This POM is approved by the Authority

B747

No.	
Team	

POM

(Pilot Operations Manual)

ASIANA AIRLINES

경제혁신 3개년 계획, "3년의 혁신, 30년의 성장"

국토교통부

국 토 교 통 부

수신 아시아나항공(주) 사장
(경유)
제목 아시아나항공 운항규정(POM) 변경 신고수리 알림

1. 아시아나 운표 제16-15호(2016.9.22)호의 관련입니다.

2. 귀 사에서 신고한 운항규정(POM)에 대하여 검토한 결과, 기준에 적합하여 「항공법」 제116조 및 같은 법 시행규칙 제282조에 따라 붙임과 같이 수리하였음을 알려드립니다.

붙임 : 검토결과서(POM) 각 1부. 끝.

국토교통부장관

국토교통부장관인

주무관 김인곤 항공사무관 황재갑 과장 전결 2016. 9. 30. 강승호

협조자

시행 항공운항과-2525 (2016. 9. 30.) 접수

우 30103 세종특별자치시 도움6로 11 국토교통부 항공정책실 운항안전과 (5동 640호) / http://www.molit.go.kr

전화번호 044-201-4269 팩스번호 044-201-5629 / wings@molit.go.kr / 비공개(5,7)

Contents

Record of Revision (B747)

R.Number	Revision Date	Insert Date	Inserted By	Remark
1	2007.11.01			Refer to Application
2	2008.09.22			Refer to Application
3	2009.10.01			Refer to Application
4	2010.01.01			Refer to Application
5	2010.06.22			Refer to Application
6	2011.02.25			Refer to Application
7	2011.09.23			Refer to Application
8	2012.03.13			Refer to Application
9	2012.06.22			Refer to Application
10	2012.12.31			Refer to Application
11	2013.07.04			Refer to Application
12	2014.04.18			Refer to Application
13	2014.07.18			Refer to Application
14	2014.10.17			Refer to Application
15	2015.06.25			Refer to Application
16	2016.09.30			Refer to Application
17				
18				
19				
20				

Intentionally

Blank

B747 POM Application

In charge of	Flight Crew Evaluation	Reg	Classification No	OIA806
Authority	President		Date	2007.07.12
Effective Date	2007.07.12	Declaration Date		2007.07.12

Rev No	Date	Contents of the Change	etc
Rev.0	2007.07.12	Establishment (publication delay by correction items by Authority)	
Rev.1	2007.11.01	Entire Revision from FHB (Flight Hand Book) to POM - Restructure Chapters and Complement procedures - Change numbering system - Contain important items from FCOM 3 - Item transfer from FOM to POM	
Rev.2	2008.09.22	Contain revised items from FOM - Chapter 3 CAT-II Weather Minima	
Rev.3	2009.10.01	Entire Revision - Reformat the Chapters - Renumbering - Delete bulletin & Ch.5 Limitations	
Rev.4	2010.01.01	Revision of RVR Table for CAT-II/III Landing Minima	
Rev.5	2010.06.22	Revision to terms (First officer → Co-pilot) Clarify the duty of captain/co-pilot and PF/PM for each flight phase Correction of final decision to land and callout procedures Time to change company to emergency frequency	
Rev.6	2011.02.25	Add provision regarding administer of Bulletins Adjust final checking procedure to prevent mistaking of runways	
Rev.7	2011.09.23	Delete duplicate contents with FOM Correction by Operations Standardization Committee	
Rev.8	2012.03.13	Deletion of CAT-II Manual landing Correction of Standard Callouts Add provisions regarding Iridium SATCOM	
Rev.9	2012.06.22	Raised Taxi speed of ICN R7/R8 Changed Stabilized Approach standard Changed CAT-IIIb Lowest RVR to 75m Changed procedures of FOM and FCOM, etc.	

Rev No	Date	Contents of the Change	etc
Rev.10	2012.12.31	Established Chapter 9 'Cargo' Correction by Operations Standardization Committee Contains items from FCOM, FCTM	
Rev.11	2013.07.04	Wind Limitation change (30 knots, gust included) Addition of 'Engine Cross Bleed Start Procedure' Addition of provisions for W&B manifest confirmation by ACARS Addition of provisions for 'Use of Lights' Recommendations of Line Audit items, etc.	
Rev.12	2014.04.18	Standardization of numbering and revised items for Boeing Aircraft types Changed procedures of Visual Approach Contains revised text of POM Bulletin(Regarding changed procedures of CAT-IIIb as of 2013.12.24) Revised form of Weight and Balance Manifest	
Rev.13	2014.07.18	The following items of implementation for improvement order from MOLIT special audit(introduction of TEM CARD) Reflect items decided by the committee of Flight Crew Quality Assurance in the 1st Q of 2014(WX Radar operational procedure) The loading procedure of security box inside the cockpit of B747F, B767F(IOSA Finding) Add information of ground equipment for approaching CAT-II/III	
Rev.14	2014.10.17	Change the policy of Automation Policy, Stabilized Approach, Go-around and Standard Callout	
Rev.15	2015.06.25	Revision concerning; - corrective action recommendation of 2014 line audit (briefing items, timing of approach signal, etc.) - resolutions of standardization committee (TEM card, standard callouts, etc.) - application of EDTO - rolling standing takeoff establishment, etc.	
Rev.16	2016.09.30	Standard Callout & Response Procedures Change	

Effective Page List - 1

Page	RevNo	Date	Page	RevNo	Date	Page	RevNo	Date
Record of Revision			Chapter.1			Chapter.2		
A-1	16	2016.09.30	General			Supplementary NP		
A-2	15	2015.06.25	1-I	3	2009.10.01	2-I	15	2015.06.25
Application			1-II	6	2011.02.25	2-II	10	2012.12.31
B-1	15	2015.06.25	1-1	10	2012.12.31	2-III	11	2013.07.04
B-2	16	2016.09.30	1-2	10	2012.12.31	2-IV	15	2015.06.25
Effective Page List			1-3	10	2012.12.31	2-V	15	2015.06.25
C-1	16	2016.09.30	1-4	6	2011.02.25	2-VI	5	2010.06.22
C-2	15	2015.06.25	1-5	3	2009.10.01	2-VII	7	2011.09.23
C-3	16	2016.09.30	1-6	3	2009.10.01	2-VIII	5	2010.06.22
C-4	16	2016.09.30	1-7	3	2009.10.01	2-IX	14	2014.11.01
C-5	15	2015.06.25	1-8	6	2011.02.25	2-X	5	2010.06.22
C-6	15	2015.06.25	1-9	10	2012.12.31	2-XI	12	2014.04.18
			1-10	3	2009.10.01	2-XII	12	2014.04.18
			1-11	10	2012.12.31	2-XIII	12	2014.04.18
			1-12	6	2011.02.25	2-XIV	16	2016.09.30
			1-13	3	2009.10.01	2-XV	16	2016.09.30
			1-14	3	2009.10.01	2-XVI	5	2010.06.22
						2-1	11	2013.07.04
						2-2	5	2010.06.22
						2-3	5	2010.06.22
						2-4	8	2012.03.13
						2-5	9	2012.06.22
						2-6	9	2012.06.22
						2-7	14	2014.11.01
						2-8	15	2015.06.25
						2-9	15	2015.06.25
						2-10	15	2015.06.25
						2-11	15	2015.06.25
						2-12	15	2015.06.25
						2-12a		DELETED
						2-12b		DELETED
						2-13	11	2013.07.04
						2-14	7	2011.09.23
						2-15	7	2011.09.23
						2-16	7	2011.09.23
						2-17	5	2010.06.22
						2-18	7	2011.09.23
						2-19	15	2015.06.25
						2-20	10	2012.12.31
						2-21	6	2011.02.25
						2-22	11	2013.07.04
						2-23	15	2015.06.25
						2-24	7	2011.09.23
						2-25	10	2012.12.31
						2-26	7	2011.09.23
						2-27	7	2011.09.23

Effective Page List – 2

Page	RevNo	Date	Page	RevNo	Date	Page	RevNo	Date
2-28	7	2011.09.23	2-75	10	2012.12.31	2-122	10	2012.12.31
2-29	7	2011.09.23	2-76	11	2013.07.04	2-123	5	2010.06.22
2-30	7	2011.09.23	2-77	5	2010.06.22	2-124	5	2010.06.22
2-31	8	2012.03.13	2-78	11	2013.07.04	2-125	8	2012.03.13
2-32	5	2010.06.22	2-79	11	2013.07.04	2-126	5	2010.06.22
2-33	10	2012.12.31	2-80	8	2012.03.13	2-127	14	2014.11.01
2-34	10	2012.12.31	2-81	5	2010.06.22	2-128	5	2010.06.22
2-35	15	2015.06.25	2-82	10	2012.12.31	2-129	9	2012.06.22
2-36	15	2015.06.25	2-83	11	2013.07.04	2-130	15	2015.06.25
2-37	6	2011.02.25	2-84	5	2010.06.22	2-131	15	2015.06.25
2-38	8	2012.03.13	2-85	10	2012.12.31	2-132	15	2015.06.25
2-39	7	2011.09.23	2-86	6	2011.02.25	2-133	15	2015.06.25
2-40	5	2010.06.22	2-87	10	2012.12.31	2-134	15	2015.06.25
2-41	5	2010.06.22	2-88	9	2012.06.22	2-135	15	2015.06.25
2-42	7	2011.09.23	2-89	10	2012.12.31	2-135a	15	2015.06.25
2-43	10	2012.12.31	2-90	5	2010.06.22	2-135b	15	2015.06.25
2-44	7	2011.09.23	2-91	9	2012.06.22	2-136	9	2012.06.22
2-45	10	2012.12.31	2-92	10	2012.12.31	2-137	9	2012.06.22
2-46	11	2013.07.04	2-93	5	2010.06.22	2-138	5	2010.06.22
2-47	5	2010.06.22	2-94	7	2011.09.23	2-139	5	2010.06.22
2-48	7	2011.09.23	2-95	10	2012.12.31	2-140	10	2012.12.31
2-49	6	2011.02.25	2-96	5	2010.06.22	2-141	5	2010.06.22
2-50	5	2010.06.22	2-97	5	2010.06.22	2-142	15	2015.06.25
2-51	15	2015.06.25	2-98	15	2015.06.25	2-143	15	2015.06.25
2-52	15	2015.06.25	2-99	5	2010.06.22	2-144	15	2015.06.25
2-53	15	2015.06.25	2-100	5	2010.06.22	2-145	14	2014.11.01
2-54	15	2015.06.25	2-101	15	2015.06.25	2-146	14	2014.11.01
2-55	7	2011.09.23	2-102	15	2015.06.25	2-147	5	2010.06.22
2-56	7	2011.09.23	2-103	5	2010.06.22	2-148	9	2012.06.22
2-57	15	2015.06.25	2-104	5	2010.06.22	2-149	5	2010.06.22
2-58	11	2013.07.04	2-105	5	2010.06.22	2-150	15	2015.06.25
2-59	5	2010.06.22	2-106	7	2011.09.23	2-151	14	2014.11.01
2-60	7	2011.09.23	2-107	10	2012.12.31	2-152	5	2010.06.22
2-61	7	2011.09.23	2-108	7	2011.09.23	2-153	5	2010.06.22
2-62	11	2013.07.04	2-109	5	2010.06.22	2-154	5	2010.06.22
2-63	12	2014.04.18	2-110	7	2011.09.23	2-155	5	2010.06.22
2-64	7	2011.09.23	2-111	5	2010.06.22	2-156	5	2010.06.22
2-65	15	2015.06.25	2-112	5	2010.06.22	2-157	5	2010.06.22
2-66	15	2015.06.25	2-113	7	2011.09.23	2-158	5	2010.06.22
2-67	15	2015.06.25	2-114	5	2010.06.22	2-159	5	2010.06.22
2-68	14	2014.11.01	2-115	14	2014.11.01	2-160	5	2010.06.22
2-69	15	2015.06.25	2-116	14	2014.11.01	2-161	5	2010.06.22
2-70	15	2015.06.25	2-117	7	2011.09.23	2-162	5	2010.06.22
2-71	15	2015.06.25	2-118	7	2011.09.23	2-163	12	2014.04.18
2-72	15	2015.06.25	2-119	15	2015.06.25	2-164	5	2010.06.22
2-73	7	2011.09.23	2-120	15	2015.06.25	2-165	12	2014.04.18
2-74	5	2010.06.22	2-121	5	2010.06.22	2-166	12	2014.04.18

Effective Page List – 3

Page	RevNo	Date	Page	RevNo	Date	Page	RevNo	Date
2-167	12	2014.04.18	2-214	12	2014.04.18	Chapter.3 CAT-II/III		
2-168	12	2014.04.18	2-215	16	2016.09.30			
2-169	12	2014.04.18	2-216	16	2016.09.30	3-I	13	2014.07.25
2-170	12	2014.04.18	2-217	16	2016.09.30	3-II	14	2014.11.01
2-171	12	2014.04.18	2-218	16	2016.09.30	3-III	5	2010.06.22
2-172	12	2014.04.18	2-219	16	2016.09.30	3-IV	5	2010.06.22
2-173	14	2014.11.01	2-220	16	2016.09.30	3-1	11	2013.07.04
2-174	14	2014.11.01	2-221	16	2016.09.30	3-2	5	2010.06.22
2-175	12	2014.04.18	2-222	16	2016.09.30	3-3	7	2011.09.23
2-176	12	2014.04.18	2-223	16	2016.09.30	3-4	5	2010.06.22
2-177	12	2014.04.18	2-224	16	2016.09.30	3-5	6	2011.02.25
2-178	12	2014.04.18	2-225	16	2016.09.30	3-6	15	2015.06.25
2-179	12	2014.04.18	2-226	16	2016.09.30	3-6a	13	2014.07.25
2-180	12	2014.04.18	2-227	16	2016.09.30	3-6b	13	2014.07.25
2-181	12	2014.04.18	2-228	16	2016.09.30	3-7	12	2014.04.18
2-182	12	2014.04.18	2-229	16	2016.09.30	3-8	11	2013.07.04
2-183	12	2014.04.18	2-230	16	2016.09.30	3-9	12	2014.04.18
2-184	12	2014.04.18	2-231	16	2016.09.30	3-10	15	2015.06.25
2-185	14	2014.11.01	2-232	16	2016.09.30	3-11	5	2010.06.22
2-186	12	2014.04.18	2-233	16	2016.09.30	3-12	15	2015.06.25
2-187	12	2014.04.18	2-234	16	2016.09.30	3-13	12	2014.04.18
2-188	12	2014.04.18	2-235	16	2016.09.30	3-14	14	2014.11.01
2-189	12	2014.04.18	2-236	16	2016.09.30	3-15	7	2011.09.23
2-190	12	2014.04.18	2-237	16	2016.09.30	3-16	12	2014.04.18
2-191	12	2014.04.18	2-238	16	2016.09.30	3-17	7	2011.09.23
2-192	14	2014.11.01	2-239	16	2016.09.30	3-18	12	2014.04.18
2-193	12	2014.04.18	2-240	16	2016.09.30	3-19	7	2011.09.23
2-194	14	2014.11.01	2-241	16	2016.09.30	3-20	14	2014.11.01
2-195	15	2015.06.25	2-242	16	2016.09.30	3-21	14	2014.11.01
2-196	15	2015.06.25	2-243	16	2016.09.30	3-22	12	2014.04.18
2-197	15	2015.06.25	2-244	16	2016.09.30	3-23	5	2010.06.22
2-198	15	2015.06.25	2-245	16	2016.09.30	3-24	5	2010.06.22
2-199	14	2014.11.01	2-246	16	2016.09.30	3-25	15	2015.06.25
2-200	12	2014.04.18				3-26	12	2014.04.18
2-201	12	2014.04.18				3-27	14	2014.11.01
2-202	12	2014.04.18				3-28	5	2010.06.22
2-203	12	2014.04.18				3-29	14	2014.11.01
2-204	12	2014.04.18				3-30	14	2014.11.01
2-205	14	2014.11.01				3-31	14	2014.11.01
2-206	12	2014.04.18				3-32	14	2014.11.01
2-207	12	2014.04.18				3-33	12	2014.04.18
2-208	12	2014.04.18				3-34	14	2014.11.01
2-209	12	2014.04.18				3-35	8	2012.03.13
2-210	12	2014.04.18				3-36	5	2010.06.22
2-211	12	2014.04.18				3-37	7	2011.09.23
2-212	12	2014.04.18				3-38	8	2012.03.13
2-213	15	2015.06.25						

Effective Page List – 4

Page	RevNo	Date	Page	RevNo	Date	Page	RevNo	Date
Chapter.4 Non-Normal Procedures			Chapter.5 Aircraft Differences			Chapter.6 Weight & Balance		
4-I	5	2010.06.22	5-I	8	2012.03.13	6-I	3	2009.10.01
4-II	5	2010.06.22	5-II	8	2012.03.13	6-II	3	2009.10.01
4-III	5	2010.06.22	5-1	8	2012.03.13	6-1	3	2009.10.01
4-IV	5	2010.06.22	5-2	8	2012.03.13	6-2	3	2009.10.01
4-1	5	2010.06.22	5-3	3	2009.10.01	6-3	3	2009.10.01
4-2	5	2010.06.22	5-4	3	2009.10.01	6-4	5	2010.06.22
4-3	5	2010.06.22	5-5	3	2009.10.01	6-5	3	2009.10.01
4-4	5	2010.06.22	5-6	3	2009.10.01	6-6	3	2009.10.01
4-5	5	2010.06.22	5-7	3	2009.10.01	6-7	3	2009.10.01
4-6	5	2010.06.22	5-8	3	2009.10.01	6-8	3	2009.10.01
4-7	5	2010.06.22	5-9	6	2011.02.25	6-9	3	2009.10.01
4-8	5	2010.06.22	5-10	3	2009.10.01	6-10	3	2009.10.01
4-9	5	2010.06.22	5-11	8	2012.03.13	6-11	3	2009.10.01
4-10	5	2010.06.22	5-12	3	2009.10.01	6-12	3	2009.10.01
4-11	16	2016.09.30	5-13	8	2012.03.13	6-13	12	2014.04.18
4-12	5	2010.06.22	5-14	3	2009.10.01	6-14	12	2014.04.18
4-13	9	2012.06.22	5-15	5	2010.06.22	6-15	12	2014.04.18
4-14	9	2012.06.22	5-16	3	2009.10.01	6-16	12	2014.04.18
4-15	8	2012.03.13	5-17	8	2012.03.13	6-17	12	2014.04.18
4-16	16	2016.09.30	5-18	3	2009.10.01	6-18	12	2014.04.18
4-17	15	2015.06.25	5-19	3	2009.10.01	6-19	12	2014.04.18
4-18	15	2015.06.25	5-20	3	2009.10.01	6-20	12	2014.04.18
4-19	5	2010.06.22	5-21	3	2009.10.01	6-21	12	2014.04.18
4-20	5	2010.06.22	5-22	3	2009.10.01	6-22	12	2014.04.18
4-21	5	2010.06.22	5-23	3	2009.10.01			
4-22	5	2010.06.22	5-24	3	2009.10.01			
4-23	5	2010.06.22	5-25	8	2012.03.13			
4-24	5	2010.06.22	5-26	8	2012.03.13			
4-25	8	2012.03.13						
4-26	7	2011.09.23						
4-27	5	2010.06.22						
4-28	5	2010.06.22						
4-29	5	2010.06.22						
4-30	16	2016.09.30						
4-31	16	2016.09.30						
4-32	5	2010.06.22						
4-33	5	2010.06.22						
4-34	5	2010.06.22						

Effective Page List – 5

Page	RevNo	Date	Page	RevNo	Date	Page	RevNo	Date
Chapter.7 Performance			Chapter.8 Adverse Weather			Chapter.9 Cargo		
7-I	5	2010.06.22	8-I	3	2009.10.01	9-I	10	2012.12.31
7-II	5	2010.06.22	8-II	3	2009.10.01	9-II	10	2012.12.31
7-1	3	2009.10.01	8-1	3	2009.10.01	9-III	10	2012.12.31
7-2	3	2009.10.01	8-2	3	2009.10.01	9-IV	10	2012.12.31
7-3	3	2009.10.01	8-3	3	2009.10.01	9-1	10	2012.12.31
7-4	3	2009.10.01	8-4	3	2009.10.01	9-2	10	2012.12.31
7-5	3	2009.10.01	8-5	11	2013.07.04	9-3	10	2012.12.31
7-6	3	2009.10.01	8-6	11	2013.07.04	9-4	10	2012.12.31
7-7	3	2009.10.01	8-7	3	2009.10.01	9-5	10	2012.12.31
7-8	3	2009.10.01	8-8	3	2009.10.01	9-6	10	2012.12.31
7-9	3	2009.10.01	8-9	3	2009.10.01	9-7	10	2012.12.31
7-10	3	2009.10.01	8-10	3	2009.10.01	9-8	10	2012.12.31
7-11	3	2009.10.01				9-9	10	2012.12.31
7-12	3	2009.10.01				9-10	10	2012.12.31
7-13	5	2010.06.22				9-11	10	2012.12.31
7-14	5	2010.06.22				9-12	15	2015.06.25
7-15	6	2011.02.25				9-13	10	2012.12.31
7-16	5	2010.06.22				9-14	10	2012.12.31
7-17	5	2010.06.22				9-15	10	2012.12.31
7-18	5	2010.06.22				9-16	10	2012.12.31
7-19	5	2010.06.22				9-17	10	2012.12.31
7-20	5	2010.06.22				9-18	10	2012.12.31
						9-19	10	2012.12.31
						9-20	13	2014.07.25
						9-21	10	2012.12.31
						9-22	10	2012.12.31
						9-23	10	2012.12.31
						9-24	10	2012.12.31
						9-25	10	2012.12.31
						9-26	10	2012.12.31
						9-27	10	2012.12.31
						9-28	10	2012.12.31
						9-29	10	2012.12.31
						9-30	10	2012.12.31
						9-31	10	2012.12.31
						9-32	10	2012.12.31
						9-33	10	2012.12.31
						9-34	10	2012.12.31
						9-35	10	2012.12.31
						9-36	10	2012.12.31
						9-37	10	2012.12.31
						9-38	10	2012.12.31
						9-39	10	2012.12.31
						9-40	10	2012.12.31
						9-41	10	2012.12.31

Effective Page List - 6

Page	RevNo	Date	Page	RevNo	Date	Page	RevNo	Date
9-42	10	2012.12.31						
9-43	10	2012.12.31						
9-44	10	2012.12.31						
9-45	10	2012.12.31						
9-46	10	2012.12.31						
9-47	10	2012.12.31						
9-48	10	2012.12.31						
9-49	10	2012.12.31						
9-50	10	2012.12.31						
9-51	11	2013.07.04						
9-52	10	2012.12.31						
9-53	10	2012.12.31						
9-54	10	2012.12.31						
9-55	10	2012.12.31						
9-56	10	2012.12.31						

Bulletin Application

▣ Record of Bulletin

Bulletin Page	Rev. Date	Subject	Remarks
2-85 223~4	2012.05.01	Standard callouts passing Transition Level	Included to Rev.10
2-203	2012.05.01	One Engine Out Missed Approach	Included to Rev.10
3-10,12 13,21,30	2013.12.24	CAT-IIIb procedure change	Included to Rev.12
2-23,98	2015.01.01	VHF RADIO Tuning panel setting procedure change.	Included to Rev.15
2-215 ~246	2015.11.01	Standard Callout & Response Procedures Change	Included to Rev.16
4-11	2015.11.01		
4-16	2015.11.01		
4-30	2015.11.01		
4-31	2015.11.01		
2-12,232	2017.04.28	Logo Light ON/OFF procedure change	
2-80	2017.04.28	Change in Airports without NADP	
2-119	2017.04.28	Control transfer procedure during Approach Briefing	
2-127, 128 3-11,19	2017.04.28	Change in Approach Ban reference	
2-231	2017.04.28	Standard Callout procedure change of checking RWY CLEAR	
3-18	2017.04.28	Restricted PED usage during CAT II/III App' Briefing	

Bulletin Effective Page List

No.	Page	Rev. Date	No.	Page	Rev. Date	No.	Page	Rev. Date
Chapter 1			Chapter 5			Chapter 9		
Chapter 2			Chapter 6					
1	2-12	2017.04.28						
2	2-80	2017.04.28						
3	2-119	2017.04.28						
4	2-127	2017.04.28						
5	2-128	2017.04.28						
6	2-231	2017.04.28						
7	2-232	2017.04.28						
Chapter 3			Chapter 7					
1	3-11	2017.04.28						
2	3-18	2017.04.28						
3	3-19	2017.04.28						
Chapter 4			Chapter 8					

Table of Contents

The end of section

1.1 Introduction

1.1.1 Objectives

The objective of the POM (Pilot Operations Manual) is to establish and standardize the safety procedures, flight techniques, standard callouts and guidelines necessary for Asiana Airlines operations. It provides additional information to conduct commercial air transportation operations and to assist the flight operations personnel to perform their duties and responsibilities in the best interest of safety.

1.1.2 Application

a. As a standard operations procedure manual, the POM applies to all procedures related to flight operations and simulator flights conducted by flight crew of Asiana Airlines.
b. All subjects that are not included in this POM, should be referred to other manuals such as: Operations Specifications, Operations Manual, FOM (Flight Operations Manual), FCOM (Flight Crew Operating Manual), FCTM (Flight Crew Training Manual) and QRH (Quick Reference Handbook) and should be applied as operation standards.
c. Flight crew should follow the restrictions stated in the POM when it is more restricted than other manuals such as: Operations Specifications, Operations Manual, FOM, FCOM, FCTM and QRH.
d. The General Manager of Flight Crew Evaluation Team shall take corrective measures immediately when the Aviation law, Aviation law Enforcements, Flight Safety Regulations, Operation Manual or any polices/procedures of Operations Manual are found to be more limiting than the POM.
e. Any changes in flight operations procedure, which becomes a matter of great urgency will be notified as a "Standard Evaluation Notice" then will be applied when periodic or on demanded revision is issued.

1.1.3 Effective

a. As part of the requirement for aircraft operations, the POM is the standard company operation procedure which was examined and approved by the Operations Standardization Committee or company internal approval system.
b. The POM shall take effect upon the approval of the Chief Manager in the Authority, provided that EI (Engineering Information) would be operated as supplements without approval of the Chief Manager in the Authority.

1.1.4 Responsibility

a. The Executive Officer of the Flight Operations Planning Department (General Manager of Flight Crew Evaluation Team) is responsible for the establishment, amendment and management of the POM.
b. The responsibility of each part of POM is as follows:
   1) CHAPTER 1 ~ 4: Under the supervision of Flight Crew Evaluation Team.
   2) CHAPTER 5 ~ 8: Under the supervision of Flight Operation Engineering Team.
      * EI (Engineering Information) would be provided as supplements (Under the supervision of Flight Operation Engineering Team).
   3) CHAPTER 9: Under the supervision of B747 Flight Crew Operations Team
c. The Executive Officer of the Flight Operations Planning Department (General Manager of Flight Operations Engineering Team) is responsible for the distribution of the POM.
d. Flight Crew should carry the POM during flight.

1.1.5 Distribution and Management

a. The POM should be distributed to all Asiana Airlines flight crew and related teams. The distribution of the manual is limited to company personnel, with the exception of those who have been approved specifically by the Executive Officer of the Flight Operations Planning Department (General Manager of Flight Crew Evaluation Team).
b. Each person holding the manual is responsible for updating, revising, adding or removing the appropriate pages promptly using the correct revision procedures.
c. The released "Standard Evaluation Notice" has the same effect as the Bulletins in the POM during days in effect.
d. If there is any other requirements needed regarding the distribution and management of the POM, they should be notified to Flight Standards Department in writing or thru the company communications network.

1.1.6 Amendments

1.1.6.1 General

a. Amendments of the POM shall be implemented after a report has been made to Authority (exception of Supplement: Engineering Information) and the considerations for the amendment are to be held periodically, annual-basis or a non-periodically, on-demand-basis.
b. If any urgent change arises between the amendments, the crew shall be notified on the Creworld system or thru other media as a "Standard Evaluation Notice" and these changes will supplemented through either a periodic examination or a non-periodic, on-demand examination
c. If any correction or supplement is needed in the POM, the manual holder shall inform the Executive Officer of Flight Operations Planning Department (General Manager of Flight Crew Evaluation Team) to take an appropriate action regarding the matter.

1.1.6.2 Records of Revision

a. The Records of Revision in the POM is provided to reflect the updated procedure or information.
b. A new revision is published by adding (or updating) the latest issue of **POM Bulletin** information. When the revised issue is distributed, the List of Effective Page and a revision record are attached.
c. In order to check the newly updated contents of POM, refer to the information on "List of Effective Page". The revised contents should be indicated by the "Correction line (Under line)".

1.1.6.3 Filing Instructions

a. Refer to the List of Effective Page.
b. Pages distinguished by 'correction lines' are substituted or newly issued. In this case, the old page is to be detached and the new page should be added.
c. Pages named 'DELETION' must be detached. In this case, there are no substitute pages for the deleted pages.

The end of section

1.2 User Guide

1.2.1 Definition of Terms

1.2.1.1 Will / Shall / Must

The words "will, shall, and must" are used in an imperative sense to state the requirement to accomplish the act prescribed. Compliance is mandatory.

1.2.1.2 Should

The word "should" means that the application of a procedure or provision is recommended.

1.2.1.3 May

The word "may" means that the application of a procedure or provision is optional.

1.2.1.4 Recommend

The word "RECOMMENDED" indicates the meaning of permission without compulsion and includes the meaning that complying with is better than not doing it. Compliance is only recommended.

1.2.1.5 No person may ~ / A person may not ~

"No person may ~" or "A person may not ~" means that no person is required, authorized or permitted to do the act concerned.

1.2.1.6 Warning

"WARNING" is used when an operating procedure, technique etc, may result in personal injury or loss of life if not carefully followed.

WARNING

Example) DO NOT place objects between pilot's seat and aisle stand. Injury can occur when the seat is adjusted forward.

1.2.1.7 Caution

"CAUTION" is used to when an operating procedure, technique etc, may result in damage to equipment if not carefully followed.

CAUTION

Example) DO NOT hold or turn the nose wheel tiller during pushback or towing. This can damage the nose gear or the tow bar.

1.2.1.8 Note

"NOTE" is used when an operating procedure, technique, etc, is considered essential to be emphasized.

Example) Consider engine warm up recommendations before selecting takeoff thrust.

1.2.1.9 References

Should further discussion or reference be suggested, the notation "Refer to xxyyzz" directs the holder (reader) to material located in the FOM or any other reference statements will list the other manual.

1.2.2 Page Numbering, Identification and Change Bar

1.2.2.1 Page Numbering

POM has a numbering system using a combination of letters and numbers. Numbering system is divided into two parts, which are Chapter, Section and Page. For example, the following 2.13 means that page 13 chapter2. If more informations are needed on certain page and need more pages, add in alphabetical order (A, B~).

Figure – Example Page Number

Chapter (Normal Procedures) **Page Number**

2. 13 (or 13A)

1.2.2.2 Page Identification

Each page can be checked with page numbers and dates.
The date on each page means either issued date or the latest revised date.

1.2.2.3 Revision Lines

Black revision lines (under line) are used for indicating the parts of:
a. Newly issued contents or,
b. Revised contents or,
In case of the next revision, the previous revision lines are deleted.

1.2.2.4 Intentionally Blank Pages

When a page is needed to be intentionally empty, the words "Intentionally Blank" are placed in that page.

1.2.3 POM Organization

POM consists of 8 chapters and 1 supplement.

a. Chapter 1. General

The chapter contains introduction of POM (Objectives, application, effective, amendment etc), user guide and definition of terms

b. Chapter 2. Supplementary Normal Procedures

The chapter contains supplementary normal procedures needed to operate the aircraft, controlling, the latest knowledge and experiences.

c. Chapter 3. CAT-II/III Procedures

The chapter contains equipment and operation procedures needed for CAT-II/III.

d. Chapter 4. Non-normal Procedures

The chapter shows Non-normal Procedures. Flight crew must follow these procedures when non-normal operations occur. For more details, refer to QRH.

e. Chapter 5. Aircraft Differences

The chapter shows the difference among aircraft types and helps the pilot to quickly examine particular differences.

f. Chapter 6. Weight & Balance

The chapter contains description of Weight and Balance, FMC Performance and Takeoff Analysis Chart Guide.

g. Chapter 7. Performance

The chapter contains summary of required aircraft performance.

h. Chapter 8. Adverse Weather

The chapter contains required operation procedures under bad weather.

i. Chapter 9. CARGO Flight Procedure
The chapter contains normal and non-normal procedures required for cargo flights.

j. Supplements. EI (Engineering Information)
The supplement provides useful information during aircraft operation.

The end of section

Intentionally
Blank

1.3 Bulletins

1.3.1 General

Any urgent changes in flight operations procedure are currently notified through CREWORLD but there is hardship in referencing revised or updated information during flight. For this reason Bulletin is created.

1.3.2 Management Policy

a. Bulletin is issued only when an immediate application is necessary for safe operations.
b. Any changes shall be communicated through Standard Evaluation Notice of Creworld before the issuance of the Bulletin.
c. Contents of the Bulletin shall be promptly reflected in the POM.
d. Issuance and Management of Bulletin shall be applied with the POM.

1.3.3 Process

When changes in Operations Manual of the aircraft manufacturer, introduction of new procedures, revision of current procedures is needed, Director of flight planning(flight crew evaluation team manager) shall revise and issue/distribute the POM for use by the flight crew.

1.3.4 Content

The bulletin contains the following items:
a. Verbal instructions and subject that is needed to be implemented immediately.
b. Subjects that must be immediately carried out before the POM revision is issued.
c. Subjects that must be issued promptly
d. Other subjects that need to be implemented before the regular POM revision

1.3.5 Issuance Guideline

Bulletin issuance should follow the guidelines below:

a. Size equal to POM
b. Bulletin record needs to be issued along with the Bulletin
c. Use yellow colored paper to differentiate from existing content
d. Flight crew evaluation Team is responsible for issuance of the Bulletin.

1.3.6 Distribution and Management

a. Bulletin is distributed Flight Team
b. Bulletin is managed by individual POM user.

The end of section

1.4 Others

1.4.1 Abbreviations

a. Abbreviations used in the POM have same meanings with the FCOM and Airway Manuals.
b. All other abbreviations are in accordance with the FOM.

1.4.2 Definitions

The words used in the POM are in accordance with FOM, FCOM and Airway Manuals.

1.4.3 Operations Policy

Refer to the FOM “Chapter 2. Operations Policy”.

The end of section

Intentionally
Blank

Table of Contents

The end of section

Intentionally

Blank

2.1 Introduction

2.1.1 General

This chapter gives :
a. An Introduction to normal procedures philosophy and assumptions
b. Step by step normal procedures

2.1.2 Normal Procedures Philosophy & Assumptions

a. Normal procedures verify for each phase of flight that:
 1) the airplane condition is satisfactory
 2) the flight deck configuration is correct
b. Normal procedures shall be completed on each flight. Refer to the FCOM normal procedures and (NP) and Supplementary Procedures (SP) chapter for procedures that are done as needed.
c. Normal procedures are used by a trained flight crew and assume:
 1) all systems operate normally
 2) the full use of all automated features (LNAV, VNAV, autoland, autopilot, and autothrottle)
d. Normal procedures also assume coordination with the ground crew before:
 1) Hydraulic system pressurization, or
 2) Flight control surface movement, or
 3) Airplane movement
e. Normal procedures do not include steps for crew comfort items.
f. Normal procedures shall be done by recall and scan flow. The panel illustration in the FCOM Vol 1 N.P shows the scan flow. The scan flow sequence may be changed as needed.

2.1.3 Configuration Check

a. To verify that system response is correct is the crew member's responsibility.

b. Before engine start, use lights or indications to verify each system's condition or configuration.

c. If there is an incorrect configuration or response:

1) verify that the system controls are set correctly

2) check the respective circuit breaker as needed. Maintenance must first determine that it is safe to reset a tripped circuit breaker on the ground.

3) Test the respective system light as needed

d. Before engine start, review the EICAS alert messages and status display.

e. If there are unexpected messages

1) check the Dispatch MEL (Minimum Equipment List) or the operator equivalent to decide if the condition has a dispatch effect

2) decide if maintenance is needed

f. If, during or after engine start, there is an alert message:

1) do the respective non-normal checklist (NNC)

2) on the ground, check the DDG or the operator equivalent

g. After engine start, EICAS alert messages are the primary means of alerting the flight crew to non-normal conditions or incorrect configurations.

h. After engine start, there is no need to check status messages. Any message that has an adverse affect on safe continuation of the flight appears as an EICAS alert message.

2.1.4 Crew Duties

a. Preflight and postflight crew duties are divided between the captain and Co-pilot(F/O).
b. Phase of flight duties are divided between the Pilot Flying (PF) and the Pilot Monitoring (PM).
c. Each crewmember is responsible for moving the controls and switches in their area of responsibility.
d. The Area of Responsibility illustrations in the FCOM Vol 1 N.P shows the area of responsibility for both normal and non-normal procedures. Typical panel locations are shown.
e. The captain may direct actions outside of the crewmember's area of responsibility.

2.1.4.1 PF

The general PF phase of flight responsibilities are :
a. Taxi
b. Flight path and airspeed control
c. Airplane configuration
d. Navigation

2.1.4.2 PM

The general PM phase of flight responsibilities are :
a. Checklist reading
b. Communications
c. Tasks asked for by the PF
d. Monitoring taxiing, flight path, airspeed, airplane configuration, and Navigation

Note) Refer to the FOM Chapter 3. "Crewmembers" for additional authority and responsibility of captain and Co-pilot(F/O).

2.1.4.3 Supporting Flight Crew

Refer to the FOM Chapter 3. "Crew Members"

2.1.5 CDU Procedures

2.1.5.1 On Ground

a. The priorty of inputting the initial position is as followings.
   1) Coordinate (Gate Position)
   2) FMS-CDU Database
   3) Coordinate data on Route Guide

b. Before taxi, the captain or Co-pilot(F/O) may make CDU entries. The other pilot must verify the entries

c. Make CDU entries before taxi or when stopped, when possible. If CDU entries must be made during taxi, the PM makes the entries. The PF must verify the entries before they are executed. (Usually the Co-pilot(F/O) (PM) or student/ examinee may make FMS-CDU entries and the captain (PF) or Instructor/checker must verify the entries.)

d. PM should put the Flight Number which is same with ICAO Flight Plan form in the FMC RTE page, and then check the flight number in the ACARS INIT page. (ex: if the Flight number is AAR202, "AAR202" should be put in the FMC RTE page.)

a. Captain and co-pilot should thoroughly review the flight data in OFP and FMS(FMGS) in the following manner.
   1) Each pilot should compare waypoints, headings and distances in FMS-CDU Leg Pages with those in OFP.
   2) When new waypoints (which are not included in NAV Data) are manually input, first officer should read the waypoints, headings and distances in FMS-CDU Leg Pages and captain should compare those with data in OFP.

b. Different data should be corrected If there are difference data between FMS-CDU and OFP.

Note)

1. There might be discrepancies of track miles between flight plan and FMC leg pages. This discrepancy may result from SID and STAR selection on FMC. The pilots need to verify the discrepancy.

2. ZFW (Zero Fuel Weight) should not be put in the GR WT (Gross Weight) Boxes

2.1.5.2 During Flight

a. CDU should be operated to provide the flight crew with information enough for safety flying.
b. Information from CDU should be checked by other equipments such as ADF, VOR and ILS, if required.
c. Flight crew shall not change CDU bellow 10000ft, except special procedure or conducting ATC request.
d. CDU display by flight phase
   The PF and the PM may not choose the same pages.
   1) PF : choose the reference by flight phase
   2) PM : assist PF's job and choose the reference to provide information to the PM.

2.1.6 AFDS Procedures

2.1.6.1 General

The crew must always monitor :
a. Airplane Course
b. Vertical Path
c. Speed

When selecting a value on the MCP, verify that the respective value changes on the flight instruments, as applicable.
The crew must verify manually selected or automatic AFDS changes.

Use the PFD FMAs to verify mode changes for the :
a. Autopilot
b. Flight Director
c. Autothrottle

During LNAV and VNAV operations, verify all changes to the airplane's :
a. Course
b. Vertical path

c. Thrust
d. Speed

Announcing changes on the PFD FMAs and thrust mode display when they occur is a good CRM practice.

2.1.6.2 AFDS Guidelines

a. Automatic Flight Control System consists of AFDS (Autopilot Flight Director System) and Autothrottle System.
b. Autopilot and Autothrottle must be controlled in order to accomplish Climb, Cruise, Descent and Approach by using MCP. (Mode Control Panel)
c. Operations by A/P and A/T have preference to improve safety margin to reduce workload and to enhance operational capability. When a non-normal situation occurs, the PF and the PM make full use of A/P and A/T.
d. It is strongly recommended to use AFDS when operating in the terminal areas where air traffic congestion could be expected
e. Automatic Landing is recommended for long distance flight (including night flying). However, Manual Landing can be performed by PF's decision.
f. Flight crew shall use the A/P and the A/T together. However, the A/P and the A/T can be used separately by the PF's decision or airplane's characteristic.
g. The PF must compare the performance of the auto flight systems with the flight path of the aircraft. If any auto flight system is not operating as expected, change the automation level or disengage that function.
h. The PF will normally engaging the autopilot with call out, but the PM also shall engage the auto pilot by the order of PF.

Note) PIC has to put hands on control wheel and thrust lever in preparation of conducting manual flight no later than final approach fix in auto flight control system mode.

2.1.6.3 Time for Automation Guidelines A/P and A/T

a. When using the Autopilot, pilots must adhere to the minimum autopilot engagement and disengagement altitude.
b. When using autopilot after take-off, it is recommended to engage autopilot after aircraft being stabilized. For the purpose of improvement of manual flight skill, Instructors and Checker can control the time of autopilot engagement, but it is usually recommended to engage autopilot at no more than 10,000FT considering traffic in departure phase, restriction altitude and weather etc.
c. After autopilot being engaged, pilots must monitor constantly all setting and changes to automation systems and the attitude of the aircraft.
d. It is also recommended to engage the Autopilot as soon as possible after passing minimum autopilot engage altitude to reduce pilot workload in adverse weather and non-normal condition.
e. The use of the autopilot can be in accordance with type of approach during approach phase.

2.1.6.4 A/P And A/T Disengage (Disconnect) Procedure

The Flight Crew should notify other crew of Autopilot and/or autothrottle disengage or disconnect.

Note) When disengaging autopilot and auto throttle, press disengage button once then cancel the autopilot or auto throttle disengage warning by pressing the button one more time

Intentionally

Blank

Intentionally

Blank

2.1.7 Time to start Normal Checklist

QRH includes 'Normal Checklist' and mentions the way of usage and proper time to perform.

2.1.8 Scan Flow and Areas of Responsibility

Refer to FCOM VOL 1 N.P.

2.1.9 Areas of Responsibility-CAPT as PF or Taxiing

Refer to FCOM VOL 1 N.P.

2.1.10 Areas of Responsibility- Co-Pilot(F/O) as PF or Taxiing

Refer to FCOM VOL 1 N.P.

2.1.11 Use of Lights

a. Cockpit lights

1) Daytime

a) After checking light test, set the Indicator light S/W to 'BRT' position, and the PDF, ND and FMC CDU lights brightly. Set the other PANEL lights off.

b) However, lights can be set properly by the situation (e.g. adverse weather)

2) Nighttime

a) Getting into the cockpit, set the STORM LIGHT S/W on, and control the all PANEL light S/W properly.

b) Before starting taxi, if required, set the STORM LIGHT S/W off and control the PFD, ND, FMC CDU and all other panel light S/W properly. And then set the STORM LIGHT S/W on again.

c) Starting taxi, set the STORM LIGHT S/W off.

d) During cruise, if required, pilots can turn the map light on and set proper position.

e) In principle, indicator light S/W should be set BRT for daytime and DIM for night. However it can be set proper position at dusk.

f) After completing descent checklist, set the forward instrument panel not to be too bright for the dark adaptation.

g) When the aircraft is stopped after landing and ramp in, co-pilot(F/O) should turn the STORM LIGHT S/W on immediately.

3) After flight duty (whenever daytime or nighttime), set all the lights off and leave the cockpit.

b. External lights

1) Turn the Beacon Light on after received pushback clearance (if pushback is not required, turn it on after received engine start clearance). After ramp in and stopping the engines, turn the Beacon Light off.
2) In the phase of taxing on the ground, always set the taxi light on. If required, runway turn off light can be used. (In case of Special Freighter which is not equipped with taxi light, turn the landing light on during taxi.)
3) Strobe light should be on from the time of entering runway to the time of vacating runway.
4) Use logo light in nighttime.
5) Use of lights in the instrument flight or low visibility is up to captain's discretion. In these cases, be careful of spatial disorientation.
6) After landing and ramp in, turn the external lights (L/D Light, Taxi Light, Turn Off Light) off not to disturb ground staffs

2.1.12 Clock Set

a. Performing the cockpit preparation before flight, pilots should check the clock is accurately set.

b. The clock mounted on the aircraft should be set as below;

1) Captain : Block Time Set
2) Co-pilot(F/O) : Flight Time Set (From takeoff to landing)

b. External lights

1) Turn the Beacon Light on after received pushback clearance (if pushback is not required, turn it on after received engine start clearance). After ramp in and stopping the engines, turn the Beacon Light off.
2) In the phase of taxing on the ground, always set the taxi light on. If required, runway turn off light can be used. (In case of Special Freighter which is not equipped with taxi light, turn the landing light on during taxi.)
3) Strobe light should be on from the time of entering runway to the time of vacating runway.
4) Use logo light in nighttime only below 10,000ft.
5) Use of lights in the instrument flight or low visibility is up to captain's discretion. In these cases, be careful of spatial disorientation.
6) After landing and ramp in, turn the external lights (L/D Light, Taxi Light, Turn Off Light) off not to disturb ground staffs

2.1.12 Clock Set

a. Performing the cockpit preparation before flight, pilots should check the clock is accurately set.

b. The clock mounted on the aircraft should be set as below;

1) Captain : Block Time Set
2) Co-pilot(F/O) : Flight Time Set (From takeoff to landing)

The end of section

2.2 Amplified Procedures

2.2.1 Flight Plan Check

Crews should check flight schedule and others related schedule through AAR Network System (Creworld), ARS or other ways.

a. http://creworld.flyasiana.com

b. 02-2669-3600

2.2.2 Flight Crew Show Up

a. The Flight crew must arrive at the place on time set by company.

b. Refer to the FOM ch.6 for the flight crew Show up Time, the place, method, meaning of show up and report of late show up.

2.2.3 Flight plan Preparation and Check

2.2.3.1 Flight plan Preparation

a. Preparation of domestic flight plan is somewhat different from international flight plan. For more Details, refer to FOM chapter 6 “Normal Operations”.

b. Flight crew should check related information and instructions when preparing the flight plan.

2.2.3.2 Flight plan check and sign up

a. Basically, flight crew should check flight plan and other items. And refer to FOM for flight plan check and sign up procedure.

b. Refer to FOM chapter 6 “Normal Operations” for preparation list and related items.

c. Flight crew member who has mission limitations should notify the other crew and dispatcher.

2.2.4 Required Documents and belongings for Flight Crew

2.2.4.1 Required Documents

a. Flight crew must keep the required documents for operations.
b. Refer to the FOM ch.3 for the details.

2.2.4.2 Belongings (FOM 4.1.7)

Refer to FOM chapter 3 “Crew Members” for flight crew must carry items and route guide sign out and return procedure.

2.2.5 Pre-Briefing

2.2.5.1 Crew Briefing

a. Refer to "flight preparation" in FOM chapter 6 "Normal operations".
b. PIC should discuss with other flight crew and make fair duty change time based on scheduled flight time.

2.2.5.2 Dispatcher Briefing

a. Refer to “flight preparation” in FOM chapter 6 “Normal operations”.

2.2.6 Joint Briefing

2.2.6.1 General

Captain(PIC) will brief the entire flight and cabin crew on all matters pertaining to their flight duties in order to foster and maintain close cooperation among all crew members.

2.2.6.2 Joint Briefing Place and Time

Joint Briefing shall be performed in Aircraft and briefing times are as follows.

<table>
<tr><th rowspan="2">Departure Place</th><th colspan="2">Based on Departure time</th></tr>
<tr><th>Domestic</th><th>International</th></tr>
<tr><td>Gimpo</td><td>• B747, B777, A330 :
50 min before ETD.
• Other Types of A/C:
40 min before ETD.</td><td rowspan="3">• All Types of A/C
: 55 min before ETD</td></tr>
<tr><td>Incheon</td><td rowspan="2">All Types of A/C :
40 min before ETD</td></tr>
<tr><td>Layover Station</td></tr>
</table>

Note) If unable to make joint briefing in the designated area for any reason such as gate congestion or delay aircraft towing and etc, you may brief in a proper place where separated from passengers (example : gate entry). If preparing time for departure is not enough, the captain may give a briefing only to the senior cabin attendant.

2.2.6.3 Joint Briefing Items

a. All Flights

The following must be included in the Joint briefing and for detailed items refer to Joint Briefing Checklist.

1) Introduce Flight crews to each other.
2) Flight plan.
3) Weather information.
4) Mutual Cooperation items with Crew.
5) Security Matters
6) Other information.

b. For First Flight of the Day or After Crew Exchange

If for the first flight of the day or after crew exchange, following must be included in the joint briefing and for detailed items refer to Joint Briefing Checklist.

1) Sterile cockpit and Cockpit Entry Procedure
2) Safety Considerations and emergency procedure.
3) Coordination between flight crew and Cabin Crews
4) Coordination for CDL (Cabin Discrepancies List)
   a. Exchange information regarding duty of cabin crew, or defect or malfunction of equipment/item that may affect passenger safety or convenience.
   b. Should a safety item which is logged in CDL occurs, the purser shall notify the PIC of it.

2.2.7 Arrival at the Aircraft

a. Flight crew should plan to arrive at the A/C until designated time unless inevitable.
b. For the time of arriving at the Aircraft, refer to FOM chapter 6 “Normal operations”

2.2.8 Preliminary Preflight Procedure – CAPT or Co-pilot(F/O)

a. General

1) The captain who is in charge of takeoff should put on a safety jacket for exterior inspection. When necessary, captain shall carry the reference book for exterior inspection procedures. If the captain wears winter or rain coat, he should wear the safety jacket on the coat.
2) After exterior inspection the captain and Co-pilot(F/O) shall exchange the information about interior and exterior inspection. In case of 2 sets flight, the captain shall notify the information about exterior inspect to all pilots.
3) The senior cabin crew should report the cabin inspection result to the captain. In case of flight without cabin crew, the chapter 6 normal operations in FOM should be applied.
4) The captain will have aircraft briefing from the maintenance. To confirm and manage the aircraft defects should be applied with the chapter 2 Operations Policy in FOM.
5) For captain's substitution for return to service, refer to FOM chapter 6 "Normal operations"

b. Items to be inspected and managed

1) The captain shall clearly put his/her Korean (Foreigner captain's English) name on signature column of technical logbook the flight log book after confirming following items.
   a) Defects related with MEL (Minimum Equipment List) or CDL (Configuration Deviation List)
   b) Defects which happens on the day of the flight
   c) Defects which happens consecutively
   d) Deferred Items
   e) The category of fuel and fuel quantity on board
   f) The Items which should be inspected before flight
   g) To confirm the maintenance's signature for flight release
2) The captain shall do the cockpit preparation which is applied with B747 FCOM Normal Procedure (Preflight Procedure – Captain)
3) Captain will order the Preflight Checklist to the Co-pilot(F/O) after completing the procedures which are already mentioned.

a) After completing the Normal checklist items, captain orders the Preflight Checklist at least 15 minutes before departure time.

Note) The Time for Normal Checklist, T/O & APP briefing, PA is PIC's discretion with consideration of workload management.

b) Co-pilot(F/O) challenges each item of the checklist together with captain. After completing the checklist, Co-pilot(F/O) calls "Preflight Checklist Complete."

4) For other details, refer to the FCOM VOL 1 Normal Procedures and the chapter 6 Normal Operations in FOM.

5) For the flight of cargo aircraft, load master or cargo handling company employee gives the explanation and documents of shipments to the PIC. For other details refer to the chapter 11 "Passenger and Cargo Management" in FOM.

2.2.9 CDU Preflight Procedure - CAPT & Co-pilot(F/O)

Refer to FCOM VOL 1 N.P

a. When enter the data on RTE Page refer to following.

1) Enter correct company flight number in the Flight Number (FLT NO) prompt. Entered Flight Number appears title of PROGRESS page and propagates to the ATC RADAR by Euro control-compliant Transponder.

2) If there is an appropriate company route, input that in RTE page (Ex: ICNLHR2, LAXICN1)

3) Input a waypoint as 'N4530W17030' for the random route

b. When enter the data of EEP/ETP/EXP/FIR (UIR) on RTE Page.

1) When able use along track method (Ex: PABBA/80, ONEOX/-65)

2) If cannot make it with along track method, input as coordinates (Ex: N5005.5W15225.7)

2.2.10 Exterior Inspection

Refer to FCOM VOL 1 N.P

2.2.10.1 Generals

Before each flight the captain, Co-pilot(F/O), or maintenance crew must verify that the airplane is satisfactory for flight.
The captain should do exterior inspection after "Flight and Maintenance Log" check and safety inspection of cockpit. If conditions permit, captain may entrust or participate with a Co-pilot(F/O) or other crews for purpose of educating. Items at each location may be checked in any sequence.
Use the detailed inspection route with referring to FCOM VOL 1 N.P Exterior Inspection to check that:

a. The surfaces and structures are clear, not damaged, not missing parts and there are no fluid leaks
b. The tires are not too worn, not damaged, and there is no tread separation
c. The Gears struts are not fully compressed
d. The engine inlets and tailpipes are clear, the access panels are secured, the exterior is not damaged, and the reversers are stowed
e. Every doors and access panels that are not in use are latched
f. The probes, vents, and static ports are clear and not damaged
g. The antennae are not damaged
h. The light lenses are clean and not damaged

For cold weather operations see the Supplementary Procedures.

2.2.11 Preflight Procedure – Co-pilot(F/O)

Refer to FCOM VOL 1 N.P
When doing Preflight Checklist, complete the RVSM and RNP-10 checklist with the flight being planned through a relevant airspace.

2.2.12 Preflight Procedure – CAPT

Refer to FCOM VOL 1 N.P

Note) The time for Normal Checklist, T/O & APP briefing, PA is PIC's discretion with considering the workload management.

2.2.12.1 HF Communication/SELCAL

a. When anticipated using SELCAL, SELCAL Check should be performed. (SELCAL Code is recorded in OFP or center instrument panel)

b. When SELCAL Check, following terms shall be used

1) When request SELCAL Check:
"Request SELCAL Check (SELCAL Code xxxx)"
2) When received SELCAL Code Tone: "SELCAL OK"
3) When SELCAL Code Tone is not received: "Negative (Inoperative) SELCAL"

WARNING

DO NOT OPERATE the HF Communication system while the airplane is refueled or de-fueled. An explosion can cause injury to persons and damage to the airplane.

2.2.12.2 Weather Radar Check

a. Weather radar test should be done before Preflight Checklist with following the FCOM procedures.

b. Weather Radar Test : Refer to the "Supplementary procedures" in FCOM VOL.1.

Weather Radar Mode selector ---------- TEST
ND Mode selector ------------------- MAP
EFIS WXR switch -------------------- Push
Verify radar test pattern displays on ND
EFIS WXR switch -------------------- Push
Select Captain's and Co-pilot(F/O)'s weather radar displays off.
Weather Radar Mode selector ---------- TEST

CAUTION

The weather radar should not be operated on Operation Mode in the event that the aircraft is in the following circumstances.

a) When the aircraft is parked at Hangar/ Jetway/ Gate.

b) On Refueling or Defueling.

c) Explosive liquid, Flammable container or truck around the Aircraft.

Note) Weather radar check must be in accordance with "Supplementary Procedures" in FCOM VOL. 1, and captain and Co-pilot(F/O) must pay attention to setting weather radar in TEST mode while checking.

2.2.12.3 Radio Tuning Panel Set

Left VHF	Center VHF	Right VHF
ATC/ATC	ACARS/Air to Air	121.5/ATIS or (121.5/company)

Note) Left radio transmitter select switch for communication should be selected when the all electrical system are failed.

2.2.12.4 MCP Set up

a. IAS/MACH Selector -------------------------------- Set V2

b. Initial Heading or Track ------------------------------ Set

c. Initial Altitude ------------------------------------- Set

Note) Altitude on the MCP should be set by ATC clearance or restricted altitude on SID chart whichever is lower.

2.2.12.5 Radio navigation system set up will be as follows ;

a. VOR : It is a principle to tune VOR frequency automatically. However, it is also possible to tune the frequency and course manually for the reference of SID transition route.

b. ADF : It is possible to set the frequency manually for the reference of the first Leg in SID transition route.

2.2.13 RVSM/RNP-10 flight

Refer to FCOM and FOM chapter 8 "Navigation" for RVSM/ RNP-10 flight.

2.2.14 QFE Operation for Departure

a. On Ground

1) Altimeters ------------------------------ Set QFE (PF/PM)

Note) If QFE altimeter setting is exceeding range of Altimeter Setting, fligt crew shall set QNH and perform QNH procedures.

2) CDU --------------------------------- Select QFE (PF/PM)

Select QFE on the APPROACH REF page. Set for departure.

b. After Airborne

1) 400FT (AFE) -------------Select HDGSEL or HDG HOLD (PF)

2) 1,000FT (AFE)---------- Select FLCH, VREF + 100 KIAS (PF)

3) After Flap 5 set --------------------- Select Climb THR (PF)

c. At Transition Altitude

1) Altimeter standard ------------------------ Set QNE (PF/PM)

2) CDU ----------------------------------Set QNH (PF/PM)

a) QNH set ; pushing barometric standard switch to STD or Select QNH on the APPROACH REF page

b) LNAV and VNAV are available.

Note) LNAV & VNAV shall not be used until TA (Transition Altitude). When selected QFE, VNAV Altitude shall not make Navigation Database.

2.2.15 Flight and Maintenance Log Record

Refer to Ch.2 in FOM for Technical log Record items.

2.2.16 Landing Gear Ground Pin Removal, tire Wear and APU/GPU Usage

For landing gear ground pin removal, tire wear and APU/GPU usage, refer to FOM chapter 6 “Normal operations”

2.2.17 Flight without Cabin Crew

a. For a flight without cabin crew, refer to FOM chapter 6 "Normal operations"

b. In case of Freighter, location of Upper Deck Escape Slide should be in Forward Lock Position when Taxi, Takeoff or Landing. (In case of Special Freighter, Upper Deck Door Evacuation Slide Lever should be Automatic condition. Except for emergency, door open in airplane shall be prohibited

2.2.18 Cockpit Access Procedures

a. The flight deck shall be closed and locked from the time when the PIC approves the passenger boarding.

b. Other procedures, such as entering cockpit before operation, application or issuance of permit of admission, admission procedures of aviation safety inspectors or CAA inspectors refer to ch.10 in FOM for more details.

2.2.19 Passenger Boarding

2.2.19.1 Boarding Sign Release

a . PIC shall release boarding sign after PIC confirmed that all conditions related are meat.

b . For boarding sign conditions, refer to FOM chapter 6 “Normal Operations”.

c . Boarding Sign Release Time

1) International

Classification	A320, B737	A330, B747 COMBI, B767, B777	B747 PAX
Boarding Sign	25 min before ETD	30 min before ETD	35 min before ETD

Boarding Sign Release time can be changed as needed.

.

2) Domestic

Classification	B737 A320	A321	B767	A330, B747, B777
Boarding Sign	15 min before ETD	17 min before ETD	20 min before ETD	25 min before ETD

Boarding Sign Release time can be changed as needed.

2.2.19.2 Fueling/De-fueling while Passengers are boarding

Refer to Ch.10 in FOM for all conditions, cautions while passengers are boarding / deplaning or in cabin.

Intentionally

Blank

Intentionally

Blank

2.2.20 Study of the Non-Normal Procedures

2.2.20.1 General

a. Flight crew should always be well aware of non-normal procedures for the possible non-normal situations.
b. Pilots in training should review the applicable study item of the day during crew briefing.

2.2.20.2 Study Items

Date	Study Items	Remark
1	ABORTED ENGINE START	QRH
2	CABINE ALTITUDE (RAPID DEPRESSURIZATION)	QRH
3	ENGINE 1,2,3,4 FAIL	QRH
4	ENGINE LIMIT/SURGE/STALL	QRH
5	EVACUATION	QRH
6	FIRE ENGINE 1,2,3,4	QRH
7	IAS DISAGREE (AIRSPEED/MACH UNRELIABLE)	QRH
8	ENGINE IN-FLIGHT START	QRH
9	FLAP INDICATION DISAGREE	QRH
10	FUEL JETTISON	QRH
11	FUEL LEAK ENGINE	QRH
12	GEARS LEVER JAMMED IN OFF POSITION	QRH
13	MULTIPLE ENGINE FLAMEOUT/STALL	QRH
14	SMOKE/FUMES AIRCONDITION	QRH
15	SEVERE ENGINE DAMAGE OR SEPARATION	QRH
16	FUEL LEAK	QRH
17	FUEL IMBALANCE	QRH
18	ELEC DRIVE 1,2,3,4	QRH
19	ENGINE 1,2,3,4 OIL PRESS	QRH
20	FLAPS CONTROL	QRH
21	HYD OVHT SYS 1,2,3,4	QRH
22	FLAPS DRIVE	QRH
23	SLUSH/STANDING WATER TAKEOFF	QRH
24	SLIPPERY RUNWAY TAKEOFF	QRH
25	LOW GROSS WEIGHT, AFT CG TAKEOFF, FREIGHTER	FCOM VOL.1
26	OXYGEN TEST	FCOM VOL.1
27	PACK OFF TAKEOFF	FCOM VOL.1
28	ENGINE MANUAL START	FCOM VOL.1
29	WEATHER RADAR TEST	FCOM VOL.1
30	WET OR CONTAMINATED RWY CONDITIONS	FCOM VOL.1

2.2.21 ATC Clearance

2.2.21.1 ATC Clearance Request and Receipt

a. Clearance items and Full Clearance request

1) For ATC clearance Request and Receipt refer to Airway Manual Procedures in airport concerned.
2) Full Clearance includes the following items, and for special procedures in airport concerned refer to Airway Manual.
    a) Aircraft identification.
    b) Clearance limits.
    c) Route of flight.
    d) Level of flight for the en-route or changes of level if required.
    e) Any necessary instructions and information.
3) Under the following circumstances, make it a rule to request full clearance.
    a) In the event that clearance request differs from filed OFP.
    b) Flight is departing an off-line station.
    c) Special procedures are designated in airport concerned.

b. Clearance by ACARS

1) In some airport requesting PDC(Pre Departure Clearance) by using ACARS (Airborne Communication Addressing and Reporting System) is available and the airport procedure should be observed.
2) PDC (Pre Departure Clearance) Request – Receive PDC – PDC Read – Confirm Push – PRINT – Perform Clearance Confirm Procedure with Printout
3) If there is a specific airport procedure, that procedure should be applied with the priority.

2.2.21.2 ATC Clearance Read Back

a. Acknowledgement

1) Clearance should be acknowledged with a readback preceded by the flight identifications.

2) The followings are included in the Clearance Readback.
   a) ATC route clearances.
   b) Clearance instructions for departure.
   c) Runway in use.
   d) Altimeter setting.
   e) Squawk code.
   f) Level instructions.
   g) Heading and speed instructions.
   h) Other instructions.
3) If there is special airport procedure for Readback, flight crews should follow that.

b. Short Clearance Read Back

At some airports, ATC requires a read back only the transponder code or initial altitude. (Ex: LAX)

2.2.21.3 ATC Clearance Confirm

After ATC clearance received, Co-pilot(F/O) should confirm through related pages in FMS-CDU mutually with Captain.
Then check that the cockpit set-up, AFDS panel, navigation equipment and transponder are properly set.

Classification	Check Items
RTE	• Destination Airport • Departure Runway • SID • En-route
VNAV CLB & MCP	• Flight Level • Restraint or Intermediate altitude
Transponder	• Squawk code
Radio panel	Departure Frequency

Note) If the special altitude restriction is received from ATC, Captain / Co-pilot(F/O) should check the obstacle clearance before takeoff.

2.2.22 Takeoff Briefing

2.2.22.1 General

a. PF performs the briefing to PM for simple and clear understanding.
b. Takeoff Briefing should be performed after Cockpit preparation is completed and ATC clearance is received. However, if ATC clearance is delayed or PF needs enough briefing time, perform the Takeoff Briefing with expecting clearance based on OFP before receiving ATC Clearance and check after received ATC Clearance.
c. Takeoff Briefing must be finished before Takeoff.
d. Regarding other briefing, items to be included, refer to the chapter 6. "Normal Operations" in FOM.

2.2.22.2 Takeoff Briefing Items

The followings are included in Takeoff Briefing.
a. Weather & NOTAMS: Origin & T/O Alternate Airport
b. T/O flaps and Thrust reduction
c. ATC Clearance for TAKEOFF & DEPARTURE
d. Departure procedures
   1) Validity of the Charts to be used
   2) Type of Departure
   3) Departure Frequency
   4) TA (Transition Altitude)
   5) MSA (Minimum Safe Altitude)
   6) Departure Route, Altitude & Speed restrictions
   7) Noise Abatement Procedures
e. Adverse WX, Wx Radar(TERR) mode selection
f. Push back and Taxi route to T/O RWY
   1) HOT Spots, Hold Line
   2) Multiple Runway
g. Crew actions & callouts
h. Non-normal procedures
   1) Before 80 knots
   2) 80 knots to Before V1

3) After V1
4) Emergency Return
5) Fuel Dumping

i. Threat & Error Management (TEM)
1) Bird Strike
2) MEL/CDL
3) Cold or Hot Weather Operation Procedures
4) Wet or Slippery Runway Operation
5) Other Special Procedures or Requirement

Observer Briefing (If Required)
- Observer Seat Operation (Seat Belt & Shoulder Harness)
- Oxygen Mask Location and Operation
- Radio/Head Set & Audio Select Panel Operation
- Traffic Watch Requirements
- Evacuation Route

2.2.23 Flight Data Input and Check

2.2.23.1 Receipt of W&B

Refer to FOM chapter 6 “Normal operations”.

2.2.23.2 Flight Data Input

a. Flight data has a great effect on flight safety, so it is required for flight crews to manage the data with care.
b. PIC confirms flight date, flight and registration number, passengers and cargoes on board, fuel quantity, ZFW, TOW, STAB TRIM then (electronically) signs.

Note)
1. TO compare and confirm SOW on the Load Sheet and OFP, refer to latest SOW table on the first page of the Takeoff Chart Binder.
2. Electronic signature should be completed before door close.

c. When Captain calls ZFW, Co-pilot(F/O) inputs the data and both captain and Co-pilot(F/O) will check the data inserted in the FMC together.

The maximum tolerance limit due to the change of fuel and passenger on board or cargo weight runs as follows.

Weight Tolerance	CG Tolerance
± 0.5% of MLDW - PAX/COMBI : 3,150LBS (15 passengers) - Freighter : 3,300LBS - Freighter (SF) : 3,260LBS	When the weight is changed, the modified CG must stay within FWD and AFT CG Limit.

Note) When W&B exceeds tolerance limit due to change of fuel on board, it is required to check the modified CG.

d. Co-pilot(F/O) calls TOW (takeoff weight) of PERF INIT page and Captain confirms the data and Optimum Altitude in CRZ page.

e. PIC shall decide type of Takeoff thrust (Max, Fixed de-rate, TO-1, TO-2, Assumed Temperature Method and Combination Fixed De-rate/ATM) considering TOW runway length, runway condition, A/C condition, weather, etc.

f. Co-pilot(F/O) shall advise captain the optimum T/O thrust in the T/O analysis chart for runway, flaps setting, TOW, climb limit weight and weather. Captain decides type of takeoff thrust to use.

Note) When deciding the type of T/O Thrust, It is required to check conditions, which are not allowed to use ATM (Assumed Temperature Method)

(Refer to "Reduced Takeoff Thrust" of Normal Procedures in this POM)

g. Co-pilot(F/O) can make FMC speeds (V1, VR, and V2 on TAKEOFF REF PAGE) LARGE FONT, or input speeds that the captain called out into FMC. However, when V1 speed has been adjusted as follows, manual inputs must be made.

1) When changing V1 by clearway or stop way.
2) When changing V1 by deactivating brake
3) When changing V1 under contaminated runway.

h. Captain sets V2 speed in the MCP IAS/MACH Window and makes VNAV and LNAV armed. It is required for captain and Co-pilot(F/O) to verify if V2 speed set and VNAV and LNAV armed.

Note) If the use of HDGSEL as instructed by ATC or LNAV is not usable, LNAV must not be armed.

i. Captain sets stabilizer trim and Co-pilot(F/O) verifies the trim setting.

2.2.23.3 Confirmation Data and Legs

a. After completion of FMC-CDU preflight procedures, captain and Co-pilot(F/O) check the flight data in the FMC and OFP mutually.
   1) Each pilot should compare waypoints, headings and distances in FMS-CDU Leg Pages with those in OFP.
   2) When new waypoints (which are not included in NAV Data) are manually input, first officer should read the waypoints, headings and distances in FMS-CDU Leg Pages and captain should compare those with data in OFP.
   3) As the FLT NUMBER which is already put on the FMC RTE Page is displayed on the ATC RADAR on the ground, confirmation of FLT ID which can be read on the ACARS INIT Page 4R is needed not to confuse the air traffic controller.
   4) As AIRLINE ID which can be read on the ACARS INIT Page 4L is the receiving point of ACARS Data, the default ID "OZ" should not be replaced by other IATA code.

b. Captain should have additional check for followings.
   1) Total distance from origin to destination.
   2) Remaining fuel at destination.
   3) ETA (current time + flight time on OFP).
   4) Optimum and maximum altitude.
   5) Others.

Note) If there is large difference between OFP (Operational Flight Plan) and FMC-CDU, comfirm the reason and must correct.

2.2.24 Receipt of NOTOC

Refer to FOM chapter 6 “Normal operations” for receipt of NOTOC, and chapter 11 “Passenger and Cargo Management” for detail procedure.

The end of section

Intentionally

Blank

2.3 Before Start Procedure

Refer to FCOM VOL 1 N.P

2.3.1 Stabilizer Trim set

a. Captain request ground staff to pressurize hydraulic pumps on after closing all doors, Co-pilot(F/O) pressurizes hydraulic pumps on after approved by ground staff..

b. Captain set Stabilizer Trim, Co-pilot(F/O) confirms it.

Note) check both Stabilizer Trim Indicator of aircraft and Stabilizer Trim of W/B.

2.3.2 To Remove Tail post

2.3.2.1 General

1) Tail Post Guidelines shall be applied to all Asiana regional branches' offices and flights when B747-400 COMBI is operating. If there are other overseas contracted grounds handling companies' guidelines for tail post, those guidelines shall be applied.
2) If there is no Tail Post to assist the aircraft due to malfunction or other reasons, AFT Tipping Limit should be applied within 38% MAC for more safety in the ramp area.
3) It is supposed that the cargo Load Plan is organized for AFT Tipping Limit within 38% MAC. (If Load Sheet is issued to the flight crew, Tipping Limit is guaranteed within 38% MAC)
   - Absolute Tipping CG for B747-400 is 62.5% MAC. The standard for Nose Gear Zero Load is 44% MAC. (For B747-400 Combi, refer to WBM 1-84-001.)
4) If the Zero Fuel Weight CG and Takeoff Weight CG are within company's operational limit, Landing CG is supposed within flight operational limit. Landing CG does not exceed AFT Limit 33%.

2.3.2.2 How to remove Tail post before pushback

For B747 COMBI, the procedures to remove Tail post in ramp area as follows,

a. Check that parking brake is set.
b. Order the ground handling person to remove Tail post.
c. After confirmation of tail post removal from ground handling person, start push back.

2.3.3 Pushback or Towing Procedure

Refer to FCOM VOL 1 N.P

Note) When performing pushback,

a. Set 121.5 to Left Radio Panel,

b. Set Transponder (As Require),

c. After completed pushback, set the Parking Brake and set the Weather Radar mode to WX or WX-T.

2.3.3.1 The Movement of the Aircraft by Flight Crews

Refer to FOM chapter 6 “Normal Operations”

2.3.3.2 Standard Communication Procedure with Ground Crew

Refer to FOM chapter 6 “Normal Operations”

The end of section

Intentionally

Blank

2.4 Engines Start

2.4.1 General

a. Captain will order Co-pilot(F/O) to request ATC for pushback and engines start.
b. Captain calls for "Before Start Checklist" after receiving pushback and engines start clearance from ATC. Co-pilot(F/O) performs the Checklist after relevant procedure completed.
c. Captain requests to the ground staff for Pushback.
d. Engines start procedures might be completed while commencing pushback or towing the aircraft.

2.4.2 Engines Start Procedures

a. When PF gives Before Start Checklist order, PM starts the instruments according to the FCOM VOL.1 Normal Procedures. After pushing RECALL s/w, check whether Fuel Pumps s/w is ON/OFF, push CANCEL s/w and execute Before Start Checklist
b. Refer to FCOM VOL 1 N.P for engines start procedures.
c. Captain calls "APU OFF" after all engines are normal and stabilized. Co-pilot(F/O) performs procedures in order.
d. Captain calls FLAPS 1, 20 after co-pilot completed the relevant procedures.
e. Captain requests for disconnecting Ground Equipment and checks the Flight Controls.

2.4.2.1 Engines Start at Gate/Ramp

a. The Ramp coordinator/Interphone man will contact the captain when it is ready to start the engine(s).
b. The Gate Agent will remain at the Jet Way (Boarding Bridge) Control Panel until the aircraft has been pushed back or taxied clear of any obstacle that could prevent proper operation of escape slides.
c. The Ramp coordinator/Interphone man will watch for any non-normal conditions in the process of engine start. Captain shall request to disconnect GPU before Pushback.

2.4.2.2 Callout Procedures for Start Engines

Refer to the POM 2.20 "Standard Callout & Response Procedure"

2.4.3 Engine Cross Bleed Start Procedure

Refer to FCOM VOL 1 Supplementary Procedures.

Note) Set the parking brake and verify the area behind the airplane is clear of equipment and personnel prior to increasing thrust on operating engine.

The end of section

2.5 Before Taxi

2.5.1 Generals

a. If engines are stabilized in idling condition, aircraft's system will conduct test this status of the aircraft automatically. If there is any non-normal item, related message will be displayed on EICAS. Captain (PIC) will ask ground crew to disconnect all ground equipments if there is no abnormality after engines start.

b. NAI switches must be on after engines start in icing condition.

1) In case of possibility of icing accumulation due to prolonged ground operation, it is required to run up engines with high thrust (N1 60%) for 30 seconds at intervals of 30 minutes.

2) If required, flight crew must request ATC for run-up clearance or verify ground personnel and equipments have been cleared before commencing these procedures.

c. Wing anti-ice shall be checked only when flaps are retracted in flight.

2.5.2 Before Taxi Procedures

Refer to FCOM VOL 1 N.P

2.5.3 Takeoff Flaps Set

FLAPS 10 or 20 is used as takeoff flaps, and it is required to consider all sorts of conditions such as departure procedures, NADP, aircraft, economy, runway and weather condition.

a. Strong Points for Takeoff Flaps 20
  1) Lower Takeoff Speeds
  2) Less Takeoff Distance
  3) RTO (Rejected Takeoff)시 Safety Factor Increase
  4) Close-in Obstacle Clearance increased
  5) Tire and Brake Save
  6) Tail Clearance at Lift Off increased

b. Strong Points for Takeoff Flaps 10
  1) Better Climb Gradient
  2) Better Rate of Climb
  3) Less Fuel Consumption
  4) Distant Obstacle Clearance Increased

Note) Refer to the B747-400 FCTM

Flaps	Liftoff Attitude (degrees)	Minimum Tail Clearance Inches(cm)	Tail Strike Pitch Attitude (degrees)
10	10.1	39 (99)	12.5
20	10.0	40 (102)	12.5

c. Takeoff Flaps Setting Procedures
  1) Captain will order Co-pilot(F/O) to set “Flaps 1 (one)”, and Co-pilot(F/O) will position flap lever on Flaps 1 (one) gate.
  2) After ensuring that flap lever position indication changed to green on upper EICAS with flaps 1 set, captain will order Co-pilot(F/O) to set takeoff flaps (“Flaps 10” or “Flaps 20”).
  3) It is recommended for Co-pilot(F/O) to hold flap lever until takeoff flaps set in order not to miss setting takeoff flaps.

2.5.4 Flight Controls Check

a. Time for Flight Control Check

1) Implement check after the Ground staff has moved to left/right safety area.
2) Captain will do flight control check prior to Taxi after F/O has set the Takeoff flap lever to ensure aircraft control performance.

Note) Flight controls check should be completed before starting taxi. Flight control check should be completed before entering the runway in some exceptions.

b. Method

1) It will be done with EICAS in "STATUS" mode.
2) Flight control should be checked by Captain. Captain will perform flight controls check in the following sequence after callout;
   a) Sequence of Control wheel and column check is : Full Left -> Center -> Full Right -> Center -> Full forward -> Center -> Full after -> Center
   b) Sequence of rudder pedal check is: hold Tiller and turn Full Left -> Center -> Full Right -> Center
   c) Co-pilot(F/O) will check the items to be verified while flight controls check.
3) Flight crews should check the following items during Flight Controls Check.
   a) Freedom of Movement.
   b) The controls/ the rudders return to center.
   c) Correct flight control and rudder movement on EICAS display.

The end of section

Intentionally

Blank

2.6 Taxi Procedure

2.6.1 Generals

a. Captain should check the Wheel Chocks removal and Lock Out Pin etc. Refer to the Chapter 6. Normal Operation in FOM.

b. Co-pilot(F/O) will request ATC for taxi clearance by order of Captain (PF).

c. After getting taxi clearance, If required, mutual verification for taxing procedures might be helpful.

d. Captain (PIC) orders Co-pilot (F/O) to turn on taxi light and turnoff light as well if needed.

e. Pilots should check Left/Right side of the aircraft and make callout.

   1) CAPT : “Left Clear”

   2) Co-pilot(F/O) : “Right Clear”

f. Some handling items such as configuration change or FMC modification due to SID change will be performed at straight taxiway after leaving congested ramp area.

g. While taxing, PM will be reading airway manual (chart 10-9 or 10 9B) to make PF taxi easier. (Example: “Approaching A, Next B”)

h. For other general items regarding taxi and taxi procedures on contaminated taxiway, refer to the chapter 7. “Normal Operations” in FOM.

Note) If PA is needed during taxi, make PA after stopping the A/C.

i. In case of the change of SID or T/O runway during taxi, captain orders Co-pilot(F/O) to change the data, and when the change is done, captain make a short briefing for T/O.

   1) Pilots stop to change items after delay taxi or request holding at proper place if necessary.

   2) Required changes

      a) Takeoff runway and/ or SID revision

      b) FMC LEG page

      c) Takeoff Analysis(Takeoff Performance and Eng’ out procedure)

      d) FMC THRUST LIM & TAKEOFF REF page (for speed)

      e) MCP set (HDG, Limited Altitude, LNAV/VNAV)

      f) Necessary items of change

2.6.2 Maximum Taxi Speed

a. Taxi speed must be within limitations, and it is required to follow the specific airport procedures or limitations.
b. Except emergency, it is not allowed to use nose wheel steering tiller at the speed of 20knots or more while taxing. However, in case of emergency, pilots should use the tiller with attention.
c. PM shall callout "check Speed" when the taxi speed exceeds the limitation.
d. The taxi speeds are limited as follows

Location	Maximum Speed
Entering gate	5 Knots
Ramp area	10 Knots
Turning on taxiway	10 Knots (Note : 5 Knots)
Straight taxiway	30 Knots (Note : 10 Knots)
On runway	30 Knots
High speed taxiway	60 Knots

Note)
1. Although taxiway ICN R8/R7 is located within ramp area, apply straight taxiway speed for R8 (maximum 30 knots) and for R7 (maximum 20 knots) as an exception.
2. When runway is wet, slippery or contaminated

2.6.3 Wet/Contaminated Taxiway

a. Captain should consider that the aircraft might turn to a direction or slide when increasing thrust for starting taxi on the icy or slippery ramp.
b. Since jet blast can cause severe damage to outside equipment and personnel, be careful.
c. Since jet blast can cause severe damage to stands, baggage, carts and light airplane, use Thrust when minimum Taxi.
d. When taxiing on the slippery surface with either ice or snow, maintain enough space and keep the minimum speed for turning.
e. When taxiway is wet with wet snow or standing water, taxi with flaps up. T/O flaps will be set before T/O checklist. If flaps stop extending, set the flaps lever in accordance with indicator.
f. If the ramp taxiway or runway is covered with standing water, ice or snow, maintain more space with other A/Cs.
g. While taxing, captain should consider the distance from barrier or aircraft of le FT side and Co-pilot(F/O) should do for the right side. And the flight crew on observer seat shall help captain to check the clearance to other traffic or barrier from le FT side.

2.6.4 Engine Anti-Ice Operation On the ground

Refer to FCOM VOL. 1 Supplementary Procedures.

2.6.5 De-Icing/Anti-Icing

Refer to FCOM VOL. 1 Supplementary Procedures and FOM Ch.5.

2.6.6 Taxi in Summer Season

In general, the temperature of ramp, taxiway or runway is higher than expected, so captain should be careful of Brake Temperature, refer to B747-400 FCTM “Ground Operation” for more details.

2.6.7 Taxi in Winter Season

Captain should consider that the aircraft might turn to a direction or slide when increasing thrust for starting taxi on the icy or slippery ramp.
Jet blast might give severe damage to stand, baggage, cart and light aircraft, so use the minimum thrust for taxi. For more details, refer to B747-400 FCTM "Ground Operation"

The end of section

2.7 Before Takeoff

2.7.1 Considerations before Takeoff

It is required for flight crew to consider the following items before T/O, and for the details, refer to the FOM chapter 6."Normal Operations"

2.7.1.1 Takeoff Alternate Airport

a. Refer to FOM 4.3.3.2 for selection of takeoff alternate airport.
b. Refer to FOM 4.3.3.2 for the application, weather and location of takeoff alternate airport.

Intentionally

Blank

2.7.1.2 Minimum Takeoff Fuel

a. Minimum Takeoff Fuel is a sum of Trip Fuel, Contingency Fuel, Destination Alternate Fuel, Final Reserve Fuel and Additional Fuel.
b. For the details, refer to the chapter 4. "Classification for Fuel Loading" in FOM.

2.7.1.3 Intersection Takeoff

Intersection T/O can save some fuel and time. It is required to request ATC for intersection takeoff and to consider T/O performance.

2.7.1.4 Rejected Takeoff Procedure

PIC is responsible for deciding and performing RTO. For more details, refer to FOM chapter 6 "Normal operations".

2.7.1.5 Takeoff Thrust

It is in accordance with "Takeoff Thrust Consideration" in this POM.

2.7.1.6 Airport Restrictions

Refer to the chapter 2. "Flight Limitations" of Operational Policy and the chapter 4. "Airport Restriction" of Dispatch in FOM.

2.7.1.7 Brake Action

When reported braking action is less than good, refer to FOM chapter 6 "Normal operations".

2.7.1.8 Engine out Departure procedure

Refer to FOM chapter 6 “Normal operations” for engine out departure procedure.

2.7.1.9 Oil Temperature

It is required to check the following items during cold weather operation.

a. Oil temperature shall increase to normal operating range (more than 50 Degrees C) prior to takeoff.
b. Max Oil Temperature 15 Minutes Limit (175℃).
c. Min Oil Pressure (10 PSI).

2.7.1.10 Engine warm up requirements

Refer to FCOM VOL 2 SUPPLEMENTARY N.P.

2.7.1.11 Packs off Takeoff

Refer to the FCOM Vol. 1.Supplementary Procedures.

2.7.2 Takeoff Thrust

2.7.2.1 Generals

It is recommended to use Reduced Thrust Takeoff method for long engine life within performance limits and noise abatement procedures. However, flight safety is a matter of highs priority.

2.7.2.2 Considerations for Takeoff Thrust Set

a. Captain should consider the followings for T/O thrust.
  1) Runway condition. (Dry, Wet, Standing Water, Slush, Slippery, others)
  2) Aircraft weight and CG.
  3) Weather condition.
  4) Autothrottle or EEC operation.
  5) Any contaminated substance from jet blast.
  6) The aircraft condition.

b. A derated engine will have a lower VMCG when T/O at runway contaminated with slush or standing water. In this circumstance, allowable takeoff weight may increase. However, it is required to reduce takeoff weight due to slush or standing water, so keep in mind the fact that allowable takeoff weight does not always increase.

2.7.2.3 Reduced Takeoff Thrust Methods

The following methods are used for Reduced T/O thrust.

a. Fixed De-rate (As Installed)
  1) This method is for selecting TO1 or TO2 (Fixed De-rated Setting) when selecting T/O thrust.
  2) When taking off with fixed de-rated engines, it is not allowed to increase thrust levers beyond fixed de-rate limit unless it requires in special circumstances such as windshear condition.
  3) The use of Fixed De-rate can decrease engine maintenance cost but it also increase total trip fuel quantity, so it is required to use

the method properly. Asiana recommends to use fixed de-rate method.

Note)

1. Fixed De-rate method may be used in wet or contaminated runway condition.

2. When making a VMCG limited T/O, DO NOT exceed the Fixed De-rate Thrust Limit except in an emergency.

CAUTION

1. It is NOT ALLOWED to use Fixed De-rate method when wind shear condition exits or expected.

2. When one engine failure occurs during take off with using Fixed De-rate method, LOSS OF DIRECTIONAL CONTROL can be encountered in case of increasing thrust beyond Fixed De-rate limit.

b. ATM (Assumed Temperature Method)

1) This method is to reduce T/O thrust below maximum thrust by applying lower temperature than real.
2) Takeoff thrust can be reduced by up to 25% of each takeoff thrust ratings (Maximum, TO1, TO2).
3) Manual thrust increase might be applicable up to maximum thrust limit, when additional thrust is required in the circumstance of windshear.etc, however it does not need to be in a hurry.
4) Limitation for ATM is in accordance with the chapter 6. "Takeoff Thrust" of Normal Operations in FOM.

c. Combination of Fixed De-rate and ATM

This is thrust reduction method which reduces each takeoff thrust ratings (TO1, TO2) further up to 25% by first selecting a fixed derate and then an assumed temperature higher than the actual ambient temperature.

d. Periodic Check (AFM Limitation)

Pilots of the first flight in the month must perform periodic checks to ensure that the engines are capable of producing full takeoff thrust without exceeding any engine operating limits and record any exceedance in the flight and maintenance log.

2.7.2.4 Comparison ATM and Fixed De-Rated

The following should be considered when using reduced thrust method or derated thrust method.

Index	ATM	Fixed De-rated
Method of Thrust Reduction	•Thrust is reduced by input assumed temperature to OAT. • Original engine performance will remain same. • All takeoff characteristics will not be changed. Thrust reduction is only based on assumed temperature.	•Thrust reduction is a result of de-rating engine. •When applying De-rate thrust method, it is considered as the type of engine is changed. •Engine maximum parameters after derate should be considered as limitations. •All engine performance will be changed as appropriate. •If engine maximum parameters exceeds, the changes of aircraft control and performance will occur
Performance Calculation	Assumed temperature will be calculated from each different performance chart based on the temperature.	Assumed temperature will be calculated from each different performance chart based on derate (TO1,TO2)
VMCG	VMCG will remain same after thrust reduction	VMCG will be decreased as derated.
V1 Calculation	V1 will be calculated by applying assumed temperature as OAT.	V1 will be calculated as derated for the same OAT.

Additional Thrust use during T/O	Thrust can increase manually after HOLD in FMA mode. Directional control could be maintained with manual thrust increase while engine failure after V1.	After lift-off, pushing TO-GA switch will change Fixed De-rate thrust to Max takeoff thrust. CAUTION *When one engine failure occurs during T/O with using Fixed De-rate method, LOSS OF DIRECTIONAL CONTROL can be encountered in case of increasing thrust beyond Fixed De-rate limit.*
Amount of Thrust Reduction	•Maximum thrust reduction will be used when using assumed temperature derived from T/O analysis chart, applying OAT of actual weight.	Company Application - TO1 : 5% - TO2 : 15%
limitations	•It is NOT allowed to use reduced thrust method when runway is contaminated and wind shear is expected. (for more detail refer to bellow)	Use maximum T/O thrust When EEC Failure/ windshear is expected.
Primary EICAS	D-TO, D-TO 1, D-TO 2	TO 1, TO 2

CAUTION

ATM for T/O is PROHIBITED if any of the following condition exists ;

a. T/O runway is contaminated with standing water, ice, slush, or snow.

b.. Anti-skid inoperative.

c. Report or anticipate windshear.

d.. T/O analysis chart is not available.

e. One engine inoperative ferry flight.

f.. MEL/CDL states "Reduced thrust T/O using the ATM is not permitted" (Example EEC failure).

WARNING

If you increase thrust manually, LOSS OF DIRECTIONAL CONTROL might occur when one engine becomes inoperative after V1 speed during takeoff.

Thus, it is NOT ALLOWED to increase thrust manually, except in the condition of emergency such as wind shear.

2.7.3 Takeoff signs before departure (FOM 2.8.2.3)

Refer to FOM 2.8.2.3 for takeoff signs and standard communication signal.

2.7.4 Before Takeoff Procedures

Refer to FCOM Vol I Normal Procedure.

The end of section

2.8 Takeoff Procedure

2.8.1 Types of Takeoff

2.8.1.1 Rolling Takeoff

a. If it is cleared for T/O before or while entering the runway, maintain normal taxi speed. When the airplane is aligned with the runway centerline, check engines are stabilized, and apply T/O thrust by pushing TO/GA switch.

b. If it is instructed to line up and wait runway 00 by ATC, follow the instruction. When it is cleared for T/O, increase thrust to N1 70% with brake released, and check engines are stabilized, and apply T/O thrust by pushing TO/GA switch.

2.8.1.2 Standing Takeoff

Once aligning on the runway centerline, increase thrust to N1 70% (thrust level position), and check all engines are stabilized, then set T/O thrust (TO/GA push) with brake release.

2.8.1.3. Application of Rolling or Standing Takeoff

a. The rolling takeoff procedure is recommended for setting takeoff thrust. It expedites the takeoff and reduces the risk of foreign object damage or engine surge/stall due to a tailwind or crosswind.

b. The standing takeoff procedure allows the engines to stabilize provides uniform engine acceleration to takeoff thrust and minimizes directional control problems. This is particularly important if cross- winds exist or the runway surface is slippery. The exact initial setting is not as important as setting symmetrical thrust. If thrust is to be set manually, smoothly advance thrust levers toward takeoff thrust.

c. Engine surge can occur with a strong crosswind or tailwind component if takeoff thrust is set before brake release. Therefore, the rolling takeoff procedure is strongly advised when crosswinds exceed 20 knots or tailwinds exceed 10 knots.

2.8.2 General– Takeoff

a. After "CLEARED FOR T/O" or "LINE UP WAIT" clearance, captain orders Before Takeoff Checklist. Co-pilot gives takeoff signal to cabin and check the following items before performing "Before Takeoff Checklist".

1) Refer to the chapter 2, "Communication between cockpit and cabin" of Operation Policies and the chapter 13, "Standard Communication Signal" of supplement in FOM.
2) Landing and Strobe Lights : ON (All exterior lights on if required).
3) Transponder : TA/RA (The "TFC" must be displayed on ND)
4) Check final course and runway cleared.
5) Weather radar (PF and PM): ON
   (During Night or IMC, PM side is TERR SW – ON)

Note) Whenever the possibility exists for adverse weather and terrain/obstacles near the intended flight path, one pilot should monitor the weather radar display and the other pilot should monitor the terrain display. The use of the terrain display during night or IMC operations, on departure and approach when in proximity to terrain/obstacles, and at all times in non-radar environment is recommended.

6) Map range : 10NM or 20NM select.

b. Entering the runway, PF will call the type of T/O as a reminder to all flight crew members.

c. After alignment, the airplane symbol on the ND or compass heading and runway direction and runway number should be cross checked. Also, in case of a takeoff at airports operating with multiple number of runways, confirm the right runway to prevent any confusion.

d. The elapsed time should be set to the run position prior to T/O roll following the T/O clearance.

e. When taking off under IMC condition, WX RADAR switch in display switch in Glare Shield Panel should "ON" for captain and TERR switch should be "ON" for Co-pilot(F/O).

f. If PF/PM duties need to be transferred between captain and first officer before takeoff, transfer the flight control after the aircraft is aligned with the runway and stopped with brake applied.

2.8.3 Takeoff Roll

2.8.3.1 General

a. PF advances thrust levers to N1 70% and check all engine instruments are stabilized, then callout "STABILIZED". PF should call "TO/GA" with pushing TO/GA switch at the same time.

b. PM should monitor FMA in PFD for "THR REF" and callout "THRUST REFERENCE".

Note) TO/GA switches shall be pushed before 50knots for normal operation.

c. If TO/GA switch fails, PF will advance thrust manually to takeoff REF N1 and order PM to "SET TAKEOFF THRUST". PM will adjust thrust levers to complete setting Takeoff N1 by 80 knots, and callout "TAKEOFF THRUST SET".

d. When Co-pilot(F/O) is controlling the airplane as PF, captain will take over thrust levers after pushing TO/GA switch. Captain calls "THRUST REF" and "I HAVE THRUST", then co-pilot(F/O) replies "YOU HAVE THRUST". Captain puts his hands and feet on the control wheel and rudders softly in order to correct immediately when the co-pilot(F/O) operates the airplane incorrectly.

e. When GPS is not working, PM checks the FMC position has been updated on ND.

f. When airplane finishes lining up, hands should be on control wheel from tiller.

Note) The use of wheel tiller SHOULD BE AVOIDED at the speed of more than 20 knots to prevent LOSS OF DIRECTIONAL CONTROL due to over controlling except emergency condition.

g. PF should put forward pressure on control wheel to increase nose wheel steering effectiveness.

h. Rudder becomes effective from the speed of approximately 40~60knots.

i. PM must confirm FMA changes to HOLD mode from THR REF. If no change on FMA, PM must callout about it. If HOLD annunciation does not appear, no crew action is required unless a subsequent system fault causes unwanted thrust lever movement. As with any autothrottle malfunction, the autothrottle should then be disconnected and desired thrust set manually.

j. Reject T/O immediately when it is unable to maintain runway centerline before rudder effects or takeoff rolling.

k. PM calls "80knots"and PF responses "Checked" at the speed of 80knots. It is required to check the following items as well.
  1) Throttle Hold Mode (HOLD) Engaged.
  2) The speed is 80knots on PFD.
  3) The aircraft conditions.
  4) Forward control wheel pressure released.

Note) If there is no response from the PF after PM calls out 2 times at "80knots", PM should take over the aircraft control.

Note) T/O into head wind of 20knots or greater may result in HOLD before the autothrottle can make final thrust adjustments.

l. Captain shall keep holding thrust levers until V1 to ensure immediate corrective actions for rejected T/O.

m. At V1 speed, PM should monitor 'V 1'auto call out. PM calls "V 1"If no auto call out, then PF moves hand to control wheel from thrust levers.

Note) V1 must be callout by V1 speed at the latest.

n. Thrust Lever Control During Takeoff (FOM 7.4.2)
  1) When training captain is PF
     Training captain will control the thrust lever during takeoff and instructor/evaluator will soft touch thrust lever until V1.
  2) When Co-pilot(F/O) is PF
     a) PIC (instructor/evaluator) will control the thrust levers after takeoff thrust is set until V1.
        - PIC (instructor/evaluator) : "I Have Thrust"
        - Co-pilot(F/O): "You Have Thrust"
     b) PIC will soft touch the control column (side stick) and rudder in case of non-normal situation or unsafe maneuver by the Co-pilot(F/O).
     c) If situation dictates PIC will take over the flight controls.
        - PIC (instructor/evaluator) : "I Have Control"
        - Co-pilot(F/O): "You Have Control"

CAUTION

In case of tail strike (not tailskid) during takeoff, land as soon as possible. Check for structural damage to the aircraft and until then cabin pressurization is not reliable.

o. Speed Check

Each flight crew should check speedometer at the 80Knots.

Note) If there is no response from captain after PM calls out 2 times at the speed above, PM follows the following procedures.

1) Consider it as PF's incapacitation.
2) Take over A/C control.
3) Follow Rejected Takeoff Procedure.

p. At V1

At V1 speed, PM should monitor 'V 1' auto call out. PM calls "V 1" if no auto call out.

Note) V1 must be called out by V1 speed at the latest.

q. At VR

1) PM calls out "Rotate" at VR speed.
2) Smooth and steady rotation is required at VR
3) For details, refer to 2.8.4 below.

2.8.4 Rotation and Liftoff Technique

a. T/O speeds are established based on minimum control speed, stall speed, and tail clearance margins. When a smooth continuous rotation is initiated at VR, tail clearance margin is assured.

b. At VR speed, PM calls "ROTATE". PF starts rotation to Typical Rotation Attitude (15˚) at rate of 2.5˚/Sec Pitch rate (Engine failure/flame out : 2˚/Sec). using the technique above, liftoff altitude is achieved in approximately 3 to 4 seconds.

c. T/O and initial climb performance depend on rotating at the correct airspeed and proper rate to the rotation target altitude.

d. Early, rapid rotation or over rotation may cause after fuselage contact.

After fuselage contact may occur with wheels on the runway and landing gear strut extended at the pitch of approximately 12.5˚.

e. Late, slow, or under-rotation increases T/O ground roll.

f. For optimum T/O and initial climb performance, continuous and gradual rotation to typical target altitude at VR is required (2.5 degrees/sec), and 10 degrees body pitch attitude should not exceed before liftoff.
After liftoff, FD should be primary pitch reference.

Note) DO NOT Follow FD (Flight Director) Commands until After Liftoff.

g. Smooth and proper rotation from VR to target altitude ensure V2~ V2+10 knots speed (All engines operation) from 35 feet AFE.

h. The speed from V2+10 ~ V2+25knots will not affect T/O profile. Abrupt pitch changes to maintain V2+10knots are not necessary.

CAUTION

DO NOT PRESSURIZE the aircraft without examining structural damages of aircraft after fuselage contacts on runway. Landing are nearest suitable airport is recommended. TAIL SKID & TAIL STRIKE are separated. For the details, refer to the chapter 7 "Non-normal Operations" in FOM.

2.8.5 Gusty and Strong Crosswind Takeoff

a. For T/O in gusty or strong crosswind conditions, use of a higher thrust setting than the minimum required is recommended.

b. When the prevailing wind is at or near 90 degrees to the runway, the possibility of wind shifts resulting in gusty tailwind components during rotation or liftoff increases. During this condition, consider the use of thrust setting at maximum T/O thrust. The use of maximum T/O thrust setting reduces the required runway length and minimize the airplane exposure to gusty conditions during rotation, liftoff.

c. If a gust is experienced near VR, as indicated by stagnant airspeed or rapid air speed acieration, momentarily delay rotation.

d. Early Rotation or fast rate of rotation which can reduce the Tail Clearance Margin should be avoided.

e. Limit control wheel input to that required to keep the wings level. Use of excessive control wheel may cause spoilers to rise which has the effect of reducing tail clearance.

h. Crosswind T/O cross wind limitations are in accordance with the chapter 8, "Adverse Weather" in this POM

2.8.6 Improved Climb Performance Takeoff

If the field length is not limited, an increased climb limit weight is achieved by using the excess field length to accelerate to higher T/O and climb speeds.
For other procedures, refer to B747-400 FCTM (Boeing). This improves the climb gradient, thereby raising the climb and obstacle limited weights. V1, VR and V2 are increased and must be obtained from dispatch or by airport analysis.

Note) Improved climb performance is certified for flaps 20 takeoff only.

2.8.7 Low Visibility Takeoff

a. Low visibility T/O operations, below CAT-I landing minima, may REQUIRE a T/O ALTERNATE AIRPORT. For selecting a T/O alternate airport, refer to the chapter 5. "Weather" in FOM.
b. All RVR readings must be equal to or greater than required T/O minima. Regarding T/O basic minima, T/O and landing minima, refer to the chapter 5 "Weather" in FOM and the chapter 8 "Adverse Weather" in this POM.
c. For other low visibility T/O procedures, refer to B747-400 FCTM (Boeing).

2.8.8 Low Gross Weight, AFT CG Takeoff

a. Confirm 15% (or greater) thrust derated for take off
b. The aircraft is aligned with runway centerline and check whether RWY direction & airplane heading is corresponding.
c. Release brakes
d. After set 70% N1 and engines is stabilized, push TO/GA switch to take off thrust or manually advanced thrust levers.

e. Input full forward control wheel deflection to approximately 80kts to improve nose wheel steering. When above minimum altitude for autopilot engagement, engage A/P, others same as normal T/O procedures.

2.8.9 Wet/Contaminated Runway Takeoff

a. Slush, Standing Water, Deep Snow reduce takeoff performance because of tire to ground friction reduction and takeoff roll resist.
b. Refer to ch.8 Adverse Weather for takeoff and landing limitations under adverse runway conditions.

Note) Over control of rudder pedal makes it easy to loose directional control on slippery runway during takeoff initial acceleration.

2.8.10 Effective De/Anti-Icing Fluids on Takeoff

a. Testing of undiluted TYPE II/IV fluids has shown that some of the fluid remains of the wing during T/O rotation and during initial climb out. This may cause a temporary decrease in lift and increase drag. These effects are more significant at lower ambient temperatures.
b. No performance adjustments or limitations for ATM and/or fixed de-rate are required for the application of deicing/anti-icing fluids

2.8.11 The Use of FMS-CDU, MCP & EICAS during Takeoff

a. FMS-CDU
1) During T/O, PF uses TAKEOFF REF page, and he/she should check altitude and airspeed restrictions on CLB page.
2) PM verifies next waypoint becomes active. He/she must be ready to modify leg page according to ATC instructions.

b. NAV Aid

If required, PM may input required NAV aids frequency on NAV radio panel (PM side) to check SID track.

c. Runway heading must be preset on MCP window before T/O. However, the specific desired heading may be pre set, when immediate turns are required after T/O.

Note) Without instruction from ATC or otherwise, all turns after takeoff should be made after 400FT AGL.

d. On MCP Altitude window, first altitude “With at or below restriction” should be set.

e. VNAV should be armed to provide the VNAV profile and acieration schedule compatible with the planned departure.

f. LNAV must be armed prior to T/O for flying along the SID track in data base. (when LNAV is available with heading information in FMC) However, it does not need to arm LNAV mode in case of flying after T/O in HDG mode. (Example : Radar vector).

g. Secondary EICAS screen should maintained OFF in order not to be disturbed by unnecessary information display.

2.8.12 Flap Retraction Schedule

Refer to FCOM Vol I Normal Procedure

2.8.13 Takeoff Procedures

Refer to FCOM Vol I Normal Procedure

The end of section

Intentionally

Blank

2.9 Climb & Departure

2.9.1 General

a. After liftoff, use FD as the primary pitch reference and airspeed, airspeed trend and others must be cross checked. If FD is not used, use airspeed and attitude as the primary pitch reference.

b. After Liftoff, PM calls out "Positive Rate" with confirming the aircraft climbing by checking the altitude and V/S. When PF call out "Gears Up", PM lifts the Gears Lever up.

c. If LNAV is armed before takeoff, check LNAV is captured at 50ft RA.

d. The details for using A/P and A/T shall be applied with FOM ch.2 about A/P and A/T.

e. If LNAV fails to capture, PNF calls "LNAV FAIL" keep following SID profile by changing lateral navigation mode to HDG SEL mode from TO/GA mode.

Note) Without special procedure from ATC or otherwise, all turns after T/O should be made after 400ft (AGL).

f. If VNAV is armed before takeoff, check 'VNAV' is captured at 400ft RA.

g. If VNAV fails to be captured, PM calls for "VNAV not captured." Continue to climb by using vertical mode(FLCH, V/S)

h. Maintain V2+10~V2+25kts until reaching flap retraction altitude.

i. If speed exceeds V2+10 kts, maintain present speed between V2+10 to V2+25 which is higher.

j. When immediate turns is needed after T/O due to obstruction clearance, noise abatement procedure or SID profile, V2+10 speed with T/O flaps bank angle is 25˚. The SID restriction must be followed during special airport take off.

Note) A maximum bank angle of 25˚ is permitted at V2+10 kts with takeoff flaps.

k. Set the L/G lever to OFF position when Landing Gear is fully up positioned and Flap Retraction is completed.

l. Weather Radar (User's Manual by Honeywell)

1) Maintain antenna tilt +4˚ during initial climb.

2) During climb, adjust antenna tilt downward and do not over-scanning in proportion to decrease climb rate according to altitude increase.
3) Refer to FPV for antenna tilt control is an efficient way.

m. After Flaps are retracted, PM checks Air Conditioning Packs operating (set NAI switch auto position if required), PF orders "After Takeoff Checklist" after checking Flap Position Indication is disappeared on EICAS DISPLAY.

2.9.2 Climb Pitch Mode

a. Throttle "HOLD" Mode is changed from TO/GA Mode to other Pitch mode, or maintained until setting Climb Thrust as a "THR" Switch of MCP.
b. If VNAV is not engaged by 1,000FT (AGL), select vertical mode (FLCH, V/S) and set Flaps Up Speed + 20Knots or 250Knots whichever higher at Flaps Acceleration Altitude on MCP.
c. Select "SPD" Switch (A/T Mode) when Altitude is captured under TO/GA Mode during level off at low altitude and set demanded Command Speed.

2.9.3 Use of Autopilot after Takeoff

Autopilot should be engaged at or above the B747-400 minimum autopilot engaging altitude at the reference with Boeing manual, if the aircraft is being stabilized after takeoff.

Note) To engage the Autopilot is available at or above 250ft (AGL) at the reference with FCOM Limitation .

2.9.4 Turns after Takeoff

The Turns after takeoff should not be started until passing 400ft AGL. However there are some exceptions as follows.

a. Turns should be technically completed to comply with Instrument Departure Procedure.
b. Turning the aircraft below 400ft AGL is required and authorized by ATC.
c. In case of engine out, the designated turning point is at or below 400 ft AGL or stated with distance.

2.9.5 Instrument Departure Types

Instrument Departure Procedure (IDP) can be divide in to ODP (Obstacle Departure Procedures) and SID (Standard Instrument Departures).

2.9.5.1 ODP

a. Printed Either Textually or Graphically.
   Ex) SHEAD ONE DEPARTURE (RNA).
b. Use the Conventional or RNAV.
c. Provide the obstacle clearances from terminal area to proper en-route structure.
d. ODP is recommened for obstruction clearance when ATC doesn't provide Alternate Departure Procedures (SID or Radar Vector).
   Ex) CROWN THREE DEPARTURE (RNAV). (OBSTACLE)

2.9.5.2 SID

a. Printed Always Graphically.
b. Crew and ATC controller use SID for obstruction clearance and transition to the proper en-route strcture in the terminal area.
c. SID is designed to enhance system capacity and reduce the workload.
d. Get ATC clearance before performing SID

2.9.6 NADP

Specific local airport procedures for NADP (Noise Abatement Departure Procedures) should be followed ;

2.9.6.1 NADP 1

a. General

1) NADP 1 is designated to provide noise reduction for noise sensitive area in close proximity to the departure end of runway.
2) For the airport with ICAO A procedure only, apply NADP 1.
3) If there is a special NADP for specific airport, which procedure should applied with priority.

b. NADP 1 Procedures

1) Takeoff
   a) Takeoff Thrust
   b) Maintain a Climb Speed of V2+10 to 20Knots
2) At or Above 800FT AFE
   a) Reduce to Climb Thrust
   b) Maintain a Climb Speed of V2+10 to 20Knots

Note) For NADP 1, you can reduce climb thrust at or above 800 FT AFE, however, company procedure defines to set climb thrust at 1500 FT AFE.

3) At 3000FT AFE
   a) Accelerate Smoothly to En-Route Climb Speed and Maintain Positive Rate of Climb
   b) Retract Flap/Slat on Schedule
4) TAKEOFF REF Page Set Up
   a) Flaps / ACCEL HT : 20/3,000FT.
   b) E/O ACCEL HT : 800FT.
   c) THR REDUCTION : 1,500FT

2.9.6.2 NADP 2

a. General

1) NADP 2 is intended to provide noise reduction to area more distant from the end of runway.
2) For the airport with ICAO B procedure only, apply NADP 2.
3) If there is a special NADP for specific airport, which procedure should applied with priority.

b. NADP 2 Procedures

1) Takeoff
   a) Takeoff Thrust
   b) Maintain a Climb Speed of V2+10 to 20Knots
2) At or Above 800FT AFE
   a) Accelerate to Vzf and Maintain Positive Rate of Climb
   b) Retract Flap/Slat on Schedule
   c) Reduce to Climb Thrust with the Initiation of the First Flaps/Slats Retractions or at an Intermediate Flap Setting

Note) For NADP 2, company procedure defines to accelerate at 1000FT AFE and reduce to climb thrust with first flaps retraction.

3) At 3000FT AFE
   Transition to Normal En-Route Climb Speed
4) TAKEOFF REF Page Set Up
   a) Flaps / ACCEL HT : 20/1,000FT.
   b) E/O ACCEL HT : 800FT.
   c) THR REDUCTION : Flaps 5.

2.9.6.3 Airport where NADP is not Established

When there is the airport where NADP is not established, reduce to climb thrust at 1,500FT and start acceleration and flaps retraction for fuel economy (Enforcement Regulation of Aviation Law 183).
a. Flaps / ACCEL HT : 20/1,500FT.
b. E/O ACCEL HT : 800FT.
c. THR REDUCTION : 1,500FT
Note) If there are other special NADPs for specific airports (JFK, LHR etc), those NADP shall be applied with the first priority.

2.9.7 Reduced Thrust Climb

2.9.7.1 General

a. Once climb thrust is set, EEC will control thrust automatically as climb conditions vary. When EEC is in alternate mode or autothrottle is inoperative, flight crew set thrust levers manually to maintain climb thrust.
b. When adjust climb thrust manually, increase thrust N1 as altitude increasing.
c. T/O thrust should NOT EXCEED WITHIN 5 MINUTES duration.

2.9.7.2 Fixed De-Rate Climb

a. Derated climb thrust should be used appropriately as this method will reduce engine maintenance cost but increase total trip fuel.
b. Use of an assumed temperature reduced thrust T/O affects automatic selection of climb derate below table.

Reduced Thrust	Fixed De-rate	Climb Thrust (Auto Selection)
From 0 to 5 % and less	TO, TO 1 (5%)	CLB
More than 5% ~15% and less	TO 2 (15%)	CLB 1 (if selected 5% may being setting CLB 1)
More than 15%		CLB 2

2.9.6.3 Airport where NADP is not Established

The NADP1 procedure is recommended for airports without NADP or local restrictions.

Note) If there are other special NADPs for specific airports (JFK, LHR etc), those NADP shall be applied with the first priority.

2.9.7 Reduced Thrust Climb

2.9.7.1 General

a. Once climb thrust is set, EEC will control thrust automatically as climb conditions vary. When EEC is in alternate mode or autothrottle is inoperative, flight crew set thrust levers manually to maintain climb thrust.

b. When adjust climb thrust manually, increase thrust N1 as altitude increasing.

c. T/O thrust should NOT EXCEED WITHIN 5 MINUTES duration.

2.9.7.2 Fixed De-Rate Climb

a. Derated climb thrust should be used appropriately as this method will reduce engine maintenance cost but increase total trip fuel.

b. Use of an assumed temperature reduced thrust T/O affects automatic selection of climb derate below table.

Reduced Thrust	Fixed De-Rate	Climb Thrust (Auto Selection)
From 0 to 5 % and less	TO, TO 1 (5%)	CLB
More than 5% ~15% and less	TO 2 (15%)	CLB 1 (if selected 5% may being setting CLB 1)
More than 15%		CLB 2

Note) If assumed temperature applied when CLB 2 selected, thrust reduction will exceed 15%.

c. Maintain 10% derated thrust of MAX CLB THRUST until 10,000FT altitude, and DERATE CLMB THRUST gradually increase to MAX CLB Thrust at 15,000FT.

d. Maintain 20% derated thrust of MAX CLB THRUST until 10,000FT attitude, and DERATE CLB THRUST gradually increase to MAX CLB THRUST at 15,000FT.

e. If rate of climb drops below 500 FPM, next higher climb rate should be selected.

CAUTION

1. It is NOT ALLOWED to use Fixed Derate method if windshear condition is encountered or expected.

2. Thrust levers should NOT be advanced beyond the fixed derate limit during T/O with engine failure. A thrust increase following an engine failure could result in a LOSS OF DIRECTIONAL CONTROL.

2.9.7.3 Climb Thrust During NADP

a. For NADP 1, initial power will be reduced to Climb Thrust at 1,500FT, and accelerate to en-route climb speed retracting flaps/slats on schedule at 3,000FT.

b. For NADP 2, initial power reduction and flaps retraction on schedule should begin at 1,000FT.

c. When there is the airport where NADP is not established, initial power reduction should begin at 1,500FT.

d. In case that climb thrust mode is not engaged at climb thrust altitude, push “THR” switch to set climb thrust.

2.9.8 Acceleration Altitude

a. Climbing in VNAV mode, target speed will be flaps up speed + 20knots or 250knots whichever is higher at acceleration altitude.
b. With VNAV fail climb, target speed Vref 30 + 100knots or 250 knots whichever is higher by selecting FLCH mode, and retract flaps on schedule.

2.9.9 Climb Speed

2.9.9.1 Below 10,000FT

a. FMC ECON climb speed will indicate 250KIAS or flaps up speed + 20knots whichever is higher.
b. When not provided with FMC data, ECON climb speed will be 250knots or Vref 30 + 100knots whichever is higher.
c. When it is necessary to exceed 250knots at a controlled area with speed limitation of 250knots, accelerate speed to flaps up maneuvering speed with proper ATC authorization.
d. It is required to maintain 250knots or less below 10,000FT. However, specific local airport procedures should be following first.
e. For economic operation, it is recommended to climb with FMC ECON speed in the airport with no speed restriction considering flight path, traffic and weather etc.
f. Limitations
   1) Bank angle is automatically limited to 15° from flaps up speed to flaps up speed +20 knots with LNAV or HDGSEL mode activated and AFDS ON with the weight of 680,000 LBS or more.
   2) Flaps up while turning may result in overshooting SID track. In this case, pilots may commence turning with flaps 1 (One) configuration until they finish a turn and complete retracting flaps to prevent overshooting SID track.
   3) Speed intervention might be necessary to reduce turning radius in the airport which has noise abatement procedure. Command speed should be greater than Flaps up + 20knots when aircraft gross weight is more than 680,000 LBS.

2.9.9.2 Above 10,000FT

a. It is required to maintain climb speed in FMC ECON during climb. However, when FMC ECON Climb Speed is greater than OFP climb speed, climb with OFP Climb Speed.
b. During climb, captain can adjust climb speed control by the ATC request, turbulence or gross weight etc.

2.9.9.3 Econ Speed

C Speed based on the gross weight of aircraft, and it is displayed on VNAV 1/3 CLB page.

2.9.9.4 Maximum Rate Climb Speed

a. A maximum rate of climb provides both high climb rates and minimum time to cruise altitude. It changes according to the gross weight and thrust. It increases along with the gross weight.
b. Maximum rate climb speed is approximately by using flaps up maneuver speed + 60 knots until intercepting 0.82 Mach.

2.9.9.5 Maximum Angle Climb Speed

a. Maximum angle climb speed is normally used for obstacle clearance, minimum crossing altitude or to reach a specified altitude/flight level in a minimum distance.
b. It varies with gross weight and provides approximately the same climb gradient as flaps up maneuvering speed + 20knots.

2.9.10 Climb Methods

2.9.10.1 VNAV

a. Climb speed will be programmed in FMC. If restrictions or altitude limitations are programmed in FMC, VNAV will follow these restrictions on climb.
b. Default climb speed of FMC is flaps up + 20knots or 250knots whichever is higher.

2.9.10.2 FLCH

Desired speed can be set on MCP speed window. Pitch commands maintain IAS/MACH window airspeed or Mach.

2.9.10.3 V/S

AFDS pitch maintains V/S displays in V/S window. Aircraft with V/S engaged would keep the speed that is selected on MCP speed window. With autothrottle ON, power will be automatically controlled to maintain the speed on MCP speed window.

Note) As there is NO SPEED PROTETION with V/S mode, when climb rate is selected to exceed the aircraft climb performance, aircraft may stall.

2.9.11 Departure Profile

a. If LNAV mode fails to be activated, it is required to select HDG SEL mode above 400FT.
b. If VNAV mode fails to be activated, it is required to select Vertical Mode (FLCH, V/S) and set flaps up speed + 20knots or 250knots whichever is higher on MCP speed window. But, maintain speed of 250knots below 10,000FT, if required.

2.9.12 Departure Priority (Engine Out)

Refer to the Chapter 6. Normal Operations in FOM.

2.9.13 Altimeter Setting During Climb

a. QNH should be used until aircraft reaches TA (transition altitude). When aircraft is passing TA, reset altimeter as STD (QNE: 29.92 inhg or 1013 hpa).

Note) When permitted to climb to a flight level near to the Transition Altitude, QNE can be preset upon approaching the TA.

b. In case that initial restriction altitude and TA is 7,000FT, maintain 7,000FT in QNH, then when leaving 7,000FT, set STD (29.92 inHg) (Example: FRA).

c. If instructed to maintain FL70 by ATC, after altimeter reset STD them maintain FL70.

d. Refer to the POM chapter 2. Supplementary NP for QFE Operations.

2.9.14 Use Caution during Climb

a. Avoid unnecessary operations during departure; take thorough vigilance by ACAS (TCAS), visual and radio check.
b. During climbing, flight crew should closely monitor engine parameters due to high power and high chance of bird strike.
c. Avoid any unnecessary actions below 10,000FT that affects flight safety and communication other than standard callout.
d. When passing 10,000ft :
   1) Turn off all lights (excluding Beacon, NAV, Logo (Night Flight) and Strobe Light). Check cabin pressure and cabin temperature on Synoptic ECS.
   2) Based on PM's judgment, turn Seat Belt Sign "OFF(AUTO)". Inform the Senior cabin crew via Interphone in case of any delay resulting from weather conditions.
e. PF should concentrate on aircraft control, when need to take actions other than aircraft control, PF should give control to PM to avoid aircraft control gap.
f. Keep checking required indicators to keep up with restriction altitude.
g. When expecting adverse weather, make proper use of AFDS and avoid entering averse weather by using weather radar all the time.

2.9.15 Climb and Cruise Procedure

Refer to FCOM VOL I Normal Procedure

The end of section

2.10 Cruise

2.10.1 Generals

a. PM should call "1,000FT to level off" at 1,000FT prior to reaching cruise or assigned altitude, and PF will respond, "CHECKED"

b. PM will call out any FMA change.

c. Pilots should check the following items after reaching cruise altitude.

1) Flight Instruments.
2) FMA (SPD, VNAV PTH) in PFD.
3) Synoptic Status.
4) Thrust Reduction Status.
5) If altimeters on PF, PM and Standby Altimeter are indicating in an allowable error tolerance, and record to OFP.
6) FMC Settings
   a) RTE Page : ACT RTE
   b) LEGS Page : Active Way Point
   c) VNAV Page : CRZ ALT, OPT ALT, CURRENT SPD and FMC SPD.
   d) PROG Page : Current Fuel and Destination Fuel.

d. Weather Radar (User's Manual by Honeywell)

1) Maintain weather map range 40 NM for accurate detecting CB cloud after reaching cruise altitude and then select proper range.
2) At initial phase of cruise, control Radar tilt down to -10° and then smoothly upward until ground clutter disappear while scanning weather target.

Note) The flight crew will use tilt slightly negative to maintain ground returns on top of the ND.

e. After checking Level Off items at cruise altitude, pilots perform other items such as recording various data on OFP, arranging Jeppesen Charts, etc.

2.10.2 Passenger Address (PA)

a. It is required to perform aircraft controls transferring procedure before and after PA. It is a part of CRM procedures.
b. For the details of transferring procedure for the aircraft control and Captain Announcement procedure, refer to "Passenger Announcement" in the chapter 2. "Operation Policy" in FOM.

Note) The time for Normal Checklist, T/O & APP briefing, PA is PIC's discretion with considering the workload management.

2.10.3 Company Report

a. PM reports to company after entering en-route, having left congested area or after abnormal situation is under control.
b. Prior to reporting, PM should transfer radio communication to PF and PF is in charge of ATC. For more details, refer to FOM chapter 2.3 Operation Policy "Two pilot concepts."

- PM : "You have ATC"
- PF : "I have ATC"

c. PM should report the following items to Departure Airport Company.
1) Ramp Out Time.
2) Takeoff Time.
3) Destination ETA. (from Takeoff time which is designated by Flight Plan)
4) A/C Condition (in the event of Non-normal situation)

* Example of Company Report
"Asiana In-cheon Asiana 102, Ramp out 00 / 00, ETA NRT 00, (Aircraft Abnormal Status)."

2.10.4 Cruise Altitude

2.10.4.1 Generals

a. The optimum altitude displayed on FMC CRZ Page is the most economical altitude based on the selected cruise mode and flight plan distance. It is recommended to cruise at optimum altitude which shows on FMC CRZ Page, if possible.
b. Max altitude on FMC CRZ Page offers 1.2G buffet margin.
c. FMC fuel predictions are not available above the FMC maximum altitude and are not displayed on the CDU. VNAV is not available above FMC maximum altitude. Fuel burn at or above maximum altitude increases. Flight above this altitude is not recommended.
d. If ATC requires higher altitude, cruising 2,000FT below max altitude is recommended.

2.10.4.2 Step Climb

a. Generals

1) It is recommended to cruise at optimum altitude displayed on FMC CRZ Page. This will provide best fuel mileage for trip length, cost index, and gross weight.
2) In cruising at optimum altitude, pilots can have 1.5G (approximately 48˚bank) buffet margin.
3) Cruising 2,000 feet above the optimum altitude provides 45˚bank buffet margin. However, it is prohibited to cruise with the buffet margin of 1.35G or 3,000~4,000 feet above the optimum altitude.

b. Step Climb Technique

Refer to the followings in order to use properly step climb time showing on FMC.

1) 4,000Feet Step Climb
   a) This method starts cruising at 2,000 feet above the optimum altitude. The weight is reduced as flight continues, step climb 4,000 feet when 2,000 feet below the optimum altitude.
   b) When choosing 4,000 feet step climb methods, the fuel burning

during climb will be 500~650 LBS more. This penalty will be reduced or eliminated during descent by saving some fuel. If pilots have reliable wind aloft information in FMC or OFP, climbing to higher altitude will be more efficient.

2) 2,000Feet Step Climb

This method starts cruising at 1,000 feet above the optimum altitude. The weight is reduced as flight continues, step climb 2,000 feet when 1,000 feet below the optimum altitude.

3) Fuel burning rate

a) Fuel burning rate will be getting higher as cruising higher or lower than the optimum altitude.

b) Trip fuel burning rates are as follows;

OPT ALT – 2,000FT	OPT ALT – 4,000FT	OPT ALT – 8,000FT
1~2%	2~6%	6~14%

c) Higher cruising than the optimum ALT: Trip fuel will more need 1~2%.

2.10.5 Cruise Speed

a. In normal operation, cruising speed will be ECON SPD which is calculated by FMC based on trip length, cost index and gross weight.

b. When ECON SPD is slower than the speed in OFP, it is required to maintain cruise speed in OFP, if scheduled time and fuel remaining permits for schedule time operation.

c. When ATC puts limitation on the speed, it is recommended to use the following procedure;

1) Input the limited speed on VNAV CRZ Page, or
2) Use SPEED INTERVENTION.
3) Get back to ECON SPEED when there is no limitation on the speed.

d. When choosing faster speed than ECON SPD, fuel burning will be increasing. It means when increasing M 0.01 higher than ECON SPD, 2% of trip fuel will be increasing.

2.10.6 Fuel Management

2.10.6.1 Fuel Check

a. During operations, the fuel remaining should be checked
b. Data (time, fuel, temperature, wind etc) should be reviewed and recorded on the flight plan at every waypoint.
c. By difference between planned versus actual fuel on board may be indication of a flight plan error, a fuel leak or erroneous gauge indication.

2.10.6.2 Stabilizer and Center Tank Fuel

a. Stabilized tank fuel is supposed to be used after level off, and management stabilizer tank is in accordance with “FUEL PRES STAB L” and “FUEL PRES STAB R” procedures.
b. CWT (Center Wing Tank) Fuel can be used on ground and for the detail procedures, refer to the QRH.

2.10.6.3 Fuel Balancing

a. The object of fuel balancing is economic fuel management through maintaining C.G. & reducing drag of aircraft.
b. “FUEL TANK/ENG” message will be displayed when fuel quantity becomes TANK2 ≤ TANK1 or TANK3 ≤ TANK4. If the message displayed, PM should turn off OVRD FUEL PUMP SWITCHES and CROSSFEED VALVE 1 & 4 to maintain TANK TO ENGINE configuration.
c. If pilots open and close CROSSFEED valves too often, it is possible that the CROSSFEED valves will trip unwanted position which is caused by too much loads on CROSSFEED valves.
d. It is recommended to balance fuel when the difference is more than 1,000LBS.

2.10.6.4 Fuel Temperature

a. General

1) EICAS ALERT message “>FUEL TEMP LOW” will be displayed when fuel temperature is below -37℃.
2) Keep fuel temperature at least 3℃ above fuel freezing point.
3) Fuel temperature tend to move to TAT.
   - Rate of cooling : 3℃ / Hour ~ Max 12℃ / Hour

b. Fuel Freeze Point

1) Freezing point (FP) is the freezing temperature of the fuel. But this does not mean it will change to a solid.

Type	JET A	JP5	JET A1	JET B	JP4 (F40)	T1S, TS1,RT	JP8 (F34 or F35)	JET A-50	No.3 JET Fuel	RP1	RP2	RP3
FP (℃)	-40	-46	-47	-50	-58	-50	-47	-45.6	-47	-60	-50	-50
Remark	USA except ANC	Air Force				Russia	Military Europe	ANC	China (except HKG, MFM)			
Note) ( ) : NATO Code												

2) When the fuel is mixed, take highest freezing temperature of fuel as the freezing temperature of mixed fuel. But when Jet A and Jet A1 are mixed, freezing temperature could be calculated according to mix ratio. (Refer to POM Engineering Information)
3) It will be recorded as Jet A / Jet A-1(Jet A1) in the flight and maintenance log.

c. Low fuel Temperature management

Follow next methods which can be used independently or together at the same time to heat TAT.

1) Deviate to a warm air mass: Deviate to a warm air mass (Generally southern area). But in Russia, pilot must keep in mind that would be hard to acquire change of route clearance.

2) Climb or descend to a Warmer Air Mass: Before changing an altitude pilot must check temperature forecast of flight planning documents, and most of case it made by descend 3000~5000feet. But some extreme case it is required down to 25,000 feet and consider extra fuel burning.

   The other way, in polar route the tropopause is lower than low latitude and temperature inversion appears frequently above tropopause, so it will be more efficient to climb higher altitude after checking temperature forecast.

3) Increase Mach number: Increasing 0.01 Mach No makes 0.5~0.7°C TAT Increasing, but fuel burning is more than descending. Fuel have characteristic of fast cooling and slow warming, so it takes minimum 15 minutes to 1 hour to be affected by changing of TAT.

Note) In spite of endeavor, if fuel temperature cools down to freezing point fuel will flow normally until reaching pure point. Generally pure point is measured 6°C under the freezing point.

2.10.7 Navigation

2.10.7.1 Generals

a. LNAV is the primary navigation mode during cruise. When ATC requires radar vectoring, it is required to change to HDGSEL mode.

b. Navigation display

1) ND Mode Selector : MAP

2) ND Range Selector : Selecting range which can display both Active way point and next way point. With WX Radar on, select ND range as necessary.

c. The accuracy of GPS position is more reliable than radio position update.

d. It is recommended to check FMC position while flying in the are of VOR signal reception. However, it is not necessary for GPS equipped aircraft.

1) While flying over VOR signal reception area except polar operation, check the accuracy of FMC position by using the tick marks of POS switch.

2) If pilots observe out significant differences between IRS and FMS position, compare them with raw data to determine which data is correct.

3) When FMS position information is not accurate, pilots will modify FMS position by using of purge function to triple IRS mixed position.

4) When FMS position information is not accurate, “VERIFY POSITION” message will be showing on the FMS-CDU scratch pad.

Information

NAVAID, VOR Only, VOR/DME NAV Inhibit on NAV DATA page.

1) NAVAID INHIBIT

Input inaccurate NAVAIDs on 4L and 4R inhibit the NAVAIDs for radio updating.

2) VOR ONLY INHIBIT

Input VOR,VORDME or VORTAC NAVAIDs on 5L and 5R inhibits only VOR for updating.

3) VOR/DME UPDAE INHIBIT

Selecting "INHIBIT" prompt on VOR/DME NAV will display "ALL" on 5l and 5R and inhibits all VOR/DME updating.

Selecting "ENABLE" prompts will enable VOR/DME radio updating again.

2.10.7.2 Way Point Procedures

a. Passing Waypoint

1) Utilizing the Master Flight Plan, confirm with the following FMS/ANS data for the next waypoint(s).

a) Check the next way point (if required, check the coordinate) and the navigation.

b) Check the track until next way point on the ND, desired course, Distance and ETA.

2) Data (time, fuel, temperature, wind etc) should be written on the OFP. Especially, remaining fuel data should be recorded after passing waypoint.

3) Check the airplane conditions by switch on of EICAS or Synoptic (System Page Push Button), if required.

4) Refer to the FOM ch.4 when passing the re-dispatch point or ETP.

Note)

1. OFP records can be omitted within flight time 2 hours or during critical phase of flight.

2. When the waypoints are too close, OFP records should be done at least on the every FIR.

b. Position Report

1) During cruise flight, omit the position report when under radar contact, unless requested by ATC. When the radar service is terminated, Flight Crews will report their position according to the standard reporting procedure. Follow the Airway Manual procedure for the items to be included in position report.

2) Refer to the FOM Ch.9 Communications and Airway Manual – ATC Phraseologies.

2.10.7.3 Management of CDU and EICAS Operation

a. For FMS-CDU on PF side, it is recommended to set VNAV CRZ PAGE or PROG 1/3 PAGE (or PROG 2/3 PAGE), but pilots may set an appropriate page as occasion demands.

b. For FMS-CDU on PM side, it is recommended to set LEG page (or RTE DATA page) or as necessary.

c. It is recommended to keep secondary EICAS blank. Open synoptic on secondary EICAS as necessary.

d. For center FMC-CDU, ACARS will be set except communication.

2.10.7.4 Special Airspace Operation

It is in accordance with the chapter 8 “Navigation” in FOM and each aircraft operational manual.

2.10.7.5 Polar Operations

It is in accordance with B747-400 FCOM/FCTM and FOM Chapter 8.

2.10.8 Modification Procedure of ATC Clearance

2.10.8.1 PM (Pilot Monitoring)

a. Record the amended ATC clearance.
b. Load the new routing into the FMS/ANS by one of following sources.
  1) Airway Manual En-route Chart
  2) Track Message
  3) ATC Clearance
c. Modify new waypoints to be displayed on the operational flight plan.
d. Confirm correctness of the new route or waypoint.

2.10.8.2 PF (Pilot Flying)

a. Utilizing the source document, verify that waypoint coordinates were correctly loaded.
b. Crosscheck amended flight plan course and distance versus the FMS data.

2.10.9 Communication

2.10.9.1 VHF Radio

It is required to set VHF radio tuning panel as follows ;

Left VHF	Center VHF	Right VHF
ATC/ATC	ACARS/Air to Air	121.5/ATIS (121.5/company)

Note) Left transmitter select switch should be selected when the all electrical system are failed.

2.10.9.2 HF Radio set

It is required to set HF Radio Tuning Panel as follows ;

Left HF	Right HF
Primary/Secondary	Secondary/Primary

a. If aircraft is not flying over HF frequency using area, set appropriate HF frequency of flying area's ARINC for a call from company.

b. During transoceanic flight, monitor VHF 121.5 and air to air frequency or ACARS.

2.10.9.3 Position Report

a. If radar contacted by ATC, Position report is not necessary unless ATC requests. However, when radar service has terminated, make position reports with standard radio communication phraseology.

b. It is required to use standard radio communication phraseologies. FOM and Airway Manual describe phraseologies.

c. Refer to "ATC" part in Airway Manual for items for standard position reporting procedure.

d. When making a position reports by CPDLC, perform SELCAL check to inform ATC that reports are made utilizing CPDLC, and maintain HF frequency.

2.10.10 Weather

2.10.10.1 Weather Update

a. General

1) Pilots need to obtain the current and forecast weather of the airports near current position, and enroute alternate airports as available, in case they should do emergency landing for any reason.
2) Pilots should obtain the latest weather report or the forecast of destination before reaching redispatch point. Captain will check remaining fuel and weather of destination at redispatch point.
   a) If the remaining fuel is more than legal fuel, continue flying to the destination airport.
   b) If the reaming fuel is less than legal fuel, it is required to diver to the redispatch airport.

b. Methods of Checking the Destination Weather

Methods of checking destination weather

1) VOLMET
   a) Volmet is one useful method to get the destination weather. Pilots can look for information about broadcasting time and frequency at Jeppesen Manual Meteorology and Enroute Chart.
   b) Some European countries operate volmet on VHF frequencies. Look for Jeppesen Meteorology part for this information.
   c) Flight Watch
      The flight watch stations in U.S. area service the airports weather information upon pilots requests. If you fly to LAX, Oakland Flight Watch Station will provide the LAX weather on 135.7 MHz. The Flight Watch Stations operate until 10 P.M. local time.
   d) ACARS
      The ACARS equipped aircraft can use ACARS to obtain destination weather.

2.10.10.2 Weather Deviation

a. General

1) When the aircraft is expected to encounter thunderstorms or any other type of clouds in enroute, pilots should avoid them by sufficient lateral separation distance (approximately 20NM), and try to deviate towards upwind side from the thunderstorms, if possible.
2) It is necessary to have a 1000ft vertical altitude separation per 10knots of wind speed

b. Weather Deviation Procedure (Oceanic Airspace)

1) When PM initiates communications with ATC, quick response may be obtained by stating "WEATHER DEVIATION REQUIRED"To indicate that priority is desired on the frequency and ATC response. If necessary, the pilot can call out urgent call "Pan, Pan" (three times).
2) Pilots shall request clearance from ATC for deviation maneuvering from track, advising when possible, the extent of the deviation expected.
3) In case pilot cannot obtain approval from ATC, pilot can take following action in order to get ATC clearance as soon as possible :
   a) If possible, deviate from Organized Track or Route system.
   b) Transmit Aircraft identification, Flight level, Position and Intentions at 121.5 Mhz (or 123.45 Mhz) with proper interval.
   c) Prevent air-collision by using to TCAS and visual separation,
   d) All Exterior lights - On,
   e) Pilots shall maintain ATC approved altitude when the pilot make weather deviation within 10NM off-track from the airway.
   f) When deviation is greater than 10NM from track, pilot shall make level change according to the criteria defined below:

Route center line track	Deviations > 10 NM	Level Change
EAST 000˚-179˚ magnetic	LEFT RIGHT	DESCEND 90m (300 ft) CLIMB 90m (300 ft)
WEST 180˚-359˚ magnetic	LEFT RIGHT	CLIMB 90m (300 ft) DESCEND 90m (300 ft)

g) Pilot shall maintain approved flight level when the aircraft is within 10NM from the center line when returning on track.

4) Pilot shall report to ATC when deviation is not needed or completed or the aircraft has returned to the center of the route.

2.10.10.3 Turbulence Penetration

a. Maintain turbulence penetrating speed (290~310kts / M.82~M.85) when encounter turbulence or enter turbulence area.

b. If severe turbulence is encountered at altitude below 15,000 feet and the gross weight is less than the maximum landing weight, the airplane may be slowed to 250 knots in the clean configuration.

c. Delay flap extension in an area of known turbulence as long as possible because the airplane can withstand higher gust loads in the clean configuration.

d. Avoid speed or altitude change when encounter moderate turbulence. If auto throttle increase thrust levers to cruise thrust limit, maintain cruise speed would not be possible.

e. Avoid reduce speed below turbulence penetration speed. This will cause reduction of buffet margin and require time and fuel burning to maintain cruise speed again.

f. Avoid entering severe turbulence area. Once entering severe turbulence area inevitably, descend 4,000 feet below optimum altitude to increase buffet margin. Descent should be accomplished before entering severe turbulence area.

g. Turn on ignition switch as soon as possible.

h. Turn on and confirm passenger seat belt sign 2times.

i. Recommend use autopilot in severe turbulence area when in clean configuration.

j. Use V/S mode when descend or climb in severe turbulence area, and use VNAV mode or ALT Hold mode in cruising flight.
k. Disconnect auto-throttle when needed in severe turbulence area. Set N1 to target thrust indicator or slightly above it.
l. Check weather radar return.
(weather radar mode – WX+T with range 40NM or less)

Information

Severe Turbulence Air Penetration Manual Control

1) Maintain wings level and the desired pitch attitude.
2) Use The Attitude Indicator As The Primary Instrument. (PFD)
3) In Extreme Draft, Large Attitude Change May Occur.
4) Do Not Use Sudden Large Control Inputs.
5) After Establishing The Trim Setting For Penetration Speed, Do Not Chase Stabilizer Trim.
6) Allow Altitude To Vary.
7) Large Altitude Variations Are Possible In Severe Turbulence.
8) Sacrifice Altitude In Order To Maintain The Desired Altitude Airspeed.
9) Do Not Chase Altitude.
10) Do Not Chase The Airspeed.

2.10.10.4 Passing Icing Area

a. Turn on anti-ice switches when icing condition is expected.
b. It is considered visual moisture exist when flight visibility is less than 1 mile.

Information

1) Icing condition means rain, snow or flight visibility is less than 1 mile and TAT is below 10℃.
2) When SAT is below -40℃, turning on nacelle anti-ice switches is not necessary.

2.10.11 Aircraft Trimming

2.10.11.1 General (Recommended Rudder Trim Technique)

This section describes two techniques for properly trimming the rudder. It is assumed that the airplane is properly rigged and in normal cruise. The primary technique uses rudder trim only to level the control wheel and is an acceptable and effective method for trimming the airplane. It is approximately equal to a minimum drag condition. This technique is usable for normal as well as many non-normal conditions. For some non-normal conditions, such as engine failure, this technique is the preferred method and provides near minimum drag.

The alternate technique may provide a more accurate trim condition when the roll is caused by a roll imbalance. In addition, this technique outlines the steps to be taken if the primary trim technique results in an unacceptable bank angle or excessive rudder trim. The alternate technique used both rudder and aileron trim to neutralize a rolling condition using the bank pointer as reference.

Note) Large trim requirements may indicate the need for maintenance and should be noted in the airplane log.

2.10.11.2 Drag Factors Due to Trim Technique

If the control wheel is displaced to the point of spoiler deflection a significant increase in aerodynamic drag results. Additionally, any rigging deviation that results in early spoiler actuation causes a significant increase in drag per unit of trim. These conditions result in increased fuel consumption. Small out of trim conditions affect fuel flow by less than 1%, if no spoilers are deflected.

Note) Aileron trim may be required for significant fuel imbalance, airplane damage, or flight control system malfunctions.

2.10.11.3 Primary Rudder Trim Technique

It is recommended that the autopilot remain engaged while accomplishing the primary rudder trim technique (using rudder trim only). After completing this technique, if the autopilot is disconnected, the airplane should maintain a constant heading.
The following steps define the primary rudder trim technique :

1) Set symmetrical thrust
2) Balance fuel if required

Ensure the autopilot is engaged in HDG SEL or HDG HOLD and stabilized for at least 30 seconds.
Trim the rudder in the direction corresponding to the down (low) side of the control wheel until the control wheel indicates level. The indices on top of the control wheel should be used to ensure a level wheel condition. The airplane is properly trimmed when the control wheel is level, (zero index). As speed, gross weight, or altitude change, trim requirements may also change. In a proper trim condition, there a proper trim condition, there may be a slight forward slip (slight bank angle indicated on the bank pointer) and a slight deflection of the slip/skid indicator, which is acceptable.

2.10.11.4 Alternate Rudder Trim Technique

The alternate rudder trim technique is used if the primary trim technique results in an unacceptable bank angle, excessive rudder trim, or if a more accurate dual axis trim is required.

The following steps define the alternate rudder trim technique :

a. Set symmetrical thrust
b. Balance fuel if required
c. Verify rudder trim is zero
d. Ensure the autopilot is engaged in HDG SEL or HDG HOLD and stabilized for at least 30 seconds
e. Trim the rudder in the direction corresponding to the down (low) side of the control wheel until the bank indicates level (no bank

angle indicated on the bank pointer). Apply rudder trim incrementally, allowing the bank to stabilize after each trim input. Large trim inputs are more difficult to coordinate. The airplane is properly trimmed when the bank angle on the bank pointer indicates zero. If the airplane is properly rigged, the control wheel should indicate approximately level. The resultant control wheel condition indicates the true aileron (roll) trim of the airplane being used by the autopilot.

After completing the alternate rudder trim technique, if the autopilot is disengaged the airplane may have a rolling tendency. Hold the wings level using the sky pointer as reference. Trim out any control wheel forces using the aileron trim switches. If properly trimmed, the airplane holds a constant heading and the aileron trim reading on the wheel/column agrees with what was seen while the autopilot was engaged. Aileron trim inputs require additional time and should be accomplished prior to final approach.

2.10.12 Use of Oxygen Mask & PBE

Refer to FOM chapter 2 “Operations policy” for the use of oxygen by flight crew and passenger.

2.10.13 Flight Crew Change and Leaving the Cockpit Procedures

2.10.13.1 Crew Change

Refer to "Duty Shift of Flight Crew" in FOM chapter 3 "Crew Members".

2.10.13.2 Leaving the Cockpit

Refer to "Cockpit seat procedure" in FOM chapter 6 "Normal operations".

The end of section

Intentionally

Blank

2.11 Holding

2.11.1 Preparation for Holding

a. When holding is expected or instructed by ATC, insert the holding fix or waypoint on HOLD page 6L in FMS-CDU to display MOD RTE 1 HOLD page.
b. Insert holding data as depicted on Airway manual chart in FMC under directions of ATC.

2.11.1.1 Fix

a. Insert expected waypoint by referring to ATC instruction.
b. In case that ATC issues unexpected holding fix, reselect "NEXT HOLD" in HOLD page to input holding data which are instructed by ATC. Then delete "HOLDING AT" which has been entered in LEG page.

2.11.1.2 INBD Course/DIR (Holding Pattern)

a. When it is standard holding pattern (right hand holding), the controller may omit holding pattern instruction.
b. When it is non-standard holding pattern (left turn holding), the controller will issue holding pattern instruction.

2.11.1.3 Leg Time/Leg Distance (Holding Leg)

a. Refer to the procedure for specified airport.
b. Comply with time or distance (DME leg) instructed by the controller.
c. When there is no specified procedure, or ATC instructions, it is as follows.

division	At or below 14,000 Feet MSL	Above 14,000 Feet MSL
Holding Leg	1 Minutes	1.5 Minutes

2.11.2 Holding Speed and Altitude

a. Comply with the procedure for specified airport.
b. Holding speeds in the FMC provide an optimum holding speed based upon fuel burn and speed capability.
c. If the FMC holding speed is greater than the holding speed for specified airport, holding may be conducted at flaps 1, using flaps 1 maneuvering speed (VREF + 60Knots).
   Flaps I uses approximately 10% more fuel than flaps up. Advice ATC if holding at flaps up speed is necessary.
d. If the FMC holding speed is not available from the FMC, use VREF30 + 80Knots at or below FL250, and above FL250, use VREF30 + 100Knots to provide adequate buffet margin. However, comply with a local specified holding procedure.
e. It is recommended to maintain clean configuration if holding should be conducted in icing conditions or in turbulence.
f. Even if clean configuration is recommended for holding in icing condition, it might be necessary to use flaps 1 maneuvering speed not to exceed speed restrictions.
g. Maintain clean configuration, as possible, prior to leaving the holding pattern for approach after getting holding exit clearance. But, it might be necessary to extend flaps to attain a lower maneuvering speed to comply with speed restrictions.
h. Enter EFC time in the FMC when EFC (Expect Further Clearance) is issued by ATC.

2.11.3 Entering Holding Pattern

a. Start reducing to holding airspeed showing on HOLD page so that the aircraft crosses the holding fix at or below maximum holding speed.
b. Initiate holding with executing and engaging LNAV mode when ATC advises holding instruction.
c. Holding entry procedure (Refer to instrument flying, Airway manual and AIM)
   For holding entry patterns, it is as follows in accordance with ICAO

and FAA regulations.

1) The FMC will determine the type of holding entry pattern when quart/radial or inbound course/direction is entered in HOLD page.
2) Parallel, offset (tear drop) or direct entry procedure will be applied.

d. Monitor entering holding pattern showing on the map display.

2.11.4 Exit Holding Pattern

a. When ATC advises to leave the holding pattern and cleared for approach, select “EXIT HOLD” or “DIRECT TO WAYPOINT” in LEG page.
b. When initiating instrument approach from holding pattern in Race Track Approach, extend flaps to 5 position on the outbound track which is parallel to final approach course. It is required to intercept final approach course with procedure turn heading.
c. Check magenta route on ND.

The end of section

Intentionally

Blank

2.12 Descent

2.12.1 Descent Procedures

2.12.1.1 Generals

a. It is a general principle for PM to conduct the approach preparation under PF's direction after PM has checked the weather in destination airport.
b. Review all EICAS messages by using of CANC/RCL switches.
c. Weather Radar (User's Manual by Honeywell)
   1) During descent, control antenna tilt 1° upward per 10,000ft above 15,000ft altitude and 1° upward per 5,000ft below 15,000 ft
   2) During approach, considering terrain condition around an airport and prevent too much clutters from appearing on ND maintain antenna tilt about +4° upward or tilt upward to maintain clutters appear only top portion of ND. At this time, there will be a little difference according to aircraft attitude and gross weight.

2.12.1.2 FMC Set Up

a. General
PM will program the FMC for descent and approach, and the execution should be activated after confirmed by the PF.

b. Approach REF Page
Enter the Vref speed based upon expected landing configuration and landing weight. When reading approach checklist, the modified Vref speed should be entered in APP REF page, if the Vref speed has changed.

c. DEP/ARR Page
On ARR page, select required items in the sequence of STAR, STAR Transition approach and Approach transition.

d. LEGS Page

Connect waypoints in order not to make any DISCONTINUITY, and enter altitude and speed restrictions on LEG page.

e. HOLD Page

Enter required data after verifying the holding procedures depicted on approach charts.

f. NAV RADIO Page

1) Enter required approach data such as, ILS frequency/front course, VOR frequency (or identifier)/course, OM or any other available ILS frequency/front course, on the pre-select line for reference or in preparation for non-normal condition. (ex : 108.9/332, NCN/225)
2) In ILS frequency/front course and tune status line, auto tuning is required.

g. RTE 2 Page

It is required to enter the waypoint fixes from destination to alternate airport. When pilots are aware of using runway in alternate airport, information on STAR and approach type and using runway could be entered into RTE 2 page in preparation for diversion.

2.12.1.3 Flight Instruments and Landing Data

a. If required, information on VOR frequency, course and ADF frequency could be entered into NAV RADIO page. Set frequencies of possible alternate runways on PRESELECT line.
b. Leave ILS-MLS line for auto tuning.
c. Set the Vref on APP REF page based on predicted landing weight, and check and revise the Vref speed after completing Approach checklist.
d. For a short haul operation, pilots may set up all arrival/approach for destination prior to departure, it is not recommended in Asiana.

2.12.1.4 DA (DH) / MDA Setting

a. Set correct barometric altitude on PF and PM's altitude indicator.

b. Set both sides of altimeters on the same barometric altitude for radio altimeter.

c. RA is NOT AUTHORIZED in CAT-I and Non-ILS approach due to the terrain effectiveness.

<table>
<tr><th>Approach</th><th>Setting the Radio Altimeter on PFD</th><th>Setting the Barometric Altimeter on PFD</th></tr>
<tr><td>CAT-I, PAR</td><td>Blank (DH) Note1)</td><td>DA Note2)</td></tr>
<tr><td rowspan="2">Non-precision Approach</td><td rowspan="2">Blank</td><td>MDA Note 3) or
MDA + 50feet Note 4)</td></tr>
<tr><td>Landing Runway Circling Minimum, or Company Minimum Whichever is higher when Circle to Land is applicable.</td></tr>
</table>

Note)

1. The values in (DH) could be set for reference, but it should be included in approach briefing. When RA for CAT-I approach is issued, DH should NOT BE APPLIED as RA.

2. DA Set

Set DA to the close highest altitude by 10 feet unit on PFD. And set close lowest altitude by 100 feet unit on MCP.

Example)

Classification	MCP Altitude	PFD BARO
Setting Altitude	Lowest 100 feet Unit	Highest 10 feet Unit
(Example)	472 feet => 400 feet Set	472 feet => 480 feet Set

Note) Set published DA in JEPPESEN CHART on PFD BARO by 1 feet unit for possible aircraft.

3. MDA Set

Set MDA to the close highest altitude by 10 feet unit on PFD. And set close lowest altitude by 100 feet unit on MCP. But do not descend below the MDA.

Example)

PFD		MCP	
MDA 582 feet →	590 feet Set	MDA 582 feet →	590 fee Set
MDA 591 feet →	600 feet Set	MDA 591 feet →	600 feet Set

Note) Set published MDA in JEPPESEN CHART on PFD BARO by 1 feet unit for possible aircraft..

4. For VNAV/RNAV Approach, set MDA + 50feet, this is applied as decision height.

2.12.1.5 Auto Brake Select (Recommendations)

Auto Brake	Desired Braking
MAX	This setting should be used when minimum stop distance is required. (deceleration rate is less than that produced by full manual braking)
3 or 4	Use for wet or slippery runways, or when landing roll out distance is limited
2 or 1	This setting will provide a moderate deceleration effect suitable for all routine operations.

Note) It is recommended to check landing distance in QRH prior to set the auto brake.

2.12.2 QFE Operation for Arrival

Accomplish this procedure when ATC altitude assignments are referenced to QFE altimeter settings.

2.12.2.1 At Transition Level

a. Altimeter--------------------------------- Set QFE (PF/PM)

b. CDU----------------------------------Select QFE (PF/PM)

1) Select QFE on the APPROACH REF page. Set for approach

2) Use FLCH, V/S and HDGSEL mode.

Note)

1. DO NOT use LNAV or VNAV below transition altitude/level.
VNAV altitudes in the navigation database are not referenced to QFE.

2. If the QFE altimeter setting is beyond the range of the altimeters, QNH procedures must be used with QNH set in the altimeters

2.12.2.2 Glide Slope Capture

a. QFE missed approach altitude----------------------Set (PF)
- If missed approach altitude is below TA.

b. QNE missed approach altitude ---------------------Set (PF)
- If missed approach altitude is above TA.

Note)

1) Compare altitude between altitude indicator and RA on PFD.

2) The use of GPWS look-ahead terrain alerting and terrain display functions are prohibited during QFE operations.

2.12.3 Company Radio Contact

Achieve gate information by ACARS. Refer to "Company Radio" in FOM chapter 9 "Communications" when contact company radio.

2.12.4 PA (Passenger Address)

Captain announcement is refer to FOM 2.7 "Captain's Passenger Address" and company "Captain Announcement Manual".

Note) PIC is responsible to decide performing time of Normal Checklist, T/O & APP briefing, PA etc in considering of workload management.

2.12.5 Landing Preparation Signal

Refer to FOM 2.8.2.4 for landing preparation signal.

2.12.6 Approach Briefing

To keep time to do descent checklist, do approach briefing after getting destination airport information such as weather condition, NOTAM etc., then completion of approach/ landing set up in FMC-CDU and before TOD.

Approach Briefing items are as follows :

a. WEATHER& NOTAMS (Destination / Alternate Airport)

b. ARRIVAL / APPROACH & LANDING PROCEDURES

1) Arrival Procedures
   - a) Validity of the Charts to be used
   - b) Airport Elevation
   - c) TL (Transition Level)
   - d) MSA (Minimum Safe Altitude)
   - e) Arrival Route, Altitude & Speed Restrictions

2) Approach & Landing Procedures
   - a) Type of Approach
   - b) Validity of the Charts to be used
   - c) LOC (VOR) Frequency
   - d) IAF & Step Down Fix Altitude
   - e) Final Approach Course
   - f) Glide Slope Interception Altitude (Minimum Altitude: VOR)
   - g) DA (MDA)
   - h) Airport & Runway Elevation
   - i) Missed Approach Procedures (GO-AROUND PROCEDURES REVIEW)

3) Route to alternate airport
   - a) Concerning fuel for alternate airport

4) Apply cold temperature altitude correction as needed

c. CREW ACTIONS & CALLOUTS

d. NON-NORMAL CONFIGURATION & CONDITIONS

e. LANDING & TAXI IN PROCEDURES

1) Check Landing Runway, Landing Weight, distance and proper Autobrakes

2) Taxi in Procedures (Hot Spots, Hold Line)

f. Action for Adverse Weather (WX radar mode, Terrain Mode selection)

2.12.6 Approach Briefing

To keep time to do descent checklist, do approach briefing after getting destination airport information such as weather condition, NOTAM etc., then completion of approach/ landing set up in FMC-CDU and before TOD. In the approach briefing, PF should transfer control to PM in order to make sure maintaining of aircraft control.

Approach Briefing items are as follows :

a. WEATHER& NOTAMS (Destination / Alternate Airport)

b. ARRIVAL / APPROACH & LANDING PROCEDURES

1) Arrival Procedures
   - a) Validity of the Charts to be used
   - b) Airport Elevation
   - c) TL (Transition Level)
   - d) MSA (Minimum Safe Altitude)
   - e) Arrival Route, Altitude & Speed Restrictions

2) Approach & Landing Procedures
   - a) Type of Approach
   - b) Validity of the Charts to be used
   - c) LOC (VOR) Frequency
   - d) IAF & Step Down Fix Altitude
   - e) Final Approach Course
   - f) Glide Slope Interception Altitude (Minimum Altitude: VOR)
   - g) DA (MDA)
   - h) Airport & Runway Elevation
   - i) Missed Approach Procedures (GO-AROUND PROCEDURES REVIEW)

3) Route to alternate airport
   - a) Concerning fuel for alternate airport

4) Apply cold temperature altitude correction as needed

c. CREW ACTIONS & CALLOUTS

d. NON-NORMAL CONFIGURATION & CONDITIONS

e. LANDING & TAXI IN PROCEDURES

1) Check Landing Runway, Landing Weight, distance and proper Autobrakes

2) Taxi in Procedures (Hot Spots, Hold Line)

f. Action for Adverse Weather (WX radar mode, Terrain Mode selection)

2.12.7 Descent

Starts the descent checklist before the aircraft descends below the cruise altitude for arrival at destination.

Note) Perform Descent Checklist after Approach Briefing and before starting descent.

2.12.7.1 Descent Speed

a. Maintain ECON speed unless ATC instruct otherwise. Flight plan speed may be applied considering flight schedule time. However, It can be adjusted by following items;
   1) Passing the Turbulence area
   2) Speed/Altitude Restriction at Waypoint
   3) Local Restriction or ATC instructions etc

b. If input the descent speed to the FMS –CDU before descent, crew can use it.

2.12.7.2 Descent Path

a. Begin descending on TOD with VNAV mode unless ATC restriction.
b. For the accuracy of TOD, wind data could be entered into DESCENT FORECASTS page.
c. Use speed brake when it is necessary for complying descent profile.
d. Descent with LNAV and VNAV mode is recommended.
e. When ATC starts radar vectoring for descending, change the MCP mode to HDGSEL mode and FLCH or Vertical SPD mode. Use V/S mode with caution because there is no Over speed Protection.

2.12.7.3 Descent Constraints

a. Descent constraints will be entered in FMC automatically when selecting an arrival procedure. (To compare the descent constraints between in the FMC and Jeppesen Charts is absolutely required.)
b. Set all mandatory altitude restricts and “AT or ABOVE” constraints in the MCP altitude window to prevent altitude deviation.

2.12.7.4 Speed Intervention

VNAV speed intervention could be used to respond ATC speed restriction or change

2.12.7.5 Descent Planning

a. Flight deck workload increases as the aircraft descends to the terminal area. Distractions must be minimized to assure flight safety.
b. Descent planning is necessary to arrive at the desired at the proper speed and configuration.
c. The distance required for the descent is 3NM / 1000feet altitude loss for no wind conditions using ECON speed.
d. A good crosscheck is to be at 10,000feet AGL, 30NM from the airport, at 250knots.
e. When proceeding straight-in approach, plan the descent to arrive at traffic pattern altitude with flaps up maneuvering speed 20NM from the runway.
f. When making an abeam approach, plan the descent to arrive at traffic pattern altitude with flaps up maneuvering speed 8NM from the runway.

2.12.7.6 Descent Rate

Descent Rate tables provide rates of descent below 20,000feet with idle thrust and speed brakes extended or retracted. For other items, refer to B747-400 FCOM and FCTM (Boeing).

2.12.7.7 Speedbrakes

a. The PF should keep a hand on the speedbrakes lever when the speedbrakes are used in-flight.
b. While using the speedbrakes in descent, allow sufficient altitude and airspeed margin to level off smoothly.
c. Lower the speedbrakes before increase thrust.
d. To avoid buffeting, use of speedbrakes with flaps greater than flaps 5 should be avoided.
e. When it is required to use speedbrakes with flaps extended, high sink rates during the approach should be avoided. Speedbrakes should be retracted before reaching 1,000feet AGL.

2.12.7.8 Transition Level

a. Set local altimeter which has been pre-set on PFD when descending through transition level.

Note) When cleared to descend to an altitude near to Transition Level, QNH can be preset upon approaching the TL,

b. Check altitude on the altimeter of PF and PM, and standby altimeter.

Note) Accomplish QFE procedures when ATC altitude assignments are referenced to QFE altimeter settings. Refer to the chapter1. Normal Procedures, "Philosophy & Assumptions" for more detail.

c. Perform Approach Checklist

2.12.7.9 Passing 10,000FT

a. Check decent speed (example : 250knots Below 10,000feet).
b. Inboard Lights: ON (All exterior lights on if required).
c. Seat Belt Sign ON after 3 chime bell
d. Non-essential activities are not allowed below 10,000feet. Distraction might be cause by those activities at low altitude. DO NOT try to program FMC or fill out OFP, unless it requires.

2.12.8 Communication between Cockpit and Cabin

2.12.8.1 General

Refer to chapter 2 "Operation Policy" and chapter 13 "Supplement" in FOM.

2.12.8.2 Communication Procedures by Phrase of Flight

Refer to chapter 2 "Operation Policy" and chapter 13 "Supplement" in FOM.

2.12.9 Descent Procedure

Refer to FCOM VOL I Normal procedure.

The end of section

Intentionally

Blank

2.13 Approach

2.13.1 PF/PM's Duties

2.13.1.1 PF's Duties

a. All Approach

1) A/C control and Approach Briefing
2) Follow published approach procedures.
3) Cross check all flight instruments.
4) When using AFDS, PIC should be ready for manual flight before passing FAF.

Note) The time for Normal Checklist, T/O & APP briefing and PA is PIC's discretion with consideration of workload management.

b. ILS Approaches (CAT-I), Non-ILS Approaches

1) Active visual scan is required while approaching MDA or DA (H). But pilots should be reminded that main duty is correct operation to maintain correct MDA when A/C descends to MDA or DA (H).
2) If pilots have visual contact with runway reference before passing DA (H) or MAP, follow inside & outside definition and procedures.
3) PIC should decide to continue approach or missed approach.

c. CAT-II/III

1) For CAT II/III operation, PIC's main duty is control and decision.
2) For CAT II operation, Auto approach and autoland must be conducted until touchdown.
3) For CAT III operation, Captain must make auto land and auto roll out regardless of visual key at AH/DH

2.13.1.2 PM (Pilot Monitoring)'s Duties

a. All Approaches
1) Active Standard Callout
2) Cross check all primary instrument and Raw Data.
3) Monitor any in-operation or deviation and callout.
4) Monitor speed and descent rate until touchdown.
5) After landing, advise runway and taxiway to PF.
6) When A/C is unstable or safe landing is not assured, advise missed approach to PF.

b. CAT-I
1) Monitor flight instrument while approaching DA(H) or MDA(H) carefully.
2) Monitor airspeed and descent rate until touchdown.

c. CAT-II/III
1) For CAT-II/III operation, PM's main duty is to monitor AFDS.
2) Closely monitor LOC, GS(Glide Slope), Speed, etc.
3) Callout any change in the FMA.
4) Actively follow POM standard callout procedures.

2.13.2 CRM

2.13.2.1 General

a. When an unstable landing is expected due to the excess of approach and landing limitations, advise the PF of the opinion beforehand.

b. Convince the PF to initiate missed approach (Go-Around Callout), if required. If it is under the condition of executing missed approach.

c. Refer to "Stabilized Approach" of the chapter 6 "Normal Operations" in FOM.

2.13.2.2 Deviation Callout

Deviation callouts after entering final approach segment are in accordance with “POM 2.13.7.3”.

2.13.3 Approach Category

B747-400 is classified as a Category “D” airplane.

2.13.4 Using AFDS

Refer to FCOM & FCTM

2.13.5 Approach Ban

a. Approach begins once an A/C has passed a final fix on the airway or radar vector has been provided from ATC.
b. Asiana Airlines’ Approach Ban as follows. If there is special procedures for airport, that has priority.

2.13.5.1 Initiating Instrument Approach

a. To commence an instrument approach, the airport weather should be above the landing minimums before passing IAF (Initial Approach Fix), and A/C should have approach clearance.
b. If the airport weather becomes below landing minimum before passing IAF, PIC should decide holding or divert.

2.13.5.2 Stopping Instrument Approach

If the airport weather is reported below landing minimum when the A/C is between IAF and FAF, PIC can approach until FAF. Landing minimum when the A/C is at the FAF, PIC should stop approach and perform missed approach.

2.13.2.2 Deviation Callout

Deviation callouts after entering final approach segment are in accordance with “POM 2.13.7.3”.

2.13.3 Approach Category

B747-400 is classified as a Category “D” airplane.

2.13.4 Using AFDS

Refer to FCOM & FCTM

2.13.5 Approach Ban

REFER TO FOM 6.8.3 “Approach Ban”

2.13.5.3 Continuing Instrument Approach (When using MDA/DH)

a. Once the A/C has passed a FAF, it may continue approach to the minimum altitude (MDA/DA/DH) even if the weather becomes below minimum.

b. At the published minimum altitude (MDA/DA/DH), if the PIC has visual contact with runway or visual reference or safe landing, land on the runway and if not, perform missed approach.

Note)

1. *For CAT-III approach which applies AH, even if the weather becomes below minimum after passing FAF/FAP, PIC can continue approach and landing unless weather deteriorates to the point that A/C equipment can not permit. For CAT-III approach which applies DH, at DH visual contact is absolutely required for landing.*
2. *Policy regarding approach ban may differ from country to country. Flight crew must confirm and apply the specific procedures at the country.*

CAUTION

When the safe landing is suspected regardless con A/C condition or weather, perform missed approach (Go-Around)

2.13.6 Scan Policy

2.13.6.1 Purpose

On final approach course, the following division of flight deck workload is made for instrument scan and acquisition of visual clues in order to complete a safe approach and landing.

2.13.6.2 Definition

a. Inside and Outside

Pilots will scan inside instrument and outside reference.

b. Inside

Pilots will continuously monitor the instrument.

2. 2.13.6 Scan Policy

2.13.6.1 Purpose

On final approach course, the following division of flight deck workload is made for instrument scan and acquisition of visual clues in order to complete a safe approach and landing.

2.13.6.2 Definition

a. Inside and Outside
Pilots will scan inside instrument and outside reference.
b. Inside
Pilots will continuously monitor the instrument.

2.13.6.3 Operation Procedure

a. During approach and landing, flight crew should strictly follow scan policy of PF/PM.

b. Scan policy is as follows.

Condition		PF	PM
Auto Coupled Approach (At or Below 1,000FT)	IMC (or at Night)	Inside & Outside	Inside
	After Visual Reference Contact	Inside & Outside	Inside
Manual approach (At or Below 1,000FT)	IMC (or at Night)	Inside	Inside & Outside
	After Visual Reference Contact	Inside & Outside	Inside & Outside
Visual approach	After Visual Reference Contact	Inside & Outside	Inside & Outside

Note)

1. *The inside & outside pilot should call "Approach Light In Sight" or "Runway In Sight" when in sight of the runway reference prior to arriving at DA(H) or MDA(H).*
2. *However, the "Landing" or "Go Around" callout for the final landing decision to descent, below DA(H) or MDA(H) will be made by the PIC. When the Co-pilot(F/O) calls out "LANDING" during his PF job, Captain should either call out "LANDING" in a normal approach or say "Go-Around" if go-around is necessary. In case of a go-around, Captain should take back the control.*
3. *When the Co-pilot(F/O) conducts a practice auto landing as a PF, (s)he will callout for the runway visual references before descending below DA(H).*
4. *PM should monitor airspeed and sink rate through touchdown*
5. *when there is additional pilot in the cockpit, (s)he should perform back up duty for PM during approach.*

2.13.7 Stabilized Approach

2.13.7.1 General

a. Stabilized Approach refers to an adjustment which maintains the Aircraft's stable speed, rate of descent, and vertical/horizontal flight path in order to perform safe approach and landing while A/C is in Landing Configuration state.
b. Asiana airlines emphasizes to abide Stabilized Approach in order to guarantee safety while approach and landing. Flight crew members shall monitor and operate to comply with Stabilized Approach.
c. Accomplishment of Stabilized Conditions to perform stabilized approach shall be made before 1,000 feet regardless of weather condition (IMC/VMC).
d. In case that stabilized conditions are not accomplished before the altitude stated in article c. above or in case the conditions are not maintained, the A/C must Go-Around.
e. A go-around must be initiated if stabilized conditions are not accomplished at the altitude mentioned in article c. above or it cannot be maintained after the altitude.

Note) Deciding to perform Go-Around does not mean that the flight crew members have failed to performed approach procedure, but that they have followed the company safety policy by deviating from non-normal situation and re-executed the safety procedure.

2.13.7.2 Stabilized Conditions

a. Complete Landing Configuration.
b. Complete Landing Checklist.
c. Descent rate is not greater than 1,000 fpm
d. Located on a stabilized vertical/horizontal flight path, and able to maintain the location with minor maneuvering(Pitch/Roll)
e. A/C speed is to be maintained between Target speed +10 knots at most, Target speed - 5 knots at least (Target speed = Vref + Wind Correction)

f. Thrust status Idle Thrust or more to maintain stable Target speed
g. No excessive flight parameter deviation (apply 2.13.7.3).
h. Within range of Slight Low/Slight High In case of visual approach utilizing equipment such as glide path indicator (PAPI, VASI, etc.)
i. Following conditions are to be fulfilled before A/C passes runway threshold
 1) Maintain within maximum Target Airspeed + 10 knots, minimum Target Airspeed -5 knots until before Flare
 2) Located on a stable flight path which can be adjusted with minor maneuver
 3) Positioned to make a normal landing in the touchdown zone (the first 3,000 feet or first third of the runway, whichever is less)

Note)

1. Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing. Special briefing is also required when instant overshooting of the stabilized criteria is expected during approach because of turbulence, wind shear, gust wind or the sudden change of wind direction.

2. In case of Circling/Visual Traffic Pattern Approach where turning to align can be made at Short Final, Wings must be leveled when passing above 300 feet AFE on final.

2.13.7.3 Flight Parameter Deviation & Correction Callout

Parameter	Exceedance	Correction Callout
IAS	TGT SPD + 10 (Non precision +15)/ −5 knots	"SPEED"
V/S (Rate of descent)	Greater than 1000 fpm	"SINK RATE"
Altitude	TGT Altitude + (−) 100 feet or more	"ALTITUDE"
Bank angle	Greater than 10°	"BANK"
Localizer	[Expanded Localizer Indications.] • Greater than 1 rectangle at or below 1,000 feet AFE • Greater than 2/3 rectangle at or below 500 feet AFE *Note) A rectangle equals 1/2 dot deviation.*	"LOCALIZER"
VOR/NDB	• Greater than VOR 1/2 dot • Greater than NDB + (−) 5°	"COURSE"
Glide slope	• Greater than 1 dot at or below 1000 feet AFE • Greater than 1/2 dot at or below 500 feet AFE	"GLIDE SLOPE"
PAPI (Visual/Circling approach)	1 White 3 Red (Slightly Low)	"SLIGHTLY LOW"(or "1 WHITE 3 RED")
	3 White 1 Red (Slightly High)	"SLIGHTLY HIGH"(or "3 WHITE 1 RED")

Note) Correction Callout shall be performed by PM for PF's correction in case deviation is expected.

2.13.7.4 Safe Threatening Factors during Unstabilized Approach

a. Un-stabilized Approach can cause an accident and lead to CFIT.
b. By having an approach without enough time for stabilized approach, safety hazards may be caused.
c. Low/Slow or High/Fast approach could cause the followings.
 1) Low/Slow (Low Energy Approach) : Can cause CFIT from not having enough obstacle clearance.
 2) High/Fast (High Energy Approach) : Overrun, runway deviation or CFIT
d. Tail strike can be happened.
e. Not following altitude, speed, rate of descent etc might be the causes of accident.

2.13 7.5 Unstabilized Approach Prevention

a. Anticipate
PF and PM shall discuss during the briefing factors that can cause Un-Stabilized approach.
Ex) Nonstandard Altitude, Airspeed, Energy Management, etc.
b. Detect
PF and PM shall thoroughly monitor and support one another in a mutually reinforcing manner.
Ex) Unnecessary Actions, Sterile Cockpit Rule, etc.
c. Correct
Be proactive in making early any corrections before resulting in a critical condition.
Ex) Corrective Actions (Excessive Height, Excessive Airspeed, Extended the Outbound Leg or Downwind Leg) etc.
d. Decide
If the approach is instable or not steady, Go around procedures absolutely must be performed.

2.13.7.6 Stabilized Approach Criteria

a. All approaches should be stabilized by 1,000 feet AFE regardless of weather condition(IMC/VMC). An approach is considered stabilized when all of the following criteria are met:
   1) the airplane is on the correct flight path
   2) only small changes in heading and pitch are required to maintain the correct flight path
   3) Airspeed: Max Target speed +10 knots, (non-precision:+15 knots), Min Target speed -5 knots (Target speed = Vref+5 knots)
   4) the airplane is in the correct landing configuration
   5) sink rate is no greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted
   6) thrust setting is appropriate for the airplane configuration
   7) all briefings and checklists have been conducted.

b. Specific types of approaches are stabilized if they also fulfill the following:
   1) ILS approaches should be flown within one dot of the glide slope and 1/2 dot of the localizer (at or below 1,000 feet AFE), or within 1/2 dot of the glide slope and 1/3 dot of the localizer (at or below 500 feet AFE).
   2) VOR : within ±1/2 DOT, NDB : within ±5 degrees
   3) During a circling approach, wings should be level on final when the airplane reaches 300 feet AFE.

c. Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

Note)

1. An approach that becomes unstabilized at or below 1,000 feet AFE regardless of weather condition (IMC/VMC) requires an immediate go-around.

2. There will be delayed final flap setting during perform a certain approach such as emergency/non-normal procedure, circling approach, visual traffic pattern. In these cases checklist must be completed before final flaps.

d. At 100 feet HAT for all visual approaches, the airplane should be positioned so the flight deck is within, and tracking to remain within, the lateral confines of the runway edges extended.
e. As the airplane crosses the runway threshold it should be:
1) stabilized on airspeed to within max target speed + 10 knots, min target speed –5 knots until arresting descent rate at flare
2) on a stabilized flight path using normal maneuvering
3) positioned to make a normal landing in the touchdown zone (the first 3,000 feet or first third of the runway, whichever is less).

Note)
1. It is acceptable to overshoot instantly in the event of turbulence, wind shear, gust wind or the sudden change of wind direction. However, the frequent occurrence of such overshooting is not proper and should not be allowed.
2. If PF decides to correct temporary deviations safely and recognizes present flying stage and mentioned it in preliminary approach briefing, he/she continue approaching in the event that GPWS alert " SINK RATE " was announced temporarily below 1,000feet and VMC (Visual Meteorological Conditions).

2.13.7.7 Operation below DH or MDA

Pilot must not descend below DH or MDA to continue approaching unless following conditions are satisfactory.
a. In position where plane can land at designated runway TDZ with the normal maneuvers and normal descent rate.
b. Pilot recognizes one of runway visual references.
1) Approach Light System.
2) Threshold Markings/Lights.
3) Runway End Identifier Lights.
4) Visual Glide Path Indicator (VASI, PAPI 등).
5) TDZ or TDZ Markings/Lights.
6) Runway or Runway Markings/Lights.

Note)
1. The visual reference items for the CAT II/III are explained in POM.
2. PF calls out "Approach Light in Sight." when he or she recognizes the approach light at or above MDA or DA (H).

2.13.7.8 Missed Approach (Go-around) Conditions

Missed Approach (Go-Around) conditions are as follows.

a. When exceeding stabilized approach limit at or below 1000 feet AFE regardless of weather condition(IMC/VMC)

b. When visual contact is lost at or after MAP.

c. When aircraft is not aligned with runway.

Note) Even if the conditions of stabilized approach are not satisfied at 1,000feet or 500 feet, descent may be continued with the unavoidable conditions (FAA TERPS, Local procedure, restricted maneuvering airspace etc.). However, if the approach is not stabilized below the altitude set by the specific conditions, missed approach must be accomplished.

d. Aircraft instrument, ILS component inoperative, big difference between PF/PM's instruments.

e. Windshear or abnormal weather condition

f. ATC instruction.

g. When the aircraft can not land within safe touchdown zone.

h. Non-normal or other conditions that make it impossible to land safe.

i. When recent information of wind provided by Tower is exceeded at 1,000 feet.

j. When anyone in the cockpit make a callout below 1,000 feet AFE

Note) Deciding to perform Go-Around does not mean that the flight crew members have failed to performed approach procedure, but that they have followed the company safety policy by deviating from non-normal situation and re-executed the safety procedure.

Note) Refer to the CAT-II/III in the POM for CAT-II/III Approach

2.13.7.9 Standard Callout & Response

a. During ILS or Non-ILS approach, the PM makes callout "ONE THOUSAND" at 1,000 feet AFE, the PF should response "STABILIZED" or "GO AROUND TOGA FLAPS 20"depending on the aircraft's situation regardless of weather condition(IMC/ VMC).

b. In case of Circling approach/typical type visual approach (traffic pattern), It is principal to call out 500 feet AFE, instead 1000 feet AFE call out can be omitted because A/C is performing Turning base. However, in case short final is expected because of limited time of Turning base due to the environment of the Airport (ex. PUSAN KIMHAE airport), standard altitude for stabilization can be persuaded to 300 feet AFE.

c. When auto callout is made by system, it is principal for PM to monitor auto call out. However, PM should make call out If no auto call out.

d. The PM should take over the aircraft control when there is no response to the PM's callout twice from the PF at the altitude of 500 feet or 300 feet.

e. Refer to the "Standard Callout" in POM.

2.13.8 Approach Types

Authorized instrument approach types are ILS approach and non-ILS approach.

2.13.9 Considerations before Approach

2.13.9.1 Landing Performance check

PF/PM should check following items that can affect to landing performance before approach.

a. Weather and runway condition
b. NOTAM
c. Airplane condition and defects
d. Landing weight and target speed
e. Actual Landing Distance etc.

Note) In case of Non-Normal Configuration, runway shall be longer than which ever it is longer: either Actual Landing Distance in a Non-Normal state or Required Landing Field Length (Dry or Wet) in a Normal Landing Configuration.

2.13.9.2 Pilot weather limitation check

a. A PIC shall not conduct an instrument approach procedure when visibility conditions are reported to be less than 3/4SM or RVR 1,200m (4,000ft) until that pilot has been specifically qualified to use normal landing minimums(CAT-I).

b. A PIC shall not begin an instrument approach procedure when the visibility conditions are reported to be less than 3/4SM or RVR 1,200m (4,000ft), unless the following conditions exist:

1) Fifteen percent additional runway length is available over the Required Runway Length specified for the destination airport by the Airplane Flight Manual.

Note) Required Runway Length is the actual landing distance multiplied by a factor of 1/0.6 (1.67)

2) All weather runway markings or runway centerline lights are operational on that runway.

2.13.9.3 Runway Condition

a. Refer to the FOM Ch. 6 for landing limitations regarding contaminated runways and braking actions.

b. When reported braking action is less than good, consider:

1) Types of Contamination
2) Usable Runway(s) and Taxiway(s) through the information (NOTAM, SNOWTOM, ATIS, ATC/Company Advise etc)
3) Weather (specially, wind) Condition
4) Aircraft Gross Weight
5) Use of Auto Brakes
6) Other Performance Factors

2.13.9.4 Others

a. Wind Limitation

1) Three methods of performing crosswind landings are presented. They are the de-crab technique (with removal of crab in flare), touchdown in a crab, and the sideslip technique. Whenever a crab is maintained during a crosswind approach, offset the flight deck on the upwind side of centerline so that the main gear touches down in the center of the runway.
2) Before flare, an aircraft is deviated from runway centerline due to crosswind or the other reason, Captain must immediately execute a go-around with wings level.
3) Refer to the Chapter 8. “Adverse Weather” in POM.

b. Mandatory Missed Approach During Autoland

Refer to the Chapter 3. CAT-II/III Approach “CAT-II/III Missed Approach” in POM

2.13.10 NAVAIDs Set Up for Approach

a. Keep checking aircraft’s position and distance from the airport’s NAVAIDs.

b. Set up VOR frequency and final approach course on FMC (auto tuning is primary and when needed manual tuning is available)

When conducting cockpit setup for approach, and verify it again when performing descend checklist.

c. When following the START procedure, set the Navigation Frequency after passing the final reference station. At latest navigation frequency should be set and identified over the final base leg.

d. During VOR approach, the PF will keep MAP mode on the navigation display (ND), and the PM will display raw data on the PM side navigation display (ND) by order of the PF until landing or missed approach.

e. It is required to check Localizer frequency/course and auto tuning status before approaching terminal area.

f. The captain will put Standby Attitude Indicator Approach switch on 'APP or BCRS (when needed)' position when receiving localizer interception or approach clearance. (Appropriate airplane)

g. On demand, marker beacon receiver in audio panel will be used, and the volume should be adjusted properly.

2.13.11 Low Barometric Pressure Correction

a. Remember "GOING FROM A HIGH TO A LOW, LOOK OUT BELOW.

b. Thea ltimetere rror:A na ppropriatec orrectioni s2 8feetp erh pa below 1013hpa or 10feet per 0.01 inHg below 29.92inHg.

c. For other items, refer to "Altimetry" of the chapter .5 Weather" in FOM.

2.13.12 Cold Temperature Altitude Correction

a. The Captain should mention about the altimeter correction procedures during approach briefing when airport temperature is under freezing level. (Refer the Chapter 5. Weather "Altimetry" in FOM)

b. Refer to the FOM Ch.5 for Cold Weather Operation, ROC (Required Obstacle Clearance), Altimeter Setting etc.

2.13.13 Approach Charts

Flight crew should have airway charts (STAR, Approach Chart, Airport Diagram Chart, etc) readily visible during approach and landing.

Note) The assistance crew should check the airway chart to advice, if necessary.

2.13.14 Flaps Extension Schedule

Refer to FCOM VOL I Normal procedure

a. The PM should check the speed prior to extending flaps.
- PF : "FLAPS ONE"
- PM : "SPEED CHECK, FLAPS ONE"

b. In normal condition, pilots may reduce airspeed to selected flap maneuvering speed while flaps extending. Generally, it is recommended to reduce airspeed after selected flap extension completed for flaps protection and prevention of over speed.

2.13.14.1 Flaps 5

a. Except the following cases, it is required to pass IAF at flaps 5 maneuvering speed with flaps 5.

b. During radar vector, flaps 5 and flap 5 speed should be achieved no later than intercepting final approach course the Localizer. This helps prevent overshoot when using larger intercept angles by providing a smaller turn radius.

c. During staring-in approach, flaps 5 and flaps 5 maneuvering speed should be achieved no later than approximately 12nm to prevent excessive using of thrust.

d. During visual approach, flaps 5 and flaps 5 speed should be achieved no later than entering downwind.

2.13.14.2 Flaps 10

As an option, the localizer can be intercepted at Flaps 10 and Flaps 10 speed.

2.13.14.3 Landing Flaps (Flaps 25/30)

a. The following table represents time to extend specified flaps and landing gear. (Exception of circling and visual approach)

L/G Down & Flaps 20	Landing Flaps
• Glide Slope Alive or • 2,400FT (AFE) or • 8 NM or • 2 NM prior to FAF • apply special procedures of specific airport.	• 1,800FT (AFE) or Glide Slope Capture or • 6 NM or • prior to FAF • apply special procedures of specific airport.

Note)

1. PM should check speed before down the Flaps.

- PF : "Flaps One"

- PM : "Check Speed, Flaps One"

2. It is required to adjust the time for configuration change in order to meet the requirements or procedures in local airport (Speed limit, delayed flaps approach, landing gear down operation. etc) or direction from ATC.

b. Chime once using Seat Belt Selector after Landing Gears Down.

2.13.15 Speed Control

While flying with Speed Intervention or SPD mode in autothrottle, selecting proper airspeed can minimize the movement of thrust levers.

2.13.16 Conducting Landing Checklist

a. Once landing configuration done, the PF will check landing gear position indication, Flaps position, and SET APPROACH SPEED and MISSED APPROACH ALTITUDE on MCP, and then order the PM to read landing checklist.

b. The PM will call out "Landing Checklist Completed. Cleared to land (or Continue approach) RWY 00 L/R." after conducting the checklist items. In case of airports operating multiple number of runways, confirm runway in use to prevent confusion.

The end of section

2.14 ILS Approaches

2.14.1 ILS (ILS, ILS/DME) Approach

2.14.1.1 Preparation

a. The way to set Barometric and RA on PFD shall be applied with POM chapter 2. Normal procedures.
b. Set or Check the ILS Frequency and Course on NAV Radio Page in FMC.

2.14.1.2 ILS Initial Approach

a. Procedure Turn (45˚/ 180˚)

1) NAV DATA in FMC will be in accordance with the airspace operation regulation.
2) It is required to monitor the position of the aircraft shown in MAP mode to prevent the aircraft deviation
3) The procedure turn begins with a 45˚ turn away from the outbound track after checking the time.
4) Fly that heading for 1minute 15 seconds, then make a 180˚ turn away.
5) Arm the approach mode when the LOC intercept heading established.
6) Refer to Airway manual for other reversal procedures turn and race track pattern.

b. LNAV and VNAV

1) LNAV and VNAV mode could be activated at initial approach phase when the complete arrival procedure to the glide slope capture point has been programmed in FMC system. However, it is required to maintain the designated speed with MCP speed intervention.
2) Pilots should check if the sequence of waypoints and altitude restrictions and MAP Display exactly corresponds with ATC clearance.

c. FMS-CDU Display

It is recommended to make FMS-CDU displayed as follows;

PF	PM
VNAV DES or PROG	ACT RTE (1) LEGS

d. ND Mode Select (Raw Data Monitoring Requirements)

1) The PF keeps the ND in "MAP MODE" and increases the ND display gradually to 10NM before reaching FAF/FAP.
2) When the PM is asked to change "MAP MODE" into "APPROACH MODE" in the ND display, it is not always required to monitor raw data during ILS approach. If necessary, the PF asks the PM to select "APPROACH MODE" in ND display before intercepting the Localizer. (Call out " L/H or R/H Side Raw Data")
3) In case that the PM is asked to change "MAP MODE" into "APPROACH MODE" in the ND display, flight crews should verify on course after localizer intercepted.
4) When the approval procedure is not required due to radar vector, select "Direct to" or "Intercept course" to FAF, OM or a proper active waypoint in order to simplify the ND. By doing this, lateral displacement from final approach course and the remaining distance form FAF, OM or the specified active waypoint could display on FMC-CDU. In addition, pilots might be able to activate LNAV mode when initiating missed approach.

2.14.1.3 ILS Final Approach

a. Selecting Approach Mode

Arm the "APPROACH MODE" on MCP after checking the following items.

1) ILS Tuned & Identified.
2) When Aircraft Heading is Inbound Intercept Heading
3) Localizer & Glideslope Pointer shows on PFD.
4) Approach Clearance.

Note)

1. To avoid unwanted glideslope capture, LOC mode may be selected initially, followed by APP mode.

2. ILS Tuned & Identified is the procedure to visually check if decoded identified showed on PFD & decoded identified of approaching runway is corresponding. If it is inconsistent when checking visually or showed abnormally, Morse Code Identifier should be confirmed whether Morse code identifier of approaching runway is corresponding or not.

WARNING

1. When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it. The airplane can then descend on the glideslope with the localizer not captured. However, it is recommended to arm the LOC to prevent the Glide Slope being captured first.

2. When using LNAV mode to intercept the final approach course, PF/PM should check if the LOC interception completed correctly. If required, HDGSEL or HDGHOLD mode might be selected for intercept heading to the final approach course.

b. Localizer Capture

1) When turning to the LOC intercept heading, the maximum bank angle should NOT EXCEED 30˚

2) Establish the LOC first, and then capture the Glide Slope at lower altitude than glide slope path.

3) If false LOC captured condition occurs, select “HDGSEL” mode, maintain the intercept heading, and then arm the “LOC” mode after checking the LOC pointer and scale.

4) Tell the ATC of intercepting the LOC with the call of “Established Localizer”.

c. Glideslope Alive

1) PF

a) The PF will ask the PM for extending “(LANDING) GEAR DOWN and FLAPS 20” position.

b) The PF will ARM the speedbrake levers and set flaps 20 maneuvering speed on MCP speed window.

2) PM

a) On the PF’s order, the PM callout “(Landing) Gear Down, “Speed check Flaps 20”.

b) Cycle the seatbelt sign once (One Chime) the notify the flight attendants to check the cabin prearrange for landing.
c) Check Landing gear and flaps position on EICAS display, flaps 20 maneuvering speed on MCP
d) When expecting two engines inoperative condition or circling approach, comply with the appropriate procedure.
e) For passenger's comfortableness and extending the life of Landing gear doors, it is recommended to avoid extending Landing gear at or above the speed of 200 knots to prevent noise and the aircraft vibration.
f) When landing flaps are extended above Vref 30 + 20Knots, flaps load relief may be activated, the flaps can be retracted and excessive thrust change can occur.

d. Glideslope Capture

The pilots can control the aircraft to descend along glideslope after intercepting final approach course.

1) PF
   a) The PF can order PM to extend landing flaps.
   b) The PF can set final approach speed and missed approach altitude on MCP. However, he/she may order the PM to set the speed and altitude.
2) PM
   a) On the PF's order, the PM would check speed and call out "Speed Check flaps 30 (or 25)" then extend flaps to 30 position (in normal operation).
   b) It is required to check flap position on EICAS display and final approach speed and missed approach altitude on MCP.

e. Passing OM or FIX

1) The PM should check the passing of OM/FIX altitude (On the approach chart)
2) The PF responds "checked" after verifying that OM/FIX passing altitude is same as the altitude depicted on the approach chart.
3) Pilots should take the appropriate action to deal with glide slope out or unreliable condition in accordance with "Glide Slope out Procedure" stated in "ILS Approach" of the chapter 2. in POM.

f. At 1,500Feet (RA)

1) The PM will call out "ROLLOUT, FLARE ARMED" after verifying that rollout and flare mode armed on PFD.
2) The PF will call out any annunciation on PFD FMAs (LAND 3, LAND 2, or NO AUTOLAND).
3) When there is any change in PFD FMA, it is required to take action as follows.
 a) When "NO AUTOLAND" message annunciated, disengage the autopilot depend on approach condition, and fly the aircraft manually or execute missed approach (Go-around).
 b) When a change from "LAND 3"or "LAND 2" to "NO AUTOLAND" is annunciated, disengage the autopilot depend on approach condition, and fly the aircraft manually or execute missed approach (Go-around).

g. At 1,000Feet (AFE)

1) When the aircraft is at 1,000 feet AFE, the PM will call out "1,000 (ONE THOUSAND)"
2) The PF should response "STABILIZED" or "GO AROUND TOGA FLAPS 20" regardless of weather condition(IMC/ VMC).

Note) Pilots should execute missed approach immediately whenever it does not meet the stabilized approach criteria at 1,000 feet AFE regardless of weather condition(IMC/VMC)

h. At 100Feet above DA (H)

1) The PM calls "APPROACHING MINIMUM when the airplane reaches 100feet above DA . (H)
2) The PF responses "CHECKED".

i. At DA (H)

1) PF
   a) Response should be done to auto callout or PM's call out.
   b) If the PF does visually contact with runway visual reference, he/ she calls out the reference item.
   (ex: Approach/Strobe/Centerline Lights etc)
   c) Having appropriate visual reference in sight, PF calls "LANDING" and tries to land the airplane on the runway safely.
   d) When there is no appropriate visual reference, he/she should execute missed approach with saying "GO-AROUND TOGA FLAPS 20".
2) PM
   a) When the airplane reaches DA (H), monitor auto callout 'MINIMUMS MINIMUMS', PM has to callout "MINIMUM" if no auto callout.
   b) In case of no response from the PF, the PM calls "I HAVE CONTROL" and takes over the aircraft control to land the airplane or execute missed approach.
   c) The PM calls out any mode change in FMA.

j. Missed Approach conditions

1) Airports where DH is applied

   Refer to missed approach conditions of "Stabilized approach" in this POM.

   Note) In case of initiating missed approach at 50feet DH (HAT), the touchdown may occur during missed approach.
2) Airports where AH (Alert Height) is applied

   Regarding mandatory missed approach for airports where AH is applied, refer to chapter 3. "CAT-II/III Approach" in this POM.

k. Glide Slope Out Procedure

If the G/S is out during ILS Approach, notify ATC as soon as possible, and perform the following procedures.

1) VMC

When glide slope is out in the middle of ILS approach, if the weather is VMC and obstacles, visual references can be contacted in visual, the approach may be changed to visual approach and continued in visual.

2) IMC

If the weather is IMC, the approach can be continued after completion of following items prior to passing FAF.

a) Completion of briefing for G/S out procedure
b) Set the next fix altitude or MDA on altimeter window
c) Barometric altimeter bug set
d) Completion of landing configuration and checklist

Note)

1. If a false G/S capture is suspected after passing FAF, missed approach must be conducted if visual conditions cannot be maintained and the Glide Slope out procedure must be complied.

2. If the approach chart doesn't specify glide slope out procedure, the approach must not be continued.

2.14.1.4 ILS Auto Coupled Approach and Autoland

a. Recommendations for Auto APP and Autoland

1) Below ceiling 200feet or below 800M of visibility.
2) Less than RVR 600M.
3) Contaminated runway.
4) Whenever pilots feel tired and/or uncomfortable
   (e.g: accumulated fatigue due to jet leg)
5) Others.

b. Manual Landing Followed by Auto Approach

The PF may land the airplane manually in consideration of the circumstances and airplane configuration, and it is recommended to disconnect the autopilot for manual landing no lower than 500 feet (HAT).

Note)

1. *If planned manual landing during ILS approach, minimum altitude for autopilot is MDA or DH(A) -50FT. (Flight Safety Regulation Chapter 8 Minimum height for AFDS)*
2. *Pilot shall disconnect the autothrottle in case of Manual Landing*
3. *When the pilot has disconnected the Autopilot and the Autothrottle manual landing, it is not allowed to re-engage them below 500feet for.*

c. Restrictions for Autopilot Approach and Auto Land

1) Unless restricted in the Route Guide, auto coupled approach and autoland is always available.
2) During approach, if manual flight is required due to frequency intervention from other A/Cs, G/S deviation or LOC deviation, PF should change to manual flight.
3) When conducting auto approach or auto land with ceiling at or above 800 FT and visibility at or above 2miles, no ILS critical area protection will be provided, flight crew must notify ATC auto approach or autoland.
   Ex) "We are conducting autoland/auto coupled approach."
4) Practice Auto Land
   a) An autopilot coupled approach utilizing CAT-II or CAT-III procedures in weather conditions at or above CAT-I approach minima shall be regarded as a practice CAT-II or CAT-III approach.
   b) When a restrictive note regarding the localizer or glide slope (Such as offset localizer, glide slope unusable or localizer unusable) describes on the Route Guide's approach chart, auto land is not authorized.
   c) A practice CAT-II or CAT-III approach can only be accomplished if both PF/PM have complete CAT-II/III training and certified.

   Note) Crew should have hand on the control wheel, thrust lever in order to perform the manual flight during approach using AFDS not later than FAF.

d. FMAs Display during Autoland

Refer to the followings for the management according to the FMA indications below 50 feet RA. However, the captain will be responsible for the managements.

FMA indication	Management	Remarks
NO FLARE	Go-Around	Below 45FT RA
NO IDLE	Landing is available	Below 25FT RA Retard thrust levers to the idle position manually at 10FT RA
NO ROLLOUT	Go-Around	Refer to POM CAT-II/III

Note) In case of CAT-II/III, refer to the chapter.3.

2.14.1.5 CAT-II/III Approach

Refer to the chapter 3. “CAT-II/III Approach” in this POM.

2.14.1.6 Landing Procedure – ILS

Refer to FCOM VOL I Normal Procedure

2.14.2 Simultaneous Close Parallel (Independent) ILS PRM Approach

2.14.2.1 General

If operation information about ILS/PRM or LDA/PRM approach is obtained through ATIS before TOD, understand that heavy traffic condition exists around the airport and do ‘PRM APPROACH’ briefing in addition to normal approach briefing by reviewing the contents of ‘ATTENTION TO ALL USER PAGE’.

2.14.2.2 PRM Approach Briefing

The followings are included in PRM Approach Briefing.

a. Breakout maneuver.

b. Each VHF radio frequency setting.

c. TCAS display on ND.

d. ND distance range check.

e. ILS/PRM (or LDA/PRM) AIRWAY MANUAL check.

1) ILS/PRM (or LDA/PRM) APPROACH RWY.

2) CAUTION: SIMULTANEOUS CLOSE PARALLEL OPERATION.

3) Tower frequency and PRM frequency.

4) Highest obstacle on final.

f. Breakout maneuver procedure (Duty assignment between the captain and Co-pilot(F/O)).

2.14.2.3 PRM Procedure

a. The use of VHF radio frequency follows the below. The volume of receivers must be at same level.

L/H Radio	Center Radio	R/H Radio
Tower Frequency	ACARS/Company	PRM Frequency
Active		Monitor only

b. The pilot initiating PRM approach shall anticipate other airplane is approaching to a adjacent parallel runway at the same time. Keep it minds that breakout maneuver other than normal missed approach track can be announced by FINAL MONITOR CONTROLLER at any time before Missed Approach Point(MAP), and prepare manual maneuver all the time.

c. Breakout maneuver instruction includes TURN and/or DESCEND, CLIMB or MAINTAIN ALTITUDE. However, TCAS guidance must be referred as vertical guidance because it is more accurate.

Example) "TRAFFIC ALERT, AAR 214, IMMEDIATETLY TURN LEFT HEADING 180, CLIMB AND MAINTAIN 4,000".

d. Descent breakout maneuver by ATC does not instruct to descend below MVA(Minimum Vector Altitude), which is 1,000FT above the highest obstacle, or in descent rate greater than 1,000FPM.

e. Manual maneuver must be made in standard rate turn(standard time to turn, 3°/sec) and in 8 seconds after the instruction is issued.

Note) It is not applied to the weather conditions less than CAT-I requirement.

f. Follow ATC instructions for radio contact frequency and vectoring, executing breakout procedure.

g. In case of traffic alert and breakout maneuver, the captain shall take charge of PF and the Co-pilot(F/O) take charge of PM. Crew action and callouts are shown in the below.

2.14.2.4 Crew Action and Callout for Breakout maneuver

PF	PM
(autopilot switch twice push and manual flight)	
"BOTH F/D OFF THEN ON" →	"BOTH F/D OFF THEN ON"
"SET HEADING 000" →	"HEADING 000 SET"
"SET (ALTITUDE) 000 AND PUSH FLCH, SET SPEED 000" →	"(ALTUTUDE) 000 SET AND FLCH PUSH, SPEED 000 SET"
"AUTOPILOT CENTER (L or R) ON" →	"AUTOPILOT CENTER (L or R) ON"
"FLAPS 20"	"SPEED CHECK FLAPS 20"
"GEARS UP" →	←"POSITIVE RATE" "GEARS UP"
"FLAPS 10" →	"SPEED CHECK FLAPS 10"
"FLAPS 5" →	"SPEED CHECK FLAPS 5"
"FLAPS 1" →	"SPEED CHECK FLAPS 1"
"FLAPS UP" →	"SPEED CHECK FLAPS UP"
"AFTER TAKEOFF CHECKLIST" →	"AFTER TAKEOFF CHECKLIST COMPLETED"

2.14.3 Parallel (Dependent) ILS Approach

Parallel approaches are an ATC procedure permitting parallel ILS/MLS approaches to airports having parallel runways separated by at least 2,500FT between centerlines.

2.14.4 Simultaneous Parallel (Independent) ILS Approach

An ILS approach to parallel runways separated by 4,300FT to 9,000FT, and equipped with final monitor controllers. More information can be found in FOM and Route Guide.

2.14.5 Simultaneous Converging Instrument Approach

a. ATC may conduct instrument approaches simultaneously to converging runways; i.e., runways having an included angle from 15 to 100 degrees, at airports where a program has been specifically approved to do so.
b. Missed approach point must be at least 3 miles apart and missed approach procedures ensure that missed approach protected airspace does not overlap. Whenever simultaneous converging approaches are in progress, the controller will inform aircraft as soon as feasible after initial contact or via ATIS. In this case, the pilot should confirm minimum, missed approach procedure, etc.

2.14.6 Special Operations During Instrument Approach ILS Approaches to Parallel Runways

2.14.6.1 Classifications

ILS/MLS approaches to parallel runways are grouped into three classes dependent on ATC procedures, and airport ATC radar monitoring and communications capabilities.

a. Parallel (dependent) ILS/MLS Approaches

b. Simultaneous Parallel (independent) ILS/MLS Approaches;

c. Simultaneous Close Parallel (independent) ILS Precision Runway Monitor (PRM) Approaches.

2.14.6.2 Considerations

Pilot should take followings into account when approaches to parallel runways are expected.

2.14.6.3 Situation Awareness

a. Parallel approach operations demand heightened pilot situational awareness. A thorough Approach Procedure Chart review should be conducted with necessary information.

b. Pilots will be advised that simultaneous ILS/MLS or simultaneous close parallel ILS PRM approaches are in use. This information may be provided through the ATIS.

2.14.6.4 ATC Instruction

a. The aircraft conducting simultaneous parallel ILS/MLS and simultaneous close parallel ILS PRM approaches mandates strict pilot compliance with all ATC clearances and assigned airspeeds, altitudes, and headings must be complied with in a timely manner.

b. Precise localizer tracking is needed to minimize final monitor controller intervention, and unwanted No Transgression Zone (NTZ) penetration.
c. Pilots should notify ATC immediately if there is a degradation of aircraft or navigation systems.
d. NTZ (No Transgression Zone)
An area 2,000 feet wide located equidistant between parallel final approach courses.

2.14.6.5 Radio communication

a. Strict radio discipline is mandatory.
b. Lengthy, unnecessary radio transmissions and abbreviated call signs must be avoided.

2.14.6.6 Use of ACAS (TCAS)

Use of ACAS (TCAS) provides an additional element of safety to parallel approach operations. Pilots should follow recommended operating procedures.

2.14.7 Parallel ILS/MLS Approaches (Dependent)

a. Parallel approaches are an ATC procedure permitting parallel ILS/MLS approaches to airports having parallel runways separated by at least 2,500 feet between centerlines.
b. This differs from a simultaneous (independent) approach in that
1) The minimum distance between parallel runway centerlines is reduced.
2) There is no requirement for radar monitoring or advisories.
3) A staggered separation of aircraft on the adjacent localizer/azimuth course is required.
c. Pilots are informed that approaches to both runways are in use.

2.14.8 Simultaneous Parallel ILS Approaches (Independent)

2.14.8.1 System

a. This system permits simultaneous ILS/MLS approaches to parallel runways with centerlines separated by 4,300 to 9,000 feet.
b. Requires radar monitoring to ensure separation between aircraft on the adjacent parallel approach course.
c. The Approach Procedure Chart permitting simultaneous parallel ILS/MLS approaches will contain the note "simultaneous approaches authorized RWYS 14L and 14R."

2.14.8.2 Radar Monitoring

a. This service is provided to ensure aircraft do not deviate from the final approach course.
b. Aircraft observed to overshoot the turn-on or to continue on a track which will penetrate the NTZ will be instructed to return to the correct final approach course immediately. The final monitor controller may also issue missed approach or breakout instructions to the deviating aircraft.

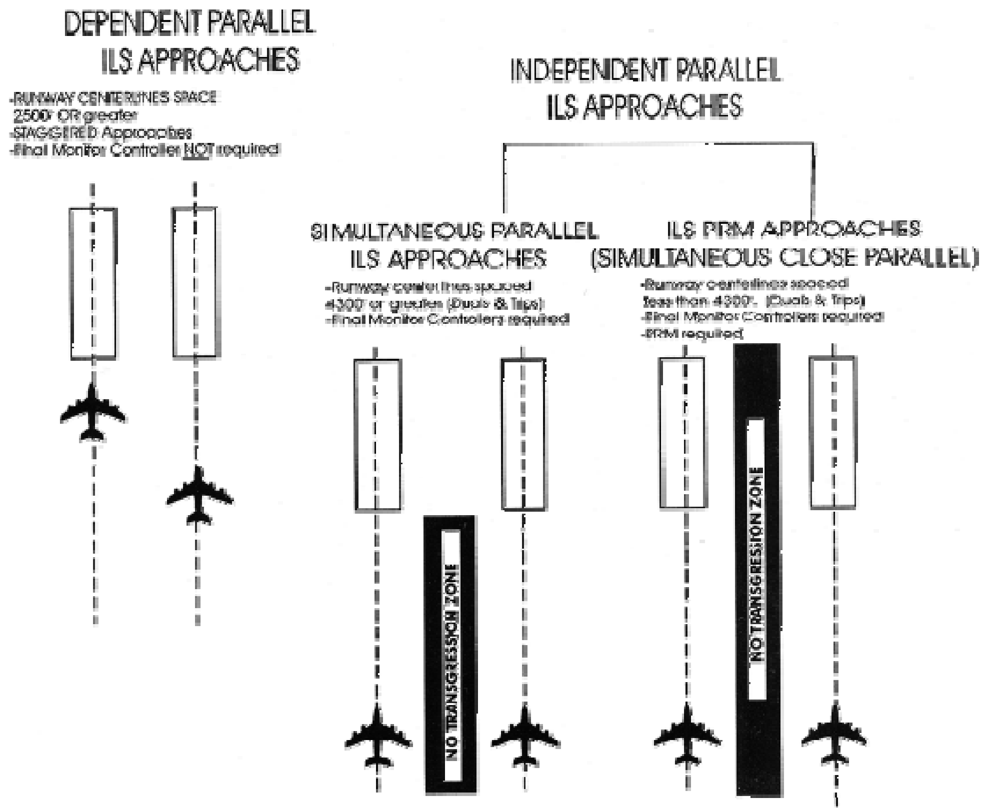
c. PHRASEOLOGY
  1) "(Aircraft C/S) YOU HAVE CROSSED THE FINAL APPROACH COURSE. TURN (left/right) IMMEDIATELY AND RETURN TO THE LOCALIZER/AZIMUTH COURSE." or
  2) "(Aircraft C/S) TURN (left/right) AND RETURN TO THE LOCALIZER COURSE." or
  3) "RADAR INDICATES YOU ARE DEVIATING LEFT(or RIGHT) OF THE LOCALIZER COURSE" (Australia)

d. If a deviating aircraft fails to respond to such instructions or is observed penetrating the NTZ, the aircraft on the adjacent final approach course may be instructed to alter course.

e. PHRASEOLOGY

1) “TRAFFIC ALERT (Aircraft C/S) TURN LEFT (or RIGHT) IMMEDIATELY HEADING (degrees), CLIMB (or DESCEND) AND MAINTAIN (altitude). or
2) “BREAKOUT ALERT, (C/S) TURN LEFT (or RIGHT) IMMEDIATELY HEADING (3digits), CLIMB (or DESCEND) TO (altitude)” (Australia).

Parallel ILS Approaches



2.14.9 Simultaneous Close Parallel ILS PRM Approach (Independent) & SOIA

2.14.9.1 System

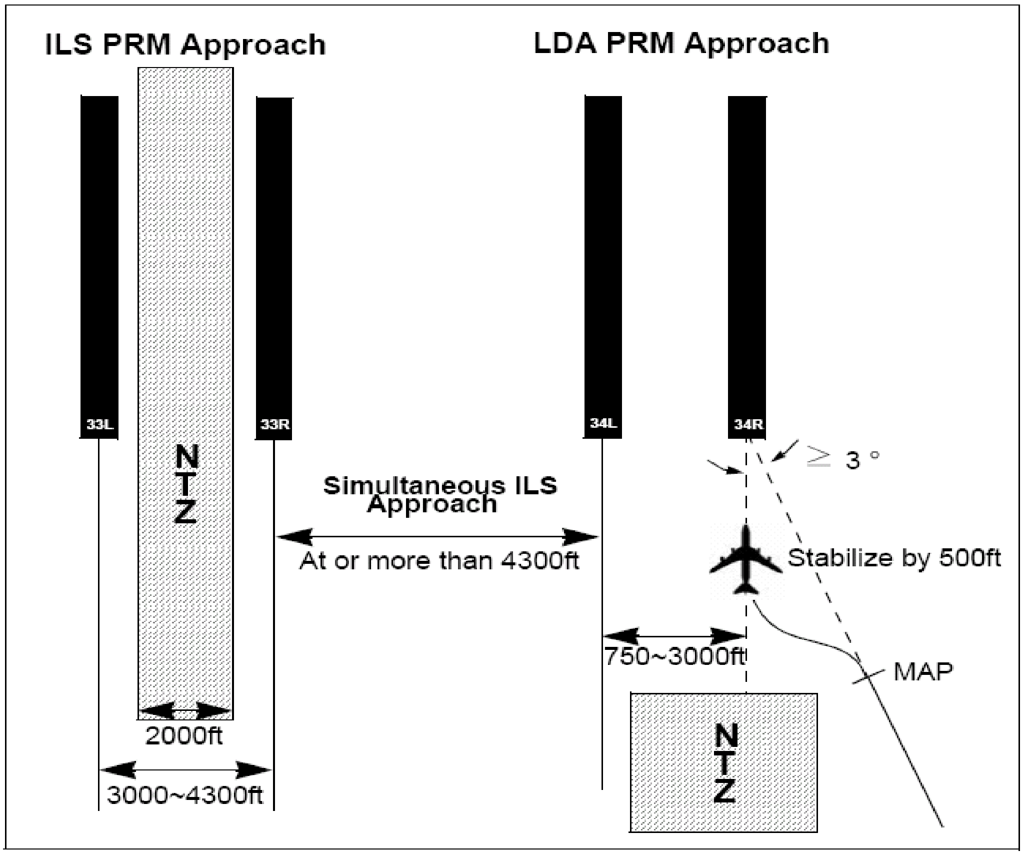
a. ILS/PRM (Precision Runway Monitor)

1) This system permits simultaneous ILS/PRM approaches to dual runways with centerlines separated by
   a) less than 4,300 feet but at least 3,400 feet for parallel approach courses,
   b) and at least 3,000 feet if one ILS if offset by 2.5 to 3.0 degrees.
2) Simultaneous close parallel ILS/PRM approaches are depicted on a separate Approach Procedure Chart titled ILS/PRM Rwy XXX (Simultaneous Close Parallel).

b. SOIA (Simultaneous Offset Instrument Approach)

1) The procedure utilizes an ILS/PRM approach to one runway and an offset Localizer Type Directional Aid (LDA)/PRM approach with glide slope to the adjacent runway.
2) This procedure is used to conduct simultaneous approaches to runways spaced less than 3,000 feet, but at least 750 feet apart.
3) Chart provides the separation between the two runways used for simultaneous approaches.
4) The procedures and system requirements for SOIA ILS/PRM and LDA/PRM approaches are identical with those used for simultaneous close parallel ILS/PRM approaches until near the LDA/PRM approach missed approach point (MAP)---where visual acquisition of the ILS aircraft by the LDA aircraft must be accomplished.
5) Visual Segment
   a) Established between the LDA MAP and the runway threshold.
   b) Aircraft transition in visual conditions from the LDA course, beginning at the LDA MAP, to align with the runway and can be stabilized by 500 feet above ground level (AGL)

c) If visual acquisition of ILS aircraft ahead is not accomplished, a missed approach must be executed.



2.14.9.2 Requirement

Pilots must have completed special training before accepting a clearance to conduct ILS/PRM or LDA/PRM Simultaneous Close Parallel Approaches.

a. Pilot Training Requirement

Pilots are required to review ILS PRM/LDA PRM Approach and SOIA and complete ILS PRM training (including breakout maneuver). (Refer to: Information for Air carrier Pilots, http://www.faa.gov or http://www.tc.faa.gov/acb300/330_video.asp)

Note) Refer to "Attention All Users Page" of Airway Manual for PRM special procedure of the airport.

b. ATC Directed Breakout

ATC direct "breakout" to vector off the ILS or LDA approach course in response to another aircraft penetrating the NTZ.

c. Dual Communication

Aircraft must have the capability of enabling the pilot/s to listen to two communications frequencies simultaneously.

2.14.9.3 Radar Monitoring

a. Simultaneous close parallel ILS/PRM and LDA/PRM approaches require that final monitor controllers utilize the PRM system to ensure prescribed separation standards are met.
   Procedures and communications phraseology are also described in Independent Simultaneous ILS Approach.
b. PRM radar monitoring terminates at the LDA MAP. Final monitor controllers will **not** notify pilots when radar monitoring is terminated.

2.14.9.4 AAUP(Attention All Users Page)

a. AAUP of an approach chart must be referred to in preparation for conducting the approach.
b. AAUP covers ATIS, Dual VHF Communication Required, Breakouts, ILS/PRM Navigation, SOIA Visual Segment.

2.14.9.5 SOIA LDA Approach Wake Turbulence

Pilots are responsible for wake turbulence avoidance when maneuvering between the LDA missed approach point and the runway threshold.

2.14.9.6 Comparing between ILS & ILS/PRM approach

a. Runway Spacing and Breakout

1) With PRM approaches, two aircraft could be along side each other, navigating on courses that are separated by less than 4,300 feet.

2) In the unlikely event that an aircraft "blunders" off its course, Monitor Controller issues breakout instructions to the endangered aircraft.
3) The pilot will not have any warning that a breakout is imminent because the blundering aircraft will be on another frequency.
   It is important that, when a pilot receives breakout instructions, he/she assumes that a blundering aircraft is about to or has penetrated the NTZ and is heading toward his/her approach course. The pilot must initiate a breakout as soon as safety allows.
4) A descending breakout will only be issued when it is the only controller option. In no case will the controller descend an aircraft below the MVA, which will provide at least 1,000 feet clearance above obstacles. The pilot is not expected to exceed 1,000 feet per minute rate of descent.

b. Communication

1) To help in avoiding communication problems caused by stuck microphones and two parties talking at the same time, two frequencies for each runway will be in use during ILS/PRM and LDA/PRM approach operations, the primary tower frequency and the PRM monitor frequency.
2) Pilots begin to monitor the PRM monitor controller when instructed by ATC to contact the tower. The volume levels should be set about the same on both radios.
3) The tower controller transmits and receives in a normal fashion on the primary frequency and also transmits on the PRM monitor frequency.
4) The monitor controller's transmissions override on both frequencies
5) The pilots flying the approach will listen to both frequencies but only transmit on the primary tower frequency.
6) If the PRM monitor controller initiates a breakout and the primary frequency is blocked by another transmission, the breakout instruction will still be heard on the PRM monitor frequency.

c. Hand-flown Breakouts

The use of the autopilot is encouraged while flying an ILS/PRM or LDA/PRM approach, but the autopilot must be disengaged in the rare event that a breakout is issued to break out in a shortest amount of time.

d. TCAS

1) The ATC breakout instruction is the primary means of conflict resolution.
2) ACAS (TCAS) provides another form of conflict resolution in the unlikely event but ACAS (TCAS) is not required to conduct a closely spaced approach.
3) ACAS (TCAS) may be operated in TA/RA mode while executing ILS PRM or LDA PRM approaches. (Australia: Select TA Mode, or operate in RA Mode in accordance with Tower instruction.)
4) Pilot should understand that Final Monitoring Controller's turning instruction is the primary means for safe separation from other aircraft. The ACAS (TCAS) provides only vertical resolution of aircraft conflicts, not horizontal resolution.
5) ATC command to turn with ACAS (TCAS)RA : Flight crew must follow both the final monitor controller's turn command and the ACAS (TCAS)RA's climb or descent command.
6) ACAS (TCAS)RA Alone : In the extremely unlikely event that an RA occurs without a concurrent breakout instruction from the final monitor controller, the pilot should follow the RA and advise the controller of the action taken as soon as possible. In this instance, it is likely that a breakout command would follow.

e. Breakouts

1) ATC directed breakouts will consist of a turn and a climb or descent. Pilots must always initiate the breakout in response to an air traffic controller's instruction.
2) Controllers will give a descending breakout only when there are no other reasonable options available, but in no case will the descent be below the minimum vectoring altitude (MVA) which provides at least 1,000 feet required obstruction clearance.
3) Phraseologies for Breakouts are as same as in Simultaneous Parallel ILS Approach.

2.14.9.7 ILS PRM, LDA PRM and the Use of TCAS

a. U.S.A.

ACAS (TCAS) may be operated in TA/RA mode while executing ILS PRM or LDA PRM approaches.

1) ATC command to turn with ACAS (TCAS) RA in the unlikely event that a flight crew should simultaneously receive a final monitor controller's command to turn and a ACAS (TCAS) RA, the flight crew must follow both the final monitor controller's turn command and the ACAS (TCAS)RA's climb or descent command.
2) ACAS (TCAS) RA Alone
   In the extremely unlikely event that an RA occurs without a concurrent breakout instruction from the final monitor controller, the pilot should follow the RA and advise the controller of the action taken as soon as possible. In this instance, it is likely that a breakout command would follow.
3) ACAS (TCAS) Requirement
   An operative ACAS (TCAS) is not required to conduct ILS/PRM or LDA/PRM approaches.

b. Australia

Select "TA Only Mode" in accordance with ATC instruction.

2.14.9.8 Auto Coupled Approach

It is recommended that ILS PRM approaches are flown with the aircraft autopilot coupled whenever practicable.

The end of section

2.15 Non – ILS Instrument Approach

Non-ILS instrument are defined as LOC (LOC BC), VOR, NDB, LDA (LDA/DME) and SDF.
VNAV is the preferred method of flying non-ILS approaches. V/S may be used as an alternate method (Supplementary Procedures) for accomplishing non-ILS approaches if VNAV method cannot be used (due to aircraft performance or when VNAV is not authorized).

2.15.1 General

2.15.1.1 Recommended Pitch and Roll Mode

	Pitch Mode	Roll Mode
LOC	VNAV, V/S	LOC
VOR, NDB	VNAV, V/S	LNAV, HDG SEL

2.15.1.2 The Use of LNAV

To use LNAV for approaches, a proper series of legs/waypoints that describe the approach route must be displayed on the LEGS page. There are two methods of loading these waypoints.

a. Data base (FMC) selection

1) Select an approach procedure through the FMC ARRIVALS page.
2) If the approach to be flown is not in the database, another approach having the same plan view may be selected. For example, an ILS procedure might be selected if the plan view(route) is identical to an NDB approach, when an NDB approach to be flown is not in the database.
   In this case, waypoint altitudes must be checked and modified as required.
3) When an approach is flown by this 'overlay' method, raw data should be monitored throughout the approach to assure obstacle clearance.
4) If a waypoint is added to or deleted from a database procedure, FMC "on approach" logic is partially or completely disabled and VNAV obstacle clearance integrity of the procedure may be adversely affected. If an additional waypoint reference is desired, use the FIX page and do not modify waypoints on the LEGS

page

b. Manual Waypoint Entry

1) When no procedure is available from the FMC ARRIVALS page, manual entry of a series of waypoints may be accomplished.
2) Then waypoints may be conveniently defined by using names of waypoints or navies in the database, bearing/distance from such fixes, intersections of radials or latitude/longitude information. (Procedure turns and DME arcs cannot usually be manually entered.)
3) Deviation from the defined route may require use of 'DIRECT TO' or 'INTERCEPT LEG TO/ INTERCEPT COURSE TO'. (when intercept the inbound course)
4) Constant monitoring of raw data during the approach is required.
5) HDG SEL or TRK SEL should be used to fly the approach ground track.

Note) Automatic procedure turning and VNAV PTH operation using speed intervention are not available with manual entered waypoints.

c. ND Mode Select (Raw Data Monitoring Requirements)

1) The PF should select MAP mode for ND mode, ND range should reach to 10NM before FAF/FAP.
2) Monitor raw data when performing the localizer-based approach (LOC, LOC-BC, LDA, SDF & IGS)
3) Raw data monitoring is recommended during performing non-localizer base approach (VOR, TACAN, NDB, RNAV GPS, etc)
4) Raw data monitoring is not required for the airplanes equipped FMC which has two operational FMCs, two IRSs and two GPS receivers (or two DME receivers if GPS updating is not available)or RNP/ANP. However, raw data monitoring can be performed by the PF's decision.
5) When raw data monitoring is required, the PF ask change approach mode for ND mode to the PM before final course Intercept. (callout: "L/H or R/H side raw data")
6) The PM change ND mode from MAP mode to proper mode (approach or VOR mode) by the PF's demand, and keep it until landing or missed approach (Go-Around).

Note) It must be needed monitoring raw data when operating non WGS-84 application air space (ex: Russia, Mongol, China)

2.15.1.3 Use of V/S (Vertical Speed)

When V/S or FPA is used for approaches CDFA (Continuous Descent Final Approach) is preferred method. (No level flight segment at minimums)

a. Preparations

1) Recommended Roll Mode

Approach Methods	Recommended Roll Mode
RNAV, GPS, LOC-BC, VOR, NDB	LNAV, HDG SEL
LOC, SDF, LDA	LOC, LNAV

2) Approach Set Up

a) Select the approach procedure from the ARRIVAL page of the FMC

b) Tune and identify appropriate navaids.

c) If additional waypoint references are desired, use the fix page.

d) If required verify/modify the appropriate RNP.

e) MDA SET

① Airports with authorized DA : use DA (regions under EU-OPS)

② Airports with authorized MDA : use MDA

If CDFA(Continuous Descent Final Approach) is made to MDA(H), set MDA+50ft to avoid descending below MDA(H) during the missed approach.

f) VDP (Visual Descent Point)

① Try to arrive at VDP at MDA wherever VDP is established.

② Most VDPs are between 1 and 2 NM from the runway Threshold.

HAA(FT)	300	400	450	500	600	700
VDP Dist', NM	1.0	1.3	1.5	1.7	2.0	2.3

Reference

Descent gradient

③ IF the final speed is 140knots

ⓐ 300FT/NM = 700FPM, 400FT/NM = 933FPM

④ IF the final speed is 150knots

ⓐ 300FT/NM = 750FPM, 400FT/NM = 1,000FPM

ⓑ 3˚Glide path = 318FT/NM
ⓒ 2.8˚ Glide path = 300FT/NM
ⓓ 3.8˚ Glide path = 400FT/NM

b. Approach Procedure

1) Approaching FAF

a) Use appropriate Pitch mode and Roll mode until FAF.

b) Approaching FAF (approximately 2NM), select landing gear down and flaps 20 and adjust speed.

c) Set the MCP altitude window to the first intermediate altitude or MDA.

2) At or after FAF

a) At or after the FAF, select V/S or FPA mode and at appropriate vertical speed to arrive at the MDA at VDP to allow a normal landing profile.

b) Vertical speeds vary with the ground speed on final approach.

2.15.1.4 Use of VNAV

a. General

Using VNAV is primary procedures at NON- ILS approaches (preferred method)

1) Instrument approaches using VNAV is a performance based approach procedures and it calculate GP angle from FAF to 50 feet above specific runway threshold and follow that. And at this time it only be authorized for previously mentioned segment.
2) VNAV is working with LNAV, HDG/TRK SEL or LOC mode for an approach.
3) Select the appropriate approach profile in FMC ARR page.
4) Do not construct waypoint data manually or make additional waypoint to the approach procedure.

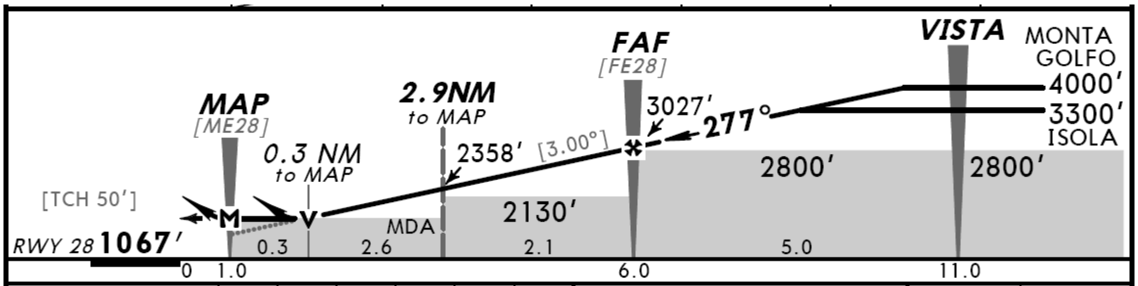
Note) With the waypoint programmed manually in FMC, VNAV PATH operation working with procedure turn and speed intervention function is not available.

5) When OAT is below 0°C, cold temperature altitude correction should be applied to the restriction altitude (altitude constraint) for a waypoint in accordance with the authorized altitude correction chart. Cold temperature altitude correction should be applied to all waypoints including missed approach below published MSA and after correcting the altitude, crosscheck should be done between PF and PM to prevent mistakes.

b. Approach Chart (Profile View)

1) Chart with VNAV information (VNAV Path, VNAV Angle)

a) When DA/DH is authorized in the profile view;



Gnd speed-Kts	70	90	100	120	140	160
Descent angle [3.00°]	372	478	531	637	743	849

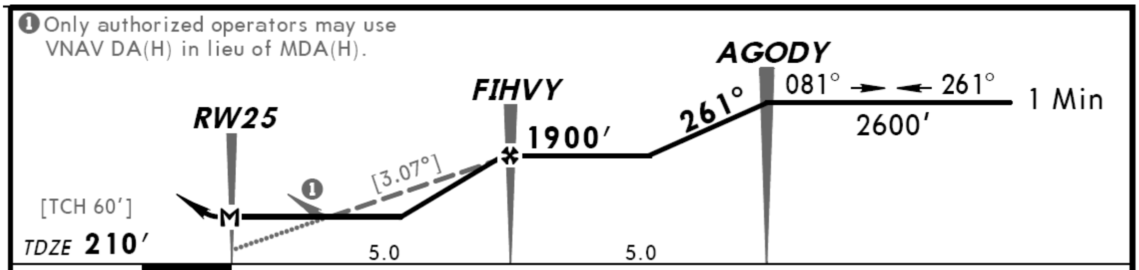
SALS PAPI

Refer to Missed Approach Above

STRAIGHT-IN LANDING RWY 28
Missed apch climb gradient mim 3.0%

LNAV/VNAV	LNAV	CIRCLE-TO-LAND
DA(H) 1500'(433')	MDA(H) 1500'(433')	Not Authorized North Side of Runway
ALS out	ALS out	Max Kts MDA(H)

b) When MDA (H) is authorized to be used as DA (H) in the profile view ;

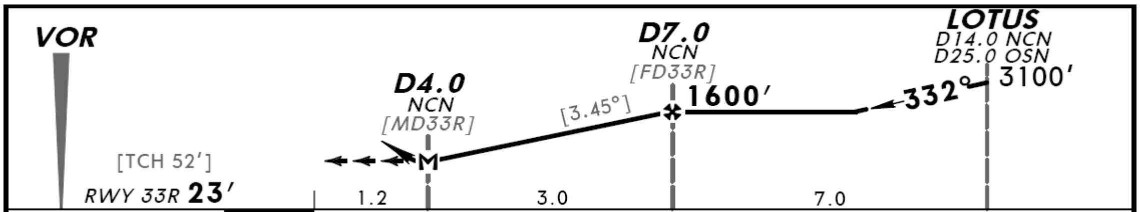


Gnd speed-Kts	70	90	100	120	140	160
Descent angle [3.07°]	380	489	543	652	760	869
MAP at RW25						

REIL VASI-L | 2600' | KUNWU

STRAIGHT-IN LANDING RWY 25	CIRCLE-TO-LAND
MDA(H) 580'(370')	Max Kts MDA(H)

c) When MDA (H) is authorized in the profile view ;



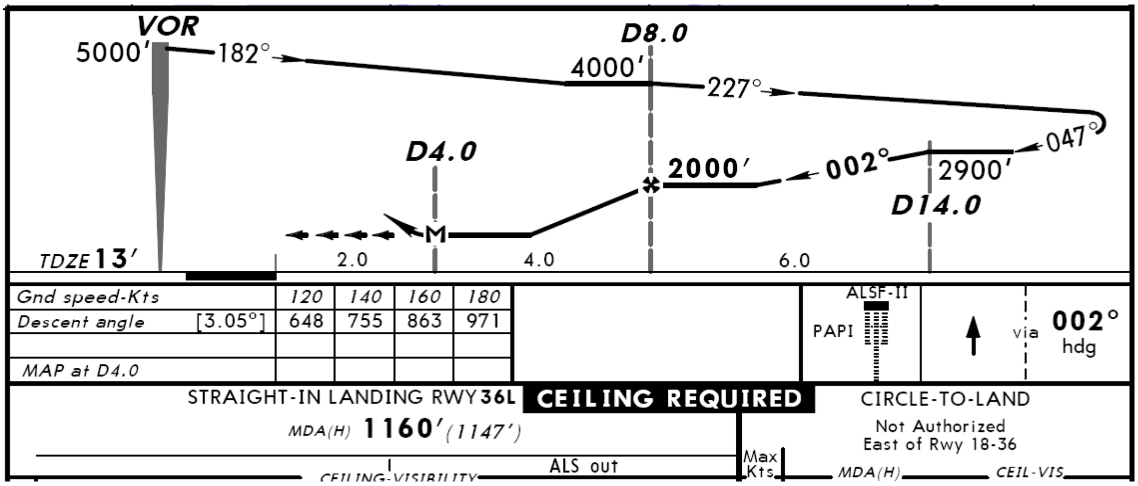
Gnd speed-Kts	120	140	160	180
Descent Gradient 6.0% or Descent angle [3.45°]	729	851	972	1094
MAP at D4.0 NCN FAF to MAP 3.0	1:30	1:17	1:08	1:00

ALSF-II REIL PAPI | STRAIGHT AHEAD | D3.0 NCN

STRAIGHT-IN LANDING RWY 33R	CIRCLE-TO-LAND
MDA(H) 500'(477')	
ALS out	

2) Chart without VNAV information;

VNAV approach can be executed If vertical path angle is displayed on the FMC-CDU LEG page.



c. Restrictions

1) VNAV Approach can not be performed under following cases (on the Approach Chart);

a) In case of the MAP is beyond the runway threshold and VNAV angle is not appeared in CDU LEGS page.

b) In case of no glide path angle is displayed on the final approach segment of the LEGS page on the FMC.

c) In case of the vertical path of RNAV approach is not designed to cross the runway threshold at approximately 50 feet.

2) When approaching airport's QNH is below 29.70 inHg/1006 hPa, transit from QNE to QNH and when Level off occurs within 2000 feet, use of VNAV must be sublated until Level off is complete

3) For other considerations, VNAV Approach can not be performed under following cases ;

a) In case of the actual navigation accuracy exceeds its required value.

b) If the airport temperature is below the minimum published temperature for the procedure being flown.

c) In case of "LNAV ONLY" is written on the RNAV (GPS) approach chart.

d) In case of QFE operation is in progress.

d. Preparation for VNAV Approach

1) FMC Approach Procedure Set Up

a) Select the ARRIVAL
b) Do not add or delete waypoints manually.
c) After set up compare following items between approach and FMC data.
① Approach VNAV path
② Approach VNAV angle
③ Distance from FAF to runway or MAP.
④ Confirm waypoints on final approach coruse and its altitude.

2) RNP

After IAF check RNP as required

Approach Type	RNP
NDB, NDB/DME	0.6 NM
VOR, VOR/DME	0.5 NM
RNAV(VOR/DME)	0.5 NM
RNAV(GPS)	0.3 NM

3) DA or MDA

Classification	When DA authorized	When authorized the use of DA in lieu of MDA	When MDA authorized
Chart with a published VNAV	Apply DA	Apply MDA as a DA	Set MDA + 50ft applying MDA
Chart without a published VNAV	VNAV Approach is available; however, MDA is applied and MDA (H) +50 is set for minimum.		

e. Considerations

1) Speed Intervention

a) When the FMC is "on approach", the following features are available:
The IAS/MACH window can be opened and the command speed can be set while VNAV remains in VNAV PTH descent; VNAV commands the set speed

b) Adding speed constraints to the final approach waypoints is not recommended because of the extra workload, no safety benefit, and reduced ability to make last minute approach changes.

2) Altitude Constraints

a) Confirm the altitude constraints of waypoints on the final course (Compare approach chart with FMC).

3) Autopilot

In general, pilots fly the airplane with the autopilot engaged until establishing visual reference. (To reduce pilot's workload)

f. Approach Procedures

1) Before 2NM to FAF

a) Before FAF, airplane should be on the descent phase and to join final approach course may follow controller's vectoring direction or fly via IAF to FAF along a STAR .

There are some kind of descent method such as VNAV, FLCH SPD, V/S and FPA, so pilot can choose an appropriate method fit that situation.

When descend make continuous descent rate as possible, for not violate altitude constraint of a FIX or directed altitude by ATC controller, pilot must understand about each descent method's characteristics thoroughly and careful attention must be paid.

b) If IAS/MACH Window was closed, open the window and control speed by IAS/MACH Selector on the MCP

c) Adding speed constraints to the final approach waypoints is not recommended because of the extra workload

d) When Radar vectoring by controller, request long final interception if needed.

e) When vectored to FAF or FAF extension course, NAV RDO frequency/ course and/or value of RNP does not change automatically until a FIX included in specific approach, therefore manually set FREQ/ Course and RNP value in to the PM side CDU and check in advance.

Note) An approach via IAF

1. Basically, for descent, reset next lower constraint, but where there are closely spaced waypoints between the IAF and the FAF, *PF may set FAF altitude initially. However, each pilot gives careful attention whether the altitude constraints are kept.*

2. Where there is published GP angle between the IAF and the FAF, PF may set DA(H) when intercepting the published GP.

2) Approximately 2NM to FAF

a) Set DA(H) or MDA(H) on MCP (with ALT or VNAV ALT FMA displayed or during VNAV PATH approach)

b) Push VNAV switch on the MCP (during VNAV PATH approach omit this procedure)

c) Confirm FMA status on PFD (VNAV Path/APP NAV)

When Radar vectoring by controller, request long final interception if needed.

d) Airport where raw data (CDI-Course Deviation Indicator) can not be confirmed during VNAV approach, check RNP (Required Navigation Performance) and ANP (Actual Navigation Performance) if it complies with the requirements.

e) PM Check the VNAV Path pointer and Deviation scale and callout "Approaching Glide Path or FAF." Then PF direct "Gear down, Flaps 20" (optional landing flaps 1 engine)

f) Confirm raw data if necessary (eg : Radial, DME, ALT, CDI etc)

3) FAF

a) Confirm FAF passing altitude

b) Descend to DA(H) or MDA(H)

c) Landing flaps (2 engine, optional 1 engine)

d) Do the Landing checklist

e) Monitor VNAV path

f) Confirm descent status (beginning of descent, descent angle, descent rate etc)

4) After FAF

a) Confirm raw data if necessary (eg : Radial, DME, ALT, CDI etc)

b) Set missed approach altitude on the MCP after passing at least 300 ft below missed approach altitude.

c) Convert to manual flight when visual reference is established while approaching DA (H)/MDA (H)

d) Make missed approach at DA (H)/MDA (H) if visual reference is not established.

e) Preform missed approach 50ft above MDA(H) when MDA (H) is applied

5) MCP Altitude Window Setting

a) When setting minimum on PFD BARO according to the chart using BARO minimum selector on EFIS control panel, DA(H) or MDA(H) on MCP altitude window is set at 100 feet interval.

b) Setting as follows ;

Classification	MCP Altitude	PFD BARO
Setting Altitude	Lowest 100 feet Unit	highest 10 feet Unit
(Example)	873FT => 800 feet Set	873FT => 880 feet Set

6) Descent

Descend can be started when ;

Classification	Descent can be started
VOR Approach	When VOR CDI is within 1 dot. (Within half full scale deflection for VOR)
DME ARC Turn	When maximum tolerance is within ± 2NM.
NDB Approach	Within ± 5˚ of the required bearing for NDB.

7) At 1,000FT (AFE)

a) PM calls out "1,000 (ONE THOUSAND)" at 1,000 feet AFE.

b) PF Responses as "STABILIZED" or "GO AROUND TOGA FLAPS 20"

c) If MDA (H) is at or above 1,000 feet AFE, PM does not call out "1,000(ONE THOUSAND)" but "APPROACH MINIMUM" and "MINIMUM".

d) If there is no response from PF after making "1,000" or 500" callout twice, PM should take over the control with saying "I HAVE CONTROL".

8) 100 feet Above MDA(H) (Except Visual Approach)

a) PM calls out "Approaching Minimums" at 100 feet above MDA (H).

b) PF Responses as "CHECKED" and continues approach for normal landing or responses as "GO AROUND TOGA FLAPS 20", and executes missed approach immediately when aircraft is unstable.

9) At MDA (H) (Except Circling/Visual Approach)

a) PF

① When PM calls out "MINIMUM" before passing MDA(H), PF responses "LANDING" if landing is considered "possible" in accordance with the conditions described in consideration STABILIZED APPROACH and turns F/D OFF, disengages autopilot, and continue to land.

② If PM calls out "MINIMUM" and no visual cue confirmed, PF responses "GO AROUND TOGA FLAPS 20" and execute a GO-AROUND.

③ If the landing runway is confirmed but the aircraft is not at the position where the safe landing can be made, executes a MISSED APPROACH.

④ If the landing runway is not confirmed on the MAP, execute a Missed Approach

b) PM

① PM calls out "MINIMUM" at MDA (H).

② If there is no response from PF after making "MINIMUM" callout, PM should take over the control for landing or missed approach verbalizing "I HAVE CONTROL, LANDING (or GO AROUND)".

③ If PF responses "LANDING" at MDA (H), turn the F/D OFF then ON and switch the ND to MAP mode.

Note) When approach using VNAV, FD indicate normal flight path angle to the 50 ft above runway threshold, so pilot may use this information if needed.

10) Missed Approach Altitude Setting

If one of the following requirements is met, missed approach altitude can be set.

a) If VNAV is used as pitch mode, set MCP altitude to the missed approach altitude when airplane is at least 300FT below the missed approach altitude and stabilized on final approach in VNAV PTH, or,

b) When the aircraft passes FAF, PF tries manual landing calling out "(RUNWAY IN SIGHT, LANDING"), set MCP altitude to the missed approach altitude.

g. Contingency Procedure

1) LNAV-VNAV Approach with RNAV (GPS)

If VNAV becomes inoperative during an approach, it is required to select other vertical mode to enable LNAV only approach, which using MDA.

2) RNAV (VOR/DME) or Other Approach Procedures

If VNAV mode fails or something is wrong with the FMC NAV DATA, select other vertical mode to keep flying all the way down to the MDA (H).

2.15.2 Localizer Approach

a. Localizer Approach does not provide glide slope, and pilots should prepare for the change to Localizer Approach when making an ILS Approach.

b. Select LOC switch after confirming the followings.

1) The localizer is turned and identified,
2) The airplane is on an inbound intercept heading,
3) The localizer pointer appears on PFD in proper position,
4) Approach clearance issued.

c. Confirm the final approach condition to localizer course, monitoring LOC pointer on PFD.

d. Notify ATC immediately when aircraft crosses localizer course without a prior instruction from ATC.

e. Descent can be made using VNAV, V/S; However, VNAV shall not be used when additional waypoint is made which is not included on the profile.

f. PM shall confirm each step down fix altitude and make standard callout.

2.15.3 Back course LOC Approach

a. Back course (BCRs) Localizer Approach is a Non-ILS approach procedures use back course information of a localizer and glide slope information is not available.

b. B747 has Back course (BCRs) Localizer Approach Reverse sensing capability, so during approach for controlling azimuth use LOC deviation pointer as front course adjustment.

c. Recommended basic flight modes for Back course (BCRs) Localizer approach are LANV/ VNAV Path. For final course intercept H/D SEL, H/D Hold may be used if needed.

d. For Back course (BCRs) Localizer Approach, LOC/APP Mode on MCP is not available.

e. Procedures

1) FMC set up: Select appropriate Back course (BCRs) Localizer Approach on DEP/ARR page and allow auto tuning.

2) Check LOC Frequency and front course on PFD. (can check also NAV/RDO Page)

3) Select Mode: Select BCRs mode on IFSD (Integrated standby Flight Display) (appropriate airplane)

4) Check raw data: PM must check raw data on ND during Back course (BCRs) Localizer final course approach.

5) Descent procedures: Follow company VNAV approach procedures. If it is not available using VNAV, V/S may be used.

6) Others:

a) If crossing Back course Localizer extension course without ATC instruction, confirm the situation to the ATC.

b) PM must check altitude constraints for each step down fix and make standard callouts.

2.15.4 VOR Approach

2.15.4.1 Preparation

a. Passing IAF, confirm proper VOR frequency and course are tuned automatically on the NAV RAD page.

b. If automatic tuning is not available manually input VOR frequency and front course in PF and PM's NAV RADIO Page.

c. Select VOR of VOR/ADF switch on EFIS panel during VOR/VOR DME approach.

2.15.4.2 Approach

a. When intercept heading is given, PF should set MAP mode of ND and PM should select VOR mode and check active route, extended runway center line, CDI center

b. VNAV, V/S are used for pitch mode.

c. LNAV, HDG SEL are used for roll mode, but LNAV is recommended.

d. When using LNAV, if a course deviation is displayed on VOR CDI, change to HDG SEL.

2.15.5 NDB Approach

2.15.5.1 Preparation

a. Set NDB frequency on NAV radio page and select ADF of VOR/ADF switch on EFIS panel during NDB Approach.

b. If there is no NDB procedure in FMC data base, pilot may input similar procedure such as an ILS Approach that has the same plan view of NDB, with reference to published MAP on NDB approach.

2.15.5.2 Approach

a. Select VOR/ADF switch on the EFIS control panel to ADF.

b. PM shall confirm ADF needle is on course, Selecting ND on EFIS control panel to expanded map mode or centered map mode from 1-2 nm before IAF. PF shall maintain map mode.

c. PF shall continue to use LNAV if it maintains the inbound course precisely and, if not, select HDG/SEL to maintain inbound course.

d. Descent can be made using VNAV and V/S. However, VNAV shall not be used when additional waypoint is made which is not included on the profile.

e. PM shall confirm each step down fix altitude and time, and make standard callout.

2.15.6 LDA Approach

a. The Localizer type Directional Aid (LDA) is of comparable accuracy to a Localizer, but it is not aligned with the runway.

b. When Glide slope information is not received, Localizer only approach will be approved starting from FAF within 10NM of runway threshold.

c. Straight-in minimums will be published where alignment does not exceed 30° between the approach course and runway. Circling minimums will be published where alignment exceeds 30°.

d. Localizer whose alignment is within 3° of runway is identified as Localizer and localizer whose alignment exceeds 3° is identified as LDA facility.

e. When alignment exceeds 6° back course LDA is not approved.

f. Some kinds of LDA approach provide glide slope information. In this case, "LDA/Glide slope" is depicted on the approach chart, and because the final approach course is not aligned with the runway, compared to the ILS approach, a corrective maneuvering is required for alignment.

2.15.7 SDF Approach

a.SDF (Simplified Directional Facility) is similar to ILS Localizer Approach but it is less accurate than LOC Approach.

b. Final course of SDF is not aligned with the runway. SDF Antenna offsets Runway Centerline, generally offset angle is not greater than 3 degrees.

c. Usable off-course indications are limited to 35 degrees either side of the course centerline. Instrument indications received beyond 35 degrees should be disregarded.

d. Identification consists of a three-letter identifier transmitted in Morse Code.

2.15.8 RNAV Procedure

a. It is defined as a method of "Waypoint to Waypoint" navigation that allows operation on any desired course within the coverage of station service volume or within the limits of a self-contained navigation system capability, or combination of these two methods.

b. RNAV navigation does not require any track directly to or from any specific radio station, and allows an airplane to fly on given airways within the limits.

c. RNAV is applicable of flying the airplane into terminal areas on arrival and departure paths as well as cruising along the airway.

d. For more information on other approach procedures, refer to the chapter 6. "Normal Operations" in the FOM.

2.15.9 GPS (Global Positioning System) Approach

Use LNAV, VNAV (or V/S) mode and it is similar to VOR/VOR DME approach.

a. Before initiating approach check if GPS operates normally in POS page of FMC and if necessary check RNP/ANP in FMC POS 2/3.

b. When GPS position is in doubt position must be verified using available method. Independent GPS approach is not approved in the place where WGS-84 is not used.

c. LNAV is used as roll mode, and VNAV (or V/S) is used as vertical mode. In addition, it is similar to VOR/VOR DME approach

Intentionally

Blank

2.16 Radar Approaches

2.16.1 PAR Approach

a. All procedures for PAR are quite similar to the ILS approach procedures except the air traffic controller directs a pilot down a runway approach course to a precision landing.

b. ASR controller provides radar vectoring to a final approach course. After that, a final controller gives pilots the azimuth information of the airplane.

c. Turn with the same amount of bank angle to be turned. (Example: 5 degrees bank when turning 5 degrees laterally) it should not exceed the maximum half rate of turn (1.5 degree/sec: approximately 11 degrees for the speed of 140 knots, and 12.5 degree for the speed of 160knots)

d. Establish a proper descent rate as follows when ATC tells you to "BEGIN DESCENT". Here is the recommended rate of descent.

Classification	3˚ Glide Path	2.5˚ Glide Path
Descent rate (FPM)	Approximately 1/2 Ground speed× 10 FPM	1/2 Ground speed × 10 – 100 FPM

e. DH is determined by the altimeter reading or the altitude ATC has instructed whichever comes first.

2.16.2 ASR Approach

2.16.2.1 General

ASR (Airport Surveillance Radar) Approach is a radar Approach by azimuth control and may provide a glide path for pilot. Controller leads pilot to a point over extension of final Approach track and a designated altitude and also order descent until MDA.

2.16.2.2 Approach

a. At final Approach segment, optimum descent gradient is 300FT/NM and maximum descent gradient is 400FT/NM.

b. Pilot inform Approach category of the aircraft (B747-400 :D) for controller and controller inform published MDA before descent to pilot.

c. VNAV or V/S is used for pitch mode.

The end of Section

2.17 Circling Approach

2.17.1 General

a. Circling approach commences after visual contact with the runway or the other visual references, and maneuvering can be started after ATC clearance is received.
b. Maintain the proper approach speed of maximum IAS and maneuver within appropriate circling area which is determined by maximum IAS to ensure safety.
c. The circling approach is able to visual approach pattern according to included approach track and wind as visual flight maneuver when ATC cleared visual approach. If the actual weather provides a margin for the circling Approach, maintain obstacles clearance within safe maneuvering area. Also should check "PANS-OPS" and obstacles by approach chart/ICAO.
d. Use the Autopilot and Autothrottle system as much as possible and the timing of auto throttle disconnect is recommended after stabilized on final roll out.
e. For reference, the crew can make a reference waypoint on ND (Navigation Display)
f. If nonstandard procedure is required, PF must do an extra briefing before the approach. (Example : Descent rate exceed 1,000FPM, downwind altitude, length, width are differ from standard procedure)
g. Obstacle Clearance

Obstacle Clearance for circling maneuvering by maximum IAS (based on threshold)

ICAO		FAA		JAPAN	
Maximum IAS	Radius (NM)	Maximum IAS	Radius (NM)	Maximum IAS	Radius (NM)
180	4.20	140	1.7	140	2.0
205	5.28	165	2.3	165	2.5

Note)

1. Obstacle clearance during circling approach is not determined by approach category, but determined by the maximum IAS during the *circling approach.*

2. Category for circling approach minimum s based on the maximum IAS during the circling approach.

2.17.2 Circling Approach Procedures

a. General

1) If circling is performed after ILS approach, it is recommended that intercept by using LOC, and descent to circling altitude by using V/S mode.

Note) Use of APPROACH MODE for descent to a circling approach is NOT RECOMMANDED for several reasons.

1) The AFDS does not level off at MCP Altitude.

2) Exiting the APPROACH MODE required initiating a GO-AROUND or disengaging the autopilot and turning off FD.

2) MDA Set procedure as below:

a) Set 100FT unit altitude lower than MDA to MCP.

b) MDA is 1,000FT HAA

① When the published MDH is 1,000 FT below, MDA set 1,000FT + Airport Elevation

② Refer to FOM Chapter 5 “Weather”

3) Entering the Down wind

1) When visual contact is established after instrument approach, report to ATC and receive a circling approach clearance, then turn to Downwind by using HDG mode.

2) Configuration for entering Downwind is L/G down, flaps 20 with flaps 20 speed, but PF can adjust the configuration by considering the weather and flight conditions. (Reference : Configuration for entering downwind is flaps 5 with flaps 5 maneuvering speed when visual approach)

3) The basic principle is maintaining company policy altitude (1,000FT AFE) on downwind leg, but maintain chart minimum or other local procedures at that airport, whichever is higher altitude. (Reference : Downwind altitude is 1,500FT above runway elevation for visual approach on B747-400 FCTM)

4) Landing configuration and LANDING CHECKLIST should be

finished before turning to final profile except straight long final.

c. On Down Wind

1) When crosswind is strong, use "TRK SEL" to fly within circling maneuvering area with ND range of 10NM.
2) The start point of turning base from the abeam position of threshold to make wings level at 300FT (AFE) on the final. (On the base of time check)

Ground Speed	170Knots	180Knots
Time Check (Second)	Approximately 23 sec	Approximately 22 sec

Note)

1. From 500FT (AFE) on final to threshold (TCH 50FT) : 1.5NM

2. Time check is based on the GS of aircraft. However, if weather condition like visibility and ceiling is good, the captain adjusts the turning point for base leg considering obstacles around the airport. In this case the captain shall mention it in the approach briefing.

d. At or below 500Feet (AFE)

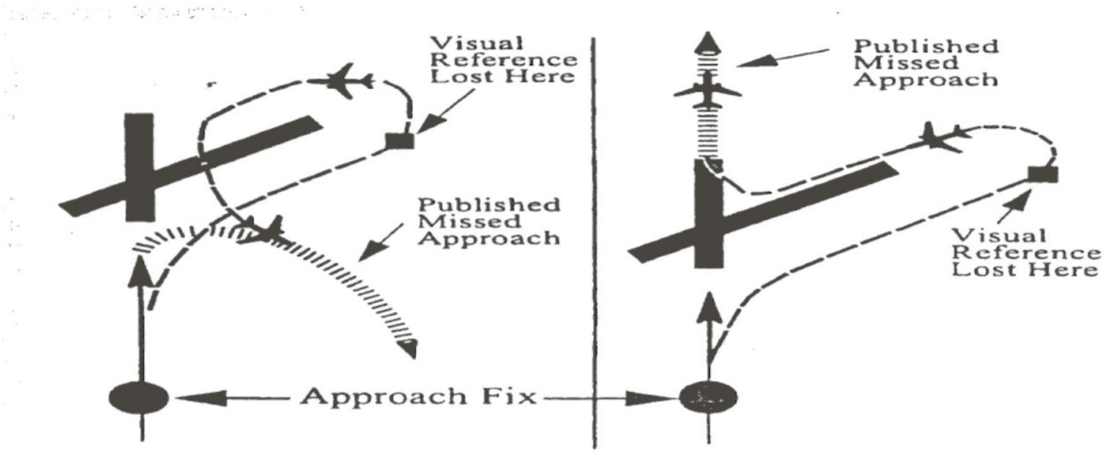
1) Passing 500FT (AFE), the airplane must be stabilized.
   Note) Refer to the POM "Stabilized Approach" about stabilized conditions.
2) PM calls out "500(FIVE HUNDRED)" at 500FT (AFE). PM takes over control, saying, "I HAVE CONTROL" when there is no response from PF after making callout twice.
3) Under unavoidable circumstances, wings should be level on final when the aircraft reaches 300Ft (AFE).
4) When the aircraft is stabilized, PF response by saying "STABILIZED, LANDING" and attempt normal landing.
5) When the aircraft is NOT STABILIZED, initiate Go-Around immediately.

e. Missed Approach

1) When the PM makes callout at the pertinent altitude, the PF should initiate landing or GO-AROUND after considering stabilization

2) If a missed approach is required at any time while circling, make a climbing turn toward the landing runway to reach the missed approach heading.

3) Since obstacle clearance is not guaranteed after passing map or leaving MDA, make a climbing turn toward the landing runway and remain within circling area until intercepting the missed approach track.



2.18 Visual Approach

Due to diversities of approach pattern and the way to use equipment on visual approach, this procedure described in this chapter is recommended procedure to be applicable in consideration of each airport's characteristics.

2.18.1 General

a. Visual approach is accomplished under IFR in the condition of VMC. The clearance for visual approach authorizes to fly to airport visually through unaided eye, avoiding clouds. Following conditions are required to accomplish visual approaches.

1) Airport weather condition: ceiling above 1000ft, visibility above 3SM
2) Pilot responsibility
    1) Responsibility of visual confirmation to adjacent forward traffic and separation
    2) Responsibility of visual confirmation to landing runway and separation

b. Visual approach should be cleared by ATC

c. No missed approach procedures

2.18.2 Approach type

a. Traffic pattern Type Visual Approach

This is a typical visual approach type operated with downwind and base leg landing pattern, this is a visual approach procedure entering downwind directly or while being vectored by ATC and landing with continuous visual confirmation with runway, which special procedure is not loaded in NAV DATA.

b. Straight In Type Visual approach

This is type of visual approach that relies on airplane navigation equipment to align the aircraft with a visual final, vectored by ATC till visual segment to contact visual reference of landing runway or converting to visual approach while following published instrument approach procedures.

2.18.3 Auto pilot – Auto throttle & FD

a. It is recommended to make the best use of Auto system in order to maintain stabilized approach by decreasing the flight crew's workload and Error. Although switching to Manual Flight is always an available option in case it is necessary to the flight condition.
b. Auto pilot is to be utilized as long as possible. However, it must be disengaged before Final Turn. This decision is to be made by the PF.
c. Auto throttle is also up to PF's decision, but it must be Disconnected before 300 feet (HAA) after 500 feet Stabilized.
d. There are no significant regulation in utilizing FD during Visual approach, but the procedures can be different according to Vertical Mode(VANA Path or V/S) which is used in order to maintain Vertical Path angle. Although FD provides necessary Guidance, Flying by observing referential objects via unaided eye comes first. FD should only function as reference information.

2.18.4 VNAV path pointer and deviation scale

a. Because VNAV path pointer and deviation scale shows relative deviation of Vertical Path according to Data (Threshold elevation+50 feet) recorded in the NAVDATA, it can be invaluable reference to maintain appropriate Vertical path when visual aiding facility such as PAPI/VASI are not operational. Therefore, it is recommended to make best use of the VNAV path pointer and deviation scale while performing all visual approach by displaying it on ND.
b. In case of deviation between visual aid facility such as PAPI/VASI and VNAV path pointer and deviation scale, prioritize the visual aid facility and approach.
c. Because true altitude lowers when outdoor temperature lowers, approach will be made from actually low altitude to even lower Vertical Path Angle. Therefore, in order to maintain appropriate

Vertical Path Angle, Cold Temperature Correction should be applied.

2.18.5 Procedures

a. Preparation

If Visual approach by ATIS information is implemented, the followings should be included in approach briefing

1) Check the weather conditions
2) Type of visual approach (typical pattern/ straight in type or charted)
3) Decision of approach type and review
4) FMC setup
5) Standard callout
6) Dealing with expected ATC restriction (ex: high speed or altitude)
7) Missed approach procedure (ex; Course & Altitude)
8) MDA on PFD is not set

b. Traffic pattern Type Visual approach

1) General

Downwind width and Base turn time can be appropriately adjusted according to Wind condition. However, visual confirmation to the landing RWY with unaided eye must be made at all situation.

2) FMC setup(Recommended)
  a) DEP/ARR Page: input distance 2 or 3 nm after select L/D RWY
  b) LEGS Page: Check in the reference altitude on RWY 00/(50 feet+FE)
  c) FIX Page: Make 2 or 3 nm circle & down track 90° from end of RWY (As necessary)
3) Initial/Intermediate Approach
  a) The pilot reports runway in sight or visual reference to ATC then requests visual approach clearance for landing.
  b) Enter maneuvering on downwind leg using HDG mode when cleared ATC.
  c) Maintain flaps 5 before entering on downwind, if the speed

control is according to traffic, wind or other factors.

d) Initiate descent after setting Downwind altitude on MCP, and when ALT mode is captured after reaching descent altitude, set Missed approach altitude.

① Downwind Height: 1500 feet or ATC assigned altitude

② Missed approach altitude: MSA or ATC assigned altitude

Note) It is recommended by company that Missed approach altitude is the highest minimum safety altitude for approaching airport.

4) Downwind

a) Width: Minimum 2 nm (Depending on weather condition)

b) Altitude : 1500 feet (The altitude above 1500ft for geographical features of airport may be indicated from ATC)

c) Configuration: Flaps 5

d) Speed: Flaps 5 Maneuvering Speed

e) Missed approach altitude: Set on MCP after ALT mode capture

f) Abeam of end of RWY: Flaps 10

g) Landing configuration: At approximately 20 sec from end of RWY

① L/G Down

② Flaps 20 & Flaps 20 Maneuvering Speed Set

③ ARM Speed brake

5) Base Turn

a) Starting point: At approximately 45 sec from end of RWY (Standard of a windless is 45 sec, but can be added or decreased according to weather condition)

b) Landing flaps Set: Flaps 30 or Flaps 25 & Target Speed Set (It is possible to early land so that L/D configuration be quickly completed with an extra time for landing).

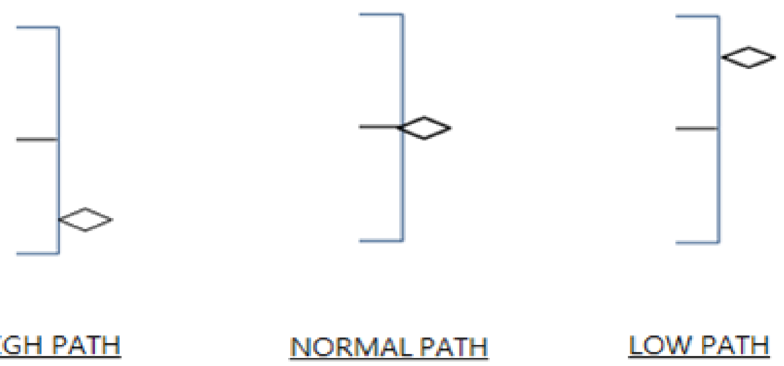
c) Landing Checklist : After complete L/D configuration

d) Begin descending on descent rate to use V/S mode. (Missed approach altitude is set to MCP, So it is impossible to descend to using the other mode).

6) Base Leg & Final turn

a) Adjust proper descent rate by visual reference of PAPI/VASI or VNAV path pointer and deviation scale of ND.

VNAV path pointer and deviation scale



b) At turning final, PF orders PM to set the RWY heading.
① PF: "SET RWY HEADING"
② PM: "RWY HEADING SET"

c) Adjust the time and bank entering final according to the wind direction.

7) Final approach

a) Recommended descent angle approximately 2 1/2~3 degrees.
Descent rate by descent angle
* 3°: G/S x 1/2 x 10 fpm
Descent rate when * 3.5°: 3° – 100fpm
Ex) in case G/S is 150kts(G/S when windless = VRep), normal descent rate is 150 x 1/2 x 10=750 fpm when descending by 3° therefore control and modify Vertical Path by 700~800 fpm.

b. Check altitude(+airport altitude) of 300 ft per mile to normal approach Profile.

c. Descend rate is normally 5% (3 degrees) and maximum 10%, but do not exceed 1,000FPM at 1,000FT (HAT). However it is possible a little over 1,000FPM when heavy weight or three VASI condition and it should be included approach briefing.

d. Must be stabilized at 500FT (HAT) on final, Execute "GO-AROUND" if unable to stabilized. It is just the same straight long final approach.

e. PM should callout “FIVE HUNDRED”, PF should response “LANDING” or “GO-AROUND TOGA FLAPS 20” at 500FT (HAT).

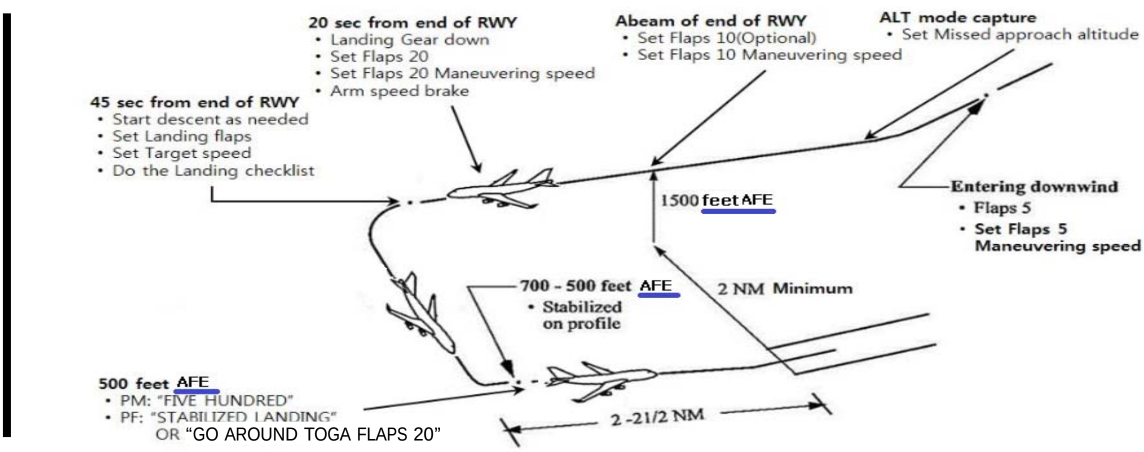
8) Callout procedures

At 500 feet AFE

① PM: “FIVE HUNDRED”

③ PF: “STABILIZED, LANDING” or “GO AROUND TOGA FLAPS 20”

〈Typical Visual Approach with traffic pattern〉



c. Straight In Type Visual approach

1) General

The term refers to and approach procedure which initiates landing after switching to Visual by using instrument landing approach procedure to visual segment after intersection to Final course before FAF. Charted Type Visual approach published in JEPPESEN Chart such as SFO’s 28L/R can also regard final waypoint on route as FAF and apply equal procedure after passage.

2) FMC setup (Recommended)

a) DEP/ARR Page: After L/D RWY Select, Push VFR APPR> of LS 2R

b) LEGS Page: Check in the reference altitude on RWY 00/(50feet+FE) & waypoint defaulted to FAF.

c) FIX Page: Make 2 or 3 nm circle from end of RWY (As necessary)

3) Initial/Intermediate Approach

a) Choose and follow appropriate instrument approach procedure (ILS, VOR, RNAV 등) equalized to the direction of approaching RWY.

b) Maintain Flaps 5 Configuration and descend (MCP altitude Setting is equal to settings when going through instrument approach procedure)

c) complete Flaps 10 Configuration before Final 8 nm at the latest.

d) when RWY or Visual Reference are confirmed with unaided eye, report to ATC and acquire Visual Approach Clearance.

e) after acquiring Visual Approach Clearance, it is fundamental to switch to Visual and initiate landing, but it is also possible to carry on with the already operating instrument approach procedure and perform approach and landing

f) Keep in mind that when proceeding instrument approach procedure, after acquiring Visual Approach Clearance, the flight crew is performing Visual approach by utilizing the relevant instrument approach procedure, not performing the instrument approach procedure itself. (one must not follow the relevant instrument approach procedure's Missed approach procedures.)

4) Final approach

a) 8 nm from end of RWY

① L/G Down

② Flaps 20 & Flaps 20 Maneuvering Speed Set

③ ARM Speed brake

b) 6 nm from end of RWY

① Landing flaps(30 or 25) & Target Speed Set

c) performing Landing Checklist : After complete L/D configuration

d) Missed approach altitude set

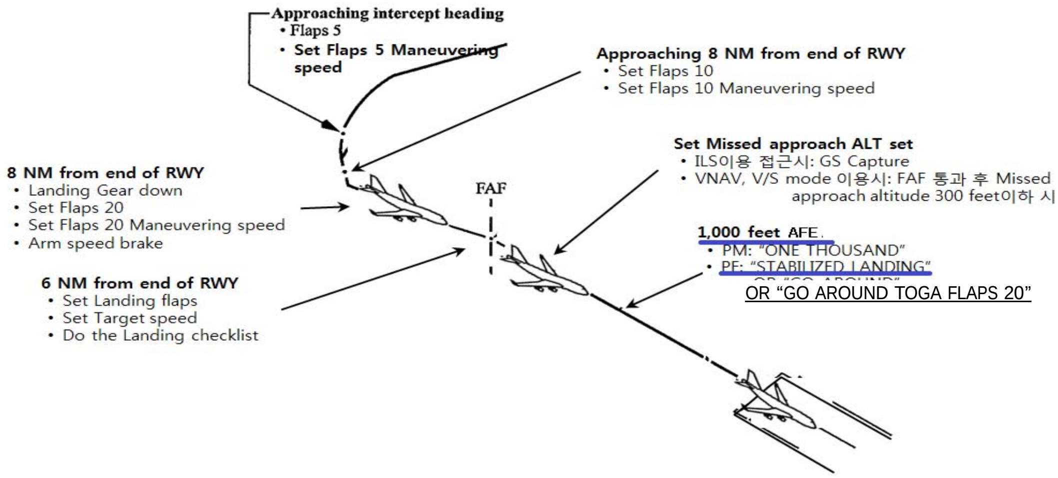
① When approaching via using ILS : GS Capture

② when using VNAV, V/S mode: when Missed approach altitude is below 300 feet after passing FAF

e) other procedures are to be applied equally to Traffic pattern Type Visual approach

Note) when performing inexact descent, it is recommended to use VNAV Mode rather than V/S mode in order to decrease the workload and errors.

〈Straight In Type Visual approach〉



2.18.6 Go-Around

a. Must be execute missed approach if un-stabilized approach, lost visual reference or ATC directions.

b. Accomplishing normal go-around procedure by runway heading or ATC instructed heading.

2.18.7 Visual Approach with No Glide Path Guidance

If glide path guidance is not available during a visual approach, the approach may be commenced or continued if :

a. Distance information (DME or GPS updated FMS distance) can be obtained to the airport.

b. Weather is not less than ceiling 2000feet and visibility 3 miles (5 miles at night) prior to commencing the approach.

WARNING

If any of above is not satisfied, execute an immediate go-around.

2.19 Missed Approach (Go-Around) Procedure

2.19.1 Applicable Common Items

2.19.1.1 Missed Approach Altitude Set

If one of the following requirements is met, missed approach altitude can be set.

a. VNAV is used as PITCH mode as soon as the aircraft is at least 300FT below the missed approach altitude and stabilized on final approach in VNAV PTH, set MCP altitude to the missed approach altitude.

b. If V/S mode is used in a pitch mode, 300 feet above the MDA(H).

c. When the aircraft passes FAF, PF tries manual landing calling out "(RUNWAY IN SIGHT), LANDING", set MCP altitude to the missed approach altitude.

d. If there is specific airport procedure, follow that procedure. (e.g. JFK)

2.19.1.2 Missed Approach (Go- Around) Conditions

Refer to the POM Stabilized Approach"

2.19.1.3 Missed Approach (Go- Around) Decision & Control

a. Deciding to perform Go-Around does not mean that the flight crew members have failed to performed approach procedure, but that they have followed the company safety policy by deviating from non-normal situation and re-executed the safety procedure.

b. Determination to perform Missed Approach(Go-Around) shall be made by

1) Above 1,000 feet: PIC's decision.

2) Below 1,000 feet: Any flight crew member in the cockpit (both operating and non-operating) calls out "GO-AROUND", PF must perform GO-AROUND procedure without hesitation.

c. In case of missed approach, whatever the reason of Go-Around the pilot should call out "GO AROUND TOGA FLAPS 20" to make the other pilot recognize the situation.

d. In the event of go-around when Co-pilot (F/O) flies the aircraft as PF, Co-pilot (F/O) must maintain positive control of the aircraft until captain takes over the control saying “I HAVE CONTROL”.

e. The pilots should be reminded that in case of Go-Around due to adverse weather, it will take more time to have approach and landing clearance. Because heavy traffic may be expected around the destination airport and landing sequence may be late.

2.19.1.4 G0-Around Thrust

a. Push the TO/GA switch and observe the autothrottle to be set to the go-around thrust.

b. Or increase the thrust manually to go-around thrust.

2.19.1.5 TO/GA Pitch Mode

a. The TO/GA pitch mode initially commands a go-around “attitude” and then transitions to “speed” as the rate of climb increases.

b. This speed is normally between command speed and command + 25 knots.

2.19.1.6 TO/GA Roll Mode

a. The TO/GA roll mode maintains existing ground track.

b. When a roll mode is selected as appropriate above 400FT (AGL), follow selected roll mode.

Note) Selection of pitch and roll mode below 400FT (AGL) does not change the autopilot and flight director modes.

2.19.1.7 FLAP Retraction Altitude

a. The minimum flap retraction altitude for normal takeoff and Noise Abatement altitude are not applied to a missed approach procedure.

b. Speed increase is initiated to retract flaps at 1,000FT (AFE). However, obstacles in the missed approach flight path must be taken into consideration.

2.19.1.8 Maneuvering

a. If initial maneuvering is required during the missed approach, accomplish the missed approach procedure through gear up before initiating the turn.

b. Delay further flap retraction until initial maneuvering is complete and a safe altitude and appropriate speed is attained.

2.19.1.9 Command Speed

a. Command speed should not be increased until a safe altitude or flap retraction altitude is attained.

b. Accelerate to flap retraction speed by repositioning the command speed to the maneuvering speed for the desired flap setting.

c. Retract flaps on the normal flap speed schedule.

d. When the flaps are retracted and the airspeed approaches maneuvering speed, check the VNAV speed or select FLCH if required and ensure that CLB thrust is set.

2.19.1.10 Use of Vertical Mode

a. Use of VNAV at or above 1,000 FT. (AGL)

b. Delay use of VNAV until appropriate FMC entries are completed.

c. If VNAV is used during go-around, premature level off may occur and Selection of FLCH may be required to complete the climb to the missed approach altitude.

d. Speed intervention may also be required to set the appropriate speed.

2.19.1.11 Use of Lateral Mode

a. LNAV

1) Before or after the approach, LNAV mode is used in the event of inputting appropriate data.

2) When using the LNAV mode, pilot should verify the aircraft flown the “Missed Approach Track” exactly.

b. HDGSEL

The HDGSEL is used in the event that the LNAV data in FMC-CDU is inappropriate and in case of vectoring from ATC.

2.19.1.12 Missed Approach Procedures

a. During Auto Coupled Approach

1) Leave the autopilot engaged.
2) Push either TO/GA switch, call for flaps 20, ensure go-around thrust for the nominal climb rate is set, and monitor autopilot performance.
3) Retract the landing gear after a "Positive rate" is indicated on the altimeter.
4) If full thrust is desired after thrust for the nominal climb rate has been established, press TO/GA a second time.
5) During an automatic Missed Approach (Go-Around) ititiated above 100FT, approximately 40Ft of altitude is lost.
6) If touchdown occurs after a go-around is initiated, the go-around continues. However, an automatic go-around can not be initiated after touchdown.

Note) An automatic missed Approach (Go-Around) cannot be initiated after touchdown or if the airplane is below 5FT RA for more 2 seconds.

7) The speed is normally between command speed and command speed + 25 knots.
8) The TO/GA roll mode maintains existing ground track.
9) Above 400Ft (AGL), select a roll mode as appropriate.
10) Above 1,000FT (AGL), select a roll mode as appropriate.

b. During Manual Approach

If a missed approach is required following a manual instrument approach or visual approach

1) Push either TO/GA switch, call for flaps 20, check go- around thrust set, and rotate smoothly toward 15 pitch attitude.
2) Then follow flight director commands and retract the landing gear after a "Positive rate of climb" is indicated on the altimeter.
3) Select proper Roll Mode above 400FT (AGL).
4) Select proper Pitch Mode above 1,000FT (AGL).

2.19.1.13 Standard Callout and Response Procedure

Refer to POM chapter 2.supplement NP

2.19.2 One Engine Inoperative Missed Approach

2.19.2.1 General

a. Missed Approach Procedure
Execute a missed approach procedure as follows;
1) In case that one engine inoperative procedure is established, follow the one engine inoperative procedure.
2) In case that one engine inoperative procedure is not established, make straight out departure.
3) Advise ATC of pilot's intention at or above 400ft AFE.

b. Speed increase must be initiated at engine out acceleration height applied to the airport.

c. After TO/GA is engaged, the AFDS commands a speed that is normally between command speed and command speed +10 knots.

d. If accomplishing a manual go-around, the pilot must control yaw with rudder and trim. Some rudder pedal pressure may be required even with full rudder trim

e. Select maximum continuous thrust when flaps are retracted.

f. For a multi-autopilot go-around, yaw is initially controlled by the autopilots. Be prepared to apply rudder input immediately when selecting another roll mode, pitch mode, or when altitude capture occurs above 400ft(AGL) because the multi autopilot reverts to single autopilot operation. The system reverts to normal autopilot operation and automatic control of rudder is discontinued.

2.19.2.2 Procedures

a. Push either TO/GA switch.
b. Set flaps 5 or flaps 20.
c. Rotate smoothly toward a G/A pitch attitude (manual G/A) or monitor autopilot go-around
d. Ensure the G/A thrust is set.
e. Retract the landing gear after check a "Positive Rate of Climb" is indicated on the altimeter.
f. At 400FT (AGL), engage any ROLL MODE (LNAV, HDGSEL or HDGHOLD).

g. Retract the Flap at or above 1,000FT (AGL) or flap retraction altitude. If a different flaps retraction altitude is specified for the landing runway to ensure obstacle clearance, initiate flap retraction at that altitude.
h. Complete the AFTER TAKEOFF checklist.

2.19.3 Two Engines Inoperative Missed Approach

a. If a go-around is absolutely necessary, increase thrust to go-around thrust at a rate that does not exceed the rudder's capability to maintain directional control.
b. Descend if needed to increase speed and retract flaps to flaps 1 on schedule.
c. Slowly increase pitch attitude to maintain flaps 1 speed and transition from a descent to a climb.

Note) The use of TO/GA is not recommended. TO/GA pitch command may exceed the performance capability of the airplane with two engines inoperative.

d. With high gross weights, temperatures, and pressure altitudes, go-around thrust on two engines may not be sufficient to achieve a positive gradient in the go-around configuration.
e. During an approach with two engines inoperative on the same side, it is possible to fly below minimum control speed when the go-around is initiated.

2.19.4 Go-Around and Missed Approach Procedure

Refer to FCOM VOL 1.Normal procedure

The end of section

2.20 Landing

2.20.1 General

Landing is from entering final approach course to entering the runway. This phase is the most importance phase, so crew should do the best and perform the standard procedures and callouts.

2.20.2 Landing Speed Addition

2.20.2.1 VREF Select

a. When normal approach, pilot should select VREF30 (or VREF25) Speed in approach REF PAGE.
b. When non-normal situations, pilot should select FLAPS by the QRH.

2.20.2.2 Command Speed

a. When Using Autothrottle
  1) Position command speed(target speed) to VREF+5knots.
  2) Sufficient wind and gust protection is available with autothrottle engaged because the autothrottle adjusts the approach speed upward to account for the gusts actually encountered during the approach.
  3) In turbulence, the result is that average thrust is higher than necessary to maintain command speed. This results in an average speed exceeding command speed.

b. When not Using Autothrottle
  1) If the autothrottle is disengaged, or to be disengaged prior to landing, the recommended method for approach speed correction is to add one half of the reported steady headwind component plus the full gust increment above the steady wind to the reference speed.
  2) When making adjustments for wind additives, the maximum command speed should not exceed VREF+20kts.

<Examples>

Example of wind additives with a runway heading of 360˚

Reported Wind	Wind Additive	Approach Speed
360 / 16knots	8	VREF + 8knots
Calm	0	VREF + 5knots
360/20 Gust 30knots	10+10	VREF + 20knots

Note)

1. The minimum command speed setting with autothrottle disconnected is VREF + 5knots.

2. The gust correction should be maintained to touchdown while the steady headwind correction should be bled off as the airplane approaches touchdown.

3. Do not apply wind corrections for tailwinds.

4. When the anticipated flaps 30 approach speed (VREF plus additives for wind and gust) is greater than 167 KIAS, schedule flaps 25 landing speed and flaps 25 landing distance.

c. Non-Normal Conditions

1) When VREF has been adjusted by the non-normal procedure, the new VREF is called the adjusted VREF and becomes the VREF for landing.

2) If a non-normal checklist specifies "use flaps 25 and VREF30 + 20 for landing", the flight crew would select flaps 25 as the landing flaps and look up the VREF 30 speed in the FMC or QRH and add 20 knots and wind correction to that speed.

Note)

1. Do not exceed flap 25 placard speed for non-normal.

2. When pilot set speed in accordance with flaps schedule on MCP, DO NOT set below final speed.

2.20.3 Decision to Land

2.20.3.1 Responsibilities

During instrument approaches, the captain has a primary responsibility to make a decision to continue to a landing or to execute missed approach. The decision must be made no later than.

2.20.3.2 Decision Point

a. Decision to land is to made at correct time. The decision must be made no later than MDA or certified minimum altitude.
b. The decision points are as follows:
  1) Precision approach: DA (H) or AH
  2) Non precision approach:
    a) DA(H) or MDA(H) by VNAV Approach
    b) VDP or MAP by Not VNAV Approach
  c. PF shall make callout intentions at decision points, so that other flight crews (PM and Assistant crew if onboard) acknowledge the PF's intention.

2.20.4 Flare

2.20.4.1 Auto Landing

a. Flare mode is engaged at 50FT (40FT~60FT in accordance with SINK RATE).
b. At 25FT RA, thrust is slowly decreased to idle and A/T annunciation changes SPD into IDLE. The descent rate is approximately 120~180FT / MIN at touchdown.
c. Refer to the FCTM for more detail.

2.20.4.2 Manual Landing

a. Initiate the flare when the main gear is approximately 30ft above the runway by increasing pitch attitude approximately 2 degrees
b. Do not increase pitch attitude continuously after initiating flare
c. During flare, avoid floating and drift

d. During flare, ground effect has influence on landing cushion below 30FT.

Note) If Co-pilot(F/O) is the PF, the captain should have his feet and hand lightly on the control wheel, rudder, thrust lever in order to immediately guard the aircraft in case of non-normal situations or inappropriate action by Co-pilot(F/O) below 500FT AFE during approach.

2.20.5 Touch Down

a. After passing threshold, touchdown at speed VREF + GUST factor between 1,000FT~1,500FT down the threshold.
b. Airplane body attitudes are based upon typical landing weights, flaps 30, VREF 30 + 5 (approach) and VEF 30 + 0 (landing), and should be reduced by 1 degree for each 5knots above this speed.
c. Refer to the FCTM for more detail.

2.20.6 Use of Spoiler & Reverser

2.20.6.1 General

a. During landing when the main gear contacts the ground and nose gear on it's way down, check speed brake lever is in the up position and auto spoiler deployed.
b. If auto spoiler is not fully extended, PM calls out "SPEED BRAKE NOT UP". Captain immediately deploys speed brakes manually.
c. As soon as interlock is engaged, use maximum symmetrical reverse thrust.

2.20.7 Thrust Reverser

2.20.7.1 Application

a. Start reducing reverse thrust at 80knots (FCTM : 60KIAS) and be at Idle detent by 60KIAS (FCTM : 40KIAS), only if braking effectiveness is good and sufficient runway length remains.
b. Use maximum reverse thrust until 60 KIAS and slowly adjust idle reverse is achieved by 40KIAS if the runway is short, wet or slippery.
c. Use Max reverse thrust until aircraft comes to complete stop in emergency situations.

2.20.7.2 Standard Callout & Response

a. Pull reverser levers to interlock position soon as the main gear touches the ground and then symmetrically pull until full reverse after interlocks are released.
b. If required, idle reverse may be used until taxi speed. Except under emergency situations, use of high reverse thrust below 40 KIAS is prohibited.
c. PM calls out airspeeds "60 KNOTS" while the PF is using reversers.
d. PM to monitor that REV unlock and REV in transit lights are normal and that EGT does not exceed their limits.
e. Select idle reverse immediately if an engine surges and shutdown the engine if engine parameters are abnormal.
f. Stow thrust reverser, when exiting runway by using HST (high speed taxiway).
g. Observe EGT for at least 15 seconds after the engine has stabilized in the forward thrust position.

2.20.7.3 Major Causes of Reverse Stall (Surge)

The main reasons why Engine Stall (Surge) event during the use of Thrust Reverser as follows:

a. Improper use of thrust reverser

   1) Abnormally high N1 during the use of reversers at low speed

   2) Sudden forward movement of reverse levers.

b. The faulty reverser actuated bleed system or miss-trimmed engines can usually cause the abnormally high N1.

c. Differences of more than ±5% between engines during use of full reverse requires a log entry.

d. Crosswind or tailwind affects the flow of air and reinvention of exhaust gas reduces engine stall margin.

The end of section

2.21 After Landing and Parking

2.21.1 General

a. After landing checklist should be performed on taxi way after clearing the runway. If requested by ATC request, report "RUNWAY VACATED" after completely clearing the runway.
b. PM advises taxi route for PF to take to the gate. Refer to Airway Manual and keep constant watch around the aircraft during ramp in.
c. Consider the remaining distances from present position to parking position for starting APU (it takes approximately 40 seconds for starting APU).
d. Co-pilot(F/O) to monitor brake pressure continuously during taxiing for ramp in and does standard call-out refer to ramp-in procedures during ramp in.
e. Accomplish parking procedure after aircraft comes to complete stop. After parking, with the instruction "chocks in, release parking brake" from ground staff, release parking brake and then accomplish shut down checklist.
f. After writing up flight log, report condition of aircraft and remaining fuel to company.

Note) The PIC must record any defect of the aircraft in the flight log.

2.21.2 Maintaining Speed

a. Maximum taxi speed at high speed taxiway and dry runway condition is 60KIAS, but deceleration below 30KIAS is recommended for safety.
b. When the runway surface is not dry or vacating the runway via taxiway which is not high speed taxiway, reduce to appropriate taxi speed (below maximum taxi speed).

2.21.3 Configuration Change

Flight crew must not change configuration before vacating. But some exceptions are accepted at the following conditions.

a. When necessary for safe vacation from runway : Change configuration after decelerating SHAT taxi speed

b. When 180° back is needed on the runway : Change configuration after turning is completed.

Note) When you have to cross another runway after vacating landing runway, you can change configuration before crossing another runway.

2.21.4 After landing Procedure

Refer to FCOM VOL 1 NP.

2.21.5 Taxi (Taxi-in)

2.21.5.1 General

a. Flight crews must listen to taxi instruction carefully and they should keep a close look out on outside conditions during configuration changes.

b. Keep the limited speed by taxiway conditions.

c. After check Taxi route by airway manual, enter the gate (spot).

d. Flight crew should keep watch to prevent collisions with other airplanes which is parked or equipment. When need help from ground staff, flight crew should stop the airplane.

e. When the APU is needed, stat as late as possible.

f. As a general rule, taxi-in should be performed with all engines operative, however taxi-in with one engine shutdown may be performed to reduce maintenance cost for brakes and to save fuel. Precedence must be given to applicable FCOM and flight safety.

Note) During taxi, co-pilot(F/O) cuts the Fuel Control S/W off 3 minutes after landing (by ACARS time) by the order of captain. Co-pilot should obtain captain's confirmation.

2.21.5.2 Low Visibility Taxi

a. Low Visibility Taxi shall be operated below RVR 1,200FT (350M). However, a procedure defined by the local airport shall be applied, if there are any.
ex) Incheon Airport ; RVR 550M

b. Taxiing with low visibility requires much caution, for it is one of the difficult operations.

c. Airport Low Visibility Taxi Route must be confirmed before approach.

d. Airport Low Visibility Taxi Route chart must be placed at a position that is easy to refer to after landing.

e. Taxi at lower than half the normal taxi speed and check the ground speed of PFD.

f. Turn On the exterior lights of the aircraft when necessary.

g. Follow the Taxiway Centerline Lights and Taxi Lead Light when taxing and be cautious in recognizing between Stop Bar Lights and Runway Guard Lights (vertical or yellow active lights on alternately that is used for discriminating Active Runway and Runway Position Marking)

h. Red Stop Bar Lights (vertical or red non- active lights on surface)are used for Active Runway ILS Critical Area Holding Position Marking or for taxiway intersections and they must be installed for RVR 600FT (175M) operation.

Note)

1. You must not pass the Red Stop Bar when it's ON

2. With the ATC permission, check for the Red Stop Bar to be OFF before passing and any inconsistency between ATC instruction and the lighting must be confirmed.

i. Taxi lead off lights with yellow and green lights alternately is installed within Critical/Sensitive Area and the lights are used for controller to confirm whether aircraft is completely vacated from runway when pilot reports vacating runway.

CAUTION

Notify the controller at the first indication of becoming disoriented.

2.21.5.3 SMGCS Management

a. There are some airports which has SMGCS (Surface Movement Guidance and Control System, Acronym Pronounced “SMIGS”) installed. It is easier to control ground movement of aircrafts and required vehicles in these airports.
b. In case of RVR 600FT (175M) ~ 1,200FT (350M), it is operated within the Movement Area (including taxiway which controller allows traffic to move).
c. In case of less than RVR 600FT (175M), the area is expanded to Non-Movement Area. (Normally within ramp area which is uncontrolled area)

2.21.6 Ramp in Procedure

2.21.6.1 General

a. In busy ramp area, PIC must control the aircraft to taxi.
b. From entering ramp, till parking at the gate, left seat captain shall have control.
c. Before entering gate (spot), check marshal and self ramp-in guidance system is normal.
d. Take thorough outside vigilance.
  1) Ensure wing tip clearance and if doubtful, stop A/C and co-operate with ground crew.
  2) If needed, report ATC, shutdown engine and request towing.
  3) Assistant crew shall also watch outside and advise if necessary.
e. At abeam of gate (spot) position, callout guide line, brake pressure and A/C speed. Max speed for parking is 5kts.
f. When approaching gate for parking, if surface condition is icy or slippery with snow, do not take chance and request towing after engine shutdown.
g. If VDGS (Visual Docking Guidance System) signal does not agree with A/C type or other irregular conditions happen, flight crew

who recognize first should callout and captain should stop the A/C.

h. Flight crew should be well aware of the airport parking system and special procedure, etc.

2.21.6.2 Parking Brakes special procedures for Cold & Slippery airport

Under special conditions, parking brakes should be set on even if the aircraft wheels are chocks in. The conditions are as follow.

a. Slope-sided Spot / Gate
b. Strong wind at or above 30kts (including Gust factor)
c. Slippery Spot / Gate with icing condition
d. Requested by ground handling staff

2.21.6.3 Standard Callout

Refer to POM Standard Callout & Response Procedures

a. Shutdown Procedure
When PM request Shutdown Checklist, PF shall set the ACTIVE Frequency on the left Radio Tuning Panel to the Company frequency and perform checklist. Refer to FCOM VOL 1 NP for detailed procedures.

b. Secure Procedure
Refer to FCOM VOL 1 NP for detailed procedures.

2.21.7 Tail Post Installation

2.21.7.1 General

a. Tail Post Guidelines shall be applied to all Asiana regional branches' offices and flights when B747-400 COMBI is operating. If there are other overseas contracted grounds handling companies' guidelines for tail post, those guidelines shall be applied.

b. If there is no Tail Post to assist the aircraft due to malfunction or other reasons, AFT Tipping Limit should be applied within 38% MAC for more safety in the ramp area.

c. It is supposed that the cargo Load Plan is organized for AFT Tipping Limit within 38% MAC. (If Load Sheet is issued to the flight crew, Tipping Limit is guaranteed within 38% MAC)

d. Absolute Tipping CG for B747-400 is 62.5% MAC. The standard for Nose Gear Zero Load is 44% MAC. (For B747-400 Combi, refer to WBM 1-84-001.)

e. If the Zero Fuel Weight CG and Takeoff Weight CG are within company's operational limit, Landing CG is supposed within flight operational limit. Landing CG does not exceed AFT Limit 33%.

2.21.7.2 Tail post Installation Procedures before disembarking passengers

For B747 COMBI, the procedures to install Tail post in ramp area as follows,

a. Check that parking brake is set after ramp in.

b. Order the ground handling person to install Tail post.

c. After confirmation of tail post installation completed from ground handling person, turn off the seat belt sign s/w.

Note) Those special procedures can be omitted at ground handling staff's decision, if there is no need for tail post installation.

The end of section

2.22 After Flight

2.22.1 MQTW (Maximum Quick Turnaround Weight)

2.22.1.1 MQTW Procedure

If the following landing weight exceeds the MQTW, the flight crew should perform the applicable procedure in AFM

a. Performing Quick Turn Around after landing with High Gross Weight
b. Over Weight Landing
c. Landing with Maximum Landing Weight

Note) MQTW limits generally become significant during landings at high temperature, high altitude airports.

2.22.1.2 MQTW application

a. Check the MQTW from AFM (Airplane Flight Manual: in the cockpit)
b. Wait at least 70minutes, when landing weight is higher than weight mentioned on the AFM Chart.
c. Check the wheel thermal plugs before subsequent takeoff.
d. Check the "Recommended Brake Cooling Schedule in the QRH.

2.22.2 Before Leaving the Airplane

a. After flight, select FLT position on transmitter selector switch of ASP (Audio Selector Panel) and make sure the HEAD SET is in stowed position.
b. All panel lights are off and the brightness control of FMC/CDU, ND, PFD, EICAS is DIM position.
c. Stow all reference materials and other items to their original place before leaving the cockpit. Be sure to leave the cockpit in a clean condition.
d. After checking the record and signature of Flight Log Book, Captain shall clearly put his/her Korean (Foreigner captain's English) name on signature column.
e. Captain and Co-Pilot(F/O) should especially check discriminated items of THREAT in accordance with TEM CARD

2.22.3 After Duty

a. If a copy of flight log is removed, place the copy in the collection box.
b. If there was an abnormal situation arising from a flight, submit an operational report or a Captain's report. For other details, refer to the chapter 12 "Report" in FOM.
c. Perform the debriefing after flight training duty and also be sure to record and sign student flight training record book.
d. Co-pilot(F/O) shall submit the OFP which recorded with flight data to the office. (If the flight time of OFP is less than 2 hours, to submit the OFP can be exempted.)
e. Whenever possible, submit 'Fuel Efficiency Checklist' except it is sent by ACARS.
f. In the briefing room company policy or other new instruction should be reviewed and next flight schedule should be checked again.

The end of section

2.23 Standard Callout & Response Procedures

2.23.1 BASIC CONCEPT

a. Definition and Classification of Standard Callouts

Callouts including any terms mentioned in this chapter can be refered as Standard callout. This callout can be classified in to Generic callouts and Specific callouts, while all terms must be intelligible among Flight Crew Members.

1) GENERIC Callouts

   Terms used within cockpit, for the purpose of maximizing CRM by improving the communications and transmission of information among flight crew members, via concise transmission of intentions and observed informations by using unified and standardized terminologies among A/C types.

2) SPECIFIC Callouts

   It is the standard callout procedure which enacted among the flight crews, cabin crew members, and ground staffs in normal, or non-normal situation. This procedure is formed based on the flight operation policy of Asiana airlines, and has been developed by reflecting the concept of cockpit design of each aircraft type. It is also standardized as table in the FOM, and POM of each A/C type. In conclusion, specific callouts can be defined as a minimum ways to communicate each other that shall be conducted in each flight phrase.

b. Crew Coordination Concept

1) The purpose of ‘Standard Callout and Response’ is using common terminology between crews to communicate each other without misunderstand the meaning of terminology for harmonious CRM.

2) Flight crews should perform always as co-operative relative back up and monitor. Therefore all crews should well aware of flight status altogether.

a) Pilot who is in charge of "flight mode change" must callout his accomplishment of mode change and the other pilot responses a confirmation.

b) When PM does not perform PF's order, PF should perform it him/herself.

c) PM calls "standing by ~" when PF does not order at the time when concerned procedures should be done.

d) Missing Standard Callout at proper time may indicate airplane system malfunction or incapacitation of other crew.

3) PF & PM should be clearly defined during whole phase of flight (including training and check flight), PF and PM should perform their own duties.

c. Importance

1) Safety operation will be guaranteed by sincerity and correct 'Standard Callout and Response'.
2) Every 'Standard Callout & Response' should be made clearly and loud enough to understand without doubt.
3) Every Standard Callout should be accompanied with Response.
4) The status of following 'Standard Callout & Response' will be emphasized in every training flight or check flight.
5) Avoid unnecessary conversation except Standard Callout during critical phase of flight below 10,000 FT.
6) Callout every action and proper respond is necessary.
7) PM calls out every FMA (Flight Mode Annunciations) mode change. Example) SPD, THR, LNAV, VNAV, FLCH, VS, ALT etc.
8) PF/PM should perform always as co-operative during flight.

ex) When captain broadcasting PA, first officer shouldn't doing modification of FMC, should be check flight status, monitor ATC, and traffic watch.

2.23.2 Standard Callouts and Response Term

a. Standard Callouts for abbreviations and symbols (all airplane type)

PHRASE	CALLOUTS
*	“STAR”
+	“AND”
1,000 feet Above / Below assigned Altitude or Flight Level.	“ONE THOUSAND TO LEVEL OFF”
1,000 feet	“ONE THOUSAND”
10,000 feet	“ONE ZERO THOUSAND”
100 feet	“ONE HUNDRED”
2,500 feet RA	"RADIO ALTIMETER"
500 feet	“FIVE HUNDRED”
A/THR	“AUTO THRUST”
ALT	“ALT”
ALTN	“ALTERNATE”
ALT HOLD	"ALT HOLD"
ALT*	“ALT STAR”
AP or A/P	“AUTO PILOT”
APP	“APPROACH”
ATT	"ATITUDE"
CLB	“CLIMB”
CMD	"COMMAND"
CRZ	“CRUISE”
CSTR	“CONSTRAINT”
DA	“DECISION ALTITUDE”
DCLB	“DERATED CLIMB”
DECEL	“DECELE”
DES	“DESCENT”
DH	“DECISION HEIGHT”
DIR	“DIRECT”
DISC	“DISCONNECT”
FAF	“FINAL APPROACH FIX”

PHRASE	CALLOUTS
FD	“FLIGHT DIRECTOR”
FINAL APP	“FINAL APPROACH”
FL	“FLIGHT LEVEL”
FLARE	"FLARE"
FLCH	“FLIGHT LEVEL CHANGE”
FLEX	“FLEX”
FLT DIR	"FLIGHT DIRECTOR"
FPA	"FPA (Alphabetic reading)"
GA	“GO-AROUND”
G/S	“GLIDE SLOPE”
G/S*	“GLIDE SLOPE STAR”
GA TRK	“GO-AROUND TRACK”
HDG	“HEADING”
HDG HOLD	"HEADING HOLD"
HDG SEL	"HEADING SELECT"
HOLD	"HOLD"
IAF	“INITIAL APPROACH FIX”
IF	“INTERMEDIATE FIX”
L SPD	“LEFT SPEED”
LAND 2, 3	"LAND 2, 3"
LNAV	“LNAV”
LOC	“LOCALIZER” or ”LOC”
LOC*	“LOC STAR”
LVR	“LEVER”
MACH.76	“MACH POINT SEVEN SIX”
MAN	“MAN”
MAP	“MAP”
MDA	“MDA (Alphabetic reading)”
MIN+100 feet	“HUNDRED ABOVE”
NAV	“NAV”
PROG	“PROGRESS”

PHRASE	CALLOUTS
R SPD	"RIGHT SPEED"
RA	"RADIO ALTIMETER"
RNAV	"RNAV"
ROLLOUT	"ROLLOUT"
RWY	"RUNWAY"
RWY TRK	"RUNWAY TRACK"
SPD	"SPEED"
SRS	"SRS" (Alphabetic Reading)
STBY	"STANDBY"
STD	"STANDARD"
THR	"THRUST"
THR DCLB	"THRUST DERATE CLIMB"
THR DES	"THRUST DESCEND"
THR HLD	"THROTTLE HOLD" (B767)
THR IDLE	"THRUST IDLE"
THR REF	"THRUST REFERENCE"
TOC or T/C	"TOP OF CLIMB"
TOD or T/D	"TOP OF DESCENT"
TOGA	"TOGA"
TRK	"TRACK"
TRK HOLD	"TRACK HOLD"
TRK SEL	"TRACK SELECT"
V/S	"VS" (Alphabetic Reading)
VNAV	"VNAV"
VNAV ALT	"VNAV ALT"
VNAV PATH	"VNAV PATH"
VNAV SPD	"VNAV SPEED"
VREF	"VREF"

b. Checklist allouts

1) "STANDING BY ___ CHECKLIST"

PM call this term in case captain or PF have not ordered checklist at the time when concerned procedures should be done

ex) “STANDING BY AFTER T/O CHECKLIST" : AFTER T/O CHECK LIST didn’t order

2) "STAND BY (HOLD) CHECKLIST AT ___"
In case captain or PF needs to stop checklist.

3) "CONTINUE (RESUME) CHECKLIST AT __"
For the continuation checklist.

4) When captain or PF orders “______ CHECKLIST”, First officer or PM read items after read back “______ CHECKLIST”

5) "CHECKED" : Response of “______ CHECKLIST COMPLETE"

Note) After completing "BEFORE TAKEOFF CHECKLIST" & "LANDING CHECKLIST”, make a callout with permission of takeoff/landing.

c. Actions Command and Response

Phrase	Explanation	Sample
Set	“Order or Done” term which is used for setting a numerical value.	"SET HEADING 050" : Set Heading 050° (Order) "SPEED 250 SET" : Speed to 250 knots set. (Done)
Check or (Checked)	“Confirmation Order or Confirmation Response” term about items.	"CHECK SPEED" : Confirm speed. (have set wrong speed) "CHECK ALTITUDE" : Confirm altitude. (have set wrong altitude) "CHECKED" : ~ confirmed. *Note) Correction Callous.* *"SPEED": Correct the speed. (There is slow or fast speed which have been set)* *"ALTITUDE": Correct the altitude.* *(There is low or high altitude which have been set)*
Engage / Disengage	Operation term of Autopilot.	"AUTOPILOT ENGAGE / DISENGAGE"

Phrase	Explanation	Sample
Connect / Disconnect	Operation term of Autothrust.	"AUTOTHRUST CONNECT / DISCONNECT"
ON/OFF	Operation term of Switch.	"TAXI LIGHT ON/OFF" "BOTH F/D OFF"
Arm or (Armed)	Arming system by pushing button.	"LNAV/VNAV ARMED" "LOC OR GS ARMED"
Capture	Confirm system be Captured (active) after arming system	"LOC/GS CAPTURE" "LNAV CAPTURE"
Execute	Get permission or permit after completing FMC	If PM make a CALLOUT "STANDBY EXECUTE", PF order "EXECUTE" after checking FMC in case of no problem.
Standing by ~ or (Standby~)	PM to use when the important operation is affected to normal operation have not been ordered or performed.	"STANDING BY LNAV" : Recognize that LNAV Mode is available. *Note) Callout can replace as "LNAV AVAILABLE"* "STANDING BY HDGSEL" : Recognize that time of turning. "STANDING BY CLIMB OR DES" : Recognize descent or climb.
DIRECT TO The waypoint	PF orders PM to go to appointed waypoint.	"DIRECT TO SEL"
INTERCEPT COURSE to The Waypoint	PF orders PM to do inbound to appointed waypoint.	"INTERCEPT COURSE TO FAF 330°" *Note) Callout can replaced to "FAF EXTENSION 330°"*

d. Instruction Items of ATC

1) During Auto flight, PM reads back an instruction of ATC. PF accomplishes an instruction and then calls out. PM responses "CHECKED" after confirmation.

2) During Manual flight, PM reads back an instruction of ATC and accomplishes PF's instruction and then callouts. PF responses "CHECKED" after confirmation.

3) Summary for Response to ATC Instruction and Callout

Phase	PF	Read back (PM)
Heading	"HEADING SEL" → (Push the MODE switch) "RIGHT TURN HEADING 270° SET" →	"RIGHT TURN HEADING 270°" "HEADING SEL" (Read FMA) "CHECKED"
Altitude	"FLIGHT LEVEL 300 SET" → "CLIMB" (use the VNAV MODE) → (Push the ALTITUDE KNOB) or "FIGHT LEVEL CHANGE" → (Push the MODE switch) or "V/S PLUS OOOO SET" → (Push the MODE switch & Control V/S KNOB)	"CLIMB AND MAINTAIN FL300" "CHECKED" "THRUST REFERENCE, VNAV SPEED" (Read FMA) "FIGHT LEVEL CHANGE SPEED" (Read FMA) "CHECKED, V/S" (Verify V/S fpm & Read FMA)
Altitude	"FLIGHT LEVEL 160 SET" → "DESCEND" (use the VNAV MODE) → (Push the ALTITUDE KNOB) or "FIGHT LEVEL CHANGE" → (Push the MODE switch) or "V/S MINUS OOOO SET" → (Push the MODE switch & Control V/S KNOB)	"DESCEND AND MAINTAIN FL160" "CHECKED" "THRUST REFERENCE, VNAV SPEED" (Read FMA) "FIGHT LEVEL CHANGE SPEED" (Read FMA) "CHECKED, V/S" (Verify V/S fpm & Read FMA)
Airspeed	"SPEED 250 SET" →	"REDUCE SPEED TO 250 KNOTS" "CHECKED"

Phase	PF	Read back (PM)
Restrictions	"ALTITUDE 10,000, SPEED 230 AT SEL" →	"CROSS SEL VOR AT OR BELOW 10,000 FEET & SPEED 230 KNOTS" "CHECKED"
Taxi	"TAXI TO RUNWAY 33L VIA A5" →	"TAXI TO RUNWAY 33L VIA A5" "CHECKED"
	"HOLDING SHORT RUNWAY 33L" →	"HOLDING SHORT RUNWAY 33L" "CHECKED"
	"CLEARED CROSS RUNWAY 33L" →	"CLEARED CROSS RUNWAY 33L" "CHECKED"
Takeoff	"CLEARED FOR TAKEOFF RUNWAY 33L" →	"CLEARED FOR TAKEOFF RUNWAY 33L" "CHECKED"
Landing	"CLEARED TO LAND RUNWAY 33R" →	"CLEARED TO LAND RUNWAY 33R" "CHECKED"

e. Thrust, Roll and Pitch Mode Change on PFD

PF	PM
"CHECKED"	← "THRUST REFERENCE", "TOGA"
"CHECKED"	← "VNAV SPEED", "VNAV"
"CHECKED"	← "SPEED", "ALTITUDE" or "ALT"
"CHECKED"	← "HOLD", "VNAV PATH"
"CHECKED"	← "FIGHT LEVEL CHANGE SPEED", "V/S"
"CHECKED"	← "HEADING SEL", "LNAV"

f. FLAPS /GEAR/ SPEEDBRAKES Configuration

1) FLAPS Callout

Role		
PF	"FLAPS ONE"	
PM	"SPEED CHECKED"	The PM checks that the flap limit speed
	"FLAPS ONE"	The PM selects the FLAP lever position and reply The PM checks the FLAPS lever position on the FLAP IND to confirm the correct selection

2) GEAR Callout

PF	"GEAR UP(DOWN)"	
PM	"GEAR UP(DOWN)"	The PM selects the landing gear lever position and reply The PM checks landing gear position indications on the landing gear panel to confirm the landing gear operation

3) SPEEDBRAKES Callout

Role	Callout	Explanation
PF	"SPEEDBRAKES"	Inform accomplishment (UP/DOWN)
PM	"CHECKED"	Confirmation response

g. Terminology for BRAKE Condition ..with Ground Staff

“PARKING BRAKE RELEASED” (Verify that the “PARKING BRAKE SET” EICAS Message is disappear.)	← “RELEASE PARKING BRAKE”
“PARKING BRAKE SET” (Verify that the “PARKING BRAKE SET” EICAS Message is shown.)	← “SET PARKING BRAKE”

h. Tools and Materials Callouts

		비고
PM	"ENG ANTI ICE S/W ON/OFF"	Performed upon captain request or approval
PF	"CHECKED"	Confirmation Response
PM	"LANDING LIGHTS ON/OFF"	Performed upon captain request or approval.
PF	"CHECKED"	Confirmation Response
PF	"SEAT BELTS ON/AUTO"	Performed upon captain request or approval.
PM	"CHECKED"	Confirmation Response

i. RCP SETTING/ CPDLC Callouts

Changing RADIO Frequency or maintaining CPDLC, confirm mutial Practice.

ex 1) ATC: Contact Tower 118.2

PM: After Read back, Set 118.2 on RMP (PRIMARY), Callout "118.2 SET"

PF: "CHECKED" (After check Frequency 118.2 setting

ex 2) Maintain CPDLC

ATC: When can you climb to FL 350

Message full read back by PM, Acknowledge by PF

j. Altimeter Setting Changes To/From QNH/QFE-STD

Barometric setting change and subsequent altimeter cross-check	"SET STANDARD"→ "CHECKED" (Verify passing altitude)	←"TRANSITION" ←"STANDARD SET" (Verify passing altitude)
	"SET QNH(or QFE) 0000" → "CHECKED" (Verify passing altitude)	←"TRANSITION" ← "QNH (or QFE) 0000 SET" (Verify passing altitude)

k. CALLOUTS when operationg specific area where uses unit of METER

ex) Decend to 11000 m

PF: “FL 361, 11000 M SET”

PM: “CHECKED”

l. PF/PM Duty Transfer

1) Aircraft Control Transfer

a) The pilot who calls out " “I HAVE CONTROL” will be in charge of PF. At the same time, another pilot does PM roll.

b) The pilot who calls out " “YOU HAVE CONTROL” will be in charge of PM, handing over Flight Control.

2) ATC Radio

a) The pilot who calls out " “I HAVE ATC" will be in charge of ATC Radio.

b) The pilot who calls out " “YOU HAVE ATC” means handing over ATC Radio to other pilot.

3) Callout & Acknowledge when Duty Transfer

“I HAVE ATC, YOU HAVE CONTROL” →	“I HAVE CONTROL, YOU HAVE ATC”
“I HAVE CONTROL , YOU HAVE ATC” →	“YOU HAVE CONTROL, I HAVE ATC” “NO CHANGE” (If no changed)
“YOU HAVE ATC & CONTROL” →	“I HAVE ATC & CONTROL”

Note) If there is no acknowledgement, it is regarded as no transfer has been made yet.

m. Flight Parameter Deviation & Correction Callout

1) Approach (After Final Segment)

Parameter	Exceedance	Correction Callout
IAS	TGT SPD + 10 (NON-ILS +15)/ -5 knots	"SPEED"
V/S (Rate of descent)	Greater than 1000 fpm	"SINK RATE"
Altitude	TGT Altitude + (-) 100 feet or more	"ALTITUDE"
Bank angle	Greater than 10°	"BANK"
Localizer	[Expanded Localizer Indications.] • Greater than 1 rectangle at or below 1,000 feet AFE • Greater than 2/3 rectangle at or below 500 feet AFE *Note) A rectangle equals 1/2 dot deviation.*	"LOCALIZER"
VOR/NDB	• Greater than VOR 1/2 dot • Greater than NDB + (-) 5°	"COURSE"
Glide slope	• Greater than 1 dot at or below 1000 feet AFE • Greater than 1/2 dot at or below 500 feet AFE	"GLIDE SLOPE"
PAPI (Visual/Circling approach)	1 White 3 Red (Slightly Low) 3 White 1 Red (Slightly High)	"SLIGHTLY LOW"(or "1 WHITE 3 RED") "SLIGHTLY HIGH"(or "3 WHITE 1 RED")

Note) PM performs correction callout for PF's change operation if the deviation of stabilized approach exceedance is expected.

2) Takeoff/Go Around

"PITCH"	If the pitch attitude is no longer appropriate for the planned flight path
"BANK"	If the bank angle is no longer appropriate for the planned flight path
"SINK RATE"	If there is no climb rate.

n. Rejected Takeoff

1) MALFUNCTION Before V1

EVENT		
If GO decision	"GO"	
If RTO decision	"STOP"	"SPEEDBRAKES UP" or "SPEEDBRAKES NOT UP" "REVERSERS NORMAL" (All engines) or "NO REVERSER NUMBER __" (One engine out) or "NO REVERSERS NUMBER __ AND __" (Two or more engines out)

2) MALFUNCTION After V1

There are no need any callouts

NOTE) The decision to reject the takeoff is the responsibility of the Captain and must be made prior to V1 speed.

- *If a malfunction occurs before V1, for which the Captain does not intend to reject the takeoff, he/she will announce his intention by calling "GO".*
- *If a decision is made to reject the takeoff, the Captain calls "STOP". This call both confirms the decision to reject the takeoff and also states that the Captain now has control. It is the only time that hand-over of control is not accompanied by the phrase "I have control*

2.23.3 Phase/Situational Standard Callout & Response

2.23.3.1 Preflight

"PREFLIGHT CHECKLIST" → "CHECKED"	"PREFLIGHT CHECKLIST" ← "PREFLIGHT CHECKLIST COMPLETE"

2.23.3.2 Engines Start

a. Auto Start

Captain	
"BEFORE START CHECKLIST" → "CHECKED"	"BEFORE START CHECKLIST" "BEFORE START CHECKLIST ← COMPLETE"
"GND COCKPIT START SEQUENCE 4,3,2,1 START NUMBER 4" →	GND: "Cockpit Ground, Ground Cleared" GND: "(Start Sequence 4, 3, 2, 1) Engine number 4 Cleared"
"CHECKED"	← "AUTO START, MAX EGT 750"
"START NUMBER__" →	(Pull Engine number__ Start Switch)
"FUEL CONTROL SWITCH RUN" →	(Monitor EICAS & Callout Non-normal Condition)
"ROGER" or "CHECKED"	GND: "Engine number 4, N1 Rotation"
"CHECKED" (Monitor Fuel Flow & EGT)	← "OIL PRESSURE"
"CHECKED"	← "PEAK EGT____"
"START NUMBER__" →	(Pull Engine number__ Start Switch)
Repeat Above	

b. Manual Start

"BEFORE START CHECKLIST" → "CHECKED"	"BEFORE START CHECKLIST" "BEFORE START CHECKLIST ← COMPLETE"
"GND COCKPIT START SEQUENCE 4,3,2,1 START NUMBER 4" →	GND: "Cockpit Ground, Ground Cleared" GND: "(Start Sequence 4, 3, 2, 1) Engine number 4 Cleared"
"CHECKED"	← "MANUAL START, MAX EGT 750" (Check Auto Start Switch-Off)
"START NUMBER__" →	(Pull Engine number __ Start Switch)

"CHECKED"	← "N2"
"CHECKED"	← "OIL PRESSURE"
At the fuel-on indicator "FUEL CONTROL SWITCH RUN" → "CHECKED" (Monitor Fuel Flow & EGT)	← "TIME CHECK"
"ROGER" or "CHECKED"	GND: "Engine number 4, N1 Rotation"
"CHECKED"	← "PEAK EGT____"
"START NUMBER__" →	(Pull Engine number__ Start Switch)
Repeat Above	

2.23.3.3 Takeoff Flaps Set & Flight Control Check

"FLAPS 1" →	"FLAPS 1"
"FLAPS 20 (or 10)" →	"FLAPS 20 (or 10)"
"FLIGHT CONTROL CHECK" →	Low EICAS Monitor
Do the Flight control Check	
"BEFORE TAXI CHECKLIST" → "CHECKED"	"BEFORE TAXI CHECKLIST" ← "BEFORE TAXI CHECKLIST COMPLETE"

2.23.3.4 Taxi & Before Takeoff

a. Taxi

Straight section	"CHECKED"	← "STRAIGHT TAXI UNTIL A-19"
	"CHECKED"	← "APPROACHING A-18 NEXT A-19"
Turning section	"CHECKED"	← "APPROACHING A NEXT B"
	"LEFT CLEAR RIGHT TURN" →	"APPROACHING B RIGHT TURN, ← RIGHT CLEAR" "CHECKED"

b. Before Takeoff

“BEFORE TAKEOFF CHECKLIST” → “CHECKED” “CLEARED FOR TAKEOFF (or LINING UP AND WAIT) RWY 00 L/R”	“BEFORE TAKEOFF CHECKLIST” “BEFORE TAKEOFF CHECKLIST ← COMPLETE” “CLEARED FOR TAKEOFF (or LINING UP ← AND WAIT) RWY 00 L/R”

Note) In case of a takeoff at airports operating with multiple number of runways, confirm the right runway to prevent any confusion.

2.23.3.5 Takeoff

“STABILIZED, TO/GA” → “CHECKED” “CHECKED”	 ← “THRUST REFERENCE” ← “THRUST SET”
“SET TAKEOFF THRUST” → (If A/T is inoperative)	“TAKEOFF THRUST SET” (If A/T is inoperative)
“CHECKED”	←“HOLD”
“CHECKED”	←“80 KNOTS” *If no acknowledge after twice callout PM take over the aircraft control.*
	← ‘V1’ (Auto Callout Monitor) ← “V1” (If no Auto Callout)
	← “ROTATE”
 “GEAR UP” →	← “POSITIVE CLIMB” “GEAR UP”
“FLAPS 10” →	“SPEED CHECK FLAPS 10”
“FLAPS 5” →	“SPEED CHECK FLAPS 5”
“FLAPS 1” →	“SPEED CHECK FLAPS 1”
“FLAPS UP” →	“SPEED CHECK FLAPS UP”

b. Before Takeoff

PF	PM
"BEFORE TAKEOFF CHECKLIST" → "CHECKED" "CLEARED FOR TAKEOFF (or LINING UP AND WAIT) RWY 00 L/R"	"BEFORE TAKEOFF CHECKLIST" "BEFORE TAKEOFF CHECKLIST ← COMPLETE" "CLEARED FOR TAKEOFF (or LINING UP ← AND WAIT) RWY 00 L/R"

Note) In case of a takeoff at airports operating with multiple number of runways, confirm the right runway to prevent any confusion.

2.23.3.5 Takeoff

PF	PM
"RWY CLEAR" (Verify RWY clear & bird activity) "STABILIZED, TO/GA" → "CHECKED" "CHECKED"	"RWY CLEAR" ← "THRUST REFERENCE" ← "THRUST SET"
"SET TAKEOFF THRUST" → (If A/T is inoperative)	"TAKEOFF THRUST SET" (If A/T is inoperative)
"CHECKED"	←"HOLD"
"CHECKED"	←"80 KNOTS" *If no acknowledge after twice callout PM take over the aircraft control.*
	← 'V1' (Auto Callout Monitor) ← "V1" (If no Auto Callout)
	← "ROTATE"
"GEAR UP" →	← "POSITIVE CLIMB" "GEAR UP"
"FLAPS 10" →	"SPEED CHECK FLAPS 10"
"FLAPS 5" →	"SPEED CHECK FLAPS 5"
"FLAPS 1" →	"SPEED CHECK FLAPS 1"
"FLAPS UP" →	"SPEED CHECK FLAPS UP"

2.23.3.6 After Takeoff

"AFTER TAKEOFF CHECKLIST"→ "CHECKED"	"AFTER TAKEOFF CHECKLIST" "AFTER TAKEOFF CHECKLIST ← COMPLETE"

2.23.3.7 Climb

"CHECKED"	← "10,000 (ONE ZERO THOUSAND)" (Verify And Silent) - Inboard L/D Light-Off - Cabin Pressure Check
"SET STANDARD" → (Verify passing altitude) "CHECKED"	← "TRANSITION" ← "STANDARD SET" (Verify passing altitude)
"CHECKED"	← "ONE THOUSAND TO LEVEL OFF"

2.23.3.8 Descent & Approach

"DESCENT CHECKLIST" → "CHECKED"	"DESCENT CHECKLIST" ← "DESCENT CHECKLIST COMPLETE"
"CHECKED" "CHECKED"	← "10,000 (ONE ZERO THOUSAND)" (Verify And Silent) - Inboard L/D Light-On ← "APPROACH SIGNAL COMPLETE"
"SET QNH (or QFE) 0000" → (Verify passing altitude)	← "TRANSITION"

2.23.3.6 After Takeoff

PF	PM
"AFTER TAKEOFF CHECKLIST"→ "CHECKED"	"AFTER TAKEOFF CHECKLIST" "AFTER TAKEOFF CHECKLIST ← COMPLETE"

2.23.3.7 Climb

PF	PM
"CHECKED"	← "10,000 (ONE ZERO THOUSAND)" (Verify And Silent) - Inboard L/D Light-Off - Logo Light-Off - Cabin Pressure Check
 "SET STANDARD" → (Verify passing altitude) "CHECKED"	← "TRANSITION" ← "STANDARD SET" (Verify passing altitude)
"CHECKED"	← "ONE THOUSAND TO LEVEL OFF"

2.23.3.8 Descent & Approach

PF	PM
"DESCENT CHECKLIST" → "CHECKED"	"DESCENT CHECKLIST" ← "DESCENT CHECKLIST COMPLETE"
"CHECKED" "CHECKED"	← "10,000 (ONE ZERO THOUSAND)" (Verify And Silent) - Inboard L/D Light-On - Logo Light-On(at Night) ← "APPROACH SIGNAL COMPLETE"
 "SET QNH (or QFE) 0000" → (Verify passing altitude)	← "TRANSITION"

"CHECKED"	← "QNH (or QFE) 0000 SET" (Verify passing altitude)
"APPROACH CHECKLIST" → "CHECKED"	"APPROACH CHECKLIST" ← "APPROACH CHECKLIST COMPLETE"
"CHECKED"	← "ONE THOUSAND TO LEVEL OFF"
"FLAPS 1" →	"SPEED CHECK FLAPS 1"
"FLAPS 5" →	"SPEED CHECK FLAPS 5"
"FLAPS 10" →	"SPEED CHECK FLAPS 10"
"CHECKED"	Below 2500 feet AGL ← "RADIO ALTIMETER"
"CHECKED" After getting ILS approach clearance "LOCALIZER MODE" → "CHECKED" "CHECKED" "APPROACH MODE" → "CHECKED"	← "ILS TUNED AND IDENTIFIED" ← "LOCALIZER ARMED" ← "LOCALIZER ALIVE" ← "LOCALIZER CAPTURED" ← "GLIDE SLOPE ARMED"
"GEAR DOWN, FLAPS 20" →	← "GLIDE SLOPE ALIVE" "GEAR DOWN, SPEED CHECK FLAPS 20"
"FLAPS 30 (or 25)" → "MISSED APPROACH ALTITUDE OOOO SET" → or "SET MISSED APPROACH ALTITUDE OOOO" → "CHECKED"	← "GLIDE SLOPE CAPTURED" "SPEED CHECK FLAPS 30 (or 25)" "CHECKED" ← "MISSED APPROACH ALTITUDE OOOO SET"
"LANDING CHECKLIST" → "CHECKED" "CLEARED TO LAND (or CONTINUE	"LANDING CHECKLIST" ← "LANDING CHECKLIST COMPLETE" "CLEARED TO LAND (or CONTINUE

APPROACH) RWY 00 L/R" "TAXI LIGHT ON" →	APPROACH) RWY 00 L/R" Taxi light on (Verify And Silent)
"LAND 3" or "LAND 2"	← "ROLLOUT, FLARE ARMED"

Note) In case of a landing at airports operating with multiple number of runways, confirm the right runway to prevent any confusion.

2.23.3.9 Passing OM (or FAF)

"CHECKED" (After comparing altitude on the approach chart and the passing altitude.)	← "OUTER MARKER (or FAF) __ FEET" (Read the published altitude on the approach chart)

2.23.3.10 Below 1,000 feet AFE

"STABILIZED" or "GO AROUND TOGA FLAPS 20 "	← "1,000 (ONE THOUSAND)" *If no acknowledge after twice callout, take over the aircraft control*
	Call out significant deviations refer to **Flight Parameter Deviation & Correction Callout** (After Final Segment)

2.23.3.11 Approach Minimum or Below

"CHECKED"	At 100 feet Above Minimum ← "HUNDRED ABOVE"
"IN-SIGHT or (Note: item) IN-SIGHT" → *Note: item* *1. Approach lights (system)* *2. Threshold / Markings / Lights* *3. Visual Glide Slope Indicator* *4. Touchdown Zone / Markings / Lights* *5. Runway End Identifier Lights* *6. Runway / Markings / Lights*	"CHECKED"

"LANDING" or "GO AROUND TOGA FLAPS 20"	At Minimum ← 'MINIMUMS MINIMUMS' (Auto Callout Monitor) ← "MINIMUM" (If no Auto Callout)
	Call out significant deviations refer to **Flight Parameter Deviation & Correction Callout** (After Final Segment)

Note)

1. *PF should be performed Transit to visual flight (refer to the scan policy) prior to arriving at Approach Minimum (except CAT-III with AH).*
2. *Before descending to below DA (H) or MDA (H) final landing decision shall be made by the Captain. When the Co-pilot (F/O) calls out "LANDING" during his PF job, the Captain should respond "LANDING" if there is no problem. If Go-Around is necessary, the Captain shall call out "GO AROUND TOGA FLAPS 20" and switch to PF position.*

2.23.3.12 Missed Approach (Go Around)

"GO AROUND TOGA FLAPS 20 " →	"TOGA SPEED CHECK FLAPS 20"
"GEAR UP" →	← "POSITIVE CLIMB" "GEAR UP"
"LNAV" or "HDGSEL" → (When PF orders) "ENGAGE LNAV" or "ENGAGE HDGSEL" → "CHECKED"	At 400 feet AGL ← "400 (FOUR HUNDRED)" "LNAV" or "HDGSEL" ← "LNAV" or "HDGSEL"
	At 1,000 feet AGL ← "1,000 (ONE THOUSAND)"

"VNAV" or "FLCH, SPD OOO SET" → (When PF orders) "ENGAGE VNAV" or "ENGAGE FLCH, SET SPD OOO" → "CHECKED"	"VNAV" or "FLCH, SPD OOO CHECKED" "VNAV" or ← "FLCH, SPD OOO SET"
"FLAPS 10" →	"SPEED CHECK FLAPS 10"
"FLAPS 5" →	"SPEED CHECK FLAPS 5"
"FLAPS 1" →	"SPEED CHECK FLAPS 1"
"FLAPS UP" →	"SPEED CHECK FLAPS UP"
"AFTER TAKEOFF CHECKLIST" → "CHECKED"	"AFTER TAKEOFF CHECKLIST " "AFTER TAKEOFF CHECKLIST ← COMPLETE"

Note) When a Co-pilot (F/O) executes Missed Approach (Go-Around) during his PF job, he shall control the aircraft until the Captain calls out "I HAVE CONTROL" (complete takeover of the aircraft control) and the PF/PM job switch occurs the moment mutual handover /takeover takes place. (SIM training is an exception.)

2.23.3.13 Landing Roll

"CHECKED" "CHECKED"	"SPEEDBRAKES UP" or ← "SPEEDBRAKES NOT UP" "REVERSERS NORMAL" (All engines) or "NO REVERSER NUMBER__" (One engine out) or ← "NO REVERSERS NUMBER__AND__" (Two or more engines out)
When attempting to use Manual Brake "MANUAL BRAKE" → "CHECKED"	← "AUTOBRAKES" (Read the Advisory message)
"CHECKED"	← "60 KNOTS"

Start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed	
	Advice taxiway & other information

2.23.3.14 Taxi In

"CHECKED"	After scan flow completed "AFTER LANDING CHECKLIST ← **COMPLETED**"

2.23.3.15 Gate (Spot) In

The Detailed Standard Callout is as below

Before Abeam Position *Note1)*	"ALL LIGHTS OFF" →	← "GATE (or SPOT)__MARSHALL (or VDGS) IN SIGHT" "ALL LIGHTS OFF"
Abeam Position	"LEFT CLEAR, LEFT (or RIGHT) TURN" → "CHECKED" "CHECKED"	← "ABEAM POSITION" "RIGHT CLEAR" "GUIDELINE CHECK, BRAKE PRESSURE NORMAL, ← SPEED__KNOTS" ← "B747 NORMAL"★★ *Note2)*
Approaching Gate (Spot)	"CHECKED" "CHECKED" "CHECKED"	"TO THE LEFT" or ← "TO THE RIGHT" ← "SPEED" (Callout when exceeding 5 knots) ← "FIVE METERS"★★ (15 feet) * After this, callout main changes in the

	"STOP"	system or Marshal (Slow, Yellow, Red, Stop, etc.) ← "STOP" (Emergency Stop Note3) or Normal Stop)

★★: VDGS operation

Note) 1. Abeam Position: Intersection point between Gate (Spot) Guide Line and Taxi Line.
2. B000 (or A000): Callout A/C type displayed in the VDGS.
Normal: Callout after checking VDGS operation (Aircraft Symbol, T-bar, Correction Symbol, etc.)
3. Callout when VDGS display does not agree with A/C type, Emergency stop, and when there are any other irregular conditions or Ground crew's stop signal.

2.23.3.16 Parking

"SHUTDOWN CHECKLIST" → "CHECKED"	"SHUTDOWN CHECKLIST" ← "SHUTDOWN CHECKLIST COMPLETE"
"SECURE CHECKLIST" → "CHECKED"	"SECURE CHECKLIST" ← "SECURE CHECKLIST COMPLETE"

2.23.4 CAT-II/III Approach

2.23.4.1 CAT-II Approach

1,500 feet (RA)	"LAND 3" or "LAND 2"	← "ROLLOUT, FLARE ARMED"
OM (FAF)	"CHECKED"	"OUTER MARKER (FAF) ← __ FEET"
1,000 feet (AFE)	"STABILIZED" or "GO AROUND TOGA FLAPS 20"	← "1,000 (ONE THOUSAND)"

100 feet Above DH	"CHECKED" (Go Head-Up And Concentrate On Expected Visual Cues) - Strobe Light - Approach Light - White Bar - Threshold * Additional Callout	←"HUNDRED ABOVE" (F/O stay head down & monitor automatic approach by instrument scan)
At DH	"LANDING" or (Visual reference established) "GO AROUND TOGA FLAPS 20" (Visual reference not established)	← 'MINIMUMS MINIMUMS' (Auto Callout Monitor) ← "MINIMUM" (If no Auto Callout) (Stay head down & monitor Go Around by instrument scan)
50 feet RA		← "FLARE" or "NO FLARE"
25 feet RA		← "IDLE" or "NO IDLE"
At or below 5 feet RA	(Check aircraft maintains RWY centerline)	"ROLLOUT" or ← "NO ROLLOUT"
On RWY	"CHECKED" "CHECKED"	"SPEEDBRAKES UP" or ← "SPEEDBRAKES NOT UP" "REVERSERS NORMAL" (All engines) or "NO REVERSER NUMBER__" (One engine out) or "NO REVERSERS NUMBER__ ← AND__" (Two or more engines out)
At 60 knots	"CHECKED" Start movement of the reverse thrust	← "60 KNOTS" The Co-pilot (F/O) should assist the

	levers to be at the reverse idle detent before taxi speed	CAPT in RWY & taxi way identification
At safe taxi speed or stop aircraft	(Disengaged Autopilot/ Check airport signs & markings) "CHECKED"	"AUTOPILOT DISENGAGED, AUTO BRAKE ← DISCONNECTED"

2.23.4.2 CAT-III Approach

1,500 feet (RA)	"LAND 3"	"ROLLOUT, FLARE ← ARMED"
OM (FAF)	"CHECKED"	"OUTER MARKER (FAF) ← __ FEET"
1,000 feet (AFE)	"STABILIZED" or "GO AROUND TOGA FLAPS 20"	← "1,000 (ONE THOUSAND)"
100 feet Above DH	"CHECKED" (Go Head-Up And Concentrate On Expected Visual Cues) - Strobe Light - Approach Light - White Bar - Threshold * **Additional Callout**	←"HUNDRED ABOVE" (F/O stay head down & monitor automatic approach by instrument scan)
100 feet Above AH	Stay head down & monitor automatic approach by instrument scan	F/O stay head down & monitor automatic approach by instrument scan
AT DH	"LANDING" or (A/C Normal Status & Visual reference established) "GO AROUND TOGA FLAPS 20" (A/C Abnormal Status or Visual reference not established)	← 'MINIMUMS MINIMUMS' (Auto Callout Monitor) ← "MINIMUM" (If no Auto Callout) (Stay head down & monitor Go Around by instrument scan)

At AH	"LANDING" or (A/C Normal Status) "GO AROUND TOGA FLAPS 20" (A/C Abnormal Status)	← "ALERT HEIGHT" (Stay head down & monitor Go Around by instrument scan)
50 feet RA		← "FLARE" or "NO FLARE"
25 feet RA		← "IDLE" or "NO IDLE"
At or below 5 feet RA	(Check aircraft maintains RWY centerline)	"ROLLOUT" or ← "NO ROLLOUT"
On RWY	"CHECKED" "CHECKED"	"SPEEDBRAKES UP" or ← "SPEEDBRAKES NOT UP" "REVERSERS NORMAL" (All engines) or "NO REVERSER NUMBER__" (One engine out) or "NO REVERSERS ← NUMBER__AND__" (Two or more engines out)
At 60 knots	"CHECKED" Start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed	← "60 KNOTS" The Co-pilot (F/O) should assist the CAPT in RWY & taxi way identification
At safe taxi speed or stop aircraft	(Disengaged Autopilot/ Check airport signs & markings) "CHECKED"	"AUTOPILOT DISENGAGED, AUTOBRAKE ← DISCONNECTED"

Note)

1. *AH (Alert Height)*
   A height above the runway based on the characteristics of the aircraft and its fail-operational landing system, above which a CAT-III approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the fail operational landing system, or in the relevant ground equipment.
2. *In below AH (100 feet RA), Please try to keep Silent Unless the Message appear like as "FLARE" or "NO FLARE", "IDLE" or "NO*

IDLE", and "ROLL OUT" or "NO ROLL OUT".

3. *In case of "NO AUTOLAND" condition during CAT-III approach, it can be change to the down grade approach to CAT-I.*
4. *DH (Decision Height)*
   A specified altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

* Additional Callout (Captain / Co-pilot (F/O)) on Final

100 feet above DH base on aircraft drift angle - Captain goes head up & concentrates on expected visual cues. - F/O stays head down & monitors auto approach by instrument scan.	"APPROACHING MINIMUM"	F/O
Individual sequence flasher light visible	"STROBE LIGHT"	Captain
Individual approach light bars visible	"APPROACH LIGHT"	
Decision bar (1,000 feet from threshold if installed)	"WHITE BAR"	
Threshold lights (if available)	"THRESHOLD"	

2.23.5 Non-ILS Approach Standard Callout & Response

2.23.5.1 Approach using V/S

a. Manual Flight

1~2 NM from IAF (Level Flight)	"CHECKED" "SET NEXT ALTITUDE 0000 FEET & V/S" →	"APPROACHING IAF (or Name of IAF) NEXT__DME, 0000 FEET" ← (Check ND at VOR Mode) "NEXT ALTITUDE 0000 SET, V/S ENGAGED"
IAF	"SET V/S MINUS 000" →	← "IAF 00 DME, NEXT__DME 0000 FEET" "V/S MINUS 000 SET"
FIX	"SET ALTITUDE 0000 FEET" →	"APPROACHING 00 DME, NEXT ← __DME 0000 FEET" "ALTITUDE 0000 FEET SET"
FAF	"SET MDA 000" →	← "APPROACHING FAF" (Approximately 2 NM) "MDA 000 SET"
	"CHECKED"	← "FAF 0000 FEET"
1,000 feet (AFE)	"STABILIZED" or "GO AROUND TOGA FLAPS 20"	← "1,000 (ONE THOUSAND)"
Approaching MDA	(At 300 feet above MDA) "SET MISSED APP-ROACH ALTITUDE" → "CHECKED"	"MISSED APPROACH ALTITUDE ←0000 SET"
100 feet Above MDA	"CHECKED"	← "HUNDRED ABOVE"
MDA (MAP)	"LANDING" or "GO AROUND TOGA FLAPS 20"	← "MINIMUM"

b. Auto Flight

1~2 NM from IAF (Level Flight)	"CHECKED" "NEXT ALTITUDE 0000 FEET SET & V/S" →	"APPROACHING IAF (or Name of IAF) ←NEXT__DME, 0000 FEET" Check ND at VOR Mode "CHECKED, V/S ENGAGED"
IAF	"V/S MINUS 000 SET" →	"IAF 00 DME, NEXT__DME ← 0000 FEET" "CHECKED"
FIX	"CHECKED, NEXT ALTITUDE 0000 SET" →	"APPROACHING 00 DME, NEXT ←__DME 0000 FEET" "CHECKED"
FAF	"MDA 000 SET" →	← "APPROACHING FAF" (Approximately 2 NM) "CHECKED"
	"CHECKED"	← "FAF 0000 FEET"
1,000 feet (AFE)	"STABILIZED" or "GO AROUND TOGA FLAPS 20"	← "1,000 (ONE THOUSAND)"
Approaching MDA	(At 300 feet above MDA) "SET MISSED APP- ROACH ALTITUDE" → "CHECKED"	"MISSED APPROACH ALTITUDE 0000 ←SET"
100 feet Above MDA	"CHECKED"	← "HUNDRED ABOVE"
MDA (MAP)	"LANDING" or "GO AROUND TOGA FLAPS 20"	← "MINIMUM"

2.23.5.2 Approach using VNAV

2 NM from FAF	"MDA 000 SET" →	"APPROACHING FAF" or ← "APPROACHING GLIDE PATH" "CHECKED"
Prior to reaching FAF	"VNAV" → "CHECKED" "SPEED 000 SET" →	← "SPD, VNAV PTH" "CHECKED"
FAF	"CHECKED"	← "FAF 0000 FEET"
300 feet below Missed Approach Altitude	"SET MISSED APP- ROACH ALTITUDE" → "CHECKED"	"MISSED APPROACH ALTITUDE ← 0000 SET"
1,000 feet (AFE)	"STABILIZED" or "GO AROUND TOGA FLAPS 20"	← "1,000 (ONE THOUSAND)"
100 feet Above MDA	"CHECKED"	← "HUNDRED ABOVE"
MDA (MAP)	"LANDING" or "GO AROUND TOGA FLAPS 20"	← "MINIMUM"

Note) 1. PF needs to confirm appropriate Visual Cue by performing Inside & Outside (Transit to Visual Flight) Scan Policy in an Approach Minimum at the latest.

2. Before descending to below MDA (H) final landing decision shall be made by the Captain. When the F/O calls out "LANDING" at the Minimum during his PF job, the Captain should respond "LANDING" if there is no problem. If Go-Around is necessary, the Captain shall call out "GO AROUND TOGA FLAPS 20 " and switch to PF position.

2.23.5.3 Circling Approach / Typical type Visual Approach

(Traffic pattern)

100 feet Above MDA**	"CHECKED"	← "HUNDRED ABOVE
MDA**	"RUNWAY IN-SIGHT" "SET MISSED APPROACH ALTITUDE" → "CHECKED"	"MISSED APPROACH ALTITUDE ← 0000 SET"
Turning to Downwind	"RIGHT (or LEFT) TURN HDG 000 SET" →	"CHECKED"
Passing End of Runway	"TIME CHECK 00 SECONDS, FLAPS 30 (or 25)" →	"SPEED CHECK FLAPS 30 (or 25)"
Turning to Base	**"LANDING CHECKLIST" →** **"CHECKED"**	**"LANDING CHECKLIST"** **"LANDING CHECKLIST** **← COMPLETE"**
500 feet	"STABILIZED, LANDING" or "GO AROUND TOGA FLAPS 20"	← "500 (FIVE HUNDRED)"
300 feet (If necessary)	"STABILIZED, LANDING" or "GO AROUND TOGA FLAPS 20"	← "300 (THREE HUNDRED)"

**: Circling Approach

Note)

1. *In case of Circling approach / Typical type Visual Approach (Traffic pattern), 1000 feet callout should be omitted because A/C is performing Turning Base.*
2. *It is mandatory for the Aircraft to remain stable when passing 500 feet (AFE). However, in case short final is expected because of limited time of Turning base due to the environment of the Airport (ex. PUSAN KIMHAE airport), standard altitude for stabilization can be persuaded to 300 feet (AFE).*

Table of Contents

The end of section

Intentionally

Blank

3.1 CAT–II/III Company Policy

3.1.1 Flight Crew

3.1.1.1 Qualification

a. Requirements for qualification

	CAT–II	CAT–III
Captain	More than 300 hours of PIC time in air transport jet air plane and more than 100 hours of PIC time of the related type air plane.	
First Officer	After completing OE	

b. Standards for initial/periodic training and check

Refer to Flight crew training regulation for CAT–II/III initial/periodic training and check standards

c. Holding certification

The flight crew shall be qualified by receiving additional certificate for CAT–II or CAT–II/III from company and must hold this certificate.

d. Management of qualification

1) Qualification

Captain	Co-pilot(F/O)
• The training and check shall be done during periodic training and check. • It is based on check plan and operation procedure "article 21 steps for check result", "article 22 steps for the person whose qualification has been expired" in case of failing to pass the check, or being suspended or canceled for certain reason, or failing to meet the requirement of flight currency. • Refer to precision approach "management guidelines for operation qualification article 6" for other things.	• The training shall be done during periodic training. • But, in case of CAT-III, he/she must pass the check after finishing periodic training and in case of failing to pass the check, or being suspended or canceled for certain reason, or failing to meet the requirement of flight currency, follow check plan and operation procedure "article 21 steps for check result", "article 22 steps for the person whose qualification has been expired". • Refer to precision approach "management guidelines for operation qualification article 6" for other things.

Note)

1. *The term of validity for CAT-II/III qualification is 1 (ONE) YEAR from the date when flight crew gets the certificate, but the qualification term is extended 3 MONTHS including 1 MONTH BEFORE and AFTER the month that has the last validity date.*
2. *CAT-II and CAT-III qualification are separate certifications. So, both CAT-II/III must be recorded separately in the periodic training and check.*
   a) Captain : Because the contents of both CAT-II/III are included in the periodic check, CAT-II/III must be expressed in the column of qualification maintenance on reverse side of the certificate after training and check for the related items for CAT-II/III.
   b) Co-pilot(F/O) : For CAT-II, because the qualification can be

maintained with only the related training, in case of having only periodic training, only CAT-II must be expressed and in case of having periodic check, both CAT-II/III must be expressed.

2) Management of Certification

In case of receiving "S (Satisfactory)" grade from check, the related details and the signature of checker must be recorded on the reverse side of the certificate "All weather operation qualification." (management guidelines for check sheet annex table 3-1)

3.1.1.2 Duty of Captain and Co-pilot(F/O)

When operating CAT-II/III Approach and Landing, the qualified captain and Co-pilot(F/O) must perform their duty in the designated seats and the followings are the duty of captain and Co-pilot(F/O) .

a. Duty of Captain

1) CAT-II

a) Decision and supervision for approach and landing.
b) Check for CAT-II required equipment.
c) CAT-II Approach Briefing (if necessary, including the case of downgraded approach to CAT-I).
d) Attempt to land is allowed only when visual reference is insight according to the scan policy.
e) Taxi safely after landing.

2) CAT-III

a) Decision and supervision for approach and landing.
b) Check for CAT-III Required equipment.
c) CAT-III Approach Briefing (if necessary, including the case of downgraded approach to CAT-I/II).
d) Visual Scan according to the scan policy.
e) When DH is applied, attempt to land is allowed only when visual reference is insight.
f) Taxi safely after landing.

b. Duty of Co-pilot(F/O)

1) Set up the approach.
2) Perform checklist by the captain's order.
3) Perform standard callout.
4) Monitor flight instrument carefully as aircraft approaches DH/AH.
5) Monitor sink rate and speed till touchdown.
6) After landing, check the location of runways and taxiways (refer to SMGCS Chart or Low Visibility Procedure) and give captain assertive advice (It is more important than after landing checklist).

Note)

1. It is very difficult to recognize the position of taxiways under limited visibility and it is also necessary that flight crew should check the heading reference to keep the aircraft on the taxiway instructed.

2. The PM should contact the ATC if his/her position is not clear or lost after landing or taxiing.

3.1.2 Aircraft

3.1.2.1 Approval for CAT–II/III Operations

a. The airports and aircrafts approved from CASA (Civil Aviation Safety Authority) and the related nation for CAT–II or CAT–III can only be used for the approach and landing (Refer to the Airway Manual for the airports approved for CAT–II or CAT–III operation).
b. The aircrafts approved for CAT–II or CAT–III approach and landing must have required equipments (Refer to the "Required Equipments" in this chapter).
c. For CAT–II approach, 3 or 4 engines operation is required.
d. For CAT–III approach, All Engines (4 Engines) operation is required.
e. For CAT–II/III Operations, aircraft systems are need to periodically evaluate required. (Instrument flight precision approach operations guide part 39)

Note) Every 1st and 15th date the crew tries to "Auto Coupled Approach & Autoland" under the permission. Then landing method is logging in principle on the "Flight and Maintenance log"

CAUTION

1. *All engines (4 Engines) operation is required for CAT–III AUTO COUPLED APPROACH & AUTOLAND. (according to the CAT–III approval from Seoul Regional Aviation Administration)*
2. *All Engines operation is required until AH. So, in case of ENGINE FAILURE BEFORE AH, Missed Approach must be executed.*
3. *If there is ENGINE FAILURE AT OR LOWER THAN AH during CAT–III approach and there is NOT ANY CHANGE of LAND 3 status FMAs on PFD, flight crew may DO THE AUTO LANDING according to the FAIL OPERATIONAL concept.*

3.1.2.2 Required Equipment

Type of Approach Equipment and Status	CAT-II	CAT-III
Autoland Status	LAND 2 or LAND 3	LAND 3
Auto Pilot	2	3
PFD FMAs	2	2
Auto Throttle	Not Required	Required
Rollout	Not Required	Required
Anti Skid System & Autobrake System	Not Required	Required
Engine Operating	3 or 4	4
Flight Director System	2	2
Hydraulic System	4	4
ILS Receiver	2	3
Instrument Warning System or Same Warning Function	Required	Required
Maker Beacon Receiver	Required (Not Required When Other NAVAID Fix is Used)	Required (Not Required When Other NAVAID Fix is Used)
Navigation Display	2	2
Nose Wheel Steering	Required	Required
PFD	2	2
RA(Radio Altimeter)	2 (Not Need When ILS Inner Maker Used)	3
Rudder Ratio System	1 (Note)	1 (Note)
Windshield Wiper	2	2

Note) Refer to FCOM/QRH in case of Rudder Ratio System failure

3.1.2.3 Ground/Runway Equipment Required for CAT–II/III Approach

Component	CAT–II	CAT–III
Localizer/glideslope	Yes	Yes
Outer marker(OM)	Yes(*)	Yes(*)
Middle marker(MM)	no	no
Inner marker(IM)	Yes(*)	Yes(*)
Approach light system(ALS)	Yes(**)	Yes(**)
Sequenced flashing light(SFL) (SFL: also part of REIL, ALSF, etc.)	Yes(***)	no
High intensity runway light(HIRL)	yes	yes
Touchdown zone light(TDZL)	Yes(***)	yes
Runway centerline light(CL)	Yes(***)	yes
RVR Reporting System	Refer to weather minima in POM	

(*) A marker is considered out of service only when none of the authorized substitutes is available. These include the following and, are shown on the approach chart.

Authorized substitute	OM	MM	IM
NDB,VOR,DME FIX, MINIMUM GSIA(glide slope/glide path intercept altitude) FIX or ASR RADAR FIX	yes	no	No
RADAR/RADIO ALTIMETER(RA)	no	no	Yes*
Except for CAT II instrument approach procedures designated as “RA NA”(radar/radio altimeter not authorized), operative RA may be used in lieu of an inner marker. A middle marker is not required.			

(**) All CAT –II and CAT–III approaches require standards (e.g. ALSF–1, ALSF–2) or equivalent international system. (e.g. HIALS)
Sequenced flashing lights are required at U.S. airports.
Sequenced flashing lights are not required at some airports in other countries where they are not required.

(***) CAT –II approach operation can be authorized at the airports with reduced lighting facilities those have been approved by Ops Specs.

Note)

1. CAT –II/III shall be operated by the approved airplanes at the approved airports, if necessary to be approved by the nation.

2. The conditions of ground equipments for approach runway can be checked through ATIS information of pertinent airport, information of low visibility of ATC and etc.

3.1.3 Weather Minima

3.1.3.1 CAT-II/III Landing Minima

a. Company Minima(Operations Specifications) as the followings.

Category	DH/AH	TDZ RVR	MID RVR	Rollout RVR	비 고
CAT-II	DH 100FT	RVR 300m (1,000FT)	–	150m	Note [1]
			150m	Not reported	Note [2]
CAT-IIIa	AH 100FT or DH 50FT	RVR 175m (600FT)	RVR 175m (600FT)	RVR 100m (300FT)	
CAT-IIIb	AH 100FT	RVR 75m (300FT)	RVR 75m (300FT)	RVR 75m (300FT)	
Runway Condition	If Runway is grooved, CAT-III approach can be made with wet runway, and if it is not grooved, the approach can be made with only dry or damp runway.				

Note)

[1] The TDZ and the Rollout RVR are required.

[2] If the Rollout RVR is not reported, the Mid RVR is substituted.

Note) CAT IIIa/b Minima inserted in Route Guide (Jeppesen) shall be applied even if only CAT II or CAT IIIa approach chart is published.

3.1.3.2 Maximum Wind Limitations

Wind	Autoland
Head Wind	25 knots
Tail Wind	10 knots
Cross Wind (Note 1)	10 knots

Note) Refer to the chapter 8. Adverse Weather "Maximum Cross Wind limitations by Brake Actions", BUT DO NOT EXCEED 10 Knots (Crosswind & Tailwind).

3.1.3.3 Application of CAT-II/III DH or AH

a. CAT-II

1) The DH (Decision Height) of CAT-II Approach is RA (Radio Altitude). DH is applied. It is a decision height at which visual reference is confirmed. Therefore when visual reference is not confirmed at DH, Missed Approach must be executed.
2) Published Minimum or 100FT HAT whichever is higher shall be applied as DH.
3) In case of CAT-II approach at the airport where the "RA NOT AUTHRIZED", Barometric Altitude (Pressure Altitude) will be set. In this case, the detail procedures must be included in the Approach Briefing.

b. CAT-III

1) The AH or DH is applied in CAT-III Approach. It is RA (Radio Altitude).
2) In case of CAT-III approach at the airport where the RA is "NOT AUTHRIZED", Barometric Altitude (Pressure Altitude) will be standard. In this case, the detail procedures must be included in the Approach Briefing.

Note) AH (Alert Height)

1. It is a height from touch down zone (or approach end of runway) that is established to the aircraft equipped with Fail Operational Automatic Landing System. And it is the final altitude at which flight crew judges whether Automatic Landing and Rollout Control System operates normally and it is applicable for CAT-III operation. In other words, it is the final altitude at which flight crew judges whether the instruments in the aircraft is shown in normal status for CAT-III approach without being aware of Visual Reference.

2. In case that any malfunction occurs in Fail Operational Automatic Landing System or the related ground equipment at or above AH, Missed Approach must be executed.

3.1.3.4 Minimum Altitude Setting

<table>
<tr><th colspan="2">Approach</th><th>RA on PFD</th><th>BARO Altitude on PFD</th></tr>
<tr><td colspan="2">CAT–II</td><td>Set DH in RA column.
ex) ICN 33R : 106 feet</td><td>Blank</td></tr>
<tr><td rowspan="2">CAT–III</td><td>DH applied</td><td>Set DH in RA column.
ex) DH 50 feet => 50 feet Set</td><td>Blank</td></tr>
<tr><td>AH applied</td><td>Blank</td><td>Blank</td></tr>
</table>

Note)

1. *In CAT–III Approach using AH (Alert Height), Radio Altitude(RA) and "ALERT HEIGHT' when reaching 100 feet is made callout. And at the same time, "ONE HUNDRED' GPWS Auto Callouts is monitored*
2. *For CAT–II/III approach using DH, RA determines DH.*

3.1.4 Company Approach Ban

Flight phase	When applying DH	When applying AH
Before passing IAF	• If the weather is below minimum, the approach can NOT be initiated. In this case, flight crew must consider the diversion to established holding point or planned alternate airport.	
From passing IAF to FAF/FAP	• If the weather is below minima after passing IAF, the approach can be continued by FAF/FAP. • If the weather is below minima at FAF/FAP, Missed Approach must be executed.	
After passing FAF/FAP	• After passing FAF/FAP, the approach can be continued by DH regardless of the present weather. • When visual DH is not confirmed or safe landing is not assured at DH, Missed Approach must be executed.	• After passing FAF/FAP, approach and landing can be made regardless of the present weather or confirming visual reference unless it comes under missed approach condition.

Note) The policy about Approach Ban can vary depending on the country. Therefore, in case that there is approach ban is established in the related country, it shall be applied first.

3.1.4 Company Approach Ban

REFER TO FOM 6.8.3 "Approach Ban"

3.1.5 Scan Policy

Condition		Captain	Co-pilot
CAT-II	Approach Minimum	Inside & Outside	Inside
	After Visual Reference Contact	Inside & Outside	Inside
CAT-III	Approach Minimum (DH applied)	Inside & Outside	Inside
	After Visual Reference Contact (DH applied)	Inside & Outside	Inside
	After Visual Reference Contact or No Contact (AH applied)	Inside	Inside

Note) Inside & Out Side means "TRANSIT to VISUAL FLIGHT," and it is applied as the followings (Except the CAT-III approach applying AH).

1. *Definition: The transition from Instrument Flying to Visual Fight is a critical part of the approach.*
2. *Method company applies : Composite flight.*
3. *Method: From when Approaching Minimums, Captain starts scanning for visual references.*

Note)

1. *During the approach, if the visual reference of runway is confirmed prior to reaching DH, the pilot who has Inside & Outside scanning shall call out "APPROACH LIGHT INSIGHT" or "RUNWAY INSIGHT".*
2. *In CAT-III Approach and Landing applying AH, Captain shall change his scanning to outside when Touchdown or Rollout Mode operates.*
3. *Before descending below DH, Captain must call out "LANDING" or "Go-AROUND."*
4. *Co-pilot(F/O) shall monitor speed and descent rate till touch down, and the supportive flight crew shall perform the duty of backup of Co-pilot(F/O) in the phase of Approach and Landing.*

3.1.6 Downgrade Approach (Revert to Higher Minimums)

3.1.6.1 Concept

a. Approach and landing may revert from CAT-II to CAT-I (CAT-II => CAT-I) or CAT-III to CAT-II (CAT-III => CAT-II) with applying "REVERT to HIGHER MINIMUMS" procedure when one of the installed equipments is inoperative but certain requirements are satisfied during CAT-II/III approach.

b. For downgraded approach and landing, the conversion must be made before reaching 1,000ft. And the briefing for downgraded approach and landing procedures must be done. It there is not enough time for the briefing, missed approach must be executed.

3.1.6.2 Possible Conditions for Downgrade Approach

a. Conditions for Downgrade Approach

In case that there is malfunction of airborne equipment for CAT-II/III and the related approach and landing is not possible, downgrade is applied. The followings are the example.

	CAT-I	CAT-II	CAT-III
When PFD FMAs is changed LAND 3 to LAND 2	Applicable	Applicable	Unable
One Engine Failure	Applicable	Applicable	Unable
2 IRU	Applicable	Applicable	Unable
A/T Inoperative	Applicable	Applicable	Unable
Autobrake Failure	Applicable	Applicable	Unable
Rollout Failure	Applicable	Applicable	Unable
Anti Skid System Failure	Applicable	Applicable	Unable
2 IRU in NAV Mode (1 IRU NON-NAV Mode)	Applicable	Applicable	Unable
ILS Receiver (2개) (1 ILS Receiver Failure)	Applicable	Applicable	Unable

b. Check items for Downgrade Approach

Captain must confirm the followings for performing downgraded approach and Landing.

1) Confirm conditions for downgrade
   a) Required Equipments
   b) Weather Minima
2) Check whether the briefing for Downgraded Approach and Landing is complete or not
3) Check whether it is possible or not to change the minima to downgraded minima before reaching 1,000ft

3.1.6.3 Standard Callout for Downgrade Approach

The followings are the standard callouts for downgraded approach.

<table>
<tr><th>Situation</th><th>Captain</th><th>First Officer</th></tr>
<tr><td>Acknowledge Downgrade Approach Condition</td><td colspan="2">"DOWNGRADE APPROACH CONDITION"</td></tr>
<tr><td rowspan="2">Execute Downgrade Approach</td><td>"DOWNGRADE TO CAT–I or CAT–II APPROACH" →</td><td>"CHECKED"</td></tr>
<tr><td>"SET DH" →</td><td>"CHECKED"</td></tr>
</table>

CAUTION

If it is not assured to make the decision for downgrade, execute Go–Around and check systems then make the approach again.

3.1.7 Landing Method

3.1.7.1 CAT-II

a. The qualified CAPTAIN and F/O must accomplish the approach and landing in the designated seat.

b. CAPTAIN must do the PF job when performing CAT-II or CAT-III approach and landing.

c. Auto approach and autoland must be conducted until touchdown.

d. Approach and Landing is available with Fail Operational System or Fail Passive System.

e. If the stabilized approach is not available, missed approach (Go-around) must be executed.

f. Refer to this POM for acquisition of qualification and maintenance of CAT-II.

3.1.7.2 CAT-III

a. The qualified CAPTAIN and F/O must accomplish the approach and landing in the designated seat.

b. Captain must do the PF job when performing CAT-III Approach and Landing.

c. Automatic landing and Automatic Rollout system must be used in CAT-III operation.(even if at an airport applying DH, apply same concept)

d. When performing automatic landing, use automatic landing system until touch down and rollout.

e. With only FAIL OPERATIONAL SYSTEM, the approach and landing can be done.

f. Refer to this POM for acquisition of qualification and maintenance of CAT-III.

The end of section

3.2 CAT-II/III Approach Procedures

3.2.1 Approach Preparation

3.2.1.1 General

a. Aircraft Status
Check the status according to this POM "Required Equipments for CAT-II/III"
b. Weather
Check the weather of destination and provision airport and refer to these POM CAT-II/III COMPANY Weather Minima.
c. Check Approach Chart
Check proper chart for the runway that flight crew intends to make approach.
d. FMC - CDU Approach Set Up
1) Check the ILS and ADF frequency on NAV radio page and turn Marker Receiver Audio ON.
2) Set the MINIMA according to this POM "CAT-II/III Minimum Altitude Setting". (Use caution when RA IS NOT AUTHORIZED)
3) Select the VREF
4) Select proper auto brake (Set 3or 4)
e. Landing Lights
When doing approach under low visibility especially at night, using landing light may badly affect to find out visual reference, because of reflected light from water drops or snow can make the visibility worse. So, it is up to PF's judgment to use landing light with CAT-II/III weather condition.
f. Seat Position
Pilot eye position determines forward vision and good seat adjustment is necessary. It should be forward and high enough to have maximum visibility over the nose of the airplane, and still allow the pilot see the instrument panel and operate flight controls efficiently.

3.2.1.2 Approach Briefing

The followings must be included to the normal approach briefing for CAT-II/III approach and landing.

a. Flight Crew
Verify Crew Qualifications are Current.

b. Aircraft
1) Review Airplane Regency.
2) Verify Aircraft Systems Serviceability and Check the Applicable Required Equipment List.
3) Familiarization with Autopilot Malfunction Warnings.

c. Airport
1) Check that the Runway is in the List of Approved CAT II/III Airport.
2) Approach Ban.
3) Obtain RVR and Braking Action for the Runway.
4) Verify Status of Airport Facilities
   예) ILS, Approach and Runway Lighting.
5) Review Low Visibility Taxi Procedures. (SMGCS)

d. Review and Actions
1) For CAT-II/III Approaches, Set Radio Altitude at DH.
2) Check Seat Positions for Correct Eye Level Reference.
3) Review Individual Crew Duties.
4) Review CAT-II/III Callouts.
5) Adjust Cockpit Lighting.
6) Use of Landing Lights is not Normally Recommended.

e. ATC
1) Review additional ATC call.
2) Request ATC for a CAT- II/III approach, unless LVP (CAT- II/III) are reported active by ATIS (or ATC).

f. Ground Maneuvering after Landing
Low Visibility Taxi Route should be reviewed.

3.2.1.2 Approach Briefing

The followings must be included to the normal approach briefing for CAT–II/III approach and landing.

a. Flight Crew

Verify Crew Qualifications are Current.

b. Aircraft

1) Review Airplane Regency.
2) Verify Aircraft Systems Serviceability and Check the Applicable Required Equipment List.
3) Familiarization with Autopilot Malfunction Warnings.
4) Notify Senior Cabin Attendant of prohibition/restricted usage of Portable Electronic Devices (PED).

c. Airport

1) Check that the Runway is in the List of Approved CAT II/III Airport.
2) Approach Ban.
3) Obtain RVR and Braking Action for the Runway.
4) Verify Status of Airport Facilities
   예) ILS, Approach and Runway Lighting.
5) Review Low Visibility Taxi Procedures. (SMGCS)

d. Review and Actions

1) For CAT–II/III Approaches, Set Radio Altitude at DH.
2) Check Seat Positions for Correct Eye Level Reference.
3) Review Individual Crew Duties.
4) Review CAT–II/III Callouts.
5) Adjust Cockpit Lighting.
6) Use of Landing Lights is not Normally Recommended.

e. ATC

1) Review additional ATC call.
2) Request ATC for a CAT– II/III approach, unless LVP (CAT– II/III) are reported active by ATIS (or ATC).

f. Ground Maneuvering after Landing

Low Visibility Taxi Route should be reviewed.

3.2.1.3 Checklist

The checklist for CAT-II/III Approach shall be done along with the descent checklist.

3.2.2 Procedures by Approach Phases

3.2.2.1 From 10,000FT to IAF

a. Check weather again and apply approach ban.
b. When the weather is above the minima, the approach can be started IAF by leaving IAF.

3.2.2.2 Approach Ban

Refer to the Company Approach Ban.

3.2.2.3 From IAF to 1,500FT

a. Arm the approach mode when aircraft is within 30° angle from localizer.
b. When Glide Slope is alive, put the landing Gear lever down and set flaps 20.
c. When Glide Slope is capture, set landing flaps (30 or 25) and final speed and missed approach altitude on MCP.
d. Complete landing checklist.
e. Refer to ILS approach procedure for others.

3.2.2.4 At 1,500FT

a. Confirm that FLARE and ROLLOUT is armed.
b. Check PFD FMAs (Flight Mode Annunciation).

Note) If proper PFD FMAs is not displayed by 1,500FT, Auto Landing is not allowed.

a. LAND 3 for CAT-II or III
b. LAND 2 for CAT-II only

3.2.1.3 Checklist

The checklist for CAT–II/III Approach shall be done along with the descent checklist.

3.2.2 Procedures by Approach Phases

3.2.2.1 From 10,000FT to IAF

a. Check weather again and apply approach ban.
b. When the weather is above the minima, the approach can be started IAF by leaving IAF.

3.2.2.2 Approach Ban

REFER TO FOM 6.8.3 “Approach Ban”

3.2.2.3 From IAF to 1,500FT

a. Arm the approach mode when aircraft is within 30° angle from localizer.
b. When Glide Slope is alive, put the landing Gear lever down and set flaps 20.
c. When Glide Slope is capture, set landing flaps (30 or 25) and final speed and missed approach altitude on MCP.
d. Complete landing checklist.
e. Refer to ILS approach procedure for others.

3.2.2.4 At 1,500FT

a. Confirm that FLARE and ROLLOUT is armed.
b. Check PFD FMAs (Flight Mode Annunciation).

Note) If proper PFD FMAs is not displayed by 1,500FT, Auto Landing is not allowed.

a. LAND 3 for CAT–II or III
b. LAND 2 for CAT–II only

3.2.2.5 At 1,000 feet

When Co-Pilot(F/O) calls out "ONE THOUSAND" at 1,000 feet, Captain confirm whether the approach is stabilized or not and continues the approach with calling out "STABILIZED" or initiated missed approach with calling out "GO AROUND TOGA FLAPS 20".

3.2.2.6 At 100 feet Above DH

a. Co-Pilot(F/O) shall call out "APPROACHING MINIMUM" and Captain respond "CHECKED".
b. Co-Pilot(F/O) shall continue to keep head down and monitor instruments.
c. Captain shall start Transit to Visual Flight (Inside & Out Side) according to the Scan Policy. (Except CAT-III Approach applying AH)

3.2.2.7 At DH

a. After Automatic Callout 'MINIMUMS MINIMUMS' comes out, Captain respond "LANDING" and land aircraft if the condition allowing descent below DH is satisfied.
b. In case that the condition allowing descent below DH is not satisfied, PF shall call out "GO AROUND TOGA FLAPS 20" and execute missed approach procedures.

3.2.2.8 Conditions allowing descent below DH

The followings are the conditions allowing descent below DH for CAT–II/III.

a. The aircraft should be positioned on normal approach path to the runway intended to land.

b. More than one of the following runway visual references must be recognized.

1) Approach Light System.
2) Threshold Markings/Lights.
3) Runway End Identifier Lights.
4) Visual Glide Path Indicator (VASI, PAPI etc).
5) TDZ or TDZ Markings/Lights.
6) Runway or Runway Markings/Lights.

Note) At or above DH when PF has only Approach light insight, Captain should call "Approach Light Insight"

3.2.2.9 At AH

After PM calls out "ALERT HEIGHT", if there is not any change on PFD FMAs LAND 3 (Fail Operational), aircraft may descend below AH.

Reference

Visual Lighting Assuming the Lowest Applicable RVR

	CAT–II	CAT–IIIa	CAT–IIIb
Approach Lights Longitudinal Bar	Yes	No	No
300 Meters Cross Bar	Possible	No	No
Red Barrettes	Yes	No	No
150 Meter Cross Bar	Yes	No	No
Green Threshold Lights	Yes	Possible	No
Touch Down Zone Lights	Yes	Yes	Yes
Light/Markings	Possible	Possible	Possible
Center Line Lights	Yes	Yes	Yes
PAPI/VASI	No	No	No

3.2.3 Landing

a. At or below AH or DH, Co-pilot(F/O) shall call out "FLARE" after confirming FLARE mode is engaged around 50FT RA, and call out "ROLLOUT" after confirming whether ROLLOUT mode is engaged at 2FT RA.
b. During Flare, first officer shall check whether Autothrottle begins to retard toward idle around 25~50FT RA and call out "IDLE" after throttle mode changes from SPD to IDLE.
c. Captain/Co-pilot(F/O) must monitor the whole process of Approach, Flare, Landing, Rollout, Spoiler deployment, Auto Braking, and must not interfere at or below AH or DH unless it is absolutely necessary.
d. If Speed Brake won't be deployed automatically after Touch Down, captain must pull the Speed Brake Lever to the UP position immediately and use the maximum reverse thrust.
e. After reaching taxi speed, PF may disengage Automatic Rollout, and use Autobrake until reaching safe speed according to situations.
f. In Low Visibility condition, it may be not possible to taxi without assistance and can use Follow me car or Tow car with Captain's discretion.
g. Notify tower when completely vacated from runway.

3.2.4 Low Visibility Taxi

3.2.4.1 General

a. Low Visibility Taxi shall be operated below RVR 1,200FT (350M). However, a procedure defined by the local airport shall be applied, if there are any.
ex) Incheon Airport ; RVR 550M
b. Taxiing with low visibility requires much caution, for it is one of the difficult operations.
c. Airport Low Visibility Taxi Route must be confirmed before approach.
d. Airport Low Visibility Taxi Route chart must be placed at a position that is easy to refer to after landing.
e. Taxi at lower than half the normal taxi speed and check the ground speed of PFD.
f. Turn On the exterior lights of the aircraft when necessary.
g. Follow the Taxiway Centerline Lights and Taxi Lead Light when taxing and be cautious in recognizing between Stop Bar Lights and Runway Guard Lights (vertical or yellow active lights on alternately that is used for discriminating Active Runway and Runway Position Marking)
h. Red Stop Bar Lights (vertical or red non- active lights on surface)are used for Active Runway ILS Critical Area Holding Position Marking or for taxiway intersections and they must be installed for RVR 600FT (175M) operation.

Note)

1. *You must not pass the Red Stop Bar when it's ON*
2. *With the ATC permission, check for the Red Stop Bar to be OFF before passing and any inconsistency between ATC instruction and the lighting must be confirmed.*

i. Taxi lead off lights with yellow and green lights alternately is installed within Critical/Sensitive Area and the lights are used for controller to confirm whether aircraft is completely vacated from runway when pilot reports vacating runway.

CAUTION

Notify the controller at the first indication of becoming disoriented.

3.2.4.2 SMGCS Management

a. There are some airports which has SMGCS (Surface Movement Guidance and Control System, Acronym Pronounced "SMIGS") installed. It is easier to control ground movement of aircrafts and required vehicles in these airports.
b. It is prescribed to operate the SMGCS when the visibility is less than RVR 1,200FT (350M).
c. In case of RVR 600FT (175M) ~ 1,200FT (350M), it is operated within the Movement Area (including taxiway which controller allows traffic to move).
d. In case of less than RVR 600FT (175M), the area is expanded to Non-Movement Area. (Normally within ramp area which is uncontrolled area)

3.2.5 CAT–II/III Missed Approach

3.2.5.1 Conditions for CAT–II Missed Approach

a. When aircraft or ground equipment is inoperative
b. Greater than LOC 1/3 rectangle or G/S 1/2 dot deviation
c. When there is ATC instruction
d. When runway visual reference is not confirmed at DH
e. When safe landing is not practicable

3.2.5.2 Conditions for CAT–III Missed Approach

Segment	Missed Approach conditions
Before Passing AH or DH (Minimum)	• Any change of LAND 3 on PFD FMAs • NO LAND 3 or LAND 2 is displayed on EICAS • NO AUTOLAND is displayed • The LOC deviation is greater than 1/3 rectangle. • Glide Slope deviation is greater than 1/2 dot. • Safe landing is not practicable • ATC instruction • Malfunction of aircraft or ground equipment • One Engine Failure occurs
At or Below DH (Airport Applying DH)	• NO AUTOLAND Message Displayed. • The LOC deviation is greater than 1/3 rectangle or the pointer flashes. • Glide Slope deviation is greater than 1/2 dot or the pointer flashes • Runway visual reference is not confirmed at DH • Safe landing is not practicable • ATC instruction • Aircraft or ground equipment is inoperative
At or Below AH (Airport Applying AH)	• NO AUTOLAND Message Displayed • Master caution alert • The LOC deviation is greater than 1/3 rectangle or the pointer flashes. • Glide Slope deviation is greater than 1/2 dot or the pointer flashes. • Safe landing is not practicable • ATC instruction • Malfunction of aircraft or ground equipment

3.2.5.3 CAT–II/III Missed Approach (Go– Around) procedures

Refer to "Missed Approach" in this POM chapter 2 Supplement NP.

3.2.5.4 Altitude Loss (Automatic Go–Around)

Go Around Altitude	Altitude Loss
100 ~ 70 feet	40 feet
60 feet	35 feet
50 feet	30 feet
40 feet	24 feet
30 feet	19 feet
20 feet	12 feet
10 feet	6 feet

Note)

1. The data is provided from Boeing Flight Manual.

2. The table above is for consideration about altitude loss when initiating missed approach and in some cases, the possibility of Touch and Go cannot be ruled out.

CAUTION

1) Once a Go–Around has been commenced, it must be continued.

2) It a missed approach has initiated at DH of 50FT HAT, touchdown may occur during missed approach.

3.2.5.5 Go Around After Rollout Mode Activated

a. During the Missed Approach, Normal missed approach procedure should be done without touchdown.

b. During the Missed Approach, if the aircraft touches down on the ground or F/D go-around mode is deactivated, the procedures are as follows:

1) After touchdown, speedbrakes will be retracted automatically and autobrakes will be disarmed when thrust levers is increased by Manual.
During the missed approach between passing down RA 5FT, 2 seconds and climbing up RA 5FT, 3 seconds, TO/GA Switch will be deactivated. During that moment, Missed Approach (Go-Around) procedures as follows:

2) As TO/GA switch is not available intermittently between down passing RA 5 feet, 2 seconds and up passing RA 5 feet, 3 seconds, missed approach procedures are as follows.

a) Autopilot Disengage and Autothrottle Disconnect.

b) Manually increase power to G/A Thrust, and rotate at Vref speed with pitch up ˚.

① "SET GO-AROUND THRUST, FLAP 20" call out

② Manual Pitch Up(rotate smoothly toward MAX 15˚ pitch attitude)

③ after increasing Positive Rate, call out "GEAR UP"

c) After Manual GA mode engaged, when TO/GA Switch is again worked, after TO/GA Switch push, normal procedures should be followed by engaging LNAV and VNAV

CAUTION

At low level Abrupt Control can be the main cause of Tail Skidding.
Other procedures are same as normal missed approach.

Note) Automatic Go-Around Function will be armed with Flaps Extended or Glide Slope Captured. But when the aircraft is descending with passing RA 5FT and 2 seconds, TO/GA Switch will be deactivated temporarily.

The end of section

Intentionally

Blank

3.3 CAT-II/III Callouts & Responses

Refer to the POM 2.23 Standard Callout & Response Procedures

Intentionally

Blank

Intentionally

Blank

Intentionally

Blank

3.4 CAT-II/III Non-Normal Procedures

3.4.1 Procedure for Irregularity

3.4.1.1 CAT-II

In case that any defect or malfunctioning of an aircraft occurs during approach, pilot should continue autoland when there is "LAND 3" or "Land 2" FMAs indication of PFD. The missed approach must be initiated when "NO AUTOLAND" is displayed on PFD.

3.4.1.2 CAT-III

a. Above AH
   1) If the PFD FMAs has not changed, and the equipment is not required for the approach or can be switched, (ex Flight Director), continue approach.
   2) If the PFD FMAs has changed, or the equipment is required for the approach, adjust to the appropriate higher minimum or GO-AROUND.

b. At or Below AH
   1) Auto coupled approach and Autoland can be made when any malfunction of aircraft system occurs below AH (Alert Height) (LAND 3 FMAs indication on PFD).
   2) In the event of one engine failure at or below AH, the followings should be accomplished.
      a) The approach and landing shall be completed automatically while "LAND 3" FMAs indication is showing on PFD.
      b) The MISSED APPROACH (GO-AROUND) must be initiated in the event that "LAND 3" FMAs indication has been changed to "LAND 2", "NO AUTOLAND" or "NOLAND 3".
   3) During CAT-III approach with DH, landing must be made only when safe landing is guaranteed.

3.4.2 Procedures by FMAs Displays on PFD

At 50FT RA or below, the followings shall be conducted in accordance with FMA displays on PFD.

3.4.2.1 If "FLARE"Mode is not Activated

The MISSED APPROACH (GO-AROUND) must be made regardless of AH/DH.

3.4.2.2 If Thrust "IDLE" Mode is not Activated

Landing can be made regardless of AH/DH. (Thrust Levers should be retarded to idle position manually after GPWS calls "10FT")

3.4.2.3 "ROLLOUT" Mode is not Activated (CAT-III)

The MISSED APPROACH (GO-AROUND) must be conducted as followings:

a. During the Missed Approach, Normal missed approach procedure should be done without touchdown. (Reference to FCTM)

b. During the Missed Approach, if the aircraft touches down on the ground or F/D go-around mode is deactivated, the procedures are as follows: (reference to FCTM)

1) After touchdown, speedbrakes will be retracted automatically and autobrakes will be disarmed when thrust levers is increased by Manual.
   - a) Autopilot Disengage and Autothrottle disconnect
   - b) After manual power set to GA Thrust, rotate the aircraft up to maximum 15˚ at Vref speed.
   - c) "SET GO-AROUND THRUST FLAP 20" call out.
   - d) After confirming Positive Rate climb, "Gears Up" call out

2) After Manual GA mode engaged, when TO/GA Switch is again worked, after TO/GA Switch push, normal procedures should be followed by engaging LNAV and VNAV

CAUTION

At low level Abrupt Control can be the main cause of Tail Skidding.

Other procedures are same as normal missed approach.

Note) Automatic Go-Around Function will be armed with Flaps Extended or Glide Slope Captured. But when the aircraft is descending with passing RA 5FT and 2 seconds, TO/GA Switch will be deactivated temporarily.

The end of section

Intentionally

Blank

3.5 Limitations

3.5.1 Operation Limitations

3.5.1.1 Not Qualified Crews for CAT-II or CAT-III

a. Flight crew without competence qualification for CAT-II or CAT-III is only approved of CAT-I approach, which means he/she did not complete CAT-II or CAT-III training and check ride.

b. A person not qualified for CAT-II, or CAT-III is not authorized to conduct an approach (Leaving IAF) under minimum weather condition for CAT –II or CAT-III approach.

c. If the aircraft is not inside FAF or FAP inbound and it receives the report that RVR drops to the below minimum, the pilot is allowed to continue until FAF/FAP. Unless the weather is reported to be above minimum, it is required to initiate the missed approach no later than FAF/FAP.

d. If the aircraft is already inside FAF/FAP inbound when it receives the report that RVR is lower than weather minimum, it may continue approach to land, when;

1) The aircraft keeps approaching any visual references for the intended runway is distinctly visible and identifiable to the pilot at CAT-I DH,
2) When the pilot considers it can be a safe landing, the pilot is able to continue the approach and landing.

3.5.1.2 Limitations in forming crews

Classification	Left seat	Right seat	Operating limitations
F/O Training (initial/transition/ Upgrade)	Instructor pilot	Trainee first officer	Observing first officer shall replace the trainee
captain Upgrade or transition course	Trainee captain	Instructor pilot	1Set : CAT-I weather minimum shall be applied 2Set : Considering duty time, proper crew shall be on duty.
2 set or 3 pilot crew	Captain	First officer	Considering duty time, proper crew shall be on duty.

3.5.2 Other Limitations

3.5.2.1 CAT-II

It is required to have a visual reference at DH (decision height), so pilots shall conduct Missed Approach (Go-Around) at DH without visual reference.

3.5.2.2 CAT-III

a. It can be conducted only in the condition of "Fail Operational System" (PFD ASAs LAND 3).
b. For landing with CAT-III approach in the airport where DH has been published, it is required to have a visual reference at decision height. The missed approach must be initiated if no visual reference can be seen at DH.
c. when applying AH, the pilot is able to land irrelevant to have a visual reference or weather condition if it is not meet missed approach condition.
d. Reported brake action shall be at or above "Medium (or Fair)"
e. Delayed Flap Setting Procedure will not be applied to CAT-III approach.

The end of section

Table of Contents

The end of section

4.1 Non-Normal Operation Policy

4.1.1 General

a. Non-normal condition is caused by any circumstance, which is not under normal operational category or aircraft malfunction. To prevent flight operation from being in danger, it is required to include any situation which needs immediate attention to be paid.
b. Emergency is defined as non-normal event which can create a hazard to the passengers, crews, aircrafts or persons on the ground.
c. To identify whether the event is an emergency or non-normal, it is required to consider the urgency or the necessity for priority handing and assistance during an abnormal event which differentiate an emergency from a non-normal.
d. Refer to chapter 7. In FOM for more information about non-normal operation policy.

4.1.2 Basic Rules

Basic rule when non normal situation occurs are as follows:

a. Fly the Airplane
  1) If non normal situation occurs PIC takes the airplane control. PIC should maintain Flight Path and Configuration .
  2) If non normal situation occurs while Co-pilot(F/O) controls the flight as PF, Co-pilot(F/O) should maintain control until captain has the positive full control of the plane.

b. Quick Actions
  Take quick actions for the following situations.
  1) Stall Warning
  2) Ground Proximity Pull Up
  3) Wind Shear Warning
  4) Rejected Takeoff
  5) Recall (Memory) Items of Quick Action Index

c. Judgment
  1) Check if System Control is in Normal Configuration

2) Silence Aural Alerts
3) Synoptic Display if available
4) Analyze the situation by all available information such as EICAS Message, Cabin Crew, Ground Crew, Tower.

d. Performing Checklist

Captain asks for checklist after confirming following items:
1) The flight path is in control
2) The airplane is not in a critical state of flight (Such as takeoff or landing)
3) All recall items are complete

e. Decision

1) Make decision of continuation of flight or land at Nearest Suitable Airport .
2) Situation that requires land at Nearest Suitable Airport are:
   a) "Plan to land at the nearest suitable airport/Land as soon as possible" is stated in Non-normal Checklist
   b) Cabin smoke or fire persists
   c) There is only one main power source
   d) Any other situation determined by the crew to have a significant adverse effect on safety if the flight is continued.

f. Maintain Radio Communication

1) Report ATC current situation and ask for advise.
2) Try to contact Company or Maintenance
3) Maintain other Communication available.

g. Refer to concerned Manual

Refer to manual for the information and under standing.
1) FCOM/ AFM (Airplane Flight Manual)
2) DDG/MEL
3) Concerned Regulations
4) FOM/POM etc

h. Make PA

PA make passengers confirmed that someone is controlling the situation. Crews should make clear and brief PA to provide clear instruction. PIC informs of crew of irregularity as possible before making a PA.

4.1.3 Recognitions and Responsibility (Chapter 2, 7 in FOM)

Pilots will consider the following conditions as an emergency.

a. The aircraft is in danger due to fire or smoke.
b. Disorientation of the flight. (The flight cannot establish its position)
c. An aircraft component or system failure which affects or may affect safety of the flight.
d. Communication and/or navigation equipment is inoperative (impaired) to a point where approach and/or landing procedures may be affected.
e. A high probability of an emergency evacuation.
f. PF considers the safety of the flight or the safety of any person onboard to be endangered.
g. For other details refer to the chapter 2 Operations Policy in FOM.

Note) In case that there is deceased or injured on board or damage to the aircraft, It is required to report to the appropriate aeronautical station as soon as possible.

4.1.4 Authority and Responsibility in Emergency

4.1.4.1 Captain (PIC) (FOM 7.1.3.1)

In an emergency situation that requires immediate action for the safety of passengers, crew and aircraft, the captain may deviate from prescribed operation procedures and aviation regulations. At this time the captain shall notify appropriate ATC facilities immediately the deviated situation. Refer to the Chapter 2, “Operations Policy” or chapter 7 “Non-normal Operations” in FOM.

4.1.4.2 Coordination between Flight Crews

Refer to the Chapter 2, “Operations Policy” in FOM.

4.1.4.3 If Immediate Communication with the Purser is required

Refer to the Chapter 2, "Operations Policy" or chapter 7 "Non-normal Operations" in FOM.

4.1.4.4 If Immediate Communication with All Crew is required

Refer to the Chapter 2, "Operations Policy" or chapter 7 "Non-normal Operations" in FOM.

The end of section

4.2 Maintenance Discrepancy

4.2.1 General

a. A maintenance discrepancy that could influence on the aircraft dispatch should be notified to company/OCC as soon as possible to reduce the possibility of flight delay.
b. Refer to the Chapter 2, "Operations Policy" in FOM.

Note) The flight crew should notify company/OCC of CDL items which is informed by the purser, using same methods.

4.2.2 Actions

4.2.2.1 On the Ground (Before Pushback)

Refer to the Chapter 2, "Operations Policy" in FOM.

a. When a problem occurs at Gate (Spot), captain shall notify Company/Flight Operation as soon as possible in order to minimize passenger's inconvenience and possible flight delay.
b. When door is open, the following procedure shall be observed.
   1) Confirm if Normal Procedures and Supplementary Procedures are properly accomplished.
   2) Carry out Non-Normal Procedure according to QRH (Quick Reference Handbook).
   3) Request corrective action on items of defect to maintenance personnel.
   4) Record items of defect on Technical Log Book according to Fault Report Manual (FRM).
   5) When an aircraft is replaced due to aircraft defect, it must be notified to related department before moving to the newly assigned aircraft.

4.2.2.2 From Pushback to Takeoff Roll

Refer to the Chapter 2, "Operations Policy" in FOM.

4.2.2.3 During Flight

Refer to the Chapter 2, "Operations Policy" in FOM.

a. Accomplish Non-Normal Procedure according to QRH/ECAM.

b. If unable to correct defect, notify Company/Flight Operation through any form of communication available.

  1) ACARS Downlink
  2) VHF, HF (Phone Patch) or Company Radio
  3) SATCOM

c. Take all necessary actions in accordance with FOM Chapter 7: Non-Normal Operation.

4.2.2.4 Landing at the Nearest Suitable Airport

Refer to B747 QRH.

4.2.2.5 Use of Oxygen Mask

a. Use of 100% Oxygen

  1) Loss of cabin pressure
  2) Use of fire extinguishing
  3) Contamination such as smoke
  4) Concentration of fumes or odors
  5) Fire main deck.
  6) Others.

b. Use of Oxygen Mask

Standard callout when putting on Oxygen mask is as follows.

	PF	PM
Done Oxygen mask	"Oxygen mask…ON" ➔	"Oxygen mask…ON"
Establish communication	"Interphone check Left" ➔	"Interphone check Right"

Note) If the oxygen mask is not required to use any more, the left oxygen compartment door must be surely closed and reset, which enable the flight crew to use the boom mike normally.

4.3 Performing Non Normal Checklist

4.3.1 Basic Rules

a. Non-Normal checklist use starts when the airplane flight path and configuration are correctly established.

b. AFDS (Autopilot Fight Director System) use is recommended in accomplishing QRH items.

c. If non-normal situation occurs, normally the captain takes the control of the aircraft.

4.3.2 Classification of QRH Items

Refer to QRH “Non-Normal Checklist”.

The end of section

Intentionally

Blank

4.4 Aborted Engine Start

4.4.1 Ground Auto Start

During auto start, the EEC (Electronic Engine Control) monitors EGT, N2 RPM and other engine parameters until the engine reaches idle.

a. If the EEC detects no EGT rise, it cuts off fuel and ignition.
b. The engine motors for 30 seconds.
c. The EEC applies fuel and ignition to both igniters for another attempt.
d. The engine motors for 30 seconds before the start and bleed air valve close.

Note) Auto Start System does not monitor Oil pressure nor N1 rotation.

4.4.1.1 Auto Start Does Corrective Steps for :

a. No EGT rise.
b. A hot start.
c. A hung start.

4.4.1.2 Do the Aborted Engine Start Checklist if :

a. There is no N1 rotation by idle N2.
b. There is no oil pressure indicated by idle N2.
c. The fuel control switch is in RUN, the engine RPM is low, and the auto start switch is off.

4.4.2 In-Flight

4.4.2.1 Auto Start

a. During in-flight flame out or start, the EEC reacts to a hung start or to EGT reaching the takeoff limit.
b. Crew reacts to a hung start or no EGT rise.
c. If the EEC detects the EGT reaching the take off limit or hung start, it cut off and then reapplies fuel.

4.4.2.2 Manual Start

Monitor engine displays for start parameters listed below until engine stabilized at idle.

a. The EGT does not increase by 25 seconds after the fuel control switch is moved to RUN
b. There is no N1 rotation by idle N2
c. The EGT quickly nears or exceeds the start limit
d. N2 does not stabilize at idle
e. The oil pressure indication is not normal by the time the engine is stabilized at idle

4.4.2.3 Aborted Engine Start Procedure

Follow the QRH "Non-Normal checklist procedures."

The end of section

4.5 Rejected Takeoff

4.5.1 General

a. The captain has the sole responsibility for the decision to reject takeoff.
b. The decision must be made in time to start rejected takeoff maneuver by V1.
c. While rejected takeoff is necessary, Captain calls out “STOP” immediately, accomplish the Rejected takeoff maneuver.
d. If the Co-pilot(F/O) is making the takeoff, the Co-pilot(F/O) must maintain control of the airplane until the captain makes a positive input to the control.
e. Make decision whether Passenger Evacuation is necessary or not.
f. Order performing a checklist.
g. Refer to the Chapter 7 “Non-normal Operations” in FOM.

4.5.2 Rejected Takeoff Situations

4.5.2.1 Prior to 80 Knots

Refer to the B747 QRH, Maneuvers"Rejected Takeoff."

4.5.2.2 Above 80 Knots and Prior to V1

Refer to the B747 QRH, Maneuvers"Rejected Takeoff".

Reference

Usage of thrust reverser during RTO due to engine fire **(From Boeing)**

a. If the RTO is a high speed, then the need for max reverse thrust is there, since the RTO stopping performance is temporarily the greater concern. Once safe stopping is assured then the crew can terminate use of reverse thrust on the affected engine.

b. If the RTO is low speed, then use of full reverse thrust may not be necessary on the affected engine.

c. If the engine is obviously showing signs of severe damage and external fire, the crew should terminate use of reverse thrust and shut the engine down as soon as conditions permit. This is what we mean by "consistent with situation."

4.5.3 Procedures

"Rejected Takeoff Maneuvers" (Refer to the B747-400 QRH)

Note)

1. *When a Co-pilot(F/O) shall control the aircraft until the Captain calls out "I HAVE CONTROL" (complete takeover of the aircraft control) during his PF job, the PF/PM job switch occurs the moment mutual handover/takeover takes place.*
2. *After the Captain rejects the takeoff and stops the airplane, take action based on preflight and postflight Areas of Responsibility. (Captain and Co-pilot(F/O)).*

The end of section

Intentionally

Blank

4.6 One Engine Failure during Takeoff

4.6.1 Engine failure Recognition

a. Aircraft longitudinal axis diverging from the runway center line.
b. Changes in Engine Instruments.
c. Movement of PFD bank indicator.
d. Secondary EICAS displayed.

Note)

1. *Autopilot may be engaged at 250FT AFE or ABOVE if aircraft is stabilized.*
2. *If the maximum thrust is required, acquire the maximum thrust by pushing the TO/GA switch or increasing the thrust manually with positive directional control.*

CAUTION

Use special CAUTION when using TO/GA with FIXED DE-RATE near V1.

4.6.2 Departure Priority (One engine failure)

Follow departure route in the order below for one engine failure/flame out during takeoff.

a. One engine out procedure for the airport (refer to takeoff analysis chart for procedure)
b. Climb straight ahead until flap up maneuvering speed considering aircraft gross weight, surrounding terrain and climb gradient.

Note) Report if flying off track from SID or one engine out procedure. But this maneuver must be conducted above MSA, MVA and MORA.

4.6.3 Procedures

PF	PM
"ENGINE FAILURE"	
(There are no need any callouts)	
Rotate smoothly to target pitch attitude(12°~13°or 2° to 3° below the normal all eng pitch attitude)	←"ROTATE"
Maintain V2 to V2 + 10	
	←"POSITIVE CLIMB"
"GEAR UP" →	"GEAR UP"
	Contact tower and notify engine fail
At engine out acceleration height (800 AGL) retract flaps on flap speed schedule	
Limit bank angle to 15 degrees until reaching flaps up speed + 20 knots	
"FLAPS 10, 5, 1, UP" →	"SPEED CHECK FLAPS 10, 5, 1, UP"
"CHECK (SET) CON THRUST" →	"CHECK" OR "CON THRUST SET"
"ENGINE (NUMBER 1,2,3 OR 4) FAIL CHECKLIST" →	"ENGINE (NUMBER 1,2,3 OR 4) FAIL CHECKLIST COMPLETED"
"AFTER TAKEOFF CHECKLIST" →	"AFTER TAKEOFF CHECKLIST COMPLETED"

Refer to " Engine(s) Failure" in FOM Chapter 7. "Non Normal Operations"

Note) *While Co-pilot(F/O) controls the flight as PF, Co-pilot(F/O) should maintain control until captain takeover control of the plane. (Except SIM training)*

4.7 Engine(s) Failure or Shutdown during Cruise

4.7.1 Condition

Engine failure or flameout

4.7.2 Procedures

PF	PM
"Engine failure"	
Maintain aircraft control	
	Select Engine out prompt on the VNAV CRZ page (Do not execute-Only check maximum engine out altitude)
Check maximum engine out altitude & (If require descent, order to request descent clearance)	
	(Get descent clearance)
(After received descent clearance by ATC Set engine out altitude on MCP and push then,) Order to execute the FMC modification (ENG OUT)	
	Execute the FMC modification (ENG OUT)
Verify E/O LRC SPD and maximum CON thrust	
(If terrain is a factor: Order to select E/O SPD prompt and to execute)	
	(Select E/O SPD & Execute)
After the descent is established, (or In cruise) call "Engine (No.1) fail checklist"	
	"Engine (No.1) fail checklist completed"

4.7.2.1 If Terrain is a Factor

Set the engine out maximum altitude in MCP altitude window and push the E/O SPD prompt on CDU.

4.7.2.2 If a Delay in Descend is Necessary

a. When a delay in descent is necessary due to traffic condition, track offset or ATC instruction etc, set the level off altitude and delay the descent by decreasing to the speed between E/O LRC speed and flaps up maneuvering speed, then descend with ATC clearance.
b. For more detail, refer to Chapter 7. Non-normal operations “In-flight Engine(s) Failure” in FOM.

The end of section

4.8 Fire Engine 1, 2, 3 or 4

(Severe Engine damage or Separation)

4.8.1 Condition

Fire detected in the engine, or airframe vibrations detected with abnormal engine indications.

4.8.2 Light

Respective fire switch and fuel control switch.

4.8.3 Procedures

PF	PM
"Engine Fire"	
Silenced fire warning	
"Thrust Lever No.1 (2,3 or 4) -- Confirm ----- IDLE" →	"Confirmed" (Throttle 2,3,4 Guard)
"Confirmed" (Fuel control switch No. 2, 3 & 4 Guard)	←"Fuel Control switch (No.1) ---- Confirm ------ Cut Off"
"Confirmed "	←"Engine fire switch (No.1) ---- Confirm ------ Pull"
"Checked (or is Shown)"	"If FIRE ENG message is Shown"
"Checked (or Rotate)"	←"Engine fire switch (No.1)------- Rotate to stop and hold for one second"
"Checked (or Time check)"	←"Time check 30 seconds"

PF	PM
"Checked (or stays shown)"	← "If, after 30 seconds, FIRE ENG message remains displayed""
"Checked (or Rotate)"	← "Engine fire switch --- Rotate to stop and hold for one second"
"Fire ENG 1(2,3or4)checklist" →	"Fire ENG 1(2,3or4)checklist"
"Checked"	Read aloud and verifies each-memory items has been done ← "Condition………"
"Checked"	← "Fire ENG 1(2,3 or 4) checklist completed"

Note)

1. *If high airframe vibration occurs and continues after engine shutdown, without delay reduce airspeed and descend to a safe altitude which results in an acceptable vibration level. If high vibration returns and further airspeed reduction and descent are not practical, increasing the airspeed may reduce the vibration.*
2. *In case of engine fire, when the airplane is under control, the gear has been retracted, and a safe altitude has been attained (minimum 400feet AGL) accomplish the NNC memory items*

For more detail, refer to Chapter 7. Non-normal operations "In-flight Engine(s)Failure" in FOM.

The end of section

4.9 FMC (s) Failure

4.9.1 Condition

a. Affected FMC has failed.
b. FMC left or right message and Fail light on both CDUS.
c. Auto throttle disconnected and Autopilot operating in a degraded mode.
d. FMC scratchpad message: “TIME OUT – RESELECT”.
e. LNAV and VNAV not available.
f. PFD drift angle pointer removed.
g. Other EFIS data, such as ND waypoints, magenta lines, vertical deviation pointer/scale, ETA etc are removed.
h. Failure flag MAP VTK is displayed.

4.9.2 Procedures

PF	PM
Select HDGHOLD (or HDGSEL) and ALT HOLD ➔	“HDG, ALT HOLD”
Due to auto throttle is not available, control thrust manually.	
“FMC left (or right) checklist” ➔	“FMC left (right) checklist”
	“Navigation source selector……… CDU R or CDU C”
“CDU R or CDU C” ➔	“CDU R or CDU C”
	If airplane position north of 82°N (or north of 70°N between 80°W and 130°W) or south of 82°S latitude (or south of 60S between 120Eand 160E) Heading reference switch--- TRUE.

PF	PM
	"Landing altitude switch----MAN"
"MAN" ➔	"MAN"
	"Landing altitude selector -----Set"
"Set" ➔	"Set"
	If both FMC failed………………
	"FMC left / right checklist completed"

4.9.2.1 During Flight

a. Use FLCH or V/S (Vertical Speed) Mode for climbing or descending.
b. 3 FMC Pages, such as IRS LEGS, IRS PROGRESS, ALTN NAV RADIO are available.
c. The waypoints input before FMC failure are usable. But if the waypoints are required to be corrected or added, input the waypoint coordinates into the same page and line on Both FMC.
d. Conditional waypoints will be deleted. The appropriate manipulation may be required on the LEGs page because the route would be discontinued after the deletion of the conditional waypoints.
e. For NAV RADIO page input, tune manually the left VOR, ILS, NDB on the left CDU and the right VOR, ILS, NDB on the right CDU.
f. Current fuel quantity will be displayed on EICAS and Fuel Synoptic. (Not displayed on IRS progress page)
g. Accomplish the QRH checklist for ballast fuel load.

4.9.2.2 Preparation for Approach

a. Derive the appropriate data for the approach from QRH due to FMC data are not available.
b. Calculate landing weight (ZFW + Fuel) and look up VREF approximately 30 minutes before landing and use it for speed setting of the flap maneuvering speed and the final approach speed.
c. Calculate and note the go-around N1 with reference to the airport OAT for possible go-around.

REFERENCE

a. On IRS leg page, only the first waypoint is referenced to magnetic north and rest of the waypoints are referenced to true north. Distance information is also provided.
b. On PROGRESS Page, Distance To Go (DTG) and Time To Go (TTG) provided for displayed TO/NEXT/DEST waypoints.
c. For cross track error, maintaining desired track will be possible by using heading selector.
d. Speed bug setting will be normal.
e. Normal ILS approach and autopilot will be functional.

The end of section

Intentionally

Blank

4.10 Cabin Altitude (Rapid Depressurization)

4.10.1 Condition

Cabin altitude exceedance occurs.

4.10.2 Procedures

4.10.2.1 Autopilot Entry & Level Off

Note) Use of the autopilot is recommended.

PF	PM
Oxygen masks……… ON (Both)	
Crew communications……… Establish (Both)	
"Cabin altitude and rate check (Verify packs are on and outflow valves are closed.) ➔	"Check" (Open ECS synoptic)
If cabin altitude uncontrollable	
Checked	← Uncontrollable
"(Supernumerary) Pass' oxygen switch --------ON" ➔	"ON" (Backs up automatic activation of the supernumerary oxygen system)
"Emergency descent" ➔	"Emergency descent"
Select lower altitude on MCP	Notify ATC-Call MAYDAY and request area altimeter (QNH) Turn on all lights and set SQ7700
Initially turning at least 45 degrees with HDG SEL to offset 15NM from the track	
Select FLCH	
Move the thrust levers to idle	
Extend the Speed Brakes	

PF	PM
"Check structural damage" →	"Checked" (Open door synoptic and check any door opened)
Descend straight ahead or initiate turn with HDG SEL.	
Set target speed : - For configuration VMO/MMO or Current speed. *Note) If structural integrity is in doubt, limit airspeed & avoid high maneuvering loads.*	
Recheck : - Move the thrust levers to idle - Extend speed brake.	
"Cabin altitude checklist" →	"Cabin altitude checklist"
"Altimeter reset 0000, Altitude check"	←"Transition Level, altimeter reset 0000" (in or mb)
Reduce speed to LRC.	← 2,000 feet (to level off)
Speed brakes in down detent. Check LRC speed or 300KIAS and maintain.	← 1,000 feet (to level off)

Note) Rapid descents are normally made with the Autopilot and Landing Gear Up.

Note) When a Co-pilot(F/O) shall control the aircraft until the Captain takeover the aircraft control completely (except SIM Training)

4.10.2.2 Manual Entry & Level Off

a. Disconnect A/T & Move the thrust levers to idle.
b. Smoothly extend the speedbrakes.
c. Disengage A/P & smoothly lower the nose to initial descent attitude (approximately 10 degrees nose down)
d. About 10Knots before reaching target speed, slowly raise the pitch to maintain target speed.
e. Keep the in trim at all times.
f. If MMO/VMO is inadvertently exceeded, change pitch smoothly to decrease speed.
g. Approaching level off altitude, smoothly adjust pitch attitude to reduce rate of descent.
h. After reaching level flight add thrust to maintaining LRC speed or 300KIAS.

4.10.2.3 Landing Gear Extended Descent

a. The rapid descent (Emergency Descent) is normally made with the landing gear up.
b. When structural integrity is in doubt and airspeed must be limited, extension of the landing gear may provide a more satisfactory rate of descent.
c. If landing gear is to be used during the descent, comply with the landing gear placard speeds.
d. Limit bank angle 15 degrees of bank when below minimum maneuvering speed.

4.10.2.4 After Level off

a. Recheck the pressurization system and evaluate the situation.
b. If cabin altitude reaches below 10,000FT, remove crew oxygen mask and establish crew communications
c. Contact flight attendant & make a PA if required.
d. Determine the new course of action based on weather, oxygen, fuel remaining, medical condition of crew and passengers, and available airport.
e. Obtain a new ATC clearance.

Refer to the FOM Chapter 7. “Non-normal Operations” and “B747-400 FCTM” for more details.

The end of section

4.11 Emergency Landing and/or Evacuation

4.11.1 General

a. In emergency landing, there are two kinds of landing: **"PLANNED EMERGENCY LANDING" and "UNPLANNED EMERGENCY LANDING".**
b. The Planned Emergency Landing has advantages that the aircraft, passengers and crews have more time to prepare for emergency landing and cabin crew can follow the procedures which are already planned and brief the passengers.
c. The Unplanned Emergency Landing has disadvantages that the crews don't have enough time for evacuation preparation and passengers and crew are exposed to risk that emergency landing can happen on the ground or on the water.
d. Refer to the Chapter 7. "Non-normal Operations" in FOM.

4.11.2 Procedures

4.11.2.1 Order to Carry out Emergency Evacuation

In an emergency situation, **Captain is in command and responsible to the emergency evacuation from the aircraft**. When Captain is unable to command, other crew make an order. Refer to FOM Chapter 7.

4.11.2.2 Signal of Emergency

Refer to the Chapter 7. "Non-normal Operations" in FOM.

4.11.2.3 In Case of Time Available

Refer to the Chapter 7. "Non-normal Operations" in FOM.

4.11.2.4 Passenger Announcement

When emergency landing or Ditching is anticipated, captain(person appointed) should make a PA.

a. At or below 2,000 FT AGL (2 minutes prior to land)

Captain should notify **"THIS IS CAPTAIN, CREW AT STATIONS, EMERGENCY LIGHTS ON"**. (Cabin crews turn Emergency Lights on)

Note) Pilot should turn on the interior or exterior emergency light, it can be guidance of exit path.

b. At or below 1,000 FT AGL (1 minutes prior to land)

1) Captain should notify **"THIS IS CAPTAIN, BRACE FOR IMPACT, BRACE FOR IMPACT"** and turn Seat Belt Sign 4 times ON/OFF (4 times chime)
2) Cabin crew should inform the Shouckproof position to the passenger according to cabin crew manual.

4.11.2.5 After Landing or Rejected Takeoff

Bring the aircraft to complete stop, set parking brake, and perform procedures as indicated below.

Note) 1. If emergency evacuation is not needed after aircraft complete stop, Captain PA should be conduct asap.
2. After the Captain rejects the takeoff and stops the airplane, take action based on preflight and postflight Areas of Responsibility. (Captain and Co-pilot(F/O)).

a. When an Emergency Evacuation is Expected (FOM 12.14)

If immediate emergency evacuation is expected, use the term **"THIS IS CAPTAIN, CREW AT STATIONS, CREW AT STATIONS"** to notify crew members.

b. When an Emergency Evacuation is Required (FOM 12.14)

If emergency evacuation is needed, make below announcement
"THIS IS CAPTAIN, EVACUATE, EVACUATE"
Note) Notify Tower: "ASIANA OOO Passenger evacuation"

CAUTION

1. When Passenger Evacuation is required, conduct evacuation procedure by reading QRH.
2. Make an evacuation on the runway as possible so that ground staff, equipment and vehicle can approach to airplane easily.

Note)
1. Evacuation must be made in a rapid and proper manner. The PIC may make announcement on the direction of exits depending on which engine has the fire, wind direction, attitude and position of the aircraft and the extent of aircraft damage, only when assured.
2. If an engine fire or other conditions make certain exits unusable, state the direction of egress

c. When an Emergency Evacuation is not Required

If emergency evacuation is not needed, use the term "THIS IS CAPTAIN, REMAIN SEATED, REMAIN SEATED" to notify crew members.

4.11.2.6 Flight Crew Duties on Passenger Evacuation

Refer to the FOM Chapter 7. Non-normal Operations.

The end of section

Intentionally

Blank

4.12 Others

4.12.1 Engine Limit/Surge/Stall

Refer to the FOM Chapter 7. “Non-normal Operations” and QRH.

4.12.2 Fuel Dumping

Refer to the FOM Chapter 7. “Non-normal Operations” and QRH.

4.12.3 Crew Incapacitation

Refer to the FOM Chapter 7. “Non-normal Operations” and B747-400 FCTM for more detail.

4.12.4 Fire in the Aircraft

Refer to the FOM Chapter 7. “Non-normal Operations” and QRH for more detail.

4.12.5 Emergency and Minimum Fuel

Refer to the FOM Chapter 7. “Non-normal Operations” Non-normal Operations.

4.12.6 Communication Failure

Refer to the FOM Chapter 7. “Non-normal Operations” and QRH for more detail.

4.12.7 Diversion

Refer to the FOM Chapter 7. “Non-normal Operations” and QRH.

4.12.8 Overweight Landing

Refer to the FOM Chapter 7. “Non-normal Operations,” B747-400 FCTM and QRH.

4.12.9 Tail strike

Refer to the FOM Chapter 7. “Non-normal Operations,” QRH and B747-400 FCTM.

4.12.10 Ditching

Refer to the FOM Chapter 7. “Non-normal Operations”(“Emergency landing/Ditching”) and QRH.

4.12.11 Intercepting Civil Aircraft

Refer to the FOM Chapter 7. “Non-normal Operations” and Airway manual.

4.12.12 Accident and Incident

Refer to the FOM Chapter 7. “Non-normal Operations”.

The end of section

Table of Contents

The end of section

5.1 General

5.1.1 Type of Aircraft

Type of A/C	Registration Number
Passenger	HL7418 HL7428
Combi	HL7421 HL7423
Freighter	HL7419 HL7420 HL7436 HL7616
Special Freighter (SF)	HL7413 HL7414 HL7415 HL7417

Note) Freighter (S): Converted from Combi to Freighter airplanes.

5.1.2 Communication

SATCOM Installed : HL7413 HL7415 HL7418
HL7428 HL7436 HL7616

5.1.3 (Deleted)

5.1.4 (Deleted)

5.1.5 Pilot Seats

HL 7417–7436 – Installed

- A master ON/OFF switch is located behind the lumbar support in/out adjustment hand wheel

5.1.6 Weight limitations

(Pound)

Weight	Passenger	Combi	Freighter	Special Freighter
Maximum Taxi Weight	873,000	873,000	873,000	873,000
Maximum Takeoff Weight	870,000	870,000	870,000	870,000
Maximum Landing Weight	630,000	630,000	666,000	652,000
Maximum Zero Fuel Weight	535,000	565,000	635,000	610,000

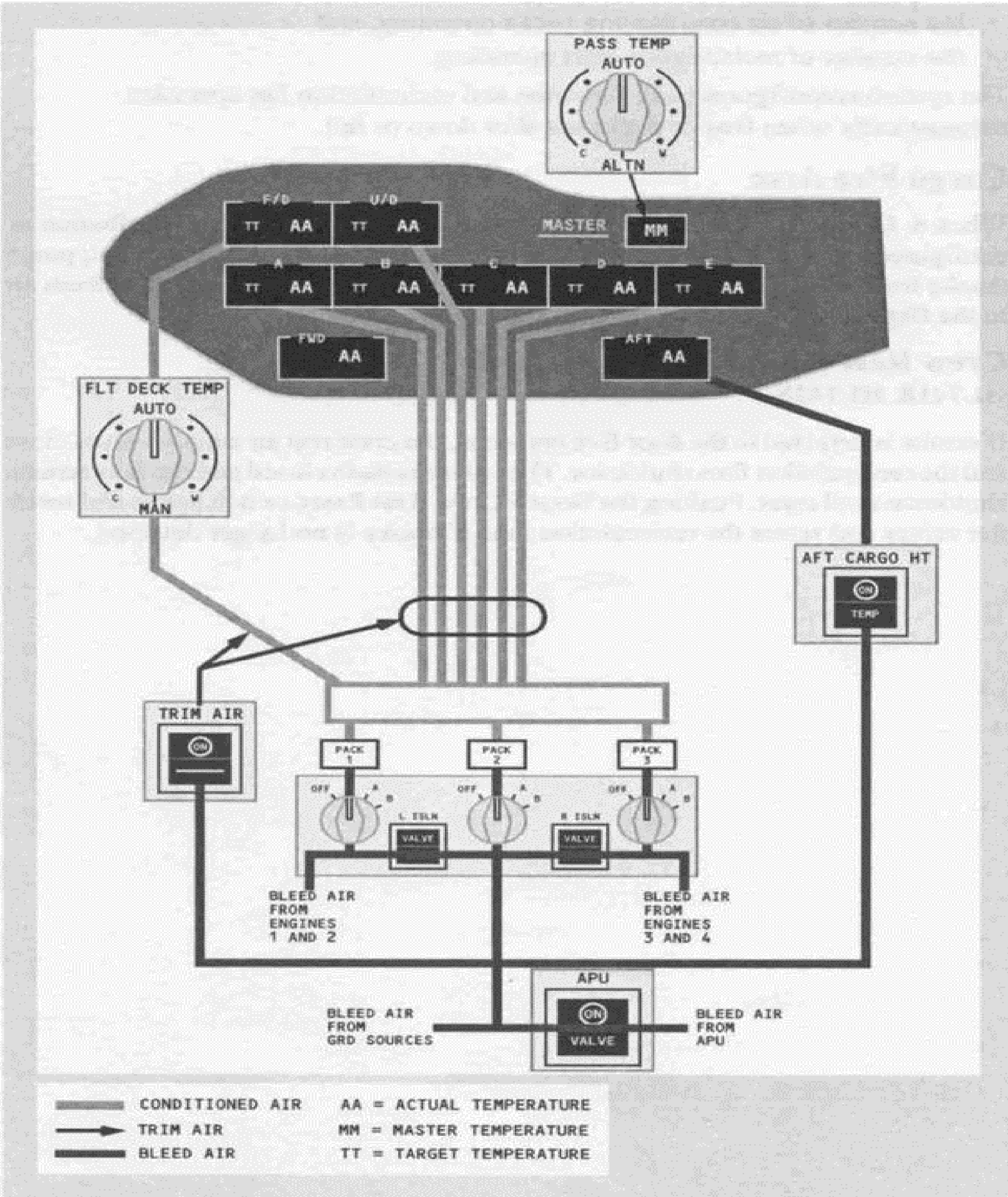
Note)

1. *For ZFW equal to 610,000 LBS and above, Maximum taxi weight equals Maximum takeoff weight at brake release plus 3,000 LBS, up to the maximum taxi weight. (Freighter)*
2. *For takeoff weight at brake release above 811,000 LBS and up to 870,000 LBS, reduce maximum ZFW linearly to 610,000 LBS (Freighter).*

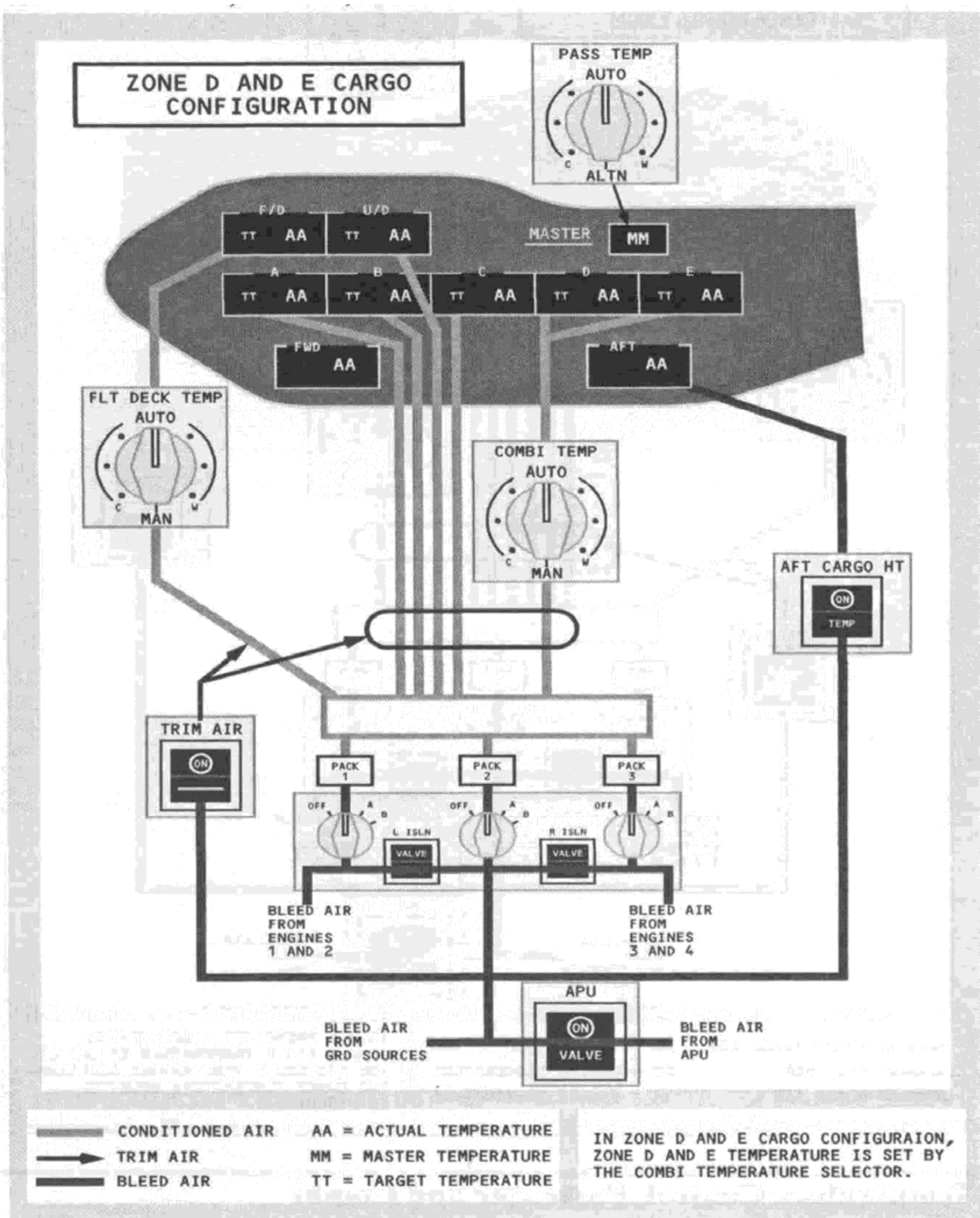
The end of section

5.2 Air Distribution Diagram

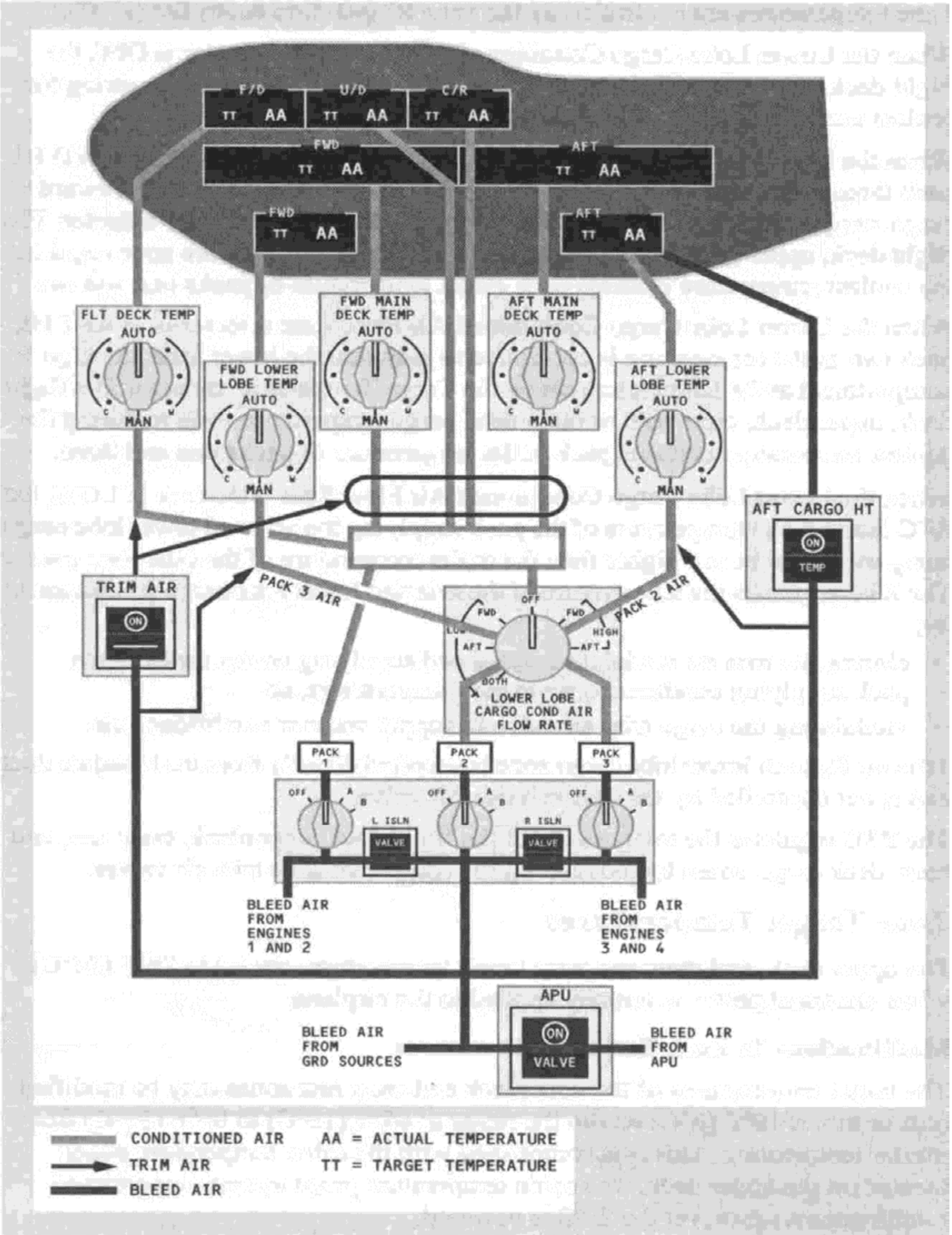
5.2.1 Passenger



5.2.2 Combi


ZONE D AND E CARGO CONFIGURATION
PASS TEMP
AUTO
ALTN
F/D
U/D
MASTER
MM
TT AA
A
B
C
D
E
FWD
AFT
FLT DECK TEMP
AUTO
MAN
COMBI TEMP
AUTO
MAN
AFT CARGO HT
ON
TEMP
TRIM AIR
ON
PACK 1
PACK 2
PACK 3
OFF
L ISLN
R ISLN
VALVE
BLEED AIR FROM ENGINES 1 AND 2
BLEED AIR FROM ENGINES 3 AND 4
APU
BLEED AIR FROM GRD SOURCES
BLEED AIR FROM APU
VALVE
CONDITIONED AIR
TRIM AIR
BLEED AIR
AA = ACTUAL TEMPERATURE
MM = MASTER TEMPERATURE
TT = TARGET TEMPERATURE
IN ZONE D AND E CARGO CONFIGURAION, ZONE D AND E TEMPERATURE IS SET BY THE COMBI TEMPERATURE SELECTOR.

5.2.3 Freighter



The end of section

Intentionally

Blank

5.3 Electrical

5.3.1 Main Deck Electrical System

Freighter	An interlock prevents either source from powering main electrical busses and main deck cargo handling bus simultaneously.
Passenger/Combi	None

The end of section

Intentionally

Blank

5.4 Fire System

5.4.1 Fire/Overheat Detection Not Installed

Crew Rest Smoke Detection	HL7418 – 20, HL7436, HL7616	HL7415 – 17, 21, 23
	Installed	Not installed

The end of section

Intentionally

Blank

5.5 Flight Instruments, Displays

5.5.1 PFD (Primary Flight Display)

a. HL7413 – HL7426 : Cathode Ray Tube
b. HL7436 – HL7616 : Liquid Crystal Display

5.5.2 Standby Flight Instruments

a. HL 7413 – HL7436 : Standby Attitude Indicator Installed
b. HL7616 : ISFD (Integrated standby flight Display) Installed

5.5.3 DH/MDA Selector

a. HL7413 – HL7423, HL7428 : DH/MDA Selector
b. HL7436 : RADIO Altitude/BARO Altitude Control

The end of section

Intentionally

Blank

5.6 Flight Control System

5.6.1 (Deleted)

The end of section

Intentionally

Blank

5.7 Fuel System

5.7.1 Stab Tank Pump Switches

a. Passenger/Combi : Installed
b. Freighter : Not installed

5.7.2 Fuel Tank Capacities

5.7.2.1 Passenger/Combi (HL7418, 7421, 7423, 7428)

Tank	U.S Gallon	Pound
1 and 4main	8,744	58,585
2 and 3main	25,092	168,116
Center	17,164	114,999
Reserves	2,644	17,714
Stabilizer	3,300	22,110
Total	56,944	381,524

NOTE) Usable fuel at level attitude, fuel density = 6.7 pounds per U.S Gallon.

5.7.2.2 Freighter

Tank	U.S gallons	Pounds
1 and 4 main	8,744	58,585
2 and 3 main	25,092	168,116
Center	17,164	114,999
Reserves	2,644	17,714
Total	53,644	359,414
Note) Usable fuel at level attitude, Fuel density = 6.7 pounds per U.S Gallon.		

The end of section

Intentionally

Blank

5.8 Warning System

5.8.1 Altitude Voice Annunciations

GPWS Provides the following altitude voice annunciations during approach:

a. HL7413 – HL7428 : 200FT, 100FT, 50FT, 40FT, 30FT, 20FT, 10FT

b. HL7436 :

1) 500FT : When Glideslope or Localizer not received, or Glideslope or Localizer deviation greater than two dots.
2) 200FT, 100FT, 50FT, 40FT, 30FT, 20FT, 10FT

The end of section

Intentionally

Blank

5.9 Special Freighter

5.9.1 Conversion Summary

5.9.1.1 General

a. Special Freighter means Freighter which is converted from Combi-aircraft.
b. Increased MZW (+45 KLBS) & decreased OEW (-42.5 KLBS).
c. Reconfigured Air Conditioning, Air Distribution, Equipment Cooling & Cabin Pressurization to freighter configuration.
d. Deactivated Horizontal Stabilizer Fuel Tanks.

5.9.1.2 Main Deck

a. Strengthened Floors & Fuselage Frames.
b. Installed new generation ANCRA's Cargo Loading System (CLS) & New Structure added to support CLS Fittings.
c. Added "9G Rigid Cargo Barrier" after FWD pressure bulkhead.
d. Added Smoke Detection & Class E Suppression capability.
e. Installed new Dado Panels, Sidewall Cargo Liners, & Flat Ceiling Panels.

5.9.1.3 Upper Deck

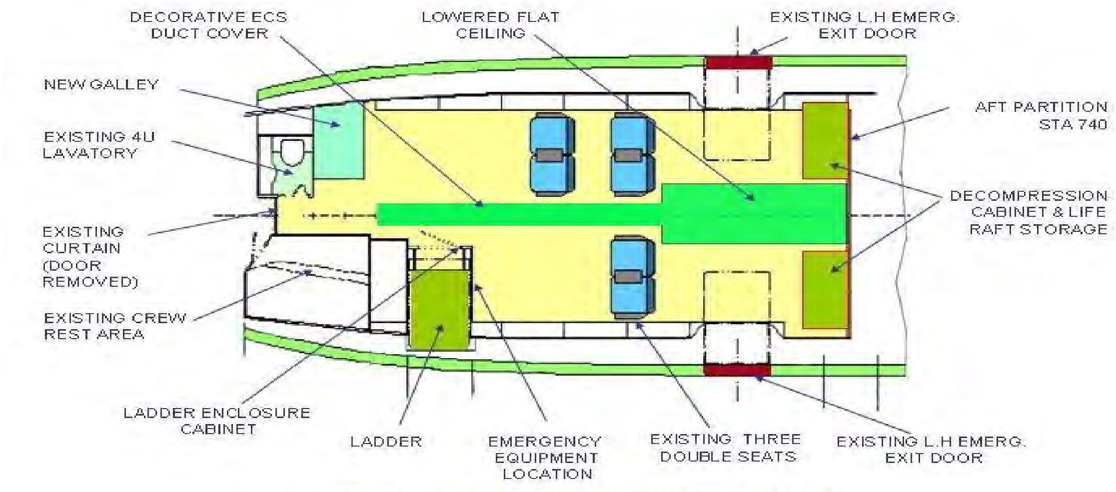
a. Replaced Floor Beam between BS 880 & 1100 with Tension Ties which were relocated to 22.6 inch upward (WL 307.5 → WL 330.1) to allow 10FT high pallets.
b. Replaced or reinforced rear Tension Ties after BS 1120.
c. Replaced Floor Beam at BS 800 to allow flight control cables rerouting.
d. Structure modified & reinforced to allow new Crew Ladder installation.
e. Added "9G Cargo Net" behind Smoke Barrier Partition at BS 840-860.

5.9.1.4 Lower Deck

a. Added Air Conditioning for the lower cargo compartment.
b. Replaced Smoke Detection System with new one minute Ambient.
c. Smoke Detectors.

5.9.1.5 Upper Deck Interior

a. Retained Existing Three (3) B/C Double Seats.
b. Retained Existing Crew Rest Bunks.
c. Retained Existing U4 FWD Lavatory with vacuum waste system.
d. Retained Existing both Type A Doors with Escape slides.
e. Installed New Crew Galley after Lavatory on RH side.
f. Installed New Crew Ladder Enclosure with a door on LH side.
g. Installed New Two (2) Life Rafts (10 Persons) at BS 720 Storages.
h. Installed New Smoke Barrier Partition with access door at BS 740.



UPPER DECK INTERIOR CONFIGURATION

5.9.2 ECS Modification

The Environmental Control System (ECS) is modified to sustain the new cargo configuration, the main changes are:

a. A new temperature control system divided into 7 zones is installed.
b. New shutoff valves, controllers and other components are installed and a new logic of operation introduced.
c. A new air distribution system is installed for the main and upper deck.
e. The flight deck E/E cooling system air source is modified to prevent odors generated in the cargo from entering the flight deck.
f. A fan is incorporated in the air supply duct to flight deck.
g. A new air conditioning zone is added in the forward and aft lower lobe cargo compartments.
h. A new cooling system for the E8 rack and SATCOM is installed.
i. A new lavatory and galley vent system is installed.

5.9.3 Fire Protection Modification

5.9.3.1 General

a. Prevent smoke penetration into occupied compartments.
b. Verify smoke does not activate warning in other compartments.

5.9.3.2 Main Deck

a. Reclassify the main deck cargo to Class "E" compartment and provide means to detect smoke within one minute.
b. Suppress fire by shutting air flow into the compartment.
c. Delete existing main deck cargo smoke detection and fire extinguishing system.

5.9.3.3 Lower Deck

a. Replace existing smoke detection system (5- minute) by a new one minute smoke detection system.

b. Retain existing fire extinguisher system.

5.9.4 Fuel System Removal

a. The existing horizontal stabilizer fuel system is removed from aircraft.

b. The following items are removed:

1) Distribution / Transfer / pressure tube lines, from the aircraft center tank (section 44) to the H.S.T including support structure for the tubes, pumps and others.
2) Jettison system.
3) Indicating (fuel quantity) in the flight deck EICAS and wing panel.
4) Vent and drain subsystem.

c. The changes to the FQIS are made using pin programming in the airplane wiring and by removing the FQIS remote electronics unit.

5.9.5 Oxygen System modification

5.9.5.1 Supernumeraries System

a. Redundant passenger oxygen system including oxygen bottles, tubing, and support structure are removed.

b. Two of passenger oxygen bottles are retained to supply oxygen in emergency cases for 195 minutes at 25,000ft to the six (6) supernumeraries in the upper deck.

c. The existing label above the oxygen switch in the flight deck is changed from “PASS” to “SUPN”.

5.9.5.2 Crew System

For incoming aircraft with one oxygen cylinder installed, a second cylinder (salvaged passenger cylinder) is added to meet the 195 minutes requirement.

5.9.6 Electrical & Avionics Modification

a. The electrical and avionics modification include:
   1) Removal of all passenger related equipment and other redundant equipment.
   2) Integration of the new equipment / systems.
   3) Modification of existing systems to Freighter configuration.

b. Wire and wire installations:
   1) Wire types used shall be of same types as exists in the aircraft.
   2) New wire types shall be compatible with the airplane wiring and shall meet the requirements of flammability, smoke and toxicity.

c. There is no change to the aircraft computers software; existing built-in software is activated to support the cargo configuration.

The end of section

Intentionally

Blank

5.10 Iridium SATCOM (HL7414/17/19/20/21/23, as installed)

5.10.1 General

a. The SATCOM system provides ACARS data communications. ACARS uses the SATCOM system when the airplane is beyond VHF communication range. Switching between VHF and SATCOM is automatic. ACARS data is controlled through the control display units (CDUs).

Note) (for SF – HL7414/7417):
The Center MCDU (MCDU 3) does not integrated to the Iridium (The Center MCDU does not show SATCOM menu.)

b. The SATCOM system also provides voice communications.

5.10.2 Placing and Receiving call

a. Placing Call

MCDU: Menu > SAT > DIRECTORY (6R) > AOC (2L) or ATC (3L)

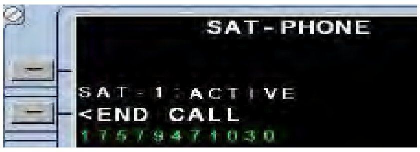
- Select Phone number (refer to attached phone number list),
- then press 'MAKE CALL (2L)

MCDU: Menu > SAT

- Enter the number using the scratchpad,
- then press 'MAKE CALL (2L)
- Six digits short code for ATS can be used (Three digits short code for AOC)

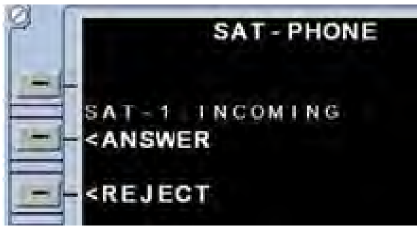
Note) Only AOC and ATC listed number in the AOC/ATC directory can be called.

b. Ending Call



- At the MCDU, SAT page, depress 'END CALL'
- Note: System status returns to SAT READY

c. Receiving Call



- SELCAL Chime-Single Stroke
- MCDU>MENU>SAT>ANSWER

5.10.3 System Status Indications

a. READY: The SAT Channel is registered onto the network and available for making a voice call
b. DIALING: The Satellite Data Unit is processing a call
c. RINGING: Call has been connected and waiting remote Party pickup
d. ACTIVE: The placed was answered
e. CALL FAIL: The call has failed
f. INCOMING: Incoming call-waiting answer
g. UNAVAILABLE: The SAT Channel is not available
h. CALL ENDED: The call has been terminated

5.10.4 MCDU Calls with priority

When placing a call, the user has the opportunity to assign the call a priority level on the MCDU screen before the <MAKE CALL button is pressed.
There are four call priority levels as below;

Priority Level	MCDU Interface	Description
1 (highest)	EMG	Emergency Highest priority level
2	HGH	Operational High
3	LOW	Operational Low
4	PUB	Public

The end of section

Table of Contents

The end of section

Intentionally

Blank

6.1 General

6.1.1 Basic Empty Weight (BEW)

MEW (Minimum Empty Weight) plus or minus (+/-) weight of standard item.

6.1.2 Standard Items

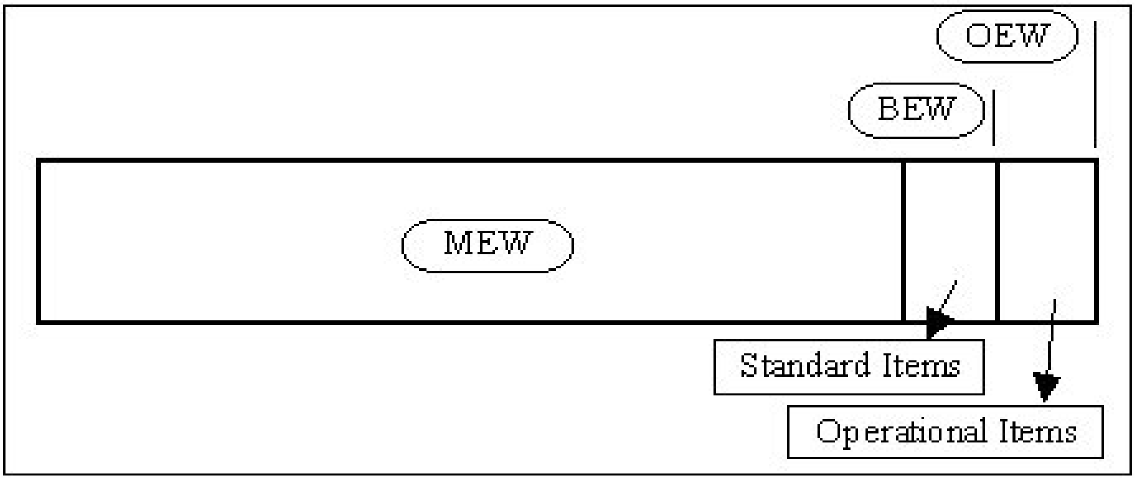
Equipment and system fluids not considered an integral part of a particular aircraft configuration. (Typically does not vary within a model type)

6.1.3 SOW or OEW

SOW (Standard Operating Weight) or OEW (Operational Empty Weight) = BEW plus operational items - may be different according to operational route.

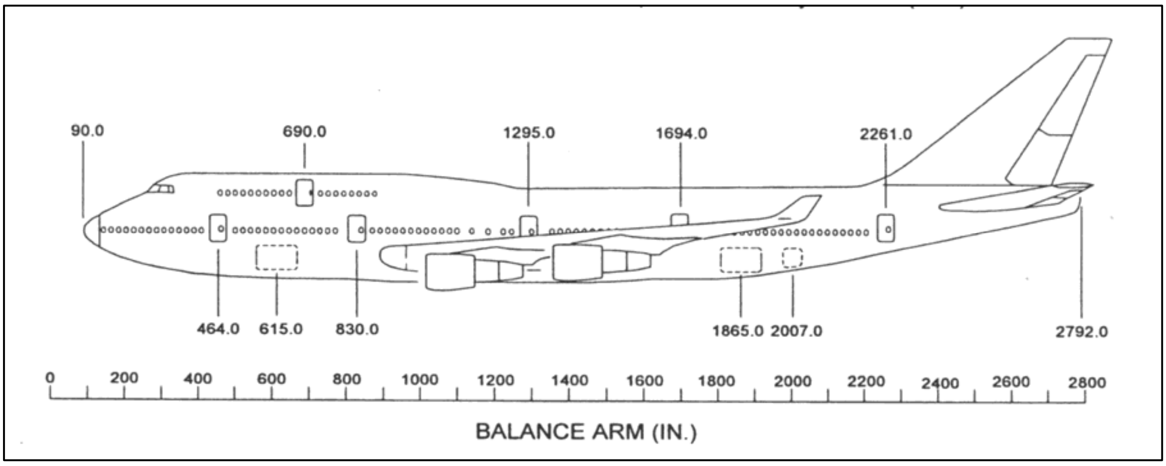
6.1.4 Operational Items

Personnel, equipment and supplies necessary for a particular operation that is not included in basic empty weight.



6.1.5 Balance Arm (B.A)

Balance Arm is a true measure in inches from the reference origin which is located 90.0 inches forward of the airplane nose.



6.1.6 Mean Aerodynamic Chord (MAC)

- Length of the MAC is 327.8 in.
- The Leading Edge of the MAC is Balance Arm 1258.0.

6.1.7 % MAC

$$CG\%MAC = \frac{ARM\,(IN) - 1258.0}{3.278}$$

6.1.8 Index Unit Equation

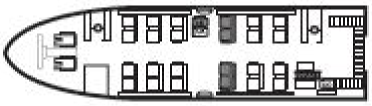
$$IU = \frac{WT(LB) \times [ARM - 1323.6]}{550{,}000} + 55$$

The end of section

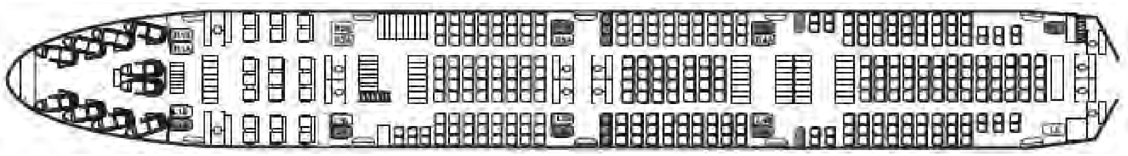
6.2 Seat Configuration

6.2.1 Passenger

Oa	Ob	Oc	Od	Oe	Of	Total
10	24	21	86	88	130	359
First	Business		Travel			



24 Business

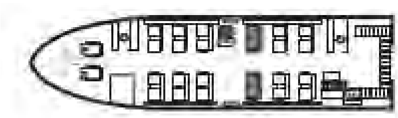


10 First 21 Business 86 Travel 88 Travel 130 Travel

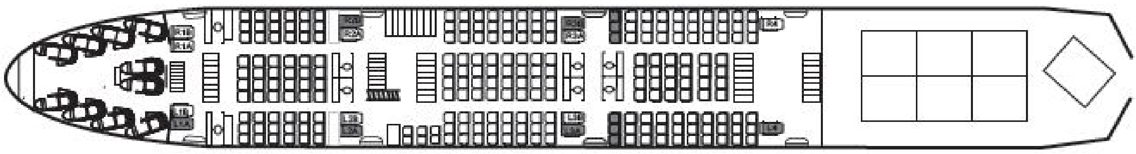
6.2.2 Combi

HL7421, HL7423

Oa	Ob	Oc	Od	Total
10	24	146	84	264
First	Business	Economy		



24 Business



10 First 60 Travel 86 Travel 84 Travel

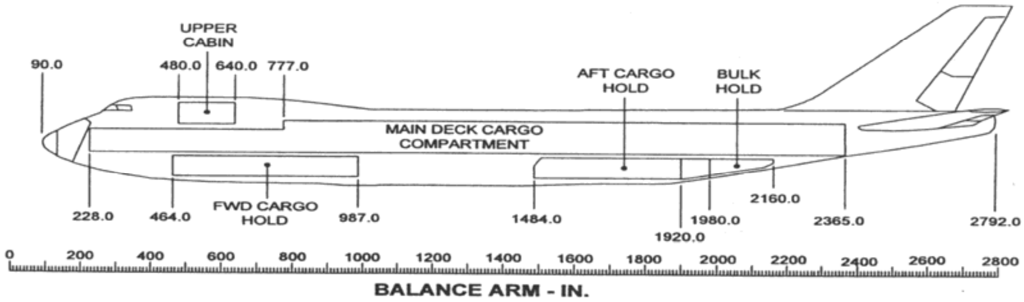
The end of section

6.3 Cargo Configuration

GENERAL LOCATION AND ARRANGEMENT

The following airplane profile illustrates cargo compartment locations.

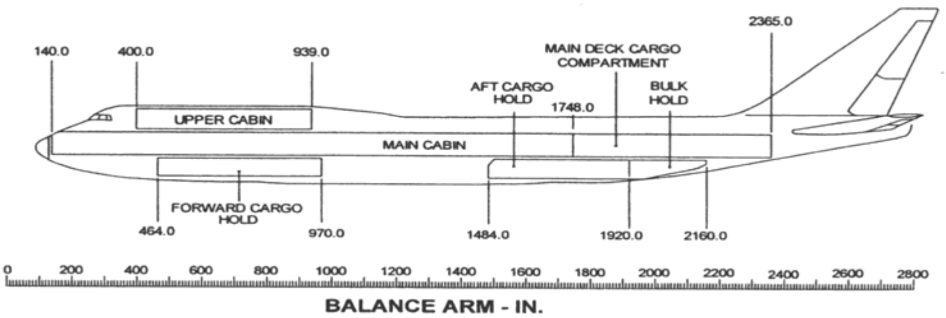
CARGO



GENERAL LOCATION AND ARRANGEMENT

The following airplane profile illustrates cargo compartment locations.

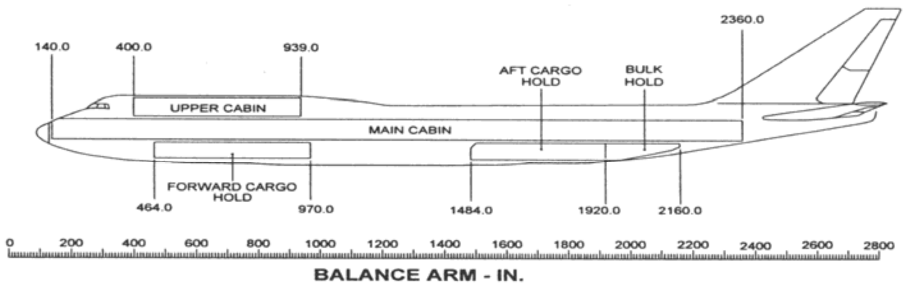
COMBI



GENERAL LOCATION AND ARRANGEMENT

The following airplane profile illustrates cargo compartment locations.

PAX



The end of section

Intentionally

Blank

6.4 Weight and Balance Manifest

6.4.1 Title

Flight Number	Reg. Number	Date	From	To
OZ 101	HL7423	07/05/01	NRT	ICN

a. Flight Number : Flight Number of Operational Route

b. Reg. Number : Registration Number of Aircraft

c. Date : Date of Flight (Year/month/day)

d. From : Departure Station

e. To : Arrival Station

6.4.2 Operating Weight Calculation

Description		Weight						I.U.
1	Standard Operating WT	3	9	7	2	0	0	71.3
	Adj. to Crew, Adj. to Cabin Crew & SVC Items							
	Operating WT	3	9	7	2	0	0	71.3

a. Standard Operating WT & Index Unit:

Standard Operating Weight & Index Unit for the given route according to Registration Number.

b. Adjustments to Crew & Service Item:

Two cockpit crew have been considered in Standard Operating Weight calculation.

Extra one cockpit crew Adjustment: 210 pound & −0.4 Unit

c. Operating WT : Summation of SOW & Adjustment

6.4.3 Total Payload Calculation

2	DEAD LOAD	FWD	Hold-1		1	0	5	0	0	-14.4
			Hold-2		1	7	0	0	0	-15.7
		AFT	Hold-3		1	1	1	6	0	+5.3
			Hold-4A		1	0	1	0	0	+7.5
			4B+P		1	1	1	0	0	+10.4
		Bulk	5A+R		1	0	4	0	0	+12.5
			5B+S		1	0	1	0	0	+14.4
		T	T				3	0	0	+0.5
	Total Dead Load				8	0	8	0	0	+20.5
3	PSGR	Cpt. 0a	9			1	4	8	5	-2.8
		Cpt. 0b	20			3	3	0	0	-3.9
		Cpt. 0c	99		1	6	3	3	5	-11.7
		Cpt. 0d	50			8	2	5	0	+2.3
	Total Passenger				2	8	4	8	0	-16.1
4	Total Payload			1	1	0	0	3	0	+4.4

a. Dead Load Information

1) Cargo Weight: Actual Weight of each cargo zone.
2) Cargo Index Unit: Table is provided in the rear page of Manifest

b. Passenger Information

1) Passenger Weight :
   165 pounds/ adult & 82 pounds/ child. (For International Flight)
   160 pounds/ adult & 80 pounds/ child. (For Domestic Flight)
   22 pound / infant (For international & Domestic)
2) Passenger Index Unit : Table is provided in the rear page of Manifest

c. Total Payload: Summation of total dead load and total passenger.

6.4.4 Zero Fuel Weight Calculation

5	Zero Fuel WT	5	0	7	2	3	0	+75.7

• Summation of SOW & Total Payload

6.4.5 Takeoff Fuel Calculation

6	Fuel	Ramp		8	1	5	0	0	
		Taxi −			1	5	0	0	
		Takeoff		8	0	0	0	0	−1.7

a. Ramp Fuel : Fuel weight before Taxi Operation

b. Taxi Fuel : 1500 pounds of fuel should be supposed to consume in taxi operation

c. Takeoff Fuel : Ramp Fuel minus Taxi Fuel

Fuel Index Unit : Table is provided in the rear page of Manifest

6.4.6 Takeoff Weight Calculation

7	Takeoff Wt	5	8	7	2	3	0	+74.0

• Summation of Zero Fuel Wt & Takeoff Fuel

6.4.7 Last Minute Change Adjustment

8	Last Minute Change Adjustment to Payload							
9	Adj. Takeoff WT	5	8	7	2	3	0	+74.0

• If last minute changes occur, Adjusted Takeoff Weight and Index Unit should be calculated.

6.4.8 Landing Weight Calculation

10	Trip Fuel		5	0	0	0	0	
	Fuel at Landing		3	0	0	0	0	
11	Landing Wt	5	3	7	2	3	0	

a. Landing Weight:
   Takeoff weight minus Trip Fuel or Zero Fuel Weight plus Fuel at Landing
b. Landing Weight Index:
   If Takeoff CG and Zero Fuel CG are within limits, Landing CG check is not necessary.

6.4.9 Allowable Gross Takeoff Weight Calculation

Max Weight For	Zero Fuel	Take-Off	Landing
	565,000		630,000
Fuel	T/O Fuel		Trip Fuel
	+ 80,000		+ 50,000
Allowed TOW (Lowest of 1,2,3)	1) 645,000	2) 870,000	3) 680,000
	645,000		

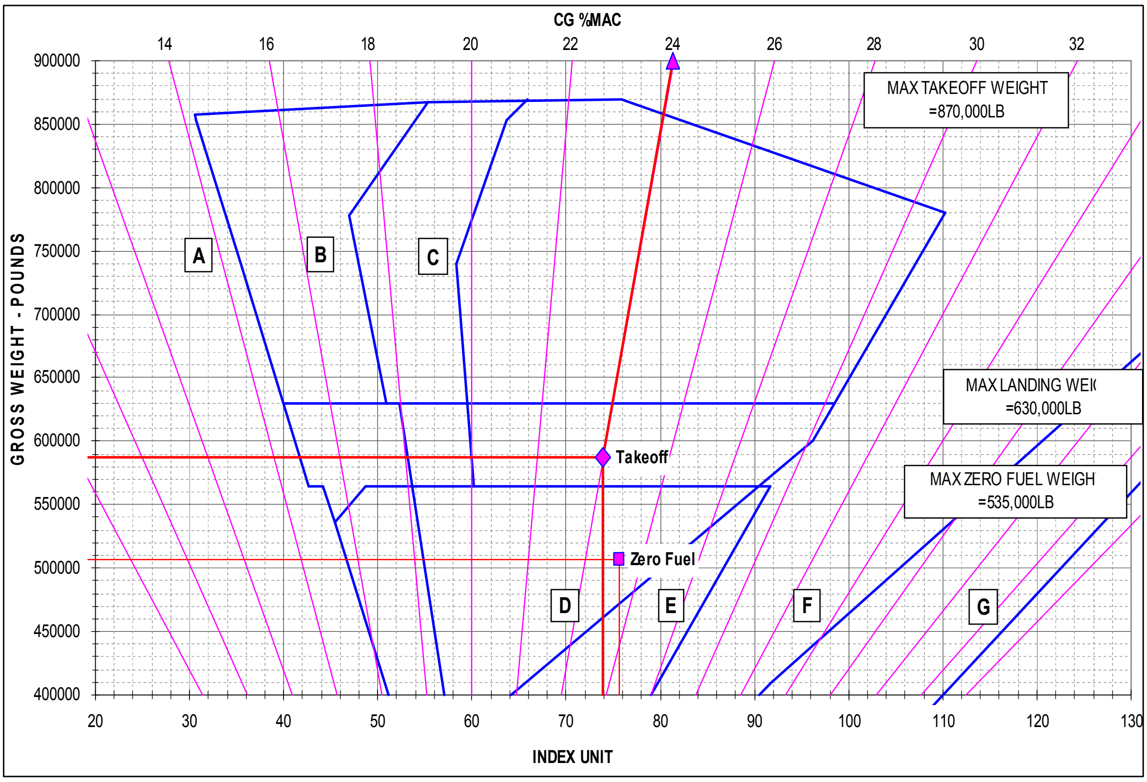
a. Allowable Gross Takeoff Weight (AGTOW) is the Lowest one of following weights.
   1) Maximum Zero Fuel Weight plus Takeoff Fuel
   2) Maximum Takeoff Weight
   3) Maximum Landing Weight plus Trip Fuel
b. AGTOW should be compared with the takeoff weight which is determined from runway condition.

6.4.10 Center of Gravity Calculation

Using Check Grid, CG%MAC can be found.

a. Enter the Check Grid, with the Takeoff Weight & Index Unit at takeoff weight.

b. From the point, across the dashed line, CG%MAC can be found.

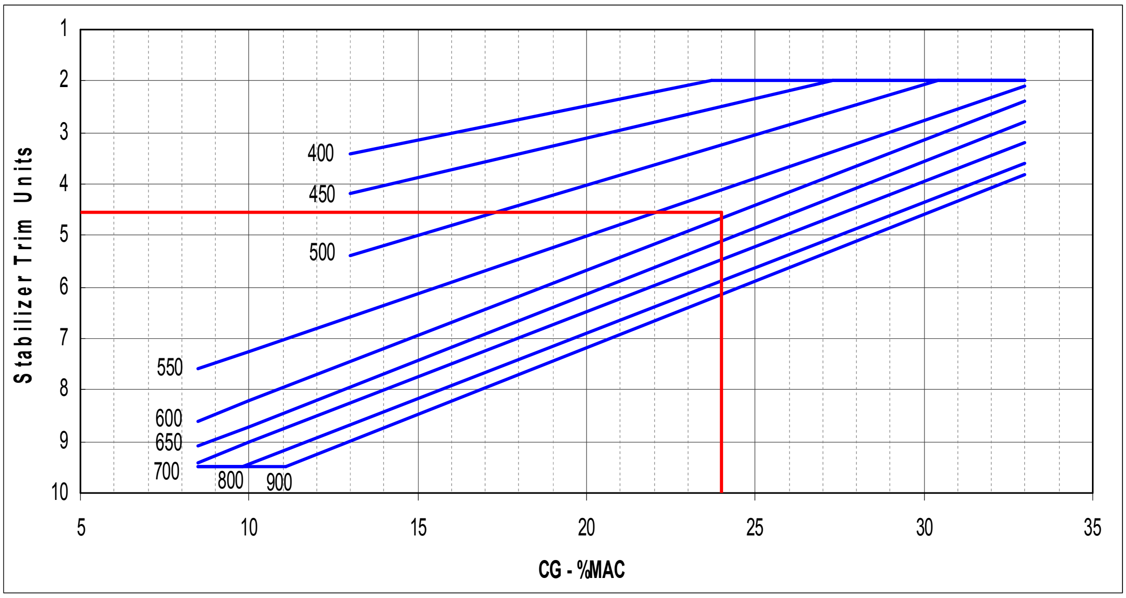


6.4.11 Stabilizer Trim Setting Value Calculation

Using Trim Setting Chart, Trim Setting value will be found.

a. Enter the Trim Setting Chart, with the CG%MAC & Takeoff weight.

b. Find the Trim Setting Value.



ASIANA AIRLINES WEIGHT AND BALANCE MANIFEST

FLIGHT NO.	REG. NO.	DATE	FROM	TO

B747-400 COMBI

	Description			Weight	I.U.
1	Standard Operating Wt				
	Adj. to Cockpit Crew				
	Adj. to Cabin Crew, SVC items				
	Operating Weight				
2	Dead Load	FWD	HOLD-1		
			HOLD-2		
		AFT	HOLD-3		
			HOLD-4A		
			4B + P		
		Bulk	5A + R		
			5B + S		
		T	T		
	Total Dead Load				
	Tipping Check				
3	Passenger	COMP' 0a			
		COMP' 0b			
		COMP' 0c			
		COMP' 0d			
	Total Passenger				
4	Total Payload (= 2+3)				
5	Zero Fuel Weight (1+4)				
6	Fuel	Ramp			
		Taxi (-)			
		Take Off			
7	Take Off Weight (5+6)				
8	Last Minute Change				
	Adjustment to Payload				
9	Adj. Takeoff Weight (7+8)				
10	Trip Fuel (-)				
	Fuel at Landing				
11	Landing Weight (9-10)				

* If Takeoff CG and Zero Fuel CG are withing limit, Landing CG check is not necessary.

Allowable Take-off Weight(AGTOW) and Traffic Load Check

	Zero Fuel	Take Off	Landing
Max Weight For			
Take-off Fuel +		Trip Fuel → +	
Allowed Weight For Takeoff (Lowest of a,b,c)	a	b	c
(Operating WT + TO Fuel) -			
Allowed Traffic Load			

Certified Weight Limits

MAX RAMP WEIGHT	873,000 LB
MAX TAKEOFF WEIGHT	870,000 LB
MAX LANDING WEIGHT	630,000 LB
MAX ZERO FUEL WEIGHT	565,000 LB

Max Load Limits

DEAD LOAD				
HOLD	ZONE	CUMULATIVE	STD	INC
1	17,832		17,832	
2	35,000		52,167	
3	21,000		89,472	104,552
4A	14,000		66,971	82,051
4B + P	25,200		54,910	69,990
5A + R	25,200		32,385	48,120
5B + S	24,420		19,284	27,005
T	4,500		4,500	4,500

Passenger Load (264 Seat: HL7421, HL7423)

COMP'	CLASS	ROWS	PSGR
COMP' 0a	F	1~4	10
COMP' 0b	C	7~12	24
COMP' 0c	Y	20~37	146
COMP' 0d	Y	38~47	84
TOTAL PASSENGER			264

Last Minute Change

Description	Compartment	Weight	I.U.
Totals			

Standard Formula

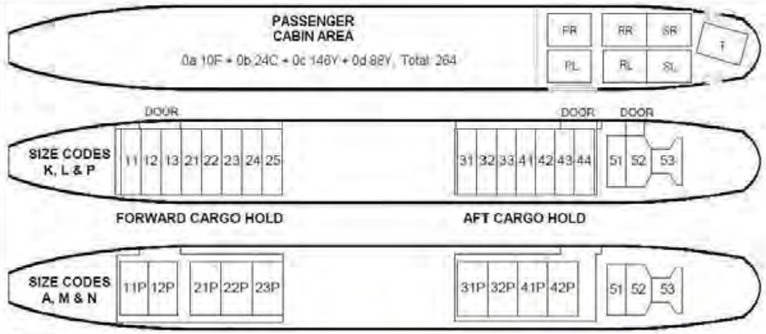
$$INDEX = \frac{\text{Weight (lb)} \times [\text{Arm (Inch)} - 1323.8]}{550,000} + 60$$

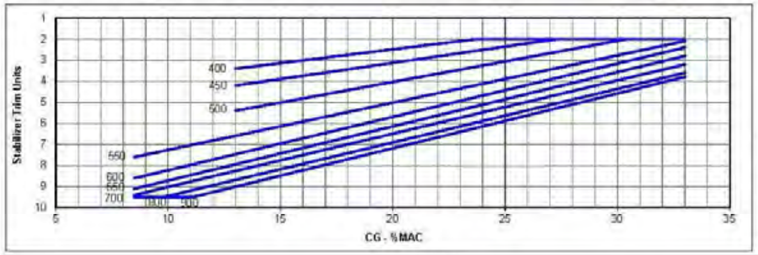
$$CG\ \%MAC = \frac{\text{Arm} - 1258}{3.278}$$

Prepared by Disp or Agent		Approved by Captain	

Effective: JUN. 2013

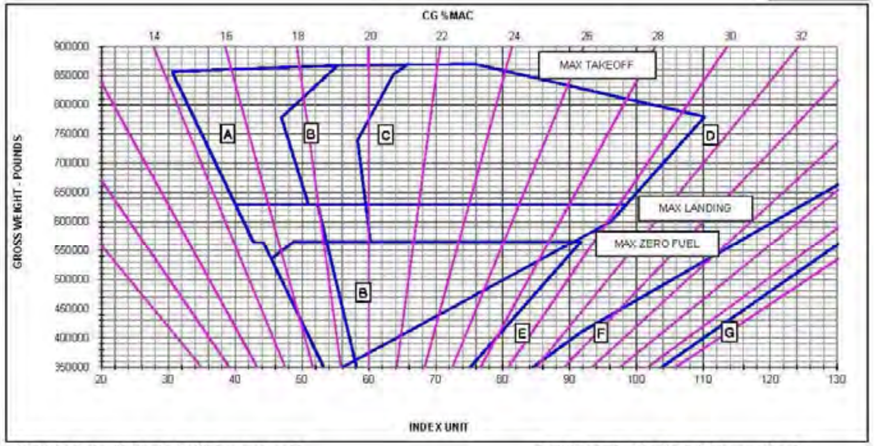
Flight Operations Engineering





Stabilizer Trim Setting

T/O C.G.
STAB TRIM



A) FWD Taxi/Takeoff Limit with NO AFT Increased Load & less than 2,500 lb of unusable tail tank fuel

B) FWD Taxi/Takeoff Limit with AFT Increased Load & less than 2,500 lb of unusable tail tank fuel

C) FWD Taxi/Takeoff Limit with tail tank fuel Loaded & NO AFT Increased Load

D) AFT Taxi/Takeoff Limit

E) AFT Zero Fuel Limit

F) AFT Towing Limit

G) AFT Tipping Limit

: B747-400Combi Weight and Balance Manifest

Dead Load Index Unit (Weight in 1,000 lb)

HOLD - 1

Wt	I.U.
1.0	-1.4
2.0	-2.7
3.0	-4.1
4.0	-5.5
5.0	-6.9
6.0	-8.2
7.0	-9.6
8.0	-11.0
9.0	-12.4
10.0	-13.7
11.0	-15.1
12.0	-16.5
13.0	-17.9
14.0	-19.2
15.0	-20.6
16.0	-22.0
17.0	-23.4
17.8	-24.5

HOLD - 2

Wt	I.U.
23.0	-21.2
24.0	-22.1
25.0	-23.0
26.0	-23.9
27.0	-24.9
28.0	-25.8
29.0	-26.7
30.0	-27.6
31.0	-28.5
32.0	-29.5
33.0	-30.4
34.0	-31.3
35.0	-32.2

P & 4B

Wt	I.U.
1.0	+0.9
2.0	+1.9
3.0	+2.8
4.0	+3.8
5.0	+4.7
6.0	+5.6
7.0	+6.6
8.0	+7.5
9.0	+8.5
10.0	+9.4
11.0	+10.3
12.0	+11.3
13.0	+12.2
14.0	+13.1
15.0	+14.1
16.0	+15.0
17.0	+16.0
18.0	+16.9
19.0	+17.8
20.0	+18.8
21.0	+19.7
22.0	+20.7
23.0	+21.6
24.0	+22.5
25.0	+23.5
25.2	+23.7

R & 5A

Wt	I.U.
15.0	+18.0
16.0	+19.2
17.0	+20.4
18.0	+21.6
19.0	+22.8
20.0	+23.9
21.0	+25.1
22.0	+26.3
23.0	+27.5
24.0	+28.7
25.0	+29.9
25.2	+30.2

T

Wt	I.U.
0.5	+0.9
1.0	+1.8
1.5	+2.6
2.0	+3.5
2.5	+4.4
3.0	+5.3
3.5	+6.2
4.0	+7.1
4.5	+7.9

INTENTIONALLY LEFT BLANK

HOLD - 2

Wt	I.U.
1.0	-0.9
2.0	-1.8
3.0	-2.8
4.0	-3.7
5.0	-4.6
6.0	-5.5
7.0	-6.4
8.0	-7.4
9.0	-8.3
10.0	-9.2
11.0	-10.1
12.0	-11.0
13.0	-12.0
14.0	-12.9
15.0	-13.8
16.0	-14.7
17.0	-15.7
18.0	-16.6
19.0	-17.5
20.0	-18.4
21.0	-19.3
22.0	-20.3

* CONTINUED *

HOLD - 3

Wt	I.U.
1.0	+0.5
3.0	+1.4
5.0	+2.4
7.0	+3.3
9.0	+4.2
11.0	+5.2
13.0	+6.1
15.0	+7.1
17.0	+8.0
19.0	+9.0
21.0	+9.9
22.2	+10.5

HOLD - 4A

Wt	I.U.
1.0	+0.7
2.0	+1.5
3.0	+2.2
4.0	+3.0
5.0	+3.7
6.0	+4.4
7.0	+5.2
8.0	+5.9
9.0	+6.7
10.0	+7.4
11.0	+8.1
12.0	+8.9
13.0	+9.6
14.0	+10.4

R & 5A

Wt	I.U.
1.0	+1.2
2.0	+2.4
3.0	+3.6
4.0	+4.8
5.0	+6.0
6.0	+7.2
7.0	+8.4
8.0	+9.6
9.0	+10.8
10.0	+12.0
11.0	+13.2
12.0	+14.4
13.0	+15.6
14.0	+16.8

* CONTINUED *

S & 5B

Wt	I.U.
1.0	+1.4
2.0	+2.8
3.0	+4.3
4.0	+5.7
5.0	+7.1
6.0	+8.5
7.0	+10.0
8.0	+11.4
9.0	+12.8
10.0	+14.2
11.0	+15.7
12.0	+17.1
13.0	+18.5
14.0	+19.9
15.0	+21.4
16.0	+22.8
17.0	+24.2
18.0	+25.6
19.0	+27.1
20.0	+28.5
21.0	+29.9
22.0	+31.3
23.0	+32.8
24.0	+34.2
24.4	+34.8

Passenger Index Unit (Weight in lb)

Compt 0a		Compt 0b	
Weight	I.U.	Weight	I.U.
200	-0.4	400	-0.5
400	-0.7	800	-1.0
600	-1.1	1,200	-1.4
800	-1.5	1,600	-1.9
1,000	-1.9	2,000	-2.4
1,200	-2.2	2,400	-2.9
1,400	-2.6	2,800	-3.3
1,600	-3.0	3,200	-3.8
1,800	-3.3	3,600	-4.3
2,000	-3.7	4,000	-4.8
2,200	-4.1	4,400	-5.2
2,400	-4.5	4,800	-5.7
		5,200	-6.2
		5,600	-6.7
		6,000	-7.2

Compt 0c		Compt 0d	
Weight	I.U.	Weight	I.U.
1,000	-0.7	1,000	+0.3
2,000	-1.4	2,000	+0.6
3,000	-2.2	3,000	+0.8
4,000	-2.9	4,000	+1.1
5,000	-3.6	5,000	+1.4
6,000	-4.3	6,000	+1.7
7,000	-5.0	7,000	+2.0
8,000	-5.8	8,000	+2.2
9,000	-6.5	9,000	+2.5
10,000	-7.2	10,000	+2.8
11,000	-7.9	11,000	+3.1
12,000	-8.6	12,000	+3.4
13,000	-9.3	13,000	+3.6
14,000	-10.1	14,000	+3.9
15,000	-10.8	15,000	+4.2
16,000	-11.5	16,000	+4.5
17,000	-12.2	17,000	+4.8
18,000	-12.9	18,000	+5.1
19,000	-13.7		
20,000	-14.4		
21,000	-15.1		
22,000	-15.8		
23,000	-16.5		
24,000	-17.3		
25,000	-18.0		
26,000	-18.7		
27,000	-19.4		
28,000	-20.1		
29,000	-20.8		
30,000	-21.6		

Fuel Index Unit (Weight in 1,000 lb)

(1) NO TAIL

Center Weight	Total Weight	I.U.
	20.0	-1.6
	30.0	-2.1
	50.0	-2.4
	70.0	-2.0
	80.0	-1.7
	90.0	-1.2
	100.0	-0.6
	110.0	+0.2
	117.2	+0.8
	120.0	+0.3
	130.0	-1.8
	140.0	-3.8
	145.7	-4.8
	150.0	-1.8
	160.0	+5.7
	163.4	+8.3
	170.0	+7.1
	180.0	+5.4
	190.0	+3.9
	200.0	+2.4
	210.0	+1.0
	220.0	-0.4
	230.0	-1.8
	240.0	-3.2
	244.4	-3.4
5.6	250.0	-5.9
10.6	255.0	-7.8
15.6	260.0	-9.7
20.6	265.0	-11.6
20.8	265.2	-11.7
25.6	270.0	-13.5
30.6	275.0	-15.4
35.6	280.0	-17.3
41.5	286.0	-19.6
45.6	290.0	-21.1
50.6	295.0	-23.0
55.6	300.0	-24.9
60.6	305.0	-26.8
65.6	310.0	-28.6
70.6	315.0	-30.6
75.6	320.0	-32.5
80.6	325.0	-34.4
85.6	330.0	-36.2
90.6	335.0	-38.1
95.6	340.0	-40.1
100.6	345.0	-42.1
105.6	350.0	-44.3
110.6	355.0	-46.6
115.0	359.4	-48.8

(2) WITH TAIL

WING TANK FUEL QUANTITY LOADED IS 244.4K

Center Weight	Tail Weight	Total Weight*	I.U.
36.4	7.0	287.8	-2.2
38.2	7.4	290.0	-2.1
42.4	8.2	295.0	-1.9
46.6	9.0	300.0	-1.7
50.8	9.8	305.0	-1.5
55.0	10.6	310.0	-1.3
59.2	11.4	315.0	-1.1
63.4	12.2	320.0	-0.9
67.6	13.0	325.0	-0.6
71.8	13.8	330.0	-0.4
76.0	14.6	335.0	-0.2
80.2	15.4	340.0	+0.0
84.4	16.2	345.0	+0.3
88.6	17.0	350.0	+0.6
92.7	17.8	355.0	+0.8
96.9	18.6	360.0	+0.8
101.1	19.4	365.0	+1.0
105.3	20.3	370.0	+1.0
109.5	21.1	375.0	+0.8
113.7	21.9	380.0	+0.6
115.0	22.1	381.5	+0.7

(3) TAIL ONLY

Weight	I.U.
0.1	+0.2
0.2	+0.4
0.3	+0.7
0.4	+0.9
0.5	+1.1
0.6	+1.3
0.7	+1.5
0.8	+1.7
0.9	+2.0
1.0	+2.2
7.0	+15.5
8.0	+17.7
9.0	+19.9
10.0	+22.2
11.0	+24.4
12.0	+26.6
13.0	+28.9
14.0	+31.1
15.0	+33.4
16.0	+35.6
17.0	+37.9
18.0	+40.2
19.0	+42.4
20.0	+44.7
22.1	+49.5

<NOTES>

- Usable fuel quantity in lines, manifold and engines : 800 LBS included
- Minimum Tail Tank Fuel : 6,700 LBS
- Minimum Center Tank Fuel : 4,000 LBS

* : TOTAL FUEL WEIGHT
  = WING TANK(244.4k) + CENTER TANK + TAIL TANK

<TABLE READING INSTRUCTION>

(1) NO TAIL
Recommended fueling procedure if tail tank INOP or NOT AVAIABLE

(2) WITH TAIL
Recommended fueling procedure for automatic fuel loading with TAIL TANK

(3) TAIL ONLY
Index Unit change Reference Table with Tail Tank Only

ASIANA AIRLINES WEIGHT AND BALANCE MANIFEST

FLT. NO.	REG. NO.	Date	From	To

B747-400 PAX

	Description			Weight	(+/-) I.U.
1	Standard Operating Wt				
	Adj. to Cockpit Crew				
	Adj. to Cabin Crew, SVC items				
	Operating Weight				
2	Dead Load	FWD	HOLD-1		
			HOLD-2		
		AFT	HOLD-3		
			4A		
			4B		
		Bulk	5A		
			5B		
	Total Dead Load				
3	PSGR	Zone 0a			
		Zone 0b			
		Zone 0c			
		Zone 0d			
		Zone 0e			
		Zone 0f			
	Total Passenger				
4	Total Payload (= 2+3)				
5	Zero Fuel Weight (1+4)				
6	Fuel	Ramp			
		Taxi (-)		1 5 0 0	
		Take Off			
7	Take Off Weight (5+6)				
8	Last Minute Change				
	Adjustment to Payload				
9	Adj. Takeoff Weight (7+8)				
10	Trip Fuel (-)				
	Fuel at Landing				
11	Landing Weight (9-10)				

* If Takeoff CG and Zero Fuel CG are within limit, Landing Weight CG check is not necessary

Last Minute Change

Description	Compartment	Weight	I.U.
Totals			

Allowable Takeoff Weight and Traffic Load Check

	Zero Fuel	Take Off	Landing
Max Weight For			
Take-off Fuel +		Trip Fuel	+
Allowed Weight For Takeoff (Lowest of a,b,c)	a	b	c
- (SOW+Takeoff Fuel)			
Allowed Traffic Load			

Certified Weight Limits

Max Ramp Weight	873,000 LB
Max Takeoff Weight	870,000 LB
Max Landing Weight	630,000 LB
Max Zero Fuel Weight	535,000 LB

Max Load Limits

DEAD LOAD

HOLD	ZONE	CUMULATIVE	STANDARD
1	17832		17832
2	35000		52328
3	21000		46669
4A	14000		31091
4B	14000		20780
5A	3780		6780
5B	3000		3000

Passenger Load

ZONE	CLASS	ROWS	PSGR
0a	F	1~4	10
0b	C	7~12	24
0c	C	20~22	21
0d	Y	27~37	86
0e	Y	38~47	88
0f	Y	48~64	130
TOTAL PASSENGER			359

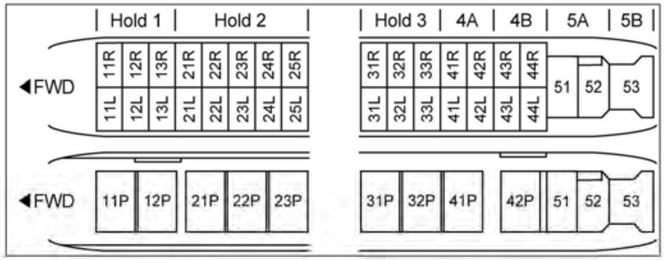
Standard Forumula

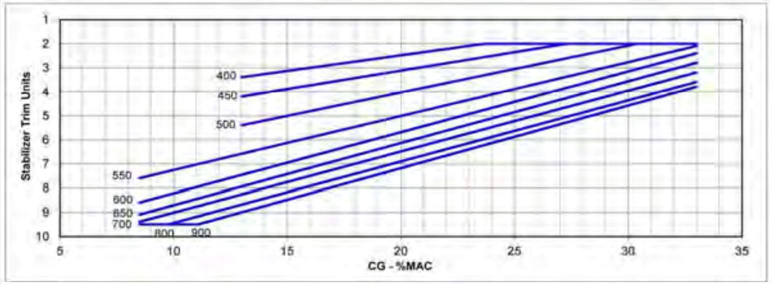
$$\text{Index Unit} = \frac{\text{Weight (lb)} \times [\text{Arm (inch)} - 1323.6)]}{550{,}000} + 60$$

$$\text{CG \%MAC} = \frac{\text{Arm (inch)} - 125}{3.278} \times 100$$

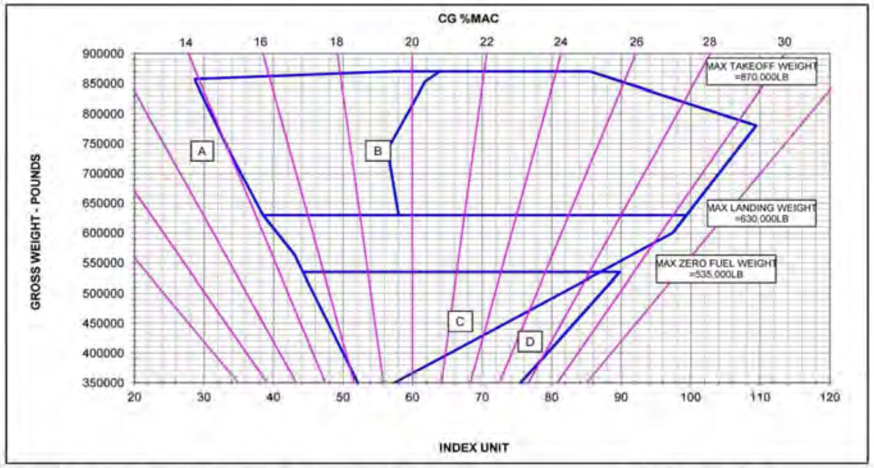
Prepared by Disp or Agent		Approved by Captain	

Effective: JUN. 2013





T/O C.G
Stab. Trim



A) FWD Taxi/Takeoff Limit with less than 2,500 lb unusable tail tank fuel
B) FWD Taxi/Takeoff Limit with tail tank fuel loaded
C) AFT Taxi/Takeoff Limit
D) AFT Zero Fuel Limit

Flight Operations Engineering

B747-400 Passenger Weight and Balance Manifest

Dead Load Index Unit (Weight in 1,000 lb)

FWD HOLD				AFT HOLD					
HOLD - 1		HOLD - 2		HOLD - 3		HOLD - 4A		HOLD - 4B	
Wt	I.U.	Wt	I.U.	Wt	I.U.	Wt	I.U.	Wt	I.U.
0.5	-0.7	1.0	-0.9	1.0	+0.5	1.0	+0.7	1.0	+1.0
1.0	-1.4	2.0	-1.8	2.0	+0.9	2.0	+1.5	2.0	+1.9
1.5	-2.1	3.0	-2.8	3.0	+1.4	3.0	+2.2	3.0	+2.9
2.0	-2.7	4.0	-3.7	4.0	+1.9	4.0	+3.0	4.0	+3.8
2.5	-3.4	5.0	-4.6	5.0	+2.3	5.0	+3.7	5.0	+4.8
3.0	-4.1	6.0	-5.5	6.0	+2.8	6.0	+4.4	6.0	+5.8
3.5	-4.8	7.0	-6.5	7.0	+3.2	7.0	+5.2	7.0	+6.7
4.0	-5.5	8.0	-7.4	8.0	+3.7	8.0	+5.9	8.0	+7.7
4.5	-6.2	9.0	-8.3	9.0	+4.2	9.0	+6.6	9.0	+8.6
5.0	-6.8	10.0	-9.2	10.0	+4.6	10.0	+7.4	10.0	+9.6
5.5	-7.5	11.0	-10.2	11.0	+5.1	11.0	+8.1	11.0	+10.6
6.0	-8.2	12.0	-11.1	12.0	+5.6	12.0	+8.9	12.0	+11.5
6.5	-8.9	13.0	-12.0	13.0	+6.0	13.0	+9.6	13.0	+12.5
7.0	-9.6	14.0	-12.9	14.0	+6.5	14.0	+10.3	14.0	+13.5
7.5	-10.3	15.0	-13.8	15.0	+6.9				
8.0	-10.9	16.0	-14.8	16.0	+7.4				
8.5	-11.6	17.0	-15.7	17.0	+7.9				
9.0	-12.3	18.0	-16.6	18.0	+8.3				
9.5	-13.0	19.0	-17.5	19.0	+8.8				
10.0	-13.7	20.0	-18.5	20.0	+9.3				
10.5	-14.4	21.0	-19.4	21.0	+9.7				
11.0	-15.1	22.0	-20.3						
11.5	-15.7	23.0	-21.2						
12.0	-16.4	24.0	-22.1						
12.5	-17.1	25.0	-23.1						
13.0	-17.8	26.0	-24.0						
13.5	-18.5	27.0	-24.9						
14.0	-19.2	28.0	-25.8						
14.5	-19.8	29.0	-26.8						
15.0	-20.5	30.0	-27.7						
15.5	-21.2	31.0	-28.6						
16.0	-21.9	32.0	-29.5						
16.5	-22.6	33.0	-30.5						
17.0	-23.3	34.0	-31.4						
17.5	-23.9	35.0	-32.3						
17.832	-24.4								

HOLD - 5A		HOLD - 5B	
Wt	I.U.	Wt	I.U.
0.5	+0.6	0.5	+0.7
1.0	+1.2	1.0	+1.4
1.5	+1.8	1.5	+2.2
2.0	+2.4	2.0	+2.9
2.5	+3.0	2.5	+3.6
3.0	+3.6	3.0	+4.3
3.5	+4.2		
3.78	+4.5		

Passenger Index Unit (Weight in 1,000 lb)

Compt 0a		Compt 0b		Compt 0c	
Weight	I.U.	Weight	I.U.	Weight	I.U.
300	-0.5	400	-0.5	500	-0.6
600	-1.1	800	-0.9	1000	-1.2
900	-1.6	1200	-1.4	1500	-1.8
1200	-2.2	1600	-1.9	2000	-2.4
1500	-2.7	2000	-2.4	2500	-3.0
1800	-3.2	2400	-2.8	3000	-3.6
2100	-3.8	2800	-3.3	3500	-4.1
2400	-4.3	3200	-3.8	4000	-4.7
		3600	-4.2	4500	-5.3
		4000	-4.7	5000	-5.9
		4400	-5.2		
		4800	-5.7		
		5200	-6.1		
		5600	-6.6		
		6000	-7.1		

Compt 0d		Compt 0e		Compt 0f	
Weight	I.U.	Weight	I.U.	Weight	I.U.
1000	-0.4	1000	+0.3	1000	+1.2
2000	-0.8	2000	+0.6	2000	+2.5
3000	-1.2	3000	+0.9	3000	+3.7
4000	-1.6	4000	+1.2	4000	+4.9
5000	-2.0	5000	+1.5	5000	+6.2
6000	-2.3	6000	+1.8	6000	+7.4
7000	-2.7	7000	+2.1	7000	+8.6
8000	-3.1	8000	+2.4	8000	+9.9
9000	-3.5	9000	+2.7	9000	+11.1
10000	-3.9	10000	+2.9	10000	+12.3
11000	-4.3	11000	+3.2	11000	+13.6
12000	-4.7	12000	+3.5	12000	+14.8
13000	-5.1	13000	+3.8	13000	+16.0
14000	-5.5	14000	+4.1	14000	+17.3
15000	-5.9	15000	+4.4	15000	+18.5
16000	-6.2	16000	+4.7	16000	+19.7
17000	-6.6	17000	+5.0	17000	+21.0
18000	-7.0	18000	+5.3	18000	+22.2
				19000	+23.4
				20000	+24.7
				21000	+25.9
				22000	+27.1
				23000	+28.4
				24000	+29.6

Fuel Index Unit (Weight in 1,000 lb)

(1) NO TAIL

Center Weight	Total Weight	I.U.
	20.0	-1.6
	30.0	-2.1
	50.0	-2.4
	70.0	-2.0
	80.0	-1.7
	90.0	-1.2
	100.0	-0.6
	110.0	+0.2
	117.2	+0.8
	120.0	+0.3
	130.0	-1.8
	140.0	-3.8
	145.7	-4.8
	150.0	-1.8
	160.0	+5.7
	163.4	+8.3
	170.0	+7.1
	180.0	+5.4
	190.0	+3.9
	200.0	+2.4
	210.0	+1.0
	220.0	-0.4
	230.0	-1.8
	240.0	-3.2
	244.4	-3.4
5.6	250.0	-5.9
10.6	255.0	-7.8
15.6	260.0	-9.7
20.6	265.0	-11.6
20.8	265.2	-11.7
25.6	270.0	-13.5
30.6	275.0	-15.4
35.6	280.0	-17.3
41.5	286.0	-19.6
45.6	290.0	-21.1
50.6	295.0	-23.0
55.6	300.0	-24.9
60.6	305.0	-26.8
65.6	310.0	-28.6
70.6	315.0	-30.6
75.6	320.0	-32.5
80.6	325.0	-34.4
85.6	330.0	-36.2
90.6	335.0	-38.1
95.6	340.0	-40.1
100.6	345.0	-42.1
105.6	350.0	-44.3
110.6	355.0	-46.6
115.0	359.4	-48.8

(2) WITH TAIL

WING TANK FUEL QUANTITY LOADED IS 244.4K

Center Weight	Tail Weight	Total Weight*	I.U.
36.4	7.0	287.8	-2.2
38.2	7.4	290.0	-2.1
42.4	8.2	295.0	-1.9
46.6	9.0	300.0	-1.7
50.8	9.8	305.0	-1.5
55.0	10.6	310.0	-1.3
59.2	11.4	315.0	-1.1
63.4	12.2	320.0	-0.9
67.6	13.0	325.0	-0.6
71.8	13.8	330.0	-0.4
76.0	14.6	335.0	-0.2
80.2	15.4	340.0	+0.0
84.4	16.2	345.0	+0.3
88.6	17.0	350.0	+0.6
92.7	17.8	355.0	+0.8
96.9	18.6	360.0	+0.8
101.1	19.4	365.0	+1.0
105.3	20.3	370.0	+1.0
109.5	21.1	375.0	+0.8
113.7	21.9	380.0	+0.6
115.0	22.1	381.5	+0.7

(3) TAIL ONLY

Weight	I.U.
0.1	+0.2
0.2	+0.4
0.3	+0.7
0.4	+0.9
0.5	+1.1
0.6	+1.3
0.7	+1.5
0.8	+1.7
0.9	+2.0
1.0	+2.2
7.0	+15.5
8.0	+17.7
9.0	+19.9
10.0	+22.2
11.0	+24.4
12.0	+26.6
13.0	+28.9
14.0	+31.1
15.0	+33.4
16.0	+35.6
17.0	+37.9
18.0	+40.2
19.0	+42.4
20.0	+44.7
22.1	+49.5

<NOTES>

- Usable fuel quantity in lines, manifold and engines : 800 LBS included
- Minimum Tail Tank Fuel : 6,700 LBS
- Minimum Center Tank Fuel : 4,000 LBS

* : TOTAL FUEL WEIGHT
  = WING TANK(244.4k) + CENTER TANK + TAIL TANK

<TABLE READING INSTRUCTION>

(1) NO TAIL
Recommended fueling procedure if tail tank INOP or NOT AVAIABLE

(2) WITH TAIL
Recommended fueling procedure for automatic fuel loading with TAIL TANK

(3) TAIL ONLY
Index Unit change Reference Table with Tail Tank Only

B747-400
Freghter A1-A2-B1

Effective: JUN. 2013
Flight Operations Engineering

ASIANA AIRLINES

Weight and Balance Manifest

Flight No.	Reg. No.	Date	From	To

	Description		Weight	(+/-)	Index
1	Standard Operating Weight				.
	Adj. to Cockpit Crew				.
	Adj. to U/D Crew				.
	Adjusted Standard Operating Weight				.
2	Total Dead Load				.
3	Zero Fuel Weight (=1+2)				.
4	Fuel	Ramp			
		Taxi (-)			
		Takeoff			.
5	Takeoff Weight (=3+4)				.
6	Last Minute Change				.
	Adjustment to Payload				.
7	Adjusted Takeoff Weight (=5+6)				.
8	Trip Fuel (-)				
	Fuel at Landing				
9	Landing Weight (=3+8)				

*If TO CG and ZF CG is within limits, LD CG check is not necessary.

Load Distribution			
Zone	Deadload	(+/-)	Index
A1			.
A2			.
B1			.
C			.
D			.
E			.
F			.
G			.
H			.
J			.
K			.
L			.
M			.
P			.
R			.
S			.
T			.
Total			.

Last Minute Changes

Description	Compartment	(+/-) Weight	I.U.
Totals			

Certified Weight Limits

Max Ramp Weight	873,000 LB
Max Takeoff Weight*	870,000 LB
Max Landing Weight	666,000 LB
Max Zero Fuel Weight*	610,000 LB

* Max Takeoff Weight should be reduced according to Max Zero Fuel Weight greater than 610,000 LB.

Allowable Gross Takeoff Weight (AGTOW) Check

Max Weight for	Zero Fuel	Takeoff	Landing
Takeoff Fuel +		Trip Fuel +	
AGTOW (= Lowest of a,b,c)	a	b	c
- SOW			
- Add Crew			
- Takeoff Fuel			
Allowed Payload			

Standard Formula

$$\text{Index} = \frac{\text{Weight (lb)} \times [\text{Arm (inch)} - 1323.6)]}{550{,}000} + 60.0$$

$$\text{CG \%MAC} = \frac{\text{Arm (inch)} - 1258}{3.278}$$

Takeoff WT.	Lateral WT.				Check
	L/H		R/H		

Zero Fuel WT. CG	Takeoff WT. CG	TO Stab. Trim

Prepared by Dispatcher or Agent		Approved by Captain	

U/D Crew Index Table

Crew	Weight	I.U.
2	420	-0.6
3	630	-0.9
4	840	-1.2
5	1050	-1.5
6	1260	-1.8

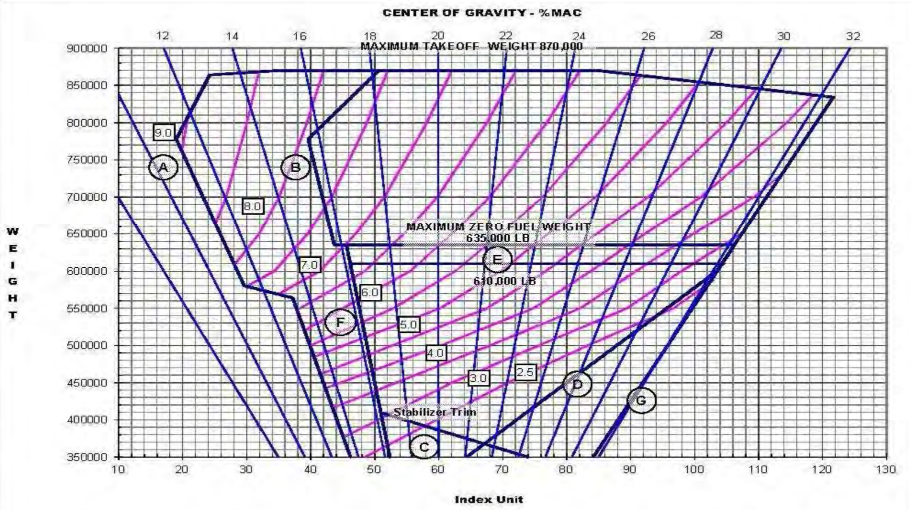
Max Takeoff Weight Restriction

Fuel Density	MTOW
>=6.43	870000
6.4	866500
6.3	854800

Lateral Imbalance

Taxi Weight	Allowed Lateral Weight	Taxi Weight	Allowed Lateral Weight
873000	36121	810000	148284
870000	41463	790000	177679
850000	77070	765000	200000
830000	112677		

Zero Fuel Weight	Forward Cumulative Load Limit								Maximum Takeoff Weight	Maximum Taxi Weight
	A1	A2	B1	C	D	E	F	G		
610000	8100	16200	29580	50774	71969	93163	116440	142826	870000	873000
612000	8100	16200	28553	49360	70573	91785	115076	141462	865280	868280
614000	8100	16004	27527	47946	69177	90407	113712	140098	860560	863560
616000	7969	15548	26500	46532	67781	89029	112348	138734	855840	858840
618000	7736	15093	25474	45118	66385	87651	110984	137370	851120	854120
620000	7502	14638	24448	43704	64989	86273	109620	136006	846400	849400
622000	7269	14182	23421	42290	63593	84895	108256	134642	841680	844680
624000	7035	13727	22395	40876	62197	83518	106892	133278	836960	839960
626000	6802	13272	21368	39462	60801	82140	105528	131914	832240	835240
628000	6569	12816	20342	38048	59405	80762	104164	130550	827520	830520
630000	6335	12361	19316	36634	58009	79384	102800	129186	822800	825800
632000	6102	11906	18289	35220	56613	78006	101436	127822	818080	821080
634000	5868	11450	17263	33806	55217	76628	100072	126458	813360	816360
635000	5752	11223	16750	33100	54520	75940	99390	125776	811000	814000



A) FWD TAXI/TAKEOFF LIMIT
B) FWD TAXI/TAKEOFF LIMIT WITH INCREASED AFT LOADS
C) FWD ZERO FUEL LIMIT, FUEL >255,000LB
D) AFT TAXI/TAKEOFF LIMIT
E) INCREASED ZERO FULE WEIGHT ZONE
F) FWD ZERO FUEL LIMIT
G) AFT ZERO FUEL LIMIT

Cargo Index Unit table (lb)

T		S		R		P		M		L		K	
WT	IU	WT	IU	WT	IU	WT	IU	WT	IU	WT	IU	WT	IU
566	+1	662	+1	780	+1	1049	+1	1381	+1	2019	+1	3757	+1
1131	+2	1323	+2	1559	+2	2098	+2	2761	+2	4038	+2	7514	+2
1697	+3	1985	+3	2339	+3	3146	+3	4142	+3	6057	+3	11270	+3
2262	+4	2646	+4	3119	+4	4195	+4	5522	+4	8076	+4	15027	+4
2828	+5	3308	+5	3898	+5	5244	+5	6903	+5	10095	+5	18784	+5
3394	+6	3969	+6	4678	+6	6293	+6	8283	+6	12115	+6	22541	+6
3959	+7	4631	+7	5458	+7	7342	+7	9664	+7	14134	+7	26298	+7
4500	+8.0	5292	+8	6238	+8	8391	+8	11044	+8	16153	+8	30055	+8
		5954	+9	7017	+9	9439	+9	12425	+9	18172	+9	31770	+8.5
		6615	+10	7797	+10	10488	+10	13805	+10	20191	+10		
		7277	+11	8577	+11	11537	+11	15186	+11	22210	+11		
		7938	+12	9356	+12	12586	+12	16566	+12	24229	+12		
		8600	+13	10136	+13	13635	+13	17947	+13	25200	+12.5		
		9261	+14	10916	+14	14683	+14	19327	+14				
		9923	+15	11695	+15	15732	+15	20708	+15				
		10585	+16	12475	+16	16781	+16	22088	+16				
		11246	+17	13255	+17	17830	+17	23469	+17				
		11908	+18	14035	+18	18879	+18	24849	+18				
		12569	+19	14814	+19	19928	+19	25200	+18.3				
		13231	+20	15594	+20	20976	+20						
		13892	+21	16374	+21	22025	+21						
		14554	+22	17153	+22	23074	+22						
		15215	+23	17933	+23	24123	+23						
		15877	+24	18713	+24	25172	+24						
		16538	+25	19492	+25	26220	+25						
		17200	+26	20272	+26	27269	+26						
		17861	+27	21052	+27	28318	+27						
		18523	+28	21832	+28	29367	+28						
		19185	+29	22611	+29	30416	+29						
		19846	+30	23391	+30	31465	+30						
		20508	+31	24171	+31	32513	+31						
		21169	+32	24950	+32	33562	+32						
		21831	+33	25200	+32.3	34611	+33						
		22492	+34			35660	+34						
		23154	+35			36200	+34.5						
		23460	+35.5										

J		H		G		F		E	
WT	IU	WT	IU	WT	IU	WT	IU	WT	IU
26961	+1	5208	-1	2375	-1	1538	-1	1137	-1
36200	+1.3	10417	-2	4750	-2	3076	-2	2275	-2
		15625	-3	7124	-3	4614	-3	3412	-3
		20833	-4	9499	-4	6152	-4	4549	-4
		26042	-5	11874	-5	7690	-5	5687	-5
		31250	-6	14249	-6	9228	-6	6824	-6
		36200	-7.0	16623	-7	10766	-7	7961	-7
				18998	-8	12304	-8	9098	-8
				21373	-9	13842	-9	10236	-9
				23748	-10	15380	-10	11373	-10
				26123	-11	16918	-11	12510	-11
				28497	-12	18456	-12	13648	-12
				30872	-13	19994	-13	14785	-13
				33247	-14	21532	-14	15922	-14
				35622	-15	23070	-15	17060	-15
				36200	-15.2	24609	-16	18197	-16
						26147	-17	19334	-17
						27685	-18	20471	-18
						27810	-18.1	21609	-19
								22746	-20
								23883	-21
								25021	-22
								25200	-22.2

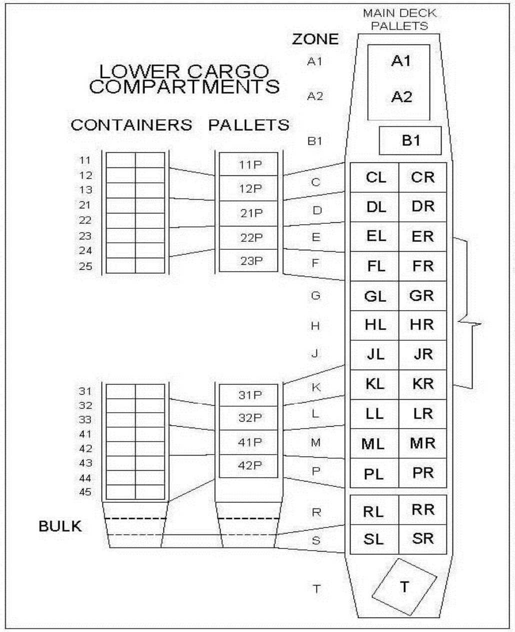
D		C		B1		A2		A1	
WT	IU	WT	IU	WT	IU	WT	IU	WT	IU
902	-1	748	-1	649	-1	582	-1	528	-1
1804	-2	1495	-2	1298	-2	1165	-2	1056	-2
2707	-3	2243	-3	1947	-3	1747	-3	1584	-3
3609	-4	2991	-4	2596	-4	2329	-4	2112	-4
4511	-5	3738	-5	3244	-5	2911	-5	2640	-5
5413	-6	4486	-6	3893	-6	3494	-6	3168	-6
6316	-7	5234	-7	4542	-7	4076	-7	3696	-7
7218	-8	5982	-8	5191	-8	4658	-8	4224	-8
8120	-9	6729	-9	5840	-9	5240	-9	4752	-9
9022	-10	7477	-10	6489	-10	5823	-10	5280	-10
9925	-11	8225	-11	7138	-11	6405	-11	5808	-11
10827	-12	8972	-12	7787	-12	6987	-12	6336	-12
11729	-13	9720	-13	8436	-13	7569	-13	6864	-13
12631	-14	10468	-14	9084	-14	8100	-13.9	7392	-14
13533	-15	11215	-15	9733	-15			7921	-15
14436	-16	11963	-16	10382	-16			8100	-15.3
15338	-17	12711	-17	11031	-17				
16240	-18	13458	-18	11680	-18				
17142	-19	14206	-19	12329	-19				
18045	-20	14954	-20	12978	-20				
18947	-21	15701	-21	13627	-21				
19849	-22	16449	-22	13791	-21.3				
20751	-23	17197	-23						
21654	-24	17945	-24						
22556	-25	18692	-25						
23458	-26	19440	-26						
24360	-27	20188	-27						
25200	-27.9	20935	-28						
		21683	-29						
		22431	-30						
		23178	-31						
		23926	-32						
		24674	-33						
		25200	-33.7						

Fuel Index Unit (lb)

Total Fuel	Density (lb/US Gal) 6.3	6.5	6.7	6.9
10000	-1.0	-1.0	-1.0	-1.0
20000	-1.6	-1.6	-1.6	-1.7
30000	-2.0	-2.0	-2.1	-2.1
40000	-2.2	-2.2	-2.3	-2.3
50000	-2.2	-2.3	-2.4	-2.4
60000	-2.0	-2.1	-2.2	-2.3
70000	-1.8	-1.9	-2.0	-2.1
80000	-1.4	-1.6	-1.7	-1.8
90000	-0.9	-1.1	-1.2	-1.4
100000	-0.2	-0.4	-0.6	-0.9
110000	+0.8	+0.4	+0.2	-0.1
120000	-1.2	-0.5	+0.3	+0.8
130000	-3.2	-2.5	-1.8	-1.1
140000	-2.4	-4.4	-3.8	-3.1
150000	+5.1	+1.6	-1.8	-4.9
160000	+6.7	+7.7	+5.7	+2.3
170000	+5.1	+6.0	+7.1	+8.2
180000	+3.5	+4.5	+5.5	+6.5
190000	+2.0	+3.0	+4.0	+5.0
200000	+0.6	+1.6	+2.4	+3.3
210000	-0.9	+1.0	+1.0	+2.0
220000	-2.2	-1.3	-0.4	+0.5
230000	-3.4	2.8	-1.8	-0.9
240000	-7.5	-4.7	-3.2	-2.4
250000	-11.4	-8.7	-6.0	-3.3
260000	-15.1	-12.5	-9.8	-7.2
270000	-18.9	-16.3	-13.6	-11.0
280000	-22.7	-20.1	-17.5	-14.8
290000	-26.5	-23.8	-21.2	-18.6
300000	-30.3	-27.6	-25.0	-22.4
310000	-34.0	-31.4	-28.7	-26.1
320000	-38.0	-35.1	-32.6	-29.9
330000	-42.2	-39.1	-36.3	-33.7
337957	-46.1	-	-	-
340000		-43.4	-40.2	-37.4
348686		-47.5	-	-
350000			-44.4	-41.3
359415			-49.0	-
360000				-45.5
370000				-50.3
370144				-50.5

Center Tank Fuel Index (1,000 lb)

WT	IU	WT	IU	WT	IU	WT	IU
1	-0.5	31	-12.2	61	-23.6	91	-34.8
2	-0.9	32	-12.5	62	-24.0	92	-35.2
3	-1.4	33	-12.9	63	-24.4	93	-35.6
4	-1.8	34	-13.3	64	-24.7	94	-36.0
5	-2.2	35	-13.7	65	-25.0	95	-36.4
6	-2.7	36	-14.1	66	-25.4	96	-36.9
7	-3.1	37	-14.4	67	-25.8	97	-37.3
8	-3.4	38	-14.8	68	-26.2	98	-37.7
9	-3.8	39	-15.2	69	-26.5	99	-38.1
10	-4.2	40	-15.6	70	-26.9	100	-38.5
11	-4.6	41	-16.0	71	-27.3	101	-38.9
12	-5.0	42	-16.3	72	-27.7	102	-39.3
13	-5.4	43	-16.7	73	-28.1	103	-39.8
14	-5.7	44	-17.1	74	-28.5	104	-40.2
15	-6.1	45	-17.5	75	-28.9	105	-40.6
16	-6.5	46	-17.9	76	-29.2	106	-41.2
17	-6.9	47	-18.3	77	-29.6	107	-41.6
18	-7.3	48	-18.6	78	-30.0	108	-41.9
19	-7.6	49	-19.0	79	-30.4	109	-42.5
20	-8.0	50	-19.4	80	-30.8	110	-42.9
21	-8.4	51	-19.8	81	-31.2	111	-43.4
22	-8.8	52	-20.1	82	-31.5	112	-43.9
23	-9.1	53	-20.5	83	-31.9	113	-44.4
24	-9.5	54	-20.9	84	-32.3	114	-44.9
25	-9.9	55	-21.3	85	-32.5	115	-45.5
26	-10.3	56	-21.6	86	-32.9		
27	-10.7	57	-22.0	87	-33.3		
28	-11.0	58	-22.4	88	-33.7		
29	-11.4	59	-22.8	89	-34.1		
30	-11.8	60	-23.2	90	-34.5		



Main Deck Center Loading Limit (lb)

Zone	Size Code A	G	M	R
C, D, E, F	18400	36600	19200	30100
G, H, J	30500	63600	33300	52200
K, L, M, P, R, S	18400	36600	19200	30100

Main Deck Maximum Pallet Load per Side (lb)

Position: C, D, P & R		E, F, K, L, M & S				G, H & J			
10710	10710	10710	10710	14600	5199	18270	18270	28000	8540
10800	10377	10800	10583	14800	4916	18500	18040	28500	8040
11000	9638	11000	10299	15000	4633	19000	17540	29000	7540
11200	8899	11200	10016	15200	4349	19500	17040	29500	7040
11400	8160	11400	9732	15400	4066	20000	16540	30000	6540
11600	7421	11600	9449	15600	3783	20500	16040	30500	6040
11800	6682	11800	9166	15800	3499	21000	15540	31000	5540
12000	5943	12000	8883	16000	3216	21500	15040	31500	5040
12200	5203	12200	8599	16200	2932	22000	14540	32000	4540
12400	4464	12400	8316	16400	2649	22500	14040	32500	4040
12600	3725	12600	8033	16600	2366	23000	13540	33000	3540
12800	2986	12800	7749	16800	2082	23500	13040	33333	3207
13000	2247	13000	7466	17000	1799	24000	12540		
13200	1508	13200	7183	17200	1516	24500	12040		
13400	769	13400	6899	17400	1232	25000	11540		
13608	0	13600	6616	17600	949	25500	11040		
		13800	6333	17800	666	26000	10540		
		14000	6049	18000	382	26500	10040		
		14200	5766	18270	0	27000	9540		
		14400	5482			27500	9040		

Shaded area exceeds the maximum load with all restraints operative.
Additional tiedowns required

B747-446F
Freghter *A1-A2-B1*

Effective. JUN. 2013
Flight Operations Engineering

ASIANA AIRLINES

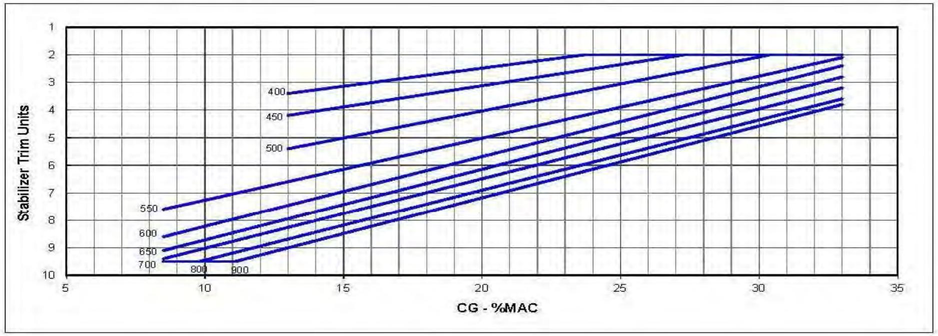
Weight and Balance Manifest

Flight No.	Reg. No.	Date	From	To

U/D Crew Index Table		
Crew	Weight	I.U.
2	420	-0.6
3	630	-0.9
4	840	-1.2
5	1050	-1.5
6	1260	-1.8

Max Takeoff Weight Restriction	
Fuel Density	MTOW
>=6.43	870000
6.4	866500
6.3	854800

Lateral Imbalance			
Taxi Weight	Allowed Lateral Weight	Taxi Weight	Allowed Lateral Weight
873000	36121	810000	148284
870000	41463	790000	177679
850000	77070	765000	200000
830000	112677		



	Description		Weight	(+/-) Index
1	Standard Operating Weight			.
	Adj. to Cockpit Crew			.
	Adj. to U/D Crew			.
	Adjusted Standard Operating Weight			.
2	Total Dead Load			.
3	Zero Fuel Weight (=1+2)			.
4	Fuel	Ramp		
		Taxi (-)		
		Takeoff		.
5	Takeoff Weight (=3+4)			.
6	Last Minute Change			.
	Adjustment to Payload			.
7	Adjusted Takeoff Weight (=5+6)			.
8	Trip Fuel (-)			
	Fuel at Landing			
9	Landing Weight (=3+8)			.

*If TO CG and ZF CG is within limits, LD CG check is not necessary.

Load Distribution		
Zone	Deadload	(+/-) Index
A1		.
A2		.
B1		.
C		.
D		.
E		.
F		.
G		.
H		.
J		.
K		.
L		.
M		.
P		.
R		.
S		.
T		.
Total		.

Last Minute Changes			
Description	Compartment	(+/-) Weight	I.U.
Totals			

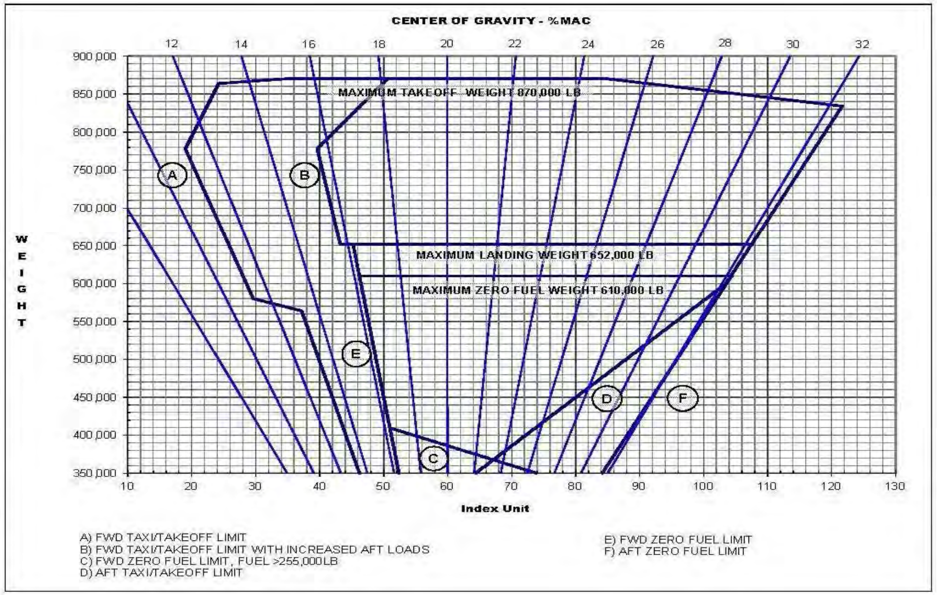
Allowable Gross Takeoff Weight (AGTOW) Check			
Max Weight for	Zero Fuel	Takeoff	Landing
Takeoff Fuel +			Trip Fuel +
AGTOW (= Lowest of a,b,c)	a	b	c
- SOW			
- Add Crew			
- Takeoff Fuel			
Allowed Payload			

Certified Weight Limits & REG. NO.	
Max Taxi Weight	873,000 LB
Max Takeoff Weight	870,000 LB
Max Landing Weight	652,000 LB
Max Zero Fuel Weight	610,000 LB
Registration Number	HL7616

Standard Formula

$$\text{Index} = \frac{\text{Weight (lb)} \times [\text{Arm (inch)} - 1323.6)]}{550{,}000} + 60.0$$

$$\text{CG \%MAC} = \frac{\text{Arm (inch)} - 1258}{3.278}$$



Takeoff WT.	Lateral WT.		Check
	L/H	R/H	

Zero Fuel WT. CG	Takeoff WT. CG	TO Stab. Trim

Prepared by Dispatcher or Agent		Approved by Captain	

Cargo Index Unit table (lb)

T WT	T IU	S WT	S IU	R WT	R IU	P WT	P IU	M WT	M IU	L WT	L IU	K WT	K IU	J WT	J IU
566	+1	662	+1	780	+1	1049	+1	1381	+1	2019	+1	3757	+1	26961	+1
1131	+2	1323	+2	1559	+2	2098	+2	2761	+2	4038	+2	7514	+2	36200	+1.3
1697	+3	1985	+3	2339	+3	3146	+3	4142	+3	6057	+3	11270	+3		
2262	+4	2646	+4	3119	+4	4195	+4	5522	+4	8076	+4	15027	+4		
2828	+5	3308	+5	3898	+5	5244	+5	6903	+5	10095	+5	18784	+5		
3394	+6	3969	+6	4678	+6	6293	+6	8283	+6	12115	+6	22541	+6		
3959	+7	4631	+7	5458	+7	7342	+7	9664	+7	14134	+7	26298	+7		
4500	+8.0	5292	+8	6238	+8	8391	+8	11044	+8	16153	+8	30055	+8		
		5954	+9	7017	+9	9439	+9	12425	+9	18172	+9	31770	+8.5		
		6615	+10	7797	+10	10488	+10	13805	+10	20191	+10				
		7277	+11	8577	+11	11537	+11	15186	+11	22210	+11				
		7938	+12	9356	+12	12586	+12	16566	+12	24229	+12				
		8600	+13	10136	+13	13635	+13	17947	+13	25200	+12.5				
		9261	+14	10916	+14	14683	+14	19327	+14						
		9923	+15	11695	+15	15732	+15	20708	+15						
		10585	+16	12475	+16	16781	+16	22088	+16						
		11246	+17	13255	+17	17830	+17	23469	+17						
		11908	+18	14035	+18	18879	+18	24849	+18						
		12569	+19	14814	+19	19928	+19	25200	+18.3						
		13231	+20	15594	+20	20976	+20								
		13892	+21	16374	+21	22025	+21								
		14554	+22	17153	+22	23074	+22								
		15215	+23	17933	+23	24123	+23								
		15877	+24	18713	+24	25172	+24								
		16538	+25	19492	+25	26220	+25								
		17200	+26	20272	+26	27269	+26								
		17861	+27	21052	+27	28318	+27								
		18523	+28	21832	+28	29367	+28								
		19185	+29	22611	+29	30416	+29								
		19846	+30	23391	+30	31465	+30								
		20508	+31	24171	+31	32513	+31								
		21169	+32	24950	+32	33562	+32								
		21831	+33	25200	+32.3	34611	+33								
		22492	+34			35660	+34								
		23154	+35			36200	+34.5								
		23460	+35.5												

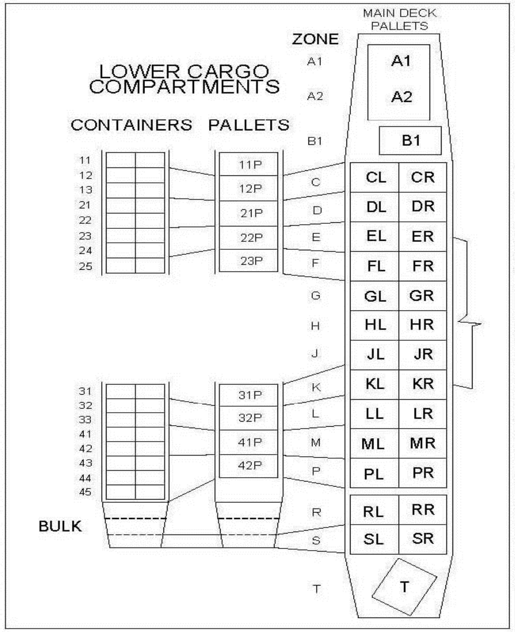
H WT	H IU	G WT	G IU	F WT	F IU	E WT	E IU	D WT	D IU	C WT	C IU	B1 WT	B1 IU	A2 WT	A2 IU	A1 WT	A1 IU
5208	-1	2375	-1	1538	-1	1137	-1	902	-1	748	-1	649	-1	582	-1	528	-1
10417	-2	4750	-2	3076	-2	2275	-2	1804	-2	1495	-2	1298	-2	1165	-2	1056	-2
15625	-3	7124	-3	4614	-3	3412	-3	2707	-3	2243	-3	1947	-3	1747	-3	1584	-3
20833	-4	9499	-4	6152	-4	4549	-4	3609	-4	2991	-4	2596	-4	2329	-4	2112	-4
26042	-5	11874	-5	7690	-5	5687	-5	4511	-5	3738	-5	3244	-5	2911	-5	2640	-5
31250	-6	14249	-6	9228	-6	6824	-6	5413	-6	4486	-6	3893	-6	3494	-6	3168	-6
36200	-7.0	16623	-7	10766	-7	7961	-7	6316	-7	5234	-7	4542	-7	4076	-7	3696	-7
		18998	-8	12304	-8	9098	-8	7218	-8	5982	-8	5191	-8	4658	-8	4224	-8
		21373	-9	13842	-9	10236	-9	8120	-9	6729	-9	5840	-9	5240	-9	4752	-9
		23748	-10	15380	-10	11373	-10	9022	-10	7477	-10	6489	-10	5823	-10	5280	-10
		26123	-11	16918	-11	12510	-11	9925	-11	8225	-11	7138	-11	6405	-11	5808	-11
		28497	-12	18456	-12	13648	-12	10827	-12	8972	-12	7787	-12	6987	-12	6336	-12
		30872	-13	19994	-13	14785	-13	11729	-13	9720	-13	8436	-13	7569	-13	6864	-13
		33247	-14	21532	-14	15922	-14	12631	-14	10468	-14	9084	-14	8100	-13.9	7392	-14
		35622	-15	23070	-15	17060	-15	13533	-15	11215	-15	9733	-15			7921	-15
		36200	-15.2	24609	-16	18197	-16	14436	-16	11963	-16	10382	-16			8100	-15.3
				26147	-17	19334	-17	15338	-17	12711	-17	11031	-17				
				27685	-18	20471	-18	16240	-18	13458	-18	11680	-18				
				27810	-18.1	21609	-19	17142	-19	14206	-19	12329	-19				
						22746	-20	18045	-20	14954	-20	12978	-20				
						23883	-21	18947	-21	15701	-21	13627	-21				
						25021	-22	19849	-22	16449	-22	13791	-21.3				
						25200	-22.2	20751	-23	17197	-23						
								21654	-24	17945	-24						
								22556	-25	18692	-25						
								23458	-26	19440	-26						
								24360	-27	20188	-27						
								25200	-27.9	20935	-28						
										21683	-29						
										22431	-30						
										23178	-31						
										23926	-32						
										24674	-33						
										25200	-33.7						

Center Tank Fuel Index (1,000 lb)

WT	IU	WT	IU	WT	IU	WT	IU
1	-0.5	31	-12.2	61	-23.6	91	-34.8
2	-0.9	32	-12.5	62	-24.0	92	-35.2
3	-1.4	33	-12.9	63	-24.4	93	-35.6
4	-1.8	34	-13.3	64	-24.7	94	-36.0
5	-2.2	35	-13.7	65	-25.0	95	-36.4
6	-2.7	36	-14.1	66	-25.4	96	-36.9
7	-3.1	37	-14.4	67	-25.8	97	-37.3
8	-3.4	38	-14.8	68	-26.2	98	-37.7
9	-3.8	39	-15.2	69	-26.5	99	-38.1
10	-4.2	40	-15.6	70	-26.9	100	-38.5
11	-4.6	41	-16.0	71	-27.3	101	-38.9
12	-5.0	42	-16.3	72	-27.7	102	-39.3
13	-5.4	43	-16.7	73	-28.1	103	-39.8
14	-5.7	44	-17.1	74	-28.5	104	-40.2
15	-6.1	45	-17.5	75	-28.9	105	-40.6
16	-6.5	46	-17.9	76	-29.2	106	-41.2
17	-6.9	47	-18.3	77	-29.6	107	-41.6
18	-7.3	48	-18.6	78	-30.0	108	-41.9
19	-7.6	49	-19.0	79	-30.4	109	-42.5
20	-8.0	50	-19.4	80	-30.8	110	-42.9
21	-8.4	51	-19.8	81	-31.2	111	-43.4
22	-8.8	52	-20.1	82	-31.5	112	-43.9
23	-9.1	53	-20.5	83	-31.9	113	-44.4
24	-9.5	54	-20.9	84	-32.3	114	-44.9
25	-9.9	55	-21.3	85	-32.5	115	-45.5
26	-10.3	56	-21.6	86	-32.9		
27	-10.7	57	-22.0	87	-33.3		
28	-11.0	58	-22.4	88	-33.7		
29	-11.4	59	-22.8	89	-34.1		
30	-11.8	60	-23.2	90	-34.5		

Fuel Index Unit (lb)

Total Fuel	Density (lb/US Gal) 6.3	6.5	6.7	6.9
10000	-1.0	-1.0	-1.0	-1.0
20000	-1.6	-1.6	-1.6	-1.7
30000	-2.0	-2.0	-2.1	-2.1
40000	-2.2	-2.2	-2.3	-2.3
50000	-2.2	-2.3	-2.4	-2.4
60000	-2.0	-2.1	-2.2	-2.3
70000	-1.8	-1.9	-2.0	-2.1
80000	-1.4	-1.6	-1.7	-1.8
90000	-0.9	-1.1	-1.2	-1.4
100000	-0.2	-0.4	-0.6	-0.9
110000	+0.8	+0.4	+0.2	-0.1
120000	-1.2	-0.5	+0.3	+0.8
130000	-3.2	-2.5	-1.8	-1.1
140000	-2.4	-4.4	-3.8	-3.1
150000	+5.1	+1.6	-1.8	-4.9
160000	+6.7	+7.7	+5.7	+2.3
170000	+5.1	+6.0	+7.1	+8.2
180000	+3.5	+4.5	+5.5	+6.5
190000	+2.0	+3.0	+4.0	+5.0
200000	+0.6	+1.6	+2.4	+3.3
210000	-0.9	+1.0	+1.0	+2.0
220000	-2.2	-1.3	-0.4	+0.5
230000	-3.4	2.8	-1.8	-0.9
240000	-7.5	-4.7	-3.2	-2.4
250000	-11.4	-8.7	-6.0	-3.3
260000	-15.1	-12.5	-9.8	-7.2
270000	-18.9	-16.3	-13.6	-11.0
280000	-22.7	-20.1	-17.5	-14.8
290000	-26.5	-23.8	-21.2	-18.6
300000	-30.3	-27.6	-25.0	-22.4
310000	-34.0	-31.4	-28.7	-26.1
320000	-38.0	-35.1	-32.6	-29.9
330000	-42.2	-39.1	-36.3	-33.7
337957	-46.1	-	-	-
340000		-43.4	-40.2	-37.4
348686		-47.5	-	-
350000			-44.4	-41.3
359415			-49.0	-
360000				-45.5
370000				-50.3
370144				-50.5



Main Deck Center Loading Limit (lb)

Zone	Size Code A	G	M	R
C, D, E, F	18400	36600	19200	30100
G, H, J	30500	63600	33300	52200
K, L, M, P, R, S	18400	36600	19200	30100

Main Deck Maximum Pallet Load per Side (lb)

Position: C, D, P & R		E, F, K, L, M & S				G, H & J			
10710	10710	10710	10710	14600	5199	18270	18270	28000	8540
10800	10377	10800	10583	14800	4916	18500	18040	28500	8040
11000	9638	11000	10299	15000	4633	19000	17540	29000	7540
11200	8899	11200	10016	15200	4349	19500	17040	29500	7040
11400	8160	11400	9732	15400	4066	20000	16540	30000	6540
11600	7421	11600	9449	15600	3783	20500	16040	30500	6040
11800	6682	11800	9166	15800	3499	21000	15540	31000	5540
12000	5943	12000	8883	16000	3216	21500	15040	31500	5040
12200	5203	12200	8599	16200	2932	22000	14540	32000	4540
12400	4464	12400	8316	16400	2649	22500	14040	32500	4040
12600	3725	12600	8033	16600	2366	23000	13540	33000	3540
12800	2986	12800	7749	16800	2082	23500	13040	33333	3207
13000	2247	13000	7466	17000	1799	24000	12540		
13200	1508	13200	7183	17200	1516	24500	12040		
13400	769	13400	6899	17400	1232	25000	11540		
13608	0	13600	6616	17600	949	25500	11040		
		13800	6333	17800	666	26000	10540		
		14000	6049	18000	382	26500	10040		
		14200	5766	18270	0	27000	9540		
		14400	5482			27500	9040		

Shaded area exceeds the maximum load with all restraints operative.
Additional tiedowns required

ASIANA AIRLINES WEIGHT AND BALANCE MANIFEST

FLIGHT NO.	REG. NO.	DATE	FROM	TO

B747-400 Special Freighter

	Description		Weight	(+/-)	Index
1	Standard Operating Weight				.
	Adjustment to Crew (210lb,-0.4/Crew)				.
	Adjustment to U/D Crew				.
	Adjusted Standard Operating Weight				.
2	Total Dead Load				.
3	Zero Fuel Weight (=1+2)				.
4	Fuel	Ramp			
		Taxi (-)			
		Takeoff			.
5	Takeoff Weight (=3+4)				.
6	Last Minute Change				.
	Adjustment to Payload				.
7	Adjusted Takeoff Weight (=5+6)				.
8	Trip Fuel (-)				
	Fuel at Landing				
9	Landing Weight (=3+8)				

NOTE: If TO CG and ZF CG are within limits, LD CG check is not necessary.

Last Minute Changes

Description	Compartment	(+/-) Weight	I.U.
Totals			

Allowable Gross Takeoff Weight (AGTOW) Check

Max Weight for	Zero Fuel	Takeoff	Landing
Takeoff Fuel	+	Trip Fuel	+
AGTOW	a	b	c
(= Lowest of a,b,c)			
- SOW			
- Add Crew			
- Takeoff Fuel			
Allowed Payload			

Takeoff WT.	Lateral WT.		Check
	L/H	R/H	

Prepared by Dispatcher or Agent	

Load Distribution

Zone	Deadload	(+/-)	Index
A1			.
A2			.
B1			.
C			.
D			.
E			.
F			.
G			.
H			.
J			.
K			.
L			.
M			.
P			.
R			.
S			.
T			.
Total			.

Certified Weight Limits

Max Ramp Weight	873,000 LB
Max Takeoff Weight	870,000 LB
Max Landing Weight	652,000 LB
Max Zero Fuel Weight	610,000 LB
Reg. No.	HL7413, HL7414, HL7415, HL7417, HL7618, HL7620

Standard Formula

$$\text{INDEX} = \frac{\text{WEIGHT (LB)} \times [\text{ARM (INCH)} - 1323.6)]}{550{,}000} + 60.0$$

$$\text{CG \%MAC} = \frac{\text{ARM (INCH)} - 1258}{3.278}$$

Zero Fuel WT. CG	Takeoff WT. CG	TO Stab. Trim

Approved by Captain	

Lateral Imbalance

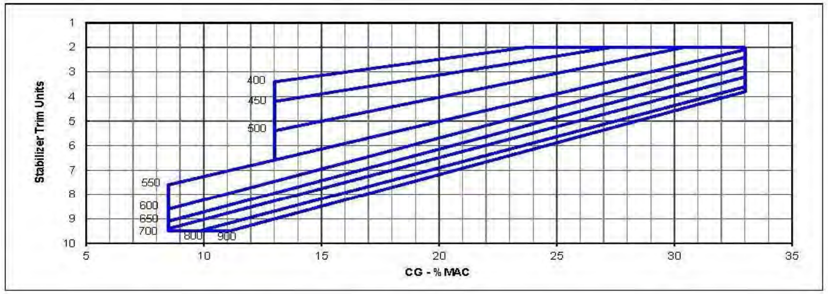
Taxi Weight	Allowed Lateral Weight	Taxi Weight	Allowed Lateral Weight
873000	38100	810000	148800
870000	43400	790000	177900
850000	78500	765000	200000
830000	113700		

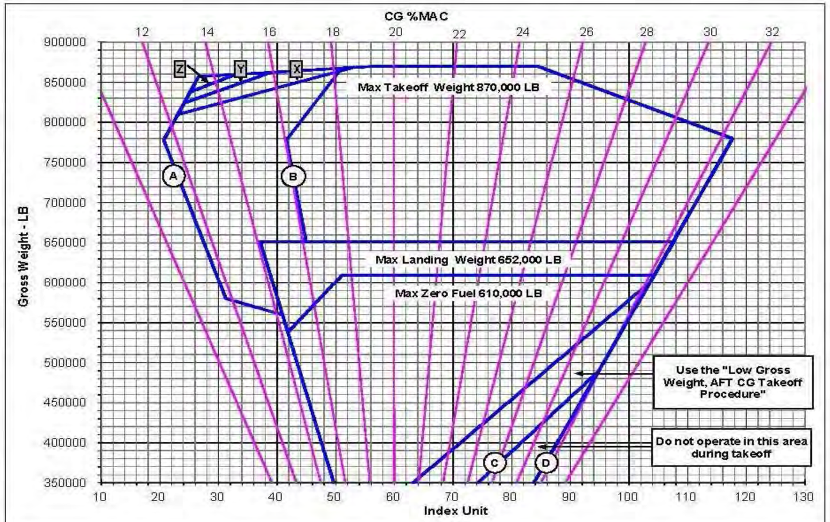
MTOW Restriction by Fuel Density

Fuel Density	MTOW
>= 6.43	870000
6.4	866500
6.3	854800

U/D Crew Index Table

Crew	Weight	I.U.
1	210	-0.3
2	420	-0.6
4	840	-1.1
6	1260	-1.7
8	1680	-2.2





A) FWD Taxi/Takeoff Limit
B) FWD Taxi/Takeoff Limit with Increased AFT Loads
C) AFT Taxi/Takeoff Limit
D) AFT Zero Fuel Limit

High Gross Weight and FWD CG Loading Limitations :

- If GW & CG lie in area X, at least 5,000 lb of CGO must be forward of E zone.
- If GW & CG lie in area Y, at least 10,000 lb of CGO must be forward of E zone.
- If GW & CG lie in area Z, at least 15,000 lb of CGO must be forward of E zone.

Effective: JUN. 2013

Flight Operations Engineering

Cargo Index Unit table (WT. Unit = LB)

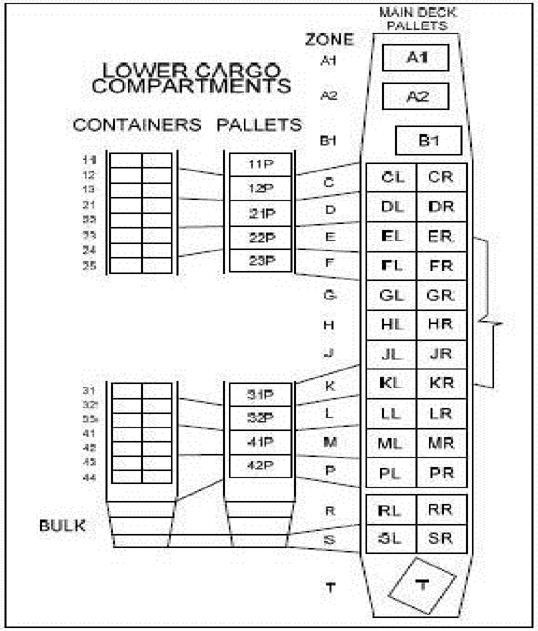
T		S		R		P		M	
MAX = 4500		MAX = 23260		MAX = 25200		MAX = 36400		MAX = 25200	
4500 ▶		15484 ▶		26469 ▶		53430 ▶		74850 ▶	
4500 ▶		23564 ▶		42878 ▶		73500 ▶		94016 ▶	
WT	IU	WT	IU	WT	IU	WT	IU	WT	IU
566	+1	661	+1	779	+1	1050	+1	1382	+1
1131	+2	1322	+2	1558	+2	2100	+2	2765	+2
1697	+3	1983	+3	2337	+3	3149	+3	4147	+3
2262	+4	2645	+4	3117	+4	4199	+4	5529	+4
2828	+5	3306	+5	3896	+5	5249	+5	6911	+5
3394	+6	3967	+6	4675	+6	6299	+6	8294	+6
3959	+7	4628	+7	5454	+7	7349	+7	9676	+7
4500	+8.0	5289	+8	6233	+8	8399	+8	11058	+8
		5950	+9	7012	+9	9448	+9	12440	+9
		6611	+10	7791	+10	10498	+10	13823	+10
		7273	+11	8571	+11	11548	+11	15205	+11
		7934	+12	9350	+12	12598	+12	16587	+12
		8595	+13	10129	+13	13648	+13	17969	+13
		9256	+14	10908	+14	14697	+14	19352	+14
		9917	+15	11687	+15	15747	+15	20734	+15
		10578	+16	12466	+16	16797	+16	22116	+16
		11239	+17	13246	+17	17847	+17	23498	+17
		11900	+18	14025	+18	18897	+18	24881	+18
		12562	+19	14804	+19	19947	+19	25200	+18.2
		13223	+20	15583	+20	20996	+20		
		13884	+21	16362	+21	22046	+21		
		14545	+22	17141	+22	23096	+22		
		15206	+23	17920	+23	24146	+23		
		15867	+24	18700	+24	25196	+24		
		16528	+25	19479	+25	26245	+25		
		17190	+26	20258	+26	27295	+26		
		17851	+27	21037	+27	28345	+27		
		18512	+28	21816	+28	29395	+28		
		19173	+29	22596	+29	30445	+29		
		19834	+30	23374	+30	31495	+30		
		20495	+31	24154	+31	32544	+31		
		21156	+32	24933	+32	33594	+32		
		21818	+33	25200	+32.3	34644	+33		
		22479	+34			35694	+34		
		23140	+35			36400	+34.7		
		23260	+35.2						

L		K		J		H		G		F	
MAX = 25200		MAX = 31770		MAX = 38000		MAX = 36000		MAX = 36000		MAX = 27850	
98270 ▶		121900 ▶		150621 ▶		CUMULATIVE (STD)		◀ 139873		◀ 111939	
119133 ▶		141000 ▶		170641 ▶		CUMULATIVE (HC*)					
WT	IU	WT	IU	WT	IU	WT	IU	WT	IU	WT	IU
2023	+1	3770	+1	27635	+1	5184	-1	2370	-1	1536	-1
4046	+2	7539	+2	38000	+1.3	10368	-2	4739	-2	3072	-2
6068	+3	11309	+3			15551	-3	7109	-3	4608	-3
8091	+4	15079	+4			20735	-4	9479	-4	6144	-4
10114	+5	18849	+5			25919	-5	11848	-5	7679	-5
12137	+6	22618	+6			31103	-6	14218	-6	9215	-6
14160	+7	26388	+7			36000	-6.9	16588	-7	10751	-7
16182	+8	30158	+8					18957	-8	12287	-8
18205	+9	31770	+8.4					21327	-9	13823	-9
20228	+10							23697	-10	15359	-10
22251	+11							26066	-11	16895	-11
24274	+12							28436	-12	18431	-12
25200	+12.5							30806	-13	19966	-13
								33175	-14	21502	-14
								35545	-15	23038	-15
								36000	-15.2	24574	-16
										26110	-17
										27646	-18
										27850	-18.1

E		D		C		B1		A2		A1	
MAX = 25200		MAX = 25200		MAX = 25200		MAX = 11594		MAX = 5760		MAX = 5760	
◀ 89580		◀ 69559		◀ 47510		◀ 27267		◀ 11846		◀ 5820	
WT	IU	WT	IU	WT	IU	WT	IU	WT	IU	WT	IU
1136	-1	901	-1	747	-1	649	-1	552	-1	528	-1
2272	-2	1803	-2	1494	-2	1298	-2	1165	-2	1056	-2
3408	-3	2704	-3	2242	-3	1947	-3	1747	-3	1584	-3
4545	-4	3606	-4	2989	-4	2596	-4	2329	-4	2112	-4
5681	-5	4507	-5	3736	-5	3244	-5	2911	-5	2640	-5
6817	-6	5409	-6	4483	-6	3893	-6	3494	-6	3168	-6
7953	-7	6310	-7	5230	-7	4542	-7	4076	-7	3696	-7
9089	-8	7212	-8	5977	-8	5191	-8	4658	-8	4224	-8
10225	-9	8113	-9	6725	-9	5840	-9	5240	-9	4752	-9
11361	-10	9015	-10	7472	-10	6489	-10	5760	-9.9	5280	-10
12497	-11	9916	-11	8219	-11	7138	-11			5760	-10.9
13634	-12	10818	-12	8966	-12	7787	-12				
14770	-13	11719	-13	9713	-13	8436	-13				
15906	-14	12621	-14	10461	-14	9084	-14				
17042	-15	13522	-15	11208	-15	9733	-15				
18178	-16	14424	-16	11955	-16	10382	-16				
19314	-17	15325	-17	12702	-17	11031	-17				
20450	-18	16227	-18	13449	-18	11504	-17.7				
21586	-19	17128	-19	14196	-19						
22723	-20	18030	-20	14944	-20						
23859	-21	18931	-21	15691	-21						
24995	-22	19833	-22	16438	-22						
25200	-22.2	20734	-23	17185	-23						
		21636	-24	17932	-24						
		22537	-25	18680	-25						
		23439	-26	19427	-26						
		24340	-27	20174	-27						
		25200	-28.0	20921	-28						
				21668	-29						
				22415	-30						
				23163	-31						
				23910	-32						
				24657	-33						
				25200	-33.7						

Main Deck Center Loading Limit (lb)

Zone	Size Code			
	A	G	M	R
C, D, E, F	18400	36900	18200	30100
G, H, J	30500	63900	33300	52200
K, L, M, P, R, S	18400	36900	18200	30100



ULD Limits

Main Deck	ZFW > 477,500 LB		ZFW <= 477,500 LB	
	Size			
	A (88")	M (96")	A (88")	M (96")
A1	5280	5760	4376	4773
A2	5280	5760	4376	4773
B1	5280	5760	4376	4773
C	10625	10625	8805	8805
D	10625	10625	8805	8805
E	10625	10625	8805	8805
F	10625	10625	8805	8805
G	18000	18000	13030	14917
H	18000	18000	13030	14917
J	18000	18000	13030	14917
K	10625	10625	8805	8805
L	10625	10625	8805	8805
M	10625	10625	8805	8805
P	10625	10625	8805	8805
R	10625	10625	8805	8805
S	10625	10625	8805	8805
T	4500	4500	4500	4500
Lower Deck All Position	10200	11100	10200	11100
	Half Width Container			
	3500			

Main Deck Max Pallet Load per Side (LB)

Position							
C, P & R		S		D,E,F,K,L, & M		G, H, & J	
L/H or R/H	R/H or L/H	L/H or R/H	R/H or L/H	L/H or R/H	R/H or L/H	L/H or R/H	R/H or L/H
10625	10625	10625	10625	10625	10625	18000	18000
11000	9239	11000	10061	11000	10085	19000	17035
11500	7391	12000	8559	12000	8644	20000	16069
12000	5543	13000	7056	13000	7203	21000	15104
12500	3696	14000	5553	14000	5763	22000	14139
13000	1848	15000	4051	15000	4322	23000	13173
13500	0	15200	3750	16000	2881	24000	12208
				17000	1441	25000	11242
				18000	0	26000	10277
						27000	9312
						28000	8346
						29000	7381
						30000	6416
						31000	5450
						32000	4485
						33000	3520
						33500	3048

Shaded area exceeds the maximum load with all restraints operative.
Additional Tiedowns required

Fuel Index : All Tanks

WT	IU	WT	IU	WT	IU
5000	-0.6	145685	-4.8	285000	-19.3
10000	-1.0	150000	-1.8	290000	-21.1
15000	-1.3	155000	1.9	295000	-23.0
20000	-1.6	160000	5.7	300000	-24.9
25000	-1.9	163400	8.2	305000	-26.8
30000	-2.1	165000	8.0	310000	-28.7
35000	-2.2	170000	7.1	315000	-30.6
40000	-2.3	175000	6.3	320000	-32.5
45000	-2.3	180000	5.5	325000	-34.4
50000	-2.4	185000	4.7	330000	-36.3
55000	-2.3	190000	4.0	335000	-38.2
60000	-2.3	195000	3.2	340000	-40.1
65000	-2.2	200000	2.4	345000	-42.2
70000	-2.0	205000	1.6	350000	-44.3
75000	-1.9	210000	1.0	355000	-46.7
80000	-1.7	215000	0.3	359415	-48.9
85000	-1.5	220000	-0.5		
90000	-1.2	225000	-1.2		
95000	-1.0	230000	-1.9		
100000	-0.7	235000	-2.6		
105000	-0.3	240000	-3.1		
110000	0.1	244416	-3.4		
115000	0.6	245000	-3.7		
117170	0.9	250000	-5.9		
120000	0.3	255000	-7.9		
125000	-0.6	260000	-9.8		
130000	-1.6	265000	-11.7		
135000	-2.6	270000	-13.6		
140000	-3.6	275000	-15.5		
145000	-4.7	280000	-17.4		

All Weight unit in LB

Fuel Index : Center Tank only

WT	IU	WT	IU
2000	-0.9	62000	-23.9
4000	-1.8	64000	-24.7
6000	-2.7	66000	-25.4
8000	-3.4	68000	-26.2
10000	-4.2	70000	-27.0
12000	-5.0	72000	-27.7
14000	-5.7	74000	-28.5
16000	-6.5	76000	-29.2
18000	-7.2	78000	-30.0
20000	-8.0	80000	-30.7
22000	-8.8	82000	-31.5
24000	-9.5	84000	-32.2
26000	-10.3	86000	-33.0
28000	-11.0	88000	-33.8
30000	-11.8	90000	-34.5
32000	-12.6	92000	-35.3
34000	-13.3	94000	-36.1
36000	-14.1	96000	-36.9
38000	-14.8	98000	-37.6
40000	-15.6	100000	-38.5
42000	-16.3	102000	-39.3
44000	-17.1	104000	-40.2
46000	-17.8	106000	-41.1
48000	-18.6	108000	-42.0
50000	-19.4	110000	-42.9
52000	-20.1	112000	-43.9
54000	-20.9	114000	-44.9
56000	-21.7	114939	-45.4
58000	-22.4		
60000	-23.2		

All Weight unit in LB

Table of Contents

The end of section

7.1 Climb Performance

7.1.1 All Engines Operating (B747-400/CF6-80C2 B1F)

7.1.1.1 All Engine Climb Gradients (%)

a. Base on

Flaps	Bleed	Anti-ice	Wind	RWY Slope
20	ON	OFF	0 Knots	0 %

b. Airport Pressure Altitude : 0 feet

1) OAT : 15 degree C

Weight (1000lb)	Geometric Height above Airport (feet)										
	1000	2000	3000	At Clean Configuration				4000	5000	6000	7000
				3545	3606	3691	3810				
870.0	8.3	7.7	7.4	–	–	–	4.6	4.7	5.1	5.4	5.7
800.0	9.4	9.0	8.8	–	–	5.3	–	5.5	5.9	6.3	6.5
700.0	11.8	11.6	11.5	–	6.3	–	–	6.6	7.2	7.6	7.8
600.0	14.9	15.2	15.2	7.5	–	–	–	7.8	8.5	9.0	9.3

2) OAT : 30 degree C

Weight (1000lb)	Geometric Height above Airport (feet)										
	1000	2000	3000	At Clean Configuration				4000	5000	6000	7000
				3753	3830	3945	4158				
870.0	8.2	7.3	6.9	–	–	–	4.3	–	4.6	4.9	5.1
800.0	9.3	8.6	8.2	–	–	5.1	–	5.1	5.6	5.9	6.1
700.0	11.7	11.2	10.9	–	6.2	–	–	6.3	6.8	7.2	7.5
600.0	14.7	14.6	14.4	7.4	–	–	–	7.6	8.2	8.7	9.0

3) Assumed Climb Technique (summary)

Landing gear UP => Thrust reduction at 1,000feet => Acceleration at 3,000feet with 500FPM => Climb to 7,000feet

c. Airport Pressure Altitude : 2,000 feet

1) OAT : 15 degree C

Weight (1000lb)	Geometric Height above Airport (feet)										
	1000	2000	3000	At Clean Configuration				4000	5000	6000	7000
				3612	3682	3784	3961				
870.0	6.7	6.7	6.6	–	–	–	4.2	4.2	4.6	4.9	5.1
800.0	7.9	8.0	7.9	–	–	4.9	–	5.0	5.5	5.8	6.1
700.0	10.5	10.7	10.6	–	6.0	–	–	6.2	6.7	7.1	7.4
600.0	13.9	14.3	14.3	7.2	–	–	–	7.5	8.1	8.6	8.9

2) OAT : 30 degree C

Weight (1000lb)	Geometric Height above Airport (feet)										
	1000	2000	3000	At Clean Configuration				4000	5000	6000	7000
				3844	3945	4177	4494				
870.0	5.9	5.6	5.5	–	–	–	3.6	–	3.8	4.0	4.2
800.0	7.1	6.9	6.7	–	–	4.3	–	–	4.7	4.9	5.2
700.0	9.7	9.5	9.3	–	5.6	–	–	5.6	6.1	6.5	6.7
600.0	13.2	13.0	12.8	6.9	–	–	–	7.0	7.6	8.0	8.3

3) Assumed Climb Technique (summary)

Landing gear UP => Thrust reduction at 1,000feet => Acceleration at 3,000feet with 500FPM => Climb to 7,000feet

d. Airport Pressure Altitude : 4,000 feet

1) OAT : 15 degree C

Weight (1000lb)	Geometric Height above Airport (feet)										
	1000	2000	3000	At Clean Configuration				4000	5000	6000	7000
				3686	3769	3922	4159				
870.0	6.1	6.1	6.0	–	–	–	3.8	–	4.1	4.4	4.6
800.0	7.2	7.3	7.2	–	–	4.5	–	4.6	5.0	5.3	5.5
700.0	9.6	9.8	9.8	–	5.6	–	–	5.8	6.3	6.7	6.9
600.0	12.8	13.2	13.2	6.8	–	–	–	7.1	7.7	8.1	8.4

2) OAT : 30 degree C

Weight (1000lb)	Geometric Height above Airport (feet)										
	1000	2000	3000	At Clean Configuration				4000	5000	6000	7000
				3948	4119	4515	5062				
870.0	4.7	4.6	4.5	–	–	–	3.0	–	–	3.2	3.4
800.0	5.9	5.7	5.6	–	–	3.7	–	–	3.8	4.1	4.3
700.0	8.2	8.0	7.9	–	4.9	–	–	–	5.3	5.6	5.9
600.0	11.4	11.3	11.1	6.3	–	–	–	6.3	6.9	7.2	7.5

3) Assumed Climb Technique (summary)

Landing gear UP => Thrust reduction at 1,000feet => Acceleration at 3,000feet with 500FPM => Climb to 7,000feet

7.1.1.2 Assumed Climb Technique (Vertical Profile)

Performance is based on the following conditions and assumptions:

a. The flight path begins at the end of the takeoff distance where the airplane has attained a height of 35 feet and continues through first, second, third, and final segments.

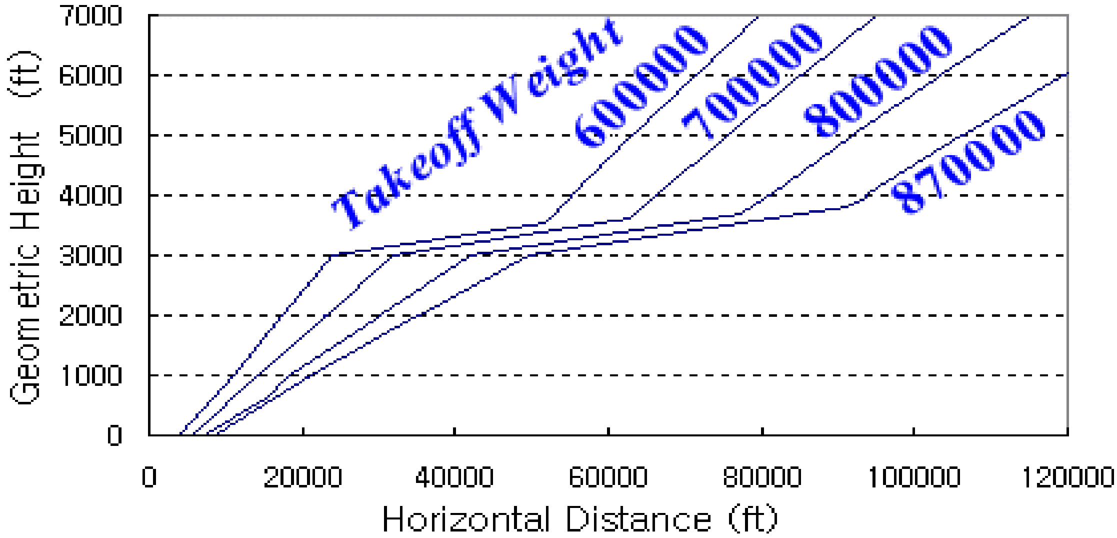
b. Landing gear retraction is completed at the end of the first segment. A speed of V2+15 knots is attained during first segment. (Gear Up, Takeoff Thrust, V2+15 KIAS)

c. Climb is continued in second segment at V2+15 knots with takeoff flaps setting and takeoff thrust to 1,000feet (Climb to 1,000feet, Takeoff Thrust, Constant Speed)

d. Thrust is reduced to climb thrust at 1,000feet. Climb is continued at V2+15 knots with takeoff flaps setting to the end of second segment (Climb to 3,000feet, Climb Thrust at 1,000feet, Constant Speed)

e. The airplane is then accelerated through the flap retraction speed schedule while retracting the flaps and climbing at a constant rate of climb. (Acceleration to Clean Configuration, Climb Thrust, 500FPM)

f. Climb is then resumed with flaps up and climb thrust (Climb to 7,000feet, Climb Thrust, Constant Speed)



7.1.1.3 Meaning of Gradient (%)

Gradient means geometric height change in response with horizontal distance.

Example)

a. Takeoff weight: 870,000 LBS

b. Geometric height change: 3,810

c. Horizontal distance : 82,233 (91,373 – 9,140)

d. Gradient = 3,810/82,233 = 0.046 => 4.6%

The end of section

Intentionally

Blank

7.2 FMC Performance Data

7.2.1 General

a. The VNAV (vertical navigation) function of the B747-400 FMC (Flight Management Computer) provides a variety of climb, cruise and descent speed modes for use during all engines operation.
b. In VNAV operation the FMC limits speed and altitude capability in order to ensure reasonable and safe operations. The VNAV operational envelope takes into account the maximum certified altitude, maximum operating speeds, buffet margins, and stick shaker margins.

7.2.2 Speed Schedule Data

a. Speed schedule affect the trip time and fuel burn, and therefore the trip cost.
b. The minimum trip cost is obtained when economy modes are used for climb, cruise, and descent and the appropriate cost index is entered.

COST INDEX =

Time-related Cost ($ per flight hour)/Fuel Cost (cents per pound)

c. The FMC defaults to the economy speed modes in VNAV operation.
d. In addition, a transition climb speed limit is observed below the speed transition altitude by default during climb. (250knots below 10,000feet).
e. The FMC increases the transition climb speed at heavier gross weights to equal the flaps-up full maneuvering speed of VREF30 + 100 knots. (Minimum transitions climb speed)
f. The speed schedules are a function of one or more of the following variables : airplane weight, altitude, cost index, wind, temperature, and flaps setting.

7.2.2.1 Parameters affecting FMC speed schedules

Performance Speed Mode	Parameter				
	Gross Weight	Cost Index	Altitude	Wind	Temperature
ECON Climb CAS	x	x		x	x
Maximum Angle Climb CAS	x				
ECON Cruise Mach	x	x	x	x	
Long Range Cruise Mach	x		x		
ECON Descent CAS	x	x			
Flaps Up Hold Speed	x		x		
Flaps 1 Hold Speed	x				

7.2.3 Climb Speed Schedules

7.2.3.1 Economy Climb Speed

a. In the economy climb mode the FMC generates a CAS/Mach speed schedule which will be fixed throughout a given climb.

b. The economy climb CAS Calibrated Airspeed) values are as a function of cost index and initial climb gross weight.

c. The economy climb CAS will be increased in response to a predicted top of climb headwind and will be decreased in response to a predicted tailwind.

d. The economy climb CAS will be decreased for a predicted top of climb temperature deviation higher than the flat-rated temperature.

e. Economy climb CAS may be limited by maximum operating speed at high cost index values. A five knot margin is applied to VMO by the FMC to allow for normal control speed variation during climb.

This limits the maximum economy climb CAS to 360 knots.

f. The FMC sets the economy climb Mach equal to the economy cruise Mach calculated at the estimated initial cruise conditions. This generally eliminates any acceleration or deceleration in the transition from climb to cruise.

g. Economy Climb Speed (CAS)

Initial Climb Weight (lbs)	Cost Index		
	0	100	200
500,000	309	317	324
600,000	319	327	335
700,000	329	337	346
800,000	340	348	356
870,000	348	356	360

7.2.3.2 Maximum Angle Climb

a. The maximum angle climb speed provides the minimum distance to optimum altitude, and approximates maximum instantaneous gradient performance.

b. The FMC generates a maximum angle climb speed schedule for flaps up operation. This speed schedule is provided for reference on the Control and Display Unit CLIMB page, and may be entered as a selected CAS speed schedule by the pilot.

c. It varies with gross weight and provides approximately the same climb gradient as Flaps up maneuvering speed + 20 knots.

d. The schedule is based on a CAS which is a function of current airplane gross weight. As a result the displayed CAS decreases slightly during a given climb due to fuel burn off.

Cutoff Mach = 0.84

Gross Weight (lbs)	CAS (Knots)
500,000	236
600,000	250
700,000	268
800,000	286
870,000	297

7.2.3.3 Maximum Rate Climb

a. The FMC does not generate a climb speed schedule which provides the maximum rate of climb.

b. Maximum rate of climb can be approximated by using the Flaps up maneuvering speed + 60 knots until intercepting 0.82 Mach.

7.2.4 Economy Cruise Speed

a. The FMC generates a variable Mach speed schedule in the economy cruise mode. The primary variables affecting the speed schedule are altitude, gross weight, and cost index.

b. Selection of zero cost index implies that the time-related operating costs are considered to be negligible. This results in MRC (Maximum Range Cruise) operation, with true airspeeds as much as 25 knots slower than LRC (Long Range Cruise).

c. Selection of cost index values greater than zero implies that flight time related costs are to be considered in the speed optimization. This results in economy cruise speeds higher than MRC.

d. The applicable VNAV speed limit is based on the airplane VMO or MMO less a 5 knots speed control margin.

7.2.4.1 Economy Cruise Speed (Mach)

Standard Day/No Wind

Cruise ALT (feet)	Cost Index	Gross Weight (1,000 LBS)				
		500	600	700	800	850
29,000	0	.700	.750	.788	.815	.825
	LRC	.748	.792	.824	.848	.856
	100	.772	.796	.818	.837	.842
33,000	0	.750	.794	.823	.838	.841
	LRC	.792	.830	.855	.860	.860
	100	.803	.827	.845	.848	.848
37,000	0	.796	.829	.840	-	-
	LRC	.830	.858	.860	-	-
	100	.833	.850	.850	-	-
41,000	0	.830	.842	-	-	-
	LRC	.858	.860	-	-	-
	100	.853	.852	-	-	-

7.2.5 Economy Descent Speed

a. The FMC generates fixed Mach/CAS schedules in the economy descent mode. The economy descent Mach is set equal to the economy cruise Mach calculated for the top of descent conditions.

b. Economy descent CAS is defined to not exceed the VNAV speed limit, which in descent is the airplane VMO (365 KCAS) reduced by an 11 knot speed control margin. An additional 5 knot margin is applied to obtain the maximum economy descent speed used for FMC descent path calculations (349 KCAS).

c. The minimum economy descent CAS has been set at 250 knots to improve air traffic control speed compatibility at low cost index values.

7.2.5.1 Economy Descent Speed (KCAS)

Initial Climb Weight (LBS)	Cost Index		
	0	100	200
500,000	–	274	319
600,000	–	282	322
700,000	259	290	324

The end of section

7.3 Takeoff Analysis Chart Guide

7.3.1 General

a. The charts show takeoff performance data for the given runway characteristics and given configuration (Thrust, Flap, Packs etc.)

b. Followings can be determined from the takeoff analysis chart;

1) The maximum Performance Limited Takeoff Weight for the ambient temperature
2) The takeoff N1 setting and takeoff speeds for the most limiting weight among the Climb, Runway or Structural Limit, for the ambient temperature
3) Maximum usable Assumed Temperature for a given weight

c. In this guide, the term "Runway Limit Weight" refers to the most limiting weight among the field length, obstacle, brake energy and tire speed limit weight.

7.3.2 Basic Conditions of Takeoff analysis chart

a. Flaps Setting: Flaps 10/20

b. Wind Component: Calm

1) Wind correction should be applied for runway limited weight.
2) No wind correction should be applied to climb limited weight.

c. Pressure Altitude: airport elevation

- QNH correction should be applied to runway and climb limited weight.

d. Runway Condition : Dry

e. Tire speed Capability : 235 MPH

f. Anti-ice Configuration : Anti-ice OFF

g. Braking Configuration : Anti-skid ON

h. A/C Packs Configuration : AUTO or OFF

i. Line-Up Effect

- The distance for 90 degree or 180 degree turn to align the airplane on the runway has been taken into account. Accordingly, the field length available has been adjusted.

7.3.3 Explanation of Takeoff Analysis Chart

7.3.3.1 Takeoff Analysis Chart Sample

ONE ENGINE INOP. PROCEDEURES

RWY 33R: MAINTAIN EXTENDED RWY CENTERLINE. THEN, COMMENCE A 15 DEGREE BANKED CLIMBING – LEFT – TURN AT D5.0 NCN VOR/DME TO A MAG HEADING OF 242 DEGREES.

B747-400 MAX

FLAP 20 **ICN** 15L/33R

SEOUL INCHEON INTL RKSI ELEVATION : 23FT

MAX BRAKE RELEASE WT-LB, LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

TAKEOFF N1	OAT DEG C	CLIMB LIMIT	** RUNWAY 01 ** WEIGHT	V1	VR	V2	** RUNWAY 19 ** WEIGHT	V1	VR	V2
0.0	64A	709600	710400*	146	156	164	705500*	145	155	163
0.0	62A	718300	719800*	147	157	165	713900*	146	156	164
0.0	60A	727100	729000*	148	158	166	722200*	147	157	165
0.0	58A	737000	740300*	149	159	167	731800*	148	158	166
0.0	56A	747100	751500*	149	160	168	741300*	148	160	168
103.0	54	760200	766100*	150	162	170	753800*	149	161	169
103.8	52	784300	791200*	152	165	173	775900*	151	163	172
104.6	50	808600	816100F	153	167	175	798100*	152	166	174
			. . .							
103.4	10	943600	946700F	152	169	180	929400*	152	169	180
103.0	8	943600	949200F	152	169	180	929900*	152	169	180
102.6	6	943600	951700F	152	170	180	930400*	152	170	180
102.3	4	943600	954200F	152	170	180	930800*	152	170	180
101.9	2	943600	956700F	152	170	180	931200*	152	170	180
101.6	0	943600	959300F	152	170	180	931700*	152	170	180
100.6	-5	943600	965900F	152	170	180	932800*	152	170	180
99.7	-10	943600	970100*	152	170	180	933900*	152	170	180
98.7	-15	943600	970300*	152	170	180	935000*	152	170	180

ADD LB/KT HEADWIND		0	120
SUB LB/KT TAILWIND		6330	6330
MIN FLAP RET. HT-FT		800	800
RUNWAY-FT		12303	12303
SLOPE (GO/STOP)-PCT		0.00/ 0.00	0.00/ 0.00
CLEARWAY/STOPWAY-FT		984/ 394	984/ 394
LOW QNH -LB/mBar	968	1162	1064
HIGH QNH +LB/mBar	125	250	220

MAX BRAKE RELEASE WEIGHT MUST NOT EXCEED STRUCTURAL LIMIT OF 870000 LB

LIMIT CODE IS F=FIELD, T=TIRE SPEED, B=BRAKE ENERGY, V=VMCG

*=OBSTACLE, W=TAILWIND TAKEOFF NOT ALLOWED

OBSTACLES CONSIDERED ARE (FROM LIFTOFF END OF RUNWAY, HT/DIST IN FT/FT):

RUNWAY	HT	DIST	HT	DIST	HT	DIST	HT	DIST	HT	DIST
15L	3	988								
33R	77	4749	377	19479	461	21877				

7.3.3.2 Header

1 **ONE ENGINE INOP. PROCEDEURES**

RWY 33R: MAINTAIN EXTENDED RWY CENTERLINE. THEN, COMMENCE A 15 DEGREE BANKED CLIMBING – LEFT – TURN AT D5.0 NCN VOR/DME TO A MAG HEADING OF 242 DEGREES.

B747-400 2 3 MAX

FLAP 20 4 5 ICN 6 15L/33R

SEOUL INCHEON INTL 7 8 RKSI 9 ELEVATION : 23FT

10 MAX BRAKE RELEASE WT-LB, LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

TAKEOFF N1	OAT DEG C	CLIMB LIMIT	** RUNWAY 01 ** WEIGHT	V1	VR	V2	** RUNWAY 19 ** WEIGHT	V1	VR	V2
0.0	64A	709600	710400*	146	156	164	705500*	145	155	163
0.0	62A	718300	719800*	147	157	165	713900*	146	156	164

Item	Description
1	One engine out turning procedure, or comments or remarks in line with the weight limitations.
2	Aircraft type
3	Thrust ratings MAX: 56,500 lbs; TO1: 5% derate; TO2: 15% derate
4	Takeoff flap configuration
5	Airport designator – IATA code
6	Runway designation
7	Airport name
8	Airport designator – ICAO code
9	Airport elevation
10	Unit for maximum brake weight is in pounds. Limit code and takeoff speeds are valid for zero wind. Otherwise, adjustments should be applied.

7.3.3.3 Table

FLAP 20 **ICN** 15L/33R

SEOUL INCHEON INTL RKSI ELEVATION : 23FT

MAX BRAKE RELEASE WT-LB. LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

11 TAKEOFF N1	12 OAT DEG C	13 CLIMB LIMIT	14 ** RUNWAY 01 ** WEIGHT	V1	VR	V2	15 ** RUNWAY 19 ** WEIGHT	V1	VR	V2
0.0	16 64A	709600	17 710400*	146	156	164	705500*	145	155	163
0.0	62A	718300	719800*	147	157	165	713900*	146	156	164
0.0	60A	727100	729000	18 148	158	166	722200*	147	157	165
0.0	58A	737000	740300*	149	159	167	731800*	148	158	166
0.0	56A	747100	751500*	149	160	168	741300*	148	160	168
103.0	54	760200	766100*	150	162	170	753800*	149	161	169
103.8	52	784300	791200*	152	165	173	775900*	151	163	172

Item	Description
11	Maximum takeoff %N1 for each OAT under standard atmospheric pressure.
12	Outside ambient temperature in Celsius degree.
13	Climb limit weight column
14	Runway limit weight and takeoff speeds column for RWY 15L
15	Runway limit weight and takeoff speeds column for RWY 33R
16	‘A’ sign shown next to OAT means "Outside Environmental Envelope". When actual OAT is in this region, takeoff is not allowed. However, these temperatures can be selected as assumed temperature.
17	Runway limit weight and its limit code. For the limiting code, refer to footer.
18	Takeoff speeds. These speeds are valid only for the lowest weight among climb limit weight, runway limit weight, and certified maximum takeoff weight

7.3.3.4 Footer

```
      98.7    -15     943600    970300*  152 170 180    935000*  152 170 180

19  ADD LB/KT HEADWIND                    0                   120
    SUB LB/KT TAILWIND                 6330                  6330
20  MIN FLAP RET. HT-FT                 800                   800
    RUNWAY-FT  21                     12303                 12303
22  SLOPE (GO/STOP)-PCT                 0.00/ 0.00            0.00/ 0.00
    CLEARWAY/STOPWAY-FT  23              984/  394             984/  394
24  LOW  QNH -LB/mBar        968       1162                  1064
    HIGH QNH +LB/mBar        125        250                   220
    MAX BRAKE RELEASE WEIGHT MUST NOT EXCEED STRUCTURAL LIMIT OF 25 870000 LB
26  LIMIT CODE IS F=FIELD, T=TIRE SPEED, B=BRAKE ENERGY, V=VMCG
                *=OBSTACLE, W=TAILWIND TAKEOFF NOT ALLOWED
    OBSTACLES CONSIDERED ARE (FROM LIFTOFF END OF RUNWAY, HT/DIST IN FT/FT):
27  RUNWAY       HT   DIST    HT   DIST    HT   DIST    HT   DIST    HT   DIST
     15L          3    988
     33R         77   4749   377  19479   461  21877
```

Item	Description
19	Wind adjustment: • Increase/Decrease runway limit weights as much as shown to the right per 1 knot of head/tail wind. **Note:** Do not apply the wind correction to climb limit weight.
20	Minimum flap retraction height above ground level. (= the height for acceleration)
21	Field length in feet.
22	Runway slope of accelerate go distance / accelerate stop distance in percent.
23	Length of clearway / stopway in feet.
24	QNH adjustment: • Increase/Decrease climb limit weight and runway limit weights respectively as much as shown to the right per 1 mbar above/below standard atmospheric pressure, 1013.25 mmBar.
25	Certified maximum takeoff weight.
26	Limit code for runway limit weight
27	Obstacle information along the flight path

7.3.4 Use of Takeoff Analysis Chart

7.3.4.1 Sample Takeoff Chart

SEOUL INCHEON INTL RKSI ELEVATION : 23FT

MAX BRAKE RELEASE WT-LB, LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

TAKEOFF N1	OAT DEG C	CLIMB LIMIT	** RUNWAY 01 ** WEIGHT	V1	VR	V2	** RUNWAY 19 ** WEIGHT	V1	VR	V2
0.0	64A	709600	710400*	146	156	164	705500*	145	155	163
0.0	62A	718300	719800*	147	157	165	713900*	146	156	164
	Step 1		:							
103.4	10	943600	946700F	152	169	180	929400*	152	169	180
103.0	8	943600	949200F	152	169	180	929900*	152	169	180
102.6	6	943600	951700F	152	170	180	930400*	152	170	180
102.3	4	943600	954200F	152	170	180	930800*	152	170	180
101.9	2	943600	956700F	152	170	180	931200*	152	170	180

ADD LB/KT HEADWIND		0		120
SUB LB/KT TAILWIND		6330	Step 2	6330
MIN FLAP RET. HT-FT		800		800
RUNWAY-FT		12303		12303
SLOPE (GO/STOP)-PCT		0.00/ 0.00		0.00/ 0.00
CLEARWAY/STOPWAY-FT		984/ 394		984/ 394
LOW QNH -LB/mBar	968	1162	Step 3	1064
HIGH QNH +LB/mBar	125	250		220

7.3.4.2 Given Conditions

Runway in Use	OAT	Reported Wind	QNH
RWY 33R	10℃	– 5 Knots	1003.25 mBar

7.3.4.3 Calculation of Performance Limited Weights

Step 1. Find the climb limit weight and runway limit weight for RWY 33R at OAT = 10℃.

- Climb limit weight = 943,600 lb
- Runway limit weight = 929,400 lb

Step 2. Apply wind correction to runway limit weight only

- Wind corrected Runway limit weight
  = 929,400 lb – 6,330 x 5
  = 897,750 lb

Step 3. Apply QNH correction to climb limit weight from step 1 and wind corrected runway limit weight from step 2.

- QNH corrected Climb limit weight
  = 943,600 lb – 968 x 10
  = 933,920 lb
- QNH & Wind corrected Runway limit weight
  = 897,750 lb – 1,064 x 10
  = 887,110 lb

Step 4. From step 3, the lower is the Performance Limited Takeoff Weight : 887,110 lb

Caution: In certain cases, the performance limit weight can be higher than the certified maximum takeoff weight (MTOW), however, taking off with the weight higher than its certified MTOW is not allowed.

The end of section

Intentionally

Blank

Table of Contents

The end of section

8.1 Wet/Contaminated Runway

8.1.1 General

8.1.1.1 Definition and Characteristic of Runway Conditions

Refer to the FOM chapter 5. Weather "Wet/Contaminated Runway".

8.1.2 Considerations

8.1.2.1 Performance on Wet/Contaminated Runway

a. Refer to the QRH for performance penalty on contaminated runway or slippery runway.
b. Refer to the FOM chapter 5. Weather for more detail.

8.1.2.2 Determining Runway Condition

Refer to the FOM chapter 5. Weather "Wet/Contaminated Runway".

8.1.2.3 Runway Braking Action

Refer to the FOM chapter 5. Weather "Wet/Contaminated Runway".

8.1.2.4 Considerations during Taxi, Takeoff & Landing

Refer to the FOM chapter 5. Weather "Wet/Contaminated Runway".

8.1.3 Wet/Contaminated Runway Limitations

8.1.3.1 T/O & L/D Limitations

a, Takeoff is PROHIBITED when the depth of slush, standing water or wet/ dry snow is more than following values;

Conditions	Values
Slush, Standing Water, Wet Snow	1/2 inch (13 mm)
Dry Snow	4 inch (102 mm)
Icy (Note)	DO NOT TAKEOFF

b. Landing is PROHIBITED when the Icy runway (melting) or high risk of hydroplaning.

8.1.3.2 Reduced Thrust Usage Limitations

a. Do not use ATM (Assumed Temperature Method) for takeoff if the runway is contaminated by slush, snow, standing water, or ice.

b. ATM is allowed for takeoff on a wet runway if suitable performance accountability is made for the increased stopping distance on a wet surface.

c. Fixed De-rate takeoff is allowed on a wet or contaminated runway provided takeoff performance accounts for the runway surface condition.

The end of section

8.2 De/Anti-icing Procedures

8.2.1 Definitions and Concepts

Refer to the FOM Chapter 5. Weather "De/Anti-icing Procedures."

8.2.2 De/Anti-icing Programs

8.2.2.1 Responsibilities of Aircraft De/Anti-icing

Refer to the FOM chapter 5. Weather "De/Anti-icing Procedures."

8.2.2.2 Fluid Characteristics and Capability

Refer to the FOM chapter 5. Weather "De/Anti-icing Procedures."

8.2.2.3 De/Anti-icing Program

Refer to the FOM chapter 5. Weather "De/Anti-icing Procedures."

8.2.2.4 Operation with De/anti-Icing Fluids

Refer to the FOM chapter 5. Weather "De/Anti-icing Procedures."

8.2.3 Holdover Time

8.2.3.1 General

Refer to the FOM chapter 5. Weather “De/Anti-icing Procedures.”

8.2.3.2 Use of Holdover Time Table

Refer to the FOM chapter 5. Weather “De/Anti-icing Procedures.”

The end of section

8.3 Wind Limitations

8.3.1 General

a. For wind limitations, use the wind data provided from the tower.
b. When PIC makes a final decision for Takeoff or Approach/Landing, PIC should consider Runway Condition, Visibility and Gust wind.
c. Maximum wind limitations mean wind limitations including gust wind.
d. Subtract 5knots from maximum cross wind limitations for the PIC less than 500 flight hours on the aircraft concerned.
e. Even if wind limitations exceed maximum wind limitations in ND, flight crews can approach continuously within wind limitations which are reported by the tower.
f. Reduce crosswind limitation by 5knots on wet or contaminated runways whenever asymmetric reverse thrust is used. (Landing only for B747-400)
g. Maximum cross wind limitations refer to the following “Maximum Crosswind Limitations”.
h. When applying the braking action, the one obtained by measuring device has a priority. If a valid braking action measurement is not available, the braking action by PIREP can be used. Equivalent Runway Condition is to be used as a reference. (Only valid for maximum crosswind determination)

8.3.2 Maximum Wind Limitations

(Knots)

Classification	Head Wind	Tail Wind	Cross Wind
Takeoff	No Limit	10	30
Manual Land	No Limit		30
Auto Land	25		25

Note) Sideslip only (zero crab) landing are NOT RECOMMANDED with crosswind components in excess of 20 knots. This recommendation ensures adequate ground clearance and is based on maintaining adequate control margin.

8.3.3 Maximum Cross Wind Limitations

8.3.3.1. When Brake Action, RRFC or RCR reported

Apply to following table if there were Brake Action, RRFC (Reported Runway Friction Coefficient) or RCR (Runway Condition Reading) report.

(Knots)

Reported Brake Action	Reported Runway Friction Coefficient	RWY Condition Reading	Takeoff	Landing	
				Man	Auto
Good	≥ 0.4	≥ 13	30	30	25
Medium to Good	0.39~0.36	12	25	20	
Medium	0.30~0.35	10~11	20	20	
Medium to Poor	0.29~0.26	8~9	15	15	
Poor	≤0.25	7	10	10	
Unreliable		≤ 6	N/A (Note)	N/A (Note)	

Note)

1. Sideslip only (zero crab) landing is NOT RECOMMANDED with crosswind components in excess of 20knots.
This recommendation ensures adequate ground clearance and is based on maintaining adequate control margin.

2. N/A : Takeoff and Landing are Prohibited.

8.3.3.2. When Brake Action, RRFC or RCR not reported

Refer to following table (Equivalent Runway conditions) if there were not Brake Action, RRFC (Reported Runway Friction Coefficient) or RCR (Runway Condition Reading) report.

Runway Surface Condition		Braking Action
Dry		Excellent
Damp		Normal
Wet	-RA, -SN Note 1)	Good
	RA, SN Note 2) Standing Water ≤ 3mm Slush ≤ 2mm Wet Snow ≤ 4mm Dry Snow ≤ 15mm	Medium (or Fair)
Contaminated	Standing Water > 3mm Slush > 2mm Wet Snow > 4mm Dry Snow > 15mm Heavy Rain	Poor
Ice		NIL (or Unreliable)

Note) Brake action of Grooved runway is regarded as follows when runway is wet.

1. Light rain (-RA) : Braking Action “NORMAL”

2. Rain (RA) : Braking Action “GOOD”

8.3.4 Application of Wind Limitation

8.3.4.1 Flight Planning Phase

Use steady wind (not including gust wind) for the application of wind limitations in the flight planning phase.

Note) For ETOPS alternate airports, MKP, RSU & KPO airports, maxima wind will be applied including gust wind.

8.3.4.2 Flight Phase

a. Before lining up for takeoff, flight crews should apply wind data reported by the tower.

b. During approach and landing, flight crews must apply wind data updated by the tower when aircraft is approaching at 1,000FT (AFE).

  1) Approach continuously in the event of within Wind Limitations.

  2) In the event of the excess of Wind Limitations, flight crews should execute go-around (before 500FT) and then perform Holding or Diversion.

c. Even though winds are within the limitations, PIC may not make a Takeoff or Approach/Landing if stable Takeoff or Approach/Landing is in doubt.

The end of section

8.4 Others

8.4.1 Cold Weather Operation

a. Refer to the B747 FCOM Volume 1. Supplementary Procedures "Adverse Weather".

b. Cold temperature altitude corrections.

1) Refer to the FOM Chapter 5. Weather "Altimetry."

2) Refer to the "Cold temperature altitude correction." In POM

8.4.2 Hot Weather Operation

Refer to the B747 FCOM Volume 1. Supplementary Procedures "Adverse Weather"

8.4.3 Engine Operation in Heavy Rain or Hail

Refer to the B747 FCOM Volume 1. Supplementary Procedures "Adverse Weather".

8.4.4 Turbulence

Refer to the FOM Chapter 5. Weather and B747 FCOM Volume 1. Supplementary Procedures "Adverse Weather".

8.4.5 Wind shear

Refer to the FOM Chapter 5. Weather and B747 FCOM Volume 1. Supplementary Procedures "Adverse Weather".

The end of section

Intentionally

Blank

Table of Contents

The end of section

Intentionally

Blank

9.1 Introduction

9.1.1 Objective

This chapter is established as policies, procedures, practices, instructions, and guidance for improving flight safety in relation to cargo flight through giving flight crew specific information.

9.1.2 Contents

a. This chapter involves information in relation to freighter operation and the standard procedures which are needed to be advised to and applied by flight crew.
b. This chapter involves the frequently used basic items which are practiced concerning cargo operation. For further details, refer to FOM.
c. Korean quoted in this is from FOM and TI(Technical Instructions for the Safe Transport of Dangerous Goods by Air) by MLTM and English from DGR by IATA.

9.1.3 Application

a. This chapter shall be applied to the operations with freighter, SF(Special Freighter), Combi and PAX.
b. Refer to FOM for further details.
c. In case that there is any discrepancy between this and FOM, FOM has a priority

The end of section

Intentionally

Blank

9.2 Glossary

9.2.1 Background

Frequently used terms are included here for efficient communication between flight crew member and ground staff in relation to cargo operations.

9.2.2 Contents

PSN (Proper Shipping Name)

The name to be used to describe a particular article or substance in all shipping documents and notifications and, where appropriate, on packagings.(e.g. PSN of dry ice is Dry Ice)

ULD (Unit Load Device)

Any type of freight container, aircraft container, aircraft pallet with a net, or aircraft pallet with a net over an igloo.

Oversized Cargo

Individual cargo items of a size/weight that does not allow it to be loaded through the aircraft doors in a normal way.

DIP (Diplomatic Pouch)

A sealed envelope or bag moving between a government and its accredited representative abroad supported by a 'Bordereau' which has been officially endorsed to indicate that the envelope or bag contains only official correspondence.

UN Number

The four-digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods to identify a substance or a particular group of substances.(e.g. UN Number of Dry Ice is 1845)

DG (Dangerous Goods)
Dangerous goods are defined as those which have a mass explosion or are liable to combustion or others that do somebody or something harm with great potentialities.

Flash Point
It is the lowest temperature of liquid that can vaporize to form an ignitable mixture in air.

Heavy Cargo
Items of weights which are more than 150kg per package and/or dimensions exceeding limits. Heavy cargos will normally demand certain special arrangements to be made.

AWB (Airway Bill)
A document made out by the consignor of goods by air freight giving details of the goods and the name of the consignee.

Shipper's Declaration for Dangerous Goods
It is a form to declare nature and packing method of dangerous goods. Consignor must provide at least two copies to an airline company.

Bulk Cargo
Cargo loaded and unloaded apiece not as an ULD into a bulk cargo compartment.

CAO (Cargo Aircraft Only)
CAO goods must not be loaded in passenger aircraft. Also when loaded, they must be loaded and kept to be easy to identify in main deck cargo compartment and lower deck cargo compartment.

Cargo Compartment ULD Location
ULD location map which is located in the aircraft to prevent confusing from different aircraft type cargo compartment position marking.

ERG
Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods.

FRTR ULD Locking & Netting Checklist
A document to sign after checking the ULD locking and netting condition.

OFLD
Cargo Offloaded

T/S Cargo (Transit Cargo)
It is cargo that is transported by company aircraft or other airline aircraft from certain station to destination.

ULD Type Code
There are various ULD type codes but PMC(96 inch Pallet) and AKE(LD-3 Container) mainly used.

Container
It is used to unitize cargo for transportation, supply, and storage. It is also able to loaded and locked in cargo compartment.

Pallet
It is a flat structure made of aluminum alloy and device to tie down with a net or strap after loading the cargo.

CARGO IMP CODE (Interline Message Procedure)

A standard system of coding for cargo message elements. IMP codes are used by operators in data exchange in order to minimize transmission time.(DGR B.2.2.4) It is also showed on back side of NOTOC delivered by load master.

a. CAO : Cargo Aircraft Only
b. ICE : Carbon dioxide, solid (dry ice)
c. IMP : Interline Message Procedure
d. MAG : Magnetized Material
e. ELI : Lithium ion batteries excepted as per Section II of PI 965 – 967.(PI : Packing Instructions)
f. ELM : Lithium metal batteries excepted as per Section II of PI 968 – 970.
g. RLI : Fully regulated lithium ion batteries (Class 9) as per Section I of PI 965 – 967.
h. RLM : Fully regulated lithium metal batteries (Class 9) as per Section I of PI 968 – 970.
i. RFL : Flammable Liquid

The end of section

9.3 Preflight check

9.3.1 General

a. Cargo flight crew must show up at the briefing room or designated place by the company where it follows hereupon at least 1 hour before ETD. But 1 hour 20 minutes would be written on printed matter(Crew Flight Schedule Information).
b. According to the definition of flying duty periods, the starting point for flying duty periods calculation should be 1 hour before ETD.
c. In case of cargo flight, flight crew should arrive at the aircraft by 35 minutes before ETD.
d. Flight crew shall confirm entries including flight date, flight number, origin, transit (when needed), and destination airports and sign up on GD. Especially, it is recommended that co-pilot bring a copy of GD in case of immigration control at night time.
e. In case of cargo flight, first officer turns S/W ON as directed by captain's order called "APU Generator 2 Control Switch ON"
f. When some empty pallets are loaded in cargo A/C, they must be fixed by tie-down strap on pallet base and the maximum stackable limit is 25 units.

9.3.2 AWB Pouch

AWB pouch is installed and fixed on the right side of M/D L1 Door (looking from inside of M/D) or located with flight crew bags in freighter and SF for safe loading and shipping of cargo document such as AWB.

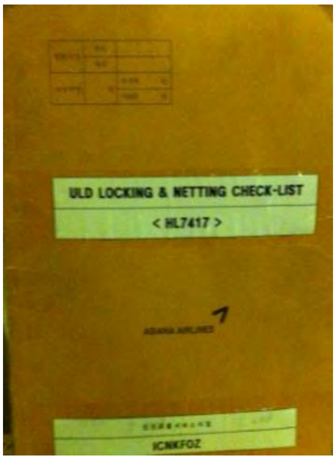
9.3.3 Additional Occupants

a. If an additional occupant (cargo attendant, shipper, veterinarian etc.) other than crew is on upper deck cabin, cabin safety briefing shall be done with the restricted usage of electronic devices by captain.
b. Briefing items include evacuation procedure and emergency equipment usage in case of emergency and safety information with cooperation items.
c. An additional occupant as passenger who departs from ICN must move to the passenger terminal and get the process of CIQ as passenger.
d. Additional occupants must attend a crew briefing according to company policy and must be well aware of the special items and instructions concerning flight operations.
e. Passenger signs (No Smoking & Fasten Seat Belts ON) including T/O & APP and L/G DOWN signal should be operated according to standard communication signal procedure even for cargo flight regardless of flight crew operation and additional occupant. One set crew flight like ICN/PVG/ICN is also included.

9.3.4 FRTR ULD LOCKING & NETTING CHECK LIST

a. When a cargo flight departs from ICN, AAS Airport Services is in charge of fixing operation for baggage which is brought by flight crew and an additional occupant.

b. Loadmaster shall obtain captain's signature after signing on "CGO Pouch & Crew Bag Status" column in "FRTR ULD LOCKING & NETTING CHECK LIST".

<table>
<tr><th>Checklist Folder</th><th>Checklist</th></tr>
<tr><td>
</td><td>

FREIGHTER ULD LOCKING & NETTING CHECK LIST

<table>
<tr><th rowspan="2">FLT No. & Date</th><th rowspan="2">Route</th><th colspan="2">Main Deck</th><th colspan="2">Lower Deck</th><th colspan="2">CGO Pouch & Crew Bag</th><th rowspan="2">Confirmed by crew</th></tr>
<tr><th>Status</th><th>Inspector</th><th>Status</th><th>Inspector</th><th>Status</th><th>Inspector</th></tr>
<tr><td>OZ /</td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>OZ /</td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>OZ /</td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>OZ /</td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>OZ /</td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>OZ /</td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
</table>

c. Flight crew or an additional occupant whoever unties the baggage during the flight should fix it again by him/herself.

9.3.5 Performance Inflight Data Application

a. QRH and FCOM 1 Performance Inflight are categorized by only two parts : PAX and Freighter.

b. The application of performance Inflight table on each types of A/C is as follows.

Type	Table Application
PAX	PAX
Freighter	Freighter
SF & Combi	PAX

The end of section

Intentionally

Blank

9.4 DG (Dangerous Goods)

9.4.1 General

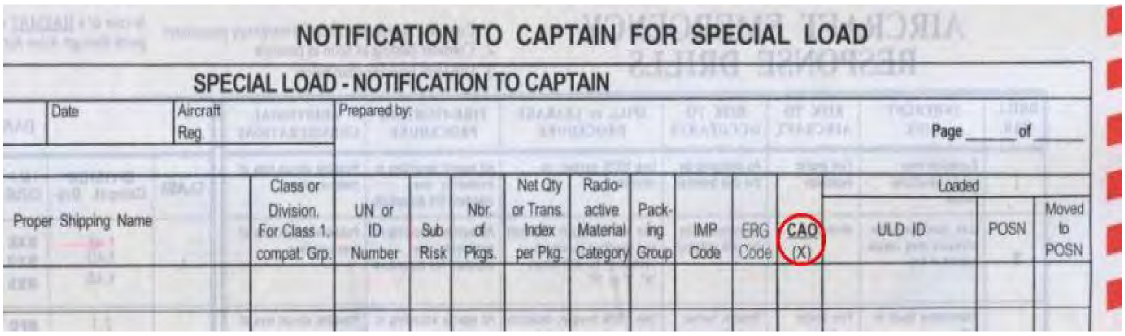
a. DG are goods listed on Aviation law or dangerous goods transportation regulations. Those are harmful things or goods to the human, safety, property or environments which are categorized by dangerous goods transportation regulations.

b. Dangerous goods are divided into 9 classes in accordance with the nature of things.

9.4.2 DG Loading

a. CAO (Cargo Aircraft Only)

1) CAO should not be loaded in passenger & Combi aircraft.
2) CAO should be loaded in one of the following.
   a) FRTR & SF **MAIN DECK** : Class **E** Cargo Compartment.
   b) FRTR & SF **LOWER DECK** : Class **C** Cargo Compartment.
3) If CAO is loaded, "X" is marked on NOTOC CAO column.


NOTIFICATION TO CAPTAIN FOR SPECIAL LOAD

SPECIAL LOAD - NOTIFICATION TO CAPTAIN

Date | Aircraft Reg. | Prepared by: | Page ___ of ___

Proper Shipping Name	Class or Division. For Class 1, compat. Grp.	UN or ID Number	Sub Risk	Nbr. of Pkgs.	Net Qty or Trans. Index per Pkg.	Radio-active Material Category	Pack-ing Group	IMP Code	ERG Code	CAO (X)	Loaded: ULD ID	Loaded: POSN	Moved to POSN

b. Magnetic materials shall be loaded in L/D after cargo compartment that does not affect the aircraft's the Magnetic Compass or Compass Detector Unit such as forward cargo compartment of aircraft. For M/D, it may be loaded from position E.

9.4.3 NOTOC

9.4.3.1 General

a. NOTOC means Notification to Captain.
b. Load master explains the name, characteristics (flammable liquid, explosives etc.) quantity, and location etc. of DG
c. Load mater must help the captain to verify the position and condition of dangerous goods before flight.
d. The captain must put English full name on the column of captain's signature of NOTOC, and retains a copy of the form for submission to related personnel at destination or keeps it in the maintenance log book.
e. The captain checks the details in the Emergency Response Drill described in NOTOC or ERG loaded in the A/C.

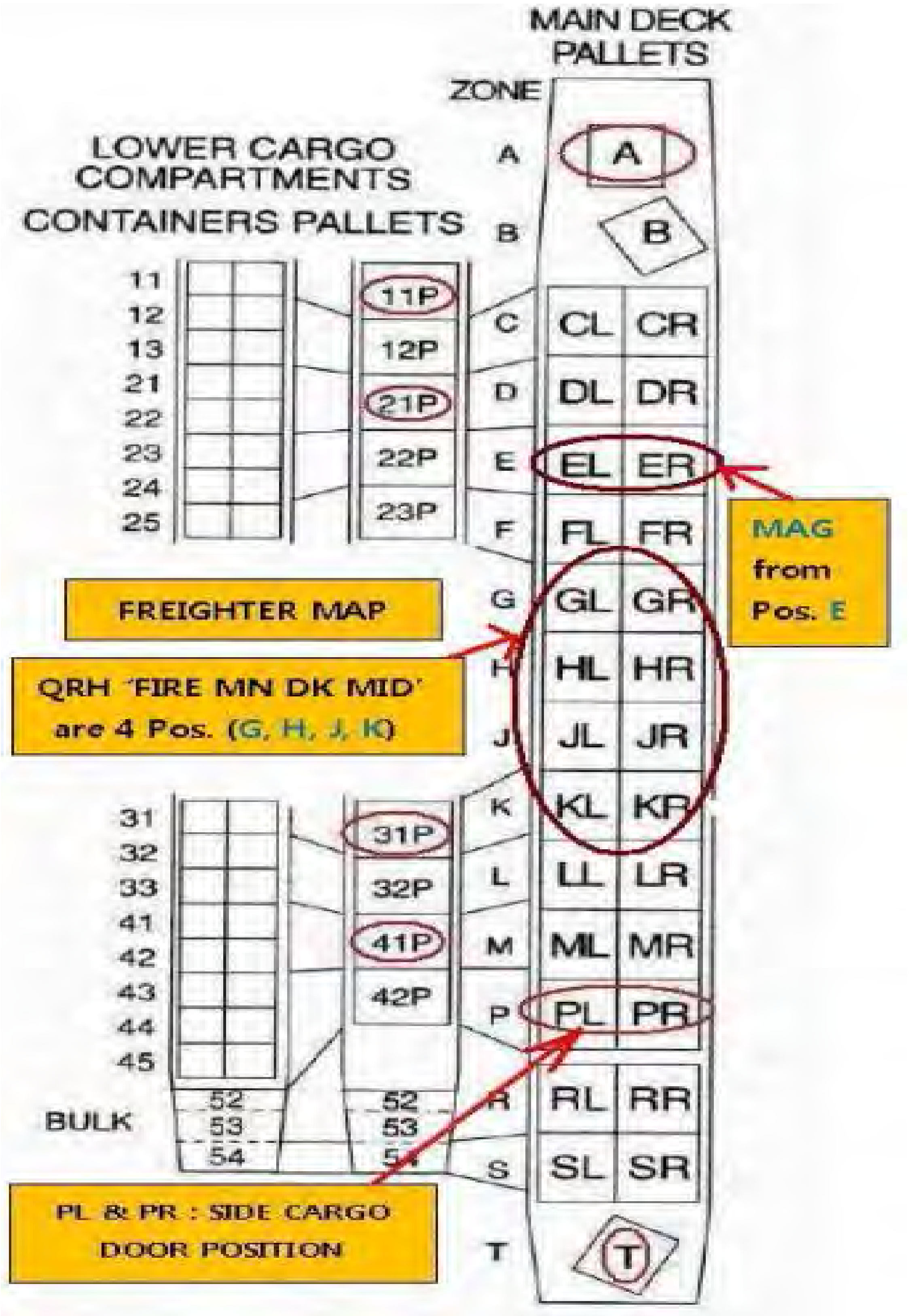
9.4.3.2 Action by the PIC

a. It is strongly recommended that the PIC shall inform the crew of the loading position, quantity, characteristics etc.
b. Carriage of magnetic material must be approved by captain for its loading position by NOTOC.
c. The captain can expect the position of DG by referring to the NOTOC.
   1) In M/D cargo compartment, the position starts with the letter A from forward and ends with the letter T. C to S position (except I,N,O,Q) is usually divided CL & CR. 30 ULDs (usually 96inch PMC pallet) will be loaded when position A1, B1, and C1 are loaded instead of position A & B.
   2) As a reference PL and PR is the position of M/D cargo compartment located in the side cargo door.
   3) L/D cargo compartments are divided into forward and after cargo compartments named by numbers.
   4) 11P ~ 23P for the FWD cargo compartment and 31P ~ 42P for the AFT cargo compartment are named when pallet is loaded in the L/D cargo compartment.
   5) Like M/D cargo compartment C to S, when LD3 type container is

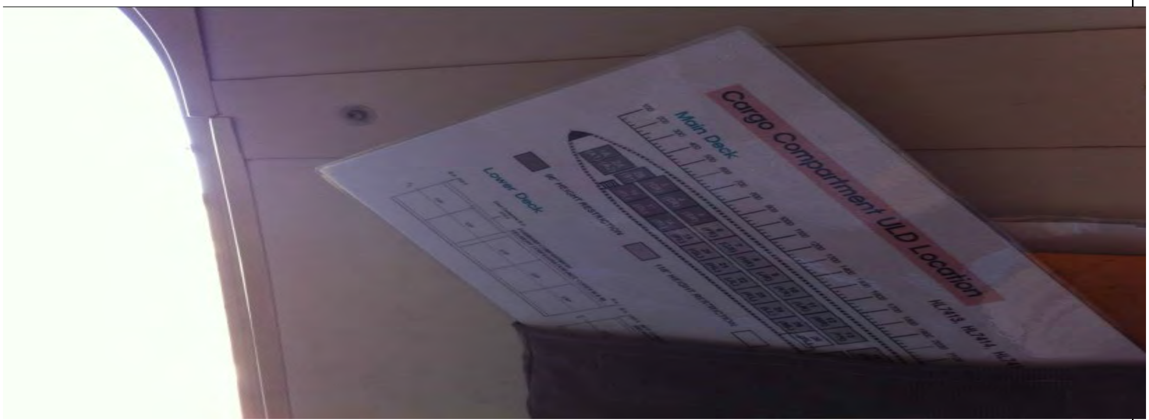
loaded in the L/D cargo compartment, the position name starts like 11L&R and ends 45L&R.

6) The following characters are marked into the 4 edges of 96 inch PMC pallet.

ULD TYPE	Inventory Number	Airline Designator
PMC	16115	OZ
P : Certified Pallet M : Base Size(96”x125”) C : Contour & Compatibility	4-5 digit	2-3 digit OZ : Asiana Airlines


MAIN DECK PALLETS
ZONE
LOWER CARGO COMPARTMENTS
CONTAINERS PALLETS
A
B
C
D
E
F
G
H
J
K
L
M
P
R
S
T
CL CR
DL DR
EL ER
FL FR
GL GR
HL HR
JL JR
KL KR
LL LR
ML MR
PL PR
RL RR
SL SR
11 12 13 21 22 23 24 25
11P 12P 21P 22P 23P
31 32 33 41 42 43 44 45
31P 32P 41P 42P
BULK
52 53 54
MAG from Pos. E
FREIGHTER MAP
QRH 'FIRE MN DK MID' are 4 Pos. (G, H, J, K)
PL & PR : SIDE CARGO DOOR POSITION

d. Because STA(station) Number is marked on side wall in some A/C, use the laminated print which is located next to the ULD Locking check list and wall document clip (near L1 Door) to verify the DG position.



e. The temperature specified in the “Other Special Load Supplementary Information” column should be set in the cockpit if controllable.

f. The range of B747 CGO Compartment Temperature is as followings.

A/C	Compartment	Temperature	Remarks
PAX	FWD	x	
	AFT/BULK	Low 4~10℃ High 10~16℃	Hot Engine Bleed Air is supplied
Combi	FWD	x	
	AFT/BULK	Low 4~10℃ High 18~24℃	Hot Engine Bleed Air is supplied
	M/D	18~29℃	
FRTR & SF	FWD	4 ~ 29 ℃	LAFRAS & LOWER LOBE Temperature Selector
	AFT/BULK	4 ~ 29 ℃	
	M/D	4 ~ 29 ℃	

Note) LAFRAS: Lower Lobe Cargo Conditioned Air Flow Rate Selector

g. Temperature control by selection of 4℃ or 10℃ of AFT CGO Temperature Selector S/W is available only when “AFT CGO HEAT S/W” is ON.

h. **For PAX & Combi**, if cargo required to keep specific temperature is loaded in the AFT or Bulk CGO compartment of PAX & Combi A/C, the flight operation is as followings.

1) For PAX, **Low 4~10℃, High 10~16℃** is maintained by selection of AFT CGO Temperature Selector S/W 4℃ or 10℃ position with AFT CGO HEAT S/W ON.
2) For Combi, **Low 4~10℃, High 18~24℃** is maintained by selection of AFT CGO Temperature Selector S/W 4℃ or 10℃ position with AFT CGO HEAT S/W ON.
3) Verify the temperature specified in NOTOC and turn the AFT CGO HEAT S/W ON by the normal procedure.

i. **For B747F & SF**, if cargo which is required to keep specific temperature is loaded in the M/D, L/D FWD, L/D AFT or Bulk CGO compartment of A/C, the flight operation is as followings.

1) For M/D, set the temperature specified in NOTOC with FWD & AFT Main Deck Temperature Selector.
2) For L/D, control the temperature by using of LAFRAS and LOWER LOBE Temperature Selector.
3) For Bulk CGO compartment Control the temperature by using of LAFRAS and AFT LOWER LOBE Temperature Selector.
4) Apply the procedure which is set up to reduce false cargo fire warning. For example, although there is a specified temperature in NOTOC, set the FWD & AFT Main Deck Temperature Selector to 9 o’clock (6~7°C) for FWD and 3 o’clock (27~28°C) for AFT when descending at TOD or passing through 25000ft.

j. The temperature in both bulk and AFT CGO compartment can be adjustable with AFT CGO Temperature Select S/W (4℃ or 10℃ position) which is located in forward side of bulk compartment.

AFT CGO Temp' Selector S/W	Bulk Cargo Compartment
	

The end of section

Intentionally

Blank

9.5 Special Cargo

9.5.1 Live Animals(AVI)

9.5.1.1 General

a. Live animals(AVI : 'ah-bee') shall be transported according to IATA LAR(Live Animals Regulations)
b. Loading of live animals, suitable cargo temperature and ventilation requirement should be notified to flight crew with NOTOC form.
c. Live animal should be handled according to procedure for processing of special goods. Live Animal should be marked on transportation document such as MFST.
d. A container which contains live animals should be maintained with enough space between cages and the other cargos for better air circulation.
e. The container for live animal transportation should not be located directly in front of or under the A/C air circulation vents. It should be located in the position which is not contacted with cargo side walls and inner lights.
f. If there is any leakage after live animal unloaded, that cargo compartments should be disinfected.
g. Use approved absorbent such as sawdust and the container lining should be conducted to keep wastes inside.

9.5.1.2 Operation Procedures

a. Captain should confirm cargo loading status and compartments' temperature.
b. Taxiing time should be minimized by selecting available T/O RW.
c. Rapid turn and stop should be avoided during taxiing.
d. Avoid temperature increase in cargo compartments by setting the all packs ON.
e. Maintain proper coordination with ATC for saving taxiing time.
f. Make a descent plan within 1000FPM during descent as much as possible.

g. Taxiing time should be minimized by selecting available L/O RW and proper parking spot.
h. All Packs ON until ramp in after L/D.
i. In case items capable of controlling large animals which are out of control such as sedative, anesthetic, and drugs for euthanasia are loaded, above items must be stored in a safe location under PIC's control and should be utilized with the PIC's approval.

Ex) Humane Killer Device	Storage place inside Cockpit
	 Security box inside cockpit

9.5.2 WET CGO

a. WET CGO is not classified as dangerous goods based on IATA DGR.
and includes one in which it contains liquid by itself and produces liquid due to the nature of the cargo.
b. The followings are included in WET CGO.
  1) liquid cargo packed in watertight container
  2) PER & AVI which is not packed in watertight container but holds ice.
  3) Cargo of AVI which can produce liquid.
c. Waterproof cloth or plastic sheet should be placed on the floor of cargo compartments and ULD to avoid leakage.

The end of section

9.6 Cargo Compartment Classification

9.6.1 General

Cargo Compartment Classification can be found in FAR § 25.857 and Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc9481 AN/928).

9.6.2 Cargo Compartment Classification

9.6.2.1 Class B

a. A Class B cargo or baggage compartment is one in which there are sufficient access in flight to enable a crewmember to effectively reach any part of the compartment with the contents of a hand fire extinguisher and a separate approved smoke detector or fire detector system to give warning at the pilot or flight engineer station.

b. Asiana : Combi M/D Cargo Compartment

9.6.2.2 Class C

a. A Class C cargo or baggage compartment is one not meeting the requirements for either a Class A or B compartment but in which there are a separate approved smoke detector or fire detector system to give warning at the pilot or flight engineer station and an approved built-in fire extinguishing or suppression system controllable from the cockpit.

b. Asiana : PAX, Combi, SF & FRTR L/D Cargo Compartment.

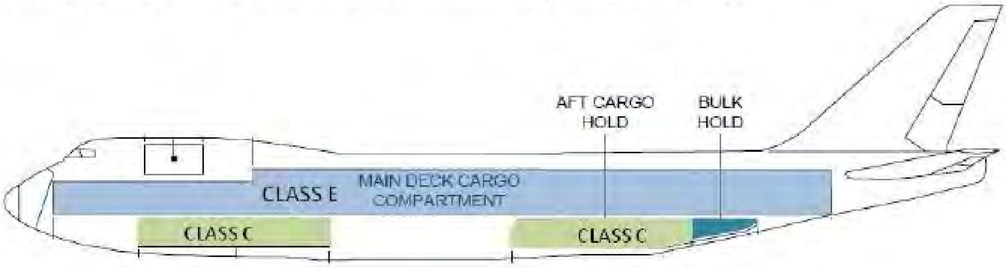
9.6.2.3 Class E

a. A Class E cargo compartment is one on airplanes used only for the carriage of cargo and in which there is a separate approved smoke or fire detector system to give warning at the pilot or flight engineer station and means to shut off the ventilating airflow to, or within, the compartment, and the controls for these means are accessible to the flight crew in the crew compartment.

b. Asiana: FRTR & SF M/D Cargo Compartment

CARGO COMPARTMENT ZONES/ CERTIFICATION

CARGO COMPARTMENT –FAA 14 CFR Part 25 - Smoke compartment - 747-400F



CLASS 'C' AND 'E' CARGO COMPARTMENTS

Cargo compartment information for Class C and Class E location and certification requirements.

9.6.3 OZ Cargo Compartment Classification

Type	Registration Number	Main Deck Cargo Compartment Classification	Lower Deck Cargo Compartment Classification
Original Freighter	HL7419/7420/ 7436/7616	Class E	Class C
SF	HL7413/7414/ 7415/7417/ 7620/7618	Class E	Class C
Combi	HL7421/7423	Class B	Class C

The end of section

9.7 False Cargo Fire Warning

9.7.1 General

a. The purpose of this procedure is to mitigate false cargo fire warning not to change the procedures for AVI and PER transportation.
b. When flowers, vegetables, fruits or animals which produces moisture is loaded in cargo compartments and flying to or from high temperature and/or humidity airport, false cargo fire warning is quite possible.
c. Procedures for mitigation of false cargo fire warning should be included in T/O & Approach briefing.

9.7.2 Three Basic Categories

a. Contamination of smoke detector and smoke detection tube.
b. Moisture, humidity or fog at smoke detector and smoke detection tubing.

9.7.3 Smoke Detector Type

9.7.3.1 Draw-Through Type

a. **PAX** : Tube is mounted in L/D FWD & AFT CGO Compartment.
b. **Freighter & Combi** : Tube is mounted in L/D FWD & AFT CGO Compartment, M/D CGO Compartment.
c. Regular cleaning is needed because tube is easy to be contaminated or humid because of its inhalation function.
d. The tube heaters are installed in PAX in order to provide a significant reduction in the amount of moisture that can build up and contaminate a draw-through detector..
e. Smoke sampling port(smoke detection tube) is mounted on main deck cargo compartment ceiling panel.

9.7.3.2 Area Type

a. SF : Smoke detector is installed in L/D FWD & AFT CGO Compartment, M/D CGO Compartment.
b. More area type smoke detectors are required because they react with natural airflow movement and the amount of air.

9.7.4 General Procedures

a. Cargo must be protected from wet damage with rainfall or snowfall. Before start cargo loading, remove standing water at ULD as much as possible not flowing into cargo compartment during loading.

b. Load master (L/M) should check the status of removing moisture and cargo clearance conducted by ground staff. L/M must make a signature on cargo clearance (PER) column of “FRTR ULD LOCKING & NETTING CHECKLIST” and then get captain’s one.

FREIGHTER ULD LOCKING & NETTING CHECKLIST

FLT No. & Date	Route	Main Deck		Lower Deck		Cargo Pouch & Crew Bag		Cargo Clearance (PER)		Confirmed by Crew
		Status	Inspector	Status	Inspector	Status	Inspector	Status	Inspector	
OZ /										
OZ										

c. The clearance between top of ULD and M/D ceiling and sidewall of cargo compartment is at or greater 2 inches (5 cm). B777’s engine and container with its own shape are exceptions.

d. Freighter main deck aisle should be usable as a passage for the crew in case of emergence.

e. Free water should be avoided on cargo compartment floor or top of ULD as much as possible. If not, it may cause false cargo fire warning by vaporization during cruise.

f. If shipper request specific temperature at L/D AFT compartment for PER in B747SF, that kind of cargo had not be loaded. But self contained cargo (styrofoam, ice pack, etc) that doesn’t have to control temperature is an exception.

g. Cargo that temperature control is required on are as follows.

1) AVI (Live Animal): dogs, cats, tropical fish and chickens etc..
2) PER(Perishable Cargo): flowers, chilled/frozen meat, fish, medicines etc..

h. High Humidity Contents cargo (fruit, fresh flowers, and vegetables etc.) should be covered with plastic or wrap to block the moisture during container or pallet build up.

9.7.5 False Cargo Fire Warning Countermeasure

a. Typical contaminants are dust, animal fur or hay particles may cause False Cargo Fire Warning regardless of the detector type.
b. Regular cleaning should be needed to prevent contaminants from entering the detector and tube.
c. Moisture, humidity, and fog are not as easy to see and control as the physical contaminants like dust, animal fur or hay particles etc..
d. Moisture that comes mainly from flowers, vegetables, fruits (cherry from SEA, SFO, PDX etc.) and animal (cow, pigs, horses from ORD) needs to be ventilated away from the smoke detection tubing and/or smoke detectors in a cargo compartment.
e. Around smoke detector inlet and smoke detector tube inlet, high humidity should be avoided. Pallets of fruits or vegetables had not better be stacked from floor to ceiling and sidewall to sidewall.
f. Cargo with high humidity content be loaded with 46 cm (18 inches) of clearance between the ceiling and the top of the cargo and between the cargo and the sidewall. (Boeing Service Letter 747-SL-26-053)
g. Package, mail, machinery should be loaded near door. These are less affected by temperature and air circulation compared with the cargo that can cause False Cargo Fire Warning.
h. It is not recommended packages, mail, or machinery etc. is not loaded near the door where air circulation is the poorest.(ML,PL,RL)
   1) The natural airflow movement in the main deck cargo compartment is longitudinally from forward to aft.
   2) The air goes to the rear cargo compartment and gathers because the air flow movement is not sufficient there.
   3) The door area has reduced circulation since conditioned air is only provided on the side opposite the door location.

4) The Combination of increased humidity and low air temperature near the door may enhance the possibility of false cargo fire warning.
5) Cargo door areas tend to be 1.5°C to 3°C (3°F to 5°F) cooler than other areas of the cargo compartment. It should actually reduce the transpiration (loss of moisture) from perishable cargo or cargo that is high in humidity.
6) It is reasonable to expect that the area around the cargo door would be one of the first areas to experience false detection due to the higher local humidity conditions.

9.7.6 Operation Procedures with False Cargo Fire Warning

9.7.6.1 Prerequisites

a. SF A/C (HL7413/14/15/17/7620/7618)
b. Arrival/departure from high temperature and/or high humidity airport as;
   1) PVG, HKG, SIN, BKK, PEN, MIA etc..
   2) High temperature or humid at ICN, TSN, ATL, DFW etc. in summer.
c. No matter what cargo they are like flowers, vegetables, fruits, or live animals.
d. Captain’s sound judgment if needed.

9.7.6.2 General

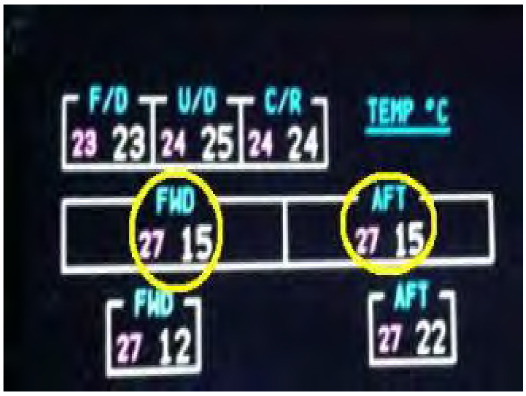
a. M/D Temperature control is able to be achieved through the FWD & AFT main deck temperature selector in overhead maintenance panel.
b. FWD in main deck temperature selector is A1 ~ D for freighter and A1 ~ F for SF.
c. L/D temperature control can be achieved through the Lower Lobe Cargo Conditioned Air Flow Rate Selector (abbreviated as 'LAFRAS') on overhead maintenance panel and LOWER LOBE Temperature Selector.

9.7.6.3 On the Ground

a. Before departure, all packs should be running with airplane doors closed for at least 20 minutes. This allows the packs to purge the cargo compartments of moisture prior to departing.
   1) 'Before departure' is take off (lift off) time.
   2) Duration of 20 minutes includes taxi time.
   3) Packs OFF time (about 4-5 minutes) for engine start during push back is not included in 20 minutes

b. Verify pack high flow status through Display Select Panel ECS.
   1) Pack high flow S/W must be selected ON if it is not automatically selected.
   2) The additional fuel consumption of 0.3% per each pack should be taken into account.
   3) This enables the maximum ventilation airflow to the compartment to carry away the moisture from the cargo.

c. Set the FWD & AFT Main Deck Temperature Selector at 3 o'clock. The temperature range is 4°C ~ 29°C based on FCOM. In reality, 3 o'clock is 27 or 28°C.



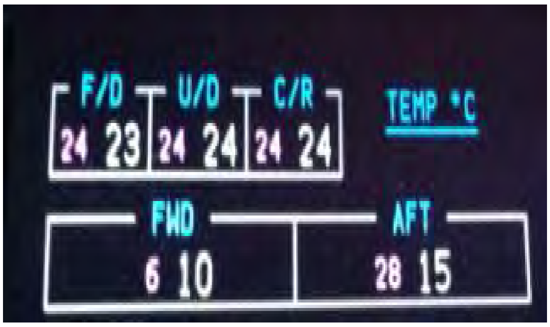
9.7.6.4 Cruise

a. At TOC, set FWD & AFT Main Deck Temperature Selector to the designated temperature on NOTOC. If not, both selectors should be set on 12 o'clock.

b. Set Pack High Flow Switch OFF if it is selected and check EICAS Memo Message is disappeared.

9.7.6.5 Descent

a. At TOD or the airplane passes through FL250, set FWD & AFT Main Deck Temperature Selector on FWD to 9 o'clock(6~7°C), AFT to 3 o'clock (27~28°C).



b. This will reduce the forward to aft airflow and reduce the relative humidity in the aft M/D due to an increased temperature in the aft.

c. Verify pack high flow status through ECS during descent. If it is not automatically selected during decent, pack high flow S/W must be selected ON

9.7.6.6 L/D Temperature Control Procedures (with PER & AVI)

a. The procedures for Lower Lobe Cargo Conditioned Air Flow Rate Selector (abbreviated as 'LAFRAS') and LOWER LOBE Temperature Selector at Overhead Maintenance Panel are below.

b. Set LAFRAS on Both LOW followed by FWD & AFT LOWER LOBE Temperature Selectors on 3 o'clock after engine start.

c. F/O sets LAFRAS BOTH LOW by captain's order unless an assistant crew is in the cockpit.
d. At TOC set the temperature mentioned on NOTOC by using LAFRAS and FWD & AFT LOWER LOBE Temperature Selectors. If not, LAFRAS should be OFF.

e. At TOD or the airplane passes through FL250, set LAFRAS on BOTH LOW and FWD & AFT LOWER LOBE Temperature Selectors on 3 o'clock.
f. Before descent or before flying through clouds, set after cargo heat S/W Off for blocking the air that is not scrubbed of moisture.
   1) The aft lower cargo compartment heat source is bleed air that is sourced from upstream of the packs.
   2) This action can reduce the false detection in L/D AFT and BULK cargo compartment.

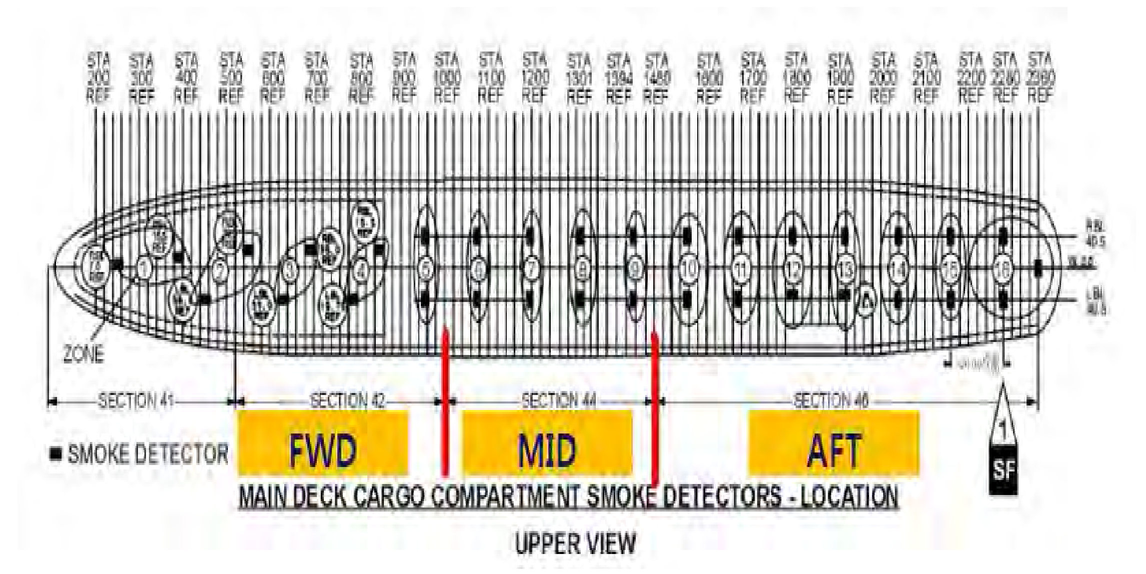
9.7.6.7 L/D Temperature Control Procedures (without PER & AVI)

a. Set LAFRAS Off from Engine start, Taxi and Climb. This can prevent false alarms due to high velocity dense fog in hot and humid airports.
b. At top of climb, set the temperature which is specified on NOTOC by using LAFRAS and FWD & AFT LOWER LOBE Temperature Selectors. If a specific temperature is not given, LAFRAS should be selected to the Off position.

c. c At TOD or the airplane passes through FL250, select LAFRAS to BOTH LOW position and FWD & AFT LOWER LOBE Temperature Selectors to 3 o'clock.
d. Before descent or before flying through clouds, set after cargo heat S/W Off.
e. Set LAFRAS OFF after Shutdown Checklist.

9.7.7 'FIRE MN DK FWD, MID & AFT' in QRH

a. Zone 1-5 : FWD
b. Zone 6-9 : MID
c. Zone 10-16 : AFT
d. MID includes G, H, J, K compared to Cargo Compartment ULD Location.
e. The positions from QRH and FWD & AFT Main Deck Temperature Selector on Overhead Maintenance Panel are different.



9.7.8 False Cargo Fire Warning Report Procedures

a. Write EICAS message on Technical Log.
   1) EICAS message which includes zone name such as "FIRE MN DK AFT" should be logged just as it is.
   2) Record it again even though False Cargo Fire Warning is a repetitive item in same aircraft.

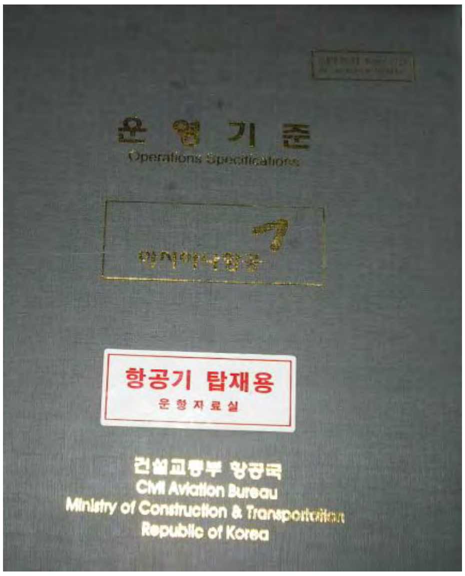
b. Make a captain report. In addition to logging on Technical Log, captain report should be submitted.
   1) In case of false warning signal of fire alarm during the flight.
   2) PIC shall submit aviation safety obstacle report to the minister of MLTM or chief of regional aviation authorities within 72 hours when the events have occurred by the Aviation Law enforcement regulation 144.

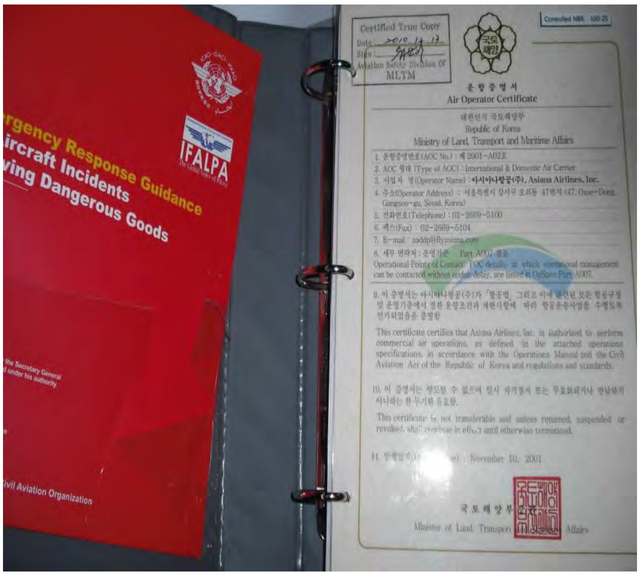
The end of section

9.8 ERG (Emergency Response Guidance)

9.8.1 General

a. ERG (Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods) is issued every two years by ICAO. It is a book for emergency response guide in the event of emergencies arising with dangerous goods.
b. ERG is an only reference book by which QRH should not be replaced.
c. Aircraft Emergency Response Drills is shown in the back of NOTOC form and in the ERG book.
d. ERG is provided inside the left side cover page of OS (Operations Specifications) with AOC(Air Operator Certificate) on the right in the cockpit.





e. This guidance book contains 4 main sections as follows.

Cover	Classification
	Sec1. General Information
	Sec2. General Considerations
	Sec3. Examples of DGs Incidents Checklists
	Sec4. Chart of Drills and List of DGs with Drill Reference Numbers

9.8.2 General Information (Section1)

a. Cargo Compartment Classification Cargo Compartment.
b. Combi M/D Cargo Compartment of Asiana Airlines is Class B with Built-In Fire-Extinguishing System based on AFM
c. Cargo Compartment Locations etc.

9.8.3 General Considerations (Section 2)

a. There are 4 main considerations which may need to be taken into account in assessing an appropriate course of action to take in the event of an incident involving dangerous goods.
  1) In the Passenger Cabin
  2) In the underfloor Cargo Compartment (L/D)
  3) On the Main Deck of Combi Aircraft
  4) On Cargo Aircraft
b. In any event on cargo aircraft, both for accessible and inaccessible dangerous goods on M/D, standard aircraft emergency procedures should always be followed. The followings can be considered
  1) Attempt to locate the source of the incident and identify whether there are fumes or smoke or evidence of spillage of leakage.

2) Follow the appropriate aircraft emergency procedures for fire or for smoke removal if fumes or smoke are present.
3) Identify the DG involved and use the NOTOC to confirm the name and/or UN number of the goods.
4) After establishing the dangerous goods, refer to Section 4 and from either alphabetical or numerical list of dangerous goods note the drill assigned to the particular item.
5) Use the guidance given against the appropriate emergency response drill to deal with the incident.

9.8.4 Examples of DGs Incidents Checklists (Section 3)

a. Checklist concerning DG Incidents
b. Amplified Checklist concerning DG Incidents etc..

9.8.5 Chart of Drills & List of DGs with Drill Reference Numbers (Sec.4)

a. Drill Number uses number from 1~11 and Drill Letter does alphabet.
b. Drill Code = Drill Number + Drill Letter
c. The drill code assigned to an item of dangerous goods consists of a number from 1 to 11 plus one or two letters.
d. Drill Code for PSN(Proper Shipping Name) Dry Ice is 9L.

Section 4. Chart of Drills and List of Dangerous Goods with Drill Reference Numbers 33

UN No.	Drill Code	Proper shipping name
1698	6i	Diphenylamine chloroarsine
1699	6i	Diphenylchloroarsine, liquid
3450	6L	Diphenylchloroarsine, solid
1769	8L	Diphenyldichlorosilane
1770	8L	Diphenylmethyl bromide
0079	1L	Dipicrylamine
0401	1L	Dipicryl sulphide
2852	3E	Dipicryl sulphide, wetted
2383	3C	Dipropylamine
2384	3H	Di-n-propyl ether
2710	3L	Dipropyl ketone
1903	8L	Disinfectant, liquid, corrosive, n.o.s.*
3142	6L	Disinfectant, liquid, toxic, n.o.s.*
1601	6L	Disinfectant, solid, toxic, n.o.s.*
3253	8L	Disodium trioxosilicate
1167	3AH	Divinyl ether, stabilized
1771	8L	Dodecyltrichlorosilane
1845	9L	Dry ice
2801	8L	Dye intermediate, liquid,

UN No.	Drill Code	Proper shipping name
1961	10L	Ethane, refrigerated liquid
1170	3L	Ethanol
2491	8L	Ethanolamine
2491	8L	Ethanolamine solution
3475	3L	Ethanol and gasoline mixture
3475	3L	Ethanol and motor spirit mixture
3475	3L	Ethanol and petrol mixture
1170	3L	Ethanol solution
3271	3L	Ethers, n.o.s.*
1173	3L	Ethyl acetate
2452	10L	Ethylacetylene, stabilized
1917	3i	Ethyl acrylate, stabilized
1170	3L	Ethyl alcohol
1170	3L	Ethyl alcohol solution
1036	10L	Ethylamine
2270	3CH	Ethylamine, aqueous solution
2271	3L	Ethyl amyl ketone
2272	6L	N-Ethylaniline
2273	6L	2-Ethylaniline
1175	3L	Ethylbenzene

e. The drill letter is shown separately on the drill chart; it indicates other possible hazards of the substance. In some cases, the guidance given by the drill number may be further refined by the information given by the drill letter(s).

f. DG table which consists of most parts of ERG has an alphabetical list and UN number.

g. Drill Chart consists of the 6 followings and it is selected as drill number.

  1) Inherent risk
  2) Risk to aircraft
  3) Risk to occupants
  4) Spill or leak procedure
  5) Firefighting procedure
  6) Additional considerations

Table 4-1. Aircraft Emergency Response Drills

1. COMPLETE APPROPRIATE AIRCRAFT EMERGENCY PROCEDURES.
2. CONSIDER LANDING AS SOON AS PRACTICABLE.
3. USE DRILL FROM THE CHART BELOW.

DRILL NO.	INHERENT RISK	RISK TO AIRCRAFT	RISK TO OCCUPANTS	SPILL OR LEAK PROCEDURE	FIREFIGHTING PROCEDURE	ADDITIONAL CONSIDERATIONS
1	Explosion may cause structural failure	Fire and/or explosion	As indicated by the drill letter(s)	Use 100% oxygen; no smoking	All agents according to availability; use standard fire procedure	Possible abrupt loss of pressurization
2	Gas, non-	Minimal	As indicated by	Use 100% oxygen;	All agents according	Possible abrupt loss

h. Case study for Dry Ice which has **Drill Code 9L** :

1) No general inherent risk.
2) Risk to aircraft: Risk is low or none as indicated by the drill letter.
3) Risk to occupants: Risk is low or none as indicated by the drill letter.
4) Spill or leak procedure: Use 100% oxygen.
5) Firefighting procedure: Use all agents according to availability.
6) Additional consideration: None.

22 *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods*

DRILL NO.	INHERENT RISK	RISK TO AIRCRAFT	RISK TO OCCUPANTS	SPILL OR LEAK PROCEDURE	FIREFIGHTING PROCEDURE	ADDITIONAL CONSIDERATIONS
9	No general inherent risk	As indicated by the drill letter	As indicated by the drill letter	Use 100% oxygen; establish and maintain maximum ventilation if "A" drill letter	All agents according to availability; no water on "W" drill letter	None
10	Gas, flammable, high fire risk if any ignition source present	Fire and/or explosion	Smoke, fumes and heat, and as indicated by the drill letter	Use 100% oxygen; establish and maintain maximum ventilation; no smoking; minimum electrics	All agents according to availability	Possible abrupt loss of pressurization

				electrics		
11	Infectious substances may affect humans or animals if inhaled, ingested or absorbed through the mucous membrane or an open wound	Contamination with Infectious substances	Delayed infection to humans or animals	Do not touch. Minimum re-circulation and ventilation in affected area	All agents according to availability. No water on "Y" drill letter	Call for a qualified person to meet the aircraft

DRILL LETTER	ADDITIONAL RISK	DRILL LETTER	ADDITIONAL RISK
A	ANAESTHETIC	N	NOXIOUS
C	CORROSIVE	P	TOXIC* (POISON)
E	EXPLOSIVE	S	SPONTANEOUSLY COMBUSTIBLE OR PYROPHORIC
F	FLAMMABLE	W	IF WET GIVES OFF POISONOUS OR FLAMMABLE GAS
H	HIGHLY IGNITABLE	X	OXIDIZER
i	IRRITANT / TEAR PRODUCING	Y	DEPENDING ON THE TYPE OF INFECTIOUS SUBSTANCE, THE APPROPRIATE NATIONAL AUTHORITY MAY BE REQUIRED TO QUARANTINE INDIVIDUALS, ANIMALS, CARGO AND THE AIRCRAFT
L	OTHER RISK LOW OR NONE		
M	MAGNETIC		

* Toxic has the same meaning as poison.

The end of section

Intentionally

Blank

9.9 OWBS (Onboard Weight & Balance System)

9.9.1 General

OWBS (Onboard Weight & Balance System) or WBS is installed on the freighters such as HL7419, 7420, 7436, 7616 etc..

9.9.2 Operation

a. When GWT on OWBS exceeds the tolerance limit,
   1) A crew member requests a load master to check the load sheet.
   2) The GWT on OWBS still exceeds the tolerance limit after checked by the load master, the crew member use the OWBS as reference only.
   3) The load sheet data takes precedence over OWBS.

b. When GWT on OWBS exceeds **887,400lbs,**
   1) The weight should be adjusted by cargo offloading or other ways.
   2) The reference time for the weight 887,400lbs is "**RAMP OUT**" time.

9.9.3 Example (Before & After Line Selection or Pilot Entry)

<table>
<tr><th>Before</th><th>After</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

a. Two examples are short-haul and long-haul flights
b. "GR WT ADV" + careted GWT in small font is displayed
   ex.) L1(Line 1) '< 481.9 '
c. Enter ZFW (L3) according to the load sheet or make the line selection.
d. The display is changed to large font (863.3) with WBS/FMC Computed Gross Weight displayed in small font (889.2).
e. "ADV 889.2" should be adjusted at or below "887.4" because the GWT on OWBS should not exceed 887,400lbs.

The end of section

9.10 Life Raft

a. Flight crew should verify life rafts gas reservoir pressure gauge. The life rafts gas reservoir pressure gauge should be 2900 ± 100 psig(2800-3000 psig).

b. Instructions: Hook snap on attachment point then throw it outside with automatic deployment. After evacuation, cut nylon string out using a knife in the survival kit.

c. Refer to these pictures.

Before Deployment	After Deployment
	

d. Survival Kit is included in each life raft and supposed to come out after automatic deployment.

e. Life Raft Attachment Point Location

Behind Capt' Seat	Next To U/D Crew Service Door
	

f. Life Rafts are differently placed for reading Gas Reservoir Gauge Pressure. For SF, they are on the rear of the cabin and for freighter, under the closet.

SF(Special Freighter)	Freighter
	

The end of section

Intentionally

Blank

9.11 Decompression Door

a. Decompression Door should always be close during flight. Opening decompression door for ventilation during rest period is not allowed.

b. Do not open it in case of fire.

Outside Upper Wall of Bunk	Inside Bunk(Crew Rest)
	

The end of section

Intentionally

Blank

9.12 Emergency Escape Device

a. Emergency Escape Devices are stowed adjacent to the flight deck overhead hatch.

b. Four emergency escape devices are stowed on the PAX/Combi/SF and 8 on the freighter. Some SF have 6 emergency escape devices.

PAX/Combi/SF	FRTR
	

c. There are 4 Emergency Escape Devices in the cockpit for flight crew because type rating for B747-400 SF is originally based on passenger airplane

d. FRTR has 8 Emergency Escape Devices in the cockpit instead of slide because it has an exception from basic type rating.

e. There are two escape slides for passenger on both sides of SF in upper deck. Emergency Escape Harness is optional for SF.

f. 6 Emergency Escape Harnesses are stowed on the two places for the freighter.

On the side wall in the cabin(4EA)	On the wall of L/H Bunk (2EA)
	
Case & Harness	Hook in harness
	

g. Emergency Escape Harness instructions :

1) Don garment (harness) with buckles forward.
2) Put black strap over shoulder and tighten it.
3) Hook snap on end of strap to escape reel on emergency escape handle.
4) Hold onto escape reel and evacuate airplane through overhead hatch using seats as foothold. The descent speed is adjusted through inertial reel.
5) Upon reaching ground unhook red strap and move to safe area before removing garment.

6) Don garment prior to donning life vest. Do not inflate vest inside airplane.

The end of section

Intentionally

Blank

9.13 Miscellaneous

9.13.1 Lithium Battery

a. In general lithium batteries are prohibited to be loaded on PAX, Combi, SF, and FRTR with exceptions like ELI & ELM.

b. Lithium Battery Classification

Classification	Transportation
RLI (Regulated Lithium Ion)	Prohibited
RLM (Regulated Lithium Metal)	Prohibited
ELI (Excepted Lithium Ion)	Allowed
ELM (Excepted Lithium Metal)	Allowed

Note) Lithium battery UN3480 and UN3090 in Section IB can be transported by PAX and CGO aircraft although it is categorized as RLI/RLM.

c. ELI and ELM are allowed to be carried on all types of aircraft PAX/Combi/SF/FRTR. Statement about ELI and ELM is also not necessary on NOTOC.

d. Some load masters especially in the overseas used to make statement about it on NOTOC but ELI and ELM are still allowed to be loaded.

9.13.2 MAG (Magnetized Material)

a. Magnetic materials should not be placed on the position which may affect indications of the aircraft compass and compass detector unit especially on the forward of aircraft.

b. Magnetized Material should be loaded in lower deck after cargo compartment on PAX.

c. For freighter and SF, MAG may be loaded from position E in M/D.

d. Carriage of magnetic material shall be notified to the PIC by load master.

9.13.3 Curfew Time

a. Much attention is needed to be paid to curfew time especially in case of the flight in the middle of the night by using NOTAM etc..

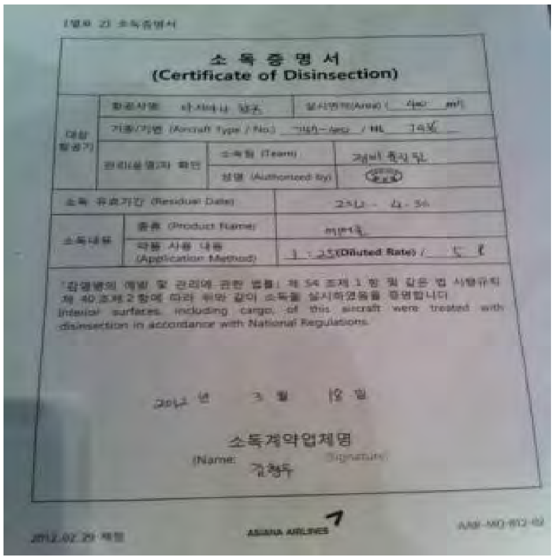
b. Examples : FRA, BRU (winter+1/ summer+2)

Season	FRA	BRU
winter	2200-0400(Z) 2300-0500(L)	2200-0500(Z) 2300-0600(L)
summer	2100-0300(Z) 2300-0500(L)	2100-0400(Z) 2300-0600(L)

c. Curfew for FRA and BRU starts from 23:00(L). It ends at 05:00(L) for FRA and 06:00(L) for BRU.

9.13.4 Disinfection Certificate

a. Disinfection certificate should be carried in the aircraft on the request of Italian Aviation Authorities (ENAC) at MXP.
b. Disinfection certificate is stowed inside the pocket near L1 Door which is same one for cargo compartment ULD location map.
c. Application : all cargo flights to MXP.
d. Instructions : Flight crew should show disinfection certificate on ENAC's request.

Disinfection Certificate Folder	Disinfection Certificate
	

9.13.5 Reporting Procedures after Inspection

a. Captain Report should be submitted after inspection by MLTM, SAFA or FAA etc..

b. Reporting items :
   1) date and place
   2) inspector's name, certificate number etc..
   3) inspection items
   4) findings

c. F/O must hold some documents like W&B, NOTOC, NOTAM, WX, OFP etc. in preparation for EC SAFA (Safety Assessment of Foreign Aircraft) inspection.

SAFA-Ramp Inspection Form

SAFETY ASSESSMENT of FOREIGN AIRCRAFT- POI (Proof of Inspection)

Date: 14.12.2011	Local Time Start: 1430	Local Time End: 15:25	Place: LOWW
Operator: ASIANA			AOC Number: 2001-A02
State: SOUTH KOREA	Type of Operation: ☑ Commercial Air Transport (Annex 6 Part I)	☐ General Aviation (Annex 6 Part II)	☐ Helicopter Operation (Annex 6 Part III)
Route from: UUDD			Flight No.: AAR731
Route to: N/A			Flight No.: N/A
Chartered by Operator: (where applicable)			Charterer's State: (where applicable)
Aircraft type: B747F	Aircraft configuration: ☐ Passenger ☑ Freight ☐ Combi		Registration mark: HL 7415
Flight crew state of licensing: SOUTH KOREA	2nd state of licensing: (where applicable)		Construction No.: 25777

austro CONTROL

Austro Control Österreichische Gesellschaft für Zivilluftfahrt mbH Department AOT/SAFA

E-Mail: contact.safa@austrocontrol.at
Fax: +43 517031666

d. In case of EC SAFA Inspection, inspection form is also required to be sent to B747 flight crew operations office in addition to captain report.

9.13.6 Door Close/Open Status Instructions

a. Door Close/Open Status should be confirmed through door EICAS Message(Advisories/Cautions) for the aircraft with door synoptic display deactivation.

b. Verification must be taken in door related EICAS Message.

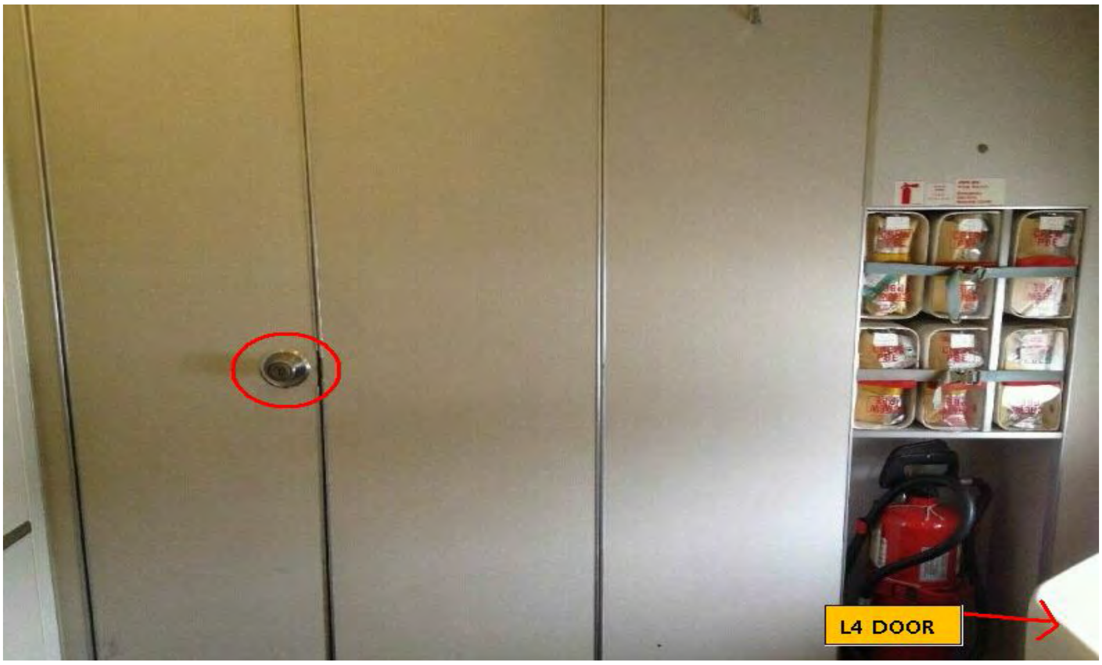
c. Door Close/Open Status verification through Center CDU is only used for reference.

d. Normal operation without any actions is allowed with 'DOORS OPEN' status in Center CDU unless Door EICAS Message is displayed. (TIB NO. : 747-52-007)

Doors Open	Doors Close
	

9.13.7 M/D Cargo Compartment Fire (Combi)

a. In B747-400 Combi aircraft, cabin crew in charge of L4 Door is assigned to perform the duty for prevention and suppression of fire.
b. The key to Cargo Access Door for entering M/D Cargo Compartment is stowed in L4 door overhead bin.

Combi Cargo Access Door


c. When EICAS MSG concerning fire happens or information about Smoke, Fire or Fume is given to captain, QRH must be followed by flight crew.
d. When captain is informed of fire or smoke in M/D cargo compartment, he has to keep continuous communication with cabin crew until the fire has been extinguished.
e. If a fire is little, cabin crew in charge of L4 Door can directly do the fire fighting. For a big fire, it is able to be suppressed through pushing M/D Cargo Fire Discharge Switch in the cockpit by flight crew.
f. In case of fire suppression by flight crew in the cockpit, cabin must be informed of that and come out immediately to the cabin from M/D cargo compartment.
g. When cabin crew in charge of L4 Door confirms whether a fire in M/D cargo compartment is under control or not through view port and a fire exists no more, the cabin crew who puts on fire fighting suit, PBE, fire fighting gloves and flash light enters M/D cargo compartment to check for fire followed by a report to the captain.

The end of section

<References>

- TIB NO. : 747-52-007 (Technical Information Bulletin)
- Tie down procedure for the baggage of flight crew and additional occupants
- Cargo handling procedures of cargo flight for mitigation of false cargo fire warnings.
- Boeing Message No.1-396773825-3
- Boeing Service Letter 747-SL-26-053 15 February 2011
- COM(Cargo Operation Manual)
- Dangerous Goods Regulations 53rd Edition
- Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods
- FAR25.857 Cargo Compartment Classification