA	19	1818	1900	PI 00226	B737	1	1	1	1	1	1	1	7
DCA	MIA	19	1930	2145	FLA00131	B737	1	1	1	1	1	1	0	6
DCA	ROA	19	1940	2030	PI 00239	B737	1	1	1	1	1	1	1	7
DCA	LGA	19	1900	2000	NYA00030	DC9	1	0	0	0	0	0	0	1
DCA	LGA	19	1900	2000	NYA00030	DC9	0	1	1	1	1	1	0	5
ISP	DCA	19	1803	1900	AL 00122	DC9	1	1	1	1	1	1	1	7
PVD	DCA	19	1755	1902	AL 00103	DC9	1	1	1	1	1	1	0	6
DCA	PVD	19	1915	2019	AL 00246	DC9	1	1	1	1	1	1	0	6
BOS	DCA	19	1800	1925	NYA00057	DC9	1	1	1	1	1	1	0	6
DCA	ISP	19	1930	2024	AL 00143	DC9	1	1	1	1	1	1	1	7
LGA	DCA	19	1830	1930	NYA00025	DC9	0	1	1	1	1	1	0	5
LGA	DCA	19	1830	1930	NYA00025	DC9	1	0	0	0	0	0	1	2
DCA	ATL	19	1935	2108	EA 00593	DC9	1	1	1	1	1	1	1	7
DCA	PIT	19	1940	2030	AL 00103	DC9	1	1	1	1	1	1	0	6
DCA	BOS	19	1945	2100	NYA00056	DC9	1	1	1	1	1	1	0	6
CKB	DCA	19	1835	1925	KCI00407	E110	1	1	1	1	1	1	0	6
ABE	DCA	19	1838	1925	AAR00221	ND26	1	1	1	1	1	1	0	6
PHL	DCA	19	1840	1930	AL 0956N	ND26	1	1	1	1	1	1	0	6
DCA	PHL	19	1950	2040	AL 0957N	ND26	1	1	1	1	1	1	0	6
DCA	BGM	19	1955	2105	AAR00272	ND26	1	1	1	1	1	1	0	6
PHL	DCA	19	1905	1955	AL 0989N	ND26	1	1	1	1	1	1	0	6
DCA	MDT	19	1905	1945	AL 0736N	NORD	1	1	1	1	1	1	0	6
BGM	DCA	19	1815	1945	FIM00550	PA31	0	1	1	1	1	1	0	5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	AL 0614N	SHD3	0	1	0	0	0	0	1	1

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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
MDT	DCA	19	1915	1959	AL 0721*	SHD3	1	1	1	1	1	1	0	6
DCA	ITH	19	1925	2030	EMP00911	SW4	0	1	1	1	1	1	0	5
OAJ	DCA	19	1745	1903	PI 00912	YS11	1	1	1	1	1	1	1	7
DCA	CHO	19	1950	2027	PI 00949	YS11	1	1	1	1	1	1	1	7
HOURLY	TOTAL						52	54	54	54	54	54	29	351
DCA	CMH	20	2000	2108	AL 00465	BA11	1	1	1	1	1	1	0	6
PIT	DCA	20	1910	2000	AL 00480	BA11	1	1	1	1	1	1	1	7
DCA	HGR	20	2010	2040	AL 0614*	BE99	1	1	1	1	1	1	0	6
DCA	SBY	20	2030	2110	AL 0599*	BE99	1	1	1	1	1	1	0	6
HGR	DCA	20	2010	2040	AL 0668*	BE99	1	1	1	1	1	1	0	6
ACY	DCA	20	2000	2050	DCN00038	BE99	0	1	1	1	1	1	0	5
DCA	SHD	20	2059	2145	AL 00648	BE99	1	1	1	1	1	1	0	6
DCA	BOS	20	2000	2115	DL 00500	B725	1	1	1	1	1	1	0	6
DCA	LGA	20	2000	2100	EA 0253<	B725	1	1	1	1	1	1	1	7
DCA	BNA	20	2000	2036	AA 00275	B725	1	1	1	1	1	1	0	6
DCA	PIT	20	2000	2053	NW 00293	B725	1	1	1	1	1	1	0	6
JAX	DCA	20	1820	2000	PA 00716	B725	1	1	1	1	1	1	0	6
DTW	DCA	20	1850	2003	NW 00370	B725	1	1	1	1	1	1	0	6
LGA	DCA	20	1900	2003	EA 0152<	B725	1	1	1	1	1	1	1	7
PIT	DCA	20	1915	2003	UA 00340	B725	1	1	1	1	1	1	1	7
ORD	DCA	20	1730	2009	UA 00962	B725	1	1	1	1	1	1	0	6
MSP	DCA	20	1700	2011	NW 00068	B725	1	1	1	1	1	1	1	7
ORD	DCA	20	1730	2013	TW 00234	B725	1	1	1	1	1	1	0	6
DCA	BOS	20	2020	2139	AA 00140	B725	1	1	1	1	1	1	0	6
IND	DCA	20	1800	2023	TW 00122	B725	1	1	1	1	1	1	1	7
DCA	IND	20	2025	2057	TW 00549	B725	1	1	1	1	1	1	0	6
DCA	EWR	20	2030	2126	PA 00716	B725	1	1	1	1	1	1	0	6
BNA	DCA	20	1820	2045	BN 00214	B725	1	1	1	1	1	1	1	7
DCA	DTW	20	2050	2206	NW 00371	B725	1	1	1	1	1	1	0	6
DCA	RDU	20	2000	2051	EA 00653	B727	1	1	1	1	1	1	1	7
DCA	JFK	20	2000	2105	PA 00066	B727	1	1	1	1	1	1	1	7
DCA	CLT	20	2015	2116	EA 00391	B727	1	1	1	1	1	1	1	7
ISO	DCA	20	1910	2000	PI 00254	B737	1	1	1	1	1	1	1	7
TYS	DCA	20	1910	2024	UA 00989	B737	1	1	1	1	1	1	0	6
ORF	DCA	20	1947	2025	PI 00282	B737	1	1	1	1	1	1	1	7
MIA	DCA	20	1830	2050	FLA00093	B737	1	1	1	1	1	1	1	7
DCA	OAJ	20	2055	2155	PI 00277	B737	1	1	1	1	1	1	1	7
DCA	CRW	20	2055	2150	PI 00282	B737	1	1	1	1	1	1	1	7
TPA	DCA	20	1755	2000	AL 00138	DC9	1	1	1	1	1	1	1	7
MCO	DCA	20	1820	2010	EA 00858	DC9	1	1	1	1	1	1	1	7
BUF	DCA	20	1925	2023	AL 00335	DC9	0	0	0	0	0	0	1	1
ATL	DCA	20	1850	2024	EA 00904	DC9	1	1	1	1	1	1	1	7
MSP	DCA	20	1720	2025	RC 00676	DC9	1	1	1	1	1	1	0	6
ORF	DCA	20	1949	2028	AL 00100	DC9	1	1	1	1	1	1	0	6
DCA	BUF	20	2030	2134	AL 00138	DC9	1	1	1	1	1	1	1	7
LGA	DCA	20	1930	2030	NYA00027	DC9	1	0	0	0	0	0	0	1
LGA	DCA	20	1930	2030	NYA00027	DC9	0	1	1	1	1	1	0	5
DCA	MSP	[illegible]	2053	2219	RC 00679	DC9	1	1	1	1	1	1	0	6
[illegible]	[illegible]	[illegible]	[illegible]	2015	AL 0617*	DH6	1	1	1	1	1	1	0	6

[redacted]

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ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	BWI	20	2035	2055	AL 0617M	DH6	1	1	1	1	1	1	0	6
DCA	MGW	20	2000	2105	KCI00408	E110	1	1	1	1	1	1	0	6
EWR	DCA	20	1925	2040	HVA00089	E110	0	1	1	1	1	1	0	5
EWR	DCA	20	1935	2030	AAR00379	FA28	1	1	1	1	1	1	0	6
DCA	RIC	20	2050	2130	AAR00379	FA28	1	1	1	1	1	1	0	6
MDT	DCA	20	2020	2059	AL 0736M	NORD	1	1	1	1	1	1	0	6
DCA	BGM	20	2030	2200	FDM00551	PA31	0	1	1	1	1	1	0	5
BWI	DCA	20	1945	2005	AL 0831M	SHD3	0	0	0	0	0	0	1	1
DCA	HGR	20	2010	2040	AL 0614M	SHD3	0	0	0	0	0	0	1	1
DCA	SBY	20	2030	2110	AL 0831M	SHD3	0	0	0	0	0	0	1	1
DCA	MDT	20	2035	2120	AL 0721M	SHD3	1	1	1	1	1	1	0	6
ITH	DCA	20	1900	2010	EMP00971	SW4	1	0	0	0	0	0	0	1
DCA	ITH	20	2040	2145	EMP00970	SW4	1	0	0	0	0	0	0	1
HOURLY TOTAL							49	50	50	50	50	50	23	322
DCA	ALB	21	2100	2203	AL 00406	BA11	1	1	1	1	1	1	0	6
SYR	DCA	21	2011	2111	AL 00400	BA11	1	1	1	1	1	1	0	6
ROC	DCA	21	2034	2133	AL 00366	BA11	1	1	1	1	1	1	0	6
DCA	ACY	21	2110	2200	OCN00039	BE99	0	1	1	1	1	1	0	5
BOS	DCA	21	1945	2100	DL 00433	B725	0	0	0	0	0	0	1	1
BOS	DCA	21	1945	2100	DL 00409	B725	1	1	1	1	1	1	0	6
DCA	CLE	21	2100	2205	UA 00075	B725	1	1	1	1	1	1	1	7
DCA	ORD	21	2100	2148	UA 00207	B725	1	1	1	1	1	1	0	6
DCA	LGA	21	2100	2156	EA 0254<	B725	1	1	1	1	1	1	1	7
LGA	DCA	21	2000	2100	EA 0153<	B725	1	1	1	1	1	1	1	7
MIA	DCA	21	1850	2100	EA 00198	B725	1	1	1	1	1	1	1	7
CMH	DCA	21	2000	2102	TW 00456	B725	1	1	1	1	1	1	1	7
MSP	DCA	21	1800	2104	WA 00502	B725	1	1	1	1	1	1	0	6
ORD	DCA	21	1825	2104	AA 00326	B725	0	0	1	0	0	0	0	1
MSP	DCA	21	1755	2106	NW 00070	B725	1	1	1	1	1	1	1	7
DCA	EWR	21	2115	2205	BN 00214	B725	1	1	1	1	1	1	1	7
MIA	DCA	21	1855	2122	PA 00336	B725	1	1	1	1	1	1	1	7
CLT	DCA	21	2025	2125	EA 00394	B725	1	1	1	1	1	1	1	7
ATL	DCA	21	1959	2130	DL 00318	B725	1	1	1	1	1	1	1	7
DCA	ABE	21	2130	2212	EA 00198	B725	1	1	1	1	1	1	1	7
DCA	STL	21	2130	2235	TW 00137	B725	1	1	1	1	1	1	1	7
STL	DCA	21	1851	2143	AA 00680	B725	1	1	0	1	1	1	0	5
LGA	DCA	21	2100	2155	EA 0154<	B725	1	1	1	1	1	1	1	7
PIT	DCA	21	2010	2100	NW 00376	B727	1	1	1	1	1	1	0	6
ORD	DCA	21	1825	2104	AA 00326	B727	1	1	0	1	1	1	0	5
ORD	DCA	21	1840	2115	UA 00302	B727	1	1	1	1	1	1	0	6
BOS	DCA	21	2010	2127	AA 00607	B727	1	1	1	1	1	1	0	6
CVG	DCA	21	2025	2130	PI 00620	B727	1	1	1	1	1	1	1	7
ORD	DCA	21	1851	2130	AA 00540	B727	1	1	1	1	1	1	1	7
JFK	DCA	21	2040	2144	PA 00800	B727	1	1	1	1	1	1	1	7
MEM	DCA	21	1910	2159	BN 00112	B727	1	1	1	1	1	1	0	6
DCA	HPN	21	2120	2210	FLA00093	B737	0	1	1	1	1	1	0	5
DCA	HPN	21	2120	2210	FLA00093	B737	1	0	0	0	0	0	0	1
BWI	DCA	21	2035	2100	EA 00694	DC9	1	1	1	1	1	1	1	7
[illegible]	DCA	21	2035	2100	EA 00473	DC9	1	1	1	1	1	1	1	7

ANALYSIS OF FLIGHTS BY HOUR AT DCA
DATA FROM MAY 1981 OAG
REPORT PREPARED BY APO-130 -- QUERY 8345

ORIG	DEST	TIME	LEAVE TIME	ARRIVE TIME	FLIGHT NUMBER	EQUIP	SUN	MON	TUE	WED	THU	FRI	SAT	FLIGHT PER WEEK
DCA	LGA	21	2100	2200	NYA00034	DC9	1	1	1	1	1	1	0	6
DCA	SDF	21	2100	2218	EA 00904	DC9	1	1	1	1	1	1	1	7
DCA	ROC	21	2100	2200	AL 00100	DC9	1	1	1	1	1	1	0	6
BOS	DCA	21	1946	2105	EA 00583	DC9	1	1	1	1	1	1	1	7
DCA	ATL	21	2110	2243	EA 00459	DC9	1	1	1	1	1	1	1	7
MDW	DCA	21	1850	2120	MID00052	DC9	1	1	1	1	1	1	0	6
BUF	DCA	21	2025	2123	AL 00170	DC9	1	1	1	1	1	1	0	6
DCA	RDU	21	2130	2217	EA 00583	DC9	1	1	1	1	1	1	1	7
RIC	DCA	21	2045	2115	AL 00625	DH6	1	1	1	1	1	1	0	6
DCA	EWR	21	2110	2220	HVA00090	E110	0	1	1	1	1	1	0	5
BGM	DCA	21	1959	2109	AAR00273	ND26	1	1	1	1	1	1	0	6
DCA	PHL	21	2110	2200	AL 0906M	ND26	1	1	1	1	1	1	0	6
DCA	RIC	21	2135	2215	AAR00273	ND26	1	1	1	1	1	1	0	6
PHL	DCA	21	2050	2140	AL 0976M	ND26	1	1	1	1	1	1	0	6
DCA	MDT	21	2129	2215	AL 0737M	NORD	1	1	1	1	1	1	0	6
BWI	DCA	21	2110	2130	AL 0637M	SHD3	1	1	1	1	1	1	0	6
BWI	DCA	21	2125	2145	AL 0833M	SHD3	1	1	1	1	1	1	0	6
DCA	SBY	21	2145	2225	AL 0660M	SHD3	1	1	1	1	1	1	0	6
LYH	DCA	21	2020	2109	PI 00929	YS11	0	0	0	0	0	0	1	1
CHO	DCA	21	2035	2113	PI 00919	YS11	1	1	1	1	1	1	0	6
HOURLY TOTAL							49	51	50	51	51	51	24	327
BDL	DCA	22	2055	2200	AL 00378	BA11	1	1	1	1	1	1	0	6
DCA	BDL	22	2200	2300	AL 00358	BA11	1	1	1	1	1	1	0	6
DCA	SYR	22	2200	2303	AL 00482	BA11	1	1	1	1	1	1	0	6
DCA	ATL	22	2200	2333	DL 00395	B725	1	1	1	1	1	1	1	7
DTW	DCA	22	2050	2200	NW 00372	B725	1	1	1	1	1	1	1	7
ORD	DCA	22	1925	2200	UA 00146	B725	1	1	1	1	1	1	1	7
STL	DCA	22	1910	2200	TW 00240	B725	1	1	1	1	1	1	0	6
DCA	ORF	22	2200	2245	PI 00620	B727	1	1	1	1	1	1	1	7
CLE	DCA	22	2100	2200	UA 00638	B737	1	1	1	1	1	1	0	6
CRW	DCA	22	2115	2200	PI 00228	B737	1	1	1	1	1	1	1	7
TPA	DCA	22	2000	2200	FLA00027	B737	1	1	1	1	1	1	0	6
DCA	MIA	22	2200	0017	EA 00473	DC9	1	1	1	1	1	1	1	7
DCA	PVD	22	2200	2304	AL 00109	DC9	1	1	1	1	1	1	0	6
LGA	DCA	22	2100	2200	NYA00029	DC9	1	1	1	1	1	1	0	6
MIA	DCA	22	1940	2200	EA 00200	DC9	1	1	1	1	1	1	1	7
PVD	DCA	22	2053	2200	AL 00251	DC9	1	1	1	1	1	1	0	6
DCA	PHF	22	2200	2245	AL 0625M	DH6	1	1	1	1	1	1	0	6
DCA	PHL	22	2200	2245	AL 0977M	ND26	1	1	1	1	1	1	0	6
DCA	BWI	22	2200	2220	AL 0635M	SHD3	1	1	1	1	1	1	0	6
DCA	FAY	22	2200	2327	PI 00965	YS11	1	1	1	1	1	1	1	7
LYH	DCA	22	2111	2200	PI 00976	YS11	1	1	1	1	1	1	0	6
HOURLY TOTAL							21	21	21	21	21	21	8	134
FINAL TOTALS							638	774	771	771	772	772	541	5039

843 RECORDS TOTALED

APPENDIX C

METHODOLOGY FOR ESTIMATING

NOISE IMPACTS

APPENDIX C

METHODOLOGY FOR ESTIMATING NOISE IMPACTS

1. Integrated Noise Model

The Office of Environment and Energy's Integrated Noise Model (INM) was used to forecast major noise impacts. The model uses an input forecast of fleet mix, number of operations, and stage lengths to generate a set of contours representing levels of noise exposure. Noise exposure is measured by the Yearly Average Day-Night Sound Level, which is a weighted summation of impacts of individual aircraft movements. The method assigns a 10 dB penalty to movements between 10:00 p.m. and 7:00 a.m., reflecting the increased effect of operations when background noise levels are lower and most people are asleep.

The Ldn level corresponds, in general, to the Noise Exposure Forecast (NEF) scale of noise exposure, except for a constant adjustment of 35 dB. That is, NEF 30 is equivalent to 65 dB, NEF 40 is equivalent to 75 dB, and so on. 65 dB is considered to be the minimum level at which the sound is annoying to most people.

The Integrated Noise Model produces noise contours (isoquants at selected noise levels) embracing ground areas impacted by given or higher noise levels resulting from an identified or assumed set of aircraft operations. For each contour generated, the Integrated Noise Model accesses

Census data to calculate the demographic characteristics of the area within the contour. These demographic data printouts from the model are shown, for selected cases of interest, in Figure C-1.

2. Ldn Formula

In some cases it is appropriate to use other methods in addition to or in place of the INM forecasts, since the model is relatively insensitive to small changes in number of operations. For such cases, the basic Ldn formula is used: $Ldn = SEL + 10 \log (N_D + 10 N_N) - 49.4$ dB, where SEL is the mean single event noise, in decibels, of each aircraft operation; N_D is the number of day (7 a.m. to 10 p.m.) operations; and N_N is the number of night (10 p.m. to 7 a.m.) operations. The use of this formula to measure impacts of small numbers of operations is consistent with the INM and uses the same definition of Ldn; it has also been shown to be consistent with other studies which attempted to relate changes in sound level to changes in contour areas.[1/]

3. Effect of Noise on Property Values

Various studies have attempted to quantify the impact of noise on quality of life. The method used here is adapted from an earlier, extensive study which reviewed the earlier work and analyzed in great detail the

1/ Day, C.F., and White, J.M., "A Slot Allocation Model for High-Density Airports, "Federal Aviation Agency contract report number FAA-APO-80- , Contract Number DOT-FA-79WA-4334, August 1980, Appendix B. This report in turn references other work on noise estimation performed by the contractor, J. Watson Noah, Inc., for FAA and the Civil Aeronautics Board.

historical and forecast effects of noise in the Metropolitan Washington ares.[2/] This study featured a regression experiment which supported the hypothesis that aircraft noise impacts are reflected in reduced values of residential and rental property. The study found that a 1-dB change in noise exposure would result in a 1.5-percent change in property values and rents. This estimate was consistent with the previous studies reviewed and covered marginal changes in noise exposure ranging from 1.01 dB to 33.27 dB. While the regression analysis provides an efficient method of generalizing the impact of noise exposure on areawide property and rental values, it is not considered adequate for establishing changes in the value of specific parcels of property. Such valuation requires an assessment of all the specific factors and unique features affecting the parcel.

For the economic impact analysis of the current policy proposals, the affected area was considered to be that within the base case 65-dB contour, that is, those residences and rental properties currently affected by noise from National Airport. The Integrated Noise Model was used to generate new 65 dB and 75 dB contours for major policy cases, and the demographic data from the model were used to estimate the number of households receiving significant noise impacts under the new scenario. Value of property affected was estimated as the percentage of owner-occupied households (20 percent for most cases) times number of

2/ Fromme, William R., "Conceptual Framework for Trade-Off Analysis of Multiple Airport Operation: Case Study of the Metropolitan Washington Airports," PhD. dissertation in Civil Engineering, University of Maryland, 1978.

households within the contour as of (1970) times average value of owner-occupied residences as of (1970) times 3. The latter factor is an estimate by the Arlington and Alexandria, Virginia, assessors' offices of the 1970-1980 inflation factor for the value of residential property in the affected areas. This estimate does not include the effect of improvements and new construction, so the resulting estimates of property values are likely to be low.

Similarly, the value of rental properties affected is taken as the percent of households renting (usually 80 percent) times the number of households times the average monthly rent times 12 (to annualize rents) times 3. Again, the assessors' offices for the affected communities estimated that rents had roughly tripled for comparable properties in the area from 1970 to 1980. As before, this estimate is likely to be low since it does not include the effects of improvements and new construction.

It should also be noted that residential property values are considered to increase immediately upon reduction of noise levels, while the change in rents is an annual stream which is discounted to arrive at a present value. Therefore, conversions of rental properties to condominiums would change the timing of the benefit in a way which would increase its present value. Since such considerations are not take into account in this study, a further bias toward underestimation may have affected the predicted effects of noise on property values.

When applying a particular change in Ldn levels to property values, this analysis assumed that no impacts on areas whose present noise exposure is below 65 dB are significant since 65 dB is the threshold of annoyance. Therefore, if a 5 dB reduction in noise was predicted, the resulting benefit could not be applied fully to the entire area within the 65 dB contour, as some of those properties would be at the 66 dB level and therefore would be relieved of noise annoyance after only a 1dB reduction, and would not realize any further benefit from airport noise reduction. Estimation of the number of residences that would not receive the full property value change of a given noise exposure reduction was carried out by interpolation. It was assumed that the contours could be subdivided uniformly with respect to Ldn levels. The full reduction was applied to that portion of the affected area that was estimated to presently experience high enough noise impact to benefit from the full reduction. For the remaining portion of the affected area, half the reduction was applied. That is, a 5 dB change would be applied in full to the base case 75 dB contour area and to half of the area between the base case 65 dB and 75 dB contours; the other half of the area between the base case 65 dB and 75 dB contours would be assumed to receive a 2.5 db reduction. Similarly, a 2 dB reduction would be applied in full to the entire base case 75 dB area and 80 percent of the area between the 65 dB and 75 dB contours; the remaining 20 percent of the area between the 65 dB and 75 dB contours would be assumed to receive a 1 dB reduction. Since detailed demographic data were not available on such small areas, it is impossible to assess the effect of this simplification on the estimates.

Figure C-1: Base Case 65 dB Area (May, 1981)

1

DCAPT33
DCA 1✓
CASE 2 - LDN 65

SUMMARY REPORT

PAGE 1

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

22 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1980 POPULATION	97747	-11076
1980 HOUSEHOLDS	45213	819
1980 PER CAP INCOME	$12482	$ 6458

ANNUAL COMPOUND GROWTH -1.1%

1970 CENSUS DATA

POPULATION

TOTAL	108823	100.0%
WHITE	82018	75.4%
NEGRO	24844	22.8%
OTHER	1961	1.8%
SPAN	3077	2.8%

HOUSEHOLD PARAMETERS

FAMILY POP	69538	63.9%
INDIVIDUALS	27019	24.8%
GROUP QTRS	12266	11.3%
NO OF HH+S	44394	
NO OF FAM+S	22494	
AVG HH SIZE	2.2	
AVG FAM SIZE	3.1	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 12039	$ 16476
HOME VALUE	$ 31638	$ 35697
MONTHLY RENT	$ 135	$ 149
AGE (MALE)	28.6	—
AGE (FEMALE)	30.7	—
EDUCATION (YEARS)	11.8	—

HOUSING

PERCENT OWNERS	19.3%
PERCENT RENTERS	80.7%

CACI,INC

NOTE: Contour Area is 24.7 square miles.

Figure C-1 (continued): Base Case 75 dB Area (May, 1981)

1 SUMMARY REPORT PAGE 1

DCAPTS3
DCA 1/2
CASE 2 - LDN 75

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

19 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1980 POPULATION	6137	-330
1980 HOUSEHOLDS	2952	115
1980 PER CAP INCOME	$12143	$ 6472

ANNUAL COMPOUND GROWTH -.5%

1970 CENSUS DATA

POPULATION		
TOTAL	6467	100.0%
WHITE	4214	65.2%
NEGRO	2195	33.9%
OTHER	58	.9%
SPAN	57	.9%

HOUSEHOLD PARAMETERS		
FAMILY POP	4726	73.1%
INDIVIDUALS	1610	24.9%
GROUP QTRS	131	2.0%
NO OF HH+S	2837	
NO OF FAM+S	1561	
AVG HH SIZE	2.2	
AVG FAM SIZE	3.0	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 9140	$ 11761
HOME VALUE	$ 24198	$ 31399
MONTHLY RENT	$ 119	$ 124
AGE (MALE)	27.8	--
AGE (FEMALE)	28.5	--
EDUCATION (YEARS)	11.3	--

HOUSING	
PERCENT OWNERS	20.2%
PERCENT RENTERS	79.8%

CACI,INC

NOTE: Contour area is 5.9 square miles.

Figure C-1 (continued): 65 Ldn Area
For October, 1981, 38-Slot Quota, Noise Limits

1 SUMMARY REPORT PAGE 1

DCAPT20
DCA
1981 38 SLOTS-LDN 65

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

28 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1980 POPULATION	97412	-11200
1980 HOUSEHOLDS	43754	947
1980 PER CAP INCOME	$12080	$ 6095

ANNUAL COMPOUND GROWTH -1.1%

1970 CENSUS DATA

POPULATION

TOTAL	108612	100.0%
WHITE	82002	75.5%
NEGRO	24625	22.7%
OTHER	1985	1.8%
SPAN	3067	2.8%

HOUSEHOLD PARAMETERS

FAMILY POP	67578	62.2%
INDIVIDUALS	26106	24.0%
GROUP QTRS	14928	13.7%
NO OF HH+S	42807	
NO OF FAM+S	21715	
AVG HH SIZE	2.2	
AVG FAM SIZE	3.1	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 11849	$ 16451
HOME VALUE	$ 33191	$ 36342
MONTHLY RENT	$ 133	$ 147
AGE (MALE)	27.7	--
AGE (FEMALE)	29.7	--
EDUCATION (YEARS)	11.8	--

HOUSING

PERCENT OWNERS	18.8%
PERCENT RENTERS	81.2%

CACI,INC

NOTE: Contour area is 25.7 square miles.

Figure C-1 (continued): 75 Ldn Area

For October, 1981, 38-Slot Quota, Noise Limits

1 SUMMARY REPORT PAGE 1

DCAPT20
DCA
1981 38 SLOTS-LDN 75

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

20 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1980 POPULATION	6137	-330
1980 HOUSEHOLDS	2952	115
1980 PER CAP INCOME	$12143	$ 6472

ANNUAL COMPOUND GROWTH -.5%

1970 CENSUS DATA

POPULATION		
TOTAL	6467	100.0%
WHITE	4214	65.2%
NEGRO	2195	33.9%
OTHER	58	.9%
SPAN	57	.9%

HOUSEHOLD PARAMETERS		
FAMILY POP	4726	73.1%
INDIVIDUALS	1610	24.9%
GROUP QTRS	131	2.0%
NO OF HH+S	2837	
NO OF FAM+S	1561	
AVG HH SIZE	2.2	
AVG FAM SIZE	3.0	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 9140	$ 11761
HOME VALUE	$ 24188	$ 31399
MONTHLY RENT	$ 118	$ 124
AGE (MALE)	27.8	--
AGE (FEMALE)	28.5	--
EDUCATION (YEARS)	11.3	--

HOUSING	
PERCENT OWNERS	20.2%
PERCENT RENTERS	79.8%

CACI,INC

NOTE: Contour area is 5.9 square miles.

Figure C-1 (continued): 65 Ldn Area

For October, 1986, 38-Slot Quota, No Noise Limits

1 SUMMARY REPORT PAGE 1

DCAPT14 + 15
DCA
1986 38 SLOTS -LDN 65

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

21 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1980 POPULATION	59149	-7392
1980 HOUSEHOLDS	26992	81
1980 PER CAP INCOME	$11797	$ 5876

ANNUAL COMPOUND GROWTH -1.2%

1970 CENSUS DATA

POPULATION		
TOTAL	66541	100.0%
WHITE	50943	76.6%
NEGRO	14165	21.3%
OTHER	1433	2.2%
SPAN	1929	2.9%

HOUSEHOLD PARAMETERS		
FAMILY POP	41139	61.8%
INDIVIDUALS	16532	24.8%
GROUP QTRS	8871	13.3%
NO OF HH+S	26911	
NO OF FAM+S	13423	
AVG HH SIZE	2.1	
AVG FAM SIZE	3.1	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 11321	$ 14554
HOME VALUE	$ 22680	$ 30419
MONTHLY RENT	$ 138	$ 150
AGE (MALE)	27.5	--
AGE (FEMALE)	29.3	--
EDUCATION (YEARS)	11.8	--

HOUSING	
PERCENT OWNERS	15.4%
PERCENT RENTERS	84.6%

CACI,INC

NOTE: Contour area is 19.7 square miles.

Figure C-1 (continued): 75 Ldn Area

For October, 1986, 38-Slot Quota, No Noise Limits

1

SUMMARY REPORT PAGE 1

DCAPT14 + 15
DCA
1986 38 SLOTS -LDN 75

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

20 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1980 POPULATION	1237	-60
1980 HOUSEHOLDS	734	66
1980 PER CAP INCOME	$17372	$ 9996

ANNUAL COMPOUND GROWTH -.5%

1970 CENSUS DATA

POPULATION		
TOTAL	1297	100.0%
WHITE	1243	95.8%
NEGRO	38	2.9%
OTHER	16	1.2%
SPAN	0	0.0%

HOUSEHOLD PARAMETERS		
FAMILY POP	844	65.1%
INDIVIDUALS	441	34.0%
GROUP QTRS	12	.9%
NO OF HH+S	668	
NO OF FAM+S	328	
AVG HH SIZE	1.9	
AVG FAM SIZE	2.6	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 11923	$ 15464
HOME VALUE	$ 55323	$ 50149
MONTHLY RENT	$ 148	$ 173
AGE (MALE)	29.8	--
AGE (FEMALE)	39.6	--
EDUCATION (YEARS)	12.6	--

HOUSING	
PERCENT OWNERS	15.4%
PERCENT RENTERS	84.6%

CACI•INC

NOTE: Contour area is 5.2 square miles.

Figure C-1 (continued): 65 Ldn Area
For October, 1990, 38-Slot Quota, No Noise Limits

1 SUMMARY REPORT PAGE 1

DCAPT19
DCA
S[redacted]-LDN 65

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

20 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1990 POPULATION	42129	-4551
1990 HOUSEHOLDS	18453	6
1990 PER CAP INCOME	$10819	$ 5705

ANNUAL COMPOUND GROWTH -1.0%

1970 CENSUS DATA

POPULATION		
TOTAL	46680	100.0%
WHITE	32669	70.0%
NEGRO	13224	28.3%
OTHER	787	1.7%
SPAN	899	1.9%

HOUSEHOLD PARAMETERS		
FAMILY POP	35799	76.7%
INDIVIDUALS	8802	18.9%
GROUP QTRS	2079	4.5%
NO OF HH'S	18447	
NO OF FAM'S	11144	
AVG HH SIZE	2.4	
AVG FAM SIZE	3.2	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 10946	$ 13311
HOME VALUE	$ 20549	$ 25379
MONTHLY RENT	$ 137	$ 147
AGE (MALE)	28.9	--
AGE (FEMALE)	30.5	--
EDUCATION (YEARS)	11.6	--

HOUSING	
PERCENT OWNERS	21.2%
PERCENT RENTERS	78.8%

CACI,INC

NOTE: Contour area is 17.9 square miles.

Figure C-1 (continued): 75 Ldn Area
For October, 1990, 38-Slot Quota, No Noise Limits

1 SUMMARY REPORT PAGE 1

DCAPT18
DCA
[redacted]-LDN 75

	DEG	MIN	SEC
LATITUDE	38	51	42
LONGITUDE	77	2	39

20 POINT POLYGON

WEIGHTING PCT 100%

	LATEST	CHANGE FROM 70
1990 POPULATION	1237	-60
1990 HOUSEHOLDS	734	66
1990 PER CAP INCOME	$17372	$ 9996

ANNUAL COMPOUND GROWTH -.5%

1970 CENSUS DATA

POPULATION

TOTAL	1297	100.0%
WHITE	1243	95.8%
NEGRO	38	2.9%
OTHER	16	1.2%
SPAN	0	0.0%

HOUSEHOLD PARAMETERS

FAMILY POP	844	65.1%
INDIVIDUALS	441	34.0%
GROUP QTRS	12	.9%
NO OF HH'S	668	
NO OF FAM'S	328	
AVG HH SIZE	1.9	
AVG FAM SIZE	2.6	

	MEDIAN	AVERAGE
FAMILY INCOME	$ 11923	$ 15464
HOME VALUE	$ 55323	$ 50149
MONTHLY RENT	$ 148	$ 173
AGE (MALE)	29.8	--
AGE (FEMALE)	29.6	--
EDUCATION (YEARS)	12.6	--

HOUSING

PERCENT OWNERS	15.4%
PERCENT RENTERS	84.6%

CACI,INC

NOTE: Contour area is 4.7 square miles.

APPENDIX D

SERVICE AVAILABILITY

AT

WASHINGTON NATIONAL AIRPORT

TABLE I-a

Air Carrier Service Availability Originating at DCA

Weekday Activity

	AA 72S	AA 727	AL SH3	AL BE9	AL DC9	AL B11	AL ND2	AL DH6	AK ND2	AK F28	BN 72S	BN 727	CB SWM	CB PAN	CJ BE9	DL 72S	EA 72S	EA 727	EA DC9	KC EMB	MI DC9	NC EMB	NO GRS
Albany					1	2																	
Allentown									4								1						
Asbury Park																							
Atlanta																9	3		4				
Atlantic City																							
Baltimore			4	3				3									2		1				
Binghamton									2				1	3									2
Boston	6															7	1	2	3				
Bridgeport																							
Buffalo					3	1																	
Charleston																							
Charlotte																		3	1				
Charlottesville																							
Chicago	3	4																			4		
Cincinnati					2	1																	
Cleveland																							
Columbus						1																	
Dayton						1																	
Detroit					2																		
Elkins																				1			
Fayetteville																							
Greensboro																			2				
Hagerstown				2																			
Hartford					2	4																	
Harrisburg			5	2			3																
Hot Springs															2								
Huntsville																							
Indianapolis																							
Islip					2																		
Ithaca																							
Jacksonville, Fla.																		1	1				
Jacksonville, N.C.																							
Kinston																							
Knoxville																							

NOTE: An index of air carriers and equipment types is on the last page of this appendix.

Appendix D

TABLE I-b

Air Carrier Service Availability Originating at DCA

Weekday Activity

	NW 72S	NW 727	NY DC9	OZ DC9	PA 72S	PA 727	PI 73S	PI YS1	PI 727	QH 737	RC DC9	TW 72S	TW 727	UA 72S	UA 727	UA 737	UR SWM	VL EMB	VN BE9	WA 72S	PM BE9	City Totals	Air Miles	Ticket Prices
Albany																						3	314	37.00
Allentown																						5	147	56.00
Asbury Park																			1			1	178	62.22
Atlanta																						16	550	91.00
Atlantic City																			3			3	136	48.62
Baltimore							1															14	26	37.00
Binghamton																						8	235	88.00
Boston	1		4																			24	396	79.00
Bridgeport																					2	2	310	69.00
Buffalo																						4	293	87.00
Charleston							3															3	251	85.00
Charlotte																						4	334	77.00
Charlottesville								3														3	94	64.00
Chicago												1	1	10	1							24	597	132.00
Cincinnati									1													4	412	110.00
Cleveland	3													1		4						8	310	89.00
Columbus												3	1									5	323	94.00
Dayton												2										3	392	110.00
Detroit	6																					8	405	110.00
Elkins																						1	153	51.00
Fayetteville								2														2	288	85.00
Greensboro							1		1													4	252	80.00
Hagerstown																						2	67	55.00
Hartford																						6	310	90.00
Harrisburg																						10	89	57.00
Hot Springs																						2	231	70.00
Huntsville																1						1	616	[illegible]
Indianapolis												1	1									2	500	132.00
Islip																						2	246	78.00
Ithaca																	3					3	249	[illegible]
Jacksonville, Fla.				1																		3	641	[illegible]
Jacksonville, N.C.							3															3	[illegible]	90.00
Kinston							1															1	248	84.00
Knoxville																2						2	[illegible]	122.00

NOTE: Ticket prices are tourist fares listed in the May, 1981 Official Airline Guide. Where a range of fares is listed with a difference greater than $5.00, the median of the range is listed. Where the range is equal to or less than $5.00, the top of the range is listed.

TABLE I-o

Air Carrier Service Availability Originating at DCA

Weekday Activity

	AA 72S	AA 727	AL SH3	AL BE9	AL DC9	AL B11	AL ND2	AL DH6	AK ND2	AK F28	BN 72S	BN 727	CB SWM	CB PAN	CJ BE9	DL 72S	EA 72S	EA 727	EA DC9	KC EMB	NI DC9	NC EMB	NO GRS
Lexington																			1				
Louisville																							
Lynchburg											2	1											
Memphis	2																3	1	2				
Miami																							
Milwaukee																							
Minneapolis																				1			
Morgantown																							
Myrtle Beach												2											
Nashville	3																						
New Bern																						3	
New Haven											1	1					15						
New York										4	1						4					1	
Newark																							
Newport News			1					4															
Norfolk					2	1											1		1				
Orlando					1																		
Philadelphia							9	10															
Pittsburgh					3																		
Providence					2	2											1	1	3				
Raleigh-Durham																							
Richmond								1	5	1													
Roanoke																							
Rochester					3																		
Salisbury			1	3																			
Savannah																							
State College Pa.																							
Staunton				1				1															
St. Louis	1	1																					
Syracuse					1	2													2				
Tampa					1														1				
West Palm Beach																		1					
Wilkes-Barre													2							2			
Clarksburg																							
White Plains																							
Totals	15	5	11	11	25	15	12	19	11	5	4	4	3	3	2	16	32	9	21	4	4	4	2

TABLE I-d

Air Carrier Service Availability Originating at DCA

Weekday Activity

	NW 72S	NW 727	NY DC9	OZ DC9	PA 72S	PA 727	PI 73S	PI YSI	PI 727	QH 737	RC DC9	TW 72S	TW 727	UA 72S	UA 727	UA 737	UR SWM	VL EMB	VM BE9	WA 72S	PM BE9	City Totals	Air Miles	Ticket Prices
Lexington							2															2	416	106.00
Louisville							2															3	475	115.00
Lynchburg							1	1														2	161	80.00
Memphis																						5	763	138.00
Miami					1	2				2												11	922	143.00
Milwaukee	1																					1	634	145.00
Minneapolis	4										2									2		8	930	160.00
Morgantown																						1	164	53.00
Myrtle Beach																						0	363	118.00
Nashville																						5	564	120.00
New Bern																						0	264	83.00
New Haven																						3	273	79.00
New York			14			4						2										37	205	59.00
Newark					2	1																13	205	59.00
Newport News																						5	125	67.00
Norfolk							2															5	145	72.00
Orlando					1	1																5	762	144.00
Philadelphia																						19	117	51.00
Pittsburgh	4	1												1								9	204	62.00
Providence																						4	353	103.00
Raleigh-Durham							2															7	231	68.00
Richmond																		3				10	98	55.00
Roanoke							2	2														4	195	82.00
Rochester																						3	293	92.00
Salisbury																						4	90	60.00
Savannah					1																	1	523	132.00
State College Pa.																						0	137	70.00
Staunton																						2	111	64.00
St. Louis				2								5	1									10	720	161.00
Syracuse																						3	295	96.00
Tampa						2				1												6	818	150.00
West Palm Beach					1					1												3	861	163.00
Wilkes-Barre																						3	181	76.00
Clarksburg																						2	172	56.00
White Plains										3												3	231	69.00
Totals	19	1	18	3	6	10	20	8	2	7	2	14	4	12	1	7	3	3	4	2	2	385		

NOTE: Ticket prices are tourist fares listed in the May, 1981 Official Airline Guide. Where a range of fares is listed with a difference greater than $5.00, the median of the range is listed. Where the range is equal to or less than $5.00, the top of the range is listed.

Appendix D

TABLE II-a

Air Carrier Service Availability Terminating at DCA

Weekday Activity

	AA 72S	AA 727	AL SH3	AL BE9	AL DC9	AL B11	AL ND2	AL DH6	AK ND2	AK F28	BN 72S	BN 727	CB SWM	CB PAN	CJ BE9	DL 72S	EA 72S	EA 727	EA DC9	KC EMB	MI DC9	NC EMB	NO GRS
Albany					2	2																	
Allentown									4								1						
Asbury Park																							
Atlanta																9	2	1	3				
Atlantic City																							
Baltimore			2	1				3											3				
Binghamton									2				1	3									2
Boston	4	2														7	1	1	4				
Bridgeport																							
Buffalo					4																		
Charleston																							
Charlotte																	2		2				
Charlottesville																							
Chicago	5	2																			4		
Cincinnati					1	2																	
Cleveland																							
Columbus						2																	
Dayton																							
Detroit					2																		
Elkins																				1			
Fayetteville																							
Greensboro																	1		1				
Hagerstown			1	3																			
Hartford					2	2																	
Harrisburg			5				3																
Hot Springs															2								
Huntsville																							
Indianapolis																							
Islip					1	1																	
Ithaca																							
Jacksonville, Fla.																	1		1				
Jacksonville, N.C.																							
Kinston																							
Knoxville																							

TABLE II-b

Air Carrier Service Availability Terminating at DCA

Weekday Activity

	NW 72S	NW 727	NY DC9	OZ DC9	PA 72S	PA 727	PI 73S	PI YS1	PI 727	QH 737	RC DC9	TW 72S	TW 727	UA 72S	UA 727	UA 737	UR SWM	VL EMB	VM BE9	WA 72S	PM BE9	City Totals	Air Miles	Ticket Prices
Albany																						4	314	37.00
Allentown																						5	147	56.00
Asbury Park																			1			1	178	62.22
Atlanta																						15	550	91.00
Atlantic City																			3			3	136	48.62
Baltimore							1															10	26	37.00
Binghamton																						8	235	88.00
Boston	1		4																			24	396	79.00
Bridgeport																					2	2	310	69.00
Buffalo																						4	293	87.00
Charleston							3	1														4	251	85.00
Charlotte																						4	334	77.00
Charlottesville							1	2														3	94	64.00
Chicago												3	1	10	1							26	597	132.00
Cincinnati									1													4	412	110.00
Cleveland	4													1	4							9	310	89.00
Columbus												2	1									5	323	94.00
Dayton												1	1									2	392	110.00
Detroit	6																					8	405	110.00
Elkins																						1	153	51.00
Fayetteville							2															2	288	85.00
Greensboro							2															4	252	80.00
Hagerstown																						4	67	55.00
Hartford																						4	310	90.00
Harrisburg																						8	89	57.00
Hot Springs																						2	231	70.00
Huntsville																1						1	616	142.00
Indianapolis												2										2	500	132.00
Islip																						2	246	78.00
Ithaca																	3					3	249	96.00
Jacksonville, Fla.					1																	3	641	138.00
Jacksonville, N.C.							1	1														2	289	90.00
Kinston							1															1	248	84.00
Knoxville																2						2	430	122.00

NOTE: Ticket prices are tourist fares listed in the May, 1981 Official Airline Guide. Where a range of fares is listed with a difference greater than $5.00, the median of the range is listed. Where the range is equal to or less than $5.00, the top of the range is listed.

TABLE II-c

Air Carrier Service Availability Terminating at DCA

Weekday Activity

	AA 72S	AA 727	AL SH3	AL BE9	AL DC9	AL B11	AL ND2	AL DH6	AK ND2	AK F28	BN 72S	BN 727	CB SWM	CB PAN	CJ BE9	DL 72S	EA 72S	EA 727	EA DC9	KC EMB	MI DC9	NC EMB	NO GRS
Lexington																							
Louisville																			1				
Lynchburg																							
Memphis	2										1	1											
Miami																	1	2	3				
Milwaukee																							
Minneapolis																							
Morgantown																				1			
Myrtle Beach																							
Nashville	2	[illegible]									2	1											
New Bern																							
New Haven																						3	
New York												2					15						
Newark										4	1						4					1	
Newport News			1					3															
Norfolk					3	1																	
Orlando					1												1		1				
Philadelphia							9	10															
Pittsburgh					3	1																	
Providence					5																		
Raleigh-Durham																		2	3				
Richmond								2	5	1													
Roanoke																							
Rochester						2																	
Salisbury			2	3																			
Savannah																							
State College Pa.				1																			
Staunton				1				1															
St. Louis	2	1																					
Syracuse					1	2																	
Tampa					1												1	1					
West Palm Beach																		1					
Wilkes-Barre													2				1						
Clarksburg																				2			
White Plains																							
Totals	15	6	11	9	26	15	12	19	11	5	4	4	3	3	2	16	31	8	22	4	4	4	2

TABLE II-d

Air Car.ier Service Availability Terminating at DCA

Weekday Activity

	NW 72S	NW 727	NY DC9	OZ DC9	PA 72S	PA 727	PI 73S	PI YSI	PI 727	QH 737	RC DC9	TW 72S	TW 727	UA 72S	UA 727	UA 737	UR SWM	VL EMB	VM BE9	WA 72S	PM BE9	City Totals	Air Miles	Ticket Prices
Lexington							1															1	416	106.00
Louisville							1		1													3	475	115.00
Lynchburg							1	2														3	161	80.00
Memphis																						4	763	138.00
Miami					2	1				1												10	922	143.00
Milwaukee	1																					1	634	145.00
Minneapolis	4										2									2		8	930	160.00
Morgantown																						1	164	53.00
Myrtle Beach							1															1	363	118.00
Nashville																						6	564	120.00
New Bern																		1				1	264	83.00
New Haven																						3	273	79.00
New York			14		1	4						1	1									38	205	59.00
Newark					1	2																13	205	59.00
Newport News																						4	125	67.00
Norfolk							1		2													7	145	72.00
Orlando					1	1																5	762	144.00
Philadelphia																						19	117	51.00
Pittsburgh	3	1												1								9	204	62.00
Providence																						5	353	103.00
Raleigh-Durham							1															6	231	68.00
Richmond																		2				10	98	55.00
Roanoke							2	2														4	195	82.00
Rochester																						2	293	92.00
Salisbury																						5	90	60.00
Savannah						1																1	523	132.00
State College Pa.																						1	137	70.00
Staunton																						2	111	64.00
St. Louis				2								5										10	720	161.00
Syracuse																						3	295	96.00
Tampa						1				2												6	818	150.00
West Palm Beach						1				1												3	861	163.00
Wilkes-Barre																						3	181	76.00
Clarksburg																						2	176	56.00
White Plains										3												3	231	69.00
Totals	19	1	18	2	6	11	19	8	4	7	2	14	4	12	5	3	3	3	4	2	2	385		

NOTE: Ticket prices are tourist fares listed in the May, 1981 *Official Airline Guide*. Where a range of fares is listed with a difference greater than $5.00, the median of the range is listed. Where the range is equal to or less than $5.00, the top of the range is listed.

INDEX: Air Carrier and Equipment Listed,
Tables I and II, Appendix D

Air Carriers		Equipment
AA American	B11	BAC 111 (all series)
AL U.S. Air	BE9	Beechcraft 99
BN Braniff	727	Boeing 727 (all series)
DL Delta	72S	Boeing 727-200
EA Eastern	737	Boeing 737 (all series)
PA Pan American	73S	Boeing 737-200
NW Northwest	DC9	McDonnel Douglas DC9 (all series)
PI Piedmont	DH6	DeHavilland DHC-6-300
TW Trans World	EMB	Bandeirante
UA United	F28	Fokker F-28
ND Air North	GRS	Grumman Gulfstream
QH Air Florida	NDS	Nord 262
AK Altair	PAN	Piper Navajo
NC Newair	SH3	Short Bros. and Harland SD3-30
UR Empire	SWM	Swearingen Metro
KC Aeromech	YS1	Namco YS-11
OZ Ozark		
RC Republic		
WA Western		
MI Midway		
VL Midsouth		
CJ Colgan		
NY New York Air		
PM Pilgrim		
VM Ocean		
CB Commuter		

APPENDIX E

Methodology for Estimating

Ground Access Time

APPENDIX E

Methodology for Estimating Ground Access Time

Data

The data are taken from "Washington-Baltimore Airport Access Survey," May 1968, prepared by ABT Associates, Inc. The data are summarized in Table E-1.

TABLE E-1

Distribution of Trips to Area Airports
by Off-Peak Driving Time of Passengers

Time	DCA	IAD	BWI
0-15 minutes	.50	.03	.04
16-30 minutes	.36	.39	.43
Over 30 minutes	.14	.58	.53
Total	1.00	1.00	1.00

Assumptions

To calculate the mean travel time to each airport, a time value must be assigned to each time range. For the 0-15 minute category, 7.5 minutes is assigned. For the 16-30 minute category, 22.5 minutes is assigned. For the over 30 minute category, it is assumed that nearly all trips are between 30 and 45 minutes in length, and therefore, a value of 37.5 minutes is assigned.

A second assumption is that because the survey was actually conducted in 1966, the results are not a correct description of the present situation nor is it an accurate projection of the future. Over the past fifteen years, the largest increases in population have occurred closer to BWI and IAD than to DCA, because the suburban areas are growing substantially faster than the downtown area. Increasing numbers of passengers are beginning their ground travel in suburban areas, and this pattern is expected to further develop during 1981-1990. The implication of this assumption is that the distributions of Table E-1 overstate travel times to BWI and IAD. To correct for this change in population distribution, the over 30 minute proportion of BWI and IAD trips has been decreased by .10, and the 0-15 minute and 16-30 minute proportions of BWI and IAD trips have been increased by .02 and .08, respectively. These changes are believed to be conservative and necessary reflections of the continuing shift in population distribution since 1966. The data used in the final calculations are summarized in Table E-2.

TABLE E-2

Revised Distribution of Trips to Area Airports
by Off-Peak Driving Time of Passengers

	Airport		
Time	DCA	IAD	BWI
7.5 minutes	.50	.05	.06
22.5 minutes	.36	.47	.51
37.5 minutes	.14	.48	.43
Total	1.00	1.00	1.00

Calculations

Multiplying each time value by its respective proportion and summing the appropriate three results for each airport, an estimate of the mean driving time to each airport is calculated. The results are summarized in Table E-3.

TABLE E-3

Mean Driving Time to Area Airports
for Passengers

Airport	Time
DCA	17.10
IAD	28.95
BWI	28.05

Conclusion

The average IAD/BWI travel time is 28.5 minutes, and the average DCA travel time is 17.1 minutes. Therefore, the added travel time for an average passenger who uses IAD/BWI instead of DCA is 11.4 minutes.

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