Università degli Studi di Trieste
Dipartimento di Ingegneria e Architettura
Laurea Magistrale: Ingegneria Civile
Corso di INFRASTRUTTURE AEROPORTUALI

Lezione 07: Capacità aeroportuale

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Argomenti

Definizioni di capacità

Componenti della capacità aeroportuale

Fattori di capacità

Capacità e ritardi delle runway per la pianificazione

Capacità oraria Runway

Capacità oraria Taxiway

Capacità oraria gate

Capacità oraria Aeroporto

Calcolo ritardi sulle runway

Capacità di una singola runway

VFR: **50 – 100 operazioni / ora**

IFR: **50 –70 operazioni / ora**

Modalità operative sulle runway

APPROCCI SIMULTANEI

Approcci indipendenti: la separazione minima tramite radar, sulle diverse piste, non è prescritta (se le piste sono opportunamente distanziate).

Approcci dipendenti: la separazione minima tramite radar, sulle diverse piste, è prescritta.

PARTENZE SIMULTANEE

Partenze indipendenti: Partenze che avvengono nella stessa direzione simultaneamente (se le piste sono opportunamente distanziate).

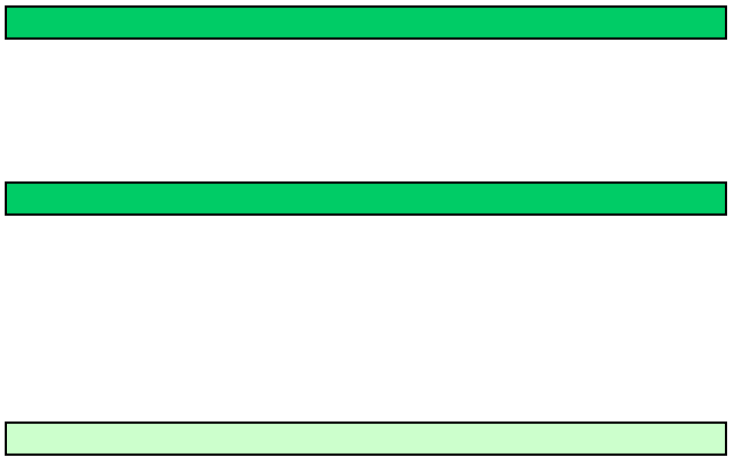
APPROCCI E PARTENZE SEGREGATI

Operazioni segregate: una pista è utilizzata per i decolli e l'altra per gli atterraggi

Operazioni semi – miste: una pista è utilizzata o per gli atterraggi o per i decolli e l'altra può essere utilizzata sia per i decolli che per gli atterraggi.

Operazioni miste: tutte le altre

Piste parallele



SOGLIE ALLINEATE

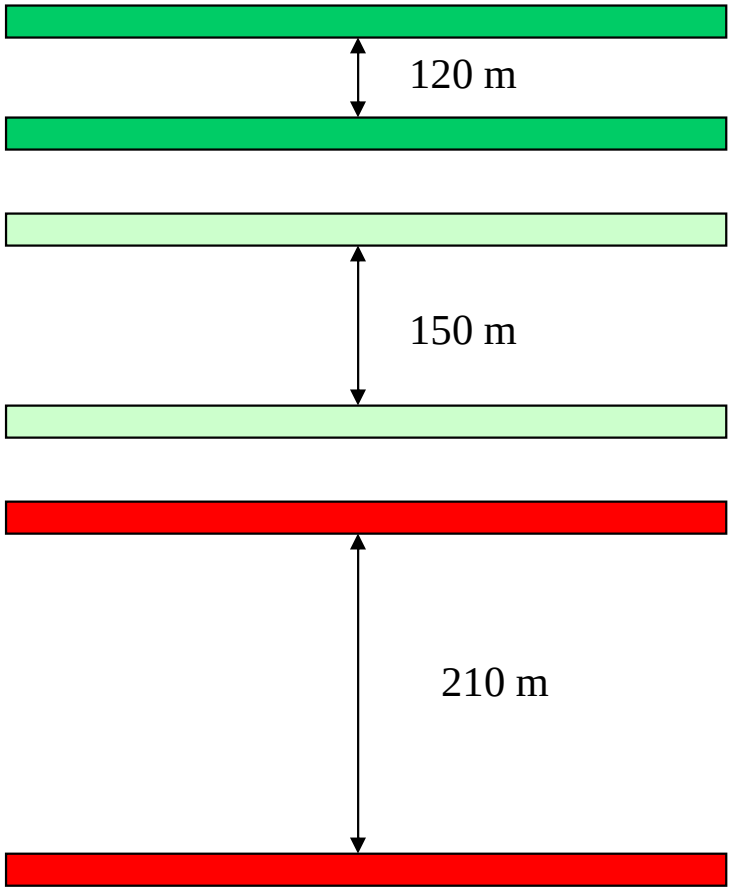
SOGLIE SFALSATE

Separazione tra runway non strumentali

Codice numerico più alto delle piste: 1

Codice numerico più alto delle piste: 2

Codice numerico più alto delle piste: 3 o 4

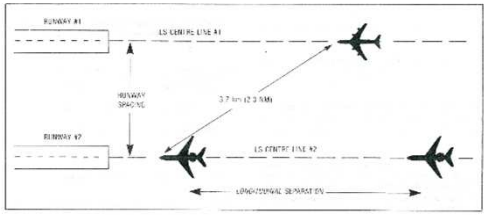


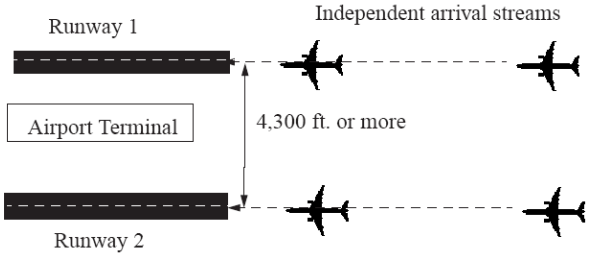
Separazione tra runway strumentali

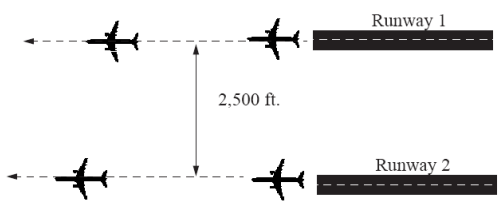
Piste completamente Dipendenti D < 760 m (2500 ft) / 915 m

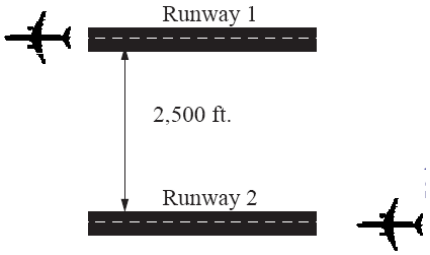
Piste Parzialmente Dipendenti 760 m (2500 ft) / 915 m < D < 1310 m (4300 ft)

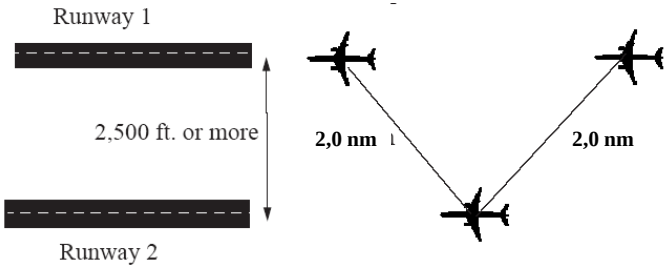
Piste Indipendenti D > 1310 m (4300 ft) / 1035 m





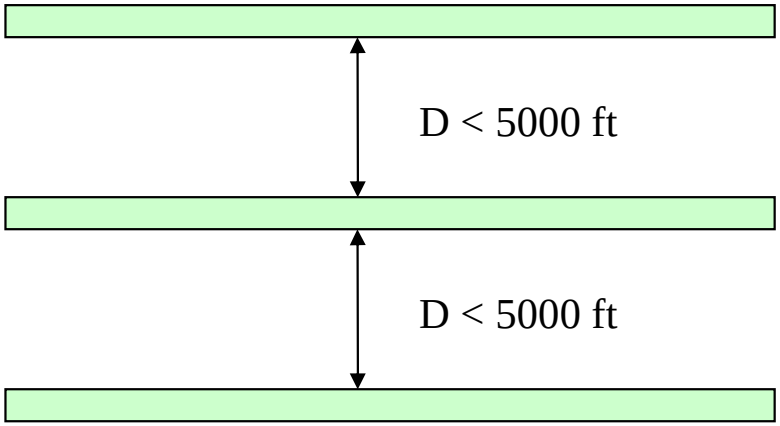


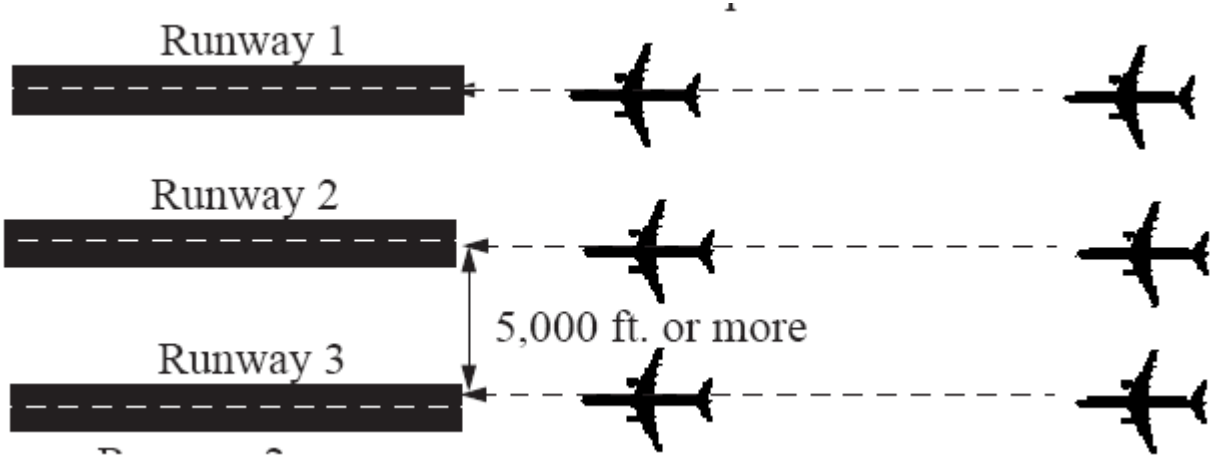




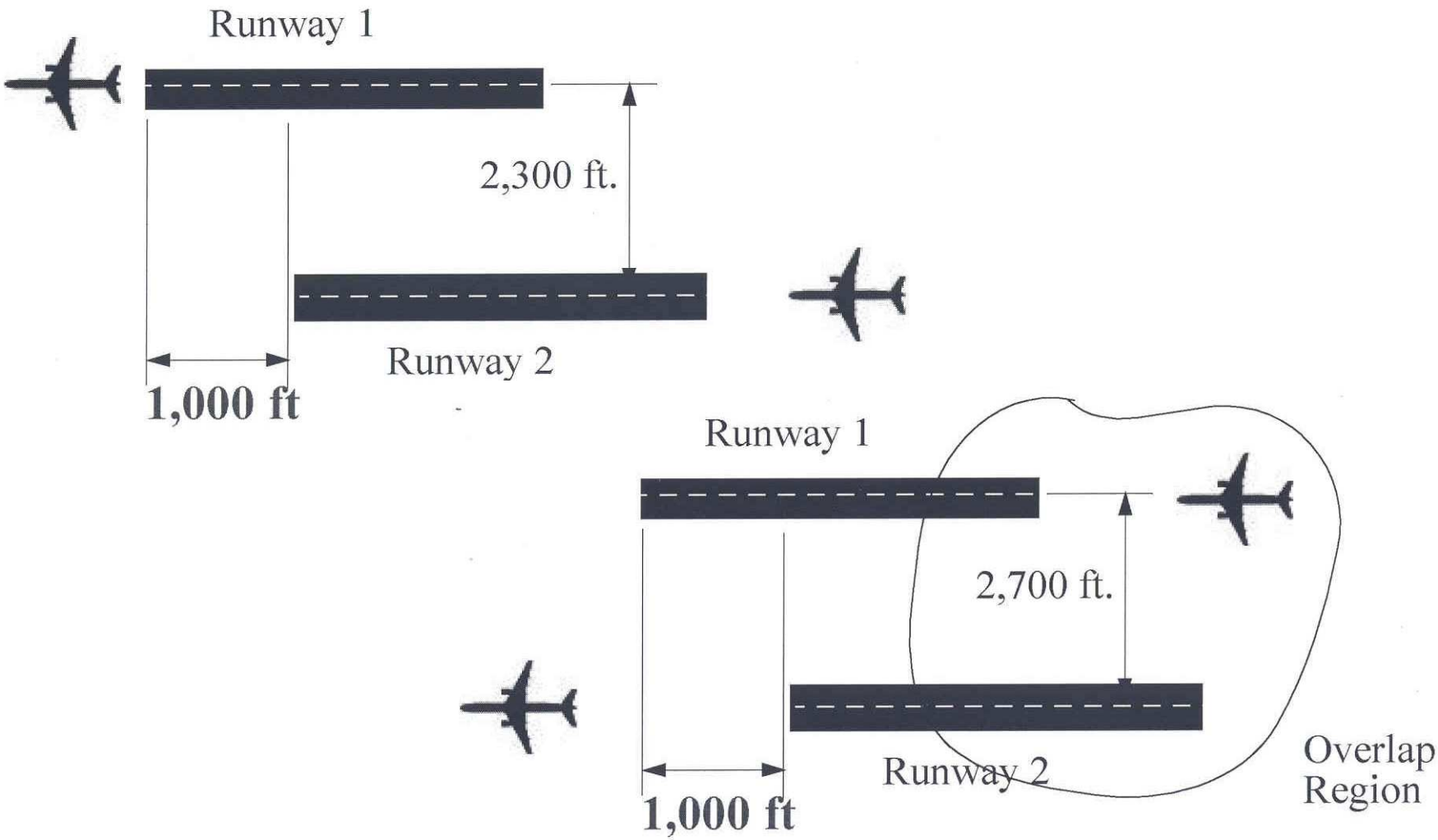
Situazione minime di indipendenza per partenze simultanee, operazioni segregate, atterraggi indipendenti

Separazione tra più runway strumentali

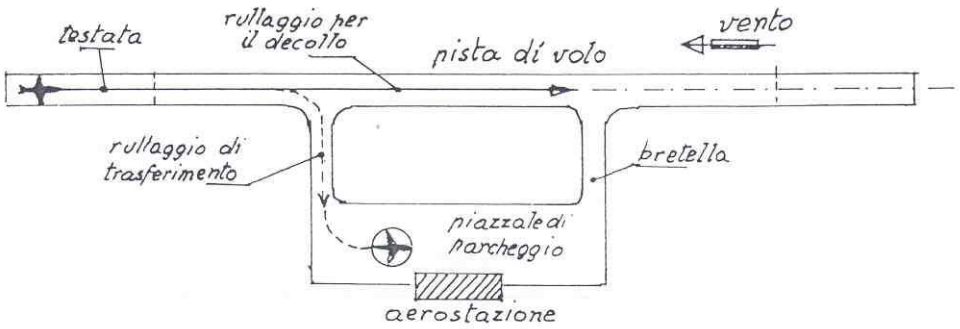


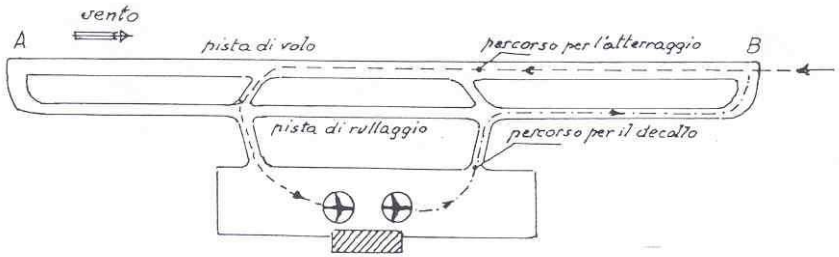


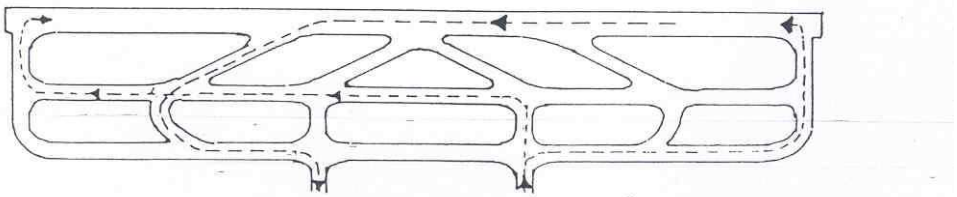
Runway sfalsate



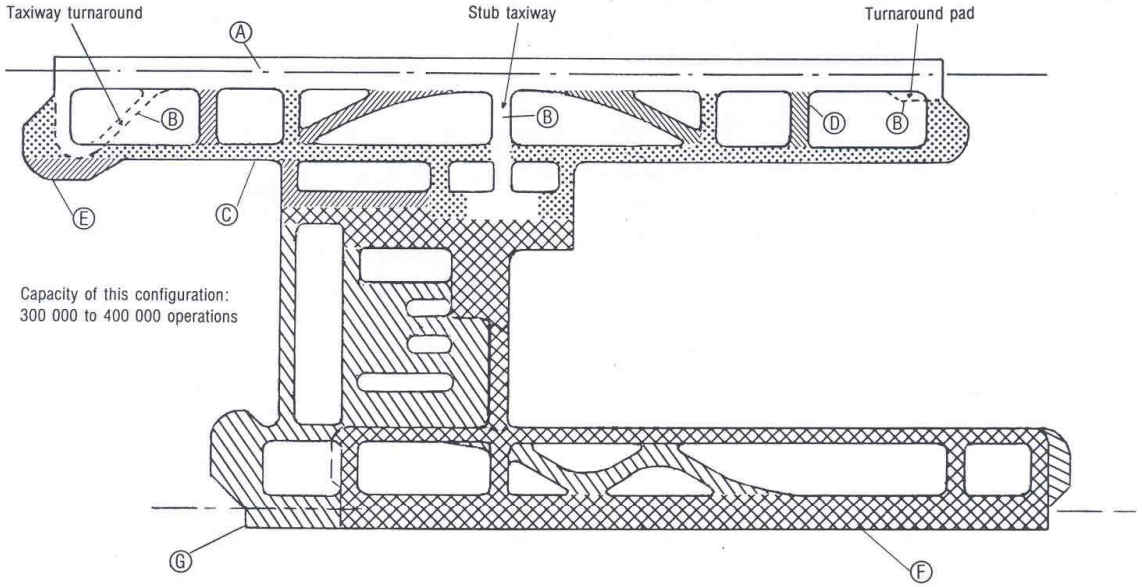
Sistema delle Taxiway







Capacità e configurazione aeroportuale



ITEM	LOCATION OF CRITERIA
	SECTION
A	6.3.2
B	6.3.5 a)
C	6.3.5 b)
D	6.3.5 c)
E	6.3.5 d)
F	6.3.4 a) to c)
G	6.3.4 d)

LEVEL AT WHICH TO BUILD

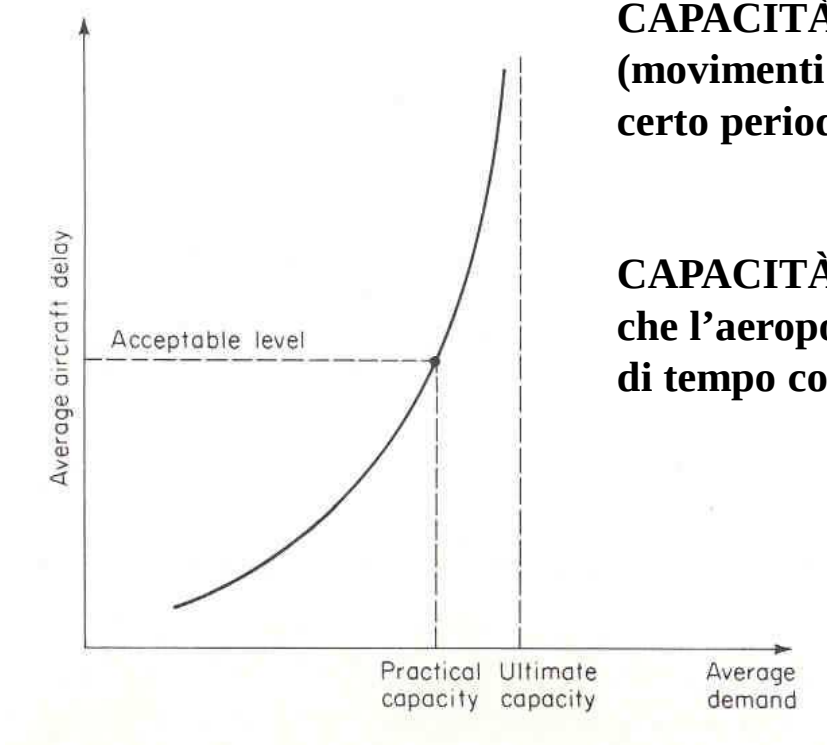
- Up to 20 000 to 30 000 operations
- 30 000 to 60 000 operations
- 50 000 to 99 000 operations
- 75 000 to 150 000 operations
- 150 000 to 250 000 operations

* The above ranges represent activity levels typical of values that would be obtained by use of these instructions. Although computed values would most likely fall in these ranges, this tabulation does not represent criteria.

Programmi di simulazione

Dominio Applicazione	Modello Macroscopico	Modello Microscopico
RUNWAY	-	REDIM, RUNSIM, LMI Run. Model, RDSIM
AIRSIDE	Airport Capacity Model	SIMMOD, Airport Machine
	DELAYS	TAAM
AIRSPACE	SIMMOD	SIMMOD, TAAM, RAMS
	NASPAC	
TERMINAL	APMSIM, ALDSIM	ALSIM
RUMORE	INM	SAIC Noise
INQUINAMENTO	EDMS	VPI plume Model

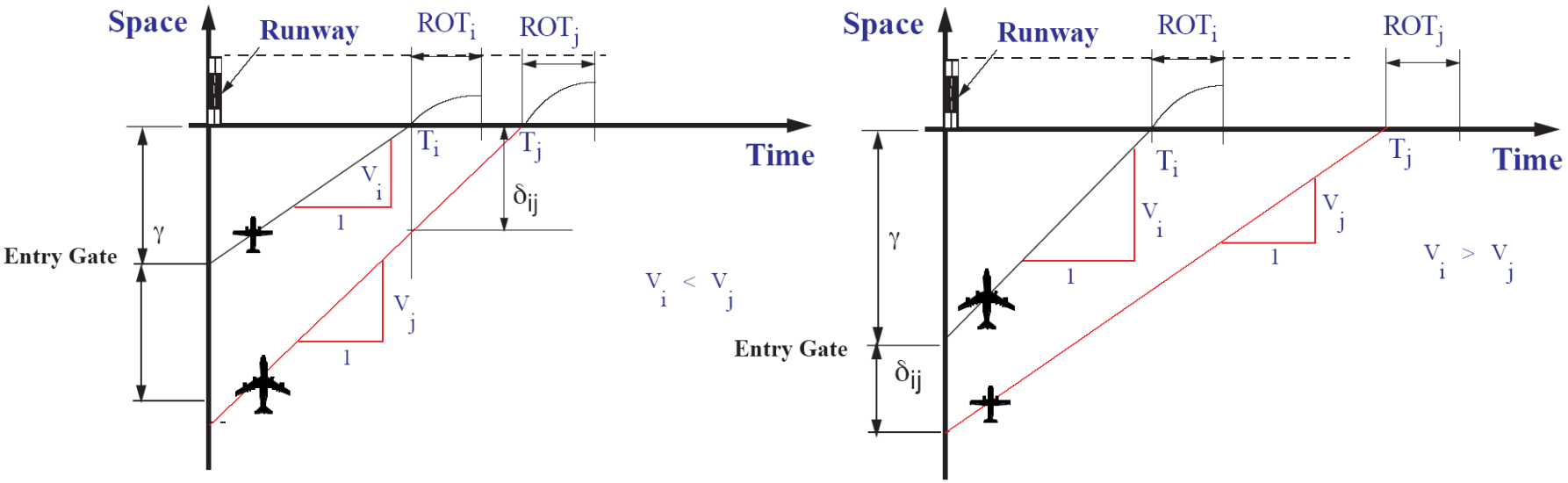
Definizioni di capacità



CAPACITÀ ULTIMA: è il numero massimo di operazioni (movimenti aerei) che l'aeroporto riesce a svolgere in un certo periodo di tempo.

CAPACITÀ PRATICA: è il numero massimo di operazioni che l'aeroporto riesce a svolgere in un determinato periodo di tempo con un determinato livello di servizio.

Capacità ultima



$$T_{ij} = \frac{\delta_{ij}}{V_j}$$

$$T_{ij} = \frac{\delta_{ij}}{V_j} + \gamma\left(\frac{1}{V_j} - \frac{1}{V_i}\right)$$

Calcolo Capacità ultima

$$T = \sum_{i,j} P_i \cdot P_j \cdot T_{ij}$$

$$C = \frac{1}{T}$$

Esempio: γ = 6 nm, δ = 3 nm

Classe aereo	Percentuale	Velocità (nm/h)	ROT
1	0,20	100	50
2	0,20	120	60
3	0,60	135	70

T_{11} = δ /V_1 = 3600 * 3/100 = 108 s; T_{12} = 3600 * 3/120 = 90; T_{13} = 3600 * 3/135 = 80;

T_{21} = (δ /V_1) + (γ / V_1) - (γ / V_2) = 3600 * (3/100 + 6/100 – 6/120) = 144 s; T_{22} = 3600 * 3/120 = 90; T_{23} = 3600 * 3/135 = 80;

T_{31} = (δ /V_1) + (γ / V_1) - (γ / V_3) = 3600 * (3/100 + 6/100 – 6/135) = 164 s;

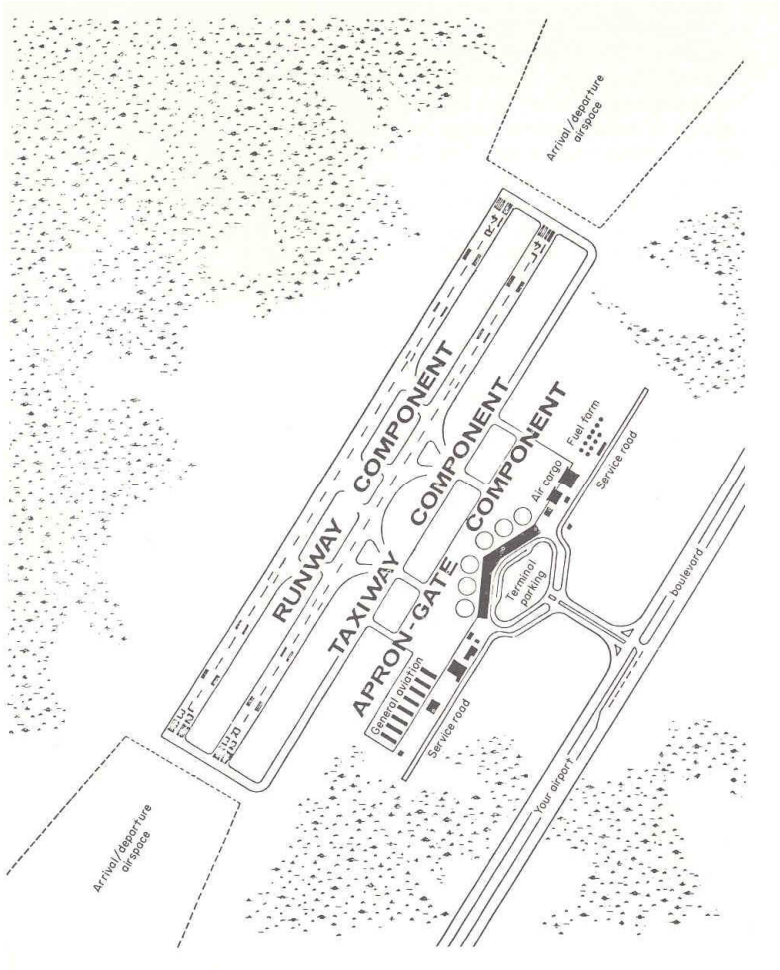
T_{32} = (δ /V_2) + (γ / V_2) - (γ / V_3) = 3600 * (3/120 + 6/120 – 6/135) = 110 s;

T_{33} = 3600 * 3/135 = 80;

$$T = \sum_{i,j} P_i \cdot P_j \cdot T_{ij} = (0{,}20 \cdot 0{,}20 \cdot 108) + (0{,}20 \cdot 0{,}20 \cdot 90) + (0{,}60 \cdot 0{,}20 \cdot 80) + \ldots = 98$$

C = 1/T = 3600* 1/98 = 36 [arrivi/ora]

Componenti del lato aria e capacità



Fattori da cui dipende la capacità

CONFIGURAZIONE D'USO DELLE RUNWAY

CONDIZIONI METEOROLOGICHE

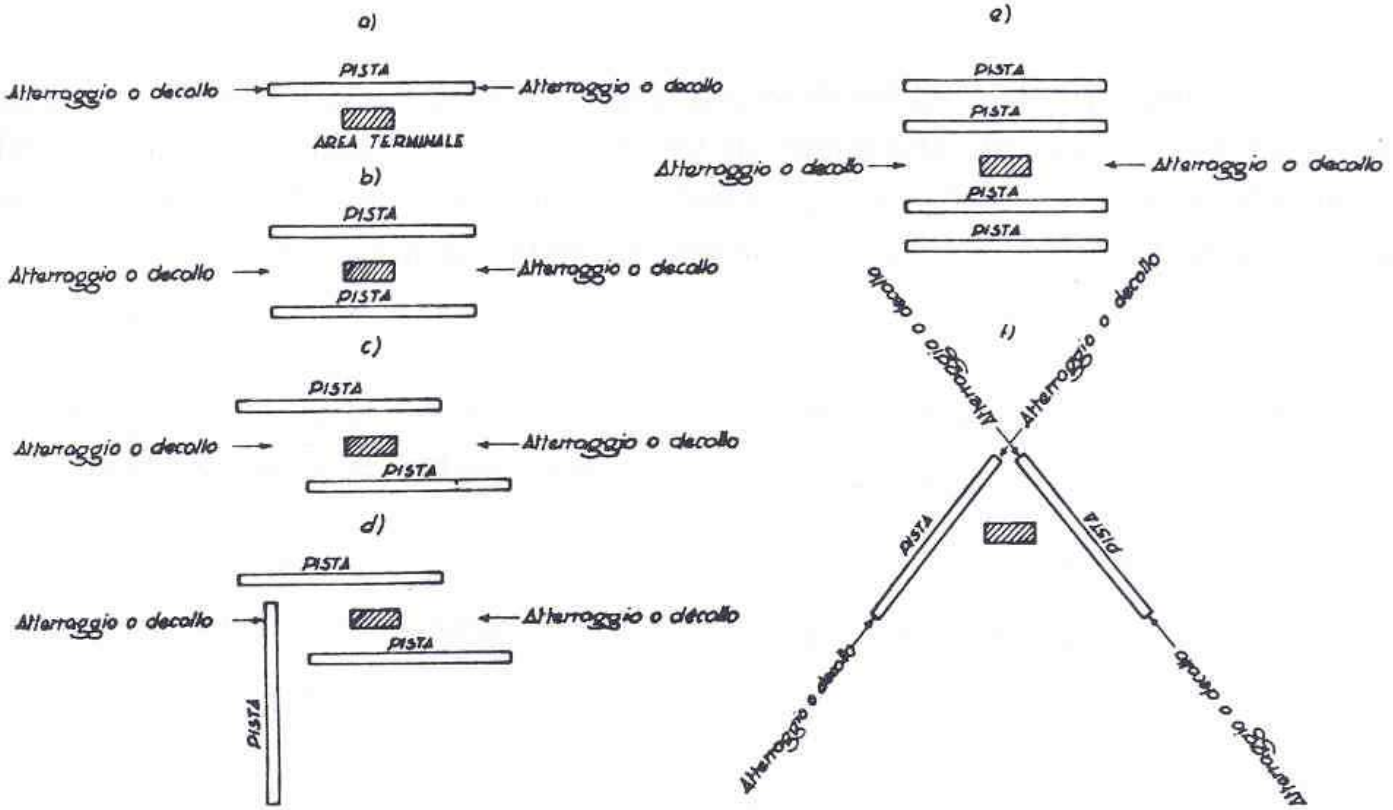
PIORITÀ DI TRAFFICO

COMPOSIZIONE DEL TRAFFICO AEREO

TEMPI DI SERVIZIO

INTERFERENZA CON AEROPORTI VICINI

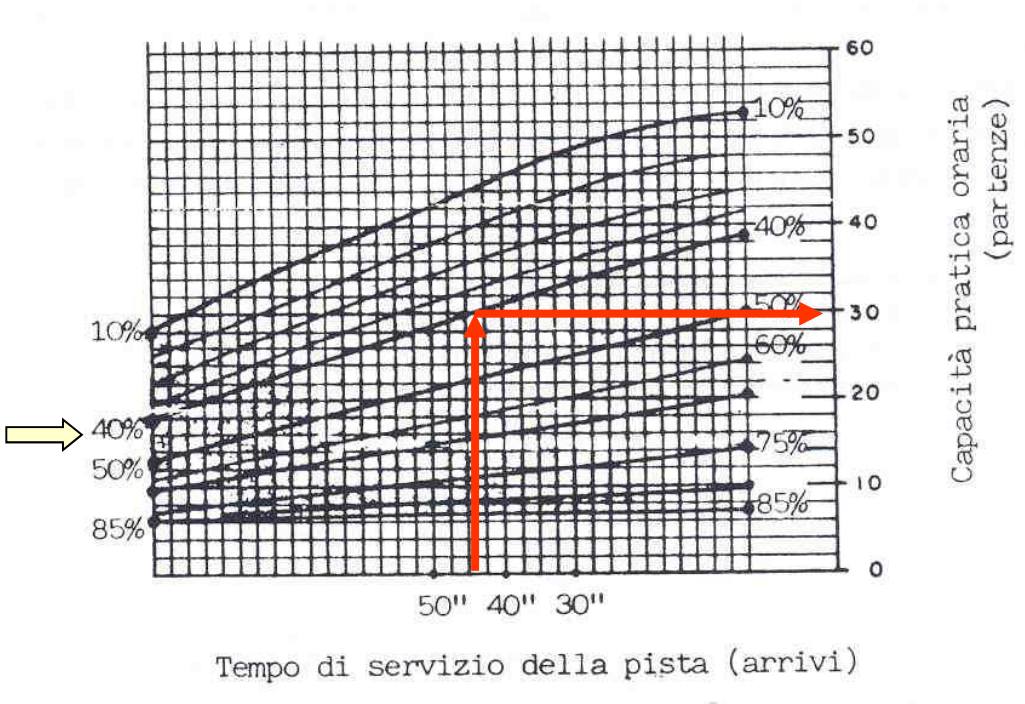
Configurazione delle piste



Priorità di traffico

$$Pa = \frac{A + 0{,}5 \cdot (T \,\&\, G)}{A + DA + (T \,\&\, G)} \cdot 100$$

$$Ptg = \frac{(T \,\&\, G)}{A + DA + (T \,\&\, G)} \cdot 100$$



Pa = percentuale arrivi;

A = numero aerei in arrivo;

T&G = numero di operazioni Touch and Go (voli di addestramento)

DA = numero di partenze

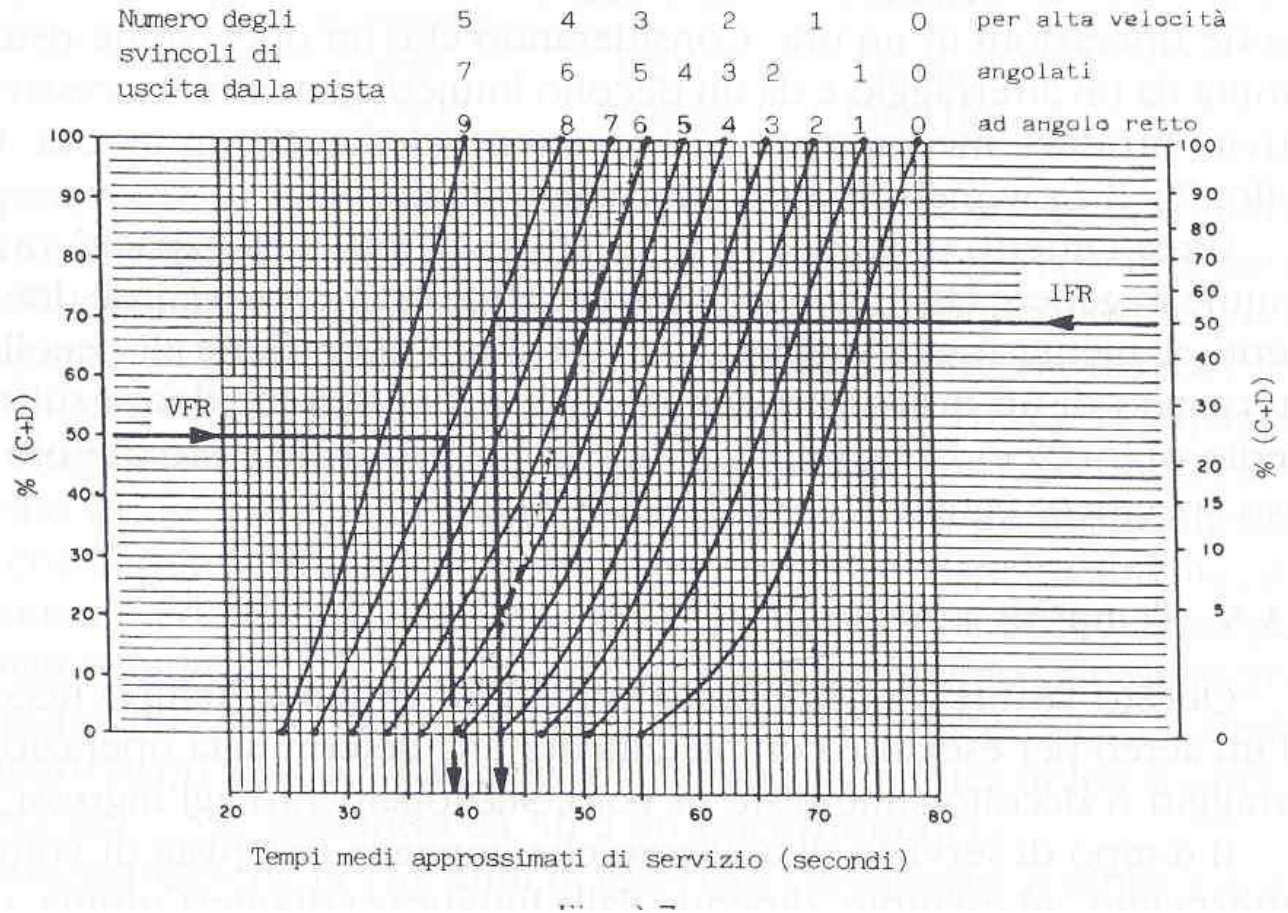
Ptg = percentuale T&G

Composizione traffico aereo

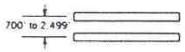
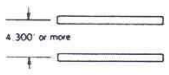
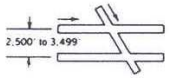
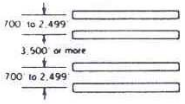
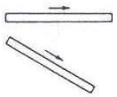
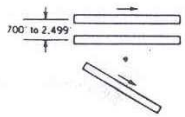
Aircraft Class	Max. Cert. T.O. Weight (lbs)	Number Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B		Multi	
C	12,500 - 300,000	Multi	Large (L)
D	over 300,000	Multi	Heavy (H)

Mix Index = % (C + 3 D) **C e D percentuali aerei appartenenti alle classi C e D**

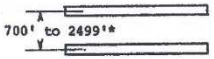
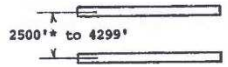
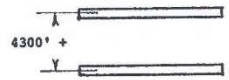
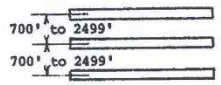
Tempi di servizio



Capacità per pianificazioni (1)

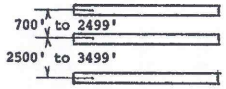
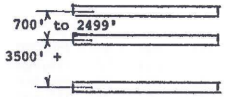
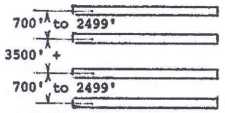
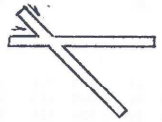
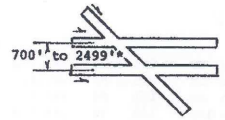
Configuration	Runway Configuration Diagram	Mix Index—Percent (C + 3D)	Hourly Capacity (Operations per Hour) VFR	Hourly Capacity (Operations per Hour) IFR	Annual Service Volume (Operations per Year)
A Single Runway		0–20	98	59	230,000
		21–50	74	57	195,000
		51–80	63	56	205,000
		81–120	55	53	210,000
		121–180	51	50	240,000
B Dual Lane Runways		0–20	197	59	355,000
		21–50	145	57	275,000
		51–80	121	56	260,000
		81–120	105	59	285,000
		121–180	94	60	340,000
C Independent IFR Parallels		0–20	197	119	370,000
		21–50	149	114	320,000
		51–80	126	111	305,000
		81–120	111	105	315,000
		121–180	103	99	370,000
D Parallels plus Crosswind Runway		0–20	197	62	355,000
		21–50	149	63	285,000
		51–80	126	65	275,000
		81–120	111	70	300,000
		121–180	103	75	365,000
E Four Parallels		0–20	394	119	715,000
		21–50	290	114	550,000
		51–80	242	111	515,000
		81–120	210	117	565,000
		121–180	189	120	675,000
F Open V Runways		0–20	150	59	270,000
		21–50	108	57	225,000
		51–80	85	56	220,000
		81–120	77	59	225,000
		121–180	73	60	265,000
G Parallels plus Crosswind Runway		0–20	295	59	385,000
		21–50	210	57	305,000
		51–80	164	56	275,000
		81–120	146	59	300,000
		121–180	129	60	355,000

Capacità per pianificazioni (2)

No.	Runway-use Configuration	Mix Index %(C+3D)	Hourly Capacity Ops/Hr VFR	Hourly Capacity Ops/Hr IFR	Annual Service Volume Ops/Yr
1.		0 to 20	98	59	230,000
		21 to 50	74	57	195,000
		51 to 80	63	56	205,000
		81 to 120	55	53	210,000
		121 to 180	51	50	240,000
2.		0 to 20	197	59	355,000
		21 to 50	145	57	275,000
		51 to 80	121	56	260,000
		81 to 120	105	59	285,000
		121 to 180	94	60	340,000
3.		0 to 20	197	62	355,000
		21 to 50	149	63	285,000
		51 to 80	126	65	275,000
		81 to 120	111	70	300,000
		121 to 180	103	75	365,000
4.		0 to 20	197	119	370,000
		21 to 50	149	113	320,000
		51 to 80	126	111	305,000
		81 to 120	111	105	315,000
		121 to 180	103	99	370,000
5.		0 to 20	295	62	385,000
		21 to 50	213	63	305,000
		51 to 80	171	65	285,000
		81 to 120	149	70	310,000
		121 to 180	129	75	375,000

* Staggered threshold adjustments may apply, see paragraph 4-6.

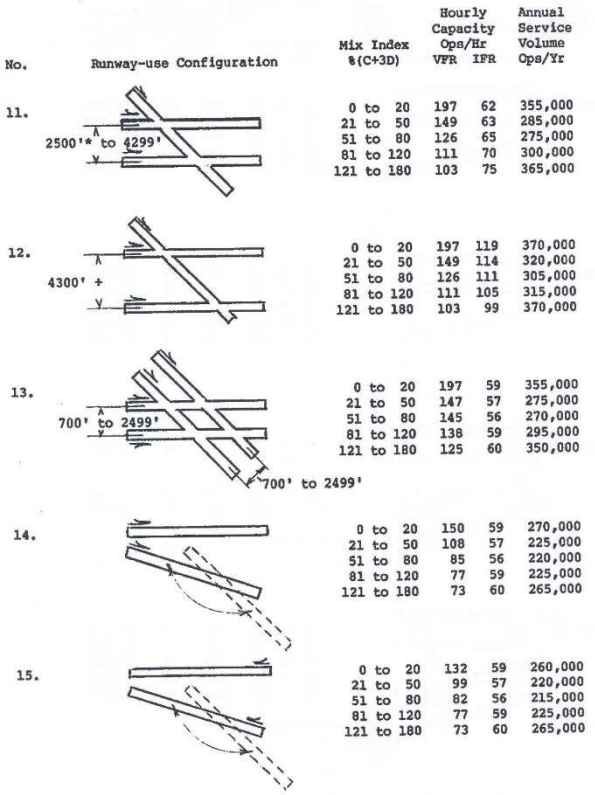
Figure 2-1. Capacity and ASV for long range planning

Runway-use Configuration	Mix Index %(C+3D)	Hourly Capacity Ops/Hr VFR	Hourly Capacity Ops/Hr IFR	Annual Service Volume Ops/Yr
	0 to 20	295	62	385,000
	21 to 50	219	63	310,000
	51 to 80	184	65	290,000
	81 to 120	161	70	315,000
	121 to 180	146	75	385,000
	0 to 20	295	119	625,000
	21 to 50	219	114	475,000
	51 to 80	184	111	455,000
	81 to 120	161	117	510,000
	121 to 180	146	120	645,000
	0 to 20	394	119	715,000
	21 to 50	290	114	550,000
	51 to 80	242	111	515,000
	81 to 120	210	117	565,000
	121 to 180	189	120	675,000
	0 to 20	98	59	230,000
	21 to 50	77	57	200,000
	51 to 80	77	56	215,000
	81 to 120	76	59	225,000
	121 to 180	72	60	265,000
	0 to 20	197	59	355,000
	21 to 50	145	57	275,000
	51 to 80	121	56	260,000
	81 to 120	105	59	285,000
	121 to 180	94	60	340,000

*Staggered threshold adjustments may apply, see paragraph 4-6.

Figure 2-1. Capacity and ASV for long range planning (cont.)

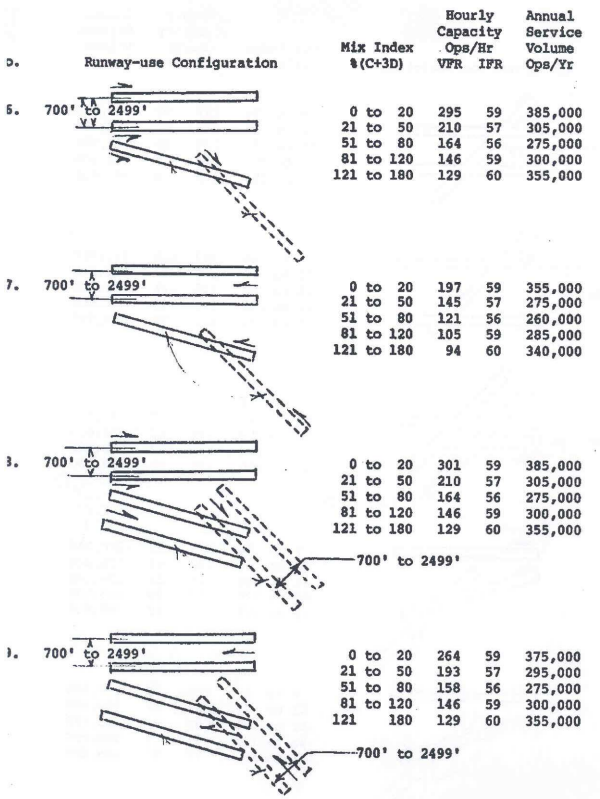
Capacità per pianificazioni (3)



No.	Runway-use Configuration	Mix Index %(C+3D)	Hourly Capacity Ops/Hr VFR	IFR	Annual Service Volume Ops/Yr
11.	2500'* to 4299'	0 to 20	197	62	355,000
		21 to 50	149	63	285,000
		51 to 80	126	65	275,000
		81 to 120	111	70	300,000
		121 to 180	103	75	365,000
12.	4300' +	0 to 20	197	119	370,000
		21 to 50	149	114	320,000
		51 to 80	126	111	305,000
		81 to 120	111	105	315,000
		121 to 180	103	99	370,000
13.	700' to 2499' / 700' to 2499'	0 to 20	197	59	355,000
		21 to 50	147	57	275,000
		51 to 80	145	56	270,000
		81 to 120	138	59	295,000
		121 to 180	125	60	350,000
14.		0 to 20	150	59	270,000
		21 to 50	108	57	225,000
		51 to 80	85	56	220,000
		81 to 120	77	59	225,000
		121 to 180	73	60	265,000
15.		0 to 20	132	59	260,000
		21 to 50	99	57	220,000
		51 to 80	82	56	215,000
		81 to 120	77	59	225,000
		121 to 180	73	60	265,000

*Staggered threshold adjustments may apply, see paragraph 4-6.

Figure 2-1. Capacity and ASV for long range planning (cont.)



No.	Runway-use Configuration	Mix Index %(C+3D)	Hourly Capacity Ops/Hr VFR	IFR	Annual Service Volume Ops/Yr
5.	700' to 2499'	0 to 20	295	59	385,000
		21 to 50	210	57	305,000
		51 to 80	164	56	275,000
		81 to 120	146	59	300,000
		121 to 180	129	60	355,000
7.	700' to 2499'	0 to 20	197	59	355,000
		21 to 50	145	57	275,000
		51 to 80	121	56	260,000
		81 to 120	105	59	285,000
		121 to 180	94	60	340,000
3.	700' to 2499' / 700' to 2499'	0 to 20	301	59	385,000
		21 to 50	210	57	305,000
		51 to 80	164	56	275,000
		81 to 120	146	59	300,000
		121 to 180	129	60	355,000
).	700' to 2499' / 700' to 2499'	0 to 20	264	59	375,000
		21 to 50	193	57	295,000
		51 to 80	158	56	275,000
		81 to 120	146	59	300,000
		121 180	129	60	355,000

Figure 2-1. Capacity and ASV for long range planning (cont.)

Ipotesi per pianificazioni

Mix Index %(C+3D)	Percent Arrivals	Percent Touch & Go	Demand Ratios	
			Annual Demand / Av. Daily Demand*	Av. Daily Demand* / Av. Peak Hour Demand*
0-20	50	0-50	290	9
21-50	"	0-40	300	10
51-80	"	0-20	310	11
81-120	"	0	320	12
121-180	"	0	350	14

* In the peak month

Per la valutazione della capacità oraria:

Taxiways presenti per tutta la lunghezza delle piste;

Nessuna limitazione dello spazio aereo;

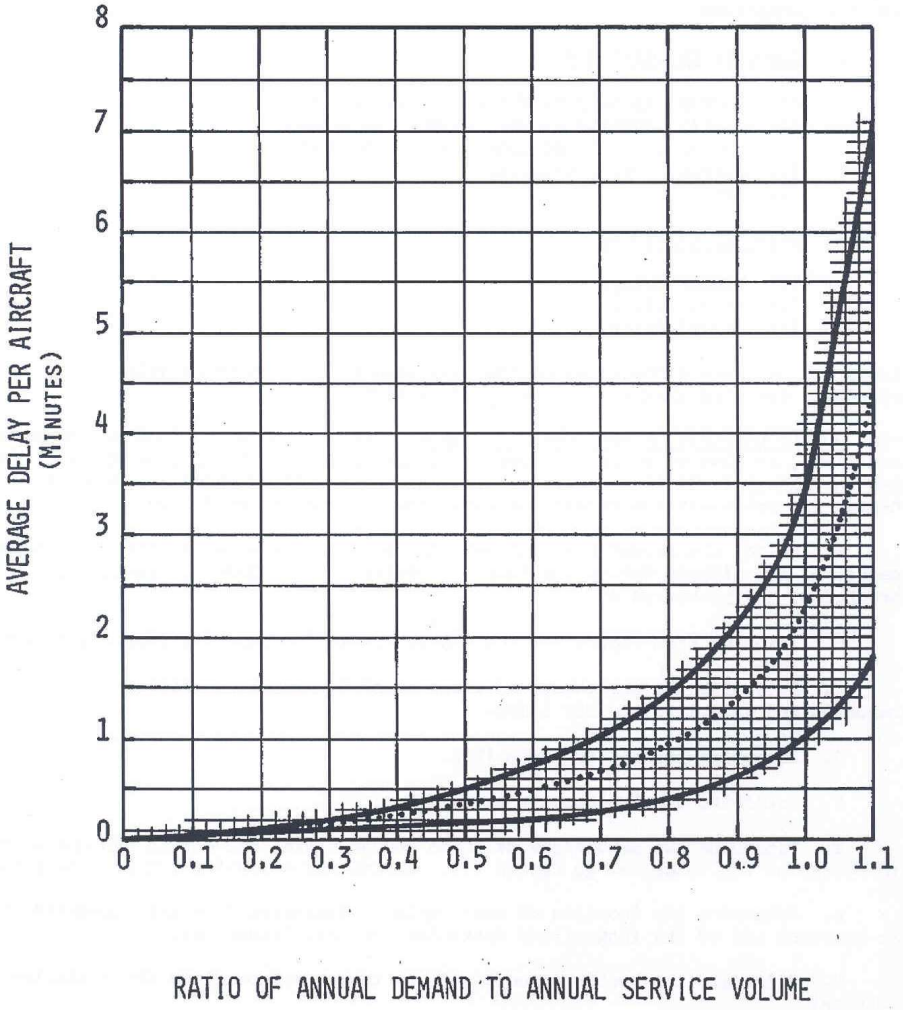
Almeno una pista strumentale e dotazione del radar

Per la valutazione del volume annuale:

Solo il 10 % del tempo si hanno situazioni di tempo di IFR

80 % del tempo l'aeroporto lavora alla massima capacità oraria

Ritardi per pianificazioni



Esempio (1)

DATI:

aeroporto con 1 runway;

domanda di 220.000 operazioni/anno;

41% Aerei Small (metà con un motore), 55 % large, 4 % heavy.

Calcolare la capacità esistente;

identificare le modifiche per soddisfare la domanda;

determinare il ritardo annuale.

EXAMPLE 1. Determine whether the runway capacity is adequate to accommodate the forecasted demand.

SOLUTION:

1. Aircraft Mix. Enter the mix of the forecasted demand (41% small, 55% large, 4% heavy) in columns 1 through 4 of the work sheet.

Table 1-1. Aircraft classifications

Aircraft Class	Max. Cert. T.O. Weight (lbs)	Number Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B		Multi	
C	12,500 - 300,000	Multi	Large (L)
D	over 300,000	Multi	Heavy (H)

2. Runway-use. Select the runway-use configuration from figure 2-1 that best represents the airport. Enter the diagram number (1) in column 6 and a line sketch of the configuration in column 7.

No.	Runway-use Configuration	Mix Index %(C+3D)	Hourly Capacity Ops/Hr VFR	Hourly Capacity Ops/Hr IFR	Annual Service Volume Ops/Yr
1.		0 to 20	98	59	230,000
		21 to 50	74	57	185,000
		51 to 80	63	56	205,000
		81 to 120	55	53	210,000
		121 to 180	51	50	240,000

3. Mix Index. Calculate the mix index, 55+3(4) = 67, and enter in column 5.

4. Hourly Capacity. Enter the hourly VFR and IFR capacities and the ASV, obtained from diagram 1, figure 2-1, in columns 8, 9, and 10.

Aircraft Mix				Mix Index	Configuration		Capacity (Ops/Hour) (000)		ASV	Annual Demand	Annual Demand ASV	Average Delay per Aircraft (Minutes)		Minutes of Annual Delay (000)	
%A	%B	%C	%D	%(C+3D)	No.	Sketch	VFR	IFR	(000)	(000)		Low	High	Low	High
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
21	20	55	4	67	1		63	56	205						

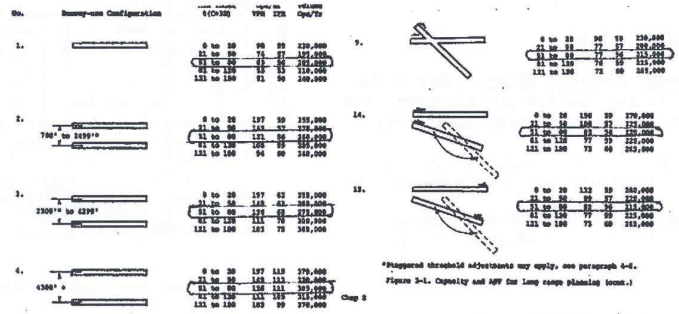
5. Conclusion. The ASV of 205,000 operations is less than the forecasted demand of 220,000 annual operations. Unless additional capacity is provided, delays will become costly.

Esempio (2)

EXAMPLE 2. Example 1 concluded that the ASV of 205,000 operations is less than the forecasted 220,000 operational demand. Identify alternative two-runway configurations that will accommodate the demand.

SOLUTION:

1. Capacity of Alternatives. Repeat each of the calculations of example 1 for each of the two-runway configurations.



*Staggered threshold adjustments may apply, see paragraph 6-6.

Figure 3-1. Capacity and ASV for long range planning (cont.)

Aircraft Mix				Mix Index	Configuration		Capacity (Ops/Hour) (000)		ASV	Annual Demand	Annual Demand ASV	Average Delay per Aircraft (Minutes)		Minutes of Annual Delay (000)	
%A	%B	%C	%D	%(C+3D)	No.	Sketch	VFR	IFR	(000)	(000)		Low	High	Low	High
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
21	20	55	4	67	1		63	56	205						
"	"	"	"	"	2		121	56	260						
"	"	"	"	"	3		126	65	275						
"	"	"	"	"	4		126	111	305						
"	"	"	"	"	9		77	56	215						
"	"	"	"	"	14		85	56	220						
"	"	"	"	"	15		82	56	215						

2. Conclusion. The parallel runway-use configuration (4), which meets the separation requirements for simultaneous instrument approaches, provides the best VFR and IFR hourly capacities and ASV. Any of the parallel runway-use configurations as well as the diverging runway-use configuration meet the forecasted demand. The crossing and converging runway-use configurations have less capacity than the forecasted demand.

EXAMPLE 3. What annual delay is anticipated for the existing and each of the alternative runway-use configurations?

SOLUTION: The following calculations are for the existing single runway-use configuration are repeated for each of the alternative runway-use configurations.

1. Annual Demand. Enter 220,000 (operations) in column 11.

2. Demand-ASV Ratios. Divide the annual demand by the ASV and enter in column 12.

220/205 = 1.07

3. Average Aircraft Delay. Obtain the high and low average delays per aircraft from figure 2-2 and enter in columns 13 and 14.

4. Annual Delay. Calculate annual delay and enter results in columns 15 and 16.

3.5 x 220,000 = 770,000 minutes
5.8 x 220,000 = 1,276,000 minutes

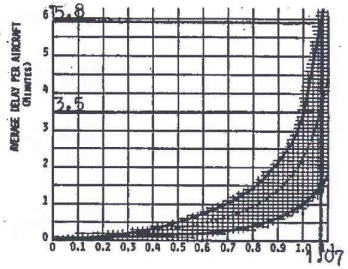


Figure 3-2. Average aircraft delay for long range planning

Aircraft Mix				Mix Index	Configuration		Capacity (Ops/Hour) (000)		ASV	Annual Demand	Annual Demand ASV	Average Delay per Aircraft (Minutes)		Minutes of Annual Delay (000)	
%A	%B	%C	%D	%(C+3D)	No.	Sketch	VFR	IFR	(000)	(000)		Low	High	Low	High
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
21	20	55	4	67	1		63	56	205	220	1.07	3.5	5.8	770	1276
"	"	"	"	"	2		121	56	260	"	.85	1.15	1.8	253	396
"	"	"	"	"	3		126	65	275	"	.80	.95	1.45	209	319
"	"	"	"	"	4		126	111	305	"	.72	.7	1.1	154	242
"	"	"	"	"	9		77	56	215	"	1.02	2.6	4.0	572	880
"	"	"	"	"	14		85	56	220	"	1.0	2.3	3.4	506	748
"	"	"	"	"	15		82	56	215	"	1.02	2.6	4.0	572	880

5. Conclusions. Average delay per aircraft and annual delay with parallel runway-use configurations are significantly less than with any of the other runway-use configurations.

Calcolo capacità oraria Runway (1)

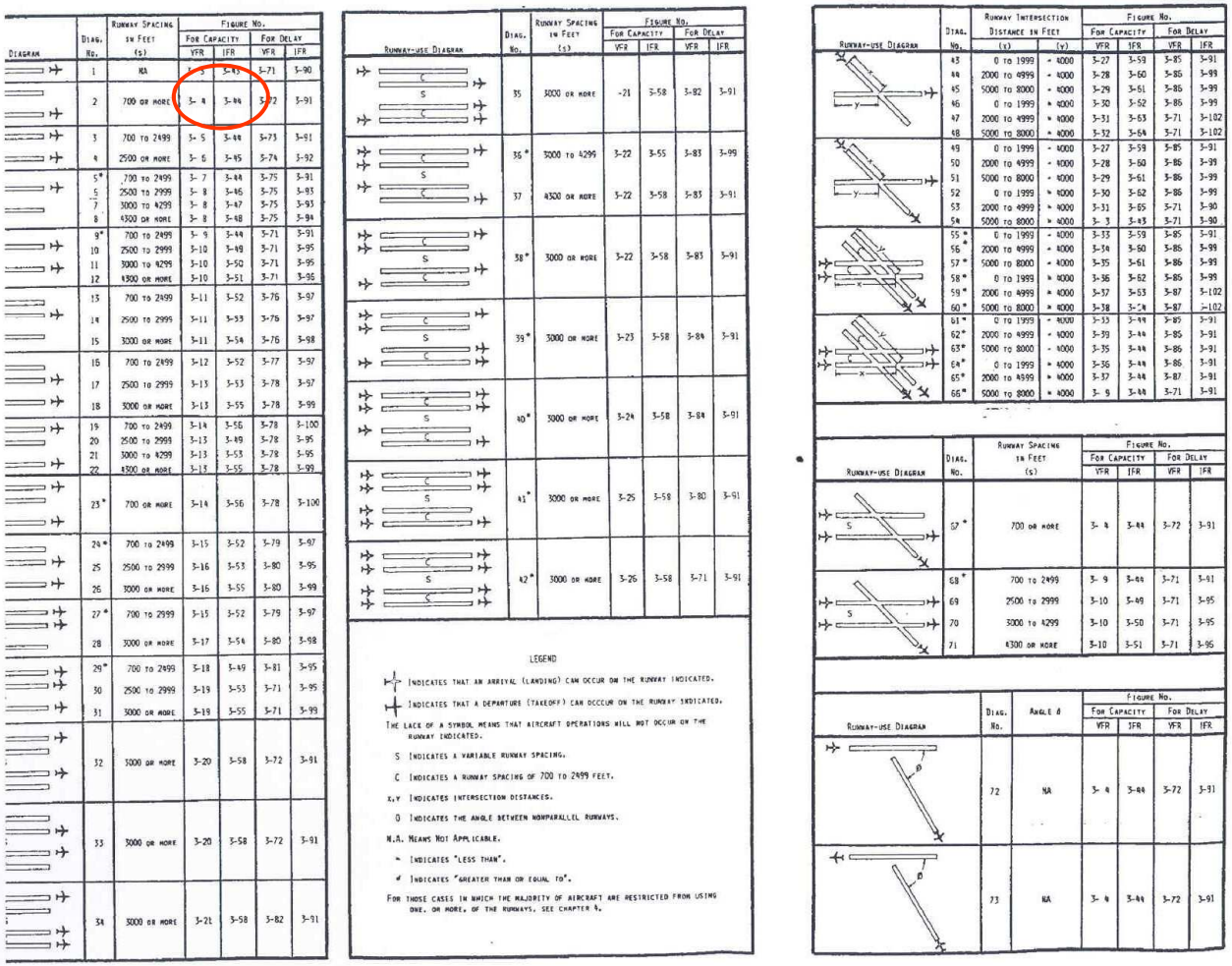


Diagram	Diag. No.	Runway Spacing in Feet (s)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	1	NA	3- 3	3-43	3-71	3-90
	2	700 or more	3- 4	3-44	3-72	3-91
	3	700 to 2499	3- 5	3-44	3-73	3-91
	4	2500 or more	3- 6	3-45	3-74	3-92
	5*	700 to 2499	3- 7	3-44	3-75	3-91
	6	2500 to 2999	3- 8	3-46	3-75	3-93
	7	3000 to 4299	3- 8	3-47	3-75	3-93
	8	4300 or more	3- 8	3-48	3-75	3-94
	9*	700 to 2499	3- 9	3-44	3-71	3-91
	10	2500 to 2999	3-10	3-49	3-71	3-95
	11	3000 to 4299	3-10	3-50	3-71	3-95
	12	4300 or more	3-10	3-51	3-71	3-96
	13	700 to 2499	3-11	3-52	3-76	3-97
	14	2500 to 2999	3-11	3-53	3-76	3-97
	15	3000 or more	3-11	3-54	3-76	3-98
	16	700 to 2499	3-12	3-52	3-77	3-97
	17	2500 to 2999	3-13	3-53	3-78	3-97
	18	3000 or more	3-13	3-55	3-78	3-99
	19	700 to 2499	3-14	3-56	3-78	3-100
	20	2500 to 2999	3-13	3-49	3-78	3-95
	21	3000 to 4299	3-13	3-53	3-78	3-95
	22	4300 or more	3-13	3-55	3-78	3-99
	23*	700 or more	3-14	3-56	3-78	3-100
	24*	700 to 2499	3-15	3-52	3-79	3-97
	25	2500 to 2999	3-16	3-53	3-80	3-95
	26	3000 or more	3-16	3-55	3-80	3-99
	27*	700 to 2999	3-15	3-52	3-79	3-97
	28	3000 or more	3-17	3-54	3-80	3-98
	29*	700 to 2499	3-18	3-49	3-81	3-95
	30	2500 to 2999	3-19	3-53	3-71	3-95
	31	3000 or more	3-19	3-55	3-71	3-99
	32	3000 or more	3-20	3-58	3-72	3-91
	33	3000 or more	3-20	3-58	3-72	3-91
	34	3000 or more	3-21	3-58	3-82	3-91

Runway-use Diagram	Diag. No.	Runway Spacing in Feet (s)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	35	3000 or more	-21	3-58	3-82	3-91
	36*	2500 to 4299	3-22	3-55	3-83	3-99
	37	4300 or more	3-22	3-58	3-83	3-91
	38*	3000 or more	3-22	3-58	3-83	3-91
	39*	3000 or more	3-23	3-58	3-84	3-91
	40*	3000 or more	3-24	3-58	3-84	3-91
	41*	3000 or more	3-25	3-58	3-80	3-91
	42*	3000 or more	3-26	3-58	3-71	3-91

LEGEND

- Indicates that an arrival (landing) can occur on the runway indicated.
- Indicates that a departure (takeoff) can occur on the runway indicated.

The lack of a symbol means that aircraft operations will not occur on the runway indicated.

S Indicates a variable runway spacing.

C Indicates a runway spacing of 700 to 2499 feet.

X,Y Indicates intersection distances.

Ø Indicates the angle between nonparallel runways.

N.A. Means Not Applicable.

< Indicates "less than".

≥ Indicates "greater than or equal to".

For those cases in which the majority of aircraft are restricted from using one, or more, of the runways, see Chapter 9.

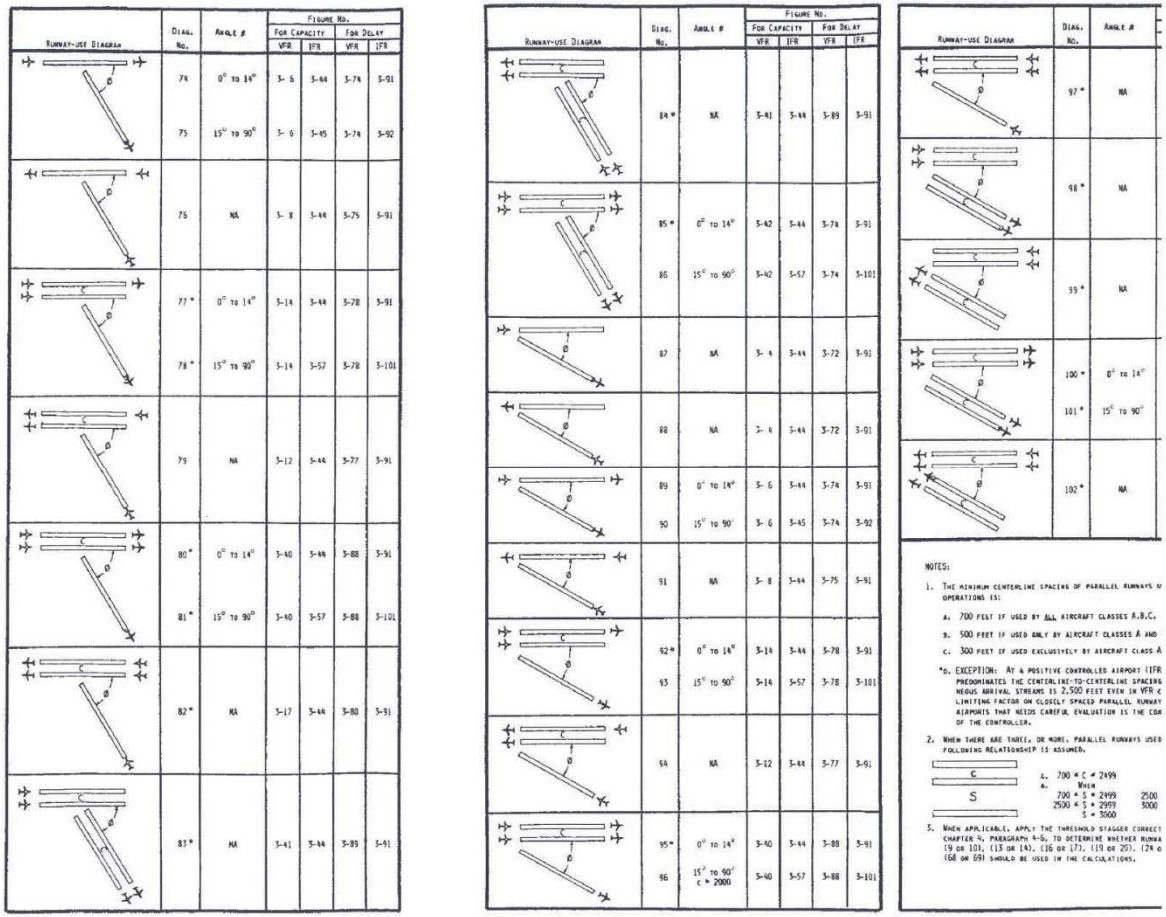
Runway-use Diagram	Diag. No.	Runway Intersection Distance in Feet (x)	(y)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	43	0 to 1999	< 4000	3-27	3-59	3-85	3-91
	44	2000 to 4999	< 4000	3-28	3-60	3-86	3-99
	45	5000 to 8000	< 4000	3-29	3-61	3-86	3-99
	46	0 to 1999	≥ 4000	3-30	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
	50	2000 to 4999	< 4000	3-28	3-60	3-86	3-99
	51	5000 to 8000	< 4000	3-29	3-61	3-86	3-99
	52	0 to 1999	≥ 4000	3-30	3-62	3-86	3-99
	53	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	3-33	3-59	3-85	3-91
	56*	2000 to 4999	< 4000	3-34	3-60	3-86	3-99
	57*	5000 to 8000	< 4000	3-35	3-61	3-86	3-99
	58*	0 to 1999	≥ 4000	3-36	3-62	3-86	3-99
	59*	2000 to 4999	≥ 4000	3-37	3-63	3-87	3-102
	60*	5000 to 8000	≥ 4000	3-38	3-64	3-87	3-102
	61*	0 to 1999	< 4000	3-33	3-44	3-85	3-91
	62*	2000 to 4999	< 4000	3-39	3-44	3-85	3-91
	63*	5000 to 8000	< 4000	3-35	3-44	3-86	3-91
	64*	0 to 1999	≥ 4000	3-36	3-44	3-86	3-91
	65*	2000 to 4999	≥ 4000	3-37	3-44	3-87	3-91
	66*	5000 to 8000	≥ 4000	3- 9	3-44	3-71	3-91

Runway-use Diagram	Diag. No.	Runway Spacing in Feet (s)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	67*	700 or more	3- 4	3-44	3-72	3-91
	68*	700 to 2499	3- 9	3-44	3-71	3-91
	69	2500 to 2999	3-10	3-49	3-71	3-95
	70	3000 to 4299	3-10	3-50	3-71	3-95
	71	4300 or more	3-10	3-51	3-71	3-96

Runway-use Diagram	Diag. No.	Angle Ø	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	72	NA	3- 4	3-44	3-72	3-91
	73	NA	3- 4	3-44	3-72	3-91

Calcolo capacità oraria Runway (2)

9/23/83



Runway-use Diagram	Diag. No.	Angle ϕ	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	74	0° to 14°	3-6	3-44	3-74	3-91
	75	15° to 90°	3-6	3-45	3-74	3-92
	76	NA	3-8	3-44	3-75	3-91
	77*	0° to 14°	3-14	3-44	3-78	3-91
	78*	15° to 90°	3-14	3-57	3-78	3-101
	79	NA	3-12	3-44	3-77	3-91
	80*	0° to 14°	3-40	3-44	3-88	3-91
	81*	15° to 90°	3-40	3-57	3-88	3-101
	82*	NA	3-17	3-44	3-80	3-91
	83*	NA	3-41	3-44	3-89	3-91
	84*	NA	3-41	3-44	3-89	3-91
	85*	0° to 14°	3-42	3-44	3-74	3-91
	86	15° to 90°	3-42	3-57	3-74	3-101
	87	NA	3-4	3-44	3-72	3-91
	88	NA	3-4	3-44	3-72	3-91
	89	0° to 14°	3-6	3-44	3-74	3-91
	90	15° to 90°	3-6	3-45	3-74	3-92
	91	NA	3-8	3-44	3-75	3-91
	92*	0° to 14°	3-14	3-44	3-78	3-91
	93	15° to 90°	3-14	3-57	3-78	3-101
	94	NA	3-12	3-44	3-77	3-91
	95*	0° to 14°	3-40	3-44	3-88	3-91
	96	15° to 90° c = 2000	3-40	3-57	3-88	3-101
	97*	NA				
	98*	NA				
	99*	NA				
	100*	0° to 14°				
	101*	15° to 90°				
	102*	NA				

NOTES:

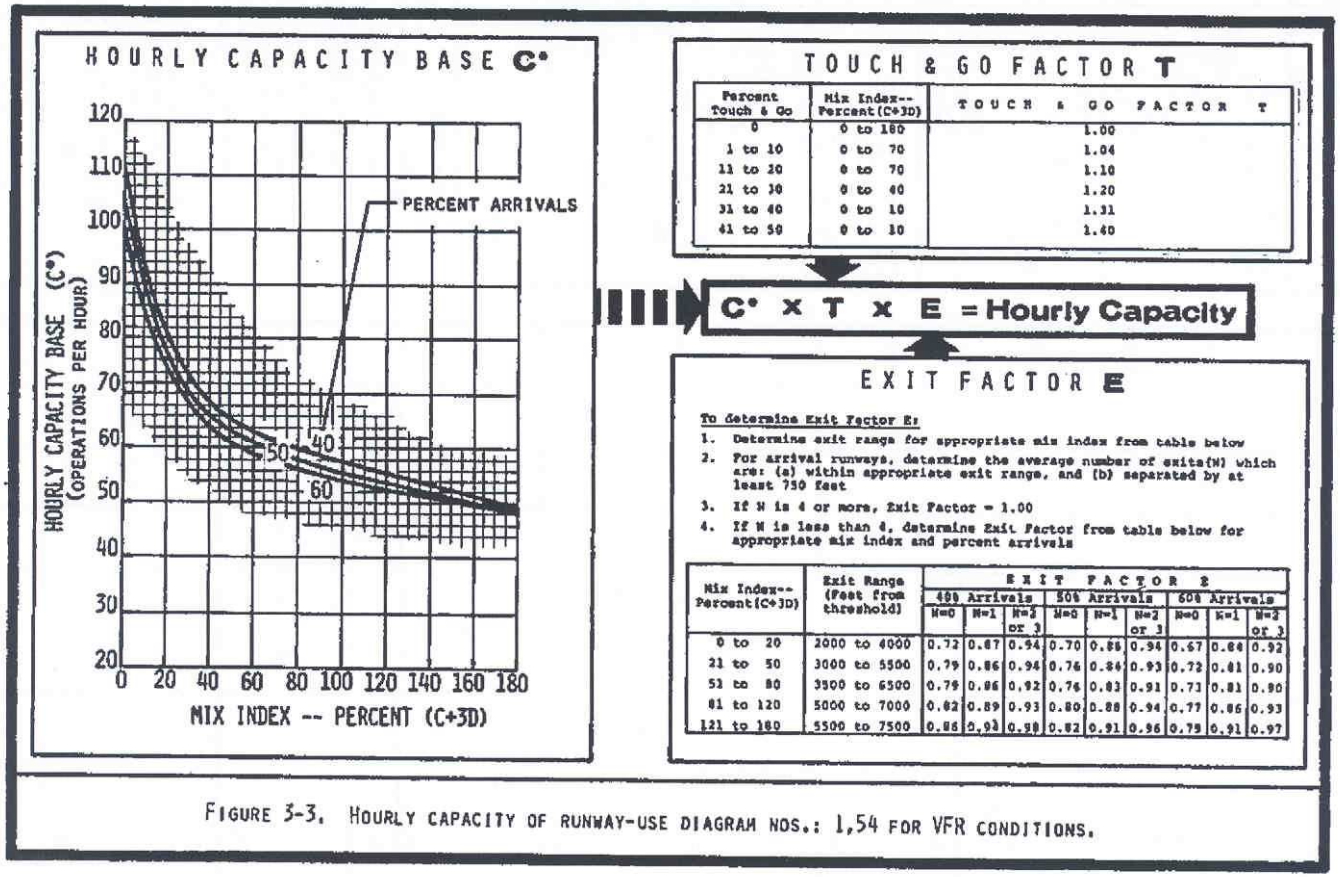
1. The minimum centerline spacing of parallel runways u operations is:
   a. 700 FEET IF USED BY ALL AIRCRAFT CLASSES A,B,C.
   b. 500 FEET IF USED ONLY BY AIRCRAFT CLASSES A AND
   c. 300 FEET IF USED EXCLUSIVELY BY AIRCRAFT CLASS A
   *b. EXCEPTION: AT A POSITIVE CONTROLLED AIRPORT (IFR PREDOMINATES THE CENTERLINE-TO-CENTERLINE SPACING NEEDS ARRIVAL STREAMS IS 2,500 FEET EVEN IN VFR c LIMITING FACTOR ON CLOSELY SPACED PARALLEL RUNWAY AIRPORTS THAT NEEDS CAREFUL EVALUATION IS THE COO OF THE CONTROLLER.
2. WHEN THERE ARE THREE, OR MORE, PARALLEL RUNWAYS USED FOLLOWING RELATIONSHIP IS ASSUMED.

When	
700 < S < 2499	2500
2500 < S < 2999	3000
S > 3000	

3. WHEN APPLICABLE, APPLY THE THRESHOLD STAGGER CORRECT CHAPTER 4, PARAGRAPH 4-5, TO DETERMINE WHETHER RUNWA 19 OR 101, (13 OR 14), (16 OR 17), (19 OR 20), (24 o (68 OR 69) SHOULD BE USED IN THE CALCULATIONS.

Figure 3-2. Runway-use diagrams

Calcolo capacità oraria Runway (3)



TOUCH & GO FACTOR T

Percent Touch & Go	Mix Index--Percent (C+3D)	TOUCH & GO FACTOR T
0	0 to 180	1.00
1 to 10	0 to 70	1.04
11 to 20	0 to 70	1.10
21 to 30	0 to 40	1.20
31 to 40	0 to 10	1.31
41 to 50	0 to 10	1.40

EXIT FACTOR E

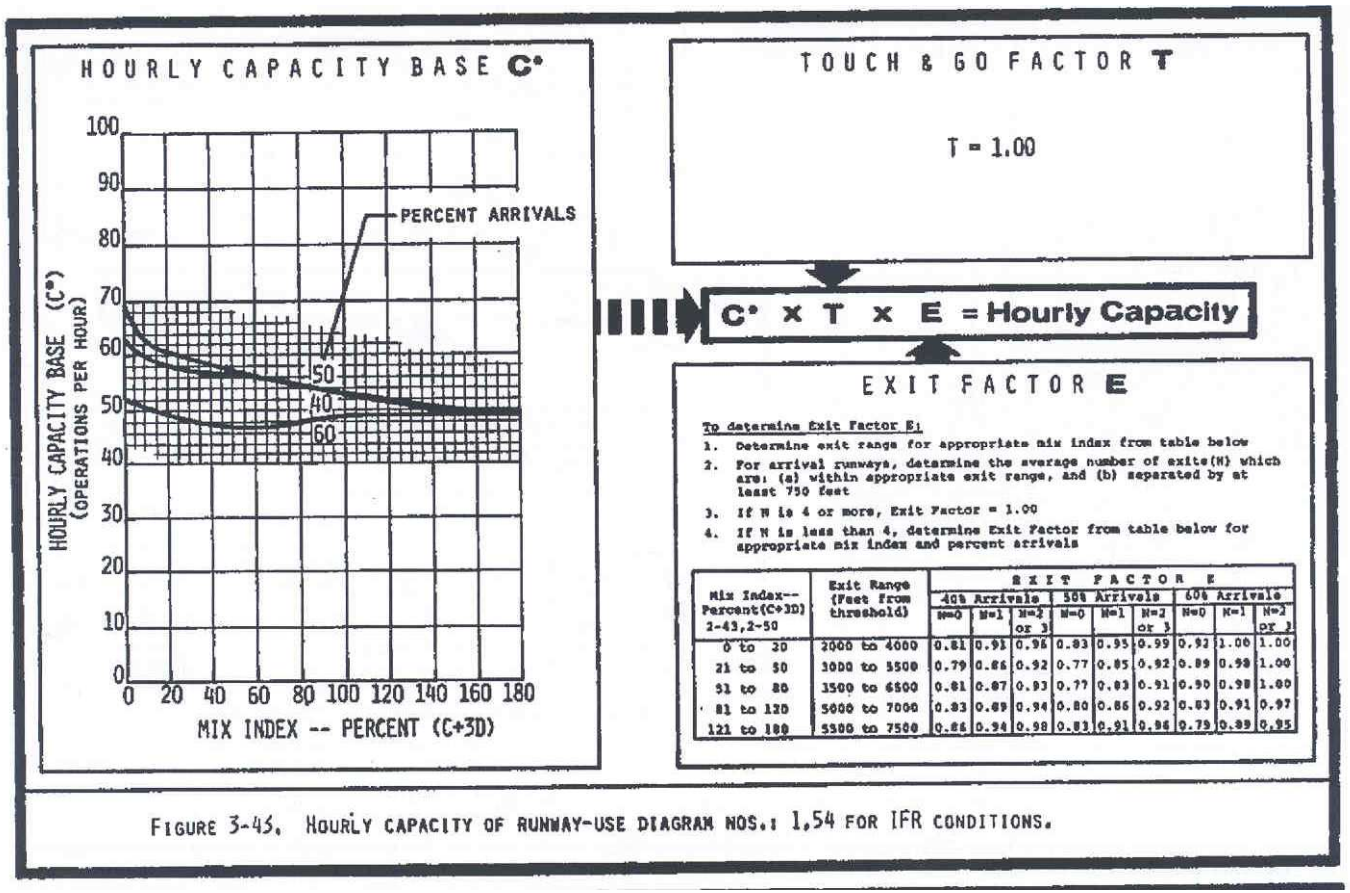
To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E								
		40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.72	0.87	0.94	0.70	0.86	0.94	0.67	0.84	0.92
21 to 50	3000 to 5500	0.79	0.86	0.94	0.76	0.86	0.93	0.72	0.81	0.90
51 to 80	3500 to 6500	0.79	0.86	0.92	0.76	0.83	0.91	0.71	0.81	0.90
81 to 120	5000 to 7000	0.82	0.89	0.93	0.80	0.88	0.94	0.77	0.86	0.93
121 to 180	5500 to 7500	0.86	0.93	0.98	0.82	0.91	0.96	0.79	0.91	0.97

FIGURE 3-3. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 1,54 FOR VFR CONDITIONS.

Calcolo capacità oraria Runway (4)

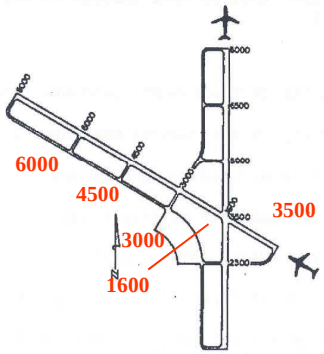


Mix Index--Percent(C+3D) 2-43,2-50	Exit Range (Feet from threshold)	EXIT FACTOR E								
		40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.81	0.91	0.96	0.83	0.95	0.99	0.92	1.00	1.00
21 to 50	3000 to 5500	0.79	0.86	0.92	0.77	0.85	0.92	0.89	0.98	1.00
51 to 80	3500 to 6500	0.81	0.87	0.93	0.77	0.83	0.91	0.90	0.98	1.00
81 to 120	5000 to 7000	0.83	0.89	0.94	0.80	0.86	0.92	0.83	0.91	0.97
121 to 180	5500 to 7500	0.86	0.94	0.98	0.83	0.91	0.96	0.79	0.89	0.95

FIGURE 3-45. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 1,54 FOR IFR CONDITIONS.

Calcolo capacità oraria Runway (5)

EXAMPLE 1. Determine VFR and IFR hourly capacities of the depicted airport. In the typical busy hour, it has 13 single-engine, 10 light twin-engine, 25 transport type, and two widebody operations. During VFR conditions, arrivals constitute 45 percent of the operations and there are three touch and go's. During IFR conditions, the busy hour count of small aircraft operations drops to two single-engine and five light twin-engine aircraft and arrivals constitute 55 percent of the operations. There are no touch and go's during IFR conditions. The airport typically operates with arrivals on one runway and departures on the other.



SOLUTION: The work sheet on page 5 illustrates one method of recording data.

1. Weather. Enter the weather condition(s) applicable to the capacity determination in column 1.

2. Runway-use. From figure 3-2 (illustrated), the runway-use configuration diagram is No. 43. Enter this diagram number in column 3, and a line sketch of the configuration in column 2.

3. Capacity Figure(s). The appropriate figures for determining capacity are No. 3-27 for VFR conditions and No. 3-59 for IFR conditions. These VFR and IFR references are entered on the line in column 4 corresponding to the weather condition.

Runway-use Diagram	Diag. No.	Runway Intersection Distance in Feet (x)	(y)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay 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	3-98
	45	5000 to 8000	4000	3-29	3-61	3-86	3-99
	46	0 to 1999	8000	3-30	3-62	3-86	3-99
	47	2000 to 4999	8000	3-31	3-63	3-71	3-102
	48	5000 to 8000	8000	3-32	3-64	3-71	3-102

Weather	Runway-use Diagram No.	Capacity Figure No.	Aircraft Mix %A	%B	%C	%D	Mix Index %(C+3D)	Percent Arrivals	Percent Touch & Go	Runway Exits (00 feet) Location			No.	Hourly Capac. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity (000) C*·T·E
1	2	3	4	5	6	7	8	9	10	11	12			13	14	15	16	17
VFR		43	3-27	26	20	50	4	62	45	12	45	60		2	89	1.06	.94	89
IFR			3-59	6	15	73	6	91	55	0	60			1	53	1.00	.97	51

Work sheet for runway hourly capacity.

Calcolo capacità oraria Runway (6)

4. Mix Index. This input is calculated using data provided in the example statement. Table 1-1 (illustrated) is used to make the conversion.

Table 1-1. Aircraft classifications

Aircraft Class	Max. Cert. T.O. Weight (lbs)	Number Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B		Multi	
C	12,500 - 300,000	Multi	Large (L)
D	over 300,000	Multi	Heavy (H)

The computation of aircraft mix is carried out by setting up a table in the following format. The percent of operations by each aircraft class is recorded in columns 5 through 8.

Aircraft		VFR Mix		IFR Mix	
Description	Class	No. Ops.	% Ops.	No. Ops.	% Ops.
Single-engined	A	13	26	2	6
Light-twins	B	10	20	5	15
Transport-type	C	25	50	25	73
Widebodied	D	2	4	2	6
Totals (No. Ops. & % Ops.)		50	100	34	100

The mix indices are calculated and entered in column 9.

VFR = 50+3(4) = 62 %C + 3 * %D

IFR = 73+3(6) = 91

5. Percent Arrivals. The percent arrivals is given as 45 for VFR conditions and 55 for IFR conditions. Enter in column 10.

6. Hourly Capacity Base (C*). Obtain C* from figure 3-27 for VFR and 3-59 for IFR, and enter in column 14.

7. Touch and Go Factor (T). The statement specified 3 touch and gos during VFR and none in IFR. Since a touch and go is a landing and a takeoff (2 operations), the percent of touch and go operations in VFR conditions is 6/50 or 12 percent. Obtain the touch and go factor T from figure 3-27 for VFR and 3-59 for IFR and enter in column 15.

Weather	Runway-use Diagram	No.	Capacity Figure No.	Aircraft Mix %A	%B	%C	%D	Mix Index %(C+3D)	Percent Arrivals	Percent Touch & Go	Runway Exits (00 feet) Location			No.	Hourly Capac. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity (000) C*+T+E
1	2	3	4	5	6	7	8	9	10	11	12			13	14	15	16	17
VFR		43	3-27	26	20	50	4	62	45	12	45	60		2	89	1.06	.94	89
IFR			3-59	6	15	73	6	91	55	0	60			1	53	1.00	.97	51

Work sheet for runway hourly capacity.

Calcolo capacità oraria Runway (7)

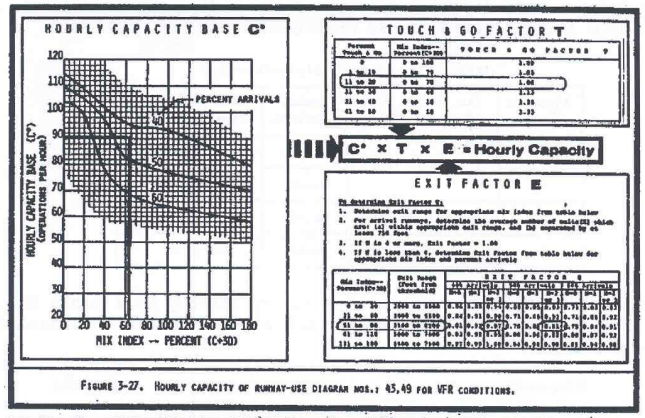


FIGURE 3-27. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 43,49 FOR VFR CONDITIONS.

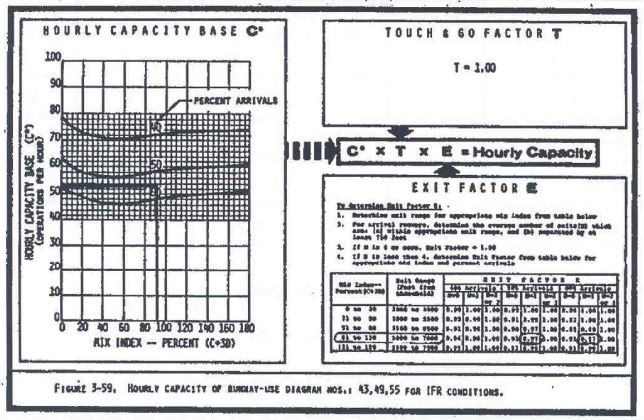


FIGURE 3-59. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 43,49,55 FOR IFR CONDITIONS.

8. Exit Factor E. A landing aircraft might exit at the runway intersection (1600 feet) or at one of the three right-angled exits located 3000, 4500, and 6000 feet from the threshold. From figures 3-27 for VFR and 3-59 for IFR, determine the exit range and the exit factor E. In this example, only two exits are within the range between 3500 to 7000 feet. Enter the exit locations in columns 12 and the number of usable exits in column 13. The exit factors E are entered in column 16.

9. Calculate Capacity. Compute the hourly capacity of the runway-use configuration and enter in column 17.

VFR Capacity = 89·1.06·0.94 = 88.68 or 89 operations per hour

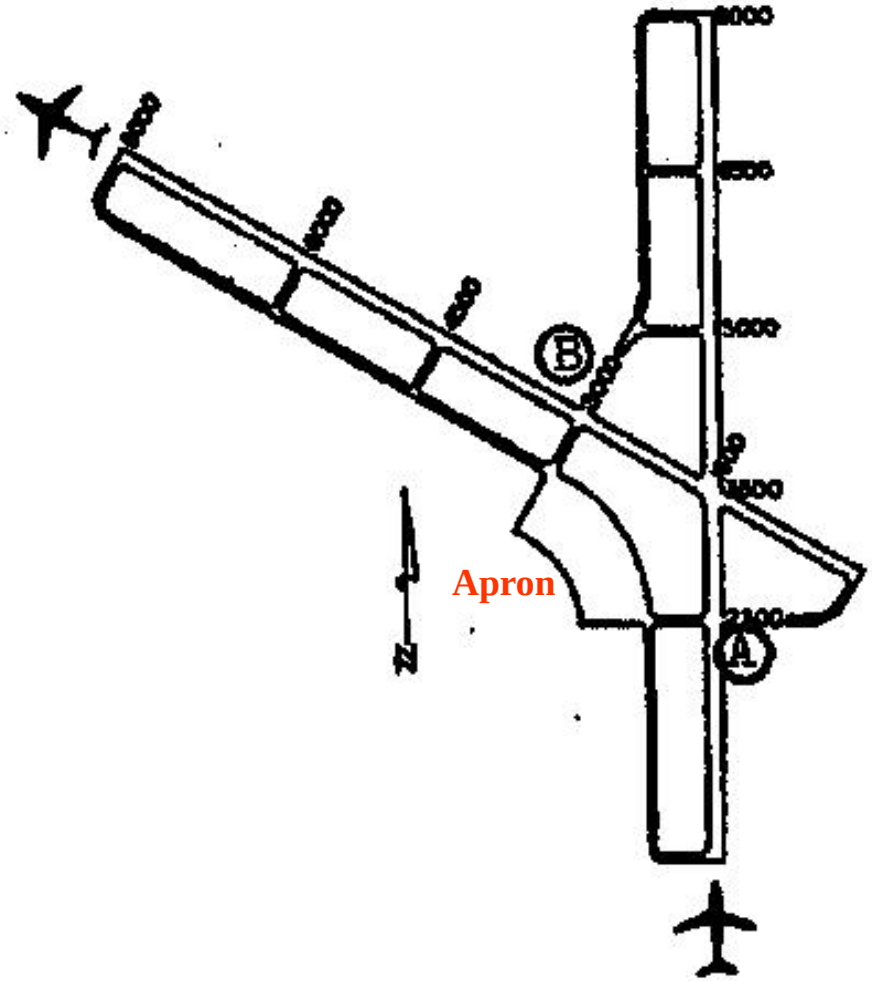
IFR Capacity = 53·1.00·0.97 = 51.41 or 51 operations per hour

Weather	Runway-use Diagram	No.	Capacity Figure No.	Aircraft Mix %A	%B	%C	%D	Mix Index %(C+3D)	Percent Arrivals	Percent Touch & Go	Runway Exits (00 feet) Location			No.	Hourly Capac. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity (000) C*·T·E
1	2	3	4	5	6	7	8	9	10	11	12			13	14	15	16	17
VFR		43	3-27	26	20	50	4	62	45	12	45	60		2	89	1.06	.94	89
IFR			3-59	6	15	73	6	91	55	0	60			1	53	1.00	.97	51

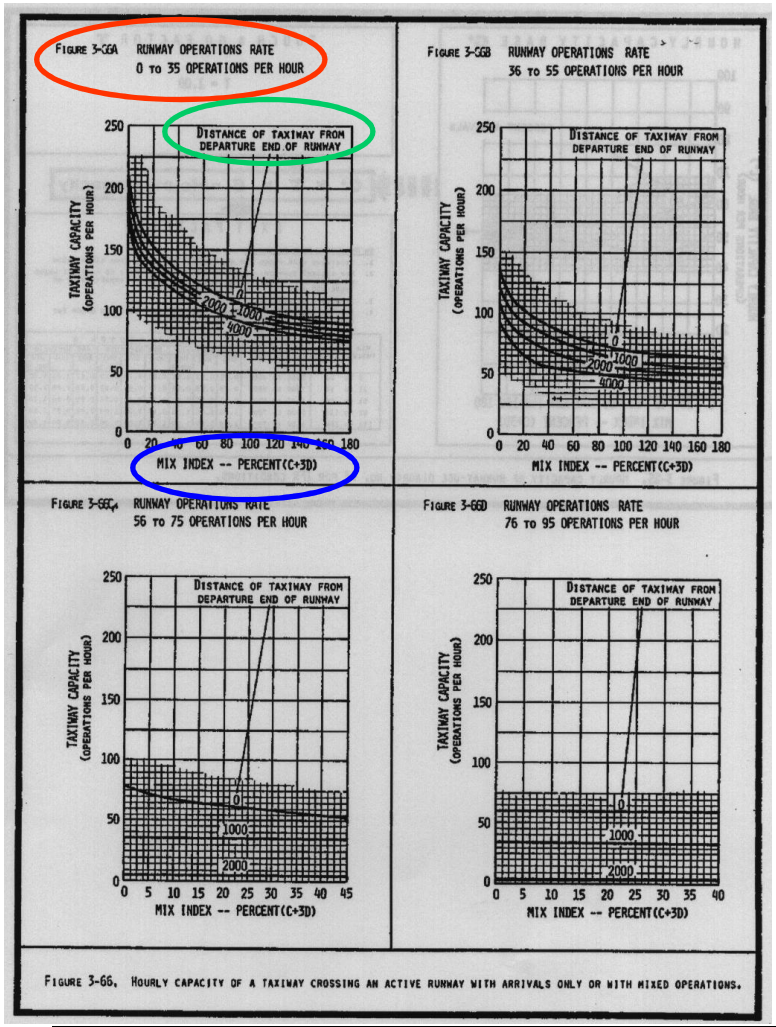
Work sheet for runway hourly capacity.

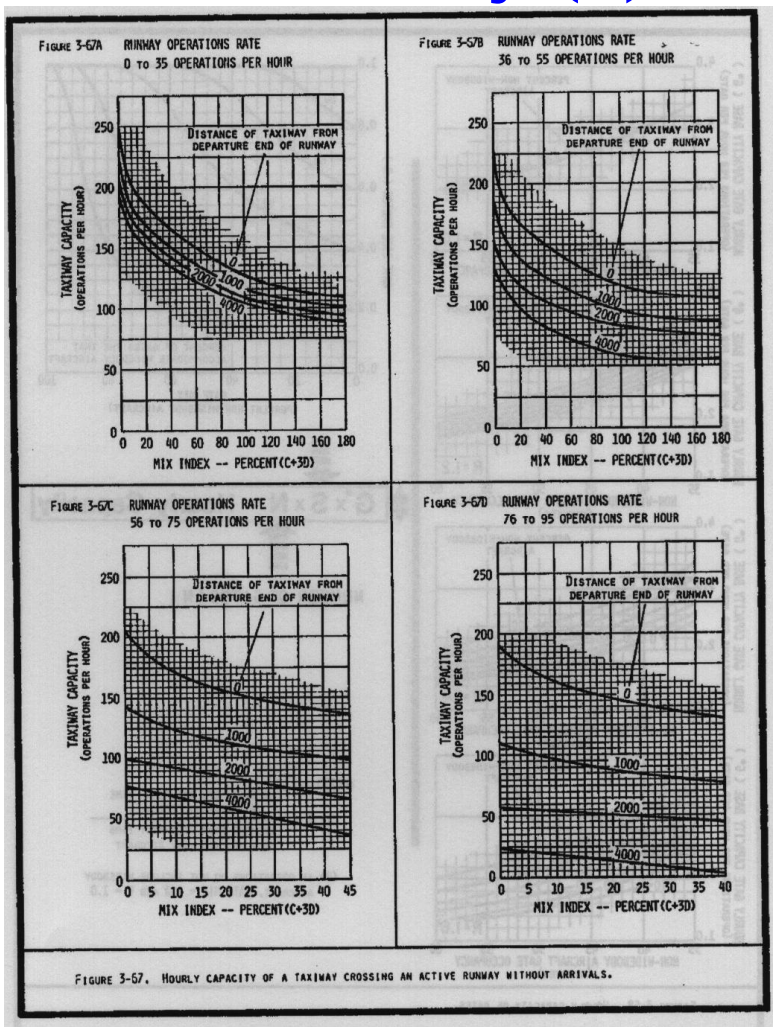
10. Conclusion. The calculated hourly capacities of the runway-use configuration of 89 operations per hour in VFR conditions and 51 operations per hour in IFR conditions exceeds the aeronautical demands of 50 VFR operations and 34 IFR operations specified in the statement.

Calcolo capacità oraria Taxiway (1)

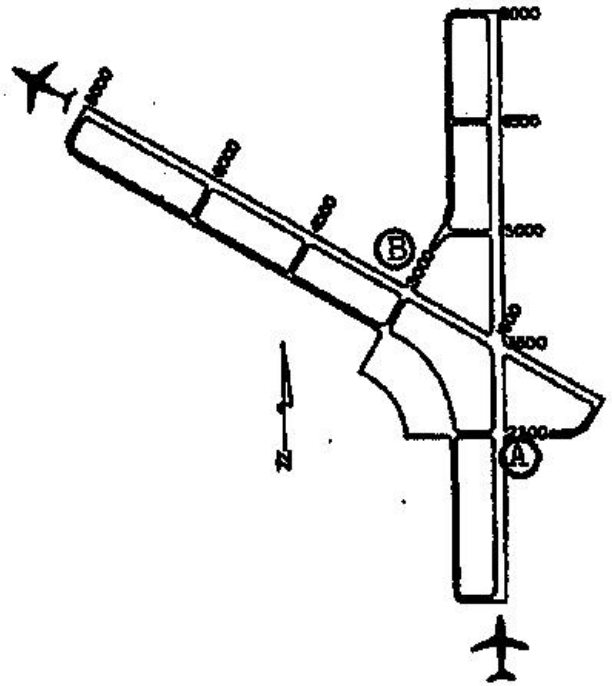


Calcolo capacità oraria Taxiway (2)





Calcolo capacità oraria Taxiway (3)



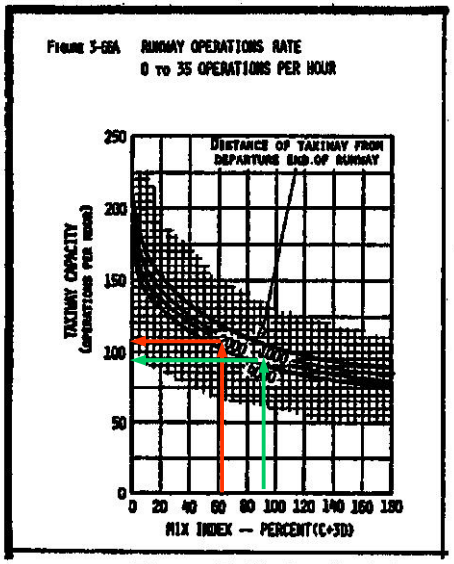


Figure 3-66 (arrivals).

Taxiway A

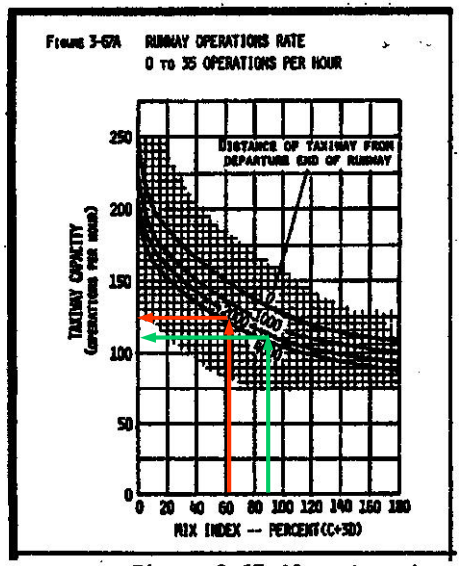


Figure 3-67 (departures).

Taxiway B

Weather	Taxiway Crossing	Distance from Threshold	Runway		Taxiway Crossing Capacities (Operations per Hour)	
			Ops. Rate	Mix Index	Arrivals and Mixed Operations	Departures Plus T & G
1	2	3	4	5	6	7
VFR	A	2300'	24	62	107	-
"	B	3000'	20	62	-	125
IFR	A	2300'	15	91	92	-
"	B	3000'	19	91	-	112

Calcolo capacità oraria Gate (1)

$$u_k \cdot N_k = \left(\sum_i m_i \cdot \frac{T_i}{60} \right) \cdot C_k$$

$$u_k \cdot N_k \cdot 60 = \left(\sum_i m_i \cdot T_i \right) \cdot C_k$$

Tempo disponibile > Tempo richiesto

u_k = fattore di utilizzazione (percentuale di tempo, 0 – 1) del gruppo di gates (indicati k) che possono accogliere gli aerei di tipo i

N_k = numero gates (indicati k) che possono accogliere gli aerei di tipo i

m_i = % di aerei del gruppo i che opera sull'aeroport

T_i = tempo di servizio del gate per l'aereo di tipo i (minuti)

C_k= Capacità aeroporto nella condizione di utilizzo k (Aerei/ora)

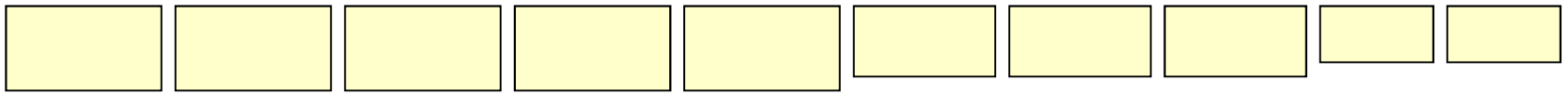
$$u \cdot N = \left(\sum_i m_i \cdot \frac{T_i}{60} \right) \cdot C$$

$$C = \min[C_k]$$

Calcolo capacità oraria Gate (2)

Esempio - Mix traffico: A $m_A = 0,3$ $T_A = 60$; B $m_B = 0,5$ $T_B = 45$; $m_C = 0,2$ $T_C = 30$

10 gate - Operatività $N_1 = 5$ utilizzabili da aerei A ; $N_2 = 8$ da aerei B; $N_3 = 10$ da aerei C



$$u_k \cdot N_k \cdot 60 = \left(\sum_i m_i \cdot T_i \right) \cdot C_k$$

$1 * 5 * 60 = 0,3 * 60 * C_1$ $\quad C_1 = 16,67$

$1 * 8 * 60 = [\, 0,3 * 60 + 0,5 * 45] * C_2$ $\quad C_2 = 11,85$

$1 * 10 * 60 = [\, 0,3 * 60 + 0,5 * 45 + 0,2 * 30] * C_3$ $\quad C_3 = 12,90$

$1 * 10 * 60 = 600 > [\, 0,3 * 60 + 0,5 * 45 + 0,2 * 30] * 11,85 = 551$

Tempo disponibile > Tempo richiesto

Condizione k=1: 0,3*16,67*60/60 = 5 ok; 0,5*16,67*45/60=6,25>3; 0,2*16,67*30/60=1,67 ok

Condizione k=2: 0,3*11,85*60/60 = 3,55 ok; 0,5*11,85*45/60=4,45 ok; 0,2*11,85*30/60=1,19 ok

Condizione k=3: 0,3*12,90*60/60 = 3,87 ok; 0,5*12,90*45/60=4,84>4,13; 0,2*12,90*30/60=1,29 ok

Calcolo capacità oraria Gate, FAA (1)

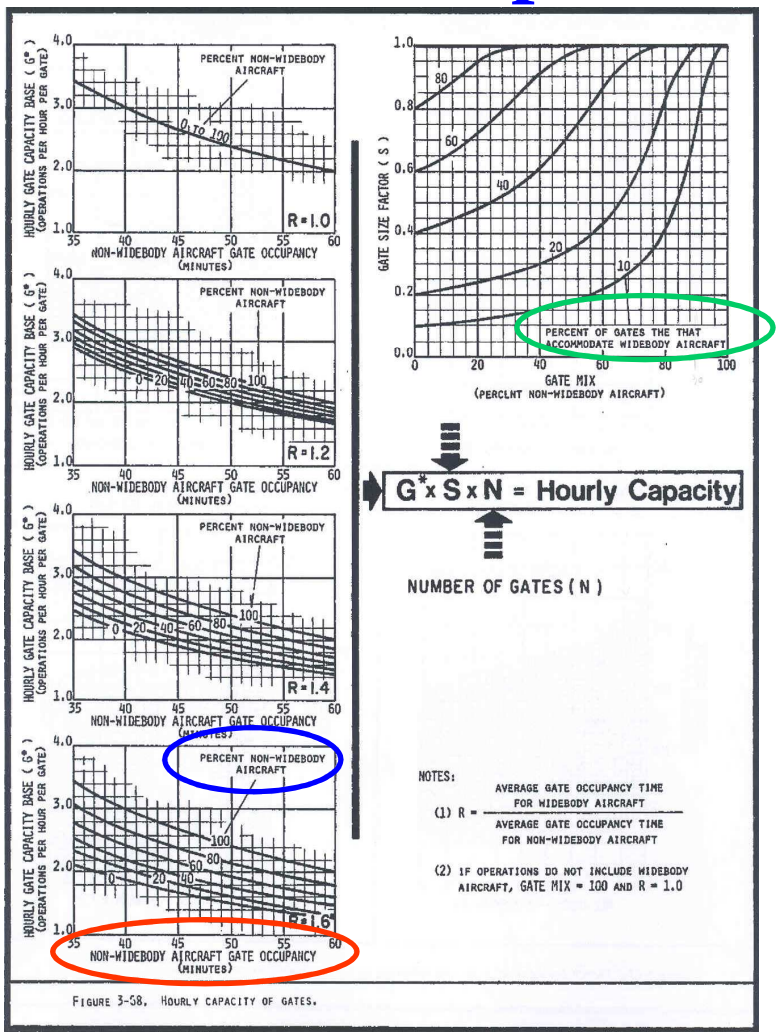


FIGURE 3-58. HOURLY CAPACITY OF GATES.

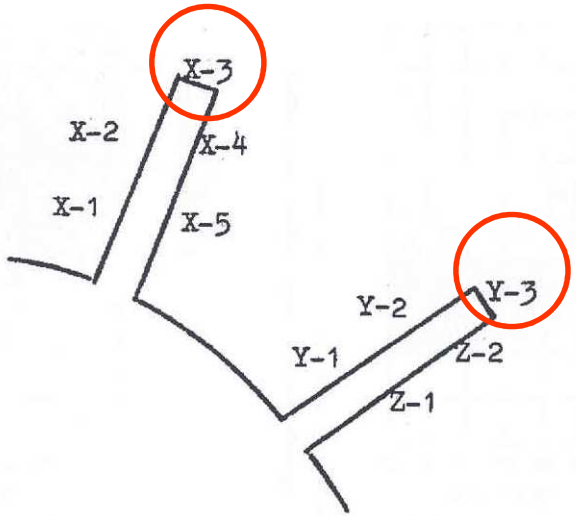
$$HC_i = G^* \cdot S \cdot N$$

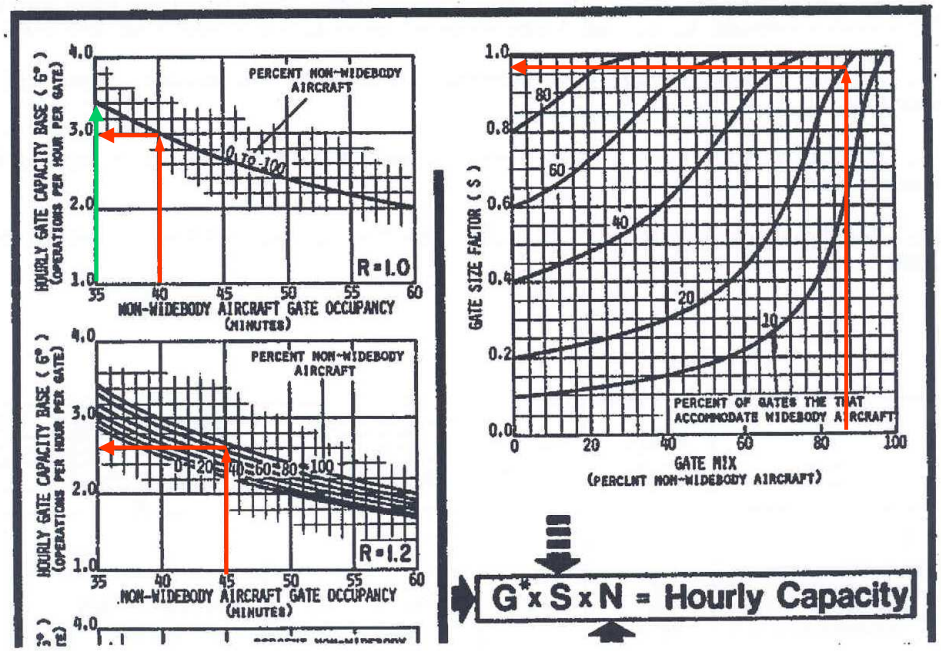
HC_i = capacità oraria dei gates di una compagnia

$$HC_T = \sum_{i=1}^{n} HC_i$$

HC_T = capacità oraria del terminal

Calcolo capacità oraria Gate, FAA (2)





Non-widebody (N) Widebody (W) % Gate per widebody

Gate Group	Demand (N)	Demand (W)	No. Gates (N)	No. Gates (W)	Gate Mix (N) (%)	Gate Mix (W) (%)	Average Gate Time (Min.) (N) (T_n)	Average Gate Time (Min.) (W) (T_w)	Gate Occupancy Ratio (T_w/T_n) (R)	Hourly Capac. Base (G*)	Gate Size (S)	No. Gates (N)	Hourly Capacity ($G^* \cdot S \cdot N$)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
X	13	2	4	1	87	20	45	55	1.22	2.6	.97	5	13
Y	8	0	2	1	100	33	40	0	1.00	3.0	1.00	3	9
Z	4	0	2	0	100	0	35	0	1.00	3.4	1.00	2	7
% aerei NON widebody									Capacity of the Terminal				29

Calcolo capacità oraria Aeroporto

Numero operazioni orarie

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

107/0,48 = 222

125/0,40 = 312

Volume annuale di servizio (1)

Operating Condition			Mix Index	Percent of Year (P)	Hourly Capacity (C)	Percent Maximum Capacity	Weighting Factor (W)
No.	Weather	Rwy-use Diagram					
1	2	3	4	5	6	7	8
1	VFR		62	74	89	100	1
2	IFR		91	5	51	57	20
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

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

Capacità oraria pesata

$$C_W = \frac{(P_1 \cdot C_1 \cdot W_1) + (P_2 \cdot C_2 \cdot W_2) + \cdots (P_n \cdot C_n \cdot W_n)}{(P_1 \cdot W_1) + (P_2 \cdot W_2) + \cdots (P_n \cdot W_n)} = \frac{287,56}{5,64} \cong 51 \quad op./ora$$

$$C_W = \frac{(0,74 \cdot 89 \cdot 1) + (0,05 \cdot 51 \cdot 20) + \cdots (0,03 \cdot 0 \cdot 25)}{(0,74 \cdot 1) + (0,05 \cdot 20) + \cdots (0,03 \cdot 25)} = \frac{287,56}{5,64} \cong 51 \quad op./ora$$

Volume annuale di servizio (2)

$$C_W = \frac{(P_1 \cdot C_1 \cdot W_1) + (P_2 \cdot C_2 \cdot W_2) + \cdots (P_n \cdot C_n \cdot W_n)}{(P_1 \cdot W_1) + (P_2 \cdot W_2) + \cdots (P_n \cdot W_n)} = \frac{287{,}56}{5{,}64} \cong 51 \quad \text{op./ora}$$

$$D = \frac{NO}{AD, PM} = \frac{219.750}{690} = 318$$

$$H = \frac{AD, PM}{APH, PM} = \frac{690}{50} = 14$$

ASV = Cw * D * H = (Op/ora) * (Op/anno)/(Op/giorno) * (Op/giorno)/(Op/ora)
ASV = 51 * 318 *14 = 227.052 Op./anno

Mix Index	Daily (D)	Hourly (H)
0-20	280-310	7-11
21-50	300-320	10-13
51-180	310-350	11-15

Ritardo orario sulle Runway (1)

Diagram	Diag. No.	Runway Spacing in Feet (s)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay IFR
	1	NA	3-3	3-83	3-71	3-90
	2	700 or more	3-4	3-84	3-72	3-91
	3	700 to 2499	3-5	3-48	3-73	3-91
	4	2500 or more	3-6	3-85	3-74	3-92
	5*	700 to 2499	3-7	3-88	3-75	3-91
	6	2500 to 2999	3-8	3-86	3-75	3-93

ADF = ADI (D/C)

DDF = DDI (D/C)

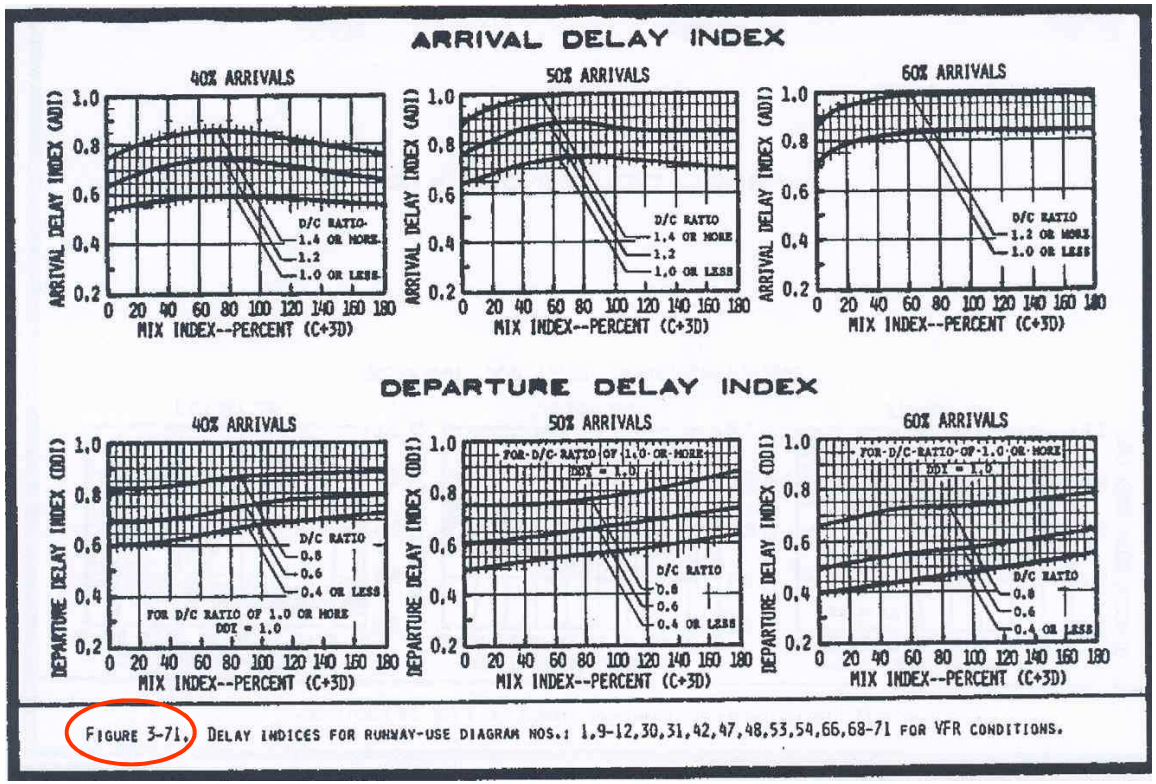


FIGURE 3-71. DELAY INDICES FOR RUNWAY-USE DIAGRAM NOS.: 1,9-12,30,31,42,47,48,53,54,66,68-71 FOR VFR CONDITIONS.

Ritardo orario sulle Runway (2)

DPF = 100 * Q / HD

HD domanda oraria

Q domanda di picco nei 15 min.

DPF fattore di profilo della domanda

DTH = HD * (PA * DAHA + (100-PA) * DAHD)/100

DTH ritardo orario totale

PA % arrivi

DAHA ritardo orario medio arrivi

DAHD ritardo orario medio partenze

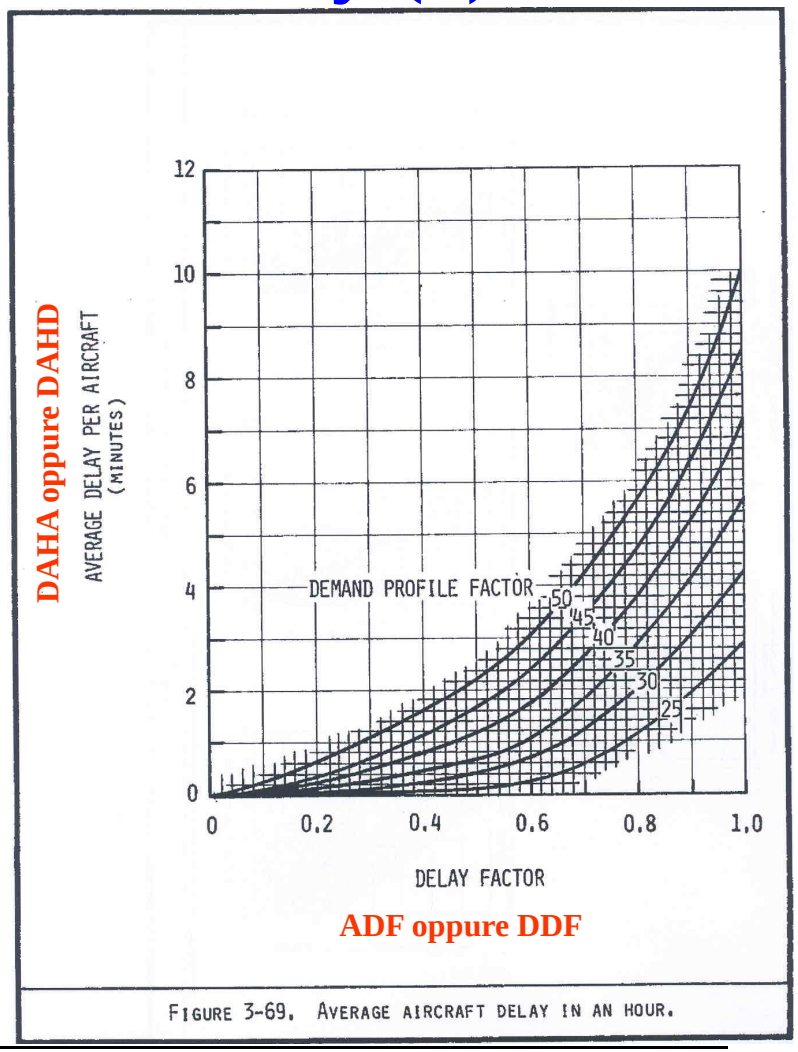
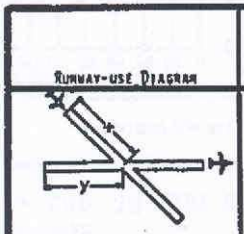
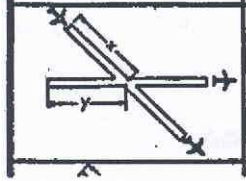


FIGURE 3-69. AVERAGE AIRCRAFT DELAY IN AN HOUR.

Ritardo orario sulle Runway (3)

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	5000 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
	50	2000 to 4999	4000	3-28	3-60	3-86	3-99
	51	5000 to 8000	4000	3-29	3-61	3-86	3-99
	52	0 to 1999	4000	3-30	3-62	3-86	3-99
	53	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

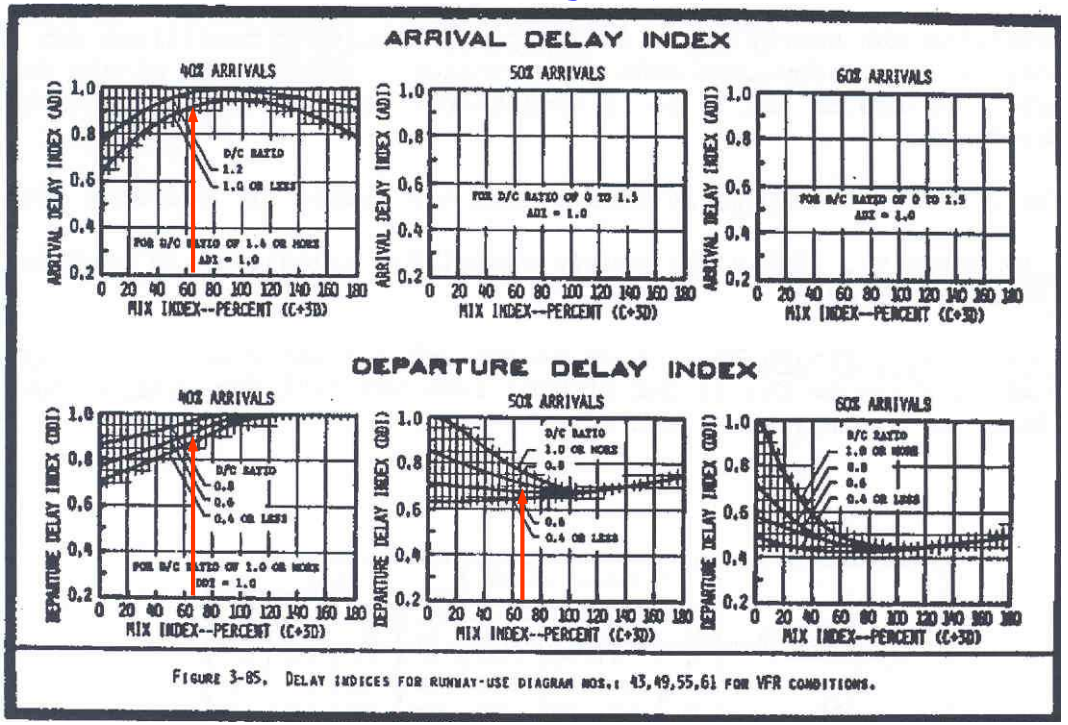


FIGURE 3-85. DELAY INDICES FOR RUNWAY-USE DIAGRAM NOS.: 43,49,55,61 FOR VFR CONDITIONS.

% 40 ADI = 0,90 DDI = 0,90

% 50 ADI = 1,00 DDI = 0,67

% 45 ADI = 0,95 DDI = 0,78

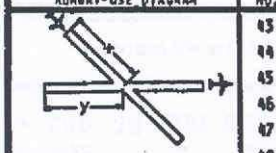
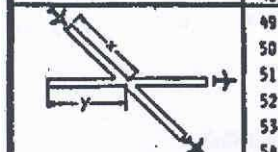
dati

Rwy-use Configuration Sketch	No.	Delay Fig. No. VFR	IFR	Capacity	Demand Hourly	15 Min.	D/C Ratio	Percent Arrivals	Mix Index	Arrival Delay Index ADI	Factor ADF	Depart. Delay Index DDI	Factor DDF	Demand Profile Factor DPF	Aver. Delay (Minutes) Arr.	Dep.	Hourly Delay (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

ADF = ADI (D/C)

DDF = DDI (D/C)

Ritardo orario sulle Runway (4)

Runway-use Diagram	Diag. No.	Runway Intersection Distance in Feet (x)	(y)	Figure No. For Capacity VFR	For Capacity IFR	For Delay VFR	For Delay 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	5000 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
	50	2000 to 4999	≤ 4000	3-28	3-60	3-86	3-99
	51	5000 to 8000	≤ 4000	3-29	3-61	3-86	3-99
	52	0 to 1999	≥ 4000	3-30	3-62	3-86	3-99
	53	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
	CC*90	0 to 1000	≤ 4000				

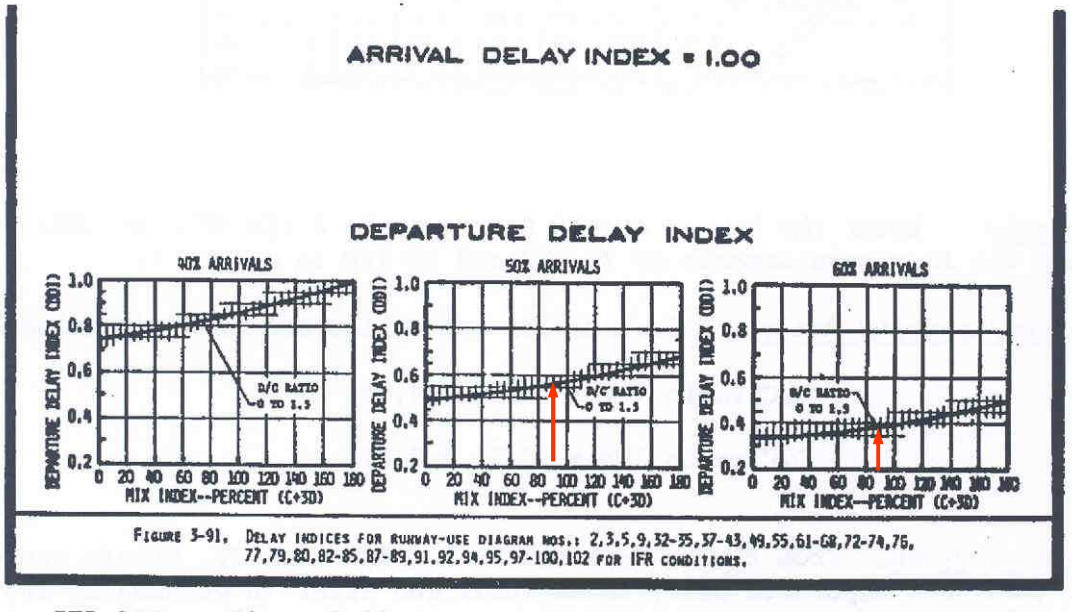


Figure 3-91. Delay indices for runway-use diagram nos.: 2,3,5,9,32-35,37-43,49,55,61-68,72-74,76, 77,79,80,82-85,87-89,91,92,94,95,97-100,102 for IFR conditions.

% 40 ADI = 1,00 DDI = 0,57

% 50 ADI = 1,00 DDI = 0,38

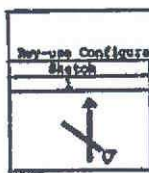
% 45 ADI = 1,00 DDI = 0,47

Rwy-use Configuration Sketch	No.	Delay Fig. No. VFR	Delay Fig. No. IFR	Capacity	Demand Hourly	Demand 15 Min.	D/C Ratio	Percent Arrivals	Mix Index	Arrival Delay Index ADI	Arrival Delay Factor ADF	Depart. Delay Index DDI	Depart. Delay Factor DDF	Demand Profile 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	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

ADF = ADI (D/C)

DDF = DDI (D/C)

Ritardo orario sulle Runway (5)

Key-use Configuration Sketch	No.	Delay Fig. No. VFR	Delay Fig. No. IFR	Capacity	Demand Hourly	Demand 15 Min.	D/C Ratio	Percent Arrivals	Mix Index	Arrival Delay Index ADI	Arrival Delay Factor ADF	Depart. Delay Index DDI	Depart. Delay Factor DDF	Demand Profile 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	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

DPF = 100 * Q / HD

DPF fattore del profilo di domanda

HD domanda oraria

Q domanda di picco nei 15 min.

DTH = HD * (PA * DAHA + (100-PA) * DAHD)/100

Per VFR DTH = 50 * (45 * 1,3 + (100-45) * 0,95)/100 = 55 min

Per IFR DTH = 34 * (55 * 2,9 + (100-55) * 0, 60)/100 = 53 min

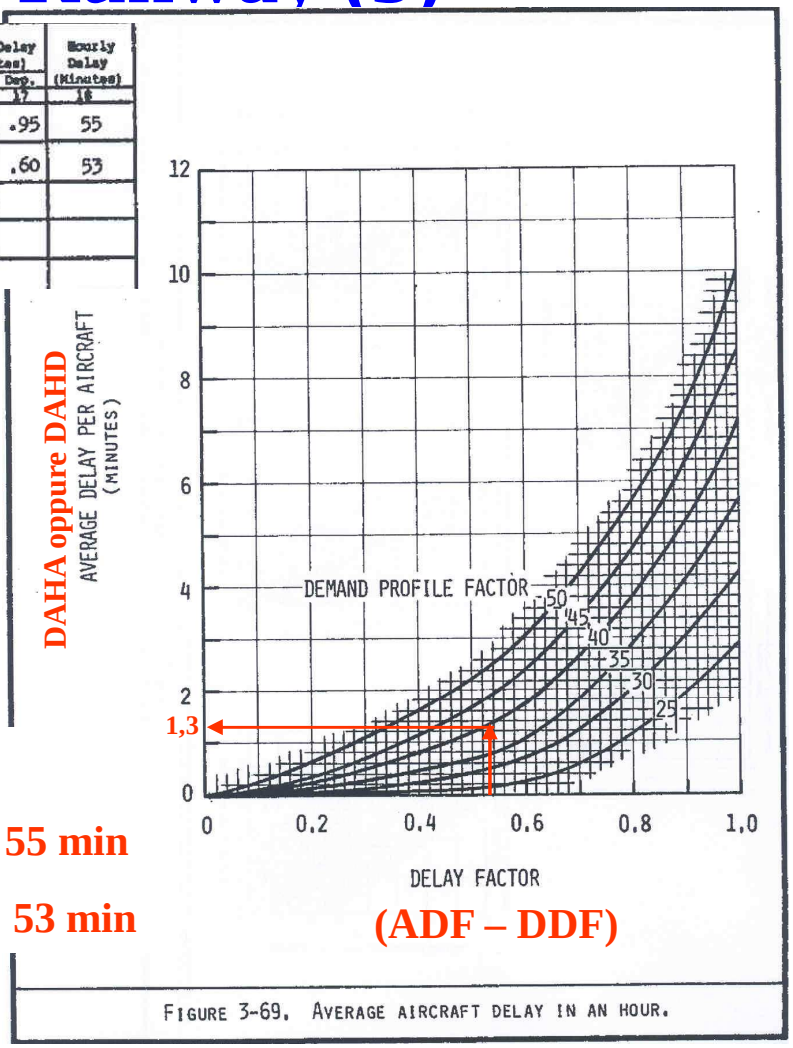
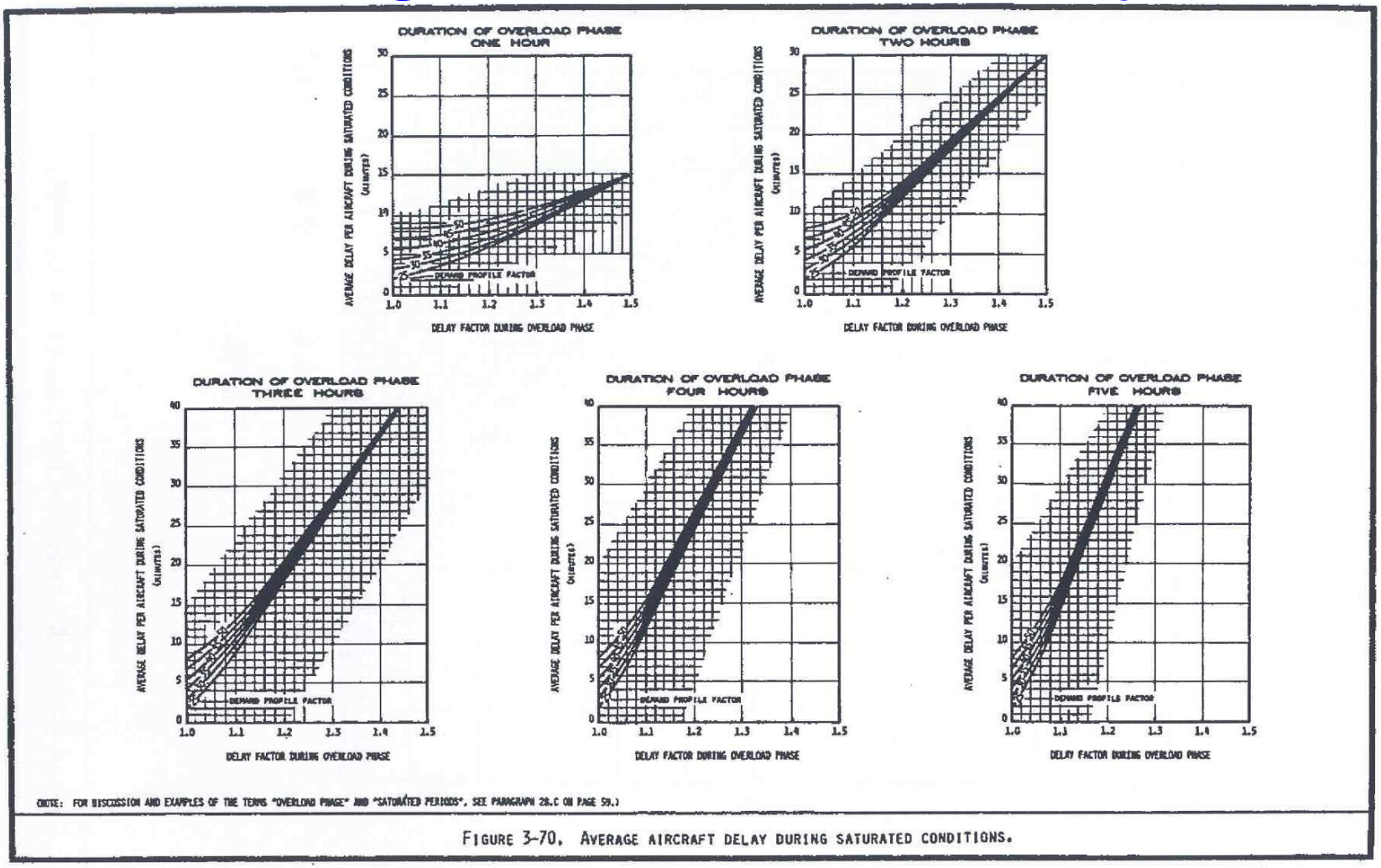


FIGURE 3-69. AVERAGE AIRCRAFT DELAY IN AN HOUR.

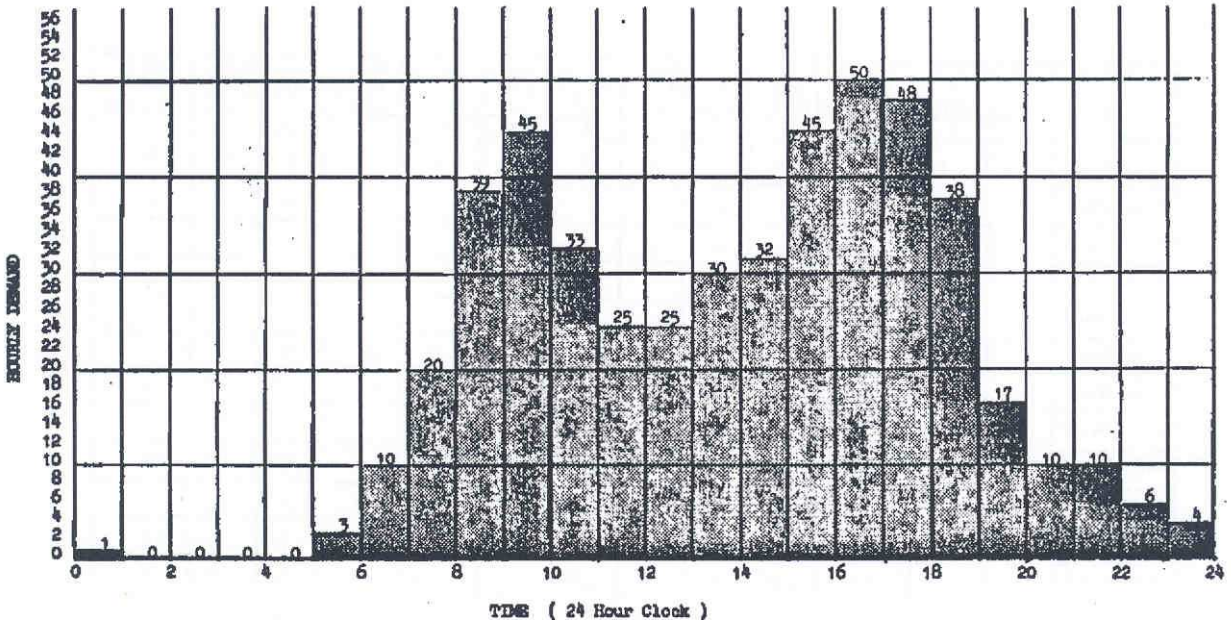
Ritardo giornaliero sulle Runway (1)



NOTE: FOR DISCUSSION AND EXAMPLES OF THE TERMS "OVERLOAD PHASE" AND "SATURATED PERIODS", SEE PARAGRAPH 28.C ON PAGE 59.)

FIGURE 3-70. AVERAGE AIRCRAFT DELAY DURING SATURATED CONDITIONS.

Ritardo giornaliero sulle Runway (2)



% aerei

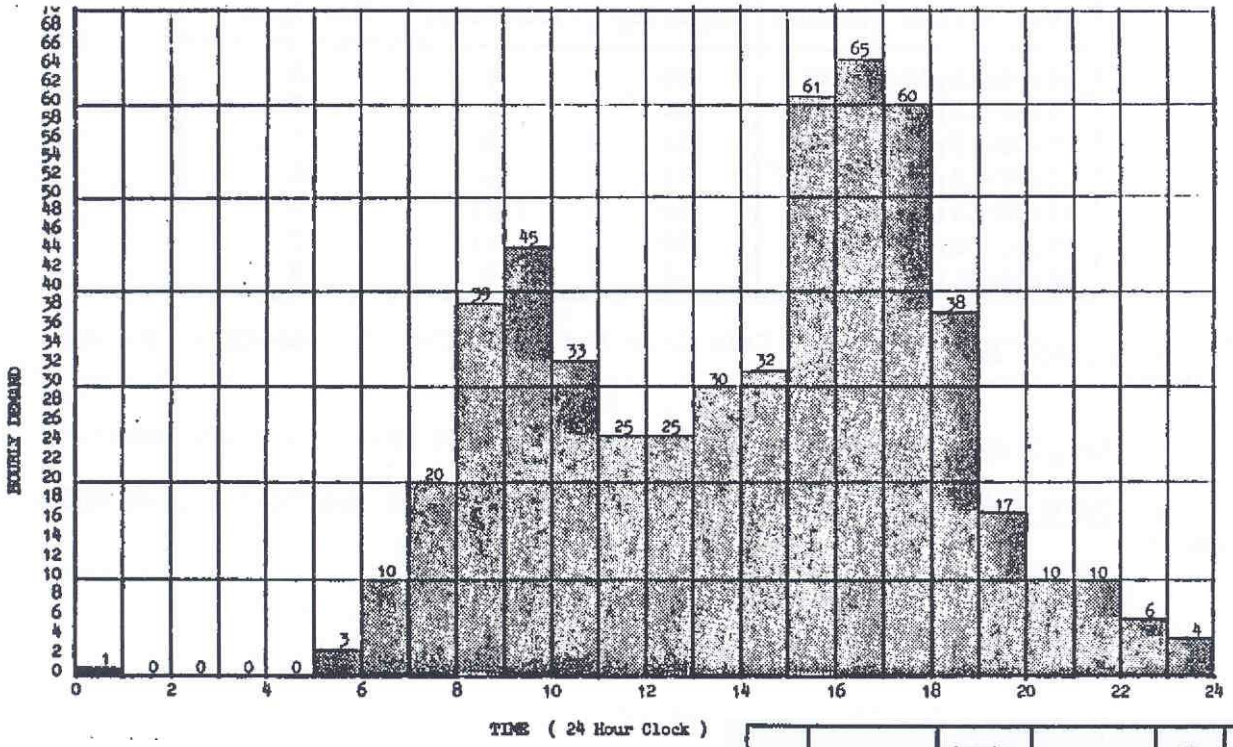
Demand	Runway-use Diagram	Runway-use No.	Capacity Figure No. VFR	Capacity Figure No. IFR	Aircraft Mix %A	%B	%C	%D	Mix Index %(C+3D)	Arrivals %	Touch and Go %	Runway Exits Location	Runway Exits No.	Hrly. Cap. Base C*	T & G Factor T	Exit Factor E	Hourly Capacity (000) C*·T·E
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
11-19		1	3		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

Ritardo giornaliero sulle Runway (3)

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 DFF	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

Dati

Ritardo giornaliero sulle Runway (4)

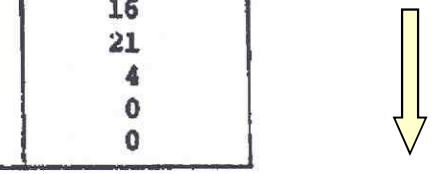


Demand	Runway-use Diagram	No.	Capacity Figure No. VFR	IFR	Aircraft Mix %A	%B	%C	%D	Mix Index %(C+3D)	Arrivals %	Touch and Go %	Runway Exits Location				No.	Hrly. Cap. Base C^o	T & G Factor T	Exit Factor E	Hourly Capacity (000) $C^o \cdot T \cdot E$
1	2	3	4	5	6	7	8	9	10	11	12	13				14	15	16	17	18
11-19		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

Ritardo giornaliero sulle Runway (5)

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

AD/C = (61+65+60)/(55+55+55) = 1,13



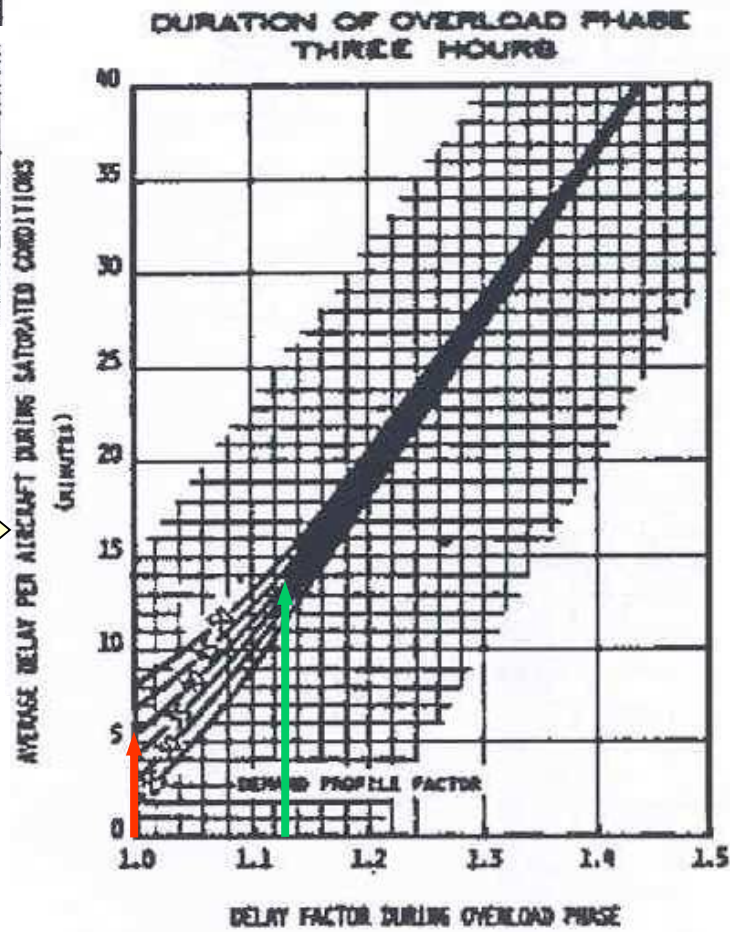
Hour	Misc.	Hourly Demand	Hourly Capacity	D/C Ratio	Mix Index	Arrival Delay Index ADI	Arrival Delay Factor ADF	Depart. Delay Index DDI	Depart. Delay Factor DDF	Delay Factor DFF	Aver. Delay (Minutes) Arr.	Aver. Delay (Minutes) Dep.	Hourly Delay (Minutes)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
13:00-14:00		30	"	.43	"	"	.30	.53	.23	"	0.5	0.3	12
14:00-15:00		32	69	.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	.78	.88	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	.11	5	.65	.07	.50	.06	40	0.1	0.0	1

Ritardo giornaliero sulle Runway (6)

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 DFF	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
13:00-14:00		30	"	.43	"	"	.30	.53	.23	"	0.5	0.3	12
14:00-15:00		32	69	.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	.78	.88	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	.11	5	.65	.07	.50	.06	40	0.1	0.0	1

ADF=(D/C)*ADI

DDF=(D/C)*DDI



DTS = [Σ(HD)] * [PA * DAHA + (100-PA) * DAHD]/100

= (61+65+60+38+17)*[45*4,9 + (100-45) * 13,7]/100

= 2347 min

Ritardo giornaliero sulle Runway (7)

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	-	-	-	-	-	-	-	-	-	-
01:00-02:00		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	.54	"	1.1	1.4	57
10:00-11:00		33	69	.48	30	.70	.34	.56	.27	"	0.6	0.4	17
11:00-12:00		25	"	.36	"	"	.25	.52	.19	"	0.4	0.2	8
12:00-13:00		25	"	.36	"	"	.25	.52	.19	"	0.4	0.2	8
13:00-14:00		30	"	.43	"	"	.30	.53	.23	"	0.5	0.3	12
14:00-15:00		32	69	.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	.78	.88	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	.11	5	.65	.07	.50	.06	40	0.1	0.0	1
21:00-22:00		10	"	.11	"	"	.07	"	.06	"	0.1	0.0	1
22:00-23:00		6	"	.07	"	"	.05	"	.04	"	0.0	0.0	0
23:00-24:00		4	92	.04	5	.65	.03	.50	.02	40	0.0	0.0	0
											Daily Delay		2507

Ritardo annuale sulle Runway (1)

Month	No. Days	Demand per Month	Ave. 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
Jan.	31	11,631	375	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 5.6	414 282	185 130	4,144 728	4,872
Mar.	31	12,561	405	VFR IFR	85 15	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	193 145	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	278 195	7,673 468	8,141
July	31	13,832	446	VFR IFR	95 5	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	415	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	225 162	6,705 194	6,899
Nov.	30	12,456	415	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 15	26.3 4.7	426 290	192 143	5,050 672	5,722
							TOTALS:	VFR IFR	74,129 5,404	79,533

Σ(colonna 3) = 153000

Ritardo annuale sulle Runway (1)

Month	No. Days	Demand per Month	Ave. 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
Jan.	31	11,631	375	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 5.6	414 282	185 130	4,144 728	4,872
Aug.	31	15,227	491	VFR	98	30.4	521	355	10,792	
								TOTALS: VFR	74,129	
								IFR	5,404	79,533

DMG = %G(VFR)*D(VFR)+%G(IFR)*D(IFR) = [1-%G(IFR)]*D(VFR)+%G(IFR)**%D(IFR/VFR)*D(VFR) =

= D(VFR)*[1-%G(IFR)+%G(IFR)**%D(IFR/VFR)] = D(VFR)*[1-%G(IFR)*(1-%D(IFR/VFR))]

D(VFR) = DMG/[1-%G(IFR)*(1-%D(IFR/VFR))]

375 =(25,4/31)*D(VFR)+(5,6/31)*D(IFR) = (25,4/31)*D(VFR)+(5,6/31)*0,68*D(VFR) = (1-0,18)*D(VFR)+0,18*0,68*D(VFR)

= D(VFR)*[1-0,18+0,18*0,68] = D(VFR)*[1-0,18*(1-0,68)]

Domanda(VFR) = (Domanda Media Giornaliera)/[1- %Giorni(IFR)*(1-%Domanda IFR/VFR)]

= 375/[1-0,18*(1-0,68)] =398 op./giorno

Domanda(IFR) = 398 *0,68 =271 op./giorno

375 = (25,4/31)*398+(5,6/31)*271

Ritardo annuale sulle Runway (2)

TABULATION OF HOURLY DEMAND FOR REPRESENTATIVE DAYS

Clock	Daily	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Time	Ops	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	%	398	271	414	282	430	292	428	291	436	296	478	325	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	.6	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	2.0	8	5	8	6	9	6	9	6	9	6	10	6	9	6	10	7	9	6	9	6	9	6	9	6
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	16	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	11	18	12	15	10	16	11	15	10	15	10
20-21	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
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	5	4	6	4	6	4	6	4	5	4	5	4	5	4	5	3
23-24	.8	3	2	3	2	3	2	3	2	3	2	4	3	4	3	4	3	4	2	4	2	4	2	3	2

Representative daily demand VFR - IFR calculations.

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

Da statistiche [in %]

398*2/100 ≅ 8 [operazioni /ora]domanda dalle 20 alle 21

Ritardo annuale sulle Runway (3)

stima

stima

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 DFF	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	.15	.10	2
08:00-09:00		31	97	.32	30	"	.32	.63	.20	"	.55	.25	12
09:00-10:00		37	89	.42	45	"	.42	.65	.27	"	.85	.40	23
10:00-11:00		27	97	.28	30	"	.28	.63	.18	"	.40	.20	8
11:00-12:00		20	"	.21	"	"	.21	"	.13	"	.30	.10	4
12:00-13:00		20	"	.21	"	"	.21	"	.13	"	.30	.10	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	.44	45	"	.44	.65	.29	"	.90	.45	26
18:00-19:00		31	97	.32	30	"	.32	.63	.20	"	.55	.25	12
19:00-20:00		14	97	.14	5	1.00	.14	.62	.09	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

Ritardo annuale sulle Runway (4)

Month	No. Days	Demand per Month	Ave. 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
Jan.	31	11,631	375	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 5.6	414 282	185 130	4,144 728	4,872
Mar.	31	12,561	405	VFR IFR	85 15	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	193 145	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	278 195	7,673 468	8,141
July	31	13,832	446	VFR IFR	95 5	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	415	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	225 162	6,705 194	6,899
Nov.	30	12,456	415	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 15	26.3 4.7	426 290	192 143	5,050 672	5,722
							TOTALS:	VFR IFR	74,129 5,404	79,533