REPUBLIC OF INDONESIA

FEASIBILITY STUDY FOR THE BALI INTERNATIONAL AIRPORT DEVELOPMENT

FINAL REPORT

APPENDIX

JUNE 1982

Japan International Cooperation Agency

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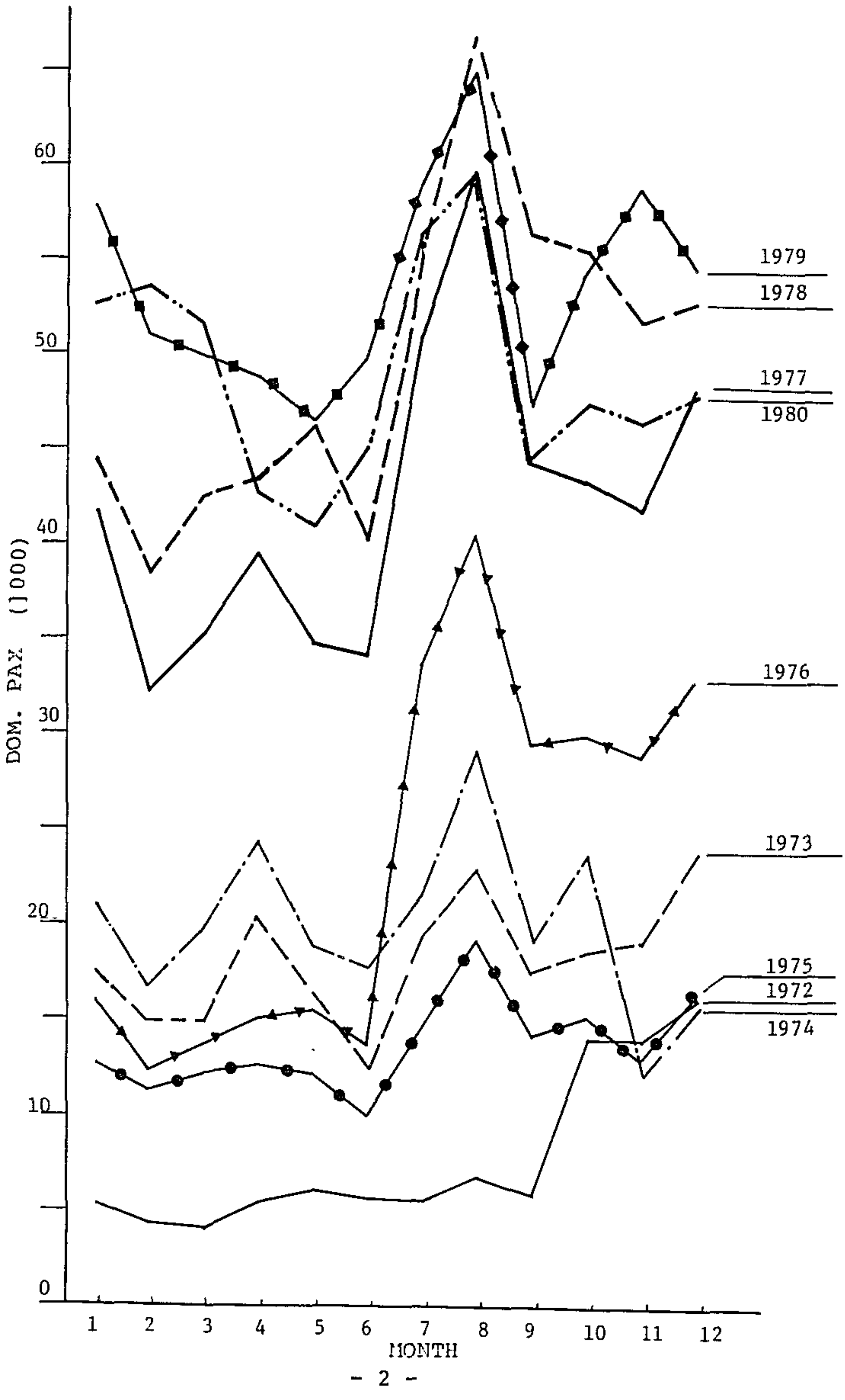
LIST OF APPENDICES

APPENDIX TO CHAPTER 3

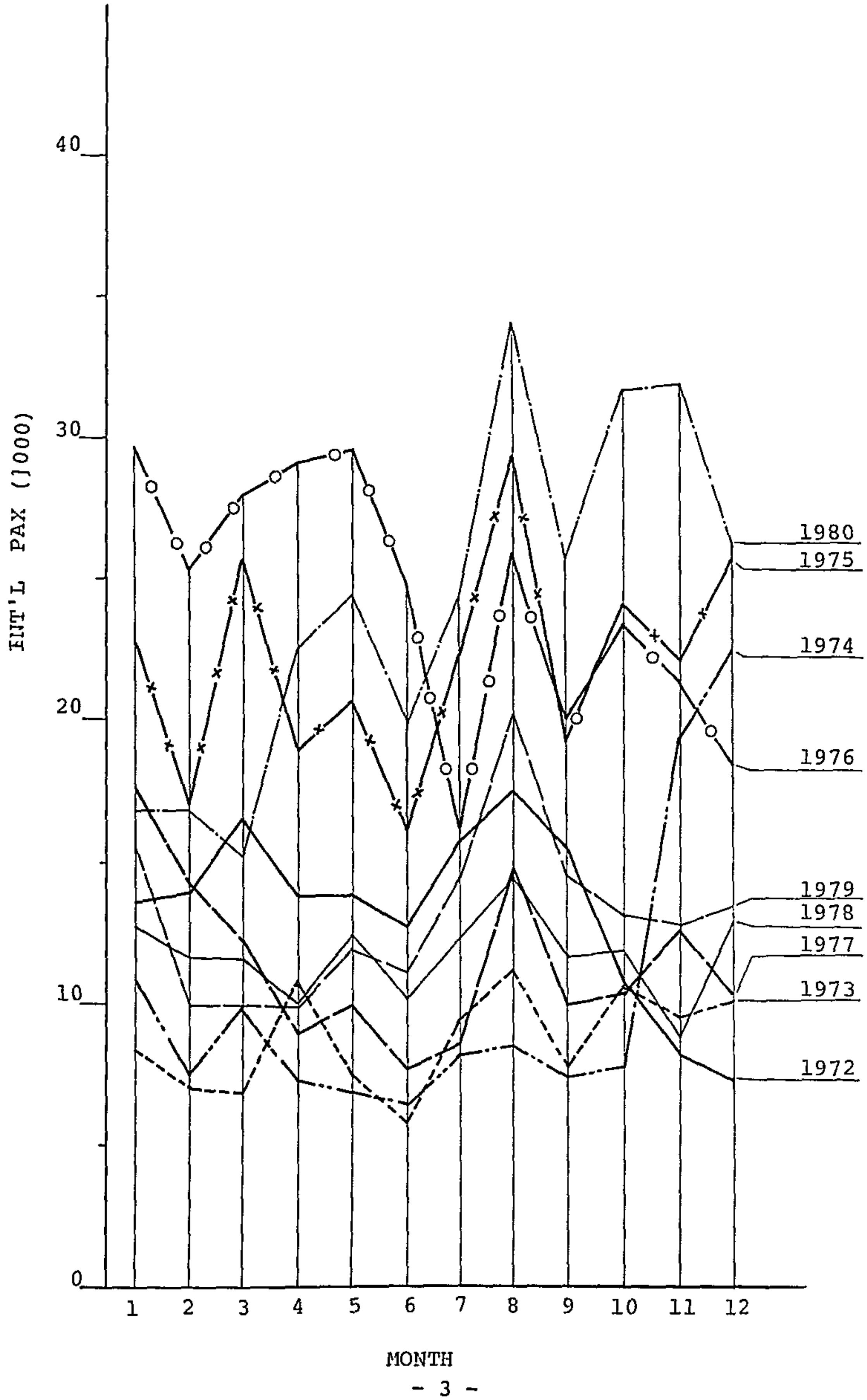
DATA OF MONTHLY PASSENGER'S NUMBER (INCLUDING TRANSIT)

Year / Month		1972		1973		1974		1975		1976		1977		1978		1979		1980	
1	INT'L / DOM	13,541 / 5,410	18,951	8,104 / 17,477	25,581	19,898 / 21,141	32,039	22,692 / 12,787	35,479	29,727 / 16,025	45,752	17,840 / 41,794	59,634	12,841 / 44,401	57,242	15,875 / 57,820	73,695	16,923 / 52,751	69,674
2	INT'L / DOM	13,926 / 4,343	18,269	7,036 / 14,790	21,826	7,536 / 16,631	24,167	16,905 / 11,212	28,117	25,263 / 12,305	37,568	14,286 / 32,192	46,478	11,615 / 38,290	49,905	9,704 / 50,928	60,632	16,862 / 48,459	65,321
3	INT'L / DOM	16,414 / 4,220	20,634	6,902 / 14,821	21,723	9,384 / 19,684	29,068	25,616 / 12,105	37,721	27,935 / 13,613	41,548	12,136 / 35,128	47,264	11,578 / 42,442	54,020	9,689 / 49,842	59,531	15,178 / 51,523	66,701
4	INT'L / DOM	13,866 / 5,403	19,269	10,638 / 20,322	30,960	7,248 / 24,212	31,460	18,950 / 12,548	31,498	29,132 / 15,073	44,205	8,886 / 39,320	48,206	9,917 / 43,333	53,250	9,663 / 48,706	58,369	22,535 / 42,589	65,124
5	INT'L / DOM	13,685 / 6,034	19,719	7,349 / 16,287	23,636	6,881 / 18,732	25,613	20,715 / 12,131	32,846	29,603 / 15,431	45,034	9,923 / 34,575	44,498	12,257 / 45,949	58,206	11,980 / 46,322	58,302	24,481 / 40,843	65,324
6	INT'L / DOM	12,602 / 5,455	[illegible]	[illegible] / 12,382	[illegible]	6,248 / 17,593	23,841	15,995 / 9,886	25,881	24,789 / 13,616	38,405	7,624 / 33,961	41,585	10,010 / 40,108	50,118	11,035 / 49,525	60,560	19,973 / 44,811	64,784
7	INT'L / DOM	15,661 / 5,653	[illegible]	9,248 / 19,366	[illegible]	[illegible] / 21,441	[illegible]	22,420 / 14,562	36,982	15,718 / 33,434	49,152	8,487 / 50,375	58,862	12,229 / 54,797	67,026	14,161 / 58,457	72,618	24,091 / 55,892	79,983
8	INT'L / DOM	17,384 / [illegible]	[illegible]	11,061 / 22,884	[illegible]	8,418 / [illegible]	[illegible]	29,365 / 19,001	48,366	26,162 / 40,240	66,402	14,774 / 54,224	68,998	14,407 / 66,164	80,571	20,213 / 64,237	84,450	34,171 / 59,074	93,245
9	INT'L / DOM	15,455 / 5,794	21,249	[illegible] / 17,492	[illegible]	[illegible]	26,201	19,204 / 14,185	33,389	19,942 / 29,326	49,268	9,884 / 43,847	53,731	11,460 / 55,817	67,277	14,502 / 46,790	61,292	25,793 / 43,629	69,422
10	INT'L / DOM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24,146 / 15,162	39,308	23,403 / 29,727	53,130	10,298 / 42,854	53,152	11,479 / 55,060	66,539	13,075 / 53,842	66,917	31,805 / 46,965	78,770
11	INT'L / DOM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22,030 / 12,916	34,946	21,397 / 28,618	50,015	12,443 / 41,263	53,706	8,712 / 51,166	59,878	12,734 / 57,891	70,625	31,987 / 45,898	[illegible]
12	INT'L / DOM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25,668 / 16,110	41,778	18,303 / 32,383	50,686	10,501 / 47,524	58,025	12,677 / 52,024	64,701	13,303 / 53,762	67,067	26,282 / 47,284	[illegible]
TOTAL	INT'L / DOM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	263,906 / 164,587	428,493	291,374 / 279,794	571,164	137,091 / 497,057	634,148	139,182 / 589,551	728,733	155,936 / 638,122	794,058	[illegible]	[illegible]
Peak ratio	[illegible]	[illegible]		[illegible]		[illegible] (Dec.)		11.2% (Aug.)		10.1 (May)		13.0% (Jan.)		10.4 (Aug.)		13.0% (Aug.)		[illegible] (Aug.)	
	[illegible]					[illegible] (Aug.)		11.7 (Aug.)		14.4% (Aug.)		10.9% (Aug.)		11.2 (Aug.)		10.1 (Aug.)		[illegible] (Aug.)	
	[illegible]					[illegible] (Aug.)		11.4% (Aug.)		11.6% (Aug.)		10.9 (Aug.)		11.1 (Aug.)		10.6 (Aug.)		[illegible] (Aug.)	

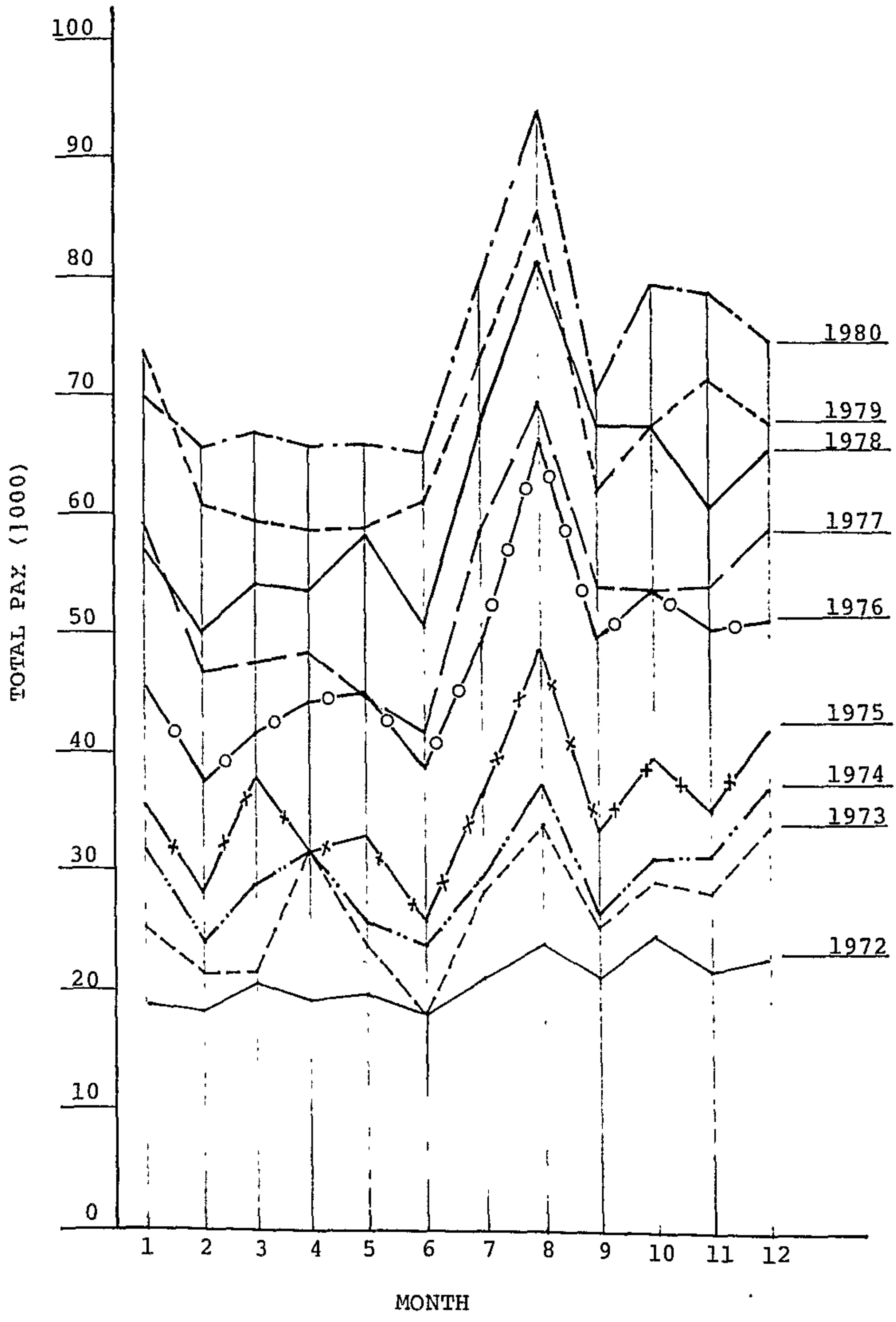
BEAKDOWN OF DOM. AIR TRAFFIC VOLUME



BREAKDOWN OF INT'L. AIR TRAFFIC VOLUME



BREAKDOWN OF TOTAL OF INT'L AND DOM. AIR TRAFFIC VOLUME



DEMAND FORECAST OF PASSENGERS BY DOMESTIC ROUTE

(1) Share by route

There are about 20 airports which might be linked to Bali. Some of the airports are situated on one and the same island, and some are pioneer air routes with an exceedingly small transport volume. For this reason, future routes to the east of Bali are predicted here based on the condition that one airport would represent one island.

TABLE 1 FORECAST ROUTES

Island	Airport	Representative Airport	City
-	Halim	Halim	JAKARTA (JKT)
-	JOGYA	Jogya	JOGYA (JOG)
-	Juanda	Juanda	SURABAYA (SUB)
LOMBOK	Rembiga	Rembiga	AMPENAN (AMI)
SUMBAWA	Sumbawa BIMA	Sumbawa	SLMBAWA (SWQ)
SUMBA	Wingapu Tambolaka	Wingapu	WINGAPU (WGP)
FLORES	Ruteng Ende Maumere	Maumere	MAUMERE (MOF)
TIMOR	Kupang Dili	Kupang	KUPANG (KOE)
SULAWESI	Makassar	Makassar	UJUNG PANDAN (UPG)
	Other		

The past-record is an important index to forecast the demand for domestic passengers. There are wide variations for the domestic passenger on the DPS-JKT route because of the modification of statistical method for passenger volume between Domestic and International Airline, discontinuance of direct flights by foreign Airlines or commencement of mixed-flights by G.I.A.

TABLE 2.

Year	International Passenger	Ratio This Year/ Last Year	Domestic Passenger	Ratio This Year/ Last Year	Ratio (DOM./INTL.)
1972	158,504	-	93,067		0.59
1973	103,868	0.66	216,729	2.33	2.09
1974	121,019	1.17	237,400	1.09	1.96
1975	263,906	2.18	162,587	0.68	0.62
1976	291,374	1.10	279,794	1.72	0.96
1977	137,091	0.47	497,057	1.78	3.63
1978	139,182	1.02	589,551	1.19	4.26
1979	155,936	1.12	638,122	1.08	4.09
1980	290,083	1.86	579,718	0.91	2

The foreign airlines which discontinued direct flights to B.I.A. are as follows:

Airline	Operation Period	No. of Flights
PA	1971 - 1975	2FL/W
TG	1969 - 1980	3FL/W
LX	1974 - 1975	1FL/W
SQ	1980 (Jan-April)	5FL/W
TYO-DPS (non-scheduled)		54 FL/1979

The passenger's share by each domestic route during three years are shown in Table-3.

TABLE 3 PASSENGER'S SHARE BY DOMESTIC ROUTE

Unit: %

Route to DPS	1979	1980	1981	Average
JKT	54.2	45.4	46.5	48.7
JOG	10.8	13.4	13.1	12.4
SUB	11.9	12.9	13.0	12.6
AMI	9.5	11.7	10.7	10.6
SWQ	1.5	1.8	2.0	1.8
WGP	1.1	1.1	0.5	0.9
MOF	0.3	0.3	0.4	0.3
KOE	4.9	6.6	6.2	5.9
UPG	5.4	6.4	6.4	6.1
OTHER	0.4	0.4	1.2	0.7
TOTAL	100	100	100	100

Generally, the average value of past data is used for the setting up a standard to determine the share by each route for the forecasted value. But is has wide variation in relation with international route.

Judging from the abovementioned table, 1979 to 1980 was considered to be too irregular. Therefore, the share value for each route was fixed by 1980 data.

(2) Passengers by route

The number of Indonesian's passenger in 1980 was calculated from the actual movement of domestic passengers including foreigners.

(a) 40% of foreign passengers to visit the Bali Island are coming from a place in Indonesia other than Bali.
Therefore:

- The Foreigners coming to Bali	478,000 x 0.6 ≑ 287,000 person/year
- The Foreigners going to other destinations	478,000 x 0.4 ≑ 191,000 person/year

191,000 foreigners per year were considered to come by mixed flight or other domestic route.

(b) There are 241,000 domestic passengers per year (Not including the transit passengers) on the JKT-DPS route (mixed-flight) in 1980.

The data from Peruma Angkasa Pura on B.I.A. indicates that the ratio between Indonesian and Foreigners is 50:50 on domestic routes.

This means that foreigners and Indonesians are each 120,500 person/year.

(c) The foreign passengers coming to Bali by domestic routes other than JKT-DPS are calculated as follows:

191,000 - 120,500 = 70,500 person/year

These foreign passengers can be allocated as 50% on Jogya route and 25% each on Ujungpandang and Surabaya routes.

JOGYA	35,000 person/year
SURABAYA	17,750 "
UJUNGPANDANG	17,750 "
TOTAL	70,500 person/year

(d) In total, the share of Indonesian passengers in Bali in 1980 is shown in Table 4.

TABLE 4 INDONESIAN PASSENGER'S SHARE BY EACH ROUTE

Route To DPS	1 : DOM PAX	2 : Foreigner included in 1	1 − 2	Ratio
JKT	241,000	120,500	120,500	33.5
JOG	75,400	35,000	40,400	11.2
SUB	72,400	17,750	54,650	15.2
AMI	65,900	-	65,900	18.3
SWQ	9,900	-	9,900	2.7
WGP	5,900	-	5,900	1.6
MOF	1,500	-	1,500	0.4
KOE	37,100	-	37,100	10.3
UPG	36,000	17,750	18,250	5.1
OTHER	6,000	-	6,000	1.7

360,100 person/year 100%

DEMAND OF INDONESIAN PASSENGER ON EACH ROUTE

ROUTE	1985	1990	1995	2000	2005	2010
JKT	218,000	385,000	553,000	804,000	1,022,000	1,290,000
	32,000	51,000	72,000	96,000	125,000	156,000
	250,000	436,000	625,000	900,000	1,147,000	1,446,000
JOG	73,000	129,000	185,000	269,000	341,000	431,000
	11,000	17,000	24,000	32,000	42,000	52,000
	84,000	146,000	209,000	301,000	383,000	483,000
SUB	99,000	175,000	251,000	365,000	464,000	585,000
	15,000	23,000	32,000	44,000	57,000	70,000
	114,000	198,000	283,000	409,000	521,000	655,000
AMI	119,000	210,000	302,000	439,000	558,000	705,000
	17,000	28,000	39,000	53,000	68,000	85,000
	136,000	238,000	341,000	492,000	626,000	790,000
SWQ	18,000	31,000	44,000	65,000	82,000	104,000
	2,000	4,000	6,000	8,000	10,000	13,000
	20,000	35,000	50,000	73,000	92,000	117,000
WGP	10,000	18,000	26,000	38,000	49,000	62,000
	2,000	2,000	3,000	4,000	6,000	7,000
	12,000	20,000	29,000	42,000	55,000	69,000
MOF	2,000	5,000	7,000	10,000	12,000	15,000
	-	1,000	1,000	1,000	1,000	2,000
	2,000	6,000	8,000	11,000	13,000	17,000
KOE	67,000	118,000	170,000	247,000	314,000	397,000
	10,000	15,000	22,000	30,000	38,000	48,000
	77,000	133,000	192,000	277,000	352,000	445,000
UPG	33,000	59,000	84,000	122,000	156,000	196,000
	5,000	8,000	11,000	15,000	19,000	24,000
	38,000	67,000	95,000	137,000	175,000	220,000
OTHER	11,000	20,000	28,000	41,000	52,000	65,000
	2,000	3,000	4,000	5,000	6,000	8,000
	13,000	23,000	32,000	46,000	58,000	73,000
TOTAL	650,000	1,150,000	1,650,000	2,400,000	3,050,000	3,850,000
	96,000	152,000	214,000	288,000	372,000	465,000
	746,000	1,302,000	1,864,000	2,688,000	3,422,000	4,315,000

upper : No. of PAX (ARR + DEPT)
medium: Transit
lower : Total

DEMAND FORECAST OF PASSENGER BY INTERNATIONAL ROUTE

	(A) Indonesian Passenger	(B) Foreign Passenger	Total
1985	650,000	800,000	1,450,000
1990	1,150,000	1,250,000	2,400,000
1995	1,650,000	1,800,000	3,450,000
2000	2,400,000	2,450,000	4,850,000
2005	3,050,000	3,150,000	6,200,000
2010	3,850,000	4,000,000	7,850,000

	(C) Foreigner Immigrated at other than Bali (40%)	(D) Foreigner Immigrated at Bali (60%)
1985	320,000	480,000
1990	500,000	750,000
1995	720,000	1,080,000
2000	980,000	1,470,000
2005	1,260,000	1,890,000
2010	1,600,000	2,400,000

	(E) Foreigner on Other than the Australian Route	(F) Foreigner on the Australian Route	*1	*2
1985	210,000	270,000	(57%)	(34%)
1990	290,000	460,000	(61%)	(37%)
1995	360,000	720,000	(67%)	(40%)
2000	440,000	1,030,000	(70%)	(42%)
2005	470,000	1,420,000	(75%)	(45%)
2010	480,000	1,920,000	(80%)	(48%)

	(G) Mixed-flight's PAX on JKT-DPS route	(H) Direct flight *3 from Foreign (DPS-TYO)
1985	157,000	53,000
1990	207,000	83,000
1995	241,000	119,000
2000	278,000	162,000
2005	262,000	208,000
2010	216,000	264,000

Note: *1 : Ration of (F)/(D)
1985's share is the average value between 1977 ∿ 1981.

*2 : Ratio of (F)/(B)

*3 : Calculated of 11.0% with actual movement of 1980

SHARE DEMAND OF EACH AUSTRALIAN ROUTE

Route to DPS	1979	1980	1981	Average
SYD	43,000 (48.3%)	76,200 (50.9%)	60,400 (46.5%)	(48.6%)
DRW	2,900 (3.3%)	4,650 (3.1%)	8,000 (6.2%)	(4.2%)
PER	18,200 (20.4%)	36,800 (24.6%)	34,800 (26.8%)	(23.9%)
MEL	25,000 (28.0%)	31,900 (21.3%)	26,637 (20.5%)	(23.3%)
				100%

NO. OF FOREIGNER COMING BALI ISLAND BY DOMESTIC LINE OR MIXED FLIGHT BEING IMMIGRATED OTHER PLACE

ROUTE	1985	1990	1995	2000	2005	2010
JKT	160,000	250,000	360,000	490,000	630,000	800,000
JOG	80,000	125,000	180,000	245,000	315,000	400,000
SUB	40,000	63,000	90,000	122,000	158,000	200,000
UPG	40,000	62,000	90,000	123,000	157,000	200,000
TOTAL	320,000	500,000	720,000	980,000	1,260,000	1,600,000

DEMAND OF EACH AUSTRALIAN ROUTE

ROUTE	1985	1990	1995	2000	2005	2010
SYD	131,000	224,000	350,000	501,000	690,000	933,000
	(8,000)	(13,000)	(19,000)	(29,000)	(42,000)	(58,000)
	139,000	237,000	369,000	530,000	732,000	991,000
PER	65,000	110,000	172,000	246,000	339,000	459,000
	(4,000)	(6,000)	(10,000)	(14,000)	(20,000)	29,000
	69,000	116,000	182,000	260,000	359,000	488,000
MEL	63,000	107,000	168,000	240,000	331,000	447,000
	(4,000)	(6,000)	(9,000)	(14,000)	(20,000)	(28,000)
	67,000	113,000	177,000	254,000	351,000	475,000
DRW	11,000	19,000	30,000	43,000	60,000	81,000
	(1,000)	(1,000)	(2,000)	(3,000)	(4,000)	(5,000)
	12,000	20,000	32,000	46,000	64,000	86,000
TOTAL	270,000	460,000	720,000	1,030,000	1,420,000	1,920,000
	(30,000)	(43,000)	(60,000)	(85,000)	(115,000)	(150,000)
	300,000	503,000	780,000	1,115,000	1,535,000	2,070,000

TYO	53,000	83,000	119,000	162,000	208,000	264,000
	(3,000)	(5,000)	(7,000)	(9,000)	(13,000)	(16,000)
	56,000	88,000	126,000	171,000	221,000	280,000

upper :No. of PAX(ARR+DEP)

medium:Transit

lower :Total

AIRCRAFT MIX PROJECTION ON DOMESTIC ROUTE

No	Route	CONDITION: Existing Runway Length (m)	CONDITION: RWY LCN	CONDITION: Maximum Projected Aircraft	Scheduled in A/C PELITA III	DEMAND FORECAST AND AIRCRAFT MIX BY ROUTE (Unit 1000 Person/Year): 0 – 50	100	200	300	400	500	600	700	800	900	1000	1,500	1,500以上
1	JAKARTA (JKT)	3000×60	80	B-747								P1 577 J/WB				P2 903 J/WB	P3 1,231 J/WB	P4 1,684 J, P5 2,056 J, P6 2,476 J
2	JOGYAKARTA (JOG)	1850×40	45	DC-9				P1 164 NJ	P2 271 NJ	P3 389 NJ/NMJ		P4 546 NMJ/WB	P5 698 WB		P6 883 WB			
3	SURABAYA (SUB)	3000×60	60	DC-10	DC-10			P1 154 NJ	P2 261 NJ/WB	P3 373 WB		P4 531 NMJ/WB	P5 679 WB		P6 855 WB			
4	AMPENAN (AMI)	1600×40	22	F-28				P1 136 SP/STOL	P2 238 SJ	P3 341 SJ/NJ	P4 492 NJ		P5 626 NMJ	P6 790 NMJ				
5	SUMBAWA (SWQ)	1450×30	14	F-27		P1 20 STOL, P2 35 SP, P3 50 ST (Routes 5–6)	P4 73 ST, P5 92 NJ (Routes 5–6)	P6 111 NJ (Routes 5–6)										
6	BIMA (BMU)	1255×30	14	HS-748														
7	WINGAPU (WGP)	1300×30	12	F-27		P1 12 STOL, P2 20 STOL, P3 29, P4 42 SP (Routes 7–8)	P5 53 SJ, P6 69 SJ (Routes 7–8)											
8	TAMBOLAKA (TLK)	1500×30	15	F27														
9	RUTENG (RTG)	700×18	–	DHC-6		P1 2 STOL, P2 6 STOL (Routes 9–10)	P3 8 STOL, P4 11 STOL (Routes 9–10)	P5 13 STOL, P6 17 STOL (Routes 9–10)										
10	ENDE (ENE)	750×18	–	DHC-6														
11	MAUMERE (MOF)	1,470×30	16	F-27	F-28													
12	KUPANG (KOE)	1,240×30 1,610×30	19	F28			P1 77 SJ (Routes 12–13)	P2 133 SJ, P3 182 NJ (Routes 12–13)	P4 277 NJ (Routes 12–13)	P5 352 NJ/NMJ (Routes 12–13)	P6 445 NJ/NMJ (Routes 12–13)							
13	DILI (DIL)	1,400×25	12	F27														
14	UJUNGPANDANG (UPG)	1,550×30 2,345×45	50	A300	DC-10		P1 76 WB	P2 129 WB/ST, P3 185 WB/NJ	P4 260 WB	P5 352 WB/NJ	P6 420 WB							
Scale for A/C Projection						0 STOL 30 / 20 SP 50 / 50 SJ 200 / 100 NJ / 400 NMJ / 800 J / WB												

Forecast of Assigned Aircraft by Domestic Route

A) Basic Assumptions:

(1) Mixed flights between JKT and DPS are expected not to be cancelled in the future.

(2) Wide-bodied aircraft B-747 are also expected to operate mainly between JKT and domestic trunk line airports (Category II), and for international routes.

(3) NMJ such as B-767 are anticipated to be operated by GIA as one of the major assigned aircraft for domestic air routes around 1995.

B) Assigned Aircraft by Route are forecast, as follows:

(1) JOG Route

Because the existing Jogya (Juanda) Airport cannot be expanded due to geographical limitations new Jogya Airport is planned to be constructed from 1982 and to be completed around 1995. Therefore, the presently assigned aircraft (DC-9 and NMJ) are expected to operate for about 10 years from now on.

(2) Surabaya (SUB) Routes

SUB routes between SUB and DPS has been operated by DC-9. The route between JKT and SUB, however, has been operated as a shuttle service by A-300 since January 1982.

Air transport volume on the route between SUB and DPS is expected to be increased rapidly in the future. A-300 aircraft is expected to be introduced in the route between JKT and DPS through SUB in the near future.

(3) Ampenan (AMI) Route

Ampenan (Rembiga) Airport is equipped with 1,600m long of the runway. Because there is about 100Km in distance between AMI and DPS only, the route has been operated by DHC-6 (by MNA).

The following assumptions form the basis for assigning of aircraft for the future are:

- The route handles the largest air transport volume among the eastern air routes from Bali island.
- The route once had been operated by F-28
- Passenger volumes on the route are forecast to show rapid growh from 240,000 annual pax. in 1990 and 490,000 annual pax in 2000. DHC-6 aircraft cannot handle the increased passenger volume on the route in the future.

  As explained above future air transport demand is expected to increase substantially. On the other hand, Ampenan Airport has not developed sufficient airport facilities based on air transport demand. Therefore, small aircraft are expected to continue operating in the future taking into consideration the present situation.

(4) Ujung Pandang (UPG) Routes

The route between UPG and DPS has been operated by A-300 since January 1982. Based on present conditions, the type of aircraft to be assigned on the route are forecast.

APPENDIX TO CHAPTER 5

APPENDIX 5.2.1

RUNWAY REQUIREMENTS (B-747 TAKE-OFF)

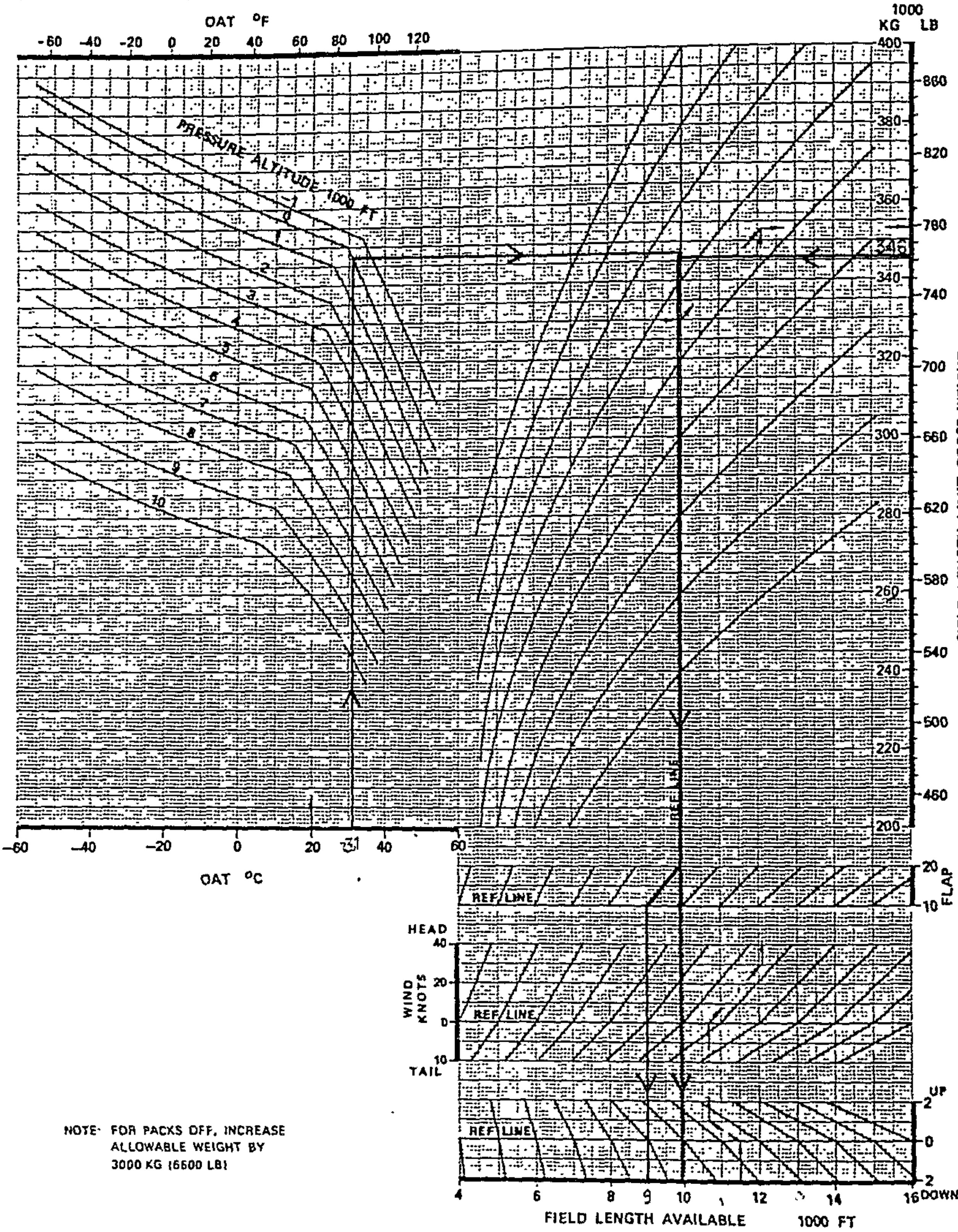
ASSUMPTIONS

OAT	:	31° C (ISA + 16° C)
Elevation	:	0 feet
Slope	:	0 percent
Procedure	:	Take-off
Route	:	DPS ———→ TYO ---------→ FUK 3224 NM 515 NM
FL/Wind	:	+15Kt/FL350 -70Kt/FL350
Alternate	:	Fukuoka

TAKE-OFF WEIGHT	:	346,000 Kg
D.O.W	:	173,000 Kg
Fuel Carried	:	107,000 Kg
Max. Payload	:	66,000 Kg

MONOGRAPH APPLIED : 2,750 m (20°FL), 3,000 m (10°FL)

RWY FIELD LENGTH REQUIRED : 2,800 m (20°FL), 3,000 m (10°FL)



NOTE: FOR PACKS OFF, INCREASE ALLOWABLE WEIGHT BY 3000 KG (6600 LB)

USE THE SMALLER LIMIT MAX

APPENDIX 5.2.2

RUNWAY REQUIREMENTS (DC-10 TAKE-OFF)

ASSUMPTIONS

OAT	:	31° C (ISA + 16° C)	
Elevation	:	0 feet	
Slope	:	0 percent	
Procedure	:	Take-off	
Route	:	DPS ——→ TYO(NRT)	----→ FUK
Distance	:	3224 NM	515 NM
FL/Wind	:	+15Kt/FL350	-70Kt/FL350
Alternate	:	Fukuoka	

TAKE-OFF WEIGHT	:	242,800 Kg
D.O.W	:	123,400 Kg
Fuel Carried	:	75,600 Kg
Max. Payload	:	43,800 Kg

MONOGRAPH APPLIED : 3140 m

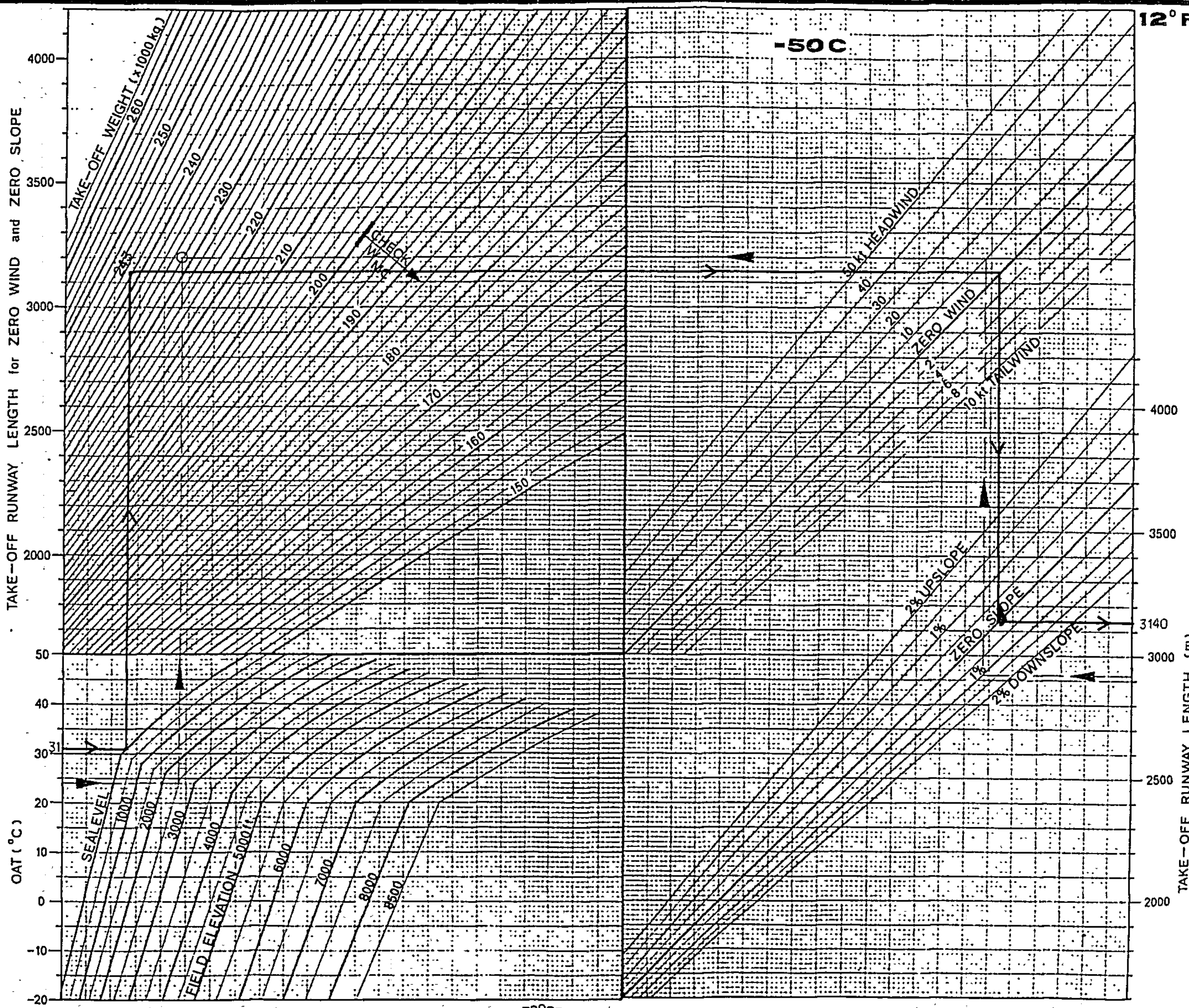
RWY FIELD LENGTH REQUIRED : 3,200 m

(Flaps 12°)

12° FLAPS

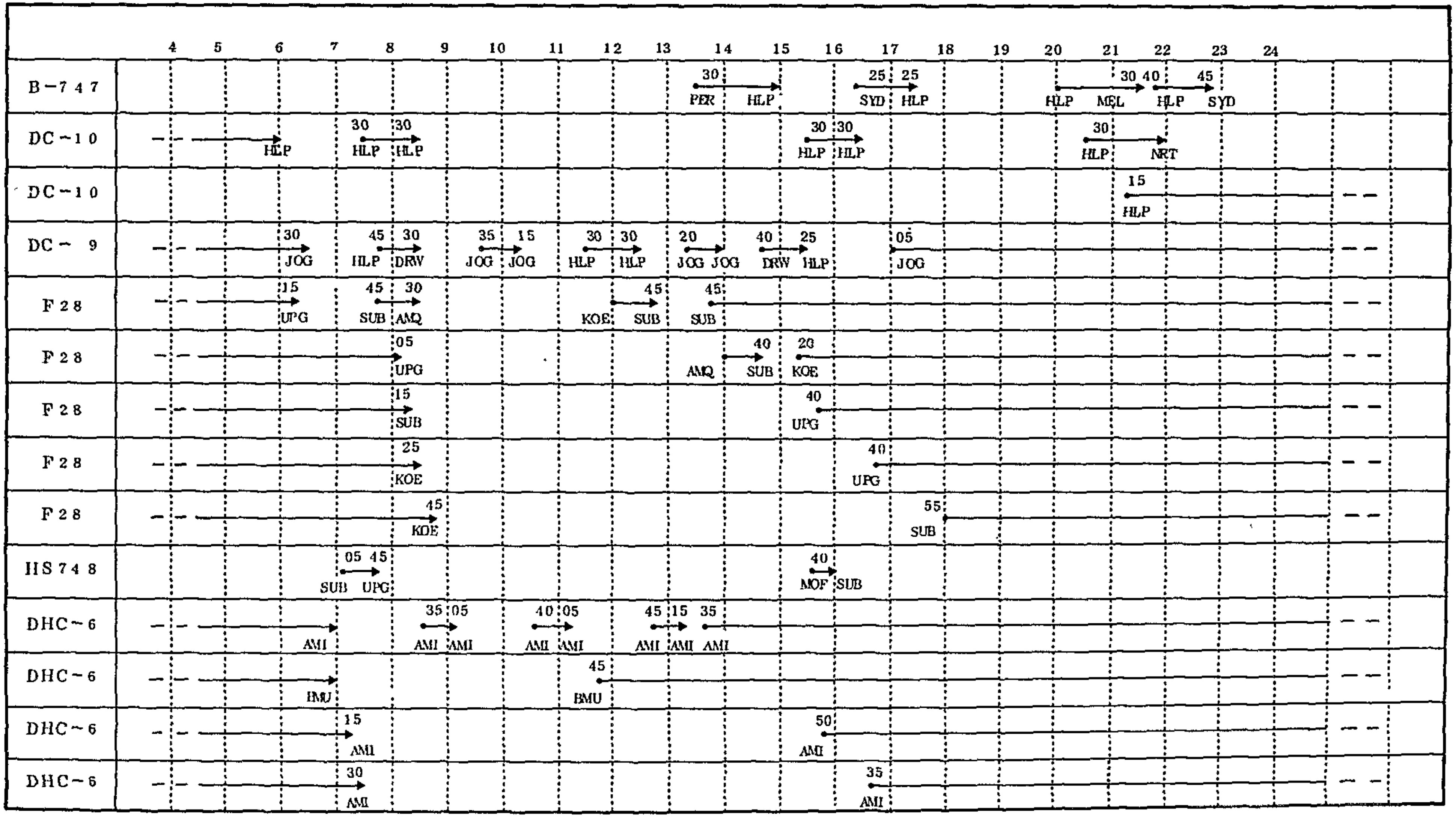
Chart based on:
. No Engine bleed

CORRECTIONS:
. Engine Anti-Ice:
SUBTRACT: 1500 kg



DATA OF UTILIZATION ON APRON

Friday at Dec. '81



DATA OF OCCUPY TIME ON APRON
[Calculated from A/L Time Table]

Date	Type of Aircraft	Staying Time Data [minute]					Mean Value of Staying Time (Minute)
MONDAY	DC-10	60	60	60			60
	DC-9	40	40				40
	HS-748	30	30				30
	F-28	45	45	40			44
	DHC-6	30	30	30			30
	B-747	75	60	65			67
TUESDAY	DC-10	60	60	60			60
	DC-9	40	40				40
	B-747	90					90
	HS-748	30	20				25
	F-28	45	45	40			44
	DHC-6	30	30	45	30		34
WEDNESDAY	DC-10	60	60	60	70		63
	DC-9	40	40				40
	B-747	60					60
	HS-748						-
	F-28	45	45	40			43
	DHC-6	30	30	45	30	135	54
THURSDAY	DC-10	60	60	60	90	85	71
	DC-9	40	40				40
	B-747	60					60
	HS-748	45	40				43
	F-28	45	45	40			44
	DHC-6	30	30	45			35
FRIDAY	DC-10	60	60	90			70
	DC-9	45	40	60	40	45	46
	B-747	90	60	90	65		77
	HS-748	40	20				30
	F-28	45	45	40			44
	DHC-6	30	25	30			29
SATURDAY	DC-10	60	60	60			60
	DC-9	40	40	45			42
	B-747	65	90				78
	HS-748	10	30				20
	F-28	45	45	40			44
	DHC-6	30	30				30
SUNDAY	DC-10	60	60	60			60
	DC-9	45	40	40	45		43
	B-747	60	60	90	65		69
	HS-748	30	30				30
	F-28	45	40				43
	DHC-6	30	30	30			30

Weekly Mean Value [minute]

DC-10:	64	HS-748:	30
DC-9 :	42	F-28 :	44
B-747:	72	DHC-6 :	35

Calculation Table of A/C Movements (1)

PEAK DAY COEFFICIENT : 0.003548

INT'L 1985

ROUTE	A/C Seat / PAX	Number/day J	WB	NMJ	MJ	SJ	LP	SP	STOL
		432	270		105				
MEL SYD	206	(2.4) 40							
DRW	12				(0.6) 20				
PER	69	(0.8) 2.0							
TYO	56		(1.1) 2.0						
TOTAL		6.0	20		20				

PEAK DAY COEFFICIENT : 0.003548

INT'L 1990

ROUTE	A/C Seat / PAX	Number/day J	WB	NMJ	MJ	SJ	LP	SP	STOL
		432	270		105				
MEL SYD	350	(4.1) 40							
DRW	20				(10) 2.0				
PER	116	(1.4) 2.0							
TYO	88		(1.7) 20						
TOTAL		6.0	20		2.0				

Calculation Table of A/C Movements (2)

PEAK DAY COEFFICIENT : 0.003387

INT'L
1995

ROUTE	PAX	J	WB	NMJ	MJ	SJ	LP	SP	STOL
A/C Seat		432	270		150				
MEL SYD	546	(6.1) 60							
DRW	32				(1.0) 2.0				
PER	182	(2.0) 20							
TYO	126	(1.4) 20							
TOTAL		10.0			2.0				

PEAK DAY COEFFICIENT : 0.003387

INT'L
2000

ROUTE	PAX	J	WB	NMJ	MJ	ST	LP	SP	STOL
A/C Seat		432	350		150				
SYD	530	(59) 60							
DRW	46				(1.5) 20				
PER	260	(2.9) 40							
MEL	254	(28) 40							
TYO	171	(1.9) 20							
TOTAL		16.0			20				

Calculation Table of A/C Movements (3)

PEAK DAY COEFFICIENT : 0.003226

INT'L
2005

ROUTE	PAX \ A/C / Seat	Number/day J	WB	NMJ	MJ	SJ	LP	SP	STOL
		432	350		150				
SYD	732	(7.8) 8.0							
DRW	64				(20) 20				
PER	359	(3.8) 4.0							
MEL	351	(3.7) 4 0							
TYO	221	(2.4) 4.0							
TOTAL		20.0			2.0				

PEAK DAY COEFFICIENT : 0.003226

INT'L
2010

ROUTE	PAX \ A/C / Seat	Number/day J	WB	NMJ	MJ	SJ	LP	SP	STOL
		432	350	230					
SYD	991	(105) 12.0							
DRW	86			(1.7) 2.0					
PER	488	(52) 6.0							
MEL	475	(5.1) 6 0							
TYO	280	(3.0) 4.0							
TOTAL		28.0		2.0					

Calculation Table of A/C Movements (4)

PEAK DAY COEFFICIENT : 0.003323

DOM
1985

ROUTE \ A/C Seat / PAX		Number/day J 485	WB 283	NMJ 230	MJ 105	SJ 65~85	LP 135	SP 60	STOL 20
JKT	577	20	80						
JOG	164				8.0				
SUB	154				80				
AMI	136							8.0	80
SWQ	20								6.0
WPG	12								40
MOF	2								2.0
KOE	77					60			
UPG	78		20						
OTHER	13								40
TOTAL		2.0	100		160	6.0		8.0	24.0

PEAK DAY COEFFICIENT : 0.003323

DOM
1990

ROUTE \ A/C Seat / PAX		Number/day J 485	WB 283	NMJ 230	MJ 105	SJ 65~85	LP 135	SP 60	STOL 20
JKT	905	60	6.0						
JOG	271				140				
SUB	261		40		20				
AMI	238					140			
SWQ	35							40	
WPG	20								6.0
MOF	6								2.0
KOF	133				60				
UPG	129		20			2.0			
OTHER	23								6.0
TOTAL		60	120		220	160		40	14.0

Calculation Table of A/C Movements (5)

PEAK DAY COEFFICIENT : 0.003226

DOM
1995

ROUTE	A/C Seat PAX	J 485	WB 305	NMJ 230	MJ 150	SJ 65~85	LP 135	SP 60	STOL 20
		Number / day							
JKT	1,239	8.0	60						
JOG	389			40	60				
SUB	373		60						
AMI	341				6.0	10.0			
SWQ	50					4.0			
WPG	29							20	20
MOF	8								2.0
KOE	192				6.0				
UPG	185		2.0		20				
OTHER	32								80
TOTAL		8.0	12.0	4.0	20.0	14.0		20	120

PEAK DAY COEFFICIENT : 0.003226

DOM
2000

ROUTE	A/C Seat PAX	J 485	WB 350	NMJ 230	MJ 150	ST 65~85	LP 135	SP 60	STOL 20
		Number / day							
JKT	1,684	16.0							
JOG	546		6.0	2.0					
SUB	531		60	2.0					
AMI	492				160				
SWQ	73					40			
WPG	42							40	
MOF	11								40
KOE	277				10.0				
UPG	260		40						
OTHER	46							20	60
TOTAL		16.0	16.0	4.0	26.0	4.0		60	10.0

Calculation Table of A/C Movements (6)

PEAK DAY COEFFICIENT : 0.003065

DOM
2005

ROUTE \ A/C Seat PAX		Number / day J	WB	NMJ	MJ	SJ	LP	SP	STOL
		485	350	230	150	65~85	135	60	20
JKT	2,055	200							
JOG	698		100						
SUB	679		10.0						
AMI	626			120					
SWQ	92				40				
WPG	55					4.0			
MOF	13								4.0
KOE	352			60	2.0				
UPG	332		4.0		2.0				
OTHER	58							2.0	80
TOTAL		20.0	240	18.0	80	40		2.0	12.0

PEAK DAY COEFFICIENT : 0.003065

DOM
2010

ROUTE \ A/C Seat PAX		Number / day J	WB	NMJ	MJ	SJ	LP	SP	STOL
		485	350	230	150	65~85	135	60	20
JKT	2,476	240							
JOG	883		12.0						
SUB	855		120						
AMI	790			160					
SWQ	117				40				
WPG	69					40			
MOF	17								4.0
KOE	445			80	2.0				
UPG	420		6.0						
OTHER	73							40	60
TOTAL		240	300	24.0	60	4.0		4.0	10.0

Calculation Table of A/C Stand Requirement on Apron

INT'L (1)

		A	B		C		D	E	Total
		J	WB	NMJ	MJ	SJ	SP	STOL	
85	No. of flight at day	60	20	—	20	—	—	—	100
	Peak hour coefficient	022							—
	Peak hour of A/C landing	0.73	024		0.24		—	—	—
	Ocupation time of Apron	75	90		55		—	—	—
	Calculated stand	09	0.4		02		—	—	—
	Spare stand	—	—		—		—	—	—
	A/C stand						—	—	—
	Stand cap.	10	10		—		—	—	2.0
90	No. of flight at day	DITTO							
	Peak hour coefficient								
	Peak hour of A/C landing								
	Ocupation time of Apron								
	Calculated stand								
	Spare stand								
	A/C stand								
	Stand cap.								
95	No. of flight at day	10.0	—	—	20	—	—	—	12.0
	Peak hour coefficient	0.2							—
	Peak hour of A/C landing	1.10	—		022		—	—	—
	Occupation time of Apron	75	—		55		—	—	—
	Calculated stand	1.4	-		0.2		-	-	-
	Spare stand	1.0	-		-		-		-
	A/C stand	—			-		-		-
	Stand cap.	30	-		(1.0) *		-		3.0

NOTE: * Included in the surplus of A or B

Calculation Table of A/C Stand Requirement on Apron

INT'L (2)

		A	B		C		D	E	Total
		J	WB	NMJ	MJ	SJ	SP	STOL	
00	No. of flight at day	160	-	-	20	-	-	-	180
	Peak hour coefficient	015							-
	Peak hour of A/C landing	132	-		017		-	-	-
	Ocupation time of Apron	75	-		55		-	-	-
	Calculated stand	1.7	-		02		-	-	-
	Spare stand	10	-		-		-	-	-
	A/C stand	-			-		-	-	-
	Stand cap.	30	-		(10)*		-	-	3.0
05	No. of flight at day	200	-	-	20	-	-	-	220
	Peak hour coefficient	0.14							-
	Peak hour of A/C landing	1.54	-		015		-	-	-
	Ocupation time of Apron	75	-		55		-	-	-
	Calculated stand	19	-		01		-	-	-
	Spare stand	1.0	-		-		-	-	-
	A/C stand	-			-		-	-	-
	Stand cap.	3.0	-		(1.0)*		-	-	3.0
10	No of flight at day	280	-	20	-	-	-	-	300
	Peak hour coefficient	013							-
	Peak hour of A/C landing	200	014		-		-	-	-
	Occupation time of Apron	75	55		-		-	-	-
	Calculated stand	25	01		-		-	-	-
	Spare stand	1.0	-		-		-	-	-
	A/C stand	-			-		-		-
	Stand cap.	4.0	(1.0)*		-		-		4.0

Note: * Included in the surplus of A or B.

Calculation Table of A/C Stand Requirement on Apron

DOM. (1)

		A	B		C		D	E	Total
		J	WB	NMJ	MJ	SJ	SP	STOL	
85	No. of flight at day	2.0	100		16.0	60	8.0	240	660
	Peak hour coefficient	0.14							
	Peak hour of A/C landing	015	077		1.69		062	185	
	Ocupation time of Apron	70	70		55		45	45	
	Calculated stand	0.2	0.9		1.5		05	1.4	
	Spare stand	1.0							
	A/C stand	1.0			60		20	60	
	Stand cap.	2.0	1.0		60		2.0	60	170
90	No. of flight at day	6.0	120		22.0	160	40	110	740
	Peak hour coefficient	014							
	Peak hour of A/C landing	046	092		293		0.31	1.08	
	Ocupation time of Apron	70	70		55		45	45	
	Calculated stand	05	1.0		2.7		02	08	
	Spare stand	1.0							
	A/C stand	2.0			80		1.0	30	
	Stand cap.	20	1.0		80		1.0	30	150
95	No. of flight at day	8.0	120	4.0	200	140	20	12.0	720
	Peak hour coefficient	0.14							
	Peak hour of A/C landing	062	1.23		262		015	092	
	Occupation time of Apron	70	70		55		45	45	
	Calculated stand	0.7	1.4		31		01	07	
	Spare stand	10							
	A/C stand	2.0			100		20		
	Stand cap.	2.0	2.0		10.0		20		16.0

Calculation Table of A/C Stand Requirement on Apron

DOM (2)

		A	B		C		D	E	Total
		J	WB	NMJ	MJ	SJ	SP	STOL	
00	No. of flight at day	160	160	40	260	40	60	100	820
	Peak hour coefficient	013							
	Peak hour of A/C landing	114	1.43		215		1.14		
	Ocupation time of Apron	70	70		55		45		
	Calculated stand	1.3	1.7		25		0.8		
	Spare stand	1.0							
	A/C stand	20	20		9.0		50		
	Stand cap	30	20		9.0		5.0		190
05	No. of flight at day	200	24.0	180	80	40	2.0	120	880
	Peak hour coefficient	013							
	Peak hour of A/C landing	1.43	229		0.86		1.00		
	Ocupation time of Apron	70	70		55		45		
	Calculated stand	1.7	2.7		0.8		0.8		
	Spare stand	1.0							
	A/C stand	20	30		20		2.0		
	Stand cap.	30	30		20		2.0		100
10	No. of flight at day	240	300	24.0	60	4.0	10	100	102.0
	Peak hour coefficient	013							
	Peak hour of A/C landing	1.72	3.86		072		1.00		
	Occupation time of Apron	70	70		55		45		
	Calculated stand	2.0	4.5		07		0.8		
	Spare stand	10							
	A/C stand	20	3.0		20		20		
	Stand cap.	3.0	50		2.0		2.0		120

Int'l Pax Terminal BLDG.

Facility requirement

1. Check-in Counter

$$L = \frac{p \cdot t_2}{t - t_1} \cdot \ell = \frac{289 \times 4}{60 - 10} \times 2 = 46 \text{ m}$$

Where: L : Length of check in counter (m)
P : Peak hour pax (PAX/H) 525 x 0.55 = 289 PAX
t : Check-in time (min)
t_1: Resting time for check-in counters (min)
t_2: Handling capacity per PAX (min)
ℓ : One unit length (2 m)

2. Departure Lobby

$$S = \frac{X_1 + X_2}{60} \cdot t \cdot a = \frac{289+29}{60} \times 30 \times 2.5 = 397.5 \text{ m}^2$$

Where: S : DEPT. Lobby (m^2)
X_1: Peak Hour Pax (PAX/H)
X_2: Visitors (PAX/H) = X_1 x 0.1
t : Staying time (min)
a : Unit rate (m^2/PAX)

3. Immigration Counter "For DEPT & ARR"

$$I = \frac{P \times t}{T} = \frac{289 \times 1.5}{45} = 9.6 \doteqdot 10 \text{ units}$$

Where: I : No. of Immigration Counters (Unit)
P : Peak hour Pax (PAX/H)
t : Handling capacity per PAX (min)
T : Inspection time (min)

4. Quarantine Inspection Counter (Q.I.C) "For ARR"

$$QIC = \frac{P \times t}{T} = \frac{289 \times 1}{45} = 6.4 \doteqdot 7 \text{ units}$$

Where: QIC: No. of Q.I.C. (Unit)
P : Peak hour Pax (PAX/H)
t : Handling Capacity per PAX (min)
T : Inspection time (min)

5. Customs Inspection Counter (CIC) "For ARR"

$$CIC = \frac{P \times t}{T} = \frac{289 \times 2}{45} = 12.8 \fallingdotseq 13 \text{ units}$$

Where: CIC : No. of CIC (Unit)

P : Peak Hour Pax (PAX/H)

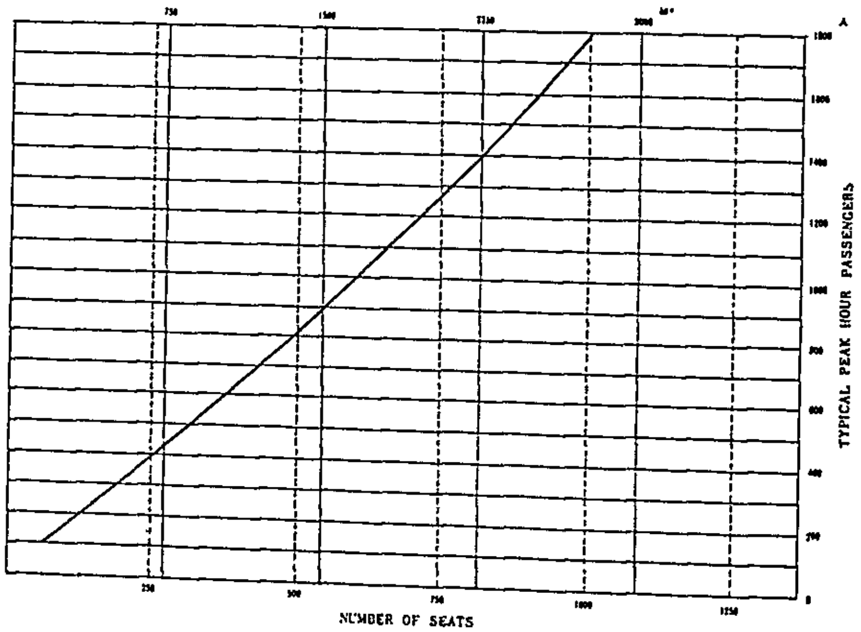
t : Handling capacity per PAX (min)

T : Inspection time (min)

WAITING LOUNGE

FAA "Space Relationships & Area Requirements" Airport Terminal Buildings
Sept. 1960 P.35 Fig.17

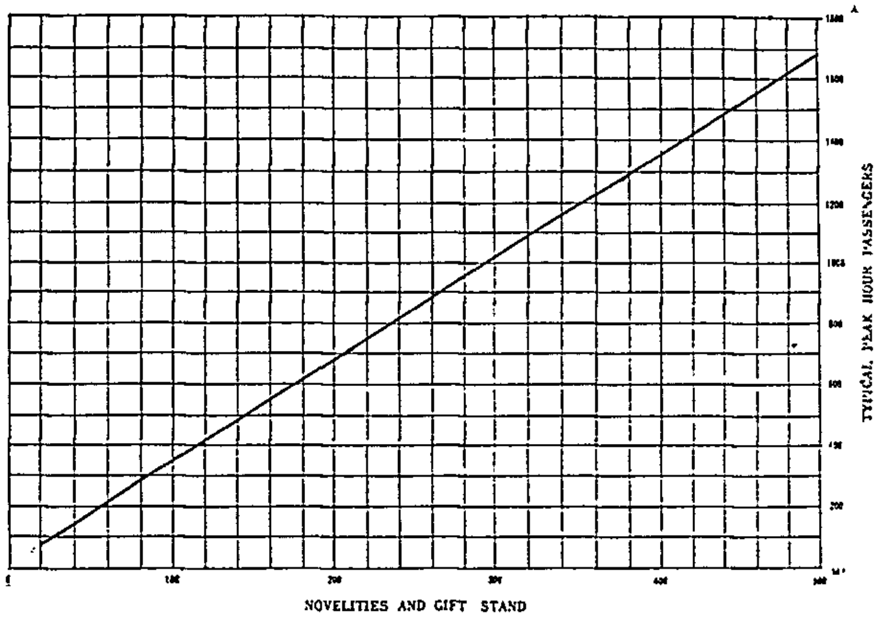
LOUNGE AREA



For Reference Only

CONCESSION AREA

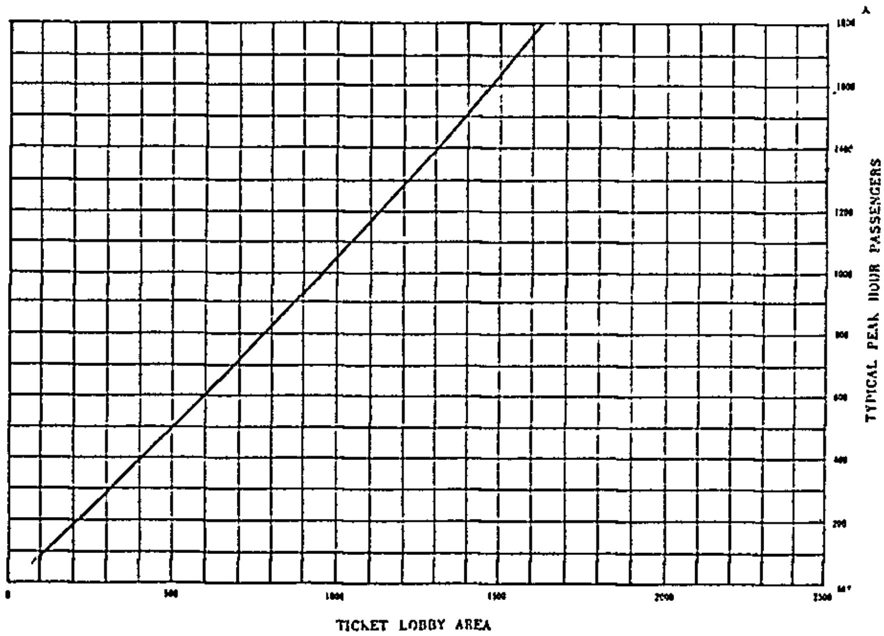
FAA "Space Relationships & Area Requirements" Airport Terminal Buildings
Sept. 1960 P. 41 Fig. 19



APPENDIX 5.5.3

CHECK-IN LOBBY

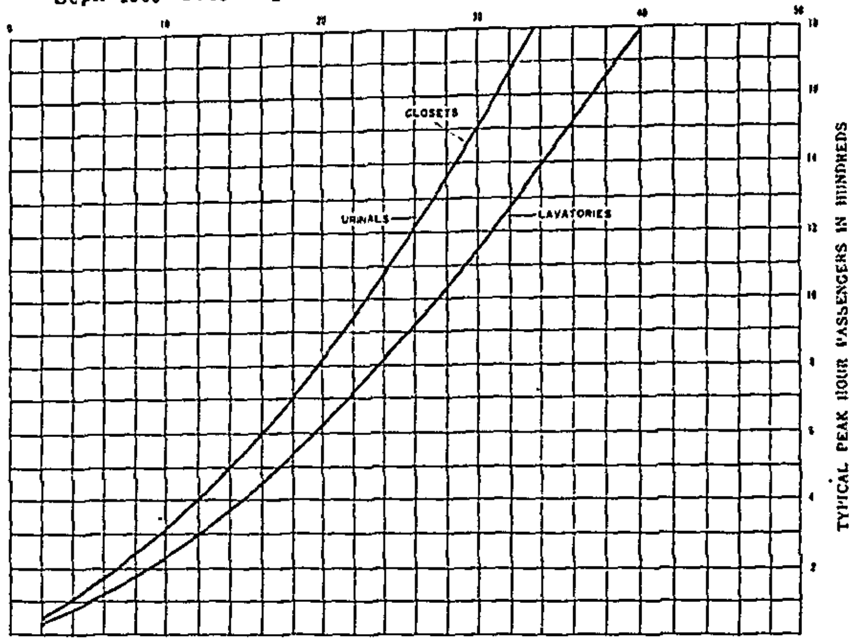
FAA "Space Relation ships & Area Requirements" Airport Terminal Buildings
Sept. 1960 P. 21 Fig. 10



For Reference Only

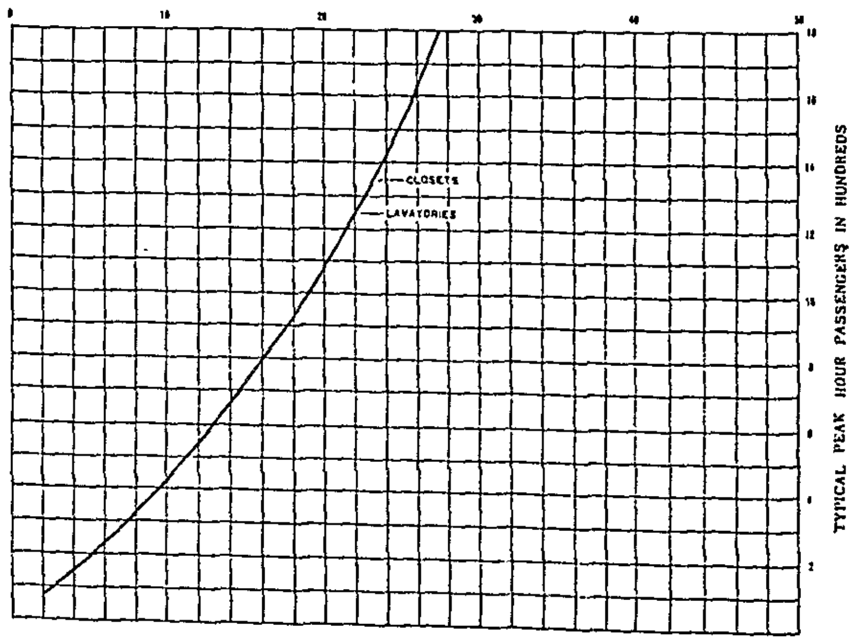
No. OF CLOSETS AND LAVATORIES FOR MEN

FAA "Space Relationships & Area Requirements" Airport Terminal Buildings
Sept. 1960 P.43 Fig.20



No. OF CLOSETS AND LAVATORIES FOR WOMEN

P.44 Fig.21



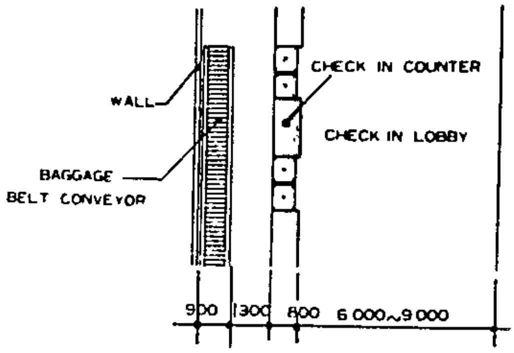
GATE LOUNGE AREA
TYPE OF AIRCRAFT SERVED (LOAD FACTOR 40 TO 80 %)

AIRCRAFT TYPE MODEL	SEAT CAPACITY RANGE	TOTAL AREA (M^2) RANGE
CV-580; DC-9 -10; BAX-111; YS-11-B; M-404; F-227B	40 TO 80 AV 60	35 TO 65
B-737; B-727 -100; DC-9 30; CV-880	90 TO 110 AV 100	60 TO 100
DC-8 -50; DC-8 -62; B-727 -200; B-727 -300; B-707 (ALL); B-720	120 TO 160 AV 140	80 TO 140
DC-8 61	170 TO 210 AV 190	110 TO 190
DC-10; L-1011	220 TO 210 AV 250	140 TO 240
B-747	300 TO 420 AV 360	210 TO 360

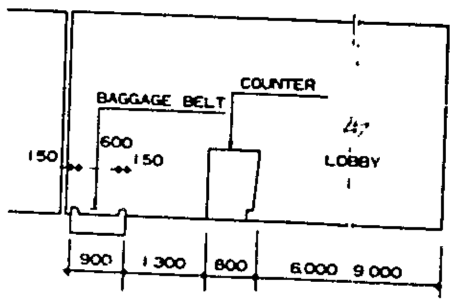
For Reference Only

LINEAR CHECK-IN COUNTER

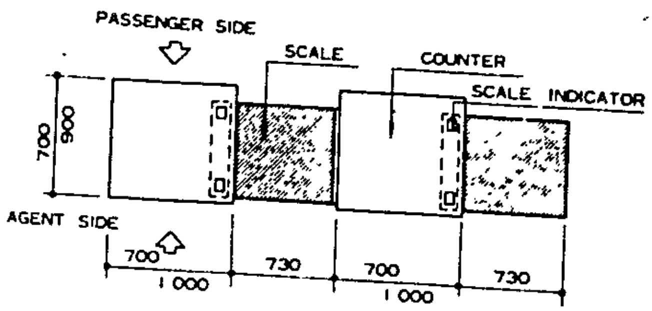
CHECK-IN COUNTER



PLAN SCALE · 1 200



SECTION SCALE : 1/100



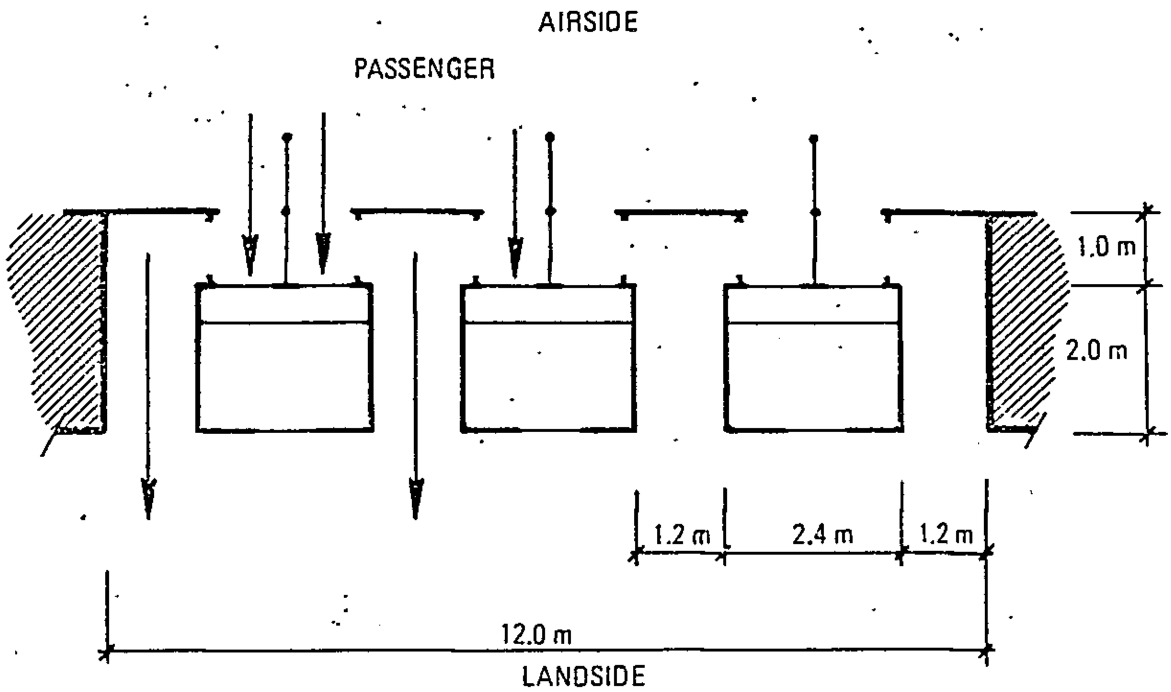
PLAN SCALE : 1 50

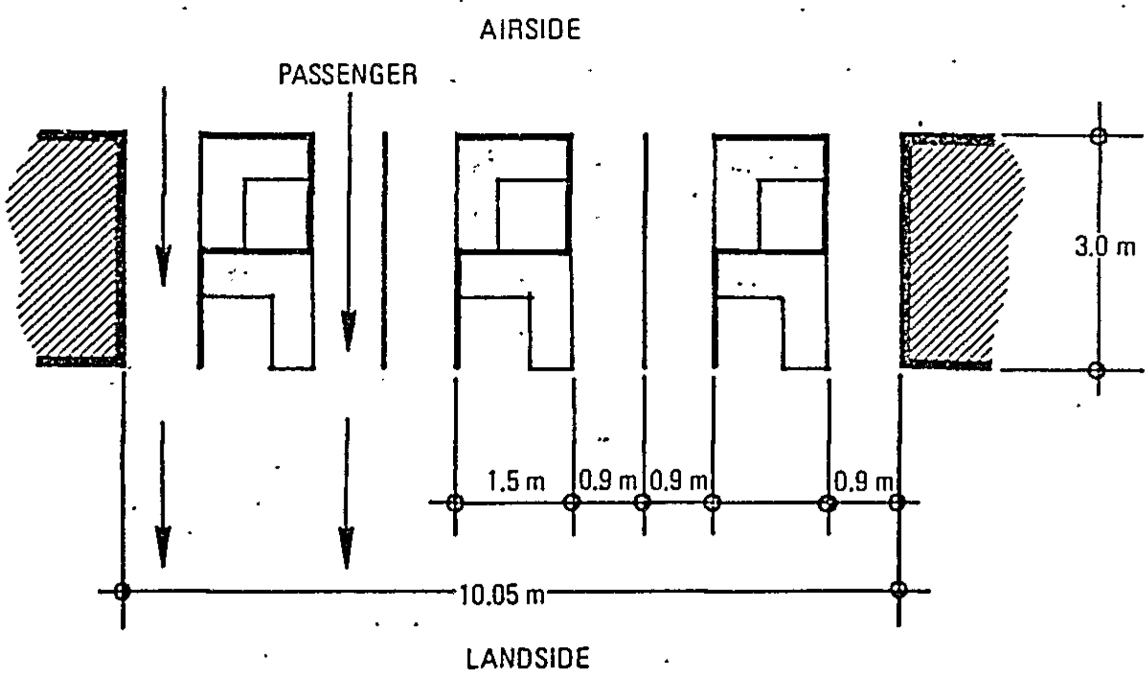
For Reference Only

EXAMPLES OF TYPICAL OUTBOUND/INBOUND IMMIGRATION DESK LAYOUTS

IATA: Airport Terminals Reference Manual
6th. Edition ATRM 3.3.7

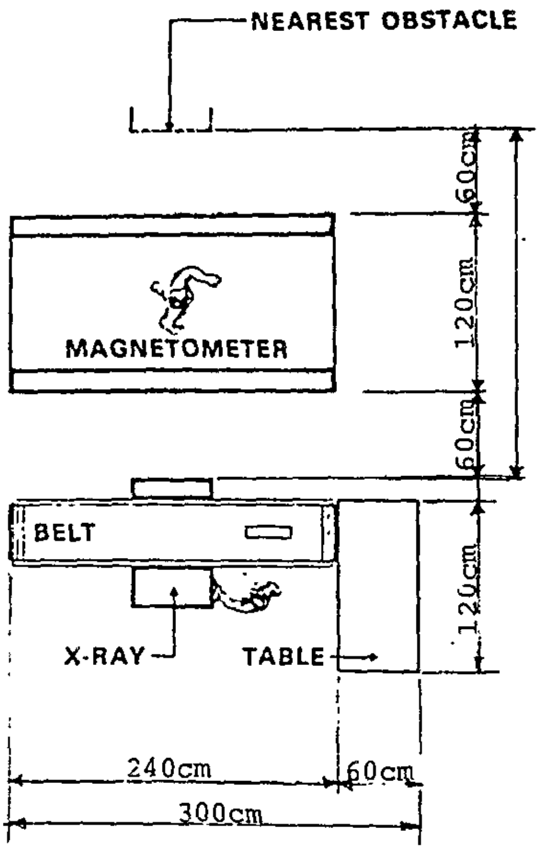
PLAN VIEW





For Reference Only

SECURITY LAYOUT

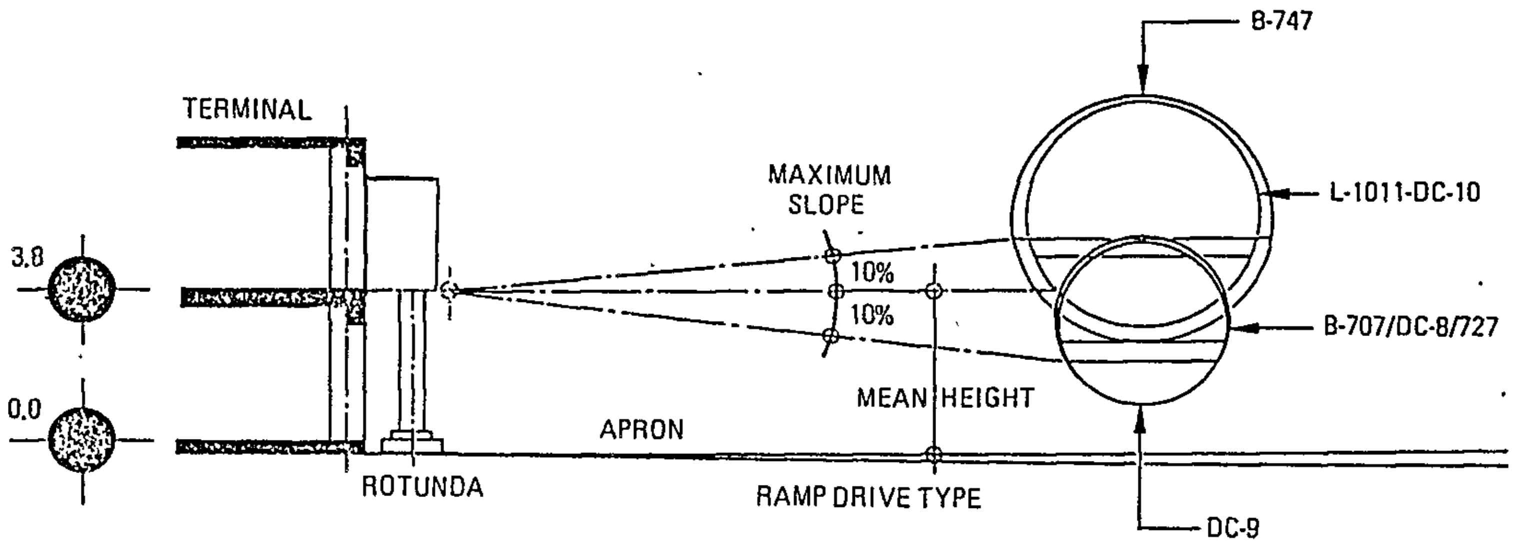


X-RAY SEARCH

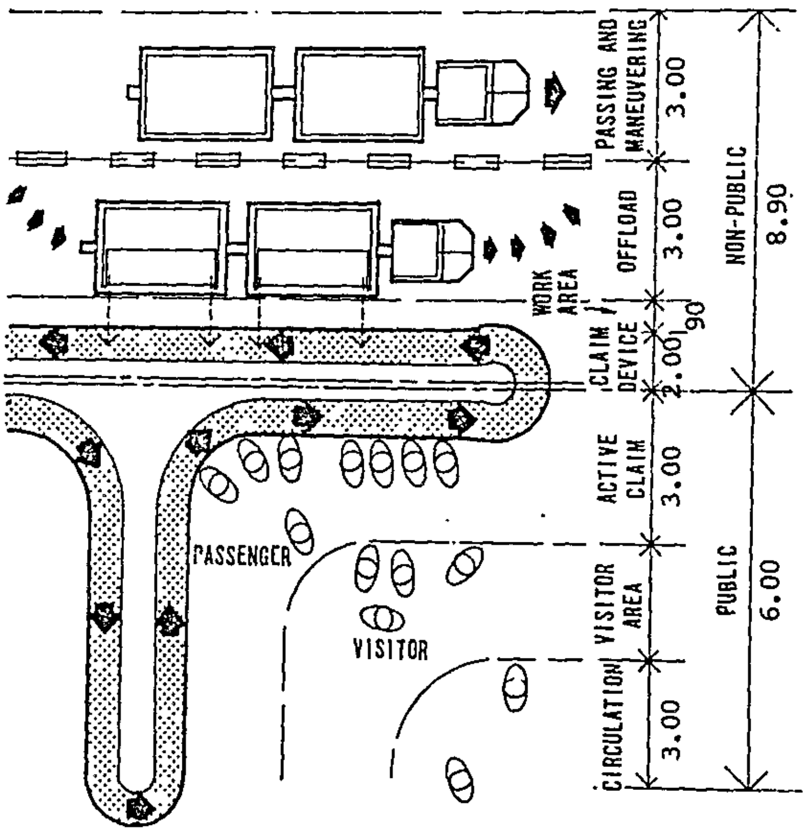
For Reference Only

EXAMPLE OF RELATIONSHIP OF AIRCRAFT HEIGHTS TO BUILDING LEVEL

IATA: Airport Terminals Reference Manual 6th. Edition ATRM 3.4.3



For Reference Only



Inbound Baggage, Circulating Type UNIT = cm

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Calculation for Length of Conveyor

1. Conveyor for Departure
   Length of conveyor will be determined by adding the total length of check-in counters charged with the conveyor and of make-up area and the distance between the check-in counter and the make-up area.

2. Conveyor for Arrival
   General speaking, as a guide line, the standard for the length of conveyor is mentioned below.

Type of Aircraft	The effective baggage claim length
B-747 & wide bodied aircraft	40 - 45m
DC-9-80	20 - 30m

3. Required length of conveyor will basically be determined by type of aircraft based on the following assumptions:

   - The first passenger arrives at the baggage claim area within 10 minutes after he gets off the airplane.
   - It is assumed that all baggages will be handled within the following specific period from the time when the first passenger arrives at the baggage claim.

     20 minutes for domestic flights
     30 minutes for international flights

Formula:

$$Pn = \frac{N2}{N1} \times \frac{(N2 - 1)}{(N1 - 1)} \times Pax \times (1 - \text{Overlook rate})$$

Where:

Pn: No. of Baggages that can be picked up in one cycle of conveyor

N1: Total No. of Baggages

N2: No. of Bags that can be carried by the conveyor in one cycle of conveyor

Pax: No. of Pax. that can stand abutting the conveyor

4. The followings are the assumptions:

Total length of conveyor	:	55m
Effective baggage claim length of conveyor	:	40m
Velocity	:	24m/min.= 0.4m/sec.
One cycle 55m/0.4	:	137 sec. = 2 min.17sec.
Baggage interval	:	0.41m
Pax. interval	:	0.50m
No. of Bags per Pax.	:	2
Overlook rate	:	5%

5. Calculation for Length of Conveyor for B-747(INT'L & DOM)

N1 : 425 x 0.6 x 0.5 x 2 = 256

N2 : 40m / 0.41m = 98

Pax: 40m / 0.50m = 80

	No. of Bags	Time
$P1 = \frac{98}{256} \times \frac{97}{255} \times 80 \times 0.95 =$	6	2 min.17 sec.
$P2 = \frac{98}{250} \times \frac{97}{249} \times 80 \times 0.95 =$	12	
$P3 = \frac{98}{238} \times \frac{97}{237} \times 80 \times 0.95 =$	13	
$P4 = \frac{98}{225} \times \frac{97}{224} \times 80 \times 0.95 =$	14	
$P5 = \frac{98}{211} \times \frac{97}{210} \times 80 \times 0.95 =$	16	11 min.25 sec.
$P6 = \frac{98}{195} \times \frac{97}{194} \times 80 \times 0.95 =$	19	
$P7 = \frac{98}{176} \quad \frac{97}{175} \times 80 \times 0.95 =$	23	
$P8 = \frac{98}{153} \times \frac{97}{152} \times 80 \times 0.95 =$	31	
$P9 = \frac{98}{122} \times \frac{97}{121} \times 80 \times 0.95 =$	49	
$P10 = \frac{98}{73} \times \frac{97}{72} \times 80 \times 0.95 =$	76	22 min.50 sec.
Total Bags	259	

For INT'l Flights: 22 min. 50 sec. (less than 30 min. therefore, OK)

For DOM Flights: 22 min. 50 sec. (a little more than 20 min., therefore, almost OK)

6. Calculation for Length of Conveyor for A-300 (DOM)

N1 : 302 x 0.6 x 0.5 x 2 = 181

N2 : 40m / 0.41m = 98

Pax.: 40m / 0.50m = 80

	No. of Bags	Time
$P1 = \frac{98}{181} \times \frac{97}{180} \times 80 \times 0.95 =$	22	2 min. 17 sec.
$P2 = \frac{98}{159} \times \frac{97}{158} \times 80 \times 0.95 =$	29	
$P3 = \frac{98}{130} \times \frac{97}{129} \times 80 \times 0.95 =$	43	
$P4 = \frac{87}{87} \times \frac{86}{86} \times 80 \times 0.95 =$	76	
$P5 = \frac{11}{11} \times \frac{10}{10} \times 80 \times 1 =$	11	11 min. 25 sec.

For DOM Line: 11 min. 25 sec. (less than 30 min., therefore, OK)

DOM Pax Terminal BLDG.

Facility requirement

1. Check-in Counter

$$L = \frac{P \cdot t_2}{t - t_1} \cdot \ell = \frac{420 \times 3}{60 - 10} \times 1.75 = 44 \text{ m}$$

Where:

L	:	Length of check-in counter (m)
P	:	Peak hour Pax 765 x 0.55 = 420 (PAX/H)
t	:	Check-in time (min)
t_1	:	Resting time for check-in counter (min)
t_2	:	Handling capacity per PAX (min)
ℓ	:	One unit length 1.75

2. Departure Lobby

$$S = \frac{X_1 + X_2}{60} \cdot t \cdot a = \frac{420 + 42}{60} \times 30 \times 2.5 = 577 \text{ m}^2$$

SEE APPENDIX 5.5.1 of Page 33

Calculation for the length of curb

General speaking, length of curb in Japan has a range between 100m-200m per 1,000 peak hour passengers.
Hence, one peak hour passenger is needed to have 0.1-0.2 m long as a unit. The length of curb at BIA is calculated based on the unit, as follows;

year	Peak hour Pax.		Unit length of curb
1990	1,390	x	0.1-0.2 m/pax =140-280 m
2010	3,425	x	0.1-0.2 m/pax =340-680 m

BIA is planned to have length of curb, 330 and 580 m by the year 1990 and 2010 respectively. In conclution, BIA has is small traffic volumes at BIA as compared with airport in Japan.