Air Transportation Office
Department of Transportation and Communications
Republic of The Philippines

BASIC DESIGN STUDY REPORT ON REHABILITATION OF CIVIL AVIATION TRAINING CENTER IN THE REPUBLIC OF THE PHILIPPINES

March 1997

JAPAN INTERNATIONAL COOPERATION AGENCY
JAPAN AIRPORT CONSULTANTS, INC.

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Preface

In response to a request from the Government of the Philippines, the Government of Japan decided to conduct a basic design study on Rehabilitation of Civil Aviation Training Center and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team from December 8 to December 19, 1996.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the teams.

March 1997

Kimio Fujita
President
Japan International Cooperation Agency

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Rehabilitation of Civil Aviation Training Center in the Philippines.

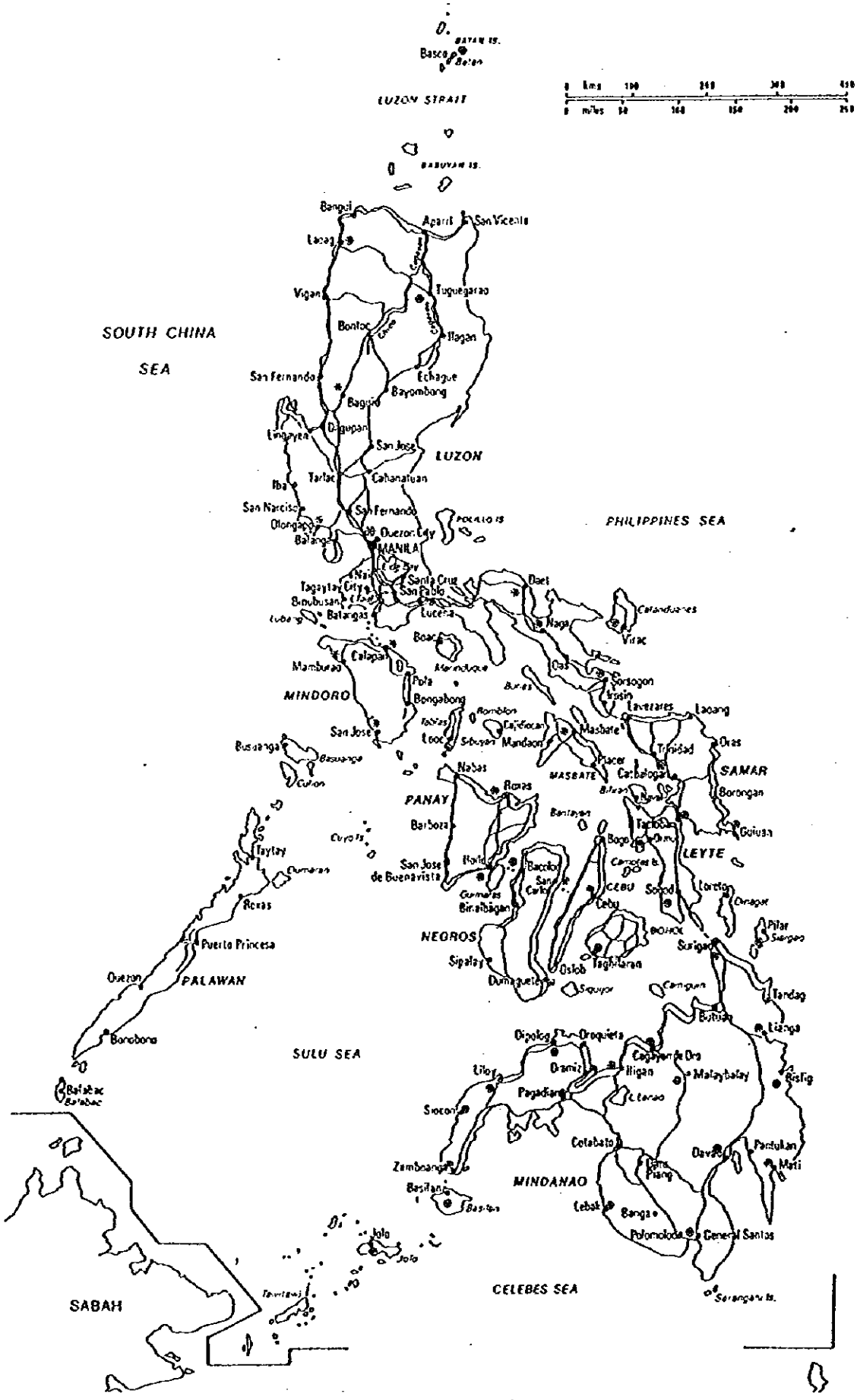
This study was conducted by Japan Airport Consultants, Inc., under a contract to JICA during the period from November 18, 1996 to March 31, 1997. In conducting the study , we have examined the feasibility and rationale of the project with due consideration to the present situation of the Philippines and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

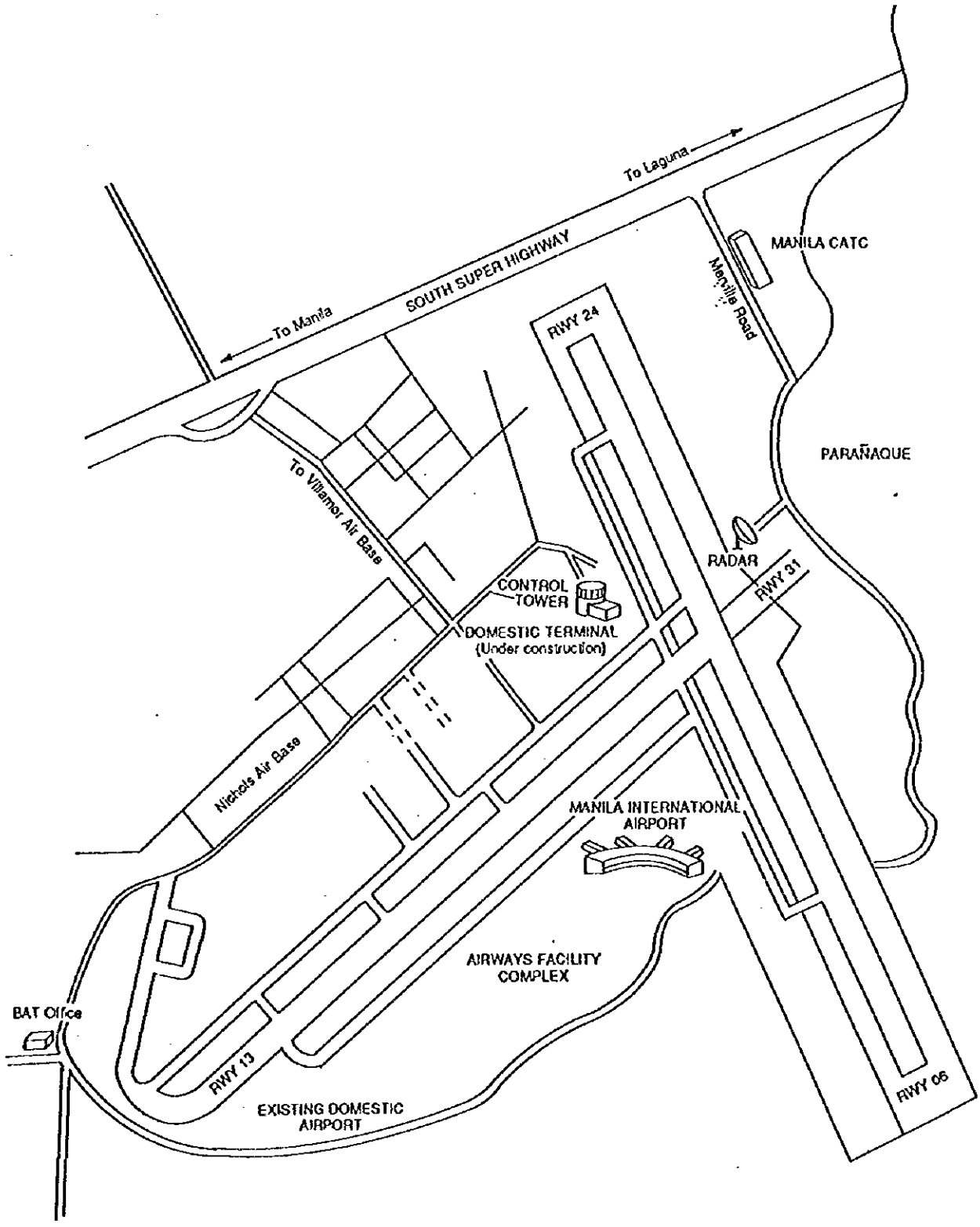
高野邦弘

Kunihiro Takano
Project Manager
Basic design study team on
Rehabilitation of Civil Aviation Training Center
Japan Airport Consultants, Inc.



Location Map

CATC Location Map



Abbreviations

ICAO	International Civil Aviation Organization
UNDP	United Nation Development Program
DOTC	Department of Transportation and Communications
ATO	Air Transportation Office
CATC	Civil Aviation Training Center
ATS	Air Traffic Service
ANS	Air Navigation Service
SSR	Secondary Surveillance Radar
NDB	Non-Directional Beacon
VOR	VHF Omni-Range
D-VOR	Doppler VOR
DME	Distance Measuring Equipment
ILS	Instrument Landing System
FANS	Future Air Navigation System
ATC	Air Traffic Controller
ACOM	Airways Communicator
ANSS	Air Navigation System Specialist

1 Background of the Project

1-1 Needs of Training the ATO Technical Personnel

1-1-1 Air Transportation in the Philippines

Air transportation in the Philippines is a vital means of traveling within the country because of the archipelagic characteristics of the country. Even during the economic difficulties in the middle of the 1980s, air transportation activities have never been seriously affected. In the 1990s, as shown in **Table 1-1**, the total number of air passengers has grown significantly. Noteably in 1994, a steep increase was observed. The announcement of the "Philippine 2000" policy by the present administration and various supportive policies encouraged foreign investers to establish their own business or joint ventures in the Philippines. The upward trend in air transportation will continue through the 21st century.

The "Philippine 2000" policy has also encouraged the establishment of a number of airline businesses in the Philippines, since the government has officially announced deregulation policy in air transportation. Grand Air, the new airline operating A300s and B737s, offers major domestic routes and regional international services. Air Philippines, using DC-9s covers the major cities of the Philippines. Cebu Pacific Airways offers comfortable domestic air travel by B737s.

In the air transportation sector, DOTC has launched the revision of the civil aviation master plan (CAMP). The first CAMP was prepared in 1982 under the assistance of UNDP and ICAO. Review and enhancement of CAMP is almost completed under the technical assistance of Asian Development Bank.

Air transportation in the Philippines will continuously grow beyond the year 2000.

Table 1-1 Number of Air Passenger in the Past 5 Years

No.	Area	Airports	Class	1990	1991	1992	1993	1994
1	1	Mactan	I	1,740,809	2,046,663	1,104,124	1,495,122	1,833,973
2	1	Dumaguete	T	111,383	82,421	91,165	125,165	106,367
3	1	Tagbilaran	S	41,066	55,599	61,775	52,961	73,771
4	1	Siquijor	F	-	-	-	-	-
5	1	Ubay	F	23	28	46	25	38
6	2	Laoag	A	11,649	17,143	26,764	32,535	72,903
7	2	Tuguegarao	S	76,392	41,012	42,079	50,103	48,289
8	2	Cauayan	S	58,557	18,453	27,392	23,072	17,499
9	2	Basco	S	12,950	15,166	15,834	18,705	16,520
10	2	San Fernando	S	4,551	8,787	9,824	3,003	4,361
11	2	Vigan	S	608	903	832	744	308
12	2	Bagabag	S	6,351	2,077	4,282	2,112	3,291
13	2	Itbayot	F	-	-	-	-	-
14	2	Lingayen	F	525	-	1,253	1,835	1,276
15	2	Rosales	F	333	2,796	555	362	123
16	2	Palanan	F	1,906	3,213	3,246	2,446	8,322
17	3	Manila	I	7,242,000	7,247,800	8,196,800	8,895,000	9,685,220
18	3	Puerto Princesa	A	119,058	113,717	113,490	126,105	132,780
19	3	Baguio	T	42,447	21,050	13,570	34,480	29,533
20	3	Calapan	S	768	1,040	1,580	1,385	2,407
21	3	Lubang	S	9,577	5,541	5,579	6,361	3,601
22	3	Romblon	S	10,295	12,147	12,803	10,237	11,026
23	3	Marinduque	S	29,970	25,513	29,066	36,456	39,268
24	3	San Jose	T	65,461	53,916	48,453	44,494	30,664
25	3	Cuyo	F	2,629	1,845	1,777	1,720	2,027
26	3	Wasig	F	-	39	20	-	6
27	3	Planidel	S	12,101	14,566	21,945	21,139	19,148
28	3	Mamburao	S	20,495	14,519	10,566	7,821	6,630
29	3	Iba	F	551	337	212	217	238
30	3	Jomalig	F	20	72	150	86	265
31	3	Alabat	F	-	5	4	14	-
32	3	Lucena	F	146	158	178	205	81
33	3	Busuanga	F					
34	3	Baler	F	13	-	-	16	-
35	4	Legaspi	T	117,454	145,491	144,260	138,461	145,267
36	4	Daet	S	7,809	7,301	3,520	2,716	7,513
37	4	Naga	S	50,463	45,437	47,334	51,742	51,638
38	4	Virac	S	45,840	52,765	48,392	46,055	48,545
39	4	Sorsogon	S	2	-	-	-	-
40	4	Bulan	F	-	12	-	-	-
41	4	Masbate	S	7,809	7,301	3,520	2,716	7,513

Table 1-1 Number of Air Passenger in the Past 5 Years (cont'd)

No.	Area	Airports	Class	1990	1991	1992	1993	1994
42	5	Iloilo	T	414,936	351,952	382,760	437,185	470,573
43	5	Bacolod	T	334,377	324,987	324,502	384,657	317,202
44	5	Antique	S	399	7,452	329	4	8
45	5	Roxas	T	66,549	54,973	68,960	72,100	76,468
46	5	Kalibo	S	138,685	79,542	220,797	52,176	175,517
47	5	Caticlan	F	29,982	30,362	36,866	4,601	34,239
48	6	**Tacloban**	T	196,821	170,596	144,087	167,867	239,777
49	6	Calbayog	S	21,779	20,932	22,140	17,387	21,182
50	6	Ormoc	S	10,965	4,159	3,433	124	1,851
51	6	Catarman	S	18,784	17,965	19,829	11,503	22,824
52	6	Dolores	F	-	-	-	-	-
53	6	Biliran	F	-	-	-	-	-
54	6	Catbalogan	F	82	57	22	-	-
55	6	Guiuan	F	69	155	139	900	209
56	6	Hilongos	F	201	186	218	254	327
57	6	Maasin	F	-	-	390	119	-
58	7	**Zamboanga**	A	331,128	284,393	334,873	317,798	313,880
59	7	Pagadian	S	61,007	57,521	60,865	28,351	58,111
60	7	Jolo	S	76,095	57,720	51,088	38,227	46,676
61	7	Dipolog	S	70,153	68,943	66,810	78,912	53,926
62	7	Ozamis	S	20,430	17,981	19,533	10,887	25,345
63	7	Sanga-Sanga	S	27,321	9,147	21,766	23,266	24,463
64	7	Cagayan de Sulu	F	358	15	-	-	-
65	7	Ipil	F	8,637	4,001	1,878	1,408	1,633
66	7	Liloy	F	15	58	22	2	8
67	7	Siocon	F	8,947	5,959	2,855	2,904	3,861
68	8	**Davao**	A	464,814	401,584	454,096	481,151	540,829
69	8	Cotabato	T	139,978	101,058	131,018	83,170	151,249
70	8	Mati	S	1,922	1,427	1,030	314	-
71	8	Tandag	S	9,729	6,730	9,926	7,414	10,076
72	8	Bislig	S	4,750	-	-	-	-
73	8	Allah Valley	S	31	-	-	-	114
74	8	General Santos	S	54,486	55,089	70,541	71,296	74,286
75	9	**Cagayan de Oro**	T	214,991	234,751	321,403	340,605	353,800
76	9	Butuan	S	46,951	43,422	42,392	13,875	448,341
77	9	Iligan	S	28,557	24,412	3,589	-	-
78	9	Malabang	S	2,647	-	-	-	85
79	9	Surigao	S	20,287	21,539	22,781	24,505	25,181
80	9	Siargao	F	-	-	-	-	-
81	9	Malaybalay	F	30	-	2,194	-	-
82	9	Camiguin	F	292	832	3,128	557	90
Total				**12,679,196**	**12,524,733**	**12,938,650**	**13,909,135**	**15,902,542**

LEGEND

I : International, AI : Alternate International, T : Trunkline, S : Secondary, F : Feeder

1-1-2 Airports and Air Navigation Facilities in the Philippines

Numerous airports and air navigation facilities in the Philippines have been developed by foreign economic assistance and technical assistance. The number of airports in the Philippines reached nearly 90 in 1996. Major airports, such as Manila International Airport, Mactan International Airport, and Davao International Airport have been developed or are being developed under the economic assistance of foreign countries and international lending institutes.

The major airports and air navigation facilities development projects are listed in the **Table 1-2.**

Significant development of Air Navigation Facilities (ANF) are being carried out under the Nationwide Air Navigation Facilities (ANF) Modernization Project financed by the Overseas Economic Cooperation Fund of Japan (OECF). This Project was started in 1979 and continues to be implemented. Phase III of the project is about to commence in April, 1997.

(1) Equipment installed under Phase I and Phase II are shown in **Table 1-3** and **Table 1-4**, and the locations of projects including Phase III are shown in **Figures 1-1** through **1-3.**

Table 1-2 List of Foreign Assisted Airports and Air Navigation Facilities Development Projects

Name of Project	Duration	Donor	Project Cost
Manila Int'l Airport and Navaids	1946-1952	USA	N. A.
VOR Installation	1958-1959	USA	N. A.
	1961-1964	USA	US$5Million
Manila Comm. Center	1964-1967	USAID	N. A.
ANF Modernization	1968-1972	Netherland	US$6.4Million
		USA	US$5.8 Million
ANF Modernization	1972-1974	Japan	N. A.
ANF Modernization	1972-1976	USA	US$7.2 Million
Manila & Mactan Radar	1973-1976	USA	US$2.4 Million
Airfield Lighting Development	1974-1976	Belgian	US$1.0 Million
MIA Terminal Development	1973-1982	ADB	US$ 30 Million
ANF Improvement	1975-1977	Australia	N. A.
Fire Trucks Procurement	1978-1980	US Loan	US$2.3 Million
CATC Development	1978-1988	UNDP	US$4.0 Million
Nationwide ANF Modernization	1979-1984	OECF	¥5.3 Billion
Mactan Airport Master Planning	1980-1981	USTDP	N. A.
CATC Training	1983-1987	UNDP	US$2.6 Million
Nationwide ANF Modernization-II	1987-1995	OECF	¥7.6 Billion
MIA Master Planning	1987-1988	USAID	N. A.
VOR/DME & ILS Improvement	1988-	USESF	US$3.6 Million
Airfield Lighting Modernization	1988-	Belgian	US$2.5 Million
Mactan Airport Development	1989-1990	OECF	¥ 400 Million
MIA Master Planning	1989-1990	French	N. A.
Civil Aviation Master Planning	1989-1991	UNDP/ICAO	N. A.
Zamboanga Airport Master Planning	1990-1992	Singapore	N. A.
MIA Terminal 2 Development	1990-1992	French	N. A.
Mactan Airport Development	1991-	OECF	¥9.2 Billion
Gen. Santos Airport Development	1991-1995	USAID	US$29 Million
Davao Airport Master Planning	1992-1993	JICA	N. A.
Civil Aviation Development	1993-	Sweden	N. A.
Procurement of Fire Trucks	1994-1996	French	FF21 Million
MIA Terminal 2 Development	1994-	OECF	¥19 Billion
Davao Airport Development	1995-	ADB/EIA	US$105 Mil.
Second Airports Development	1996-	ADB	US$0.6 Million.
Local Major Airports Development	1996-	JICA	N. A.

Table 1-3 Equipment Installed Under the ANF Modernization Project - Phase I

SITE	FACILITY	RADAR SYSTEM		AUTOMATED ATC SYSTEM			NAVAIDS SYSTEM					
		ARSR	SSR	TRDPS	FDPS	ERDPS	100W DVOR	200W CVOR	1KW DME	50W NDB	100W NDB	NDB MONITOR RECEIVER
BAGUIO	CONTROL TOWER											
BALESIN	CVOR							1				
BANCO	FSS											
	NDB									1		1
BUTUAN	DVOR						1					
CAUAYAN	NDB										1	1
	VHF DDF											
COTABATO	SALS / REIL											
	POWER STATION											
DAVAO	CONTROL TOWER											
ILOILO	CONTROL TOWER											
	SALS / REIL											
JOLO	NDB									1		1
KALIBO	NDB										1	1
LAHUG	CONTROL TOWER											
LAOAG	CONTROL TOWER											
LEGASPI	DME								1			
MACTAN	UHF LINK											
MANILA AFC	ACC				1	1						
MIA	SSR		1									
	TRACON			1								
PAGADIAN	FSS											
PUERTO PRINCESA	CONTROL TOWER											
TACLOBAN	CONTROL TOWER											
	SALS / REIL											
TAGAYTAY	ARSR / SSR	1	1									
	RCAG											
	TOTAL	1	2	1	1	1	1	1	1	2	2	4

SITE	FACILITY	COMMUNICATION SYSTEM											
		250W VHF AM TRANSMITTER	50W VHF AM TRANSMITTER	VHF AM RECEIVER	EW VHF AM TRANSCEIVER (ACH)	100W UHF AM TRANSMITTER	UHF AM RECEIVER	150W HF SSB TRANSCEIVER	400W HF SSB TRANSCEIVER	VHF DOPPLER DIRECTION FINDER	ATIS	LIGHT GUN	BINOCULAR
BAGUIO	CONTROL TOWER		2	2	3			2				1	1
BALESIN	CVOR							2					
BANCO	FSS		2	2					2				
	NDB												
BUTUAN	DVOR												
CAUAYAN	NDB												
	VHF DDF									1			
COTABATO	SALS / REIL												
	POWER STATION												
DAVAO	CONTROL TOWER		2								1		
ILOILO	CONTROL TOWER												
	SALS / REIL												
JOLO	NDB												
KALIBO	NDB												
LAHUG	CONTROL TOWER		2	2	3							1	1
LAOAG	CONTROL TOWER		4	4	3	2	2					1	1
LEGASPI	DME												
MACTAN	UHF LINK												
MANILA AFC	ACC												
MIA	SSR												
	TRACON												
PAGADIAN	FSS		2	2				2					
PUERTO PRINCESA	CONTROL TOWER		4	4	3	2	2					1	1
TACLOBAN	CONTROL TOWER		4	4	3	2	2					1	1
	SALS / REIL												
TAGAYTAY	ARSR / SSR												
	RCAG	4	2	6									
	TOTAL	4	24	26	16	6	6	6	2	1	1	5	5

SITE	FACILITY	CONSOLE					TAPE RECORDER AND REPRODUCER			LINK	
		VFR CONSOLE	TRACON CONSOLE	SATELLITE FSS CONSOLE	COMMUNICATION CONSOLE	ACC CONSOLE	6CH TAPE RECORDER	10CH TAPE RECORDER	REPRODUCER	2CH UHF LINK	RADAR MICROWAVE LINK
BAGUIO	CONTROL TOWER	1					1		1		
BALESIN	CVOR										
BANCO	FSS				1						
	NDB										
BUTUAN	DVOR										
CAUAYAN	NDB										
	VHF DDF										
COTABATO	SALS / REIL										
	POWER STATION										
DAVAO	CONTROL TOWER							1	1		
ILOILO	CONTROL TOWER						1		1		
	SALS / REIL										
JOLO	NDB										
KALIBO	NDB										
LAHUG	CONTROL TOWER	1					1		1	1	
LAOAG	CONTROL TOWER	1					1		1		
LEGASPI	DME						1		1		
MACTAN	UHF LINK									1	
MANILA AFC	ACC					1					1
MIA	SSR										
	TRACON		1								
PAGADIAN	FSS			1							
PUERTO PRINCESA	CONTROL TOWER	1					1		1		
TACLOBAN	CONTROL TOWER	1					1		1		
	SALS / REIL										
TAGAYTAY	ARSR / SSR										1
	RCAG										
	TOTAL	5	1	1	1	1	7	1	8	2	2

SITE	FACILITY	WEATHER INSTRUMENTS					AFL			ENGINE GENERATOR					UPS		AVR		TRANSFORMER				
		ANEMOMETER SENSOR	ANEMOMETER INDICATOR	BAROMETER	TEMPERATURE SENSOR	TEMPERATURE INDICATOR	SALS REIL	REMOTE CONTROL PANEL	LOCAL CONTROL PANEL	175KVA E/G	125KVA E/G	80KVA E/G	30KVA E/G	15KVA E/G	20KVA UPS	10KVA UPS	30KVA AVR	15KVA AVR	200KVA	100KVA	75KVA	20KVA	15KVA
BAGUIO	CONTROL TOWER	1	1	1	1	1																	
BALESIN	CVOR												3										
BANCO	FSS																						
	NDB													3									
BUTUAN	DVOR													1									2
CAUAYAN	NDB																						
	VHF DDF																						
COTABATO	SALS / REIL						1	1															
	POWER STATION										1									1			
DAVAO	CONTROL TOWER																						
ILOILO	CONTROL TOWER																						
	SALS / REIL						1	1	1														
JOLO	NDB													3									
KALIBO	NDB													1									
LAHUG	CONTROL TOWER	1	1	1	1	1																	
LAOAG	CONTROL TOWER	1	1	1	1	1																	
LEGASPI	DME																						
MACTAN	UHF LINK																						
MANILA AFC	ACC											1			1	1	1			1			
MIA	SSR																						
	TRACON															1		1					
PAGADIAN	FSS	1	1	1	1	1								2									
PUERTO PRINCESA	CONTROL TOWER	1	1	1	1	1																	
TACLOBAN	CONTROL TOWER	1	1	1	1	1																	
	SALS / REIL						1	1													1		
TAGAYTAY	ARSR / SSR									2							1		3			2	
	RCAG																						
	TOTAL	6	6	6	6	6	3	3	1	2	1	1	3	10	1	2	2	1	3	2	1	2	2

NOTE : 1. Number Represent Quantity of Item
2. Single Composite Equipment
3. Dual composite Equipment

Table 1-4 Equipment Installed Under the ANF Modernization Project - Phase II

RADAR SYS. / AUT. ATC SYS. / NAVAIDS SYSTEM

SITE	FACILITY	ASR	SSR	TROPS	ILS LOCALIZER	ILS GLIDE PATH	300W DVOR	100W DVOR	1KW DME	100W DME	100W NDB	NDB MONITOR RECEIVER	NAVAID MONITOR
BUTUAN	FSS												
	VOR/DME								1				
DAVAO	CONTROL TOWER												
	FSS												
	VOR/DME							1	1				
DIPOLOG	FSS												
DUMAGUETE	FSS												
FT. BONIFACIO	FSS												
	AMS												
JOLO	FSS											1	
LAOAG	FSS												
	RCAG												
MACTAN	TRACON	1	1	1									
	CONTROL TOWER												
	VOR/DME						1		1				
	ILS				1	1				1			
	MAIN POWER SUPPLY												
	NDB										1		
MACTAN AFC	RCAG												
	FSS												
MT. MAJIC	AMS												
	RCAG												
	FSS												
MAMBURAO	FSS												
MIA	TRACON												1
	CONTROL TOWER												
	MAIN POWER SUPPLY												
	AFL REMOTE CONTROL												
MANILA AFC	AMS												
	RCAG												
	FSS												
ROXAS	FSS												
TAGAYTAY	AMS												
	RCAG												
	FSS												
VIRAC	NDB										1		
ZAMBOANGA	CONTROL TOWER												
	FSS												
	DME								1				
ATO WAREHOUSE	RESERVE EQUIPMENT								1				
	TOTAL	1	1	1	1	1	1	1	7	1	2	1	1

COMMUNICATION SYSTEM

SITE	FACILITY	250W VHF AM TRANSMITTER	50W VHF AM TRANSMITTER	VHF AM RECEIVER	10W VHF AM TRANSCEIVER (3CH)	5W VHF AM TRANSCEIVER (3CH)	1W VHF AM TRANSCEIVER (BASE TYPE)	1W VHF AM TRANSCEIVER (PORTABLE TYPE)	400W HF ISB TRANSMITTER	HF ISB RECEIVER	5KW HF SSB TRANSMITTER	100W HF SSB TRANSMITTER	HF SSB RECEIVER	100W HF SSB TRANSCEIVER	TELEX MASSAGE SWITCHING EQUIPMENT	TELEX WITH VDU, KEYBOARD AND PRINTER	TELEX WITH KEY BOARD	TELEX PRINTER	VFT	ATIS	MONITOR RECEIVER	COMMUNICATION MONITOR AND CONTROL EQUIPMENT	LIGHT GUN	BINOCULAR	SIREN	PRINTER FOR CHARACTER GENERATOR	INCREASE IN RCL CHANNEL
BUTUAN	FSS				2	1								2									1	1	1		
	VOR/DME																										
DAVAO	CONTROL TOWER		4	4		3	1	6															1	1	1		
	FSS				2							2	3	1		2			1		1						
	VOR/DME																										
DIPOLOG	FSS				2	1								2										1	1		
DUMAGUETE	FSS				2	1								2							1		1	1	1		
FT. BONIFACIO	FSS											2															
	AMS										4																
JOLO	FSS				2	1	1	2						2										1	1		
LAOAG	FSS				2							2	3	1		2			1		1						
	RCAG	2		2																							
MACTAN	TRACON		6	6		2												1									
	CONTROL TOWER		6	6		4	1	6										1		1			1	1			
	VOR/DME																										
	ILS																										
	MAIN POWER SUPPLY																										
	NDB																										
MACTAN AFC	RCAG	4		4														1									
	FSS				2				1			2		2	1	4			3		1						
MT. MAJIC	AMS		2	2																							
	RCAG	2	6	8																							
	FSS									2			3														
MAMBURAO	FSS				2	1								2										1	1		
MIA	TRACON		8	8		2															4					1	
	CONTROL TOWER		10	10		3	2	6												1			1	1			
	MAIN POWER SUPPLY																										
	AFL REMOTE CONTROL																										
MANILA AFC	AMS												3			2											
	RCAG																										1
	FSS				2									2		1			2		1						
ROXAS	FSS				2	1								2							2		1	1	1		
TAGAYTAY	AMS		2	2									22														
	RCAG	4	4	6																	1	1					1
	FSS									2			3														
VIRAC	NDB																										
ZAMBOANGA	CONTROL TOWER		2	2																							
	FSS				2				1	2		2	3	1		2			1		1						
	DME																										
ATO WAREHOUSE	RESERVE EQUIPMENT					24							6	24		8	2	2	17		24						
	TOTAL	12	50	60	22	44	5	20	2	6	4	10	46	43	1	24	2	5	20	2	38	1	6	9	7	1	2

CONSOLE / TAPE RECORDER AND REPRODUCER / LINK / WEATHER INSTRUMENTS / AFL

SITE	FACILITY	VFR CONSOLE	TRACON CONSOLE	SATELLITE FSS CONSOLE	BACKBONE FSS CONSOLE	CENTER FSS CONSOLE	ACC CONSOLE	AMS CONSOLE	2CH TAPE RECORDER	100CH TAPE RECORDER	20CH TAPE RECORDER	REPRODUCER	1CH VHF LINK	6CH VHF LINK	12CH VHF LINK	24CH VHF LINK	ANEMOMETER SENSOR	ANEMOMETER INDICATOR	BAROMETER	TEMPERATURE SENSOR	TEMPERATURE INDICATOR	PAPI	REMOTE CONTROL DESK	SECONDARY CONTROL DESK	RELAY PANEL
BUTUAN	FSS			1					1								1	1	1	1	1				
	VOR/DME																								
DAVAO	CONTROL TOWER														2		1	1	2	1	1				
	FSS				1				1																
	VOR/DME																								
DIPOLOG	FSS			1													1	1	1	1	1				
DUMAGUETE	FSS			1					1								1	1	1	1	1				
FT. BONIFACIO	FSS																								
	AMS																								
JOLO	FSS			1													1	1	1	1	1				
LAOAG	FSS				1				1																
	RCAG																								
MACTAN	TRACON		1															2							
	CONTROL TOWER	1									1	1					2	2	1	1	2				
	VOR/DME																								
	ILS																								
	MAIN POWER SUPPLY																								
	NDB																								
MACTAN AFC	RCAG						1				1					1									
	FSS					1										1									
MT. MAJIC	AMS																								
	RCAG															1									
	FSS																								
MAMBURAO	FSS			1													1	1	1	1	1				
MIA	TRACON										1	1	10			1		2							
	CONTROL TOWER	1									1	1				1	3	2	1	1	2				
	MAIN POWER SUPPLY																								
	AFL REMOTE CONTROL																						1	1	1
MANILA AFC	AMS							1																	
	RCAG										2	1				1									
	FSS					1																			
ROXAS	FSS			1					1								1	1	1	1	1				
TAGAYTAY	AMS																								
	RCAG															1									
	FSS																								
VIRAC	NDB																								
ZAMBOANGA	CONTROL TOWER														2										
	FSS				1					1				2											
	DME																								
ATO WAREHOUSE	RESERVE EQUIPMENT												3				10	10				1			
	TOTAL	2	1	6	3	2	1	1	5	1	6	4	13	2	4	8	22	25	10	9	11	1	1	1	1

NOTE : 1. Number Represent Quantity of Item 3. Dual composite Equipment
2. Single Composite Equipment 4. Equipment for Relocation

Table 1-4 Equipment Installed Under the ANF Modernization Project - Phase II (cont'd)

SYSTEM/EQUIPMENT / SITE	FACILITY	ENGINE GENERATOR								UPS				M/G		AUTOMATIC VOLTAGE REGULATOR								TRANSFORMER												SWITCHGEAR AND PANEL								BATTERY BACK-UP												ACU	
	EQUIPMENT	300KVA E/G	125KVA E/G	80KVA E/G	60KVA E/G	30KVA E/G	20KVA E/G	15KVA E/G	12.5KVA E/G AUTOMATIC START AND CHANGE-OVER SET	60KVA UPS	30KVA UPS	5KVA UPS	2KVA UPS	5KVA M/G	40KVA M/G	50KVA AVR	30KVA AVR	20KVA AVR	10KVA AVR	5KVA AVR	5KVA AVR	1KVA AVR	50KVA	50KVA	50KVA	25KVA	15KVA	20KVA	20KVA	20KVA	15KVA	15KVA	10KVA	5KVA	MONITOR PANEL	13.8KV SWITCHGEAR	4.16KV SWITCHGEAR	13.8KV TRANSFORMER PANEL	4.16KV TRANSFORMER PANEL	13.8KV CAPACITOR PANEL	4.16KV DISTRIBUTION PANEL	DC SOURCE PANEL AND BATTERY CHARGER	11.5 LOCALIZER	11.5 GLIDE PATH	6KW GSE	100W DME	200W DVOR	100W DVOR	10W VHF AM TRANSCEIVER	5W VHF AM TRANSCEIVER	TELEX	VSAT	HF SSB RECEIVER	UHF LINK	ACU WITH PROTECTIVE AVR AND TIME DELAY CONTROL DEVICE	PROTECTIVE AVR AND TIME DELAY CONTROL DEVICE
BUTUAN	FSS																																																				
	VOR/DME																		1																																		7	
DAVAO	CONTROL TOWER								1								1																																		2	
	FSS			1	1												1		1		1																															4	
	VOR/DME							1										1													1	1																					
DIPOLOG	FSS						2	1													1			1																													
DUMAGUETE	FSS																				1																																	
FT. BONIFACIO	FSS		2													1								1																													2	
	AMS																																																				
JOLO	FSS					3																																															
LAOAG	FSS							1									2		1								3	3																									2	
	RCAG								1																																													
MACTAN	TRACON			2						1					1	1								3			3																									4	
	CONTROL TOWER																																																				
	VOR/DME							1										1													1																					3		
	ILS							2								1					2										1	1																					
	MAIN POWER SUPPLY	2									1																									1	8		2		3	6	1											
	NDB																																																				
MACTAN AFC	RCAG																																																				
	FSS		1		1												1										3																									2	
MT. MAJIC	AMS																																																				
	RCAG					3						1							1					1																														
	FSS																																																				
MAMBURAO	FSS						2													1					1																													
MIA	TRACON							1	1															1										1																			
	CONTROL TOWER										1																																											
	MAIN POWER SUPPLY	1																																		1	4		2		3	6	1											
	ANT. REMOTE CONTROL																																																				
MANILA AFC	AMS																																																				
	RCAG																																																				
	FSS																																																				
ROXAS	FSS							1	1												1																																	
TAGAYTAY	AMS																																																			
	RCAG							1	1																																											
	FSS											1				1																																					
VIRAC	NDB					1															1			1																													
ZAMBOANGA	CONTROL TOWER						2														1				1																											2	
	FSS				1														2																																	2	
	DME						1											1																																			2	
ATO WAREHOUSE	RESERVE EQUIPMENT																																																			
	TOTAL	2	1	2	3	3	9	12	6	1	1	1	2	1	1	1	2	1	4	5	4	9	1	4	1	2	4	3	3	3	3	1	3	1	1	2	8	4	2	2	3	12	2	1	1	4	1	1	1	12	1	3	3	1	14	28	4

NOTE :
1. Number Represent Quantity of Item
2. Single Composite Equipment
3. Dual composite Equipment
4. Equipment for Relocation

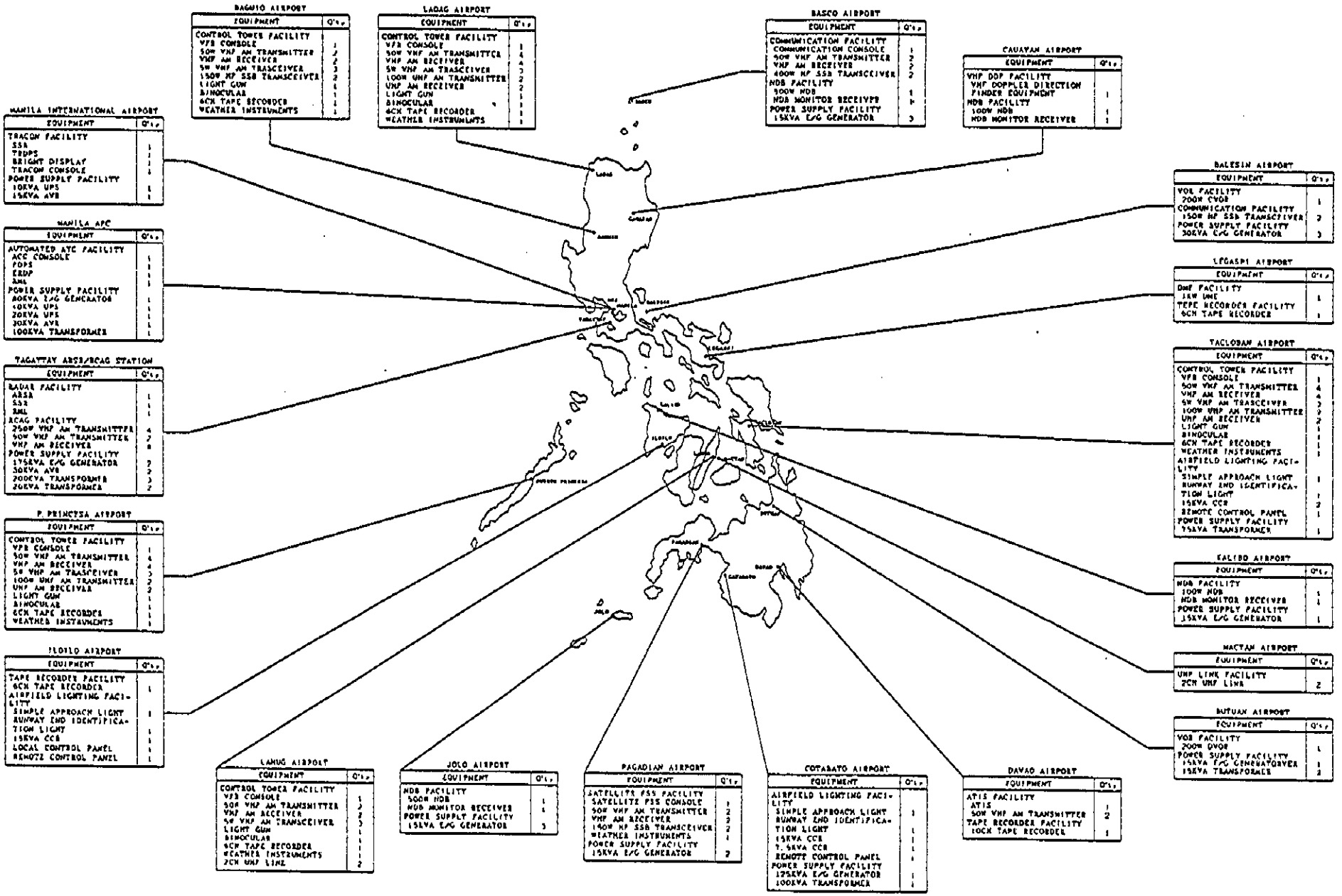


Figure 1-1 Locations and Equipment Installed Under ANF Modernization Project - Phase I

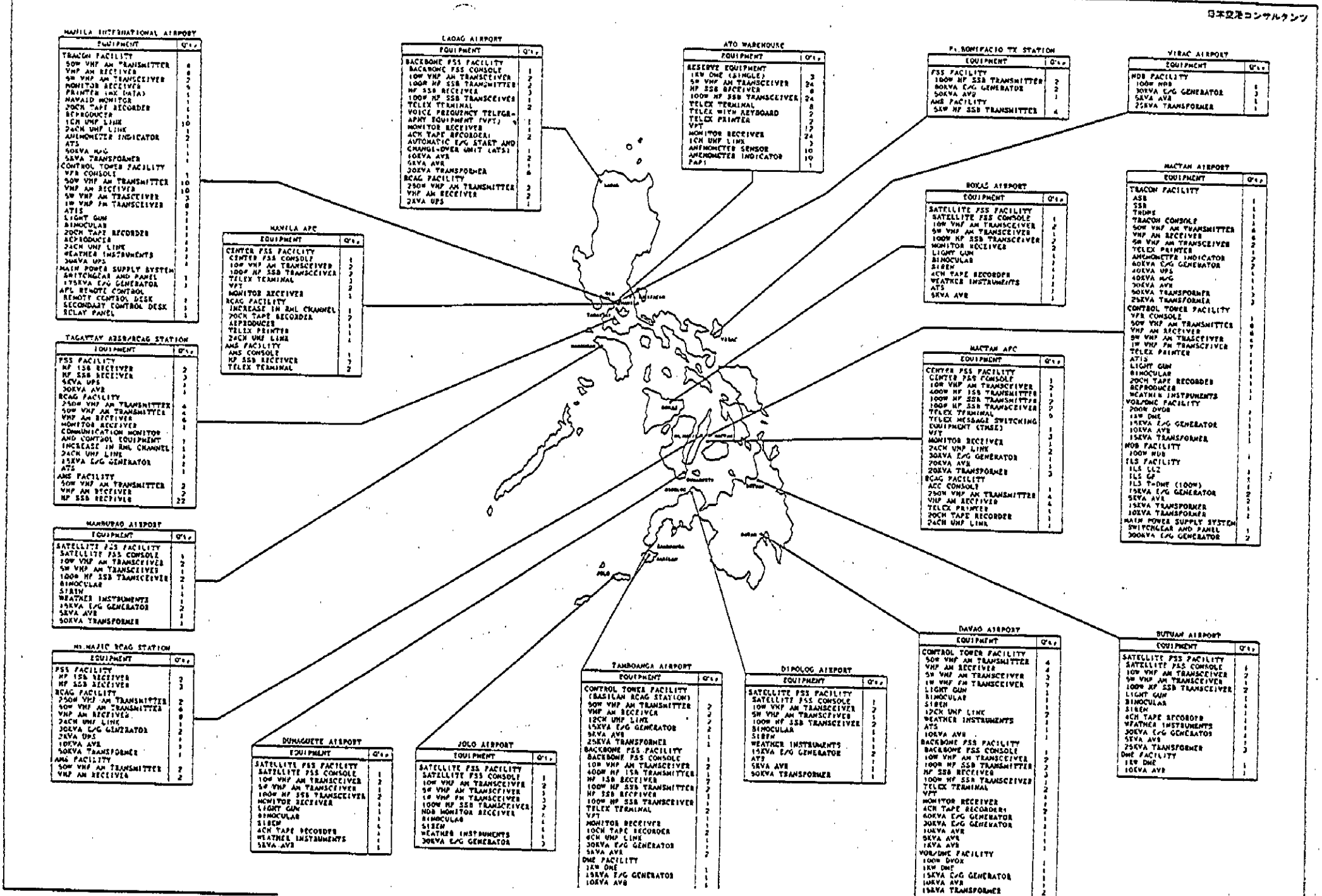


Figure 1-2 Locations and Equipment Installed Under ANF Modernization Project - Phase II

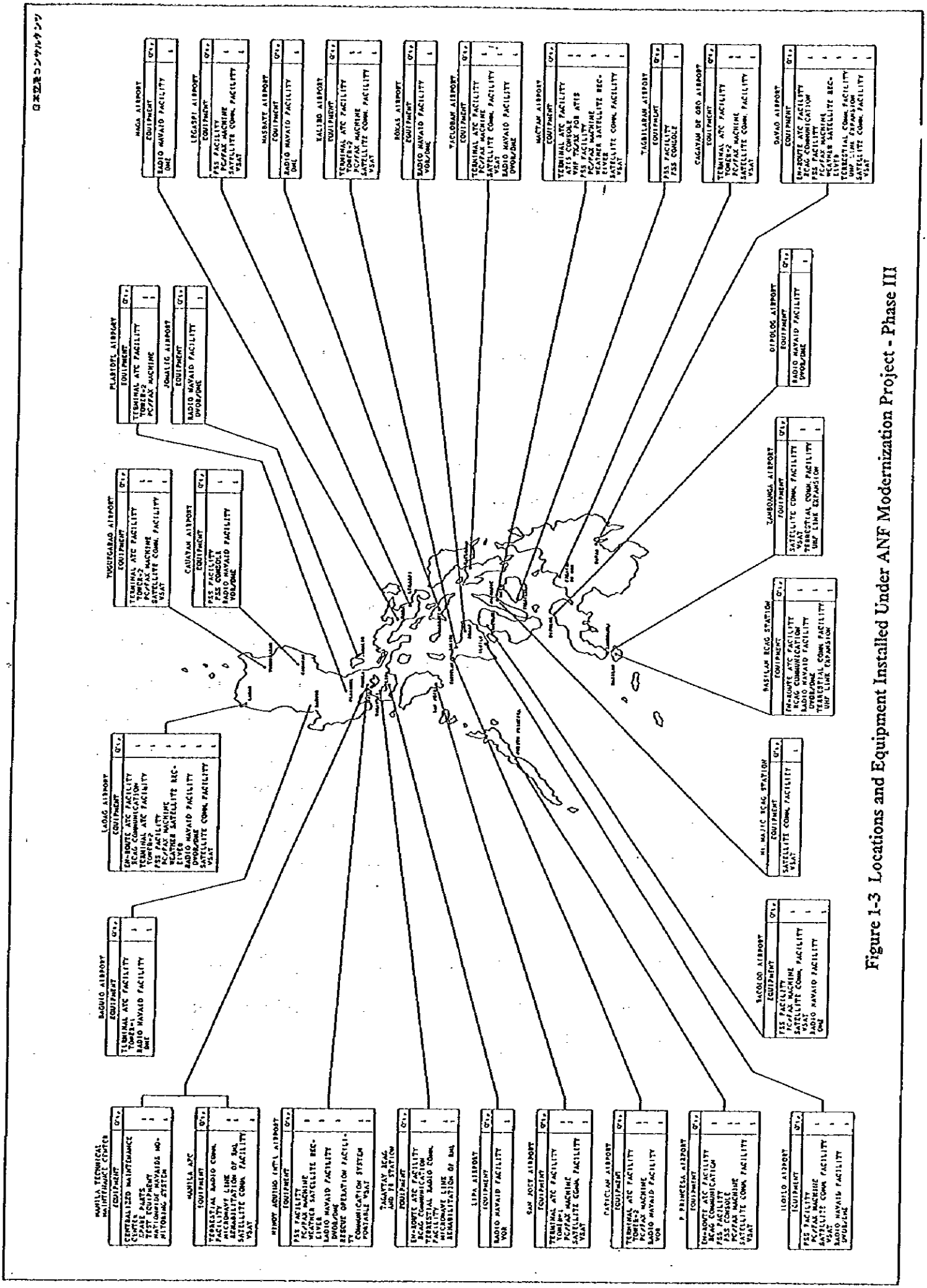


Figure 1-3 Locations and Equipment Installed Under ANF Modernization Project - Phase III

1-1-3 Needs of Training of ATO Technical Personnel

The number of Air traffic Controllers (ATC), Airways Communicators (ACOM), and Air Navigation System Specialists (ANSS) at present are shown in **Tables 1-5 to 1-7.**

According to the ATO, even at present, the ideal numbers of personnel for each category are estimated as shown in **Tables 1-8 to 1-10.**

Table 1-11 shows the total number of technical personnel broken down by grade for each category and details the required number thereof. As shown in **Table 1-11,** nearly 900 personnel should be recruited and assigned to the existing stations as soon as possible.

In addition to the existing staff requirement above, the ATO should additionally comply with the requirement for the assignment of new technical personnel to the newly developed airports, such as General Santos, Clark and Subic. Aside from airport development, air navigation facilities are being modernized under various foreign assisted projects. Such as, the Nationwide Air Navigation Facilities Modernization Project being financed by the OECF. Phase III of which, is about to commence. When the Nationwide Air Navigation Facilities Modernization Project - Phase III is completed, further increases in the number of technical personnel will be required.

In order to fulfill such manning requirements, the CATC should be capable of providing the necessary training services and should be revitalized with the required training equipment and staff.

Table 1-5 Number of ATC Personnel by Station

	ATS Supervisor	CHIEF ATC	ASST. CHIEF ATC	SUPERVISING ATC	SENIOR ATC	ATC II	ATC I	Total
1 Manila ACC	-	1	-	6	19	5	7	38
2 Manila Radar	-	-	1	6	9	6	9	31
3 Manila Tower	-	-	1	5	10	9	7	32
4 Manila RCC	-	1	2	1	2	3	-	9
5 Baclod Tower/App	-	1	-	3	1	5	-	10
6 Baguio Tower	-	-	-	2	1	3	1	7
7 Butuan Advry Tower	-	-	-	1	-	5	-	6
8 C. De Oro Tower/App	-	2	-	2	3	-	1	8
9 Caticlan Advy Tower	-	-	-	-	-	1	-	1
10 Clark Tower	-	-	-	2	6	5	5	18
11 Subic Tower	-	1	1	2	6	5	6	21
12 Cotabato Tower*	-	-	-	2	2	1	-	5
13 Davao Tower/App	-	1	-	1	3	10	4	19
14 Dumaguete A. Tower	-	-	-	1	2	3	-	6
15 G. Santos Tower	-	-	-	-	-	-	-	-
16 Iloilo Tower	-	-	1	2	4	3	-	10
17 Kalibo Advry Tower	-	-	-	-	1	2	2	5
18 Laoag Tower	-	-	1	2	1	2	1	7
19 Legaspi Tower	-	-	1	-	3	3	-	7
20 Mactan Tower	-	1	-	5	1	1	2	10
21 Mactan APP	-	-	1	3	5	3	-	12
22 Mactan ACC	-	1	1	4	4	4	1	15
23 Plaridel Tower	-	-	-	1	1	4	-	6
24 P. Princesa Tower	-	-	1	1	1	4	-	7
25 Roxas Advry Tower	-	1	-	-	1	-	-	2
26 San Fernando Tower	-	-	-	1	2	1	-	4
27 Tacloban Tower	-	-	1	1	2	3	-	7
28 Zamboanga Tower	-	1	-	3	5	3	4	16
Total	-	11	12	57	95	94	50	319

Table 1-6 Number of ACOM Personnel by Station

	Chief ACOM	Asst. Chief ACOM	Supervising ACOM	Senior ACOM	ACOM II	ACOM I	Total
1 ATO Ops. Center	-	-	1	3	2	-	
2 Manila AFS	1	1	2	8	4	-	16
3 Manila AMS	1	-	3	6	9	3	22
4 Manila FSS	1	1	4	6	7	4	23
5 MIA FOBS (Int'l)	1		3	2	6	1	13
6 MIA FOBS (Domestic)	1		4	1	1	2	9
7 Bacolod FSS		1	2	1			4
8 Basco FSS			1	1	1		3
9 Caticlan FSS					2	1	3
10 Cauayan FSS			2	2	2		6
11 Clark FSS						2	2
12 Davao FSS	1	1	3	2	8	2	17
13 Dipolog FSS			1		5		6
14 Gen. Santos FSS				1	5	1	7
15 Jolo FSS					2		2
16 Laoag FSS	1		2	2	2	1	8
17 Legaspi FSS		1		3	3	1	8
18 Mactan FOBS			1	2	1		4
19 Mactan FSS	1	1	3	4	9		18
20 Mamburao FSS				1	1	1	3
21 Marinduque FSS			1	2	1		4
22 Masbate FSS			1	1	1	-	3
23 Naga FSS			2	2			4
24 Ozamis FSS					1	2	3
25 Pagadian FSS			1	3			4
26 P. Princesa FSS			2	2			4
27 Romblon FSS			1	2	1		4
28 Roxas FSS			1	3	1		5
29 San Fernando FSS							-
30 San Jose FSS			1	2	1		4
31 Subic FSS						1	1
32 Surigao FSS			1	1	3		5
33 Tagbilaran FSS			1	1	2		4
34 Tandag FSS			1	1	2		4
35 Tuguegarao FSS		1	1	1	2		5
36 Virac FSS			1	3	1		5
37 Zamboanga FSS	1	1	3	3	2	5	15
Total	9	8	49	69	86	27	248

Table 1-7 Number of ANSS Personnel by Station

	ANS Supvr	Chief ANSS	Asst. Chief ANSS	Supvng ANSS	Sr. ANSS	ANSS II	ANSS I	Airfield Power Technician V	Airfield Power Technician IV	Airfield Power Technician III	Airfield Power Technician II	Airfield Power Technician I	Total
1 Manila Tower			2		3	6	2		1	3	4		21
2 Manila Navaids S.			1	2	3	6	1		2	1	2		18
3 Manila Transmitter S.			1	1	2	6			1	2	3	1	17
4 Manila Radar S.		1		4	4	5	4		2	1	2		23
5 Binangonan NDB				1								1	2
6 Cabanatuan					1	2			1	2	1		7
7 Las Pinas Receiver				2									2
8 Lipa VOR				1		2			1	1	2		7
9 Rosario NDB					1		1			1	7		10
10 Tagaytay VHF-ER S.		1	2	3	3	8	2		2	3	8	2	34
11 Tagug OM/OL											2		2
12 Mactan Int'l Airport	1	2	2	5	29	21	3		2	4	15	5	89
13 Tagbilaran Airport			1	1			1				1	1	5
14 Dumaguete Airport				1		4			1	1	4	1	12
15 Laoag Airport			1	5	7		2		5		3	1	24
16 San Fernando Airport				1	2	3			1	3	5		15
17 Basco Airport						2	1			1	2		6
18 Casayan Airport					1	1	2		1	1	2		8
19 Tuguegarao Airport				1	1	2	1		1	1	2		9
20 Bagmo Airport			1		3	7			2	2	1		16
21 Alabat Airport					1		1		1	2	1		6
22 Jomalig Airport				1			1		1		2		5
23 Lubang Airport			1				2		1	2	3		9
24 Mamburao Airport					1		1						2
25 Marinduque Airport					1		2			1	1		5
26 P. Princesa Airport				1	3	2	2		1	1	2		12
27 Romblon Airport				1	1					1	1		4
28 San Jose Airport				1	3						2		6
29 Plaridel Airport				1	1		2		1		2		7
30 Masbate Airport					1	1	1		1		2		6
31 Naga Airport				1		1	2		1	1	1	1	8
32 Virac Airport					1	1	1		1	1	1		6
33 Legaspi Airport			1	2	3		3		3	2	8	1	23
34 Bacolod Airport			1		2	4	1			2	4		14
35 Catuclan Airport						1	2						3
36 Iloilo Airport		1	1	3	1	5			1	2	6	1	21
37 Kalibo Airport						1	4		1		2	1	9
38 Roxas Airport			1		2	3	1			1	1		9
39 Tacloban Airport		1	1	1	2	5	1		2	1	4		18
40 Dipolog Airport						2	2						4
41 Jolo Airport					1						4		5
42 Pagadian Airport				1	1	2	1			1	2		8
43 Sanga Sanga Airport							3				1		4
44 Zamboanga Airport	1	1	2	3	7	7	1		2	7	3	4	38
45 Allah Valley Airport					1								1
46 G. Santos Airport				1	2	1			1		2		7
47 Davao Airport	1	2	1	3	6	9	1				4		27
48 Tandag Airport					1		2		1	3			7
49 Cotabato Airport			1		1	2				2	1		7
50 Surigao Airport							4			1			5
51 C. de Oro Airport		1	1	1	3	2	3		1	3	4		19
52 Butuan Airport				1		4	2			2			9
Total	3	10	22	50	106	128	66	-	43	63	130	20	641

Table 1-8 Ideal Number of ATC Personnel by Station

	ATS Supervisor	CHIEF ATC	ASST. CHIEF ATC	SUPERVISING ATC	SENIOR ATC	ATC II	ATC I	Total
1 Manila ACC	-	1	-	6	19	5	7	38
2 Manila Radar	-	-	1	6	9	6	9	31
3 Manila Tower	-	-	1	5	10	9	7	32
4 Manila RCC	-	1	2	1	2	3	-	9
5 Baclod Twr/App	-	1	1	5	6	5	4	22
6 Baguio Tower	-	-	1	4	4	4	3	16
7 Butuan Advr'y Tower	-	-	1	2	2	2	2	9
8 C. De Oro Tower/App	-	1	1	4	4	3	3	16
9 Caticlan Adv'y Tower	-	-	1	1	1	1	1	5
10 Clark Tower	-	1	1	6	6	5	5	24
11 Subic Tower	-	1	1	6	6	5	6	25
12 Cotabato Tower*	-	-	-	2	2	1	-	5
13 Davao Tower/App	-	1	1	4	6	5	5	22
14 Dumaguete A. Tower	-	1	1	4	4	3	3	16
15 G. Santos Tower	-	1	1	6	6	6	7	27
16 Iloilo Tower	-	1	1	4	4	3	3	16
17 Kalibo Advr'y Tower	-	-	1	2	2	2	2	9
18 Laoag Tower	-	1	1	4	6	5	5	22
19 Legaspi Tower	-	1	1	4	4	3	3	16
20 Mactan Tower	-	1	1	6	9	8	2	27
21 Mactan APP	-	1	1	6	9	8	2	27
22 Mactan ACC	-	1	1	4	4	4	1	15
23 Plaridel Tower	-	-	1	2	2	2	2	9
24 P. Princesa Tower	-	1	1	4	6	5	5	22
25 Roxas Advr'y Tower	-	1	1	4	4	3	3	16
26 San Fernando Tower	-	-	1	2	2	2	2	9
27 Tacloban Tower	-	1	1	4	4	3	3	16
28 Zamboanga Tower	-	1	1	4	6	5	5	22
Total	-	19	27	112	149	116	100	523

Table 1-9 Ideal Number of ACOM Personnel by Station

	Chief ACOM	Asst. Chief ACOM	Supervising ACOM	Senior ACOM	ACOM II	ACOM I	Total
1 ATO Ops Center	-	1	3	3	4	-	11
2 Manila AFS	1	1	4	7	9	-	22
3 Manila AMS	1	1	4	9	12	-	27
4 Manila FSS	1	1	4	9	12	-	27
5 MIA FOBS (Int'l)	1	1	4	7	9	-	22
6 MIA FOBS (Domestic)	1	1	4	5	5	-	16
7 Bacolod FSS	-	1	1	1	2	2	7
8 Basco FSS	-	1	1	1	2	2	7
9 Caticlan FSS	-	1	1	1	2	2	7
10 Cauayan FSS	-	1	1	1	2	2	7
11 Clark FSS	1	1	3	5	6	6	22
12 Davao FSS	1	1	3	5	6	6	22
13 Dipolog FSS	-	1	1	1	2	2	7
14 Gen. Santos FSS	1	2	2	2	4	4	15
15 Jolo FSS	-	1	1	1	2	2	7
16 Laoag FSS	1	1	2	3	3	4	14
17 Legaspi FSS	1	1	2	3	3	4	14
18 Mactan FOBS	-	1	1	1	2	2	7
19 Mactan FSS	1	1	4	5	7	9	27
20 Mamburao FSS	-	1	1	1	2	2	7
21 Marinduque FSS	-	1	1	1	2	2	7
22 Masbate FSS	-	1	1	1	2	2	7
23 Naga FSS	-	1	1	1	2	2	7
24 Ozamis FSS	-	1	1	1	2	2	7
25 Pagadian FSS	-	1	1	1	2	2	7
26 P. Princesa FSS	-	1	1	1	2	2	7
27 Romblon FSS	-	1	1	1	2	2	7
28 Roxas FSS	-	1	1	1	2	2	7
29 San Fernando FSS	-	1	1	1	2	2	7
30 San Jose FSS	-	1	1	1	2	2	7
31 Subic FSS	1	1	3	5	6	6	22
32 Surigao FSS	-	1	1	1	2	2	7
33 Tagbilaran FSS	-	1	1	1	2	2	7
34 Tandag FSS	-	1	1	1	2	2	7
35 Tuguegarao FSS	-	1	1	1	2	2	7
36 Virac FSS	-	1	1	1	2	2	7
37 Zamboanga FSS	1	1	3	5	6	6	22
Total	13	37	65	93	134	91	433

Table 1-10 Ideal Number of ANSS Personnel by Station

	ANS Supvsr	Chief ANSS	Asst. Chief ANSS	Supvng ANSS	Sr. ANSS	ANSS II	ANSS I	Airfield Power Technician V	Airfield Power Technician IV	Airfield Power Technician III	Airfield Power Technician II	Airfield Power Technician I	Total
1 Airway Facility Complex	1	2	3	8	8	8	8		2	3	4		47
2 Manila Tower		1	1	4	4	4	4		2	3	4		27
3 Manila Navaids S.		1	1	4	6	4	2		1	1	2	1	23
4 Manila Transmitter S.		1	1	3	4	2	2		2	3	4		22
5 Manila Radar S.		1	2	4	6	4	4		2	3	4		30
6 Mla. Technical Center	1	2	3	6	8	6	8						34
7 Binangonan NDB										1	1	2	4
8 Cabanatuan				1	1	2	2			1	1	2	10
9 Las Pinas Receiver										1	1	2	4
10 Lipa VOR				1	1	2	2			1	1	2	10
11 Rosario NDB					1	2	2		1	1	2	1	10
12 Tagaytay VHF-ER S.		2	2	6	8	6	4		3	6	6	3	46
13 Taguig OM/OL					1	1	2						4
14 Mactan Int'l Airport	1	6	6	22	30	24	20	1	4	12	11		137
15 Tagbilaran Airport			1	2	2	2	4		1	1	2	1	16
16 Dumaguete Airport		1	1	2	4	4	4		1	1	2	1	21
17 Laoag Airport	1	2	2	4	8	8	4		1	2	3	2	37
18 San Fernando Airport									1	2	3	2	9
19 Basco Airport				1	2	2	2			1	1	2	11
20 Catuyan Airport				1	2	2	2			1	1	2	11
21 Tuguegarao Airport				1	2	2	2		1	1	2	1	12
22 Baguio Airport		1	1	2	4	4	4		1	1	2	1	21
23 Alabat Airport				1	1	2	2			1	1	2	10
24 Jomalig Airport				1	1	2	2			1	1	2	10
25 Lubang Airport				1	1	2	2		1	2	3		12
26 Mamburao Airport				1	1	2	2			1	1	2	10
27 Marinduque Airport				1	1	2	2			1	1	2	10
28 P. Princesa Airport		1	1	2	4	4	4	1	2	3	4	2	28
29 Romblon Airport				1	2	2	2			1	1	2	11
30 San Jose Airport			1	2	2	4	2		1	1	2	1	16
31 Pitaridel Airport				1	2	2	2			1	1	2	11
32 Masbate Airport				1	2	2	2		1	1	2	1	12
33 Naga Airport			1	2	4	4	4		1	1	2	1	20
34 Virac Airport				1	2	2	2			1	1	2	11
Sub Total	4	21	27	87	125	119	110	2	29	61	77	44	706

Table 1-10 Ideal Number of ANSS Personnel by Station (cont'd)

	ANS Supvsr	Chief ANSS	Asst. Chief ANSS	Supvng ANSS	Sr. ANSS	ANSS II	ANSS I	Airfield Power Technician V	Airfield Power Technician IV	Airfield Power Technician III	Airfield Power Technician II	Airfield Power Technician I	Total
35 Legaspi Airport		1	1	2	4	4	4	1	3	4	4	2	30
36 Bacolod Airport		1	1	2	4	4	4		2	3	4		25
37 Caticlan Airport				1	2	2	2			1	1	2	11
38 Iloilo Airport	1	1	1	4	4	4	4	1	2	3	4	2	31
39 Kalibo Airport			1	2	2	4	4		1	1	2	1	18
40 Roxas Airport		1	1	2	4	4	4		1	2	3	1	23
41 Tacloban Airport	1	1	1	4	4	4	4	1	2	3	3		28
42 Dipolog Airport			1	2	2	4	2			1	1	2	15
43 Jolo Airport				1	2	2	2			1	1	2	11
44 Pagadian Airport				1	2	2	2			1	1	2	11
45 Sanga Sanga Airport				1	2	2	2			1	1	2	11
46 Zamboanga Airport	1	2	2	6	6	6	4	1	3	6	4	2	43
47 Allah Valley Airprot										1	1	2	4
48 G. Santos Airport		1	2	4	4	4	4	1	2	3	4	2	31
49 Davao Airport	1	2	2	6	6	6	4	1	3	6	6		43
50 Tandag Airport				1	2	2	2			1	1	2	11
51 Cotabato Airport		1	1	2	4	4	4		1	1	2	1	21
52 Surigao Airport				1	2	2	2		1	1	2	1	12
53 C. de Oro Airport	1	1	2	4	4	4	4		1	2	3	3	29
54 Butuan Airport			1	2	4	4	4		1	2	3	1	22
55 Bagabag FSS				1	2	2	2			1	1	2	11
56 Bislig FSS				1	2	2	2			1	1	2	11
57 Busuanga FSS				1	2	2	2			1	1	2	11
58 Calbayog FSS				1	2	2	2			1	1	2	11
59 Camiguin FSS				1	2	2	2			1	1	2	11
60 Catarman FSS				1	2	2	2			1	1	2	11
61 Clark Airport	1	1	2	2	4	4	4		1	2	3	1	25
62 Daet FSS				1	2	2	2			1	1	2	11
63 Lingayen FSS				1	2	2	2			1	1	2	11
64 Ormoc FSS				1	2	2	2			1	1	2	11
65 Ozamis				1	2	2	2			1	1	2	11
66 Subic	1	1	2	2	4	4	4						18
Sub Total	7	14	21	62	92	96	90	6	24	56	64	51	583
Total	11	35	48	149	217	215	200	8	53	117	141	95	1,289

Table 1-11 Number of Present and Required Personnel

	Current	Ideal	Vacancy
Air Traffic Controller			
ATC Supervisor	-	-	-
Chief ATC	11	19	8
Asst. ATC	12	27	15
Supervising ATC	57	112	55
Senior ATC	95	149	54
ATC II	94	116	22
ATC I	50	100	50
Total	**319**	**523**	**204**
Airways Communicator			
ACOM Supervisor	-	-	-
Chief ACOM	9	13	4
Asst. Chief ACOM	8	37	29
Supervising ACOM	49	65	16
Senior ACOM	69	93	24
ACOM II	86	134	48
ACOM I	27	91	64
Total	**248**	**433**	**185**
Air Navigation System Specialist			
ANS Supervisor	3	14	11
Chief ANSS	10	28	18
Asst. Chief ANSS	22	41	19
Supervising ANSS	50	106	56
Senior ANSS	106	151	45
ANSS II	128	195	67
ANSS I	66	206	140
sub-total	**385**	**741**	**356**
Airfield Power Technician V	-	8	8
Airfield Power Technician IV	43	86	43
Airfield Power Technician III	63	101	38
Airfield Power Technician II	130	189	59
Airfield Power Technician I	20	26	6
sub-total	**256**	**410**	**154**
Total	**641**	**1,151**	**510**
Ground Total	**1,208**	**2,107**	**899**

1-2 Civil Aviation Training Center at Present

1-2-1 Administration of CATC

(1) Administrative Organization

The CATC is an organization attached to the Assistant Secretary for Air Transportation within the Department of Transportation and Communications (DOTC). The CATC is directly under the Assistant Secretary through the Executive Officer of the Air Transportation Office.

The CATC is managed by the "Director I" and composed of two branches. Namely the Academic Branch and the Administrative Branch. The Academic Branch has four (4) Sections in charge of the management of classes.

Organization charts for DOTC, ATO and CATC are presented in **Figure 1-4** through **Figure 1-6.**

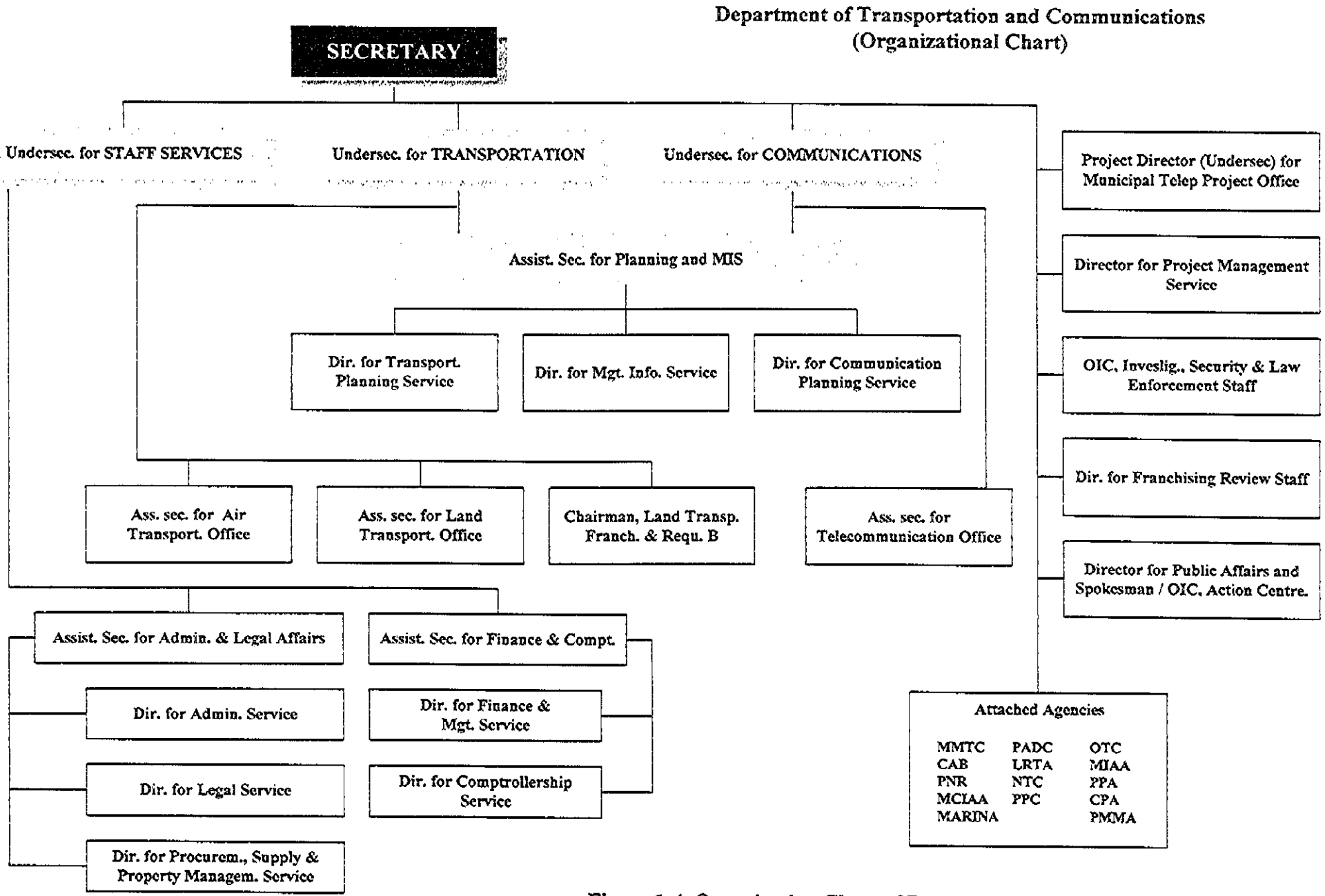


Figure 1-4 Organization Chart of Department of Transportation and Communications

ATO ORGANIZATIONAL STRUCTURE

As per Department Order No. 92-569, with the nine Area Centers Established in Lieu of this Regional Office.

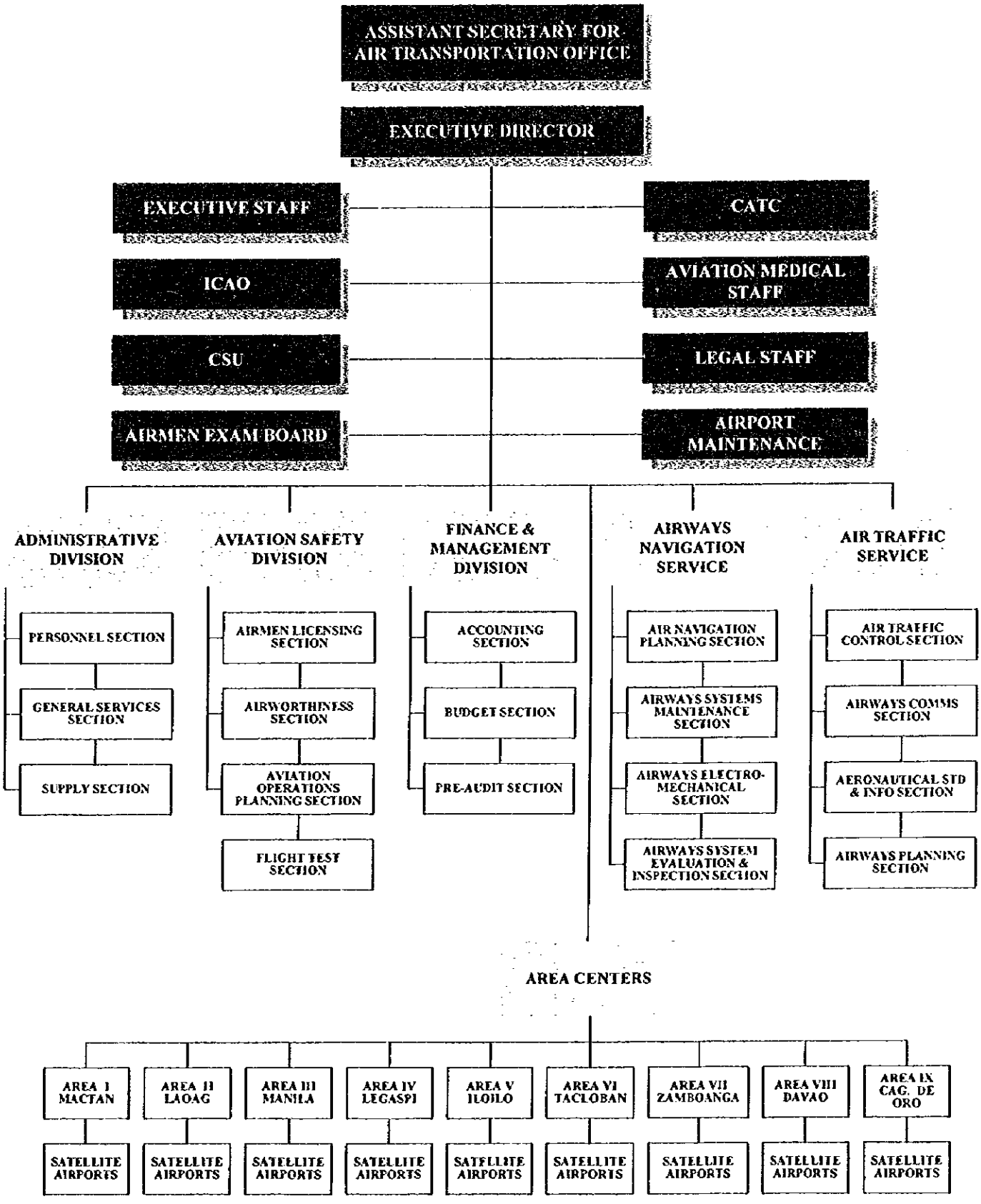


Figure 1-5 Organization Chart of Air Transportation Office

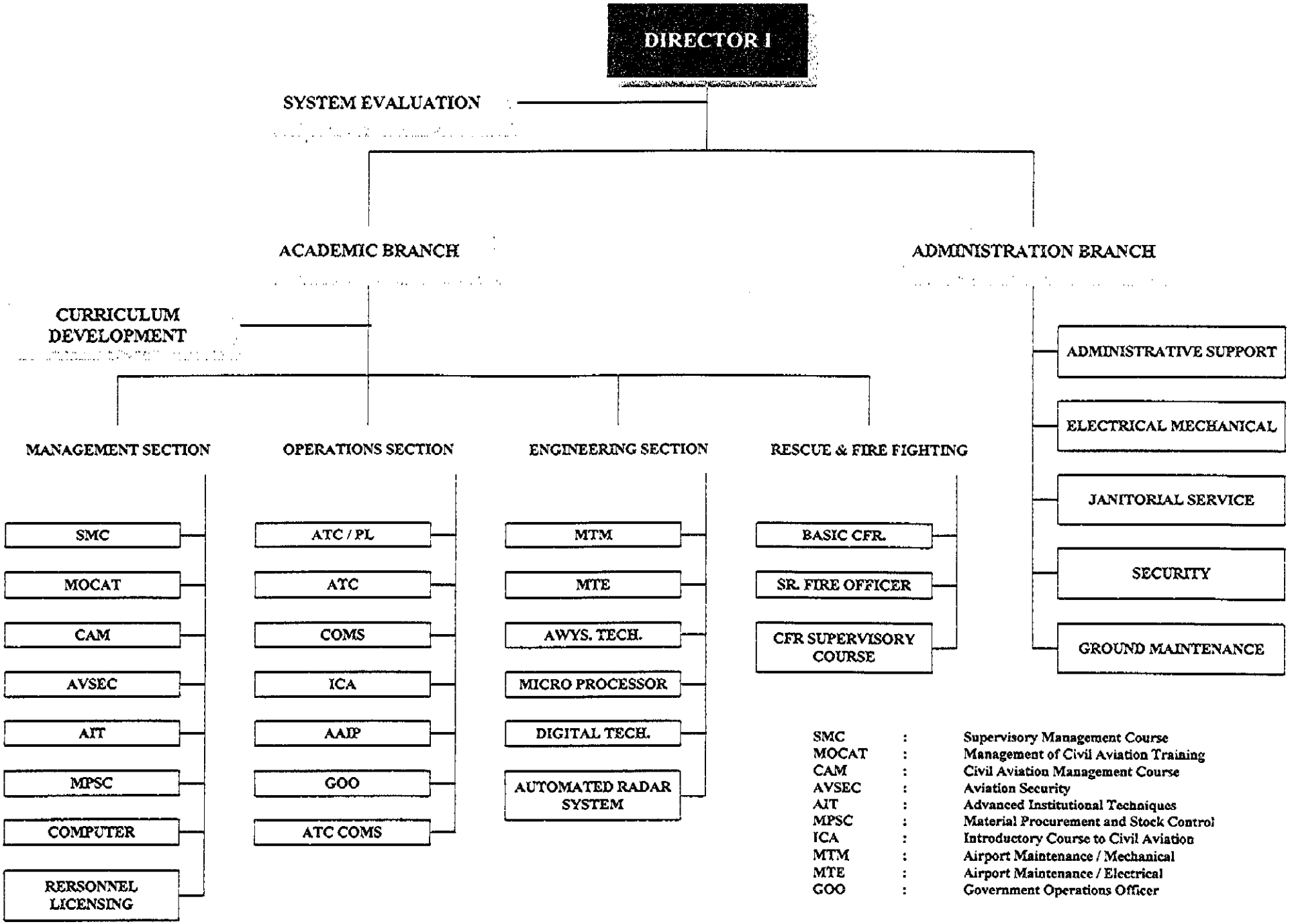


Figure 1-6 Organization Chart of Civil Aviation Training Center

(2) Operation and Maintenance

The minimum number of officers and personnel are presently assigned to the CATC. Operational staff acts as instructors for the Air Navigation System Specialist (ANSS), Air Traffic Controllers and Airways Communicators who are assigned by the CATC to the various airports and stations, and temporarily invited to CATC as instructors when the need arises.

Maintenance personnel for the training equipment are not presently assigned to CATC.

(3) Budget of ATO

Annual appropriations in ATO budget during the period from 1986 to 1995 are as shown below:

	Personal Services	Maintenance & Other Operating Expenses	Capital Outlay	Total
1986	73,873	83,574	360	157,807
1987	92,109	90,539	50	182,698
1988	125,299	93,874		219,173
1989	123,499	113,343	637	237,429
1990	123,798	115,261	649	239,708
1991	101,521	112,275		213,796
1992	162,881	138,676		301,557
1993	164,986	149,992	1,626	316,604
1994	182,439	96,046		278,485
1995	292,339	193,116	1,892	487,347
1996	338,368	245,041	5,942	589,351

1-2-2 Role of CATC

The present Civil Aviation Training Center of the Philippines was established in 1978, under the financial and technical assistance of UNDP/ICAO. The ICAO had originally planned to establish civil aviation training centers in Manila, Singapore, Bangkok and Jakarta for the purpose of training civil aviation personnel in Asia and Pacific Regions. Each of the centers was designated a specific role as follows:

- CATC Manila — Advanced Management Personnel
- Singapore — Air Traffic Controllers
- Bangkok — Air Navigation System Specialist
- Jakarta — Aircraft Pilots and Maintenance

The development project for Manila CATC was scheduled to be completed within four (4) years, but, after several revisions of the program, the project lasted for 10 years. The initial cost estimate of the project was US$940,000, but finally reached US$4 Million before it was terminated.

It was expected by UNDP/ICAO that Manila CATC would have achieved sustainability in its operation and training program so that the Philippino instructors would maintain the training courses for both national and regional civil aviation personnel. As stated in the Application Form for Japan's Grant Aid, the ATO has been suffering from a lack of training facilities for technical personnel while it has been implementing multifarious projects to modernize and upgrade various airports and air navigation facilities. To meet the increasing air traffic demand and corresponding requirements for air safety, the ATO has been expanding radar coverage and airways networks, However, the ATO has no training equipment for ILS, VOR/DME, SSR in its CATC. As of December 1996, the CATC offers training courses as listed in **Table 1-12**.

Table 1-12 Outlook of Training Courses of CATC Manila

COURSES		DURATION (Weeks)	FEE	NO. OF TRAINEES	FREQUENCY
Advanced Instructional Techniques	R	6	$675	16	1
Government Operations Officer	R	8	$900	16	1
Supervisory Management Course	R	4	$450	16	1
Civil Aviation Management Course	R	4	$450	16	1
Management of Civil Aviation Training	R	4	$450	16	
Material Procurement and Stock Control	R	4	$450	16	1
Introductory Course to Civil Aviation	N	3		16	1
Aviation Security	R	4	$450	16	1
Aircraft Accident Investigation and Prevention	R	4	$450	16	1
Airspace Planning in Air Traffic Control	R	3	$450	16	1
Basic Air Traffic Control Course	N	24		50	
Basic Airways Communication Operation Course	N	24		As Required	
Basic Airways Operation Specialist Course	N	24		As Required	
Airport Maintenance/Electrical	R	12	$1,350	16	1
Airport Maintenance/Mechanical	R	12	$1,350	16	1
Airways Navigation System Specialist Training Course	N	24		As Required	
Digital Techniques	N	4		Abolished	
Automated Radar Course	N	14		As Required	
Microprocessors	N	6		As Required	
Crash/Fire Rescue Training Officer Course	N	15		As Required	
CNS/ATM Course				Under Planning	

1-2-3 Accomplishment of CATC in the Past

Since the present CATC was established under UNDP/ICAO assistance, a significant number of civil aviation officials from the Asia Pacific Region and Middle East Region as well as from the Philippines herself, have been trained to date. The CATC was highlighted as one of the best in training output for 1984, according to its brochure.

For the Philippines, the CATC is only an educational institute for civil aviation attached to the ATO under the DOTC. Without exemption, all the technical personnel for civil aviation shall have to graduate from the CATC to join the ATO. The CATC also offers various specialized training courses for technical personnel who have been assigned to the facilities.

Table 1-13 shows the number of trainees by courses at the CATC from 1982 to 1995. The number of students for air traffic controller, airways communicator and air navigation system specialist are as follows:

Basic Airways Operations Specialist Course(ATC/ACOM)	**189**
Basic Air Traffic Control Course(ATC)	**54**
Basic Airways Communication Operations Course(ACOM)	**50**
Airways Navigation System Specialist Training Course(ANSS)	**179**
Airfield Power Technician	**196**

During the period from 1987 through 1992, the performance of the CATC has been comparatively lower. It should be noted that the training courses for newcomers to the ATO airways operation work force were not implemented so often. This low performance by the CATC may be due to stagnation in the Philippine economy.

Table 1-13 Historical Record of Number of Personnel Trained in CATC Manila

Courses / Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
VOR/DME/ILS	15														15
COM/OPS Qualifying Course	14														14
PAF/ATC			22												22
MPO			23												23
Digital Techniques			22	17	16										55
ATC/COMS (BATS)			24		37							52		76	189
Airways Technician			14	26	17	17		29				41	35		179
Basic Instructional Techniques (CFR)			20												20
ICA			15								41	45	19	11	131
Power Plant Operators			14												14
Basic Crash Fire & Rescue (CFR)				38											38
Leadership Training (All Chiefs)				17											17
Automated Radar				16	16	16									48
Seminars - Airports Inspector				4											4
- VOR Accelerated Maintenance				11											11
Integrated Course on Single Side Band/Digital Electronics					16										16
Basic ATC					25				29						54
Basic COMS					23				27						50
PAL 86B Logic Microprocessor					12										12
Microprocessor (Software & Hardware)					16										16
Basic Aerodrome Firefighting						45									45
Aviation Security (AVSEC)						50									50
Basic Electro-Mechanical Training						15									15
CFR Refresher							66		16						82
Computer Concepts							24								24
CFR- Supervisory								12							12
PAF ATC Refresher								17							17
Supervisory Management								21	27	22	16				86
ATC/COMS Refresher									30						30
CFR Vechile Proficiency									19	16	15				50
Leadership										12	13	22	22		69
Seminar - MACH Technic Number										29					29
Civil Aviation Management/Career Executive												44			44
Intro. To Computer System (Software)													16		16
Secretarial Course													18		18
Nihongo for ATO														14	14
Basic Firefighting for ATO Fire Reaction Team														29	29
TOTAL	29	-	154	129	178	143	90	135	92	79	85	204	110	130	1,558

1-2-4 CATC Facilities

Presently the CATC is located at the North East end of Manila International Airport, adjacent to the threshold of Runway 24. The South Super Highway passes nearby the CATC. The Surrounding area is developed as residential area.

The area of the CATC premises is approximately 30,000m^2, with a floor area of the two (2) stories building is 3,535m^2. Composition of rooms are as follows:

• Classroom	10
• Laboratory	8
• Instructors room	1
• Conference room	2
• Superintendent's room	1
• Administration room	1
• Auditorium	1
• Library	1
• Cafeteria	1
• Storage	1
• Licensing Office	1

Vertical plan and floor plans of the CATC building are shown in **Figure 1-7** through **Figure 1-9**

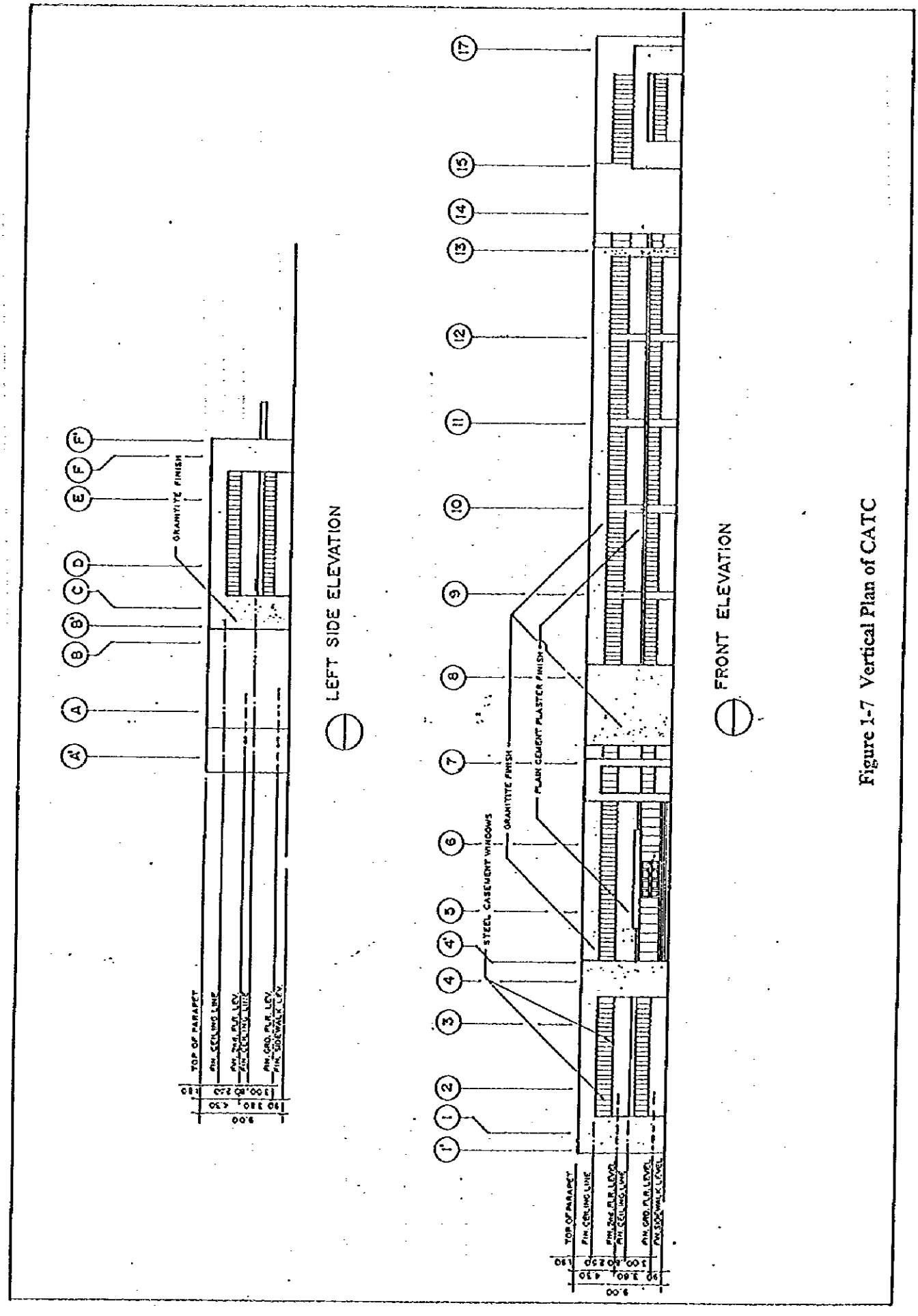


Figure 1-7 Vertical Plan of CATC

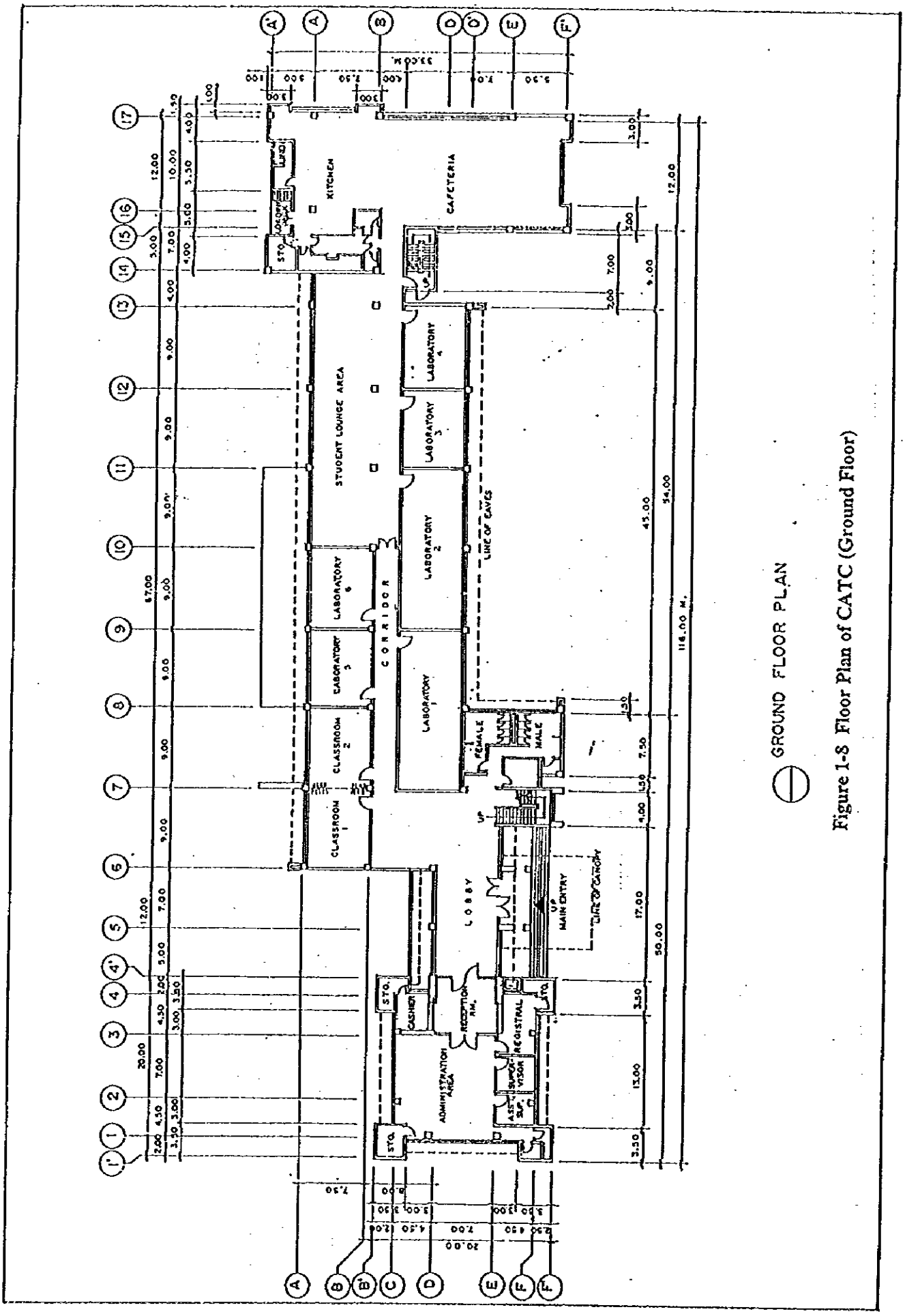


Figure 1-8 Floor Plan of CATC (Ground Floor)

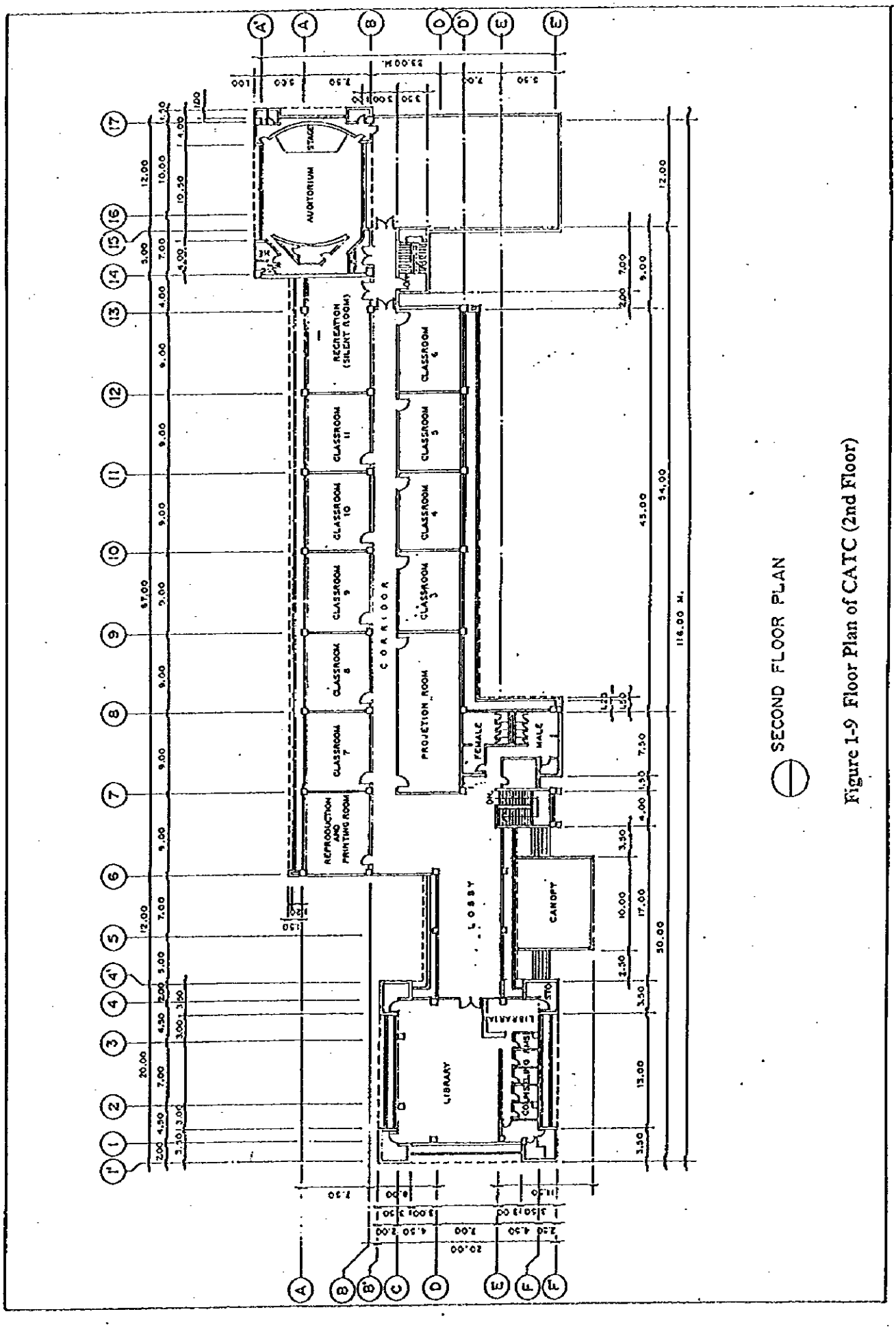


Figure 1-9 Floor Plan of CATC (2nd Floor)

1-2-5 Training Equipment of CATC

The major training equipment of the CATC are listed in **Table 1-14**. Among 28 items of training equipment, 9 items are now in working condition. Most of the equipment is no longer repairable.

The equipment such as Radar Simulator, Flight Simulator, Area Control Laboratory are placed in the class rooms mostly displaying what they are, only.

Table 1-14 Training Equipment of CATC

	Items	Quant'y	Operational Status	Remarks
1	Overhead Projector	4	Operational	
2	Slide Projector	3	Out of order	
3	Film Projector	3	Out of order	
4	TV Monitor	1	Out of order	Under repair
5	VCR Recorder	2	Out of order	Under repair
6	Camera (movie)	1	Operational	
7	Amplifier	1	Out of order	To be repaired
8	Speaker	4	Out of order	To be replaced
9	Microscope	1	Operational	
10	Baggage X-Ray Machine	1	Out of order	Unable to repair
11	Handheld Metal Detector	1	Out of order	Unable to repair
12	Walk Thru Metal Detector	3	Operational	
13	Explosive Detector	2	Out of order	Unable to repair
14	Radar Simulator	1	Out of order	Unable to repair
15	Voice Tape Recorder	1	Out of order	Unable to repair
16	Flight Simulator	1	Out of order	Unable to repair
17	Area Control Laboratory	1	Out of order	Unable to repair
18	CW Laboratory	1	Out of order	Unable to repair
18	Teletype Laboratory	1	Operational	6 of 18 are usable
20	Language Laboratory	1	Out of order	Unable to repair
21	Lab Volt	2	Out of order	Unable to repair
22	VASI/PAPI	1	Out of order	
23	Leveling Instrument	1	Operational	
24	Electrical Laboratory	1	Out of order	Disposed
25	Engine Generator	2	Out of order	Unable to repair
26	Automatic Voltage Regulator	1	Out of order	Unable to repair
27	Constant Current Regulator	1	Out of order	Unable to repair
28	Aircon Trainer	2	Operational	Unable to repair

1-3 Revitalization Plan of CATC

1-3-1 General Concept of Revitalization of CATC

In order to meet the training requirement and in consideration of the present training equipment at the CATC, it essential to revitalize the CATC in terms of training equipment and the quality of instructors. The training equipment for principle air navigation system should be provided. The requested equipment are fundamental and popular in the Philippine airways system. Under the Grant Aid Program of Japan, provision of such training equipment will help the CATC revitalize existing basic training courses for air traffic controllers, airways communicators and air navigation system specialists, such as Basic Airways Operation Specialist Course, Basic Air Traffic Control Course and Basic Airways Communication Course and Airways Navigation System Specialist Course.

In parallel with the above Grant Aid Program, JICA intends to extend Project Type Technical Assistance to improve the training program itself and the quality of instructors through cooperative work with Experts dispatched by JICA.

When the efforts of the above two programs are integrated, the true revitalization of the CATC will be achieved.

1-3-2 Organizational Setup of CATC Revitalization

The ATO has organized the Executive Committee and Technical Working Group by Office Order No. 236-96 for the Revitalization Project of Civil Aviation Training Center. The Organizational structure of Committee and Technical Working Group is shown in **Figure 1-10.**

The members of the Executive Committee and Technical Working Committee are as follows:

Executive Committee

Mr. Carlos F Tañega	Assistant Secretary, ATO
Mr. Cesar T. Valbuena	Assistant Secretary, DOTC
Mr. Toshiji Abe	JICA Expert, ATO
Mr. Reynaldo D. Fernando	Director of CATC
Mr. Manuel E. Escobar	Director of ANS, ATO
Mr. Anacleto V. Venturina	Director of ATS, ATO

Technical Working Committee

Project Management

Mr. Renato M. Santos

Administrative Group

Mr./ Rodolfo Peñafiel

Ms. Emily Osorio

Technical Working Group

Mr. Rey Jimenez

Mr. Ernesto Orcal

Mr. Jesus Llamas

Mr. Joseph Intal

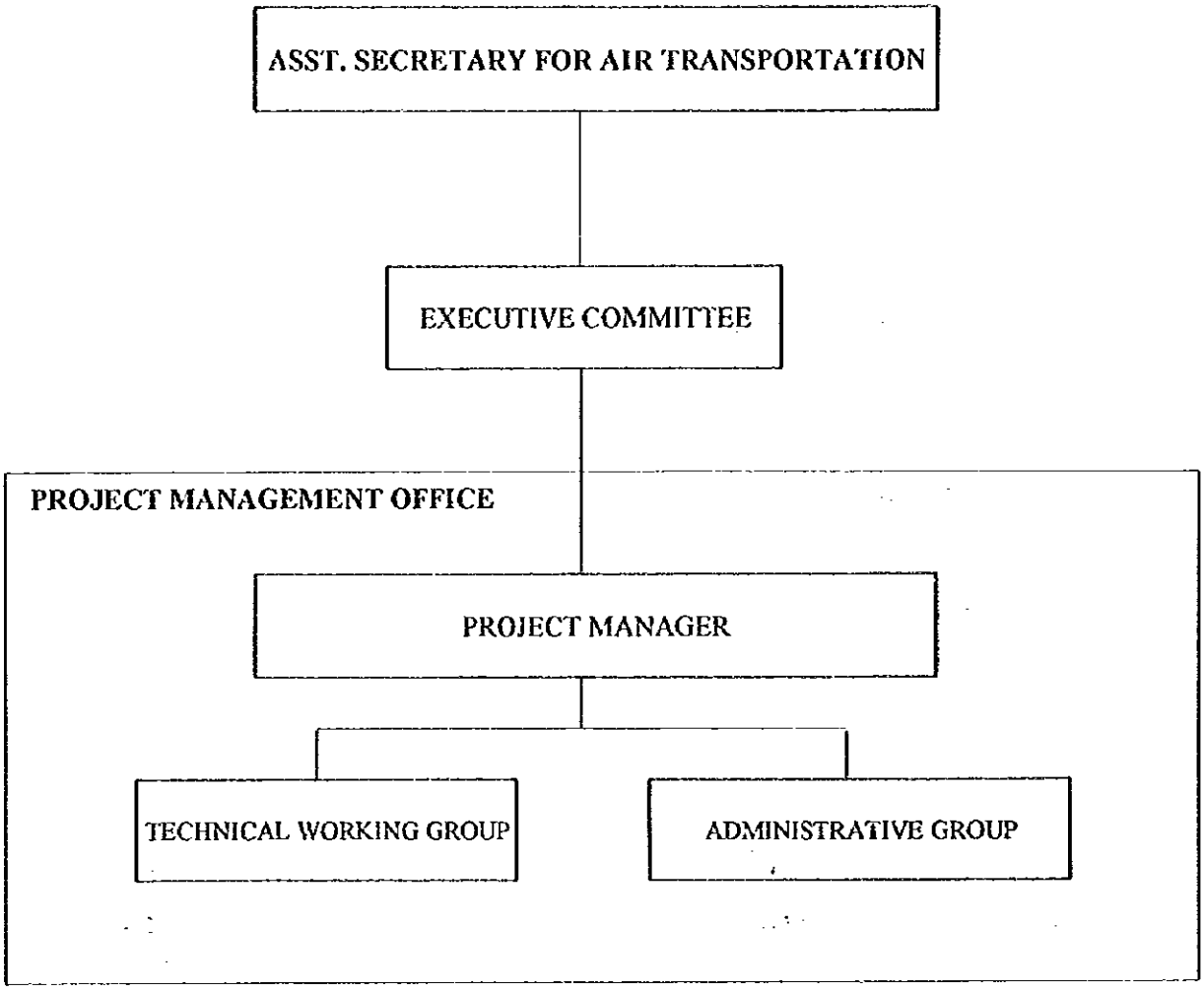


Figure 1-10 Organization Structure of the Committees

1-3-3 ATO Personnel Training Program

As presented in **Table 1-11**, the employment requirement for technical personnel is estimated at 900. In addition to the present requirement for employment of personnel only to fill out the vacancies, the ATO is further required to add technical personnel to fulfill the number of resigning personnel. The annual average rate of which is estimated at 3% and 4% of the required number of personnel of air traffic controller/airways communicator and air navigation system specialist respectively.

Although, in consideration of the above fact, the ATO plans to recruit 10% of the required number of technical personnel every year, it seems to be reasonable to adjust the number of annual recruiting personnel to 5%. It is also noted that the rate of casualty among trainees in each field of services are 33% and 64% in air traffic controller/airways communicator and air navigation system specialist respectively.

Taking into account the desire of the ATO to limit the number of trainees in each class to 12, the annual number of required trainees, annual number of employment and annual number of classes are estimated below:

	Number of Employment	Number of Trainees	No. of Classes
Air Traffic Controller	36	48	4
Airways Communicator	27	36	3
Air Nav. System Specialist	107	168	14
Total	170	252	21

1-3-4 Training Program

The course layouts are presented in Table 1-15 through Table 1-18. It is expected that the present training syllabus will be adopted by the CATC even after the completion of the Revitalization Project of the CATC until such time as the Experts deployed by JICA accomplish possible revisions of the course layout for each training course.

1-3-5 Budget of Project Implementation

The ATO's Budget appropriation over the last 10 years are shown in Section 1-2. The President's budget for the ATO for 1997 vs. 1996 appropriation are shown below:

Particulars	1996 Appropriation	1997 Budget
Current Operating Expenditures		
Personal Services	338,368,000 Pesos	391,058,000 Pesos
Maint. & Operating Expenses	245,583,000 Pesos	221,074,000 Pesos
Total	583,409,000 Pesos	612,132,000 Pesos
Capital Outlay		
Equipment Outlay	5,942,000 Pesos	6,200,000 Pesos
Total	5,942,000 Pesos	6,200,000 Pesos
Grand Total	589,351,000 Pesos	618,332,000 Pesos

1-3-6 Maintenance Plan

The ATO is planning to create a new section for maintenance services of the training equipment to be installed under the Grant Aid Program. The ATO assured further that, since the training equipment will be composed of various systems which are equivalent to those for an international airport, the most experienced air navigation

system specialist will be assigned to the said section to be a newly created section within CATC.

1-3-7 Course Layout Plans

As presented in Table 1-1, the CATC has been offering various training courses for civil aviation personnel from the countries of South East Asia, Pacific, Africa and Middle East region as well as the ATO personnel. For the purpose of upgrading the qualification of the personnel related to air traffic controllers, airways communicators, and air navigation system specialist, the course layout of training courses will be updated and modernized in consideration of introduction of state-of-art technology in the field of air navigation systems. For example, the CATC is planning to create a new training course for introduction and implementation of satellite-based CNS/ATM in the Philippines.

In relation to the nature of the Project for Revitalization, of the CATC, attention should be focused on the training courses of the CATC for air traffic controllers, airways communicators and navigation system specialists.

There are two courses to train the air traffic controller and airways communicator. The Basic Airways Operations Specialist Course (ATC/COM) provide the students with the necessary training for being qualified as air traffic controllers and airways communicators. The students will be evaluated and designated to air traffic controller or airways communicator in consideration of aptitude and accomplishment during the training. There is another course to exclusively train the air traffic controller or airways communicator, namely Basic Air Traffic Control Course (ATC) and Basic Airways Communications course (ACOM). For Air Navigation System Specialist, the CATC offers Airways Navigation System Specialist Training Course (ANSS).

Table 1-15 Course Layout for Basic Airways Operations Specialist Course (ATC/ACOM)

	Subject	Hours	Remarks
1	Air Traffic Service	20	
2	Rules of the Air	15	
3	Principles of Flight	30	
4	Aviation Meteorology	20	
5	Basic Air Navigation	20	
6	Radio Aids to Navigation	15	
7	Aerodrome Control Procedures	15	
8	Approach Control Procedures	30	
9	Area Control Procedures	20	
10	Search and Rescue Coordination	10	
11	Aeronautical Fixed Services Procedures	160	Computer
12	Flight Service Procedures	160	Computer
13	Aeronautical Mobil Services Procedures	160	Computer
14	Radar Principles	15	
15	Radar Control Procedures	27	
16	Terminal Area Study	15	
17	Enroute Area Study	20	
18	Terminal Strip Marking and Coordination	20	
19	Enroute Strip Marking and Coordination	30	
20	ATC Exercise (Non-Radar)	50	
21	Radar Control Exercise	60	
22	Communication Exercise	20	
	Total	932	

Table 1-16 Course Layout for Basic Air Traffic Control Course (ATC)

	Subject	Hours	Remarks
(Phase I)		150	
1	Air Traffic Service	20	
2	Rules of the Air	15	
3	Aids to Navigation	15	
4	Basic Air Navigation	20	
5	Aviation Meteorology	20	
6	COMS Procedures	20	
7	Search and Rescue	10	
8	Basic Aerodynamics/Aircraft Performance	30	
(Phase II)		337	
9	Terminal Area Study	15	
10	Terminal Strip Making	30	
11	Enroute Area Study	20	
12	Enroute Strip Making	30	
13	ADC Procedures	15	VFR SIMULATOR
14	APC Procedures	30	
15	ACC Procedures	20	
16	Coordination	5	
17	Emergency	7	
18	ADC Laboratory	45	VFR SIMULATOR
19	APC Laboratory	30	
20	ACC Laboratory	40	
21	Mixed Laboratory (Review and Tests)	50	
22	Review for Licensing		
Total		487	

Table 1-17 Course Layout for Basic Airways Communication Course (ACOM)

Subject	Hours	Remarks
(Phase I)	115	
1 Rules of the Air	15	
2 Air Traffic Services	20	
3 Basic Aerodynamics	30	
4 Aviation Meteorology	20	
5 Air Navigation	20	
6 Search and Rescue	10	
(Phase II)	360	
7 Class Room Lecture		
a) Aeronautical Communication	20	Computer
b) RTF/RTG Procedures	10	Computer
8 Laboratory		
a) Teleprinter Operation	80	Computer
b) Baudot Tape Reading	10	
c) AFTN Operation Procedures	80	Computer
d) AMS Com. Procedures & Technique	80	Computer
e) FSS/ASS Procedures & Technique	80	Computer
Total	475	

Table 1-18 Course Layout for Airways Navigation System Specialist Course (ANSS)

	Subject	Hours	Remarks
1	Training Orientation	6	
2	Laboratory Orientation	6	
3	Direct Current Circuits	21	
4	Electron & Semiconductor Devices	36	
5	Alternating Current Circuits	30	
6	Power Supply Circuits	30	
7	Amplifier Circuits	90	
8	Digital Techniques	75	
9	Oscillator Circuits	45	
10	Pulse Circuits	45	
11	Transmission Lines	21	
12	Antenna System	24	
13	Modulation & Wave Propagation	15	
14	Communication System	60	
15	Nav. Aids System	60	
16	Radar System	60	
17	Computer System	60	
18	Power Plant	12	
19	Air Traffic Service	3	
20	Air Navigation System/Service	3	
21	Training Evaluation	6	
22	Graduation Day	6	
	Total	714	

2 Contents of the Project

2-1 Objective of the Project

Objective of the Project is to revitalize the CATC Manila by providing the fundamental training equipment under the Grant Aid Program of Japan.

2-2 Basic Concept of the Project

In order to comply with the requirements in the CATC for training of technical personnel of the ATO, the Government of the Philippines requested Grant Aid Assistance from Japan for implementation of the Revitalization of the Civil Aviation Training Center. In order to comply with the civil aviation personnel training requirements, The application specifies the following educational equipment to be granted by the Japanese government through the Japan International Cooperation Agency (JICA):

Secondary Surveillance Radar (SSR)	1 set
Visual Flight Rules Simulator (VFR Simulator)	1 set
Automatic Voltage Regulator	1 set

The Japanese Government sent a Basic Design Study Team for the Project on Revitalization of the CATC to the Philippines from December 8 through 19, 1996 to discuss with the ATO officials to confirm the intention and scope of the Project and to conduct a necessary on-site survey. The ATO and the Study Team agreed to include the equipment in the Study as listed in the **Table 2-1.** The Study Team performed analyses in Japan, of the necessity on each piece of equipment and its required number to be procured and installed in the CATC.

The scope of the Project was finally determined in consideration of the objectives of the Project, as presented in **Table 2-2.** Some equipment was excluded, deferred or

reduced in number from the scope of the Project due to the following reasons:

(1) Air Navigation Management System (ANMS)

Intending to improve the efficiency in training of newcomers to air navigation services and in refresher training courses of incumbent personnel and to diversify the training coverage in consideration of possible introduction of the FANS concept, installation of ANMS was requested by the ATO. Although the needs of such training system is identified, the urgency of installation of the said system is not found and the degree of improvement of training effectivity was not verified during the study. Therefore, it is so decided to defer its introduction until such time that the effectivity is verified.

(2) Educational Training Equipment (Computer)

Among the requested equipment, it is recommended that the number of computers will be reduced from 39 sets to 13 sets which is regarded as the minimum required number since the Study Team could not identify the necessity to procure those for three (3) classes at this stage.

(3) Basic Educational Equipment

The requested equipment can be procurred in the Philippines and it is believed that the cost is within the financial capability of the CATC or the ATO. So, all of the equipment under this item are excluded from those to be granted by the Japanese Government.

(4) Language Laboratory

This was not included in the list which was agreed to by the ATO and the Basic Design Study Team in December 1996. Although it is understood that the CATC

should be equipped with the language laboratory for training of air traffic controllers and airways communicators, the objective of the revitalization project will be achieved without this equipment. It was decided that the language laboratory is excluded from the scope of the Project.

2-3 Equipment to be Granted

The list of equipment to be granted by the Japanese government is as shown in Table 2-2.

It should be noted that the Air Navigation Management System will be studied further by the Team of Project Type Technical Cooperation so as to firm up the needs and necessity of the CAI system as well as to develop training programs to be adopted for the system.

Table 2-1 List of Equipment Requested by ATO

Equipment	Quantity	Priority
1 Educational SSR	1 set	A
1) Transmitter/Receiver	1 ea.	
2) Display Unit	1 ea.	
3) Control Box	1 ea.	
4) Test Equipment	1 lot	
5) UPS	1 ea.	
2 Educational VFR Simulator	1 set	A
1) Display Unit	1 ea.	
2) Data Processing System	1 ea.	
3) Training Console	3 ea.	
4) Instructor Console	1ea.	
5) Test Equipment	1 lot	
6) UPS	1ea.	
3 Educational Air Navigation Management System	1 set	A
1) Display Unit	1 ea.	
2) Data Processing System	1 ea.	
3) Training Console	3 ea.	
4) Instructor Console	1 ea.	
5) UPS	1ea.	
4 Educational Power Supply System	1set	A
1) Engine Generator	1 ea.	
(1) Engine Generator (Cut-Model)	1 ea.	
(2) Control Panel	1 ea.	
2) AVR	1 ea.	
3) UPS	1 ea.	
5 Educational D-VOR	1 set	A
1) Transmitter	1 ea.	
2) Remote Control Unit	1 ea.	
3) Monitor	1 ea.	
4) Test Equipment	1 lot	
5) UPS	1 ea.	
6 Educational DME	1 set	A
1) Transmitter/Receiver	1 ea.	
2) Remote Control Unit	1 ea.	
3) Monitor	1 ea.	
4) Test Equipment	1 lot	
5) UPS	1 ea.	
7 Educational ILS	1 set	A
1) Localizer	1 set	
(1) Transmitter	1 ea.	
(2) Remote Control Unit	1 ea.	
(3) Monitor	1 ea.	
(4) Test Equipment	1 lot	
2) Glide Slope	1set	
(1) Transmitter	1 ea.	
(2) Remote Control Unit	1 ea.	
(3) Monitor	1 ea.	
(4) Test Equipment	1 ea.	

Table 2-1 List of Equipment Requested by ATO (cont'd)

Equipment	Quantity	Priority
3) Marker	1 set	
(1) Transmitter	1 ea.	
(2) Remote Control Unit	1 ea.	
(3) Monitor	1 ea.	
(4) Test Equipment	1 lot	
4) UPS	1 ea.	
8 Basic Training Equipment	1 set	
1) Computer	1 set	B
(1) Personal Computer	39 sets	
(2) LAN System	1 lot	
2) Circuit Training Equipment	1 set	C
3) Basic Training Instrument	1 set	C
(1) Multi-tester (Digital) - Bench Type	16 pcs.	
(2) Oscillator (Dual Trace) Wide Band	8 pcs.	
(3) Cpacitor Tester	8 pcs.	
(4) IC Tester	8 pcs.	
(5) Breadboards	16 pcs.	
(6) Assorted Components (resisters, capacitors, inductors, transistors, Ics)	1 lot	
(7) Soldering Iron (25 watts)	16 pcs.	
(8) Desoldering Tool	16 pcs.	
(9) Tool Kit (screw drivers, pliers, long nose, etc., with case)	16 pcs.	
(10) Assorted Jumper Wires	1 lot	
(11) Basic Electronic Trainer Kits	16 pcs.	
(12) Advance Trainer Kits	16 pcs.	
(13) Digital Trainer Kits	16 pcs.	
(14) Audio Generators	8 pcs.	
(15) RF Generators	8 pcs.	
4) Basic Educational Equipment	1 set	C
(1) Visual Monitor	5 sets	
(2) OHP	5 sets	
(3) Copy Machine	2 sets	
(4) Video Cassette Recorder	5 sets	
(5) Audio Visual Equipment	1 set	
(6) White Board	8 sets	
9 Language Training Equipment	1 set	C

Note: Priority is expressed in alphabetical order

Table 2-2 List of Equipment to be Granted by JICA

Equipment	Quantity
1 Educational SSR	1 set
1) Transmitter/Receiver	1 ea.
2) Display Unit	1 ea.
3) Control Box	1 ea.
4) Test Equipment	1 lot
5) UPS	1 ea.
2 Educational VFR Simulator	1 set
1) Display Unit	1 ea.
2) Data Processing System	1 ea.
3) Training Console	3 ea.
4) Instructor Console	1ea.
5) Test Equipment	1 lot
6) UPS	1ea.
5 Educational Power Supply System	1set
1) Engine Generator	1 ea.
(1) Engine Generator (Cut-Model)	1 ea.
(2) Control Panel	1 ea.
2) AVR	1 ea.
3) UPS	1 ea.
6 Educational D-VOR	1 set
1) Transmitter	1 ea.
2) Remote Control Unit	1 ea.
3) Monitor	1 ea.
4) Test Equipment	1 lot
5) UPS	1 ea.
7 Educational DME	1 set
1) Transmitter/Receiver	1 ea.
2) Remote Control Unit	1 ea.
3) Monitor	1 ea.
4) Test Equipment	1 lot
5) UPS	1 ea.
8 Educational ILS	1 set
1) Localizer	1 set
(1) Transmitter	1 ea.
(2) Remote Control Unit	1 ea.
(3) Monitor	1 ea.
(4) Test Equipment	1 lot
2) Glide Slope	1set
(1) Transmitter	1 ea.
(2) Remote Control Unit	1 ea.
(3) Monitor	1 ea.
(4) Test Equipment	1 lot
3) Marker	1 set
(1) Transmitter	1 ea.
(2) Remote Control Unit	1 ea.
(3) Monitor	1 ea.
(4) Test Equipment	1 lot
4) UPS	1 ea.

Table 2-2 List of Equipment to be Granted by JICA (cont'd)

Equipment	Quantity
8 Basic Training Equipment	1 set
1) Computer	1 set
(1) Personal Computer	13 sets
(2) LAN System	1 lot
2) Circuit Training Equipment	1 set
3) Basic Training Instrument	1 set
(1) Multi-tester (Digital) - Bench Type	12 pcs.
(2) Oscillator (Dual Trace) Wide Band	6 pcs.
(3) Cpacitor Tester	6 pcs.
(4) IC Tester	6 pcs.
(5) Breadboards	12 pcs.
(6) Assorted Components (resisters, capacitors, inductors, transistors, Ics)	1 lot
(7) Soldering Iron (25 watts)	12 pcs.
(8) Desoldering Tool	12 pcs.
(9) Tool Kit (screw drivers, pliers, long nose, etc., with case)	12 pcs.
(10) Assorted Jumper Wires	1 lot
(11) Basic Electronic Trainer Kits	12 pcs.
(12) Advance Trainer Kits	12 pcs.
(13) Digital Trainer Kits	12 pcs.
(14) Audio Generators	6 pcs.
(15) RF Generators	6 pcs.

2-4 Basic Design

2-4-1 Design Concept

The CATC intends to provide the trainees with the necessary basic education in technical requirements to be airways operation specialists and to provide incumbent personnel with the necessary refresher's training course. Considering the fact that all the trainees will be in charge of operations and maintenance services of air navigation facilities after graduation form the CATC, the training equipment should be compatible with those which are actually in operation at various sites. The specifications of training equipment shall be determined in consideration of those in service and also worldwide trends in terms of specifications and performance.

2-4-2 Basic Design

(1) Number of Equipment

The number of equipment to be provided and installed at CATC under the Grant Aid Assistance should be referred to **Table 2-1.**

(2) Composition of Equipment

(a) Educational SSR

In accordance with the ATO's plan to upgrade the radar system in Manila FIR, mono-pulse type of SSR is selected. Contrary to the systems in service, this educational equipment is a single unit of each component without backup units. Composition of the system is as follows:

Transmitter/Receiver

- Monitor/Control Unit

- Radar Display
- Dummy Antenna
- UPS

(b) VFR Simulator

- Trainee's Console
  - Aerodrome Control Position
  - Ground Control Position
  - Auxiliary Position
- Instructor's Console
- Pilot Console
- Display Units
- Data Processing Unit
- UPS

(c) Air Navigation Management System

- Instructor's Terminal
- Trainee's Terminal
- Server
- Programming Terminal
- Printers
- LAN

(d) Educational Power Supply System

- Engine Generator (Cut-model)
- Automatic Voltage Regulator
- UPS

(e) Educational VOR

Single system with the following component:

- Transmitter
- Monitor/Control Unit
- Dummy Antenna
- UPS

(f) Educational DME

A single system with the following component:

- Transponder
- Monitor/Control Unit
- Dummy Antenna
- UPS

(g) Educational ILS

Single system with the following component

- Localizer
- Glide Slope
- Marker
- Monitor/Control Unit
- Dummy Antenna
- UPS

(h) Basic Training Equipment

Please refer to **Table 2-2.**

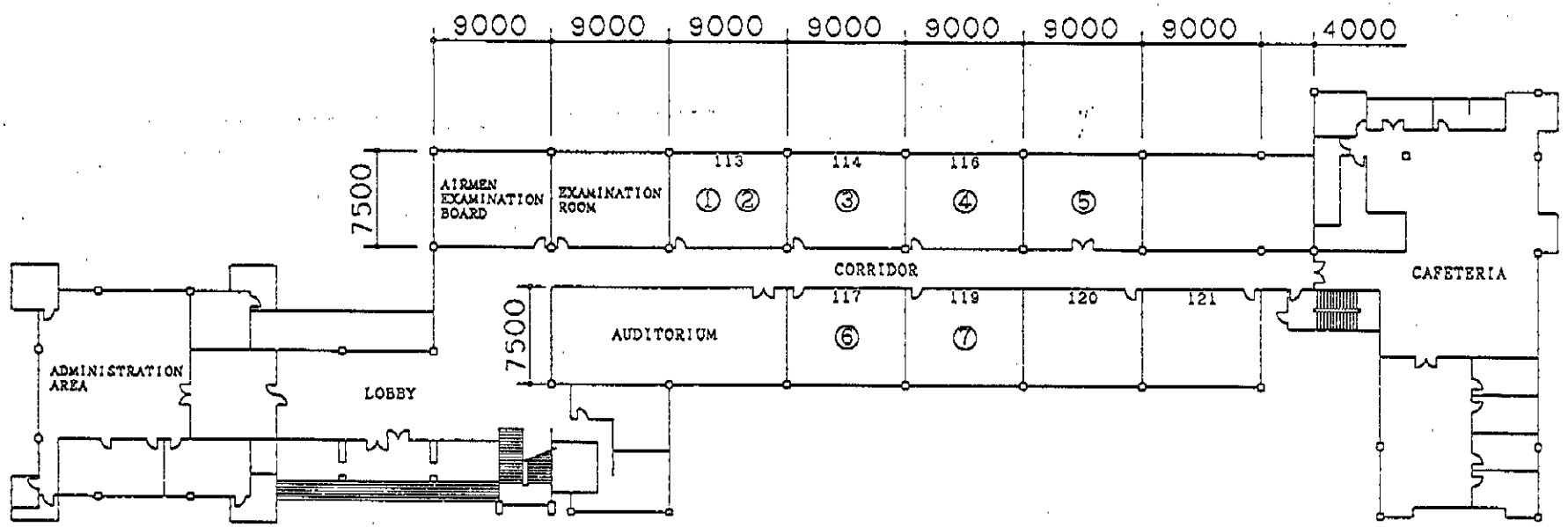
(3) Equipment Installation Plan

The equipment will be installed in the classroom or laboratory of the existing CATC as shown in **Figure 2-1.** The rooms selected to install the equipment are all on the ground floor because of the following reasons:

- Strength of structure of second floor could not be confirmed since no as-built drawing of existing building are available.
- There was water leakage on the second floor.
- It is easier to carry the equipment to the ground floor than to the second floor.
- Existing laboratories are located on the ground floor.

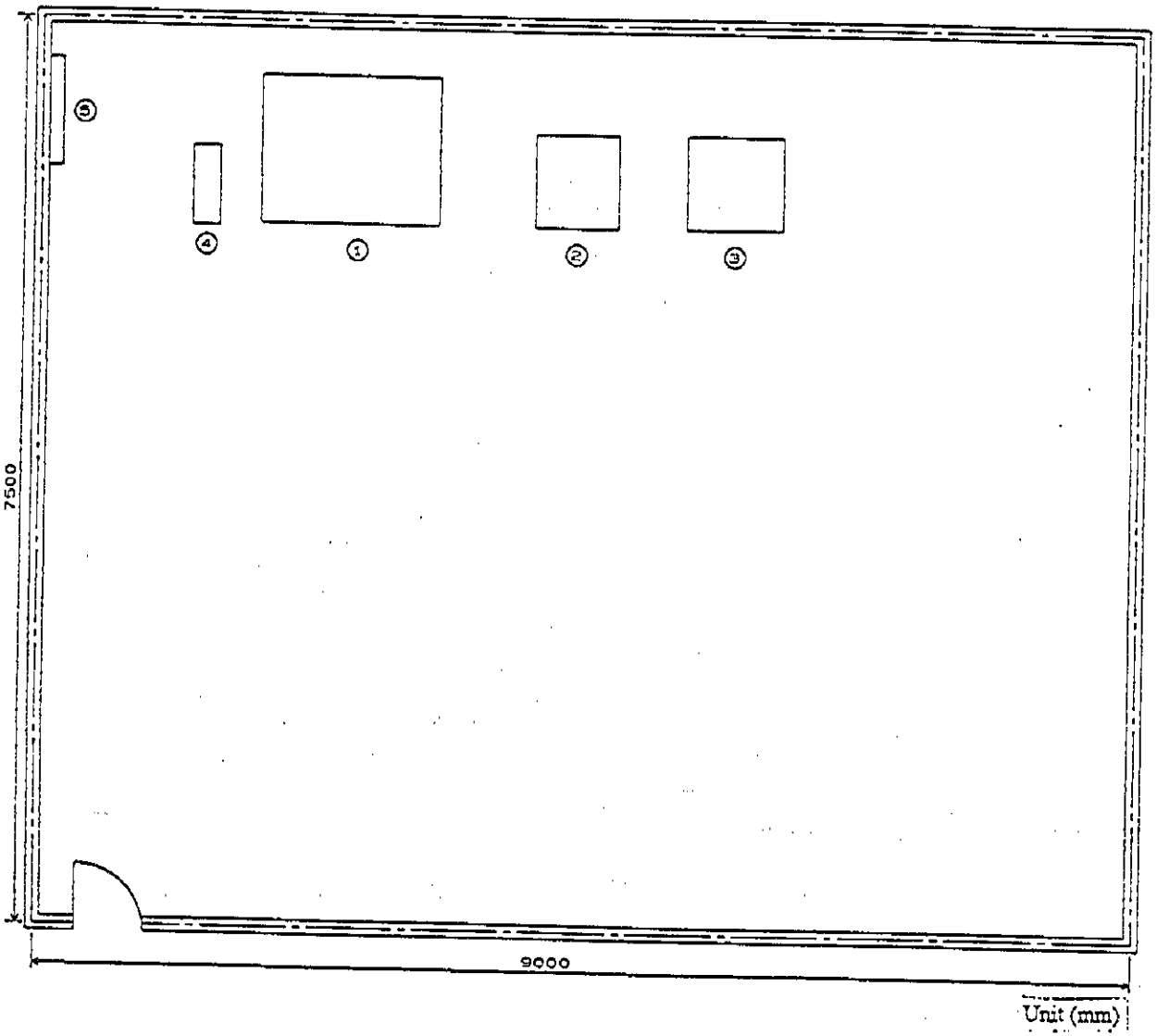
Special attention should be paid to the lightning protection and to unreliable commercial power.

(4) Layout plans of each training equipment are shown in **Figure 2-2** through **Figure 2-7.**



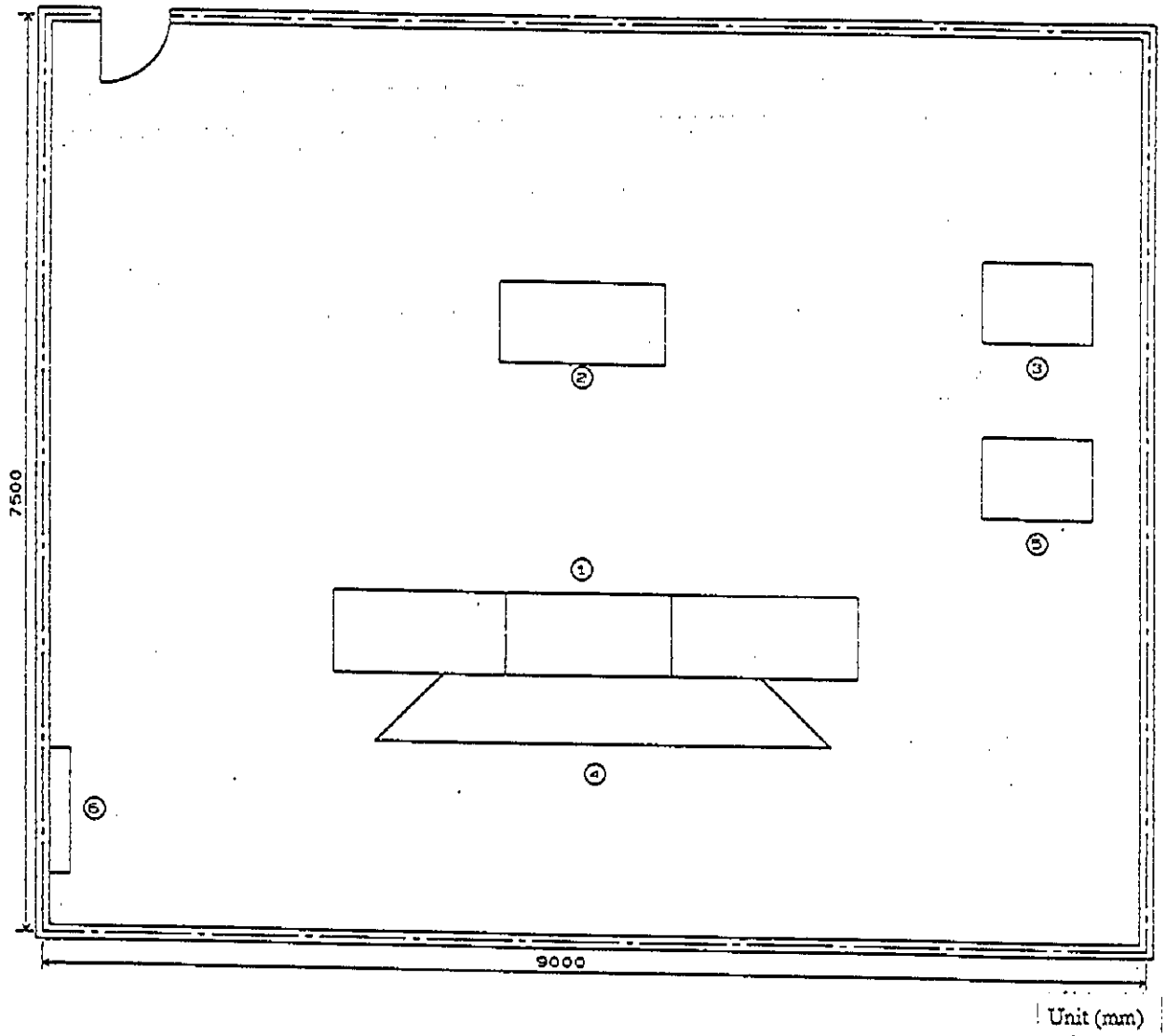
No.	Equipment	No.	Equipment
①	VOR Equipment	⑥	VFR Simulator
②	DME Equipment	⑦	Basic Training Equipment (Computer)
③	ILS Equipment		
④	SSR Equipment		
⑤	Power Supply Equipment		

Figure 2-1 Proposed Location of Equipment



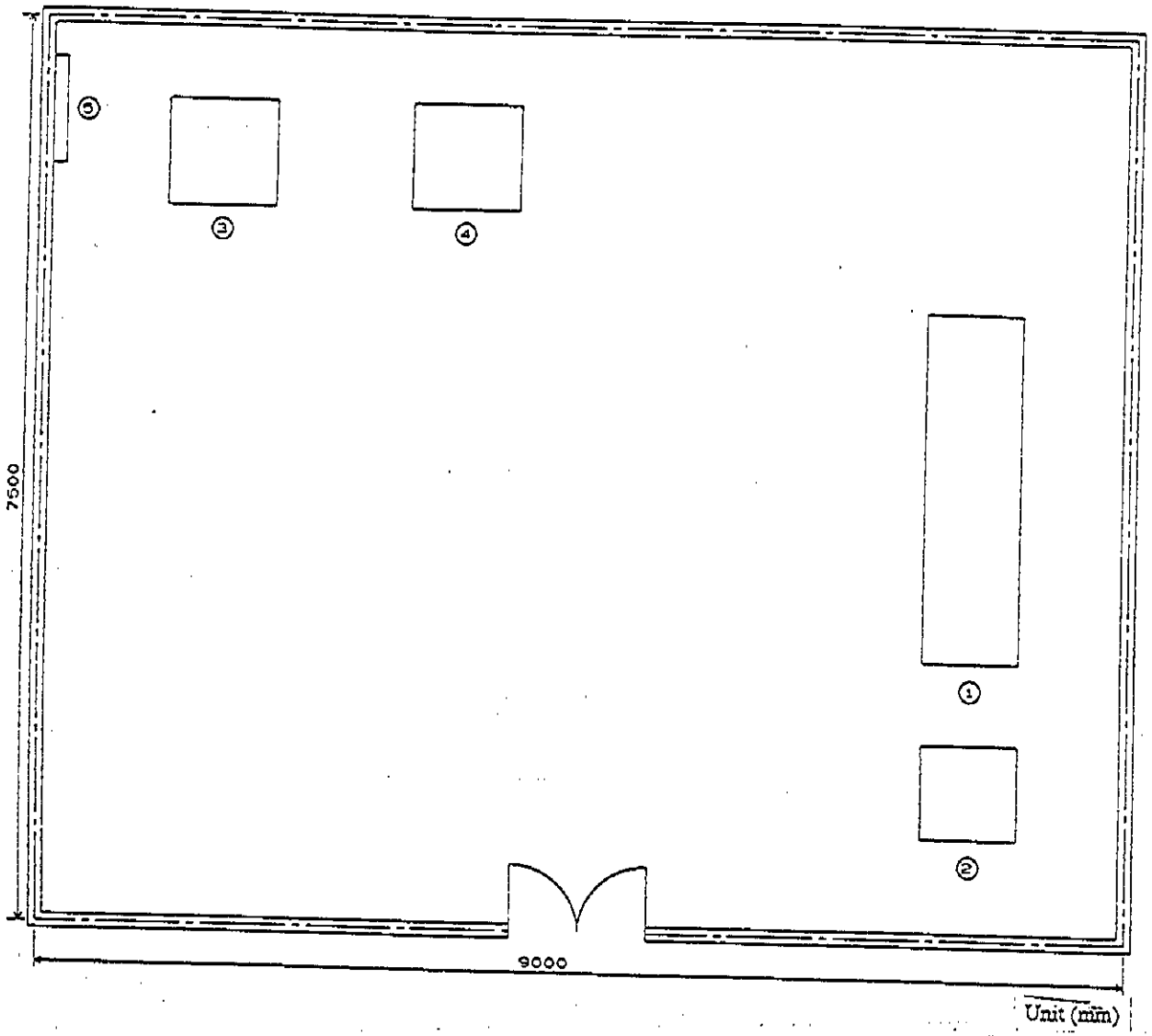
No.	EQUIPMENT
1	SSR Tx / Rx
2	Remote Control Panel
3	Display Unit
4	UPS
5	Power Distribution Panel

Figure 2-2 SSR Equipment Layout Plan



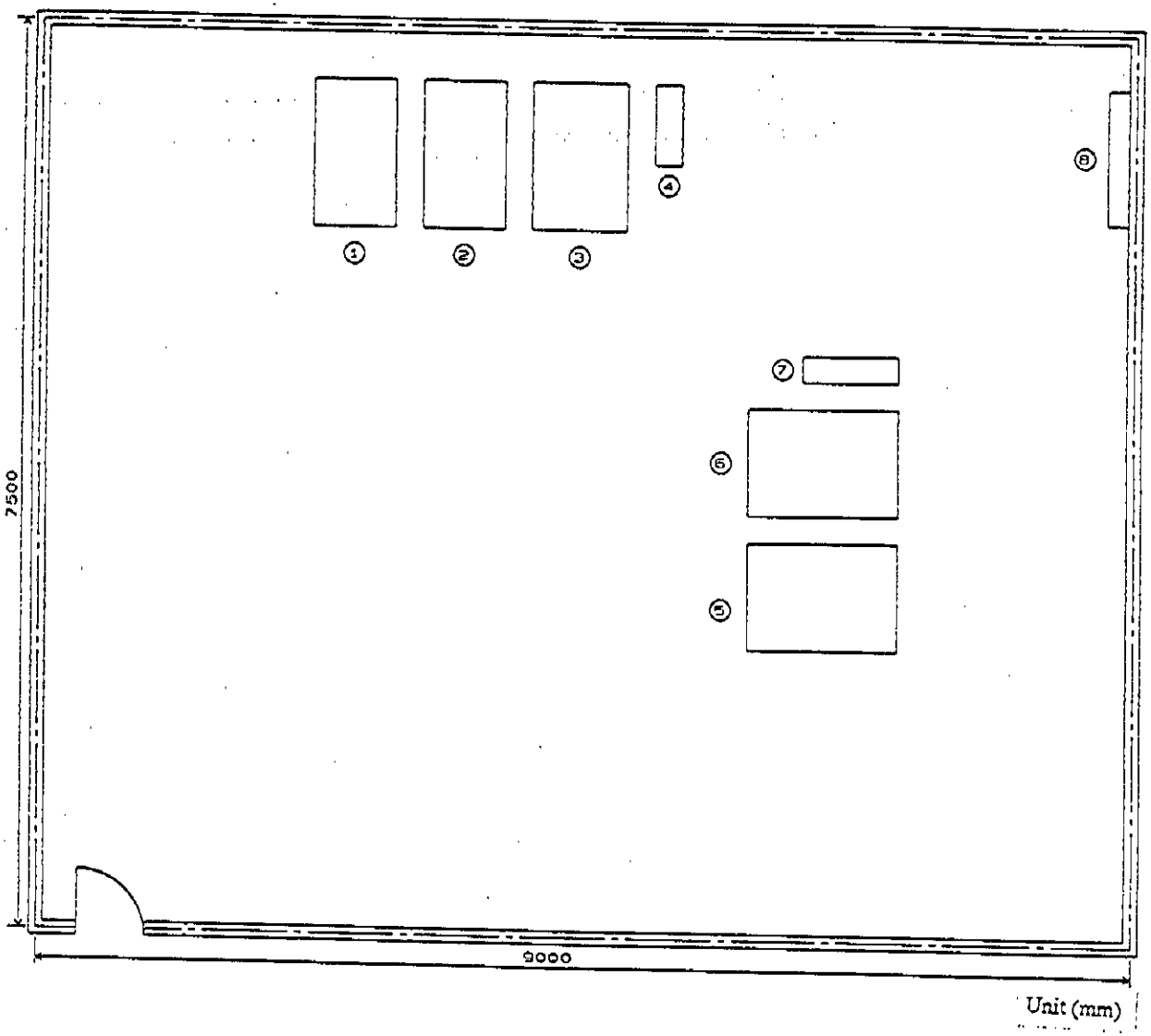
No.	EQUIPMENT
1	Trainees' Consoles
2	Instructor's Console
3	UPS
4	Display units
5	Data Processing Unit
6	Power Distribution Panel

Figure 2-3 VFR Simulator Layout Plan



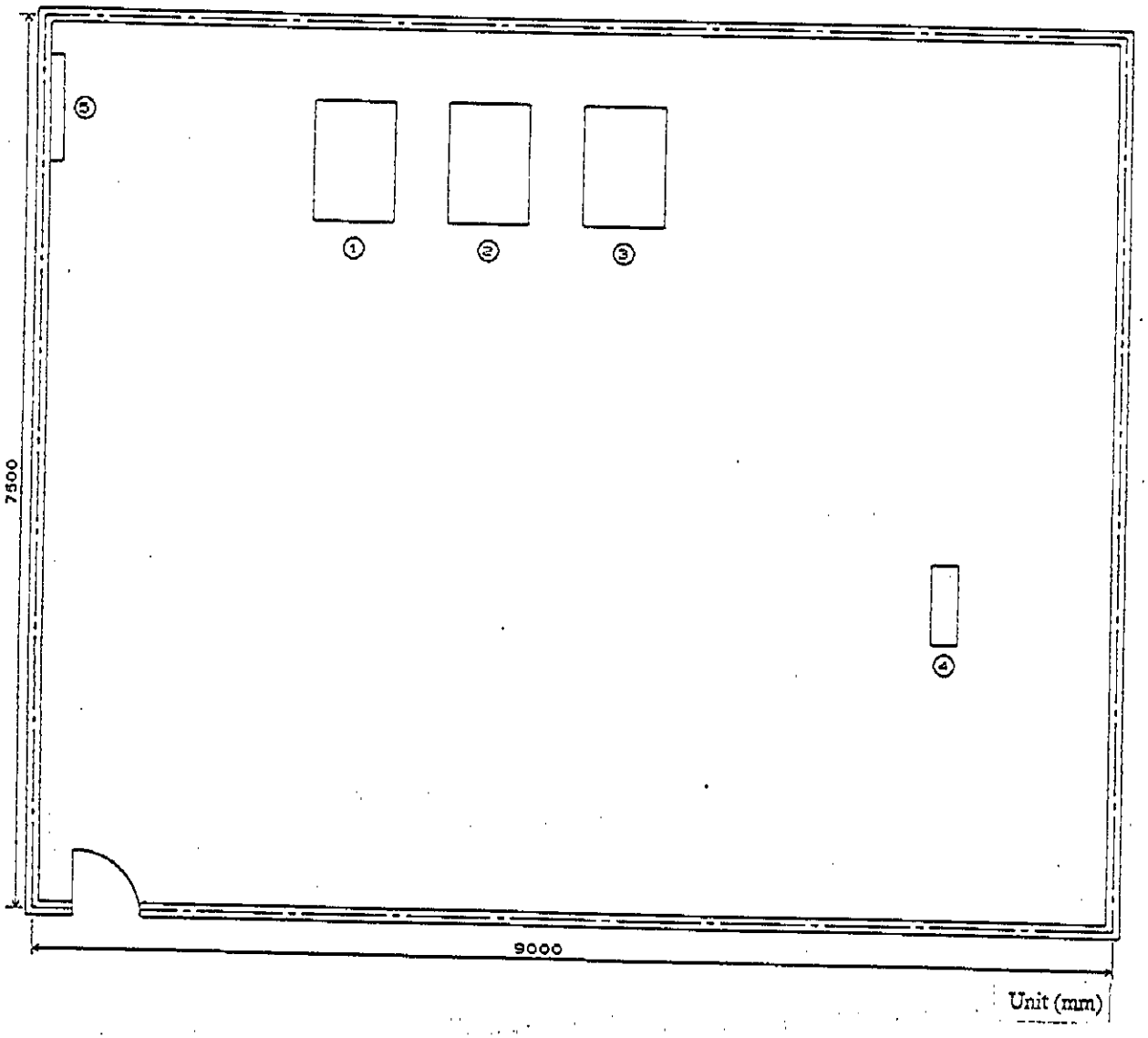
No.	EQUIPMENT
1	Engine Generator (Cut Model)
2	Engine Control Unit
3	AVR
4	UPS
5	Power Distribution Panel

Figure 2-4 Power Supply System Layout Plan



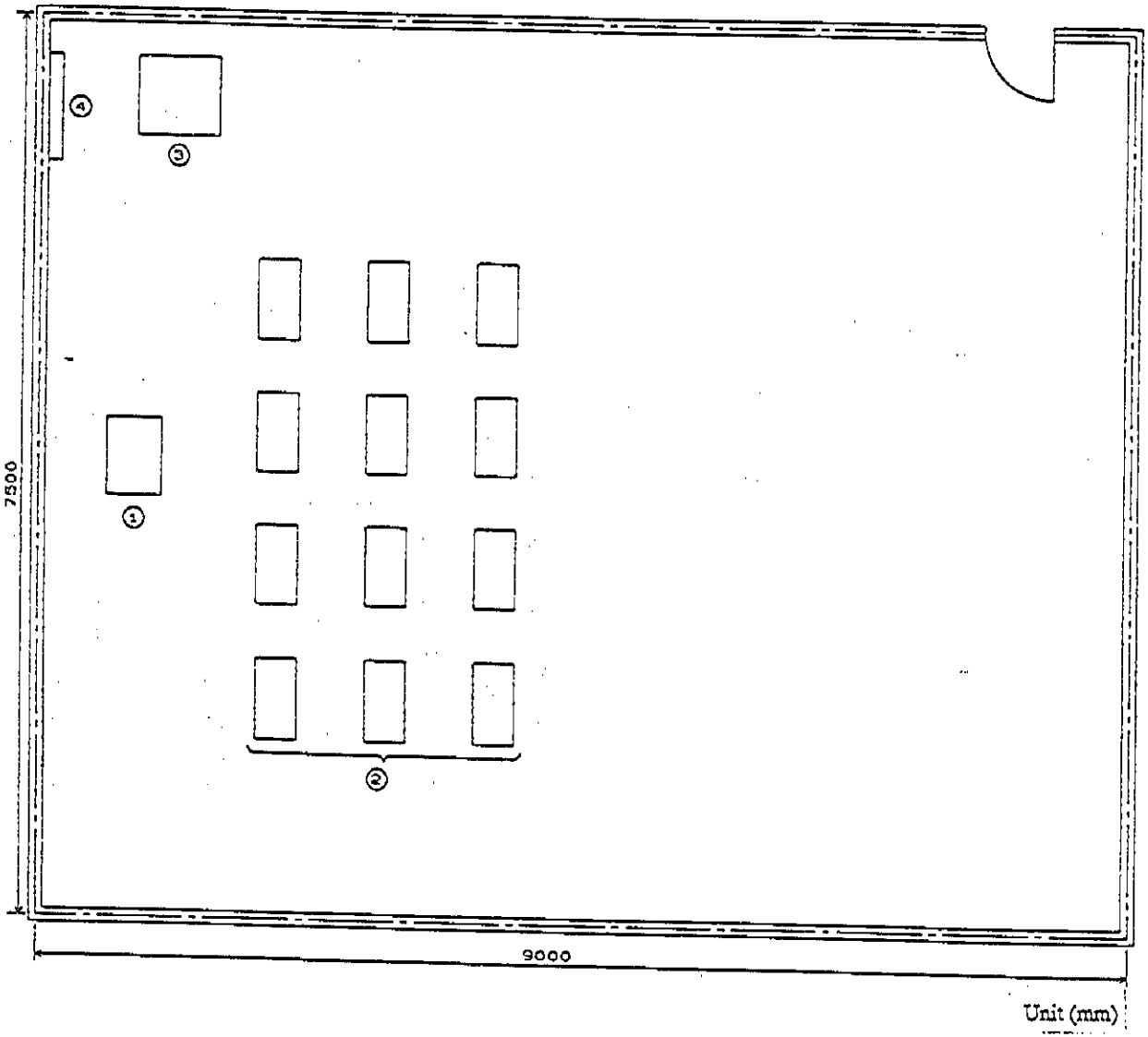
No.	EQUIPMENT
1	D-VORTransmitter
2	D-VOR Remote Control Unit
3	Monitor
4	UPS for D-VOR
5	DME Transmitter
6	DME Remote Control Unit
7	UPS for DME
8	Power Distribution Panel

Figure 2-5 D-VOR/DME Equipment Layout Plan



No.	EQUIPMENT
1	ILS Localizer
2	ILS Glide Path
3	ILS Marker
4	Monitor Control Unit
5	Power Distribution Panel

Figure 2-6 ILS Equipment Layout Plan



No.	EQUIPMENT
1	Instructor's Desk
2	Trainees' Desks
3	UPS
4	Power Distribution Panel

Figure 2-7 Basic Training Equipment Layout Plan

(5) Facility Rehabilitation Planning

In order to enable the installation of equipment and to improve the training environment, the following rehabilitation of the CATC building is required:

(a) For rooms of SSR, VOR, DME, and ILS equipment;

- Installation of blinds to windows
- Making holes on the wall for cabling
- Repainting of walls

(b) VFR Simulator

- Modifications of lighting and switches
- Installation of blinds and curtains to windows
- Making holes on the wall for cabling
- Repainting of walls
- Installation of air-conditioners

(c) Power Supply System

- Installation of blinds to windows
- Making holes on the wall for cabling
- Repainting of walls
- Installation of partition wall to storage room
- Installation of air-conditioners

(d) Computers

- Installation of blinds to windows
- Making hole on the wall for cabling

- Repainting of walls
- Installation of air-conditioners

(e) Others

- Improvement of lavatory
- Improvement of water pipes

The cost for facility rehabilitation as indicated above should be shouldered by the ATO.

(6) Outline Specifications of Equipment

Outline specifications of equipment are as follows:

(a) Common requirements

- All the equipment shall be designed to protect itself from any mistake in manipulation.
- To be equipped with functions of Dummy Load and Test Signal Generator
- To be equipped with Test Points for signal monitoring
- Provision of false printed circuit boards for simulated failure

(b) Educational Secondary Surveillance Radar (SSR)

The SSR equipment shall be all solid state monopulse SSR(MSSR)which conforms to the requirements of ICAO Annex 10.

1) Composition

Transmitter/Receiver	1 ea.
Display Unit	1 ea.
Local Control Unit(Control Box)	1 ea.
Uninterruptible Power Supply Equipment(UPS)	1 ea.
Test Equipment	1 lot

2) Function

Interrogation Frequency	: 1030±0.2MHz
Receiving Frequency	: 1090±3MHz
Interrogation Modes	: A.C
Mode Interlace	: 2 or 3 modes
Receiver Bandwidth	: 8MHz
Tangential MDS	: -87dbm
Output Power	: 1.5kw(peak)
Simulated Targets	: Plural

(c) Educational VFR Simulator

1) Composition

Display Unit	1 ea.
Data Processing System	1 ea.
Training Console	3 ea.
Instructor Console	1 ea.
Test Equipment	1 lot
UPS	1 ea.

2) Function

Training Position	: 3 position
Display Screen	: 67inch min ×3face
Field of View	: 180° (H)×60° (V)
Resolution	: 1024×1280 pixels
Color	: 256 color
Display Control	: 16
Aircraft Model	: 20 models (including vehicles)
Aerodrome Numbers	: 2 airport (NAIA,MACTAN)
Background	: day/dusk/night
Weather	: fine/cloudy/rain/foggy
Training Area	: 30NM/0 to 10000ft
Training Scenario	: approach/departure/ground control
Digital Recorder	: magnet optical (MO) disk type

(d) Educational Power Supply System

1) Composition

Engine Generator	1set
(1) Engine Generator (Cut-Model)	1ea.
(2) Control Panel	1ea.
Automatic Voltage Regulator(AVR)	1ea.
Uninterruptible Power Supply Equipment(UPS)	1ea.

(e) Function

1) Engine Generator

Type	: open type (cut-model)

Phase	: single phase
Rated Output Power	: 15KVA
Rated Voltage	: AC220V
Frequency	: 60Hz
Engine	: 4-cycle,vertical and water-cooled

2) AVR

Rating	: continuous duty
cooling	: forced air cooling
AC Input:	
- Phase	: three phase
- Rated Voltage	: AC220V
-Voltage Fluctuation Range	: within 220V -15% to +10%
-Rated Frequency	: 60Hz
-Frequency Fluctuation Range	: within 58 to 61Hz
AC Output:	
- Phase	: three phase
- Rated Voltage	: AC220V
-Voltage Regulation Range	: within 220V $\pm$1%
-Rated Output Power	: 30KVA
-Rated Frequency	: 60Hz

3) UPS

Rating	: continuous duty
Conversion	: full wave rectification
Inversion	: transistor bridge

Cooling	: forced air cooling
AC Input:	
- Phase	: three phase
- Rated Voltage	: AC220V
- Rated Frequency	: 60Hz
AC Output	
- Phase	: three phase
- Rated Voltage	: AC220V
- Voltage Accuracy	: within 220V±2%
- Rated Output Power	: 30KVA
- Rated Frequency	: 60Hz
- Battery Type	: alkaline battery

(f) Educational Doppler VHF Omni-directional Radio Range (D-VOR)

The VOR equipment shall be all solid state Doppler VOR(D-VOR) type which conforms to the requirements of ICAO Annex 10.

1) Composition

Transmitter	1 ea.
Remote Control Unit	1 ea.
Monitor	1 ea.
Test Equipment	1 lot
UPS	1 ea.

2) Function

Frequency Range	: 108 to 118MHz
Frequency Tolerance	: $\pm 2 \times 10^{-5}$

Carrier Transmitter

- Output Power	: 100W(transmitter output)
- Spurious Radiation	: less than -60Db
- Modulation Frequency:	
Reference Phase	: 30Hz±0.2%
Identification	: 1020Hz±50Hz
Modulation Depth:	
Reference Phase	: 30Hz±0.2% mean
Identification	: 0 to 25% adjustable
Modulation Linearity	: linear up to 70%
Distortion	: less than 5%
S/N Ratio	: more than 40dB at 30% modulation

Side band Transmitter

Spacing	: ±9960Hz from carrier
Frequency Tolerance	: ±0.01% referred to 9960Hz
Phase Control	: ±7° referred to 9960Hz

Spurious Radiation: less than -60dB

(g) Educational Distance Measuring Equipment (DME)

The DME equipment shall be all solid state DME which conforms to the requirements of ICAO Annex 10.

1) Composition

Transmitter / Receiver	1 ea.
Remote Control Unit	1 ea.
Monitor	1 ea.
Test Equipment	3 lot
UPS	1 ea.

2) Function

Transmitter

-Frequency Range	: 960 to 1215MHz
-Frequency Stability	: ± 0.002%
-Capacity	: 100 aircraft
-Output Power	: nominal 1KW(peak)
-Pulse Count	: 700pps to 2700pps±90pps
-Pulse Width	: 3.5 μs ± 0.5 μs
-Spurious Radiation	: 85dB or more
-Pulse Power Variation	: less than 1dB
-Accuracy	: ± 1 μs

Receiver

- Frequency Range	: 1025 to 1150MHz
- Frequency Stability	: ± 0.002%
- Triggering Level	: 70% replies at -125dBW (-95dBm)
- Band Width	: 85dB or less
- Blanking Time	: 50 μs to 150 μs / 60 μs ±1 μs

- Delay Time :(X mode)50 μ s±0.5 μ s
: (Y mode)56 μ s±0.5 μ s

(h) Educational Instrument Landing System (ILS)

The ILS equipment shall be all solid state type which conforms to the requirements of ICAO Annex 10.

1) Composition

<u>Localizer Equipment</u>	1set
- Transmitter	1 ea.
- Remote Control Unit	1 ea.
- Monitor	1 ea.
- Test Equipment	1 lot
<u>Glide Path Equipment</u>	1 set
- Transmitter	1 ea.
- Remote Control Unit	1 ea.
- Monitor	1 ea.
- Test Equipment	1 lot
<u>Marker Beacon Equipment</u>	1 set
- Transmitter	1 ea.
- Remote Control Unit	1 ea.
- Monitor	1 ea.
- Test Equipment	1 lot.

UPS 1ea

2) Function

Localizer Equipment

Frequency Range	:108 to 112MHz
Frequency Stability	:±0.001%
Nominal Output Power	:15W
Carrier Modulation:	
- Frequency	:90Hz±1%,150Hz±1%
- Depth	:18% to 22%
- Total Harmonic Content	:less than 5%
- Phase Lock	: 3° max.
Spurious Emission	: more than 60dB

Glide Path Equipment

Frequency Range	: 328.6 to 335.4MHz
Frequency Stability	: ±0.001%
Nominal Output Power	: (DIR)5W,(CL)0.5W
Carrier Power Ratio	: 10dB or more
Carrier Modulation:	
- Frequency	: (DIR)90Hz±1%,150Hz±1%
	(CL)150Hz±1%
-Depth	: (DIR)37.5% to 42.5%
	(CL)75% to 95%
-Total Harmonic Content	: less than 5%
-Phase Lock	: 3° max.
Spurious Emission	: more than 60dB

Marker Beacon Equipment

Frequency Range	: 75MHz
Frequency Stability	: ±0.005%
Nominal Output Power	:(IM)1W,(MM)1W,(OM)3W
Modulation:	
-Frequency	: (IM)3000Hz±1Hz
	(MM)1300Hz±1Hz
	(OM)400Hz±1Hz
-Depth	: 95%±4%
Spurious Emission	: more than 60dB

Remote Control and Monitoring System

Remote Control and Status Unit

-Status Indication

-Control

Monitor Indicator Unit

-Status Indication

Remote Maintenance Monitor

-Status Indication

-Control

-Measurement

-Diagnostics

-Logging

(i) Basic Training Equipment

1) Composition

Computer 1set

(1) Personal Computer	13sets
(2) LAN System	1 lot
Circuit Training Equipment	1set
Basic Training Instrument	1set
Multi-tester(Digital)Bench Type	12pcs.
Oscillator (Dual Trace) Wide Band	6pcs.
Capacitor Tester	6pcs.
IC Tester	6pcs.
Breadboards	12pcs.
Assorted Components	1 lot
(resisters, capacitors, inductors, transistors, ICs)	
Soldering Iron(25watts)	12pcs.
Disordering Tool	12pcs.
Tool Kit	12pcs.
(screw drivers, pliers, long nose, etc. with case)	
Assorted Jumper Wires	1 lot
Basic Electronic Trainer Kits	12pcs.
Advance Trainer Kits	12pcs.
Digital Trainer Kits	12pcs.
Audio Generator	6pcs.
RF Generator	6pcs.