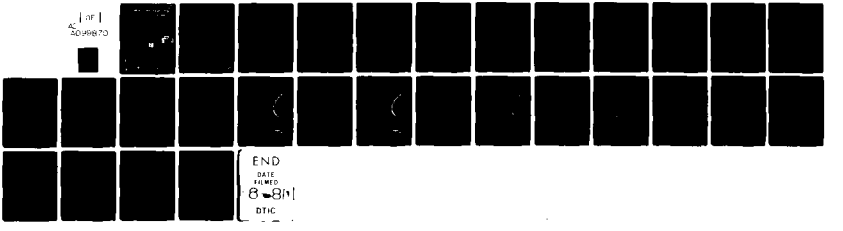
AD-A099 870 PEAT MARWICK MITCHELL AND CO SAN FRANCISCO CALIF F/G 1/2
NEW YORK AIRPORTS DATA PACKAGE NUMBER 7, JOHN F. KENNEDY INTERN--ETC(U)
JUL 79 DOT-FA77WA-3961

UNCLASSIFIED NL



END
DATE FILMED
8-81
DTIC

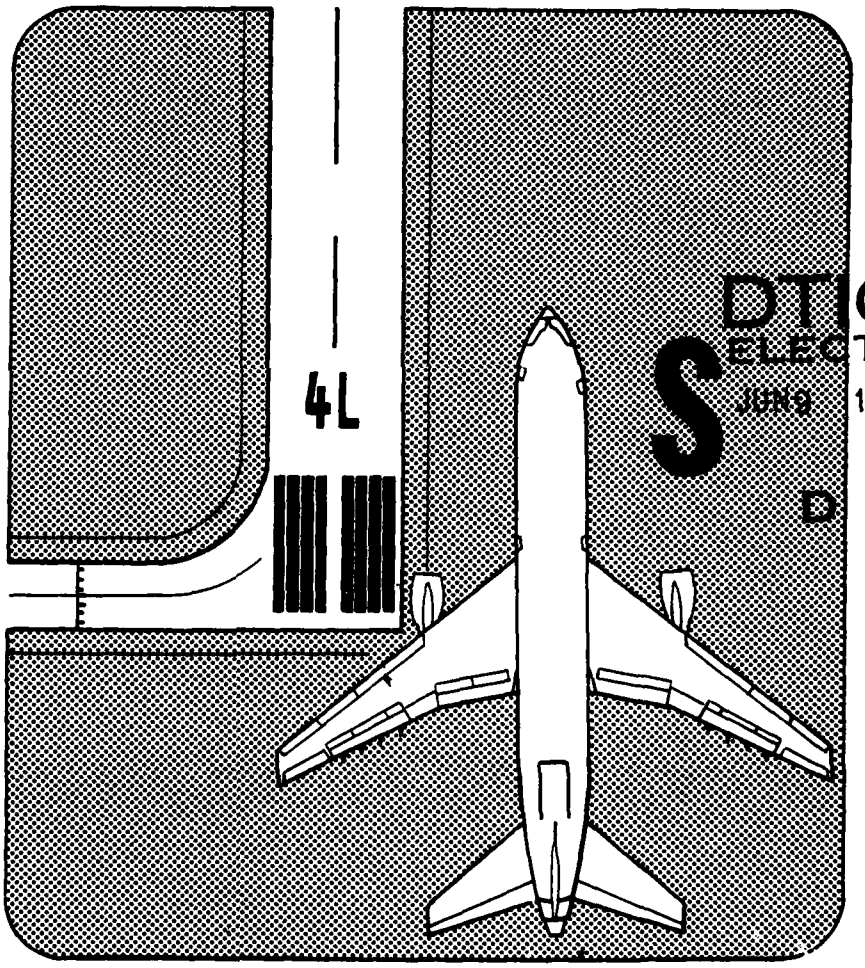
LEVEL III

NEW YORK AIRPORTS

DATA PACKAGE NO. 7

JOHN F. KENNEDY INTERNATIONAL AIRPORT
LA GUARDIA AIRPORT

AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES



prepared for
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
under contract
DOT-FA77WA-3961

PMM&Co. Peat, Marwick, Mitchell & Co.

PEAT, MARWICK, MITCHELL & CO.
P. O. BOX 8007
SAN FRANCISCO INTERNATIONAL AIRPORT
SAN FRANCISCO, CALIFORNIA 94128
Telephone: (415) 347-9521

July 6, 1979

Mr. Michael M. Scott, ATF-4
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Re: New York Data Package No. 7, July 1979

Dear Mike:

Attached is New York Data Package No. 7. The material in this Data Package is a supplement to Data Package No. 6, and it contains the following:

- Attachment A contains highlights and conclusions of the annual delay results and the results of the west-taxiway experiments.
- Attachment B has the LGA west-taxiway experiment results.
- Attachment C presents the LGA and JFK annual delay results and graphics.

This information should be reviewed by members of the New York Task Force at their July 10, 1979, meeting.

Sincerely,

William D. Conley, for

Stephen L. M. Hockaday
Manager

SLMH/jc
Enclosure

cc: Mr. J. R. Dupree (ALG-312)
Mr. C. Caiafa (AEA-4)

Attachment A

HIGHLIGHTS AND CONCLUSIONS
WEST TAXIWAY EXPERIMENTS
AND ANNUAL DELAY RESULTS

New York

Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

July 1979

New York Task Force Delay Studies
Data Packages No. 6 & 7

HIGHLIGHTS AND CONCLUSIONS

Purpose

This brief overview of the highlights and conclusions of the airfield simulation results is intended to guide the reader through the major findings of this report.

Scope

This data package contains the results of the simulation experiments except for the four west-taxiway experiments at LaGuardia Airport. Those west-taxiway results, along with the results of the annual delay model experiments, will be reported in a supplement to this data package at the next Task Force meeting.

Organization

A summary table of results is presented for each Airport (Table A-1, page 2, for LGA, and Table C-1, page 58, for JFK), along with summary sheets and graphics of individual experiment results. Also included are the following items:

- Tables of demand for each year and demand-sensitivity experiment (Attachments B and D)
- Short-form network diagrams for each experiment (Attachments B and D)
- Tables of the standard VFR and IFR separations used in the simulations (Attachments E and F)

Results for LaGuardia Airport

LaGuardia results are summarized in Table A-1. The experiments in Table A-1 are grouped by runway-use configuration and weather condition to facilitate comparisons of results over different years and sensitivity conditions.

The sensitivity runs tested the effects of: (1) the PNYNJ forecast, which contains a higher percentage of heavy aircraft and fewer total operations than the schedules used in the

other experiments; (2) levels of general aviation operations observed in August 1978 instead of the PNYNJ general aviation forecasts used in the other experiments; and (3) using today's ATC separations instead of the 1982 and 1987 ATC separations used in the other experiments. All of the sensitivity tests were done using the same runway-use configuration and weather condition, namely arrivals on 22 and departures on 13 in IFR1.

The following are the major conclusions of the LGA results:

1. The ATA forecast used in the standard experiments contained fewer OAG scheduled operations than in 1977 (see Tables B-1 through B-3); this, coupled with the relatively low PNYNJ general aviation forecasts, contributed to lower delays in both 1982 and 1987 than estimated for today for all runway uses.

2. Another factor in the foregoing delay reductions is the reduced aircraft separations assumed for 1982 and 1987 (see Tables E-1 and F-1).

3. The sensitivity tests indicated that the delays appear very sensitive to the general aviation forecasts (especially in 1982) and the assumed separations (especially in 1987), as shown below (see Figures 50b, 52b, 51b, and 53b):

	Baseline Delays		Delays with Today's GA		Delays with Today's ATC	
Year	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
1982	19.3	1.0	29.5	1.0	22.0	0.9
1987	3.0	1.5	4.4	1.6	24.3	1.0

4. Delays were not very sensitive to the 1982 PNYNJ forecast but were very sensitive to the 1987 PNYNJ forecast (see Figures 48b and 49b):

	Baseline Delays		Delays with PNYNJ Forecast	
Year	Arrivals	Departures	Arrivals	Departures
1982	19.3	1.0	18.8	0.9
1987	3.0	1.5	1.1	1.1

This is probably due to the large percentage of heavy aircraft in the 1987 PNYNJ forecast and the associated drop in total operations, coupled with the fact that the 1987 ATC Scenario of Report No. FAA-EM-78-8A has greatly reduced wake-turbulence effects.

5. West-Taxiway Experiments. The two west-taxiway improvements investigated made the greatest difference for the case where both arrivals and departures use Runway 4, as shown in the following table:

Experiment No.	Runways Used			Average Runway Delays*	
	Arrivals	Departures	Improvement	Arrivals	Departures
1	22	13	None	20.4	6.4
3	22	13	Phase I	20.5	5.3
2	4	4	None	19.6	30.4
4	4	4	Ultimate	20.8	6.2

*Average delays over the 4-hour simulation period.

6. Annual Delay Results. The 1982 and 1987 GA-sensitivity schedules were used in the annual delay experiments. The results of these experiments show that:

a. Under the do-nothing assumptions, average annual delays increase by 8% by 1982 and 26% by 1987.

b. Airfield improvements, which did not include the ultimate west-taxiway experiments, lower these delay increases to 3% and 6%, respectively, for 1982 and 1987.

c. Near-term and far-term ATC improvements result in average annual delay reductions of 8% by 1982 and 18% by 1987; intermediate-term ATC improvements result in a 3% increase by 1987.

d. With both airfield improvements and near-term and far-term ATC improvements, delays are expected to decrease 12% by 1982 and 39% by 1987 (4% for intermediate-term ATC).

e. The LGA airfield improvements assumed in these experiments include:

- ASDE
- Runway 13 Glide Slope Antenna
- High Speed Exit on Runway 13

f. The LGA improvements can lead to annual savings in aircraft operating costs of $86 million ($39 million for the intermediate-term ATC).

Results for John F. Kennedy International Airport

The JFK results are summarized in Table C-1 and are organized the same way as the LaGuardia results. In this case, sensitivity runs were done only to test the effects of today's ATC separations in 1982 and 1987 (Experiments 44 and 45); there were no demand-sensitivity experiments for JFK. The forecasts for JFK provided by PNYNJ showed increases in both air carrier and general aviation traffic over today's traffic levels (see Tables D-1, D-2, and D-3).

The following are the major conclusions of the JFK results:

1. Delays are estimated to increase between today and 1982 and then they fall below today's levels by 1987 in all cases except the 2 n.m. stagger experiments (Experiments 18, 27, and 36).

2. The major factor contributing to the reduction in delays by 1987 is probably the assumed 1987 ATC Scenario, based on Report No. FAA-EM-78-8A, and its reduced separations and wake-turbulence effects.

3. Future delays are very sensitive to the assumed 1982 and 1987 ATC separations (especially in 1987), as shown below:

	Baseline Delays		Delays with Today's ATC Separations	
Year	Arrivals	Departures	Arrivals	Departures
1982	95.1	5.9	122.0	4.2
1987	32.5	4.4	131.9	5.2

The high separation sensitivity in 1987 is due to the very high percentage of heavy aircraft (71.6%) in the 1987 PNYNJ forecast and the fact that the 1987 separations have greatly reduced wake-turbulence effects compared to today's separations.

4. JFK Annual Delay Results. The following are the main conclusions of the annual delay results for JFK:

   a. In the "do-nothing" cases, average annual delays increase 109% by 1982 and 149% by 1987.

   b. Airfield improvements alone limit the annual delay increases to 53% by 1982 and 54% by 1987.

   c. Near-term ATC improvements alone result in delays in 1982 that are 44% greater than in the baseline case.

d. Far-term ATC improvements alone in 1987 result in average annual delays that are 8% lower than today's (intermediate-term ATC results in 35% higher delays than today).

e. The combination of airfield improvements and near-term ATC results in 1982 delays that are 16% greater than today's.

f. The combination of airfield improvements and far-term (intermediate-term) ATC improvements results in 1987 annual delays that are 50% (27%) lower than today's baseline annual delay.

g. Compared to the "do-nothing" case, the airfield improvements and far-term ACT improvements lead to annual savings of $247 million in aircraft operating costs ($219 million for the intermediate-term case).

h. The package of JFK airfield improvements assumed in the annual delay experiments includes:

- o New exits on Runways 4R, 22L, and 31L
- o Simultaneous independent operations on Runways 31L and 31R in VFR1 and IFR1 weather
- o 2-nautical-mile stagger on Runways 4R and 4L
- o Improved ASDE

Attachment B

LGA WEST TAXIWAY EXPERIMENT RESULTS

LaGuardia Airport

New York

Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

July 1979

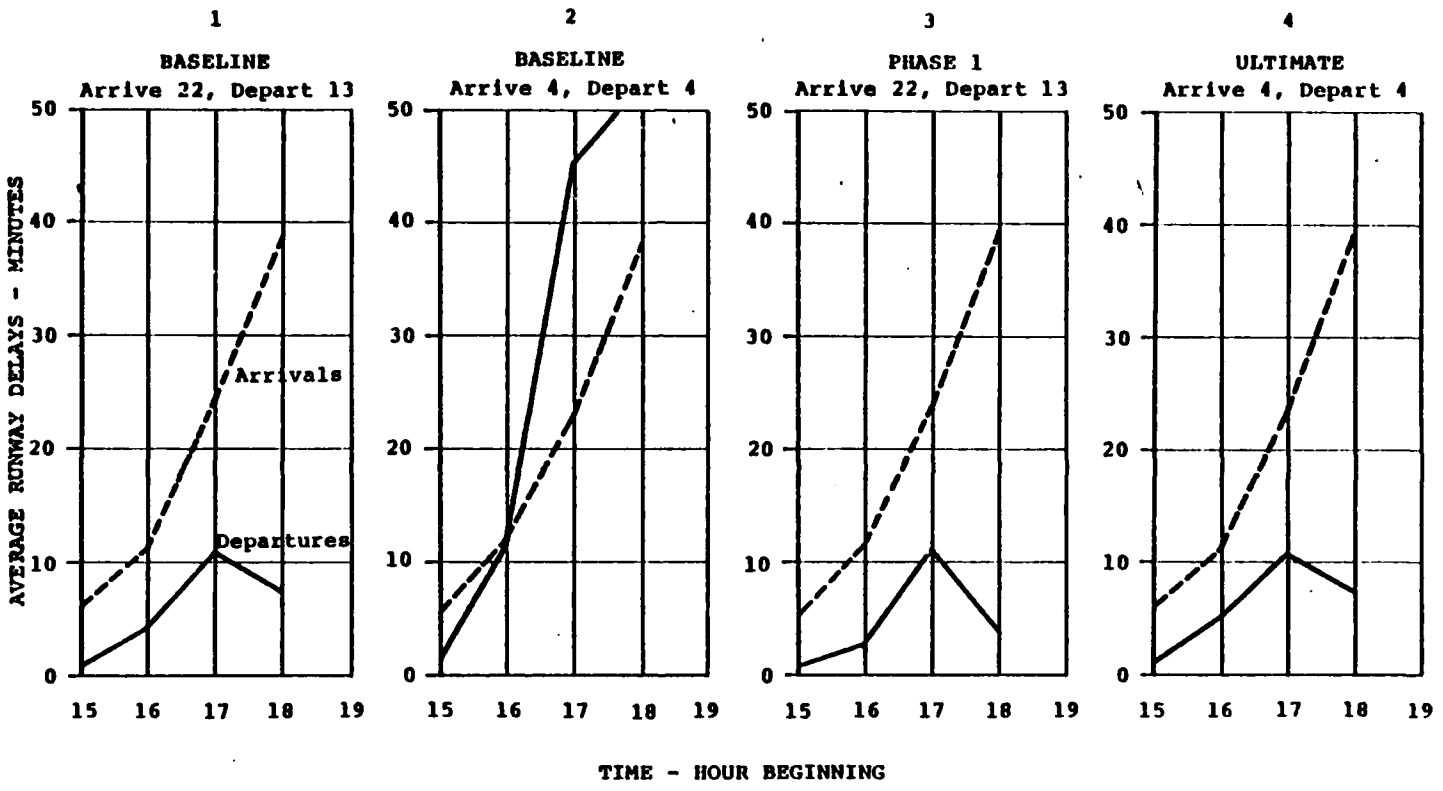


Figure B-1
WEST-TAXIWAY EXPERIMENTS
LaGuardia Airport
PMM & Co. July 1979

Weather: IFR1
Arrivals: 22
Departures: 13
Improvement: None

LaGuardia Airport
New York Task Force Delay Studies
WEST-TAXIWAY EXPERIMENTS
Experiment No. 1

Hour Beginning	Aircraft Demand			Average Flow Rates-Aircraft/hr.			Average Runway Delays-minutes	
	Arrivals	Departures	Total	Arrivals	Departures	Total	Arrivals	Departures
1500	36	28	64	29	26	55	5.36	0.61
1600	35	37	72	29	36	65	12.10	4.45
1700	41	41	82	30	31	61	24.25	11.87
1800	34	36	70	29	48	77	39.87	7.64
Total	146	142	288	117	141	258		
Average							20.4	6.4

Weather: IFR1
Arrivals: 4
Departures: 4
Improvement: None

LaGuardia Airport
New York Task Force Delay Studies
WEST-TAXIWAY EXPERIMENTS
Experiment No. 2

Hour Beginning	Aircraft Demand			Average Flow Rates-Aircraft/hr.			Average Runway Delays-minutes	
	Arrivals	Departures	Total	Arrivals	Departures	Total	Arrivals	Departures
1500	36	28	64	29	25	54	5.4	1.5
1600	35	37	72	29	29	58	11.5	12.2
1700	41	41	82	30	14	44	23.6	45.9
1800	34	36	70	29	45	74	38.1	53.3
Total	146	142	288	117	113	230		
Average							19.6	30.4

Weather: IFR1
Arrivals: 22
Departures: 13
Improvement: PHASE I

LaGuardia Airport
New York Task Force Delay Studies
WEST-TAXIWAY EXPERIMENTS
Experiment No. 3

Hour Beginning	Aircraft Demand			Average Flow Rates-Aircraft/hr.			Average Runway Delays-minutes	
	Arrivals	Departures	Total	Arrivals	Departures	Total	Arrivals	Departures
1500	36	28	64	29	25	54	5.9	0.6
1600	35	37	72	29	36	65	12.0	3.3
1700	41	41	82	30	37	67	24.4	11.4
1800	34	36	70	30	42	72	39.2	4.5
Total	146	142	288	118	140	258		
Average							20.5	5.3

Weather: IFR1
Arrivals: 4
Departures: 4
Improvement: Ultimate

LaGuardia Airport
New York Task Force Delay Studies
WEST-TAXIWAY EXPERIMENTS
Experiment No. 4

Hour Beginning	Aircraft Demand			Average Flow Rates-Aircraft/hr.			Average Runway Delays-minutes	
	Arrivals	Departures	Total	Arrivals	Departures	Total	Arrivals	Departures
1500	36	28	64	28	25	53	5.8	0.9
1600	35	37	72	29	37	66	12.3	4.0
1700	41	41	82	30	35	65	24.4	11.3
1800	34	36	70	30	44	74	39.6	7.0
Total	146	142	288	117	141	258		
Average							20.8	6.2

SCENARIO - LAGUARDIA WESTSIDE TAXIWAYS

	RESTRICTIONS S. W.	SBJ	HUO	MARES	REROUTES FROM - TO
Preload 25 Aircraft Start 4 p.m. local		20 MIT 5 MIN			15% SBJ to S.W. 15% SBJ to HUO
4:15 p.m.	10 MIT 2 MIN	"	10 MIT 2 MIN		15% SBJ - S.W. 15% SBJ - HUO
4:30 p.m.	20 MIT 5 MIN	150 MIT 20 MIN	20 MIT 5 MIN		50% SBJ - S.W. 50% SBJ - HUO
4:45 p.m.	150 MIT 20 MIN	150 MIT 20 MIN	20 MIT 5 MIN		100% S.W. - Hold 90% SBJ - HUO 10% SBJ - MARES
5:00 p.m.	20 MIT 5 MIN	20 MIT 5 MIN	150 MIT 20 MIN	150 MIT 20 MIN	MARES:Hold 20% HUO - SBJ 80% HUO - Hold
5:15 p.m.	20 MIT 5 MIN	20 MIT 5 MIN	20 MIT 5 MIN	150 MIT 20 MIN	MARES:Hold
5:30 p.m.		20 MIT 5 MIN		150 MIT 20 MIN	50% MARES - HUO 50% MARES - Hold
5:45 p.m.		20 MIT 5 MIN		150 MIT 20 MIN	50% MARES - HUO 50% MARES - Hold
6:00 p.m.					Normal opns.
6:15 p.m. End					Normal opns.

NOTE: S. W. - Southwest Holmdel and Keansburg SID's
SBJ - Ringoes SID
HUO - Sloat SID
MARES - Norwalk SID

At 4:00 p.m. a WX pattern builds over SBJ moving east northeast, restricting the SBJ route.
At 4:30 p.m. the WX is located between SBJ and LGA, restricting the SBJ and MIV routes.

At 5:00 p.m. the WX is located over LGA and north of LGA restricting HUO and MARES route:

At 5:30 p.m. the WX is located NE of LGA restricting MARES route.
At 6:00 p.m. the WX pattern has dissipated.

Imposed intrail restrictions are caused by the WX directly on a route or because of additional traffic added to a route due to reroutes.

Ground Scenario LaGuardia Airport

Configuration - LGA #1 (Figure #1) Present Taxiway Structure

Runways - In this configuration, Runway 22 is used for arrivals and Runway 13 for departures.

Arrivals: Arriving aircraft will normally turn off the runway at Charlie, Bravo or runway end onto the outer taxiway for east side terminals; or Foxtrot-Delta-Charlie or runway end onto Taxiway Bravo to Marine Air Terminal.

Departures: Departing aircraft from east side terminals proceed via the inner to the outer and cross Runway 4/22 at Papa or Golf. Clearance must be received from local controller prior to crossing the runway. During ground delay situations, SBJ departures are taxied across Runway 4/22 at Echo and queued on Bravo after being mixed with aircraft being taxied on Bravo from marine air terminal. Additional mixing of departure SID's is accomplished on taxiways Golf and Papa east of Runway 4/22. When taxiways Bravo, Echo, Golf and Papa become congested west of Runway 4/22, departures from main terminal will taxi east on inner taxiway until transition can be made to outer taxiway. Inner taxiway between Echo and Lima will not be used for queing departure aircraft.

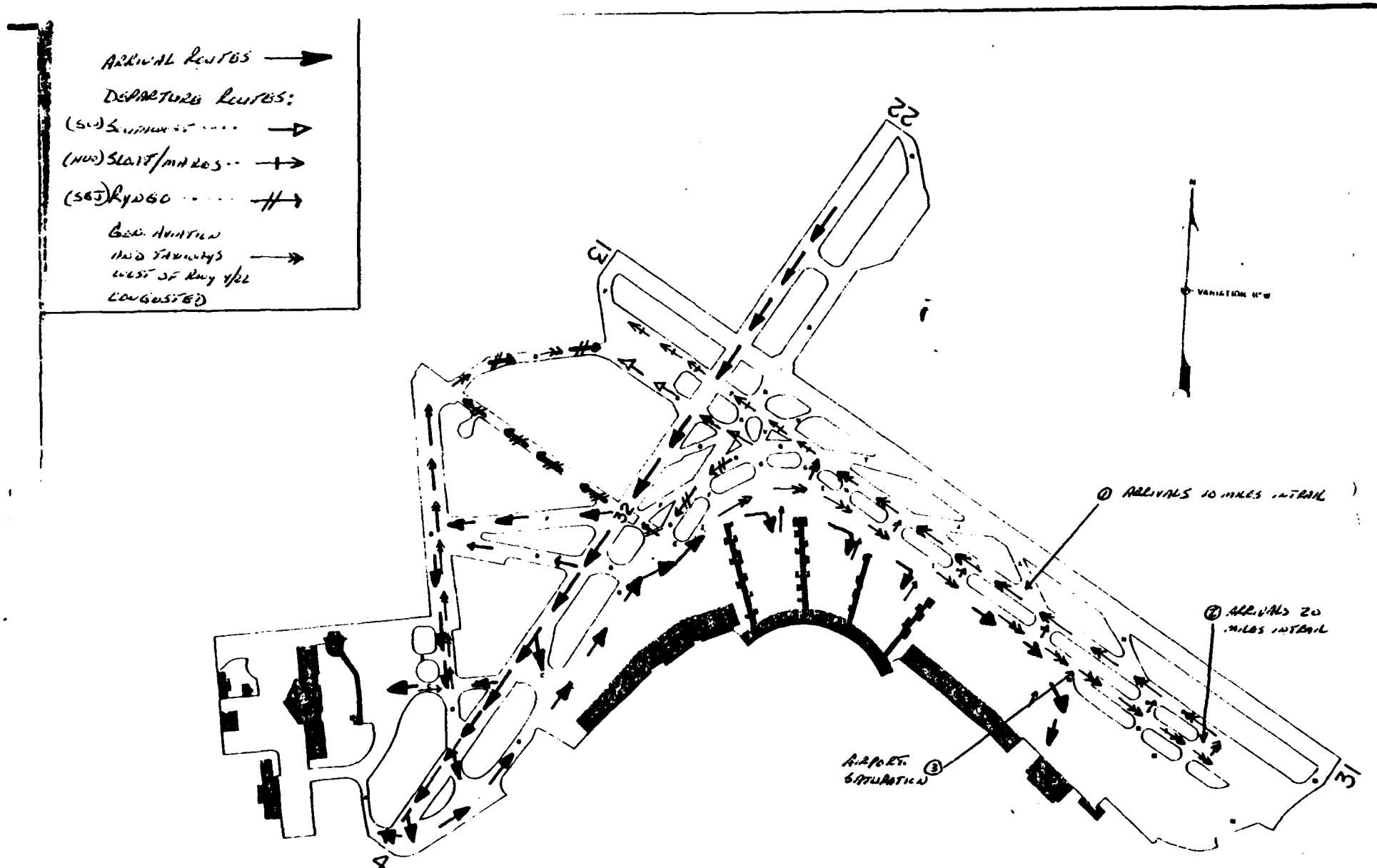


Figure #1

LGA AIRPORT LAYOUT

Configuration - LGA #2 (Figure #2) Present Taxiway Structure

Runways - In this configuration Runway 4 is used for arrivals and departures

Arrivals - Arriving aircraft will normally turn off at Foxtrot, Quebec, Golf, Papa, Uniform or Romeo and be transitioned to inner taxiway for main terminal gates and shuttle area. Aircraft proceeding to marine air terminal will normally turn off at Foxtrot, Echo, Golf or Papa and intercept taxiway Bravo to gates.

Departures - Departures from main terminal will taxi from the inner to the outer to Runway 4. When departures back up to Taxiway Echo they will be queued on outer to Golf, outer remains clear to Tango to accommodate arrivals, Tango down outer to Mike and back up inner to Lima. The inner between Echo and Lima will remain clear to accommodate arrivals. Departures from marine air terminal will be queued on Alfa, Charlie, Delta, Foxtrot and Golf. Taxiway Bravo will remain clear to accommodate arrivals. Aircraft will cross Runway 4/22 after coordination with local controller and mix with east side departures on outer taxiway.

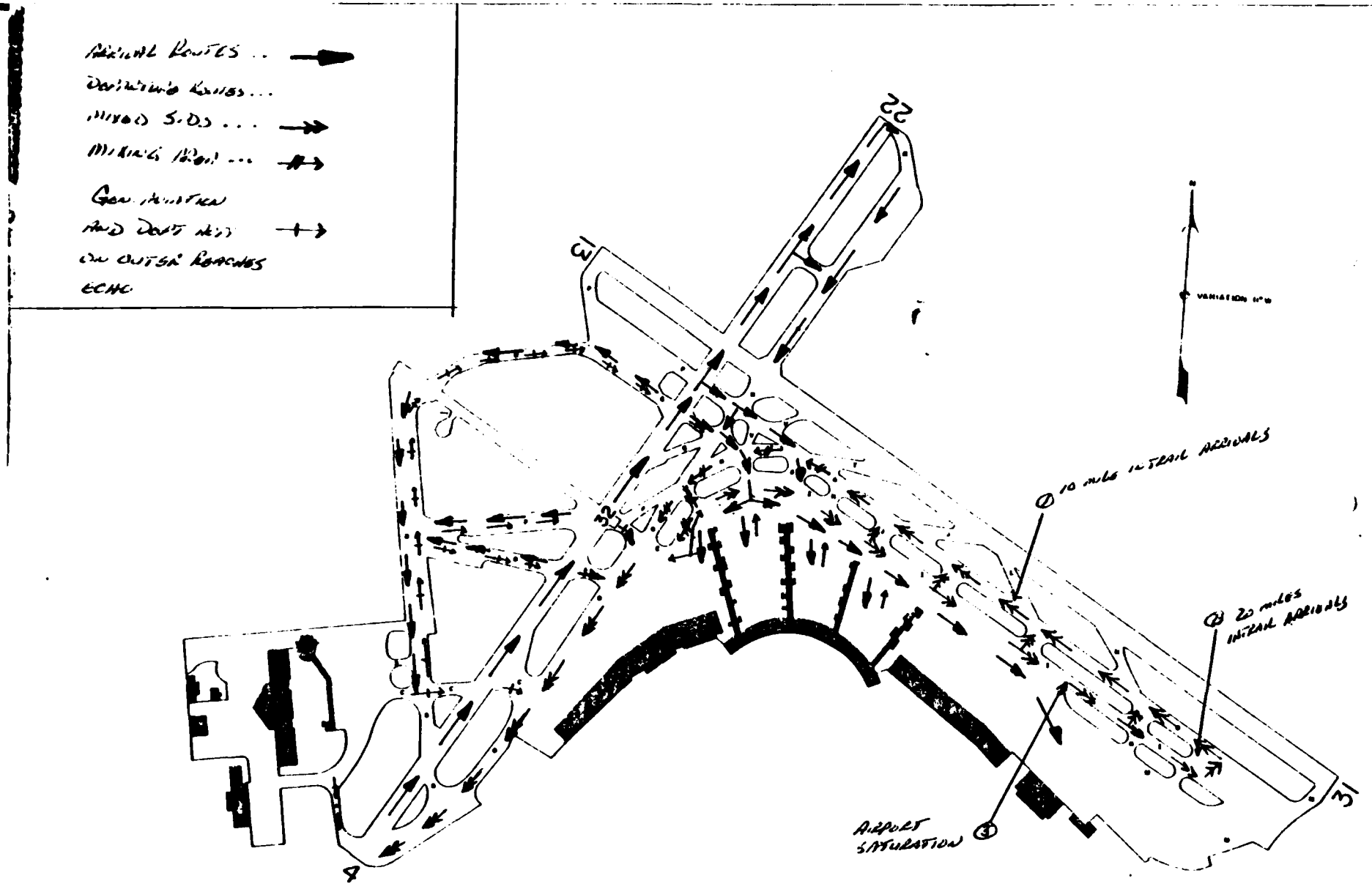


Figure #2

LGA AIRPORT LAYOUT

Configuration - LGA #3 (Figure #3) West Side Taxiway Structure Phase #1

Runways - In this configuration, Runway 22 is used for arrivals and Runway 13 for departures.

Arrivals - Arriving aircraft will normally turn off the runway at Charlie, Bravo or Runway end onto outer taxiway for east side terminals or Foxtrot, Delta, Charlie or Runway end. Then via Taxiway Bravo to marine air terminal.

Departures - Departing aircraft from east side terminals proceed via the inner to the outer and cross Runway 4/22 at Taxiway Echo or Delta. Clearance must be received from local controller prior to crossing runway. During ground delay situations SBJ departures are staged on Taxiway #1, HBO departures on Taxiway #2, southwest departures on Taxiway #3, and Mares departures on Taxiway Bravo. Departing aircraft from marine air terminal are taxied via Bravo, Delta or Echo into Taxiways One, Two, Three or remain on Bravo to Taxiway Golf. When the west taxiway structure becomes congested, departures from east side terminals will be queued on outer taxiway to Mike and on inner taxiway between Lima and Mike. These departures will taxi east on inner taxiway until transition can be made to outer traxiway. The inner taxiway between Echo and Lima will not be used for queing departure aircraft.

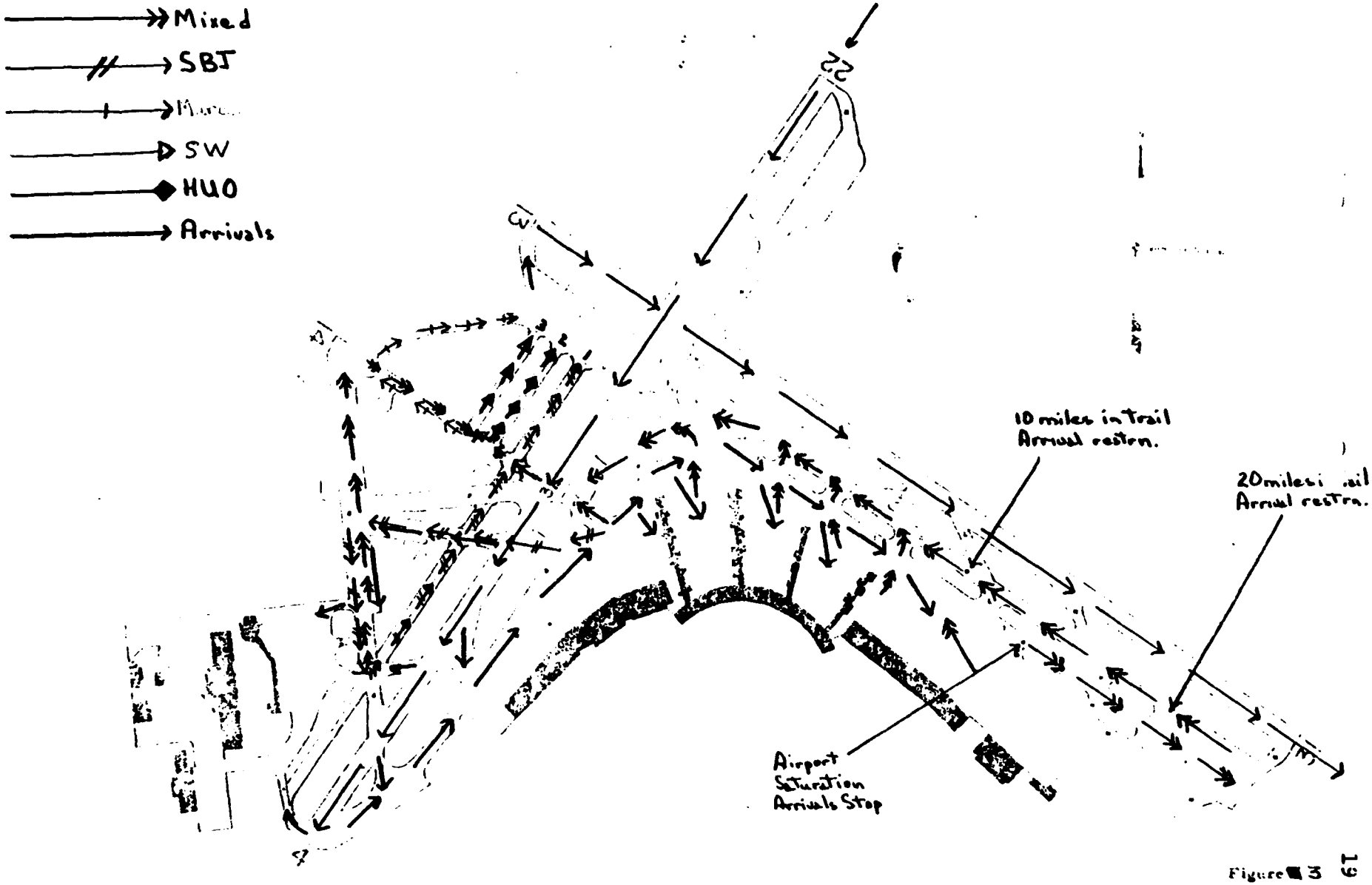

Mixed
SBJ
SW
HUO
Arrivals
10 miles in Trail
Arrival restrn.
20 miles in Trail
Arrival restrn.
Airport
Saturation
Arrivals Stop

Figure 3

Configuration - LGA #4 (Figure #4) West Side Taxiway Structure

Runways - In this configuration Runway 4 is used for arrivals and departures.

Arrivals - Arriving aircraft will normally turn off at Foxtrot, Quebec, Golf, Papa, Uniform or runway end at Romeo and be transitioned to inner taxiway for main terminal gates and shuttle area. Aircraft proceeding to marine air terminal will normally turn off at Delta, Echo, Golf or Papa and intercept Taxiway Bravo to gates.

Departures - Departures from main terminal will taxi from the inner to the outer to Runway 4 or cross Runway 4 at Taxiway Echo for staging on the west taxiway structure. SBJ departures will be staged on Taxiway #1, HUD departures on Taxiway #2, southwest departures on Taxiway #3 and Mares departures will remain on the outer taxiway east of Runway 4. When the west taxiway structure becomes congested departure aircraft from the main terminal and shuttle area will be queued on the outer taxiway from Echo to Golf (Golf and Papa will remain clear to accommodate arrivals) and from Tango down the outer to Mike. Also, on the inner between Lima and Mike. The inner taxiway between Echo and Lima will not be used for queing departure traffic. Departures from the marine air terminal will taxi via Bravo to Delta, Echo or Golf and be staged on Taxiways #1, #2 or #3 according to departure fix.

All departures staged on Taxiways #1, #2 or #3 will be held short of Taxiway Bravo. Mixing departure route fixes will be accomplished via Taxiway Bravo into the final extension of Taxiway #1 to the approach end of Runway 4.

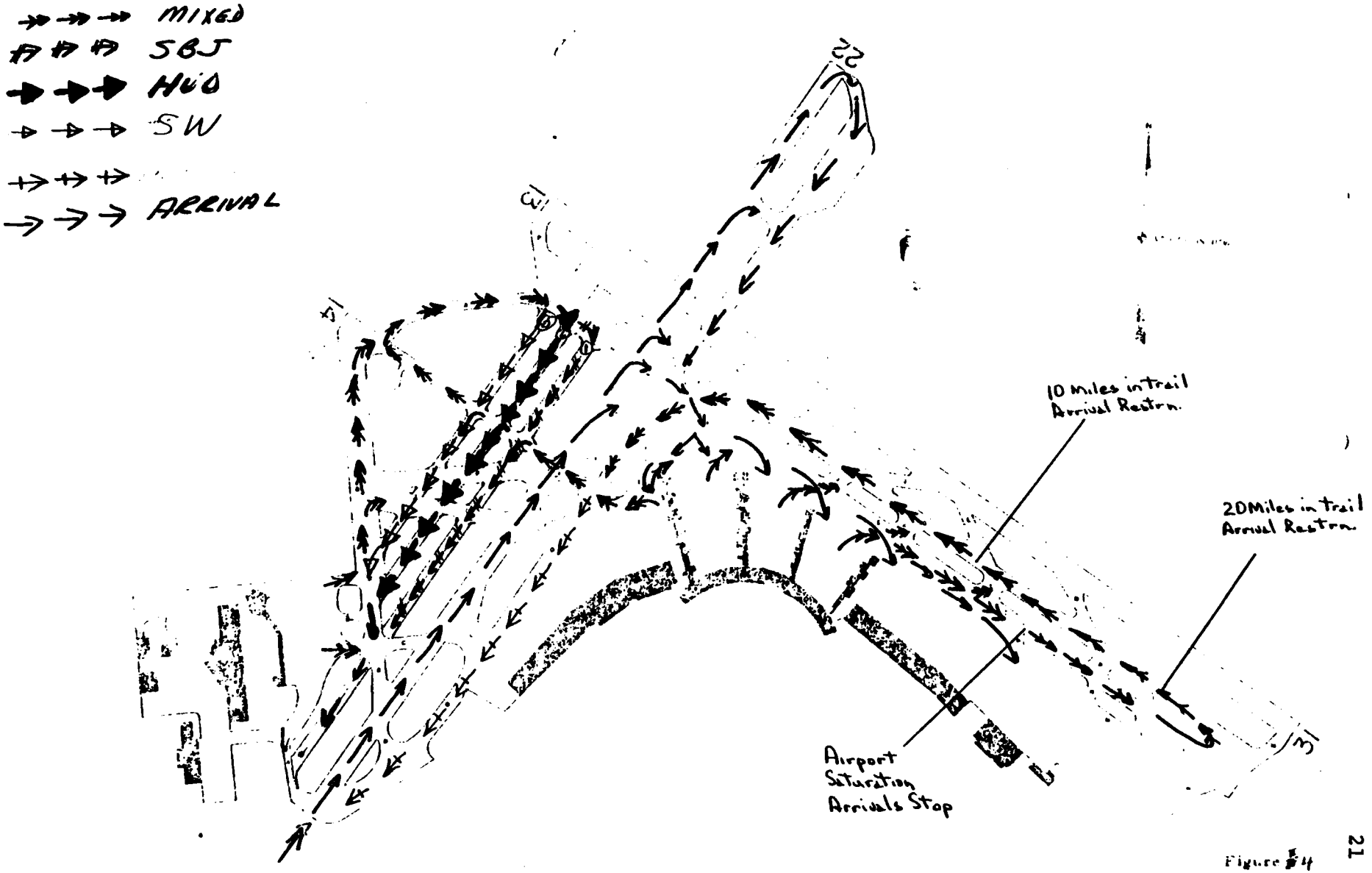

MIXED
SBJ
HUB
SW
ARRIVAL
22
10 Miles in trail
Arrival Restrn.
20Miles in trail
Arrival Restrn.
Airport
Saturation
Arrivals Stop

Figure #4

Attachment C

ANNUAL DELAY RESULTS

AND GRAPHICS

LaGuardia Airport

and

John F. Kennedy International Airport

New York

Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co.
San Francisco, California

July 1979

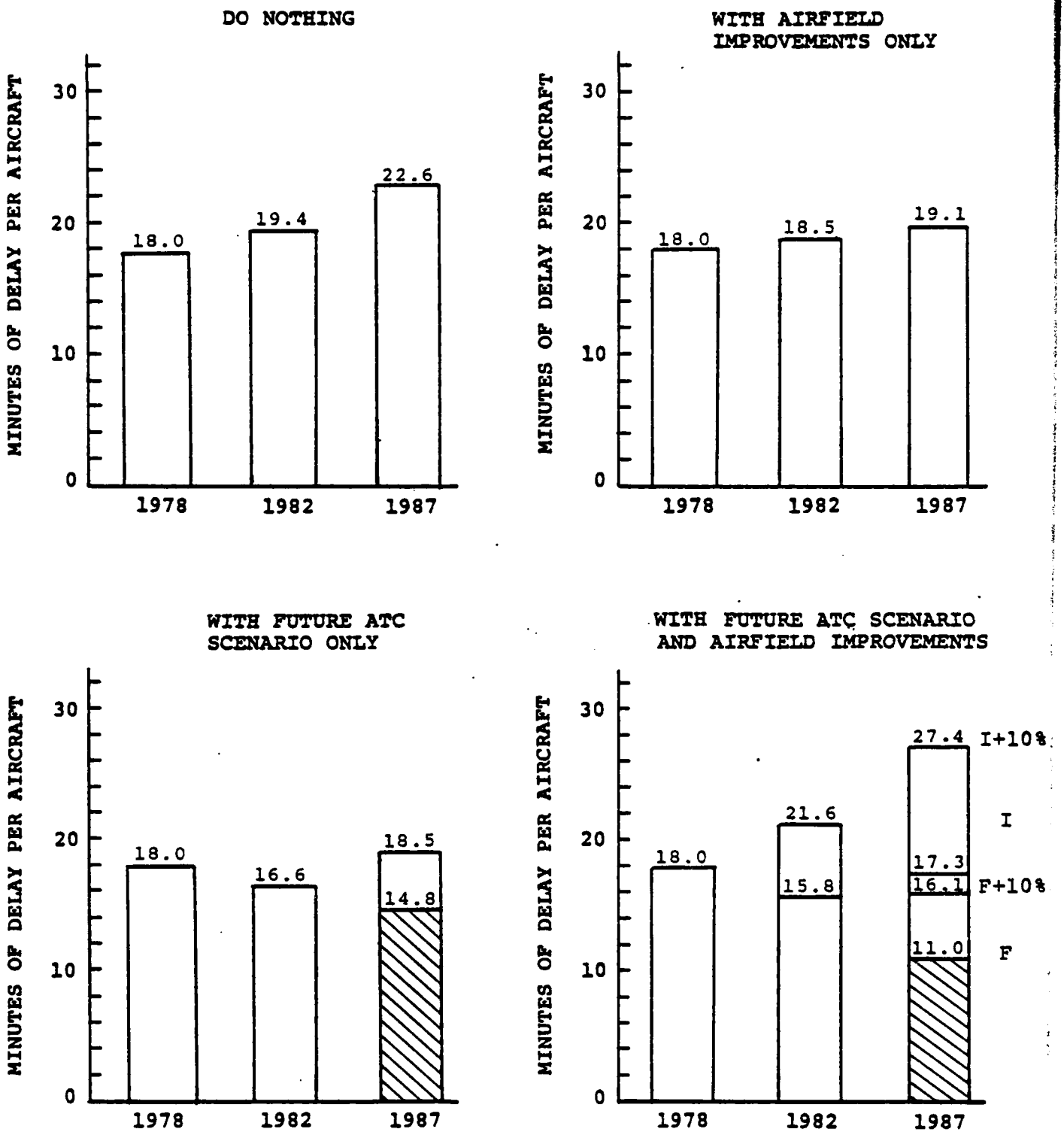
Table C-1

SUMMARY OF ANNUAL DELAY MODEL EXPERIMENT RESULTS
LaGuardia Airport

Experiment No.	Demand[a]	ATC Scenario	Airfield Improvements	Annual Delay (hours)	Average Aircraft Delay (minutes)	Average Peak-Hour Delays (arrivals on 22, departures on 13) VFR	IFR
39	1978	1978	1978	106,020	18.0	3.3	47.7
40	1982	1982	1982	95,390	15.8	3.3	42.8
40A	1982+10%	1982	1982	142,840	21.6	5.0	60+
41	1982	1982	1978	99,840	16.6	3.3	42.8
42	1982	1978	1982	111,180	18.5	3.4	49.1
43	1982	1978	1978	116,770	19.4	3.4	49.1
44	1987	1987	1987	68,040	11.0	3.0	3.3
44A	1987+10%	1987	1987	109,280	16.1	4.3	4.6
44B	1987	Inter[b]	1987	106,720	17.3	3.5	11.0
44C	1987+10%	Inter[b]	1987	185,700	27.4	6.4	49.0
45	1987	1987	1978	91,130	14.8	3.0	3.4
45A	1987	Inter[b]	1978	114,340	18.5	3.5	11.0
46	1987	1978	1987	117,890	19.1	3.9	60+
47	1987	1978	1978	139,670	22.6	5.3	60+

a. Annual demand: 1977 = 353,300
1982 = 361,000
1987 = 370,000

b. Assumes that only "Intermediate Term" ATC separations are achieved by 1987, as defined in Report No. FAA-EM-78-8A.



Source: PMM & Co. estimates based on Task Force inputs.

Figure C-1
ANNUAL DELAYS
LaGuardia Airport
PMM & Co. June 1979

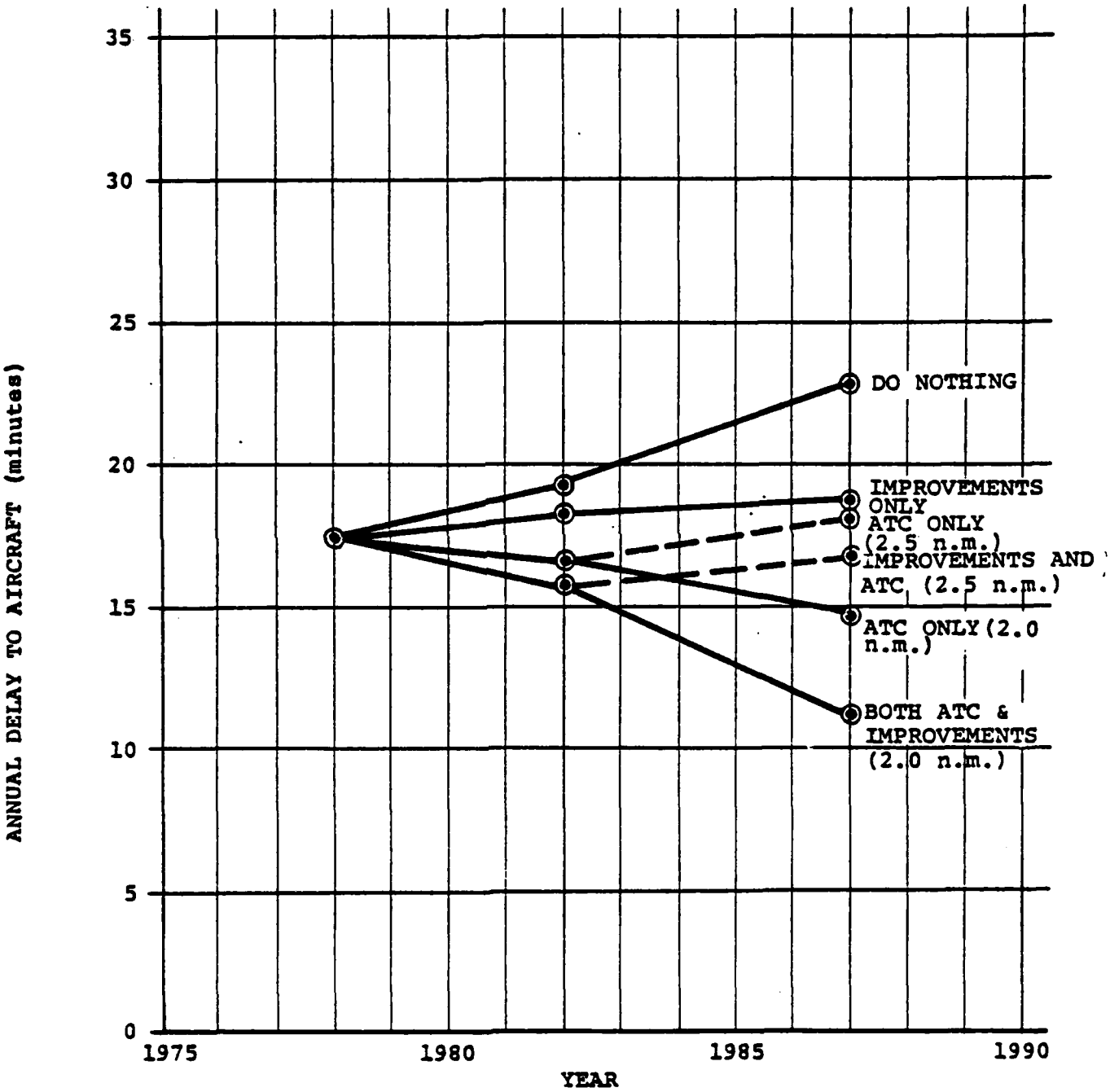


Figure C-2
ANNUAL DELAYS
LaGuardia Airport
PMM & Co. June 1979

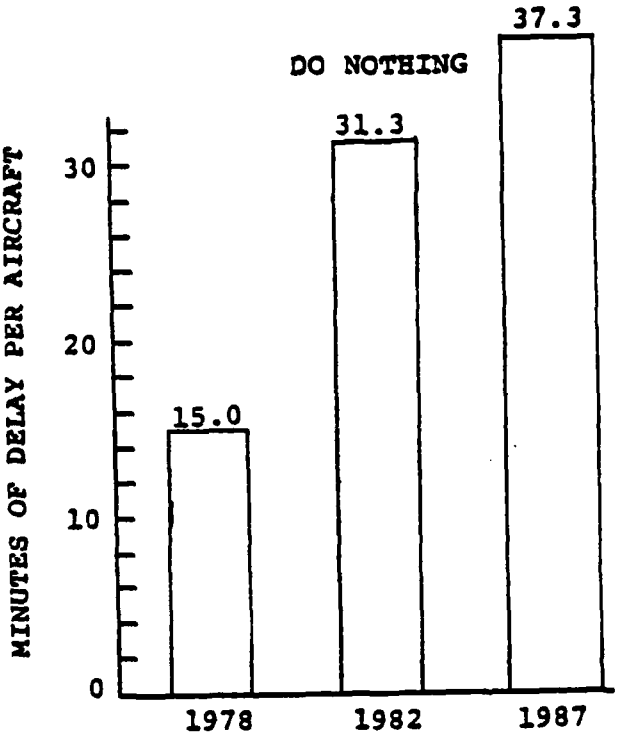
Table C-2

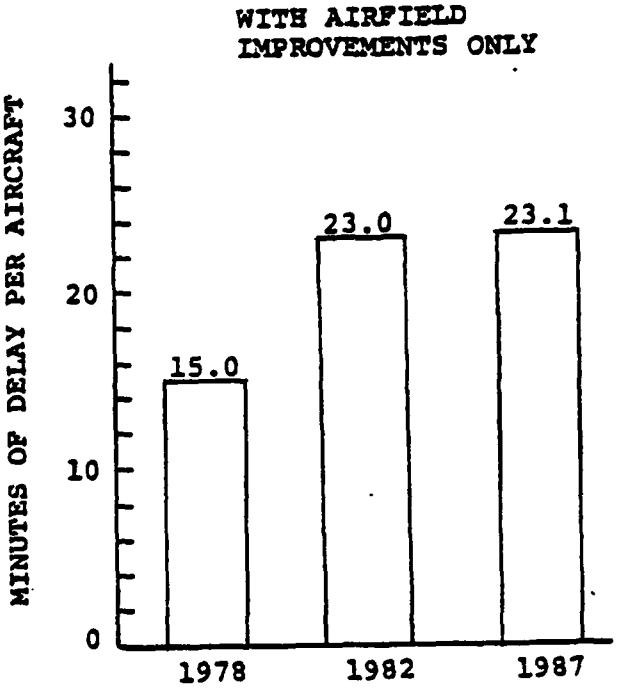
SUMMARY OF ANNUAL DELAY MODEL EXPERIMENT RESULTS
John F. Kennedy International Airport

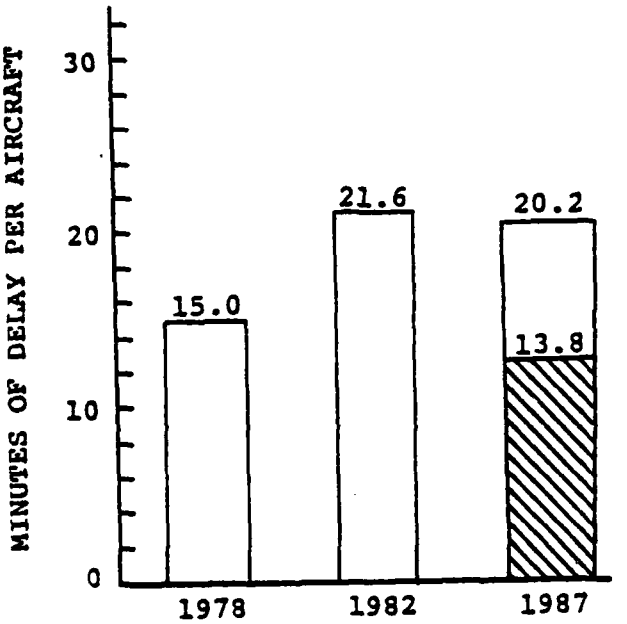
Experiment No.	Demand[a]	ATC Scenario	Airfield Improvements	Annual Delay (hours)	Average Aircraft Delay (minutes)	Average Peak-Hour Delays (arrivals on 22L, 22R, departures on 22R)	
						VFR	IFR
34	1978	1978	1978	86,420	15.0	6.4	60+
35	1982	1982	1982	118,750	17.4	21.1	60+
35A	1982+10%	1982	1982	194,690	25.9	38.3	60+
36	1982	1982	1978	148,260	21.6	27.1	60+
37	1982	1978	1982	158,490	23.0	28.5	60+
38	1982	1978	1978	214,520	31.3	28.5	60+
39	1987	1987	1987	51,850	7.5	5.6	10.5
39B	1987+10%	1987	1987	89,960	13.0	7.2	34.9
39A	1987	Inter[b]	1987	82,710	10.9	6.8	14.4
39C	1987+10%	Inter[b]	1987	154,970	20.4	13.3	54.9
40	1987	1987	1978	95,660	13.8	6.1	26.0
40A	1987	Inter[b]	1978	140,390	20.2	7.3	60+
41	1987	1978	1987	159,840	23.1	34.0	60+
42	1987	1978	1978	258,240	37.3	38.2	60+

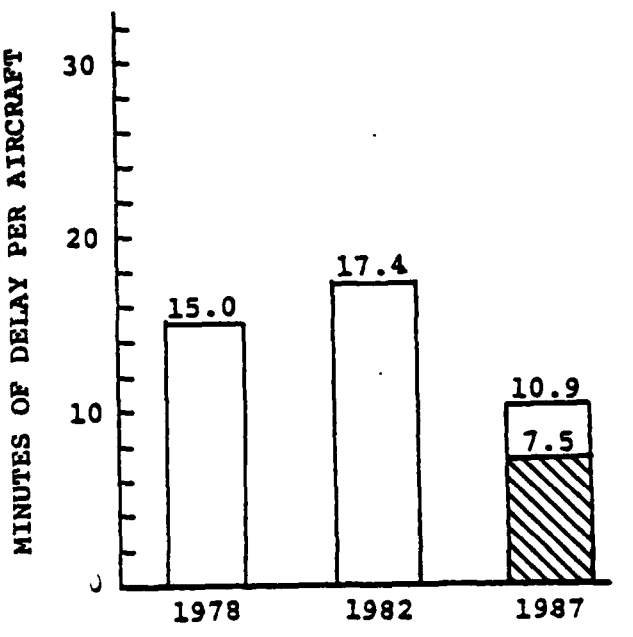
a. Annual demand: 1977 = 345,005
1982 = 409,800
1987 = 415,310

b. Assumes that only "Intermediate-Term" ATC separations are achieved by 1987, as defined in Report No. FAA-EM-78-8A.









Source: PMM & Co. estimates based on Task Force inputs.

Figure C-3
ANNUAL DELAYS
John F. Kennedy International Airport
PMM &CO. June 1979

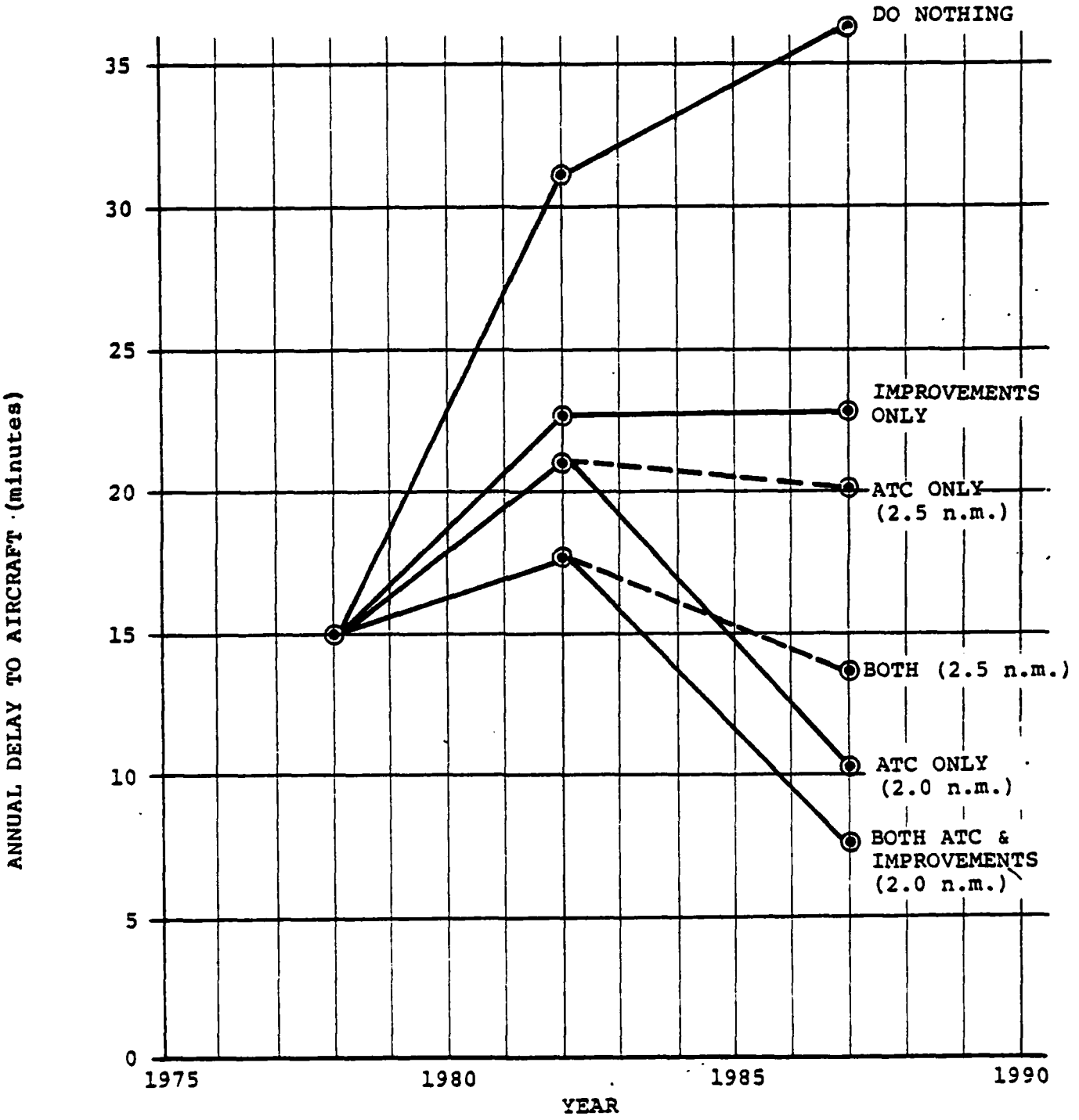


Figure C-4
ANNUAL DELAYS
John F. Kennedy International Airport
PMM & CO. June 1979