EXAMPLE 4. Identify the constraining component under VFR conditions of the example airport. Use previously calculated data.

SOLUTION: The work sheet below illustrates one method of recording data.

1. Capacity and Demand. The airport components, hourly capacities and demands obtained from examples 1, 2, and 3 are entered in columns 2 and 3 of the work sheet.

2 Demand Ratio. Divide each component demand by the runway demand and enter in column 4.

3. Component Quotients. Divide each components hourly capacity by its demand ratio and enter in column 5.

4. Constraining Component. Identify the lowest component quotient in column 5 (i.e. 54).

Component	Hourly Capacity	Hourly Demand	Demand Ratio' Componet Demand Runway Demand	Component Quotient Component Capacity Demand Ratio
1	2	3	4	5
Runway	89	50	50/50 = 1.00	89/1.00 = 89
Twy Xing A	107	20	20/50 = .40	107/.40 = 267
Twy Xing B	125	24	24/50 = .48	125/.48 = 260
Gates	29	27	27/50 = .54	29/.54 = 54

Work sheet for identifying the constraining component.

5. Conclusion. The constraining component is the terminal gate complex which limits the airports hourly capacity to 54 operations per hour.

Figure A2-4. Airport hourly capacity

EXAMPLE 5. Determine the ASV of the example airport assuming there are 219,750 annual operations, 690 average day operations and 50 peak hour operations.

SOLUTION: The work sheet on page 12 illustrates one method of recording data.

1. Calculate C_w.

a. Runway-use Configuration. Identify the different runway-use conditions used over the course of a year and the mix index for each use. Enter in columns 1 through 4.

b. Percent of Use (P). Identify the percent of the time each configuration is used and enter in column 5. The figures shown on the work sheet in column 5 are hypothetical.

c. Runway Hourly Capacity (C). Calculate the hourly capacities of operating conditions as in example 1 and enter in column 6. Example 1 data are used for operating conditions 1 and 2.

d Maximum Capacity Configuration. Identify the runway-use configuration that provides the maximum capacity.

e. Percent of Maximum Capacity. Divide the hourly capacity of each runway-use configuration by the capacity of the configuration that provides the maximum capacity and enter in column 7.

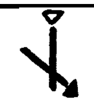
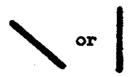
Operating condition	1	89/89 =	100
" "	2	51/89 =	57
" "	3	62/89 =	70
" "	4	52/89 =	58
" "	5	59/89 =	66
" "	6	46/89 =	52

f. ASV Weighting Factor (W) From Table 3-1, identify the weighting factor (W) for each operating condition and enter in column 8.

Table 3-1. ASV Weighting Factors

Percent of Maximum Capacity	Weighting Factors			
	VFR	IFR		
		Mix Index (0-20)	Mix Index (21-50)	Mix Index (51-180)
91+	1	1	1	1
81-90	5	1	3	5
66-80	15	2	8	15
51-65	20	3	12	20
0-50	25	4	16	25

Figure A2-5. Annual service volume

Operating Condition No.	Weather	Rwy-use Diagram	Mix Index	Percent of Year (P)	Hourly Capacity (C)	Percent Maximum Capacity	Weighting Factor (W)
1	2		4	4	6	7	8
1	VFR		91	74.5	51	100 57	20
2	IFR						
3	VFR		62	5	62	70	15
4	IFR		91	5	52	58	20
5	VFR		62	4	59	66	15
6	IFR		91	4	46	52	20
7	IFR	Below Minimums		3			25

Work sheet for ASV factors.

g. Weighted Hourly Capacity (C_w). Calculate the weighted hourly capacity using the **following** equation:

$$C_w = \frac{(P_1C_1W_1) + (P_2C_2W_2) + \cdots (P_nC_nW_n)}{(P_1W_1) + (P_2W_2) + \cdots (P_nW_n)}$$

$$C_w = \frac{(.74\cdot89\cdot1) + (.05\cdot51\cdot20) + (.05\cdot62\cdot15) + (.05\cdot52\cdot20) + (.04\cdot59\cdot15) +}{(.74\cdot1) + (.05\cdot20) + (.05\cdot15) + (.05\cdot20) + (.04\cdot15) +}$$

$$\frac{(.04\cdot46\cdot20) + (.03\cdot0\cdot25)}{(.04\cdot29) + (.03\cdot25)}$$

$$C_w = \frac{287.56}{5.64} \text{ or } 51 \text{ operations per hour.}$$

2. **Daily Demand Ratio (D).** Calculate D using the equation:

$$D = \frac{\text{Annual}}{\text{Average Day-peak month}} = \frac{219,750}{690} = 318$$

3. **Hourly Demand Ratio (H).** Calculate H **from** the equation:

$$H = \frac{\text{Average Day--peak month}}{\text{Avetage Peak Hour--peak month}} = \frac{690}{50} = 14$$

4. **Calculate ASV.** ASV is calculated from the **equation** $ASV = C_w \cdot D \cdot H$

$$ASV = 51\cdot318\cdot14 = 227,052 \text{ operations per year.}$$

5. **Conclusion. ASV** is **an** indicator of the annual operational capability of an airport adjusted for differences in hourly capacities **which** occur **over** the **course** of **a year. In** this example, the airport theoretically could. have **accommodated** and **additional** 7,302 operation8 **during the year.**

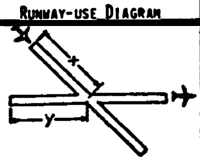
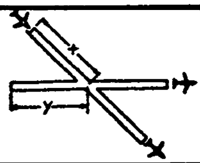
Figure A2-5. Annual service volume (cont.)

EXAMPLE 6. Determine the hourly delay in **VFR** and IFR weather conditions for the example airport in its predominate mode of operation. The peak 15 minute demand in **VFR** is 20 operations and in IFR it is 15 operations. Extract necessary data from examples 1 through **5.**

SOLUTION: The work sheet on page 16 illustrates one method of recording data.

1. Hourly Capacity. Enter the hourly'capacities calculated in example 1 (89 **VFR,** 51 IFR) in column 5.

2. Identify Delay Figure **Nos.** From figure 3-2 (illustrated), identify the **runway-use** configuration as **No.** 43 and figures 3-85 and 3-91 for determining **VFR** and IFR **delay.** Enter in **columns** 2, **3,** and 4,

Runway-use Diagram	Diag. No.	Runway Intersection Distance in Feet (x)	(y)	Figure No. For Capacity VFR	IFR	For Delay VFR	IFR
	43	0 to 1999	< 4000	3-27	3-59	3-85	3-91
	44	2000 to 4999	< 4000	3-28	3-60	3-86	3-99
	45	sow to 8000	< 4000	3-29	3-61	3-86	3-99
	46	0 to 1999	≥ 4000	3-30	3-62	3-86	3-99
	47	2000 to 4999	≥ 4000	3-31	3-63	3-71	3-102
	48	5000 to 8000	≥ 4000	3-32	3-64	3-71	3-102
	49	0 to 1999	< 4000	3-27	3-59	3-85	3-91
	S0	2000 to 4999	< 4000	3-28	3-60	3-86	3-99
	51	5000 to 8000	< 4000	349	3-61	3-86	3-99
	S2	0 to 1999	≥ 4000	3-30	3-62	3-86	3-99
	S3	2000 to 4999	≥ 4000	3-31	3-65	3-71	3-90
	54	5000 to 8000	≥ 4000	3- 3	3-43	3-71	3-90
	55	0 to 1999	< 4000	[illegible]	[illegible]	[illegible]	[illegible]

3. **Demands.** Enter the hourly demand **from** example 1 (50 **VFR,** 34 **IFR)** in **column 6,** and the 15 minute **demands** of 20 **VFR** and 15 IFR in column **7.**

4. **Demand/Capacity Ratio.** Calculate the D/C ratios and enter in column **8.**

D/C ratio **VFR = 50/89 =** 0.56

D/C ratio **IFR = 34/51 =** 0e67

5. **Delay Indices. From** figure **3-85 and 3-91** (illustrated), obtain arrival delay **index (ADI)** and **departure** delay index (DDI) and enter in columns 11 and **13.** Enter **example** 1 **mix** indices in column 10 (62 **VFR,** 91 IFR) and percent **arrivals** in **column** 9 (459 **VFR,** 559 **IFR).**

Figure **A2-6. Hourly** delay

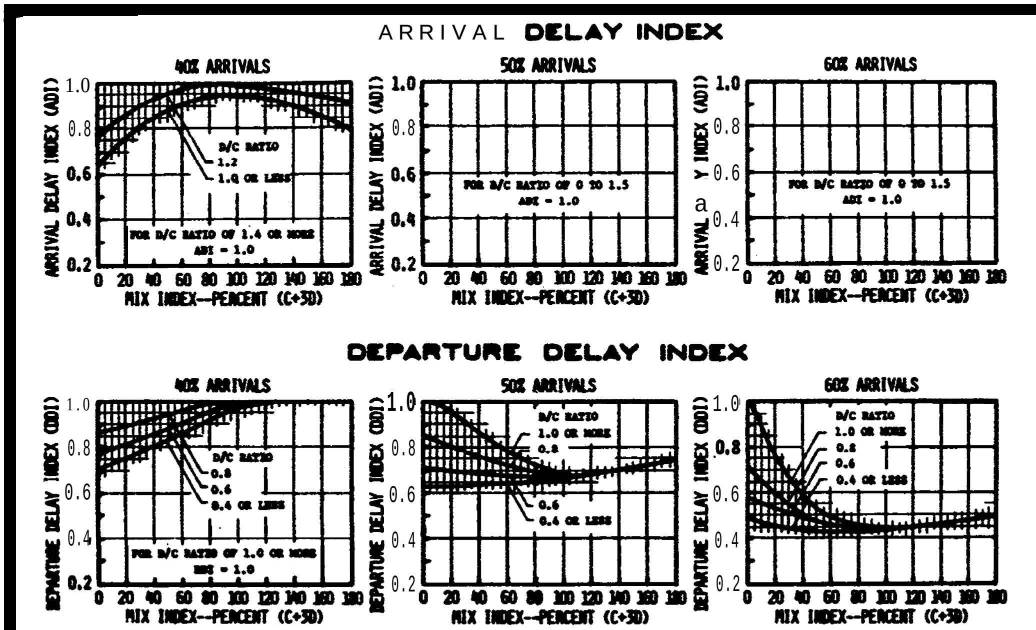


FIGURE 3-85. DELAY INDICES FOR RUNWAY-USE DIAGRAM NOS.: 43,49,55,61 FOR VFR CONDITIONS.

VFR ADI at 40% = 0.90		**VFR DDI** at 40% = 0.90
" " 50% = 1.00		" " 50% = 0.67
" 45% = 0.95		" " 45% = 0.78

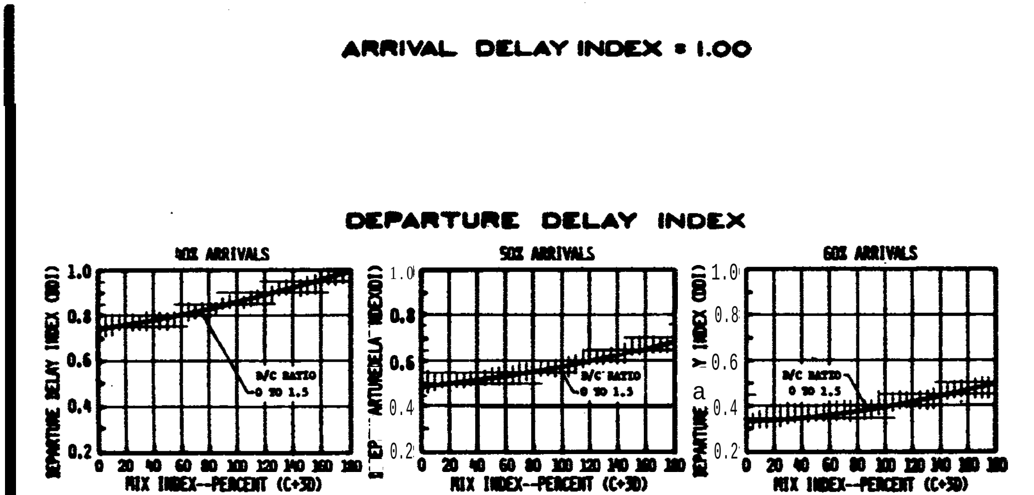


FIGURE 3-91. DELAY INDICES FOR RUNWAY-USE DIAGRAM NOS.: 2,3,5,9,32-35,37-43,49,55,61-68,72-74,76, 77,79,80,82-85,87-89,91,92,94,95,97-100,102 FOR IFR CONDITIONS.

IFR ADI at 50% = 1.00	**IFR ADI at** 50% = 0.57
" " 60% = 1.00	" " 60% = 0.38
" " 55% = 1.00	" " 55% = 0.47

Figure **A2-6. Hourly delay** (cont.)

6. Delay Factors. Calculate the arrival and departure delay factors (ADF and DDF) using the equation ADF = ADI· (D/C) and DDF = DDI·(D/C). Enter results in columns 12 and 14.

ADF for VFR = 0.95·0.56 = 0.53 DDF for VFR = 0.78·0.56 = 0.44

ADF for IFR = 1.00·0.67 = 0.67 DDF for IFR = 0.47·0.67 = 0.31

7. Demand Profile Factor (DPF). Divide the 15 minute demand (column 7) by the hourly demand (column 5) and multiply the result by 100. Enter results in column 15.

DPF for VFR = (20/50)·100 = 40%

DPF for IFR = (15/34)·100 = 44%

8. Determine Average Delay. Using figure 3-69 (illustrated), the delay factors (columns 12 and 14), and the demand profile factors (column 15), determine the average delay to an arriving and a departing aircraft for VFR and IFR conditions and enter in column 16 and 17.

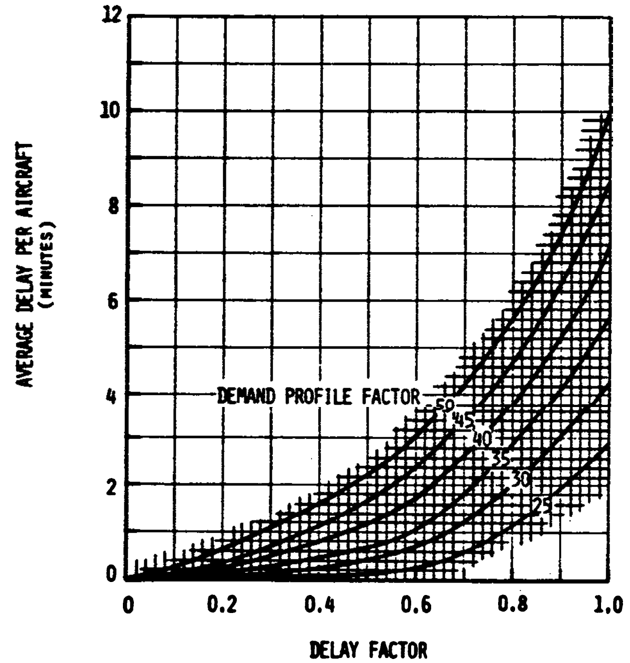


FIGURE 3-69. AVERAGE AIRCRAFT DELAY IN AN HOUR.

Figure A2-6 Hourly delay (cont.)

9. **Hourly Delay.** Calculate the hourly delay using the following equation and enter in column 18.

Hourly delay = **Hourly** demand [(% arrivals · average arrival delay) + (% departures · average departure delay)]

Delay in VFR = 50 [(0.45 · 1.3) + (0.55 · 0.95)] = 55 minutes

Delay in IFR = 34 [(0.55 · 2.8) + (0.45 · 0.06)] = 53 minutes

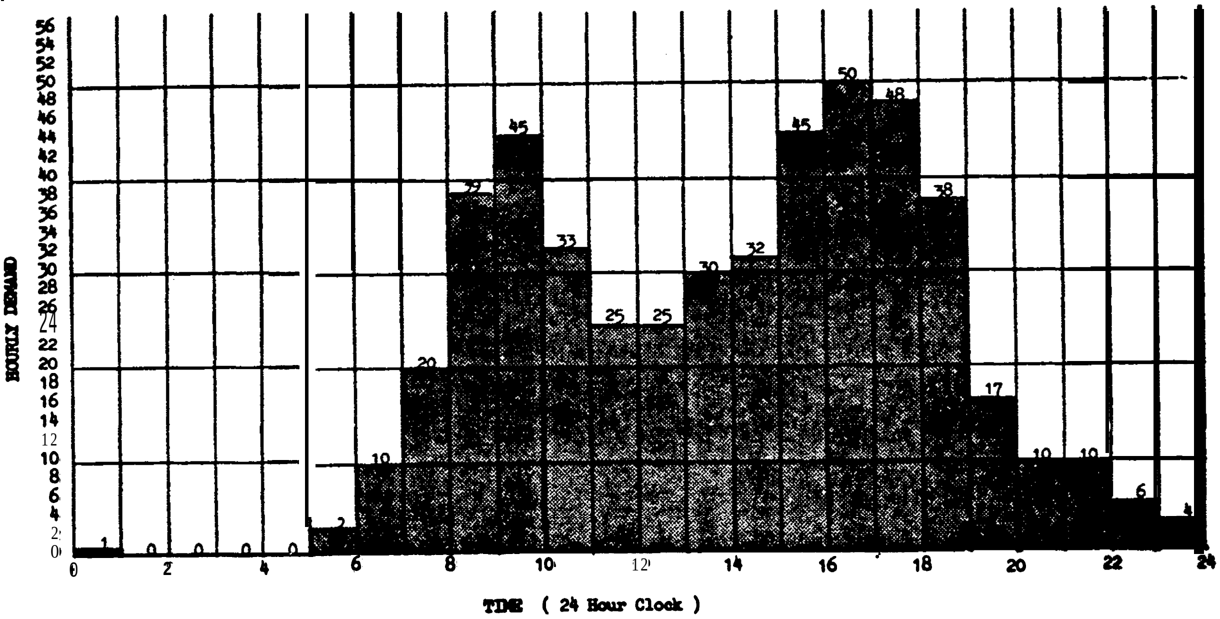
Rwy-use Configuration		Delay Fig. No.			Demand					Arrival Delay		Depart. Delay		Demand Profile	Aver. Delay (Minutes)		Hourly Delay
Sketch	No.	VFR	IFR	Capacity	Hourly	15 Min.	D/C Ratio	Percent Arrivals	Mix Index	Index ADI	Factor ADF	Index DDI	Factor DDF	Factor DPF	Arr.	Dep.	(Minutes)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	43	85		89	50	20	.56	45	62	.95	.53	.78	.44	40	1.3	.95	55
	43		91	51	34	15	.67	55	91	1.00	.67	.47	.31	44	2.9	.60	53

Work sheet for hourly delay.

10. **Conclusion.** Because the **demand** is significantly less than capacity, and the scheduled **airline operations** are reasonably constant in **VFR** or IFR weather conditions, there is little **difference** in the minutes of delay experienced **in** the typical **VFR** or **IFR hour.**

Figure A2-6. Hourly delay (cont.)

EXAMPLE 7. **Determine** the daily delay in **VFR** conditions for the example **airport.** The **hourly demand** for a typical **VFR** day is as plotted. **Demand is always less** than capacity. For **demands** of 11 to *44* operations per hour**,** arrivals equal **departures.** *For* demands aver **44 operations** per **hour,** the arrival rate drops to 45 percent. **Noise** abatement practices limit the airport to the use of one runway **from 10:00 pm to 7:00** am.



Histograph of daily demand

SOLUTION: **The** work sheet on page 18 illustrates one **method** of **recording** data.

1. Calculate Capacities. Calculated runway capacities for the different operating conditions are illustrated **below.** Assumptions **were** made for demand, aircraft mix, and percent of touch and go's for the first four operating **conditions. Data from** example 1 are used for the fifth aperating condition.

Demand 1	Runway-use Diagram 2	Runway-use No. 3	Capacity Figure No. VFR 4	Capacity Figure No. IFR 5	Aircraft Mix %A 6	Aircraft Mix %B 7	Aircraft Mix %C 8	Aircraft Mix %D 9	Mix Index %(C+3D) 10	Arrivals % 11	Touch and Go % 12	Runway Exits Location 13				Runway Exits No. 14	Hrly. Cap. Base C* 15	T & G Factor T 16	Exit Factor E 17	Hourly Capacity C*·T·E 18
11-19		1	3		23	75	2	0	2	50	5	30	45	60		1	103	1.04	.86	92
11-19		43	27		40	55	5	0	5	"	20	"	"	"		1	108	1.08	.85	97
20-35		"	"		35	35	30	0	30	"	10	"	"	"		2	102	1.03	.92	97
36-44		"	"		30	27	42	1	45	50	8	"	"	"		"	94	1.03	.92	89
45+		43	27		26	20	50	4	62	45	12	30	45	60		2	88	1.06	.94	89

Work sheet for hourly capacity.

Figure A2-7. Daily delay, D/C ratio equal or less than **1.00**

2. **Calculate Hourly** Delay. The hourly runway delay calculations of example 6 are repeated 24 times to develop average arrival and departure delays per aircraft and the minutes of delay for each **hour.** Assume the demand is fairly uniform so that the **DPF** (column 11) is 25 when the demand is less than 10 operations per hour. When the demand is 10 or **more,** the DPF is **40.** Forty percent of the operations occur in a 15 minute period whenever the demand is 10 or **more.**

Hour	Misc.	Hourly Demand	Hourly Capacity	D/C Ratio	Mix Index	Arrival Delay Index ADI	Arrival Delay Factor ADF	Depart. Delay Index DDI	Depart. Delay Factor DDF	Delay Factor DPF	Aver. Delay (Minutes) Arr.	Aver. Delay (Minutes) Dep.	Hourly Delay (Minutes)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
24:00-01:00		1	92	.01	0	0	0	0	0	0	0	0	0
01:00-02:00		0	-	-	-	-	-	-	-	-	-	-	-
02:00-03:00		"	-	-	-	-	-	-	-	-	-	-	-
03:00-04:00		"	-	-	-	-	-	-	-	-	-	-	-
04:00-05:00		"	-	-	-	-	-	-	-	-	-	-	-
05:00-06:00		3	92	.03	0	.64	.02	.50	.01	25	0	0	0
06:00-07:00		10	92	.11	2	.64	.07	.50	.06	40	.05	.05	1
07:00-08:00		20	97	.21	30	1.00	.21	.63	.13	"	.30	.15	4
08:00-09:00		39	89	.44	45	1.00	.44	.65	.29	"	.95	.50	28
09:00-10:00		45	"	.51	62	.95	.48	.78	.37	"	1.10	.80	42
10:00-11:00		33	89	.37	30	1.00	.37	.63	.23	"	.70	.35	17
11:00-12:00		25	97	.26	"	"	.26	"	.16	"	.40	.20	7
12:00-13:00		25	97	.26	"	"	.26	"	.16	"	.40	.20	7
13:00-14:00		30	89	.34	"	"	.34	"	.21	"	.60	.30	14
14:00-15:00		32	"	.36	30	1.00	.36	.63	.23	"	.65	.35	16
15:00-16:00		45	"	.51	62	.95	.48	.78	.39	"	1.10	.80	42
16:00-17:00		50	"	.56	"	"	.53	"	.44	"	1.30	.95	55
17:00-18:00		48	"	.54	62	.95	.51	.78	.43	"	1.20	.90	50
18:00-19:00		38	89	.43	45	1.00	.43	.65	.28	"	.90	.40	25
19:00-20:00		17	97	.18	5	"	.18	.63	.11	"	.25	.15	4
20:00-21:00		10	"	.10	"	"	.10	"	.06	"	.05	.05	1
21:00-22:00		10	97	.10	5	1.00	.10	.63	.06	40	.05	.05	1
22:00-23:00		6	92	.07	2	.64	.04	.50	.04	25	0	0	0
23:00-24:00		4	92	.04	0	.64	.03	.50	.02	25	0	0	0
											Daily Delay		295

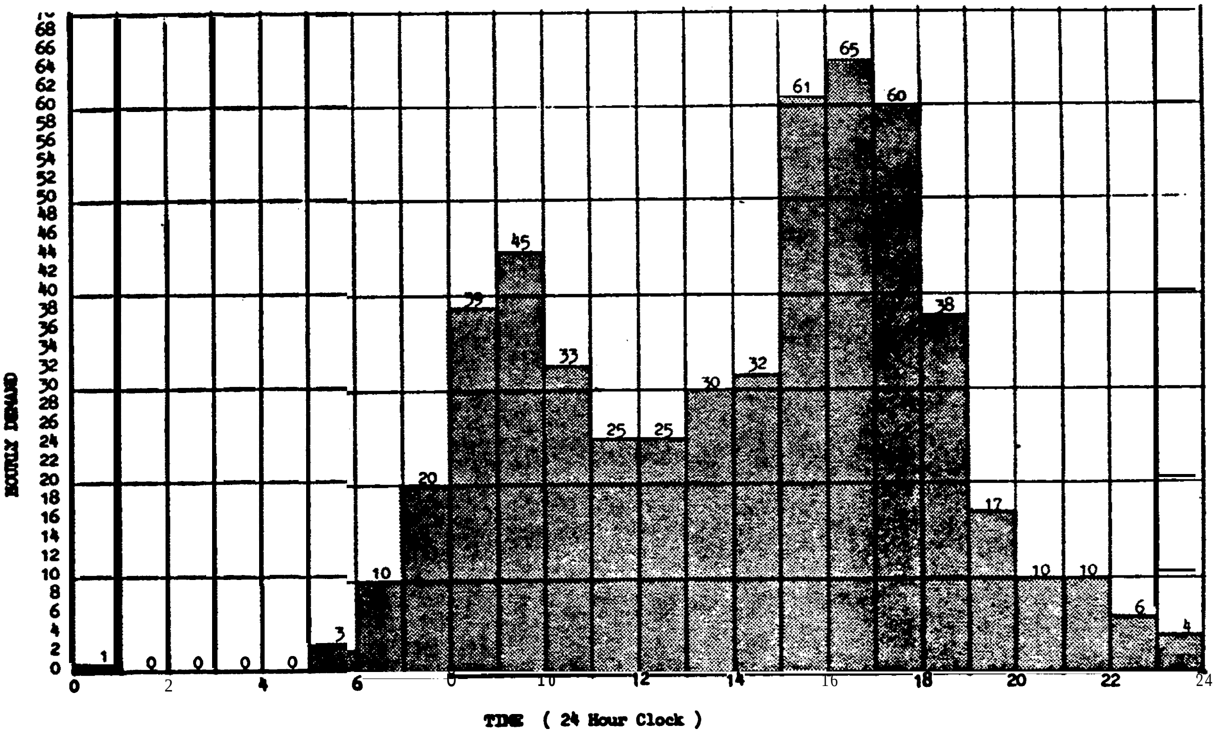
Work sheet for daily **runway** delay.

3. Total Delay. **Sum** the hourly delays, i.e. 295 minutes.

4. **Conclusion. The** 295 minutes of &lay for the day is influenced by **scheduling practices** within the **hour.**

Figure **A2-7.** Daily delay, D/C **ratio** equal or less than 1.00 (cont.)

EXAMPLE 8. Determine the daily delay in **VFR conditions** if the example airport closes the **north-south runway** and the demand during the 3:00 **PM to** 6:00 **PM time** period is increased to exceed the runways capacity.



Histograph of daily **demand.**

SOLUTIONs **The work** sheet cm page 21 illustrate one method of recording data.

1. Identify Saturated **Time Periods:**

a. Calculate Capacities. Calculated runway capacities for the single runway condition are illustrated **below. Since operations** are **limited to a single** runway, capacity values will differ **from** those of **example 7.** Enter data **from below** and **from** example 7 in **columns 3, 4, 6, and 11.**

Demand	Runway-use Diagram	Runway-use No.	Capacity Figure No. VFR	Capacity Figure No. IFR	Aircraft Mix %A	Aircraft Mix %B	Aircraft Mix %C	Aircraft Mix %D	Mix Index %(C+3D)	Arrivals %	Touch and Go %	Runway Exits Location				Runway Exits No.	Hrly. Cap. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity C*·T·E
1	2	3	4	5	6	7	8	9	10	11	12	13				14	15	16	17	18
11-19		1	3		40	55	5	0	5	50	20	30	45	60		1	97	1.10	.86	92
20-35		"	"		35	35	30	0	30	50	10	"	"	"		2	71	1.04	.93	69
36-44		"	"		30	27	42	1	45	45	8	"	"	"		"	65	1.04	.93	63
45-50		"	"		26	20	50	4	62	"	12	"	"	"		"	62	1.10	.91	62
51-59		"	"		21	17	59	3	68	"	10	"	"	"		"	61	1.04	.91	58
60+		1	3		20	15	62	3	71	45	9	30	45	60		2	58	1.04	.91	55

Work sheet **for capacity.**

Figure **A2-8. Daily** delay when D/C ratio is greater than **1.00**

b. Identify Saturated Period. Compare calculated capacities to the demand histograph. The time period from initial overload through recovery (15:00 to20:00) is the saturated period,

Time Period	Demand	Capacity	Overload (Recovery)	Cummulative Overload
14:00-15:00	32	69	0	0
15:00-16:00	61	55	6	6
16:00-17:00	65	55	10	16
17:00-18:00	60	55	5	21
18:00-19:00	38	55	(17)	4
19:00-20:00	17	55	(4)	0
20:00-21:00	10	92	0	0

2. Saturated Period Delay. Calculate the delay for the saturated period as follows:

a. Duration of Overload Phase. Identified as 15:00 to 18:00 hours.

b. AD/C Ratio. Calculate the AD/C ratio for the overload period and enter in column 5.

$$AD/C = \frac{61+65+60}{55+55+55} = \frac{186}{165} = 1.13$$

c. Percent Arrivals. Given as 45%.

d. Delay Indices. Obtain ADI and DDI from figure 3-71 and enter in columns 7 and 9.

AD1 at 40% = 0.74 DDI at 40% = 1.00

" 50% = 0.83 " 50% = 1.00

" 45% = 0.78 a 45% = 1.00

e. Arrival and Departure Delay Factors. Calculate ADF and DDF for the saturated period by multiplying AD1 and DDI by the AD/C ratio and enter in columns 8 and 10.

$$ADF = 0.78 \cdot 1.13 = 0.88$$

$$DDF = 1.00 \cdot 1.13 = 1.13$$

f. Average Delays. Determine average delay from figure 3-70 for a 3-hour overload phase and entered in columns 12 and 13.

Figure A2-8. Daily delay when D/C ratio is greater than 1.00 (cont.)

g. Saturated **Period** Delay. Calculate **the saturated period (DTS)** de&y **and** enter in column 14.

DTS = (61+65+60+38+17)(45·4.9+(100-45)·13.7)/100
= 241(974.0)/100
= 2,347 minutes of delay

3. **Hourly** Delays Unsaturated Periods. **Calculate hourly delays for the unsaturated** periods (24:00 to 15:00 and 20:00 to 24:00) **as in example 6.**

Hour	Misc.	Hourly Demand	Hourly Capacity	D/C Ratio	Mix Index	Arrival Delay Index ADI	Arrival Delay Factor AD?	Depart. Delay Index DDI	Depart. Delay Factor DDF	Delay Factor DPF	Aver. Delay (Minutes) Arr.	Aver. Delay (Minutes) Dep.	Hourly Delay (Minutes)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
24:00-01:00		1	92		–	–	–	–	–	–	–	–	–
01:00-02:00		0	"			–							
02:00-03:00		0	"		–			–		–	–		
03:00-04:00		0	"			–		–				–	
04:00-05:00		0	"	–			–	–			–	–	–
05:00-06:00		3	"	.03	5	.65	.02	.50	.02	40	0.0	0.0	0
06:00-07:00		10	92	.11	5	.65	.07	.50	.06	"	0.1	0.0	1
07:00-08:00		20	69	.29	30	.70	.20	.52	.15	"	0.2	0.2	4
08:00-09:00		39	63	.62	45	.72	.45	.64	.40	"	1.0	0.8	35
09:00-10:00		45	62	.73	62	.67	.49	.74	1.54	"	1.1	1.4	57
10:00-11:00		33	69	[illegible]	30	.70	.34	.56	.27	"	0.6	0.4	17
11:00-12:00		25	"	.36	"	"	[illegible]	[illegible]	.19	"	0.4	0.2	8
12:00-13:00		25	"	.36	"	"	[illegible]	[illegible]	[illegible]	"	0.4	0.2	8
13:00-14:00		30	"	.43	"	"	[illegible]	.53	[illegible]	"	0.5	0.3	12
14:00-15:00		32	60	.46	30	.70	.32	.56	.26	40	0.6	0.4	16
15:00-16:00		61	55										
16:00-17:00		65	"	1.13	71	[illegible]	[illegible]	1.00	1.13	40	4.9	13.7	2347
17:00-18:00		60	"										
18:00-19:00		38	"										
19:00-20:00		17	55										
20:00-21:00		10	92	[illegible]	5	[illegible]	.07	[illegible]	[illegible]	40	Oel	0.0	1
21:00-22:00		10	"	1	"	"	.07	"	[illegible]	"	0.1	0.0	[illegible]
22:00-23:00		6	"	.07	"	"	[illegible]	"	.04	"	0.0	0.0	0
23:00-24:00		4	92	[illegible]	5	[illegible]	[illegible]	.50	.02	40	0.0	0.0	0
											Daily Delay		2507

Work sheet for daily delay **when D/C** ratio is greater than 1.00.

4. Daily Delay. Sum the hourly delays for the saturated and unsaturated **periods,** i.e. 2,507 minutes.

5. Conclusion. When **demand exceeds capacity for several consecutive hours,** daily delays increase significantly.

Figure **A2-8.** Daily delay when D/C ratio **is greater** than 1.00 (cont.)

EXAMPLE 9. Determine the annual runway delay for the example airport, assuming that the airport has an annual demand of 153,000 operations, a demand profile factor of 40, no runway closures, and relatively uniform daily demand throughout each month.

SOLUTION: The work sheet on page 25 illustrates one method of recording data.

NOTE: Use procedures illustrated in examples 7 and 8 to determine the delays for VFR and IFR days. To allow for seasonal variations of demand, 24 representative days are used, i.e., a VFR and an IFR day for each calender month.

1. Distribute Demands. Distribute the annual demand of 153,000 operations to representative daily demands as follows:

a. Distribute to Months. Distribute annual demand to the 12 calendar months and enter in column 3. Use historical data when available.

b. Distribute to Days. Monthly demand is uniformly distributed over the days of the month and entered in column 4.

$$\text{January: } \frac{11{,}631 \text{ operations}}{31 \text{ days}} = 375 \text{ operations/average day}$$

2. Develop Representative Days Demands. Adjust average day demand to representative day demands to account for differences in VFR and IFR operations, as follows:

a. Percent IFR Weather. From historical records, determine the percent of the time that IFR (and PVC) weather conditions prevail in each of the months and enter in column 6.

January: 18% IFR weather
82% VFR weather

b Number of Representative Days. Convert percentages of VFR and IFR weather to days and enter results in column 7.

January: 31 days·82% VFR weather = 25.4 VFR days

31 days·18% IFR weather = 5.6 IFR days

c. Percent IFR Demand. The IFR demand is 68% of VFR demand.

d. Representative Day Demands. Calculate daily demand as follows and enter in column 8.

$$\text{January: } \frac{100 \cdot 375}{100-18(1-68/100)} = \frac{37500}{94.24} = 398 \text{ VFR ops/day}$$

$$398 \cdot 68/100 = 271 \text{ IFR ops/day}$$

Figure A2-9. Annual delay

3 **Develop Hourly Demand for Representative Days.** Fran historical data, deter&e the percentage of daily **operations occuring** in each **hour** of the day. The percentage of demand for each **hour** is assumed to be the same for each representative day whether it is an IFR or VFR **day. A** work sheet, similar to that on page 24, is useful for keeping track of **hourly** demands.

4. **Representative Daily Delay.** Calculated delay for a VFR day in January is **illustrated below** using the procedures of examples 7 and **8. Enter** calculated delays in column **9.**

Hour	Misc.	Hourly Demand	Hourly Capacity	D/C Ratio	Mix Index	Arrival Delay Index ADI	Arrival Delay Factor ADF	Depart. Delay Index DDI	Depart. Delay Factor DDF	Delay Factor DPF	Aver. Delay (Minutes) Arr.	Aver. Delay (Minutes) Dep.	Hourly Delay (Minutes)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
24:00-01:00		1	-	-	-	-	-	-	-	-	-	-	-
01:00-02:00		0	-	-	-	-	-	-	-	-	-	-	-
02:00-03:00		0	-	-	-	-	-	-	-	-	-	-	-
03:00-04:00		0	-	-	-	-	-	-	-	-	-	-	-
04:00-05:00		0	-	-	-	-	-	-	-	-	-	-	-
05:00-06:00		2	-	-	-	-	-	-	-	-	-	-	-
06:00-07:00		8	-	-	-	-	-	-	-	-	-	-	1
07:00-08:00		16	97	.16	5	1.00	.16	.62	.10	40	[illegible]	[illegible]	2
08:00-09:00		31	97'	.32	30	"	.32	.63	.20	"	.55	[illegible]	12
0988040880		37	89	.42	45	"	[illegible]	.65	.27	"	.85	.40	23
10:00-11:00		27	97	.28	30	"	.28	.63	.18	"	.40	[illegible]	8
11:00-12:00		20	"	.21	"	"	[illegible]	[illegible]	[illegible]	.13 "	[illegible]	[illegible]	.104
12:00-13:00		20	"	.21	"	"	.21	"	.13 "	[illegible]	[illegible]	[illegible]	4
13:00-14:00		24	"	.25	"	"	.25	"	.16	"	.35	.15	6
14:00-15:00		26	97	.27	30	"	.27	.63	.17	"	.40	.15	7
15:00-16:00		37	89	.42	45	"	.42	.65	.27	"	.85	.40	23
16:00-17:00		41	"	.46	"	"	.46	"	.30	"	1.00	.50	31
17:00-18:00		39	89	[illegible]	45	"	[illegible]	.65	[illegible]	"	[illegible]	.45	26
18:00-19:00		31	97	[illegible]	30	"	[illegible]	63	20	"	.55	[illegible]	12
19:00-20:00		14	97	.14	5	1.00	[illegible]	[illegible]	[illegible]	40	.10	.10	1
20:00-21:00		8	-	-	-	-	-	-	-	-	-	-	1
21:00-22:00		8	-	-	-	-	-	-	-	-	-	-	1
22:00-23:00		5	-	-	-	-	-	-	-	-	-	-	1
23:00-24:00		3	-	-	-	-	-	-	-	-	-	-	-
											Daily Delay		163

Generally, **it** is not necessary to calculate delay for very low levels **of demand. In** this example**,** a one minute **delay was** assumed for demands between 5 to 10 operations per **hour.**

Figure **A2-9.** Annual runway delay (cont.)

TABULATION OF HOURLY DEMAND FOR REPRESENTATIVE DAYS

Clock Time	Daily Ops	Jan		Feb		Mat		Apr.		Mav		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
		VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR
x:00	8	398	271	414	282	430	292	428	291	436	296	478	323	473	322	521	354	440	299	449	305	440	299	426	290
12-1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-6	[illegible]	2	2	2	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	2	2	3	2
6-7	2:x	8	s	8	6	9	6	9	6	9	6	10	6	9	6	10	7	9,	6	9,	6	9,	6	9	6
7-8	4.1	16	11	17	12	18	12	18	12	18	12	20	13	19	13	21	15	18	12	18	13	18	12	17	12
8-9	7.9	31	21	33	22	34	23	34	23	34	23	38	26	37	25	41	28	35	24	35	24	35	24	34,	23
9-10	9.2	37	25	38	26	40	27	39	27	40	27	44	30	44	30	48	33	40	28	41	28	40	28	39	27
10-11	6.7	27	18	28	19	29	20	29	19	29	20	32	22	32	22	35	24	29	20	30	20	29	20	29	19
11-12	5.1	20	14	21	14	22	15	22	15	22	15	24	17	24	16	27	18	22	15	23	16	22	15	22	15
12-13	5.1	20	14	21	14	22	15	22	15	22	15	24	17	24	161	27	18	22	15	23	16	22	15	22	15
13-14	6.1	24	17	25	17	26	18	26	18	27	18	29	20	29	20	32	22	27	18	27	19	27	18	26	18
14-15	6.5	26	18	27	18	28	19	28	19	28	19	31	21	31	21	34	23	29	19	29	20	29	19	28	19
15-16	9.2	37	25	40	26	40	27	39	27	40	27	44	30	44	30	48	33	40	28	41	28	40	28	39	27
16-17	10.2	41	28	42	29	44	30	44	30	44	30	49	33	48	33	53	36	45	30	46,	31	45	30	43	30
17-18	9.8	39	27	41	28	42	29	42	29	43	29	47	32	46	32	51	35	43	29	44	30	43	29	42	28
18-19	7.7	31	21	32	22	33	22	33	22	34	23	37	25	36	25	40	27	34	23	35	23	34	23	33 .	22
19-20	3.5	14	9	14	10	15	10	15	10	15	10	17	11	17	1 1	18	12	15	10	16	11	15	10	13	10
20-21	2.0	8	S	8	6	9	6	9	6	9	6	10	6	9	6	10	7	9	6	9	6	9	6	9	6
21-22	2.0	8	5	8	6	9	6	9	6	9	6	10	6	9	6	10	7	9	6	9	6	9	6	9	6
22-23	1.2	5	3	5	3	5	4	5	3	S	4	6	4	6	4	6	4	S	4	5					
23-24	[illegible]	3	2	3	2	3	2	3	2	3	2	4,	3.	4	3	4	3	4	2	4	4	5	4	5	2
																					2	4	2	3	2

Representative daily demand **VFR** - IFR calculationa.

January **12:00 to 13:00 hours.**
VFR = **0.051·398** = 20
IFR = **0.051·271 = 14**

Figure A2-9. Annual delay (cont.)

5. Monthly Delay. The delay for each representative VFR and IFR day is multiplied by the number of representative days and entered in column 10. Total monthly delay is entered in column 11.

6. Annual Delay. Sum monthly delays to obtain annual delay.

Month	No. Days	Demand per Month	Awe. Daily Demand	Weather	Percent occur.	Representative Day(s) No. of Days	Representative Day(s) Demand	Representative Day(s) Delay	Monthly Delay (minutes) VFR/IFR	Monthly Delay (minutes) Total
1	2	3	4	5	6	7	8	9	10	11
Jan.	31	11,631	37s	VFR IFR	82 18	25.4 5.6	398 271	163 116	4,140 650	4,790
Feb	28	10,926	390	VFR IFR	80 20	22.4 S.6	414 282	185 130	4,144 728	4,872
Mar.	31	12,561	40s	VFR IFR	85 1s	26.4 4.6	430 292	199 146	5,254 146	5,926
Apr.	30	12,096	403	VFR IFR	87 13	26.1 3.9	428 291	193 14s	5,037 566	5,603
May	31	12,756	411	VFR IFR	90 10	27.9 3.1	436 296	201 148	5,608 459	6,067
June	30	13,508	450	VFR IFR	92 8	27.6 2.4	478 325	278 19s	7,673 468	8,141
July	31	13,832	446	VFR IFR	9s S	29.4 1.6.	473 322	270 190	7,938 304	8,242
Aug.	31	15,227	491	VFR IFR	98 2	30.4 0.6	521 354	355 251	10,792 151	10,943
Sep.	30	12,456	41s	VFR IFR	98 2	29.4 0.6	440 299	209 150	6,145 90	6,235
Oct.	31	13,119	423	VFR IFR	96 4	29.8 1.2	499 305	22s 162	6,705 194	6,899
Now.	30	12,456	41s	VFR IFR	90 10	27.0 3.0	440 299	209 150	5,643 450	6,093
Dec.	31	12,432	401	VFR IFR	85 1s	26.3 4.7	426 290	192 143	s,oso 672	5,722
							TOTALS:	VFR IFR	74,129 5,404	79,533

Work sheet for annual delay.

7. Conclusion. Variations in demand contribute more to the 79,533 minutes of delay than weather, as can be seen in the difference between VFR delays and IFR delays for any month.

Figure A2-9. Annual delay (cont.)

EXAMPLE 10. **Determine** the hourly demand that results in an average departure delay of 0.5 minutes in **VFR** conditions. The demand profile factor **is 40,** the runway capacity is 89, the mix index is 62, and the arrival rate is 45 percent.

SOLUTION: Use a trial demand and compute the associated de&y. Repeat for a refined demand closer to the target delay. Plotting the calculated demand--delay values on a graph will expedite the procedure,

1 Plot Known Point. **From** example 6, the average departure delay in **VFR** condition: is 0.95 minutes when the demand is 50 operations per **hour.** Plot this **point.**

2. Calculate and Plot a Second Demand--Delay. Select a **second demand,** calculate the delay, and plot the point.

a. A demand of 25 operations per hour is selected.

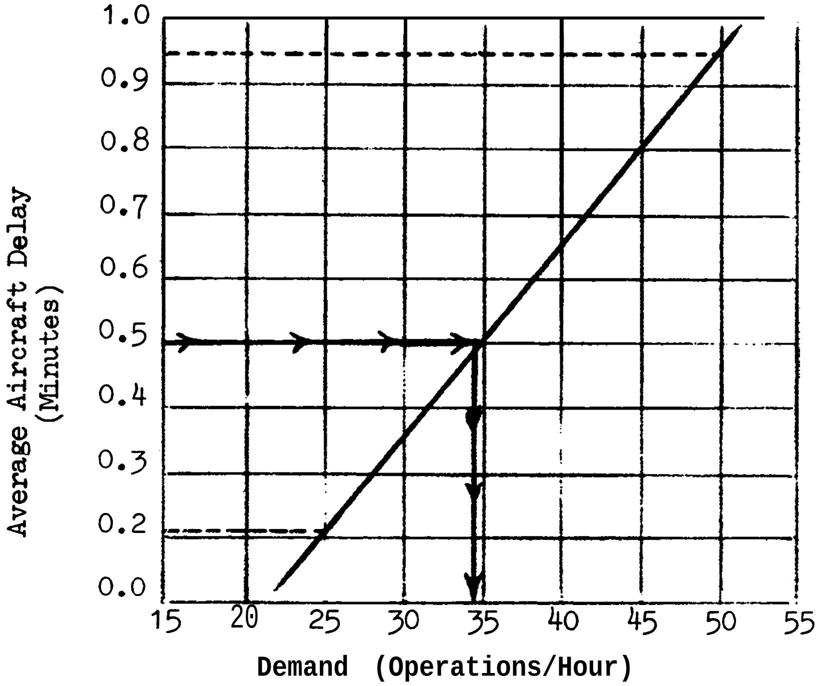
b. **The** demand to capacity ratio **is 25/89 or 0.28.**

c. **From** figure 3-85 , the departure delay index **is 0.75.**

d. **The** departure **delay** factor is **0.75•0.28** or **0.21.**

e. **From** figure **3-69,** the average delay to a departure is 0.22 minutes.

f. Plot the point and connect the two points.



Demand versus delay graph.

Figure **A2-10. Hourly demand** at **a specified level of delay**

3. Graphic Delay Demand. The 0.5 minute delay line intersects the plotted line at a demand of 34 operations per hour.

4 Check Graphic Derived Demand. Calculate and plot the graphically derived demand:

a. The demand is 34 operations per hour.

b. The demand to capacity ratio is34/89 or 0.38.

c. The departure delay index is 0.75.

d. The departure delay factor is 0.75·0.38 or 0.285; say 0.29.

e. From figure 3-69, average departure delay is 0.5 minutes.

5. Conclusion. Limiting the demand to 34 operations per hour meets the average delay of 0.5 minutes per departing aircraft.

Figure A2-10. Hourly demand at a specified level of delay (cont.)

APPENDIX 3. EXAMPLES APPLYINGCHAPTER 4 CALCULATIONS

1. **GENERAL.** The examples in this appendix illustrate applications of chapter 4 capacity calculations with portions of the appropriate figures reproduced in the examples.

2. **EXAMPLES.** Fax examples, figures A3-1 through A3-4, follow:

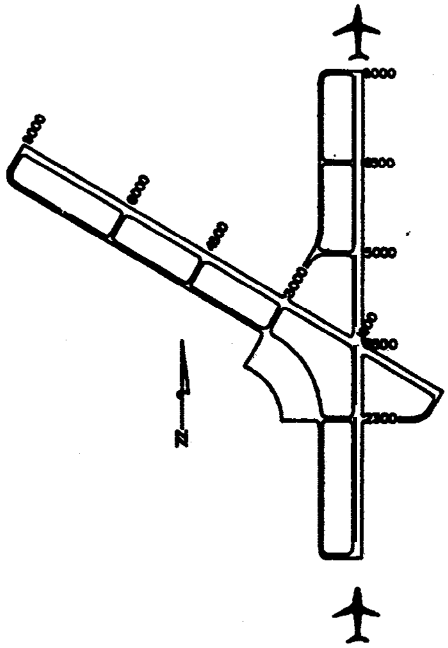
a. Hourly capacity in PVC condition (figure A3-1).

b. Hourly capacity in tine absence of radar coverage or ILS (figure A3-2).

c. Hourly capacity of parallel runway airport with one runway restricted to small aircraft (figure A3-3).

d. Hourly capacity of a single runway airport used exclusively by small aircraft that lacks radar or ILS (figure A3-4).

EXAMPLE 1. **Determine** the capacity of the example airport in PVC conditions. Operations are limited to the N-S runway. **Hourly** demand consists of 25 Class C and two Class **D** aircraft with a 55 percent arrival rate.



SOLUTION:

1. Capacity Figure. **From** figure 4-1 (illustrated), the runway-use configuration **is** diagram No. 1, and the figure for determining capacity is No. **4-2.**

Runway-use Diagram	Diag. No.	Runway Spacing (S) in feet	Figure No. for Capacity: Poor Visibility Conditions	Figure No. for Capacity: Inoperative Navaids	Figure No. for Capacity: Restricted Runway-use VFR	Figure No. for Capacity: Restricted Runway-use IFR
	1	N A	4-2	4-15	-	-
S	2a	700 to 2499	4-3	4-16	-	-
	2b	2500 or more	4-4			

2. Mix Index. For 25 Class C aircraft and 2 by Class D aircraft, the **mix index is:**

$$(25/27) + 3(2/27) = 93 + 3(7) \text{ or } 114$$

3. Percent Arrivals. 55 percent.

Figure **A3-1.** **Hourly** capacity in PVC **conditions**

4. **Hourly Capacity**, Fran figure 4-2 (illustrated)@ the **airport capacity is** 46 operations per **hour.**

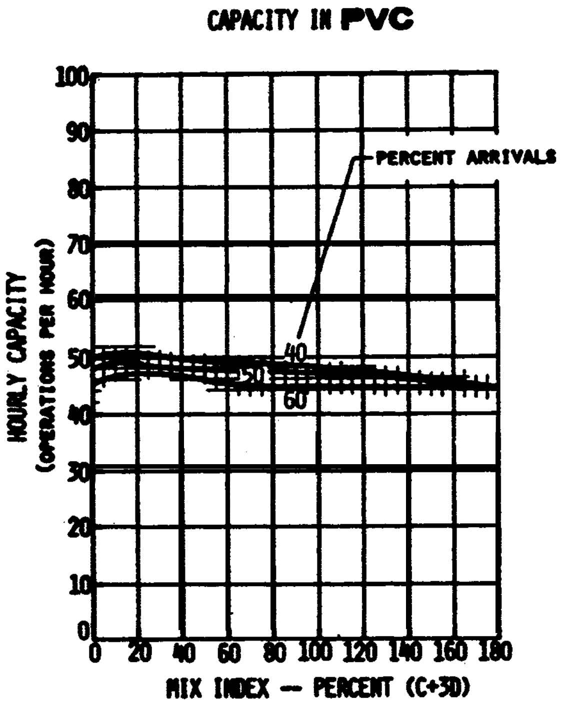
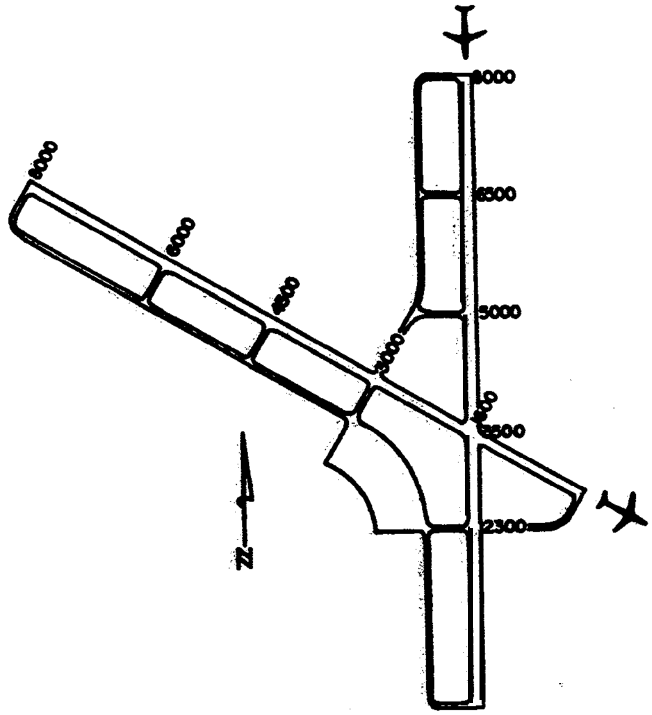


FIGURE 4-2. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NO. 1.

5. **Conclusion.** Under these conditions, the airport loses 10 percent of its capacity when the weather deteriorates **from IFR** to PVC conditions.

Figure **A3-1.** Hourly capacity in *WC* conditions (cont.)

EXAMPLE 2. Determine the IFR capacity of the example airport when the glide slope portion of the ILS is inoperative, radar coverage is out, and a circling approach is used. Demand consists of 25 Class C and 2 Class D aircraft.



SOLUTION:

1. Capacity Figure. From figure 4-1 (illustrated), the runway-use configuration is diagram No. 44 & 47 and the figure for determining capacity is No. 4-15.

Runway-use Diagram	Diag. No.	Runway Spacing (S) in feet		Figure No. for Capacity: Poor Visibility Conditions	Inoperative Navaids	Restricted Runway-use: VFR	IFR
	1	N A		4- 2	4-15	-	-
S	2a	700 to 2499		4- 3	4-16	-	-
X Y		X(ft)	Y(ft)				
	43&46	0 to 1999	0 to 8000	4-12	4-15	-	-
	44&47	2000 to 4999		4-13			
	45&48	5000 to 8000		4-14			

2. Inoperative Aid. The radar and glide slope are art and a circling approach is used.

3. Mix Index. For 25 Class C and 2 Class D aircraft, the mix index is:

$$(25/27)+3(2/27) = 93+3(7) = 114$$

Figure A3-2. Hourly capacity in the absence of radar coverage or ILS

4. **Hourly** capacity. **From** figure 4-15 (illustrated) **, the airport capacity is** 26 operations per **hour.**

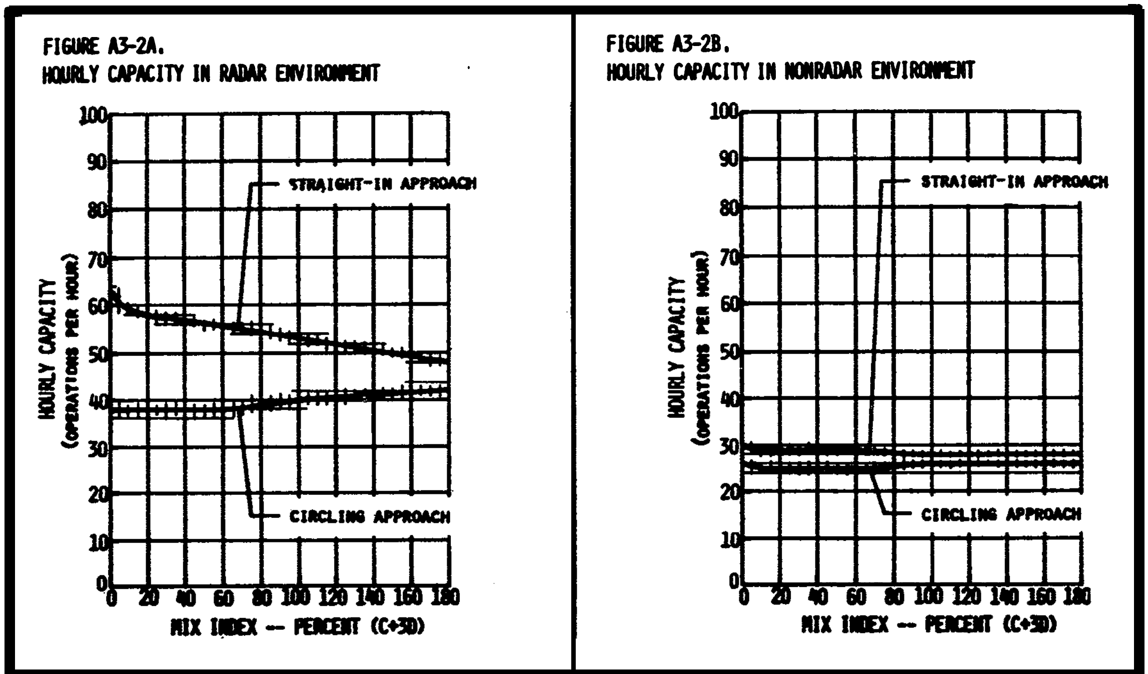
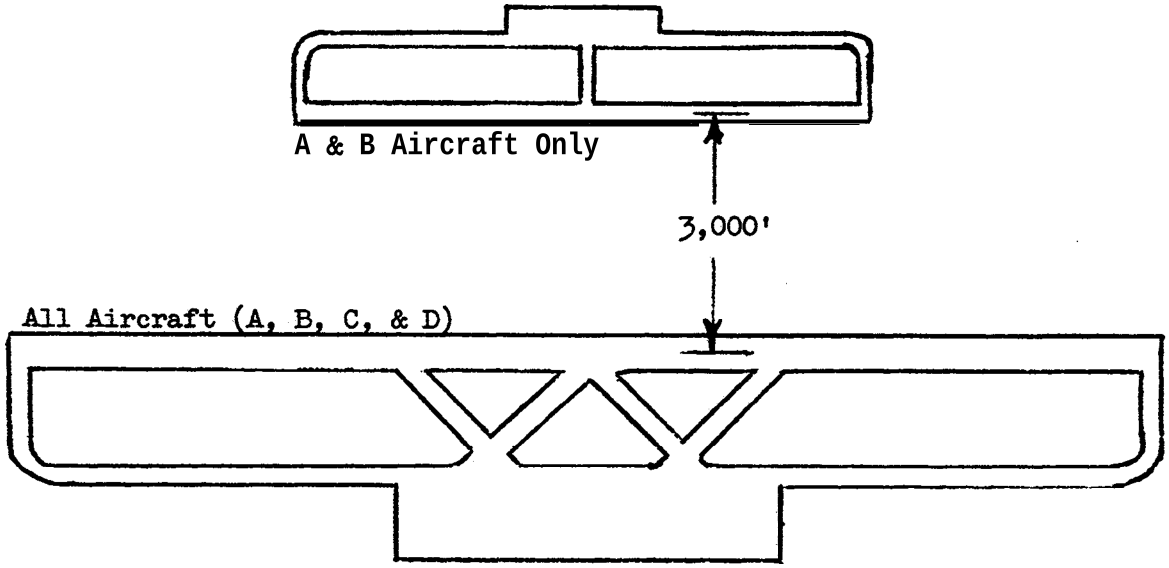


FIGURE 4-15. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS. 1, 43-54.

5. **Conclusion. Airport** capacity is limited to 26 operations per hour when the glide **slope** portion of the ILS **or** radar **are inoperative** and a circling approach is used. With radar coverage, the airport capacity is **40** operations per hour.

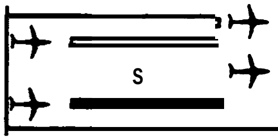
Figure **A3-2. Hourly** capacity in the **absence of** radar coverage or ILS (cont.)

EXAMPLE 3. Determine the VFR **hourly** capacity of the runway configuration depicted below When one runway is used only by Class A and **B** aircraft. **Hourly** demand consists of 20% Class A, 15% Class B, 55% Class C, and 10% Class D aircraft with a **50** percent arrival rate.



SOLUTION:

1. Capacity **Figure.** **From** figure 4-l (illustrated) **, the runway-use configuration is** diagram No. 11 and the figure for determining capacity **is No. 4-18.**

Runway-use Diagram	Diag. No.	Runway Spacing (S) in feet	Figure No. for Capacity: Poor Visibility Conditions	Inoperative Navaids	Restricted Runway-use: VFR	IFR
	9	700 to 2499	4- 3	4-16	4-17	4-21
	10	2500 to 2999	4- 9		4-18	
	11 12	4300 3000 or more 4199	4-11			4-22

2. Mix Index. For 55% Class C and 10% Class D aircraft, the mix **index** is:

$$55 + 3(10) = 85$$

3. Percent Arrivals. 50 percent.

Figure **A3-3.** **Hourly capacity** of parallel runway airport with one runway restricted to small aircraft

4. Hourly Capacity. From figure 4-18 (illustrated), the airport capacity is 83 operations per hour.

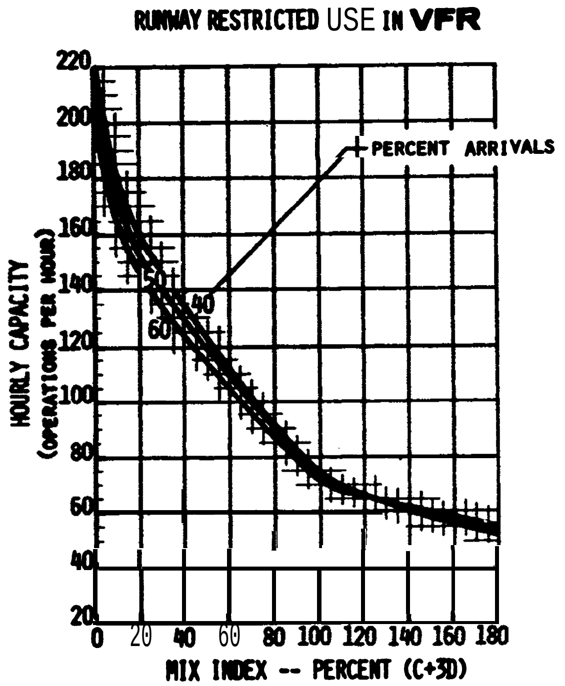
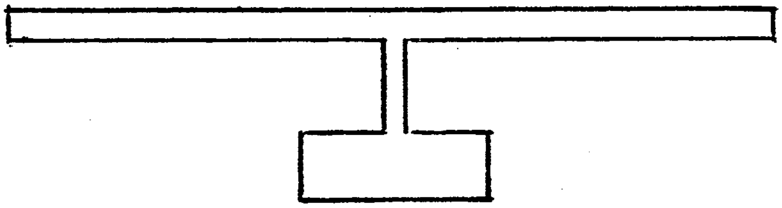


FIGURE 4-18. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS. 10, 11, 12.

5. Conclusion. The capacity of a single runway under these conditions is 57 operations per hour. The capacity of full-length, parallel, unrestricted runways is 115 operations per hour. The capacity of parallel runways when one is limited to use by small aircraft is 83 operations per hour.

Figure A3-3. Hourly capacity of parallel runway airport with one runway restricted to small aircraft (cont.)

EXAMPLE 4. Determine the hourly capacity in **VFR** and **IFR** conditions of the runway-**taxiway** configuration depicted below. The airport is used exclusively by small (Class A and **B)** aircraft and there is no radar coverage or ILS facility. Arrivals generally equal departures, and touch and **go's** approach the 20 percent level.

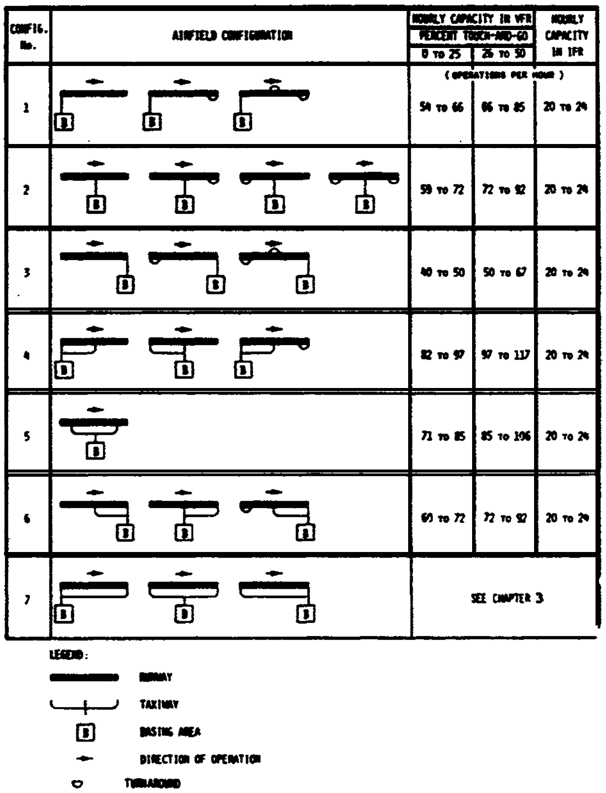


SOLUTION:

1. **Airport Configuration. From** figure 4-26 (illustrated), identify the **runway-taxiway** configuration that best represents **the airport.**

2. Percent **Touch-and-Go.** 20 percent.

3. . Hourly Capacity. **From** figure **4-26,** the range of **VFR and IFR** hourly capacity is 59 to 72 operations, and 20 to 24 operations, respectively.



CONFIG. No.	AIRFIELD CONFIGURATION	HOURLY CAPACITY IN VFR PERCENT TOUCH-AND-GO 0 TO 25	26 TO 50	HOURLY CAPACITY IN IFR
		(OPERATIONS PER HOUR)		
1		54 TO 66	66 TO 85	20 TO 24
2		59 TO 72	72 TO 92	20 TO 24
3		40 TO 50	50 TO 67	20 TO 24
4		82 TO 97	97 TO 117	20 TO 24
5		71 TO 85	85 TO 106	20 TO 24
6		60 TO 72	72 TO 92	20 TO 24
7		SEE CHAPTER 3		

4. **Conclusion. The airport is able to accomodate** 59 **to** 72 operations per **hour in VFR conditions and** 20 **to** 24 **operations per hour in IFR conditions.**

Figure A3-4. Hourly capacity **of a single runway airport used exclusively by small** aircraft that **lacks** radar or ILS.

APPENDIX 4. GLOSSARY OF SYMBOLS/TERMS

%(C+3D) = mix index = the percent of Class C aircraft plus 3 times the percent of Class D aircraft

%IFR = percent of the time that IFR and PVC operating conditions prevail

%IFR demand = **100·(IFR demand)/(VFR** demand)

A = number of arriving aircraft in the hour

AD/C = **average demand-capacity** ratio = (the **sum of** the hourly demands during the overload **phase)/(the** sum of the hourly capacities during the overload phase)

ADF = arrival delay factor = **ADI·(D/C)** or **ADI·** (AD/C) **[overload phase]**

ADI = arrival delay index (figures 3-2 and 3-71 through **3-102)**

Annual capacity = **ASV**

ASV = **annual** service volume = $C_w \cdot D \cdot H$ or (figure 2-1) **[approximate]**

C^* = hourly capacity base (figures 3-2 through 3-65)

C_i = **hourly** capacity for each runway-use configuration (Cl through C_n)

Class A aircraft = **single-engined** small aircraft (table l-l)

Class B aircraft = **multi-engined** small aircraft (table 1-l)

Class C aircraft = large aircraft (table l-1)

Class D aircraft = heavy aircraft (table 1-1)

C_w = **weighted** hourly capacity =
$(P_1 \cdot C_1 \cdot W_1 + P_2 \cdot C_2 \cdot W_2 + \ldots + P_n \cdot C_n \cdot W_n)/(P_1 \cdot W_1 + P_2 \cdot W_2 + \ldots + P_n \cdot W_n)$

D = demand ratio = **(annual demand)/(average** daily demand during the peak **mouth)** (table 3-2) **[typical]**

DA = number of departing aircraft in the hour

DAH = **average delay** per **aircraft** (figure **2-2) [approximate]**

DAHA = average delay for arriving aircraft (figure 3-69)

DAHD = average delay for departing aircraft (figure 3-69)

DASA = average delay **per** arrival (figure **3-70) [saturated period]**

DASD = average delay per departure (figure 3-70) **[saturated period]**

D/C = demand-capacity ratio = (hourly **demand)/(hourly** capacity)

DDF = departure delay factor = **DDI· (D/C) or DDI· (AD/C)** **[overload phase]**

DDI = departure delay **index** (figures **3-2** and 3-71 through **3-102)**

DPF = demand profile factor = **100·Q/HD**

DTH = hourly delay = HD·(PA·DAHA + (100-PA)·DAHD)/100 or HD·DAH [approximate]

DTS = delay in saturated period =
$(HD_1+HD_2+...+HD_n)$·(PAS· DASA+100-PAS)· DASD)/100

E = exit factor (figure 3-2 through 3-65)

G^* = hourly gate capacity base (figure 3-68)

H = demand ratio = (average daily demand)/(average peak hour demand during the peak month) or (table 3-2) [typical]

HD = hourly demand on the runway canponent

HD_i -hourly demand on the runway component during hours 1 through n of the saturated period

Hourly capacity of gates = G^*·S·N (figure 3768)

Hourly capacity of runway canponent = C*·T·E or (figures 4-1 through 4-26) [special applications], or (figure 2-l) [approximate]

Hourly capacity of taxiway crossing an active runway (figures 3-66 and 3-67)

Hourly delay on runway canponent = DTH

IFR demand = VFR demand .%IFR demand/100

N = number of gates

PA = percent arrivals = 100·(A+½(T&G))/(A+DA+(T&G))

PAS = percent of arrivals in the saturated period

PT&G = Percent touch and gos = 100·(T&G)/(A+DA+(T&G))

P_i = percent of the time each runway-use configuration is in use (Pl through Pn)

PVC = poor visibility and ceiling = lower end of IFR conditions

Q = peak 15-minute demand on the runway component

R = gate occupancy ratio = (average gate occupancy time of widebodied aircraft)/(average gate occupancy time of non-widebodied aircraft)

S - factor for gate size (figure 3-68)

T = touch and go factor (figures 3-2 through.3065)

T&G = number of touch and go's in the hour

Type 1 gate = a gate that is capable of accamodating all aircraft

Type 2 gate = a gate that will accommodate only non-widebodied aircraft

VFR demand = (average day demand)/(1-%IFR(1-%IFR demand/100)/100)

W_i = ASV weighting factor for each runway-use configuration (W_1 through W_n) (table 3-1)

APPENDIX 5. BLANK FORMS

Aircraft Mix				Mix Index	Configuration		Capacity (Ops/Hour)		ASV (000)	Annual Demand (000)	Annual Demand / ASV	Average Delay per Aircraft (Minutes)		Minutes of Annual Delay (000)	
%A	%B	%C	%D	%(C+3D)	No.	Sketch	VFR	IFR				Low	High	Low	High
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Figure A5-1. Hourly capacity, ASV, delay for long range planning

Weather	Runway-use Diagram	Runway-use No.	Capacity Figure No.	Aircraft Mix %A	Aircraft Mix %B	Aircraft Mix %C	Aircraft Mix %D	Mix Index (C+3D)	Percent Arrivals	Percent Touch & Go	Runway Exits (00 feet) Location	Runway Exits (00 feet) No.	Hourly Capac. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity C*·T·E
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Figure AS-2. Hourly capacity runway component

Weather	Taxiway Crossing	Distance from Threshold	Runway		Taxiway Crossing Capacities (Operations per Hour)	
			Ops. Rate	Mix Index	Mixed Operations Arrivals and '	Departures Plus T & G
1	2	3	4	5	6	7

Figure A5-3. Hourly capacity taxiway coponent

Non-widebody (N) **Widebody** (W)

Gate Group"	Demand		**No.** Gates		Gate Mix		Average Gate Time (Min.)		Gate **Occupancy** Ratio (T_w/T_n) (R)	Hourly **Capac.** Base (G*)	'Gate Size **(S)**	No. Gates (N)	**Hourly** Capacity **(G*·S·N)**
	(N)	**(W)**	**(N)**	**(W)**	**(N) (%)**	**(W) (%)**	**(N)** (T_n)	**(W)** (T_w)					
1	**2**	3	4	5	6	7	8	9	10	11	**12**	13	14

Figure A5-4. Hourly capacity gate group component

Component	Hourly Capacity	Hourly Demand	Demand Ratio Componet Demand / Runway Demand	Component Quotient Component Capacity / Demand Ratio
1	2	3	4	5

Figure AS-S. Airport hourly capacity

Operating Condition			Mix	Percent of Year	Hourly Capacity	Percent Maximum	Weighting Factor
No.	Weather	Rwy-use Diagram	Index	(P)	(C)	Capacity	(W)
1	2	3	4	5	6	7	8

Figure A5-6 Annual service volume

Rwy-use Configuration		Delay Fig. No.		Capacity	Demand		D/C Ratio	Percent Arrivals	Mix Index	Arrival Delay		Depart. Delay		Demand Profile Factor	Aver. Delay (Minutes)		Hourly Delay (Minutes)
Sketch	No.	VFR	IFR		Hourly	15 Min.				Index ADI	Factor ADF	Index DDI	Factor DDF	DPF	Arr.	Dep.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Figure A5-7. Hourly delay

Hour	Misc.	Hourly		D/C	Mix	Arrival Delay		Depart. Delay		Delay Factor	Aver. Delay (Minutes)		Hourly Delay (Minutes)
		Demand	Capacity	Ratio	Index	Index ADI	Factor ADF	Index DDI	Factor DDF	DPF	Arr.	Dep.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
24:00-01:00													
01:00-02:00													
02:00-03:00													
03:00-04:00													
04:00-05:00													
05:00-06:00													
06:00-07:00													
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19:00-20:00													
20:00-21:00													
21:00-22:00													
22:00-23:00													
23:00-24:00													
											Daily Delay		

Figure A5-8. Daily delay

Clock Time	Daily Ops	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
		VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR	VFR	IFR
x:00	%																								
12-1																									
1-2																									
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Demand	Runway-use Diagram	Runway-use No.	Capacity Figure No. VFR	Capacity Figure No. IFR	Aircraft Mix %A	Aircraft Mix %B	Aircraft Mix %C	Aircraft Mix %D	Mix Index %(C+3D)	Arrivals %	Touch and Go %	Runway Exits Location	Runway Exits No.	Hrly. Cap. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity C*·T·E
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Figure A5-10. Hourly delay, different demands

Month	No. Days	Demand per Month	Av. Daily Demand	Weather	Percent Occur.	Representative Day(s)			Monthly Delay (minutes)	
						No. of Days	Demand	Delay	VFR/IFR	Total
1	2	3	4	5	6	7	8	9	10	11

Figure A5-11. Annual delay

Aircraft		Percent of Aircraft	Dollars Minute	Average cost
Class A 12,500 Pounds or less Single Engine	1-3 Seats		0.60	
	4 + Seats (GA)		1.00	
	4 + Seats (AT)		1.80	
Class B 12,500 Pounds or less Multi Engine	Piston Twin (GA)		2.50	
	Piston Twin (AT)		3.70	
	Turbine Twin (GA)		5.20	
	Turbine Twin (AT)		6.80	
Class C 12,500 to 300,000 Pounds	Piston Engine (GA)		2.80	
	Piston Engine (AT)		4.00	
	Piston Engine (AC)		2.90	
	Turbine Twin (GA)		5.60	
	Turbine Twin (AT)		7.30	
	Turbine Twin (AC)		6.60	
	Turbine Four (AC)		15.10	
	2 Engine Jet (GA)		13.60	
	2 Engine Jet (AT)		16.80	
	2 Engine Jet (AC)		22.00	
	3 Engine Jet (AC)		31.40	
	4 Engine Jet (AC)		35.50	
Class D Over 300,000 Pounds	2 Engine Jet (AC)		39.00	
	3 Engine Jet (AC)		57.60	
	4 Engine Jet (AC)		79.30	
Helicopters	Piston (GA)		1.40	
	Piston (AT)		2.30	
	Turbine (GA)		3.30	
	Turbine (AT)		4.40	
	Totals	loo	cost	

(GA) General Aviation (AT) Air Taxi (AC) Air Carrier

	Low	High
Current Delay (000 Minutes)		
Projected Delay (000 Minutes)		
Potential Savings (000 Minutes)		
Average Cost Per Minute		
Projected Benefit Per Year (000 Dollars)		

Figure A5-12. Savings associated with reduced delay

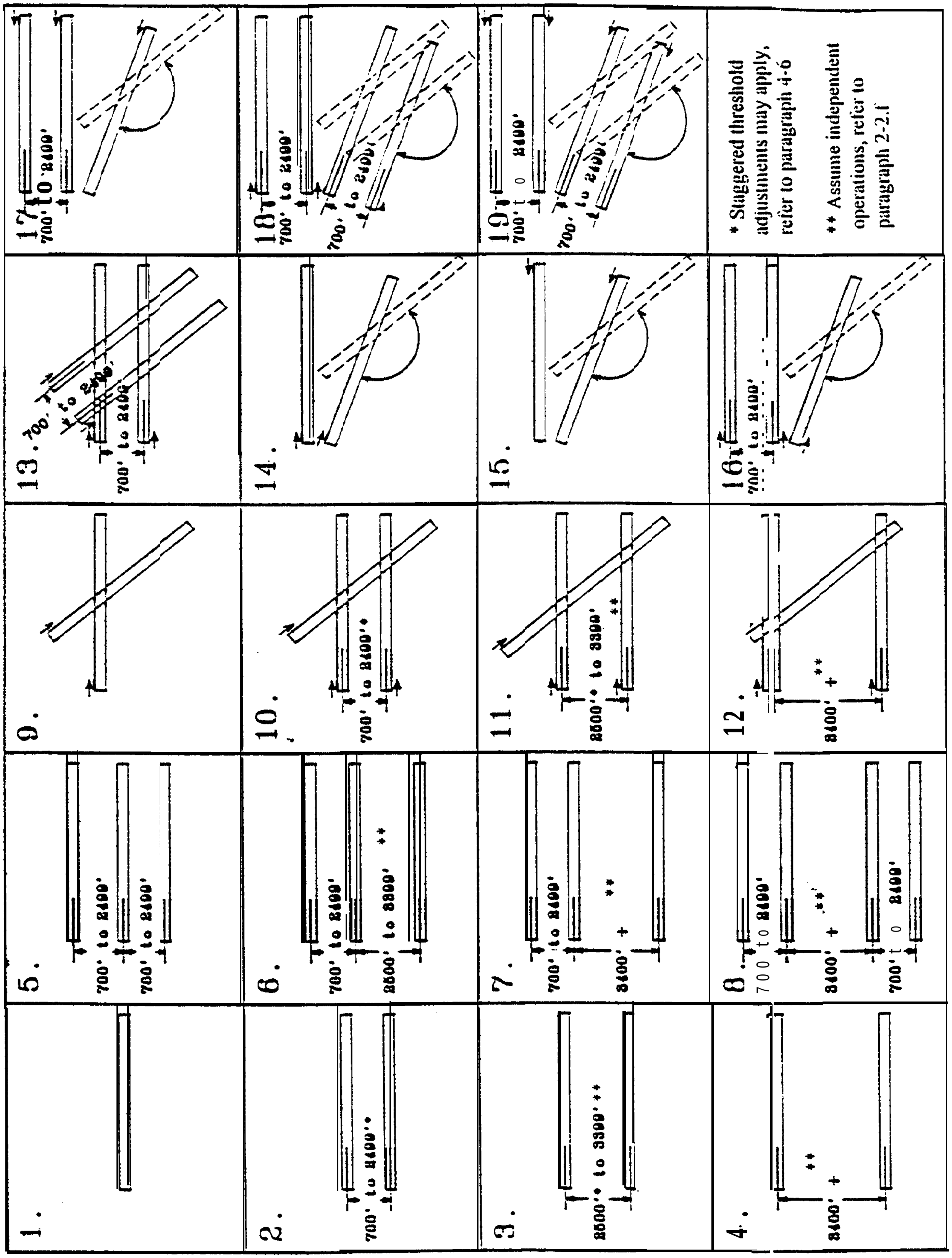

Figure A5-13 The runway-use configuration sketches printout

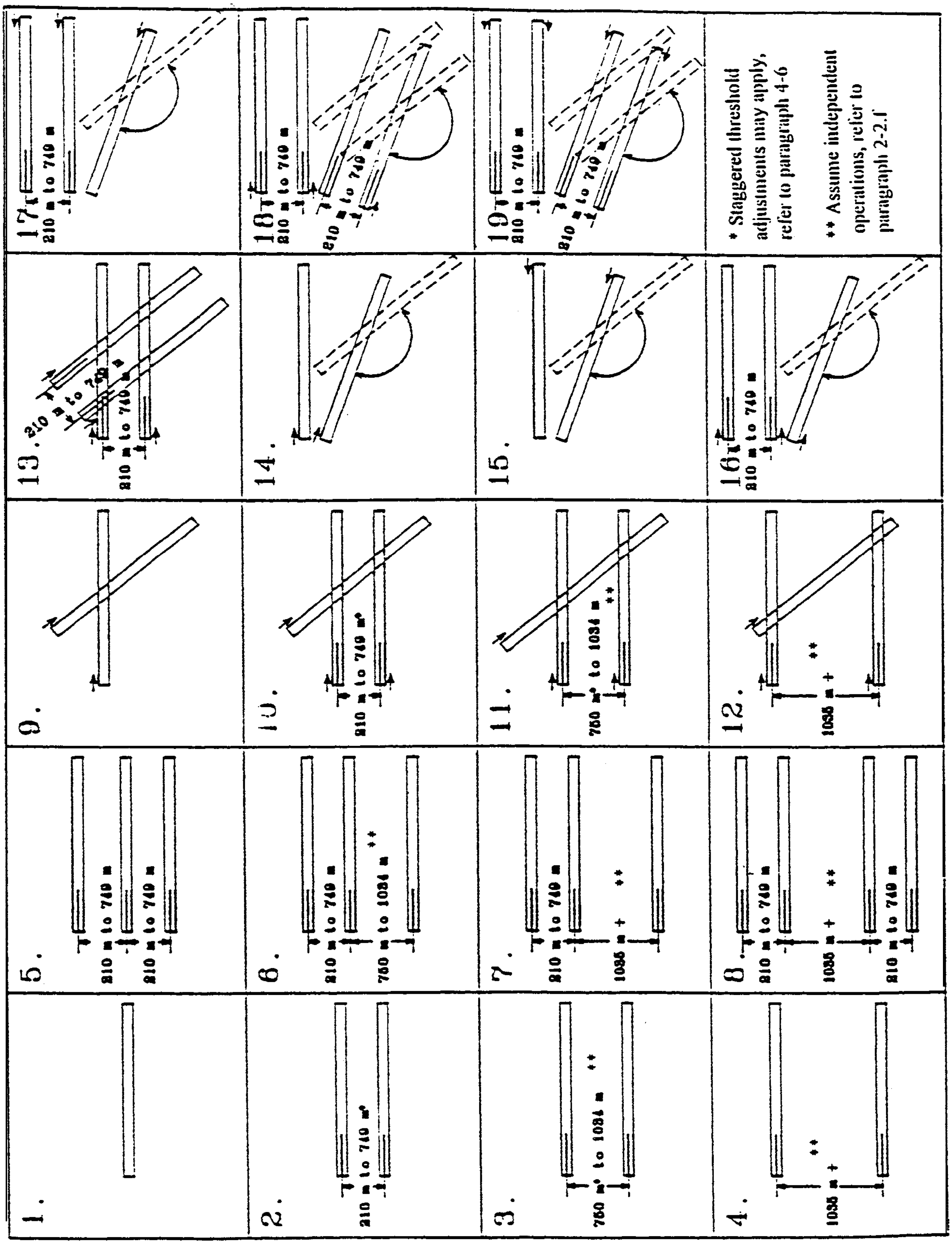

Figure A5-13. The runway-use configuration sketches printout

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