B777

Pilot Operating Manual

ASIANA AIRLINES

MANUAL RIGHTS

국 토 교 통 부

수신 아시아나항공
(경유)
제목 아시아나항공 운항규정(B777 POM) 개정 신고수리

1. 아시아나항공 운항표준평가 제2026-009호('26.2.10) 관련입니다.

2. 귀 사에서 제출한 운항규정(B777 POM) 개정안에 대하여 항공안전법 제93조 및 같은 법 시행규칙 제267조에 따라 운항규정 개정 신고를 수리합니다.

붙임 신구조문 대비표 1부. 끝.

국토교통부장관

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TABLE OF CONTENTS

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REVISION LOG

GENERAL

The POM shall be revised to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued operations manual bulletins. Formal revisions include a new Revision Log, and a current List of Effective Pages. Use the information on the new Revision Log and List of Effective Pages to verify the POM content. Pages containing revised material have revision bars associated with the changed text or illustration.

REVISION RECORD

No.	Revision Date	FCOM Rev No.	No.	Revision Date	FCOM Rev No.
10	04 JUL 2013		22	08 DEC 2021	
11	18 APR 2014		23	31 DEC 2021	
12	23 JUN 2014		24	26 APR 2022	
13	18 JUL 2014		25	23 JUN 2022	
14	17 OCT 2014		26	12 DEC 2022	
15	25 JUN 2015		27	20 JUN 2023	
16	30 SEP 2016		28	26 FEB 2024	
17	28 AUG 2017		29	28 OCT 2024	
18	05 APR 2018		30	25 JUN 2025	
19	04 OCT 2018		31	24 NOV 2025	
20	22 OCT 2019		32	26 FEB 2026	
21	10 FEB 2021				

FILING INSTRUCTIONS

Consult the List of Effective Pages (Section 0.2). Pages identified with change bar are either replacement pages or new (original) issue pages.

Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

REVISION HIGHLIGHTS

유효페이지 목록
(List of Effective Pages)

Approved by MOLIT	REV NO.
신고필 2026.02.26 국토교통부 MOLIT	REV 32 Corresponding to B777 POM REVISION ISSUED 26 FEB 2026

LIST OF EFFECTIVE PAGES

* = Revised, Added, or Deleted

Page	Date
5.1.3	01 AUG 2025
5.1.4	01 AUG 2025
5.1.5	01 AUG 2025
5.1.6	01 AUG 2025
5.1.7	01 AUG 2025
5.1.8	01 AUG 2025
5.1.9	01 AUG 2025
5.1.10	01 AUG 2025
5.2.1	24 NOV 2025
5.2.2	01 AUG 2025
5.2.3	01 AUG 2025
5.2.4	01 AUG 2025
5.2.5	01 AUG 2025
5.2.6	01 AUG 2025
5.2.7	01 AUG 2025
5.2.8	01 AUG 2025
5.2.9	01 AUG 2025
5.2.10	01 AUG 2025
5.2.11	01 AUG 2025
5.2.12	01 AUG 2025
5.3.1	01 AUG 2025
5.3.2	01 AUG 2025
5.3.3	01 AUG 2025
5.3.4	01 AUG 2025
5.3.5	01 AUG 2025
5.3.6	01 AUG 2025
5.3.7	01 AUG 2025
5.3.8	01 AUG 2025
5.3.9	01 AUG 2025
5.3.10	01 AUG 2025
5.3.11	01 AUG 2025

Page	Date
5.3.12	01 AUG 2025
5.3.13	01 AUG 2025
5.3.14	01 AUG 2025
5.3.15	01 AUG 2025
5.3.16	01 AUG 2025
5.3.17	01 AUG 2025
5.3.18	01 AUG 2025
5.3.19	01 AUG 2025
5.3.20	01 AUG 2025
5.3.21	01 AUG 2025
5.3.22	01 AUG 2025
5.3.23	01 AUG 2025
5.3.24	01 AUG 2025
5.3.25	01 AUG 2025
5.3.26	01 AUG 2025
5.3.27	01 AUG 2025
5.3.28	01 AUG 2025
5.3.29	01 AUG 2025
5.3.30	01 AUG 2025
5.3.31	01 AUG 2025
5.3.32	01 AUG 2025
5.3.33	01 AUG 2025
5.3.34	01 AUG 2025
5.3.35	*16 MAR 2026
5.3.36	01 AUG 2025
5.3.37	01 AUG 2025
5.3.38	01 AUG 2025
5.3.39	01 AUG 2025
5.3.40	01 AUG 2025
5.4.1	01 AUG 2025
5.4.2	01 AUG 2025

Page	Date
5.4.3	01 AUG 2025
5.4.4	01 AUG 2025
5.4.5	01 AUG 2025
5.4.6	01 AUG 2025
5.4.7	24 NOV 2025
5.4.8	01 AUG 2025
5.4.9	01 AUG 2025
5.4.10	01 AUG 2025
5.4.11	01 AUG 2025
5.4.12	01 AUG 2025
5.5.1	01 AUG 2025
5.5.2	01 AUG 2025
5.5.3	01 AUG 2025
5.5.4	01 AUG 2025
5.5.5	01 AUG 2025
5.5.6	*16 MAR 2026
5.5.7	01 AUG 2025
5.5.8	01 AUG 2025
5.5.9	01 AUG 2025
5.5.10	01 AUG 2025
5.5.11	01 AUG 2025
5.5.12	01 AUG 2025
5.6.1	01 AUG 2025
5.6.2	01 AUG 2025
5.7.1	01 AUG 2025
5.7.2	01 AUG 2025
5.8.1	01 AUG 2025
5.8.2	01 AUG 2025
5.8.3	01 AUG 2025
5.8.4	24 NOV 2025
5.9.1	01 AUG 2025

Page	Date
5.9.2	01 AUG 2025
5.9.3	01 AUG 2025
5.9.4	01 AUG 2025
5.9.5	24 NOV 2025
5.9.6	24 NOV 2025
5.9.7	01 AUG 2025
5.9.8	01 AUG 2025
5.9.9	01 AUG 2025
5.9.10	24 NOV 2025
5.9.11	01 AUG 2025
5.9.12	01 AUG 2025
5.9.13	01 AUG 2025
5.9.14	01 AUG 2025
5.9.15	01 AUG 2025
5.9.16	01 AUG 2025
5.9.17	01 AUG 2025
5.9.18	01 AUG 2025
5.9.19	01 AUG 2025
5.9.20	01 AUG 2025
5.9.21	01 AUG 2025
5.9.22	01 AUG 2025
5.9.23	*16 MAR 2026
5.9.24	12 JAN 2026
5.9.25	12 JAN 2026
5.9.26	12 JAN 2026
5.9.27	01 AUG 2025
5.9.28	24 NOV 2025
5.9.29	01 AUG 2025
5.9.30	24 NOV 2025
5.9.31	01 AUG 2025
5.9.32	01 AUG 2025

Page	Date
5.9.33	01 AUG 2025
5.9.34	12 JAN 2026
5.9.35	01 AUG 2025
5.9.36	24 NOV 2025
5.9.37	01 AUG 2025
5.9.38	01 AUG 2025
5.9.39	01 AUG 2025
5.9.40	12 JAN 2026
5.9.41	01 AUG 2025
5.9.42	01 AUG 2025
5.9.43	12 JAN 2026
5.9.44	12 JAN 2026
5.9.45	12 JAN 2026
5.9.46	*16 MAR 2026
5.9.47	12 JAN 2026
5.9.48	12 JAN 2026
5.9.49	12 JAN 2026
5.9.50	12 JAN 2026
5.9.51	12 JAN 2026
5.9.52	12 JAN 2026
5.9.53	12 JAN 2026
5.9.54	12 JAN 2026
5.9.55	12 JAN 2026
5.9.56	12 JAN 2026
5.9.57	12 JAN 2026
5.9.58	12 JAN 2026
5.9.59	01 AUG 2025
5.9.60	01 AUG 2025
5.9.61	24 NOV 2025
5.9.62	24 NOV 2025
5.9.63	24 NOV 2025

Page	Date
5.9.64	24 NOV 2025
5.9.65	24 NOV 2025
5.9.66	24 NOV 2025
5.9.67	24 NOV 2025
5.9.68	24 NOV 2025
5.9.69	24 NOV 2025
5.9.70	24 NOV 2025
5.10.1	*16 MAR 2026
5.10.2	01 AUG 2025
5.10.3	01 AUG 2025
5.10.4	01 AUG 2025
5.10.5	01 AUG 2025
5.10.6	01 AUG 2025
5.11.1	24 NOV 2025
5.11.2	01 AUG 2025
5.11.3	01 AUG 2025
5.11.4	01 AUG 2025
6. Supplementary Procedures	
6.0.1	01 AUG 2025
6.0.2	01 AUG 2025
6.0.3	01 AUG 2025
6.0.4	01 AUG 2025
6.0.5	01 AUG 2025
6.0.6	01 AUG 2025
6.05.1	01 AUG 2025
6.05.2	01 AUG 2025
6.1.1	01 AUG 2025
6.1.2	01 AUG 2025
6.1.3	01 AUG 2025
6.1.4	01 AUG 2025

Page	Date
6.1.5	01 AUG 2025
6.1.6	01 AUG 2025
6.1.7	01 AUG 2025
6.1.8	01 AUG 2025
6.2.1	01 AUG 2025
6.2.2	01 AUG 2025
6.2.3	01 AUG 2025
6.2.4	01 AUG 2025
6.4.1	01 AUG 2025
6.4.2	01 AUG 2025
6.4.3	01 AUG 2025
6.4.4	24 NOV 2025
6.4.5	01 AUG 2025
6.4.6	01 AUG 2025
6.5.1	01 AUG 2025
6.5.2	*16 MAR 2026
6.5.3	01 AUG 2025
6.5.4	01 AUG 2025
6.5.5	01 AUG 2025
6.5.6	01 AUG 2025
6.5.7	01 AUG 2025
6.5.8	01 AUG 2025
6.5.9	01 AUG 2025
6.5.10	01 AUG 2025
6.5.11	01 AUG 2025
6.5.12	01 AUG 2025
6.5.13	01 AUG 2025
6.5.14	01 AUG 2025
6.6.1	01 AUG 2025
6.6.2	01 AUG 2025
6.7.1	01 AUG 2025

Page	Date
6.7.2	24 NOV 2025
6.7.3	24 NOV 2025
6.7.4	24 NOV 2025
6.7.5	24 NOV 2025
6.7.6	24 NOV 2025
6.7.7	24 NOV 2025
6.7.8	24 NOV 2025
6.10.1	01 AUG 2025
6.10.2	01 AUG 2025
6.10.3	01 AUG 2025
6.10.4	01 AUG 2025
6.10.5	01 AUG 2025
6.10.6	01 AUG 2025
6.10.7	01 AUG 2025
6.10.8	01 AUG 2025
6.10.9	01 AUG 2025
6.10.10	01 AUG 2025
6.10.11	01 AUG 2025
6.10.12	01 AUG 2025
6.11.1	01 AUG 2025
6.11.2	01 AUG 2025
6.11.3	01 AUG 2025
6.11.4	01 AUG 2025
6.11.5	24 NOV 2025
6.11.6	01 AUG 2025
6.11.7	*16 MAR 2026
6.11.8	01 AUG 2025
6.11.9	24 NOV 2025
6.11.10	24 NOV 2025
6.11.11	24 NOV 2025
6.11.12	24 NOV 2025

Page	Date
6.11.13	24 NOV 2025
6.11.14	24 NOV 2025
6.11.15	24 NOV 2025
6.11.16	01 AUG 2025
6.11.17	01 AUG 2025
6.11.18	01 AUG 2025
6.12.1	01 AUG 2025
6.12.2	01 AUG 2025
6.13.1	01 AUG 2025
6.13.2	01 AUG 2025
7. Adverse Weather Operations	
7.0.1	01 AUG 2025
7.0.2	01 AUG 2025
7.1.1	01 AUG 2025
7.1.2	01 AUG 2025
7.1.3	01 AUG 2025
7.1.4	01 AUG 2025
7.1.5	01 AUG 2025
7.1.6	01 AUG 2025
7.1.7	01 AUG 2025
7.1.8	01 AUG 2025
7.1.9	01 AUG 2025
7.1.10	01 AUG 2025
7.1.11	01 AUG 2025
7.1.12	01 AUG 2025
7.1.13	01 AUG 2025
7.1.14	01 AUG 2025
7.1.15	01 AUG 2025
7.1.16	01 AUG 2025
7.1.17	01 AUG 2025

Page	Date
7.1.18	01 AUG 2025
7.1.19	01 AUG 2025
7.1.20	01 AUG 2025
7.1.21	01 AUG 2025
7.1.22	01 AUG 2025
7.1.23	01 AUG 2025
7.1.24	01 AUG 2025
7.1.25	01 AUG 2025
7.1.26	01 AUG 2025
7.1.27	01 AUG 2025
7.1.28	01 AUG 2025
7.1.29	01 AUG 2025
7.1.30	01 AUG 2025
8. Non-normal Operations	
8.0.1	01 AUG 2025
8.0.2	01 AUG 2025
8.0.3	01 AUG 2025
8.0.4	01 AUG 2025
8.1.1	01 AUG 2025
8.1.2	01 AUG 2025
8.1.3	01 AUG 2025
8.1.4	01 AUG 2025
8.2.1	01 AUG 2025
8.2.2	01 AUG 2025
8.2.3	01 AUG 2025
8.2.4	01 AUG 2025
8.2.5	01 AUG 2025
8.2.6	01 AUG 2025
8.2.7	01 AUG 2025
8.2.8	01 AUG 2025
8.2.9	01 AUG 2025

Page	Date
8.2.10	01 AUG 2025
8.2.11	01 AUG 2025
8.2.12	01 AUG 2025
8.2.13	01 AUG 2025
8.2.14	01 AUG 2025
8.2.15	01 AUG 2025
8.2.16	01 AUG 2025
8.2.17	01 AUG 2025
8.2.18	01 AUG 2025
8.2.19	01 AUG 2025
8.2.20	01 AUG 2025
8.2.21	01 AUG 2025
8.2.22	01 AUG 2025
8.3.1	01 AUG 2025
8.3.2	01 AUG 2025
8.3.3	01 AUG 2025
8.3.4	01 AUG 2025
8.3.5	01 AUG 2025
8.3.6	01 AUG 2025
8.3.7	01 AUG 2025
8.3.8	01 AUG 2025
8.3.9	01 AUG 2025
8.3.10	01 AUG 2025
8.3.11	24 NOV 2025
8.3.12	01 AUG 2025
8.3.13	01 AUG 2025
8.3.14	01 AUG 2025
8.3.15	01 AUG 2025
8.3.16	01 AUG 2025
9. Appendix	
9.0.1	01 AUG 2025

Page	Date
9.0.2	01 AUG 2025
9.1.1	01 AUG 2025
9.1.2	01 AUG 2025
9.1.3	01 AUG 2025
9.1.4	01 AUG 2025
9.1.5	01 AUG 2025
9.1.6	01 AUG 2025
9.1.7	01 AUG 2025
9.1.8	01 AUG 2025
9.1.9	01 AUG 2025
9.1.10	01 AUG 2025
9.1.11	01 AUG 2025
9.1.12	01 AUG 2025
9.1.13	01 AUG 2025
9.1.14	01 AUG 2025
9.1.15	24 NOV 2025
9.1.16	24 NOV 2025
9.1.17	24 NOV 2025
9.1.18	01 AUG 2025
9.2.1	01 AUG 2025
9.2.2	01 AUG 2025
9.2.3	01 AUG 2025
9.2.4	01 AUG 2025
9.2.5	01 AUG 2025
9.2.6	01 AUG 2025
9.2.7	01 AUG 2025
9.2.8	01 AUG 2025
9.2.9	01 AUG 2025
9.2.10	01 AUG 2025
9.3.1	01 AUG 2025
9.3.2	01 AUG 2025

Page	Date
9.3.3	01 AUG 2025
9.3.4	01 AUG 2025
9.3.5	01 AUG 2025
9.3.6	01 AUG 2025
9.3.7	01 AUG 2025
9.3.8	01 AUG 2025
9.3.9	01 AUG 2025
9.3.10	01 AUG 2025
9.3.11	01 AUG 2025
9.3.12	01 AUG 2025
9.3.13	01 AUG 2025
9.3.14	01 AUG 2025
9.3.15	01 AUG 2025
9.3.16	01 AUG 2025
9.3.17	01 AUG 2025
9.3.18	01 AUG 2025
9.3.19	01 AUG 2025
9.3.20	01 AUG 2025
9.3.21	01 AUG 2025
9.3.22	01 AUG 2025
9.3.23	01 AUG 2025
9.3.24	01 AUG 2025
9.4.1	01 AUG 2025
9.4.2	01 AUG 2025
9.4.3	01 AUG 2025
9.4.4	01 AUG 2025
9.4.5	01 AUG 2025
9.4.6	01 AUG 2025
9.4.7	01 AUG 2025
9.4.8	01 AUG 2025
9.4.9	01 AUG 2025

Page	Date
9.4.10	01 AUG 2025
9.4.11	01 AUG 2025
9.4.12	01 AUG 2025
9.5.1	01 AUG 2025
9.5.2	01 AUG 2025
9.5.3	01 AUG 2025
9.5.4	01 AUG 2025
9.5.5	01 AUG 2025
9.5.6	01 AUG 2025
9.5.7	01 AUG 2025
9.5.8	01 AUG 2025
9.5.9	01 AUG 2025
9.5.10	01 AUG 2025

TABLE OF CONTENTS

POM OVERVIEW

PURPOSE

The Boeing Company developed normal and non-normal procedures for the 777 aircraft. Asiana Air has modified some of the procedures for simplification and standardization, when appropriate, with other AAR aircraft.

These procedures are company policy for pilots to follow during ground operations and in flight. Deviations from these policies and procedures should be made only with good cause and based on the safest course of action. If an abnormality occurs that is not covered by these procedures, the Captain must use his best judgement.

CORRECTION TO THE MANUAL

Any questions about the content or use of this manual can be directed to:

- Flight Standard Department
- Flight Operations Technical Support Department

GENERAL FORMATS AND CONVENTIONS

The following levels of written advisories are used throughout the manual and are not to be confused with EICAS messages, which are separately identified in the text.

WARNING

An operating procedure, technique, etc., that may result in personal injury or loss of life if not carefully followed.

WARNING! Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.

CAUTION

An operating procedure, technique, etc., that may result in damage to equipment if not carefully followed.

> **CAUTION!** ***Failing to lower tilt from initial takeoff setting will cause over scanning of weather areas enroute.***

NOTE

An operating procedure, technique, etc., considered essential to emphasize. Information contained in notes may also be safety related.

> Note: If the ECON descent speed is much less than the OFP's descent speed, enter the Cruising Mach No./290 into FMS or set the speed properly on the MCP.

WILL, MUST, SHALL, SHOULD, MAY

WILL, SHALL, MUST

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

SHOULD

The word "should" is used in an imperative sense to state the requirement to accomplish the act prescribed. Nevertheless, it can be ignored under reasonable circumstances.

MAY

The word "may" is used in a permissive sense to state authority or permission. Compliance is not mandatory

ALTITUDE/AIRSPEED REFERENCES

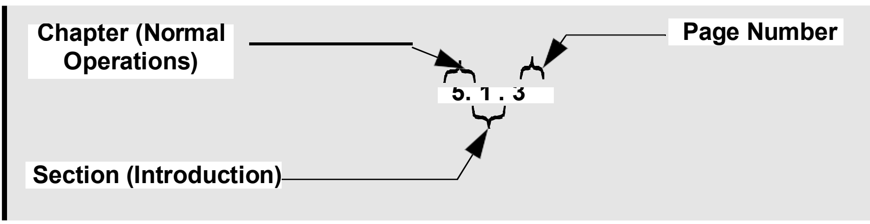
Altitudes by default are above Mean Sea Level (MSL) unless otherwise specified. (e.g. FL200, 400 ft AGL, 1500 ft AFE, 2000 ft RA, etc.)

Airspeed/Mach values are the indicated airspeed/Mach.

PAGE NUMBERING

The Pilot Operating Manual uses a page numbering system. The page number is divided into three fields; chapter, section, and page. An example of a page number for the Normal Operations chapter follows: chapter 5, section 1, page 3.

Figure - Example Page Number



PAGE IDENTIFICATION

Each page is identified by a page number and a page date. The page date is the date of publication of the manual or the most recent revision date.

CHANGE BAR

Black vertical change bars, located in the outside margin, are used to highlight the location of revised or deleted information on a newly published page. With the next revision of that page, previous change bars are deleted.

AIRPLANE EFFECTIVITIES

Differences in airplane configuration are shown by use of airplane effectivities throughout POM. The following rules are used to express airplane effectivities:

- Airplane effectivities are listed in registration number or airplane configuration

e.g. HL7700, B777-200ER

- A range of airplanes is defined by a dash.

e.g. HL7700-HL8254

- Airplane effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any).
- When airplane effectivities are immediately below the title, the entire section applies to the listed airplanes.

Example (with subordinate items):

Passenger

Flight deck door------------------------Closed and locked

Verify the LOCK FAIL light is extinguished.

Exterior doors----------------------------------Verify closed

Ensure that all exterior doors are closed and armed to AUTOMATIC (or ARMED).

In this example, the effectivity Passenger applies to the first procedural step (Flight deck door.....) and further indented/subordinate step (Verify....). The effectivity does not apply to the next equivalently indented step (Exterior doors .....).

Example (without subordinate items):

~~**HL8005, HL8043-HL8076, HL8226, HL8251, HL8252, HL8285**~~

~~# Do not use the autopilot below 100 ft radio altitude at airport field elevations above 8500 ft.~~

The autopilot must not be engaged below a minimum engage altitude of 200 ft AGL after takeoff.

In this example, the effectivity applies to the first paragraph only. The effectivity does not apply to the next equivalently indented paragraph.

Example (below the title)

~~**RIGID CARGO BARRIER DOOR**~~

~~**Freighter**~~

~~The rigid cargo barrier door must be closed during taxi, takeoff, and landing.~~

~~The rigid cargo barrier door must be closed except when entering and exiting the cargo compartment.~~

~~In this example, the RIGID CARGO BARRIER DOOR is applicable to freighter only.~~

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POM ORGANIZATION

This manual is organized in the following manner.

0. PREFACE

REVISION LOG

The Revision Log is used to record all posted revisions.

LIST OF EFFECTIVE PAGES

The List of Effective Pages is located after the Revision Log. It lists pages included in an up-to-date POM. However, POM Bulletins are not included.

1. USER GUIDE

User guide contains general information regarding the manual’s purpose, and organization. The USER GUIDE outlines the organization of the POM. It explains how the manual should be used during line operations.

POM OVERVIEW

POM ORGANIZATION

MODEL IDENTIFICATION

The airplanes listed in the table are covered in the POM.

ABBREVIATIONS

The abbreviations may be found throughout the B777 manuals.

2. BULLETINS

The Pilot Operating Manual Bulletins is issued as required. Bulletins must be issued before the next formal revision to the Pilot Operating Manual or information of interest to all operators.

OPERATIONS MANUAL BULLETIN(OMB)

OMB's are issued by Boeing when the need arises to present interim information or general guidelines pertaining to aircraft operation.

OMB's are numbered sequentially they are issued, i.e. AAR-15, AAR-7R etc. and remain in effect until cancelled.

~~FLIGHT CREW BULLETIN(FCB)~~

~~FCB's are issued by Asiana Air when the need arises to present interim information or general guideline pertaining to aircraft operation. FCB's are numbered sequentially they are issued, i.e. FCB-1, FCB-2 etc. and remain in effect until cancelled.~~

3. AIRCRAFT DIFFERENCES

This chapter highlights operational differences for each aircraft model. It provides a means to quickly review differences that are unique to a particular aircraft.

4. LIMITATIONS

Limitations chapter covers operational limitations.

5. NORMAL OPERATIONS

Normal Operations chapters cover normal procedures. All operating procedures are based on a thorough analysis of crew activity required to operate the airplane, and reflect the latest knowledge and experience available.

6. SUPPLEMENTARY PROCEDURES

This chapter contains procedures (engine crossbleed start, and so on) that are accomplished as required rather than routinely performed on each flight.

7. ADVERSE WEATHER OPERATIONS

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, severe turbulence, and windshear.

8. NON-NORMAL OPERATIONS

Non-normal operations chapters cover non-normal procedures. Pilots are expected to follow these procedures when an abnormal situation occurs. System controls are assumed to be in the normal configuration for phase of flight prior to the initiation of procedures. Non-normal operation and procedures are included in QRH. A comprehensive non-normal operations and procedures can be found in QRH.

9. APPENDIX

This is a reserved chapter to provide an information or data.

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MODEL IDENTIFICATION

The airplanes listed in the table below are covered in the operations manual. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator’s fleet for airplanes covered in this manual. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
104	HL7700	30859	WC114
105	HL7732	29174	WC115
106	HL7739	29175	WC116
108	HL7755	30861	WC118
109	HL7756	30860	WC119
110	HL7775	30862	WC120
111	HL7791	35525	WC581
112	HL8254	40198	WC586
113	HL8284	40199	WC587

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ABBREVIATIONS

The following abbreviations may be found throughout the manual. Some abbreviations may also appear in lowercase letters. Abbreviations having very limited use are explained in the chapter where they are used.

A	
ABV	Above
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACP	Audio Control Panel
ACT	Active
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
AFDS	Autopilot Flight Director System
AFM	Airplane Flight Manual (FAA approved)
A/G	Air/Ground
AGL	Above Ground Level
AIMS	Airplane Information Management System
ALT	Altitude
ALTN	Alternate
AM	Amplitude Modulation
AMI	Airline Modifiable Information
ANP	Actual Navigational Performance
ANT	Antenna
AOA	Angle of Attack
A/P	Autopilot
APP	Approach
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
ARR	Arrival
ASYM	Asymmetry
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control
AUTO	Automatic
AUX	Auxiliary
AVAIL	Available

B	
BARO	Barometric
BAT	Battery
BFO	Beat Frequency Oscillator
BLD	Bleed
BLW	Below
BRG	Bearing
BRT	Bright
BTL	Bottle
C	
C	Captain Celsius Center Cool
CANC	Cancel
CAPT	Captain
CB	Circuit Breaker
CDU	Control Display Unit
CG	Center of Gravity
CL	Close
CLB	Climb
CLR	Clear
CO	Company
COMM	Communication
COMP	Comparator
COMPT	Compartment
CON	Continuous
CONFIG	Configuration
CONT	Control
COOL	Cooling
CRS	Course
CRT	Cathode Ray Tube
CRZ	Cruise
CTL	Control
CTR	Center
D	
DA(H)	Decision Altitude (Height)
DC	Direct Current
DDG	Dispatch Deviations Guide
DEL	Delete
DEP	Departure
DEPR	Depressurize
DES	Descent
DH	Decision Height
DISC	Disconnect
DISCH	Discharge
DK	Deck

DME	Distance Measuring Equipment
DN	Down
DSPL	Display
E	
EAI	Engine Anti-ice
E/D	End of Descent
EDTO	Extended Diversion Time Operation
E/E	Electrical/Electronic
EEC	Electronic Engine Control
EFIS	Electronic Flight Instrument System
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENG	Engine
ENT	Entry
EO	Engine Out
EPR	Engine Pressure Ratio
EQPT or EQUIP	Equipment
EVAC	Evacuation
EXEC	Execute
EXT	Extend External Extension Exterior
F	
F	Fahrenheit
FCOM	Flight Crew Operations Manual
FD, F/D or FLT DIR	Flight Director
FF	Fuel Flow
FLCH	Flight Level Change
FLT	Flight
FMA	Flight Mode Annunciations
FMC	Flight Management Computer
FMS	Flight Management System
F/O or FO	First Officer
FPA	Flight Path Angle
FPM	Feet Per Minute
FPV	Flight Path Vector
FREQ	Frequency
FT	Feet

FWD	Forward
G	
GA	Go–Around
GEN	Generator
GND	Ground
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
G/S	Glide Slope
GS	Ground Speed
H	
HAA	Height Above Aerodrome
HDG	Heading
HF	High Frequency
HI	High
HLD	Hold
HYD	Hydraulic
I	
IAF	Initial Approach Fix
IAS	Indicated Airspeed
IDENT	Identification
IFE	Inflight Entertainment
IGN	Ignition
IND LTS	Indicator Lights
INIT	Initialization
INSTR	Instrument
ILS	Instrument Landing System
INBD	Inboard
IND	Indicator
INOP	Inoperative
INT or INTPH	Interphone
INTC	Intercept
IRS	Inertial Reference System
ISA	International Standard Atmosphere
ISLN	Isolation
ISFD	Integrated Standby Flight Display
K	
K or KTS	Knots
KGS	Kilograms
L	
L	Left
LBS	Pounds
LD	Load

LDA	Localizer-type Directional Aid
LDG	Landing
LE	Leading Edge
LIM	Limit
LKD	Locked
L NAV or LNAV	Lateral Navigation
LOC	Localizer
LT	Light
M	
M	Mach
MAG	Magnetic
MAN	Manual
MAX	Maximum
MCP	Mode Control Panel
MDA(H)	Minimum Descent Altitude (Height)
MEL	Minimum Equipment List
MFD	Multifunction Display
MIC	Microphone
MIN	Minimum
MKR	Marker
MLS	Microwave Landing System
MMO	Maximum Mach Operating Speed
MOD	Modify
MSG	Message
N	
N	Normal
NAV	Navigation
NM	Nautical Miles
NORM	Normal
NPS	Navigation Performance Scales
N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed (Pratt & Whitney engines) Intermediate Pressure Rotor Speed (Rolls–Royce engines)
O	
OAT	Outside Air Temperature
OCA	Obstacle Clearance Altitude
OFST	Offset
OP	Open
OVHT	Overheat
OVRD	Override
OXY or O2	Oxygen

P	
PA	Passenger Address
PASS	Passenger
PERF	Performance
PF	Pilot Flying
PM	Pilot Monitoring
PNL	Panel
POS	Position
PPOS	Present Position
PRES or PRESS	Pressure
PREV	Previous
P/RST	Push To Reset
PROX	Proximity
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PTU	Power Transfer Unit
PWR	Power
PWS	Predictive Windshear System
Q	
Q	Quantity
QFE	Local Station Pressure
QNH	Local Station Pressure corrected to MSL
QTY	Quantity
R	
R	Right
RA	Radio Altitude Resolution Advisory
RAD	Radio
RAT	Ram Air Turbine
RDMI	Radio Distance Magnetic Indicator
REC	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
REV	Reverse
RF	Refill, Radius to Fix
RNAV	Area Navigation
RNP	Required Navigational Performance
RPM	Revolutions Per Minute
RST	Reset
R/T	Radio Transmit
RTE	Route
RTO	Rejected Takeoff

RVSM	Reduced Vertical Separation Minimum
S	
SAT	Static Air Temperature
SATCOM	Satellite Communication
SB	Service Bulletin
S/C	Step Climb
SEL	Select
SDF	Simplified Directional Facility
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SPD	Speed
SPDBRK	Speedbrake
STAB	Stabilizer
STBY	Standby
SUPR or SUPRNMRY	Supernumerary
SYS	System
T	
T or TRU	True
T or TK or TRK	Track
TA	Traffic Advisory
TAI	Thermal Anti–Ice
TAT	Total Air Temperature
T/C	Top of Climb
TCAS	Traffic Alert and Collision Avoidance System
T/D	Top of Descent
TE	Trailing Edge
TEMP	Temperature
TERR	Terrain
TFC	Traffic
TFR	Transfer
THR	Throttle Thrust
TO or T/O	Takeoff
TO/GA	Takeoff/Go–Around
TURB	Turbine Turbulence
U	
UNLKD	Unlocked
USB	Upper Side Band
UTC	Universal Time Coordinated
UTIL	Utility
V	
VA	Design maneuvering Speed

VHF	Very High Frequency
VIB	Vibration
VMO	Maximum Operating Speed
VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed
VSI	Vertical Speed Indicator
V/S	Vertical Speed
VTK	Vertical Track
V1	Takeoff Decision Speed
V2	Takeoff Safety Speed
W	
W	Warm
WHL	Wheel
WPT	Waypoint
WT	Weight
WXR	Weather Radar
X	
XPDR or XPNDR	Transponder
XTK	Cross Track

TABLE OF CONTENTS

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INTRODUCTIONS

GENERAL

The Boeing Company issues Operations Manual Bulletins to provide important information to flight crew prior to the next formal revision of the Operations Manual. The transmitted information may be of interest to only specific operators or may apply to all operators of this model airplane. Each bulletin will vary.

Bulletins are dated and numbered sequentially. Each bulletin identifies airplanes affected by the bulletin. Absence of airplane effectivity indicates the bulletin applies to all airplanes in an operator's fleet. When appropriate, the next formal Operations Manual revision will include an updated bulletin record page to reflect current bulletin status.

Bulletin status is defined as follows:

- In Effect (IE) - the bulletin contains pertinent information not otherwise covered in the Operations Manual or the POM. The bulletin remains active and should be retained in the manual.
- Incorporated (INC) - the bulletin operating information has been incorporated into the Operations Manual or the POM. However, the bulletin remains active and should be retained in the manual.
- Cancelled (CANC) - the bulletin is no longer active and should be removed from the POM. All bulletins previously cancelled are no longer listed in the Bulletin Record.

The person filing a new or revised bulletin should amend the Bulletin Record as instructed in the Administrative Information section of the bulletin. When a bulletin includes replacement pages for the Operations Manual or QRH, the included pages should be filed as instructed in the Operations Manual Information section of the bulletin.

OPERATIONS MANUAL BULLETIN (OMB)

OMB's are issued by Boeing when the need arises to present interim information or general guidelines pertaining to aircraft operation.

~~FLIGHT CREW BULLETIN (FCB)~~

~~FCB's are issued by Asiana Air the need arises to present interim information or general guideline pertaining to aircraft operation.~~

OPERATIONS MANUAL BULLETIN

OPERATIONS MANUAL BULLETIN RECORD

POM user should update below bulletin record when you receive new or revised OMB pages.

Number	Subject	Date	Status
AAR-5	ILS/GPS Multi-Mode Receiver (MMR) Failure	January 23, 2001	IE
AAR-15 R1	Electronic Checklist (ECL) Line Items not Completing Correctly	June 30, 2006	IE
AAR-18 R1	APU Start Failures Due to APU Start Switch	July 1, 2002	IE
AAR-28 R2	Fuel Temperature Blanking Indication	August 31, 2006	IE
AAR-34 R1	Generator OFF Light ON After Engine Start With No EICAS Message	December 15, 2013	IE
AAR-42 R1	777 Fuel Quantity Indicating System Fluctuations or Blanking Due to Wiring Harness Problem	June 15, 2012	IE
AAR-52 R1	Engine Anti-Ice Valve Sticking Due to Debris	June 16, 2017	IE
AAR-54 R1	Delayed Release of Landing Gear Lever Lock	February 26, 2013	IE
AAR-62 R2	Uncommanded Autothrottle Movement on the Ground	March 21, 2019	IE
AAR-75 R3	ANP Fluctuation Caused by ADIRU Erroneous Output	June 15, 2024	IE
AAR-76 R1	Departure from a runway with 5G C-Band Wireless Broadband Interference as identified by NOTAM	June 30, 2023	IE
AAR-77 R2	Radio Altimeter Anomalies Due to 5G C-Band Wireless Broadband Interference in the United States	June 30, 2023	IE

	Departure from a runway in the contiguous U.S.		
AAR-78 R3	Descent and Go-around Procedure Changes	December 15, 2024	INC

OPERATIONS MANUAL BULLETIN(AAR-5)

Airplane Effectivity: All Airplanes

Subject: ILS/GPS Multi-Mode Receiver (MMR) Failure

Reason: To inform the flight crew of the lack of failure indications associated with a Multi-Mode Receiver (MMR) system processor card failure

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

Background Information

The Collins MMR combines ILS and GPS functions in a single electronic component. Flight testing has shown certain internal MMR failures can occur leaving the associated ILS and/or GPS inoperative, but without specific MMR failure indications. When this occurs, the approach reference on the PFD (ILS station identifier, or frequency and DME, as appropriate), and localizer/glideslope deviation indicators and scales will not display. The MMR failure may result in a GPS L or GPS R status message. (Status messages are checked prior to flight to determine dispatchability of the airplane and are checked after the flight for possible maintenance action.) The MMR failure may also be indicated by display of the GPS EICAS advisory message. However, this failure may occur and result in no EICAS messages (status or advisory) for the crew

Operating Instructions

If any of the following conditions are observed, the left and/or right ILS receiver(s) may be failed:

- the GPS L or GPS R EICAS status message is observed during preflight on the ground
- the GPS EICAS advisory message is displayed
- absence of the ILS station identifier or frequency and the absence of ILS deviation pointers and ILS scales when the ILS is tuned.

To verify ILS receiver operation:

- Enter an ILS frequency on the FMS-CDU NAV RADIO page (if a frequency is not already entered):

- Place the captain's and first officer's navigation displays (NDs) in approach (APP) mode and verify the appropriate ILS frequency is displayed on the NDs.
- If either the captain's or first officer’s ILS receiver source is C (center), then the L or R ILS receiver is failed.
  - Failure flags will not be displayed.
  - The NO LAND 3 EICAS message will be displayed on approach.
- If the captain's or first officer’s ILS frequency is not displayed, then multiple ILS receivers are failed.
  - Failure flags will not be displayed
  - The NO AUTOLAND EICAS message will be displayed on approach.

- Once this test is complete, delete the manually entered ILS frequency, if necessary, to allow ILS autotuning.

If the approach reference is not displayed, assume ILS receiver failure. Triple channel autoland will not be available. Consider the effect on approach minimums and select an appropriate course of action.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-5 as "In Effect" (IE) .

This condition is temporary until the system is modified. Incorporation of Collins GLU-920 Service Bulletin (8) and Service Bulletins (10 - 15) together constitute the terminating action for the MMR condition.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-15 R1)

Subject: Electronic Checklist (ECL) Line Items not Completing Correctly

Reason: To inform flight crews of a problem with ECL line items not completing correctly and appropriate crew response.

Airplane Effectivity : All

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

Boeing has received reports from operators of ECL closed loop line items not completing correctly (not changing from white to green) when performing a normal checklist despite the respective switch being selected to the correct position and system operating normally. Boeing engineering has determined that the contacts within the switch which provide switch position to ECL may be intermittent. The affected contacts do not control the system component or function associated with the switch. Switch contact faults can cause ECL line item problems in both normal and non-normal checklists. However, they are most likely when several frequently-used switches must be correctly positioned for the line item to turn green. This occurs with the HYDRAULICS or FUEL items that some operators add to their customized normal checklists. The failure of a switch contact to close or open cannot complete an ECL closed loop line item.

OPERATING INSTRUCTIONS

If an ECL closed loop line item does not complete as expected, confirm that the switch is positioned correctly. If the system is functioning normally, or is otherwise operating as expected, override the line item and continue with the checklist. The failure of a line item to automatically complete is not indicative of an ECL fault. Therefore, the ECL should continue to be used for all checklists.

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-15 dated June 30, 2006. Discard AAR-15. Revise the Bulletin Record to show AAR-15 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-15 R1 as "In Effect" (IE) .

A vendor design improvement of the push button switches has corrected the problem. Details may be found in Boeing Service Letter 777-SL-31-021. This bulletin will be cancelled when Boeing is notified that the push button switches have been replaced according to the service letter.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-18 R1)

Subject: APU Start Failures Due to APU Start Switch

Reason: To advise flight crew when starting the APU to manually position APU Start Switch to ON after selecting START.

Revised to add Service Letter Information.

Airplane Effectivity : HL7700

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

The APU Selector has caused failed APU starts on 777 airplanes. Testing of the APU selector has shown that the internal contacts may not make a proper connection when the selector is momentarily placed to the START position and allowed to spring back to the ON position. This condition can be avoided if the pilot manually places the APU Selector to ON after selecting START.

OPERATING INSTRUCTIONS

When starting the APU, position the APU selector to the START position and hold it there for one second. Then, position the APU selector to ON manually. Do not allow the APU selector to spring back to the ON position.

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-18 dated July 1, 2002. Discard AAR-18. Revise the Bulletin Record to show AAR-18 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-18 R1 as "In Effect" (IE) .

Boeing Service Letter 777-SL-49-012, dated 22 May, 2002, “APU Start Failure due to APU Start Switch” provides instructions on how to replace the faulty switch. This bulletin will be cancelled when Boeing is notified that the switch has been replaced. A Service Bulletin will not be issued.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-28 R2)

Subject: Fuel temperature blanking indication.

Reason: To inform flight crews of a Fuel Quantity Processor Unit (FQPU) anomaly that may cause blanking of the fuel temperature indication.

Airplane Effectivity : HL7732-HL7791

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

The fuel temperature indication may blank on certain 777 airplanes, accompanied by the EICAS status message FUEL TEMP INDICATION.

Smiths recently introduced new Fuel Quantity Processor Unit (FQPU) part numbers 0335KPU01 and 0330KPU01 and Boeing incorporated them in production at line positions 423, 429, 466, and 477 and on (refer to Service Letter 777-SL-28-016). The subject problem is associated with the new FQPUs.

OPERATING INSTRUCTIONS

In the event of inflight blanking of the fuel temperature indication, use Total Air Temperature (TAT) as a conservative indication of fuel temperature.

The FUEL TEMP LOW EICAS advisory message will not display when the fuel temperature indication is blank. Therefore, maintain TAT greater than 3 degrees C above the fuel freeze point.

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-28 R1 dated August 31, 2006. Discard AAR- 28 R1. Revise the Bulletin Record to show AAR-28 R1 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-28 R2 as "In Effect" (IE) .

This condition is corrected with FQPU modifications provided in Smiths Aerospace Service Bulletin 0330KPU01-28-0437 or 0335KPU01-28-438, depending on the installed FQPU part number. This bulletin will be cancelled when Boeing is notified all affected airplanes in the customer fleet are modified by appropriate Smiths Aerospace service bulletin.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-34 R1)

Airplane Effectivity: HL7700 - HL7791

Subject: Generator OFF Light ON After Engine Start With No EICAS Message

Reason: To inform flight crews of potential generator off line with no alert message.

Revised to add Service Bulletin information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

Background Information

In normal operation, if a main generator drops off line for any reason, the associated generator OFF light illuminates, and an EICAS Advisory message ELEC GEN OFF L, R is shown.

During an engine start if a generator does not reach a minimum frequency of 380 Hz the generator will not come on line and the generator OFF light will remain illuminated. However, the ELEC GEN OFF L, R EICAS message may not show. This lack of an EICAS message is known to have occurred on two or more occasions during engine starts only.

The Generator Control Unit supplier, Hamilton Sundstrand, is studying the feasibility of incorporating a change which will assure the ELEC GEN OFF L, R message is displayed on EICAS if the generator fails to come on line during engine start.

Operating Instructions

After engine start, flight crews should check that the generator OFF lights on the electrical panel are not illuminated. If a generator OFF light is illuminated, maintenance action is required.

Administrative Information

This bulletin replaces bulletin AAR-34 dated October 13, 2006. Discard AAR-34. Revise the Bulletin Record to show AAR-34 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-34 R1 as "In Effect" (IE) .

This condition is corrected by Service Bulletins 777-24-0113 and 777-24-0117. This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet are modified with Service Bulletins 777-24-0113 and 777- 24-0117.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-42 R1)

Airplane Effectivity: HL7700 - HL7791

Subject: 777 Fuel Quantity Indicating System Fluctuations or Blanking Due to a Wiring Harness Problem

Reason: To inform flight crews of fuel quantity indicating system fluctuations Revised to add corrective Service Bulletin information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

Background Information

777 operators report FUEL IMBALANCE EICAS advisory messages and/or the fuel quantity display blanking in flight due to fluctuating main and center tank fuel quantity indications. Fluctuating indications will usually result in a sudden fuel quantity increase or decrease of one main tank relative to the other main tank, but have occurred in the center tank also.

Erroneous fuel indications have been observed to either suddenly increase or decrease and recover within several minutes. The events can be a single occurrence or multiple events throughout the flight. To date, these occurrences have occurred during cruise flight, and with different fuel loads.

The condition normally does not result in any fuel system status messages and postflight troubleshooting does not reveal any discrepancies. Boeing and GE Aviation are currently in the process of formulating a retrofit program to replace discrepant FQIS wiring harnesses.

Operating Instructions

If the FUEL IMBALANCE EICAS advisory message occurs in flight, check fuel quantity readings to determine if the fuel quantity is fluctuating, or if a true imbalance or fuel leak exists.

If the fuel quantity fluctuates or suddenly increases or decreases and remains at a low level, and an imbalance or fuel leak is not suspected, consider the indications erroneous.

A steady increase in fuel imbalance or steadily increasing difference between fuel totalizer and calculated fuel quantities of approximately 1000 lbs / 500 kgs or more in 30 minutes should be considered a fuel leak.

To prevent unnecessary fuel balancing, do not accomplish the FUEL IMBALANCE checklist unless an actual fuel imbalance can be confirmed. An actual fuel imbalance can be confirmed by comparison of FMC calculated fuel used, comparison of respective engine fuel flows, or other evidence indicating a true imbalance exists.

Note: Should fuel jettison be required with erroneous fuel indications, the fuel jettison system will use the indicated totalizer fuel to determine when to cease jettisoning at the fuel TO REMAIN value set by the crew. Therefore, if the indicated fuel quantity indications are in error, the crew should use the FMC calculated fuel value and determine the jettison time using the jettison rates of 5400 lbs / 2500 kgs per minute with fuel in the center tank, or 3100 lbs / 1400 kgs per minute with center tank empty.

Administrative Information

This bulletin replaces bulletin AAR-42 dated February 25, 2011. Discard AAR-42. Revise the Bulletin Record to show AAR-42 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-42 R1 as "In Effect" (IE) .

This bulletin will be cancelled when Boeing is notified that all airplanes in the customer fleet have Service Bulletin 777-28-0073 installed.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-52 R1)

Subject: Engine Anti-Ice Valve Sticking Due to Debris

Reason: To inform flight crews of additional actions which may allow the engine anti-ice system to operate.

Revised to add Service Bulletin information.

Airplane Effectivity : HL7700-HL7791

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

Engine anti-ice valve malfunctions have occurred due to small particle debris in the valve.

The existing ANTI-ICE ENG L, R non-normal checklist directs the crew to cycle the engine anti-ice selector to OFF then ON one time.

Boeing Engineering has reported that additional cycling of the engine anti-ice valve may clear the debris causing the malfunction and allow continued engine anti-ice operation.

OPERATING INSTRUCTIONS

If the engine anti-ice system is not restored following completion of the ANTI-ICE ENG L, R NNC the following actions may restore the system:

Move the affected engine anti-ice selector to ON.

If the ANTI-ICE ENG L, R message shows, wait 3 seconds and then cycle the engine anti-ice selector OFF then ON. This step may be repeated up to 5 times.

If these actions restore the system, move the engine anti-ice selector to the AUTO position after exiting icing conditions.

If these actions do not restore the system, the selector should be moved to OFF and icing conditions should be avoided.

After doing this procedure a maintenance log entry should be made.

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-52 dated December 19, 2012. Discard AAR-52. Revise the Bulletin Record to show AAR-52 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-52 R1 as "In Effect" (IE) .

This bulletin will be cancelled when Boeing is notified that all airplanes in the customer fleet have the applicable Service Bulletin(s) installed: SB 777-30-0017 (GE90-100 Series Engines), SB 777-30-0018 (Pratt and Whitney Engines), SB 777-30-0019 (GE90-76B, -85B, -90B and -94B Engines), or SB 777-30-0020(Rolls Royce Engines).

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-54 R1)

Subject: Delayed Release of Landing Gear Lever Lock

Reason: To inform flight crews of the possibility the landing gear lever lock may not immediately release after takeoff.

Airplane Effectivity : ALL

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

Several 777 operators have reported occurrences in which flight crews were unable to raise the landing gear lever after takeoff. After the initial retraction attempt, crews were able to retract the gear by raising the landing gear lever after a short delay or by accomplishing the Gear Lever Locked Down NNC.

The Weight-On-Wheels (WOW) system engages the landing gear lever lock while on the ground and releases the lock after transition to the air mode. Analysis has shown the 777 WOW system can delay the ground-to-air transition if the take-off weight is light (< 490K lbs/220K kg) and the 2 preceding landing weights were heavy (> 525K lbs/240K kg). This delay can be as long as 17 seconds.

A delay or failure of the 777 landing gear lever lock to release when the airplane is in the air does not indicate the landing gear is out of configuration for retraction.

In this case, overriding the gear lever lock and raising the landing gear will not cause damage to the landing gear.

OPERATING INSTRUCTIONS

If this condition occurs the flight crew should accomplish the Gear Lever Locked

Down NNC:

- Landing gear lever LOCK OVRD switch...........Push and hold
- Landing gear lever...UP

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-54 dated February 11, 2013. Discard AAR-54. Revise the Bulletin Record to show AAR-54 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-54 R1 as "In Effect" (IE) .

This condition is fixed with the incorporation of Service Bulletin 777-32-0097, or PRR61777-243. This bulletin will be cancelled when Boeing is notified that all airplanes in the customer fleet have received this update.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-62 R2)

Subject: Uncommanded Autothrottle Movement on the Ground.

Reason: To inform flight crews of an autothrottle advancement during ground operations.

Revised to add corrective Service Bulletin information.

Airplane Effectivity : ALL

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

There have been reports of uncommanded autothrottle advancement during ground operations. The majority of reports have occurred during taxi. In one report, the autothrottles advanced after landing before speedbrakes were retracted.

During investigation, it was determined these events were most likely caused by a short between grounding wires to the TO/GA switches. When this occurs, the aircraft senses the TO/GA switches have been pushed, the autothrottles activate in THR REF mode, and the thrust levers advance to set takeoff thrust.

The system will be revised to rewire the TO/GA switches, preventing uncommanded autothrottle movement on the ground.

OPERATING INSTRUCTIONS

Boeing recommends the pilot flying keeps a hand on the thrust levers as much as possible during ground operations. This action will allow the pilot to monitor the movement of thrust levers and prevent thrust from advancing during an uncommanded autothrottle advancement.

If there is uncommanded autothrottle movement, retard the thrust levers and disconnect the autothrottle.

On takeoff, the autothrottles will advance normally when the TO/GA switches are pushed.

ADMINISTRATIVE INFORMATION

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-62 R2 as "In Effect" (IE) .

This bulletin will remain in effect until the grounding for the TOGA switches is modified. This anomaly is corrected with service bulletin 777-22-0038. This bulletin will be cancelled when Boeing is notified that the applicable service bulletin has been incorporated into the customer’s fleet.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-75 R3)

Subject: ANP Fluctuation Caused by ADIRU Erroneous Output

Reason: To inform flight crews of potential ADIRU ANP fluctuations. Revised Bulletin to reflect the latest information

Airplane Effectivity : All 777 Airplanes

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

As described in the FCOM, the ADIRU supplies primary flight data, inertial reference, and air data. The ADIRU is fault-tolerant and fully redundant.

Boeing has received two reports of ANP fluctuations caused by an erroneous output from the ADIRU. An undetected gyro failure within the ADIRU resulted in the erroneous output. This type of failure in the ADIRU is not common.

In the most recent event, the flight crew noticed that the ANP slowly increased from 0.05 NM to 0.49 NM, then slowly decreased to the initial value of 0.05 NM. These ANP fluctuations continued during the flight. Flight data from the events indicated ADIRU position errors as high as 150 NM and ground speed errors as high as 160 knots. GPS operation was normal, and there were no EICAS alerts or status messages shown prior to the approach.

However, during the approach and on the final localizer intercept heading, the airplane did not capture the localizer and resulted in a missed approach. The flight crew performed another approach, captured the localizer, and landed safely.

If the error between ADIRU and GPS is large enough, the FMC scratchpad messages VERIFY POSITION or NOT ON INTERCEPT HEADING show. If ANP exceeds RNP, the EICAS caution message NAV UNABLE RNP shows. It is possible to have ADIRU erroneous output and ANP fluctuations without any scratchpad or EICAS message showing.

GPS, ILS, VOR, DME, ADF, standby magnetic compass, and ISFD attitude are not affected by ADIRU erroneous output because they do not use inertial data from the ADIRU.

The autoflight system can be affected by erroneous output from ADIRU. During ILS approach mode, autopilot roll mode fail (amber line through roll FMA) or flight director roll bar is removed from the PFDs and the EICAS caution message AUTOPILOT or the EICAS warning message AUTOPILOT DISC can show.

The antiskid system uses ADIRU groundspeed. Erroneous ADIRU groundspeed can cause reduced braking effectiveness, anti-skid deactivation, and runway overrun.

OPERATING INSTRUCTIONS

If ANP fluctuations occur or the FMC scratchpad message VERIFY POSITION shows, flight crews can perform the FMS Position Update Supplementary Procedure any time the present position is inaccurate.

This SP can be performed more than once per flight, as needed.

Do not use autoland. If the flight crew determines that the autoflight system performance is not acceptable for the situation, manual flight may be required.

Do not use an approach that requires GPS, including RNAV (RNP) AR approaches, if abnormal ANP fluctuations occur. Autopilot localizer and glideslope capture and tracking can be erratic.

These items can be unreliable:

- FMC position
- ND wind indication
- PFD and ND groundspeed indications
- ND map display
- PFD and ND track indications
- PFD, ND, and ISFD heading indications

Autobrake is inoperative. Plan to use maximum manual braking.

Landing distance can increase up to 40% for all runways with Runway Condition Codes 2, 3, 4, 5, or 6 (or the equivalent runway condition assessment from the Runway Condition Assessment Matrix). Do not land on a runway with Runway Condition Codes 0 or 1 (or the equivalent

runway condition assessment from the Runway Condition Assessment Matrix). Calculate landing distance using the Normal Configuration Landing Distance table in the QRH or other approved source, MAX MANUAL for the applicable runway surface condition, apply appropriate adjustments, and increase the result by 40%.
It is not possible to provide a procedure for all conceivable erroneous ADIRU situations. In all situations, the captain must assess the situation and use good judgment to determine the safest course of action.

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-75 R2 dated December 15, 2023. Discard AAR-75 R2. Revise the Bulletin Record to show AAR-75 R2 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-75 R3 as "In Effect" (IE) .

As an interim solution, a new EICAS Caution message has been developed to alert the flight crew of excessive velocity differences (errors) between the ADIRU and GPS: ADIRU/GPS DISAGREE. This new EICAS message will be available for AIMS-2 hardware in software BP V18. The planned long-term solution is a software update to the ADIRU to correct the gyro fault detection and isolation algorithms. A future Service Bulletin(s) will provide for the installation of the new software. This Operations Manual Bulletin will be cancelled when Boeing is notified that the applicable Service Bulletin(s) have been incorporated into the customer’s fleet.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-76 R1)

Subject: Departure from a runway in the contiguous U.S.

Reason: New FAA Airworthiness Directives (AD 2023-10-02 and 2023-12-05) state that radio altimeters cannot be relied upon when interference from 5G C-Band wireless broadband is present. This bulletin provides guidance for departing from a runway in the contiguous U.S. where 5G interference may be present.

This bulletin is being revised to reflect the latest information released by the FAA on 5G C-Band interference.

Airplane Effectivity : ALL 777 Airplanes

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

This bulletin provides guidance for departing from a runway with 5G C-Band interference without an approved AMOC.

Frequency spectrum, power levels, tower location, and antenna direction used by new 5G C-Band wireless broadband technology in the United States can interfere with radio altimeters, especially at lower altitudes. Radio altimeters can fail or can present erroneous information, which affects systems using radio altimeter data.

In response to this, the FAA has issued Airworthiness Directives (AD 2023-10-02 and AD 2023-12-05) that prohibit certain operations requiring radio altimeter (RA) data when in the presence of 5G C-Band interference.

The FAA considers these ADs to be an interim action. Once the Technical

Standard Order (TSO) standard for radio altimeters is established, which will follow the existing international technical consensus on the establishment of the minimum operational performance standards (MOPS), the FAA anticipates that the MOPS will be incorporated into the TSO. Once a new radio altimeter TSO is developed, approved, and available, the FAA might consider additional rulemaking.

In the interim, an airplane that has equipment installed that meets the tolerances specified in the applicable ADs is considered a radio altimeter tolerant airplane. Aircraft unable to meet these tolerances are considered non-radio altimeter tolerant airplanes.

AD 2023-12-05 establishes the new concept of 5G C-Band Mitigated Airports (CMAs). CMAs are airports at which 5G providers have voluntarily agreed to limit 5G C-Band interference through limiting power levels and tower locations. They will be identified through an FAA Domestic Notice, and all 5G NOTAMs and current Alternative Methods of Compliance (AMOCs) will be discontinued as of June 30, 2023. The AD 2023-12-05 requires operational restrictions for radio altimeter tolerant airplanes at non-CMAs and for non-radio altimeter tolerant airplanes at all airports in the contiguous U.S. due to the potential presence of 5G C-Band wireless broadband interference.

5G Interference and Potential Effects on Radio Altimeter Indications

When a radio altimeter is subjected to 5G interference, there are three different possible effects for each radio altimeter:

- Fail Warning: Failure of the radio altimeter results in failure alerts of radio altimeter including flags and other system alerts
- No Computed Data (NCD): No data is generated by the radio altimeter. The data shown on the Primary Flight Display (PFD) is removed from view, however this condition does not generate an alert since it is a normal state of the radio altimeter
- Erroneous: There could be a case where the interference causes

valid but erroneous data that is used by other systems. The erroneous radio altimeter data is shown on the PFD, however it can be erroneously high or low.

5G Interference and Potential Effects on Airplane Systems

This type of 5G interference may not impact all of the radio altimeters on the airplane in the same way, so the flight deck effects may be variable. On the 777, multiple systems can be impacted. They include, but are not limited to the following:

Autopilot Flight Director System

- LNAV may not engage or can engage at an erroneous altitude after departure
- Takeoff or Go-Around (TO/GA) mode may not be available

Autothrottle System

- HOLD mode can remain engaged during climb out

Engines

- Thrust reversers many not deploy during rejected takeoff
- On ground, when thrust levers are at idle, engine thrust can be at approach idle

Flight Controls

- Tail Strike Protection (as installed) can be inoperative or operate prematurely

Flight Instruments

- The radio altitude indication on the PFD may not show or can be erroneous

Traffic Alert and Collision Avoidance System (TCAS)

- TCAS alerts may not be available (TCAS alerts that occur are valid)
- TCAS descent resolution advisory inhibit function can be inoperative below approximately 1,000 feet AGL

Ground Proximity Warning System (GPWS)

- GPWS alerts (mode 1-7) may not be available or can be erroneous
- Runway Awareness and Advisory System (RAAS) (as installed) callouts can be erroneous
- Windshear detection systems (predictive and reactive) can be inoperative

Configuration Warnings

- CONFIG WARNING SYS Advisory alert can occur

5G Interference Impacts on Dispatch Performance Calculations

Departure Airport - Takeoff Performance

In the event of 5G interference, stopping distance during a rejected takeoff (RTO) can be significantly increased due to the following potential effects on airplane systems:

- Higher engine idle
- Thrust reversers may not deploy.

In order to account for the increased stopping distance during an RTO, refer to the guidance in the Operating Instructions section below.

OPERATING INSTRUCTIONS

When departures are planned at an airport in the contiguous U.S., the flight crew should be alert for system anomalies that have been described above.

For non-radio altimeter tolerant airplanes, comply with the following instructions at airports in the contiguous U.S.

For radio altimeter tolerant airplanes, comply with these instructions at non- CMAs in the contiguous U.S., unless covered by an Alternative Method of Compliance (AMOC).

If the autopilot or autothrottle is not performing as expected, pilots should disconnect both the autopilot and autothrottle and apply manual inputs to ensure proper control of path and performance.

Radio altimeter anomalies can be present on the ground and at very low altitudes.

Departure Airport - Takeoff Performance

In the event of 5G interference, stopping distance during a rejected takeoff (RTO) can be significantly increased. To account for the increased stopping distance during an RTO, do the following:

- Adjust the accelerate stop distance available (ASDA) using the following table:

Runway Condition Code	Runway Surface Condition	Subtract from ASDA
6	Dry	120ft (37m)
5	Wet Skid Resistant*	180ft (55m)
5	Wet	330ft (101m)
5, 4 and 3	Dry Snow / Wet Snow / Compact Snow / Slippery	1,010ft (308m)
2	Slush or Standing Water	1,900ft (580m)

Complete the takeoff performance calculations using:

- Actual departure runway conditions
- Actual departure environmental conditions
- Do not take credit for use of reverse thrust when calculating takeoff performance

Dispatch at airports with runway condition code of 1 or 0 should not be attempted.

Note: The FCOM Volume 1 Performance Dispatch Chapter does not provide a method to adjust the ASDA, therefore, another approved source needs to be used.

Note: *Provided the operator has received approval to use Wet Skid Resistant data from the appropriate regulatory authority in accordance with the Airplane Flight Manual (AFM).

Departure Airport - Takeoff Performance

Since it is possible that the brakes may provide the only means to slow the airplane, it is not advisable to dispatch from an impacted airport with the following brake system Minimum Equipment List (MEL) items. This list is not all inclusive and other MELs may need to be considered:

- 32-42-01 - Antiskid System
- 32-42-02 - Alternate Antiskid Valves
- 32-45-01 - Wheel Brakes

Prior to Takeoff

- Verify normal radio altimeter indications

Takeoff

- Flight crew and cabin crew should be alert for potential tail strike. If a tail strike is perceived by the flight crew or reported from the cabin crew during takeoff, do the Tail Strike Non-Normal Checklist

Climb Out

- Monitor roll mode engagement
- Monitor pitch mode engagement
- Monitor autothrottle mode engagement

If Radio Altimeter Anomalies are Experienced

Operators and pilots who experience radio altimeter anomalies should notify air traffic control as soon as practical. Post flight, an entry should be made in the maintenance log so that the radio altimeters can be checked for proper operation. Pilots are encouraged to submit detailed reports of radio altimeter disruptions or interference events, as soon as practical, using the Radio Altimeter Anomaly Reporting Form available on the FAA website at https://www.faa.gov/air_traffic/nas/RADALT_reports/.

Additional References

FAA Airworthiness Directives 2023-10-02 and 2023-

12-12 FAA Safety Alert for Operators SAFO 21007

FAA Special Airworthiness Information Bulletin SAIB AIR-21-18R3

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-76 dated January 19, 2022. Discard AAR-76. Revise the Bulletin Record to show AAR-76 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-76 R1 as "In Effect" (IE) .

This Bulletin will be revised when more information becomes available.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-77 R2)

Subject: Radio Altimeter Anomalies Due to 5G C-Band Wireless Broadband Interference in the United States

Reason: Radio altimeters can be unreliable due to interference from 5G C-Band wireless broadband.

This bulletin is being revised to reflect the latest information released by the FAA on 5G C-Band interference.

Airplane Effectivity : All 777 Airplanes

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

Frequency spectrum, power levels, tower location, and antenna direction used by new 5G C-Band wireless broadband technology in the United States can interfere with radio altimeters, especially at lower altitudes. Radio altimeters can fail or present erroneous information, which affects systems using radio altimeter data.

In response to this, the FAA has issued Airworthiness Directives (AD 2023-10-02 and AD 2023-12-05) that prohibit certain operations requiring radio altimeter (RA) data when in the presence of 5G C-Band interference.

The FAA considers these ADs to be an interim action. Once the Technical Standard Order (TSO) standard for radio altimeters is established, which will follow the existing international technical consensus on the establishment of the minimum operational performance standards (MOPS), the FAA anticipates that the MOPS will be incorporated into the TSO. Once a new radio altimeter TSO is developed, approved, and available, the FAA might consider additional rulemaking.

In the interim, an airplane that has equipment installed that meets the tolerances specified in the applicable AD is considered a radio altimeter tolerant airplane. Aircraft unable to meet these tolerances are considered non-radio altimeter tolerant airplanes.

AD 2023-12-05 establishes the new concept of 5G C-Band Mitigated Airports (CMAs). CMAs are airports at which 5G providers have voluntarily agreed to limit 5G C-Band interference through limiting power levels and tower locations. They will be identified through an FAA Domestic Notice, and all 5G NOTAMs and current Alternative Methods of Compliance (AMOCs) will be discontinued as of June 30, 2023. The AD 2023-12-05 requires operational restrictions for radio altimeter tolerant airplanes at non-CMAs and for non-radio altimeter tolerant airplanes at all airports in the contiguous U.S. due to the potential presence of 5G C-Band wireless broadband interference.

FAA AD 2023-10-02 identifies several types of operations that are prohibited when operating a non-radio altimeter tolerant airplane in the contiguous U.S. airspace:

- Instrument Landing System (ILS) Instrument Approach Procedures (IAP) SA CAT I, SA CAT II, CAT II, and CAT III
- Automatic landing operations
- Manual Flight Control Guidance System operations to landing/head-up display (HUD) to touchdown operation
- Use of Enhanced Flight Vision System (EFVS) to touchdown under 14 CFR Part 91.176(a)

5G INTERFERENCE AND POTENTIAL EFFECTS ON RADIO ALTIMETER INDICATIONS

When a radio altimeter is subjected to 5G interference, there are three different possible effects for each radio altimeter:

- Fail Warning: Failure of the radio altimeter results in failure alerts of radio altimeter including flags and other system alerts
- No Computed Data (NCD): No data is generated by the radio altimeter. The data shown on the Primary Flight Display (PFD) is removed from view, however this condition does not generate an alert since it is a normal condition of the radio altimeter
- Erroneous: Interference causes erroneous data to be sent to the airplane systems. The radio altimeter data in this case is shown on the PFD, however it can be erroneously high or low.

5G C-BAND INTERFERENCE AND POTENTIAL EFFECTS ON AIRPLANE SYSTEMS

Flight deck effects may be variable on the 777, and multiple systems can be impacted regardless of the approach type or weather. They include, but are not limited to the following:

Autopilot Flight Director System

- NO AUTOLAND caution or Advisory message may be shown
- NO AUTOLAND can show on the Autoflight Status Annunciation (ASA) on the PFD
- AUTOPILOT caution message and associated autopilot or flight director degraded mode indication can occur during ILS approach prior to LAND 2 or LAND 3 annunciation
- Autopilot disconnect can occur when LAND 2 or LAND 3 is shown
- Flare mode and runway alignment may not occur or can activate earlier than expected
- Flight director pitch guidance can be erroneous during ILS approach
- Flight director pitch and roll bars can be removed from view on PFD during ILS approach
- Takeoff or Go-Around (TO/GA) mode may not be available

Autothrottle System

- Autothrottle (A/T) can remain in SPD mode and can advance to maintain speed during flare instead of reducing the thrust to IDLE at 25 feet RA
- Autothrottle can transition to IDLE mode above 25 feet AGL

Engines

- Thrust reversers may not deploy during a rejected takeoff or landing roll
- In air, when thrust levers are at idle, engine thrust can be at minimum idle
- On ground, when thrust levers are at idle, engine thrust can be at approach idle

Flight Controls

- Auto speedbrake deployment may be inoperative
- SPEEDBRAKE EXTENDED caution message may not be available
- Spoilers #5 and #10 can remain in the DOWN position during landing roll even if the speedbrake lever is in the UP position
- Spoilers may be limited to their maximum in-flight position during manual deployment
- Tail Strike Protection (as installed) can be inoperative or operate prematurely
- Landing Attitude Modifier (LAM) (as installed) can be erroneous
- Minor elevator pitch down commands during manual flare can be inoperative or operate prematurely

Flight Instruments

- The radio altitude indication on the PFD may not show or can be erroneous
- The RADIO minimums indications (flashing and turning amber) may not occur on the PFD
- Rising runway symbol (as installed) may not show on the PFD
- The localizer deviation alert (amber scale on the PFD and flashing pointer on the PFD) may not show (the deviation indications are still available)
- The glideslope deviation alert (amber scale on the PFD and flashing pointer on the PFD) may not show (the deviation indications are still available)

Traffic Alert and Collision Avoidance System (TCAS)

- TCAS alerts may not be available (TCAS alerts that occur are valid)
- TCAS inhibits for resolution advisories may be erroneous

Ground Proximity Warning System (GPWS)

- GPWS alerts (mode 1-7) may not be available or can be erroneous
- Radio altitude-based altitude and minimums aural callouts during approach may be not available or can be erroneous
- Runway Awareness and Advisory System (RAAS) (as installed) callouts can be erroneous
- Windshear detection systems (predictive and reactive) may be inoperative

Configuration Warnings

- Erroneous CONFIG GEAR warning alert can occur
- CONFIG WARNING SYS advisory alert can occur

OPERATING INSTRUCTIONS

When operating in the contiguous U.S. airspace, the flight crews should be alert for system anomalies that have been described above.

For non-radio altimeter tolerant airplanes, comply with the following instructions at airports in the contiguous U.S.

For radio altimeter tolerant airplanes, comply with these instructions at non-CMAs in the contiguous U.S., unless covered by an Alternative Method of Compliance (AMOC).

Operations for Non-Radio Altimeter Tolerant Airplanes

WARNING: Due to the presence of 5G C-Band wireless broadband interference, dispatching or releasing to airports, and approaches or landings on runways, in the contiguous U.S. airspace is prohibited.

If Radio Altimeter Anomalies are Experienced During Approach or Landing

Operators and pilots who experience radio altimeter anomalies should notify air traffic control as soon as practical. Post flight, an entry should be made in the maintenance log so that the radio altimeters can be checked for proper operation. Pilots are encouraged to submit detailed reports of radio altimeter disruptions or interference events, as soon as practical, using the *Radio Altimeter Anomaly Reporting Form* available on the FAA website at https://www.faa.gov/air_traffic/nas/RADALT_reports/.

Additional References

FAA Safety Alert for Operators SAFO 21007

FAA Special Airworthiness Information Bulletin (SAIB) AIR-21-18R3

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-77 R1 dated June 30, 2022. Discard AAR-77 R1. Revise the Bulletin Record to show AAR-77 R1 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-77 R2 as "In Effect" (IE) .

This Bulletin will be revised when more information becomes available.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

OPERATIONS MANUAL BULLETIN(AAR-78 R3)

Subject: Descent and Go-around Procedure Changes

Reason: Update the Descent and the Go-Around Procedure/Callouts to enhance flight crew awareness of TO/GA and thrust logic in go-arounds, rejected landings, and balked landings.

Airplane Effectivity : All 777 Airplanes

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

BACKGROUND INFORMATION

There have been in-service events in which recommended guidance for go-around, rejected landing, or balked landing was not followed. Some of these events resulted in airplane damage and, in one event, a hull loss. A lack of awareness of thrust lever position and TO/GA logic on or near the ground has been shown to be a contributing factor.

Although the conditions and initial actions are different for rejected, balked, and high bounced landings, all result in performing a go-around.

This bulletin notifies of a change to the Descent and the Go-Around Procedure/Callouts to highlight the need for thrust awareness and management during these maneuvers. It also reminds flight crews of existing guidance in the POM and FCTM for:

- Go-Around (POM: Normal Procedures: Go-Around Procedure/ Callouts)
- Rejected Landing (FCTM: Landing: Rejected Landing/Balked Landing)
- Balked Landing (FCTM: Landing: Rejected Landing/Balked Landing)
- Bounced Landing (FCTM: Landing: Flare and Touchdown: Bounced Landing Recovery)

TO/GA System Behavior

TO/GA is inhibited close to the ground and after touchdown. If the TO/GA switch is pushed near the ground within the inhibit threshold, the thrust levers do not automatically advance and need to be manually advanced.

TO/GA logic, including inhibit heights, is described in the FCOM: Autothrottle Disconnect and TO/GA Switches.

Pilot Technique

Pilots do not need to recall or monitor inhibit height during landing as the basis of a decision to use TO/GA.

Pilots need to be aware that:

- If the airplane has touched down, prior to thrust reverser engagement, the thrust levers must be advanced manually to go-around thrust. Both pilots must monitor the thrust levers. The Pilot Flying (PF) must advance thrust levers manually.
- If the airplane has not touched down, TO/GA should be pushed in all instances. If an inhibit is active, or the thrust levers do not respond as expected, the PF must advance the thrust levers manually.

Awareness of the thrust levers must be maintained during landing. Boeing recommends that the PF keep one hand on the thrust levers during approach, flare, landing, and go-around. The PF's hand position should permit full control of the thrust levers.

Both pilots should actively monitor airspeed, pitch attitude, thrust lever behavior, flight mode annunciations, and the external runway environment. This enhances awareness during a dynamic and time-critical maneuver.

Descent Procedure Changes

A note has been added to the descent procedure to prompt the flight crew to brief the need for manual advancement of the thrust levers in the event of a go-around on or near the ground. Details of the change are shown in the Operating Instructions section of this bulletin.

Go-Around Procedure Changes

A callout has been added to the Pilot Monitoring duties in the go-around procedure in POM to ensure go-around thrust is set.

A warning note has been added to the procedure to highlight the need to manually set and verify thrust for go-around on or near the ground.

Details of the change are shown in the Operating Instructions section of this bulletin.

Clarification on Balked, Rejected, and Bounced Landing Guidance

Changes will also be made in a future revision of the FCTM to improve guidance for balked, rejected, and bounced landings.

Go-around After Touchdown as an Alternative to Balked Landing

Boeing recommends the balked landing technique as described in the FCTM. However, operators can elect to use the Go-Around Procedure/ Callouts after touchdown, including retraction to the go-around flap configuration in accordance with the procedure.

Note: Thrust must be advanced manually during a go-around after touchdown if the thrust levers do not respond to TO/GA.

Thrust Management Function Updates

The Thrust Management Function has been updated to automatically disconnect the autothrottle if the thrust levers are advanced again after initially retarding for the flare. The 777 no longer needs a step to disconnect the autothrottles in the Balked Landing or Go-Around After Touchdown Procedure. See FCOM: Flight Management, Navigation: Flight Management Computer: Thrust Management for more information.

This will be updated in the next revision of the FCTM.

Training Recommendations

Boeing recommends that all pilots receive balked landing (or go-around after touchdown) training, with emphasis placed on thrust lever position awareness and manual application of thrust.

OPERATING INSTRUCTIONS

The following pages contain the revised Descent Procedure and Go-Around Procedure/Callouts to be used until these procedures are updated in the POM.

LANDING BRIEFING

- Use the Crew Briefing.
- When the weather condition is below CAT I, landing briefing should add in general Landing Briefing for CAT II/CAT III approach.

Note: Landing briefing must include a reminder that go-arounds on or near the ground require go-around thrust to be set manually and that a flap configuration warning can sound.

GO-AROUND PROCEDURE/CALLOUTS

[ ]: Manual Flight

PF	PM
Call "GO-AROUND", "TO/GA" Push TO/GA switch. • advance thrust levers manually. [Rotate smoothly toward 15° pitch attitude then follow flight director commands] Note: PF should consider tail strike pitch attitude during rotation.	**"THR, TO/GA(LNAV), TO/GA"** Call "PITCH", if significant pitch attitude deviation or tail strike pitch exceedance is expected.
Verify that the thrust increases. ***WARNING!*** ***TO/GA function is inhibited close to the ground and after touchdown. If the thrust levers do not respond when TO/GA is pushed, or if the go-around is initiated after touchdown, advance the thrust levers manually to go-around thrust.***	
Call "**FLAPS 20**"	Repeat "**FLAPS 20**" and set the flap lever to 20
Verify: • the rotation to go-around attitude • mode annunciation (THR | TO/GA(LNAV) | TO/GA).	
Note: An automatic go-around cannot be initiated after touchdown.	
	Verify that the thrust is sufficient for the go–around or adjust as needed. Call "**THRUST SET**".
	Verify a positive rate of climb on the altimeter and call "**POSITIVE CLIMB**"
Verify a positive rate of climb on the altimeter and call "GEAR UP"	Repeat "GEAR UP" and set the landing gear lever to UP.

ADMINISTRATIVE INFORMATION

This bulletin replaces bulletin AAR-78 R2 dated August 30, 2024. Discard AAR- 78 R2. Revise the Bulletin Record to show AAR-78 R2 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin AAR-78 R3 as "Incorporated" (INC) .

This bulletin will be canceled when the information in this bulletin is incorporated into the FCTM.

FCTM changes are being considered for clarity and organization of guidance on balked, rejected, and bounced landings. This bulletin can be retained for information purposes until the FCTM is revised.

Please send all correspondence regarding this Flight Crew Operations Manual Bulletin to Flight Operations, through the Boeing Communications System (BCS) on the MyBoeingFleet home page.

If User does not have access to MyBoeingFleet, please consult with the Boeing Field Service Office for assistance.

~~FLIGHT CREW BULLETIN~~

~~FLIGHT CREW BULLETIN RECORD~~

~~POM user should update below bulletin record when you receive new or revised FCB pages.~~

~~Number~~	~~Subject~~	~~Date~~	~~Status~~
~~FCB-63R1~~	~~Undetected Erroneous Radio Altitude~~	~~27 NOV 2023~~	~~IE~~
~~FCB-67~~	~~SATCOM Logon failure Issue~~	~~21 FEB 2020~~	~~IE~~
~~FCB-70R1~~	~~LNAV Path Deviation from Published Procedures Path~~	~~27 NOV 2023~~	~~IE~~

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~~FLIGHT CREW BULLETIN(FCB-63R1)~~

~~Subject: Undetected Erroneous Radio Altitude~~

~~Airplane Effectivity : All~~

~~Insert this FCB in the FCB section of your POM. And fill in the FCB record to show bulletin FCB-63R1 "In Effect" (IE).~~

~~BACKGROUND INFORMATION~~

~~777 operators have reported events in which one or more of the three installed Low Range Radio Altimeters (LRRAs) produce undetected erroneous altitude. These events are presumed to occur because of one or more of the following reasons:~~

- ~~Leakage of signal~~
- ~~Cross talk between the antennas~~
- ~~Loose connector~~
- ~~Disturbed co-axial cable length~~
- ~~A faulty LRRA~~

~~AIRPLANE EFFECTS~~

~~SINGLE ERRONEOUS ALTITUDE READING~~

~~If one LRRA provides an erroneous altitude reading, the airplane effects may include any of the following:~~

- ~~Erroneous radio altitude displayed on the captain's or first officer's Primary Flight Display (PFD)~~

  ~~Note: Erroneous altitude from the center LRRA will not be evident to the flightcrew.~~

- ~~Inability to engage LNAV~~
- ~~Inhibiting of various FMC alerting and communications CDU~~

~~scratchpad messages~~

- ~~Unavailability of autothrottle wakeup protection~~
- ~~Annunciation of NO LAND 3 EICAS message~~
- ~~Potential false or missing Ground Proximity Warning System (GPWS) warnings~~
- ~~Inhibiting of some Traffic Alert and Collision Avoidance System (TCAS) resolution advisories in-flight (left LRRA failure only)~~
- ~~Inhibiting of all TCAS advisories on final approach (left LRRA failure only)~~
- ~~Possible loss of, or nuisance, predictive windshear cautions/warnings~~

~~MULTIPLE ERRONEOUS ALTITUDE READINGS~~

~~If multiple LRRAs provide erroneous altitude readings, the airplane effects may include any of the following, in addition to those listed above:~~

- ~~Erroneous radio altitude displayed on one, or both, of the PFDs~~
- ~~Indicated airspeed errors up to 10 knots (777-200LR/777F only)~~
- ~~Autothrottle retard~~
- ~~Autothrottle disconnect and inability to engage into SPD mode (if not in SPD mode)~~
- ~~Second push of TOGA to remove derates after takeoff may not function~~
- ~~Inhibiting of Thrust Management Function (TMF) engagement of TOGA during go-around~~
- ~~Inhibiting of Autopilot Flight Director System (AFDS) engagement of TOGA (pitch and roll) during go-around~~
- ~~Unavailability of some VNAV autothrottle modes~~
- ~~Annunciation of NO LAND 3 or NO AUTOLAND EICAS message~~
- ~~Autopilot disconnect~~
- ~~Flight Directors (F/Ds) bias-out-of-view~~
- ~~Inhibiting of autopilot engagement~~

- ~~If the autopilot is disengaged and both flight directors are turned off, subsequent selection of either flight director switch could engage the AFDS into TOGA for takeoff~~
- ~~During autopilot coupled approach, yaw engagement may occur early or late, glideslope tracking performance may be degraded, the autopilot may request autothrottle retard early or late, and transition to flare mode could be early or late, and with degraded performance~~
- ~~Pitch down command from the Primary Flight Control System (PFCS) due to flare control law and tailstrike protection activation (pilot back pressure on column may be required to compensate for pitch down command)~~
- ~~Unavailability of auto speedbrakes as annunciated via the AUTO SPEEDBRAKE EICAS message~~
- ~~Electronic Engine Control (EEC) indicating ground mode and causing engine to go to ground idle, having the following effects:~~
  - ~~ground idle produces less thrust than flight idle or approach idle~~
  - ~~engine flameout/operability margins are not assured at ground idle (when in flight)~~
  - ~~acceleration rate from ground idle will be reduced, so engine response may not be adequate to maintain glideslope during final approach~~
- ~~Activation of WINDSHEAR SYS or WINDSHEAR PRED EICAS messages~~

~~BOEING RECOMMENDATIONS~~

~~Whether in automated or manual flight, flight crews must carefully monitor primary flight instruments (airspeed, attitude etc.) for aircraft performance and the flight mode annunciation for autoflight modes.~~

~~During approach, the pilot flying should keep one hand on the thrust levers, even with the autothrottle engaged.~~

~~If the left and right LRRA disagree significantly, or if either one appears to be providing an erroneous altitude reading, disengage the automation.~~

~~Note that the center LRRA condition is not evident to the flight crew.~~

~~Do not use the autoland system if either the left or right LRRA appears to be providing an erroneous altitude reading.~~

~~GENERAL GUIDELINES~~

~~Crew Resource Management (CRM) involves the effective use of all available resources to operate a flight safely. It is important that all flight deck crewmembers identify and communicate any situation that appears potentially unsafe or out of the ordinary. Experience has proven that the most effective way to maintain safety of flight and resolve these situations is to combine the skills and experience of all crewmembers in the decision making process to determine the safest course of action.~~

~~Situational awareness, or the ability to accurately perceive what is going on in the flight deck, requires ongoing questioning, monitoring, crosschecking, communication, and refinement of perception.~~

~~Early intervention prevents unsatisfactory airplane performance or a degraded flight path.~~

~~When the automatic systems as described above do not perform as expected, the Pilot Flying (PF) should reduce the level of automation to ensure proper control of the airplane is maintained.~~

~~The PF should not attempt to restore higher levels of automation until after aircraft control is assured.~~

~~Flight crew must ensure the proper configuration for the phase of flight. Time may be required in order to assess the situation, take corrective action and resolve the discrepancy; therefore a go-around, holding, or additional maneuvering may be necessary. Flight path control and monitoring of instruments must never be compromised.~~

~~NON-NORMAL SITUATION GUIDELINES~~

~~When a non-normal situation occurs, the following guidelines apply.~~

- ~~NON-NORMAL RECOGNITION:~~

  ~~The crewmember recognizing the malfunction calls it out clearly and precisely.~~

- ~~MAINTAIN AIRPLANE CONTROL:~~

  ~~It is mandatory that the Pilot Flying (PF) fly the airplane.~~

- ~~ANALYZE THE SITUATION:~~

  ~~Any further action should only be initiated after the malfunctioning system has been positively identified.~~

~~ADDITIONAL INFORMATION~~

~~Any occurrences of erroneous display data, even if intermittent, should be reported to maintenance.~~

~~More information can be found in the Boeing 777 Flight Crew Training Manual (FCTM) and Flight Crew Operations Manual (FCOM). Operators may want to review the following:~~

~~777 FCTM~~

1. ~~Chapter 1 - Crew Resource Management~~
2. ~~Chapter 1 - Callouts~~
3. ~~Chapter 1 - AFDS Guidelines~~
4. ~~Chapter 5 - Approach Briefing~~
5. ~~Chapter 5 - Stabilized Approach Recommendations~~

~~777 FCOM~~

1. ~~NP11 - Autopilot Flight Director Systems (AFDS) Procedures~~
2. ~~Chapter 4 - Automatic Flight System Description~~
3. ~~Chapter 10 - Flight Instruments, Displays System Description~~
4. ~~Chapter 15 -Warning Systems System Description~~

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~~FLIGHT CREW BULLETIN(FCB-67)~~

~~Subject: SATCOM Logon failure Issue~~

~~Airplane Effectivity : B777-300ER (HL8006/07/08/09/10/11- 6 A/Cs)~~

~~BACKGROUND INFORMATION~~

~~SATCOM logon failure cases have been reported on some aircrafts after the DO-260B ADS-B modification.~~

~~In case of failure, SATCOM communication is disabled.~~

~~OPERATING INSTRUCTIONS~~

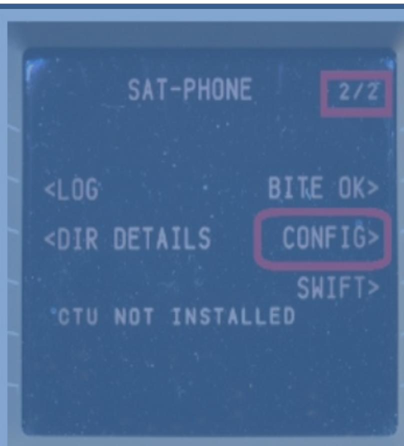
~~1. Before Push Back~~

- ~~Check MCDU SATCOM page after completion of the aircraft alignment.~~
- ~~If 'NOT READY' is displayed, it is log-on failure. Ask the mechanic to take the necessary action (SATCOM Reset).~~

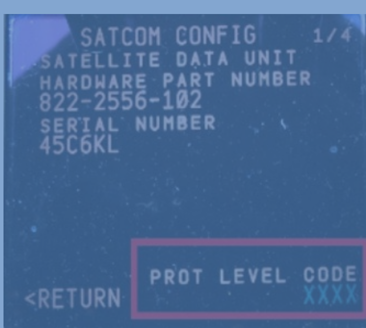
~~2. After Push Back~~

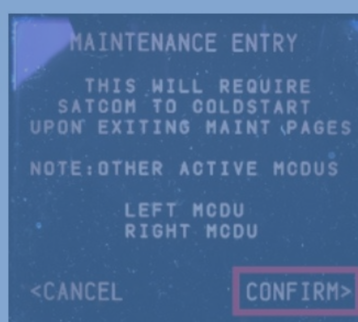
~~- If 'NOT READY' is displayed on MCDU SATCOM Page, follow the actions below. (SATCOM Reset)~~

~~1) MCDU SAT menu, Press NEXT Page~~ ~~2) Press CONFIG (3R LSK)~~

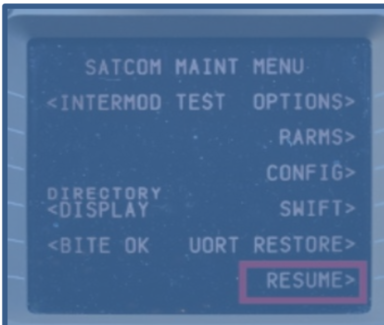


~~3) Input PROT LEVEL CODE 1234 (6R LSK)~~ ~~4) Press CONFIRM (6R LSK)~~





~~5) Press RESUME (6R LSK)~~



~~6) Press CONFIRM (6R LSK)~~

~~7) Wait 60 Sec / Reset Done~~

~~ADMINISTRATIVE INFORMATION~~

~~This condition is under investigation.~~

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~~FLIGHT CREW BULLETIN (FCB-70R1)~~

~~Subject: LNAV Path Deviation from Published Procedures Path~~

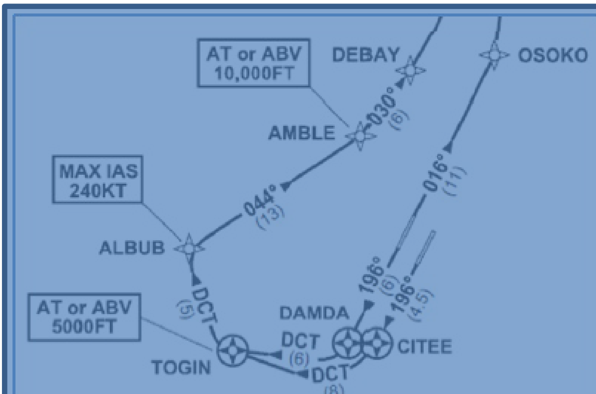
~~Airplane Effectivity: All~~

~~Reason: To inform flight crews of the potential for lateral navigation (LNAV) path deviation from the published procedural path.~~

~~BACKGROUND INFORMATION~~

~~Boeing has received reports of LNAV path deviation from the published procedure for certain standard instrument departures (SIDs). These reports have occurred most often on SIDs that include waypoints that are close together with large course changes between the waypoints, high airspeed, and fly-over waypoints.~~

~~An example of this type of SID is the BIXAD1 SID at Brisbane International Airport (YBBN). This SID has two consecutive fly-over waypoints, followed by a fly-by waypoint within 5NM, and then followed by a 90 degrees course change at a procedure specified speed of 240Kts. See Figure 1.~~



~~Figure 1~~

~~When the SID is loaded from the navigation data base which specifies a maximum speed, the FMS targets the maximum Indicated Airspeed (IAS) as soon as possible, provided the airplane flaps configuration allows it, until reaching the speed restricted waypoint. At a constant IAS, as airplane altitude increases, the true airspeed increases. Furthermore the wind could increase the airplane's ground speed. The combination of high speed with~~

~~waypoints that are close together with large course changes between the waypoints will not allow the FMC to compute flyable paths, including required turns that comply with the published procedural requirements. The ND will then display a straight-line LNAV path between waypoints with the sharp turn. This will most likely cause an overshoot of the LNAV track. See Figure 2.~~

~~Figure 2~~

~~OPERATING INSTRUCTIONS~~

~~Pilots must ensure the waypoints listed on the LEGS page of the CDU match the route depicted on ND and compare them with the appropriate chart and ATC clearance.~~

~~The combination of procedure-specified high speed with waypoints that are spaced closely, plus large course changes between the waypoints, will not allow the FMC to compute a flyable path. The pilot must ensure that the LNAV path shown on the ND complies with the ATC clearance. A lower airspeed constraint or speed intervention maybe needed.~~

~~All data entered into the FMC must be confirmed to be accurate and current by comparison to published and approved flight navigation charts. All entries and edits to the FMC flight plan, both laterally and vertically, must be confirmed to be in compliance with ATC clearances. If LNAV or VNAV guidance does not appear to be complying with the desired flight profile, the crew must intervene and ensure that the aircraft flight profile conforms to clearance requirements.~~

~~ADMINISTRATIVE INFORMATION~~

- ~~Boeing FOTB 777 21-59 (August 27, 2021)~~

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TABLE OF CONTENTS

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AIRCRAFT DIFFERENCES

AIRCRAFT GENERAL

Item	B777-200	~~B777-300~~	~~B777-300ER~~	~~B777F~~
Wing span *<CLICK>*	199 ft 11 inch (60.93 m)	~~199 ft 11 inch~~ ~~(60.93 m)~~	~~212 ft 7 inch~~ ~~(64.80 m)~~	~~212 ft 7 inch~~ ~~(64.80 m)~~
Length	209 ft 1 inch (63.73 m)	~~242 ft 4 inch~~ ~~(73.86 m)~~	~~242 ft 4 inch~~ ~~(73.86 m)~~	~~209 ft 1 inch~~ ~~(63.73 m)~~
Wheel Base	84 ft 11 inch (25.89 m)	~~102 ft 5 inch~~ ~~(31.20 m)~~	~~102 ft 5 inch~~ ~~(31.20 m)~~	~~84 ft 11 inch~~ ~~(25.89 m)~~
Minimum Width of Pavement for 180° Turn	155.8 ft (47.5 m)	~~183.8 ft~~ ~~(56.0 m)~~	~~185.5 ft~~ ~~(56.5 m)~~	~~157.4 ft~~ ~~(48.0 m)~~
~~**Passenger Entry / Overwing Exit Doors**~~	~~8 / 0 (Plug Type)~~	~~8 / 2 (Plug Type)~~	~~8 / 2 (Plug Type)~~	~~N/A~~
~~**CREW Entry/ Cargo Doors**~~	~~N/A~~	~~N/A~~	~~N/A~~	~~2(Plug Type) / 3 (Latch Type)~~ ~~1 Plug (Bulk)~~
~~**GMCS Light**~~	~~N/A~~	~~3 Installed~~	~~3 Installed~~	~~N/A~~
~~**GMCS Lights Switch**~~	~~N/A~~	~~Installed~~	~~Installed~~	~~N/A~~
~~**GRD Maneuver Camera System**~~	~~N/A~~	~~Installed~~	~~Installed~~	~~N/A~~
~~**Interior Configurations Seating**~~	~~(HL7574 - HL7598)~~ ~~8F / 28C / 212Y~~ ~~(HL7751 - HL7766)~~ ~~8F / 28C / 225Y~~	~~6F / 35C / 297Y~~	~~8F / 56C / 227Y~~ ~~(HL7202-HL7205, 8006 - HL8042)~~ ~~8F / 42C / 227Y~~	~~N/A~~
~~**Supernumerary Area**~~	~~N/A~~	~~N/A~~	~~N/A~~	~~4seats, galley, lavatory, and sleeping facilities for additional crew members.~~
Lower/Upper Crew Rest Compartment Oxygen System	Y (Auto-Drop)	~~N/A~~	~~Y (Auto-Drop)~~	~~Y (Auto-Drop)~~
Lower/Upper Crew Rest Compartment	Y	~~N/A~~	~~Y~~	~~Y~~

AIR CONDITIONING & PRESSURIZATION SYSTEM

Item	B777-200	~~B777-300~~	~~B777-300ER~~	~~B777F~~
Crew Rest Area Temperature Control	Y (Manually)	~~N/A~~	~~Y (Manually)~~	~~Y (Manually)~~
~~**Supernumerary Area Temperature Control**~~	~~N/A~~	~~N/A~~	~~N/A~~	~~Y (Manually)~~

FIRE PROTECTION

~~Item~~	B777-200	~~B777-300~~	~~B777-300ER~~	~~B777F~~
Lower/Upper Crew Rest Compartment Somke Detection	Y	~~N/A~~	~~Y~~	~~Y~~
~~**Supernumerary Area Smoke Detection**~~	~~N/A~~	~~N/A~~	~~N/A~~	~~Y~~
~~**Lower/Upper Crew Rest Compartment Fire Extinguishing**~~	~~Y (Manually)~~	~~N/A~~	~~Y (Manually)~~	~~Y (Manually)~~
~~**Supernumerary Area Fire Extinguishing**~~	~~N/A~~	~~N/A~~	~~N/A~~	~~Y (Manually)~~

FLIGHT CONTROLS

Item	B777-200	~~B777-300~~	~~B777-300ER~~	~~B777F~~
Flap Limit Placard **Flap 1** **Flap 5** **Flap 15** **Flap 20** **Flap 25** **Flap 30**	Speed Limitations 255K 235K 215K 195K 185K 170K	~~Speed Limitations~~ ~~255K~~ ~~235K~~ ~~215K~~ ~~200K~~ ~~190K~~ ~~180K~~	~~Speed Limitations~~ ~~265K~~ ~~245K~~ ~~230K~~ ~~225K~~ ~~200K~~ ~~180K~~	~~Speed Limitations~~ ~~265K~~ ~~245K~~ ~~230K~~ ~~225K~~ ~~200K~~ ~~180K~~
Slat Load Relief (in Secondary Mode)	If airspeed exceeds 239 kts with the slats fully extended, they retract to midrange.	~~If airspeed exceeds 246 kts with the slats fully extended, they retract to midrange.~~	~~If airspeed exceeds 256 kts with the slats fully extended, they retract to mid-range.~~	~~If airspeed exceeds 256 kts with the slats fully extended, they retract to midrange.~~
~~Tail Strike Protection~~	~~Y (HL7751 ~)~~	~~N~~	~~Y~~	~~Y~~

~~FLIGHT INSTRUMENTS, DISPLAYS~~

~~Item~~	~~B777-200~~	~~B777-300~~	~~B777-300ER~~	~~B777F~~
~~Current Groundspeed on PFD~~	~~N/A~~	~~Displays groundspeed when Mach number is less than 0.40~~	~~Displays groundspeed When Mach number is less than 0.40.~~	~~N/A~~
~~GMCS Display Switch on DSP~~	~~N/A~~	~~Y~~	~~Y~~	~~N/A~~
~~Inboard/Lower Display Brightness Control~~	~~Weather Radar or Terrain~~	~~Weather Radar, Terrain or Ground Maneuver Camera~~	~~Weather Radar, Terrain or Ground Maneuver Camera~~	~~Weather Radar or Terrain~~

~~LANDING GEAR~~

~~Item~~	~~B777-200~~	~~B777-300~~	~~B777-300ER~~	~~B777F~~
~~Tail Skid System~~	~~N/A~~	~~Y (Center hydraulic system)~~	~~HL7782-HL8275 (Center hydraulic system)~~	~~N/A~~

GENERAL, EMERGENCY EQUIPMENT

Airplane Number		7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
IDENT Page Model	777-200.1	○									777-200ER
	777-200.3		○	○	○	○	○	○	○	○	777-200ER with extended forward CG
Configuration	Business	22	22	24	24	24	24	24	24	24	
	Economy	278	278	278	278	278	277	277	278	278	
	Total	300	300	302	302	302	301	301	302	302	
Crew Rest Compartment	Flight Deck	○	○				○	○			Smoke Detection
	Door 1 Upper								○	○	Smoke Detection
	Lower	○	○	○	○	○	○	○			Smoke Detection and Fire Extinguishing Sys’
	Door 3 Upper								○	○	Smoke Detection
Emergency Equipment Locations	Type 1	○	○								POM Chapter 6
	Type 2				○						〃
	Type 3			○		○					〃
	Type 4						○	○			〃
	Type 5								○	○	〃

AUTOMATIC FLIGHT

Airplane Number	7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
Automatic LNAV Activation after G/A						○	○	○	○	FCOM Ch.4 Sec.20

COMMUNICATIONS

Airplane Number	7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
Intermittent Tone with Stuck Mic								○	○	FCOM Ch.5 Sec.20

FLIGHT CONTROLS

Airplane Number	7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
Tail Strike Protection				○	○	○	○	○	○	

FLIGHT INSTRUMENTS, DISPLAYS

Airplane Number	7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
PFD Navigation Performance Indication						○	○	○	○	FCOM Ch.10 Sec.10
ND Navigation Performance Indication						○	○	○	○	FCOM Ch.10 Sec.10
SIDE Cursor Location S/W				○	○	○	○	○	○	CCD
Dual Data Base (ECL)							○			FCOM Ch.10 Sec.60
Installed EFB (Electronic Flight Bag)				○	○	○	○	○	○	

FLIGHT MANAGEMENT

Airplane Number	7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
Assumed Temp, APU-to-Pack, OAT								○	○	FCOM Ch.11 Sec.40

WARNING SYSTEMS

Airplane Number	7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
Highest Elevation of Obstacle or Terrain Displayed						○	○	○	○	FCOM 15.10.15
Lowest Elevation of Obstacle or Terrain Displayed						○	○	○	○	FCOM 15.10.15
Look-ahead Obstacles and Peaks Terrain Alerting System						○	○	○	○	FCOM 15.20.22

MTOW

Airplane Number		7700	7732	7739	7755	7756	7775	7791	8254	8284	Remarks
MTOW	632,500LBS			○	○	○					FCOM Limitations
	648,000LBS	○	○								
	656,000LBS						○	○	○	○	

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TABLE OF CONTENTS

OPERATING LIMITATIONS

GENERAL

This chapter contains:

- Airplane Flight Manual (AFM) limitations
- AFM operational information
- Non-AFM operational information.

Limitations and operational information are included if they are:

- operationally significant
- required by regulatory requirement.

Limitations and operational information are not included if they are:

- incorporated into FCOM normal, supplementary, or non-normal procedures, with a few exceptions
- ~~shown on a placard, display, or other marking.~~

  ~~(e.g. No Stowage Behind Seat, DOOR TO BE CLOSED DURING TAXI, TAKEOFF AND LANDING, etc.)~~

Listed in this chapter that must be memorized (memory items) are marked with a (#) symbol. They meet the following criterion – flight crew access by reference can not assure timely compliance, e.g., severe turbulence penetration speeds. They need only be memorized to the extent that compliance is assured. Knowing the exact wording of the limitation is not required.

Assuming that the remaining items are available to the flight crew by reference (e.g. placard, display, or other marking), they do not need to be memorized.

AIRPLANE GENERAL

AFM LIMITATIONS

Runway slope	± 2%
Maximum Operating Altitude	43,100 ft pressure altitude

HL7700-HL8284

Maximum Takeoff and Landing Altitude	8400 ft pressure altitude

~~HL7202 - HL7205, HL8005, HL8041 - HL8077, HL8226, HL8251, HL8252, HL8285 - HL8347~~

~~Maximum Takeoff and Landing Altitude~~	~~9800 ft pressure altitude~~

WIND LIMITATION(TAKEOFF AND LANDING)

	Braking Action					
	Good	**Good to Medium**	**Medium**	**Medium to Poor**	**Poor**	**Nil**
Crosswind	30 kts	20 kts	20 kts	10 kts	10 kts	NA
Tailwind	10 kts[1)]	5 kts	5 kts	NA	NA	

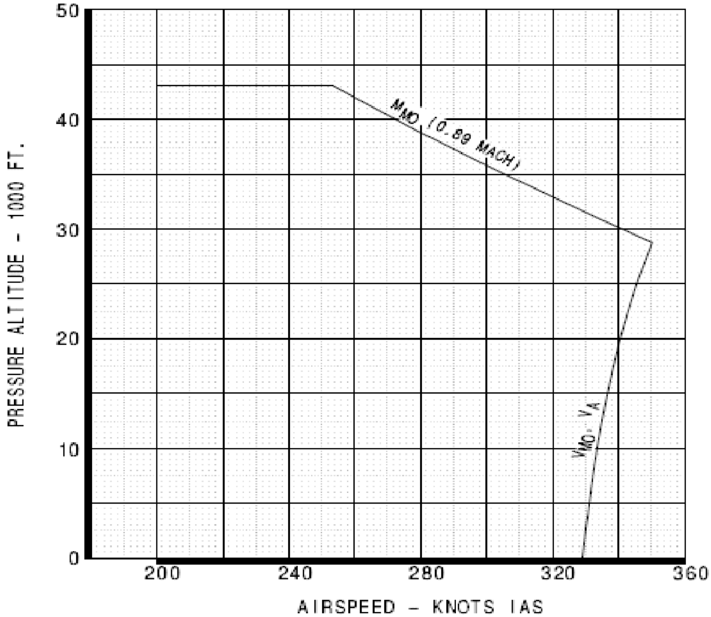
~~1) B777 is certified of tailwind 15kt for takeoff and landing in AFM. Tailwind 15kt limitation can be applied only to specified airports by company. Refer to FOM 5.8 - Airport Restrictions for the relevant information.~~

For Braking Action, refer to POM 9.2 RUNWAY CONDITION ASSESSMENT MATRIX

MAXIMUM OPERATING LIMIT SPEED(Vmo/Mmo)

Item	B777-200	~~B777-300~~	~~B777-300ER/B777F~~
Vmo/Mmo	330 KIAS/M 0.87	~~330 KIAS/M 0.89~~	~~*330~350 KIAS/M 0.89~~

~~B777-300ER/B777F Maximum Airspeed Limits~~



Maximum Operating Altitude for Flaps

The maximum altitude with flaps extended is 20,000 ft.

DOOR MOUNTED POWER ASSISTS AND ESCAPE SLIDES

~~FREIGHTER~~

~~Main door emergency power assists and evacuation slide systems must be armed with the mode select handle in the ARMED position prior to taxi, takeoff and landing whenever supernumeraries are carried.~~

PASSENGER

Main door emergency power assists and evacuation slide systems must be armed with the mode select handle in the ARMED position prior to taxi, takeoff and landing whenever passengers are carried.

CAUTION! ***Do not operate the entry or cargo doors with winds of more than 40 kts at the door. Do not keep doors open when wind gusts are more than 65 kts.***

Strong winds can cause damage to the structure of the airplane.

LOWER CREW REST COMPARTMENT

HL7700 – HL7791

The lower crew rest compartments may not be occupied, and the main entry hatch or the door must be closed during taxi, takeoff, or landing.

~~RIGID CARGO BARRIER DOOR~~

~~FREIGHTER~~

~~The rigid cargo barrier door must be closed during taxi, takeoff, and landing.~~

~~The rigid cargo barrier door must be closed except when entering and exiting the cargo compartment.~~

~~MAIN DECK CARGO COMPARTMENT ACCESS~~

~~FREIGHTER~~

~~Occupancy of the main deck cargo compartment is prohibited during taxi, takeoff, and landing.~~

~~Main deck cargo compartment access is limited to:~~

- ~~caring for live animals~~
- ~~caring for cargo requiring special attention~~

Turbulent Air Penetration Speed

The turbulent air penetration speed (in severe turbulence) is defined as:

- 270 KIAS below 25,000 ft
- 280 KIAS/.82 Mach(whichever is lower) at 25,000 ft and above.

- Maintain a minimum speed of 15 kts above the minimum maneuvering speed at all altitude when below 0.82 Mach.

NON-AFM OPERATIONAL INFORMATION

Do not operate HF radios during refueling operations.

Avoid weather radar operation in a hangar.

Avoid weather radar operation when personnel are within the area normally enclosed by the aircraft nose radome.

Note: The hangar recommendation does not apply to the weather radar test mode.

RVSM OPERATIONS

Prior to takeoff the maximum allowable difference between captain's or first officer's altitude display and field elevation is 75 ft.

The standby altimeter does not meet altimeter accuracy requirements of RVSM airspace.

WEIGHT LIMITATIONS

a) HL7739,7755,7756

Maximum Taxi Weight	BASIC 634,500	1st Alternate 575,000	2nd Alternate 513,400
Maximum Takeoff Weight	BASIC 632,500	1ST Alternate 573,000	2nd Alternate 511,400
Maximum Landing Weight	460,000		
Maximum Zero Fuel Weight	430,000		

b) HL7700,7732

Maximum Taxi Weight	BASIC 650,000	1st Alternate 575,000	2nd Alternate 513,400
Maximum Takeoff Weight	BASIC 648,000	1ST Alternate 573,000	2nd Alternate 511,400
Maximum Landing Weight	460,000		
Maximum Zero Fuel Weight	430,000		

c) HL7775,7791,8254,8284

Maximum Taxi Weight	BASIC 658,000	1st Alternate 575,000	2nd Alternate 513,400
Maximum Takeoff Weight	BASIC 656,000	1ST Alternate 573,000	2nd Alternate 511,400
Maximum Landing Weight	460,000		
Maximum Zero Fuel Weight	430,000		

~~B777-300: HL7532 - HL7573~~

~~B777-300ER: HL7202 - HL7205, HL7782 - HL7783, HL8006 – HL8042, HL8208 - HL8218, HL8250, HL8274, HL8275, HL8346, HL8347~~

~~B777F: HL8005, HL8043 – HL8077, HL8226, HL8251, HL8252, HL8285~~

~~[Unit: lbs]~~

~~Weights~~		~~B777-300~~	~~B777-300ER~~	~~B777F~~
~~Maximum Taxi Weight~~	~~Basic~~	~~603,800~~	~~762,000~~	~~768,800~~
	~~1st Alternate~~	~~590,600~~	~~703,000~~	
	~~2nd Alternate~~	~~561,900~~	~~617,000~~	
~~Maximum Takeoff Weight~~	~~Basic~~	~~601,800~~	~~760,000~~	~~766,800~~
	~~1st Alternate~~	~~588,600~~	~~701,000~~	
	~~2nd Alternate~~	~~559,900~~	~~615,000~~	
~~Maximum Landing Weight~~		~~524,000~~	~~554,000~~	~~575,000~~
~~Maximum Zero Fuel Weight~~		~~495,000~~	~~524,000~~	~~547,000~~

~~These aircrafts are certified with multi MTOW and they can be operated with one of the following weight configurations;~~

- ~~B777-300 - MTOW 601,800 lbs, 588,600 lbs or 559,900 lbs~~
- ~~B777-300ER - MTOW 760,000 lbs, 701,000 lbs or 615,000 lbs~~
- ~~B777F - MTOW 766,800 lbs, 701,000 lbs or 615,000 lbs~~

FLIGHT CONTROLS

AFM LIMITATIONS

Avoid rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw(e.g. large side slip angles) as they may result in structural failure at any speed, including below V_A.

Aircraft Geometry Limits(Tail Strike Pitch Attitude)

	B777-200/~~B777F~~	~~B777-300~~	~~B777-300ER~~
Takeoff	12.1°	~~8.9°~~	~~10.0°~~
Landing	10.2°	~~7.6°~~	~~7.6°~~

~~Note: For takeoff, 777-300ER values valid when the Semi-Levered Gear(SLG) is operative. When the SLG is inoperative, use 777-300 values~~

AIR SYSTEMS

CABIN PRESSURIZATION

Maximum differential pressure (relief valves)	9.1 psi
Maximum allowable cabin pressure differential for takeoff and landing	0.11 psi

APU to PACK Operation

HL8254, HL8284

APU to pack takeoffs are prohibited at airport pressure altitudes above 6900 feet.

AUTOFLIGHT

AFM LIMITATIONS

AUTOPILOT/FLIGHT DIRECTOR SYSTEM

~~HL7202 - HL7205, HL8041, HL8042,HL8346, HL8347~~

~~# Do not use the autopilot below 100 ft radio altitude at airport field elevations above 8400 ft.~~

~~HL8005, HL8043 - HL8077, HL8226, HL8251, HL8252, HL8285~~

~~# Do not use the autopilot below 100 ft radio altitude at airport field elevations above 8500 ft.~~

The autopilot must not be engaged below a minimum engage altitude of 200 ft AGL after takeoff.

For circling/visual approach, the autopilot can be used until intercepting a normal landing profile, but it must be disengaged before 500ft HAA/HAT.

Without LAND 2 or LAND 3 annunciated, the autopilot must be disengaged before the airplane descends below 200 ft AGL.

Use of FLCH mode is prohibited in approach after FAF (in case of no FAF, starting point of Final Approach Segment) for instrument approach or below 1500 ft HAT/HAA for visual approach.

~~Note: During a descent in FLCH mode or VNAV SPD mode, the autothrottle may be changed to HOLD mode. When in HOLD mode, the autothrottle will not wake up even during large deviations from target speed and does not support stall protection.~~

AUTOMATIC LANDING

Auto Land Wind Limitations

Wind Direction	CAT II or CAT III	CAT I or better			
		B777-200	~~B777-300~~	~~B777-300ER~~	~~B777F~~
Headwind	25 kts	25 kts	~~29/27 [1)] kts~~	~~40/33 [1)] kts~~	~~30/28 [1)] kts~~

Tailwind	10 kts	10 kts	~~10 kts~~	~~10 kts~~	~~10 kts~~
Crosswind	15 kts	25 kts	~~28/30 1) kts~~	~~28/29 1) kts~~	~~27/25 1) kts~~
1) is the wind limitation for one engine inoperative.					

Note: For auto landings, apply either the Wind limitations or Auto Land Wind limitations whichever is lower.

The maximum glideslope angle is 3.25 degrees.

The minimum glideslope angle is 2.5 degrees.

HL7700 - HL8284

Automatic landings can be made using flaps 20 2) or 30, with both engines operative or one engine inoperative.

~~**HL7532 - HL8044, HL8075, HL8076, HL8208 - HL8285**~~

Note: AUTO landing with flaps 25 is not permitted.

~~**HL7202 - HL7205, HL8045, HL8046, HL8077, HL8346, HL8347**~~

~~Automatic landings can be made using flaps 20 2), 25 or 30, with both engines operative or one engine inoperative.~~

Note: 2) Flaps 20 landings (manual or automatic) should be made only in non-normal situation as directed by the appropriate non-normal checklist.

The autopilot flight director system (AFDS) autoland status annunciation must display LAND2 or LAND3.

COMMUNICATIONS

SATCOM PHONE

~~**HL7202 - HL7205, HL8005-HL8077, HL8226, HL8251, HL8252, HL8285 - HL8347**~~

~~**Non-AFM Operational Information**~~

~~Do not use SwiftBroadband (SBB) service for ATC communications.~~

ENGINES

AFM LIMITATIONS

ENGINE EGT

PW engine (777-200ER/~~777-300~~)

Operational Condition	Temperature Limits	Time Limit
	PW4090	
Takeoff	675 ℃	5 mins
Maximum Continuous	650 ℃	No Limit
Starting (Ground)	535 ℃	No Limit
Starting (Inflight)	675 ℃	No Limit

~~GE engine (777-300ER/777F)~~

~~Operational Condition~~	~~Temperature Limits~~	~~Time Limit~~
	~~GE90-115// GE90-110B1L~~	
~~17,000 ft and below~~	~~1095 ℃~~	~~30 secs~~
~~All Altitudes~~	~~1090 ℃~~	~~5 mins~~
~~All Altitudes~~	~~1050 ℃~~	~~No Limit~~
~~Starting (Ground)~~	~~750 ℃~~	~~No Limit~~
~~Starting (Inflight)~~	~~825 ℃~~	~~No Limit~~

ENGINE LIMIT DISPLAY MARKINGS

Maximum and minimum limits are red.

Caution limits are amber.

ENGINE OIL SYSTEM

~~HL7532 - HL7766 (~~PW engine~~)~~

Oil temperature must be greater than 50 °C before advancing thrust levers to takeoff power.

ENGINE FUEL SYSTEM

The maximum tank fuel temperature is 49 °C (120 °F).

Tank fuel temperature prior to takeoff must not be less than -40 °C or 3 °C above the fuel freezing point temperature, whichever is higher. In-flight tank fuel temperature must be maintained at least 3 °C above the freezing point of the fuel being used. The use of Fuel System Icing Inhibitor additives does not change the minimum fuel tank temperature limit.

REVERSE THRUST

Intentional selection of reverse thrust in flight is prohibited.

Backing the airplane with use of reverse thrust is prohibited.

NON-AFM OPERATIONAL INFORMATION

~~**HL7202 - HL7205, HL7782 - HL8347 (GE Engine)**~~

~~# For ground operation (exclusive of takeoff) in tailwinds and crosswinds between 30 and 45 kts, engine power should be limited to a maximum of 70 % N1. Avoid thrust levels above that required for normal taxi operation in all tailwinds and crosswinds greater than 45 kts.~~

APU

The APU's starter motors duty cycle for the electric starter motor and air turbine starter is 3 starts attempts in a 60 minutes period each.

APU start cycle restrictions are:

Between Starts	Electric Starter Motor wait:	Air Turbine Starter wait
1 and 2	1 minute	1 minute
2 and 3	1 minute	1 minute

FLIGHT INSTRUMENTS, DISPLAYS

AFM OPERATIONAL INFORMATION

~~**GROUND MANEUVER CAMERA SYSTEM**~~

~~B777-300, B777-300ER~~

~~The ground maneuver cameras should not be used during takeoff, approach, and landing.~~

FLIGHT MANAGEMENT, NAVIGATION

AFM LIMITATIONS

AIR DATA INERTIAL REFERENCE UNIT (ADIRU)

ADIRU alignment must not be attempted at latitudes greater than 78 degrees, 14.75 minutes.

QFE SELECTION

A QFE altitude reference for the primary flight displays must be selected in the flight management system whenever QFE is used instead of QNH.

> Note: Do not use LNAV and/or VNAV below transition altitude/level. Altitudes in the navigation database are not referenced to QFE. Use only raw data for navigation.

FUEL SYSTEM

AFM LIMITATIONS

The use of Jet B or JP-4 fuels is prohibited.

Main tanks must be scheduled to be full if center tank fuel is loaded.

Note: The center tank may contain up to 3000 lbs of fuel with less than full main tanks provided center tank fuel weight plus actual zero fuel weight does not exceed the maximum zero fuel weight, and center of gravity limits are observed.

~~FUEL SYSTEM - LOADING~~

~~HL7532 - HL7598~~

~~When center tank fuel is required for the mission, an additional 700 pounds (320 kilograms) of reserve fuel must be added to the center tank fuelload.~~

WARNING SYSTEMS

AFM LIMITATIONS

GPWS - LOOK-AHEAD TERRAIN ALERTING

Do not use the terrain display for navigation.

The use of look-ahead terrain alerting and terrain display functions is prohibited[1)] within 15 NM of takeoff, approach or landing at an airport or runway not contained in the GPWS terrain database.

> Note: [1)] To inhibit look-ahead terrain alerts and terrain display, push GND PROX - TERR OVRD switch on the Ground Proximity Panel.

> Note: If the look-ahead terrain alerts and terrain display functions are inhibited, RNAV (RNP) approach is not authorized.

NON-AFM OPERATIONAL INFORMATION

~~RUNWAY AWARENESS AND ADVISORY SYSTEM (RAAS)~~
~~HL8043 - HL8077~~

~~Do not use RAAS voice annunciations or alerts for navigation.~~

~~Do not use RAAS voice annunciations or alerts as a substitute for NOTAM or ATIS information.~~

TCAS

Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with a TCAS II resolution advisory.

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TABLE OF CONTENTS

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INTRODUCTION

GENERAL

This chapter contains Normal Procedures. It incorporates routine normal procedures/callouts and associated flight patterns.

CONTROLS AND INDICATORS – NOMENCLATURE

Controls and indications appear in all UPPERCASE type to correspond to the words on the control panel or display. For example, the following item has UPPERCASE words to match what is found on the panel:

PRIMARY FLIGHT COMPUTERS
DISCONNECT switch .... AUTO (guarded position)

The word DISCONNECT is spelled out, even though it is abbreviated on the panel.

The following appears in all lower case because there are no words identifying the panel name:

Landing gear panel.. Set

NORMAL PROCEDURES

Normal procedures are used by the trained flight crew to ensure airplane condition is acceptable and that the flight deck is correctly configured for each phase of flight. These procedures assume all systems are operating normally and automated features are fully utilized.

Normal procedures are done by memory and scan flow. These procedures are designed to minimize crew workload and are consistent with flight deck technology. If the correct indication is not observed during accomplishment of procedures, verify controls are positioned correctly. If necessary, check the appropriate circuit breaker(s) and test the related system light(s).

Before engine start, lights or indications verify the systems' condition or configuration. Review the EICAS alert messages and status display before engine start to determine if messages are displayed which may affect dispatch and require maintenance action or compliance with the Minimum Equipment List (MEL).

During engine start and prior to take-off, it is not necessary to check status messages as any message having an adverse effect on safe continuation of the flight, and requiring crew attention, will appear as an EICAS alert message (warning, caution, or advisory).

> Note: When an EICAS alert message is triggered after engine start, the EICAS status message may need to be checked to identify which MEL item is applicable.

EICAS alert messages are the primary means of alerting the flight crew to non–normal conditions or improper configuration. During engine start and prior to takeoff, any alert message requires accomplishment of the appropriate non–normal procedure. Upon completion of the procedure and prior to takeoff, the AAR MEL should be consulted to determine if MEL relief is available.

> Note: The EICAS advisory message TCAS OFF is displayed until TA/RA is selected just prior to takeoff.

Exterior lighting, flight deck lighting, and personal comfort items (such as shoulder heaters) are systems assumed to have obvious procedural requirements and are not addressed in this section.

Flight crew duties are organized in accordance with an area of responsibility concept. Each crewmember is assigned a flight deck area where the crewmember initiates actions for required procedures. The panel illustrations in this section describe each crewmember's area of responsibility for pre/post flight and phase–of–flight.

Pre/post flight duties are apportioned between the captain and first officer, while phase–of–flight duties are apportioned between the pilot flying (PF) and pilot monitoring (PM). A normal panel flow is encouraged; however, certain items may be handled in the most logical sequence for existing conditions. Actions outside the crewmember's area of responsibility are initiated at the direction of the captain. General phase–of–flight responsibilities are as follows:

Pilot flying:

- flight path and airspeed control

- navigation
- airplane configuration

Pilot monitoring:

- checklist reading
- communications
- tasks requested by PF
- monitoring taxiing, flight path, airspeed, airplane configuration and navigation

Phase–of–flight duties, beginning when the airplane starts takeoff roll and ending when the airplane reaches taxi speed after landing, are presented in table form in the appropriate procedures section.

The first officer, when flying the airplane, performs the duties listed under pilot flying and the captain performs those duties listed under pilot monitoring.

> Note: Although the mode control panel is designated as the PF's responsibility, the PM should operate the controls on the mode control panel at the direction of the PF when the airplane is being flown manually.

The captain retains final authority for all actions directed and performed.

AUTOPILOT FLIGHT DIRECTOR SYSTEM AND FLIGHT MANAGEMENT SYSTEM MONITORING

When the autopilot, flight director, or autothrottles are in use and a mode change is selected or is scheduled to occur, the annunciation must be verified on the primary flight display (PFD). Airplane course, vertical path, and speed must always be monitored.

Similarly, when a thrust reference mode change is selected or is scheduled to occur, the annunciation must be verified on the EICAS display.

In LNAV and VNAV, all airplane course, vertical path, thrust, and speed changes must be verified.

Note: In the event the autopilot is overridden by the flight crew, the autopilot should be disengaged as soon as practical. Continued override is not recommended.

RECOMMENDED PITCH AND ROLL MODES

If the LEGS page and map display reflect the proper sequence and altitudes, LNAV and VNAV are recommended. If LNAV is not used, use an appropriate roll mode. When VNAV is not used, the following modes are recommended:

- FLCH has logic to allow shallow climbs and descents for small altitude changes.(A/T advances or retards thrust levers to provide 500 FPM vertical speed for each 1000 feet altitude change)
- There is no need to use V/S mode for passenger comfort.

FMS-CDU OPERATION

FMS Data Selection/Entry Identification:

After a selection of the DEP, Route, ARR, APP, a defined Waypoint in FMS NAV DATA or a manual entry of coordinates, both pilots must check if the selected/entered data is identical to those of the related charts/flight plan and compare them with the displayed data in ND (if applicable). This includes:

- Waypoints Sequence
- Track Courses and Distances
- Any Altitude or Speed Constraints [1)]

Note: [1)] If altitude/speed constraints are not contained in the selected FMS departure/arrival procedure, flight crew should insert/modify the required constraints on the FMS RTE LEGS or VNAV page.

On the ground:

The control display unit (CDU) manipulations are normally performed by the first officer and verified by the captain. When the exterior preflight inspection is delegated to the first officer, all the CDU manipulations are performed by the captain and must be verified by the first officer.

In flight:

CDU entries should be normally made by the PM and must be verified by the PF prior to execution. However, if the PM's workload is high, the PF may make CDU changes while monitoring the aircraft's flight path. CDU manipulations should be accomplished prior to high workload periods such as departure, arrival, or holding. During high workload periods, using autopilot modes such as heading select, flight level change, and the altitude and speed intervention features, along with the ND map switches, may be more efficient than entering complex route modifications into the CDU.

FMS-CDU PAGE SELECTION

The specific page listed below is recommended for each flight phase. But another selection can be used if necessary.

Flight Phase	PF	PM
Takeoff	TAKEOFF REF	ACT RTE LEGS
Climb	ACT (ECON) CLB	ACT RTE LEGS
Cruise	ACT (ECON) CRZ	ACT RTE LEGS
Descent	ACT (ECON) DES or PROG 1/4	ACT RTE LEGS
Approach	PROG 1/4 or ACT RTE LEGS [1]	ACT RTE LEGS or PROG 4/4 [1]

[1] During RNAV (RNP) approach, PF should select ACT RTE LEGS page and PM should select PROG 4/4 page.

Note: If the aircraft course tracking performance is in doubt during RNAV DEP/ARR, consider to monitor XTK error displayed in the FMS PROG 2/4 (or 4/4) page.

ELECTRONIC FLIGHT BAG(EFB) OPERATION

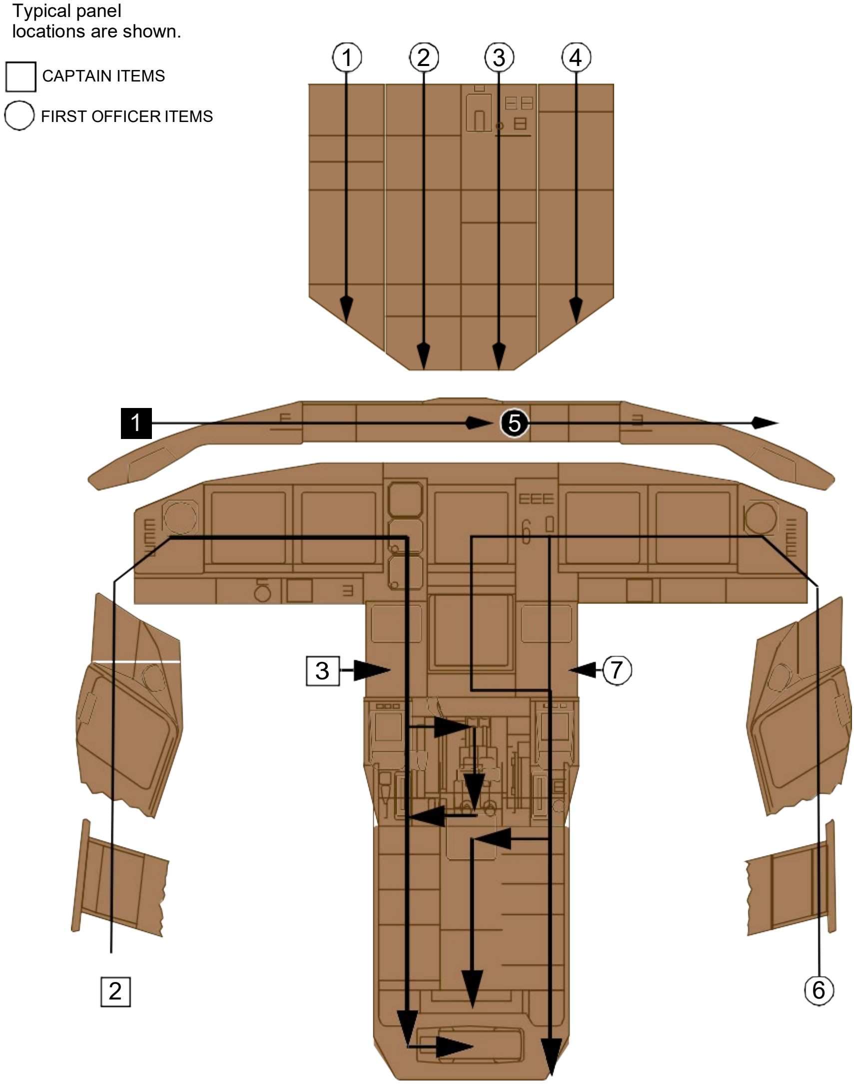
Both flight crewmembers should not become preoccupied with the EFB system (including portable EFB) at the same time in flight. Workload should be apportioned between flight crewmembers to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. ~~In case of a conflict in the data between the two Electronic Flight Bags(EFB), crews are advised to use the data on the EFB with the later~~

~~effective date. To check the validity of the eDocs; refer to the IDENT PAGE of the EFB. To check the validity of the OPT data; refer to the AIRPORT INFO page of the EFB~~.

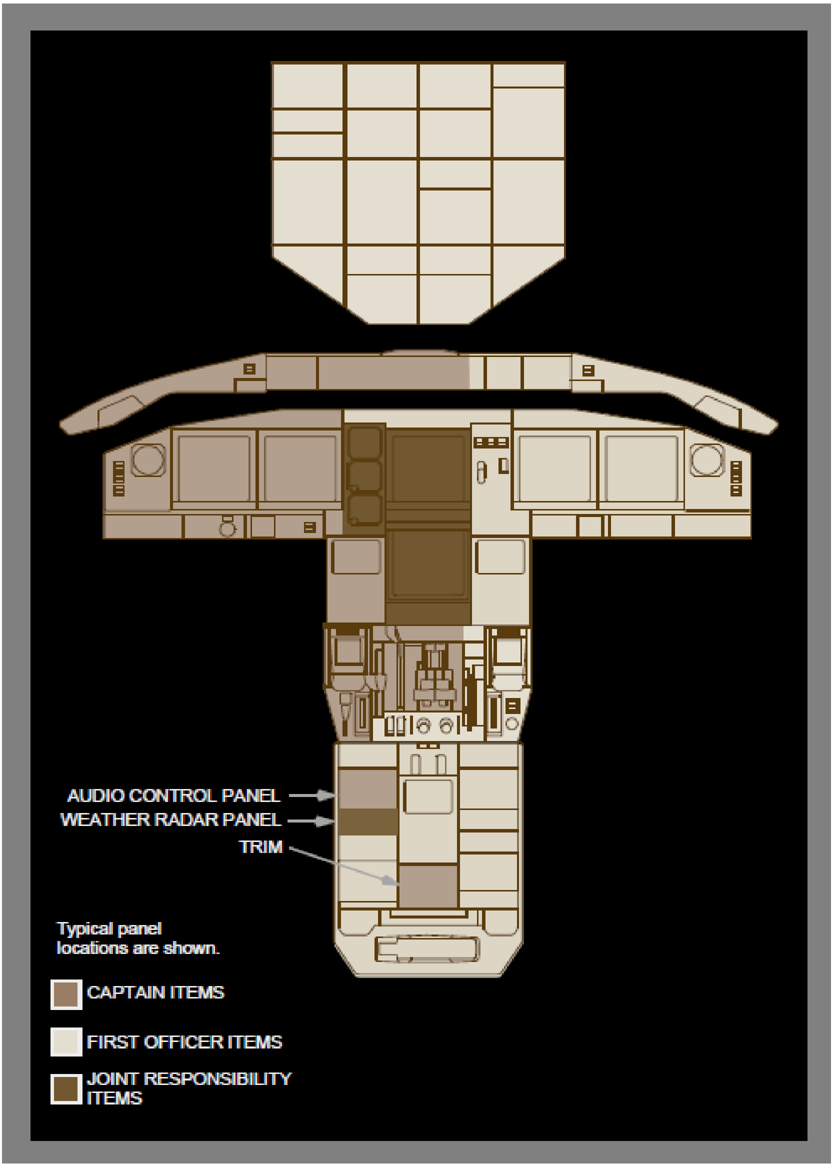
Note: If one EFB fails in flight, performance data should be calculated through the OPT of remaining EFB. Then, the performance data will be crosschecked by another flight crew.

Portable EFB must be placed on the mount prior to takeoff and landing at or below 10,000ft.
On cruise phase, consider screen-off a portable EFB to preserve battery life.

PREFLIGHT AND POSTFLIGHT SCAN FLOW

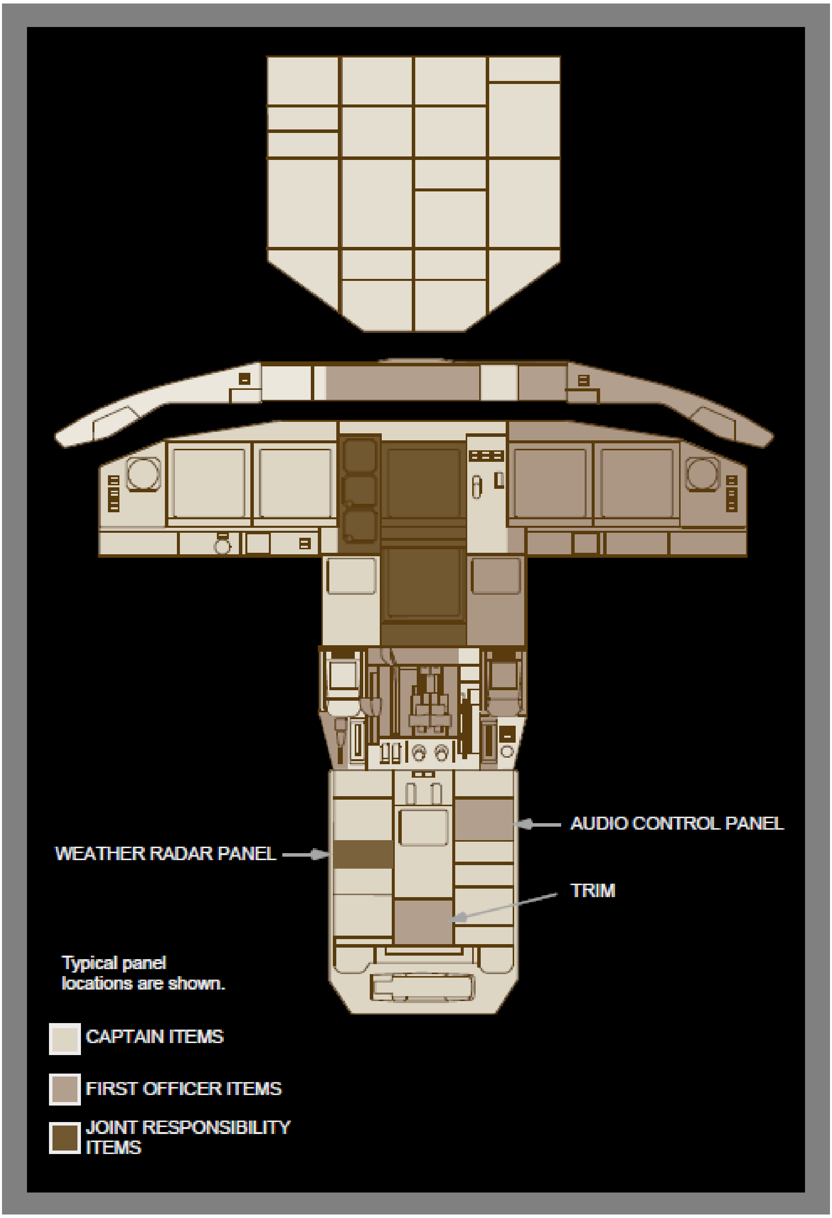


AREAS OF RESPONSIBILITY - CAPTAIN AS PF OR TAXIING



Note: With the airplane stationary on the ground, Captain cuts off the Fuel Control switch(es).

AREAS OF RESPONSIBILITY - FIRST OFFICER AS PF



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OPERATION POLICY

CREW DUTIES REFERENCE CHART

The Crew Duties Reference Chart below indicates normal divisions in pilot work load. This chart serves as a guide to help crew members coordinate their duties with regard to typical flight.

(●) As required

CREW DUTIES	Reference	CAPT	F/O	PF	PM
REPORT					
Report & Sign-in	FOM 6	●	●		
FLIGHT PLANNING					
Review flight plan, weather, route information and NOTAMs	FOM 6	●	●		
Self briefing	FOM 6	●	●		
Take FLT document folder to A/C	FOM 6		●		
Joint Briefing	FOM 6	●	●		
COCKPIT PREPARATION					
Security search	FOM 12	●	●		
Exterior inspection	FOM 6	●	(●)		
Check A/C documents & manuals *<CLICK>*	FOM 1/6	●	●		
Cockpit preparation/Interior inspection	FOM 6	●	●		
Check Flight Log	FOM 6	●	●		
Set up FMS equipment	FOM 2/6	(●)	●		
Verify FMS equipment	FOM 2/6	●	(●)		
Check final document (GD, NOTOC, W/B and etc.) on board	FOM 2/6	●	●		

Takeoff briefing	FOM 6			●	
ATC clearance	FOM 2/6		●		
TAXI AND BEFORE TAKEOFF					
Taxi clearance	FOM 2/6		●		
Takeoff briefing if changed	FOM 6			●	
Ensure Required takeoff fuel	FOM 6	●	●		
Takeoff reminder	FOM 6			●	
CLIMB AND CRUISE					
Report to Company Radio	FOM 9				●
FMS modification	FOM 2/6				●
MCP modification: • Autopilot engaged • Autopilot not engaged	FOM 2/6			●	●
PA announcement	FOM 6/14	●	(●)		
Monitor enroute fuel temperature	FOM 6			●	●
Enroute HF SELCAL check	FOM 6				●
Update Wx (En-route, Destination & Alternate Airport)	FOM 6			●	●
WAYPOINT PASSAGE					
Confirm name of next waypoint, desired track distance & time to next waypoint.	FOM 6			●	●
Transmit position report to ATC , controlling HF facility, or Company Radio	FOM 6/9				●
Record flying data on FLT plan	FOM 6			●	●
BEFORE DESCENT					

Arrival ATIS	FOM 6			●	●
FMS set up for approach	FOM 2/6			(●)	●
Landing briefing	FOM 6			●	
APPROACH AND LANDING					
Report to Company Radio	FOM 9				●
Ground control communications	FOM 6		●		
POSTFLIGHT					
Perform ACARS post flight	FOM 6		●		
FLT and MAINT Log book entries	FOM 6		●		
Check Flight Log	FOM 6	●			
Report to Company	FOM 6/9	(●)	●		
Return flight and maintenance log white copy	FOM 6		●		

WEATHER MINIMA

TAKEOFF MINIMA

The Company Standard Takeoff Minima is RVR 1500 m (5000 ft)/VIS 1600 m (1SM) for B777 at all airport unless a higher minimum is specified in the takeoff section of the Jeppesen chart.

When the reported weather is below the Company Standard Takeoff Minima, the requirements of the Lower Than Standard Takeoff Minima will be applied (Refer to FOM 4.1 - Takeoff Minima (Lower than Standard Takeoff Minima)).

Operating procedures for takeoffs with visibility less than RVR 1500m (5000ft)/VIS 1600m (1SM) are:

- The captain will make the takeoff.
- The flight crew must confirm the runway heading and runway number prior to taxiing into the runway.

- The flight crew must routinely check the airplane compass heading and runway number against the desired runway heading and runway number after taxiing on the runway.
- Perform a standing takeoff.

TAKEOFF ALTERNATE AIRPORT

When the weather conditions at the departure airport are at or below the landing minima (including one engine out landing minima), or the aircraft cannot return to the departure airport because of other reasons, such as performance, there must be a designated takeoff alternate airport.

Takeoff alternate airport should be located within a distance from departure airport equivalent to a flight time of one hour at single-engine operating cruise speed calculated in ISA, calm wind with actual take-off weight.

Prior to dispatch, the weather conditions at the takeoff alternate airport must be at or above the Alternate Airport IFR Weather Minima (Refer to FOM 4.1 - Approach and Landing Minima (Alternate Airport IFR Weather Minima)).

SMGCS (SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM)

When RVR is less than, or anticipated to be less than 350 m / 1200 ft (for ICN 550 m), review the SMGCS (SURFACE MOVEMENT GUIDANCE & CONTROL SYSTEM) LOW VISIBILITY TAXI ROUTES Chart if published.

APPROACH AND LANDING MINIMA

For instrument approaches, the B777-200 is classified as Category C ~~and B777-300/B777F is classified as Category D.~~ Landing Minima will be applied to whichever is higher of the local published minimum in the Airway Manual and the Company Minima.

When executing circling approaches, the B777-200 shall be applied as a Category D (FAA) or Category C (ICAO, JAA). An instrument approach requiring circle-to-land shall be conducted when the ceiling is at or above 1000 ft (300 m) and the visibility is at or above 3 SM (4800 m). If a higher MDH and/or weather restrictions are published, it will control.

ADDITIONAL WEATHER MINIMA REFERENCE

Refer to FOM 4.1 - Weather Minima.

STANDARD PROCEDURE AND CALLOUTS

For the purpose of normal line operations, the standard procedures and callouts are depicted in the "NORMAL PROCEDURE/CALLOUTS" tables. The Pilot Monitoring (PM) should accomplish all callouts on the basis of instrument indications (including FMA) or by observing various conditions as found necessary.

The Pilot Flying (PF) should always verify and acknowledge the condition on the basis of actual instrument indication. In an event that the PM does not make the required callouts, the PF should accomplish them.

Whenever the system status changes are to be made, including activation of any switches, the flight crew should always inform the other crew, before the change.

The PF should acknowledge all GPWS~~/RAAS~~ voice callouts except altitude callouts during approach while below 500 feet AFE. If automatic GPWS voice callout is not heard due to system failure or geographical characteristics of the airport, the PM should make appropriate callouts, such as **“RADIO ALTIMETER”,”ONE THOUSAND”, “FIVE HUNDRED”, “MINIMUM”,”ONE HUNDRED”, “FIFTY”** etc.

Each pilot must be aware of status and situation of the aircraft, and make appropriate callouts.

To check level off at a cleared altitude, PM calls out **“ONE THOUSAND TO LEVEL”** when passing 1000 ft before the cleared altitude or FL, and the PF calls out **“CHECK”**.

The callout phrase "CHECK" means distinctly visible and checked.

The callout phrase "ROGER" means "I understand."

STANDARD PHRASEOLOGY

A partial list of recommended words and phrase follows:

- Transfer of control / ATC:

- **"YOU HAVE CONTROL"**
- **"I HAVE CONTROL"**
- **"YOU HAVE ATC"**
- **"I HAVE ATC"**

• Thrust settings:

- **"SET TAKEOFF THRUST"**
- **"SET GO-AROUND THRUST"**

• Flap settings:

- check speed limitation with flaps setting
- **"FLAPS UP"**
- **"FLAPS THIRTY"**

• Airspeed:

- **"80 KNOTS"**
- **"ROTATE"**
- **"SET VREF PLUS (ADDITIVE)", OR**
- **"SET _____ KNOTS"**
- **"SET FLAPS______SPEED"**

ADDITIONAL STANDARD PROCEDURE AND CALLOUTS REFERENCE

Refer to FOM 2.2 - Standardization.

SCAN POLICY

PURPOSE

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

DEFINITION

• **Inside & Outside**: As the aircraft descends, outside references are used more than the instruments. However, Pilots must also monitor their instruments.

- **Inside**: Pilots will continuously monitor the instruments.

Conditions	PF	PM
Coupled approach (Below 1000 ft HAT)		
IMC (or at night)	Inside & Outside	Inside
After visual reference contact	Inside & Outside	Inside
Manual approach (Below 1000 ft HAT)		
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: Before reaching the DA(H) or MDA(H)+50ft, the Inside & Outside scanning flight crew shall call **"Approach Light in sight"** or **"Runway in sight"** when the runway environment is in sight and cross check with the ND (Track, Runway extension line, and etc.)

In case of non-precision or visual approaches to close parallel runways, **"RUNWAY XXX(runway number) IN SIGHT"** callout shall be made after identifying both runways and positively distinguishing the landing runway.

ADDITIONAL STANDARD SCAN POLICY REFERENCE

Refer to FOM 6.7 - Instrument Approach Procedures (Scan Policy).

RADIO COMMUNICATIONS

Taking a memo of ATC instruction is a good practice for helping manage the limitations of short term memory. CDU scratchpad may be used temporarily for taking a memo, however after using the CDU scratchpad, it should be deleted to allow the FMC messages to be displayed

Note: Flight path and aircraft status must be always monitored while taking memos.

AUDIO CONTROL PANEL (ACP) SET

After wearing or taking off the headset, or communicating for other than ATC purpose during the flight, the flight crew shall:

- Verify that the ACP is properly set for ATC communications:
  - Designated Transmitter/Receiver Switch selections
  - Headset and speaker volume adjustments
- Call “AUDIO CONTROL PANEL SET, VOLUME SET” (Standard Callout)

VHF RADIO COMMUNICATIONS

- VHF LEFT will normally be selected for active ATC communications.
- VHF RIGHT will normally be selected to 121.5MHZ for emergency.
- VHF CENTER will normally be selected to ACARS (also used for ATIS and company radio).

Note: The speaker volume should be turned on for ATC monitor during flight.

Note: Normally the Offside Tuning lights should be extinguished.

ADDITIONAL RADIO COMMUNICATIONS REFERENCE

Refer to FOM 9 - Communication.

AUTOPILOT, WEATHER RADAR AND TCAS SELECTIONS

It is the basic principle that the PF has to select his own side.

During flying in RVSM airspace, the TCAS must be selected same side with autopilot.

WEATHER RADAR AND TERRAIN DISPLAY POLICY

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 is recommended.

Note: Normally, PM should select TERR mode on his/her ND if necessary, to monitor both WXR and TERR.

Note: It may be useful to show the terrain display at other times to enhance terrain/situational awareness.

ALTIMETER SETTING

The flight crew should use QNH as a primary altimeter reference at or below Transition Level / Altitude. However, the flight crew may use QFE at the airport using QFE Altimetry if unable to apply QNH due to other situations.

Refer to FOM 4.4 - Altimetry.

NORMAL CHECKLIST

NORMAL CHECKLIST USAGE

All checklists will be performed by the assigned flight crew. But the PF or Captain should call for these checklists.

CALLING FOR THE CHECKLIST

On the ground, the Captain calls for the checklist. In flight, the PF calls for the checklist.

READING THE CHECKLIST

The checklist is read by the First Officer on the ground or the PM in flight.

Note: When F/O(or PM) announces "__ **CHECKLIST COMPLETE**" after completing BEFORE TAKEOFF and BEFORE LANDING Electronic Normal Checklists, CAPT (or PF) visually confirms that CHECKLIST COMPLETE indication is shown on the MFD, and announces "**CHECKLIST COMPLETE**".

CHECKLIST INITIATION

Preflight Checklist

When PF has finished takeoff briefing.

Before Start Checklist

The Before Start Checklist will be performed after:

- Arrival of the weight and balance sheets
- Confirm ground staff and cabin attendants ready for push back
- ATC Clearance and pushback clearance has been received
- Completion of cockpit preparation for pushback and start

After Start Checklist

When the flight controls check has been completed.

Before Takeoff Checklist

After the line-up clearance or takeoff clearance has been issued.

After Takeoff Checklist

After flap indication change to up green on EICAS.

Descent Checklist

After Descent Preparation and around TOD.

If Approach PA is not completed, perform the Descent Checklist except the PA. After the PA is completed, the PM calls out “DESCENT CHECKLIST COMPLETE”

Approach Checklist

While descending through 10,000ft.

In case transition level is below 10,000 ft, perform the approach checklist except altimeter setting. After the altimeter is set at transition level, the PM calls out "APPROACH CHECKLIST COMPLETE".

Before Landing Checklist

When the landing configuration has been completed (Landing Flaps set).

After Landing Checklist

On the taxiway when clearing the runway. (Do not perform the After Landing Procedure until vacating the active runway.)

Shut Down Checklist

After arriving at the ramp/gate and completing the Shutdown Procedure.

Secure Checklist

After completing the Secure Procedure.

Intentionally

Blank

PREFLIGHT

SECURITY SEARCH

This procedure will be performed for security when entering the cockpit before Exterior Inspection and Cockpit Preparation.

Search for any unusual items in the following area:

SECURITY SEARCH ITEM
Flight Crew Rest Bunk Adjacent To The Cockpit
Floor
Ceiling
Aft Flight Deck Wall
Coat Room
Suitcase Stowage
Overhead Stowage
Spare Bulb Stowage
Escape Ropes Compartments
Manual Stowage Behind The F/O Seat
Observer Seat Manual Stowage
Maintenance Manual Stowage
Manual Stowage
Seat Backside Pockets (Life Vest Stowage)
Upper/Under Side Area Of The Pilot Seat
QRH Stowage
Map Stowage
Side Display Stowage

Under The Glareshield Panel
Oxygen Mask Stowage
Area Around Rudder/Brake Pedals
~~ADDITIONAL SEARCH ITEMS FOR FREIGHTER~~
~~Seat Cushions and underside of seats~~
~~Bed Blankets and underside of seats~~
~~Area under sink~~
~~Rubbish bins~~
~~Inside of Ovens/Refrigerators~~
~~Storage compartments and pockets~~

PRELIMINARY PREFLIGHT PROCEDURE - CAPTAIN OR FIRST OFFICER

This procedure assumes that the Electrical Power Up supplementary procedure is completed.

Note: For initial power up, refer to supplementary procedures.

MTOW Placard .... Check

Verify that the MTOW on the Placard corresponds exactly with the Operational Flight Plan (OFP).

Note: If there is a difference between MTOW on the OFP and the placard, instruct maintenance personnel to replace with a correct MTOW placard which corresponds with OFP.

ADIRU switch .... OFF 30 secs, then ON

Verify that the ON BAT and OFF lights are extinguished.

STATUS display .... Check

Verify that only expected messages are shown.

HL8284

Verify that UTC time and date are correct.

Verify that the following are sufficient for flight:

- crew oxygen pressure

~~**Freighters**~~

- ~~supernumerary oxygen pressure~~
- hydraulic quantity
- engine oil quantity

EICAS display .... Check

Verify that only expected alert and memo messages are shown.

Accomplish the following procedures in their entirety on each originating trip or crew change or following maintenance action.

Note: The following oxygen pressure drop test only needs to be performed at one crewmember station.

Oxygen pressure drop .... Test

Oxygen mask............................. Stowed and doors closed

Crew oxygen pressure .... Check STATUS display

Note oxygen pressure.

RESET/TEST switch .... Push and hold

Verify that the yellow cross shows momentarily in the flow indicator.

EMERGENCY/TEST selector......................... Push and hold

While continuing to hold the RESET/TEST switch down, push the EMERGENCY/TEST selector for 5 seconds. Verify that the yellow cross shows continuously in the flow indicator.

Verify that the crew oxygen pressure does not decreasemore than 50 PSIG.

If the oxygen cylinder valve is not in the full open position, pressure can:

- decrease rapidly, or
- decrease more than 50 PSIG, or
- increase slowly back to normal

RESET/TEST switch and EMERGENCY/TEST select (both) .... Release

Verify that the yellow cross does not show in the flow indicator.

Normal/100% switch...100%

Passengers

Crew oxygen pressure .... Check STATUS display

Verify that the pressure is sufficient for dispatch.

~~**Freighters**~~

~~**Crew and supernumerary oxygen pressure. Check STATUS display**~~

~~Verify that the pressure is sufficient for dispatch.~~

Maintenance documents .... Check

Passengers

FLIGHT DECK ACCESS SYSTEM switch..NORM(guard closed)

Note: For Flight Deck Access System Test, refer to supplementary procedures.

Emergency equipment .... Check

PBE – Stowed

Fireproof gloves – Stowed

~~**Freighters**~~

~~Fire containment bag – Stowed~~

Crash axe – Stowed

Fire extinguisher – Checked and stowed

- trigger safety pin in place
- handle safety wired
- bottle pressure in green band.

Oxygen masks - Stowed and test

Flash light – Stowed

Life vests – Stowed

Escape ropes – Stowed

Gear Pins....................................Check Onboard and Stowed

Overhead maintenance panel .... Check

Verify:

- all guards closed
- flight control VALVE CLOSED lights extinguished.

~~HL7202-7205, HL8006-8011, HL8041-8042, HL8346-8347~~
~~if BROADBAND COM switch installed~~

- ~~BROADBAND COM switch...ON~~

CARGO TEMPERATURE selectors – As needed (normally AFT CARGO HEAT Low)

Circuit breakers...Check

Parking brake ....As needed

Set the parking brake if brake wear indicators will be checked during the exterior inspection.

CDU PREFLIGHT PROCEDURE - CAPTAIN AND FIRST OFFICER

Start the CDU Preflight Procedure anytime after the Preliminary Preflight Procedure. The Initial Data and Navigation Data entries must be complete before the flight instrument check during the Preflight Procedure. The Performance Data entries must be complete before the Preflight Checklist.

The captain or first officer may make CDU entries. The other pilot must verify the entries.

Enter data in all the boxed items on the following CDU pages.

Enter data in the dashed items or modify small font items that are listed in this procedure. Enter or modify other items at pilot's discretion.

Failure to enter enroute winds can result in flight plan time and fuel burn errors.

Note: Refer to B777 FCOM 11.40 - FMC Preflight.

Initial data .... Set

IDENT page:

Verify that the MODEL is correct.

Verify that the ENG RATING is correct.

Verify that the navigation database ACTIVE date range is current.

POS INIT page:

Verify that the time is correct.

Enter the present position on the SET INERTIAL POS line.

After comparing LAST POS, REF AIRPORT, GATE and GPS POS on POS INIT page to the actual ramp coordinates, select the most accurate latitude / longitude without correction. It is recommended that the GPS POS should be selected if there is no significant difference from the other coordinates stated above.

Note: Manual entry is not recommended.

Note: For ADIRU Alignment/Position update procedures, refer to POM 6.11 - ADIRU Alignment/Position Update. *<CLICK>*

Navigation data ....Set

RTE page:

Enter the FLIGHT NUMBER (AAR0000).

Note: For ATC needs, the crew should enter exactly the entire Flight number, as shown on the flight plan, without inserting any space, on the RTE page. (e.g. AAR112 or AAR1234) *<CLICK>*

Enter the route.

Refer to POM 6.11 FMS Route Uplink Request *<CLICK>*

Note: When the data link system is not available, enter the route manually.

Activate and execute the route.

DEPARTURES page:

Select the RUNWAY, SID and SID TRANS (if required).

Execute the runway and departure routing.

The crew may insert the Arrival and Approach procedure, if needed.

Note: For FMS-CDU arrival and approach setup, refer to POM 5.8 - Descent Preparation, Procedure/Callouts *<CLICK>*

Verify that the route is correct on the RTE pages. Check the LEGS pages as needed to ensure compliance with the flight plan.

Note: After verifying the route on the RTE pages, it is not recommended to delete waypoints on the LEGS pages to correspond with the computer flight plan. Those waypoints were deleted as a matter of convenience.

Verify that the selected runway and departure route including the altitude/speed constraints is correct on the LEGS pages.

Verify or enter correct RNP for departure.

NAV RADIO page:

Tune the navigation radios, as needed.

Performance data.. Set

PERF INIT page:

Enter the ZFW.

Verify that the FUEL on the CDU, the OFP, and EICAS agree. Verify that the fuel is sufficient for flight.

Verify that the GR WT on the CDU and the OFP agree.

Enter the RESERVES.

Enter the COST INDEX.

Note: Enter the Cost Index value of the flight plan. The Cost Index will be decided in consideration with the economical efficiency by the company.

Enter the CRZ ALT.

Modify the MIN FUEL TEMP as needed.

Modify the STEP SIZE as needed.

THRUST LIM page:

Note: Prior to selecting desired derate takeoff and climb thrust, confirm TO-1 set at 10%, TO-2 at 20%.

Select an assumed temperature, or a fixed derate takeoff, or both as needed.

HL8254, HL8284

Select the APU to pack mode, if needed.

Select a full or a derated climb thrust as needed.

TAKEOFF REF page:

Note: Make data entries on page 2/2 before page 1/2.

TAKEOFF REF page 2/2 (Enter):

- surface wind
- runway wind component
- runway slope
- engine-out acceleration height
- acceleration height
- thrust reduction point

TAKEOFF REF page 1/2:

Enter takeoff flap setting.

Enter assumed temperature.

EXTERIOR INSPECTION

Before each flight a flight crew must verify that the airplane is satisfactory for flight.

If necessary, wing lights can be used during exterior inspection. But during refueling, do not operate the wing light switch.

Items at each location may be checked in any sequence.

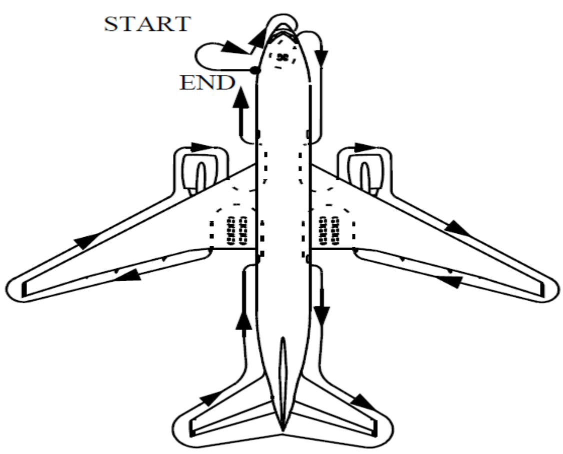
Use the detailed inspection route below to check that:

- the surfaces and structures are clear, not damaged, not missing parts and there are no fluid leaks

- the tires are not too worn, not damaged, and there is no tread separation
- the gear struts are not fully compressed
- the gear pins have been removed
- the engine inlets and tailpipes are clear, the access panels are secured, the exterior is not damaged, and the reversers are stowed
- the doors and access panels that are not in use are latched
- the probes, vents, and static ports are clear and not damaged
- the skin area adjacent to the pitot probes and static ports is not wrinkled
- the antennas are not damaged
- the light lenses are clean and not damaged

For cold weather operations, see the Adverse Weather Operations.

Inspection Route



Left Forward Fuselage *<CLICK>*

Probes, sensors, ports, vents,

and drains (as applicable).. Check

Doors and access panels (not in use) .... Latched

Oxygen pressure relief green disc .... In place

Forward outflow valve.. Check

Nose *<CLICK>*

Radome.. Check

Diverter strips - Secure

Forward access door ....Secure

Nose Wheel Well *<CLICK>*

Tires and wheels .... Check

Gear strut and doors .... Check

Nose wheel steering assembly.. Check

Gear pin ....As needed

Nose gear towing lever ....As needed

Nose gear towing lever pin ....As needed

Exterior lights .... Check

Wheel well light switches..As needed

Forward E and E door ....Secure

Right Forward Fuselage *<CLICK>*

Probes, sensors, ports, vents,

and drains (as applicable)... Check

Doors and access panels (not in use) ....Latched

Negative pressure relief vents ....Closed

Right Wing Root, Pack, and Lower Fuselage *<CLICK>*

Probes, sensors, ports, vents,

and drains (as applicable)... Check

Exterior lights .... Check

Pack inlet and pneumatic access doors............................Secure

Leading edge flaps..Check

Right Engine *<CLICK>*

Access panels..Latched

Probes, sensors, ports, vents,

and drains (as applicable)..Check

Fan blades, probes, and spinner.......................................Check

Thrust reverser..Stowed

Exhaust area and tailcone..Check

Right Wing and Leading Edge *<CLICK>*

Access panels..Latched

Leading edge slats..Check

Fuel measuring sticks..................................Flush and secure

Wing Surfaces...Check

Fuel tank vent...Check

Right Wing Tip and Trailing Edge *<CLICK>*

Navigation and strobe lights..Check

Static discharge wicks..Check

Fuel jettison nozzle..Check

Aileron, flaperon, and trailing edge flaps..........................Check

Right Main Gear *<CLICK>*

Tires, brakes and wheels..Check

Verify that the wheel chocks are in place as needed.

If the parking brake is set, the brake wear indicator pins must extend out of the guides.

Gear strut, actuators, and doors .... Check

Hydraulic lines .... Secure

Gear pins .... As needed

Right Main Wheel Well *<CLICK>*

Wheel well .... Check

Right Aft Fuselage *<CLICK>*

Ram air turbine door .... Check

Doors and access panels (not in use) .... Latched

Probes, sensors, ports, vents,

and drains (as applicable) .... Check

~~Freighter~~

~~Oxygen pressure relief green disc .... In place~~

Tail *<CLICK>*

Vertical stabilizer and rudder .... Check

~~777-300 / 777-300ER~~

~~Tail skid .... Check~~

~~Verify that the tail skid is not damaged.~~

Horizontal stabilizer and elevator .... Check

Static discharge wicks .... Check

Strobe light .... Check

APU exhaust outlet .... Check

Left Aft Fuselage *<CLICK>*

Aft outflow valve .... Check

Doors and access panels (not in use) .... Latched

Probes, sensors, ports, vents,

and drains (as applicable)..Check

Left Main Wheel Well

Wheel well...Check

Left Main Gear

Tires, brakes and wheels ....Check

Verify that the wheel chocks are in place as needed.

If the parking brake is set, the brake wear indicator pins must extend out of the guides.

Gear strut, actuators and doors...Check

Hydraulic lines...Secure

Gear pins .... As needed

Left Wing Tip and Trailing Edge

Navigation and strobe lights..Check

Static discharge wicks ....Check

Aileron, flaperon, and trailing edge flaps ....Check

Fuel jettison nozzle ....Check

Fuel tank vent...Check

Left Wing and Leading Edge

Wing Surfaces ....Check

Fuel measuring sticks.................................... Flush and secure

Fuel tank vent...Check

Leading edge slats ....Check

Access panels ....Latched

Left Engine

Exhaust area and tailcone..Check

Thrust reverser..Stowed

Probes, sensors, ports, vents,

and drains (as applicable).. Check

Access panels ....Latched

Fan blades, probes, and spinner .... Check

Left Wing Root, Pack, and Lower Fuselage

Probes, sensors, ports, vents,

and drains (as applicable).. Check

Exterior lights .... Check

Pack inlet and pneumatic access doors.............................Secure

Negative pressure relief vents ....Closed

Positive pressure relief valves...Closed

Leading edge flaps .... Check

PREFLIGHT PROCEDURE - FIRST OFFICER

The first officer normally does these procedures. The Captain may do these procedures if required.

THRUST ASYMMETRY COMPENSATION

switch ....AUTO

Verify OFF light extinguished.

PRIMARY FLIGHT COMPUTERS

DISCONNECT switch ....AUTO (guarded closed)

Verify DISC light extinguished.

ELECTRICAL panel ....Set

BATTERY switch – ON

Verify OFF light extinguished.

Passenger

IFE/PASS SEAT POWER Switch installed;

IFE/PASS SEAT POWER switch – ON

Verify OFF light extinguished.

CABIN/UTILITY POWER switch installed;

CABIN/UTILITY POWER switch – ON

Verify OFF light extinguished.

APU GENERATOR switch – ON

Verify OFF light extinguished.

APU selector – START, then ON

Do not allow APU selector to spring back to the ON position.

Verify FAULT light extinguished.

BUS TIE switches – AUTO

Verify ISLN lights extinguished.

GENERATOR CONTROL switches – ON

Verify OFF and DRIVE lights illuminated.

BACKUP GENERATOR switches – ON

The OFF lights stay illuminated until the respective engine is started.

APU selector (as needed) panel........................ START, then ON

Do not allow APU selector to spring back to ON position.

Verify that the FAULT light is extinguished.

~~777-300 / 777-300ER~~

~~**CAMERA LIGHTS switch..As desired**~~

~~**LEFT WIPER selector...OFF**~~

~~HL8043 - HL8077~~

~~**GROUND PROXIMITY RUNWAY OVERRIDE switch...............OFF**~~

ELT switch .... Guard closed

EMERGENCY LIGHTS switch .... Guard closed

SERVICE INTERPHONE switch..OFF

Passenger

PASSENGER OXYGEN ON light.................. Verify extinguished

Note: Do not push the PASSENGER OXYGEN switch. The switch causes deployment of the passenger oxygen masks.

~~**Freighter**~~

~~**SUPRNMRY OXYGEN switch................................ Guard closed**~~

~~Note: Do not set the SUPRNMRY OXYGEN switch to ON. The switch causes deployment of the supernumerary oxygen masks.~~

WINDOW HEAT switches ....ON

Verify INOP lights extinguished.

RAM AIR TURBINE UNLKD light................. Verify extinguished

WARNING! Do not push the RAM AIR TURBINE switch. The switch causes deployment of the ram air turbine.

HYDRAULIC panel...Set

LEFT and RIGHT PRIMARY pump switches – ON

Verify FAULT lights illuminated.

C1 and C2 PRIMARY pump switches – OFF

Verify FAULT lights illuminated.

DEMAND pump selectors – OFF

Verify FAULT lights illuminated.

Passenger

PASSENGER SIGNS panel ....Set

NO SMOKING selector – ON

SEAT BELTS selector – ON

~~**Freighter**~~

~~**SUPRNMRY SIGNS panel..Set**~~

~~SEAT BELTS selectors – ON~~

Lighting panel..Set

OVERHEAD/CIRCUIT BREAKER panel light controls – Mid position

DOME light control – As needed

STORM light switch – As needed

MASTER BRIGHTNESS switch – ON

MASTER BRIGHTNESS control – As needed

GLARESHIELD PANEL/FLOOD light controls – Mid position

LANDING light switches – OFF

APU fire panel..Set

Verify APU BTL DISCH light extinguished.

APU fire switch – In

Verify APU fire warning light extinguished.

Passenger

CARGO FIRE panel ....Set

CARGO FIRE ARM switches – OFF

Verify FWD and AFT fire warning lights extinguished.

Verify cargo fire DISCH light extinguished.

~~**Freighter**~~

~~**CARGO FIRE panel ....Set**~~

~~CARGO FIRE ARM switches – OFF~~

~~Verify MAIN, FWD and AFT fire warning lights extinguished.~~

~~Verify cargo fire DISCH and DEFR light is extinguished.~~

ENGINE panel..Set

EEC MODE switches – NORM

~~HL7532 - HL7766~~

~~START/IGNITION selectors – NORM~~

~~HL7202 - HL7205, HL7782 - HL8285~~

START selectors – NORM

AUTOSTART switch – ON

Verify OFF light extinguished.

FUEL JETTISON panel ....Set

FUEL JETTISON NOZZLE switches – OFF

Verify VALVE lights extinguished.

FUEL TO REMAIN selector – IN

FUEL JETTISON ARM switch – OFF

Verify FAULT light extinguished.

FUEL panel ....Set

CROSSFEED switches – OFF

Verify VALVE lights extinguished.

FUEL PUMP switches – OFF

Verify that the left forward pump PRESS light is extinguished if the APU is on or is illuminated if the APU is off.

Verify that the other left and right pump PRESS lights are illuminated.

Verify that the center pump PRESS lights are extinguished.

ANTI–ICE panel ....Set

WING anti–ice selector – AUTO

ENGINE anti–ice selectors – AUTO

Lighting panel...Set

BEACON light switch – OFF

NAVIGATION, LOGO, and WING light switches – As needed

INDICATOR LIGHTS switch – As needed

RUNWAY TURNOFF, TAXI, and STROBE light switches – OFF

~~Freighter~~

~~**LWR CARGO TEMP panel ....Set**~~

~~FORWARD LOWER CARGO AIR CONDITIONING control- As needed~~

~~AFT LOWER CARGO AIR CONDITIONING control - As needed (normally AFT CARGO HEAT Low)~~

Passenger

AIR CONDITIONING panel...Set

EQUIPMENT COOLING switch – AUTO

Verify OVRD light extinguished.

RECIRCULATION FANS switches – ON

FLIGHT DECK TEMPERATURE control – mid AUTO position

CABIN TEMPERATURE control – Mid position

PACK switches – AUTO

Verify OFF lights extinguished.

TRIM AIR switches – ON

Verify FAULT lights extinguished.

~~**Freighter**~~

~~**AIR CONDITIONING panel...Set**~~

~~EQUIPMENT COOLING switch – AUTO~~

~~Verify OVRD light extinguished.~~

~~RECIRCULATION FANS switch – ON (or As needed)~~

~~MAIN DECK FLOW control – NORMAL (or As needed)~~

~~ALTERNATE VENTILATION switch – OFF~~

~~FLIGHT DECK TEMPERATURE control – mid AUTO position~~

~~FORWARD MAIN DECK CARGO~~

~~TEMPERATURE control – As needed~~

~~AFT MAIN DECK CARGO~~

~~TEMPERATURE control – As needed~~

~~PACK switches – AUTO~~

~~Verify OFF lights extinguished.~~

~~TRIM AIR switches – ON~~

~~Verify FAULT lights extinguished.~~

BLEED AIR panel...Set

LEFT, CENTER and RIGHT ISOLATION switches – AUTO

Verify CLOSED lights extinguished.

ENGINE bleed switches – ON

The OFF lights stay illuminated until the respective engine is started.

APU bleed switch – AUTO

Verify OFF light extinguished.

PRESSURIZATION panel...Set

OUTFLOW VALVE switches – AUTO

Verify MAN lights extinguished.

LANDING ALTITUDE selector – IN

RIGHT WIPER selector...OFF

Right FLIGHT DIRECTOR switch ....ON

Display select panel ....Set

LWR CTR display switch – Push

Right EFIS control panel...Set

MINIMUMS reference selector and MINIMUMS selector – As needed

FLIGHT PATH VECTOR switch – As needed

METERS switch – As needed

BAROMETRIC reference selector and BAROMETRIC selector – Set

Set the local altimeter setting on the PFD.

VOR/ADF switches – As needed

ND mode selector – MAP

ND CENTER switch – As needed

ND range selector – As needed

ND TRAFFIC switch – As needed

Map switches – As needed

WEATHER RADAR - Off

Verify that the weather radar indications are not shown on the ND.

Map switches - As needed

MAP light control... As needed

Window 2 right .... Check

Verify the lock lever is in the locked (forward) position and the orange indicator is not in view.

Note: The oxygen test and set is not needed if the oxygen pressure drop test was done at this crewmember station during the Preliminary Preflight Procedure - Captain or First officer.

OXYGEN .... Test and set

Oxygen mask - Stowed and doors closed

RESET/TEST Switch - Push and hold

Verify the yellow cross shows momentarily in the flow indicator.

RESET/TEST switch - Release

Verify that the yellow cross does not show in the flow indicator.

NORMAL/100% selector - 100%

EMERGENCY/TEST selector - Normal (non-emergency)

~~**ELECTRONIC FLIGHT BAG(AS INSTALLED) .... Set**~~

~~PWR switch - Push~~

~~Adjust display brightness~~

~~MENU key - Push~~

~~Complete EFB data load if MEMO notification next to the DATA LOAD button is displayed.~~

~~DATA LOAD button – Select~~

~~LOAD button (on the DATA LOAD screen) - Select~~

~~Note: The EFB data load is available only before initializing the flight. Typical data loading time is less than one minute.~~

~~Note: The EFB data load must be performed on both EFBs independently. Loading data onto one EFB does not automatically sync the data on the other EFB.~~

~~(If DATA LOAD is accomplished, MENU key – Push)~~

~~IDENT PAGE button (on the MAIN MENU screen) - Select~~

~~Verify the operational readiness of the system, data, and documents required for your flight including effective date.~~

~~INITIALIZE FLIGHT button (on the MAIN MEMU screen) - Select~~

~~Note: If the INITIALIZE FLIGHT button is not on the screen, a flight was already initialized. It must be closed out before you can initialize your current flight.~~

SIDE DISPLAY control .... As needed

First officer's heater ....Set

SHOULDER control and FOOT selector – As needed

First officer's FORWARD PANEL

BRIGHTNESS controls...Set

Right Instrument source select panel......................................Set

NAVIGATION source switch – Off

DISPLAY CONTROL source switch – Off

AIR DATA/ATTITUDE source switch – Off

HL7700 – HL8254

Right clock..Set

Time/date selector – UTC

Right PFD .... Check

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is TO/GA
- pitch mode is TO/GA
- AFDS status is FLT DIR

HL8284

- UTC Time is displayed

Right ND .... Check

Verify map mode displayed.

Right INBOARD DISPLAY selector .... MFD

FMC selector...AUTO

Landing gear panel..Set

Verify GND PROX light extinguished.

Ground proximity FLAP OVERRIDE switch – Off

Ground proximity GEAR OVERRIDE switch – Off

Ground proximity TERRAIN OVERRIDE switch – Off

Landing gear lever – DN

ALTERNATE GEAR switch – NORM (guarded position)

AUTOBRAKE selector – RTO

EICAS display..Check

Verify that the primary engine indications show existing conditions.

Verify that no exceedance is shown.

MFD...Check

Secondary ENGINE indications – Check

Verify that the secondary engine indications show existing conditions.

Verify that no exceedance is shown.

STATUS display switch – Push

Check status messages and

- hydraulic quantities do not display RF
- oxygen pressure is sufficient for flight.

HL8284

- UTC Time and Date are displayed

If any status message is displayed, refer to the Minimum Equipment List to determine if dispatch relief is available.

CHECKLIST display switch – Push

LOWER CENTER cursor location switch – Push

Verify LOWER CENTER cursor location light illuminated.

RESETS – Select

RESET ALL – Select

COMMUNICATION display switch – Push

MANAGER – Select

MASTER – Select

DATA LINK SYSTEM RESET – Select

CONFIRM RESET – Select

MANAGER – Select

SYSTEM INFORMATION – Select

Verify TAIL NUMBER is correct.

Center DISPLAY CONTROL source switch .... Off

CENTER PANEL BRIGHTNESS controls .... Mid position

FLAP position indication and FLAP lever ....Agree

The flap position indication does not show when the flaps are up.

Set the flap lever to agree with the flap posittion.

ALTERNATE FLAPS panel...Set

ALTERNATE FLAPS ARM switch – OFF

ALTERNATE FLAPS selector – OFF

Engine fire panel ....Set

Verify ENG BTL 1 DISCH and ENG BTL 2 DISCH lights extinguished.

Engine fire switches – In

Verify LEFT and RIGHT fire warning lights extinguished.

Center CDU...Set

Flight deck printer...Set

POWER -- On

Verify that the DOOR PAPER light is extinguished.

Verify that the PAPER light is extinguished.

Right radio tuning panel ....Set

Verify that the OFF light is extinguished.

First officer's audio control panel.............................. As needed

Transponder panel ....Set

Transponder ALTITUDE SOURCE selector – NORM

Transponder mode selector – STBY

~~**Evacuation COMMAND switch.................... OFF (guard closed)**~~

FLOOR LIGHTS switch... As needed

OBSERVER AUDIO selector ....NORM

AISLE STAND PANEL/FLOOD light controls ....Mid position

Right flight instruments .... Check

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- NO VSPD on PFD until takeoff V-speeds are selected
- TCAS OFF on ND

Verify that the displayed route is correct.

Right seat ....Adjust

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fwd and aft) seat lock by pushing against the seat.

WARNING! Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.

Rudder Pedals..Adjust

Adjust the rudder pedals to allow full rudder pedal and brake pedal movement. Stow the rudder pedal adjust crank.

CAUTION! Turn the rudder pedal adjust crank no faster than approximately one turn per second to avoid damage. Do not apply force to the pedals during adjustment.

WARNING! If the rudder pedal adjust crank is not stowed

after use the rudder pedals can move out of the desired position.

Right seat belt and shoulder harness ....Adjust

PORTABLE EFB ....SET

Complete EFB-OPT required entries for runway specific performance information based on OFP.

Select departure and/or arrival charts as desired.

Select map as desired.

Accomplish PREFLIGHT CHECKLIST on captain's command.

PREFLIGHT PROCEDURE - CAPTAIN

The captain normally does this procedure. The first officer may do this procedure if required.

MAP light control .... As needed

Left EFIS control panel...Set

MINIMUMS reference selector and MINIMUMS selector – As needed

FLIGHT PATH VECTOR switch – As needed

METERS switch – As needed

BAROMETRIC reference selector and BAROMETRIC selector – Set

Set the local altimeter setting on the PFD.

VOR/ADF switches – As needed

ND mode selector – MAP

ND CENTER switch – As needed

ND range selector – As needed

ND TRAFFIC switch – As needed

WEATHER RADAR - Off

Verify that the weather radar indications are not shown on the ND.

Map switches – As needed

Mode control panel ....Set

Left FLIGHT DIRECTOR switch – ON

AUTOTHROTTLE ARM switches – ARM

Autopilot DISENGAGE bar – UP

HEADING/TRACK reference switch – As needed

BANK LIMIT selector – AUTO

VERTICAL SPEED/FLIGHT PATH ANGLE reference switch – As needed

ALTITUDE increment selector – As needed

Window 2 left..Check

Verify the lock lever is in the locked (forward) position and the orange indicator is not in view.

Note: The oxygen test and set is not needed if the oxygen pressure drop test was done at this crewmember station during the Preliminary Preflight Procedure - Captain or First officer.

OXYGEN ....Test and set

Oxygen mask - Stowed and doors closed

RESET/TEST Switch - Push and hold

Verify the yellow cross shows momentarily in the flow indicator.

RESET/TEST switch - Release

Verify that the yellow cross does not show in the flow indicator.

NORMAL/100% selector - 100%

EMERGENCY/TEST selector - Normal (non-emergency)

~~**ELECTRONIC FLIGHT BAG (As Installed).................................Set**~~

~~PWR switch - Push~~

~~Adjust display brightness~~

~~MENU key - Push~~

~~Complete EFB data load if MEMO notification next to the DATA LOAD button is displayed.~~

~~DATA LOAD button – Select~~

~~LOAD button (on the DATA LOAD screen) - Select~~

~~Note: The EFB data load is available only before initializing the flight. Typical data loading time is less than one minute.~~

~~Note: The EFB data load must be performed on both EFBs independently. Loading data onto one EFB does not automatically sync the data on the other EFB.~~

~~(If DATA LOAD is accomplished, MENU key – Push)~~

~~IDENT PAGE button (on the MAIN MENU screen) - Select~~

~~Verify the operational readiness of the system, data, and documents required for your flight including effective date.~~

~~INITIALIZE FLIGHT button (on the MAIN MEMU screen) - Select.~~

~~Note: If the INITIALIZE FLIGHT button is not on the screen, a flight was already initialized. It must be closed out before you can initialize your current flight.~~

SIDE DISPLAY control.. As needed

Captain's heaters ....Set

SHOULDER control and FOOT selector – As needed

**Captain's FORWARD PANEL
BRIGHTNESS controls..Mid position**

Left instrument source select panel ....Set

NAVIGATION source switch – Off

DISPLAY CONTROL source switch – Off

AIR DATA/ATTITUDE source switch – Off

HL7700 – HL8254

Left clock ....Set

Time/date selector – UTC

Verify that UTC time and date are correct.

Left PFD .... Check

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is TO/GA

- pitch mode is TO/GA
- AFDS status is FLT DIR.

HL8284
- UTC Time is displayed

Left ND .... Check

Verify map mode displayed.

Left INBOARD DISPLAY selector .... MFD

HEADING REFERENCE switch .... NORM

Integrated standby flight display .... Set

Verify that the approach mode display is blank.

Set local altimeter setting.

Verify that the flight instrument indications are correct.

Verify that no flags or messages are shown.

ALTERNATE PITCH TRIM levers .... Neutral

SPEEDBRAKE lever .... DOWN

Note: Verify that the SPEEDBRAKE lever is in the DOWN detent position by touching the SPEEDBRAKE lever.

Reverse thrust levers .... Down

Forward thrust levers .... Closed

Parking brake .... Set

Verify PARKING BRAKE SET message displayed.

Note: Do not assume that the parking brake can prevent airplane movement. Accumulator pressure can be insufficient.

If chocks are in place, parking brake can be released to increase brake cooling, but it should be set before the exterior doors are closed for pushback.

STABILIZER cutout switches .... NORM (guards closed**)**

FUEL CONTROL switches... CUTOFF

Verify FUEL CONTROL fire warning lights extinguished.

Left radio tuning panel ....Set

Verify that the OFF light is extinguished.

Captain's audio control panel .... As needed

WEATHER RADAR panel ....Set

Center radio tuning panel ....Set

Verify that the OFF light is extinguished.

Observer's audio control panel .... As needed

Passenger

FLIGHT DECK DOOR LOCK selector..................................AUTO

Passenger

PA ....Test

Check the volume and quality of sound.

Check at first flight with same flight crew in a day.

Refer to FOM S14.7 Passenger Announcements.

Left flight instruments.. Check

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- NO VSPD on PFD until takeoff V-speeds are selected
- TCAS OFF on ND

Verify that the displayed route is correct.

Left seat ....Adjust

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fwd and aft) seat lock by pushing against the seat.

WARNING!* *Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.

Rudder Pedals ....Adjust

Adjust the rudder pedals to allow full rudder pedal and brake pedal movement. Stow the rudder pedal adjust crank.

CAUTION! ***Turn the rudder pedal adjust crank no faster than approximately one turn per second to avoid damage. Do not apply force to the pedals during adjustment.***

WARNING! ***If the rudder pedal adjust crank is not stowed after use the rudder pedals can move out of the desired position.***

Left seat belt and shoulder harness ....Adjust

PORTABLE EFB ....SET

Complete EFB-OPT required entries for runway specific performance information based on OFP.

Select departure and/or arrival charts as desired.

Select map as desired.

Call for "PREFLIGHT CHECKLIST."

PRE-FLIGHT PROCEDURE - AIRPLANE ACCEPTANCE

ALTIMETER CHECKS

After setting the current barometric pressure, check that all altimeters including standby, agree within 75 ft of:

- Airport elevation (using QNH), or zero feet (using QFE), and
- Altitude reading in all altimeters.

For RVSM airspace operations, perform the altimeter checks refer to FOM 10.4 - RVSM Airspace Operations (RVSM Airspace Operation Procedures).

REQUIRED OXYGEN QUANTITY

The following minimum oxygen requirement is based on the ambient temperature (oxygen cylinder temperature), 21°C.

Refer to FOM Chapter 6 - Normal Operations (Preflight).

Note: For pressure correction for the temperature other than 21°C refer to 777 FPPM - Oxygen Requirements.

Flight Crew Oxygen

Gaseous Oxygen Type

Type of Aircraft	Number of Cylinder	Min Oxygen Requirement	Remark
Passenger	1	870 PSI	4 Crews
~~Freighter~~	~~3~~	~~1283 PSI~~	~~4 Crews~~

Passenger Oxygen

Chemical Oxygen Type

Oxygen Flow Time	22 mins

~~**Supernumerary Oxygen**~~

~~Gaseous Oxygen Type~~

~~Type of Aircraft~~	~~Number of Cylinder~~	~~Min Oxygen Requirement~~	~~Remark~~
~~Freighter~~	~~3~~	~~1362 PSI~~	~~4 Supernumeraries~~

Refer to FOM 6.1 - Oxygen Supply.

HF RADIO COMMUNICATION/ SELCAL CHECK

Perform HF radio communication/SELCAL check where required by route requirements.

Refer to POM 6.5 - HF Radio Communication/SELCAL Check. *<CLICK>*

WARNING! Do not perform this check if fueling is in progress on your aircraft.

EDTO FLIGHT PROCEDURES

Refer to FOM 5.13 - EDTO Flight Procedure.

POLAR OPERATION

Refer to the Polar Operation Manual.

FUEL LOADING

Maximum Allowable Overfill

1500 lbs

Fueling/ Defueling with passengers/supernumeraries on board

Refer to FOM 5.6 - Fuel Loading Criteria and FOM 6.1 – Fuel Loading (Re/defueling when Passengers are Embarking, On board or Disembarking).

AIRPLANE ACCEPTANCE

After preflight check, fueling and other aircraft maintenance related services are completed and there is no problem affecting airworthiness, the PIC must write his/her name as an acceptance of mechanic's release on the Flight and Maintenance Log.

Note: The preflight check shall include the following items, and if any deficiency is found, it shall be reported to PIC.

- FMS/CDU, EICAS, NAV RADIO system and any other required systems for flight operations
- Interior and/or exterior inspections
- Flight and Maintenance Log

~~CARGO LOADING CHECKS~~

~~Refer to FOM 13.1 - Cargo Flight.~~

~~Note: If special cargo is loaded, refer to Load Instructions/Report Form or Load Planning Sheet in POM 9.5 – Reference Forms and Sheets (Load Instructions/Report) for its location.~~ ~~*<CLICK>*~~

ATC CLEARANCE

The time requesting ATC clearance may have difference according to the airport procedure.

- F/O obtains ATC clearance through the voice or data communications.
- CAPT checks that FMS-CDU and MCP entries are correct to ensure compliance with the ATC clearance, and F/O verifies it.
  - FMS-CDU: call sign, destination, T/O runway, SID, transition and airway from RTE page, cruise level from VNAV page
  - MCP: heading (initial assigned or RWY) and initial altitude (any restricted by SID or ATC)

OBSERVER SEAT BRIEFING

The Captain will ensure that each occupant in observer seat is familiar with the Crew Briefing.

TAKEOFF BRIEFING

Use the Crew Briefing.

PREFLIGHT CONSIDERATIONS

NOISE ABATEMENT DEPARTURE PROCEDURES

Refer to FOM 6.4 - Noise Abatement Departure Procedures (NADP).

TAKEOFF FLAP USAGE

Normal takeoff flaps are F5, F15 and F20. The PF will select the optimum flaps for takeoff considering weather conditions, takeoff runway, takeoff thrust, weight and etc. If the environment is not a factor, consider the use of the takeoff flap which enables more thrust reduction. If equivalent assumed (flexible) temperature is obtained, selection of the flap giving the greater AGTOW is recommended.

REDUCED AND DERATED THRUST TAKEOFF

Use reduced takeoff thrust whenever performance limits and noise abatement procedures permit. Reduced thrust takeoffs lower EGT and extend engine life.

When conditions permit, it is recommended to use the ATM rather than Derate Takeoff Thrust.

ATM procedures are allowed on a wet runway if suitable performance accountability is made for increased stopping distance on a wet surface.

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

Do not use ATM thrust under the following conditions:

- Contaminated runway with slush, snow or standing water,
- Slippery runway with ice or compacted snow,
- If potential windshear conditions exist,
- Anti skid-inoperative, or

- Alternate EEC (Electronic Engine Control) mode.

Note: If the engines are not capable of producing normal rated takeoff thrust, the Flight Crew is not authorized to make a reduced power takeoff.

When using the derated takeoff thrust, thrust levers should not be advanced beyond the fixed derate limit unless conditions are encountered during the takeoff where additional thrust is needed on both engines, such as a windshear condition.

WARNING! If an engine failure occurs during takeoff, any thrust increase beyond the fixed derate limit could result in loss of directional control.

Use of derated takeoff thrust is not allowed for alternate EEC mode.

COMBINATION ATM AND FIXED DERATE

Note: All limitations and restrictions for reduced takeoff thrust (ATM) and derated takeoff thrust (fixed derate) must be observed.

Reduced takeoff thrust (ATM) and derated takeoff thrust (fixed derate) may be combined by first selecting a fixed derate and then an assumed temperature higher than the actual ambient temperature. Although the takeoff thrust setting is not considered a takeoff operating limit for the ATM thrust reduction, the selected fixed derate is still considered a takeoff operating limit since takeoff speeds consider VMCG and VMCA only at the fixed derate level of thrust. Since the crew has no indication of the fixed derate limit, thrust levers should not be advanced unless conditions are encountered during the takeoff where additional thrust is needed on both engines, such as a windshear condition. If an engine failure occurs during takeoff, any thrust increase beyond the fixed derate limit could result in loss of directional control.

Note: When combining a high level of derate with a high assumed temperature. it is possible that the climb thrust may be higher than the takeoff thrust.

In such case, thrust levers will advance forward upon reaching thrust reduction altitude.

SPEED SCHEDULE

B777 aircraft speed schedule is based on economy speed commanded by FMS cost index.

Speed schedule for actual operating

- Cost index: the value decided by the company
- Climb: ECON Climb speed (or 310 kts whichever is lower) /
  ECON Cruising Mach No. (or M.83 whichever is lower)
- Cruise: ECON Cruise speed

  Note: If ATC restricts the speed, insert the required speed at VNAV CRZ page or use the speed intervention in MCP (when expected for a short term). After the restriction is canceled, resume the normal ECON Cruise speed.
- Descent: ECON cruising Mach No./ECON descent speed or 310 kts whichever is lower until 10,000 ft.
- Captain may change cost index and speeds flexibly within operational limitation.

GPS SIGNAL INTERFERENCE

If a GPS signal interference (or an abnormal GPS signal reception) is recognized, follow the GPS Signal Interference Procedure in the POM 9.1 - GPS Signal Interference. <CLICK>

EGPWS LOOK-AHEAD TERRAIN ALERTING

If a departure airport/runway is not contained in the EGPWS terrain database, the look-ahead terrain alerting and terrain display functions should be inhibited when operating within 15nm [1)] of the departure airport/ runway.

- Push GND PROX - TERR OVRD switch on the Ground Proximity Panel.
- Verify the crossing altitude referenced to published departure procedure, especially when encountering an adverse weather with low visibility and terrain/obstacles near the intended flight path.

Note: 1) Use FMS fix page to identify the corresponding area as a reference.

TODAY'S NON-NORMAL PROCEDURE STUDY

Passenger Aircrafts		
Date	**Month (1,3,5,7,9,11)**	**Month (2,4,6,8,10,12)**
1	ABORTED ENGINE START L, R	ENG START VALVE L, R ENG STARTER CUTOUT L, R
2	AIRSPEED UNRELIABLE	FIRE APU FIRE CARGO AFT
3	DUAL ENG FAIL/STALL	FIRE CARGO FWD
4	ENG IN–FLIGHT START L, R	FIRE ENG L, R FIRE ENG TAILPIPE L, R
5	ENG LIMIT / SURGE / STALL L, R	OVERHEAT ENG L, R
6	ENG SVR DAMAGE/SEP L, R	FLAPS DRIVE FLAP PRIMARY FAIL
7	FIRE ENG TAILPIPE	FLAP/SLAT CONTROL
8	FUEL JETTISON	FLIGHT CONTROL MODE
9	FUEL LEAK	FLIGHT CONTROLS
10	OVERWEIGHT LANDING	PITCH DOWN AUTHORITY PITCH UP AUTHORITY
11	SMOKE CREW REST LWR	PRI FLIGHT COMPUTERS
12	SMOKE REST UPR DR5	SLAPS DRIVE, STABILIZER
13	SMOKE/FUMES REMOVAL	FMC, NAV UNABLE RNP
14	ICE CRYSTAL ICING	NAV ADIRU INERTIAL
15	VOLCANIC ASH	AIR DATA SYS
16	WINDOW DAMAGE L, R	FUEL AUTO JETTISON
17	DOOR FWD CARGO	FUEL DISAGREE
18	BLEED LEAK STRUT L, R	FUEL IMBALANCE
19	CABIN ALTITUDE	FUEL PRESS ENG L, R FUEL PUMP CENTER L, R

Passenger Aircrafts		
Date	Month (1,3,5,7,9,11)	Month (2,4,6,8,10,12)
20	CABIN ALTITUDE AUTO EQUIP COOLING OVRD OUTFLOW VALVE AFT, FWD	FUEL QTY LOW FUEL TEMP LOW
21	PACK L, R	HYD PRESS SYS C
22	PACK L+R	HYD PRESS SYS L
23	ANTI–ICE ENG L, R	HYD PRESS SYS L+C
24	ANTI–ICE LEAK ENG L, R	HYD PRESS SYS L+R
25	ANTI–ICE WING L, R	HYD PRESS SYS R
26	WINDOW HEAT L, R FWD WINDOW HEAT L, R SIDE	HYD PRESS SYS R+C
27	ELEC AC BUS L, R	HYD QTY LOW
28	ELEC GEN DRIVE L, R ELEC GEN OFF L, R, APU	BRAKE TEMP
29	ENG AUTOSTART L, R ENG EEC MODE L, R	GEAR DISAGREE
30	ENG FAIL L, R	MAIN GEAR BRACE L, R TAIL STRIKE
31	ENG OIL PRESS L, R ENG OIL TEMP L, R	

~~Freighter Aircrafts~~			
~~Date~~	~~Non-Normal Item~~	~~Date~~	~~Non-Normal Item~~
~~1~~	~~ANTISKID~~	~~16~~	~~ENGINE OIL FILTER L, R~~
~~2~~	~~OVERWEIGHT LANDING~~	~~17~~	~~VOLCANIC ASH~~
~~3~~	~~DOOR AFT CARGO~~	~~18~~	~~FIRE CAGO FWD~~
~~4~~	~~DOOR MAIN DECK CARGO~~	~~19~~	~~FIRE CARGO AFT~~
~~5~~	~~CABIN ALTITUDE~~	~~20~~	~~FIRE CARGO MAIN DECK~~
~~6~~	~~CABIN ALTITUDE AUTO /~~ ~~EQUIP COOLING OVRD /~~ ~~OUTFLOW VALVE AFT, FWD~~	~~21~~	~~SMOKE EQUIP COOLING~~

~~7~~	~~CABIN TEMPERATURE~~	~~22~~	~~SMOKE/FUMES REMOVAL~~
~~8~~	~~PACK L+R~~	~~23~~	~~AIRSPEED UNRELIABLE~~
~~9~~	~~PACK L, R~~	~~24~~	~~GPS~~
~~10~~	~~ANTI-ICE LEAK ENG L, R~~	~~25~~	~~FUEL SCAVENGE SYS~~
~~11~~	~~ELEC AC BUS L, R~~	~~26~~	~~HYD PRESS SYS C~~
~~12~~	~~ICE CRYSTAL ICING~~	~~27~~	~~HYD PRESS SYS L+C~~
~~13~~	~~DUAL ENGINE FAIL/STALL~~	~~28~~	~~HYD PRESS SYS L+R~~
~~14~~	~~ENGINE FAIL L, R~~	~~29~~	~~HYD PRESS SYS R+C~~
~~15~~	~~ENG IN-FLIGHT START L,R~~	~~30~~	~~DITCHING~~
		~~31~~	~~GEAR DISAGREE~~

GROUND OPERATION

BEFORE START PROCEDURE

This procedure is accomplished after required papers are on board.

LOAD SHEET . . . . Check ALL

Both flight crews shall thoroughly check the load sheet.

- Make sure that the load sheet data is correct: Correct flight (FLT number, date), correct aircraft, configuration, dry operating index, etc.
- Compare the load sheet ZFW with the previously entered Operational Flight Plan (OFP) ZFW on the FMS.
- Check the difference between the load sheet TOW and the CDU GR WT agrees with the difference between the load sheet Takeoff Fuel (TOF) and fuel on board (FOB).
- Enter CG.
- Verify that the trim is in the greenband.
- Accept the load sheet if the weight and balance data is confirmed.

Note: The Load sheet should be read clearly by the Captain to other crew members and the required performance data entries in the FMS-CDU are made by the F/O.

Note: Compare Index Unit(I.U) between "Placard W/B Data" and the given W/B load sheet prior to flight. If the I.U of the given W/B load sheet is out of the "Placard W/B Data", contact SELOCC(LCC) prior to flight to check and confirm the error in the load sheet provided.

Note: If weight is changed after completing the load sheet, tolerance limit that does not need for the loadsheet to be changed is,

- the amount of CG change is less than 0.5 [%MAC].

- the amount of weight changed is less than 2300 lbs.

(approximately 0.5% of maximum landing weight)

It is applied within the range that does not exceed ACL(Allowable Cabin Load, Maximum Payload) and C.G Limit.

Takeoff Performance . . . . Check ALL

Compute takeoff performance by using EFB-OPT. The computed takeoff performance data shall be checked by both flight crews.

Note: If EFB-OPT is not available, contact OCC to request the required takeoff performance data.

Note: If discrepancies of computed takeoff speeds exist between OPT and FMS, use OPT-computed takeoff speeds. It has priority over FMS-computed takeoff speeds.

CDU . . . . Set ALL

Complete the CDU Preflight Procedure - Performance Data Set.

Verify or enter takeoff thrust.

Verify or enter takeoff flap setting.

Select or enter the takeoff V speeds.

Verify that the takeoff V speeds on both CDUs agree. If the

speeds disagree, re-enter the takeoff speeds.

Note: If any changes are made to the CDU entries, verify that the takeoff V speeds on both CDUs and PFDs agree. If the speeds disagree, re-enter the takeoff V speeds.

Verify or enter engine-out acceleration height

Select an appropriate CDU page for takeoff (Refer to POM 5.1 - FMS-CDU Page Selection).*<CLICK>*

MCP . . . . .Set CAPT

IAS/MACH selector – Set V2 speed

Arm LNAV as needed

Arm VNAV

Initial assigned heading or Runway heading – Set

Initial altitude – Set

Passenger

Flight deck door . . . . Closed and locked F/O

Verify the LOCK FAIL light is extinguished.

Exterior doors.. Verify closed ALL

Ensure that all exterior doors are closed and armed to AUTOMATIC (or ARMED).

~~Freighter~~

~~**Entry Door Mode Select Levers .... Confirm CAPT**~~

~~**ARMED F/O**~~

~~After visual confirmation by PIC(or Relief captain), set the Door Mode Select Levers to ARMED position by First Officer.~~

~~Observe yellow forward and aft girt bar flags are in view.~~

Note: After all ground crew have deplaned, all Entry Door Mode Select Levers should be placed to ARMED.

Refer to POM 6.1.1 - ENTRY/SERVICE DOOR CLOSING <*CLICK*>

Start clearance . . . . Obtain ALL

Captain confirms:

- "Ready for pushback" call or "CABIN READY" message from cabin.
  - "Ready for pushback" and/or "Cleared to start engines" from ground crew.

Note: Ground crew informs "Ready for pushback" after completing the preparations for pushback and hydraulic pressurization including the installation of the nose wheel steering lockout pin.

F/O obtains clearance for pushback and/or start engines.

Before push back or engine start:

HYDRAULIC panel. . . . . .Set F/O

WARNING! If the tow bar is connected, do not pressurize the hydraulic systems until the nose gear steering is locked out. Unwanted tow bar movement can occur.

Note: Pressurize the right system first to prevent fluid transfer between systems.

R ELEC DEMAND pump selector – AUTO

Verify FAULT light extinguished.

C1 and C2 ELEC PRIMARY pump switches – ON

L ELEC DEMAND pump selector - AUTO

C1 and C2 AIR DEMAND pump selectors – AUTO

Verify the respective FAULT lights extinguished.

The C2 ELEC PRIMARY FAULT light may stay illuminated until after engine start because of load shedding.

Note: With only a single ground power source available including the APU, the C2 PRIMARY pump will not run if the C1 pump is selected ON. The C2 primary pump FAULT light remains illuminated until an engine generator is operating. The HYD PRESS PRI C2 message is inhibited.

FUEL panel. . . . . Set F/O

LEFT and RIGHT FUEL PUMP switches – ON

Verify PRESS lights extinguished.

If the FUEL IN CENTER message shows:

CENTER FUEL PUMP switches - ON

One or both PRESS lights may stay illuminated until after engine start because of load shedding.

Note: During taxi or takeoff, FUEL PUMP CENTER L, R EICAS Advisory (Status) message may be displayed with a low center tank fuel quantity (3000~10,000 lbs) due to a momentary fuel pump starvation when the aircraft jolted.

If FUEL PUMP CENTER L, R EICAS Advisory message is displayed,

During taxi:

Affected FUEL PUMP CENTER S/W…OFF then ON

Verify the displayed EICAS message is cleared.

Continue to a normal operation.

If the EICAS message is displayed continuously.

Follow a Non-Normal Procedure.

During Take-off:

Follow a Non-normal Procedure.

BEACON light switch . . . . ON F/O

CANCEL/RECALL switch . . . . Push F/O

Verify that only the expected alert and memo messages are shown.

CANCEL/RECALL switch . . . . Push F/O

Verify that the messages cancel.

Trim. . . . . Set ALL

Stabilizer trim –____UNITS

Set the trim for takeoff.

Verify that the trim is in the green band.

Aileron trim – ZERO units

Rudder trim – ZERO units

Transponder mode selector . . . . XPNDR F/O

Call for "BEFORE START CHECKLIST." .... CAPT

Accomplish BEFORE START CHECKLIST.................................F/O

ENGINE START PROCEDURE/CALLOUTS

The "Cleared to start engines" from ground personnel does not mean to start engine(s) immediately.

Adjust the time of starting engine(s) during pushback to minimize engines running time prior to taxi.

Autostart corrects for:

- no EGT rise
- a hot start
- a hung start
- no N1 rotation
- a compressor stall
- a starter shaft failure
- insufficient starter air pressure
- a start time that exceeds the maximum starter duty cycle time

Do the ABORTED ENGINE START checklist for the following abort start condition:

- there is no oil pressure indication after the EGT increases

Normal start sequence is RIGHT then LEFT.

PW engine (777-200ER~~/777-300)~~
Engines may be started at the same time.

~~**GE engine (777-300ER/777F)**~~
~~After the engine is stable at idle, start the other engine.~~

CAPT	F/O
Announce start sequence.	Select the secondary engine display.
Call “**START____**”	Repeat "**START____**” and Position____START/ IGNITION selector(s) to START.

Position____FUEL CONTROL switch(es) to RUN with calling "**RUN**".	
Observe oil pressure increase.	
Call “**CHECK**” After oil pressure increases, move the hand from the fuel control switch.	Call "**OIL PRESSURE**" when the pressure is increasing
Acknowledge when calling "**N1 ROTATION**" from ground staff.	
Call "**STABILIZED**" when engine indications are stabilized.	Monitor engine instruments.
If the engines were not started at the same time, repeat above procedure after the engine is stable at idle.	

AFTER START PROCEDURE

APU selector. . . . . OFF F/O

ENGINE ANTI–ICE selectors . . . . As needed F/O

Recall . . . . Check F/O

Verify that only expected alert and memo messages are shown.

CANCEL/RECALL switch - Push

Verify messages cancelled.

After the engine start procedure has been completed and the captain is ready to disconnect the interphone, the captain will give the message "**CLEAR TO DISCONNECT**" to ground staff. Then continue the following procedure.

FLAPS . . . . Set F/O

Position FLAP lever to take off flaps setting.

Flight controls(Aileron and Elevator) . . . . Check CAPT

Make slow and deliberate input, one direction at a time.

Note: To avoid nuisance FLIGHT CONTROLS faults, a complete cycle of the control wheel during the flight control check should be done slowly (more than approximately 6 seconds) and not combined with the check of the pitch controls.

Move the control wheel and control column to full travel in both directions and verify:

- freedom of movement
- that the controls return to center.

Ground personnel and equipment . . . . Clear ALL

Check that the nose wheel steering lockout pin is removed and no persons and equipment in the vicinity of the aircraft.

RUNWAY TURNOFF light switches..ON then OFF CAPT

Flight controls (Rudder) . . . . Check CAPT

Hold the nose wheel steering tiller during rudder check to prevent undesired nose wheel movement.

Move the rudder pedals to full travel in both directions and verify:

- freedom of movement
- that the rudder pedals return to center

Note: The F/O shall place his/her feet lightly on the rudder pedals and 'ride' the rudder pedals to the full extent of their travel, during the 'Rudder Control Check' conducted by the Captain.

~~**EFB installed**~~

~~**EFB AIRPORT MAP application. . . . . .Select ALL**~~

~~Select map as desired.~~

~~***CAUTION! Do not use the Airport Map application as a***~~

~~*primary navigation reference. The Airport Map application is designed to aid flight crew positional awareness only.*~~

Call for "AFTER START CHECKLIST" .... CAPT

Accomplish AFTER START CHECKLIST ....F/O

RAMP OUT

Apply the 'Disconnect' and 'Ramp-Out' procedure in the FOM 6.2 - Pushback and Start.

TAXI PROCEDURE/CALLOUT

CAPT	F/O
Call for "**REQUEST TAXI**"	Obtain taxi clearance.
Do Taxi Clearance Awareness.	
	Brief Present Position.
Brief taxi Route.	
Position TAXI light and RUNWAY TURNOFF light switches ON.	
Verify own side is clear.	
Release parking brake.	
Position Awareness during Taxi.[1]	
Announce intention.	Make a verbal confirmation.[2]
1) Either flight crew should consider making a callout of location signs/markings (Point it out if needed) for monitoring taxi progress and direction instructed by ATC. 2) If captain doesn't announce his/her intention, F/O advises aircraft position and taxi instruction in a timely manner, and captain verifies or confirms if F/O advises.	

TAXI CONSIDERATIONS

GENERAL

- External vigilance during taxiing should be a top priority.
- A head-down situation during taxi should be limited to the minimum amount of time possible.
  - Plan ahead to minimize cockpit tasks at critical taxi phase.
  - If a head-down activity is required, it should be advised to the other flight crew before undertaking head-down tasks.
- If taxi route or ramp area is dark, use aircraft exterior lights as needed. (e.g. landing lights, wing lights, etc.)
- Maintain taxiway centerline at all times. If obstacle clearance is in doubt, stop the aircraft immediately and advise ATC (Request tug or obtain a wing-walker). *<CLICK>*
  - Use Over-steering technique during a turn to keep the main gear tracks close to the taxiway centerline. *<CLICK>*
- Airport Moving Map(AMM) or its comparable equipment is recommended to be used while taxiing if it is available on the aircraft, but this equipment is not designed to replace conventional taxiing procedure which is to visually identify airport signs and markings, taxiways, runways and other airport traffic.

  Note: While using Airport Moving Map(AMM), Flight Crew should not be fixed to AMM and neglect their basic duties.
- Update changes to the takeoff briefing and/or takeoff performance data, as needed.

TAXI ROUTE AWARENESS

- Both flight crews shall make an effort to enhance taxi route and position awareness.
- Before Taxi, F/O briefs the present position then Captain briefs the taxi route.

- Verbal confirmation should be made between flight crews when identifying the cleared taxi route including aircraft present position.
- **Captain announces his/her intention clearly** to first officer during taxi.
- **F/O responds after confirming** that the captain's intention and the aircraft present position agree with the cleared taxi instruction.

Note: Captain shall not continue to taxi if F/O does not respond to or does not agree with captain's intention.

- F/O advises captain about aircraft position and taxi instruction in a timely manner.

Note: If captain doesn’t announce his/her intention in time or make inadequate announcement for turn, stop, cross RWY, join TWY, etc., F/O should make a callout such as **“STOP”, “NEGATIVE”, “SLOWDOWN”**, etc.

- When in doubt about the aircraft position or instructed taxi route(including "Follow the green", "Follow Follow-me-car"), stop and confirm the exact aircraft position or instructed taxi route with ATC.
- When more than one directional guidance are provided ahead or hard to see the guidance due to reflection of sunlight, pilots shall stop and ask ATC for onward clearance before taxing.
- The following is just an example for practicing taxi route awareness procedures. Flight crew should consider adopting his/her own best practices and callouts depending on the situation and must be proactive to prevent incursions during taxi.

Practice Example:

ATC : “Taxi to 8E, taxi via R4, R11, hold short of A”

F/O : “Taxi to 8E, taxi via R4, R11, holding short of A”

[Clearance Awareness]

CAPT : “Taxi to 8E, taxi via R4, R11, hold short of A”

[Position and Route Briefing]

F/O : “We are on R4, abeam Gate 232 (or abeam Taxiway M13)”

CAPT : “Straight ahead, second left turn at R11, holding short of A”

F/O : “Check”

[Intention Announcement & Confirmation]

Captain announces his/her intention when approaching stop or turning position.

CAPT : “R11 (sign) in sight, left turn, left side clear”

F/O : “R11 check, right side clear”

CAPT : “Approaching A, holding short of A”

F/O : “A in sight (A Check)”

F/O advises aircraft position and taxi instruction in a timely manner if captain doesn’t announce his/her intention.

F/O : “Slow down, approaching left turn point R11”

CAPT : “R11 in sight (R11 check), left turn, left side clear”

F/O : “Stop, hold short of A”

CAPT : “A Check (A in sight), holding short of A”

TAXI SPEED

- Normal taxi speed is approximately 20 knots, adjusted for conditions. On long straight taxi routes, speeds up to 30 knots are acceptable.
- On a dry surface, use approximately 10 kts for turn angles greater than those typically required for high speed runway turnoffs.

TAXI - ADVERSE WEATHER

- Taxi under adverse weather conditions requires more awareness of surface conditions.
- Taxi speed should be reduced to the speed that aircraft can be stopped immediately under adverse weather condition.
- If the aircraft position is in doubt or not clearly identified due to snow, ice, slush, frost, low visibility and etc., stop immediately and request a FOLLOW ME vehicle, tug or progressive taxi instructions.

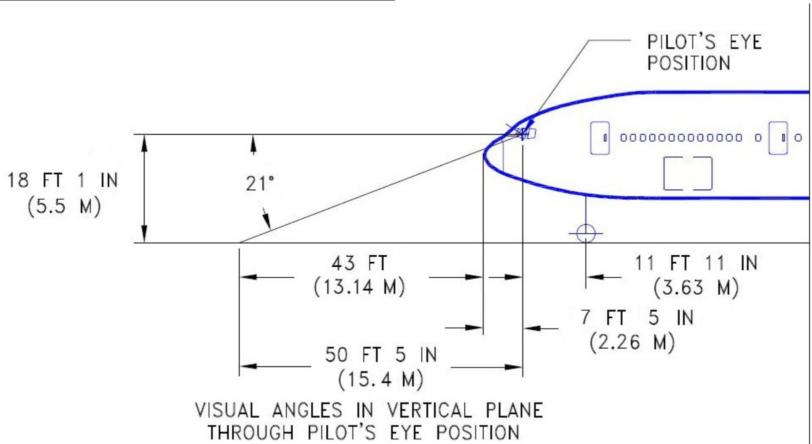
TURNS OF 180 DEGREES

- With the recommended 180 degrees turn technique, on dry runway, the approximate turn width is:
  - B777-200 : 47.5 m (155.8 ft)
  - ~~B777-300 : 56.0 m (183.8 ft)~~
  - ~~B777-300ER : 56.5 m (185.5 ft)~~
  - ~~B777F : 48.0 m (157.4 ft)~~

  Note: The flight crew should consider additional margin when the runway is wet or contaminated

For more information on the recommended 180 degrees turn technique, Refer to FCTM 2.Ground Operations - Turns of 180 Degrees.

VISUAL GROUND GEOMETRY *<CLICK>*



TAKEOFF

BEFORE TAKEOFF PROCEDURE/CALLOUTS

PW engine (777-200ER/~~777-300)~~

Engine warm up requirements:

- engine oil temperature must be above the lower amber band before takeoff

PW engine (777-200ER/~~777-300)~~

Engine warm up recommendations (there is no need to delay the takeoff for these recommendations):

- when the engines have been shut down more than 2 hrs:
  - run the engines for 5 mins
  - when the taxi time is expected to be less than 5 mins, start the engines as early as feasible
  - use a thrust setting normally used for taxi operations

~~**GE Engine (777-300ER/777F)**~~

~~Engine warm up requirements:~~

- ~~engine oil temperature must be above the bottom of the temperature scale~~

~~**GE Engine (777-300ER/777F)**~~

~~Engine warm up recommendations:~~

- ~~run the engines for at least 3 mins.~~
- ~~use a thrust setting normally used for taxi operations.~~

CAPT	F/O
About 3 minutes prior to the estimated takeoff time, call “**TAKEOFF SIGNAL**”	Notify the cabin crew/supernumeraries to prepare for takeoff (makes 3 chimes), then position the SEATBELTS selector ON.
Verify that the cabin is ready for takeoff. Note: Do not takeoff until cabin readiness confirmation is received from the purser.	

CAPT	F/O
After obtaining takeoff (or line-up) clearance.	
Repeat ATC clearance.	Read back ATC takeoff (or line-up) clearance.
Before entering the departure runway	
• +Verify that the runway and runway entry point are correct. Note: If first officer does not respond to or does not agree with captain’s challenge, the aircraft shall not enter the departure runway. Note: Check the runway number on a holding position sign(entry point) and cross check against the ND before taxiing into the runway. • Each flight crew confirms his/her side clear before crossing RUNWAY HOLDING POSITION MARKING of departure runway, and call - “**FINAL CLEAR**”(Confirm no traffic on short final) - “**RUNWAY CLEAR**” Note: If there is any traffic on short final for the departure runway, flight crew should confirm ATC clearance - line up/takeoff.	
	Position STROBE light switch to ON. Position transponder mode selector to TA/RA. When cleared for takeoff, position LANDING light switches - ON
(PF) Set the weather radar display. (PM) Set the weather radar display or terrain display as needed.	
Call for “**BEFORE TAKEOFF CHECKLIST**”	Accomplish BEFORE TAKEOFF checklist.

TAKEOFF CONSIDERATIONS

REQUIRED TAKEOFF FUEL

Flights will not takeoff with less than the legal fuel requirements.

If necessary, The Required Takeoff Fuel should be checked in sufficient time before Takeoff.

Refer to FOM 6.3 - Required Fuel for Takeoff.

TAKEOFF REMINDER

The PF will conduct the takeoff reminder prior to the application of takeoff power. The briefing may be accomplished at any time prior to taking the runway, including any last minute tower instruction reviewed when received.

The acronym **HAA** is an easy guide for remembering all items included in the Takeoff Reminder. The PF will verbalize the following and confirm that the heading and altitude are correctly set on the mode control panel:

- **H**eading (Initial assigned Heading, or RWY Heading)
- **A**ltitude (Restricted altitude, or cruise level/altitude) and Transition Altitude/Height if other than 14,000 ft
- **A**irspeed restrictions(If any, restricted airspeed other than 250 kts below 10,000 ft)

FLIGHT MANAGEMENT SYSTEM USAGE FOR TAKEOFF

- The PF should display TAKEOFF REF page to ensure the entries are correct.
- The map display on the ND, map range, and LEGS page sequence should be consistent with the departure procedure.
- If a database SID, including SID containing heading vectors leg, is to be flown, LNAV should be armed prior to takeoff.
- To reduce heads down activity, climb constraint modification immediately after takeoff should normally be accomplished on the mode control panel. Modify the CLB page when workload permits.
- The PM should monitor the LEG page of the CDU for departure to allow timely route modification if necessary.

LNAV USED FOR DEPARTURE

If LNAV is to be used for departure, accomplish the following procedures:

- Verify the aircraft symbol is in close proximity to the departure end of the runway symbol on the 10 NM scale.
  - If GPS NAV is on, the FMC update function is inhibited.

- If GPS NAV is off, the FMC update position to takeoff runway threshold when a TOGA switch is pushed.
- When an intersection takeoff is made with GPS NAV off, the intersection displacement distance from the runway threshold must be entered on the TAKEOFF REF page.

NAVIGATION DISPLAY (ND) USAGE

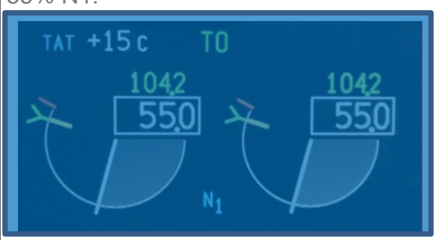
PF/PM should select the ND mode and range properly to enhance the situational awareness of the aircraft position and flight path, or as required for weather radar or EGPWS terrain data display.

TAKEOFF PROCEDURE/CALLOUTS

PF	PM
Confirm takeoff reminder (**HAA**).	Verify takeoff reminder.
Announce type of takeoff except rolling takeoff.	
Align airplane with the runway.	
Verify that the airplane heading agrees with the assigned runway heading and the runway designator.	
After obtaining takeoff clearance	
Repeat ATC clearance	Read back ATC takeoff clearance Position LANDING light switches - ON

PF	PM
HL7700 – HL8254 Set the elapsed time (ET) selector to Run. **HL8284** The elapsed time is counted automatically when the aircraft is airborne.	
If there is any doubt when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.	
Note: Takeoff thrust should be applied after the aircraft is aligned with the runway centerline and the nose wheel steering tiller is released. Note: TO/GA switches shall be pushed before 50 kts(KIAS).	
WARNING! Use caution not to apply brakes inadvertently if flight crew puts his/her feet up on the rudder/brake pedals (i.e. heels are raised off the floor) during the takeoff roll. Inadvertent brake application can seriously threaten the safety of flight due to slow acceleration.	

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td>
PW engine (777-200ER/777-300)
Advance thrust levers to approximately 1.05 EPR.


~~GE engine (777-300ER/777F)~~
~~Advance thrust levers to approximately 55% N1.~~


Allow engines to stabilize.
Call "STABILIZED, TO/GA" and push TO/GA switch to advance thrust levers to takeoff thrust.

(Advance thrust levers to approximately takeoff thrust and call “SET TAKEOFF THRUST”)
</td><td>
Observe mode annunciation and call "THRUST REFERENCE"

(If no ‘THR REF’ in FMA call "NO THRUST REFERENCE")

(Adjust Takeoff thrust and call "THRUST SET " by 80 kts)
</td></tr>
<tr><td colspan="2">If EICAS caution ‘AUTOTHROTTLE DISC’ is displayed, reject the takeoff.</td></tr>
<tr><td colspan="2">Verify that correct takeoff thrust setting.</td></tr>
</table>

PF	PM
	Call "**THRUST SET”** when correct takeoff thrust is set. Monitor engine instruments throughout takeoff. Call out any abnormal indications. Adjust takeoff thrust prior to 80 kts, if required. During strong headwind, if the thrust levers do not advance to the planned takeoff thrust manually advance the thrust levers by 80 kts.
Note: When the first officer is PF; After pushing the TO/GA switches, the First Officer must move his/her hand from the thrust lever to control wheel when "THR REF" is displayed on FMA. The captain’s hand must be on the thrust levers until V1.	
Monitor airspeed. Maintain light forward pressure on the control column.	Monitor airspeed indications and call out any abnormalities.
Verify 80 kts. Call **"CHECK".**	Call **“80 KNOTS”** “**HOLD**”. Verify that A/T annunciation changes to HOLD.
Verify V1 speed.	Verify automatic V1 callout [1] or call “**V1**”, if not called by GPWS.
Note: [1] EGPWS initiates automatic V1 callout at V1 - 3 kts.	
At Vr, rotate toward 15° pitch attitude. After liftoff, follow F/D commands.	At Vr call “**ROTATE**”. Call “**PITCH**”, if rotation rate is excessive or tail strike pitch exceedance is expected. Monitor airspeed and vertical speed.
Establish a positive rate of climb.	Verify positive rate of climb on the altimeter and Call "**POSITIVE CLIMB**"
Verify a positive rate of climb on the altimeter and call “**GEAR UP**”.	Repeat "**GEAR UP**" and position landing gear lever Up.

PF	PM
Above 400 ft RA, call for a roll mode as needed.	Select or verify the roll mode. Set heading as required. Verify VNAV engaged.
Engage A/P when above minimum altitude for autopilot engagement if needed. Call **"AUTOPILOT"**	Verify autopilot engaged and call "**AUTOPILOT**"
Verify climb thrust set (monitor CLB/CLB1/CLB2 on EICAS). If not, select CLB/ CLB1/CLB2 thrust on CDU.	
	Call **"CLIMB THRUST"**
Verify acceleration at acceleration height. Call for "**FLAPS______**" according to flap retraction schedule.	Call "**SPEED CHECK, FLAPS______**" and position flap lever as directed.
	After flap retraction is complete, set the ENGINE ANTI-ICE selectors to AUTO.
Call for "**AFTER TAKEOFF CHECK-LIST**"	Accomplish AFTER TAKEOFF checklist.

TAKEOFF ROTATION

- For optimum takeoff and initial climb performance, initiate a smooth continuous rotation at VR toward 15° of pitch attitude. However, takeoffs at low thrust setting (low excess energy) will result in a lower initial pitch attitude target to achieve the desired climb speed.
- The use of stabilizer trim during rotation is not recommended.
- Rotate smoothly at an average pitch rate specified at below.
  - B777-200~~/F~~: 2.5° per second
  ~~- B777-300/300ER: 2° per second~~
- Liftoff attitude ~~(7.0° for B777-300 /~~ 8.5° for B777-200~~/300ER/F)~~ will be achieved in approximately 4 seconds.
- During liftoff, crosscheck the actual liftoff pitch attitude with the PFD. If

there are no liftoff indications at liftoff attitude, hold that attitude until verifying any positive liftoff indication. After that, increase pitch attitude toward 15° of pitch attitude.

Note: The pitch attitude displayed in PFD should be used as a primary means to check the aircraft pitch angle.

- Liftoff indications:
  - Climb indication of Altitude
  - Climb indication of V/S
  - Increasing of RA
  - Landing gear lock solenoid release sound
  - Visual recognition of climb

Note: The flight director pitch command is not used for rotation.

- Aft fuselage contact occurs at a pitch attitude of 12.1°(B777-200~~/F)/~~ ~~8.9°(B777-300)/10.0°(B777-300ER)~~ with wheels on the runway and landing gear struts extended.

Note: The tail strike alert system detects ground contact which could damage the airplane pressure hull. The EICAS caution message TAIL STRIKE is displayed when a tail strike is detected.

LOW ALTITUDE LEVEL OFF

When a low altitude level off is required after takeoff, the flight crew should make sure not to overshoot a selected altitude. For the detailed information, refer to FCTM 4.2 - Low Altitude Level Off. *<CLICK>*

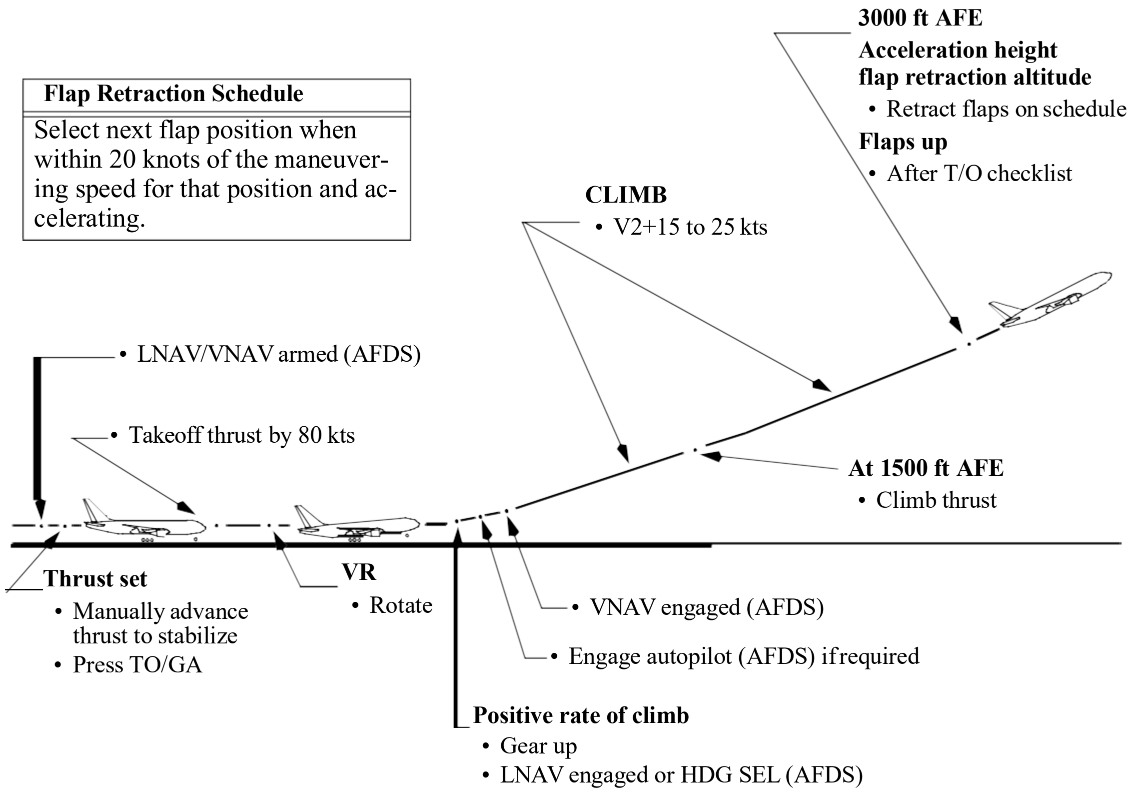
FLAP RETRACTION SCHEDULE

During flap retraction, selection of the next flap position is initiated when airspeed is increasing and reaching the maneuver speed for the existing flap position.

WARNING! Do not maintain airspeed below the maneuver speed for the current flap setting.

T/O Flaps	At "Display"	Select Flaps
20 or 15	"20" or "15" "5" "1"	5 1 UP
5	"5" "1"	1 UP

TAKEOFF


Flap Retraction Schedule
Select next flap position when within 20 knots of the maneuvering speed for that position and accelerating.
3000 ft AFE
Acceleration height
flap retraction altitude
• Retract flaps on schedule
Flaps up
• After T/O checklist
CLIMB
• V2+15 to 25 kts
• LNAV/VNAV armed (AFDS)
• Takeoff thrust by 80 kts
At 1500 ft AFE
• Climb thrust
Thrust set
• Manually advance thrust to stabilize
• Press TO/GA
VR
• Rotate
• VNAV engaged (AFDS)
• Engage autopilot (AFDS) if required
Positive rate of climb
• Gear up
• LNAV engaged or HDG SEL (AFDS)

Intentionally

Blank

CLIMB

CLIMB PROCEDURE/CALLOUTS

Note: Maintain at least 15 kts above minimum maneuver speed when climbing through FL200 to prevent the EICAS caution message, "AIRSPEED LOW" from occurring.

PF	PM
Call "**CHECK**".	At 10,000 ft, call "**ONE ZERO THOUSAND**" Position LANDING, RUNWAY TURNOFF, TAXI light switches OFF. Position SEATBELTS selector to AUTO
When approaching or passing Transition Altitude.	
Call "**STANDARD RESET**" and set altimeter(s) to standard.	Call "**TRANSITION, ALTIMETER RESET STANDARD**" set altimeter(s) to standard.

NORMAL ECONOMY CLIMB

The normal economy climb speed schedule of the FMC minimizes trip cost. The FMC generates a fixed speed schedule as a function of cost index and gross weight. (Refer to POM 5.3 - Preflight Considerations (Speed Schedule)) *<CLICK>*

MAXIMUM RATE CLIMB

A maximum rate climb provides both high climb rates and minimum time to cruise altitude. Maximum rate climb can be approximated by using the following:

- Flaps up maneuver speed + 60 kts until intercepting 0.82 M

MAXIMUM ANGLE CLIMB

A maximum angle climb speed is normally used for obstacle clearance, minimum crossing altitude or to reach a specified altitude in a minimum distance. The FMC provides maximum angle climb speeds on the VNAV CLB page. It varies with gross weight and provides approximately the same climb gradient as flaps up maneuver speed.

ENROUTE

CRUISE PROCEDURE/CALLOUTS

PF	PM
	If the FUEL IN CENTER message shows, set both CENTER FUEL PUMP switches to ON. When the FUEL LOW CENTER message shows, set both CENTER FUEL PUMP switches to OFF.

CREW MEMBER AT STATIONS

Refer to FOM 2.3 - Crew Members at Stations.

ENROUTE CREW CHANGE BRIEFING

If a flight crew needs to leave the cockpit, a briefing should be conducted to the other flight crew.

For more information, refer to FOM 6.5 - Enroute Crew Change Briefing and a Leaving the Cockpit Briefing (Leaving The Cockpit).

EDTO ENROUTE DUTIES

Refer to FOM 5.13 - EDTO Flight Procedure.

RVSM ENROUTE PROCEDURE

Refer to FOM 10.4 - RVSM Airspace Operations (RVSM Airspace Operation Procedures).

COMPANY POSITION REPORTS

Refer to POM 6.5 - ACARS Operations Procedure (Climb and Cruise Procedure). *<CLICK>*

ENROUTE HF SELCAL CHECK / CPDLC OPERATIONS PROCEDURE

Refer to POM 6.5 Communication.

UPDATE ENROUTE WEATHER

Refer to FOM 6.5 - General Duties (Weather Update).

POLAR OPERATION

Refer to the Polar Operation Manual.

OVERSPEED PREVENTION

During cruise with normal ECON CRZ speed at high altitude, a sudden decrease of tailwind component or increase of headwind component may lead to overspeed events even though the autothrottles are engaged.

- If a sudden decrease of tailwind component or increase of headwind component is expected/existed:
  - Reduce cruise speed to at or below M .81/280 kts (whichever is lower), but no less than 15 kts above the minimum maneuvering speed.

  Note: If severe turbulence is encountered, use the turbulent air penetration speed. Refer to POM 4.1 - Airplane General (Operational Limitations).
- If an inadvertent overspeed is encountered:
  - Refer to POM 8.2 - Overspeed. *<CLICK>*

PORTABLE EFB

If necessary, verify the mount is secured before TOD.

DESCENT

DESCENT PROCEDURE/CALLOUTS

Generally a Descent Preparation and Landing Briefing should be completed prior to beginning of descent.

PF	PM
Check latest destination weather.	
The PF also may modify the FMS if needed. In that case the PF must transfer the control of aircraft to the PM.	Before the top of descent, modify the active route as needed for the arrival and approach. Set ARRIVALS Page: • Select the Approach/Runway and Approach Transition (if required) • Select the STAR and STAR Transition(if required)
Verify the correct arrival and approach procedure selected.	Verify the correct arrival and approach route including constraints (altitude/ speed) in LEGS page and execute it.
Verify the NAV RAD page.	Set NAV RAD page
Recall and review all alert and memo messages Review operational notes.	
Compute landing performance by using EFB-OPT or QRH. Note: If discrepancies of computed landing distances exist between EFB-OPT and QRH, use EFB-OPT landing performance data output. Note: If the distance between visual aid (PAPI or VASI) location and threshold exceeds more than 1500 ft, it may be considered to add the distance exceeded to the computed landing distance.	
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set RADIO or BARO minimums as required for approach.	
	Set AUTOBRAKE selector to desired brake setting.
Accomplish landing briefing.	

DESCENT PROCEDURE/CALLOUTS

PF	PM
Around TOD, The captain makes PA “**CABIN CREW PREPARE FOR LANDING**”	
Call for "**DESCENT CHECKLIST**"	Accomplish DESCENT checklist.

HOLDING

- If a descent profile exists beyond a holding pattern, and the holding pattern does not have a target altitude specified in the FMS, the hold is designed to level flight at around holding fix passing altitude when passing holding fix.
  - To avoid unnecessary level-offs while descending with VNAV, insert target holding altitude in the FMS HOLD page, or push the MCP altitude selector knob after cleared holding altitude set in the MCP to load the target altitude into FMS HOLD page.
  - When entering holding pattern, verify that MCP target altitude and FMS HOLD TGT ALT agree with the cleared ATC holding instructions.
- To avoid unwanted TCAS events, use of V/S mode with appropriate vertical speed (approximately ±1000 fpm) is recommended for altitude change when in the hold.
- If FMC holding speed is greater than the ICAO or FAA maximum holding speed, holding may be conducted at flaps 1, using flaps 1 maneuver speed. Flaps 1 uses approximately 7% more fuel than flaps up.

  Note: Maintain clean configuration if holding in turbulence. Clean configuration is also recommended for holding in icing conditions. However, to comply with speed restrictions, flaps 1 may be used in icing.

- If holding speed is not available from the FMC, recommended holding speeds can be approximated by using the following guidance until more accurate speeds are obtained from the PI section of QRH:
  - flaps up maneuver speed approximates minimum fuel burn speed

and may be used at low altitudes

777-200~~, 777-300~~

- above FL250, use VREF 30 + 100 knots to provide at least a 0.3 g margin to initial buffet (full maneuver capability).

~~777-300ER/777F~~

~~- above 10,000 feet, use VREF 30 + 120 knots to provide at least a 0.3 g margin to initial buffet (full maneuver capability).~~

LANDING FLAP USAGE

- For normal landings, use flaps 25 or flaps 30.
- When conditions permit, use flaps 30 to minimize approach speed, and landing distance.
- Flaps 25 provides better noise abatement, reduced flap wear/loads and fuel efficiency.

Note: Runway length and condition must be taken into account when selecting a landing flap position.

~~Note: For auto landing with flaps 25, refer to POM 4.1 AUTOMATIC LANDING.~~

AUTOBRAKES

Use appropriate autobrakes mode to vacate runway at the planned exit point.

If stopping distance is not assured with autobrakes engaged, the PF should immediately apply manual braking sufficient to assure deceleration to a safe taxi speed within the remaining runway.

Note: The landing runway exit should be planned to minimize the runway occupancy, if it is not contrary to the airport operational requirement.

- Autobrakes mode 3 or greater is used when the landing distance available is less than 9000 ft or the runway condition is other than dry.
- Autobrakes mode MAX AUTO is used when minimum stopping distance is required. Its deceleration rate is less than that produced by full manual braking.

LANDING BRIEFING

- Use the Crew Briefing.
- When the weather condition is below CAT I, landing briefing should add in general Landing Briefing for CAT II/CAT III approach.

Note: Landing briefing must include a reminder that go-arounds on or near the ground require go-around thrust to be set manually and that a flap configuration warning can sound.

GPS SIGNAL INTERFERENCE

If a GPS signal interference (or an abnormal GPS signal reception) is recognized, follow the GPS Signal Interference Procedure in the POM 9.1 - GPS Signal Interference. <CLICK>

EGPWS LOOK-AHEAD TERRAIN ALERTING

If a landing airport/runway is not contained in the EGPWS terrain database, the look-ahead terrain alerting and terrain display functions should be inhibited when operating within 15nm [1)] of the landing airport/runway.

- Push GND PROX - TERR OVRD switch on the Ground Proximity Panel.
- Verify the crossing altitude referenced to published approach procedure, especially when encountering an adverse weather with low visibility and terrain/obstacles near the intended flight path.

Note: [1)] Use FMS fix page to identify the corresponding area as a reference.

APPROACH & LANDING

APPROACH AND LANDING CONSIDERATIONS

STABILIZED APPROACH REQUIREMENTS

Refer to FOM 6.7 - Stabilized Approach Requirements.

Note: When PF callouts “STABILIZED”, he/she shall confirm that all required conditions of Stabilized Approach Criteria are satisfied. In addition, the Landing Gear and Flap position indications shall be visually checked to make sure that those are configured for landing.

ALTITUDE COMPENSATION

Refer to FOM 4.4 - Pressure Altimeter Corrections.

APPROACH BAN

To commence an instrument approach, the reported weather must be at or above the approach minima. Once an aircraft has passed beyond a point on an instrument approach procedure, which is the beginning of the final approach segment or 1000 ft AFE, it may continue the approach to the MDA(H)/DA(H)/AH even if the weather deteriorates below the approach minima.

Note: Policy regarding an approach ban may differ from country to country Flight crew must confirm and apply the procedures specific to that country.

BAROMETRIC AND RADIO ALTIMETER MINIMUMS

<table>
<tr><th colspan="2">Approach</th><th>Radio Altimeter Minimum</th><th>Barometric Altimeter Minimum</th></tr>
<tr><td rowspan="2">ILS CAT III</td><td>Operating with DH</td><td>RA</td><td>Blank</td></tr>
<tr><td>Operating with AH</td><td>Blank 1)</td><td>Blank</td></tr>
<tr><td colspan="2">ILS CAT II</td><td>RA 2)</td><td>Blank</td></tr>
</table>

Approach	Radio Altimeter Minimum	Barometric Altimeter Minimum
ILS CAT I, PAR	Blank	DA(H) 3)
Non-precision approach	Blank	MDA(H) + 50 ft or MDA(H) 4) or DA(H) 5)
Circle-to-Land	Blank	MDA(H) or 1000 ft + HAA whichever is higher

1) If the automatic landing system operates as a fail passive, set the radio altimeter minimum(DH) at 50 ft RA even though the ILS CAT III approach is published only with AH.

2) If the radio altimeter (RA) is not authorized for CAT II ILS approach:

Note: Where “RA NOT AUTH/RA NA” is shown in the published CAT II ILS approach minimum, a decision altitude (DA/H; 100 ft above touchdown zone elevation) at the inner marker (IM) is shown also.

Set DA(H) on the Barometric Altimeter Minimum and when the aircraft is reaching the DA(H) or the IM signal is received, whichever occurs first, a decision must be made to either continue the landing or execute a missed approach.

3) In case of RADIO/BARO Altitude Control can be set in 10 ft increments, if DA(H) does not end in 00 ft unit, set it to 10 ft unit to the closest 10 ft increments above DA(H). In case of RADIO/BARO Altitude Control can be set in one foot increments, set the exact DA(H).

4) Apply to the special approach procedures (Ex; JFK 13L/R LDIN (Lead-In Light System) Approach, Sidestep Approach, procedure without DME and descent rate information in approach chart, etc.) where Constant Descent Non-Precision Approach cannot be applied.

5) Apply to VNAV Approach using DA(H).

COMMAND SPEED

Autoland

With a command speed of VREF + 5 kts and landing flaps, there is sufficient wind and gust protection available with the autothrottle connected.

Manual Landing

When using autothrottle, position command speed to VREF + 5 kts.

Sufficient wind and gust protection is available with autothrottle connected because the autothrottle is designed to adjust thrust rapidly when the airspeed drops below command speed while reducing thrust slowly when the airspeed exceeds command speed. In turbulence, the result is that average thrust is higher than necessary to maintain command speed.

If a manual landing is planned with the autothrottle connected in gusty or high wind conditions, consider positioning the command speed to VREF + 10 kts. This helps protect against a sudden loss of airspeed during the flare.

If the autothrottle is disconnected, or is planned to be disconnected 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. The minimum command speed setting is VREF + 5 kts. One half of the reported steady headwind component can be estimated by using 50% for a direct headwind, 35% for a 45° crosswind, zero for a direct crosswind and interpolation in between.

When making adjustments for winds, the maximum approach speed should not exceed VREF + 15 kts or landing flap placard speed minus 5 kts, whichever is lower.

The minimum command speed setting with autothrottle disconnected is VREF + 5 kts. The gust correction should be maintained to touchdown while the steady headwind correction should be bled off as the airplane approaches touchdown.

The following table shows examples of wind additives with a runway heading of 360°.

Reported Winds	Wind Additive	Approach Speed
360 at 16	8	VREF + 8 kts
Calm or Tailwind	0	VREF + 5 kts
360 at 20 Gust 30	10 + 10	VREF + 15 kts 1)
060 at 24	6	VREF + 6 kts
060 at 12 Gust 20	3 + 8	VREF + 11 kts

Reported Winds	Wind Additive	Approach Speed
090 at 15	0	VREF + 5 kts
090 at 15 Gust 25	0 + 10	VREF + 10 kts
120 at 10 Gust 20	0	VREF + 5 kts [2)]
135 at 10	0	VREF + 5 kts [2)]
Note: [1)] The maximum wind additive should not exceed 15 kts. [2)] Do not apply wind additive for steady tailwinds or tailwind gusts.		

Non-Normal Conditions

Occasionally, a non-normal checklist instructs the flight crew to use a VREF speed that also includes a speed additive such as VREF 30 + 20. When VREF has been adjusted by a NNC this becomes the VREF used for landing. This VREF does not include wind additives. For example, if a non-normal checklist specifies “Use flaps 20 and VREF 30 + 20 for landing”, the flight crew would select flaps 20 as the landing flaps and look up the VREF 30 speed in the FMC or QRH and add 20 kts to that speed.

When using the autothrottle, position command speed to VREF + 5 kts. Sufficient wind and gust protection is available with the autothrottle engaged that no further wind additives are needed.

If the autothrottle is disconnected, or is planned to be disconnected prior to landing, appropriate wind additives must be added to the VREF to arrive at command speed, the speed used to fly the approach. For example, if the checklist states “use VREF 30 + 20 kts”, command speed should be positioned to VREF (VREF 30 + 20) plus wind additive (5 kts minimum, 15 kts maximum).

CROSSWIND LANDING TECHNIQUES

Touchdown in a crab only condition is not recommended when landing on a dry runway in strong crosswinds.

For crosswind landing technique, refer to FCRM 3.1 or FCTM Reverse Thrust and Crosswind. *<CLICK>*

FMS - ACTIVE WAYPOINT SEQUENCING

The FMS may not sequence to the next waypoint if the aircraft intercepts the final approach course after the FMS active waypoint. In this case, the DIRECT TO or INTERCEPT COURSE TO method can be used to sequence to the next waypoint in the FMS LEGS page.

DEVIATION CALLOUTS

PF	PM
During Approach and Landing. Verify the deviation, and if appropriate, correct deviation with call "**CORRECTING**" or "**GO-AROUND**"	During Approach and Landing. Any excessive deviations or uncorrected minor deviations from desired flight path, airspeed or descent rate occurs, the PM must callout; "**BANK**" "**LOCALIZER**" "**GLIDE SLOPE**" "**SPEED HIGH/LOW**" "**ALTITUDE**" "**ARC**" "**CDI**" "**BEARING**" or "**RADIAL**" "**SINK RATE**" (when below 1000 ft HAT, any descent rate exceeding 1000 fpm) "**LOW**", "**TOO LOW**", "**HIGH**", "**TOO HIGH**" (VASI or PAPI indication) "**PITCH**" **“FLARE”** (if a flare is not initiated at the appropriate flare height) Note: The Captain shall take over control regardless of the “**FLARE**” callout when necessary. If an approach is unstabilized or for any other reason, the approach cannot safely be continued: Call "**GO-AROUND**"
During Landing roll. Verify the deviation, and if appropriate, correct deviation with call	During Landing roll. If off-centerline during rollout, call **“CENTERLINE”** or **"STEER RIGHT/LEFT"** (as appropriate)

"CORRECTING"	

APPROACH PROCEDURE/CALLOUTS

PF	PM
When approaching or passing Transition Level. Note: When cleared to descend to an altitude below Transition Level in relatively low Transition Level area compared to other regions (Europe etc.) from ATC, flight crew should reset immediately Altimeter setting to QNH(QFE). However, if ATC instruction is received to level off at or above Transition Level, flight crew shall reset applicable Altimeter back to QNE.	
Call "_____**inHg/hPa RESET**" and set altimeter(s) to QNH(QFE) setting.	Call "**TRANSITION, ALTIMETER RESET**______**inHg/hPa**" Set altimeter(s) to QNH(QFE) setting.
Verify correct arrival and approach procedures selected. Verify or enter the correct RNP for the arrival and approach. • RNP value for non-precision approach, - 0.3 NM: RNAV(GNSS or GPS) or RNP approach - 0.5 NM: RNAV(VOR or VOR/DME) approach	
Call **" CHECK "** Call **“LANDING SIGNAL”**	Approximately 10,000 ft (consider airport field elevation) • Call "**ONE ZERO THOUSAND**" • Set the LANDING & TAXI, RUNWAY TURNOFF light switches to ON. • Make 3 chimes, then position the SEATBELTS selector to ON.
Call for “**APPROACH CHECKLIST**”	Accomplish APPROACH checklist.

FLAP EXTENSION SCHEDULE

During flap extension, selection of the flaps to the next flap position should be made when approaching, and before decelerating below, the maneuver speed for the existing flap position.

WARNING! ***Do not maintain airspeed below the maneuver speed for the current flap setting. Full maneuver margin exists for all normal***

landing procedures whenever speed is at or above the maneuver speed for the current flap setting.

Current Flap Position	At Speedtape "Display"	Select Flaps	Command Speed for Selected Flaps
UP	"UP"	1	"1"
1	"1"	5	"5"
5	"5"	20	"20"
20	"20"	25 or 30	(Vref 25 or Vref 30) + wind additives

GROUND/RUNWAY EQUIPMENT REQUIRED FOR PRECISION INSTRUMENT APPROACHES

Component	CAT I [1)]	CAT II	CAT III
Localizer/Glideslope	Yes	Yes	Yes
Outer Marker	Yes [2)]	Yes [2)]	Yes [2)]
Middle Marker	No [3)]	No [3)]	No
Inner Marker	No	Yes [2)]	Yes [2)]
Approach Light System (ALS)	Yes [4)]	Yes [4)]	Yes [4)]
Sequenced Flashing Lights (SFL; also part of RAIL, ALSF, etc.)	Yes [5)]	Yes [7)]	No
High Intensity Runway Lights (HIRL)	Yes	Yes	Yes
Touchdown Zone Lights (TDZ)	Yes [6)]	Yes [7)]	Yes
Runway Centerline Lights (CL)	Yes [6)]	Yes [7)]	Yes

[1)] CAT I ILS approaches may be flown with equipment outages (e.g. CL out) if the approach chart gives specific minima to be used with such outages.

[2] A marker is considered out of service only when none of the authorized substitutes is available. These include the following and, except for ASR and PAR, are shown on the approach chart.

Authorized Substitute	Outer Marker	Middle Marker	Inner Marker
Compass Locator [8]	Yes	Yes	No
NDB, VOR, DME fix, Minimum GSIA Fix or ASR Radar Fix [9]	Yes	No	No
PAR Radar Fix [9]	Yes	Yes	No
Radio Altimeter	No	No	Yes [10]

[8] If locators are used for both the outer and middle marker, dual ADF or single ADF with a dual tuning head is required.

[9] Where available and if requested by the flight crew.

[10] Where applicable : e.g., at some CAT II installations radio altimeter is not authorized to identify decision height, and this is specified on the approach chart. (e.g. "RA NA")

[3] For countries that impose higher minima for MM OUT condition, refer to Airway Manual.

[4] CAT I ILS approaches in visibilities of 1200 m (4000 ft) RVR or 3/4 mile (or better) however, do not require ALS. All CAT II approaches and CAT III approaches require "standard"ALS (e.g. ALSF-1, ALSF-2) or equivalent international system. (e.g. HIALS)

[5] CAT I ILS approaches in visibilities of RVR 1200 m (4000 ft) or 3/4 mile (or better) however, do not require SFL.

[6] If TDZ and/or CL inoperative, refer to FOM 4.1 - Approach and Landing Minima (CAT I Minima by Lighting Facilities).

[7] CAT II approach operation can be authorized at the airports with reduced lighting facilities those have been approved by Ops Specs. Refer to the NOTAM - ‘COMPANY MINIMA FOR CAT II/III’ for approved runways. (e.g. ANC RWY07L - SA CAT II).

ILS AIRBORNE REQUIRED EQUIPMENT

The following chart covers general requirements for ILS approaches. This list may vary from the B777 MEL since dispatch requirements can differ from enroute requirements.

AFDS MONITORED EQUIPMENT		
Required Equipment	FMA / ASA	
	LAND 2	LAND 3
Instrument Landing System (ILS)	2	3
Radio Altimeter Systems	2	3
Air Data Inertial Reference Unit (ADIRU)	1	1
Pitot/Static Air Data Module (ADM)	2	3
Autopilot Flight Director Computer (AFDC)	2	3
Autopilot	2	3
Autopilot Engage Switch	1	1
Autopilot Backdrive actuator system	1	2
Autopilot Disconnect Switch	1	2
TOGA Switch	1	2
Hydraulic Systems	2	3
Normal flight controls [1)]	Required	
[1)] Primary Flight Control System mode should be NORMAL.		

AFDS NOT MONITORED EQUIPMENT		
Approach Type	CAT II	CAT III
Required Equipment	Required number	
Anti-skid	0	Required
Autobrake or Groundspeed Indicator	0	Required
Autothrottle System and Disconnect Warning [2)]	0	1
Autothrottle Disconnect Switch [3)]	0	2

AFDS NOT MONITORED EQUIPMENT		
Approach Type	**CAT II**	**CAT III**
Required Equipment	**Required number**	
Nose Wheel Steering	0	1
Autopilot Disconnect Warning	1	
Windshield Wipers	2	
Window Heat on FWD and No. 2 Window [4]	3	
Flight Director Display	2	
Primary Flight Displays (PFD) [5] [6]	2	
Navigation Displays (ND)	2	
Flight Mode Annunciator/Autoland Status Annunciator (FMA/ASA) [7]	2	
Decision Height (DH) Indication	2	
Engines Operating	1	

[2] Autothrottle system consists of 2 A/T servos,left and right A/T arm switches, and 1 A/T engage switch.

[3] One may be inoperative provided both A/T ARM switches operate normally

[4] Left FWD must be operative.

[5] Appropriate marker beacon information, or equivalent, must be displayed to each pilot for outer, middle and inner markers. The appropriate equivalent information, such as a precision or surveillance radar fix, a designated NDB, VOR, DME fix, or a published minimum Glide slope interception Altitude fix, may be used as a substitute for the outer marker beacon information.

[6] The following EICAS messages are not displayed:
- SINGLE SOURCE ILS
- SGL SOURCE RAD ALT
- SGL SOURCE DISPLAYS

[7] G/S, LOC, FLARE, ROLLOUT, and G/A mode annunciations required.

ILS APPROACHES

CONSIDERATIONS

- Review all messages.
- Confirm ILS identification. The requirement to tune and identify navaids can be satisfied by aurally identifying the navaid or by confirming that the tuned navaid frequency is replaced by the correct alphabetical identifier on the PFD.
- Set DA or DH(RA).

AFDS APPROACH PROCEDURES

Refer to the FOM 6.7 - Precision Approach (ILS Approach)

Initial Approach:

- Ensure that the LEGS page sequence, altitude restrictions and the map display reflect the ATC clearance.
- During approach, adjust the map display and range to provide a scaled plan view of the area.

Final Approach

- When the glideslope pointer begins to move (glide slope alive), extend the landing gear, select flaps 20 and decrease the speed to flaps 20 speed.
- Check for correct crossing altitude and begin timing, if required, when crossing the final approach fix (FAF or OM).

Intercepting Glide Slope (G/S) from Above

- When intercepting G/S from above, flight crew should attempt to capture the G/S prior to the FAF.

  Note: Before intercepting the G/S from above, the flight crew must ensure that the localizer is captured before descending below the cleared altitude or the FAF altitude.

- Use the following procedure to intercept the G/S from above:
  - use of autopilot is recommended.
  - select APP on the MCP and verify that the G/S is armed.
  - establish final landing configuration and set an altitude higher than aircraft altitude in the MCP.
  - select the V/S mode and set -1500 fpm to achieve G/S capture.
  - monitor the rate of descent and airspeed to avoid exceeding flap placard speeds and flap load relief activation.
  - at G/S capture, observe the flight mode annunciations for correct modes and monitor G/S deviation. Continue with normal procedures.

  Note: If the G/S is not captured by 1000 ft HAT, even in VMC, set missed approach altitude and initiate a go-around.

CAT II AND CAT III APPROACH

GENERAL

The B777 is certified for CAT III(Fail-Operational) precision approaches and landings. It incorporates a Fail Operational Triple-Autopilot system with rollout control.

Approach Type	Autoland Status Annunciation (ASA)
CAT II	LAND3, LAND2
CAT III with DH(Fail-Passive)	LAND3, LAND2
CAT III with AH(Fail-Operational)	LAND3

CAT II/III OPERATING REQUIREMENT

Crew Qualification

Refer to the FOM 6.7 - CAT II/III Operations (Flight Crew Qualification Requirement).

Ground Based Equipment

Refer Ground/Runway Equipment Required for Precision Instrument Approaches in this Chapter.

Review NOTAMS to make sure that the destination airport still meets visual or non-visual CAT II or CAT III requirements:

- Runway and approach lighting
- Radio navaid availability
- RVR equipment availability, etc.

Airborne Required Equipment

Refer to ILS Airborne Required Equipment in this Chapter.

Airplane Status, Airplane Recency Requirements

Refer to the FOM 6.7 - CAT II/III Operations (Aircraft's CAT II/III Recency Requirements)

Operating Limitations

Subject to the operating procedures herein, the B777 is authorized to be operated to the following minima:

- Weather

  Check weather conditions at destination and at alternate. Refer to the FOM 4.1 – Approach and Landing Minima and NOTAM - 'COMPANY MINIMA FOR CAT II/III' for specific weather minima for the runway.

- Braking Action

  A CAT III approach is permitted when braking action is reported to be at least medium for all part of the runway.

- Landing Distance

  The landing distance for a CAT II/III landing must meet the wet required landing field length (i.e. 1.15 times the required landing field length for dry runway).

- Wind Limitations

  The maximum surface crosswind component for CAT II/III autoland is 15 kts.

- Flight Crew Duties
  - The captain will conduct all CAT II/III approaches as a PF.
  - An approach and landing in conditions below CAT I minima will be accomplished by the captain occupying the left seat.
  - The captain may only operate as a PM in the right seat in actual CAT II/III conditions if he has been trained for CAT II/III PM duties and has a certificate.

DOWNGRADING CONDITIONS

If the following conditions are met above 1000 ft HAT, a flight crew can perform an approach with a higher minima when downgrading conditions exist (including downgrading to fail passive system).

- Briefing for approach procedure with a higher minima
- Reset minimum (if required)
- Reported RVR is at or above the approach minima

- Decision to downgrade is completed above 1000 ft HAT

Note: If an automatic landing system has downgraded to Fail passive (LAND2) while approaching with AH, use DH as a minimum.

Note: If DH is not published for CAT III approach and the aircraft is fail passive automatic landing system, set Radio Altimeter Minimum(DH) at 50 ft RA as a CAT III decision height.

ATC CALLS

Unless LVP are reported active by ATIS, clearance to carry out a CAT II or CAT III approach must be requested from ATC, who will check the status of the ILS and lighting and protect the sensitive areas from incursion by aircraft or vehicles. Such an approach may not be undertaken until the clearance has been received.

SEAT POSITION

Correct adjustment of flight crew's seat prior to approach in low visibility conditions is very important in order to take full advantage of existing visibility. The seat should be adjusted to confirm the external visual reference over the airplane nose.

USE OF LANDING LIGHTS

At night in low visibility conditions, landing lights can be detrimental to the acquisition of visual references. Reflected light from water droplets or snow may actually reduce visibility. Landing lights would therefore not normally be used in CAT II or CAT III weather conditions.

CAT II/III LANDING BRIEFING

In addition to the normal briefing, the PIC should include items for CAT II/III operations.

Refer to the FOM 6.7 - CAT II/III Operations (CAT II/III Landing Briefing).

AUTOMATIC SYSTEM USAGE

Autopilot

An approach in conditions below Category I weather minima shall be coupled using all available autopilots and shall be completed by an automatic landing.

The autopilots shall be engaged such that localizer capture would occur no later than the Final Approach Fix (FAF) and the airplane shall be fully configured for landing by 1500 ft HAT. The autopliot should only be disengaged upon reaching a safe taxi speed or stopping the aircraft after landing.

Autothrottle

Autothrottle is mandatory for all CAT Ill operations. For all other low visibility landings, the autothrottle shall be used, if available.

Autobrake

Autobrakes shall be used for CAT II/III operations if available. Autobrakes 3 or 4 should be selected to expedite stopping when landing in low visibility.

PRACTICE CAT II/III APPROACH

A Practice CAT II/III Approach can only be accomplished if both the PIC and F/O have completed CAT II/III training.

An auto-coupled approach and landing utilizing CAT II/III procedures in weather conditions at or above CAT I approach minima shall be deemed a practice CAT II/III approach.

Use the DA on a Practice CAT II/Ill Approach and visual cues must be obtained at the applicable CAT I DA, otherwise a go-around must be performed.

The ILS critical area is not protected from ground vehicles or other aircraft during auto coupled approach or landing when the weather is above ceiling 800 ft and visibility 2 miles. Regardless of ILS critical area protection, flight crews shall always use caution due to the possibility of glide slope or localizer signal interference.

CAT II/III APPROACH PROCEDURES

CAT II OPERATIONS

In CAT II operations, at DH the approach may be continued provided that the visual references is adequate and that the flight path is acceptable. If both these conditions are not satisfied, a go around is mandatory.

Missed Approach(CAT II)

A missed approach must be executed when any of the following conditions exist:

At or below 1000 ft HAT and prior to DH

- Any of the airborne equipment required for the particular CAT II operation being conducted becomes inoperative.
- Any of the required elements of the CAT II ground system becomes inoperative.
- Engine failure unless engine failure procedures are completed above 1000 ft HAT (recommended to continue if below 100 ft AGL).
- Crew incapacitation is evident (recommended to continue if below 100 ft AGL).
- Upon reaching the authorized decision height, the pilot has not identified the required visual references to safely continue the approach by visual reference alone.
- The localizer deviation is greater than 1/2 of the expanded scale (in the Decision Region).
- The glide-slope deviation is greater than 1/2 dot (in the Decision Region).

Prior to Touchdown

- The rate of descent exceeds 1000 fpm.
- After passing the authorized decision height, the pilot loses contact with the required visual references, or a reduction in visual reference occurs which prevents the pilot from safely continuing the approach by visual

reference alone.

- The pilot determines that a landing cannot be safely accomplished within the touchdown zone.
- Autoland cannot be accomplished due to airborne or ground equipment failure(s).
- The Autoland Status changes to NO AUTOLAND.
- FLARE is not annunciated on the PFD.
- If an ATC instruction is issued.

After a go-around, if another approach is planned:

- Re-assess the capability of the airplane (i.e. refer to the Required Equipment List).
- Re-assess the weather and runway conditions.
- Consider another approach at a different category if necessary.

CAT III OPERATIONS:

In CAT III operations with DH, the condition required at DH is that there should be visual references, which confirm that the aircraft is over the touchdown zone. Go around is mandatory if the visual references do not confirm this.

For CAT III operations with AH, the decision to continue does not depend on visual references, even though a minimum RVR is specified. The decision depends only on the operational status of the aircraft and ground equipment. If a failure occurs prior to reaching the AH, a go-around will be made. A go around must nevertheless be performed if EICAS Caution alert NO AUTOLAND triggers or FLARE is not annunciated on the PFD below AH.

Note: Operations based on an AH may continue to land regardless of reported weather conditions if equipped with a fail operational rollout system which did not indicate a malfunction prior to passing alert height, and the flight crew considers continuation a safe course of action.

Missed Approach(CAT III)

A missed approach must be executed when any of the following conditions exist:

At or below 1000 ft HAT and prior to AH or DH

- Any of the airborne equipment required for the particular CAT III operation being conducted becomes inoperative.
- Any of the required elements of the ground system becomes inoperative. However, CAT III approaches and landings may be continued even though the sequenced flashers became inoperative.
- Engine failure unless engine failure procedures are completed by 1000 ft HAT (recommended to continue if below 100 ft AGL).
- Crew incapacitation is evident (recommended to continue if below 100 ft AGL).
- The localizer deviation is greater than 1/2 of the expanded scale (in the Decision Region).
- The glide-slope deviation is greater than 1/2 dot (in the Decision Region).

Prior to Touchdown

- The rate of descent exceeds 1000 fpm.
- If the pilot determines that touchdown cannot be safely accomplished within the touchdown zone.
- Autoland cannot be accomplished due to airborne or ground equipment failure(s).
- The Autoland Status changes to NO AUTOLAND.
- FLARE is not annunciated on the PFD.
- If an ATC instruction is issued.

When Operating with DH

- At the DH, if the flight crew cannot clearly identify the required visual references (touchdown zone or touchdown zone lights) to verify that the aircraft will touch down in the touchdown zone.

- After passing the DH, If the flight crew has lost a visual reference(s) or flight crew cannot identify the visual reference(s).

After a go-around, if another approach is planned:

- Re-assess the capability of the airplane (i.e. refer to the Required Equipment List).
- Re-assess the weather and runway conditions.
- Consider another approach at a different category if necessary.

ILS APPROACH PROCEDURES/CALLOUTS

ALL ILS APPROACH (CAT I)

[ ] : Manual Flight

PF	PM
Call for "**FLAPS_____**"according to flap extension schedule	Call "**SPEED CHECK, FLAPS_____**" then position flap lever as directed
During flap extension, selecting the next flap setting should be initiated when reaching the maneuver speed for the existing flap position. Selection of the flaps to the next position should be made prior to decelerating below the recommended flap speed for the current flap setting.	
Call "**CHECK**"	For low altitude awareness during approach (approximately 2500 ft RA), call **"RADIO ALTIMETER"** when the radio altimeter is displayed.
Verify ILS identified Call "**CHECK**" or "**ROGER**"	Before clearance for approach, after identification of ILS by display or morse code, call "**_____IDENTIFIED**"
On intercept heading, after clearance for approach and checking the LOC & GS pointers. Call "**APPROACH MODE**" and push the approach mode switch [call for "**SELECT APPROACH MODE**"] Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it. Call "**CHECK**"	Call "**LOCALIZER & GLIDE SLOPE ARM**" (push the approach mode switch with call "**APPROACH MODE**") When the first positive motion of localizer pointer Call "**LOCALIZER ALIVE"**
Call "**CHECK**"	Call "**LOCALIZER CAPTURE"**

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td>Call "CHECK"
Call for "GEAR DOWN" "FLAPS 20"
["SET FLAPS 20 SPEED"]
Position speedbrake lever to ARMED.</td><td>When the first positive motion of glide slope pointer
Call "GLIDE SLOPE ALIVE"

Call "GEAR DOWN"and position landing gear lever DN.
Call "SPEED CHECK FLAPS 20"
and position flap lever to 20.
(set the flap 20 speed on MCP with call "FLAPS 20 SPEED SET".)</td></tr>
<tr><td>Call "CHECK"
Set missed approach altitude on MCP with call "MISSED APPROACH ALTITUDE_____SET"
[Call for "SET MISSED APPROACH ALTITUDE_____"]</td><td>Call "GLIDE SLOPE CAPTURE"
Call "_____MILES,_______(Altitude)" [1)]

Call "_____CHECK"
(set missed approach altitude on MCP with call "MISSED APPROACH ALTITUDE_____SET")</td></tr>
<tr><td colspan="2">[1)] Verify the G/S captured altitude and the distance to the runway.
If a false glide slope capture is suspected, perform a go-around procedure if visual conditions cannot be maintained. <CLICK>

Note: Use the displayed DTG (Distance To Go) to the destination in the FMS progress page to check the distance from present position to the runway.</td></tr>
<tr><td>When a glide slope is captured or as required
Call for "FLAPS 30 (or 25)"
[SET VREF PLUS "]</td><td>Call "SPEED CHECK FLAPS 30 (or 25)" ("VREF PLUS SET")
Position flap lever to 30 (or 25)
(Set the Vref plus speed).</td></tr>
<tr><td>Call for "BEFORE LANDING CHECKLIST"</td><td>Accomplish BEFORE LANDING checklist.</td></tr>
</table>

PF	PM
WARNING! ***Interference with the glideslope signal can result in erroneous AFDS pitch guidance indicated by FMA mode degradation, the AUTOPILOT caution message, and removal of the F/D pitch bar. If this occurs, do a go-around unless suitable visual references can be established and maintained***	
At the final approach fix(LOM, MKR, DME, etc.), verify the crossing altitude:	
Call "**CHECK**"	Call "**FINAL APPROACH FIX** _____" (published altitude) (" _____ **DME**" " _____ **VOR**" " _____ "(NDB name))
Call **"STABILIZED" or "VMC-CORRECTING" or "GO-AROUND"** Note: If unstabilized in VMC, the approach can be continued to 500 ft HAT with "VMC-CORRECTING" call to achieve a stabilized approach.	At 1000 ft HAT, **"ONE THOUSAND"** called by GPWS, call **"CLEARED TO LAND** (or **CONTINUE**) **"** Call out any unstable conditions.
Call **"STABILIZED" or "GO-AROUND"**	At 500 ft HAT, "**FIVE HUNDRED**" called by GPWS. Call out any unstable conditions.
Check visual cue. Call "**CHECK**"	At 100 ft above DA, call **"ONE HUNDRED ABOVE**"
Captain will call "**LANDING**" or "**GO-AROUND**"	At DA, "**MINIMUM**" called by GPWS.

CAT I AUTO COUPLED APPROACH & AUTOLAND

PF	PM
Call "**CHECK**"	When annunciated (approximately 1500 ft RA), call "**LAND THREE(TWO)**" "**ROLLOUT, FLARE ARM**"
Note: Without LAND 2 or LAND 3 annunciated (i.e. NO AUTOLAND), the autopilot must be disengaged below 200 ft AGL.	
Call "**STABILIZED**" or "**VMC-CORRECTING**" or "**GO-AROUND**" Note: If unstabilized in VMC, the approach can be continued to 500 ft HAT with "VMC-CORRECTING" call to achieve a stabilized approach	At 1000 ft HAT, **"ONE THOUSAND"** called by GPWS, call **"CLEARED TO LAND** (or **CONTINUE**) " Call out any unstable conditions.
Call **"STABILIZED" or "GO-AROUND"**	At 500 ft HAT, "**FIVE HUNDRED**" called by GPWS. call **"LAND 3(2)"** or **"NO AUTOLAND"** Call out any unstable conditions.
Check visual cue. Call "**CHECK**"	At 100 ft above DA, call "**ONE HUNDRED ABOVE**"
Captain will call "**LANDING"** or **"GO-AROUND**"	At DA, "**MINIMUM**" called by GPWS.
Call **"GO-AROUND"** (if **"NO FLARE"**)	When annunciated, call "**FLARE**"(approximately 40-60 ft RA) "**IDLE**" (approximately 25 ft RA) "**ROLLOUT**"(approximately 2 ft RA) if not, call **"NO FLARE"** or **"NO IDLE"** or **"NO ROLLOUT"**
When disengage AP during landing roll, call "**AUTOPILOT DISENGAGE**"	

CAT II APPROACH

CAPT	F/O
Check visual cue. Call "**CHECK**"	At 100 ft above DH, call "**ONE HUNDRED ABOVE**"
Call "**LANDING**" or "**GO-AROUND**"	At DH, "**MINIMUM**" called by GPWS.
Call "**GO-AROUND**" (if **NO FLARE**)	When annunciated, call "**FLARE**" (approximately 40-60 ft RA) "**IDLE**" (approximately 25 ft RA) "**ROLLOUT**" (approximately 2 ft RA) If not, call "**NO FLARE**" or "**NO IDLE**" or "**NO ROLLOUT**"
When disengage AP during landing roll, call "**AUTOPILOT DISENGAGE**"	

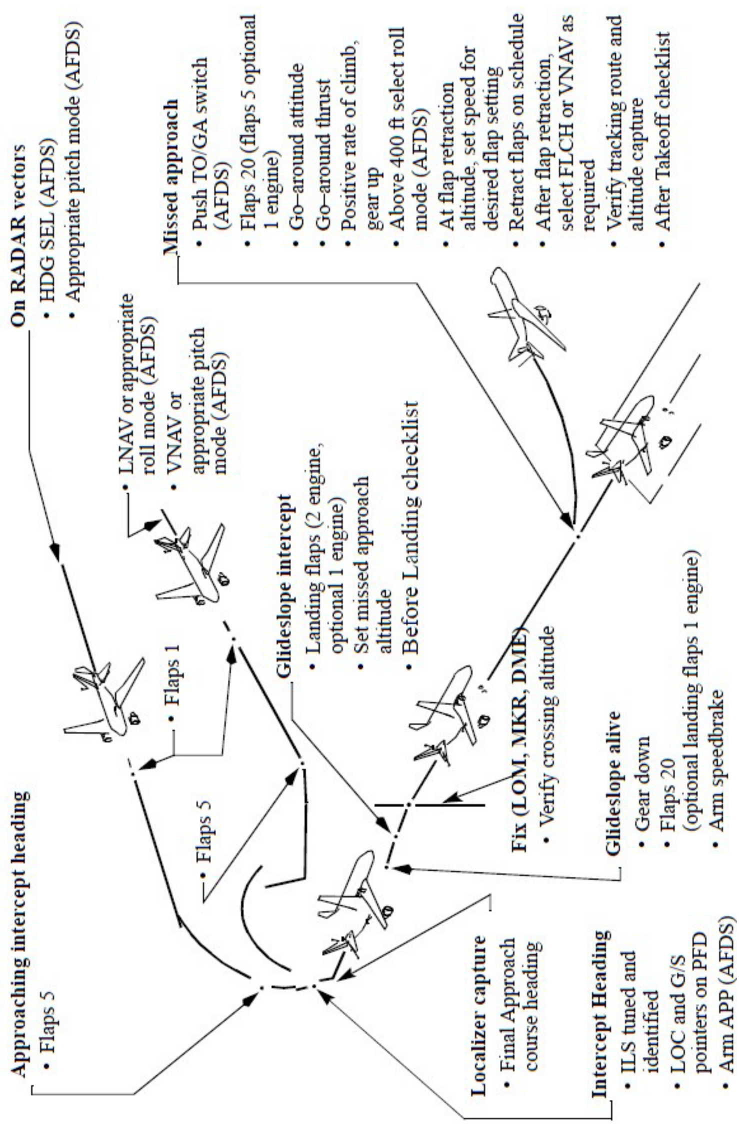
CAT III APPROACH

CAPT	F/O
If CAT III with AH: Call "**CHANGE MINIMUMS**" Change Minimums to CAT III with DH or CAT II. If CAT III with DH: Call "**CHECK**” Call "**GO-AROUND**"	Above 1000 ft HAT, if autoland status is downgraded from LAND3 to LAND2 call “**LAND2**” If CAT III with AH: Change Minimums to CAT III with DH or CAT II. if autoland status is downgraded from LAND3 or LAND2 to NO AUTOLAND, call **"NO AUTOLAND"**
Call **"STABILIZED" or "GO-AROUND"**	At 1000 ft HAT, **"ONE THOUSAND"** called by GPWS. call **"CLEAR TO LAND"(or CONTINUE)”** Call out any unstable conditions.

CAPT	F/O
If CAT III with AH: Call "**GO-AROUND**" if CAT III with DH: Call "**CHECK**" Call **"GO-AROUND"**	At or below 1000 ft HAT, if autoland status is downgraded from LAND3 to LAND2, call "**LAND2**" if autoland status is downgraded from LAND3 or LAND2 to NO AUTOLAND, call "**NO AUTOLAND**"
Call **"STABILIZED" or "GO-AROUND"**	At 500 ft HAT, **"FIVE HUNDRED"** called by GPWS. call **"LAND3" or "LAND2"** Call out any unstable conditions.
Call "**LAND3**" or "**GO-AROUND**"	If CAT III with AH: At alert height (100 ft RA), **"ONE HUNDRED"**called by GPWS, call **"ALERT HEIGHT"**
Call "**CHECK**" Call "**LANDING**" or "**GO-AROUND**"	If CAT III with DH: At 100 ft above DH, call "**ONE HUNDRED ABOVE**" At DH, "**MINIMUM**" called by GPWS
Call "**GO-AROUND**" (if **NO FLARE**)	When annunciated, call "**FLARE**" (approximately 40-60 ft RA) "**IDLE**" (approximately 25 ft RA) "**ROLLOUT**" (approximately 2 ft RA) If not, call "**NO FLARE**" or "**NO IDLE**" or "**NO ROLLOUT**"
When disengage AP during landing roll, call "**AUTOPILOT DISENGAGE**"	If off-centerline during rollout, call "**STEER RIGHT** (or **LEFT**)" (as appropriate)
Stop aircraft or make safe taxi speed on the runway. Check airport signs and markings(SMGCS [1)]).	Assist the captain to identify appropriate taxiway.

ILS APPROACH

ILS APPROACH



NON-PRECISION INSTRUMENT APPROACHES

CONSIDERATIONS

Use of Autopilot

When flying non-precision approaches, autopilot is recommended until suitable visual reference is established on final approach.

Use the autopilot during the approach to give:

- Autopilot alerts and mode fail indications
- More accurate course and glide path tracking
- Lower RNP limits

Use of flight director/autothrottle

Ensure the proper F/D modes are selected for the desired maneuver.

If the F/D commands are not to be followed, turn both F/Ds to OFF, then place the PM's F/D ON. This eliminates unwanted commands for the PF and allows continued F/D guidance for the PM in the event of a go-around when pitch or roll mode is changed.

> Note: When the autopilot is off and both flight director switches are turned off, the autothrottle mode goes to speed (SPD) mode and maintains the speed set in the MCP IAS/MACH window.

Use of LNAV (Database Selection)

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 approach is flown by this "overlay" method, raw data should be monitored throughout the approach to assure obstacle clearance.

> Note: If an NDB approach for the desired runway is in the database, an overlay approach should not be used.

Use of VNAV

There are two types of approaches in the navigation database :

- Approaches with a glide path (GP) angle displayed on the final approach segment of the LEGS page. The final approach segment is completely compatible with VNAV and complies with final approach step down altitudes (minimum altitude constraints).

- Approaches where no GP angle is published and where the approach end of the runway is defined by a runway waypoint (RWxx) or a missed approach point fix (MXxx) exists. Normally these waypoints display an approximate 50 ft threshold crossing altitude constraint and may be used "as is" for VNAV. If the RWxx waypoint altitude constraint does not coincide with approximately 50 ft, this waypoint may be modified with a threshold crossing altitude of approximately 50 ft.

  Note: Threshold crossing altitude is normally required entry of a four-digit number. Example: enter 80 ft as 0080.

  - VNAV may be used for approaches modified in this way; however, the approach should be flown by constant reference to raw data (VOR, NDB, DME, etc.) and compliance with each minimum altitude constraint is required. Use of a DA(H) is not recommended when the final approach is manually constructed in this manner.
  - ILS approaches coded with the appropriate threshold crossing height may be used as an overlay for other approaches such as LOC or NDB.

VNAV should be used only for approaches that have one of the following features:

- A published GP angle on the LEGS page for the final approach segment.
- An RWxx waypoint at the approach end of the runway.
- A missed approach waypoint before the approach end of the runway. (e.g., MXxx)

These features permit construction of a normal glide path.

VOR approaches with the missed approach point on the LEGS page beyond the runway threshold and circling only approaches do not have these features.

Note: Do not manually build the approach or add waypoints to the selected procedure. If additional waypoint references are desired, use the FIX page.

Note: Refer to VNAV Approach in FOM 6.7 - VNAV Approach (Minimum Applications) for the use of an MDA as a DA.
If required to remain at or above MDA during the missed approach, missed approach must be initiated at least 50 ft above MDA.

Use of V/S

- At or after the FAF, select V/S mode and descend at appropriate vertical speed to arrive at the MDA at a distance from the runway (VDP) to allow a normal landing profile. There should be no level flight segment at the MDA.
- Be prepared to land or go-around from the MDA at the VDP. Note that a normal landing cannot be completed from the published missed approach point on many instrument approaches.

Note: If in a descent when nearing the MDA, initiating a missed approach approximately 50 ft above MDA may be necessary to avoid descending below the MDA during the missed approach.

INSTRUMENT APPROACH USING VNAV

This procedure is not authorized using QFE.

[ ] : Manual Flight

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td colspan="2">Select the approach procedure on the arrival page.
Add cold temperature corrections to waypoint altitude constraints as appropriate.</td></tr>
<tr><td colspan="2">Verify VNAV glide path angle displayed on final approach segment of LEGS page. Detailed information may be found in POM 5.9 Non-precision Instrument Approaches - Use of VNAV. <CLICK></td></tr>
<tr><td colspan="2">Set barometric minimums selector at MDA(H)+50 ft or DA(H).</td></tr>
<tr><td colspan="2">For all approaches, ensure appropriate navaids are tuned and identified prior to commencing approach and monitor raw data if it is available. But during localizer approach, applicable raw data must be monitored throughout the approach.</td></tr>
<tr><td colspan="2">Note: If a significant disagreement exists between FMC position and raw data, discontinue use of LNAV and VNAV.</td></tr>
</table>

PF	PM
Recommended roll mode for final approach; • LOC approach : LOC or LNAV • VOR/NDB approach : LNAV, TRK SEL or HDG SEL • RNAV, GPS approach : LNAV	
Note: Autopilot use is recommended until suitable visual reference is established.	
Verify (LOC, VOR, NDB) identified. Call "**CHECK**" or "**ROGER**"	Before clearance for the approach: After identification of LOC, VOR or NDB by display or Morse code, call "**______IDENTIFIED**"
Adjust speed as needed.	
Call for "**FLAPS____**" according to flap extension schedule.	Call "**SPEED CHECK, FLAPS____**" and position flap lever as directed.
Localizer Approach	
On intercept heading, after clearance for approach, LOC identified and checking the LOC pointer; Select LOC mode switch with call "**LOCALIZER MODE**" [call for **"SELECT LOCALIZER MODE"**].	Call "**LOCALIZER ARM**" [select LOC mode switch with call **"LOCALIZER MODE"**].
WARNING! When using LNAV to intercept the localizer, LNAV might parallel the localizer without capturing it. The airplane can then descend on the VNAV path with the localizer not captured.	
Call "**CHECK**"	When the first positive movement of localizer pointer, call "**LOCALIZER ALIVE**".
Call "**CHECK**"	Call "**LOCALIZER CAPTURE**"
VOR Approach	

PF	PM
VOR/ADF switch(es) - VOR	
Before IAF, after clearance for approach, verify VOR identified. Select LNAV Switch with call "**LNAV**" [call for **"SELECT LNAV"**]	Call "**LNAV ARM**" [select LNAV mode switch with call **"LNAV"**]
Call "**CHECK**"	Call "**LNAV CAPTURE**"
NDB Approach	
VOR/ADF switch(es) - ADF	
Call "**CHECK**"	When the NDB needle within 5 degrees of final approach course. Call "**FIVE DEGREES BEFORE**".
Before IAF, after clearance for approach, verify NDB identified. Select LNAV Switch with call "**LNAV**" [call for **"SELECT LNAV"**]	Call "**LNAV ARM**" [select LNAV mode switch with call **"LNAV"**]
Call "**CHECK**"	Call "**LNAV CAPTURE**"
RNAV(GNSS or GPS), RNAV(VOR/ DME) APPROACH	
Before IAF, after clearance for approach, select LNAV Switch with call "**LNAV**" [call for **"SELECT LNAV"**]	Call "**LNAV ARM**" [select LNAV mode switch with call **"LNAV"**]
Call "**CHECK**"	Call "**LNAV CAPTURE**"
IAF TO FAF (For all Approaches)	
In descent, set intermediate altitude constraints (or closest 100 foot increments below) on MCP, Call **"NEXTALT___SET"** [call for **"SET NEXT ALT____"**]	Call "**____CHECK**" [set next altitude on MCP with call **"NEXT ALT___SET"**]

PF	PM
Call "**CHECK**"	After passing each step-down fix, callout the next DME FIX(or MARKER) and altitude limits. Call "**_____DME(MARKER),_______**"
Approaching the FAF	
Call "**CHECK**"	Approximately 2 miles prior to the FAF, verify VNAV PTH, VNAV ALT or ALT is engaged. Call "**APPROACHING FAF**" "**VNAV PTH**", "**VNAV ALT**" or "**ALT**".
Call for "**GEAR DOWN**" "**FLAPS 20**". Speed intervention, set flaps 20 speed. [call for **"SET FLAPS 20 SPEED"**] Set SPEEDBRAKE lever to ARM.	Call "**GEAR DOWN**" "**SPEED CHECK FLAPS 20**". Set the landing gear lever to DN. Set the flap lever to 20. [set FLAPS 20 SPEED on MCP with call **"FLAPS 20 SPEED SET"**]
Set MDA(H)+50 or DA(H) on MCP altitude window, call "**MDA(H)+50_____SET**" or "**DA(H) _____ SET**". [call for **"SET MDA(H)+50___" or "SET DA(H)____"**] Select VNAV switch if it is in ALT mode, call "**VNAV**". Verify speed intervention. [call for **"SELECT VNAV"**]	Call "**______CHECK**" [set MDA(H)+50 or DA(H) on MCP with call **"MDA(H)+50___SET" or " DA(H)____SET"**] Check pitch mode and call "**VNAV PATH**" [select VNAV mode switch with call **"VNAV"**, verify speed intervention, Check pitch mode and call **"VNAV PATH"**]
Call "**FLAPS 30 (or 25)**". [call for **"SET VREF PLUS____"**]	Call "**SPEED CHECK, FLAPS 30 (or 25)**". Set the flap lever to 30 (or 25). [Set VREF PLUS___SPEED on MCP with call **"VREF PLUS___SET"**]

PF	PM
Call "**BEFORE LANDING CHECKLIST**"	Accomplish BEFORE LANDING checklist.
FAF TO MDA(H) or DA(H)	
Monitor VNAV path and descent rate.	
Note: There may be a level segment beyond the FAF before intercepting the descent path.	
When at least 300 ft below missed approach altitude, set the missed approach altitude on the MCP, call "**MISSED APP ALT_____SET**". [call for **"SET MISSED APP ALT___"**]	Call "_____**CHECK**". [set Missed APP ALT on MCP with call **" MISSED APP ALT___SET"**]
Call **"STABILIZED" or "VMC-CORRECTING" or "GO-AROUND"** Note: If unstabilized in VMC, the approach can be continued to 500 ft HAT with "VMC-CORRECTING" call to achieve a stabilized approach.	At 1000 ft above HAT, "**ONE THOUSAND"** called by GPWS, call **" CLEAR TO LAND** (or **CONTINUE**)**"** Call out any unstable condition.
Call "**STABILIZED**" or "**GO-AROUND**"	At 500 ft HAT, "**FIVE HUNDRED**" called by GPWS. Callout any unstable condition.
Call "**CHECK**"	At 100 ft above Baro minimum, call "**ONE HUNDRED ABOVE**"
(CAPT) Call "**LANDING**" or "**GO-AROUND**" (If suitable visual reference is not established, execute missed approach.)	At Baro minimum, "**MINIMUM**" called by GPWS. At MAP, call "**MISSED APPROACH POINT**"
Missed Approach must be initiated at least 50 ft above MDA(H) or at DA(H).	
Landing	

PF	PM
After suitable visual reference is established: Push the A/P disengage switch.(Disengage autopilot before descending below MDA(H).)	

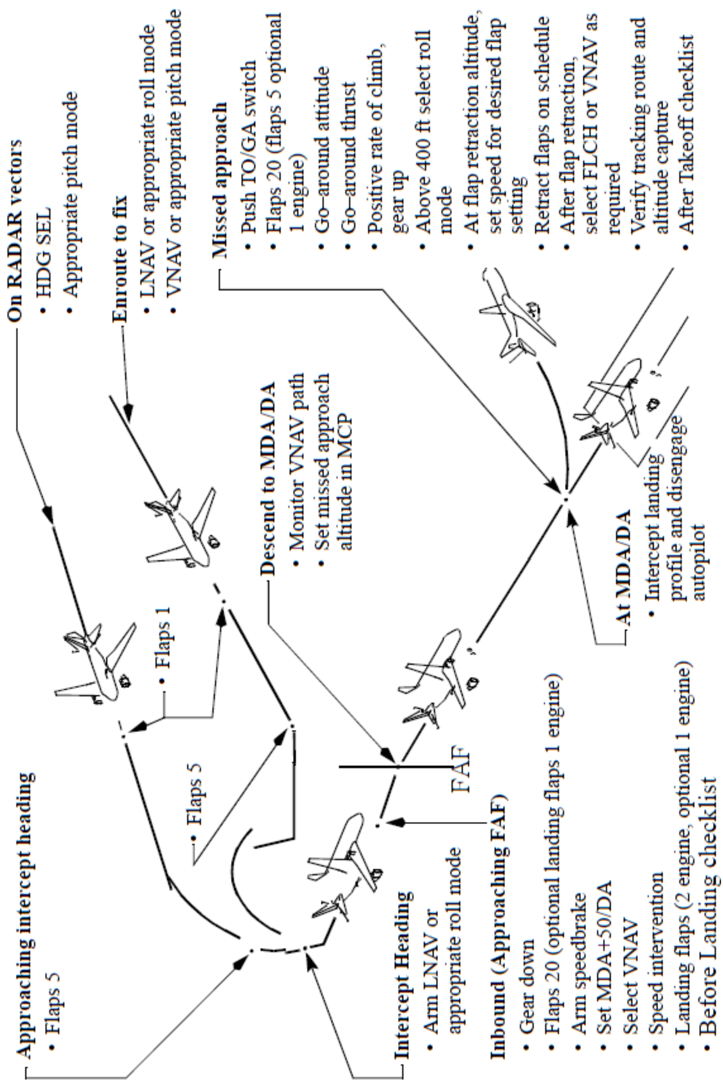
While VNAV PTH guidance may still be used as a reference once the airplane is below MDA(H) or DA(H), the primary means of approach guidance is visual.
If the flight director commands are not to be followed,

turn both F/Ds to OFF, then place the PM's F/D ON, and verify that the PFD autothrottle annunciation displays SPD mode. Complete the landing.

NON-PRECISION INSTRUMENT APPROACHES

INSTRUMENT APPROACH USING VNAV

INSTRUMENT APPROACH USING VNAV



INSTRUMENT APPROACH USING V/S OR FPA

[ ] : MANUAL FLIGHT

PF	PM
Select the approach procedure on the arrival page. Add cold temperature corrections to waypoint altitude constraints as appropriate.	
Note: Autopilot use is recommended until suitable visual reference is established.	
Set Barometric minimums selector at MDA(H)+50 ft.	
For all approaches, ensure appropriate navaids are tuned and identified prior to commencing approach and monitor raw data if it is available. But during localizer approach, applicable raw data must be monitored throughout the approach.	
Note: If a significant disagreement exists between FMC position and raw data, discontinue use of LNAV.	
Recommended roll mode for final approach; • LOC approach: LOC or LNAV • VOR/NDB approach : LNAV, TRK SEL or HDG SEL • RNAV, GPS approach : LNAV Note: When using LNAV to intercept a localizer, LNAV might parallel the localizer without capturing it. Use HDG SEL/TRK or HDG HOLD/TRK HOLD to intercept the final approach course, if needed.	
Verify (LOC,VOR,NDB) identified. Call "**CHECK**" or "**ROGER**"	Before clearance for the approach: After identification of LOC,VOR or NDB by display or Morse code, call "**______IDENTIFIED**"
Adjust speed as needed.	
Call for "**FLAPS____**" according to flap extension schedule.	Call " **SPEED CHECK, FLAPS____**" and Position flap lever as directed.
Localizer Approach	
On intercept heading, after clearance for approach, LOC identified and checking the LOC pointer; Select LOC mode switch with call "**LOCALIZER MODE**". [call for **"SELECT LOCALIZER MODE"**]	Call "**LOCALIZER ARM**" [select LOC mode switch with call **"LOCALIZER MODE"**]

PF	PM
Call "**CHECK**"	When the first positive movement of localizer pointer, call "**LOCALIZER ALIVE**"
Call "**CHECK**"	Call "**LOC CAPTURE**"
VOR Approach	
VOR/ADF switch(es) - VOR	
Before IAF, after clearance for approach, verify VOR identified. Select LNAV switch with call "**LNAV**" [call for **"SELECT LNAV"**]	Call "**LNAV ARM**" [select LNAV mode switch with call **"LNAV"**]
Call "**CHECK**"	Call "**LNAV CAPTURE**"
NDB Approach	
VOR/ADF switch(es) - ADF	
Before IAF, after clearance for approach, verify NDB identified. Select LNAV Switch and Call "**LNAV**" [call for **"SELECT LNAV"**]	Call "**LNAV ARM**" [select LNAV mode switch with call **"LNAV"**]
Call "**CHECK**"	Call "**LNAV CAPTURE**"
RNAV(GNSS or GPS), RNAV(VOR/ DME) APPROACH	
Before IAF, after clearance for approach, select LNAV Switch with call "**LNAV**" [call for **"SELECT LNAV"**]	Call "**LNAV ARM**" [select LNAV mode switch with call **"LNAV"**]
Call "**CHECK**"	Call "**LNAV CAPTURE**"

PF	PM
IAF TO FAF (For all Approaches)	
In descent, set intermediate altitude constraints (or closest 100 foot increments below) on MCP, Call **"NEXT ALT___SET"** [call for **"SET NEXT ALT____"**]	Call "**____CHECK**" [set next altitude on MCP with call **"NEXT ALT___SET"**]
Call "**CHECK**"	After passing each step-down fix, callout the next DME FIX(or MARKER) and altitude limits. Call "**_____DME(MARKER),_______**"
Call "**GEAR DOWN**" "**FLAPS 20**" [call for **"SET FLAPS 20 SPEED"**] Set SPEEDBRAKE lever to ARM.	Call "**APPROACHING FAF**" Call "**GEAR DOWN**" "**SPEED CHECK FLAPS 20**". Set the landing gear lever to DN. Set the flap leve‘r to 20. [set FLAPS 20 SPEED on MCP with call **"FLAPS 20 SPEED SET"**]
Call "**FLAPS 30 (or 25)**" [call for **"SET VREF PLUS____"**]	Call "**SPEED CHECK, FLAPS 30 (or 25)**" Set the flap lever to 30 (or 25). [set VREF PLUS SPEED on MCP with call **"VREF PLUS___SET"**]
Call "**BEFORE LANDING CHECKLIST**"	Accomplish BEFORE LANDING checklist.
Before descent to MDA(H): Set the first intermediate altitude constraint or MDA(H)+50 on MCP altitude window.	
Call "**_____SET" or "MDA(H)+50 _____SET**" [call for **"____SET or "SET MDA(H)+50___"**]	Call "**______CHECK**" [set**______SET** or MDA(H)+50 on MCP with call **"____SET or MDA(H)+50___SET"**]

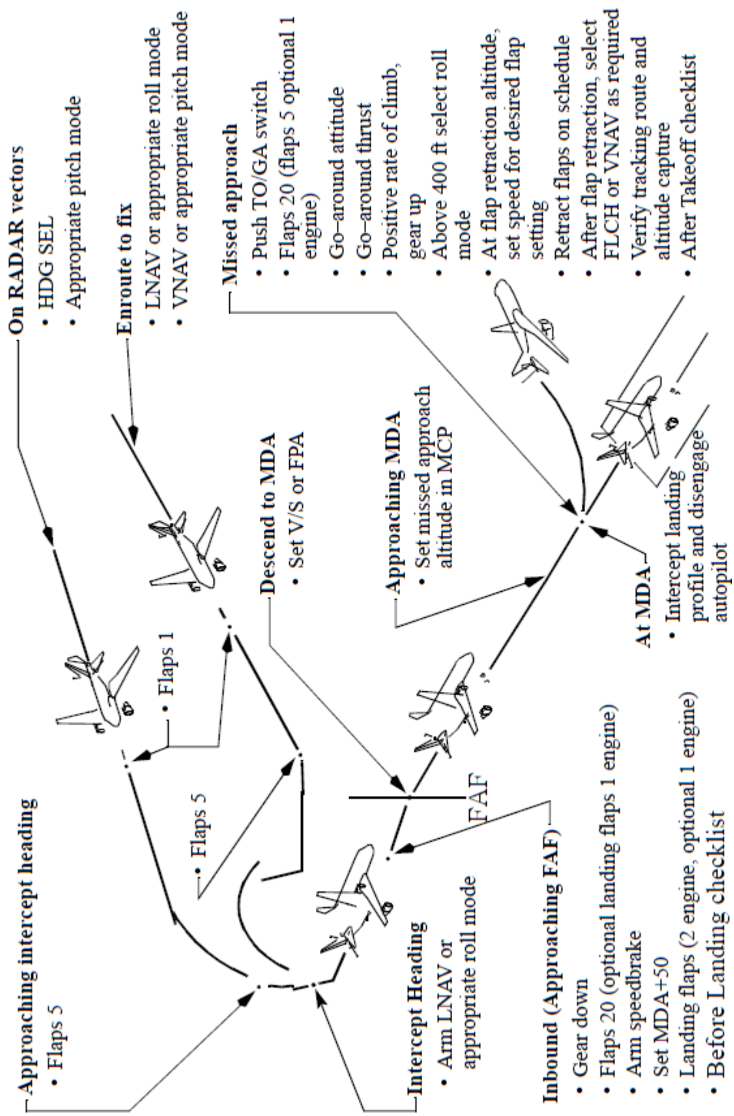
PF	PM
Set the MCP altitude to the nearest 100 foot increment at or below each intermediate altitude constraint. When the current constraint is assured, set the next constraint before ALT is engaged to achieve a continuous descent path. Set the MCP altitude to the nearest 10 foot increment at or above the MDA(H).	
FAF to MDA(H)	
At or after the FAF: Push the V/S or FPA switch and set desired V/S or FPA. Call "**V/S_____SET**" or "**FPA___SET**" [call for **"SET V/S_____" or "SET FPA"**] Set desired V/S or FPA to descend to MDA(H). Use a V/S or FPA that results in no level flight segment at MDA(H).	Call "**FINAL APPROACH FIX**" Call "**CHECK**" [set V/S or FPA on MCP with call **" V/S _____ SET" or "FPA___SET"**]
Call **"STABILIZED" or "VMC-CORRECTING" or "GO-AROUND"** Note: If unstabilized in VMC, the approach can be continued to 500 ft HAT with "VMC-CORRECTING" call to achieve a stabilized approach.	At 1000 ft HAT, "**ONE THOUSAND"** called by GPWS, call **"CLEAR TO LAND** (or **CONTINUE**)**"**. Call out any unstable condition.
Set missed approach altitude. Call "**MISSED APP ALT______SET**" [call for **"SET MISSED APP ALT_____"**]	Approximately 300 ft above the MDA(H), call "**APPROACHING MDA**" Call "**_______CHECK**" [set MISSED APP ALT on MCP with call **" MISSED APP ALT_____SET"**]
Call "**STABILIZED**" or "**GO-AROUND**"	At 500 ft HAT, if not called by GPWS, call "**FIVE HUNDRED**", Call out any unstable condition.
Call "**CHECK**"	At 100 ft above Baro Minimum, call **"ONE HUNDRED ABOVE"**

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td>(CAPT)

Call "LANDING" or "GO-AROUND"
(If suitable visual reference is not established, execute missed approach.)</td><td>At Baro Minimum,
"MINIMUM" called by GPWS.
At MAP
Call "MISSED APPROACH POINT"</td></tr>
<tr><td colspan="2">Landing</td></tr>
<tr><td>After suitable visual reference is established:
Push the A/P disconnect switch.
(Disengage autopilot before descending below MDA(H).)</td><td></td></tr>
<tr><td colspan="2">Turn both F/Ds to OFF, then place the PM's F/D ON, and verify that the PFD autothrottle annunciation displays SPD mode. Complete the landing.
However, if runway is 'in sight' near MDA(H) with low visibility condition, both F/Ds may not be turned to OFF. The primary means of approach guidance is visual.</td></tr>
</table>

INSTRUMENT APPROACH USING V/S OR FPA

INSTRUMENT APPROACH USING V/S OR FPA



RNAV (RNP AR) APPROACH

GENERAL CONCEPTS & DEFINITIONS

General

RNAV (RNP) procedures are RNP approaches that require special aircraft and aircrew authorization.

Compared to standard RNAV approach procedures, the RNAV(RNP) approach procedures are characterized by:

- RNP values $\leq$ 0.3 NM
- Curved flight path before and after the Final Approach Fix (FAF) or Final Approach Point.
- Protections areas laterally limited to 2xRNP (2 times of RNP) value without any additional buffer.

These approach procedures are always designed to be flown with baro-VNAV capability. The RNAV (RNP) operations may include missed approach procedures with reduced RNP (<1NM).

Radius to Fix(RF) Legs

The RF legs are waypoints connected by a constant radius course similar to a DME arc. These are shown on terminal procedures as a curved track between two or more waypoints. Some considerations regarding use of RF legs:

- There may be a maximum speed shown on some straight legs or some RF legs of smaller radius. This limitation is critical for the crew to observe since the ability of the AFDS to track the RF leg is determined by ground speed and maximum available bank angle. In high tailwinds, the resulting ground speed may cause the maximum bank angle to be reached. In this situation, excessive course deviation may occur if the maximum RF leg speed is exceeded.
- Do not begin a procedure by proceeding direct to an RF leg. This may cause excessive deviation when the airplane maneuvers to join the RF leg. Normally there is a track-to-fix leg prior to an RF leg to ensure proper RF leg tracking.

- Intercept course to or direct to route modifications delete an RF leg if done to the second waypoint on an RF leg.
- If a missed approach is executed while on an RF leg, it is important to immediately re-select LNAV (or verify that LNAV has re-engaged for airplanes equipped with the TO/GA to LNAV feature) to avoid excessive course deviation. GA roll mode is a track hold mode and is not compatible with low RNP operations if left engaged. The PF must continue to track the LNAV course using the map display as a reference until LNAV is re-engaged.
- In case of a missed approach, the maximum RF leg speed shall not be exceeded (if applicable).
- If a temporary loss of the FMC occurs, RF legs will appear as part of the inactive route when the FMC returns to normal operation. Once the route is activated and the EXEC key is pressed, a normal LNAV capture of an RF leg is possible if the situation permits.

Navigation Performance Scales (NPS)

~~777-300ER, 777F,~~ HL7791-HL8284 (With NPS)

For airplanes with NPS the flight crew can monitor the dynamic relationship between ANP, RNP and current flight path deviations. The lateral and vertical deviation scales are based on the familiar concepts of a centerline indication, scale limits, and a deviation pointer and provide the flight crew with a clear indication of current position in relation to desired position and the total allowable error. Full scale lateral and vertical deviation for NPS is equal to the FMC RNP value. If the deviation approaches the limit, a correction back to the path is needed.

At anytime the deviation exceeds the limit or an amber deviation alert occurs the flight crew may change to a non-RNP procedure. If unable, the crew should execute a missed approach unless suitable visual reference is already established.

Navigation Performance Scales (NPS)

~~777-200ER, 777-300,~~ HL7700-HL7756 (Without NPS)

Without the NPS system, an amber lateral and vertical deviation alert on the PFD is not available. The PM refers to the FMC progress page for XTK and VTK information during the approach. If a deviation occurs, and the correction back to course is not immediate, then the PM should refer to the FMC progress page and notify the PF if the maximum allowable deviations are reached.

RNP Manual entry

The flight crew may need to make a RNP manual entry if the displayed RNP for the route or procedure is incorrect. The RNP is depicted on the published procedure being flown. Refer to POM 6.11 - RNP Manual Entry. *<CLICK>*

The FMC uses one of the following as the displayed RNP:

- Default RNP - FMC default values are set by the FMC and are displayed if no RNP is available from the navigation database or one has not been manually entered.
- Navigation database RNP values (if available) are displayed based on values associated with the procedure. These values may be unique for certain segments or terminal procedures.
- Manually entered RNP - remains until changed or deleted.

Note: The FMC calculates, monitors and displays ANP. The flight crews should note that ANP is only related to the accuracy of FMC position.

Note: If the RNP Manual entry is made by crew, the automatic RNP change is inhibited until the crew deletes the RNP Manual entry.

RNAV (RNP) APPROACH REQUIREMENT

CREW QUALIFICATION

Refer to the FOM 6.7 - RNAV Approach (RNAV (RNP) Approach).

REQUIRED EQUIPMENT

Requirement for RNAV (RNP) approach Operations
Airplane equipment required to begin the approach: • 2 CDUs • EICAS Display • 2 NDs • 2 PFDs • 2 FMCs • 2 GPS Receivers
Verify the following EICAS messages are not shown: • GND PROX SYS • NAV ADIRU INERTIAL • NAV UNABLE RNP • SGL SOURCE RAD ALT • SINGLE SOURCE F/D • TERR POS • AIR DATA SYS • FMC • FMC L or FMC R • GPS • GPS L or GPS R

AUTOMATIC SYSTEM USAGE

The flight crew must use a lateral deviation indicator, FD in LNAV mode on RNAV (RNP) approach procedures.

During approaches using VNAV, VNAV PTH is required for any leg segment with a coded glide path angle. These procedures show only

LNAV/VNAV approach minima and do not allow use of LNAV only.

The use of autopilot is recommended for the RNAV (RNP) approaches.

ALTIMETER CROSSCHECK

The flight crew must complete an altimetry crosscheck ensuring that both pilots' altimeters agree within ±100 ft not later than the FAF after receiving the current local altimeter setting at the airport of intended landing. Do not continue the procedure if the altimetry crosscheck fails.

The flight crew must verify the current local altimeter at the airport of intended landing is set not later than the FAF.

TEMPERATURE LIMIT

The RNAV (RNP) approach charts identify outside air temperature limits applicable to conduct an approach using barometric vertical navigation (baro-VNAV).

The RNAV (RNP) approach shall not be conducted when the reported airport temperature exceeds the temperature limits specified in the approach charts.

LOW ALTITUDE TEMPERATURE CORRECTIONS

CAUTION! ***The Low Altitude Temperature Corrections shall not be applied to the final approach segment (FAF to MAP) of RNAV (RNP) approaches.***

If required, the Low Altitude Temperature Corrections shall be applied to the initial, intermediate, or missed approach segments of the RNAV (RNP) approach according to FOM 4.4 - Pressure Altimeter Corrections (Cold Temperature Corrections).

Note: The flight crews must coordinate with ATC prior to use of temperature compensation in order to prevent loss of aircraft separation.

RNAV (RNP) APPROACH OPERATIONS

APPROACH PREPARATIONS

Prior to beginning the approach, must brief the approach and complete needed preparations. These include, but are not limited to, the following items:

Approach Preparations
• Selection of the approach procedure, normally without modifications, from the navigation database and verify ACT RTE LEGS page matches the charted approach. • Verify displayed glidepath (GP) angle is not less than the charted value minus 0.01 degrees. • Lateral or Vertical Modifications: - If there is an “at or above” altitude restriction before the FAF, it may be changed to an “at” altitude restriction using the same altitude. - Speed modifications are allowed as long as the maximum published speed is not exceeded. - No other lateral or vertical modifications should be made at or after the IAF except as described in the paragraph of “Low Altitude Temperature Corrections”.
• Verify the “NAV UNABLE RNP” alert is not displayed.
• Review RNP availability predictions: - The obtained RNP availability prediction will determine the lowest value that can be used by the crew. • If there are multiple RNPs published for the approach procedure: - The crew should note if RNP availability outages affect selection of any of the published RNP values. - The RNP availability restrictions, due to known satellite outages, terrain masking, or other factors, can sometimes affect the availability of lower RNPs (less than 0.15 nm) but will only rarely affect use of RNPs above 0.15 nm. - The highest available value of RNP should be selected by the crew that is permitted by the prevailing weather conditions.

Approach Preparations

- Verify the published approach RNP is equal to or greater than:
  - 0.11 (A/P and F/D)
  - 0.11 (F/D only)

  Note: The minimum RNP values as described above are certified to B777 for RNAV (RNP) approaches and landings.

~~777-300ER, 777F,~~ **(With NPS)**

- With NPS, the flight crew may enter 125 ft for vertical RNP. While there are no vertical RNP values published on the approach chart, the use of 125 ft will cause the NPS amber deviation exceedance alert to occur at 75 ft or slightly less deviation, since vertical ANP will be at least 50 ft at all times.

- Inhibiting of navigation radio updating, as needed.
  - Verify (Select if “OFF” displayed) RAD NAV INHIBIT - ON on the REF NAV DATA page.

  Note: Use RAD NAV INHIBIT to inhibit all radio updating. When GPS updating is active, LOC updating is also inhibited.

- Verify maximum IAS for Radius-to-Fix (RF) legs for each segment of the approach:

Approach Segment	Max Indicated Airspeed (Knots) Cat C	Cat D
IAF to FAF	240	250
FAF to DA	140	165
	If a Cat C aircraft final approach speed exceeds 140 kts, it shall be regarded as a Cat D aircraft.	
	(Do not exceed 165 kts and the Cat D Weather Minima shall be applied.)	
Missed Approach	240	265
Cat: Aircraft Approach Category by Indicated Airspeed (IAS)		

B777 Maximum speeds in the RF legs

- Other speed restrictions as published for the approach.

- Verify the reported airport temperature is within published limits for the approach

- Set current local altimeter

  (remote altimeter settings not allowed)

Approach Preparations
• Verify wind is within limits published for the approach (if applicable)

RNAV (RNP) LANDING BRIEFING

In addition to the normal briefing, the PF should include items for RNAV (RNP) approach operations.

Refer to the FOM 6.7 - RNAV Approach (RNAV (RNP) Approach).

CONDUCTING AN RNAV (RNP) APPROACH

Select LNAV no later than the IAF. If on radar vectors, arm LNAV when approaching or established on an intercept heading to the final approach course.

VNAV PTH must be engaged for all segments that contain a GP angle, as shown on the LEGS page, and must be selected nearing the FAF or earlier.

The speed limits published on the approach chart must be complied with to enable adequate bank angle margins for the smaller radius-to-fix (RF) legs when strong winds exist.

Once established on final approach, the RNAV (RNP) approach is flown like any other non-ILS approach using LNAV and VNAV.

MAXIMUM LATERAL AND VERTICAL DEVIATIONS FOR RNAV (RNP) OPERATIONS

The RNP-based approach operations are normally designed to a lateral containment standard that equals twice the value of the RNP (2 x RNP) that is published for the procedure.

To provide an adequate safety margin to account for path tracking errors, crews are expected to maintain course within 1.0 x RNP. For example, an RNP 0.3 approach will have a lateral containment limit of 0.6 nm, and a lateral deviation limit of 0.3 nm. Vertically, the deviation limit from the path is 75 ft, which only applies from the FAF to the DA/MAP, unless the approach is annotated otherwise. Prior to the FAF, the vertical limit below the path is determined by the minimum altitude at the next (active) waypoint published on the approach chart.

MISSED APPROACH

The Missed approach shall be executed when any of following conditions exist:

- "NAV UNABLE RNP" EICAS message or "VERIFY POSITION" FMC alert is shown, unless suitable visual reference is established and maintained with aircraft positioned at the straight-in segment to the runway.
- If the actual flight path deviation exceeds the limit in the paragraph "Maximum Lateral and Vertical Deviations for RNAV (RNP) Operations" or an amber deviation alert occurs with NPS.
- Any system degradation affecting to the approach and landing performance.

The flight crew needs to inform ATC immediately when the performance of the aircraft will no longer support RNAV (RNP) operations and may consider requesting an alternate clearance.

In the event an early missed approach is initiated, the flight crew must follow the approach and missed approach tracks unless otherwise cleared by the ATC.

If a missed approach is executed while on an RF leg, it is important to immediately re-select LNAV (or verify that LNAV has re-engaged for airplanes equipped with the TO/GA to LNAV feature) to avoid excessive course deviation.

~~777-200ER, 777-300,~~ (Without NPS)

Note: If a go-around/missed approach is needed, track the required course manually using the trend vector and map until LNAV selected.

The Maximum RF leg speed shall not be exceeded if the missed approach course (including an early missed approach) has a RF leg(s), because the RF legs are designated based on the maximum true speed at normal altitudes, and initiating an early missed approach will reduce the maneuverability margin, and will potentially make it impractical to hold the turn at missed approach speeds.

NON-NORMAL PROCEDURES

The flight crew must be ready to react to abnormal situations that may require specific procedures in the RNAV (RNP) approach operations.

ENGINE FAILURE

During the approach or missed approach with autopilot, the crew may observe a lateral excursion when the engine fails or during acceleration and clean up with one engine condition, which normally remains withinthe 1 X RNP limit. If the 1 x RNP limit is going to be exceeded, the PF shall disengage autopilot, and correct manually increasing slightly the bank angle and following FD commands to converge towards the FMS flight path. When converging, the autopilot shall be reengaged.

NAVIGATION AND GUIDANCE SYSTEM FAILURE

Required systems specified in the paragraph “RNAV (RNP) Approach Requirement” must be operative to start an RNAV (RNP) approach procedures.

Alerts relative to the navigation and guidance system in approach such as:

- NAV UNABLE RNP or VERIFY POSITION
- GND PROX SYS or TERR POS
- FMC L or FMC R (Loss of LNAV or VNAV mode)
- GPS
- AIR DATA SYS or NAV ADIRU INERTIAL
- SINGLE SOURCE F/D
- SGL SOURCE RAD ALT

require the flight crew to initiate a missed approach procedure.

LOSS OF GPS POSITION UPLOADING

Upon loss of GPS position updating, the RNP guidance may begin to navigate on ADIRU but the aircraft will begin to drift, degrading the navigation position solution. Therefore, when RNAV (RNP) missed approach operations are based on ADIRU autonomous navigation, the inertial guidance can only provide RNP guidance for a specific amount of time.

RNAV (RNP) APPROACH PROCEDURE/CALLOUTS

Autopilot use is recommended during the RNAV(RNP) approach.

> Note: If the autopilot is used at the RNAV (RNP) approach, autopilot should remain engaged until a suitable visual reference is established and maintained in the straight-in segment to the designated runway.

This procedure is not authorized using QFE. **[ ] : Manual Flight**

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td colspan="2">Before IAF, or the start of radar vectors to the final approach course</td></tr>
<tr><td colspan="2">When receiving radar vectors from ATC, intercept course modifications may be used to join the LNAV path at any point on the initial, intermediate, or missed approach segments.

Note: Direct-To modifications are not permitted when:
• the fix is the beginning of an RF leg
• the fix is the Final Approach Fix (FAF) for the procedure</td></tr>
<tr><td></td><td>On the RNP PROGRESS Page, set or verify RNP for the approach.</td></tr>
<tr><td>Select TERR on map.
Select ACT RTE LEGS page.</td><td>Select TERR or WXR on map.
~~777-200ER, 777-300~~ (Without NPS)
Select RNP PROGRESS page.</td></tr>
<tr><td colspan="2">~~777-200ER, 777-300~~ (Without NPS)

Note: One pilot must have the map display in the 10 NM range to monitor path tracking during the final approach segment.</td></tr>
<tr><td>Before IAF, after clearance for approach,

select LNAV Switch with call "LNAV"

[call for "SELECT LNAV"]</td><td>Call "LNAV ARM"
[select LNAV mode switch with call "LNAV"]</td></tr>
<tr><td>Call "CHECK"</td><td>Call "LNAV CAPTURE"</td></tr>
</table>

IAF TO FAF	
In descent, set intermediate altitude constraints (or closest 100 foot increments below) on MCP, Call **"NEXT ALT___SET"** [call for **"SET NEXT ALT____"**]	Call **"____CHECK"** [set next altitude on MCP with call **"NEXT ALT___SET"**]
Use LNAV and VNAV or other pitch mode for initial descent. VNAV is required FAF inbound. Some approach procedures can require use of VNAV from the IAF onward.	
Call for "**FLAPS_**" according to flap extension schedule or approach speed constraint.	Call "**SPEED CHECK, FLAPS____**" and position flap lever as directed.
Call "**CHECK**"	After passing each step-down fix, callout the next FIX and altitude limits. Call "_____,_______"
Approaching the FAF	
Call "**CHECK**"	Approximately 2 miles prior to the FAF, verify VNAV PTH, VNAV ALT or ALT is engaged. Call "**APPROACHING FAF**" "**VNAV PTH**", "**VNAV ALT**" or "**ALT**".
Call for "**GEAR DOWN**" "**FLAPS 20**". Speed intervention, set flaps 20 speed. [call for **"SET FLAPS 20 SPEED"**] Set SPEEDBRAKE lever to ARM.	Call "**GEAR DOWN**" "**SPEED CHECK FLAPS 20**". Set the landing gear lever to DN. Set the flap lever to 20. [set FLAPS 20 SPEED on MCP with call **"FLAPS 20 SPEED SET"**]

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td>Set DA(H) on MCP altitude window, call "DA(H)______SET".
[call for "SET DA(H)____"]
Select VNAV switch if it is in ALT mode, call "VNAV".
Verify speed intervention.
[call for "SELECT VNAV"]</td><td>Call "______CHECK"
[set DA(H) on MCP with call "DA(H)____SET"]
Check pitch mode and call "VNAV PATH"
[select VNAV mode switch with call "VNAV", verify speed intervention, Check pitch mode and call "VNAV PATH"]</td></tr>
<tr><td colspan="2"><s>777-200ER, 777-300</s>
<u>Without NPS</u>
Maximum Lateral Deviation (XTK ERROR): 1 x RNP
Maximum Vertical Deviation - FAF to DA: 75 ft
Monitor RNP PROGRESS page.

<s>777-300ER, 777F</s>
<u>With NPS</u>
Maximum Lateral Deviation(XTK ERROR):NPS amber indication or 1 x RNP
Maximum Vertical Deviation - FAF to DA: 75 ft
Monitor NPS.</td></tr>
<tr><td>Call "FLAPS 30 (or 25)".

[call for "SET VREF PLUS____"]</td><td>Call "SPEED CHECK, FLAPS 30 (or 25)".
Set the flap lever to 30 (or 25).
["VREF PLUS____SET"]</td></tr>
<tr><td>Call "BEFORE LANDING CHECKLIST"</td><td>Accomplish BEFORE LANDING CHECKLIST.</td></tr>
<tr><td colspan="2">FAF TO DA(H)</td></tr>
<tr><td colspan="2">At the final approach fix, verify the crossing altitude matches the charted value within 100 ft.</td></tr>
<tr><td colspan="2">Monitor VNAV path and descent rate.</td></tr>
<tr><td>When at least 300 ft below missed approach altitude, set the missed approach altitude on the MCP,
Call "MISSED APP ALT______SET".

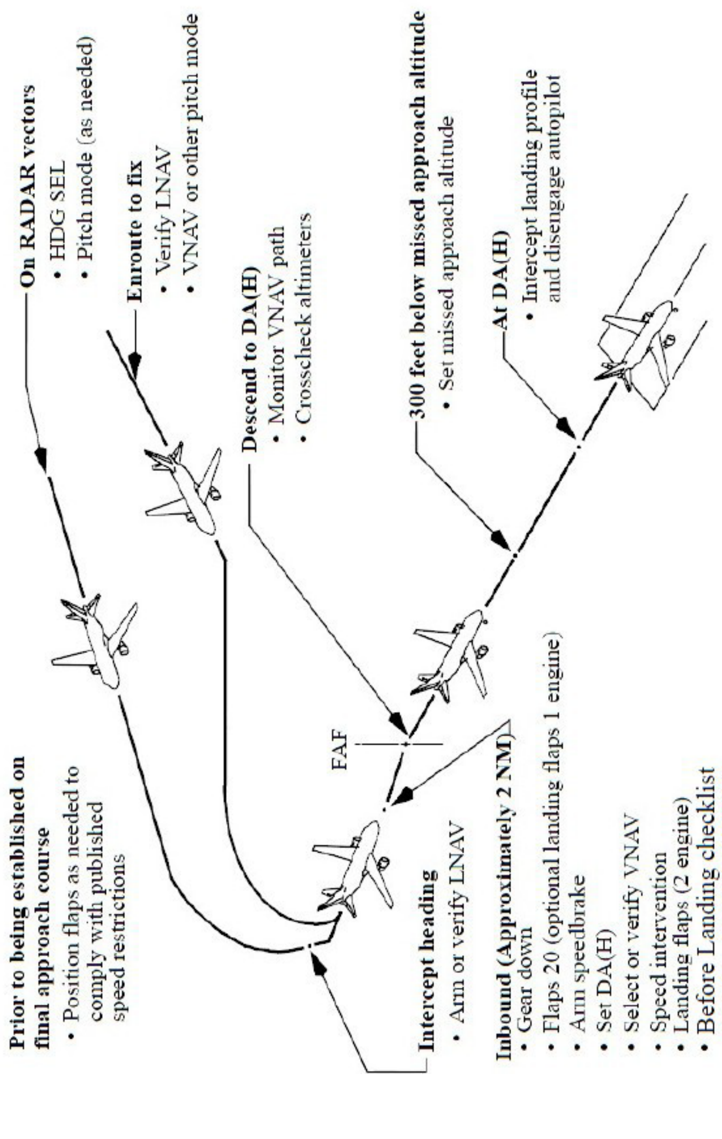
[call for "SET MISSED APP ALT____"]</td><td>Call "______CHECK".
[set Missed APP ALT on MCP with call "MISSED APP ALT___SET"]</td></tr>
</table>

PF	PM
Call **"STABILIZED" or "VMC-CORRECTING" or "GO-AROUND"** Note: If unstabilized in VMC, the approach can be continued to 500 ft HAT with "VMC CORRECTING" call to achieve a stabilized approach.	At 1000 ft above HAT, "**ONE THOUSAND**" called by GPWS, call " **CLEAR TO LAND** (or **CONTINUE**)" Call out any unstable condition.
Call "**STABILIZED**" or "**GO-AROUND**"	At 500 ft HAT. "**FIVE HUNDRED**" called by GPWS. Callout any unstable condition.
Before reaching DA(H), when in visual, call "**STROBE LIGHT IN SIGHT**" "**APPROACH LIGHT IN SIGHT**" "**RUNWAY IN SIGHT**"	Call "**CHECK**"
Call "**CHECK**"	At 100 ft above Baro minimum, call "**ONE HUNDRED ABOVE**"
(CAPT) Call "**LANDING**" or "**GO-AROUND**" (If suitable visual reference is not established, execute missed approach.)	At Baro minimum. "**MINIMUM**" called bv GPWS.
Missed Approach must be initiated at least at DA(H).	
Landing	
If suitable visual reference is established at or above DA(H), and aircraft positioned at the straight-in segment to the runway, disengage the autopilot and maintain the glide path to landing. In case of manual flight, the published lateral and vertical flight path shall be maintained, until suitable visual reference is established with aircraft positioned at the straight-in segment to the runway.	

PF	PM
While VNAV PTH guidance may still be used as a reference once the airplane is below DA(H), the primary means of approach guidance is visual. If the flight director commands are not to be followed, turn both F/Ds to OFF, then place the PM's F/D ON, and verify that the PFD autothrottle annunciation displays SPD mode. Complete the landing.	

INSTRUMENT APPROACH - RNAV (RNP)

INSTRUMENT APPROACH - RNAV (RNP)



CIRCLING APPROACH

If circling from an ILS approach, fly the ILS in LOC and VNAV or V/S modes. Use of the APP mode for a circling approach is not recommended for several reasons:

- The AFDS does not level off at MCP altitude
- Exiting the APP mode requires initiating a go-around or disconnecting the autopilot and turning off the flight directors.

Note: The autopilot can be used until intercepting a normal landing profile, but it must be disengaged before 500 ft HAA.

Note: Intercepting the landing profile is when the aircraft is aligned with the runway, wings level, and on a normal glide path to the runway.

MCP Altitude selector ....Set

Accomplish an instrument approach, establish suitable visual reference, and level off at MDA(H).

At MDA(H):

MCP Altitude selector .... Set Missed Approach Altitude

HDG SEL/TRK SEL switch .... Push

Verify HDG SEL/HDG HOLD or TRK SEL/TRK HOLD mode annunciates.

Intercepting the landing profile (Above 500 ft HAA):

Autopilot disconnect switch .... Push

If the flight director commands are not to be followed:

Flight Director switch (PF side) ....OFF

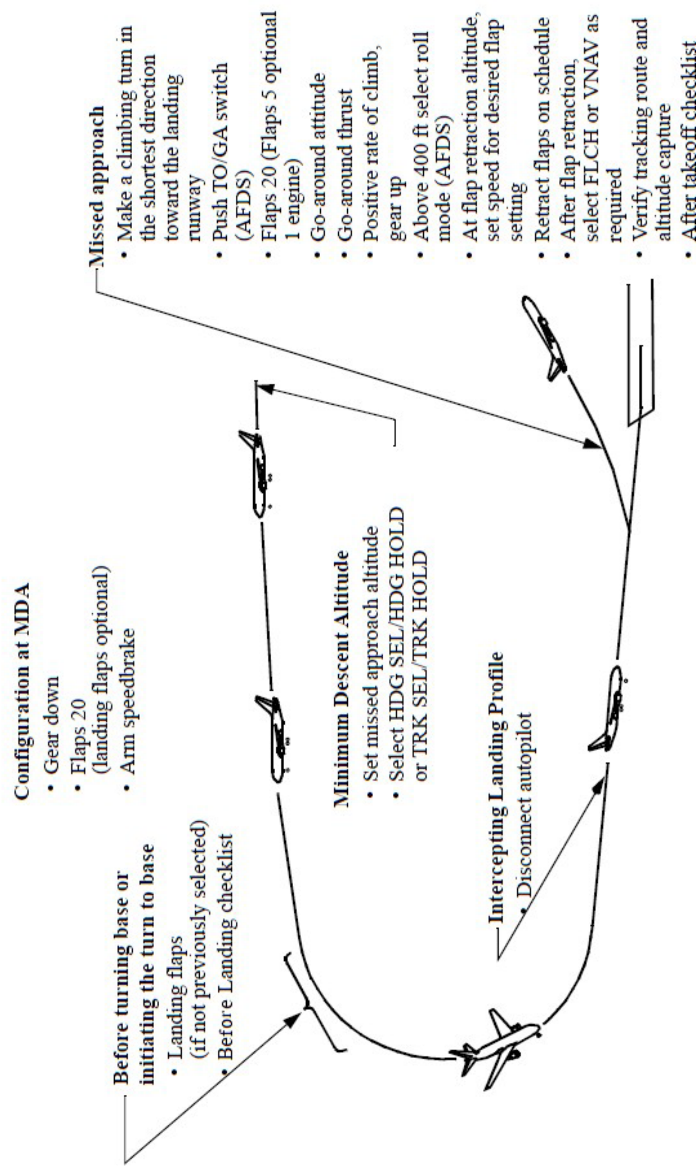
Flight Director switch (PM side)................OFF then ON

Verify that the PFD autothrottle annunciation displays SPD mode.

Note: When GPWS calls “FIVE HUNDRED”;
The PF shall make a callout “AUTOPILOT DISENGAGED” after the “STABILIZED” call and the PM shall verify Autopilot disengaged.

CIRCLING APPROACH

CIRCLING APPROACH



VISUAL APPROACH

GENERAL

- A visual approach is an approach conducted under IFR which authorizes the flight crew to proceed visually and clear of clouds, terrain and ground obstacle to the airport. The flight crew must, at all times, have either the airport or the preceding aircraft in sight.
  - The objective of a visual approach is to conduct an approach;
  - Using visual reference; and,
  - Being stabilized by at least 500ft HAT according to the stabilized approach criteria in FOM.
  - Refer to the Charted Visual Flight Procedure (CVFP) and/or A-File/Flight standard notice if applicable.

KEY POINTS OF VISUAL APPROACH

- Descent planning and making corrections early.
- Optimizing use of automation with timely reversion to hand flying.
- Maintaining a combination of visual flying supported by monitoring of instruments.

PLANNING AND PREPARATION

- The FMS and suitable NAVAIDs may be used to enhance the situational awareness.
- Plan to a continuous descent with approximate 3 degrees of descent angle for approach.
- The flight crew should be aware of the surrounding terrain and man-made obstacles.

AUTOMATED SYSTEM

- Automated systems (autopilot, flight director, autothrottle, etc.) can be used as needed. However, autopilot must be disengaged before 500ft HAT.

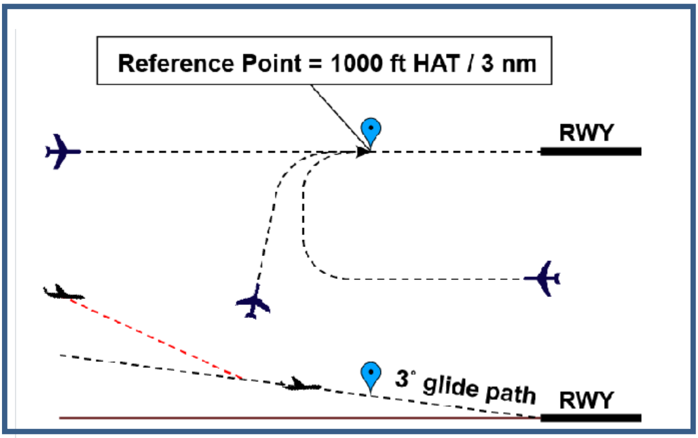
- When Flight Director (F/D) is no longer required during the visual approach, both F/Ds to OFF then select the PM side F/D to ON, And verify that the PFD autothrottle annunciation displays SPD mode.
- The FPV can be used as a crosscheck of the vertical flight path angle when established on a visual final approach segment.

VISUAL FLYING SUPPORTED BY MONITORING OF INSTRUMENTS

- Use all suitable instruments and visual references to assist in maintaining flight path and identifying airport and landing runway.e.g.) NAVAIDS (ILS LOC/GS, VOR or NDB), LNAV/VNAV, PAPI, VASI or etc.

CAUTION! ***Do not descend with following GS indication only when the aircraft is not established on the LOC course. ILS glideslope indication is reliable 30 degrees of the final approach course.***

- In case of straight-in visual approach (typically 5nm or greater of final) a published instrument approach procedure should be adhered to as closely as possible:
  - Use an ILS approach, whenever available (visual approach backed up by an ILS).
  - If an ILS approach is not available, use a constant-angle non-precision approach with FD.
  - If an instrument approach is not available, reference point of 3NM/ 1000ft HAT extension from the runway(VFR APPR or RW EXT) can be inserted into the FMS.
- Other than a straight-in visual approach:
  - If a tailored visual approach procedure is available (e.g. FUK RWY34R, PUS RWY18R) in FMS, use the tailored procedure.
  - If a tailored visual approach is not available, reference point of 3NM/ 1000ft HAT extension from the runway(VFR APPR or RW EXT) can be inserted into the FMS. Disengage the autopilot at the latest before turning final in order to complete the approach visually and manually.



Note: "BEFORE LANDING Checklist" should be completed before turning base.

GO-AROUND

- Visual Approach has no missed approach segment. Remain clear of clouds and contact ATC for further clearance.
- Set missed approach altitude when intercepting the final approach path.
  - Set the missed approach altitude (when using an instrument approach procedure) or the highest MSA.

CALLOUTS

- PM should make callouts for any altitude and/or excessive flight parameter deviations.
- Accomplish the Standard Callout at 1000ft HAT and 500ft HAT.

GO-AROUND PROCEDURE/CALLOUTS

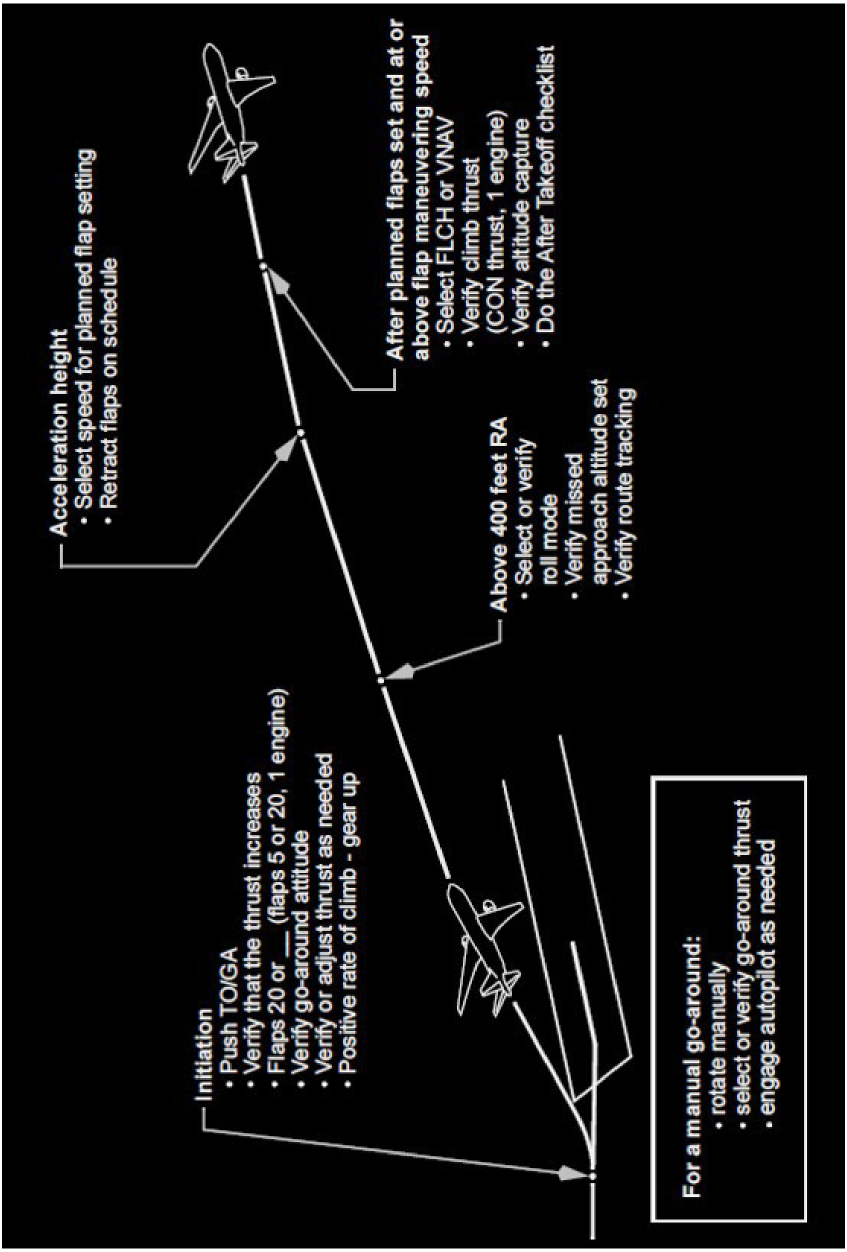
[ ]: Manual Flight

PF	PM
Call **"GO-AROUND", "TO/GA"** Push TO/GA switch. • advance thrust levers manually. [Rotate smoothly toward 15° pitch attitude then follow flight director commands] Note: PF should consider tail strike pitch attitude during rotation.	**"THR, TO/GA(LNAV), TO/GA"** Call "PITCH", if significant pitch attitude deviation or tail strike pitch exceedance is expected.
Verify that the thrust increases. ***WARNING!*** *TO/GA function is inhibited close to the ground and after touchdown. If the thrust levers do not respond when TO/GA is pushed, or if the go-around is initiated after touchdown, advance the thrust levers manually to go-around thrust.*	
Call **"FLAPS 20"**	Repeat **"FLAPS 20"** and set the flap lever to 20
Verify: • the rotation to go-around attitude • mode annunciation (THR | TO/GA(LNAV) | TO/GA).	
Note: An automatic go-around cannot be initiated after touchdown.	
	Verify that the thrust is sufficient for the go–around or adjust as needed. Call **"THRUST SET"**
	Verify a positive rate of climb on the altimeter and call "**POSITIVE CLIMB**"
Verify a positive rate of climb on the altimeter and call "**GEAR UP**"	Repeat "**GEAR UP**" and set the landing gear lever to UP.
Limit bank angle to 15 degrees if airspeed is below minimum maneuvering speed.	

Above 400 ft radio altitude, select LNAV or HDG SEL. [Call for "**LNAV or HDG SEL**"]	Verify LNAV or HDG SEL engaged. [Push LNAV or HDG SEL switch.]
Verify that the missed approach altitude is set. Verify that the missed approach route is tracked.	
At 3000 ft AFE or missed approach altitude whichever comes first, set speed to the maneuvering speed for the desired flap setting. If a special (specific) climb gradient is required during missed approach, maintain (follow) that requirement.	

Call for "**FLAPS____**" according to the flap retraction schedule.	Call "**SPEED CHECK, FLAPS____**" and set flap lever as directed.
After flap retraction to the planned flaps setting, and at or above flap maneuvering speed, select FLCH or VNAV as needed. [Call for "**FLCH or VNAV**"]	Verify FLCH or VNAV engaged. [Push FLCH or VNAV switch]
Verify that the climb thrust is set. Verify that the missed approach altitude is captured.	
Call for "**AFTER TAKEOFF CHECKLIST**"	Accomplish AFTER TAKEOFF checklist.

GO–AROUND AND MISSED APPROACH



LANDING AND LANDING ROLL PROCEDURE/CALLOUTS

PF	PM
Monitor rollout progress and proper autobrake operation.	
Verify that the thrust levers are closed and the SPEEDBRAKE lever is Up. Without delay, raise the reverse thrust levers to the interlocks and hold light pressure until the interlocks release. Then apply reverse thrust as needed.	Verify that the SPEEDBRAKE lever is Up, and call “**SPEEDBRAKES UP**". If the SPEEDBRAKE lever is not Up, call “**SPEEDBRAKES NOT UP**". The speedbrake shall be up manually by the captain. Verify deployment of engine reversers call "**TWO REVERSE GREEN**" If any engine reverse is not deployed call "**LEFT(RIGHT) REVERSE GREEN**"
WARNING! ***After the reverse thrust levers are raised, a full stop landing must be made. If an engine remains in reverse, safe flight is not possible.***	
By 80 kts, start movement of reverse thrust levers to reach reverse idle detent prior to taxi speed. After the engines are at reverse idle, move the reverse thrust levers full down.	Call “**80 KNOTS**” Call “**60 KNOTS**” Call **"40 KNOTS"** (slippery runway or CAT II/III approach only)
Before taxi speed, disarm the autobrake. Call “**MANUAL BRAKES**” Use manual braking as needed.	When AUTOBRAKE message displayed, call "**AUTOBRAKE**"
Note: When decelerating on the runway, the speed at which the transition from autobrakes to manual braking is made depends on airplane deceleration rate, runway conditions and stopping requirements.	
Call “**CHECK**” Before turning off the runway, disengage A/P with call "**AUTOPILOT DISENGAGE**".if autoland conducted.	Call “**3000 (or 2000) REMAIN, _ KNOTS**” (when plan to vacate at the end of runway)

PF	PM
Note: During landing roll, both flight crews shall check the remaining runway distance by identifying the Runway Distance Remaining Signs, Runway Centerline Lights, Runway Edge Lights, etc.	
EFB installed	
CAUTION! Do not use the Airport Map application as a primary navigation reference. The Airport Map application is designed to aid flight crew positional awareness only.	

Note: When using standard high speed turnoff after landing, the aircraft speed must be reduced to at or below 50 kts before vacating a dry runway. If it is not a dry runway or not a high speed taxiway, the aircraft must be decelerated to an appropriate safe taxi speed (max 30 kts) before 1000 ft from the planned runway exit point.

AFTER LANDING PROCEDURE/CALLOUTS

After vacating the active runway, crews should focus on Clearance Awareness & Taxi Route Awareness.

- Do not rush if a turn is required just after vacating the runway.
- Taxi slowly to identify the correct turn direction and taxi route.

When clear of the active runway:

CAPT	F/O
Perform Taxi Route Awareness Procedure.	
Position or verify that the SPEEDBRAKE lever is DOWN.	
Set the FD switch to OFF and, weather radar or terrain switch to off.	Set STROBE and LANDING light switches to OFF.
	Set the ENGINE ANTI-ICE selectors to ON, if needed.
	Set the FD switch to OFF.
	Set the weather radar or terrain switch to off.
	Set the AUTOBRAKE selector OFF.
	Set the flap lever to UP.
	Position transponder mode selector to XPNDR.
	Start APU, if needed

After landing, delay starting the APU as long as possible. If the APU will not be needed for air conditioning or electrical power, do not start it. However, passenger comfort is the primary consideration.

Engine cool down recommendations:

- run the engines for at least:

PW Engine (777-200ER~~/777-300)~~	~~GE Engine (777-300ER/777F)~~
5 mins	~~3 mins~~

- use a thrust setting no higher than that normally used for all engine taxi operations

Note: If the environment (uphill slope, high gross weight, congested ramp areas, etc.) is not a factor, consider the one engine taxi-in for fuel saving.

Intentionally

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PARKING

PARKING PROCEDURE / CALLOUTS

The aircraft exterior lights should be used until ramp-in as needed.

Note: Using the exterior lights after aligning with the lead-in line may interfere with a guidance of the marshaller.

CAPT	F/O
"CHECK" **"CHECK"** **"LEFT CLEAR"**	**"APPROACHING GATE_____, SOLID LINE (or DASHED LINE)"** **"MARSHALLER IN SIGHT"** (in the event a marshaller's guidance is provided) *<CLICK>* or Verify displayed aircraft type (if available) Ex) "B777-200" or "B772" **"RIGHT CLEAR"**
"CHECK"	**"BRAKE PRESSURE NORMAL"** (after checking accumulator pressure)
"CHECK"	**"SPEED_____"** (Make a speed callout whenever necessary)
"CHECK"	**"AMBER"** (In case of a color indicator, when green turns to amber), or **"APPROACHING TO STOP POSITION"**
"PARKING BRAKE SET"	At stop position **"STOP"** **"CHECK"**

SHUTDOWN PROCEDURE/CALLOUTS

Parking brake . . . . Set CAPT

Verify that the PARKING BRAKE SET message is shown.

Electrical power . . . . Establish F/O

If APU power is required:

Check APU RUNNING memo message is displayed.

If external power is needed:

Verify that the PRIMARY EXTERNAL POWER AVAIL light is illuminated.

PRIMARY EXTERNAL POWER switch – Push

Verify that the ON light is illuminated.

If SECONDARY EXTERNAL POWER AVAIL light is illuminated:

SECONDARY EXTERNAL POWER switch – Push

Verify that the ON light is illuminated.

FUEL CONTROL switches. . . . . .CUTOFF CAPT

If towing is needed:

Establish communications with ground crew.

Note: Ground crew confirms that parking brakes are set prior to prepare towing including the installation of the nose wheel steering lockout pin.

WARNING! If the nose gear steering is not locked out, any change to hydraulic power with the tow bar connected can cause unwanted tow bar movement.

CAUTION! Do not hold or turn the nose wheel tiller during pushback or towing. This can damage the nose gear or the tow bar.

CAUTION! Do not use airplane brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.

Set or release the parking brake as directed by ground crew.

SEAT BELTS selector . . . . .OFF CAPT

Position seat belts selector to OFF after parking (towing is completed).

Monitor all passenger doors are in manual mode, Inform the cabin crew by Interphone, if any door is not in manual mode.

HYDRAULIC panel. . . . . Set F/O

Note: Leave hydraulic pumps on until push back or tow in has been completed.

Note: Depressurize the right system last to prevent fluid transfer between systems.

C1 and C2 PRIMARY pump switches – OFF

Left, C1, and C2, DEMAND pump selectors – OFF

Right DEMAND pump selector – OFF

FUEL PUMP switches . . . . OFF F/O

BEACON light switch . . . . OFF F/O

Transponder mode selector . . . . STBY F/O

~~EFB installed~~

~~EFB CLOSE FLIGHT . . . . .Select ALL~~

Status messages. . . . . Check F/O

Note: Disregard the EICAS alert and status messages displayed during the PFC self–test after hydraulic shutdown. Wait approximately 3 minutes after HYD PRESS SYS L+C+R message is shown before recording status and alert message in the maintenance log.

APU selector . . . . .As needed F/O

If APU power is no longer needed:

APU selector – OFF

Call for “SHUTDOWN CHECKLIST.” .... CAPT

Accomplish SHUTDOWN checklist .... F/O

After wheel chocks are in place and requested by ground staff:

Parking brake . . . . Release CAPT

When requested by ground staff, release the parking brake.

Note: Leave the parking brake set when wind speed including gusts exceeds 30 kts, or in consideration of surface conditions (sloping, slippery, contaminated, etc.) where the aircraft is parked.

~~**Freighter**~~

~~**Entry Door Mode Select Levers . . . . .Confirm CAPT**~~
~~**DISARMED F/O**~~

After visual confirmation by PIC(or Relief captain), set the Door Mode Select Levers to DISARMED position by First Officer. *<CLICK>*

CAUTION! Do not confuse Door Mode Select Lever with Door Operating Handle.

CAUTION! Do not open the entry doors from inside. Wait until the ground crew opens the entry doors .

Note: Escape slide/raft and powered door opening is disarmed automatically when the door is opened from outside.

Refer to POM 6.1.1 - ENTRY/SERVICE DOOR OPENING *<CLICK>*

Secure Procedure/Callouts

ADIRU switch . . . . OFF F/O

EMERGENCY LIGHTS switch . . . . OFF F/O

PACK switches . . . . OFF F/O

~~EFB installed~~
~~EFB POWER switch. . . . . Push ALL~~

Call for “SECURE CHECKLIST.”.. CAPT

Accomplish SECURE checklist .... F/O

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NORMAL CHECKLIST

See Normal Checklist Card (hard card) or ECL.

PREFLIGHT

SECURITY SEARCH	COMPLETE	ALL
OVHD PNL (HYD, FUEL, SIGNS)	SET	F/O
GEAR PINS	ON BOARD	ALL
OXYGEN	TESTED, 100%	ALL
FLT INST’ & ALTIMETER	SET	ALL
FUEL Q’TY	___LBS +/-___LBS	ALL
AUTOBRAKE	RTO	F/O
PARKING BRAKE	SET	CAPT
FUEL CONTROL SWS	CUTOFF	CAPT
TAKEOFF BRIEFING	COMPLETED	PF

BEFORE START

WINDOWS & DOORS	CHECKED	ALL
BEACON LIGHT	ON	F/O
MCP	SET	CAPT
CDU	SET	F/O
TRIM	____ , ZERO, ZERO	CAPT
TRANSPONDER	XPNDR	F/O

AFTER START

APU	OFF	F/O
ENGINE ANTI–ICE	AS REQUIRED	F/O
RECALL	CHECKED	F/O
FLAPS	____	ALL
FLIGHT CONTROLS	CHECKED	CAPT
GROUND PERSONNEL AND EQUIPMENT	CLEAR	ALL

BEFORE TAKEOFF

FLAPS	_	ALL
TRANSPONDER	TA/RA	F/O
CABIN REPORT AND TAKEOFF SIGNAL . . .	COMPLETED	F/O
STROBE LIGHT.	ON	F/O
WX RADAR	ON	ALL

AFTER TAKEOFF

LANDING GEAR	UP	PM
FLAPS	UP	PM
ENGINE ANTI-ICE	AUTO	PM

DESCENT

RECALL & NOTES.	CHECKED	PM
AUTOBRAKE	AS REQUIRED	PF
LANDING DATA . . . . V_{REF}____,	MINIMUMS_____	ALL
LANDING BRIEFING	COMPLETED	PF
CABIN CREW	ADVISED	CAPT

APPROACH

LANDING LIGHTS	ON	PM
R/W TURNOFF LIGHTS	ON	PM
TAXI LIGHT	ON	PM
PAX SIGNS.	ON	PM
ALTIMETERS . . . . . . ___	InHg/hPa SET & X-CHECKED	ALL

BEFORE LANDING

LANDING GEAR	DOWN	ALL
SPEEDBRAKE LEVER	ARMED	PF
FLAPS	__	ALL

AFTER LANDING

STROBE LIGHT	OFF	F/O
LANDING LIGHTS	OFF	F/O
FLIGHT DIRECTORS	OFF	ALL
WX RADAR	OFF	ALL
AUTOBRAKE	OFF	F/O
SPEEDBRAKE LEVER	DOWN	CAPT
FLAPS	UP	F/O
TRANSPONDER	XPNDR	F/O
APU	START	F/O

SHUTDOWN

PARKING BRAKE	SET	CAPT
HYDRAULIC PANEL	SET	F/O
FUEL PUMP SWS	OFF	F/O
FUEL CONTROL SWS	CUTOFF	CAPT
BEACON LIGHT	OFF	F/O
SEATBELTS SIGN	OFF	CAPT
TRANSPONDER	STBY	F/O
STATUS	CHECKED	F/O

SECURE

ADIRU SW . . . . .OFF F/O

EMERGENCY LIGHTS SW . . . . .OFF F/O

PACK SWS. . . . . .OFF F/O

ECL

BEFORE EEP

EEP --- CHECKED (PF/PM)

On Flight Plan and FMC

FMC -- SET UP (PM)

Set up the alternate airport on ALTN page

FUEL -- CHECKED (PF/PM)

Compare flight plan’s with actual fuel

AIRCRAFT CONDITION -------------------------------------- CHECKED (PF/PM)

Pressurization and other systems as needed

MINIMUM ALTITUDE--- CHECKED (PF/PM)

MORA or 10,000ft whichever higher

WEATHER & NOTAM--- CHECKED (PF/PM)

For the alternate airport

PROCEDURE -- REVIEW (PF)

The one engine drift down, engine fire and emergency descent procedure

CONTINUING PROGRESS TO NEXT ETP IS IMPOSSIBLE?

◇ **YES** ◇ **NO**

ALTERANTE AIRPORT --- SELECT (PM)

Select alternate diversion airport on ALTN pages

WEATHER & NOTAM -- CHECK (PF/PM)

Verify the weather & NOTAM condition of alternate diversion airport

ETP

ETP --- CHECKED (PF/PM)

On Flight Plan and FMC

FMC --- SET UP (PM)

Set-up the alternate airport on ALTN page.

FUEL --- CHECKED (PF/PM)

Compare flight plan's with actual fuel

MEA -- CHECKED (PF/PM)

MORA or 10,000ft whichever higher

WEATHER & NOTAM -- CHECKED (PF/PM)

For the alternate airport

PROCEDURE --- REVIEW (PF)

The one engine drift down, engine fire, emergency descent procedure

NEW ALTERNATE AIRPORT IS NEEDED?

◇ YES ◇ NO

ALTERNATE AIRPORT -------------------------------------- SELECT (PM)

Select the new alternate diversion airport and check whether the airport is located in EDTO boundary or not

WEATHER & NOTAM--------------------------------------- CHECK (PF/PM)

Check the new alternate airport's weather

DE-ICING / ANTI-ICING ON GROUND

1. PARKING BRAKE --- SET (C)

2. FLAPS --UP (F)

3. THRUST LEVERS -- IDLE (C)

4. PACK SWITCHES (BOTH) --- OFF (F)

Wait approximately 10 seconds after pack switches are off before positioning bleed switches to off to reduce pack wear.

5. Choose one:

- **◆ ENGINE ON de/anti-icing is needed**
  - **► Go to step 6**
- **◆ ENGINE OFF de/anti-icing is needed**
  - **► Go to step 12**

The APU should be shut down unless APU operation is necessary.

6. ENGINE BLEED SWITCHES (BOTH) ------------------------------------ OFF (F)

7. Call to Ground Crew -------------------------------- "Ready for DE-ICING" (C)

8. Verify Starting time -- CHECK (C)

9. After de/anti-icing is completed

Wait approximately one minute after de-icing/ anti-icing is completed to restore engine and APU bleed air and pack operation to ensure all de-icing fluid has been cleared from the engines.

10. PACK SWITCHES (BOTH) -- AUTO (F)

11. ENGINE BLEED SWITCHES (BOTH) ---------------------------------- ON (F)

NOTE: Record the fluid type and starting time on the deicing code report after all procedures are completed.

■ ■ ■ ■

12. APU BLEED SWITCH -- OFF (F)

13. Call to Ground Crew ------------------------------ "Ready for DE-ICING" (C)

14. Verify Starting time -- CHECK (C)

After de/anti-icing is completed

Wait approximately one minute after de-icing/ anti-icing is completed to restore engine and APU bleed air and pack operation to ensure all de-icing fluid has been cleared from the engines.

15. PACK SWITCHES (BOTH) -- AUTO (F)

16. APU BLEED SWITCH --- AUTO (F)

NOTE: Record the fluid type and starting time on the deicing code report after all procedures are completed.

■ ■ ■ ■

PACKS OFF TAKEOFF

BEFORE TAKEOFF:

PACK SWITCHES (BOTH) -- OFF (F)

Wait 30 seconds before setting takeoff thrust---------------------- CHECK (C)

Allows packs to shut down and EECs time to recomputed maximum EPR line and reference/target EPR indications.

AFTER TAKEOFF:

PACK SWITCHES (BOTH) --- AUTO (F)

After engine thrust is reduced from takeoff to climb and prior to reaching 3,000 feet above field elevation, position both pack switches to AUTO.

APU TO PACK TAKEOFF(HL8254,8284)

Note : APU TO PACK TAKEOFF is prohibited at airport altitudes above 6900ft field elevation.

BEFORE START :

PACK SWITCHES (BOTH) --- AUTO (F)

On the THRUST LIMIT Page, select one of the following takeoff thrust ratings :

*full thrust

*percent derate --- CHECK (C)

Enter “APU” into the scratchpad and line select to the “SEL-APU” field.

“APU” appears in small font representing the armed mode --------- CHECK (C)

AFTER ENGINE START :

Leave APU running to supply air to the left pack.

Approximately one minute after second engine start, “APU” displays in large font representing the active mode ------------------ CHECK (C)

Confirm proper configuration by noting a green “A-TO”, “A-TO1”, or “A-TO2” on EICAS -- CHECK (C)

Note: If cabin temperature becomes excessive during extended ground operation,establish dual pack operation by deleting the APU selection. To re-establish APU to Pack operation, enter “APU” into the scratchpad and line select to the “SEL-APU” field.

Note: If an engine is shutdown after selecting APU to Pack operation, the engine cannot be started until APU to Pack takeoff mode has been deleted. To re-establish APU to Pack operation after start, re-enter “APU” into the scratchpad and line select to the “SEL-APU” field.

After climb thrust reduction:

APU Selector -- Off (PM)

RUNWAY CHANGE

FMC RWY SET UP & T/O PERFORMANCE CALC --------- COMPLETED (F)

- DEPARTURES RWY & SID
- THRUST LIM
- TAKEOFF REF 1 & 2
- FIX, NAV RADIO (If necessary)

TAKEOFF SPEEDS, TRIM, FLAPS --- SET (F)

MCP ------------------------------------- V2__ , LNAV, VNAV, HDG__ , ALT__ (C)

ENGINE OUT PROCEDURE & NADP -------------------------- REVIEWED (PF)

RWY CHANGE BRIEFING --------------------------------------- COMPLETED (PF)

TABLE OF CONTENTS

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INTRODUCTION

GENERAL

This chapter contains procedures (engine crossbleed start, and so on) that are accomplished as required rather than routinely performed on each flight. Systems tests are described in the System Description chapter of the applicable system.

Note: System tests are not normally a flight crew action.

Procedures accomplished in flight, or those that are an alternate means of accomplishing normal procedures (such as manual engine start), are usually accomplished by memory. Infrequently used procedures, not normally accomplished (such as engine crossbleed start) are usually accomplished by reference.

To provide clear instructions on how these procedures should be done, notations like R/R(Review Required), R/D(Read and Do) are added next to the titles of these procedures.

(R/R) means both pilot should review the procedure prior to accomplishment.

(R/D) means actions should be done while reading the procedure by the PM.

Supplementary procedures are provided by section. Section titles correspond to the respective chapter title for the system being addressed.

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AIRPLANE GENERAL, EMERGENCY EQUIPMENT, DOORS, WINDOWS

DOORS (R/R)

ENTRY/SERVICE DOOR CLOSING <CLICK>

Gust lock latch .... Release

Door .... Close

Manually position the door aft and inboard to cover the entry.

Door handle .... Rotate

Rotate forward 180° to the closed position. The door lowers into position, latches, and locks.

Passenger

Mode select lever .... ………..ARMED

Observe yellow forward and aft girt bar flags are in view.

~~**Freighter**~~

~~**Mode select lever ....ARMED**~~

~~Observe yellow forward and aft girt bar flags are in view.~~

ENTRY/SERVICE DOOR OPENING <CLICK>

Passenger

Mode select lever (interior only) **..................................... DISARMED**

Note: Escape slide/raft and powered door opening is disarmed automatically when the door is opened from outside.

~~**Freighter**~~

~~**Mode select lever (interior only).................................DISARMED**~~

~~Note: Escape slide/raft and powered door opening is disarmed automatically when the door is opened from outside.~~

~~**Freighter**~~

~~**Door handle..Rotate**~~

~~Rotate aft 180° to the open position. The door is lifted clear of the pressure stops.~~

Door .... Open

Manually position the door outboard and forward to open. The gust lock latch automatically engages and locks door in the open position.

FLIGHT DECK DOOR ACCESS SYSTEM(PASSENGER)

Flight deck access system switch .... NORM

Flight deck door .... Open

Flight deck door lock selector .... AUTO

Emergency access code .... Enter

ENT key .... Push

Verify alert sounds.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector .... DENY

Verify AUTO UNLK light extinguishes.

Flight deck door lock selector .... UNLKD

Flight deck access system switch .... OFF

Verify LOCK FAIL light illuminates.

Flight deck access system switch .... NORM

Guard - Down

Verify LOCK FAIL light extinguishes.

EMERGENCY EQUIPMENT

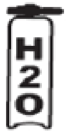
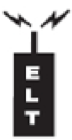
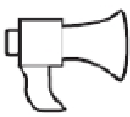
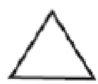
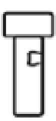
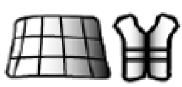
EMERGENCY OXYGEN USE

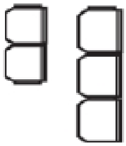
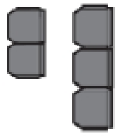
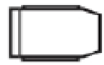
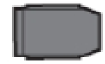
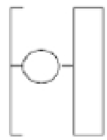
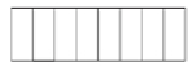
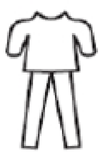
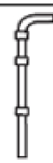
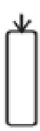
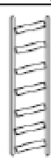
Emergency oxygen should be used when necessary to provide positive pressure in the masks and goggles to prevent or evacuate contaminants. When positive pressure is not required, but contamination of flight deck air exists, 100 % oxygen must be used. If prolonged use is required and the situation permits, oxygen availability should be extended by selecting normal flow. When oxygen use is no longer required, close the left hand oxygen compartment door, then push the RESET/TEST switch to restore normal boom microphone operation.

EMERGENCY EQUIPMENT LIST

The following diagram is for B777 emergency equipment list locations.

Emergency Equipment Symbols

			
Halon Extinguisher	Water Extinguisher	Protective Breathing Equipment (PBE)	Oxygen Bottle
			
First Aid Kit	Emergency Medical Kit	Universal Precaution Kit	Automatic External Defibrillator
			
Life Vest	Spare Life Vest	Infant Life Vest	Life Raft
			
Emergency Locator Transmitter (ELT)	Megaphone	Manual Release Tool	Hijack Warning Bell
			
Flash Light	Bomb-protective Shield & Bullet-proof Vest	Passenger Briefing Position	Emergency Light Switch
			
Crash Axe	Heat-protective Glove	Smoke Goggle	Survival Kit

			
Passenger Seat	Exit Row Seat	Jumpseat	Minimum Staffing Jumpseat
			
Exit	Overwing Exit	Lavatory	Galley
			
Exit Path	Exit Path with Rope	Exit Path with Slide	Slide with Escape Rope
			
Exit Path with Slide/Raft	Fire Fighting Suit	Smoke Barrier Net	Crew Rest Bunk Hatch
			
Halon Extinguisher for Cargo	Water Extinguisher for Cargo	Telescopic Wand	Fixed Wand
			
Signal Device	Step	Descent Device	Halon Alternative Extinguisher

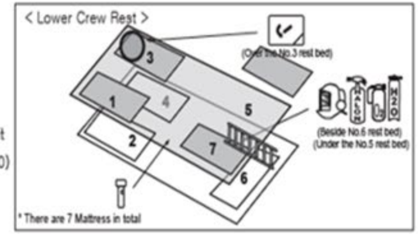
■ B777-200 HL7700/32 Emergency Equipment Location

(One under each passenger seat)

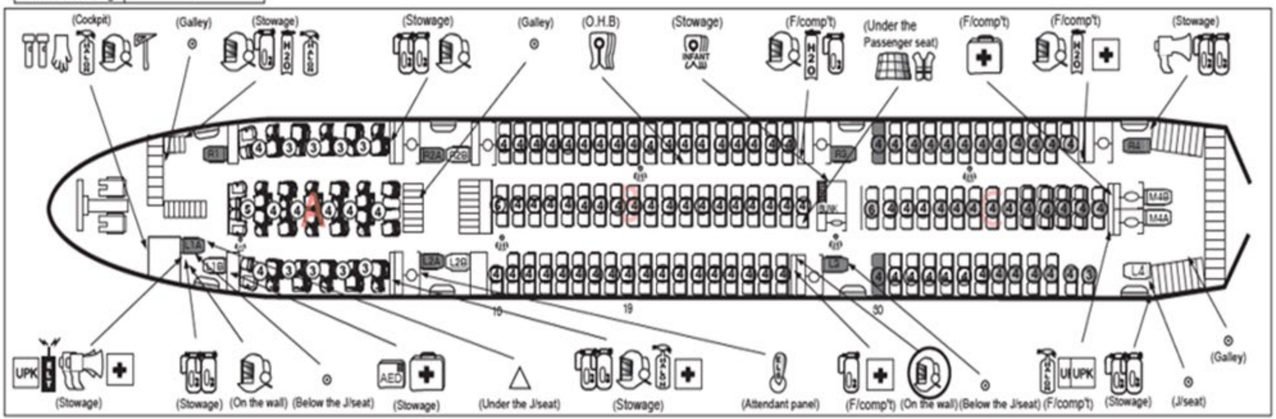
(At each attendant station)

(At each cockpit crew station)

- Circuit breakers in each galley
- Gas Spray Gun, Handcuffs, Tie –wrap, Tying Rope are located in the Closet next to the Cockpit
- Each Zone includes a door and a galley. (B Zone starts from row 10, C Zone starts from row 30)
- O.H.B : Overhead bin, J/seat : Jumpseat, F/comp't : Floor compartment
- ③,④, ⑤,⑥ stands for the number of passenger oxygen masks.



Total pax seats	300(22/278)
Minimum staffing	7



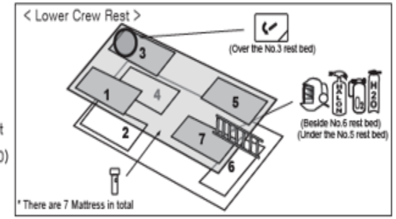
B777-200 HL7739/55/56 Emergency Equipment Location

(One under each passenger seat)

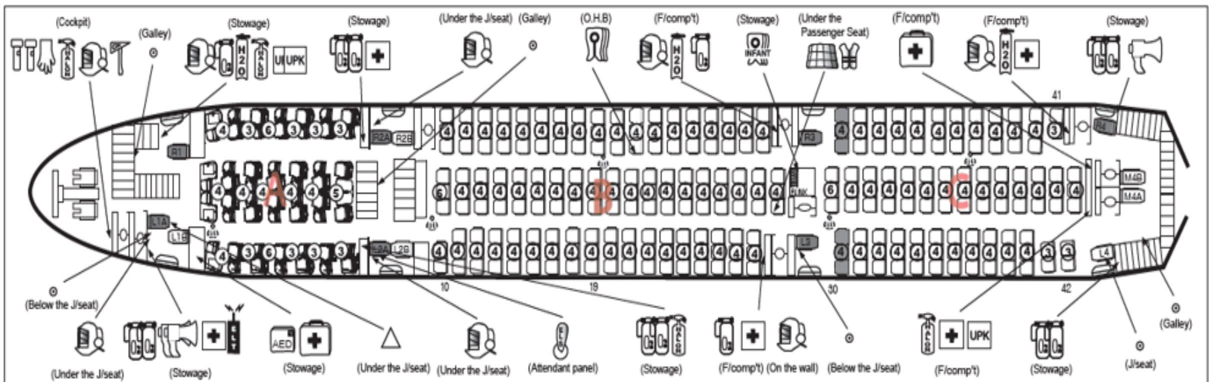
(At each attendant station)

(At each cockpit crew station)

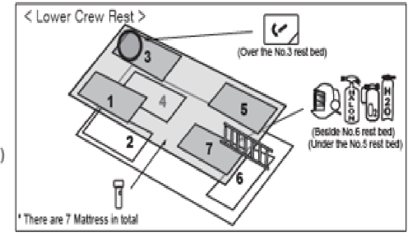
* Circuit breakers in each galley
* Gas Spray Gun, Handcuffs, Tie –wrap, Tying Rope are located in the Closet next to the Cockpit
* Each Zone includes a door and a galley. (B Zone starts from row 10, C Zone starts from row 30)
* O.H.B : Overhead bin, J/seat : Jumpseat, F/comp't : Floor compartment
* ③,④, ⑤,⑥ stands for the number of passenger oxygen masks.



Total pax seats	302(24/278)
Minimum staffing	7



B777-200 HL7775/91 Emergency Equipment Location



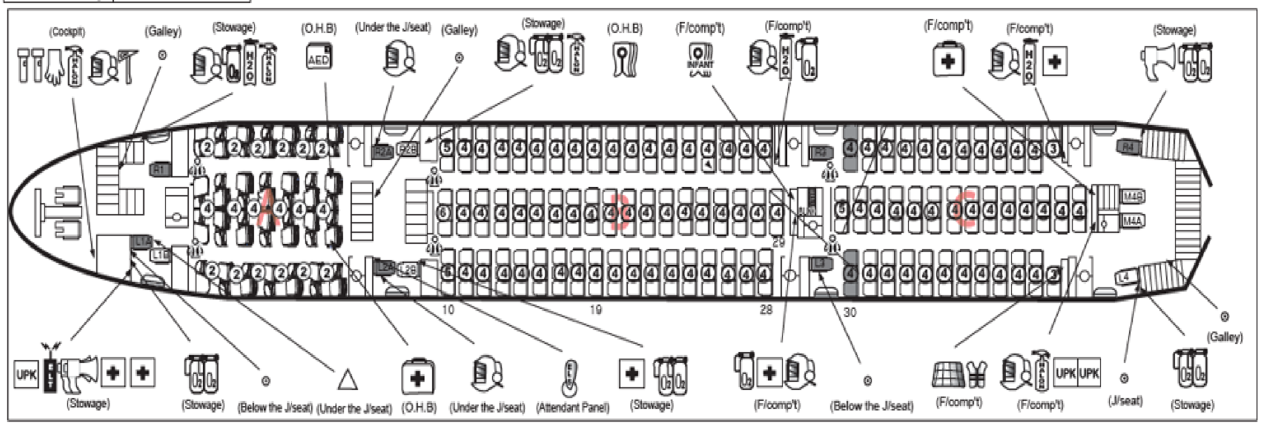
(One under each passenger seat)

(At each attendant station)

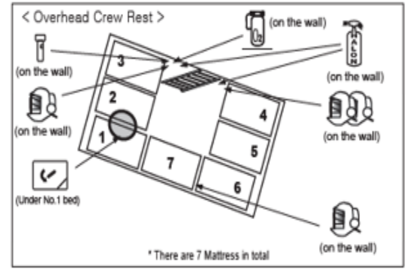
(At each cockpit crew station)

* Circuit breakers in each galley
* Gas Spray Gun, Handcuffs, Tie -wrap, Tying Rope are located in the Closet next to the Cockpit
* Each Zone includes a door and a galley. (B Zone starts from row 10, C Zone starts from row 30)
* O.H.B : Overhead bin, J/seat : Jumpseat, F/comp't : Floor compartment
* ②,③,④,⑤,⑥ stands for the number of passenger oxygen masks.

Total pax seats	301(24/277)
Minimum staffing	7



■ B777-200 HL8254/84 Emergency Equipment Location



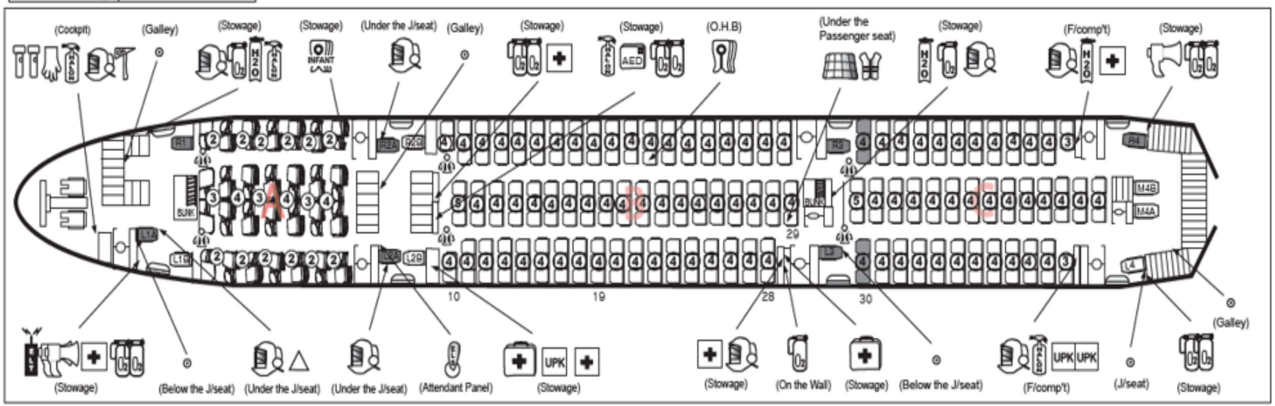
(One under each passenger seat)

(At each attendant station)

(At each cockpit crew station)

- * Circuit breakers in each galley
- * Gas Spray Gun, Handcuffs, Tie –wrap, Tying Rope are located in the Closet next to the Cockpit
- * Each Zone includes a door and a galley. (B Zone starts from row 10, C Zone starts from row 30)
- * O.H.B : Overhead bin, J/seat : Jumpseat, F/comp't : Floor compartment
- * ②,③,④,⑤ stands for the number of passenger oxygen masks.

Total pax seats	302(24/278)
Minimum staffing	7



AIR SYSTEMS

AIR CONDITIONING PACKS

GROUND CONDITIONED AIR USE

Before connecting ground conditioned air:

PACK switches (both) .... OFF

CAUTION! ***Prevents pack operation when conditioned air is supplied to the airplane. The pack or pack components can be damaged if operated with conditioned air.***

Passenger
RECIRCULATION FANS switches (both) .... OFF

Allows conditioned air unit to operate at maximum efficiency.

~~**Freighter**~~
~~**RECIRCULATION FANS switch.. OFF**~~

~~Allows conditioned air unit to operate at maximum efficiency.~~

After disconnecting ground conditioned air:

PACK switches (both) .... AUTO

Passenger
RECIRCULATION FANS switches (both) .... ON

~~**Freighter**~~
~~**RECIRCULATION FANS switch.. ON**~~

PACKS OFF TAKEOFF (R/R)

Before takeoff:

PACK switches (both) .... OFF

Wait 30 seconds before setting takeoff thrust.

PW engine (777-200ER~~/777-300)~~

Allows packs to shut down and EECs time to recompute maximum EPR line and reference/target EPR indications.

~~**GE engine (777-300ER/R777F)**~~

~~Allows packs to shut down and EECs time to recompute maximum N1 line and reference/target N1 indications.~~

After takeoff:

PACK switches (both) ....AUTO

After engine thrust is reduced from takeoff to climb and prior to reaching 3000 ft above field elevation, position both pack switches to AUTO.

APU TO PACK TAKEOFF (R/R)

HL8254, HL8284

Note: APU to Pack Takeoff is prohibited at airport pressure altitudes above 6900 feet.

Before start:

PACK switches (both) ....AUTO

On the THRUST LIMIT Page, select one of the following takeoff thrust ratings:

- full thrust
- percent derate

Enter “APU” into the scratchpad and line select to the “SEL-APU” field. “APU” appears in small font representing the armed mode.

After engine start:

Leave APU running to supply air to the left pack.

Approximately one minute after second engine start, “APU” displays in large font representing the active mode.

Confirm proper configuration by noting a green “A-TO, A-TO1, or A-TO2” on EICAS.

Note: If cabin temperature becomes excessive during extended ground operation, establish dual pack operation by deleting the APU selection. To re-establish APU to Pack operation, enter “APU” into the scratchpad and line select to the “SEL-APU” field.

Note: If an engine is shutdown after selecting APU to Pack operation, the engine cannot be started until APU to Pack takeoff mode has been deleted. To re-establish APU to Pack operation after start, re-enter "APU" into the scratchpad and line select to the "SEL-APU" field.

After climb thrust reduction:

APU Selector ....OFF

Intentionally

Blank

AUTOMATIC FLIGHT

AFDS

AFDS OPERATION

FLIGHT DIRECTOR switches .... ON

Verify FLT DIR is displayed in the AFDS system status annunciator.

If the autopilot is desired:

AUTOPILOT engage switch .... Push

Verify A/P is displayed in the AFDS system status annunciator.

HEADING HOLD

If the airplane is operating in polar regions:

HEADING REFERENCE switch .... TRUE

HEADING/TRACK reference switch...................................... Push

Verify HDG is displayed in the HDG/TRK window.

Heading/track HOLD switch... Push

Verify HDG HOLD is displayed in the roll mode annunciator.

HEADING SELECT

Maintains the airplane heading the same as the selected heading.

If the airplane is operating in polar regions:

HEADING REFERENCE switch .... TRUE

HEADING/TRACK reference switch...................................... Push

Verify HDG is displayed in the HDG/TRK window.

Heading/track SELECT switch... Push

Verify HDG SEL is displayed in the roll mode annunciator.

Heading/track selector..Rotate

Set desired heading in the HDG/TRK window.

TRACK HOLD

If the airplane is operating in polar regions:

HEADING REFERENCE switch .... TRUE

HEADING/TRACK reference switch..................................... Push

Verify TRK is displayed in the HDG/TRK window.

Heading/track HOLD switch.. Push

Verify TRK HOLD is displayed in the roll mode annunciator.

TRACK SELECT

Maintains the airplane track the same as the selected track.

If the airplane is operating in polar regions:

HEADING REFERENCE switch .... TRUE

HEADING/TRACK reference switch..................................... Push

Verify TRK is displayed in the HDG/TRK window.

Heading/track SELECT switch.. Push

Verify TRK SEL is displayed in the roll mode annunciator.

Heading/track selector ....Rotate

Set desired track in the HDG/TRK window.

ALTITUDE HOLD

Altitude HOLD switch... Push

Verify ALT is displayed in the pitch mode annunciator.

FLIGHT LEVEL CHANGE, CLIMB or DESCENT

ALTITUDE selector ....Rotate

Set the desired altitude in the MCP ALTITUDE window.

FLCH switch .... Push

Verify FLCH SPD is displayed in the pitch mode annunciator.

IAS/MACH selector..Rotate

Set the desired speed in the IAS/MACH window.

VERTICAL SPEED, CLIMB or DESCENT

ALTITUDE selector ....Rotate

Set the desired altitude in the MCP ALTITUDE window.

VERTICAL SPEED/FLIGHT PATH ANGLE reference switch... Push

Verify V/S is displayed in the vertical speed/flight path angle window.

VERTICAL SPEED/FLIGHT PATH ANGLE switch................. Push

Verify V/S is displayed in the pitch mode annunciator.

VERTICAL SPEED/FLIGHT PATH ANGLE selector ....Rotate

Set the desired vertical speed in the VERTICAL SPEED/FLIGHT PATH ANGLE window.

If a climb is desired:

Select climb thrust limit on the CDU THRUST LIM page.

FLIGHT PATH ANGLE, CLIMB or DESCENT

ALTITUDE selector ....Rotate

Set the desired altitude in the MCP ALTITUDE window.

VERTICAL SPEED/FLIGHT PATH ANGLE reference switch... Push

Verify FPA is displayed in the vertical speed/flight path angle window.

VERTICAL SPEED/FLIGHT PATH ANGLE switch................. Push

Verify FPA is displayed in the pitch mode annunciator.

VERTICAL SPEED/FLIGHT PATH ANGLE selector ....Rotate

Set the desired flight path angle in the VERTICAL SPEED/FLIGHT PATH ANGLE window.

If a climb is desired:

Select climb thrust limit on the CDU THRUST LIM page

AFDS Reset

An AFDS reset can be accomplished by reference or by memory for the following reasons:

- To permit ILS/GLS approach tuning, after localizer or glideslope captured, when below 1,500 feet radio altitude.
- A fault has caused the selected MCP altitude to change without pilot input.
- Any AFDS anomaly where individual pilot-selected AFDS modes are not responding normally to MCP switch selections.
- The FMA indicates ALT hold, when on the ground, prior to takeoff.

If the autopilot is engaged:

Autopilot disconnect switch.. Push

F/D switches (both) .... OFF

Note: The reset only occurs when the autopilot and both flight director switches are OFF at the same time.

F/D switches (both) .... ON

Verify FLT DIR is displayed in the AFDS system status annunciator.

Roll and pitch modes .... Select as needed

Verify selections on FMA.

If the autopilot is desired:

AUTOPILOT engage switch ....Push

Roll and pitch modes .... Select as needed

Verify selections on FMA.

AUTOTHROTTLE OPERATION

AUTOTHROTTLE ARM switches... **ARM**

If the pitch mode is TO/GA:

TO/GA switch..**Push**

Verify that THR REF is displayed in the autothrottle mode annunciator. THR REF changes to HOLD at 80 kts.

If the pitch mode is ALT, V/S, FPA, G/S, or no pitch mode:

AUTOTHROTTLE engage switch..**Push**

Verify that SPD is displayed in the autothrottle mode annunciator.

If a constant speed is desired:

IAS/MACH selector .... **Rotate**

Set the desired speed in the IAS/MACH window.

If climb or continuous thrust is desired:

CLB CON switch..**Push**

Verify that THR REF is displayed in the autothrottle mode annunciator.

If FLCH or VNAV is desired:

FLCH or VNAV switch ....**Push**

Verify that THR REF, THR, SPD, IDLE, or HOLD as appropriate is displayed in the autothrottle mode annunciator.

If TO/GA is desired:

TO/GA switch...**Push**

The pitch mode will change to TO/GA. Verify that THR or THR REF is displayed in the autothrottle mode annunciator.

If the pitch mode is VNAV PTH, VNAV ALT, VNAV SPD, or FLCH SPD:

AUTOTHROTTLE switch...**Push**

Verify THR REF, THR, SPD, IDLE, or HOLD as appropriate is displayed in the autothrottle mode annunciator.

PRM BREAKOUT MANEUVER (R/R)

During ILS/LDA PRM (Precision Runway Monitor) approach, a breakout is commanded by ATC using the following phraseology:

“TRAFFIC ALERT/BREAKOUT ALERT (airplane call sign), TURN (left/ right) IMMEDIATELY, HEADING (degrees), CLIMB/DESCEND AND MAINTAIN (altitude).”

All breakouts are to be hand-flown to ensure the maneuver is accomplished in the shortest amount of time.

ATC may 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 1000 ft required obstruction clearance.

PF	PM
When ATC instructs to breakout:	
Disengage A/P Turn left/right (25° bank angle) and rotate smoothly toward 10° pitch nose up attitude	Both F/Ds OFF, then PM’s F/D ON Set ALT on MCP Set V/S +1000 fpm on MCP (or select FLCH mode) Set HDG and select HDGSEL PF’s F/D ON Call “**SPD**”, “**HDG SEL**”, “**V/S**” (or “**THR**”, “**HDG SEL**”, “**FLCH SPD**”)
Verify proper mode engaged, Call “ **CHECK**” Follow F/D commands and stabilize aircraft	Verify aircraft is stabilized on course and on path
Engage A/P Call “**AUTOPILOT**”	Verify autopilot engaged, Call “**AUTOPILOT**”
Call “**FLAPS 20**”	Call “**SPEED CHECK, FLAP 20**” and position flap lever to 20.
	Verify a positive rate of climb on the altimeter and call "**POSITIVE CLIMB**"

Verify a positive rate of climb on the altimeter, call “**GEAR UP**"	Repeat "**GEAR UP**" and set the landing gear lever to UP.
Call for “**FLAPS**____” according to the flap retraction schedule.	Call "**SPEED CHECK, FLAPS**_____” and set flap lever as directed.
After flap retraction to the planned flaps setting, select FLCH or VNAV as needed.	Verify FLCH or VNAV engaged.
Verify that the climb thrust is set. Verify that the selected altitude is captured.	
Call for “**AFTER TAKEOFF CHECKLIST**”	Accomplish AFTER TAKEOFF checklist.

CAUTION! In case of a descent breakout maneuver:

- ***Maintain present descent rate (pitch attitude).***
- ***Do not descend below 1000 ft HAT/OCA and request an alternate clearance if possible.***

Note: For TCAS RA commands during ILS/LDA PRM approaches, refer to FOM 6.7 - ILS PRM and LDA PRM Approaches (ILS PRM, LDA PRM and the Use of TCAS).

COMMUNICATIONS

ACARS OPERATIONS

ACARS links the aircraft with the ground data processing and information network.

OPERATIONAL CONDITIONS

Some ACARS functions for ground support are still being developed, and such functions are not in used yet.

Refer to ACARS Pilot Guide for details.

FREQUENCY FOR ACARS COMMUNICATIONS

ACARS select suitable frequency automatically. If you need, check selected frequency and manually select frequency on ACARS MANAGER page.

ACARS OPERATIONS PROCEDURE

PRE-FLIGHT PROCEDURE

Check Comm status (Mandatory)

- Check that VHF center Radio Tuning Panel (RTP) displays DATA in the Active Frequency Window.

  Note: ACARS uses VHF or SATCOM (if VHF is unavailable) automatically. However, VHF center should be selected to data mode during the flight except when it is used for voice communications.

- Check printer. If printer doesn't work or out of paper, contact maintenance person.

Initialization (Mandatory)

- Send an Initialization after inserting flight information in the COMPANY ACARS INITIALIZATION page.

Note: The PIC's identification number should be entered as the first crew member on the Initialization page.

- Check Uplink message : CAT II/III Recency, OPF Number, &Full thrust takeoff required(if acceptable) & and SOW Index Range.

  Note: &Full thrust takeoff required(if acceptable) & message is shown if it is required

  Note: SOW Index Range is included for a month only if it is changed

Operational Utilization

- Send a request of ATIS information in the FLIGHT INFORMATION ATIS REQUEST page, if required.

  Note: Voice ATIS information verification/acquisition is required when Digital ATIS is in a trial mode or not available on the airport.

- Send a request of Departure Clearance(DCL) in the FLIGHT INFORMATION CLEARANCE page in accordance with the airport ATC clearance procedures.
  - Review uplinked DCL message in REVIEW RECEIVED page and accept/reject it.

- Weight & Balance data will be automatically uplinked.
  - Review uplinked W&B data and accept/reject it by ACARS.

  Note: If W/B data is not uplinked until 10 minutes (international)/7 mins (domestic) before Estimated Time of Departure (ETD) request W/B data by using ACARS or voice communication.

- Send a departure delay report including revised ETD and reason in the COMPANY DELAY REPORT page if delay operation is expected 30 minutes or more than ETD.

CLIMB AND CRUISE PROCEDURE

Operational Utilization

- Send a request of weather, NOTAM, ground service, SPOT Number or ATIS in the COMPANY WEATHER/NOTAMS/GROUND SVC/GATE ASSIGNMENT REQUEST or FLIGHT INFORMATION ATIS REQUEST page as needed.

- Send a report about PIREP or DELAY in the COMPANY PIREP or

DELAY REPORT page as needed.

- Send an air-to-air free text to company aircraft in flight after inserting flight number and free text message in the COMPANY AIR TO AIR FREE TEXT page as needed.
- Send a diversion report including diversion station and reason in the COMPANY DIVERSION REPORT page as needed.

Note: If hijack situation occurs, select TRUE and then select SEND on COMPANY TRUE REPORT page to generate a hijack report downlinks. Use extreme caution.

APPROACH AND LANDING PROCEDURE

Action Item (Mandatory)

- Send an ETA report in the COMPANY ETA REPORT page.
- Send a flight log report in the COMPANY FLT LOG REPORT page after ramp-in.

CPDLC OPERATIONS PROCEDURE

UP/Downlink Procedure

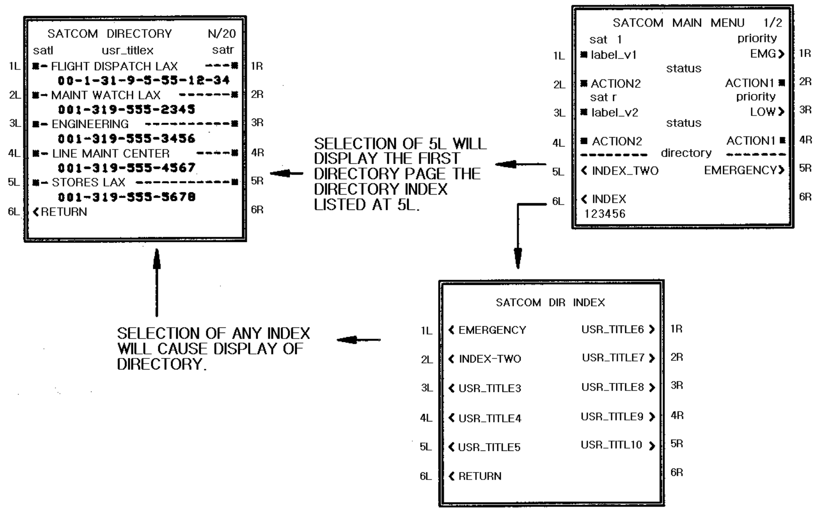
PF	PM
Downlink	
	Prepare downlink message.
Verify downlink message.	
	Send downlink message.
Uplink	
Read back uplink message.	Read uplink message.
Note: If uplink message is too large to fit in the EICAS ATC Message Block, "LARGE ATC MESSAGE" will be displayed. When it is shown, review all of the uplink message text on the MFD by selecting NEW MESSAGE menu.	

PF	PM
If uplink message is acceptable: Set the uplink message data values to MCP or related control panels according to the areas of responsibility.	
Check the Crew Feedback display on EICAS or MFD.	If uplink message data is selected: Verify that the color of data values displayed on the EICAS ATC message block or MFD are changed from white to green (Crew Feedback display), then call an appropriate callouts for changes. (e.g. “FL330, GREEN”)
Check the message status.	Send a response to ATC. Check the message status changed to ACCEPTED/REJECTED.
Select the MCP mode switch or execute the FMS modification as required.	

Refer to FOM 9.1 - CPDLC

SATELLITE COMMUNICATIONS SYSTEM

PLACING A CALL AIR-TO-GROUND



- Select SATCOM-1 or SATCOM-2 (if available) on audio control panel (ACP).
- Select SATCOM from MCDU menu.
- If the callee label is already displayed adjacent to 1 L and the available action is PLACE CALL, selecting 2R will initiate the call.
- If the desired callee label is not displayed, select <INDEX from the SATCOM MAIN MENU 1/2. From the SATCOM DIR INDEX page, select the DIR INDEX that contains the desired callee label. Upon selection of an INDEX, the SATCOM DIRECTORY page will be displayed.
- From the SATCOM DIRECTORY page, select the name or label of the callee. If the callee is not present on one of the DIRECTORY pages, refer to quick reference procedure for adding a number to the DIRECTORY.

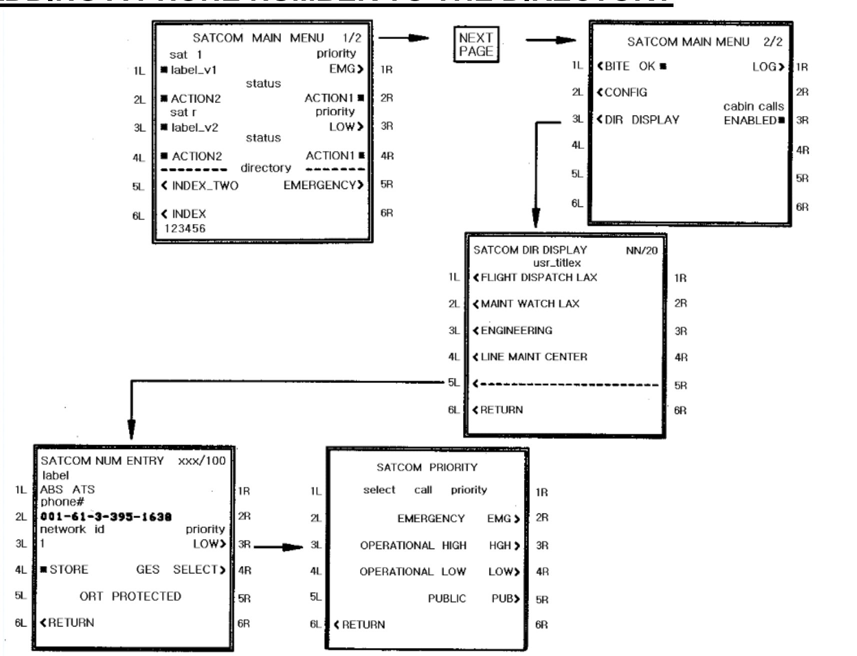
Note: If a new DIRECTORY entry is not selected, then the last entry selected (for that channel) will be used.

- After selecting the label of the callee, the display will return to the SATCOM MAIN MENU. The available action displayed on 2R will be either PLACE CALL or QUEUE CALL. PLACE CALL will be displayed if resources are available. Selecting PLACE CALL (2R) will initiate the call. If QUEUE CALL is displayed, the call will be placed only when sufficient resources become available.

  Note: A second action is displayed at 2L. If PREEMPT* is displayed, the user can select 2L to disconnect the call with the lowest priority (usually a cabin call) to make the resources available for the cockpit call.

- If the call is completed, the crew will hear the ringing signal generated by the ground network. No further crew action is necessary for the duration of the call. If the call in process fails, the crew can select the action CLEAR STATUS at 2R to acknowledge the call failure.

ADDING A PHONE NUMBER TO THE DIRECTORY



- Select SATCOM from MCDU menu.
- Select <DIR DISPLAY from SATCOM MAIN MENU 2/2.

- Select an uninitialized number (dashes displayed) from a DIRECTORY page within the desired index group.
- Enter the phone number label or callee name into the scratchpad.
- Select 1 L to place the label or name into the label field.
- Enter the phone number associated with the callee into the scratchpad. The number entered into the scratchpad will contain (in this order): the international prefix (00), country code, city or area code, and the number of the callee. Characters such as dashes and spaces may be used to separate the fields in the number.
- Select 2L to place the phone number, for the callee, into the phone number field.
- Enter the network ID for the callee in the scratchpad and place the network ID into the associated field by selecting 3L. Use a network ID of 1 for calls using the Public Telephone Network.
- Selecting 3R will display the SATCOM PRIORITY page. Select the priority from the list of priorities. OPERATIONAL LOW (LOW>) is the default priority.
- If there is a preferred GES for call placement, select 4R to display the SATCOM GES SELECT page. The preferred GES in each satellite region can be selected from the SATCOM GES SELECT page. If no GES is preferred, the user may select the log-on GES and the call will be placed over the log-on GES.
- Select 4L when *STORE is displayed to store the phone number and callee information into the DIRECTORY table.

CHECK BITE if: (R/D)

- SAT INOP advisory is displayed on SATCOM MAIN MENU.
- BITE FAIL is displayed on SATCOM MAIN MENU.

TO CHECK BITE: (R/D)

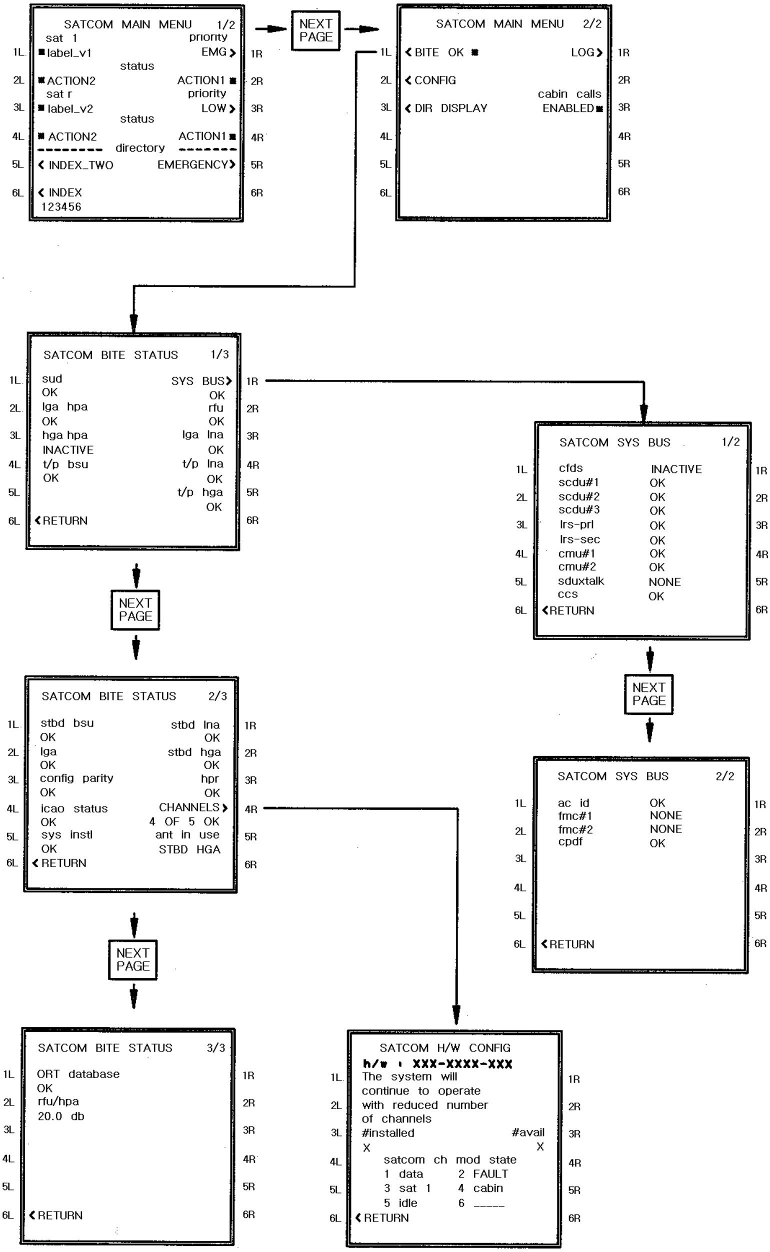
- Select SATCOM from MCDU menu.
- Observe field adjacent to 5L. If "BITE OK" is displayed all SATCOM

LRUs pass BITE, all installed channel modules are functional and SATCOM LRUs are active on system buses.

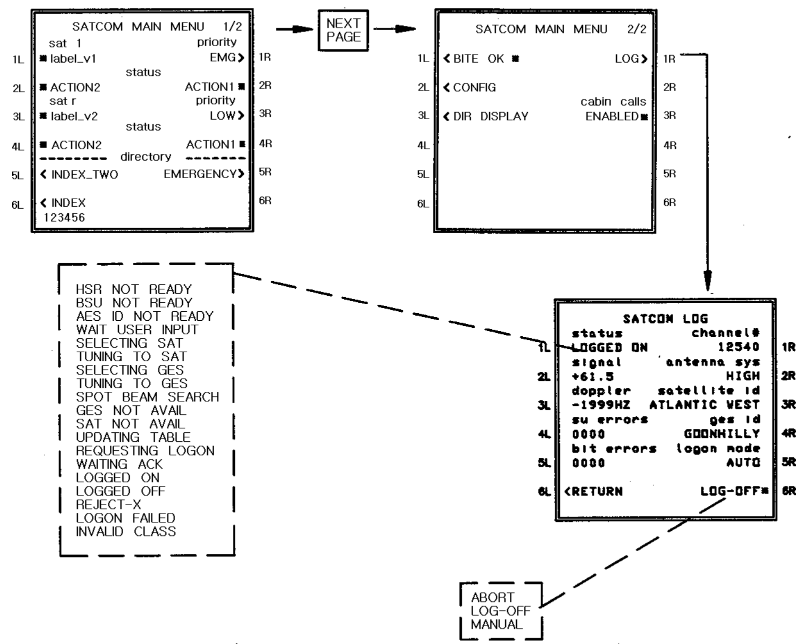
- If "BITE OK*" is displayed, all SATCOM LRUs pass BITE and are active on system buses but not all channel modules are functional. Select 5L, NEXT PAGE, then select 4R to observe SATCOM H/W CONFIG page for channel module faults.
- If "BITE FAIL" is displayed, one or more of the SATCOM LRUs report a failure of the LRU or inactivity on a system bus. Select 5L to observe the status of the SATCOM LRUs.

• Look through the BITE STATUS pages and the SYS BUS pages to determine the faulted system. In most cases the LRU status is shown as OK, INACTIVE, FAULT, or NONE. For each of these statuses there are some possible actions that the crew may take. Refer to the following list:

FAULT	The LRU should be replaced.
INACTIVE	The interwiring or power to external systems should be checked.
NONE	This indicates the rear strapping identifies the LRU is not installed.
NO DATA	This indication applies only to the IRS bus. The SDU may be receiving only partial data from the IRS. The IRS may need to be initialized.
TEST	This indication applies only to the BSUS. This status will be shown while the BSU is performing self-test. This status is not considered to be a fault unless the BSU does not end its self-test within 2 min of power-up.


SATCOM MAIN MENU 1/2
sat 1
priority
label_v1
EMG
status
ACTION2
ACTION1
sat r
priority
label_v2
LOW
status
ACTION2
ACTION1
directory
INDEX_TWO
EMERGENCY
INDEX
123456
NEXT PAGE
SATCOM MAIN MENU 2/2
BITE OK
LOG
CONFIG
cabin calls
DIR DISPLAY
ENABLED
SATCOM BITE STATUS 1/3
sud
OK
SYS BUS
OK
lga hpa
OK
rfu
OK
hga hpa
INACTIVE
lga lna
OK
t/p bsu
OK
t/p lna
OK
t/p hga
OK
RETURN
SATCOM SYS BUS 1/2
cfds INACTIVE
scdu#1 OK
scdu#2 OK
scdu#3 OK
lrs-prl OK
lrs-sec OK
cmu#1 OK
cmu#2 OK
sduxtalk NONE
ccs OK
RETURN
NEXT PAGE
SATCOM BITE STATUS 2/3
stbd bsu
OK
stbd lna
OK
lga
OK
stbd hga
OK
config parity
OK
hpr
OK
icao status
OK
CHANNELS
4 OF 5 OK
sys instl
OK
ant in use
STBD HGA
RETURN
NEXT PAGE
SATCOM SYS BUS 2/2
ac id OK
fmc#1 NONE
fmc#2 NONE
cpdf OK
RETURN
NEXT PAGE
SATCOM BITE STATUS 3/3
ORT database
OK
rfu/hpa
20.0 db
RETURN
SATCOM H/W CONFIG
h/w : XXX-XXXX-XXX
The system will
continue to operate
with reduced number
of channels
#installed
#avail
X
X
satcom ch mod state
1 data 2 FAULT
3 sat 1 4 cabin
5 idle 6 ____
RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R

HOW TO LOG ON (R/D)



The user will log-on if at power-up the owner's preference table indicates log-on is USER COMMANDED; if a user commanded log-on has failed for any reason; if the AES receives a log-on reject due to permanent unavailability; or if the user has selected LOG OFF* or ABORT*. The active advisory "LOG-ON>" indicates the log-on search process is awaiting operator command to log-on.

Note: The automatic log-on is the most common setting and requires no crew action.

- Select SATCOM from MCDU menu.
- Select 5R from SATCOM MAIN MENU.

Note: The SATCOM LOG menu can be entered from the SATCOM MAIN MENU or from any other page when the active advisory "LOG-ON>" is displayed. Select 6R when the active advisory is displayed on any page.

- The log-on status is displayed as "WAITING USER INPUT'.

- The user may select AUTO LOG* (6R) which causes the AES to select a GES according to preferences entered in the GES preference table.
  - If the user desires to manually select a satellite/GES for log-on, the user enters a new satellite ID and GES ID into the scratchpad. Selecting 3L after entering a SATID/ GESID will initiate a manual log-on to the specified GES. Attempts to enter a SATID/ GESID that is not stored in the owner's preference table will result in a scratchpad message "ENTRY NOT IN TABLE".
  - Satellite ID (SATID) is selected from the range 00 - 76.
  - GESID is selected from the range 000 - 376. The GESID is displayed as dashed while the AES is in the tuning-to-SAT portion of the log-on process.

SATELLITE AND GES IDs

SATELLITE			GES		Comment
Region	ID	Longitude (deg)	ID	Location	
AORW	00	-54	001	Goonhilly	
			002	Southbury	PSID #2
			003	Laurentides	PSID #1
			004	Eik	
AORE	01	-15	101	Goonhilly	PSID #1
			103	Aussaguel	PSID #2
			104	Eik	
			105	Fucino	
POR	02	178	201	Sentosa	
			202	Santa Paula	PSID #2
			203	Yamaguchi	
			205	Perth	PSID #1
			206	Niles Canyon	
			207	Brunei	
			210	Kumsan	

SATELLITE			GES		Comment
Region	ID	Longitude (deg)	ID	Location	
IOR	03	64	301 302 303 305 306 307 310 312	Eik Nunthaburi Aussaguel Perth Yamaguchi Brunei Sentosa Fucino	PSID #2 PSID #1

HF RADIO COMMUNICATIONS SYSTEM

HF RADIO COMMUNICATION/SELCAL CHECK

HF radio communication/SELCAL check should be performed during the preflight if the HF communication is required for flight.

Note: The HF radio communication/SELCAL check can be substituted with the completion of ‘HF communication system - operational and system test’ according to the Avionics Check List by maintenance personnel before the flight.

If the HF radio communication/SELCAL check is not completed on the ground due to poor HF signal, radio congestion, fueling, etc., it should be checked before entering the route segment which needs the HF communication.

- If unable SELCAL check, HF should be monitored until back within VHF communications coverage.

Note: HF communication while the aircraft is on the ground may be degraded by aircraft position or blocked by radio frequency signal attenuation due to ground equipment and structures.

***WARNING!* Do not perform HF radio communication/ SELCAL check if fueling is in progress.**

HF RADIO COMMUNICATION/SELCAL CHECK PROCEDURE

- Establish contact with communication facility.
- Request SELCAL check by using the following format:

"**[**Agency (e.g. SEOUL Radio)**]**, **OZ XXX, Request SELCAL Check**,
[Aircraft SELCAL Code (e.g. BX-DU)**]**"

Intentionally

Blank

ELECTRICAL

ELECTRICAL POWER DOWN (R/R)

The following procedure is accomplished to remove all electrical power from the airplane.

Before accomplishing the following steps, verify ADIRU, EMER LIGHTS, and PACK switches are off and HYD PRESS SYS L+C+R message is displayed.

APU selector and/or EXTERNAL POWER switch(es) ....OFF

External power sources .... Removed

Verify that the external power AVAIL lights are extinguished.

BATTERY switch..OFF

ELECTRICAL POWER UP (R/D)

The following procedure is accomplished to permit safe application of electrical power.

BATTERY switch...ON

C1 and C2 PRIMARY pump switches ....OFF

DEMAND pump selectors ....OFF

WIPER selectors..OFF

Landing gear lever .... DN

ALTERNATE FLAPS selector ....OFF

Electrical power..Establish

BUS TIE switches – AUTO

If external power is desired:

PRIMARY EXTERNAL POWER AVAIL light -Illuminated

PRIMARY EXTERNAL POWER switch - Push

If the SECONDARY EXTERNAL POWER AVAIL light is illuminated:

SECONDARY EXTERNAL POWER switch - Push

If APU power is desired:

APU GENERATOR switch - ON

APU selector - START, then ON

ENGINE, APU

APU GROUND PNEUMATIC START (R/D)

Duct pressure .... Observe

Observe duct pressure is a minimum of 15 PSI (less 1 PSI per 1000 ft of pressure altitude).

Accomplish normal APU start.

ENGINE BATTERY START (R/D)

Accomplish the normal Exterior Inspection and the normal Preflight Procedure – First Officer through “Circuit breakers ....Check.”

BATTERY switch.. .ON

C1 and C2 PRIMARY pump switches ....OFF

DEMAND pump selectors ....OFF

WIPER selectors...OFF

Landing gear lever .... DN

ALTERNATE FLAPS selector ....OFF

STANDBY POWER switch(overhead maintenance panel) . . . . .

. . . . . Push to BAT, release to AUTO

Center bleed ISOLATION switch...OFF

Ground pneumatic source (if available) .... Connect

If the APU is needed for pneumatic power:

APU selector..START, then ON

Speedbrake lever .... Down

Reverse thrust levers... Down

Thrust levers ....Closed

Flap position indication and flap lever .... **Agree**

Parking brake .... **Set**

FUEL CONTROL switches .... **CUTOFF**

Captain's audio control panel .... **Set**

Start the left engine using the normal Engine Start procedure. Bleed air is available only to the left engine.

Limit start attempts to one autostart or two manual start attempts.

After left engine is started:

Ground pneumatic source (if used) .... **Disconnect**

Center bleed ISOLATION switch .... **AUTO**

Complete the normal Preflight, Before Start, and Engine Start procedures.

ENGINE GROUND PNEUMATIC START (R/R)

This procedure assumes the APU is not available for engine start.

Note: Coordinate with ground staff regarding the engine start sequence and ground equipment position.

Duct pressure .... **Observe**

Observe duct pressure is a minimum of 25 PSI (less 1 PSI per 1000 ft of pressure altitude).

Accomplish normal engine start.

After the first engine start is complete:

External sources. . . . . .Disconnect

Verify that all external power AVAIL lights are illuminated.

Disconnect external sources.

Use ENGINE CROSSBLEED START procedures to start the remaining engine.

ENGINE CROSSBLEED START (R/R)

Do not accomplish a crossbleed start during pushback.

The APU must be shut down or the APU Bleed switch must be turned off.

Verify the area behind the airplane is clear of equipment and personnel before increasing thrust on operating engine.

Parking brake... **Set**

Thrust lever (operating engine)... **Advance**

Increase thrust until 5% N2 above idle (25 PSI minimum duct pressure).

Accomplish normal engine start.

MANUAL ENGINE START PROCEDURE/CALLOUTS (R/R)

CAPT	F/O
Announce start sequence.	Select secondary engine display.
Call for "**OFF AUTOSTART**"	Call "**AUTOSTART OFF**" then push the AUTOSTART switch to OFF.
Call “**START______**”	Repeat "**START______**" and position______START/IGNITION selector to START.
	Call "**N TWO**" when the N2 RPM is increasing.
Acknowledge when calling "**N1 ROTATION**" from ground staff.	Call "**N ONE**" when the N1 RPM is increasing.
Observe oil pressure increase.	
	Call "**OIL PRESSURE**" when the oil pressure is increasing.

<table>
<tr><td>PW engine(777-200ER~~/777-300)~~
When at maximum motoring, 15 % N2 minimum(less than 1 % increase in N2 for approximately 5 secs):

~~GE engine (777-300ER/777F)~~
~~When at maximum motoring(less than 1 % increase in N2 for approximately 5 secs):~~
call "MAX MOTORING RUN" and Position______FUEL CONTROL switch to RUN.
Push the clock switch</td><td>Call "TIME CHECK" and push the clock switch.</td></tr>
<tr><td colspan="2">Observe initial EGT rising and EGT within limits.</td></tr>
<tr><td></td><td>Call "EGT RISING" when the EGT is increasing.</td></tr>
<tr><td>Reset the clock switch.</td><td>Call “PEAK EGT______", "TIME OUT"
Reset the clock switch.</td></tr>
<tr><td>Call "STABILIZED" when engine indications are stabilized.</td><td></td></tr>
<tr><td></td><td>After the engine is stabilized at idle:
if AUTOSTART is operative :
push AUTOSTART switch ON [1)]</td></tr>
<tr><td colspan="2">After the engine is stable at idle, start the other engine.</td></tr>
<tr><td colspan="2">[1)] The AUTOSTART switch may stay OFF between manual starts when both engines are to be started manually.</td></tr>
</table>

Do the Aborted Engine Start checklist for the following abort start conditions:

- There is no oil pressure rise before selecting RUN.
- EGT exceeds limits.
- EGT does not increase by 20 secs after the FUEL CONTROL switch is moved to RUN.
- N2 does not reach idle within 2 mins after selecting RUN.

PW engine (777-200ER~~/777-300)~~

- There is no N1 rotation indicated by 40% N2.

~~GE engine (777-300ER/777F)~~

- ~~There is no N1 rotation indicated by 50% N2.~~

MANUAL OVERRIDE ENGINE START (R/R)

Start the engine using normal engine start procedure, except direct the ground crew to:

PW engine (777-200ER/~~777-300~~)

- manually open the start valve after positioning START/IGNITION selector to START

~~GE engine (777-300ER/777F)~~

- ~~manually open the start valve after positioning START selector to START~~

PW engine (777-200ER/~~777-300~~)

- manually close the start valve at 42 % N2

~~GE engine (777-300ER/777F)~~

- ~~manually close the start valve at 62 % N2~~

SINGLE ENGINE TAXI

WARNING! Exercise extreme caution to prevent jet blast damage. Use the minimum thrust necessary.

CAUTION! Higher break-away thrust increases the chance of FOD on the operating engine.

When planning SINGLE ENGINE TAXI operations, consider these conditions:

- Icing conditions
- Contaminated surfaces that can have reduced braking capability
- A system that affects braking or steering is inoperative or degraded
- NOTAM or specific airport requirement prohibits SET
- Taxi routing that involves tight turns or gradients requiring significant thrust increase

- Adverse weather conditions
- High gross weights
- APU inoperative
- High crew workload is expected
- Soft asphalt

Before engine shutdown, engine cool down is recommended:

- run the engines for at least :

PW Engine (777-200ER~~/777-300)~~	~~**GE Engine (777-300ER/777F)**~~
5 mins	~~3 mins~~

- use a thrust setting no higher than that normally used for all engine taxi operations

However, if operationally necessary, all engines may be shut down upon arrival at the gate, regardless of the time since landing.

Before engine shutdown, the crew must be aware of system requirements (hydraulics, brakes, electrical and etc.).
Delay starting the APU as long as possible. However, passenger's comport is the primary consideration.

For taxiing with one engine:

Left FUEL CONTROL switch..**CUTOFF**

Note: Turn off the appropriate fuel pump switches when executing the SHUTDOWN checklist.

Note: Use a thrust setting normally used for taxi operations. Limit N1 to 36%, if possible. This reduces the chance of FOD.

ENGINE SHUTDOWN AND RESTART WITHOUT GROUND CREW (R/R)

If heavy delay(e.g. traffic, weather, ATC instruction, etc.) is expected on the ground, the pilot may shutdown engine(s) during waiting for takeoff under the following conditions:

- Contact ATC to shutdown engine(s).
- Icing conditions do not exist.
- ATC or other aircraft(s) are in a position to see and advise crew of a tailpipe fire situation.
- APU(pneumatic and generator) must be operative.

ENGINE SHUTDOWN PROCEDURE WITHOUT GROUND CREW (R/D)

Contact/acknowledge ATC request for engines shutdown.

Accomplish the following procedures:

Parking Brake .... **SET**

APU .... **Start**

For single engine shutdown;

FUEL CONTROL switch .... **CUTOFF**

For all engines shutdown;

Electrical Power .... **Establish**

FUEL CONTROL switches .... **CUTOFF**

Hydraulic Panel .... **Set**

C1 and C2 PRI pump switches .... **OFF**

L Demand pump selector .... **OFF**

R Demand pump selector .... **AUTO**

C1 and C2 Demand pump selector .... **OFF**

Fuel pump switches .... **OFF**

ENGINE RESTART PROCEDURE WITHOUT GROUND CREW (R/R)

- Contact ATC to request engine(s) restarting.
- Engine may be started by APU bleed or cross-bleed.
- Conduct a pre-flight panel scan before accomplishing the "BEFORE START" checklist.
- Accomplish Engine Start Procedures/Callouts.
- Accomplish After Start Procedures/Callouts.

Intentionally
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FLIGHT INSTRUMENTS, DISPLAYS

HEADING REFERENCE SWITCH OPERATION

Use TRUE when operating in regions where true referencing is required.

Use NORM in all other regions.

HDG REF switch..NORM or TRUE

Note: If using HDG SEL or TRK SEL mode and the HDG REF switch position is changed, the AFDS roll mode changes to HDG HOLD or TRK HOLD, respectively; HDG SEL or TRK SEL may be reselected.

QFE OPERATION (R/R)

This procedure is accomplished when ATC altitude assignments are referenced to QFE altimeter settings.

Note: Do not use LNAV and/or VNAV below transition altitude/level. Altitudes in the navigation database are not referenced to QFE. Use only raw data for navigation.

PRE- FLIGHT

INIT REF key.. Push

<INDEX.. Select

<APPROACH .... Select

LANDING REF key.. Select

Verify QFE selected.

[This sets the landing altitude to zero.]

Altimeters ....Set

Set altimeter to QFE when below transition altitude/level.

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

Takeoff Performance .... Check

If QNH altimeter is not available, QFE altimeter should be converted to QNH altimeter prior to compensating pressure because the OPT is based on QNH. Refer to FOM 4.4 - Altimeter Setting (QNH Operation in QFE Airport).

TAKEOFF

Above 400 ft:

Select roll mode .... As required

Remain TOGA mode or select HDG SEL.

At climb thrust reduction point (1500 ft or Flaps 5)

Climb thrust.. Select

Set climb thrust using the THR switch on the MCP or select CLB thrust on the THRUST LIM page. Check that the thrust reference changes from TO to CLB on the EICAS.

At acceleration height :

FLCH... Select

Select FLCH and set the command speed to Vref + 80 kts or 250 kts, whichever is higher.

Altimeters .... Reset

Reset altimeters to QNE.

Note: LNAV and/or VNAV can be used above transition altitude.

CDU.. Check

Verify QNH selected automatically on the APROACH REF page.

APPROACH AND LANDING

Approach Preparation

Minima ....Set

When conducting an approach with the altimeters set to QFE, the pilots must set DH or MDH instead of DA or MDA as minimums.

CDU APPROACH REF page .... Select

Select QFE on the LANDING REF line.

If both FMCs are failed

Landing altitude .... Set at zero

Manually set to zero.

Do not accomplish the following checklist:

LANDING ALT

When descending below transition level

Altimeters .... Reset

Reset altimeters to QFE.

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

Note: ATC will assign QFE height.

Roll and Pitch mode .... Select

Use TRK SEL, HDG SEL, LOC, APP, FLCH or V/S modes below transition level.

WEATHER RADAR (R/R)

RADAR GUIDELINES

~~**Tilt accuracy check**~~

~~**WXR-700X Weather Radar**~~

- ~~Conditions:~~
  - ~~Straight and level~~
  - ~~Altitude 10,000 ft AGL or higher~~
  - ~~Level terrain~~
  - ~~No intervening weather.~~
- ~~Adjust Tilt until the yellow ground return arc starts at a distance equal to [2 X AGL altitude/1000].~~

~~e.g) At 34,000 ft AGL, yellow ground returns start at 68 NM on the the display (2 X 34).~~

~~- Verify that tilt angle indicates to 3 1/2° DOWN ± 1 1/2° (acceptable limit: 2° - 5° DOWN).~~

~~If tilt angle is not within 2° - 5° DOWN, note the difference between tilt setting and 3 1/2° DOWN.~~

~~This is the amount of tilt error present and should be applied to all tilt settings.~~

~~WXR-2100 Weather Radar~~

- ~~WXR-2100 weather radar does not require a tilt accuracy check. The tilt angle displayed on the ND is accurate.~~

~~Note: WXR-2100 contains self-detection sensors to detect a variation in the tilt or horizontal angle, and if variation is detected, an antenna fail message would be sent to the ND.~~

~~Gain control~~

~~WARNING! Always reset the gain knob to CAL position after a below gain setting has been used. Gain settings below may cause thunderstorms to appear less intense than is actually the case.~~

- ~~In normal operation, the flight crew should set GAIN control to the calibrated reflectivity level (CAL).~~
- ~~If the ND is saturated with weather returns:~~
  - ~~Reduce gain manually to identify the areas of heaviest rainfall, those are usually associated with active storm cells.~~
  - ~~After completing the cell assessment, reset the gain knob to CAL position to maintain optimum radar sensitivity.~~

~~WXR-700X Weather Radar~~

- ~~During high altitude operations (at which low reflectivity targets such as ice crystals may encounter) or under the low visibility conditions (i.e. night flight), gain can be increased to maximize detection capability.~~

~~Turbulence~~

~~WARNING! An absence of indicated turbulence in WX+T mode does not mean it is safe to penetrate a weather area that by other indications is hazardous.~~

~~Weather radar detects wet turbulence (horizontal rain movement) and displays it in magenta within 40nm when:~~

~~WXR-700X Weather Radar~~

- ~~WX+T mode is selected and ND range is 40nm or less.~~

~~WXR-2100 Weather Radar~~

- ~~WX+T mode is selected regardless of ND range selection.~~

~~Predictive Windshear (PWS)~~

~~Predictive Windshear detection is automatically activated during the landing and takeoff phases (below 2300 ft RA) of flight and generates PWS aural/visual alert (below 1200 ft RA) to provide detection and warning of windshear ahead of the aircraft.~~

~~RADAR OPERATION~~

~~The recommended tilt and range settings are guidelines for good radar operation. The flight crew is not limited to these settings. Operational needs often dictate flexibility in tilt and range selections.~~

~~WARNING! Never penetrate a storm that produces a radar shadow. Radar shadows are areas of unknown weather intensity due to attenuation.~~

~~WXR-700X Weather Radar~~

~~Phase~~	~~Recommended tilt and range settings~~
~~Taxi~~	***~~WARNING! Do not operate the weather radar in a hangar or within 50 feet of any fuel spill.~~*** ~~Weather Radar/Antenna Tilt check (if needed):~~ ~~• Clear on parking area~~ ~~• Set ND to 10nm range~~ ~~• Tilt down then up~~ ~~• Check appearance/disappearance of ground returns.~~
~~Before Takeoff~~	~~If adverse weather activity is suspected, scan weather along the departure path:~~ ~~• Set tilt at 15° UP, RANGE at 40 nm or less, then~~ ~~• Slowly lower tilt from 15° UP to 5° UP while evaluating weather returns in the area.~~ ~~(Target Cell Height = Tilt Angle X Range X 100ft)~~
~~Takeoff~~	~~• During takeoff, tilt is initially set at 5° UP, with range at shortest appropriate for terminal area conditions.~~ ~~• During initial climb (below 10,000 feet AGL) set the tilt between 2° to 7° UP, with 5° tilt being a good compromise. (Maintain the radar display clear of ground returns while allowing weather returns to be displayed).~~
~~Climb~~	~~• As climb continues above 10,000 feet AGL, lower tilt as necessary to maintain ground returns at the outer edge of the display.~~ ~~• A range selection of 80 nm or less is optimal during climb, unless a longer range setting is needed for deviation planning.~~

<table>
<tr><th>~~Phase~~</th><th>~~Recommended tilt and range settings~~</th></tr>
<tr><td>~~Level Flight/ Cruise~~</td><td>

~~Depending on cruising level and detection requirement:~~

- ~~Adjust ND range~~
  - ~~PF: adequate ranges to tactically avoid adverse weather, and monitor its severity (typically 80 NM or less).~~
  - ~~PM: adequate ranges to plan long-term weather avoidance course changes (typically 160 NM or less).~~

~~Note: Flight crew should monitor the weather at long range, as well as at shorter ranges, in order to efficiently plan course changes to avoid adverse weather.~~

- ~~Adjust tilt:~~

<table>
<tr><th>~~ND Range~~</th><th>~~Ground Returns Display~~</th></tr>
<tr><td>~~80nm or less~~</td><td>~~At the outer edge of the ND~~</td></tr>
<tr><td>~~Above 80nm~~</td><td>~~Beyond 100 nm at ND~~</td></tr>
</table>

- ~~In case that a ground clutter is not available (e.g. over water operation), the following tilt settings are recommended:~~

<table>
<tr><th rowspan="2">~~Cruise Altitude (ft)~~</th><th colspan="3">~~ND Range~~</th></tr>
<tr><th>~~40nm~~</th><th>~~80nm~~</th><th>~~160nm~~</th></tr>
<tr><td>~~40,000~~</td><td>~~-7°~~</td><td>~~-3°~~</td><td>~~-2°~~</td></tr>
<tr><td>~~35,000~~</td><td>~~-6°~~</td><td>~~-2°~~</td><td>~~-1°~~</td></tr>
<tr><td>~~30,000~~</td><td>~~-4°~~</td><td>~~-1°~~</td><td>~~0°~~</td></tr>
<tr><td>~~25,000~~</td><td>~~-3°~~</td><td>~~-1°~~</td><td>~~0°~~</td></tr>
<tr><td>~~20,000~~</td><td>~~-2°~~</td><td>~~0°~~</td><td>~~+1°~~</td></tr>
</table>

~~Note: A higher gain setting and/or a lower tilt setting may be required to adequately detect thunderstorm threats at higher cruise altitudes.~~

</td></tr>
<tr><td>~~Descent~~</td><td>

~~Scan weather along the approach path during descent (above 10,000ft):~~

- ~~Adjust tilt to display ground clutters at the outer edge of the ND.~~

~~To observe weather at lower altitude (below 10,000ft),~~

- ~~Set tilt 2° to 5° up, range at shortest appropriate distance.~~
  - ~~If ground returns flood display, adjust tilt upwards to remove it.~~

</td></tr>
</table>

~~Phase~~	~~Recommended tilt and range settings~~
~~Final Approach~~	~~Set tilt to 5° up, with range at shortest appropriate for terminal area conditions.~~ • ~~Strong weather returns at mid to upper levels indicate hazardous convective activities.~~ • ~~In a thunderstorm environment, occasional tilt adjustments are required to produce ground returns and detect radar shadows.~~

~~WXR-2100 Weather Radar~~

- ~~AUTO mode with CAL gain is recommended during all phases of flight.~~
  - ~~Automatic antenna tilt and gain, Ground Clutter Suppression (GCS), Path Attenuation Compensation (PAC) and Overflight protection features are enabled in AUTO mode.~~

~~Note: Flight crew may use temporarily manual tilt to evaluate the weather return if any ambiguous/unexpected weather display exists.~~

~~Note: PAC Alert is active in both AUTO and MAN modes for targets within 80 NM of the aircraft but only in CAL gain.~~

- ~~If automatic operation fails, use the manual mode.~~

~~Note: If AUTO mode fails, ND displays AUTOTILT FAIL annunciation.~~

~~Phase~~	~~Recommended tilt and range settings~~
~~Taxi~~	***~~WARNING! Do not operate the weather radar in a hangar or within 50 feet of any fuel spill.~~*** ~~Weather Radar/Antenna Tilt check (if needed):~~ • ~~Clear on parking area~~ • ~~Set ND to 10nm range~~ • ~~Manual tilt down then up~~ • ~~Check appearance/disappearance of ground returns.~~
~~Takeoff~~	~~Set tilt control on AUTO with range at shortest appropriate for terminal area conditions.~~

~~Phase~~	~~Recommended tilt and range settings~~
~~Climb~~	~~Set tilt control on AUTO with range selection of 80 nm or less is optimal during climb, unless a longer range setting is needed for deviation planning.~~
~~Cruise and Descent~~	~~Depending on cruising level and detection requirement:~~ ~~• Adjust ND range~~ ~~- PF: adequate ranges to tactically avoid adverse weather, and monitor its severity (typically 80 NM or less).~~ ~~- PM: adequate ranges to plan long-term weather avoidance course changes (typically 160 NM or less).~~ Note: ~~Flight crew should monitor the weather at long range, as well as at shorter ranges, in order to efficiently plan course changes to avoid adverse weather.~~ ~~• TILT/GAIN control on AUTO~~ ~~- Use Manual TILT and GAIN as needed for weather analysis.~~
~~Approach~~	~~Set tilt control on AUTO with range at shortest appropriate for terminal area conditions.~~

Adverse Weather Avoidance

If a significant cell or storm is detected, flight crew should follow the recommended avoidance procedures as specified below:

- Deviate upwind instead of downwind of a cell (less probability of turbulence or hail).
- Avoid any thunderstorm identified as severe or giving an intense radar echo (e.g. all yellow, red, or magenta areas in ND) by at least 20 nm.
- Do not attempt to penetrate a cell or clear its top by less than 5 000ft vertically (10,000ft, if possible), otherwise the aircraft may encounter severe turbulence.
- Avoid flying under a thunderstorm because of possible windshear, microbursts, severe turbulence, or hail.

If turbulence information is displayed or expected, deviate to the upwind side of storms displayed on the radar if possible.

- Closely spaced (or thin lines between) color gradations are usually associated with severe turbulence.

- Expect turbulence to be present in any convective activity, regardless of intensity level displayed on radar.

If a PWS caution/warning alert exists, flight crew shall follow the procedure specified in the POM 8.3 – Windshear.

WEATHER RADAR TEST

WARNING! Do not operate weather radar in other than the TEST mode during fueling operations, or in the vicinity of trucks/containers holding flammable (or explosive) liquids while the aircraft is in the hanger, or parked at the gate.

Weather Radar Mode selector..TEST

ND Mode selector...MAP

EFIS WXR switch.. Push

Observe the following sequence (approximately 12 seconds):

Note: *To activate the aural messages, WXR switch must be selected first on the EFIS control panel before selecting TEST mode on the radar control panel.

- Initially, the amber WINDSHEAR annunciation displays (and the aural message “MONITOR RADAR DISPLAY” sounds)*.
- Then the Master Warning Lights illuminate and the EICAS alert message “WINDSHEAR SYS” displays.
- Finally, the red “WINDSHEAR” annunciation displays (and the aural “GO AROUND WINDSHEAR AHEAD”, and then “WINDSHEAR AHEAD, WINDSHEAR AHEAD” sounds)*.
- During the test period, the “rainbow” test pattern (with embedded PWS symbol) is displayed on the ND.

Note: The source of any faults displays in the weather radar tilt field on the ND.

EFIS WXR switch.. Push

Removes Captain’s and First Officer’s weather radar displays.

Weather Radar Mode selector.......................................As desired

Note: Asiana's B777-200 is equipped with the RDR-4B.
For details, refer to "Weather Radar PILOT USER GUIDE" which is provided through Portable EFB.
Portable EFB: Content App -- FOEI -- Weather Radar

RDR-4B

Before Takeoff

Set Wx Radar switch ON.

Set Range Selector to a range sufficient to display the area included in the planned flight path.

Adjust antenna TILT control down until ground returns appear. This ensures that the radar system is operational.

If adverse weather is suspected, slowly adjust the antenna TILT control in 1 or 2 degrees steps to +15 degrees after line up while observing for weather returns.

Return antenna TILT control to +4 degrees.

Climb-Out

After takeoff, as needed to detect adverse weather, perform the following procedure.

Shortly after takeoff, slowly rotate antenna TILT control to +15, then down to where ground returns appear, and then back to +4 degrees while searching for weather targets.

Note) Maintain a tilt setting of +4 degrees as long as the aircraft's pitch attitude is approximately +15 degrees nose up or greater.

Repeat step above if the course change of 45 degrees or more is made during climb-out.

Note) ***Aircraft control has priority over anything and should not be interrupted by the above procedure. Therefore, for the auto-tilt not equipped airplane, consider the tilt 4 degrees up procedure during the climb.***

As the altitude increases, adjust the Tilt appropriate to the flight path angle.

Note) ***Typical flight path angle above 10,000ft (variable):***

Altitude	Tilt
10,000 feet ~ 20,000 feet	3°
20,000 feet ~ 30,000 feet	2°
30,000 feet ~	1°

Note) ***On the airplane with features of the flight path vector, the flight path angle is the best reference for proper tilt.***

Cruise

As soon as practical, after reaching cruise altitude, select 40 NM range and set antenna TILT control to -10 degrees.

While scanning and observing display for weather targets, adjust antenna TILT control clockwise until a sprinkle of ground return appears. (display only on top of ND)

Note) ***This ensures that the radar beam is not over-scanning any targets beginning at 40 miles out to the longest range.***

After observing the weather, the select adequate range for flight then adjust tilt for the range.

Repeat step 2 for each intermediate-range through the longest range intended for use.

Rough estimation of tilt vs. range for ground returns on top of the ND (at level flight over the sea).				
Range	320	160	80	40
Tilt DN	1	1.5	3.5	6

Note) To determine whether the detected weather affects the flight level, scan using tilt along the flight path (Tilt 0 ~ -10). Although the return image is weak, the upper level of CB may contain the dry crystal. In this case, severe turbulence should be suspected.

Descent

Just before the descent from the cruise altitude, note the TILT control setting. As descent begins, increase TILT control setting in +1 degree increments for every 10,000 feet of planned descent. This keeps the display relatively free of ground clutter.

Note) After descending to approximately 15,000 feet and when flying over exceptional terrains such as mountains or cities, it may be necessary to adjust the TILT control setting in +1 degree increments of tilt for 5,000 feet of planned descent.

During the descent, the adequate antenna tilt setting shows some ground returns at the top edge of the ND. Therefore, tilt should be adjusted whenever you change the range on the DN.

Note) On the airplane with features of the flight path vector, the flight path angle is the best reference for proper tilt.

Approach

To avoid ground return and for provision against go-around, select tilt-up 4°~5°.

Weather Radar should be kept ON until land.

After land

Set Wx Radar switch off.

Intentionally

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FLIGHT MANAGEMENT, NAVIGATION

DEPARTURE OR DESTINATION AIRPORT NOT IN THE FMC NAVIGATION DATABASE

When departing from or landing at an airport that is not in the FMC navigation database, the following items are affected:

- Cabin pressurization schedule
- Availability or departure, arrival, and approach procedures in the FMC
- Automatic tuning of VOR, DME, and ILS radios for departure, arrival, and approach procedures
- Format of altitudes and flight levels on the ND and CDU
- Barometric transition altitude alerts(amber display and box) on the PFD
- Landing altitude reference bar(white/amber bar) on the PFD altitude tape
- Landing altitude indication(amber crosshatched area) on the PFD altitude tape

Use the following procedures when departing from or landing at an airport that is not in the FMC navigation database.

DEPARTURE AIRPORT NOT IN THE FMC NAVIGATION DATABASE (R/D)

CDU PREFLIGHT PROCEDURE - CAPTAIN AND FIRST OFFICER

RTE key .... Push

If ORIGIN contains an ICAO identifier:

The following steps clear the ORIGIN and erase the previous route.

INIT REF key .... Push

<INDEX.. Select

<IDENT.. Select

Inactive date range.. Select

ACTIVE date range.. Select

Transfers the inactive navigation database to the ACTIVE line and removes the previously entered route.

Clear the NAV DATA OUT OF DATE scratchpad message.

Inactive date range.. Select

ACTIVE date range.. Select

Transfers the inactive navigation database to the ACTIVE line.

Verify that the ACTIVE date range is current.

RTE key .... Push

Leave ORIGIN blank.

DEST..Enter

Route ....Enter

LEGS key.. Push

Enter the latitude and longitude of the departure airport as the first waypoint on the route.

ACTIVATE and execute the route.

VNAV key .... Push

Shows the CLB page.

TRANS ALT ....Enter

NAV RAD key... Push

Departure navaid frequency and CRS (as needed)..............Enter

LDG ALT selector ....Pull

Rotate to set the departure airport altitude manually. This reduces crew workload in the event of a return to the departure airport.

Do not accomplish the following checklist:

LANDING ALTITUDE

After engine start, override the LANDING ALTITUDE checklist.

Note: The LDG ALT flag displays on the PFD.

Note: The landing altitude reference bar (white/amber bar) does not display on the PFD altitude tape.

Note: The landing altitude indication (amber crosshatched area) does not display on the PFD altitude tape.

When no longer needed, delete the departure navaid frequency and CRS.

BEFORE DESCENT

LDG ALT selector .... Push

The FMC sets the destination altitude automatically.

VNAV key .... Push

NEXT PAGE key .... Push

FORECAST .... Select

Shows the DESCENT FORECAST page.

TRANS LVL .... Enter

Overwrites the manually entered departure airport transition altitude.

DESTINATION AIRPORT NOT IN THE FMC NAVIGATION DATABASE (R/D)

CDU PREFLIGHT PROCEDURE - CAPTAIN AND FIRST OFFICER

The following steps can also be done in flight.

LEGS key .... Push

Enter the latitude and longitude of the destination airport as the final waypoint on the route.

Enter a speed/altitude constraint for the final waypoint. The speed constraint should be the planned approach speed and the altitude constraint should be the destination airport elevation.

ACTIVATE (if needed) and execute the route.

BEFORE DESCENT

VNAV key .... Push

NEXT PAGE key.. Push

FORECAST .... Select

Shows the DESCENT FORECAST page.

TRANS LVL... Enter

LDG ALT selector ....Pull

Rotate to set the destination airport altitude manually.

Do not accomplish the following checklist:

LANDING ALTITUDE

Override the LANDING ALTITUDE checklist.

Note: The LDG ALT flag is shown on the PFD.

Note: The landing altitude reference bar (white/amber bar) does not display on the PFD altitude tape during approach.

Note: The landing altitude indication (amber crosshatched area) is not shown on the PFD latitude tape during landing.

Note: The ARRIVALS page is not available for the destination airport.

BEFORE APPROACH

NAV RAD key .... Select

Destination navaid frequency and CRS (as needed) ....Enter

ND mode selector.. As needed

Select APP, VOR or MAP based on the type of approach to be flown.

HL7573 - HL8217

To create a reference on the ND map, on the FIX INFO page, enter the latitude and longitude of the runway threshold and enter the reciprocal of the final approach course as a bearing. This creates a dashed green line, aligned with the final approach course on the ND map.

ADIRU ALIGNMENT/POSITION UPDATE

If GPS position is unreliable or erroneous, a manual alignment is needed. If an ADIRU position update is desired during an automatic realignment (on ground only):

CDU – SET

When dash prompts appear on the SET INERTIAL POS line of the POS INIT page, enter the most accurate position.

If a manual ADIRU alignment is desired (on ground only):

CAUTION! If a manual update is unsuccessful, maintenance action may be required to restore IRS position.

ADIRU switch – OFF 30 seconds, then ON

Wait an additional 30 seconds.

CDU – SET

Enter the most accurate position in the boxes on the SET INERTIAL POS line of the POS INIT page. If GPS position is unreliable or erroneous, do not use LAST POS or GPS position. Use charted coordinates for parking position

Alignment requires from 6 to 15 minutes depending on latitude (6 minutes at the equator, 10 minutes average).

FMS POSITION UPDATE (R/R)

When the FMC message VERIFY POSITION is displayed, the FMC position may require updating.

POS REF page 2/3 ....Select

POS REF 2/3 is the second page of POS INIT 1/3.

Compare the FMS positions with the displayed GPS, RADIO, and INERTIAL positions.

Select the most appropriate source for FMC position updating.

UPDATE ARM> ....**Select**

The ARM prompt changes to ARMED and NOW prompts appear to the right of the remaining position sources.

Appropriate source UPDATE NOW key> ....**Select**

FMS ROUTE UPLINK REQUEST

When the data link system is available, the OFP route data can be uplinked automatically to the FMS by the flight crew request.

The following steps for FMS route uplink should be performed during preflight.

RTE Key ....**Push**

The FMS route uplink request can be initiated from either RTE 1 or RTE 2 page.

FLT NO ....**Enter**

Note: The flight number shall be inserted in FMS RTE page before requesting the FMS route uplink.

< ROUTE REQUEST..**Select**

Note: When the data link system is not available, "< ROUTE REQUEST" prompt would be replaced with "DATA LINK NO COMM/VOICE/FAIL" in FMS RTE page.

When "ROUTE 1 (or 2) UPLINK READY" is displayed in CDU scratch pad.

Note: The route upload will take a few minutes after requesting the route uplink. There is no indication for the failure of route uplink.

< LOAD ....**Select**

It will replace existing route data with uplinked route data.

If not desired, select "**PURGE>**" to preserve the existing data in

FMS RTE page.

EXEC .... **Push**

Verify that the uplinked route is correct, and then execute it to complete the FMS route uplink sequence.

If discrepancies, discontinuities or partial routes exist in the uplinked clearance, select "**<ERASE**" to erase the uplinked route data and enter the route manually according to OFP.

NAVAID INHIBIT OR ENABLE (R/D)

Note: GPS position updates should be used during all approaches in which the FMC database and approach procedures are referenced to the WGS-84 reference datum. GPS updates should be inhibited for other approach operations not based on WGS-84 unless other appropriate procedures are used. GPS position updates should be used for all other operations unless a specific state requires the use of other update provisions within their airspace(eg, to accommodate a non-WGS reference datum or other reason).

TO INHIBIT GPS :

GPS updating can be inhibited at pilot discretion if it is not needed or is unreliable or erroneous. It is not recommended to disable GPS updating for the entire flight.

Note: GPS updating is needed for some mandatory navigation specifications.

Note: Inhibiting GPS updating does not inhibit the GPWS look-ahead terrain function. The GPWS look-ahead terrain function can be inhibited by selecting the GND PROX TERR OVRD switch to OVRD

INIT REF key .... **Push**

<INDEX .... **Select**

<POS .... **Select**

Displays the POS INIT page 1/3.

PREV PAGE key .... **Push**

Displays the POS REF page 3/3.

GPS NAV.. **Select**

Verify OFF displays in large font.

Note: The FMC uses inertial inputs only.

Note: If GPS NAV is selected OFF, it is recommended that DME/DME, VOR/DME, and LOC NAV updating be selected ON.

TO ENABLE RADIO UPDATING:

INIT REF key.. **Push**

<INDEX.. **Select**

NAV DATA .... **Select**

Note: The default state of RAD NAV INHIBIT is ON; all radio updating is inhibited. ON displays.

RAD NAV INHIBIT .... **Select**

Selection enables all radio updating. Verify OFF displays. Second selection inhibits VOR/DME updating. Verify VOR displays. DME/DME updating is operable. Third selection inhibits all radio updating; ON displays.

TO INHIBIT VORs, VOR/DMEs, VORTACs, or DMEs:

INIT REF key.. **Push**

<INDEX.. **Select**

NAV DATA .... **Select**

TO INHIBIT NAVAID DATA(UP TO TWO NAVAIDs):

Navaid identifier (NAVAID INHIBIT line) .... **Enter**

TO INHIBIT VOR ONLY DATA(UP TO TWO VORs):

VOR identifier (VOR ONLY INHIBIT line) .... **Enter**

RNP MANUAL ENTRY

The FMC automatically supplies default RNP values based on phase of flight. When the airplane is on a procedure or airway that has an RNP requirement, and does not have an RNP value stored in the navigation database, a manual RNP entry may be made.

POS REF page 2/3 .... **Select**

POS REF 2/3 is the second page of POS INIT 1/3.

If the displayed RNP is different from the RNP for the current airway or procedure:

RNP .... **Enter**

When the manually entered RNP is no longer required:

POS REF page 2/3 .... **Select**

RNP .... **Delete**

OCEANIC TAILORED ARRIVAL(TA) PROCEDURE (R/R)

GENERAL

Oceanic Tailored Arrival (TA) Procedure allows the Oceanic controller, the Center Radar controller and Approach control to define a unique lateral and vertical profile from en-route segment to final approach segment. It minimizes vectoring or leveling during the descent, and provides a constant descent with the shortest distance to the runway by using LNAV and VNAV mode until on final approach.

REQUEST TA

Oceanic TA is a voluntary procedure upon pilot's request. If pilots choose not to participate, do not request it.

UPLINKED TA CLEARANCE

The uplinked TA procedure uses Controller Pilot Data Link Communication (CPDLC) to receive an FMS-loadable route clearance from ATC.

- TA procedure retains the naming of each descent clearance (e.g. "PACIFIC TWO TA").
- The route clearance includes lateral route, crossing restrictions, approach procedure, and runway assignment, and "maintain FL XXX" is the currently assigned flight level.
- The tailored portion of the descent ends prior to the minimum vectoring altitude where the path joins a published approach.
- The naming of each uplinked descent clearance enables ATC to issue a constant descent clearance by using "Descend-Via" instruction (e.g. "Descend via the Pacific Two TA").

  e.g.) Uplinked TA Format

  PACIFIC TWO TA

  AT DACEM CLEARED RTE CLEARANCE

  DEST: KSFO

  APPROACH: ILS28L, MENLO

  VIA TO

DCT	PAINT	
DCT	SUPER	----------/FL210A
DCT	PASIF	----------/FL210B
DCT	PIRAT	250KTS/15000B
DCT	BRINY	250KTS/12000B
DCT	N3722.012223.0	----------/6000A
DCT	OSI	
DCT	MENLO	---------- /4000A

MAINTAIN FL370

APPLICABLE AIRPORTS AND RUNWAYS

- KSFO, RWY 28L and 28R
  - Transitions from “PAINT” or “ALCOA” to KSFO

DESCENT MODE AND SPEED RESTRICTION

- Flight Mode: **LNAV/VNAV PATH** for TA
- Unless specified, descent speed schedule is **280 kts ± 10 kts** above 10,000 ft and **170 kts** for FAF

VECTOR AND RESUME DURING TA

When a traffic separation is required, aircraft descending via the TA may be vectored to ensure separation from other traffic. And after traffic separation is no longer required, ATC may clear the vectored aircraft back onto the TA again by stating:

> "**AAR XXX, cleared direct to** [Waypoint on Tailored Arrival] **the remainder of** [TA designator (e.g. **Pacific Two**)] **TA, comply with restrictions**."

DESCENT WIND FORECAST

Pilot requests weather information through the ACARS for optimization of the FMS-calculated profile and the most predictable execution of that profile.

- Using FREE TEXT, accessed via the ACARS COMPANY Menu page, type the following text:

"**RQST** [Destination (e.g. **SFO**)] **UPPER WIND FORECAST**"

e.g.) Sample of uplinked SFO Upper Wind Forecast

====================================

SFO Upper Wind

ALT	WINTEM	ALT	WINTEM
6000	2330P03	9000	2238M03
12000	2343M12	18000	2450M22
24000	2557M40	30000	2568M58
39000	2680M67		

====================================

Note: WINTEM Legend of "2330P03" means:

- Wind direction: first two digits (23 = 230 degree)
- Wind speed: third and fourth digits (30 = 30 kts)
- Temperature: last three digits (P03 = + 3°C)

TA OPERATION PROCEDURE

Note: If pilots become uncomfortable after commencing the procedure or simply choose not to continue, inform ATC about his/her intension and achieve appropriate instructions.

PILOT DOWNLINK
- No later than 45 mins prior to exiting Oceanic Airspace **Downlink** .... **Request** Using FREE TEXT MESSAGE, accessed via the ACARS ATC Menu page, type the following text: '**RQST TA**'

ATC (TA CLEARANCE) UPLINK

MFD COMM Display Switch...**Select**

Aural tone indicates an ATC data link message.

ATC Uplinked Clearance message...**Review**

Each uplinked arrival clearance will include a named designator.

e.g.) ‘PACIFIC TWO TA’

Note: The named route clearance uplink is used to ensure the oceanic controller, center controller, and the pilots are all referring to the same message.

The first section of the uplinked clearance message identifies where the clearance begins and does not authorize any change in the route prior to the point where the new clearance begins. For example, the uplinked clearance message for a TA that begins at SUPER will state ‘AT SUPER CLEARED ROUTE CLEARANCE.’ In this case, ATC expects compliance with the previous clearance for the portion of routing prior to SUPER.

LOAD FMC...**Select**

Use the LOAD FMC prompt at lower left of the ATC COMM MFD display to load the route clearance into the FMC.

FMC Entries... **Verify (do not execute)**

Review the route modification and any altitude or speed constraints using the CDU and ND displays. There should be no discontinuities or partial routes. The new route must not be executed until the uplink has been accepted.

CAUTION!* *Do not modify the ATC uplinked clearance.

Note: If discontinuities or partial routes exist in the uplinked clearance, reject ATC clearance message and erase the route modification.

Decide to accept or reject the ATC clearance.

If ATC clearance and route are acceptable:

ATC Clearance Message .... **Accept**

Route uplink .... **Execute**

Note: Compare constraints in the uplinked clearance with the constraints in the Croute.

If ATC clearance and route are not acceptable:

ATC clearance message...**Reject**

Route uplink ....**Erase**

WIND FORECAST DATA

- Get recent wind forecast data and enter cruise and descent winds on FMS DESCENT FORECAST page before descent.

PRIOR TO TOP OF DESCENT

- FMS Preparations

Descent Mach/speed schedule ....**Set**

On the DES page (VNAV), enter the assigned Mach/speed schedule M.XX/XXX (e.g., M.84/280). If ATC did not assign a descent speed, enter the planned descent transition speed **280 ± 10 kts**.

Note: During descent ATC may assign a different speed schedule to further facilitate traffic flow.

Final approach crossing speed...**Enter**

On the LEGS page, Verify (or enter) **170 kts** as the planned speed constraint at the FAF. The actual speed to the FAF will depend on operational requirements and can be changed.

- Strategic Lateral Offset Procedure (SLOP):

The route offset according to SLOP shall be removed upon exit from oceanic airspace.

- On Initial Radar Contact with Radar Controller:

  "**AAR XXX** on [TA designator (e.g. **Pacific Two**)] **TA, FL XXX**."

  The radar controller should respond with:

  "**AAR XXX**, cleared to [Destination (e.g. **KSFO**)] **airport via** [TA designator (e.g. Pacific Two)] **TA**, maintain [Current FL]."

> **CAUTION!** ***Do not descend to comply with the TA crossing altitude restrictions when if the uplinked TA clearance message was accepted only and no further ATC descent clearance is received.***
> ***The cruising level specified in TA clearance shall be maintained unless the revised cruising level is received from ATC or ATC clears to descend via TA.***

- When cleared to descend with TA altitude constraints :

  "**AAR XXX**, descend via [TA Designator (e.g. **Pacific Two**)] **TA**, [Destination (e.g. **KSFO**)] altimeter **XX.XX**."

  MCP altitude .... **Set**

  After TA descent clearance is received, the next constrained altitude shall be set at the MCP Altitude Window.

  Do not push the MCP altitude selector.

  Note: Pushing the MCP altitude selector within 50 NM of the T/D with the altitude set below the cruise altitude initiates the DES NOW feature, which is not desired.

DESCENT

- The active VNAV mode should be VNAV PTH for the descent. If VNAV SPD or VNAV ALT is active, use drag or thrust as necessary to reacquire the descent path as soon as practical.
- If the path cannot be maintained, inform ATC via VHF.

  Waypoint Altitude Constraints.. **Monitor**

  The compliance with vertical path and crossing restrictions shall be monitored.

- When crossing restriction is assured before leveling at the constraint:

  MCP Altitude.. **Set Next Constrained Altitude**

  CAUTION! Pushing the MCP altitude selector if the MCP altitude is set below a waypoint altitude constraint in the FMC will delete the waypoint constraint.

APPROACH

- On initial contact with approach controller:

  "**AAR XXX, passing FLXXX**, on [TA designator (e.g. **Pacific Two**)] **TA**, [ATIS code]"

- When approach controller provides approach clearance:

  "**AAR XXX, cross** [Waypoint (end of descent) on TA (e.g. **MENLO**)] **at or above XXXX ft. Cleared ILS XX**"

FMS LEG AND ROUTE MODIFICATION PROCEDURE/ CALLOUTS

When direct to waypoint or inflight re-route clearances are given by ATC, follow this procedure:

DIRECT TO WAYPOINT

PF	PM
Call "**DIRECT TO** ___ (Waypoint Name)"	Insert a direct-to-waypoint into an active waypoint on the FMS CDU LEGS page and verify the displayed direct-to-waypoint in FMS CDU/ND is correct, Call "**DIRECT TO___, EXECUTE STAND-BY**"
Verify the displayed direct-to-waypoint in FMS CDU/ND is correct, Call "**EXECUTE**"	Push EXEC push button with "**EXECUTE**" call

If LNAV mode is engaged,	
Verify LNAV mode annunciation Call “**CHECK**”	Verify LNAV mode annunciation Call “**LNAV**”
If other than LNAV mode is engaged,	
Select LNAV mode switch with call “**LNAV**”	
Verify LNAV is engaged, Call “**CHECK**”	Verify LNAV is engaged, call “**LNAV**”

ROUTE MODIFICATION

PF	PM
According to ATC instruction, modify a route of the active flight plan at FMS CDU RTE/LEGS page. If the next waypoint of the re-cleared route is not in the active flight plan or it is not sequenced automatically on the FMS CDU LEGS page, use an INTERCEPT COURSE TO method: • Insert the next waypoint of the route into an active waypoint (direct-to-waypoint) Iin FMS CDU LEGS page. • Insert an intercept course (INTC CRS TO). Note: The FMC will not sequence the active waypoint automatically when more than 21 nm off the active route and not on an offset route.	
	Verify the displayed route/waypoints in FMS CDU/ND is correct, Call “**EXECUTE STAND-BY**”
Verify the displayed route/waypoints in FMS CDU/ND is correct, Call “**EXECUTE**”	Push EXEC push button with “**EXECUTE**” call
Note: If a complicated FMS leg and route modification is required in a short time, pilots may consider to modify and execute the first part of the re-cleared route segments initially then finish the modification of the remaining route segments when time permits.	

<table>
<tr><th colspan="2">If LNAV mode is engaged,</th></tr>
<tr><td>Verify LNAV mode annunciation
Call “CHECK”</td><td>Verify LNAV mode annunciation
Call “LNAV”</td></tr>
<tr><th colspan="2">If other than LNAV mode is engaged,</th></tr>
<tr><td>(Set an intercept heading)
Select LNAV mode switch with call “LNAV”

Verify LNAV is engaged/armed
Call “CHECK”</td><td>Verify LNAV is engaged/armed,
call “LNAV” or “LNAV ARM”</td></tr>
<tr><td colspan="2">Note: When intercepting a segment of the airway which has a long distance between two waypoints, the flight track could deviate from an airway centerline and it may exceed the limit of airway width depending on the manually inserted intercept course (INTC CRS TO). This is due to magnetic variations being different between two waypoints, which would not be reflected in the intercept course manual input.
So if this is the case, pilots may request a direct-to-waypoint or a radar vector, if not, do not delete the previous waypoint (unless the FMC sequeces the next waypoint automatically) until performing an INTERCEPT COURSE TO procedure to join an airway. The displayed inbound course angle between two waypoints on FMS CDU LEGS page can be used to input an intercept course (INTC CRS TO) in order to join an airway.</td></tr>
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FUEL

FUEL BALANCING

- If fuel leak is suspected:

  Accomplish the FUEL LEAK non-normal checklist.

- If fuel balancing is desired prior to display of the FUEL IMBALANCE alert message, accomplish the FUEL IMBALANCE non-normal checklist.

FQIS(FUEL QUANTITY INDICATION SYSTEM) INOPERATIVE (R/R)

In case that the FQIS or fuel indications are inoperative during flight, flight crew may use the calculated fuel quantity for FMC performance predictions because its failure doesn't affect the FMC predictions.

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WARNING SYSTEMS

~~RUNWAY AWARENESS AND ADVISORY SYSTEM (RAAS) OVERRIDE OPERATION~~

~~If one or more of the following exist:~~

- ~~The airport is not in the GPWS database~~
- ~~A NOTAM applies to the intended runway~~
- ~~Company policy prohibits the use of RAAS for an airport or runway.~~

~~**GROUND PROXIMITY RUNWAY OVERRIDE switch ....OVRD**~~

Intentionally

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TABLE OF CONTENTS

ADVERSE WEATHER OPERATIONS

INTRODUCTION

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, severe turbulence and windshear. The following additional instructions are intended to supplement the normal operating procedures and should be observed when applicable.

WET OR CONTAMINATED RUNWAY CONSIDERATIONS

TAKEOFF

The following information applies to takeoffs on wet or contaminated runways:

- Do not use reduced thrust (assumed temperature method) for takeoff if the runway is contaminated (with slush, snow or standing water), or the runway is slippery (with ice or compacted snow).
- Reduced thrust (fixed derate, assumed temperature method, or both) is allowed for takeoff on a wet runway if suitable performance accountability is made for the increased stopping distance on a wet surface.
- Reduced thrust (fixed derate) takeoff is allowed on slippery or contaminated runways provided takeoff performance accounts for the runway surface condition. Reduced thrust using assumed temperature method, whether alone or in combination with a fixed derate, is not allowed.
- V1 may be reduced to minimum V1 to provide increased stopping margin provided the field length required for a continued takeoff from the minimum V1 and obstacle clearance meet the regulatory requirements. The determination of such minimum V1 may require a real-time performance calculation tool or other performance information supplied by dispatch.
- Takeoffs are prohibited when slush, wet snow, or standing water depth

is more than 1/2 inch (13 mm) or dry snow depth is more than 4 inches (100 mm).

LANDING

- One of the worst control situations occurs when there is an adverse wind condition in conjunction with a wet or contaminated runway.
- Delay landing if threats are caused by downpour. Use all available information including PIREP, aircraft radar, tower report, visual observations, etc. for appropriate judgement.
- Precise performance calculation based on actual weather and compliance with limitations are critical.
- Select maximum allowable autobrake setting and maximum flaps. Do not exceed approach speed at the runway threshold.
- Do not allow a long flare and/or drift during the flare. These are major factors of runway excursion. Whenever a touchdown far down the wet or contaminated is likely or lateral deviation occurs, go around.
- Keep the aircraft aligned with the runway centerline. If a directional control problem occurs:
  - Consider reducing reverse thrust.
  - If braking manually, consider reducing braking temporarily or use differential braking.

  After directional control has been recovered and the runway centerline has been regained:
  - Manual braking can be re-applied.
  - Reverse thrust can be re-applied.
- Touch down firmly. Do not attempt to hold the nose off for aerodynamic braking.
- Be prepared to deploy ground spoilers manually if automatic deployment does not occur. Spoiler deployment greatly assists wheel spin-up during wet runway operations.
- Apply maximum reverse thrust as soon as possible after main gear touchdown; this is when it is most effective.

- Continue maximum braking until at slow speed; do not delay braking to reduce time on the runway.

COLD WEATHER OPERATIONS

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice, snow, slush and standing water on the airplane, ramps, taxiways, and runways.

Icing conditions exist when OAT (on the ground) or TAT (in-flight) is 10 °C or below and any of the following exists:

- visible moisture (clouds, fog with visibility of one statute mile(1600 m) or less, rain, snow, sleet, ice crystals, and so on) is present, or
- ice, snow, slush and standing water is present on the ramps, taxiways, or runways.

CAUTION! ***Do not use engine anti-ice when OAT (on the ground) is above 10 °C. Do not use engine or wing anti-ice when TAT (in-flight) is above 10 °C.***

EXTERIOR INSPECTION

Although removal of surface snow, ice and frost is normally a maintenance function, during preflight procedures, the captain or first officer should carefully inspect areas where surface snow or frost could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Surfaces .... Check

Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel is allowable; however, all leading edge devices, all control surfaces, and upper wing surfaces must be free of snow, ice and frost.

Thin hoarfrost is acceptable on the upper surface of the fuselage provided all vents and ports are clear. Thin hoarfrost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to distinguish surface features underneath, such as paint lines, markings or lettering.

Pitot probes and static ports .... Check

Verify that all pitot probes and static ports are free of snow and ice. Water rundown after snow removal may freeze immediately forward of static ports and cause an ice buildup which disturbs airflow over the static ports resulting in erroneous static readings even when static ports are clear.

Air conditioning inlets and exits....................................... Check

Verify that the air inlets and exits, including the outflow valves, are free of snow and ice.

Engine inlets.. Check

Verify that the inlet cowling is free of snow and ice.

Fuel tank vents .... Check

Verify that all traces of ice and frost are removed.

Landing gear doors .... Check

Landing gear doors should be free of snow and ice.

APU air inlets.. Check

The APU inlet door must be free of snow and ice before APU start.

ENGINE START PROCEDURE

Do the normal Engine Start Procedure with the following considerations:

~~**GE engine (777-300ER/777F)**~~

- ~~If the engine has been cold soaked for more than four hours at ambient temperatures below –40 °C, do not start or motor the engine. Maintenance personnel should do appropriate procedures for adverse weather heating of the fuel system components.~~
- Oil pressure may be slow to rise.
- Initial oil pressure rise may be higher than normal.
- Additional warm-up time may be needed to allow oil temperature to

reach the normal range.

- Displays may require additional warm-up time before displayed engine indications accurately show changing values. Displays may appear less bright than normal.

ENGINE ANTI-ICE OPERATION - ON THE GROUND

Engine anti-ice must be selected ON immediately after both engines are started and remain on during all ground operations when icing conditions exist or are anticipated, except when the temperature is below –40 °C OAT.

WARNING! Do not rely on airframe visual icing cues before activating engine anti–ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION! Do not use engine anti-ice when OAT is above 10 °C.

When engine anti-ice is needed:

ENGINE ANTI-ICE selectors . . . . ON F/O

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE selectors . . . . AUTO F/O

AFTER START PROCEDURE

Do the normal After Start Procedure with the following modifications:

If taxi route is through ice, snow, slush and standing water in low temperatures or if precipitation is falling with temperatures below freezing, taxi out with the flaps up. Taxiing with the flaps extended subjects the flaps and flap drives to contamination. Leading edge devices are also susceptible to slush accumulations.

If there is snow or ice accumulation on the wing, consider delaying flap setting and the flight control check after de-icing/anti-icing is accomplished.

Call “FLAPS___” as needed. CAPT

Flap lever .... Set flaps, as needed F/O

TAXI–OUT

CAUTION! ***Taxi at a reduced speed. Use smaller tiller and rudder inputs, and apply minimum thrust evenly and smoothly. Differential thrust may be used to help maintain airplane momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.***

~~GE engine (777-300ER/777F)~~

~~***CAUTION! Precautions must be taken for jet blast up to 600 feet (200 meters) behind the aircraft, snow and ice at the edge of the taxiway that can be ingested by the engines, slippery taxi surfaces, and airport noise restrictions.***~~

When engine anti-ice is required and the OAT is 3 °C or below, do an engine run up to minimize ice build-up. Use the following procedure:

Check that the area behind the airplane is clear.

PW engine (777-200ER/~~777-300)~~

Run-up to a minimum of 50 % N1 for approximately 1 sec duration at intervals no greater than 15 mins.

~~GE engine (777-300ER/777F)~~

~~Run-up to a minimum of 50 % N1 for approximately 1 sec duration at intervals no greater than 60 mins.~~

DE-ICING / ANTI-ICING

Testing of undiluted de-icing/anti-icing fluids has shown that some of the fluid remains on the wing during takeoff rotation and initial climb. The residual fluid causes a temporary decrease in lift and increase in drag, however, the effects are temporary. Use the normal takeoff rotation rate.

CAUTION! ***Operate the APU during de-icing only if necessary. If the APU is running, ingestion of de-icing fluid causes objectionable fumes and odors to enter the airplane. Ingestion of snow, slush, ice, or de-icing/anti-icing fluid can also cause damage to the APU.***

If de-icing / anti-icing is needed:

~~HL7202-7205, HL8006-8011, HL8041-8042, HL8346-8347~~
~~if BROADBAND COM switch installed~~

~~**BROADBAND COM switch . . . . .OFF F/O**~~

APU. . . . . .As needed F/O

The APU should be shut down unless APU operation is necessary.

Call “FLAPS UP”. CAPT

Flaps . . . . .UP F/O

Prevents ice and slush from accumulating in flap cavities during de-icing.

Thrust levers . . . . Idle CAPT

Reduces the possibility of injury to personnel at inlet or exhaust areas.

Note: If engines are shut down for de/anti-icing, position ENGINE ANTI-ICE selectors to AUTO.

PACK switches...OFF

Wait approximately 10 seconds after pack switches are off before positioning bleed switches to off to reduce pack wear.

ENGINE bleed switches (engines running) . . . . . . .OFF F/O

Reduces the possibility of fumes entering the air conditioning system.

APU bleed switch (APU running) . . . . .OFF F/O

Reduces the possibility of fumes entering the air conditioning system.

After de-icing / anti-icing is completed:

~~HL7202-7205, HL8006-8011, HL8041-8042, HL8346-8347~~
~~if BROADBAND COM switch installed~~

~~**BROADBAND COM switch. ON F/O**~~

APU. . . . . .As needed F/O

Wait approximately one minute after de-icing is completed to restore engine and APU bleed air and pack operation to ensure all de-icing fluid has been cleared from the engines:

PACK switches . . . . AUTO F/O

ENGINE bleed switches . . . . ON F/O

APU bleed switch . . . . AUTO F/O

Flight Controls . . . . Check, as needed CAPT

DURING TAXI

Call "FLAPS_____" as needed for takeoff.

Flap lever..................................... Set takeoff flaps, as needed

Note: Consider delaying flap extension if taxi route is through slush or standing water in low temperatures or if precipitation is falling with temperature below freezing.

BEFORE TAKEOFF PROCEDURE

Verify takeoff flaps set.
Do the normal Before Takeoff Procedure.

PW engine (777-200ER/~~777-300~~)
Engine oil temperature........................... Minimum 50 °C CAPT

Oil temperature must be at least 50 °C before takeoff. Any subsequent drop in oil temperature will not affect engine performance.

TAKEOFF PROCEDURE

Do the normal Takeoff Procedure with the following modification:

When engine anti-ice is required and the OAT is 3 °C or below, the takeoff must be preceded by a static engine run-up. Use the following procedure:

PW engine (777-200ER/~~777-300)~~

Run-up to a minimum of 50 % N1 and confirm stable engine operation before the start of the takeoff roll.

~~**GE engine (777-300ER/777F)**~~

~~Note: Operation in icing conditions may result in engine vibration indications above the normal operating range during ice shedding.~~

~~**GE engine (777-300ER/777F)**~~

~~Run-up to as high a thrust setting as practical (minimum of 50% N1), confirm stable engine operation, and if vibration indications are available, ensure engine vibration indications are below 4 units before the start of the takeoff roll.~~

ENGINE ANTI-ICE OPERATION - IN-FLIGHT

Engine anti–ice must be AUTO or ON during all flight operations when icing conditions exist or are anticipated, except when the temperature is below –40 °C SAT.

CAUTION! Do not use engine anti-ice when TAT is above 10 °C.

Manual Use of Engine Anti-ice

When using the engine anti-ice system manually in areas of possible icing, activate engine anti–ice before entering icing conditions.

WARNING! If using the engine anti–ice system manually, do not rely on airframe visual icing cues before activating engine anti–ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

When manual use of engine anti-ice is needed:

ENGINE ANTI–ICE selectors . . . . ON PM

When manual use of engine anti-ice is no longer needed:

ENGINE ANTI–ICE selectors . . . . AUTO or OFF PM

Fan Ice Removal

CAUTION! Avoid Prolonged operation in moderate to severe icing conditions.

If moderate to severe icing conditions are encountered:

PW engine (777-200ER~~/777-300)~~

During flight in moderate to severe icing conditions for prolonged periods with N1 settings at or below 70 % and when fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure on both engines, one engine at a time; reduce thrust toward idle then increase to a minimum of 70 % N1 for 15 secs. Repeat this procedure as required to avoid high vibration.

~~**GE engine (777-300ER/777F)**~~

~~During flight in moderate to severe icing conditions for prolonged periods with N1 settings at or below 70 % and when fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure every 15 minutes on both engines, one engine at a time; reduce thrust toward idle then increase to a minimum of 70 % N1 for 10 to 30 seconds.~~

~~Note: Operation in icing conditions may result in displayed vibration levels up to and exceeding the normal operating range. Extended operation at high vibration levels in icing conditions will not result in engine damage.~~

WING ANTI-ICE OPERATION - IN-FLIGHT

Ice accumulation on the flight deck window frames, windshield center post, or windshield wiper arm, or side windows may be used as an indication of structural icing conditions and the need to turn on wing anti–ice.

The wing anti–ice system may be used as a de–icer or anti–icer in flight only. The primary method is to use the automatic ice detection system which acts as a de–icer by allowing ice to accumulate before turning wing anti–ice on. This procedure provides the cleanest airfoil surface, the least possible runback ice formation, and the least thrust and fuel penalty.

The secondary method is to select the WING ANTI–ICE selector ON when wing icing is possible and use the system as an anti–icer.

The airplane is capable of continued safe flight and landing in icing conditions in the event of an in-flight failure of the wing anti-ice system.

CAUTION! ***Do not use wing anti-ice when TAT is above 10 °C.***

Manual Use of Wing Anti-ice

When manual use of wing anti–ice is needed:

WING ANTI–ICE switch . . . . ON PM

When manual use of wing anti–ice is no longer needed:

WING ANTI–ICE switch . . . . AUTO or OFF PM

COLD TEMPERATURE ALTITUDE CORRECTIONS

Refer to FOM 4.4 - Pressure Altimeter Corrections (Cold Temperature Corrections).

AFTER LANDING PROCEDURE

CAUTION! ***Taxi at a reduced speed. Use smaller tiller and rudder inputs, and apply minimum thrust evenly and smoothly. Differential thrust may be used to help maintain airplane momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.***

Do the normal After Landing Procedure with the following modifications:

After prolonged operation in icing conditions with the flaps extended, or when an accumulation of airframe ice is observed, or when landing on a runway or taxiway contaminated with ice, snow, slush or standing water:

Do not retract the flaps until the flap areas have been checked to be free of contaminants.

Engine anti-ice must be selected ON and remain on during all ground operations when icing conditions exist or are anticipated, except when the temperature is below –40 °C OAT.

***WARNING!* Do not rely on airframe visual icing cues before activating engine anti–ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.**

***CAUTION!* Do not use engine anti-ice when OAT is above 10 °C.**

When engine anti-ice is needed:

ENGINE ANTI-ICE selectors . . . . ON F/O

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE selectors . . . . AUTO F/O

When engine anti-ice is required and the OAT is 3 °C or below, do an engine run up to minimize ice build-up. Use the following procedure:
CAPT

Check that the area behind the airplane is clear.

PW engine (777-200ER/~~777-300)~~

Run-up to a minimum of 50 % N1 for approximately 1 sec duration at intervals no greater than 15 minutes.

~~**GE engine (777-300ER/777F)**~~

~~Run-up to a minimum of 50% N1 for approximately 1 sec duration at intervals no greater than 60 minutes.~~

SECURE PROCEDURE

Do the normal Secure Procedure with the following modifications:

If the airplane will be attended:

PACK switches . . . . AUTO F/O

If the airplane will not be attended, or if staying overnight at off-line stations or at airports where normal support is not available, the flight crew must arrange for or verify that the following steps are done:

OUTFLOW VALVE switches . . . . MAN F/O

OUTFLOW VALVE MANUAL switches . . . . CLOSE F/O

Position the outflow valves fully closed to inhibit the intake of snow or ice.

Wheel chocks .... Verify in place CAPT or F/O

Parking brake . . . . .Released CAPT

Reduces the possibility of frozen brakes.

Cold weather maintenance procedures for securing the airplane may be required. These procedures are found in the approved Aircraft Maintenance Manual.

GROUND DE/ANTI-ICING PROCEDURES

IF DE/ANTI–ICING IS NEEDED:

Establish communications with ground personnel.

PARKING BRAKE .... SET

BROADBAND COM switch (if installed) . . OFF

APU .... As needed

Flaps ....UP

THRUST LEVER.. IDLE

Note: if engines are shut down for de/anti-icing, position ENGINE ANTI-ICE selectors to AUTO.

PACK switches... OFF

Wait approximately 10 sec after packs switches are off before positioning bleed switches to off to reduce pack wear.

ENG bleed switches (engines running) . . OFF

APU bleed switch (APU running)............... OFF

AFTER DE/ANTI-ICING IS COMPLETED:

OBTAIN AND READ BACK POST DE/ANTI-ICING REPORT.

Record de/anti-icing code on the "De/Anti-icing Code Report."

Verbal confirmation: "THE POST DE/ANTI-ICING CHECK IS COMPLETE AND THE AIRCRAFT IS FREE OF ICE AND SNOW"

BROADBAND COM switch (if installed) .... ON

APU...As needed

Wait approximately one minute after de-icing is completed.

Pack switches .... AUTO

ENG bleed switches .... ON

APU bleed switch .... AUTO

Flight Controls.........................Check, as needed

DETERMINE HOLDOVER TIME

- Use "FAA Holdover Time Guidelines" in the portable EFB.
- Holdover time starts when the final application of fluid begins.

DURING TAXI:

Note: Consider delaying **flap extension** when freezing precipitation may accumulate on surface, or when slush may accumulate in flap area.

COMPLETE NORMAL CHECKLISTS.
PERFORM ENGINE RUN-UPS, AS REQUIRED.

- Perform engine run-ups as defined in the following table during prolonged ground operations when in icing conditions.

ENG TYPE	INTERVAL	MIN. N1	DURATION
PW	No greater than 15 mins	50 %	Momentary
GE	No greater than 60 mins	50 %	Momentary

ADJUST HOLDOVER TIME, IF NECESSARY.

- Continuously assess weather and environmental conditions and periodically perform the **COCKPIT CHECK**.

BEFORE TAKEOFF

FLAPS .... SET

BEFORE TAKEOFF Checklist............. Accomplish

-----------------------END OF PROCEDURE-------------------

① COCKPIT CHECK

INSPECT AIRCRAFT COMPONENTS VISIBLE FROM THE COCKPIT FOR FROZEN CONTAMINATION.

- Inspect the wiper blades and arms, radome.

-----------------------END OF PROCEDURE-------------------

② CABIN CHECK

INSPECT AIRCRAFT COMPONENTS VISIBLE FROM THE CABIN FOR FROZEN CONTAMINATION.

- Inspect all the following from the best vantage points in the cabin:
  - Engine inlets
  - Both wings: upper surface and leading edge

-----------------------END OF PROCEDURE-------------------

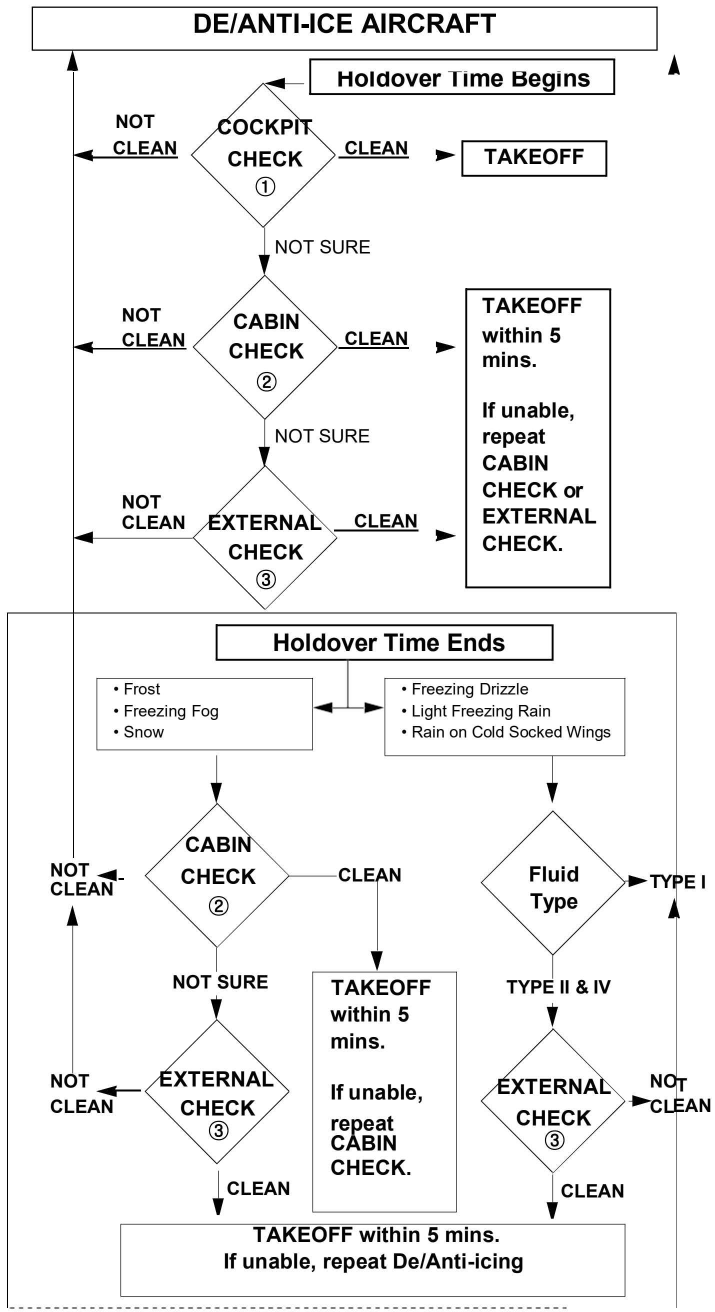
③ EXTERNAL CHECK

CONTACT LOCAL OPERATIONS.

- Secondary De/anti-icing may be performed in lieu of the EXTERNAL CHECK.

-----------------------END OF PROCEDURE-------------------

TAKEOFF DECISION TREE



Holdover Time Guidelines

Regarding the Holdover Time Guidelines, please refer to the "FAA Holdover Time Guidelines" in the portable EFB.

FAA 2015-2016 Holdover Time Guidelines 07/31/15

TABLE 4L. TYPE IV HOLDOVER TIME GUIDELINES FOR KILFROST ABC-S PLUS

Outside Air Temperature[1] Degrees Celsius	Outside Air Temperature[1] Degrees Fahrenheit	Manufacturer Specific Type IV Fluid Concentration Neat-Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours: minutes): Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets[2]: Very Light[3]	Snow, Snow Grains or Snow Pellets[2]: Light[3]	Snow, Snow Grains or Snow Pellets[2]: Moderate	Freezing Drizzle[4]	Light Freezing Rain	Rain on Cold Soaked Wing[5]	Other[6]
					[illegible]:00	[illegible]:15-2:05				
-3 and above	27 and above	100/0	2:10-4:00	[illegible]-3:00	2:05-3:05	[illegible]	1 50-2:00	1:05-2:00	0:25-2:00	
		75/25	1:25-2:40	2:05-[illegible]	[illegible]:30-1:00	0:45-1 15	1:00-1:20	0:30-0:50	0:10-1:20	
		50/50	0:30-0:55	1:05-[illegible]	[illegible]	0:15-0:30	0:15-0:40	0 15-0:20		
				[illegible]2:0[illegible]		0:[illegible]-1[illegible]				
below -3 to -14	below 27 to 7	100/0	0:55-3:30	2:5 3:00	1:45 2:55	1:00-1:45	0:25-1:3[illegible][7]	0:20-0:30[7]	CAUTION: No holdover time guidelines exist	
				0[illegible]	[illegible]30-0[illegible]40	0:15				
		75/25	0:45-1:50	[illegible]45-[illegible]0	1:00-1:45	3 [illegible]	0:20-1:10[7]	0:15-0:25[7]		
below -14 to -28	below 7 to -18.4	100/0	0:40-1:00	0:40-0:50	0:30-0:[illegible]0	0:15-0:30				

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 5) is required.
3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
5 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 7 provides allowance times for ice pellets and small hail).
7 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS:

- **The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.**
- **Fluids used during ground de/anti-icing do not provide in-flight icing protection.**

x **This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.**

40

HOT WEATHER OPERATION

During extended ground operations prior to flight deck preparation, consideration should be given to reduce the heat being generated on the flight deck. Window heat, radar, and other electronic components which contribute to a high temperature level on the flight deck may be turned off. All the flight deck air outlets should be open.

Passenger

Both packs should be used (when possible) for maximum cooling. Recirculation fans should be on for maximum cooling capacity. To maximize the cooling capacity of the air conditioning system, the flight deck side windows and all doors, including cargo doors, should be kept closed as much as possible. All gasper outlets should be open and window shades on the hot (sun–exposed) side of the passenger cabin should be closed. Flight deck cooling can be improved by closing the flight deck door and lowering the side trays adjacent to the pilot seats.

~~Freighter~~

~~Both packs should be used (when possible) for maximum cooling. Recirculation fans should be on for maximum cooling capacity. To maximize the cooling capacity of the air conditioning system, the flight deck side windows and all doors, including cargo doors, should be kept closed as much as possible. Flight deck cooling can be improved by lowering the side trays adjacent to the pilot seats.~~

Note: If only cooling air from ground air conditioning cart is supplied (no pressurized air from the APU or ground external air), then the TAT probe is not aspirated. Because of high TAT probe temperatures, the FMCs may not accept an assumed temperature derate. Delay selecting an assumed temperature derate until after bleed air is available.

MODERATE TO HEAVY RAIN, HAIL OR SLEET

Flight should be conducted to avoid thunderstorms, hail activity or visible moisture over storm cells. To the maximum extent possible, moderate to heavy rain, hail or sleet should be avoided.

OPERATION IN A SANDY OR DUSTY ENVIRONMENT

The main hazards of a sandy or dusty environment are airplane surface erosion, especially of engine fan blades, accumulation of sand or dust on critical surfaces, and blockage. The effects of sand ingestion occur predominantly during takeoff, landing and taxi operations. The adverse effects, however, can occur if the airplane's flight path was through a cloud of visible sand or dust, or the airplane was parked during a sand or dust storm. Premature engine deterioration can result from sand or dust ingestion, causing increased fuel burn and reduced EGT margins.

> *CAUTION!* ***After a sandstorm, if all taxiways and runways are not carefully inspected and swept for debris before flight ops are conducted, the risk of engine damage and wear is increased.***

EXTERIOR INSPECTION

Although removal of sand and dust contaminants is primarily a maintenance function, during the exterior inspection, the captain or first officer should carefully inspect areas where accumulation of sand or dust could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Windshield.. Check

Verify that the windshield has been cleaned.

Note: Do not use windshield wipers for sand or dust removal.

Surfaces .... Check

Verify that the upper surfaces of the wings and other control surfaces are free of sand.

> *CAUTION!* ***Particular care should be taken to ensure that the fuselage and all surfaces are clean after a sand storm that occurs with a rain storm.***

Air conditioning inlets and exits....................................... Check

Verify that the air inlets and exits are free of sand and dust.

Verify that the cabin pressure outflow valves and both positive pressure relief valves are free of sand and dust.

Leading edge flaps .... Check

Verify that all leading edges are undamaged.

Engine inlets.. Check

Verify that the inlet cowling is free of sand and dust.

Verify that the fan is free to rotate and fan blades are undamaged.

Fuel tank vents .... Check

Verify that all vents are free of sand and dust.

Landing gear .... Check

Verify that gear struts and doors are free of sand and dust build-up.

Vertical and horizontal stabilizers...................................... Check

Verify that all leading edges are undamaged.

APU air inlet.. Check

Ensure that the APU inlet door is free of sand and dust before APU start.

Note: Minimize the use of air conditioning, other than from a ground air conditioner, as much as possible. If the APU must be used for air conditioning, maintain a temperature as high as possible while still providing a tolerable flight deck and cabin environment.

PREFLIGHT PROCEDURE - FIRST OFFICER

Do the normal Preflight Procedure - First Officer with the following modifications:

Note: Minimize the use of air conditioning, other than from a ground air conditioner, as much as possible. If the APU must be used for air conditioning, maintain a temperature as high as possible while still providing a tolerable flight deck and cabin environment.

APU bleed air switch. . . . . OFF F/O

If APU bleed air will be used and the APU is not operating:

APU . . . . START, then ON F/O

Do not allow the APU selector to spring back to the ON position.

Note: Run the APU for one full minute before using it as a bleed air source.

ENG BLEED switches. . . . . OFF F/O

APU bleed switch . . . . AUTO F/O

ENGINE START PROCEDURE

Do the normal Engine Start Procedure with the following modifications:

Note: Use a filtered ground cart for pneumatic air for engine start, if available.

~~**GE engine (777-300ER/777F)**~~

~~**Engine START selector . . . . START F/O**~~

PW engine (777-200ER/~~777-300)~~

Engine START/IGNITION selector . . . . START F/O

Verify that the N2 RPM increases ALL

Allow maximum motoring for 2 mins to help remove contaminants.

Note: Maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 secs.

FUEL CONTROL switch . . . . RUN CAPT

AFTER START PROCEDURE

Do the normal After Start Procedure with special emphasis on the following steps:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi out. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU . . . . START, then ON F/O

Do not allow the APU selector to spring back to the ON position.

Note: Run the APU for one full minute before using it as a bleed air source.

ENG BLEED switches . . . . OFF F/O

APU bleed switch . . . . AUTO F/O

Flight controls . . . . Check CAPT

Verify that there is no increase in control forces due to sand or dust contaminants.

TAXI–OUT

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during taxi:

- Use all engines during taxi and taxi at low speed. Limit ground speed to 10 kts and maintain thrust below 40 % N1 whenever possible to avoid creating a vortex during ground operations
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake
- Avoid engine overhang of unprepared surfaces
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion
- Whenever possible, avoid situations that would require the airplane to be brought to a complete stop
- Avoid excessive braking. The presence of sand or dust will increase brake wear

TAKEOFF

Do the following to minimize sand and dust ingestion by the engines during takeoff:

- Use the maximum fixed derate and/or assumed temperature thrust reduction that meets performance requirements

- Avoid the use of "bump thrust"
- Prior to takeoff, allow sand and dust to settle
- Do not take off into a sand or dust cloud
- Use a rolling takeoff. Whenever possible, avoid setting high thrust at low speed
- When visible sand and dust exist, consider delaying flap retraction until above the dust cloud, if operations permit
- Use maximum climb power to minimize time spent in dusty conditions

LANDING

Do the following to minimize sand and dust ingestion by the engines during landing:

- Use autobrakes on landing to help minimize the need for reverse thrust
- Performance permitting, minimize the use of reverse thrust to prevent ingestion of dust and sand and to prevent reduction of visibility. Reverse thrust is most effective at high speed

AFTER LANDING PROCEDURE

Do the normal After Landing Procedure with the following modifications:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi out. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU . . . . START, then ON F/O

Do not allow the APU selector to spring back to the ON position.

Note: Run the APU for one full minute before using it as a bleed air source.

ENG BLEED switches . . . . OFF F/O

APU bleed switch . . . . AUTO F/O

TAXI-IN

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during the taxi-in:

- Use all engines and taxi at low speed. Limit ground speed to 10 kts and maintain thrust below 40 % N1 whenever possible.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake
- Avoid engine overhang of unprepared surfaces
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion
- Whenever possible, avoid situations that would require the airplane to be brought to a complete stop
- Avoid excessive braking. The presence of sand or dust will increase brake wear

SECURE PROCEDURE

Do the normal Secure Procedure with the following modifications:

OUTFLOW VALVE switches (both) . . . . MAN F/O

OUTFLOW VALVE MANUAL switches (both) . . . . CLOSE F/O

Position the outflow valves fully closed to inhibit the intake of sand and dust.

Additional procedures for securing the airplane during sandy or dusty conditions may be needed. These procedures are normally done by maintenance personnel, and include, but are not limited to:

- Verify that engine covers, if applicable, are in place while the airplane is parked
- Verify that airplane doors are closed
- Verify that all openings are plugged or covered while the airplane is parked. Streamers should be used to remind personnel to remove before flight
- Ensure all compartments are closed

SEVERE TURBULENCE

The turbulent air penetration speed provides ample protection from stall and high speed buffet, while also providing protection from exceeding the structural limit.

The recommended procedures for flight in severe turbulence are summarized below:

Passenger

Passenger signs..ON

Advise passengers to fasten seatbelts prior to entering areas of reported or anticipated turbulence. Instruct flight attendants to check all passengers' seat belts are fastened.

~~**Freighter**~~

~~**Supernumerary signs ....ON**~~

~~Advise supernumeraries to fasten seatbelts prior to entering areas of reported or anticipated turbulence.~~

STRUCTURAL CONSIDERATIONS

Flap extension in an area of known turbulence should be delayed as long as possible because the airplane can withstand higher gust loads in the clean configuration.

CLIMB, CRUISE AND DESCENT CONSIDERATIONS

After takeoff, and when established in a clean climb configuration, use of the autopilot is recommended for flight through turbulence.

During climb and descent, use of VNAV or FLCH may result in excessive pitch changes as the AFDS attempts to maintain target speed.

Therefore, V/S mode is recommended for climb and descent in severe turbulence.

During cruise, VNAV and altitude hold modes both fly speed on autothrottle and can be used in turbulence.

PW engine (777-200ER / ~~777-300~~)

In severe turbulence during cruise, it may be necessary to disconnect the autothrottle to prevent excessive thrust change. Thrust setting guidance is available on EICAS when VNAV is engaged. Set EPR at or slightly above the magenta VNAV target EPR indication. Change thrust setting only if required to modify an unacceptable speed trend.

~~GE engine (777-300ER / 777F)~~

~~In severe turbulence during cruise, it may be necessary to disconnect the autothrottle to prevent excessive thrust change. Thrust setting guidance is available on EICAS when VNAV is engaged. Set N1 at or slightly above the magenta VNAV target N1 indication. Change thrust setting only if required to modify an unacceptable speed trend.~~

MANUAL FLIGHT IN SEVERE TURBULENCE

If manual flight in severe turbulence is needed, trim the airplane for the turbulent air penetration speed. Control the airplane pitch attitude with the control column using the attitude indicator as the primary instrument.

In extreme drafts, large altitude changes may occur. Do not make sudden large control inputs. Corrective actions to regain the desired attitude should be smooth and deliberate. Altitude variations are likely in severe turbulence and should be allowed to occur if terrain clearance is adequate. Control airplane attitude first, then make corrections for airspeed, altitude and heading.

WINDSHEAR

Windshear is a change of wind speed and/or direction over a short distance along the flight path. Indications of windshear are listed in the POM Chapter 8.3 - Avoid and Escape Maneuvers.

AVOIDANCE

The flight crew should search for any clues to the presence of windshear along the intended flight path. Presence of windshear may be indicated by:

- Thunderstorm activity
- Virga (rain that evaporates before reaching the ground)

- Pilot reports
- Low level windshear alerting (LLWAS) warnings

Stay clear of thunderstorm cells and heavy precipitation and areas of known windshear. If the presence of windshear is confirmed, delay takeoff or do not continue an approach.

PRECAUTIONS *<CLICK>*

If windshear is suspected, be alert to any of the danger signals and be prepared for the possibility of an inadvertent encounter. The following precautionary actions are recommended if windshear is suspected:

Takeoff

- Takeoff with full rated takeoff thrust is recommended if windshear conditions exist or are suspected, unless the use of a fixed derate is required to meet a dispatch performance requirement.
- For optimum takeoff performance, use flaps 20 for takeoff unless limited by obstacle clearance and/or climb gradient. Flaps 15 may be used as a precautionary setting and will provide nearly equivalent performance to Flaps 20.
- Use the longest suitable runway provided it is clear of areas of known windshear.
- Use the flight director after takeoff.
- Consider increasing Vr speed to the performance limited gross weight rotation speed, not to exceed actual gross weight Vr+20 kts. Set V speeds for the actual gross weight. Rotate at the adjusted (higher) rotation speed. This increased rotation speed results in an increased stall margin, and meets takeoff performance requirements. If windshear is encountered at or beyond the actual gross weight Vr, do not attempt to accelerate to the increased Vr, but rotate without hesitation.
- Be alert for any airspeed fluctuations during takeoff and initial climb. Such fluctuations may be the first indication of windshear.
- Know the all-engine initial climb pitch attitude. Rotate at the normal rate to this attitude for all non-engine failure takeoffs. Minimize reductions

from the initial climb pitch attitude until terrain and obstruction clearance is assured, unless stick shaker activates.

- Crew coordination and awareness are very important. Develop an awareness of normal values of airspeed, attitude, vertical speed and airspeed build-up. Closely monitor vertical flight path instruments such as vertical speed and altimeters. The PM should be especially aware of vertical path instruments and call out any deviations from normal.
- Should airspeed fall below the trim airspeed, unusual control column forces may be required to maintain the desired pitch attitude. Stick shaker must be respected at all times.

Approach and Landing

- Use either Flaps 25 or 30 for landing.
- Establish a stabilized approach no lower than 1000 ft above the airport to improve windshear recognition capability.
- Use the most suitable runway that avoids the areas of suspected windshear and is compatible with the crosswind or tailwind limitations. Use electronic or visual glide path indications to detect flight path deviations and help with timely detection of windshear.
- If the autothrottle is disengaged, or is planned to be disengaged prior to landing, add an appropriate airspeed correction (correction applied in the same manner as gust), up to a maximum of 15 kts.
- Avoid large thrust reductions or trim changes in response to sudden airspeed increases as these may be followed by airspeed decreases.
- Crosscheck flight director commands using vertical flight path instruments.
- Crew coordination and awareness are very important, particularly at night or in marginal weather conditions. Closely monitor the vertical flight path instruments such as vertical speed, altimeters and glide slope displacement. The PM should call out any deviations from normal. Use of autopilot and autothrottle for the approach may provide more monitoring and recognition time.

RECOVERY

Accomplish the WINDSHEAR ESCAPE MANEUVER found in the POM Chapter 8.3 - Avoid and Escape Maneuvers.

ICE CRYSTAL ICING (ICI)

At temperatures below freezing near convective weather, the airplane can encounter visible moisture made up of high concentrations of small ice crystals. Ice crystals can accumulate aft of the engine fan, in the engine core. Ice shedding can cause engine vibration, engine power loss, and engine damage.

Ice crystal icing is difficult to detect because ice crystals do not cause significant weather radar returns. They are often found in high concentrations above and near regions of heavy precipitation. Ice crystals do not stick to cold aircraft surfaces.

Avoid ICI conditions flight in clouds containing high concentrations of ice crystals has been associated with engine vibration, engine power loss, engine damage, and airplane Total Air Temperature (TAT) probe icing.

Because these conditions can be difficult to recognize, careful preflight planning is a key component of in-flight situational awareness. When ICI is encountered or suspected, do the QRH Ice Crystal Icing NNC to mitigate the effect on the flight.

RECOGNIZING ICE CRYSTAL ICING

Ice crystals are most frequently found in areas of visible moisture and above altitudes normally associated with icing conditions. Their presence can be indicated by one or more of the following:

- Appearance of rain on the windshield at temperatures too cold for liquid water to exist. This is due to ice crystals melting on the heated windows (sounds different than rain)
- Airplane TAT indication remains near 0 °C due to TAT probe icing
- Areas of light to moderate turbulence
- In IMC with:

- No significant airframe icing and
- No significant radar returns at airplane altitude and
- Heavy precipitation below the airplane, identified by amber and red radar returns on weather radar

• Cloud tops above typical cruise levels (above the tropopause)

• Smell of ozone or sulfur

• Humidity increase

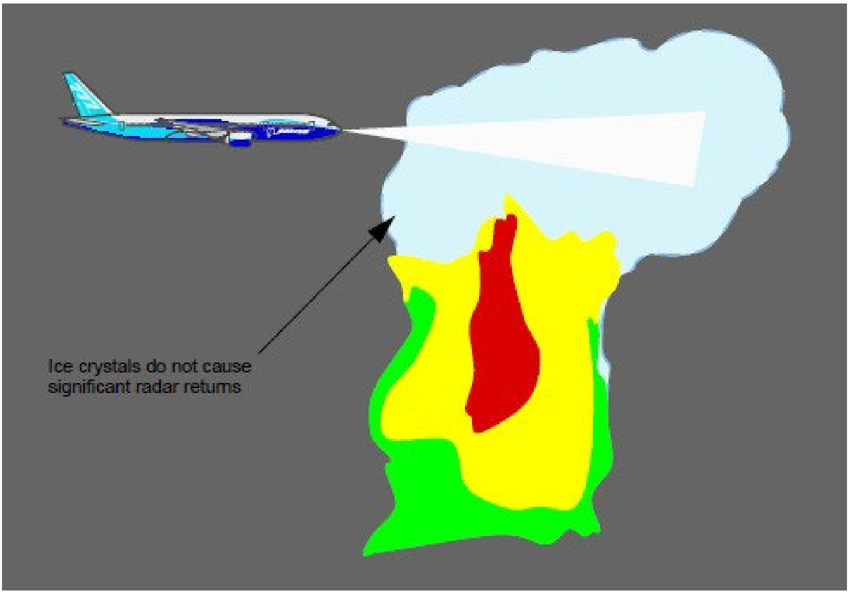
• Static discharge around the windshield (St. Elmo's fire)

Note: The icing conditions detections system does not detect ice crystal icing. It is designed to detect supercooled water only.

AVOIDING ICE CRYSTAL ICING

During flight in IMC, avoid flying directly over significant amber or red radar returns, even if there are no returns at airplane altitude.

Use the weather radar controls to assess weather radar reflectivity below the airplane flight path. Refer to weather radar operating instructions for additional information.



Areas with a higher risk of High Ice Water Content (HIWC) are identified by some aviation weather vendors. In these areas, ICI should be suspected while operating in IMC. Use of this type of HIWC information is recommended for strategic preflight planning and in–flight adjustments in order to avoid potential ICI conditions.

ICE CRYSTAL ICING SUSPECTED

If conditions allow, exit the ice crystal icing conditions laterally. Climbing or descending to exit ice crystal icing conditions is not recommended.

Request a route change to minimize the time above red and amber radar returns.

Do the Ice Crystal Icing non-normal checklist.

TABLE OF CONTENTS

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INTRODUCTION

Flight crews are expected to accomplish checklists listed in the QRH. These checklists ensure maximum safety until appropriate actions are completed and a safe landing is accomplished. Techniques discussed in this chapter minimize workload, improve crew coordination, enhance safety, and provide a basis for standardization. A thorough review of the QRH (Non-Normal Checklists) is an important prerequisite to understanding this section.

NON-NORMAL SITUATION MANAGEMENT

When a non-normal situation occurs, the following guidelines apply:

- **NON-NORMAL RECOGNITION**

  The crew member recognizing the malfunction calls it out clearly and precisely.

- **MAINTAIN AIRPLANE CONTROL**

  It is mandatory that the Pilot Flying (PF) fly the airplane while the Pilot Monitoring (PM) accomplishes the non-normal checklists. Maximum use of the autoflight system is recommended to reduce crew workload.

- **ANALYZE THE SITUATION**

  Non-normal checklists should be accomplished only after the malfunctioning system has been positively identified. Review all EICAS messages to positively identify the malfunctioning system(s).

  Note: Pilots should don oxygen masks and establish communications anytime oxygen deprivation or air contamination is suspected, even though an associated warning has not occurred.

- **TAKE THE PROPER ACTION**

  Although some in-flight non-normal situations require immediate. corrective action, difficulties can be compounded by the rate the PF issues commands and the speed of execution by the PM. Commands must be clear and concise, allowing time for acknowledgment of each command prior to issuing further commands.

  The PF must exercise positive control by allowing time for acknowledgment and execution. The other crewmembers must be certain their reports to the PF are clear and concise, neither exaggerating nor understating the nature of the non-normal situation. This eliminates confusion and ensures efficient, effective, and expeditious handling of the non-normal situation

- **EVALUATE THE NEED TO LAND**

  If the NNC directs the crew to plan to **land at the nearest suitable airport** or if the situation is so identified in the QRH section CI.2, (Checklist Instructions, Non-Normal Checklists), diversion to the nearest airport where a safe landing can be accomplished is required. If the NNC or the Checklist Instructions do not direct landing at the nearest suitable airport, the pilot must determine if continued flight to destination may compromise safety.

NON–NORMAL CHECKLIST USE

Non–normal checklist use starts when the airplane flight path and configuration are correctly established. Only a few situations need an immediate response (e.g. CABIN ALTITUDE). All actions must be coordinated under the captain's supervision and done in a deliberate, systematic manner. Flight path control must never be compromised.

After completion of the non-normal checklist, normal procedures are used to configure the airplane for each phase of flight.

MEMORY ITEMS

- When a non–normal situation occurs, at the direction of the PF, both crew members do all memory items in their areas of responsibility.
  - PF should make a callout as a direction to initiate corresponding memory items. (e.g. “(Name of Checklist) **MEMORY ITEMS/ CHECKLIST**”, etc.)

    Note: Flight crew may accomplish the necessary items of non-normal checklist, even though an associated warning has not occurred. (e.g. Don oxygen mask)

  - PM calls out the memory items prior to taking actions after PF’s direction except when an immediate response is required (e.g.

CABIN ALTITUDE, etc.).

NON-NORMAL CHECKLIST

- PF calls for the non-normal checklist when:
  - the flight path is under control
  - the airplane is not in a critical phase of flight (such as takeoff or landing)
  - all memory items are complete
- Once the checklist has been started, it should be continued to an end even though the associated alert message disappears before completing the checklist.
  - PM makes a callout after completing the checklist. (e.g. "(Name of Checklist) **CHECKLIST COMPLETE**")

VERBAL CONFIRMATION

- During an inflight non-normal situation, 'Verbal Confirmation' is required before action is taken for:
  - an autothrottle arm switch
  - an engine thrust lever
  - a fuel control switch
  - an engine or APU fire switch, or a cargo fire arm switch
  - a generator drive disconnect switch
- PF/PM or CAPT/F/O takes action based on each crewmember's area of responsibility as below:

ITEMS	Inflight		On Ground	
	PF	PM	CAPT	F/O
THRUST LEVER	Idle or Retard	Confirm	Idle or Retard	-
FUEL CONTROL SWITCH	Confirm	Cut Off	Cut Off 1)	-
ENG FIRE SWITCH	Confirm	Pull & Rotate	-	Pull & Rotate

[1] F/O has a responsibility to cut off the fuel control switch in case the aircraft is not stationary.

Note: During non-normal operations on ground, verbal confirmation is not required.

CIRCUIT BREAKERS AND INDICATOR LIGHTS TEST

Refer to QRH CI.2 - Non-Normal Checklist Operation.

OXYGEN MASK

Oxygen masks are donned, and communication established between crew members whenever their use is required. These situations may include:

- Pressurization problems which cause the cabin altitude to exceed 10,000 ft.
- Smoke in the aircraft.
- Fire extinguishing agents used in the cockpit.
- Contaminated air in the aircraft.
- The quality of breathable air is in question.

Specific steps for the use of masks are not included in all procedures.

If prolonged use of oxygen is required, and the cabin air is not contaminated, consider selecting normal (diluted) flow to extend oxygen availability time.

NON-NORMAL MANEUVERS

REJECTED TAKEOFF

CONSIDERATIONS

The Captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the rejected takeoff maneuver by V1. If the decision is to reject the takeoff, the Captain must clearly announce “STOP,” immediately start the rejected takeoff maneuver, and assume control of the airplane. If the First Officer is making the takeoff, the First Officer must maintain control of the airplane until the Captain makes a positive input to the controls.

Before 80 kts, reject the takeoff for any of the following:

- activation of the master caution system
- system failure(s)
- unusual noise or vibration
- tire failure
- abnormally slow acceleration
- takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- a side window opens
- the airplane is unsafe or unable to fly

Above 80 kts and before V1, reject the takeoff for any of the following:

- fire or fire warning
- engine failure
- predictive windshear warning
- the airplane is unsafe or unable to fly

During the takeoff, the crew member observing the non-normal situation immediately calls it out as clearly as possible.

Unsafe to fly : The circumstance whereby rejecting the takeoff carries significantly less risk than flying the aircraft.

Unable to fly : The circumstance where there is a reasonable probability of not being able to control the aircraft if the takeoff is continued and the aircraft becomes airborne.

BIRD STRIKE DURING TAKEOFF

If a bird strike occurs above 80 knots and prior to V1, and there is no immediate evidence of engine failure (e.g. failure, fire, power loss, or surge/stall), the preferred option is to continue with the takeoff followed by an immediate return, if required.

PROCEDURE AND CALLOUTS

CAPT	F/O
Call **"STOP"** Without delay: Simultaneously close the thrust levers, disconnect the autothrottles, and verify operation of RTO autobrakes or apply maximum manual wheel brakes. If RTO autobrakes is selected, monitor system performance and apply manual wheel brakes if the AUTOBRAKE message is displayed or deceleration is not adequate. Apply reverse thrust up to the maximum amount consistent with conditions. Verify the speedbrakes are extended. Continue maximum braking until certain the airplane will stop on the runway.	Verify actions as follows: • Thrust levers closed. • Autothrottles disconnected. • Maximum brakes applied. If AUTOBRAKE message displayed, call **"AUTOBRAKE"** • Reverse thrust applied. • Verify speedbrake lever UP and call **"SPEEDBRAKES UP."** If speedbrake lever not UP call **"SPEEDBRAKES NOT UP."** • Verify deployment of engine reversers call **"TWO REVERSE GREEN"** If any engine reverse is not deployed call **"LEFT(RIGHT) REVERSE GREEN"**
Field length permitting: Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.	Call out 80 kts and 60 kts. (Call 40 kts for the slippery runway or the low visibility.) Communicate the reject decision to the control tower as soon as practical.

CAPT	F/O
When the airplane is stopped, advise the cabin crew and passengers of the need to remain seated or of the evacuation expected. If needed, set the parking brake. Perform procedures as required. Review Brake Cooling Schedule for brake cooling time and precautions (refer to QRH P.I. - Recommended Brake Cooling Schedule). Consider the following: • the possibility of wheel fuse plugs melting • the need to clear the runway • the requirement for remote parking • wind direction in case of fire • alerting fire equipment • not setting the parking brake unless passenger evacuation is necessary • advising the ground crew of the hot brake hazard • completion of Non-Normal checklist (if appropriate) for conditions which caused the RTO	

TAKEOFF FOLLOWING RTO

The flight crew may consider a new takeoff attempt subsequent to the RTO.

In this case, the flight crew should

- review of system requirement
- check performance
- check the Required Takeoff Fuel
- prepare for takeoff (review normal checklists from PREFLIGHT checklist)
- accomplish BEFORE TAKEOFF checklist at appropriate time

Additional Rejected Takeoff References:

- FOM 8.2 - Rejected Takeoff (Aborted Takeoff).

EMERGENCY LANDING AND PAX EVACUATION

Refer to FOM 8.2 - Emergency Landing & Evacuation and QRH Non-Normal checklist.

FLIGHT CREW DUTIES AFTER SHUTTING DOWN ENGINES

<table>
<tr><th>CAPT</th><th>F/O</th></tr>
<tr><td colspan="2">• Assist passenger evacuation in the cabin.</td></tr>
<tr><td colspan="2">• After all assistance is completed, evacuate from the aircraft using the entry doors, or flight deck number two windows. The exit way should be decided in consideration of the situation.
• Have all passengers move to a point well clear of the aircraft, out of range of possible fire or explosion. Do not allow passengers to return to the aircraft until the danger no longer exists.</td></tr>
</table>

FLIGHT CREW CARRY-OUT ITEMS AFTER EMERGENCY LANDING OR DITCHING (IN CASE OF LANDING AT NOT IN AIRPORT)

CAPT	F/O
Flash light	Flash light, Crash Axe

ENGINE FIRE/FAIL

Engine failure or loss of thrust is normally indicated by more than one engine parameter and adverse yaw. An instrument failure is normally isolated to the associated instrument and an electrical failure may affect instruments on more than one engine. Therefore, crew should use supporting information when verifying an engine failure or loss of thurst.

The Captain will evaluate all circumstances prior to shutting down an engine. Continued engine operation at minimum thrust may be the safer course of action in certain situations.

ENGINE FIRE/FAIL AFTER V_1

PROCEDURE AND CALLOUT

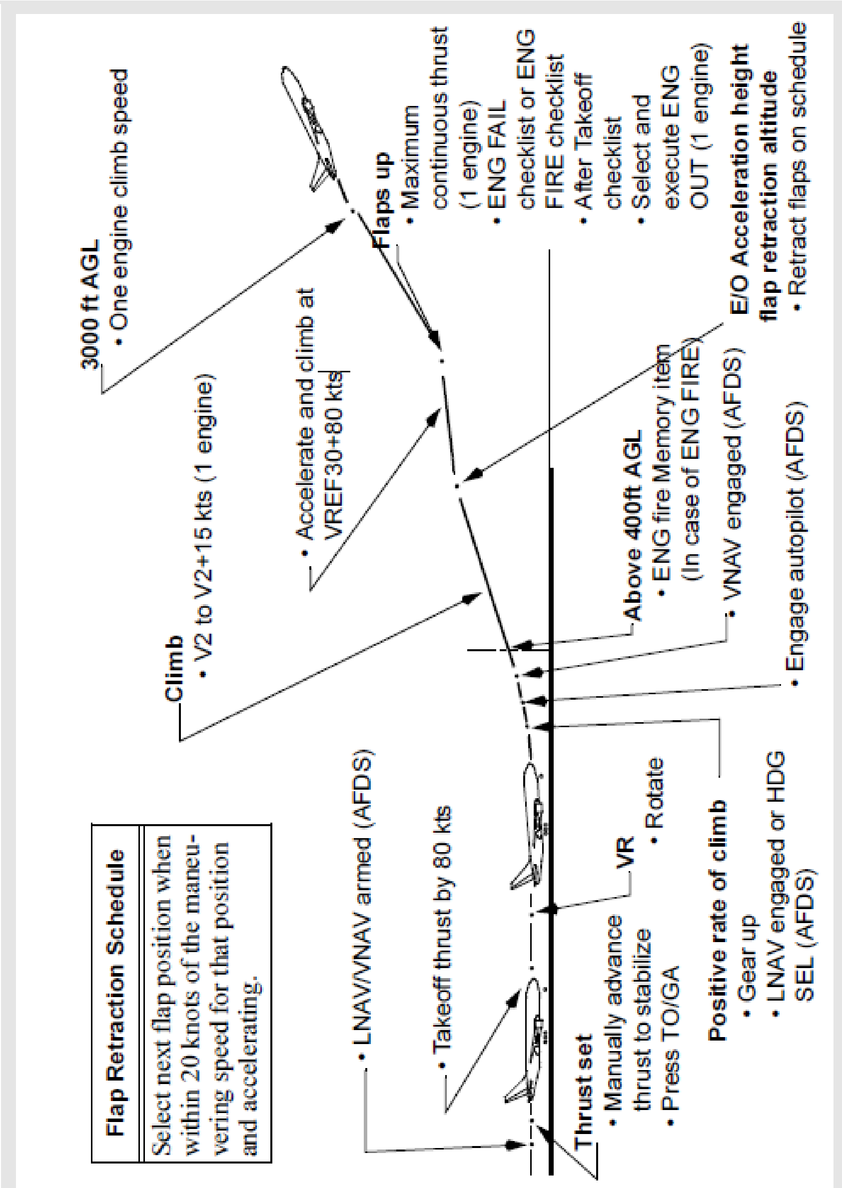
PF	PM
Maintain directional control by smoothly applying rudder proportionate with thrust decay.	If engine failure or fire occurs after V_1, call **"ENGINE FAIL or ENG FIRE"**
Note: Consider delaying "ENGINE FIRE" or "ENGINE FAIL" callout until landing gear is UP.	
At V_R, rotate towards the target pitch attitude. Do not rotate early or rapidly Adjust pitch attitude to maintain desired airspeed of V2 to V2+15 kts.	At V_R, call "**ROTATE**"
Note: The AFDS limits the bank angle to 15 degree until V2+10 kts to maintain at least adequate maneuvering margin. The bank angle limit increases to 25 degrees by V2+20 kts if LNAV is engaged, or when HDG SEL or TRK SEL is engaged with the bank limit in AUTO.	
Call "**GEAR UP**" When at a safe altitude above 200 ft AGL with correct rudder pedal input as needed, the autopilot may be engaged.	Call "**POSITIVE CLIMB**" Position landing gear lever up. Call "**FIRE ENGINE (L)** " or "**ENG FAIL(L)**"
In case of an engine failure, there are no memory items. The non-normal checklist for an engine failure is normally accomplished after the flaps have been retracted and if conditions permit. In case of an engine fire (severe damage or separation), memory items must be accomplished as soon as possible after 400 ft AGL.	
	Call "**FIRE ENGINE (L)**".
Call "**FIRE ENGINE (L) MEMORY ITEMS**"	

PF	PM
Call "**(L) CONFIRM?**" Call "**OFF**"	Call "**(L) A/T ARM SWITCH -- OFF**" Call "**CONFIRM**"
Call "**(L) CONFIRM?**" Call "**IDLE**"	Call "**(L) THRUST LEVER -- IDLE**" Call "**CONFIRM**"
Call "**CONFIRM**"	Call "**(L) FUEL CONTROL SWITCH -- CUTOFF**" Call "**(L) CONFIRM?**" Call "**CUTOFF**"
Call "**CONFIRM**"	Call "**(L) ENGINE FIRE SWITCH -- PULL**" Call "**(L) CONFIRM?**" Call "**PULL**"
Continue remaining memory items in accordance with Non-Normal Checklist. Note: In case of FIRE ENG discharge the first bottle by memory. If after 30 seconds, the FIRE ENG message shows, PF should order a second bottle discharge by memory, ECL or QRH.	
At engine out acceleration altitude, accelerate for flap retraction.	
After flaps have been retracted: Confirm CON thrust on the EICAS has been set. Accomplish the reference non-normal checklist items. Accomplish AFTER TAKEOFF checklist.	
	Select ENGINE OUT on FMS.

ADDITIONAL REFERENCES

- FOM 8.2 - Engine Failure or Shutdown
- FCRM 7.6 - Non-normal Operations

FLIGHT PATTERN FOR ENGINE FAIL/FIRE AFTER V1



EMERGENCY DESCENT

CONSIDERATIONS

Emergency descent maneuver is designed to bring the airplane down smoothly to a safe altitude, in the minimum time, with the least possible passenger discomfort.

- If the descent is performed because of a rapid loss of cabin pressure, crewmembers should place oxygen masks on and establish communication at the first indication of a loss of cabin pressurization.
- Verify cabin pressure is uncontrollable, and if so begin descent. If structural damage exists or is suspected, limit airspeed to current speed or less. Avoid high maneuvering loads.

  Note: Use of the autopilot with FLCH mode is the recommended for airspeed and altitude protection during the emergency descent.

  Note: Emergency descents are normally made with the landing gear up. However, when structural integrity is in doubt and airspeed must be limited, extension of the landing gear may provide a more satisfactory rate of descent.

- Perform the maneuver deliberately and methodically. Do not be distracted from flying the airplane.
- If icing conditions are entered, use anti-ice and thrust as required.
- The PM checks the lowest safe altitude, notifies ATC, and obtains an altimeter setting (QNH). Both pilots should verify that all memory items have been accomplished and call out any items not completed.
- Level off at the lowest safe altitude or 10,000 ft, whichever is higher. Lowest safe altitude is the Minimum Enroute Altitude (MEA), Minimum Off Route Altitude (MORA), or any other altitude based on terrain clearance, navigation aid reception, or other appropriate criteria.
- If severe turbulent air is encountered or expected, reduce to the turbulent air penetration speed.
- After Level off, recheck the pressurization system and evaluate the situation.

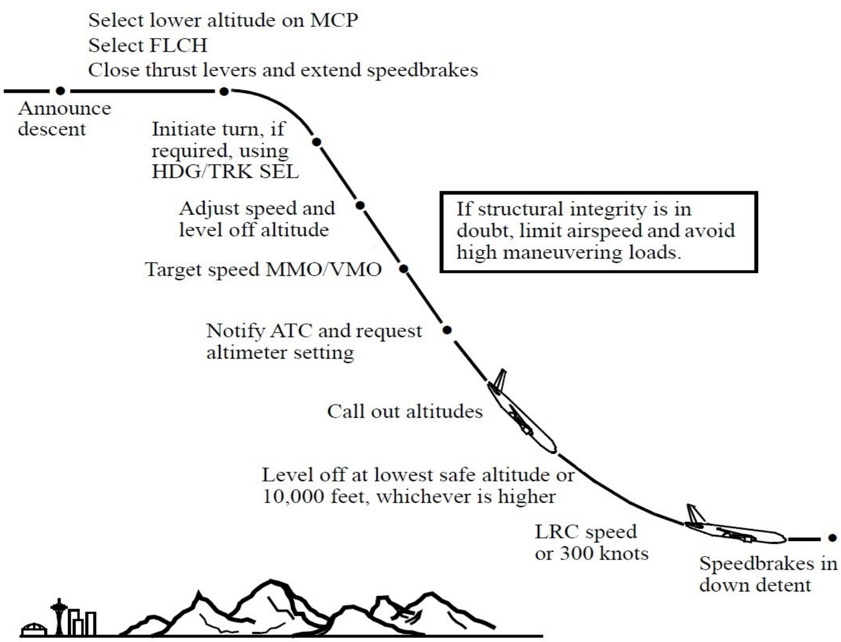
Note: Determine the new course of action based on weather, oxygen, fuel remaining, medical condition of crew and passengers, and available airports. Obtain a new ATC clearance.

EMERGENCY DESCENT PROCEDURES FOR CABIN ALTITUDE

PF	PM
Call "**CABIN ALTITUDE MEMORY ITEMS**"	
Call "**OXYGEN MASK - ON**"	Call "**OXYGEN MASK - ON**"
Establish crew communications.	
Call **"CM1"**	Call **"CM2"**
	Call "**CABIN ALTITUDE AND RATE - CHECK**"
If the cabin altitude is uncontrollable:	
Call **"UNABLE CONTROL"** and **"EMERGENCY DESCENT"** (use autopilot if available)	Call "**PASSENGER (OR SUPERNUMERARY) OXYGEN SWITCH ON**" PASS OXYGEN (or SUPRNMRY OXYGEN) switch - ON
Set lower altitude on MCP. Select FLCH. Close thrust levers. Extend speedbrakes. Descend straight ahead or initiate turn, if required, with HDG/TRK SEL. Adjust airspeed depending on A/C condition (VMO/MMO or current SPD). Adjust level off altitude. Call "**CABIN ALTITUDE CHECKLIST**"	After monitoring PF's action: Declare emergency and request area altimeter setting. Set SQ 7700 if no contact with ATC. Check lowest safe altitude (check MORA, MEA). If time permits, turn on all exterior lights. Accomplish CABIN ALTITUDE checklist.
Call "**___inHg/hPa RESET**"	At transition level Call "**TRANSITION, ALTIMETER RESET___inHg/hPa**"

When the pitch mode on FMA changes to ALT, adjust speed then retract speedbrakes [1)] to down detent. Level off at lowest safe altitude or 10,000 whichever is higher.	Call the change of pitch mode. Call **"1000 to LEVEL"** Set Long Range Cruise (LRC) speed.
Note: [1)] To avoid overspeed condition during altitude capture near VMO/MMO, retract the speedbrakes smoothly and slowly after adjusting speed.	
If cabin altitude is at or below 10,000ft, remove crew oxygen masks.	
Do PA and inform the purser.	

EMERGENCY DESCENT PROFILE



ADDITIONAL EMERGENCY DESCENT REFERENCES

- QRH
- FOM 8.2 - Loss of Cabin Pressure
- Airway Manual

AIR DATA SYSTEMS UNRELIABLE

AIRSPEED UNRELIABLE

Flight crew should be familiar with the approximate aircraft attitude and thrust for each phase of flight. Any significant change in body attitude from the attitude normally required to maintain a particular airspeed or Mach number should alert the flight crew to a potential airspeed problem.

> Note: Ground speed information is available from the FMS and on the instrument displays. These indications can be used as a crosscheck.

Procedures

If abnormal airspeed is recognized:

- immediately set the target pitch attitude and thrust setting for the aircraft configuration from the Airspeed Unreliable memory items:

Flaps Extended		Flaps Up	
Pitch Attitude	Thrust (N1)	Pitch Attitude	Thrust (N1)
10°	85 %	4°	70 %

- The memorized settings are calculated to work for all model/engine combinations, at all weights and at all altitudes.
- The flaps up settings will be sufficient such that the actual airspeed remains above stick shaker and below overspeed.

> Note: The flaps up pitch and thrust settings will result in a slight climb at light weights and low altitudes, and a slight descent at heavy weights and high altitudes.

- The flaps extended settings will be sufficient such that the actual airspeed remains above stick shaker and below the flap placard limit.

> Note: The flaps extended pitch and thrust settings will result in a climb.

- The current flap position should be maintained until the memory pitch and thrust settings have been set and the airplane stabilized. If further flap extension/flap retraction is required refer to Flight With Unreliable Airspeed Table (QRH - PI section).

• accomplish the Airspeed Unreliable NNC.

- In order to determine if a reliable source of indicated airspeed is available, the aircraft should be trimmed and stabilized to the thrust and pitch have been set before crosschecking the airspeed indicators.

• alert ATC if unable to maintain assigned altitude or if altitude indications are unreliable.

If it is determined that none of the airspeed indicators are reliable, use the Flight With Unreliable Airspeed Table (QRH - PI section) to control the aircraft pitch and thrust for the reminder of the flight.

• When changing phase of flight or aircraft configuration:

- make initial thrust change, set pitch attitude, configure the aircraft as needed, then
- recheck thrust and pitch, and trim as needed.
- do not change configuration until the aircraft is trimmed and stabilized at the current configuration.

Note: The Airspeed Unreliable checklist procedures configure the aircraft as necessary by using alternate flaps if needed to prevent unwanted flap load relief. Because the flap load relief function uses indicated airspeed, which may be unreliable.

• Descent:

- Idle thrust descents to 10,000 ft can be made by flying body attitude and checking rate of descent in the QRH-PI. tables.
- At 2000 ft above the selected level off altitude, reduce rate of descent to 1000 FPM.
- On reaching the selected altitude, establish attitude and thrust for the airplane configuration. If possible, allow the airplane to stabilize before changing configuration and altitude.

• Approach:

- If available, accomplish an ILS approach. Establish landing configuration early on final approach. At glide slope intercept or beginning of descent, set thrust and attitude per the QRH PI. tables and control the rate of descent with thrust.

- Landing:
  - Control the final approach so as to touch down approximately 1000 ft to 1500 ft beyond the threshold.
  - Fly the aircraft on to the runway, do not hold it off or let it “float” to touchdown.
  - Use autobraking if available. If manual braking is used, maintain adequate brake pedal pressure until a safe stop is assured.
  - Immediately after touchdown, expeditiously accomplish the landing roll procedure.

ALTITUDE UNRELIABLE

Altitude information transmitted to ATC by the airplane’s transponder may be unreliable. ATC is not an independent source of barometric altitude information.

In situations where altitude indications are unreliable or altimeters disagree, transponder altitude received by ATC may be unreliable and cannot be used to verify barometric altitude. Accomplish the AIR DATA SYS/NAV AIR DATA SYS NNC if the EICAS message is shown.

OVERSPEED

VMO/MMO is the airplane maximum certified operating speed and should not be exceeded intentionally. However, flight crew can occasionally experience an inadvertent overspeed.

During cruise at high altitude, wind speed or direction changes may lead to overspeed events. Although autothrottle logic provides for more aggressive control of speed as the airplane approaches VMO or MMO, there are some conditions that are beyond the capability of the autothrottle system to prevent short term overspeeds.

Note: If VMO/MMO is exceeded during the flight, the maximum airspeed and duration should be noted in the flight and maintenance log.

PROCEDURES

When encountering an inadvertent overspeed condition, flight crew should leave the autopilot engaged unless it is apparent that the autopilot is not correcting the overspeed. However, if manual inputs are required, disengage the autopilot.

WARNING! ***Be aware that disengaging the autopilot may result in an abrupt pitch change and be reminded also that there have been reports of passenger injuries due to over controlling the aircraft during high altitude, high airspeed flight. A combination of pitch up with thrust levers closed can quickly lead to a stall condition. Also, in case of RA event at high altitude and speed, crew must be aware of the high altitude characteristics before disengaging the autopilots.***

• During Cruise:

CAUTION! ***When correcting an overspeed during cruise at high altitude, avoid reducing thrust to idle which results in slow engine acceleration back to cruise thrust and may result in over-controlling the airspeed or a loss of altitude.***

- If autothrottle corrections are not satisfactory, deploy partial speedbrakes slowly until a noticeable reduction in airspeed is achieved.
- When the airspeed is below VMO/MMO, retract the speedbrakes at the same rate as they were deployed. The thrust levers can be expected to advance slowly to achieve cruise airspeed; if not, they should be pushed up more rapidly.

• During Climb/Descent:

CAUTION! ***During descents at or near VMO/MMO, most overspeeds are encountered after the autopilot initiates capture of the VNAV path from above or during a level-off when the speedbrakes were required to maintain the***

path. In these cases, if the speedbrakes are retracted during the level-off, the airplane can momentarily overspeed.

- During descents using speedbrakes near VMO/MMO, delay retraction of the speedbrakes until after VNAV path or altitude capture is complete.
- If windshear is expected, flight crew may consider a 5 to 10 kts reduction in climb or descent speeds to reduce overspeed occurrences.
- During climb or descent, if VNAV or FLCH pitch control is not correcting the overspeed satisfactorily, switching to the V/S mode temporarily may be helpful in controlling speed. In the V/S mode, the selected vertical speed can be adjusted slightly to increase the pitch attitude to help correct the overspeed. As soon as the speed is below VMO/MMO, VNAV or FLCH may be re-selected.

OVERWEIGHT LANDING

Overweight landings may be safely accomplished by using normal landing procedures and techniques. There are no adverse handling characteristics associated with overweight landings.

- Landing distance is normally less than takeoff distance for flaps 20, 25, or 30 landings at all gross weights. However, the landing performance should be calculated by using EFB-OPT or QRH.
- Brake energy limits will not be exceeded under any normal or non-normal landing conditions.

CONSIDERATIONS

For the operational considerations, refer to FOM Chapter 8.2 – Overweight Landings.

PROCEDURES

Accomplish the Overweight Landing NNC.

- According to the Overweight Landing NNC, use appropriate landing flaps and approach speed.
- If stopping distance is a concern, reduce the landing weight as much as possible. (e.g. fuel jettison or holding at low altitude with a high drag configuration (gear down))
- Observe flap placard speeds during flap extension and on final approach. During flap extension, airspeed can be reduced by as much as 20 kts below normal maneuver speeds before extending to the next flap position. These lower speeds result in larger margins to the flap placards, while still providing normal bank angle maneuver capability, but do not allow for a 15° overshoot margin in all cases.
- Use the longest available runway, and consider wind and slope effects. Where possible avoid landing in tailwinds, on runways with negative slope, or on runways with less than normal braking conditions.
- Do not carry excess airspeed on final. This is especially important when landing during an engine inoperative or other non-normal condition. At weights above the maximum landing weight, the final approach maximum wind additive may be limited by the flap placards and load relief system.
- Fly a normal profile. Ensure that a higher than normal rate of descent does not develop. Do not hold the airplane off waiting for a smooth landing.
- Fly the airplane onto the runway at the normal touchdown point. If a long landing is likely to occur, go-around.
- After touchdown, immediately apply maximum reverse thrust using all of the available runway for stopping to minimize brake temperatures. Do not attempt to make an early runway turnoff.

- If adequate stopping distance is available based upon approach speed, runway conditions, and runway length, the recommended autobrake setting should be used.

OVERWEIGHT AUTOLANDS POLICY

Overweight autolands are not recommended (Automatic landings above maximum landing weight is not certified).

- An automatic approach may be attempted, however the pilot should disengage the autopilot prior to flare height and accomplish a manual landing.

In an emergency, should the pilot determine that an overweight autoland is the safest course of action, the approach and landing should be closely monitored by the pilot and the following factors considered:

- Touchdown may be beyond the normal touchdown zone; allow for additional landing distance.
- Touchdown at higher than normal sink rates may result in exceeding structural limits.
- Plan for a go-around or manual landing if autoland performance is unsatisfactory; automatic go-arounds can be initiated until just prior to touchdown, and can be continued even if the airplane touches down after initiation of the go-around.

TAIL STRIKE

Tail strike occurs when the lower aft fuselage or tail skid (as installed) contacts the runway during takeoff or landing.

Understanding the factors that contribute to a tail strike can reduce the possibility of a tail strike occurrence.

Any one of the following risk factors may precede a tail strike:

- Takeoff Risk Factors
  - Mistrimmed stabilizer (Using erroneous takeoff data)
  - Rotation at improper speed (Early rotation)

- Trimming during rotation
- Excessive rotation rate
- Improper use of the flight director

• Landing Risk Factors

Note: A tail strike on landing tends to cause more serious damage than the same event during takeoff.

- Unstabilized approach
- Holding off in the flare (Attempting extremely soft landing)
- Trimming in the flare
- Mishandling of crosswinds
- Over-rotation during Go-around

Note: After initiating a late go-around when the airplane is still over the runway, a brief landing gear touchdown is acceptable.

BOUNCED LANDING RECOVERY

If a higher than idle thrust is maintained through initial touchdown, the automatic speedbrake deployment may be disabled even when the speedbrakes are armed. This can result in a bounced landing.

PROCEDURES

• If the airplane bounces during a landing attempt, hold or re-establish a normal landing attitude and add thrust as necessary to control the rate of descent. Thrust need not be added for a shallow bounce or skip.

Note: If the speedbrakes started to extend on the initial touchdown, they will retract once the airplane becomes airborne again on a bounce, even if thrust is not increased. The speedbrakes must then be manually extended after the airplane returns to the runway.

• When a high, hard bounce occurs, initiate a go-around. Manually advance thrust levers to go-around thrust, and verify speedbrakes are retracted. Do not retract the flaps or landing gear until a positive rate of climb is established because a second touchdown may occur during the go around.

When safely airborne continue with the Go-Around and Missed Approach procedure.

Note: When landing, the TO/GA switches are inhibited near touchdown and on the ground.

GO-AROUND AFTER TOUCHDOWN

If a go-around is initiated before touchdown and touchdown occurs, continue with normal go-around procedures or rejected landing/balked landing guidance. The F/D go-around mode will continue to provide go-around guidance commands throughout the maneuver. The takeoff configuration warning siren may sound momentarily if the flaps have not retracted to flaps 20 and the thrust levers are advanced.

Note: When landing, the TO/GA switches are inhibited near touchdown and on the ground.

If a go-around is initiated after touchdown but before thrust reverser selection, continue with normal go-around procedures or balked landing guidance. As thrust levers are advanced verify auto speedbrakes retract and autobrakes disarm. The F/D go-around mode will not be available until go-around is selected after becoming airborne.

WARNING! Once reverse thrust is initiated following touchdown, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.

REJECTED LANDING / BALKED LANDING

REJECTED LANDING

A rejected landing is a discontinued landing attempt and go-around initiated at low altitude (below DA(H) or MDA(H)) but prior to touchdown. If a rejected landing becomes necessary, follow the Go-Around and Missed Approach procedure.

When landing, the TO/GA switches are inhibited near touchdown and on the ground.

BALKED LANDING

A balked landing is a discontinued landing attempt and go-around initiated at or after touchdown, but prior to initiation of reverse thrust. The balked landing technique maintains landing flap configuration to expedite climb away from the runway environment. Considerations for a balked landing include clearance of an obstacle in the runway environment, insufficient runway for continued landing, or transitioning to a go-around from a low-energy state.

When landing, the TO/GA switches are inhibited near touchdown and on the ground.

When performing a balked landing, disengage the autopilot, disconnect the autothrottle, smoothly advance thrust levers to go-around thrust, and verify speedbrakes are retracted. Maintain landing flaps configuration and smoothly rotate toward 15° pitch attitude at no less than VREF. Column forces during rotation can vary. When safely airborne with a positive rate of climb, continue the Go-Around and Missed Approach procedure.

WARNING! Once reverse thrust is initiated following touchdown, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.

Note: The takeoff configuration warning siren sounds when on the ground due to landing flap configuration.

Selecting the go-around flaps during a balked landing can cause a decrease in the airplane lift and can result in increased takeoff distance. However, if there is sufficient runway remaining to safely complete the balked landing with the go-around flap setting, the go-around flap setting can be selected.

DITCHING

Refer to QRH Non-Normal checklist.

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AVOIDANCE AND ESCAPE MANEUVERS

APPROACH TO STALL RECOVERY OR STALL RECOVERY

All recoveries from approach to stall should be done as if an actual stall has occurred.

Immediately do the following at the first indication of stall (buffet or stick shaker):

Note: Do not use flight director commands during the recovery.

Note: If autopilot response is not acceptable, it should be disengaged.

Note: If autothrottle response is not acceptable, it should be disconnected.

PF	PM
• Initiate the recovery: Smoothly apply nose down elevator to reduce the angle of attack until buffet or stick shaker stops	• Monitor altitude and airspeed. • Verify all required actions have been done and call out any omissions • Call out any trend toward terrain contact
• Continue the recovery: - Roll in the shortest direction to wings level if needed 1) - Advance thrust levers as needed - Retract the speedbrakes - Do not change gear or flap configuration, except: During liftoff, if flaps are up, call for flaps 1	• Monitor altitude and airspeed • Verify all required actions have been done and call out any omissions • Call out any trend toward terrain contact • Set the FLAP lever as directed

PF	PM
• Complete the recovery - Check airspeed and adjustthrust as needed - Establish pitch attitude - Return to the desired flight path. • Re-engage the autopilot and activate the autothrottle, if desired	• Monitor altitude and airspeed • Verify all required actions have been done and call out any omissions • Call out any trend toward terrain contact

WARNING! 1) ***Excessive use of pitch trim or rudder may aggravate the condition, or may result in the loss of control or in high structural loads.***

UPSET RECOVERY

Historically, an upset was defined as unintentionally exceeding the following conditions:

- pitch attitude greater than 25 degrees nose up, or
- pitch attitude greater than 10 degrees nose down, or
- bank angle greater than 45 degrees, or
- Less than above parameters but flying at airspeeds inappropriate for the conditions

An upset condition is now considered any time an airplane is diverting from the intended airplane state. An airplane upset can involve pitch or roll angle deviations as well as inappropriate airspeeds for the conditions.

The following actions represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all the actions may be necessary once recovery is underway. If needed, use minimal pitch trim during initial recovery. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These actions assume that the airplane is not stalled. A stalled condition can exist at any attitude and can be recognized by stick shaker accompanied by one or more of the following:

- Buffet that can be heavy at times
- Lack of pitch authority or roll control
- Inability to stop a descent.

If the airplane is stalled, first recover from the stall by applying and maintaining nose down elevator until stall recovery is complete and stick shaker stops.

NOSE HIGH RECOVERY

PF	PM
Recognize and confirm the developing situation	
Disengage autopilot. Disconnect autothrottle, if connected. Recover: • Apply nose down elevator. Apply as much elevator as needed to obtain a nose down pitch rate • Apply appropriate nose down stabilizer trim* • Reduce thrust • Roll (adjust bank angle) to obtain a nose down pitch rate.* Complete the recovery: • When approaching the horizon, roll to wings level • Check airspeed and adjust thrust • Establish pitch attitude.	Call out attitude, airspeed and altitude throughout the recovery. Verify all needed actions have been done and call out any continued deviation.

WARNING: * Excessive use of pitch trim or rudder can aggravate an upset, result in loss of control, or result in high structural loads.

NOSE LOW RECOVERY

PF	PM
Recognize and confirm the developing situation	
Disengage autopilot. Disconnect autothrottle, if connected. Recover: • Recover from stall, if needed • Roll in the shortest direction to wings level. If bank angle is more than 90 degrees, unload and roll* Complete the recovery: • Apply nose up elevator • Apply nose up trim, if needed* • Adjust thrust and drag, if needed.	Call out attitude, airspeed, and altitude throughout the recovery. Verify all needed actions have been done and call out any continued deviation.

WARNING: * Excessive use of pitch trim or rudder can aggravate an upset, result in loss of control, or result in high structural loads.

WINDSHEAR

Avoid known or probable windshear conditions. Always report windshear to appropriate ATC facilities and include the term PIREP.

WARNING: Windshear avoidance/escape maneuver shall be immediately initiated if a windshear aural/ visual alert occurs.

WINDSHEAR CAUTION

For predictive windshear caution alert: ("MONITOR RADAR DISPLAY" aural [2)])

PF	PM
Maneuver as required to avoid the windshear	

WINDSHEAR WARNING

Predictive windshear warning during takeoff roll: (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural [2)])

- Prior to V1, reject takeoff
- After V1, perform the Windshear Escape Maneuver

Windshear encountered during takeoff roll:

- If windshear is encountered prior to V1, there may not be sufficient runway remaining to stop if an RTO is initiated at V1. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2000 ft before the end of the runway even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach: (“GO-AROUND, WINDSHEAR AHEAD” aural [2)])

- perform Windshear Escape Maneuver or, at pilot’s discretion, perform a normal go-around

Windshear encountered in flight:

- perform the Windshear Escape Maneuver

Note: The following are indications the airplane is in windshear:
- windshear warning (two-tone siren followed by “WINDSHEAR,WINDSHEAR,WINDSHEAR” aural [3)]) or
- unacceptable flight path deviations

Note: [2)] Predictive Windshear (PWS) aural alert and [3)] EGPWS Reactive Windshear (RWS) aural alert will only annunciate once per detected windshear event unless a new corresponding windshear alert condition is met. The windshear visual alert will remain until the windshear alert condition is no longer present.

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 ft AGL, in excess of any of the following:

- 15 kts indicated airspeed
- 500 FPM vertical speed
- 5 degrees pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time

WINDSHEAR ESCAPE MANEUVER

PF	PM
MANUAL FLIGHT • Call "**WINDSHEAR TOGA**" • Disconnect autopilot • Push either TO/GA switch • Aggressively apply maximum 4) thrust • Disconnect autothrottle(s) • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15° • Retract speedbrakes • Follow flight director TO/GA guidance (if available) 5) AUTOMATIC FLIGHT • Call "**WINDSHEAR TOGA**" • Press either TO/GA switch 6) • Verify TO/GA mode annunciation • Verify thrust advances to GA thrust • Retract speedbrakes • Monitor system performance 7)	MANUAL FLIGHT • Call "**MAX THRUST, SPEEDBRAKES DOWN**" • Verify maximum 4) thrust is set and speedbrakes are retracted • Verify all required actions have been completed and call out any omissions AUTOMATIC FLIGHT • Call **"MAX THRUST, SPEEDBRAKES DOWN"** • Verify GA4) thrust is set and speedbrakes are retracted. • Verify all required actions have been completed and call out any omissions.
• Do not change gear or flap configuration until windshear is no longer a factor • Maintain wings level to maximize climb gradient, unless a turn is required for obstacle clearance. • Monitor vertical speed and altitude • Do not attempt to regain lost airspeed until windshear is no longer a factor	• Monitor vertical speed and altitude • Call out any trend toward terrain contact, descending flight path, or significant airspeed changes

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: 4) Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: 5) Do not exceed the Pitch Limit Indication.

Note: 6) If TO/GA is not available, disconnect autopilot and autothrottle(s) and fly manually.

WARNING! 7) ***Severe windshear may exceed the performance capability of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle(s) and fly manually.***

GROUND PROXIMITY WARNING SYSTEM (GPWS) RESPONSE/TERRAIN AVOIDANCE

GPWS CAUTION

Accomplish the following maneuver for any of these aural alerts 1):

- CAUTION OBSTACLE
- CAUTION TERRAIN
- SINK RATE
- TERRAIN
- DON’T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN

- GLIDESLOPE
- BANK ANGLE

Note: 1) As installed, some repeat

PF	PM
• When GPWS caution alert occurs above the Stabilized Approach Criteria (IMC: 1000 ft HAT, VMC: 500 ft HAT): Correct flight path or Initiate a go-around procedure. • When GPWS caution alert 2) occurs at or below the Stabilized Approach Criteria (IMC: 1000 ft HAT, VMC: 500 ft HAT): Initiate a go-around procedure. Note: 2) If "SINK RATE" GPWS caution alert occurs at or below the Stabilized Approach Criteria due to a momentary deviation of rate of descent, the approach may be continued when flying under the VMC if the captain, after evaluating all operational aspects of the approach and landing, determines that the deviation is being immediately and safely corrected. ***CAUTION! If GPWS CAUTION "TOO LOW FLAPS" or "TOO LOW GEAR" occurs in the final approach segment, a go-around must be performed.*** ***CAUTION! If GPWS CAUTION "GLIDESLOPE" occurs at or below the Stabilized Approach Criteria, a go-around must be performed even though below the minimum for instrument approach (500 ft HAT for visual approach).***	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope

- unreliable glideslope signal

Note: Do not disregard the GPWS terrain/obstacle caution alert unless it repeats as same as previous during the approach reattempted and the following conditions are met:

- Positive visual verification is made that no obstacle or terrain hazard exists under daylight VMC, and
- The aircraft is positioned on the published lateral and vertical pathof the instrument approach.

In this case, the GPWS terrain/obstacle caution alert may be regarded as a nuisance alert and the approach may be continued.

GPWS WARNING

Accomplish the following maneuver for any of these conditions:

HL7775 – HL8284

- activation of the “PULL UP”, “OBSTACLE OBSTACLE PULL UP”, or “TERRAIN TERRAIN PULL UP” warning

HL7700 – HL7756

- activation of the “PULL UP”, or “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain

PF	PM
When GPWS Warning Alert begins or encountering situations resulting in unacceptable flight toward terrain:	
• Call “**PULL UP MAX THRUST**” • Disconnect autopilot • Disconnect autothrottle(s) • Aggressively apply maximum 3) thrust • Simultaneously roll wings level and rotate to an initial pitch attitude of 20° • Retract speedbrakes • If terrain remains a threat, continue rotation up to the pitch limit indicator or stick shaker or initial buffet	• Call “**MAX THRUST, SPEEDBRAKES DOWN**” • Assure maximum 3) thrust is set and speedbrakes are retracted. • Verify all required actions have been completed and call out any omissions
• Do not change gear or flap configuration until terrain separation is assured • Monitor radio altimeter for sustained or increasing terrain separation	• Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude) • Call out any trend toward terrain contact(e.g. “RA INCREASING / DECREASING”).
When clear of terrain (GPWS Warning Alert stops and safe flight is assured):	
• Slowly decrease pitch attitude and accelerate. • Clean up aircraft, as required.	

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control avoids a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: 3) Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: Do not disregard the GPWS warning alert unless it repeats as same as previous during the approach reattempted and the following conditions are met:

- Positive visual verification is made that no obstacle or terrain hazard exists under daylight VMC, and
- The aircraft is positioned on the published lateral and vertical path of the instrument approach.

In this case, the GPWS warning alert may be regarded as a nuisance alert and the approach may be continued.

Additional Terrain Avoidance References:

- FOM 11.8 - Controlled Flight into Terrain (CFIT)

~~RUNWAY AWARENESS AND ADVISORY SYSTEM (RAAS)~~

~~HL8043-HL8077~~

~~Accomplish the following if a RAAS voice annunciation or alert differs from the flight crew's expectation:~~

~~PF~~	~~PM~~
~~Verify position. Contact ATC for assistance, if needed.~~	

~~Do not attempt takeoff or landing for any of these RAAS cautions:~~

- ~~CAUTION ON TAXIWAY, ON TAXIWAY (takeoff)~~
- ~~CAUTION SHORT RUNWAY, SHORT RUNWAY (landing)~~

TRAFFIC AVOIDANCE

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

***WARNING!* Comply with RA if there is conflict between RA and air traffic control.**

***WARNING!* Once an RA has been issued, safe separation could be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA**

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director pitch commands until clear of conflict.

FOR TA:

PF	PM
• Look for traffic using traffic display as a guide • Call out any conflicting traffic	
• If traffic is sighted, maneuver if needed	

Note: Maneuvers based solely on a TA may result in reduced separation and are not recommended.

FOR RA, EXCEPT A CLIMB IN LANDING CONFIGURATION:

***WARNING!* A DESCEND (fly down) RA issued below 1000 ft AGL should not be followed.**

PF	PM
• Call “**TCAS RA**” • If maneuvering is required, disengage the autopilot and autothrottle.	
• Smoothly adjust pitch and thrust to satisfy the RA command.	• Monitor vertical speed
• Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	• Notify ATC
• Attempt to establish visual contact.* Call out any conflicting traffic.	

Note: *Visually acquired traffic may not be the same traffic causing an RA. The visual perception of an encounter may be misleading, particularly at night.

Note: TCAS “DESCEND” RA aural command will be changed to “LEVEL OFF, LEVEL OFF” when an aircraft follows RA command and descends below approximately 1100 ft Radio Altitude. (A “MONITOR VERTICAL SPEED” may also occur.) In this case, the flight crew should:

- Follow the revised TCAS RA.
- If TCAS RA command is inhibited (when descending below approximately 1000 ft Radio Altitude):
  - Maintain visual separation if practicable. (use displayed TCAS traffic on ND as a reference)
  - Report ATC and request an instruction required for traffic avoidance.

Note: TCAS automatically inhibits RA and remains on TA only mode if an aircraft descends below approximately 1000 ft Radio Altitude or a GPWS/PWS warning alert occurs.

FOR A CLIMB RA IN LANDING CONFIGURATION:

PF	PM
• Call "**TCAS RA**" • Disengage the autopilot and autothrottle. • Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 20. • Smoothly adjust pitch to satisfy the RA command. • Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	• Verify maximum thrust set. • Position flap lever to 20 detent. • Monitor vertical speed • Notify ATC
• Verify a positive rate of climb on the altimeter and call "GEAR UP".	• Verify a positive rate of climb on the altimeter and call "POSITIVE CLIMB". • Set landing gear lever to UP.
• Attempt to establish visual contact.* Call out any conflicting traffic.	

Note: *Visually acquired traffic may not be the same traffic causing an RA. The visual perception of an encounter may be misleading, particularly at night.

Additional Traffic Avoidance References:

FOM 11.7 - TCAS(ACAS) Operation in RVSM Airspace

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TABLE OF CONTENTS

SYSTEMS INFORMATION

This section describes operating instructions or procedures for a specific event or a system nuisance regarding airplane systems.

INADVERTENT ENTRY OF ZFW INTO THE GROSS WEIGHT LINE OF FMC

APPLICABILITY

Model 777-200 ~~and -300 series~~ airplanes.

BACKGROUND INFORMATION

Operators have reported using erroneous takeoff reference speed that was determined based on the use of incorrect gross weight. These errors have resulted in early rotation, at least one RTO, and in some cases, tail strikes. This information is intended to reduce the likelihood of such incidents.

Therefore, flight crews should apply the following recommended procedure in line operations.

CONTENTS

- One error that has occurred on several occasions is inadvertent entry of zero fuel weight(ZFW) into the gross weight(GW) line on the FMC PERF INIT Page.
- This results in a weight error equal to the weight of the fuel on board and can result in takeoff reference speeds up to 30 kts too slow.
- When takeoff performance calculations are made based on erroneously low weight values, the following adverse effects are possible;
  - Tail strike
  - Overweight takeoff if the erroneous gross weight shown by the FMC is then used to decide on the acceptability of a runway for departure
  - Increased runway length required
  - Reduced climb gradient
  - Reduced maneuver margin to stall

- Reduced obstacle clearance
- Minimum flap maneuver speeds(from FMC) too low
- Predicted maximum altitudes(from FMC) not attainable
- Approach reference speed(from FMC) too low, resulting in reduced margin to stall and reduced tail clearance for landing.

RECOMMENDED PROCEDURES

- Pilots should enter ZFW into the CDU PERF INIT page, rather than GW. If Pilots consistently use only the ZFW line to enter weight and cross-checked by each pilot, they will be less likely to enter an erroneous weight in the GW field.
- This method also has the added benefit of automatically performing the GW calculation by adding the entered ZFW to actual fuel measured by the airplane's fuel measuring system.
- Boeing is updating its Operations Manual to show that entering ZFW is the normal procedure. These changes will be incorporated in future Operations Manual revisions for each airplane model.
- In the future, Boeing will offer an FMC option that inhibits pilot entry in GW field on the PERF INIT page. Boeing has committed to making this option available in a future software revision for each FMC.

REFERENCE

Boeing Flight Operations Technical Bulletin (777-5R1, Mar 31, 2000)

STUCK "MIC" TRANSMIT SWITCH

APPLICABILITY

Model 777-200 ~~and -300 series~~ airplanes.

BACKGROUND INFORMATION

Boeing has received reports of stuck microphone("Mic") transmit switches. Although rare, a stuck microphone transmit switch (sometimes called a "hot mic") creates a possible hazard to all others using the radio frequency because the continuous radio transmission blocks the frequency and prevents normal communication.

A stuck microphone transmit switch may be suspected if normal voice "traffic" transmissions are no longer heard on the radio and the frequency suddenly becomes quiet. The crewmember with the stuck microphone transmit switch is unable to receive external radio transmission on the radio selected.

Boeing has not received a report of a continuous radio transmission due to an internal radio failure.

When the stuck microphone switch is transmitting on a radio, radio communication is possible by a different crewmember using:

- his/her audio select panel, and
- a different radio, and
- a different frequency.

Various airplane models have a "RADIO TRANSMIT" EICAS advisory message. This message indicates a VHF(or HF) radio has transmitted for 30 secs or more. This EICAS message is independent of the radio manufacturer or model and will remain displayed until the affected radio is no longer transmitting. In the case of a stuck microphone transmit switch, the message will remain displayed until the stuck microphone switch is no longer connected to any of the radios.

The Collins VHF-900 series and Honeywell RTA-44D VHF radios for all 777 and some 747 airplane model have an automatic transmission inhibit feature enabled on the ground only that will inhibit the transmitter after 30-35 secs of continuous transmission.

OPERATING INFORMATION

If a stuck microphone transmit switch is suspected, all flight crew should immediately select the Flight Interphone (or Interphone) transmit position on their respective audio select panel. The crewmember with the stuck mic transmit switch will be heard transmitting continuously, although in the stuck hand-microphone PTT switch case, the PTT signal may be active with no actual voice output. Once the affected audio select panel is identified and is in the Flight Interphone (or Interphone) transmit position, other crewmember may resume normal communications on all radios.

The affected audio select panel should remain in the Flight Interphone (or Interphone) transmit position until the microphone switch is no longer stuck in the transmit position.

~~REFERENCE~~

~~Boeing FOTB 777-9, Dated September 24, 2001~~

~~PANASONIC GLOBAL COMMUNICATION SUITES NON-NORMAL PROCEDURES~~

~~APPLICABILITY~~

~~777-300ER with BROADBAND COM switch installed~~

~~EMI/RFI INTERFERENCE~~

~~Condition: Possible EMI and RFI interference could be noise in communication systems, squelch breaks, display flickers, blanking displays, waves, etc.~~

~~Note: EMI – Electromagnetic interference; RFI - Radio Frequency Interference~~

~~1) Contact OCC for advice~~

~~2) Request purser for PA to turn off the 'T-PEDs (Transmitting Portable Electronic Devices)'~~

~~3) If the conditions continuously remain,~~

~~"IFE/SEAT PASS S/W - OFF"~~

~~Note: "IFE/SEAT PASS S/W - OFF" inhibits all AVODs and FR & PR seat motors.~~

~~REFERENCES~~

- ~~AFM SUPPLEMENT 0643-07650-2282~~

ERRONEOUS ILS CAPTURE

APPLICABILITY

Model 777-200 ~~and -300~~ series airplanes

BACKGROUND INFORMATION

There have been incidents where airplanes have captured false glideslope signals and maintained continuous on-glideslope indications as a result of an ILS ground transmitter erroneously left in test mode. It has been found that the ILS signals radiated during testing or maintenance of ground equipment can cause aircraft navigation instruments to display on-course or on-glideslope indications, with no warning flags, regardless of the actual position of the aircraft within the ILS service area.

One of the incidents shows that the aircraft's automatic flight system captured the false glideslope prior to the true glideslope intercept point and made a descent. The aircraft flight path was 3.5 degrees targeting 5 1/2 miles short of the runway threshold. With on-glideslope indications and no warning flags, the crews could perform a missed approach at around 400ft PA.

CONTENTS

Glideslope Beam Characteristics

The glideslope antennas transmit both a combined carrier and sideband (CSB) signal and a sideband only (SBO) signal. The CSB signal is a carrier signal modulated with equal amplitude in phase 90 Hz and 150 Hz signals. It has balanced 90 Hz and 150 Hz signals to give a correct glide path angle (e.g., 3 degrees). The SBO signal has similar 90 Hz and 150 Hz signals to give a "fly down" or "fly up" indication. Both the CSB and the SBO signals are required for accurate navigation within the ILS service area. Reception of only a CSB signal will cause an on-glideslope indication regardless of the aircraft's position in relation to the glide path. If only the glideslope CSB signals is being transmitted for calibration by maintenance personnel, the aircraft's ILS receiver will measure an equal amount of 90 Hz modulation and 150 Hz modulation and cause the glideslope indicator to center and the warning flags to retract (in electromechanical instruments) or not to be displayed (on electronic flight instruments).

Note: Localizer can also make false signals.

Operating Recommendation

False glideslope signals can be detected by crosschecking the final approach fix crossing altitude and VNAV path information prior to glideslope capture. A normal pitch attitude and descent rate should also be indicated on final approach after glideslope capture. Further, if a glideslope anomaly is suspected, at the glideslope capture or on the glide path[1)], an abnormal altitude range-distance relationship may exist. This can be identified by crosschecking distance to the runway with altitude or crosschecking the airplane position with waypoints indicated on the navigation display. The altitude should be approximately 300 ft HAT per NM of distance to the runway for a three-degree glideslope.

If a false glideslope capture is suspected, perform a missed approach if visual conditions cannot be maintained.

[1)] : Erroneous glideslope captures may occur prior to actual descent point or slightly short of the true glideslope intercept point or at the correct intercept point but not on a true glidepath.

WARNING! ***Do not use a radio navigation facility which is notified to be out of service even though its cockpit indications might appear to be normal. Facility status "unusable" indicates that the facility is not available for operational use but may provide unsafe or erroneous signals or provide signals of an unknown quality.***

REFERENCES

- B777 FCTM Chapter 5 (October 31, 2007)
- Aircraft Serious Incident Report (New Zealand CAA, Occurrence No. 00/2518)
- Flight Safety Digest, July 2002 by Flight Safety Foundation

FLIGHT CREW CONSIDERATIONS FOR ENGINE IN-FLIGHT SHUTDOWN

APPLICABILITY

Model 777-200 ~~and -300~~ series airplanes

BACKGROUND INFORMATION

In-flight return and engine shutdown did occur as the result of erroneous engine vibration level and high EGT. This information is to inform flight crew of the right information and recommendation concerning the engine vibration/EGT.

CONTENTS

Boeing continues to receive reports of flight crews performing engine in-flight shutdowns based solely on reasons such as loss of engine parameter indications, high engine vibration indications, or appearance of EICAS status messages. These inappropriate shutdowns can have an adverse and unnecessary impact on flight safety margins. The following guidelines are provided for flight crews to consider when anomalous engine behavior is encountered.

Loss of Engine Thrust Control

Loss of engine thrust control has been caused by failure of engine components, contamination of engine fuel control system, separation of mechanical thrust lever cables, or loss of throttle position feedback in electronic systems.

If the engine loss of control condition occurs during climb, cruise, descent or landing, the flight crew should maintain a safe altitude, stabilize the airplane and perform the Engine Limit/Surge/Stall checklist.

> Note: If the engine loss of control condition is recognized during takeoff roll, the flight crew should continue the takeoff and climb to a safe altitude, stabilize the airplane and perform the engine Limit/Surge/Stall checklist. If the flight crew decides to reject the takeoff, it will be necessary to immediately shut down the affected engine to maintain directional control and stop the airplane.

Loss of Engine Parameter Indications

Boeing has received reports regarding loss of an engine parameter indication. Examples of loss of engine parameters are: no EPR indication, RPM indicator zero, blank or zero EGT indication, etc. Flight crews should be advised that the loss of an engine parameter indication while in flight does not necessarily constitute a situation that would require the engine to be shut down. As long as there are no other accompanying indications of an engine malfunction, the engine can be operated normally for the remainder of the flight.

Engine Vibration

Current FAR requires that AVM systems should be installed in all large transport airplanes. AVM limits are provided by the engine manufacturer in their engine Operating Instructions (O.I.). However, except in a few cases, the engine manufacturers have not defined "hard" AVM limits, i.e. amber bands, red lines, lights or EICAS messages.

For the above reasons, Boeing does not publish AVM procedures on EICAS equipped airplanes. Boeing recommends that flight crews should be instructed not to shut down engines due to high AVM indications unless there are other abnormal engine indications or other engine limits are exceeded.

Extreme engine vibrations or severe damage should be addressed in accordance with the appropriate non-normal checklist. In general, the crew must determine if the vibration level is having an adverse effect on the pax and crew.

EGT Overtemperature

Occurrence of an EGT overtemperature by itself is not sufficient reason to shut down an engine. If the EGT limit is exceeded, the flight crew should take action to reduce the engine EGT below the limit by following the Non-Normal Checklist ENG LIM/SURGE/STALL L,R. However, no flight crew action should be taken on the engine until the airplane is in a safe flight condition. Also, the more rapidly EGT increases toward or above the EGT limit, the sooner that flight crew corrective action may be needed to limit an overtemperature exposure.

Engine operation can continue after an EGT overtemperature provided that:

- Limit exceedances have not resulted in any evident engine damage,
- Corrective action (if needed) has reduced EGT below the EGT limit, and
- EGT has stabilized below the EGT limit.

Operation at reduced thrust to maintain EGT below limit (for example, in a failed open bleed valve scenario) is preferred to an engine shutdown.

Flight crews should also be aware that the engine's EGT may rise 25-60 degrees C in response to the engine configuring itself for stall or surge margin protection. This may occur continuously at lower altitudes, or temporarily at any altitudes, at lower engine speeds.

Examples of other possible causes for EGT overtemperature indication include:

- An erroneous EGT indication system;
- Insufficient Takeoff or Maximum Continuous (MCT) EGT margin at hot day ambient temperature conditions for takeoff;
- Go-around, or single engine MCT operation;
- Failed open LPC bleed or HPC bleed(s) at high engine power;
- Engine surge.

Oil System Indications

Oil pressure is considered as the most significant of several oil system indicators. In addition, oil temperature and oil quantity indications, in concert with oil pressure indications, enable the flight crew to recognize a deteriorating oil system. While engine operation is governed by both oil pressure and oil temperature limits, there is no minimum oil quantity limit.

When abnormal oil quantity indications are observed, check oil pressure and temperature to confirm the abnormal quantity indication. A sudden or complete loss of oil quantity without abnormal indications of pressure or temperature is most likely a quantity indicator malfunction. In either case, if oil pressure and oil temperature indications are normal, operate the engine normally. If any operating limit is exceeded, take the appropriate action as specified in the Operations Manual.

When a steady decrease in engine oil quantity is observed over a period of time, check oil pressure and oil temperature and anticipate an engine shutdown. When an operating limit is reached, take the appropriate action.

EICAS Status Messages

EICAS status messages annunciate system failures that affect dispatch. A status message in absence of an alert message indicates a loss of system redundancy, not function, therefore does not require flight crew action. Status messages should never be considered as sole justification for an engine in-flight shutdown. System failures that require flight crew attention and/or action are annunciated by alert level (advisory, caution, warning) messages.

Cabin Reports

Passengers or cabin crew may occasionally report flames, sparks, or fluid emanating from an engine. Flight crew judgment must be applied in these cases, but it is prudent to corroborate these reports by qualified personnel before taking action.

More than one engine shutdown has resulted from a cabin report of fluid "leakage" in the vicinity of the engine nacelle which was later identified as de-icing fluid. A suspected fuel leak should be addressed in accordance with the appropriate non-normal checklist.

Recoverable Surge/Stall or Flameout

Many engine surge or stall events are recoverable and permit continued engine operation. Stabilized engine indications and decreasing EGT indicate the surge/stall has cleared. In these cases, the engine may be operated normally, or at a reduced thrust level which is surge and stall free.

Following an engine flameout, in-flight restart may be attempted if no damage is apparent. Restart should be accomplished in accordance with the appropriate non-normal checklist. Flight crews should recognize that engine acceleration to idle may be slow. The start should be allowed to proceed as long as N2 is steadily increasing and EGT is rising and remaining within limits.

> Note: The Electronic Engine Control enhances engine stability by opening bleed valves (also known as stability valves) at lower engine speeds. The bleed valves may be open continuously at lower altitudes, or temporarily at any altitudes. EGT may rise 25 - 60 degrees C when one or more valves are open.

Summary

Whenever operating limits are exceeded, the crew must take whatever action is necessary, flight conditions permitting, to return operation within limits. Engine operation can continue after operating limits have been restored providing limit exceedance has not resulted in any evident damage.

In summary, consider an engine shutdown only as directed by a non-normal checklist. If available engine parameters remain within limits, continued engine operation is normally preferable to shutdown, even if the thrust must be reduced to idle.

~~REFERENCES~~

- ~~Boeing Mail M-7661-03-0320 (January 20, 2003)~~
- ~~Boeing Mail M-7661-03-2930 (June 03, 2003)~~
- ~~P & W Wire C3115-A49052 (April 26, 2003)~~
- ~~Flt Ops Technical Bulletin 777-7 (November 30, 2000)~~

ENTRY OF APMS DATA INTO FMS

APPLICABILITY

Model B777 series airplanes

BACKGROUND INFORMATION

APMS data shown in OFP (Operational Flight Plan) means the extent of additional fuel loading percentage due to the deterioration of airplane performance from the base line. And FMS (Flight Management System) has a function to calculate corrected fuel flow and predict remaining fuel quantity by using the "FF (Fuel Flow)" data.

> Note: The APMS data in B777F OFP includes a fuel flow penalty (+0.2 %) for the use of Aft Cargo Heat.

The following procedure is to update the FF data into the FMS to eliminate the data discrepancy between OFP and FMS.

CONTENTS

In case that the data discrepancy occurs between OFP and FMS, Flight crews shall input the APMS data of OFP into FMS to improve the function of the remaining fuel prediction.

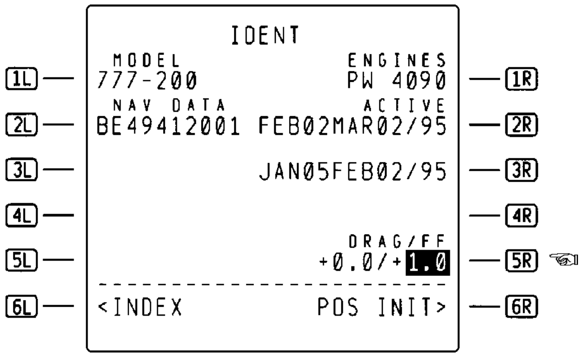
CREW ACTION

Flight crews should compare the APMS data with FF data shown in FMS "IDENT" page. If the FF data in the FMS differs with APMS data, input the APMS data into the FMS “FF” position.

> Note: FF data entries cannot be made when the aircraft is airborne.

If the APMS data is 1.0 % (APMS/P 01.0 PCNT), update the FF data as below.

e.g) FMS IDENT page



- To enable data entry, enter the word “ARM” into the scratchpad and transfer it to the DRAG/FF line (5R) on the IDENT page.

  Note: The IDENT page is accessed by pressing the “<IDENT” at 1L on the INIT/REF INDEX page.

- Enter the required “/FF (fuel flow)” data into the scratchpad and push 5R.

  Note: If the fuel flow factor is entered by itself, it must be preceded by a slash (/).

REFERENCE

- FOM 6.1 - Interior Inspection (Verification of APMS Analysis Data)
- FMS Pilot Guide Book

~~PW4090 EGT LIMIT START TO IDLE~~

~~APPLICABILITY~~

~~Model 777 series airplanes with PW4090 engines.~~

~~BACKGROUND INFORMATION~~

~~This bulletin is provided to inform you of the review results from Pratt & Whitney of HL7534 engine idle EGT rise.~~

~~CONTENTS~~

~~EGT limit for each operational conditions~~

~~Operational Condition~~	~~EGT Limit~~	~~Time Limit~~	~~Remark~~
~~Starting (Ground)~~	~~535 ℃~~	~~No limit~~	~~Start to before the Idle~~
~~Idle (Ground)~~	~~675 ℃~~	~~5 mins~~	~~After Start~~
~~Max Continuous~~	~~650 ℃~~	~~No limit~~	-
~~Take-off~~	~~675 ℃~~	~~5 mins~~	-

~~Cause of gradually increase the Idle EGT~~

~~During the idle operation, EGT can be expected to increase over 500 ℃ this is not an abnormal condition, if all other engine parameters are within the operation limit. This EGT increase can be caused by the thermal soaking of the engine. Depending upon the material properties, thickness of the material and geometrical shape and location of the material of the engine, this will cause the engine to gradually increase in temperature as the heat being generated by the engine in conducted throughout the engine. As the engine is thermally soaked, the EGT will rise as the route for the hot air is no longer through the material in the engine but rather out the core of the engine thus increasing the EGT.~~

~~Characteristic of engine idle EGT~~

~~Throttle movement from idle to higher power will increase the EGT as more fuel is being introduced into the engine thus increasing the amount of~~

~~energy in the total system, however EGT will be decreased when 2.95 bleed valves are closed at about 72 % of N2 RPM as more cooling air is forced through the core of the engine. If the EGT limit is maintained within the EGT limit for the take off power, then engine is not operating outside of normal conditions.~~

~~OPERATING INSTRUCTIONS~~

~~After N2 reaches to about 60 % the engine is considered to be in idle operation and idle EGT limit(675 ℃) is applied.~~

~~REFERENCES~~

- ~~P & W Mail PW4090 EGT limit start to idle (April 14, 2009)~~
- ~~Maintenance Dept. Technical Bulletin 777-72-008 (April 13, 2009)~~

GPS SIGNAL INTERFERENCE

APPLICABILITY

All B777 airplanes.

BACKGROUND INFORMATION

The reduction of GPS navigation data integrity caused by GNSS/GPS radio frequency interference (RFI, hereinafter referred to as GPS RFI for simplicity), is increasing in scope, complexity, and intensity worldwide. Unreliable GPS data caused by GPS RFI is in two categories, jamming and spoofing.

There are two threat categories relevant to GPS RFI:

- Known Threat – A threat that can be identified in advance
- Latent Threat – A threat that is unanticipated

To assist operators and flight crews in known threat mitigation, amendments have been made to the POM Chapter 6.11 to clarify circumstances where these procedures can be specifically applied to operations into areas or instances of known reduced GPS data integrity, including RFI.

To address latent threats, a GPS Data Unreliable NNC was created to give flight crews the ability to identify and mitigate an unanticipated reduction in GPS data integrity, including RFI.

INDICATIONS OF ABNORMAL GPS STATUS WHEN AFFECTED BY GPS INTERFERENCE

- The 'ADS-B OUT' EICAS alert message displayed.
- The "GPS" EICAS alert message displayed.
- The 'RUNWAY SYS' or 'RUNWAY POS' EICAS alert message displayed.
- The "NAV UNABLE RNP" EICAS alert message displayed.
- The "VERIFY POSITION" FMC alert message displayed.
- The 'TERR POS' EICAS alert message displayed and Terrain status annunciation 'TERR POS' displayed on the ND.
- FMC position update status 'GPS' is not displayed on the ND.
- In flight, one or more of the following can indicate unreliable GPS data:
  - PULL UP alert that occurs with verifiable terrain clearance
  - Slow increase in ANP
  - VERIFY POSITION scratchpad message
  - Change in terrain data on the ND that does not match aeronautical charts
  - FMC position status on the ND changes to DME-DME or INERTIAL
  - Inaccurate time, date, or FMC ETA
  - Excessive lateral deviation when intercepting the localizer or final approach course
  - Unable to log on to ATC datalink with inaccurate time or date
  - Inaccurate fuel predictions
- In flight, these alerts can occur and must be considered valid:
  - ADIRU/GPS DISAGREE
  - ADS-B OUT
  - GND PROX SYS
  - NAV UNABLE RNP
  - TERR POS

GPS SIGNAL INTERFERENCE PROCEDURES

Latent Threat

- GPS Data Unreliable NNC in QRH can be used when unexpected erroneous or invalid GPS data is encountered in flight, including with GPS RFI. Refer to QRH - GPS Data Unreliable NNC.

Known Threat

- Use GPS Signal Interference procedures for known threat.

  e.g. Areas of known threat(GPS Signal Interference) are described in NOTAM or ATIS

- When an abnormal aircraft position due to GPS signal interference is recognized during flight, or related messages occurred or if erroneous or invalid GPS data is encountered prior to takeoff, following procedures shall be accomplished.
  - If GPS position is unreliable or erroneous on the ground, a manual alignment is needed. According to the POM 6.11 - ADIRU ALIGNMENT/POSITION UPDATE
  - Inhibit GPS position update according to the POM 6.11 – Navaid Inhibit or Enable. *<CLICK>*

  Note: Selecting GPS updating to OFF on the POS REF page does not inhibit GPS data for GPWS Look-Ahead Terrain.

  - Push GND PROX - TERR OVRD switch on the Ground Proximity Panel.

  Note: When the Ground Proximity Terrain Override Switch is selected to override, Terrain Warning and Caution Alerts by EGPWS will be inhibited. However, Immediate Alerts ("PULL UP", "TOO LOW TERRAIN" and "TERRAIN") will not be inhibited.

- When an abnormal GPS signal reception is recognized, report it tothe ATC.
- GPS updating should be turned back on, after the position accuracy is verified. This can be accomplished by referring to the POS REF 2/3 page.
- Enable the GPS data for FMC position updating if the flight crew determined that the aircraft is adequately out of the particular GPS

interference area. At this point, closely monitor the aircraft position, and should be prepared for sudden position shift.

- If a GPWS Warning or Caution alert occurs during an approach:
  - Comply with the procedures in the POM 8.3 – Ground Proximity Warning System (GPWS) Response/Terrain Avoidance. *<CLICK>*
  - If the flight crew determined that the GPWS Warning or Caution alert was caused by GPS interference, and if another approach is required, the flight crew may proceed for an approach after accomplishing the ‘GPS Signal Interference Procedures’.
- Others
  - When information regarding GPS signal interference has been received in advance, the FMC and GPS position shall be monitored, and if an abnormal GPS position is recognized, accomplish the above ‘GPS Signal Interference Procedures’.
  - Navigation and an approach can be carried out normally after GPS position updating is inhibited as long as GPS is not required for the procedure (e.g. “GPS required” is stated in the approach chart).
  - If GPS position updating is inhibited, the aircraft position should be frequently crosschecked by monitoring raw data.
  - If a NOTAM regarding GPS is issued, matters related to GPS interference shall be briefed during a Take Off and Landing briefing.
  - If a GPWS WARNING or Caution occurs during flight, ASR shall be submitted after the flight.

APU IN-FLIGHT START TEST

APPLICABILITY

All B777 airplanes

BACKGROUND INFORMATION

For B777 EDTO, the APU In-flight Start Test is needed periodically.

OPERATING INSTRUCTIONS

- Conduct the APU In-Flight Start Test and record the Test Result Sheet.

- Flight crew carries out the test when maintenance crewrequest to do so.
- Record the test result on the Test Result Sheet located at the last page of Flight and Maintenance Log.

• After returning to the main base (Incheon), hand over the Test Result Sheet and notice any irregularity during the in-flight test to maintenance crew.

Note: There is no restriction even though the test result is fail." It is no need to record the in-flight start failure in the Flight and Maintenance Log if the APU Ground Start is successful at arrival.

Intentionally

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PERFORMANCE INFORMATION

This section describes operating instructions or procedures in the specific condition or environment regarding airplane performance or weight & balance.

THE FACTORS IMPACT ON TRIP FUEL

INTRODUCTION

Cost index is a major factor on trip fuel, but there are the other factors to be considered affecting trip fuel. The following are items affecting fuel including cost index and impact on trip fuel.

CONTENTS

Item	Impact on trip fuel
Effect of cost index on trip fuel (CI=0)	
CI=50	**0.2 %**
CI=100	**0.8 %**
CI=200	**1.8 %**
CI=300	**2.4 %**
Effect of climb speed on trip fuel (Includes up to TOC and based on Econ Climb Speed)	
If 10 kts fast	**10 lb**
If 20 kts fast	**35 lb**
Optimum altitude (LRC mach no)	
If 4000 ft below optimum	**3 %**
If 8000 ft below optimum	**9 %**

Item	Impact on trip fuel
Cruise parameters affecting trip fuel	
If 0.01 mach fast	**+ 0.2 %**
If 0.02 mach fast	**+ 1.7 %**
Aft C.G shift (per 4 % MAC)	**0.35 %**
Effect of descent speed on trip fuel	
If 20 kts fast	**80 lb**
If 40 kts fast	**200 lb**
Early descent (LB per minute early)	**250 lb/min**
Miscellaneous items	
Early flap and gear extension (per minute early)	
Gear extended	**400 lb/min**
Engine idle fuel flow on ground	**25 lb/min**
Approximate APU fuel flow	**535 lb/hr**
Taxi fuel flow(Taxi usually occurs at a thrust slightly higher than idle)	**57 lb/min**
Landing weight reduction (per 1000 LB)	**0.2 %**
Reduced climb thrust penalty	
Derate 1 (10 % reduction to 10,000 ft , tapering to full thrust at 12,000 ft)	**75 lb**
Derate 2 (20 % reduction to 10,000 ft,tapering to full thrust at 12,000 ft)	**200 lb**

REFERENCE

Boeing airliner magazine (JUL-SEP 1995)

ENGINE OPERATIONS IN YELLOW SAND AND DUST

APPLICABILITY

Model B777 series airplanes

BACKGROUND INFORMATION

Yellow Sand and Dust (S & D) typically consists of MINERAL (silica/glass-like rock) based airborne particulates, which cause deterioration similar to volcanic ash. Unlike volcanic ash, S & D are not an immediate threat.

- There is NO risk of engine flame out in sandstorm.
- But, the engine performance is affected by S & D ingestion.

Note: Over time the erosion of engine components induces performance degradation (i.e., fuel burn and EGT increase) and reduces the surge margin. Approximately 1.5 x the normal deterioration rate (in a clean environment) can be expected as a result of S & D contamination. Deterioration rates may vary depending on the severity of the S & D ingestion.

OPERATING INSTRUCTIONS

This information has been issued to give informations and guidances to the flight crew who operates within the Sand & Dust operations area (ex. China, Middle East). Operational recommendations for S & D encounters are:

- Limit taxi thrust
- Taxi with all engines
- Avoid static operation above idle
- Use rolling takeoff
- During takeoff, use unrestricted climb
- Minimize time spent in S & D clouds
- Fly around cloud or through less dense areas of S & D clouds
- Hold above S & D clouds

- Limit reverser usage

In case that severe S & D operations have been experienced during the flight, making an entry in logbook or reporting to maintenance crew is required.

REFERENCE

- SELMA Mail 0383EE dated on May 04, 2004
- P & W Message C4078-A35245 dated on Mar 18, 2004

Rwy CC [1]	Runway Condition Description	Braking Action	Mu(μ) [2]	RCR [3]	Related Landing Performance	Deceleration or Directional Control Observation
6	• Dry	-	-	-	Dry	-
5	• - RA, RA (Grooved or PFC Runway) [4] • RA(Grooved or PFC Runway)[4] • Frost • Wet (Includes damp and 3 mm (1/8 inch) depth or less of water) **3mm (1/8 inch) depth or less of:** • Slush • Dry Snow • Wet Snow	Good	0.4 Or higher	At Or Above 13	Good	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.
4	**-15ºC and Colder outside air temperature:** • Compacted Snow	Good to Medium	0.39 ~ 0.36	12	Good to Medium	Braking deceleration OR directional control is between Good and Medium.

Rwy CC [1]	Runway Condition Description	Braking Action	Mu(μ) [2]	RCR [3]	Related Landing Performance	Deceleration or Directional Control Observation
3	• RA (Smooth Runway) [5] • Slippery Wet • Dry snow or wet snow (any depth) over compacted snow **Warmer than -15ºC outside air temperature:** • Compacted Snow **Greater than 3mm (1/8 inch) depth of:** • Dry Snow • Wet Snow	Medium	0.35 ~ 0.30	11~10	Medium	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.
2	• Heavy Rain **Greater than 3mm (1/8 inch) depth of:** • Water • Slush	Medium to Poor	0.29 ~ 0.26	9~8	Medium to Poor	Braking deceleration OR directional control is between Medium and Poor.
1	• Ice	Poor	0.25 ~ 0.21	7	Poor	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.
0	• Wet Ice • Water on Top of Compacted Snow • Dry Snow or Wet Snow over Ice	Less than Poor	0.20 Or lower	At Or Below 6	-	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.

1) RwyCC: Runway Condition Code

2) *Mu: Mu is runway friction coefficient measured by a ground friction device. Normative is used at some Russian airport and flight crews should refer to Table in the Jeppesen.*

3) *RCR: Runway Condition Report (Runway Friction Coefficient X 32)*

4) *Grooved or PFC Runway: A paved runway that has been prepared with lateral grooving or a PFC (porous friction course) surface to improve braking capability when wet.*

5) *Smooth Runway: A runway that has not been prepared with lateral grooving or PFC (porous friction course)*

Note: Takeoff/Landing is prohibited when friction coefficient is 0.20 or lower, or RCR is at or below 6, or Braking Action is reported as "Less than Poor (or RwyCC is as '0')"

Note: If available information or reports are different for judging runway condition, a conservative one in terms of value or description should be selected for applying landing performance.

MAXIMUM DEPTH OF CONTAMINANT FOR LANDING

Contaminant	Water	Slush	Dry Snow	Wet Snow
Depth	13 mm (0.5 inch)	13 mm (0.5 inch)	100 mm (4 inch)	25 mm (1 inch)

Note: Landing is prohibited when depth for each contaminant exceeds the max value.

RUNWAY CONDITION & TAKEOFF PERFORMANCE TABLE

Contaminant	Runway Condition & Depth	Takeoff Performance
	Dry	Dry
Water	• -RA, RA (Grooved or PFC Runway) • Wet (Includes damp and 3mm(0.125 inch) depth or less of water) • Slippery when Wet	Wet
	• RA (Smooth Runway)	STNDNG WTR_6 mm
	• Heavy Rain	STNDNG WTR_12.7 mm
	• 3 mm (0.125 inch) < Water ≤ 12.7 mm (0.5 inch)	Reported Depth
Slush	• Slush ≤ 3 mm (0.125 inch)	Wet
	• 3 mm (0.125 inch) < Slush ≤ 12.7 mm (0.5 inch)	Reported Depth
Dry Snow	• Dry Snow ≤ 3 mm (0.125 inch)	Wet
	• 3 mm (0.125 inch) < Dry Snow ≤ 100 mm (4.0 inch)	Reported Depth
Wet Snow	• Wet Snow ≤ 3 mm (0.125 inch)	Wet
	• 3 mm (0.125 inch) < Wet Snow ≤ 12.7 mm (0.5 inch)	Reported Depth
Frost	Frost	Wet
Compacted Snow	• No Water on Top of Compacted Snow	Compacted Snow
	• Water on Top of Compacted Snow	Takeoff is not allowed
Ice	• Ice	Ice
	• Wet Ice • Dry/Wet Snow over Ice	Takeoff is not allowed

Note: Takeoff is prohibited when depth for each contaminant exceeds the max value.

Note: The runway condition “Dry Snow / Wet Snow over compacted Snow” behaves the same whether or not there is a Compacted Snow underneath the loose snow. For takeoff, apply the same performance as for Dry Snow or Wet Snow reported by itself.

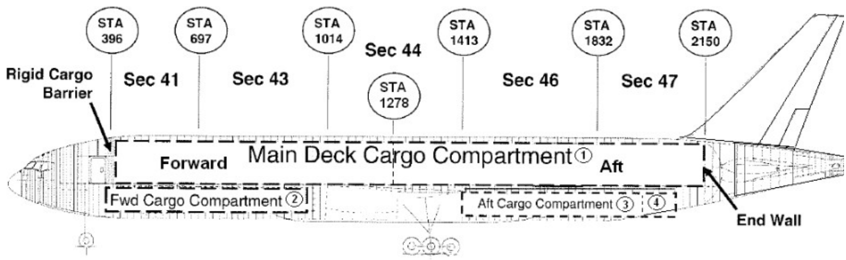
PORTABLE EFB OPT APPLICATION

Refer to Performance Tool User Guide in Portable EFB.

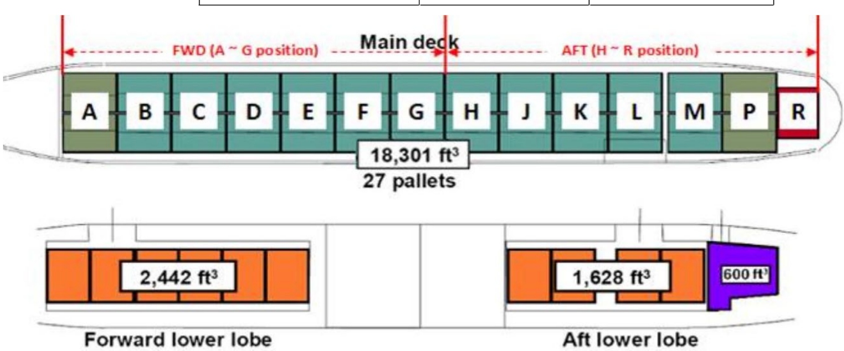
~~CARGO~~

FREIGHTER OPERATION INFORMATION

CARGO COMPARTMENT CONFIGURATION (B777F)

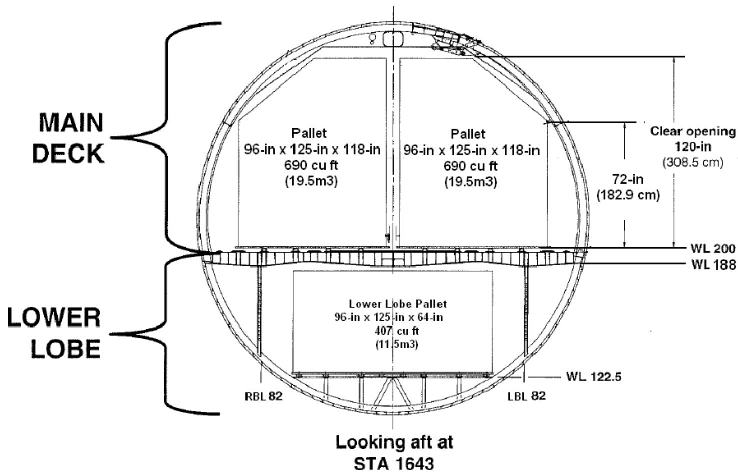


Cargo Compartment Volumes		
Compartment	**Empty Volume (ft^3)**	**Cargo Capacity (ft^3)**
Main Deck[1]	23051	18301
Forward Cargo[2]	3355	2862
Aft Cargo (Not Slanted)[3]	2557	2226
Aft Cargo (Slanted)[4]	600	600

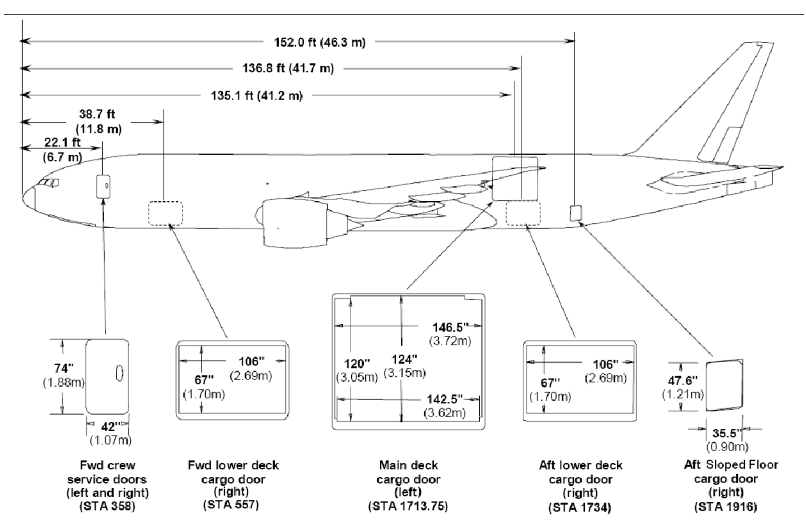


- (22) 96-in x 125-in x 10-ft contoured pallets (690 ft^3/19.5 m^3)
- (4) 96-in x 125-in x 116-in contoured pallets (627 ft^3/17.7 m^3)
- (1) 96-in x 125-in x 8-ft pallet (613 ft^3/17.3 m^3)
- (10) 96-in x 125-in x 64-in pallets (407 ft^3/11.5 m^3)
- (1) Free Space (600 ft^3/17 m^3)

Total Cargo Capacity = 22,971 ft^3 (650 m^3)



777 Freighter Cargo Arrangement and Typical Cross Section



777 Freighter Cargo Door Locations and Dimensions

AIR CONDITIONING SYSTEM (B777F)

The heating and air conditioning systems are installed in the main deck and lower lobe cargo compartments of B777F

Cargo Compartment Temperature Control Range and Air Supply

Compartment		Control Setting	Range (°C)	Supply SYS	Source	Air Flow (ft^3/min)
Main Deck (FWD/AFT)		C to W	4 to 27	Air Cond	Pack/Trim air	1500 to 2500
LWR Lobe	FWD	C to W	4 to 27	Air Cond	Pack/Trim air	1000 to 1200
		OFF 1) (6 o'clock)	No Temp Control 2)	Cargo Heat	E/E bay exhaust air	1300 to 1550
	AFT	C to W	4 to 27	Air Cond	Pack/Trim air	1000 to 1200
		OFF	N/A	N/A	N/A	N/A
		LOW	4 to 10	Cargo Heat	Bleed air	400
		HIGH	18 to 24			

1) The forward cargo heat system will operate under the normal operation whenever the Forward Cargo Air Conditioning (FCAC) System is selected OFF.
2) The forward cargo heat system depends on the E/E Cooling exhaust air, thus the temperature in compartment will vary.

Main Deck Cargo Air Conditioning System

The main deck cargo compartment has a gross volume of 23,051 ft^3. The volume is divided into two temperature zones at Station 1278; the Forward Zone and Aft Zone. For each zone a variable amount of hot bleed air is mixed with cooled air supplied by the air conditioning packs to achieve the selected temperature. Each control zone offers temperature control via Flight Deck temperature selectors with an adjustable range of 4 °C to 27 °C

The airflow rate of the air supplied to the main deck cargo compartment is dependent on whether the forward and/or aft lower cargo air conditioning systems are ON, the flow schedule, and the F/D flow setting.

Main Deck and Lower Lobe Cargo Air Conditioning Flow Schedules

Operating Mode (In Cruise)		Lower Lobe Selection		M/D Setting	Cargo Compartment Flow Rate (ft^3/min)				Outside Air (Dilution)	Additional Fuel
					Lower Cargo		Main Deck			
		FWD	AFT		FWD	AFT	FWD	AFT		
RECIRC FANS ON	5	OFF	OFF	Norm	0	0	1581	1669	53 %	0 %
	6	ON	OFF		1130	0	1594	1570	64 %	0.4 %
	7	OFF	ON		0	1212	1683	1625		
	8	ON	ON		1170	1230	1545	1630	72 %	0.8 %
	9	ON	ON		1221	1218	2254	2130	60 %	
	10	OFF	OFF	High	0	0	2484	2325	44 %	0 %
	11	ON	OFF		1145	0	2460	2295	55 %	0.4 %
	12	OFF	ON		0	1275	2460	2320		
RECIRC FANS OFF	13	ON	ON	High	468	468	2230	2229	100 %	1.3 %
	14	OFF	OFF		0	0	2361	2361		0.5 %
	15	ON	OFF		671	0	2353	2352		0.9 %
	16	OFF	ON		0	598	2390	2389		

Note: Cargo Air Conditioning Flow Operating Mode Recommendation

- Mode 5 ~ 9: For fuel burn reduction. e.g. carrying packages (cruise only)
- Mode 10 ~ 12: For carrying animal with low moisture generation & engines fuel burn reduction.
- Mode 13 ~ 16: For maximum cooling and moisture removal during flight. e.g. animal carriage.

Note: When the aircraft is on the ground and APU provides airflow to Packs, use of Recirculation Fans is recommended for maximum cooling and moisture removal e.g. animal carriage.

Note: Use of Aft Cargo Heat will cause the fuel flow penalty of 0.2 %. The APMS data in B777F Operational Flight Plan (OFP) includes a fuel flow penalty (+0.2 %) for the use of Aft Cargo Heat.

Forward Lower Lobe Cargo Air Conditioning System

The Forward Cargo Air Conditioning (FCAC) system is designed to provide conditioned air directly into the forward lower lobe cargo compartment to maintain a constant target temperature. A wide range temperature selector with two operating modes (OFF/A/C (4 °C to 27 °C)) is installed on the Flight Deck P5 overhead panel.

An FCAC exhaust system is integrated with the baseline forward cargo heat and E/E Cooling Vent systems. The baseline forward cargo heat system will operate under normal logic control whenever the FCAC system is selected OFF. The two systems cannot operate at the same time. The FCAC system is automatically shut down in the event of a forward cargo smoke detection event, arming the forward cargo fire extinguishing system, during a forward cargo pre-alarm, aft cargo fire arm, aft cargo smoke detection, main deck smoke detection, or main deck arm.

Forward Lower Lobe Cargo Heating System

The forward cargo heat system is designed to maintain the cargo compartment air temperatures above freezing, excluding areas immediately adjacent to the forward cargo door. Using cargo heat for ventilation is less optimum than using forward cargo air conditioning since air is directed in through the floor penetrations around the cargo and there is no temperature control of the compartment. The Equipment Cooling Vent System provides approximately 1350 ft^3/min of cargo heating air by drawing air from the forward Electrical Equipment (E/E) Bay compartment from the electrical equipment centers. There is no temperature monitoring or control of the forward cargo heat system. During steady state cruise conditions, the exhaust air temperature will be in the range of 13 °C to 24 °C.

Aft Lower Lobe Cargo Air Conditioning System

The Aft Cargo Air Conditioning (ACAC) system is designed to provide conditioned air to the aft cargo compartment to maintain a constant target temperature. A wide range temperature selector with three operating modes (OFF/Cargo Heat/A/C (4 °C to 27 °C)) is installed on the Flight Deck (F/D) P5 overhead panel. The ACAC selector is similar to the FCAC temperature selector, with the exception of an arc with “HEAT” nomenclature.

The aft cargo heat system will operate under normal operation whenever the ACAC system is selected OFF. The two systems cannot operate concurrently. The ACAC system is automatically shut down in the event of arming the aft cargo fire extinguishing system, during an aft cargo smoke detection event, aft pre-alarm event, forward cargo fire arm, forward cargo smoke detection, or main deck smoke detection.

Aft Lower Lobe Cargo Heating System

The aft cargo heat system provides independent heating capability for the aft cargo compartment. The system is designed to provide compartment temperature control ±5° at two temperature set points, 7 °C and 21 °C, corresponding to settings of LOW and HIGH, respectively, and to maintain the aft cargo compartment at a minimum of 4 °C at the LOW setting and a minimum of 18 °C at the HIGH setting.

The aft cargo heat system provides heating to the compartment with bleed air from the pneumatic system. Aft cargo heat can be selected OFF, LOW or HIGH, via the flight deck switch located in the P5 section of the overhead panel.

FREIGHTER OPERATION PROCEDURES

GENERAL

Cargo flight operation is the air transportation service for general and special goods and flight crews are responsible for the general safety check for the main deck compartment, cabin area, checking and carrying required documents, and catering.

Flight crews shall be well aware of the cargo characteristics and loading & handling procedures for the safety of the flight.

SECURITY CHECKS

Refer to the on board checklist for the Pre-Flight Security Check. Crew members must not hesitate to question any person not wearing an ID card or report to the PIC any suspicions concerning a person or item on board the aircraft and report to the appropriate authority in the airport, if necessary.

PERSONS ALLOWED TO BE ON BOARD

Refer to FOM 12.2 - Admission to Cockpit.

FREIGHTER CABIN OCCUPANT BRIEFING INSTRUCTION

Occupants briefing should be done by the briefing instruction and safety information card including the following items. (Refer to the Freighter Occupant Briefing Instruction and the safety information card on board for more information)

- Evacuation Route/Exit (refer to Safety Information Card)
- Coordination and Notification of entry/exit the cargo compartment
- Access to the cargo compartment is limited for specified purpose only (In-flight)
- The door to the cargo compartment must be closed at all times except for entry and exit
- Portable Oxygen Mask Location and Operation
- Carry portable oxygen supply with mask when entering the cargo compartment (In-flight)
- Seat Belt operation and requirement
- Takeoff, landing signal and Restrictions
- No Smoking in the aircraft
- Two Way Communication between the Cockpit and the Cargo Compartment
- Emergency signals & Actions
- Portable electronic devices guidelines and restrictions
- Over Water Briefing (refer to Safety Information Card)
- The cargo compartment should not be entered in case of fire/smoke detected
- Do not open the ENTRY DOORS from inside the cabin

FREIGHTER SAFETY CHECKS

A Safety Checklist should be completed prior to push back. The following items must be considered as appropriate and checked where applicable.

Refer to the B777 Freighter Reference Card for the Freighter Safety Check.

Pre-flight

- CABIN
  - The flight crew are responsible for the cabin inspection and the following items:
    - ○ Escape Slide & Door Close
    - ○ Lavatory & Portable Water Quantity
    - ○ Galley Equipment Lock & Secure
    - ○ Emergency Equipment (Fire Extinguisher x 2 (Halon & Water), Portable Oxygen Bottle x 2, PBE x 2 and First Aid Kit x 2)
    - ○ Passenger Seat (Safety Information Cards, Seat Back Position), if passenger & supernumerary are on board.
    - ○ Securing Carry-on-Baggage

    Note: Do not place any baggage unsecured on the floor of supernumerary area. Put all carry-on-baggage and cargo documents in the full height stowage (closet) or overhead mounted storages (weight limited 50 lbs/each).

    - ○ Security Check for Lavatory and Cabin
    - ○ Bunk (Security Check, Restraint belts and Door Close)
  - Identify all cabin Occupants, and Briefing

After Completion of Cargo Loading

- COCKPIT
  - Load Sheet (Specification and Limitation)
  - Load Planning Sheet
  - NOTOC (Notification To Captain), Special and Dangerous Goods Handling procedures and Emergency Response Drills

    : When carrying cryogenic containers in the AFT Lower Lobe Cargo compartment, it is recommended that the temperature selector be set to its minimum value.

Note: PIC's Signature on NOTOC means receiving and confirming of NOTOC.

- GD (General Declaration)

• CARGO LOADING CONDITION OF MAIN DECK

The flight crew member (PIC) with Load Master (or freight transportation in charge) should inspect the Main Deck Cargo Compartment freight loading conditions.

- Locking, Packaging, Tie down
- Positioning: Confirm that the freight must be loaded correctly inaccordance with LPS (Load Planning Sheet) by checking the empty space on the main deck cargo compartment. However, it does not mean that each pallet and/or ULD TAG must be checked.
- In the case of loading DG (Dangerous Goods) on the aircraft, crew members should check the status using the Load Planning sheet, the NOTOC, and the Freighter Reference Card.

Note: A minimum clearance of 2 inches should be kept between the cargo and the main deck ceiling.

• AFTER CARGO LOADING CONDITION CHECK OF MAIN DECK

- Confirm Weight & Balance Data
- Enter Weight & Balance Data
- Weight & Balance Sheet will be signed

B777F

• BEFORE START PROCEDURES:

Entry Door Mode Select Levers....................................Confirm CAPT
ARMED F/O

After visual confirmation by PIC(or Relief captain), set the Door Mode Select Levers to ARMED position by First Officer.

Note: After all ground crew have deplaned, all Door Mode Select Levers should be placed to ARMED position.

• SHUTDOWN PROCEDURES:

Entry Door Mode Select Levers.................................Confirm CAPT

DISARMED F/O

After visual confirmation by PIC(or Relief captain), set the Door Mode Select Levers to DISARMED position by First Officer.

CAUTION! Do not confuse Door Mode Select Lever with Door Operating Handle.

Place the Door Mode Select Levers to DISARMED position after visual confirmation by captain.

Note: Do not open the entry doors from inside, wait until the ground crew opens the entry doors. Escape slide/raft and powered door opening is disarmed automatically when the door is opened from outside.

TRANSPORTATION OF DANGEROUS GOODS

GENERAL

The Company handles the transportation of dangerous goods in accordance with IATA dangerous goods regulations as well as the Company regulations.

Dangerous Goods are substances or objects which in view of their nature, properties or conditions may in connection with their transportation cause danger to public safety particularly to the general public, to important common goods, to life and health of people and animals and other things. Dangerous goods include all types of explosives, gases, flammable liquids, flammable solids, oxidizing substances and organic peroxides, toxic, infectious substances, radioactive material, and corrosives.

NOTIFICATION TO CAPTAIN (NOTOC)

- Notification to captain shall be made by use of the form “Special Load-Notification to Captain” (referred to as NOTOC).
- The NOTOC has to be issued for each flight transporting dangerous goods.

- The information on the dangerous goods has to be furnished by handing over the NOTOC together with the load sheet (W&B folder) to the PIC as early as possible prior to departure.
- The captain must confirm the final loading details of those cargos through the signature on the NOTOC. For more information refer to FOM 13.1 - Items to be Checked and Performed (After completion of cargo loading).
- On transit flights with or without a crew change, only a new NOTOC will be issued by the station concerned in the case of new loaded DGR shipments. This new NOTOC must be handed over by the load master to the PIC together with the incoming NOTOC of transit shipments. Handwritten changes in the incoming NOTOC (unload of DGR or new positions in case of reloading of transit shipments) must be done.

DANGEROUS GOODS INSPECTION PROCEDURE

- After the completion of loading, incompatible groups must be checked by the flight crews for segregation requirements using the Incompatible Groups Freighter Reference Card aboard the aircraft.
  - The segregation requirements apply between separate packages having the hazard label(s) respectively, which are incompatible to each other in Freighter Reference Card.

  Note: Packages bearing the same UN number, which have incompatible hazard label(s) need not be segregated from packages.

  - A package containing dangerous goods with multiple hazards shall have primary hazard label and subsidiary hazard label(s). Thus, the segregation requirements apply based on all hazard labels applied on the package, irrespective of whether the hazard is the primary or subsidiary risk.

  Note: Even though a package has multiple hazard labels which are incompatible to each other, the package itself is not subject to the application of the segregation requirements.

- The PIC may refuse to accept a dangerous goods shipment based on an irregularity in NOTOC preparation, improper packaging, violation of dangerous goods procedures, or improper loading which will affect operational safety.

Loadmaster Brief to the Flight Crew ⇨ **Identification of Dangerous Goods via FRC** ⇩ **Final Cargo Inspection with Loadmaster** ⇨ **Captain's Acceptance of the Dangerous Goods**

SUSPECTED DAMAGE OR LEAKAGE

On Ground

If it is noticed on board an aircraft during loading or off-loading that dangerous goods shipments are damaged or their contents are leaking, the cargo agent must immediately notify the PIC.

In addition, OCC must be informed immediately by the station or alternatively by the flight crew, if:

- Dangerous goods are leaking in the aircraft, or
- Persons are injured, or
- The environment is endangered or contaminated, or
- Dangerous goods are involved in a fire or explosion.

If risk to person is doubtful, or if risk to person is acknowledged without doubt, disembark all supernumeraries, crew members and ground staff.

In-flight

Incidents, damage or leakage of dangerous goods while an aircraft is in flight can be extremely dangerous, and the Captain is expected to take whatever action that’s necessary to ensure the safety of the passengers, crews and aircraft. Indication of the problem may include unidentified smoke, fire in the aircraft or an extremely hot spot on the cabin floor, and in such cases, the following actions are recommended.

- Follow the appropriate aircraft emergency procedure for fire or smoke removal

- No Smoking Sign on
- Consider landing as soon as possible
- Consider turning off non-essential electrical power
- Determine source of smoke / fumes / fire
- Determine emergency response drill code
- Use guidance from aircraft emergency response drill chart to help deal with incident
- If the situation permits, notify ATC of the dangerous goods being carried

After Landing

- Disembark supernumeraries and crew before opening any cargo compartment doors
- Inform ground personnel / emergency services of nature of items and where stowed
- Make appropriate entry in maintenance log

AIRCRAFT EMERGENCY RESPONSE DRILLS

- The Emergency Response Drills are intended as supplemental guidance. They are not to be used in place of the appropriate Non-normal Procedures Checklist. (e.g. Smoke in Cabin, Fire)
- For more information on Emergency Response Drills, refer to FOM 13.2 - Aircraft Emergency Response Drills.

LIVE ANIMALS TRANSPORTATION PROCEDURE

The following information provides guidelines for transporting live animal cargos on the B777F (freighter) aircrafts.

TEMPERATURE GUIDELINES

Use the following temperature guidelines for the purpose of pre-cooling or pre-heating the cargo compartments on the ground in absence of the company provided specific guideline or NOTOC:

Type of Animals	Recommended Temperature
Cattle, Calves, Sheep, Horses, Pigs	10 °C~15 °C
Dogs, Cats	18 °C~20 °C
Chicken, Turkey, Ducks, other Birds	15 °C~20 °C
Reptiles	26 °C~29 °C
Live Tropical Fish	20 °C

PRE-FLIGHT PROCEDURES

- Confirm Flight Plan Trip Fuel Burn adjustment as per air conditioning flow setting, and confirm that the extra fuel for early descent is added if applicable.
- Pre-cool or pre-heat the cargo compartments by setting the target temperature recommended for the animal with APU or ground cooling unit prior to loading animals, and while loading animals. (Set the target temperature by the specific guideline or near the upper half of the acceptable temperature range recommended (refer to NOTOC) for the animals when the specific guideline is not provided.)

  Note: In absence of the company provided specific guideline or NOTOC, use the 'temperature guidelines' table above

  Example: Acceptable temperature range: 10 °C~18 °C
  Upper temperature range: 14 °C~18 °C
  Upper half of the acceptable range: 16°C(target temperature)

- Operate all available air conditioning packs.

- If main deck cargo compartment contains live animals:

  M/D Air Flow Rate Selector ....HIGH

  (when transporting large volume of Live Animals)

- If any lower lobe cargo compartment contains live animals:

  Lower Cargo Temperature selectors (FWD and/or AFT) .. Set as needed for pre-cooling or pre-heating.

  (Set the target temperature by the specific guideline or near the upper half of the acceptable range recommended (refer to NOTOC) for the animals when the specific guideline is not provided.)

- The doors of cargo compartments with live animal loads should be closed as late as possible and opened at transit and/or destination stations first; special care must be taken in case of strong winds, heavy rain, snow fall and extreme local temperature conditions. On the ground in humid ambient conditions, keep the cargo doors closed (with the packs operating) to minimize the movement of ambient humid air in the aircraft and reduce the resulting condensation.

- Ground time after loading animals should be minimized as much as possible.

  Note: The procedure to purge the cargo compartment of moisture by running all packs with aircraft doors closed at least 20 mins before departure as stated in 'Freighter operation procedure during precipitation, snowing and fog (Vis. below 1 SM) or for transportation of perishable cargo' **does not apply** in case when live animals are carried.

AFTER START PROCEDURES

- RECIRCULATION FANS switch - OFF (when transporting large volume of Live Animals)

- If the main deck cargo compartment contains live animals:

  - Main Deck Cargo Temperature Selectors (FWD & AFT)- Set

    (Set the target temperature by the specific guideline or near the upper half of the acceptable range recommended (refer to NOTOC) for the animals when the specific guideline is not provided.)

Note: Before takeoff, the time to set the target temperature can be changed in accordance with the specific guidance set forth.

- If any lower lobe cargo compartment contains live animals:
  - Lower Cargo Temperature selectors (FWD and/or AFT) - Set

    (Set the target temperature by the specific guideline or near the upper half of the acceptable range recommended (refer to NOTOC) for the animals when the specific guideline is not provided.)
- Avoid stopping abruptly and turning sharply during taxi (keep animals calm).

IN-FLIGHT PROCEDURE WHEN TRANSPORTING LARGE VOLUME OF LIVE ANIMALS

- Once every hour, check actual zone temperature.
- During cruise, adjust zone temperature in the cargo compartments if provided with the specific guideline.
- About 10 mins prior to Top Of Descent

  If possible, initiate an early descent with reduced rate of descent

  Note: Early descent allows thrust setting above idle for increased pack output and improved temperature control during descent.

POST-FLIGHT ACTION

Report in detail if any anomaly occurred to the animals being carried.

PERISHABLE CARGO TRANSPORTATION PROCEDURE

Perishable cargo is that, which due to its nature, will spoil without proper care and handling, or if exposed to adverse temperature, humidity or other environmental conditions. This includes vegetables, dairy products, chilled meat, foodstuffs, seafood and flowers.

TEMPERATURE GUIDELINES

Use the following temperature guidelines for the purpose of pre-cooling or pre-heating the cargo compartments on the ground in absence of the

NOTOC:

Type of Perishables	Recommended Temperature
Apple, Vegetables (asparagus, broccoli, cabbage, etc.) Blueberry, Cheese, Cherry, Grapes and Meat (beef, pork, etc.)	4 °C
Sea foods (fish (meat), clam, lobster (meat), salmon, shrimp, etc.)	4 °C
Flowers (iris, lily, rose, turnip, etc.)	4 °C
Avocado, Guava, Lemon, Lime, olive, orange	7 °C~10 °C
Pumpkin, Watermelon,	10 °C~15 °C

MITIGATION OF MOISTURE-INDUCED FALSE CARGO FIRE WARNINGS

Moisture, humidity and fog are forms of contamination that can enter the cargo smoke detection system by conditioned pack air circulation. Any moisture entering the fire detection tubing (smoke detector) as humidity will either condense or become frost inside the cargo smoke detection equipment. And the condensed water (or melted frost during descent) in which may trigger a false fire warning.

A perishable cargo contains a large amount of moisture which can be exposed to a cargo compartment during a flight. The potential for moisture-induced false fire warnings is directly proportional to the amount of moisture exposed to the cargo environment. And it peaks when the aircraft is passing through an area of high temperature and humidity (i.e. after leaving Top Of Descent and descending through 25,000ft toward a warm and humid area), at which, an addition of cold or warm moisture-laden air can contribute to false cargo fire warning events.

The key to the mitigation of moisture-induced false fire warnings is the supply of strong airflow (adequate ventilation) throughout the cargo compartment, especially near the smoke detector (tube) inlets to reduce humidity.

By following procedures, the spoilage of perishable cargo and a false cargo fire warning could be avoided;

GROUND STAFF'S PROCEDURE

Maintenance Department

Previously cool or heat the shipments by the APU or Air Conditioning Cart during the cargo loading.

OCC (Operations Control Center)

Adjust the departure time and add additional fuel.

FLIGHT CREW PROCEDURE

Pre-Flight

- Pre-cool or pre-heat the cargo compartments by setting the target temperature near the upper half of the acceptable range recommended (refer to NOTOC) for the cargo with APU or ground cooling unit prior to loading perishables, and while loading perishables.

  Note: In absence of the NOTOC, use the ‘temperature guidelines’ table above.

- The doors of the cargo compartments with a perishable load should be closed as late as possible and opened at transit and/or destination stations first; special care must be taken in case of strong winds, heavy rain, snow fall and extreme local temperature conditions. On the ground in humid ambient conditions, keep the cargo doors closed (with the packs operating) to minimize the movement of ambient humid air in the aircraft and reduce the resulting condensation.
- If able, all available packs should be running with the aircraft doors closed for at least 20 mins to purge the cargo compartments of moisture before departure.

After Door Close

- If the main deck cargo compartment contains Perishable Cargo:
  - MAIN DECK CARGO TEMP Selectors (FWD & AFT)................... Set

    (Set the target temperature by setting the target temperature near the upper half of the acceptable range recommended (refer to NOTOC) for the cargo)

    Example: Acceptable temperature range: 4 °C ~ 8 °C

Upper temperature range: 6 °C ~ 8 °C

Upper half of the acceptable range: 7 °C(target temperature)

- If the use of M/D High Flow Mode is requested in NOTOC:
  - M/D FLOW Selector .... HIGH
- If any lower lobe cargo compartment contains Perishable Cargo:
  - LWR CARGO TEMP Selectors (FWD and/or AFT)........................ Set

    (Set the target temperature by setting the target temperature near the upper half of the acceptable range recommended (refer to NOTOC) for the cargo)

In-Flight

- If a perishable cargo is loaded and the compartment temperature is held at 4 °C (full cold) for 6 hrs at cruise, set the target temperature to 10 °C for approximately 5 mins, and then reset back to 4 °C.

  Note: If the cargo compartment temperature setting is held at 4 °C for a long time, a part of the cargo smoke detection system will become cold-soaked (some areas of the compartment may go below freezing). It may cause a build-up of ice or frost in the cargo smoke detection system. This procedure will help to melt any ice or frost and to drive any free moisture through the system and result a mitigation of false cargo fire warning.

- If an actual temperature in the main deck cargo compartment decreases as time passes but it is maintained above the selected target temperature during cruise (about an hour after reaching Top Of Climb), follow the next procedure to prevent the cargo smoke detection system from cold-soaking:
  - M/D FLOW Selector ....HIGH (if applicable)

    RECIRC FANS Switch ....OFF (if applicable), when a perishable

  cargo is loaded in main deck and the temperature in cargo compartment cannot be maintained within the acceptable temperature range specified in NOTOC.

  Note: If the M/D High Flow Mode is applied with deactivated Recirculation FANs, additional fuel consumption (1.3 % max) shall be considered.

- MAIN DECK CARGO TEMP Selectors.................... Adjust the target temperature to same as a maintained actual temperature of the cargo compartment. But it shall not exceed the upper limit of temperature range in NOTOC.

  (e.g. If the actual temperature of main deck cargo compartment is maintained at 6 °C with the target temperature setting of 4 °C /upper limit: 6°C, reset the target temperature to 6 °C.)
- Allow time (at least 5 mins) for warming the cold-soaked cargo smoke detection system.
- MAIN DECK TEMP Selectors......... Re-adjust the target temperature 1 °C down and wait until the actual temperature drops to the adjusted target temperature.
- Then if the actual temperature equals to re-adjusted target temperature, repeat the previous step until the actual temperature in cargo compartment reaches to the original target temperature.
- If the actual temperature doesn’t drop to the re-adjusted target temperature, reset a target temperature to the last maintained actual temperature or the upper limit of temperature range whichever is lower.

CARRIAGE OF DRY ICE

The sublimation (converting from solid state to gaseous state) of dry ice may result in significant concentrations of gaseous CO_2 in the aircraft. CO_2 is not poisonous but may present a problem of oxygen dilution in confined spaces where ventilation rates are low.

GENERAL

Many factors can affect the rate at which dry ice sublimates; ambient compartment temperature, amount of insulation surrounding the dry ice, type of container, amount of surface area of the dry ice, and the temperature of the cargo being cooled by the dry ice.

Recommended dry ice carriage limits were calculated based upon the limiting factor of 0.25 percent CO_2 concentration with all air conditioning packs operating, or 0.5 percent CO_2 concentration for Minimum Equipment

List (MEL) air conditioning packs operation.

SUGGESTED PROCEDURES

- Prior to entering any compartment in which a large amount of dry ice has been loaded, ensure adequate ventilation is provided to that compartment with the use of air conditioning packs, ground carts, or by opening the respective main cargo door. Similar precautions should be followed when entering any equipment center adjacent to a cargo compartment carrying dry ice. Otherwise, the use of 100 percent portable oxygen is recommended.
- Dry Ice may be loaded in the Main Deck cargo compartment with Live Animals provided they are separated by a minimum of 3 m (1 position). For Lower Deck cargo compartments, dry ice and live animals shall not be loaded in the same compartment. However, an animal that is in a closed package (e.g. live fish etc.) may be loaded in the same compartment with Dry ice.
- All air conditioning packs (or equivalent ground cart ventilation) should be operating at all times while persons are on board an aircraft transporting dry ice. In addition, for freighter aircraft, all packs should be operable at dispatch.
- Avoid storing dry ice on aircraft unless adequate and continuous ventilation is provided.
- Per the IATA Dangerous Goods Regulations, notify the flight crew whenever the amount of dry ice stowed in the cargo compartments exceeds 440 lbs (200 kg).
- Provided that the amount of dry ice in the aircraft does not exceed the total recommended limit, the dry ice can be divided in any manner between the aircraft cargo compartments.
- The amount of dry ice carried by passengers and the dry ice used for the main deck galleys should be taken into consideration when determining the total aircraft allowable dry ice carriage amount.

Recommended Maximum Dry Ice Load (refer to FOM 13.2)

Maximum Allowable Carriage Limit of DRY ICE of the A/C Type are as follows, sublimation rate 3% is applied normally. But sublimation rate 1%, 2% should be applied when carrying lots of dry ice for vaccine, medicine, ingredient.

(Unit: kg)

A/C Type	Maximum weight per A/C		
	Sublimation Rate 3%	Sublimation Rate 2%	Sublimation Rate 1% 1)
B777F	1,300 (Including Lower Deck cargo Compartment: 350)	2,800 (Including Lower Deck cargo Compartment: 550)	5,600 (Including Lower Deck cargo Compartment: 1,100)
B777-200	400	680(1,270) 2)	1,360(2,540) 2)
B777-300/ER	500	780(1,415) 2)	1,560(2,830) 2)

Note: 1) If the weight of dry ice per packages is at or more 100 lbs(45kg) or special container for carrying vaccine, sublimation rate 1% is applied.

2) It is applied for cargo operation by using passenger airplanes as long as the total number of main cabin occupants does not exceed 15 people.

- Before push back, at least one door (including L1 door) shall remain open when dry ice is loaded on the main deck.
- Upon arrival no person shall enter the lower deck, where dry ice has been loaded, immediately after opening the door. Allow time for ventilation.

FREIGHTER OPERATION PROCEDURE DURING PRECIPITATION, SNOWING AND FOG (VIS. BELOW 1SM)

There have been reports of false cargo fire warnings during freighter operations in humid air conditions. To mitigate a false fire warning, pilots should fully understand and apply the following procedure.

GROUND STAFF'S PROCEDURE

Cargo Operations

Remove any moisture or water from the shipments, container and on the floor.

Maintenance Department

Previously cool or heat the shipments by the APU or Air Conditioning Cart during the cargo loading.

OCC (Operations Control Center)

Adjust the departure time and add additional fuel.

FLIGHT CREW PROCEDURE

Pre-Flight

- Pre-cool or pre-heat the cargo compartments by setting the target temperature recommended for the cargo with APU or ground cooling unit prior to loading cargo, and while loading cargo.
- Verify that moisture has been removed from the shipments during joint cargo status check with the Load Master.
- Before departure, all available packs should be running with aircraft doors closed for at least 20 mins to purge the cargo compartments of moisture.

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ADDITIONAL INFORMATION

This section describes miscellaneous information about flight operations in the specific condition or environment.

LOCATIONS FOR EACH PUBLICATION OF B777 *<CLICK>*

MULTI-MTOW OPERATION ROUTES

B777-200ER

1) Applicable to all B777 aircraft
2) Route Table

	MTOW		Route
	LBS	KGS	
Short	511,400	231,967	Domestic Airports Korea-Japan Korea-China(*except for Lijiang) Korea-Mongolia Korea-Taiwan Korea-Hongkong/Macau Korea-UUS, KHV, VVO
Mid	573,000	259,908	Korea-Bangladesh Korea-Brunei Korea-Cambodia Korea-Indonesia Korea-Laos Korea-Malaysia Korea-Myanmar Korea-Nepal Korea-Philippines Korea-Singapore Korea-Thailand Korea-Vietnam Korea-China Lijiang Korea/Japan-Saipan/Guam
Basic	BASIC MTOW(1)		All flights except above

(Remark)
(1) BASIC MTOW by registration number : Refer to AFM

~~B777-300 (HL7532/33/34/73)~~

~~MTOW~~	~~Route(V.V)~~		~~Remark~~
~~559,900lbs (253,966kg)~~	~~Korea~~	~~All Domestic Airports~~	
		~~Japan, Taiwan~~	
		~~CGO, CGQ, DLC, HET, HGH, MDG, NKG, PEK, PVG, SHA, SHE, TAO, TSN, TXN, TYN, WEH, YNJ, TNT~~	
	~~Japan~~	~~All Japanese Airports~~	
		~~VVO~~	
	~~AMS~~	~~MAD, ZRH~~	
	~~HAK~~	~~SZX~~	
	~~JED~~	~~RUH~~	

~~559,900lbs (253,966kg)~~	~~MEX~~	~~TIJ~~	
	~~MXP~~	~~FCO~~	
	~~TLV~~	~~CAI~~	
	~~ZRH~~	~~AMS, VIE~~	
~~588,600lbs (266,984kg)~~	~~Korea~~	~~CAN, CRK, CSX, CTU, DYG, FOC, GUM, HKG, IKT, KHV, KLO, KWL, MFM, MNL, SZX, UBN, UUS, VDO, VVO, WUH, XIY, XMN, XNN~~	
	~~Japan~~	~~GUM, SPN, PKC~~	
	~~CAI~~	~~DXB~~	
~~601,800lbs (272,971kg)~~	~~All Routes except above Flights~~		

~~B777-300ER (HL7202/03/04/05, 7782/83, 8006/07/08/09/10/11/41/42, 8208/09/10/16/17/18/50/74/75, 8346/47)~~

~~MTOW~~	~~Route(V.V)~~		Remark
~~615,000lbs (278,959kg)~~	~~Korea~~	~~All Domestic Airports~~	~~Note 1)~~
		~~Japan, China(including HKG, MFM, except KMG, URC), Mongolia, Taiwan~~	
		~~BKK, CEB, CNX, CRK, GUM, HKT, IKT, KHV, MNL, SGN, SPN, UUS, VVO~~	
	~~Japan~~	~~All Japanese Airports~~	
		~~GUM, PKC, SPN, VVO~~	
	~~AMS~~	~~MAD, ZRH~~	
	~~CAI~~	~~DXB~~	
	~~CMB~~	~~MLE~~	

~~615,000lbs (278,959kg)~~	~~HAK~~	~~SZX~~	
	~~JED~~	~~RUH~~	
	~~MEX~~	~~TIJ~~	
	~~MXP~~	~~FCO~~	
	~~TLV~~	~~CAI~~	
	~~ZRH~~	~~AMS, VIE~~	
~~701,000lbs (317,968kg)~~	~~Korea~~	~~Bangladesh, Brunei, Cambodia, Indonesia, Malaysia, Myanmar, Nepal, Philippines(except CEB, MNL) Singapore, Thailand(except BKK, CNX, HKT), Vietnam(except SGN), Uzbekistan~~	
		~~ANC, CNS, KMG, MAA, PKC, ROR, URC~~	
	~~Japan~~	~~China, ANC, CNS, ROR~~	
	~~CAI~~	~~TAS~~	
~~760,000lbs (344,730kg)~~	~~All Routes except above Flights~~		

~~Note 1) Non-Landing Sightseeing International Flight included~~

~~B777 FREIGHTER (HL8005/43/44/45/46/75/76/77, 8226/51/52/85)~~

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~ALA~~		~~ICN~~
~~AMM~~		~~BOM~~
~~AMS~~	~~ARN, BSL, CPH, MXP, OSL, VIE~~	~~TLV~~

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~ANC~~		~~YEG, YYZ~~
~~ARN~~	~~BRU~~	
~~ASB~~		~~FRA~~
~~ATL~~	~~YYZ~~	~~YHZ, YVR~~
~~ATQ~~	~~DEL~~	
~~AUH~~		~~MAA~~
~~BEN~~		~~BRU~~
~~BHK~~	~~NVI~~	
~~BKI~~	~~KUL~~	~~ICN~~
~~BKK~~	~~HAN, SGN, SIN~~	~~BOM, CMB, CTU, GMP, HGH, ICN, MAA~~
~~BOG~~	~~UIO~~	
~~BOM~~	~~CMB, DEL~~	~~AMM, BKK, DXB, KWI, NVI, SIN, TAS~~
~~BRU~~	~~BSL, CDG, CPH, LHR, MXP, OSL, ZAZ~~	~~NVI~~
~~BSL~~		~~NVI~~
~~BUD~~	~~FRA~~	
~~CAN~~	~~CJU, ICN~~	
~~CCU~~		~~BLR~~
~~CDG~~	~~LHR~~	~~ASB~~
~~CEB~~		~~ICN~~
~~CGK~~	~~BKK, KUL, PEN, SIN~~	~~HAN, HKG, MNL, SGN~~

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~CGO~~	~~ICN~~	
~~CJU~~	~~GMP, ICN, KIX, PUS, PVG~~	
~~CKG~~		~~ICN~~
~~CMB~~		~~BKK, KUL, MNL, SIN~~
~~CNX~~		~~ICN, SIN~~
~~CPH~~	~~AMS, LUX~~	~~NVI~~
~~CTS~~	~~KOJ~~	
~~CTU~~	~~HKG~~	~~DEL, ICN, PUS, SIN~~
~~DAC~~		~~NVI, ICN~~
~~DEL~~	~~BOM~~	~~BKK, DXB, KWI, MAA, NVI, TAS, XMN~~
~~DFW~~	~~GDL~~	~~ANC, YYC~~
~~DMK~~		~~ICN~~
~~DNA~~	~~ICN, OSN, TAE~~	
~~DOH~~	~~DXB~~	
~~DPS~~	~~SIN~~	
~~DXB~~		~~MAA, NVI~~
~~FAI~~	~~ANC~~	
~~FAR~~		~~ANC~~
~~FNJ~~	~~ICN~~	
~~FRA~~	~~AMS, ARN, BRU, BSL, CDG, CPH, MAN, MXP, RIX, VIE, ZRH~~	~~LLA, NVI, SVO, TLV~~

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~FRU~~	~~NVI~~	
~~FUK~~	~~ICN~~	
~~GDL~~		~~YVR~~
~~GMP~~	~~CJU, ICN, PUS~~	
~~GVA~~	~~BSL~~	
~~HAN~~	~~BKK, CTU, DAC, HKG, RGN, SGN~~	~~DEL, ICN, KUL, PEN, SIN~~
~~HEL~~	~~LUX~~	
~~HGH~~	~~ICN~~	
~~HKG~~	~~HAN, MFM~~	~~CJJ, CJU, GMP, ICN, MAA~~
~~HND~~	~~ICN~~	
~~ICN~~	~~CJU, DNA, FNJ, FUK, GMP, HGH, HND, KIX, KKJ, KOJ, NGO, NRT, OSN, PEK, PUS, PVG, SHA, TAO, TPE, TSN~~	~~BKI, BKK, CAN, CGK, CKG, CNX, CTU, DAC, DAD, DMK, HAN, HKG, KUL, MFM, MNL, PEN, RGN, SGN, SIA, SIN, UBN, XIY, XMN~~
~~IST~~		~~NVI, TAS~~
~~JFK~~	~~YHZ, YYZ~~	~~YQX, YWG, YYC~~
~~JNB~~		~~LOS~~
~~KIX~~	~~CJU, ICN~~	
~~KKJ~~	~~ICN, KIX~~	
~~KOJ~~	~~ICN~~	
~~KUL~~	~~BKK, CGK, PEN, SGN~~	~~HAN, ICN~~

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~KWI~~		~~BOM, MXP~~
~~LAX~~		~~ANC, FAI, MEX, YWG, YYC~~
~~LED~~		~~FRA~~
~~LHR~~	~~AMS, CDG, CPH~~	
~~LOS~~		~~JNB~~
~~MAA~~	~~BKK, BLR, BOM, CMB~~	~~AUH, CTU, DEL, SIN~~
~~MAN~~	~~ZAZ~~	
~~MAO~~		~~UIO~~
~~MBA~~		~~DXB~~
~~MFM~~	~~HKG~~	~~ICN, PUS~~
~~MIA~~	~~PAP~~	~~BOG, MAO, UIO, YYC~~
~~MNL~~	~~CAN, HAN, SGN~~	~~BKK, CGK, ICN, PEN, PUS, SIN~~
~~MUC~~	~~BRU, RMS~~	~~SVO~~
~~MXP~~	~~BRU~~	~~NVI, TLV~~
~~NGO~~	~~ICN~~	
~~NRT~~	~~ICN~~	~~HKG~~
~~NVI~~	~~ALA, ATQ, BOM, DEL, DOH, DXB, FRU, TAS, TMJ~~	~~BEN, DAC, HAN, ICN, IST, OSL, PEK, SAW, SVO, UBN, VIE~~
~~ORD~~	~~YMX, YWG, YYZ~~	~~ANC, YYC~~
~~OSN~~	~~DNA, ICN~~	

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~PDX~~		~~ANC~~
~~PEK~~	~~ICN~~	
~~PEN~~	~~BKI, KUL~~	~~ICN~~
~~PSA~~	~~MXP~~	
~~PUS~~	~~CJU, GMP, ICN, PEK, SSN~~	
~~PVG~~	~~CJJ, ICN~~	
~~RGN~~		~~CJJ, ICN~~
~~RIX~~		~~NVI~~
~~RMS~~		~~NVI~~
~~SAW~~		~~LGG, NVI, TAS~~
~~SCL~~		~~LIM~~
~~SEA~~		~~ANC, YYZ~~
~~SFO~~		~~ANC~~
~~SGN~~	~~BKK, PEN, SIN~~	~~CGK, ICN~~
~~SHA~~	~~ICN~~	
~~SIA~~		~~ICN~~
~~SIN~~	~~BKK, CGK, KUL, PEN, SGN, UTP~~	~~BOM, CEB, CMB, CNX, HAN, ICN, MAA, MNL~~
~~SSN~~	~~ICN~~	
~~SUU~~		~~ANC~~
~~SVO~~	~~BUD, VIE~~	~~BRU, FRA, LHR, MUC, NVI, TAS, ZAZ~~
~~SYD~~		~~AKL~~

~~Departure~~	~~Arrival~~	
	~~MTOW 615,000 lbs (278,959kg)~~	~~MTOW 701,000 lbs (317,968kg)~~
~~TAE~~	~~DNA, ICN~~	
~~TAO~~	~~ICN~~	
~~TAS~~	~~FRU, NVI~~	~~IST~~
~~TLV~~	~~SAW~~	~~BRU, FRA~~
~~TMJ~~		~~DEL~~
~~TPE~~	~~ICN~~	
~~TSN~~	~~CGO, ICN~~	
~~UIO~~	~~BOG~~	~~VCP~~
~~UBN~~		~~ICN, NVI~~
~~UTP~~	~~BKK~~	
~~VCP~~		~~LIM, SCL, UIO~~
~~VIE~~	~~AMS, ARN, BRU, BSL, CDG, CPH, FRA, MXP, OSL, ZAZ, ZRH~~	~~TLV~~
~~XIY~~		~~HAN, ICN~~
~~XMN~~	~~CJU, ICN~~	
~~YVR~~		~~YYZ~~
~~YWG~~		~~ANC~~
~~YYC~~		~~ANC~~
~~YYZ~~	~~YMX~~	~~ANC, YHZ, YVR~~
~~ZAZ~~		~~SVO~~
~~* All Routes except above Flights~~ ~~B777F – MTOW 766,800 lbs (347,814kg)~~		

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REFERENCE FORMS AND SHEETS

This section describes miscellaneous information about reference forms and sheets.

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777 Freighter Reference Card

FREIGHTER OPERATION PROCEDURES

B777 FREIGHTER REFERENCE CARD

INSTRUCTIONS

PAGE	ACTION	ITEM	INSTRUCTIONS
1	Compulsory	- PRE-FLIGHT - AFTER COMPLETION OF CARGO LOADING - AFTER COMPLETION OF CARGO LOADING CHECK - IN-FLIGHT CHECK - POST-FLIGHT CHECK	Items shall be accomplished at every cargo flight.
2~8	If Applicable	- LOAD RESTRICTIONS - QUICK REFERENCE CHART(SEGREGATION) - EMERGENCY RESPONSE DRILLS - FREIGHTER SUPPLEMENT PROCEDURES	Items shall be checked and performed when the related cargo (specified in the NOTOC) is loaded.

PRE-FLIGHT

◈ CABIN

Flight crew must perform safety and security check and emergency equipment check in the cabin

- ☐ **Escape Slide & Door Closure**
- ☐ **Lavatory & Portable Water Quantity**
- ☐ **Galley Equipment Secure & Lock**
- ☐ **Emergency Equipment**
  - Fire extinguisher (Halon & Water)(x 2) , Portable oxygen bottle(x 2) , PBE(x 2) , FAK(x 2)
- ☐ **Passenger Seats**
  - Safety Information Cards, Seat belt, Seat-back Position
- ☐ **Secure Carry-on Baggage**
- ☐ **Lavatory & Cabin Security Check**
- ☐ **Bunk area security check, Restraint belts and Bunk door closure**
- ☐ **Identification of all supernumeraries and Briefing**
  - Refer to Freighter Occupant Briefing Instruction in the Operational Documents on Board binder

AFTER COMPLETION OF CARGO LOADING

◈ COCKPIT

- ☐ **Load Sheet**
- ☐ **Load Planning Sheet**
- ☐ **NOTOC, Special and Dangerous Goods handling procedures and Emergency Response Drills**
- ☐ **GD**

◈ **MAIN DECK - Cargo Loading Condition**

- ☐ **Locking, Packing, Tie down**
- ☐ **Positioning**
- ☐ **DG status (use LPS, NOTOC, NOTOC summary, QRC)**
- ☐ **A clearance of 2 inches minimum** should be kept between cargo and main deck ceiling

AFTER COMPLETION OF CARGO LOADING CHECK

- ☐ **Confirm and enter W/B data**
- ☐ **Sign on the related Document (as required)**
- ☐ **Entry Door Mode Select Levers to AUTOMATIC**

IN-FLIGHT CHECK

- ☐ **Cabin Check**
  - Locking Galley Equipment, Securing Carry On Baggage
- ☐ **Disinfection of cabin (as required)**
  - Disinfection should be done 30 minutes prior to landing

POST-FLIGHT CHECK

- ☐ **DOCUMENT**
  - Immigration Document or GD (as required)
  - Transfer NOTOC or other necessary documents (as required)
- ☐ **Entry Door Mode Select Levers to DISARMED**
  - Place the Door Mode Select Levers to DISARMED position **after visual confirmation by captain**

Flight Standards Dept.

0RDG UHVWULFWLRQV

◆ Cargo loading restriction check with given IMP code & pallet / container hold

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B777 FREIGHTER REFERENCE CARD

TXLFN UHIHUHQFH FKDUW +VHJUHJDWLRQ,

Hazard Label	1 excl. 1.4S	2.1	2.2 2.3	3	4.1	4.2	4.3	5.1	5.2	8	9*
1 Excluding 1.4S		X	X	X	X	X	X	X	X	X	X
2.1	X										X
2.2 / 2.3	X										
3	X							X			X
4.1	X										X
4.2	X							X			
4.3	X									X	
5.1	X			X		X					X
5.2	X										
8	X						X				
9*	X	X		X	X			X			

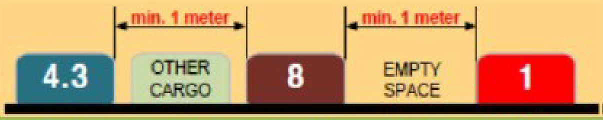
*) Applicable for RBI, RBM, RLI and RLM.

Note : *1. An "**X**" indicates that packages must be segregated.*

2. UN3528(internal combustion, flammable gas / liquid powered engines) need not be segregated from dangerous goods in Division 5.1

SEGREGATION REQUIREMENTS

▶ Incompatible Dangerous Goods (HAZMAT) groups must be separated by a **minimum 1 meter** by other cargo.



▶ When loaded with **explosives other than Division 1.4S, Division 1.4B explosives** must be **loaded into separate ULD,** and the ULD must be separated by a **minimum 2 meters** by other cargo.

▶ The segregation requirements apply **between separate packages** having the hazard label(s) respectively, which are incompatible to each other in Quick Reference Chart.

Note : Packages bearing the same UN number*, which have incompatible hazard label(s)* ***need not be segregated from packages.***

▶ A package containing **dangerous goods with multiple hazards** shall have **primary hazard label** and **subsidiary hazard label(s)**. Thus, the segregation requirements **apply based on all hazard labels applied on the package**, irrespective of whether the hazard is the primary or subsidiary risk.

***Note** : Even though a package has multiple hazard labels which are incompatible to each other, the package itself is not subject to the application of the segregation requirements.*

Flight Standards Dept.

B777 FREIGHTER REFERENCE CARD

CARGO IMP CODE

DANGEROUS GOODS

1	1.3C	RCX	Explosives
	1.3G	RGX	
	1.4B	RXB	
	1.4C	RXC	
	1.4D	RXD	*Most explosives, such as those classed within **Divisions 1.1, 1.2, 1.3** (with a few exceptions) **1.4F, 1.5** and **1.6** are normally **forbidden for carriage by air**.*
	1.4E	RXE	
	1.4G	RXG	
	1.4S	RXS	
2	2.1	RFG	Flammable Gas
	2.2	RNG or RCL	Non-Flammable, Non-Toxic Gas (RCL: Cryogenic Liquids)
	2.3	RPG	Toxic Gas
3		RFL	Flammable Liquid
4	4.1	RFS	Flammable Solid
	4.2	RSC	Spontaneously Combustible
	4.3	RFW	Dangerous When Wet
5	5.1	ROX	Oxidizer
	5.2	ROP	Organic Peroxide
6	6.1	RPB	Toxic Substance
	6.2	RIS	Infectious Substances (UN2814 or UN2900)
7	Category I	RRW	Radioactive Material - White
	Category II	RRY	Radioactive Material - Yellow
	Category III		
8		RCM	Corrosive Material
9		RSB	Polymeric Beads
		MAG	Magnetized Material
		ICE	Carbon Dioxide, Solid (Dry Ice)
		RMD	Miscellaneous Goods
		RBI RLI	Lithium Ion Battery
		RBM RLM	Lithium Metal Battery

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AOG	Aircraft on ground supplies	HEA	Heavy Cargo (150kg+)	PER	Perishable
AVI	Live Animal	HUM	Human Remains in Coffin	PES	Fish & Seafood
BIG	Outsized Cargo	KIC	High Value Product	RHF	Harmful-Stow Away from Foodstuff
BUP	Build Up Package	LHO	Living Human Organs	RBI	Lithium Ion Battery (UN3480)
CAO	Cargo Aircraft Only	MAL	Mail	RLI	Lithium Ion Battery (UN3481)
DIP	Diplomatic Bag	MUW	Munitions of War	RBM	Lithium Metal Battery (UN3090)
EAT	Foodstuffs	NWP	Newspapers, Magazines	RLM	Lithium Metal Battery (UN3091)
ELI	Lithium Ion Battery (Non-DG)	OHG	Overhang	SAL	Surface Mail
ELM	Lithium Metal Battery (Non-DG)	PEF	Flower	SVC	Company Service Items
FIL	Undeveloped/Unexposed Film	PEM	Meat	VAL	Valuable Cargo
FRC	Frozen Cargo	PEP	Foods & Vegetables	VOL	Volumetric Cargo

*** *Multiple Special Loads / DGRs (Not a Cargo IMP code but you may see this code on Load Planning Sheet.)*

CAUTION!

If more than Two (2) IMP codes assigned on One (1) cargo hold zone, "*" will be shown on Load Planning Sheet. Flight Crew should check DCS NOTOC or hand-written NOTOC list for actual loaded Special Loads or Dangerous Goods.**

Flight Standards Dept.

EMERGENCY RESPONSE DRILLS

B777 FREIGHTER REFERENCE CARD

1. COMPLETE APPROPRIATE AIRCRAFT EMERGENCY PROCEDURES.
2. CONSIDER LANDING AS SOON AS PRACTICABLE.
3. USE DRILL FROM THE CHART BELOW.

DRILL NO.	INHERENT RIST	RISK TO AIRCRAFT	RISK TO OCCUPANTS	SPILL OR LEAK PROCEDURE	FIRE FIGHTING 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-flammable, pressure may create hazard in fire	Minimal	As indicated by the drill letter(s)	Use 100% oxygen; establish and maintain maximum ventilation for "A", "i" or "P" drill letter	All agents according to availability; u se standard fire procedure	Possible abrupt loss of pressurization
3	Flammable liquid or solid	Fire and/or explosion	Smoke, fumes and heat, and as indicated by the drill letter(s)	Use 100% oxygen; establish and maintain maximum ventilation; no smoking; minimum electrics	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization
4	Spontaneously combustible or pyrophoric when exposed to air	Fire and/or explosion	Smoke, fumes and heat, and as indicated by the drill letter(s)	Use 100% oxygen; establish and maintain maximum ventilation	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization; minimum electrics if "F" or "H" drill letter
5	Oxidizer, may ignite other materials, may explode in heat of a fire	Fire and/or explosion, possible corrosion damage	Eye, nose and throat irritation; skin damage on contact	Use 100% oxygen; establish and maintain maximum ventilation	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization
6	Toxic*, may be fatal if inhaled, ingested, or absorbed by skin	Contamination with toxic* liquid or solid	Acute toxicity, effects may be delayed	Use 100% oxygen; establish and maintain maximum ventilation; do not touch without gloves	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization; minimum electrics if "F" or "H" drill letter
7	Radiation from broken/unshielded packages	Contamination with spilled radioactive material	Exposure to radiation, and personnel contamination	Do not move packages; avoid contact	All agents according to availability	Call for a qualified person to meet the aircraft

Flight Standards Dept.

EMERGENCY RESPONSE DRILLS

B777 FREIGHTER REFERENCE CARD

DRILL NO.	INHERENT RIST	RISK TO AIRCRAFT	RISK TO OCCUPANTS	SPILL OR LEAK PROCEDURE	FIREFIGHTING PROCEDURE	ADDITIONAL CONSIDERATIONS
8	Corrosive, fumes disabling if inhaled or in contact with skin	Possible corrosion damage	Eye, nose and throat irritation; skin damage on contact	Use 100% oxygen; establish and maintain maximum ventilation; do not touch without gloves	All agents according to availability; no water on "W" drill letter	Possible abrupt loss of pressurization; minimum electrics if "F" or "H" drill letter
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	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
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
12	Fire, heat, smoke, toxic and flammable vapour	Fire and/or explosion	Smoke, fumes, heat	Use 100% oxygen; establish and maintain maximum ventilation	All agents according to availability. Use water if available	Possible abrupt loss of pressurization; consider landing immediately

DRILL LETTER	ADDITIONAL RISK	DRILL LETTER	ADDITIONAL RISK
A	ANAESTHETIC	S	SPONTANEOUSLY COMBUSTIBLE OR PYROPHORIC
C	CORROSIVE	W	IF WET GIVES OFF TOXIC* OR FLAMMABLE GAS
E	EXPLOSIVE	X	OXIDIZER
F	FLAMMABLE	Y	DEPENDING ON THE TYPE OF INFECTIOUS SUBSTANCE, THE APPROPRIATE NATIONAL AUTHORITY MAY BE REQUIRED TO QUARANTINE INDIVIDUALS, ANIMALS, CARGO AND THE AIRCRAFT
H	HIGHLY IGNITABLE		
i	IRRITANT / TEAR PRODUCING		
L	OTHER RISK LOW OR NONE	Z	AIRCRAFT CARGO FIRE SUPPRESSION SYSTEM MAY NOT EXTINGUISH OR CONTAIN THE FIRE; CONSIDER LANDING IMMEDIATELY
M	MAGNETIC		
N	NOXIOUS		
P	TOXIC* (POISON)		

* Toxic has the same meaning as poison.

Flight Standards Dept.

FREIGHTER SUPPLEMENT PROCEDURES

B777 FREIGHTER REFERENCE CARD

Freighter Operation Procedure during precipitation, snowing and fog (VIS below 1 SM)

There have been reports of false cargo fire warnings during freighter operations in humid air conditions.
To mitigate a false fire warning, pilots should fully understand and apply the following procedure.

▶ Ground staff's procedure

☐ **Cargo Operations**
- Remove any moisture or water from the shipments, container and on the floor.

☐ **Maintenance Department**
- Previously cool or heat the shipments by the APU or Air Conditioning Cart during the cargo loading.

☐ **OCC (Operations Control Center)**
- Adjust the departure time and add additional fuel.

▶ Flight crew procedure

☐ **Pre-Flight**
- Pre-cool or pre-heat the cargo compartments by setting the target temperature recommended for the cargo with APU or ground cooling unit prior to loading cargo, and while loading cargo.
- Verify that moisture has been removed from the shipments during joint cargo status check with the Load Master.
- Before departure, all available packs should be running with aircraft doors closed for at least 20minutes to purge the cargo compartments of moisture.
- Additional Cargo Loading Restrictions : Refer to POM ch.9.

Note: *Perishable Cargo: Perishable cargos are those that, due to their nature, will spoil without proper care and handling, or if exposed to adverse temperature, humidity or other environmental conditions. This includes vegetables, dairy products, chilled meat, foodstuffs, seafood and flowers.*

Live Animals Transportation Procedure (In absence of the company provided specific guideline or NOTOC)

The following information provides guidelines for transporting live animal cargos on the B777F aircraft.

▶ Temperature Guidelines

☐ U[illegible] on the gr[illegible]

Type of Animals	Recommended Temperature
Cattle, Calves, Sheep, Horses, Pigs	10°C ~ 15°C
Dogs, Cats	18°C ~ 20°C
Chicken, Turkey, Ducks, other Birds	15°C ~ 20°C
Reptiles	26°C ~ 29°C
Live Tropical Fish	20°C

▶ Procedures

☐ Refer to POM ch.9.

☐ Use the following temperature guidelines for the purpose of pre-cooling or pre-heating the cargo compartments on the ground in absence of the company provided specific guideline or NOTOC.

Type of Perishables	Recommended Temperature
Apple, Vegetables (asparagus, broccoli, cabbage, etc.) Blueberry, Cheese, Cherry, Grapes and Meat (beef, pork, etc.)	4°C
Sea foods (fish (meat), clam, lobster (meat), salmon, shrimp,	4°C
Flowers (iris, lily, rose, turnip, etc.)	4°C
Avocado, Guava, Lemon, Lime, Olive, Orange	7°C~ 10°C
Pumpkin, Watermelon	10°C ~ 15°C

▶ Procedures

☐ Refer to POM ch.9.

Flight Standards Dept.

FREIGHTER SUPPLEMENT PROCEDURES

B777 FREIGHTER REFERENCE CARD

Air Conditioning System

Cargo Compartment Temperature Control Range and Air Supply

Compartment		Control Setting	Temp Range (°C)	Supply SYS	Source	Air Flow (ft³/min)
Main Deck (FWD/AFT)		C to W	4 to 27	Air Conditiong	Pack/Trim air	1500 ~ 2500
LWR	FWD	C to W	4 to 27	Air Conditiong	Pack/Trim air	1000 to 1200
		OFF [1] (6 o'clock)	No Temp Control[2]	Cargo Heat	E/E bay exhaust air	1300 to 1550
	AFT	C to W	4 to 27	Air Conditiong	Pack/Trim air	1000 to 1200
		OFF	N/A	N/A	N/A	N/A
		LOW	4 to 10	Cargo Heat	Bleed air	400
		HIGH	18 to 24			

Note: *1) The forward cargo heat system will operate under the normal operation whenever the Forward Cargo Air Conditioning (FCAC) system is selected OFF.*
2) The forward cargo heat system depends on the E/E Cooling exhaust air, thus the temperature in compartment will vary.

M/D FLOW Mode

When transporting **large volume of live animal/perishable cargo in main deck** or if the use of M/D High Flow Mode is **requested in NOTOC**:

- M/D FLOW Selector: HIGH

Main Deck and Lower Lobe Cargo Compartment Air Conditioning Flow Schedules

Operating Mode (In Cruise)		Lower Lobe Selection FWD	Lower Lobe Selection AFT	M/D Setting	Lower Cargo FWD (ft³/min)	Lower Cargo AFT (ft³/min)	Main Deck FWD (ft³/min)	Main Deck AFT (ft³/min)	Outside Air (Dilution)	Additional Fuel
RECIRC FANS ON	5	OFF	OFF	Normal	0	0	1581	1669	53%	0%
	6	ON	OFF		1130	0	1594	1570	64%	0.4%
	7	OFF	ON		0	1212	1683	1625		
	8	ON	ON		1170	1230	1545	1630	72%	0.8%
	9	ON	ON	High	1221	1218	2254	2130	60%	
	10	OFF	OFF		0	0	2484	2325	44%	0%
	11	ON	OFF		1145	0	2460	2295	55%	0.4%
	12	OFF	ON		0	1275	2460	2320		
RECIRC FANS OFF	13	ON	ON		468	468	2230	2229	100%	1.3%
	14	OFF	OFF		0	0	2361	2361		0.5%
	15	ON	OFF		671	0	2353	2352		0.9%
	16	OFF	ON		0	598	2390	2389		

Note 1: *Cargo Air Conditioning Flow Operating Mode Recommandation*
- Mode 5 ~ 9: For fuel burn reduction. e.g. carrying packages (cruise only)
- Mode 10 ~ 12: For carrying animal with low moisture generation & engines fuel burn reduction.
- Mode 13 ~ 16: For maximum cooling and moisture removal during flight. e.g. animal carriage.
Note 2: *When the aircraft is on the ground and APU provides airflow to Packs, use of Recirculation fans is recommended for maximum cooling and moisture removal e.g. animal carriage.*
Note 3: *Use of Aft cargo heat will cause the fuel flow penalty of 0.2%.7KH $306 GDWD LQ %777) 2SHUDWLRQDO)OLJKW 3ODQ(2)3) LQFOXGHV D IXHO IORZ SHQDOW\ (+0.2%) IRU WKH XVH RI $IW &DUJR +HDW.)*

Recommended Maximum Dry Ice

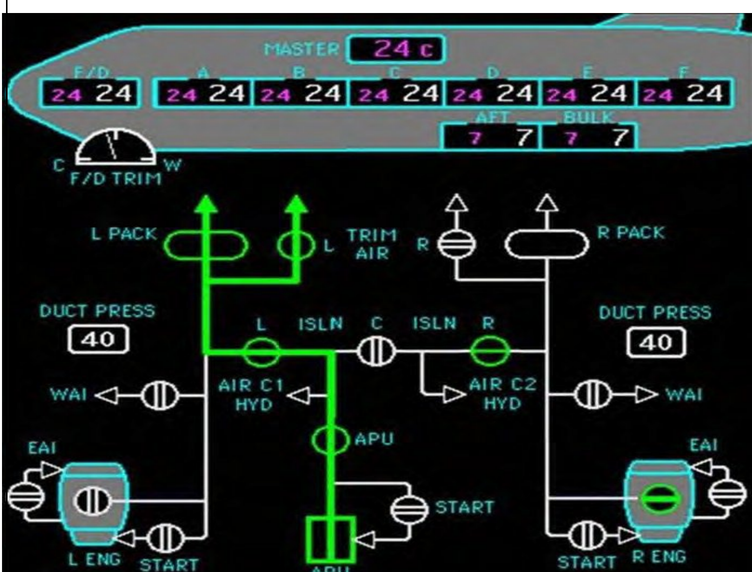
- Refer to POM ch. 9.

Maximum Dry Ice Load
1,300 kg (2,866 lbs) including Lower Lobe Cargo: 350 kg (762 lbs)

- Dry ice may be loaded in the Main Deck cargo compartment with live animals provided they are separated by a minimum of **3 m (1 position)**. For Lower Deck cargo compartments, dry ice and live animals shall not be loaded in the same compartment. However, an animal that is in a closed package (e.g. live fish etc.) may be loaded in the same compartment with dry ice.

Flight Standards Dept.

<table>
<tr><th>LINKED PAGE</th><th>REFERENCE</th></tr>
<tr><td>5.4.3</td><td>

VIDEO : Hydraulic Pressurization</td></tr>
<tr><td>6.2.2</td><td>

SYNOPTIC : APU TO PACK</td></tr>
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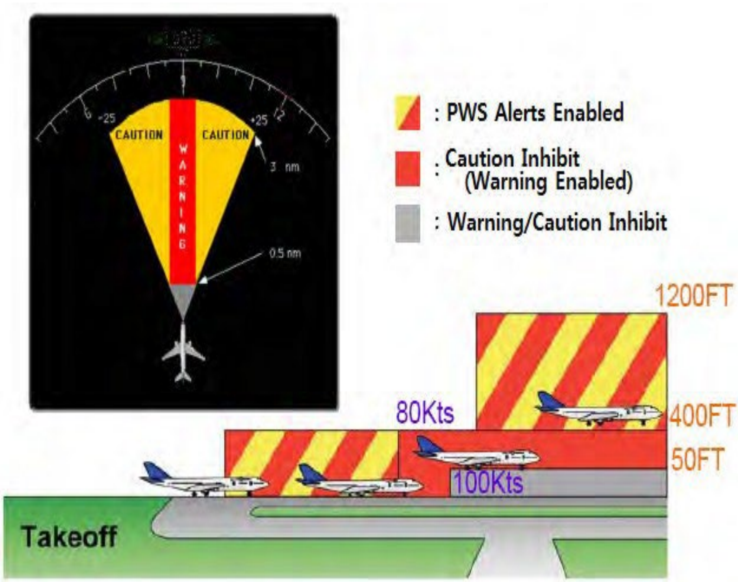

PWS LOGIC : T/O
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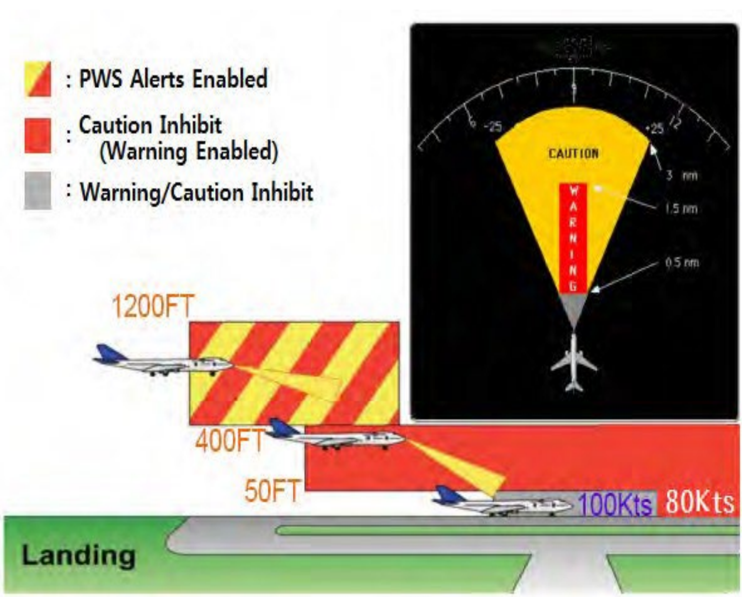

PWS LOGIC : LANDING
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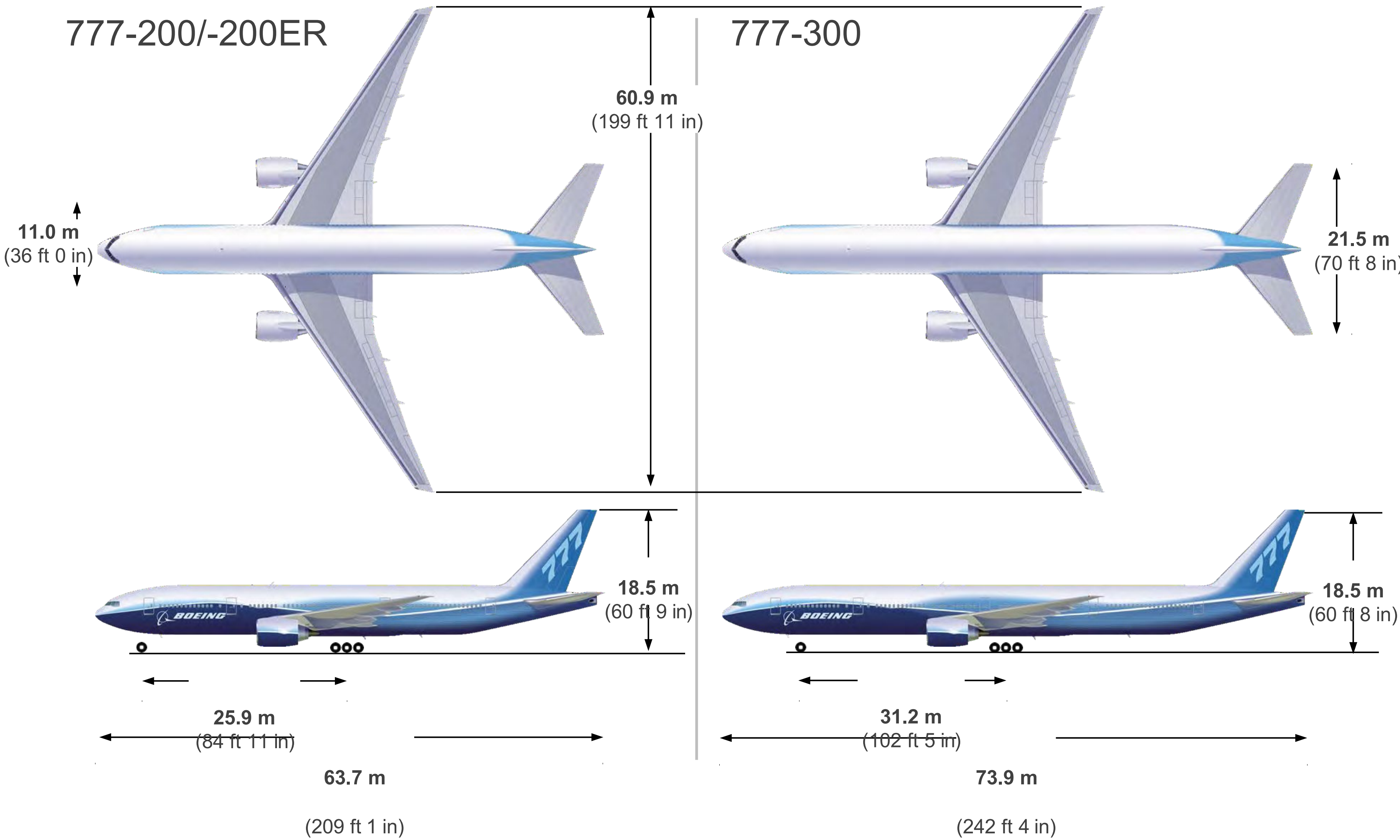
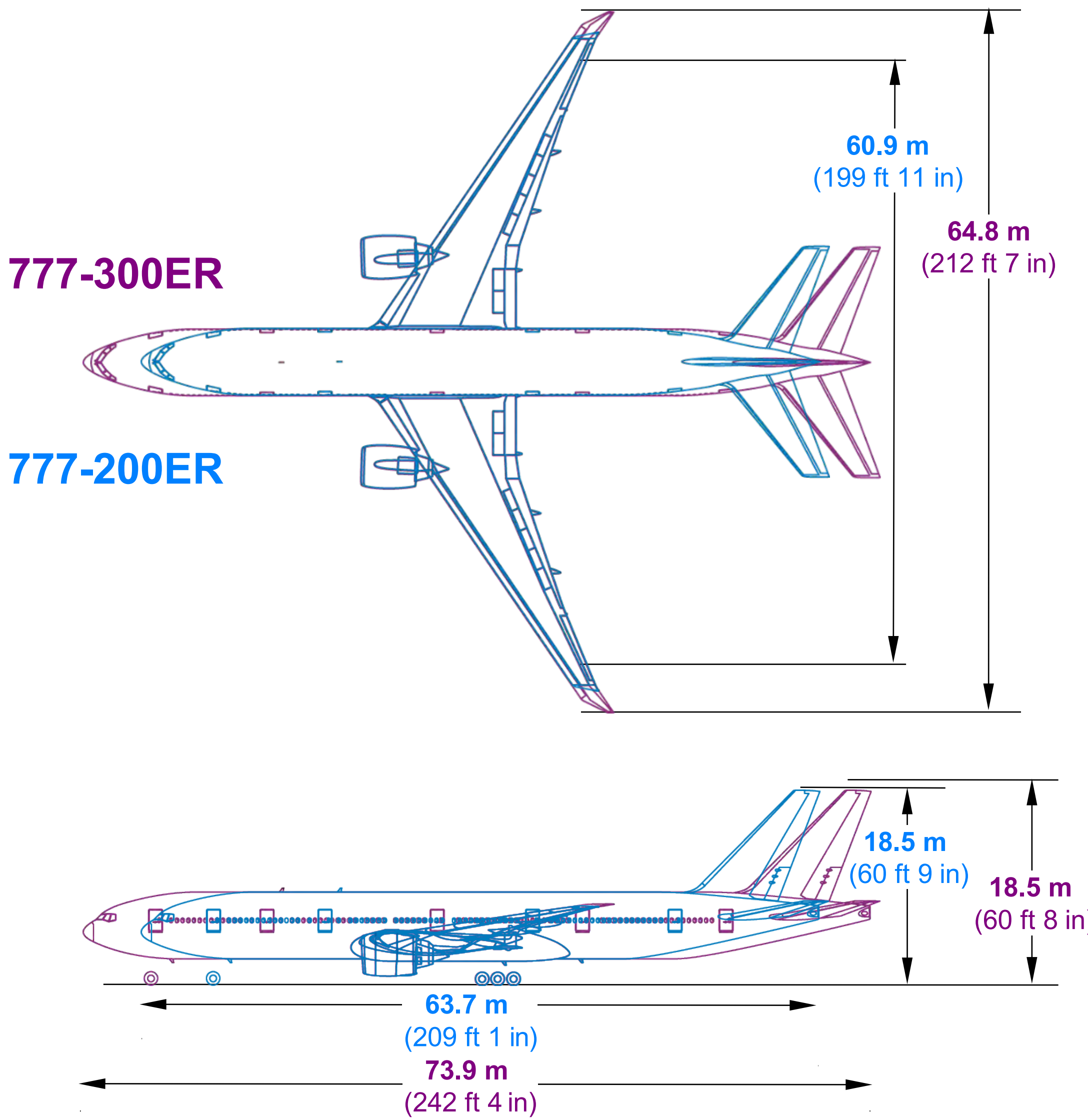
777-200, 777-200ER, and 777-300 general arrangement

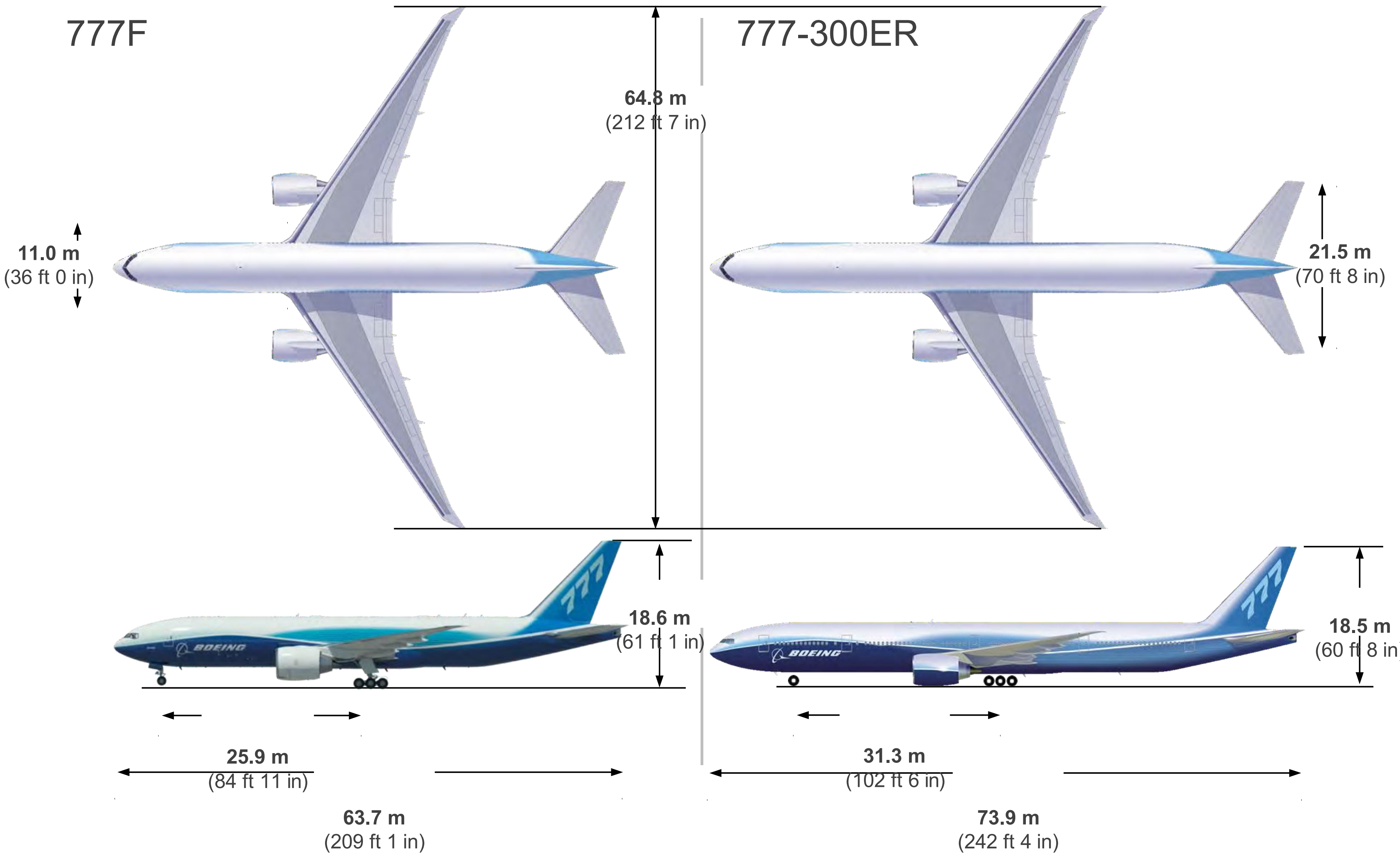


777-200ER and 777-300ER general arrangement

777-200ER versus 777-300ER



777F and 777-300ER general arrangement



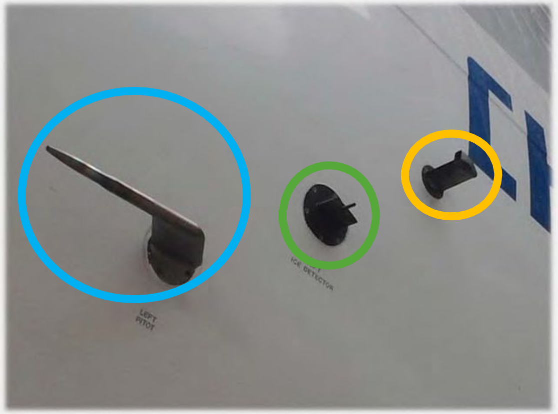
LEFT FORWARD FUSELAGE

LEFT FORWARD FUSELAGE

①

Probes, sensors, ports, vents, and drains
(as applicable) ....

Angle of Attack sensor ....
Clear and not damaged



TAT Probe, Ice detector ...
Clear and not damaged

Left Pitot Probe ...
Clear and not damaged, cover off

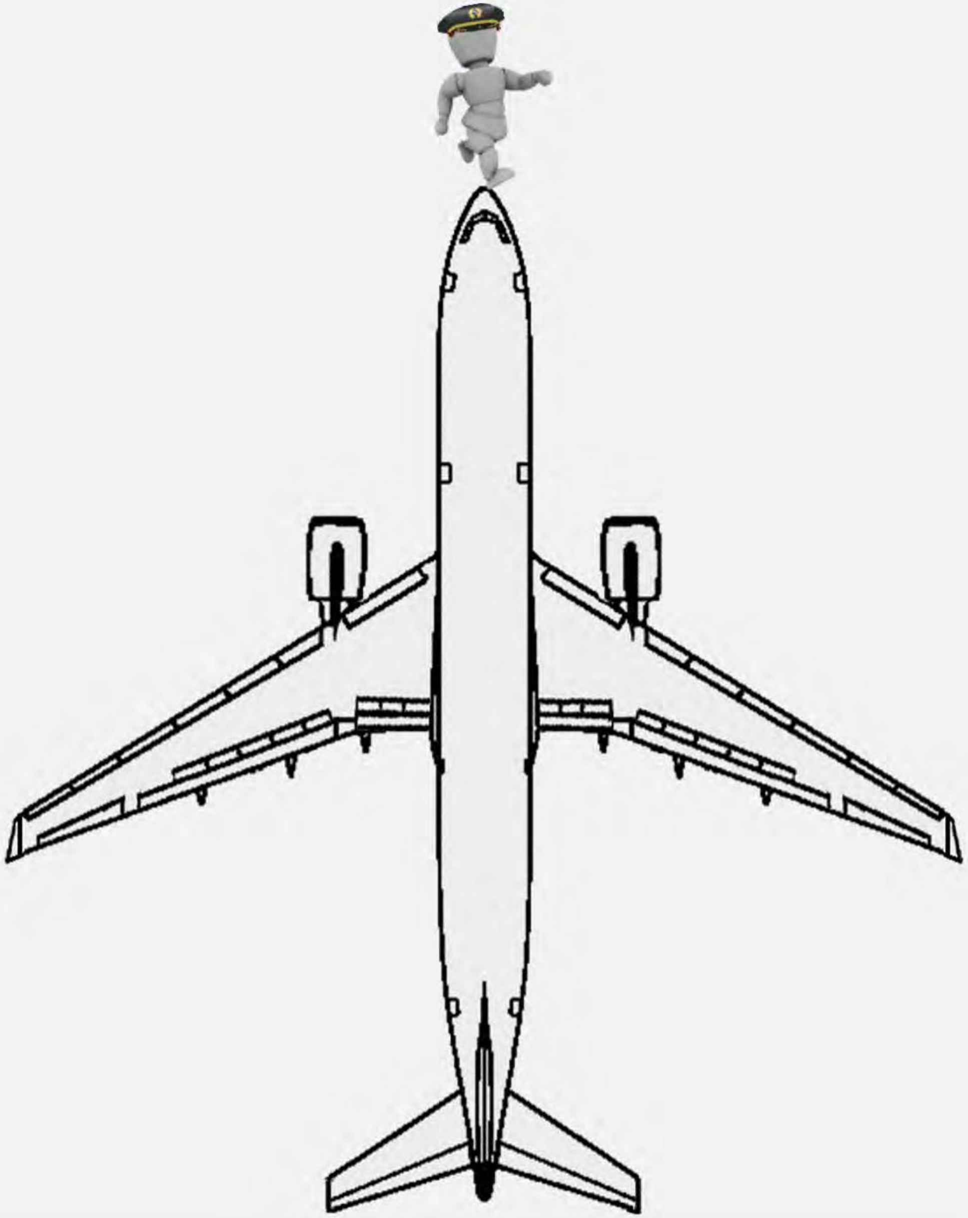
LEFT FORWARD FUSELAGE

Oxygen pressure relief green disc …
In place

Forward out flow valve …
On position, not blocked

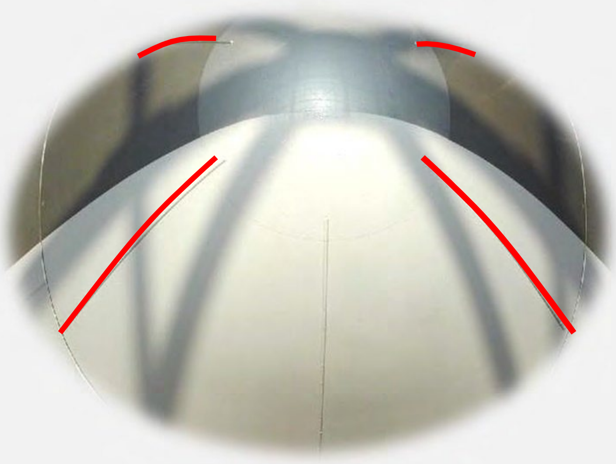
NOSE

②



NOSE

②

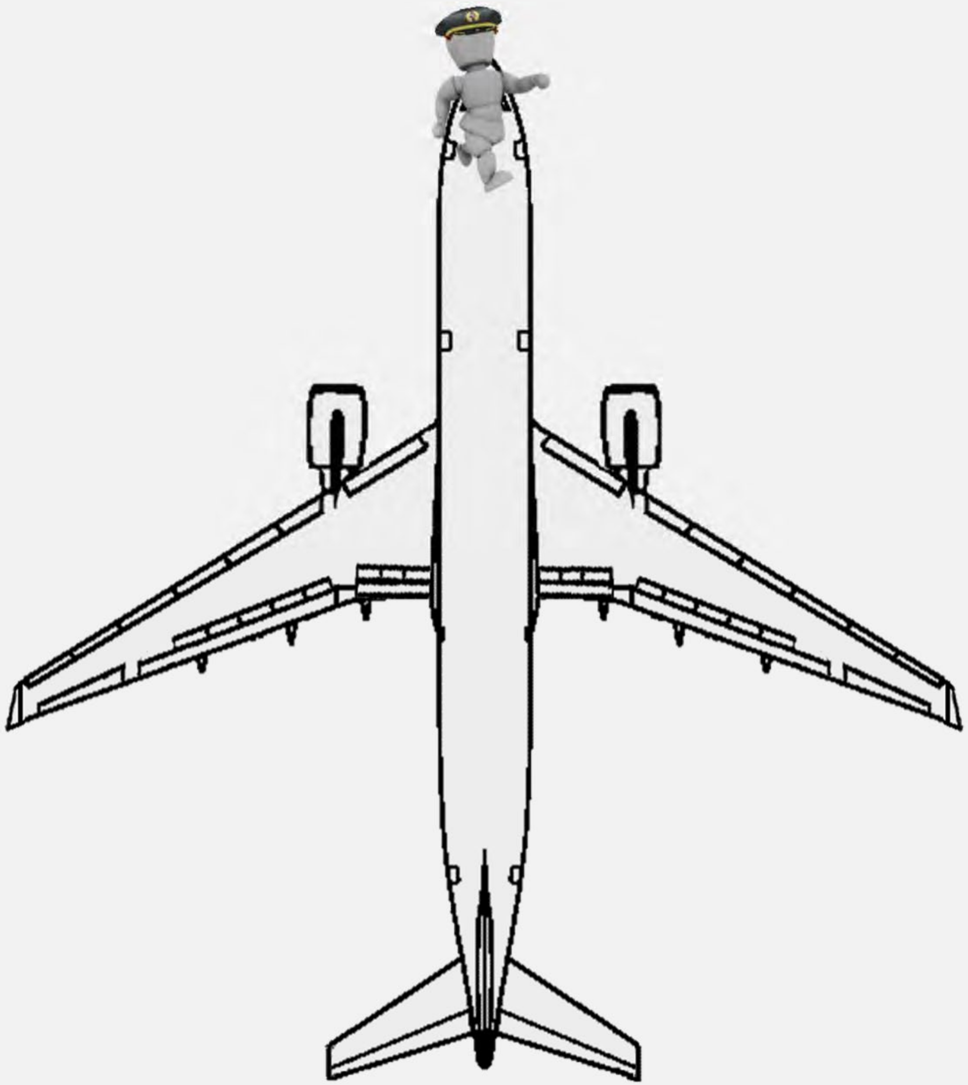


Diverter strips …… Secure ✓

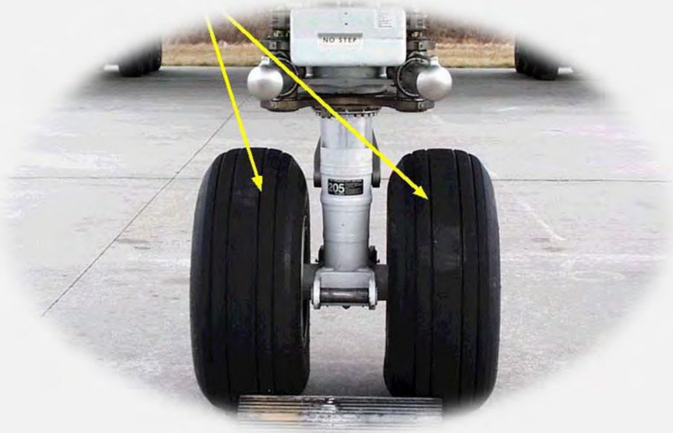
Forward access door……..Secure ✓

NOSE WHEEL WELL

③



NOSE WHEEL WELL



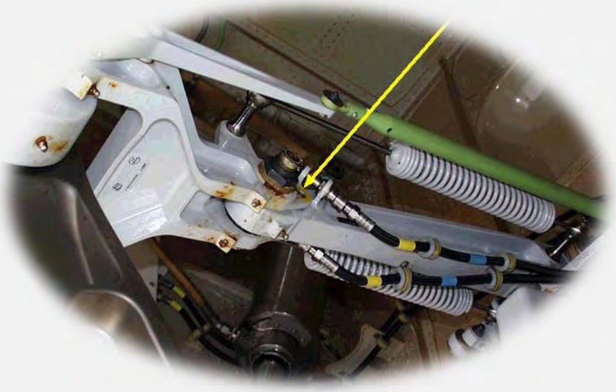
Tires and wheels ..... Not too worn, not damaged, no tread separation

Gear strut ..... Not fully compressed

Gear doors........Checked

Nose wheel steering assembly ..... Not damaged

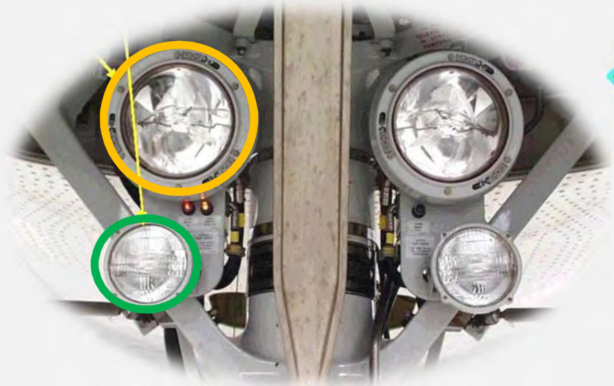
NOSE WHEEL WELL



Gear pin ..... As needed

Nose Gear towing lever ... Normal

Nose Gear towing lever pin ... Verify removed



Exterior lights ...... Clean and not damaged

Wheel well light switches ...... As needed

Forward E and E door........Secure

RIGHT FORWARD FUSELAGE

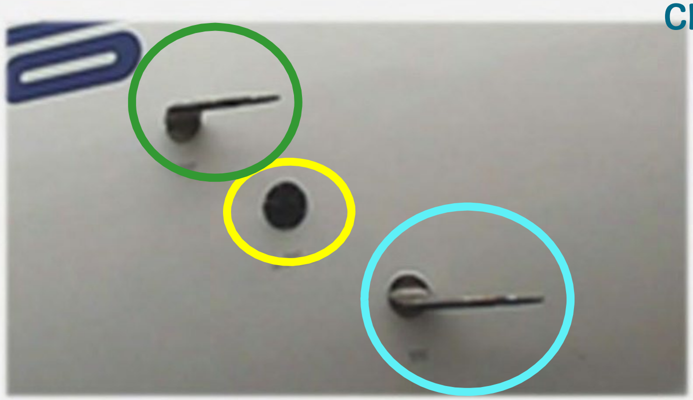
4

RIGHT FORWARD FUSELAGE

④

Probes, sensors, ports, vents, and drains (as applicable) ......

Angle Of Attack sensor ....
Clear and not damaged



Ice detector .... Clear and not damaged
Right and Center Pitot Probe ... Clear and not damaged, cover off ....

RIGHT FORWARD FUSELAGE

Doors and access panels (not in use) ..... Latched

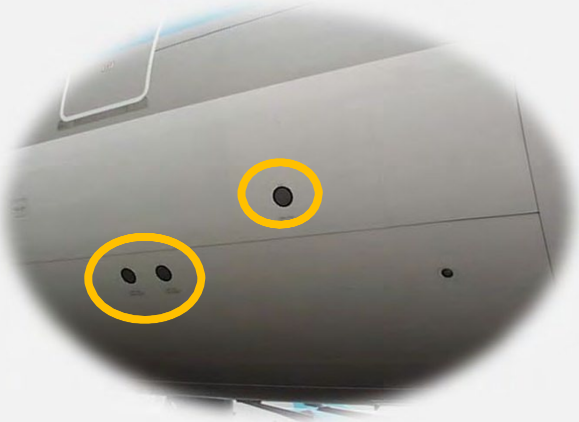
Negative pressure relief vents....... Closed

RIGHT WING ROOT, PACK, LOWER FUSELAGE

⑤

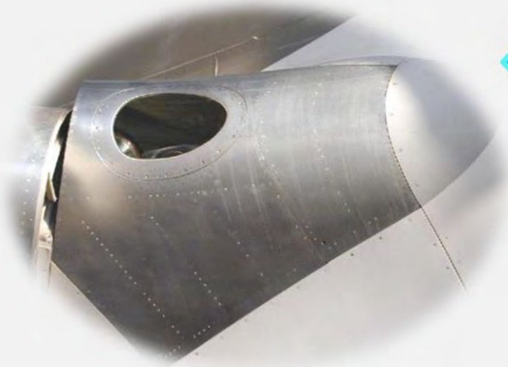
RIGHT WING ROOT, PACK, LOWER FUSELAGE

5



Probes, sensors, ports, vents, and drains (as applicable) ......

Exterior lights .....
Clean and not damaged

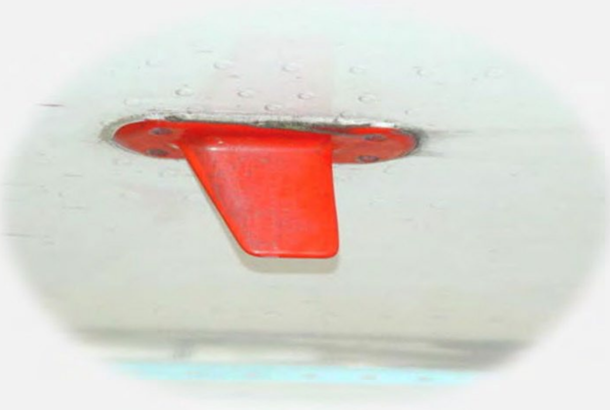


Landing, Runway turnoff light .....
Clean and not damaged

Radio Altimeter transmit/receiver antennas .....
Not damaged

RIGHT WING ROOT, PACK, LOWER FUSELAGE

5



DME antenna ..... Not damaged

Marker Beacon antenna ... Not damaged

TCAS Directional antenna .... Not damaged

RIGHT WING ROOT, PACK, LOWER FUSELAGE

⑤

Pack inlet and pneumatic access doors ..... Secure ✓

Leading edge flaps ..... Clear, not damaged, no missing parts, no fluid leaks ✓

RIGHT ENGINE

⑥

⑥

RIGHT ENGINE

Access panels ..... Latched

Probes, sensors, ports, vents, and drains (as applicable) ......

Fan blades, probes, and spinner ....
Clear, not damaged, no missing parts

RIGHT ENGINE

⑥

Thrust reverser .... Stowed ☑

Exhaust area and tailcone ......
Clear, not damaged, no missing parts ☑

6

RIGHT ENGINE

Engine core cowl ...... Latched

Engine cowl ...... Latched, Not Damaged

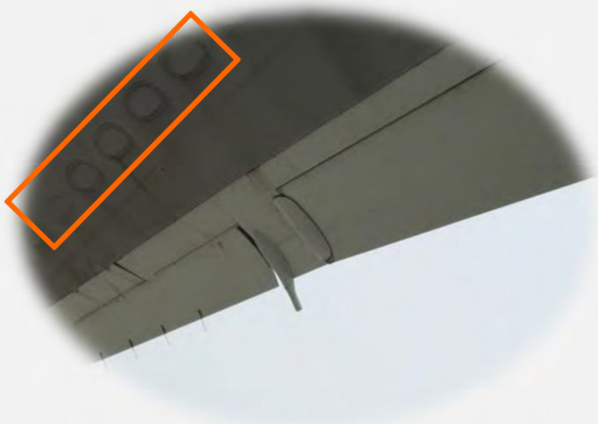
Engine core cowl ...... Not Latched

Engine cowl bottom .... Damaged

RIGHT WING AND LEADING EDGE

⑦

RIGHT WING AND LEADING EDGE



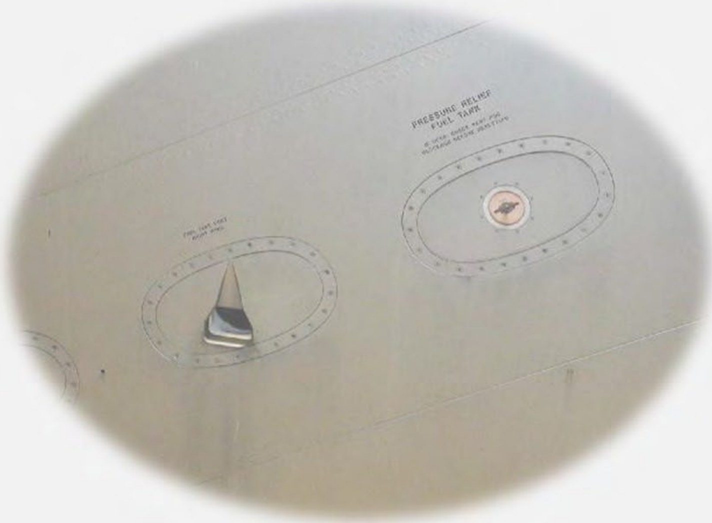
Access panels ...... Latched

Leading edge slats ....
Clear, not damaged, no missing parts

Fuel measuring sticks .... Flush and secure

RIGHT WING AND LEADING EDGE

Wing Surfaces ....
Clear, not damaged, no missing parts ✓



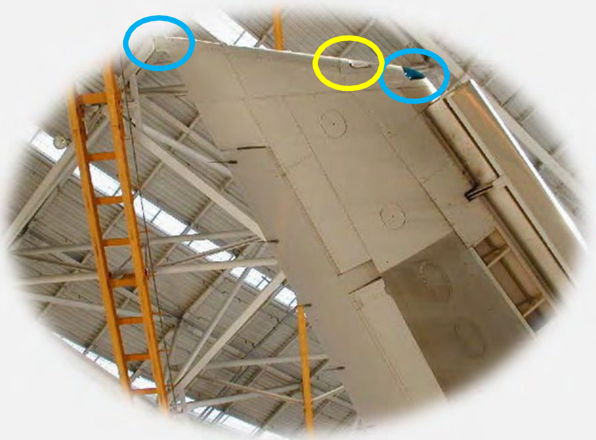
Fuel tank vent .... Not blocked ✓

8

RIGHT WING TIP AND TRAILING EDGE

8

RIGHT WING TIP AND TRAILING EDGE



Navigation and strobe lights ....
Clean and not damaged

Static discharge wicks ....
No missing parts and not damaged

Fuel jettison nozzle ......
Not damaged and not blocked

Aileron, flaperon, and trailing edge flaps ......
Clear, not damaged and no missing parts

9

RIGHT MAIN GEAR AND WHEEL WELL

9

RIGHT MAIN GEAR AND WHEEL WELL

Tires .... Not too worn, not damaged, no tread separation

Brakes ..... If the parking brake is set, the brake wear indicator pins must extend out of the guides

Gear strut ...... Not fully compressed

Wheels ..... Verify that the wheel chocks are in place as needed

9

RIGHT MAIN GEAR AND WHEEL WELL

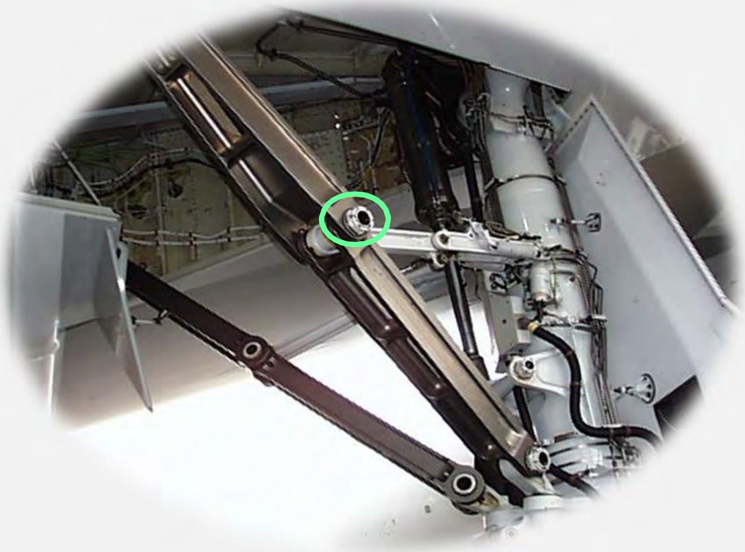
Actuators ...... Not damaged and no fluid leaks

Doors .... Not damaged

Hydraulic lines .... Secure and no fluid leaks

9

RIGHT MAIN GEAR AND WHEEL WELL



Gear pins .... As needed

Wheel well ....Clear, not damaged, no missing parts and no fluid leaks

RIGHT AFT FUSELAGE

⑩

RIGHT AFT FUSELAGE

10

Ram air turbine door .... Latched

Doors and access panels........Latched

Probes, sensors, ports, vents (as applicable) .....
Clear and not damaged

RIGHT AFT FUSELAGE

⑩

Drains (as applicable) ..... Clear and not damaged ☑

Oxygen pressure relief green disc (Freighter) ... In place ☑

TAIL

⑪

TAIL

Ver ical stabilizer and rudder ...... Clear, not damaged,
no missing parts and no fluid le ks

Tail skid (-300, -300ER) ....
On position and not damaged

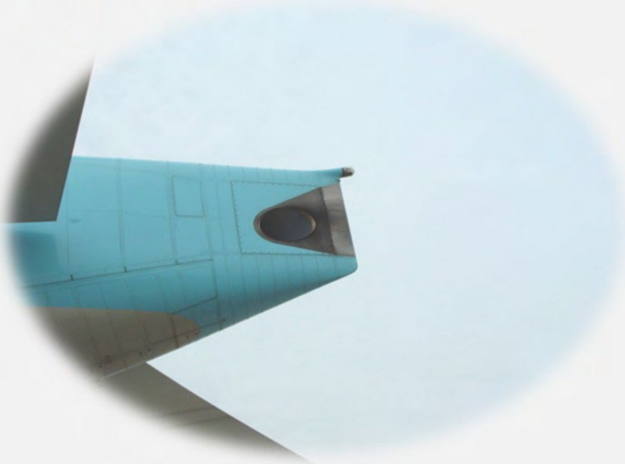
Horizontal stabilizer and elevator ....
Clear, not damaged, no missing parts and no fluid leaks

TAIL

⑪

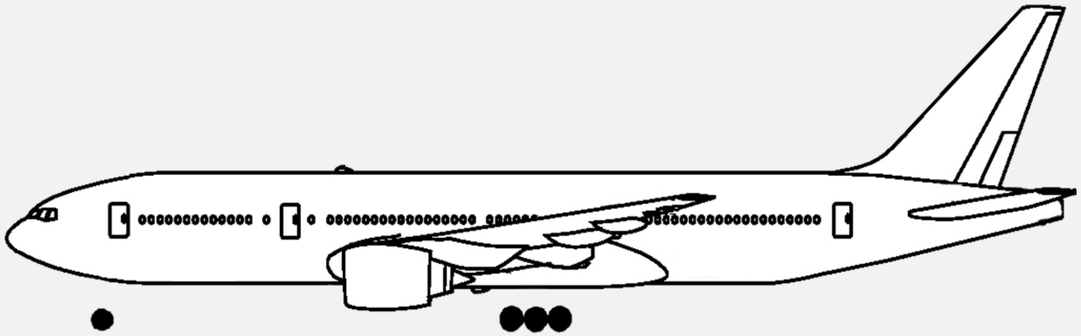
Static discharge wicks ....
No missing parts and not damaged ✓

Strobe light ...... Clean and not damaged ✓



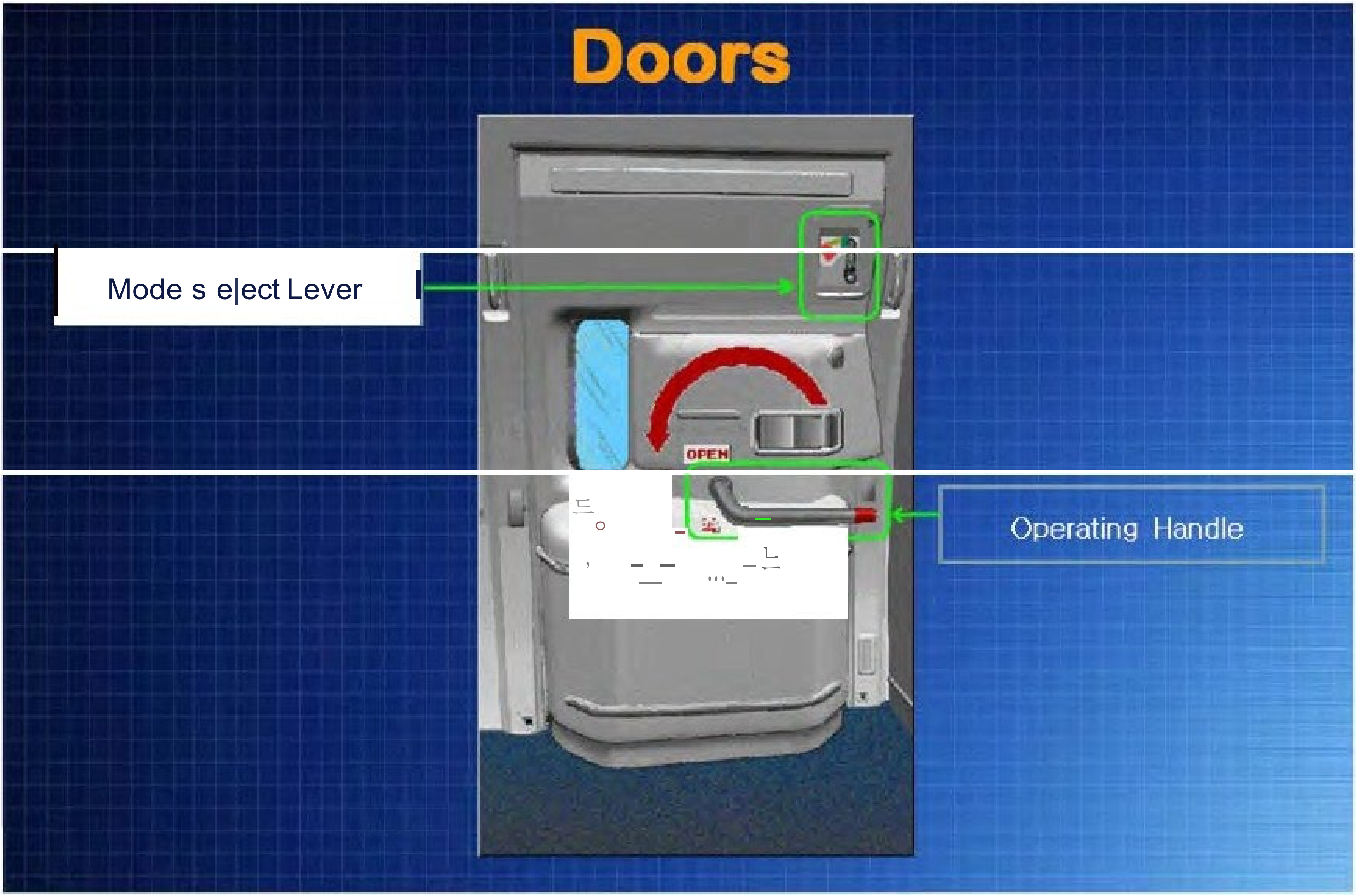
APU exhaust outlet .... Clear and not damaged ✓

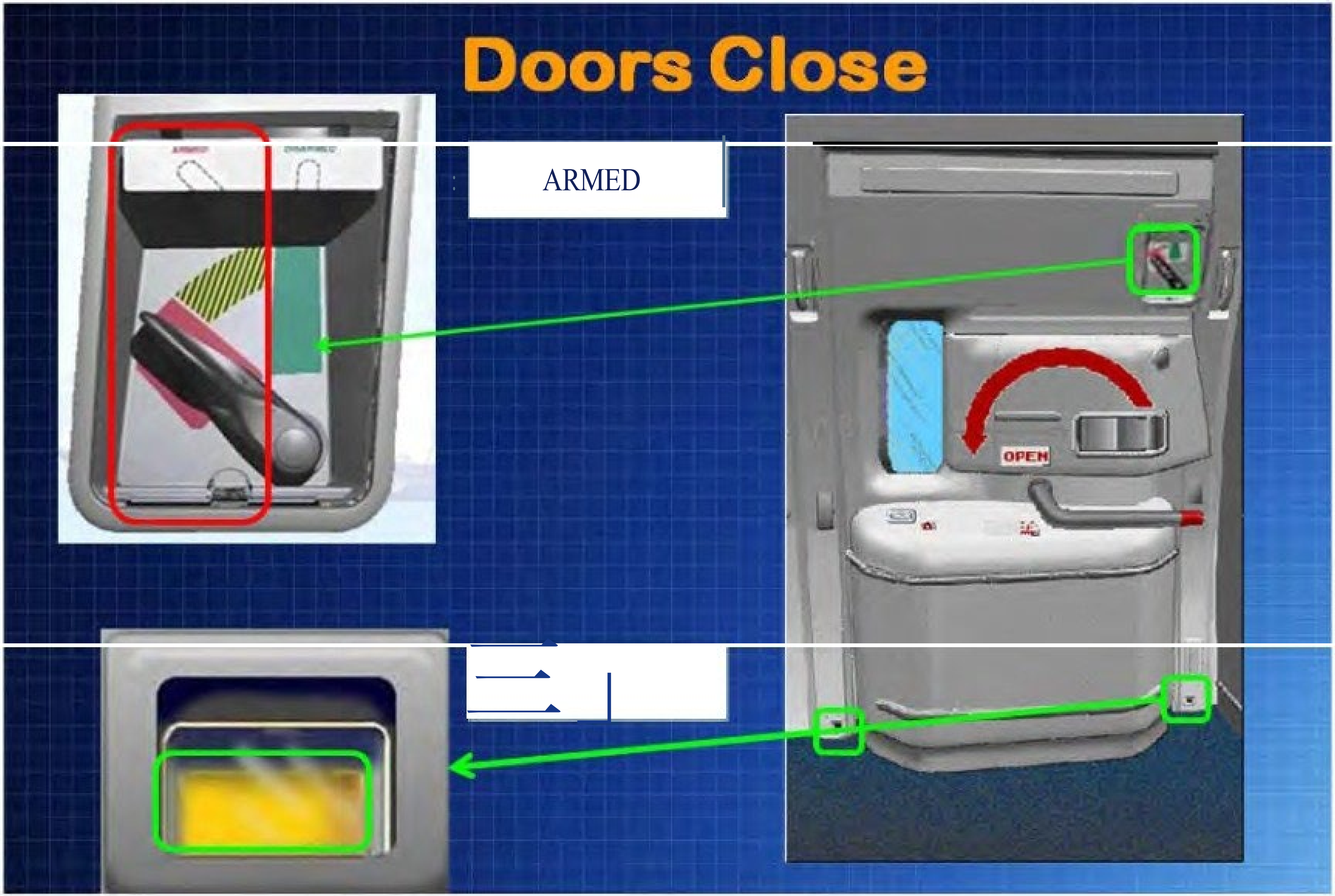
LEFT SIDE INSPECTION



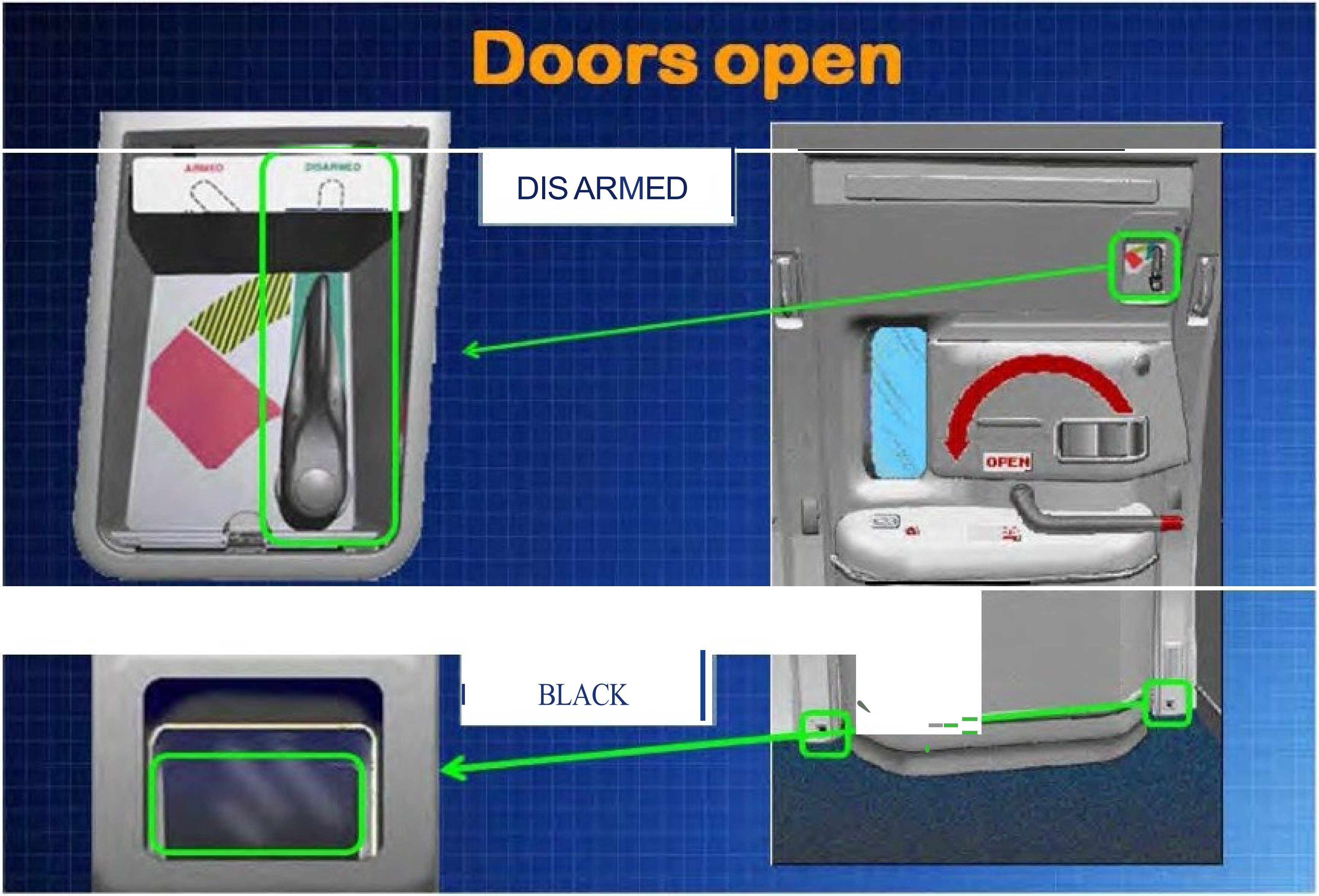
- Left wing root, pack and Lower fuselage
- Left engine
- Left wing and leading edge
- Left wing tip and Trailing edge
- Left main gear
- Left main wheel well
- Left aft fuselage

DOOR OPERATION1-3

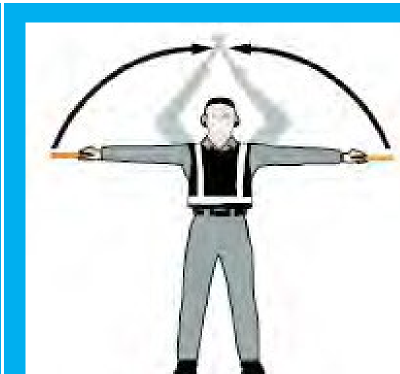



Doors Close
ARMED
OPEN

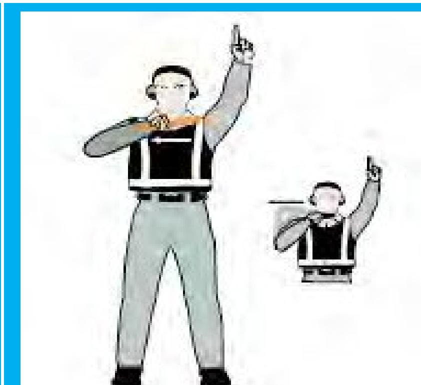
DOOR OPERATION 3-3



Marshaller hand signal (I)

Wingwalker/ guide	Identify gate	Proceed to next signalman or as directed by tower/ ground control	Straight ahead
			
Turn left (from pilot's point of view)	**Turn right** (from pilot's point of view)	**Normal stop**	**Emergency stop**
			

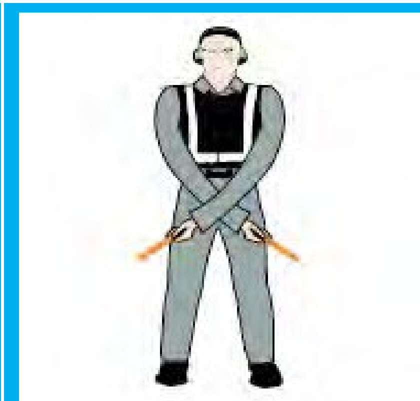
Marshaller hand signal (Ⅱ)

Set brakes	Release brakes	Chocks inserted	Chocks removed
			
Start engine(s)	**Cut engines**	**Slow down**	**Slow down engine(s) on indicated side**
			

Marshaller hand signal (Ⅲ)

Move back	Turns while backing (for tail to starboard)	Turns while backing (for tail to port)	Affirmative/ all clear
			
Hover	**Move upwards**	**Move downwards**	**Move horizontally left (from pilot's point of view)**
			

Marshaller hand signal (IV)

Move horizontally right (from pilot's point of view)	Land	Hold position/ stand by	Dispatch aircraft
			
Do not touch controls (technical/servicing communication signal)	Connect ground power (technical/servicing communication signal)	Disconnect power (technical/servicing communication signal)	Negative (technical/servicing communication signal)
			

Marshaller hand signal (V)

Establish communication via interphone (technical/servicing communication signal)	Open/close stairs (technical/servicing communication signal)Land	Recommend Evacuation	Recommended Stop
			
ALL Clear	Fire		
			

Tiller/Rudder Pedal Steering

The captain's and first officer's positions are equipped with a tiller steering control. The tiller is used to turn the nose wheels through the full range of travel at low taxi speeds. Maintain positive pressure on the tiller at all times during a turn to prevent the nose wheels from abruptly returning to center. Rudder pedal steering turns the nose wheels through a limited range of travel. Straight ahead steering and large radius turns may be accomplished with rudder pedal steering.

If nose wheel skidding or “scrubbing” occurs while turning, reduce steering angle and/or taxi speed. Avoid stopping the airplane in a turn as excessive thrust is required to start taxiing again.

Differential thrust may be required at high weights during tight turns. This should only be used as required to maintain the desired speed in the turn. After completing a turn, center the nose wheels and allow the airplane to roll straight ahead. This relieves stresses in the main and nose gear structure prior to stopping.

Main Gear Aft Axle Steering

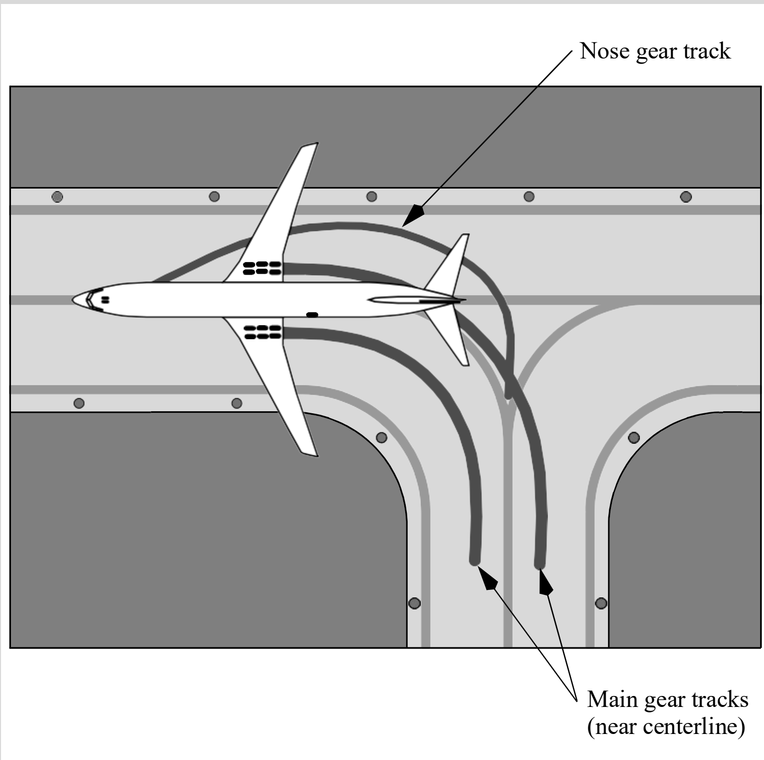
Main gear aft axle steering provides shorter turn radius, reduces thrust requirements for tight turns, and minimizes tire scrubbing. Main gear aft axle steering operation is especially important at heavy weights where stress may be applied to wheels and tires. Excessive tire scrubbing and tire slippage can result from taxiing under these conditions with main gear aft axle steering inoperative.

When lining up on the runway for takeoff, taxi forward on or near the runway centerline to ensure the main gear aft axle steering is locked. This prevents the takeoff configuration warning.

Turning Radius and Gear Tracking

During all turning maneuvers, crews should be aware of their position relative to the nose and main landing gear. The pilot seat position is forward of the nose wheels and main gear as indicated in the tables in this chapter.

As the following diagram illustrates, while the airplane is turning, the main gear tracks inside the nose gear. The smaller the radius of the turn, the greater the distance that the main gear tracks inside the nose gear and the greater the need to steer the nose gear outside of the taxi path (oversteer).



Visual Cues and Techniques for Turning while Taxiing

The following visual cues assume the pilot's seat is adjusted for optimum eye position. The following techniques also assume a typical taxiway width. Since there are many combinations of turn angles, taxiway widths, fillet sizes and taxiway surface conditions, pilot judgment must dictate the point of turn initiation and the amount of nose wheel tiller required for each turn. Except for turns less than approximately 30°, speed should be 10 knots or less prior to turn entry. For all turns, keep in mind the main gear are located behind the nose wheels, which causes them to track inside the nose wheels during turns. The pilot position forward of the nose wheels and main gear is depicted in the table below.

Model	Pilot Seat Position (forward of nose gear) feet (meters)	Pilot Seat Position (forward of main gear) feet (meters)
777 - 200	12 (3.7)	97 (29.6)
777 - 200LR	12 (3.7)	97 (29.6)
777 - F	12 (3.7)	97 (29.6)
777 - 300	12 (3.7)	114 (34.8)
777 - 300ER	12 (3.7)	114 (34.8)

Turns less than 90 degrees

During the turn, steer the nose wheels far enough beyond the centerline of the turn to keep the main gear close to the centerline.

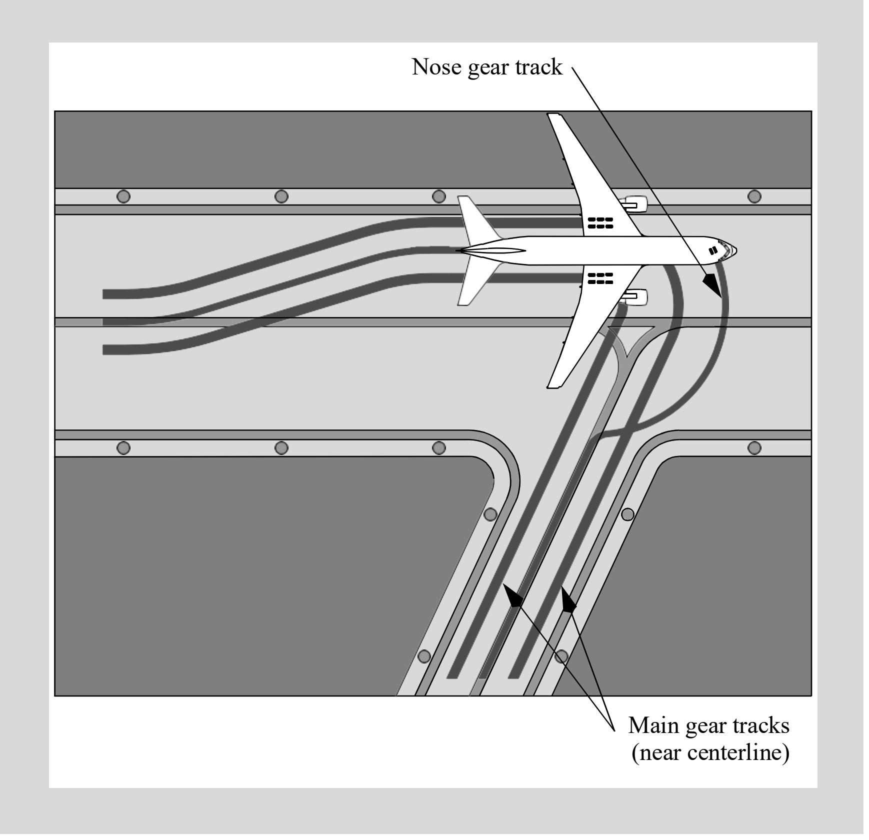
Turns of 90 degrees or more

Initiate the turn as the intersecting taxiway centerline (or intended exit point) approaches the aft edge of the number 2 window. Initially use approximately full nose wheel steering tiller displacement. Adjust the tiller input as the airplane turns to keep the nose wheels outside of the taxiway centerline, near the outside radius of the turn. Nearing turn completion, when the main gear are clear of the inside radius, gradually release the tiller input as the airplane lines up with the intersecting taxiway centerline or intended taxi path.

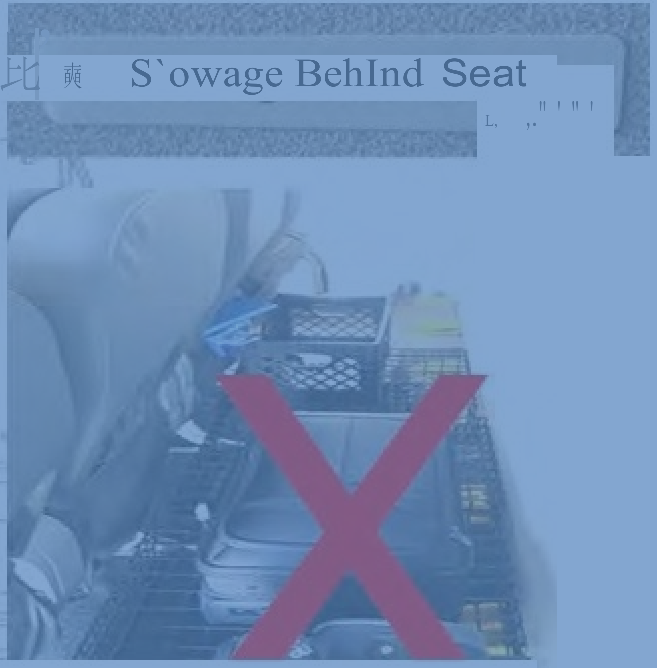
Sharp Turns to a Narrow Taxiway

When making a sharp turn from a runway or a wide taxiway to a very narrow taxiway, consider displacing the aircraft to the far side of the runway or taxiway before initiating the turn. This allows more room for the inboard gear to stay on the taxi surface during the turn, and ensures a more accurate centerline alignment entering the narrow taxiway.

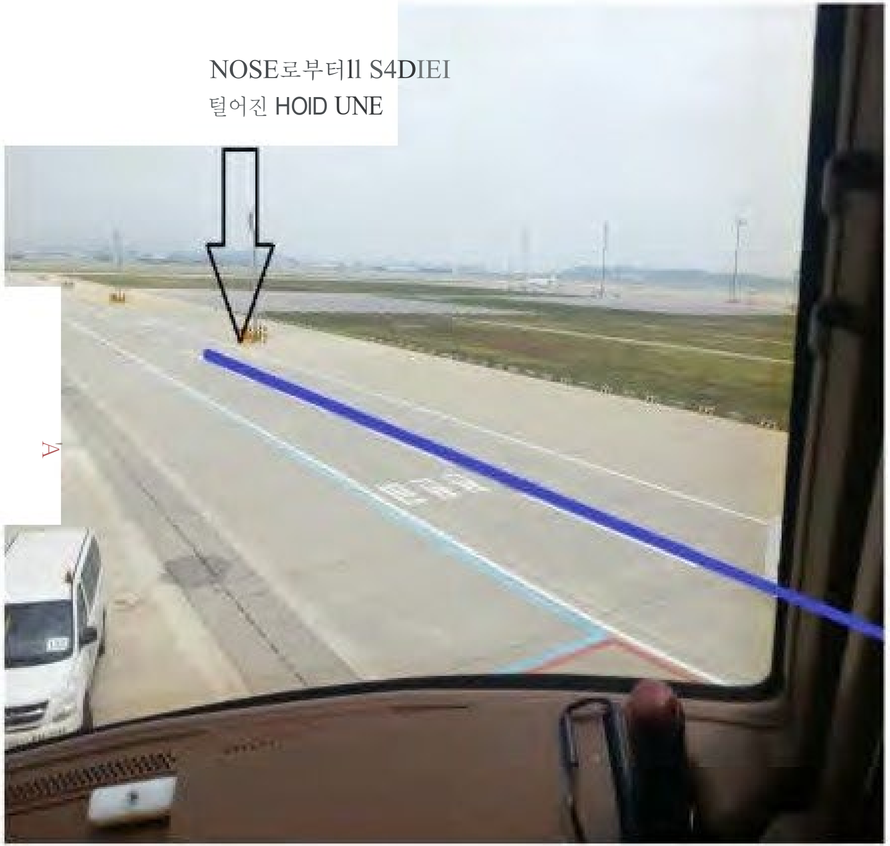
Note: Be aware of wing clearance, engine clearance, and the possibility of FOD ingestion on the side of the airplane that may be displaced over an unpaved surface.



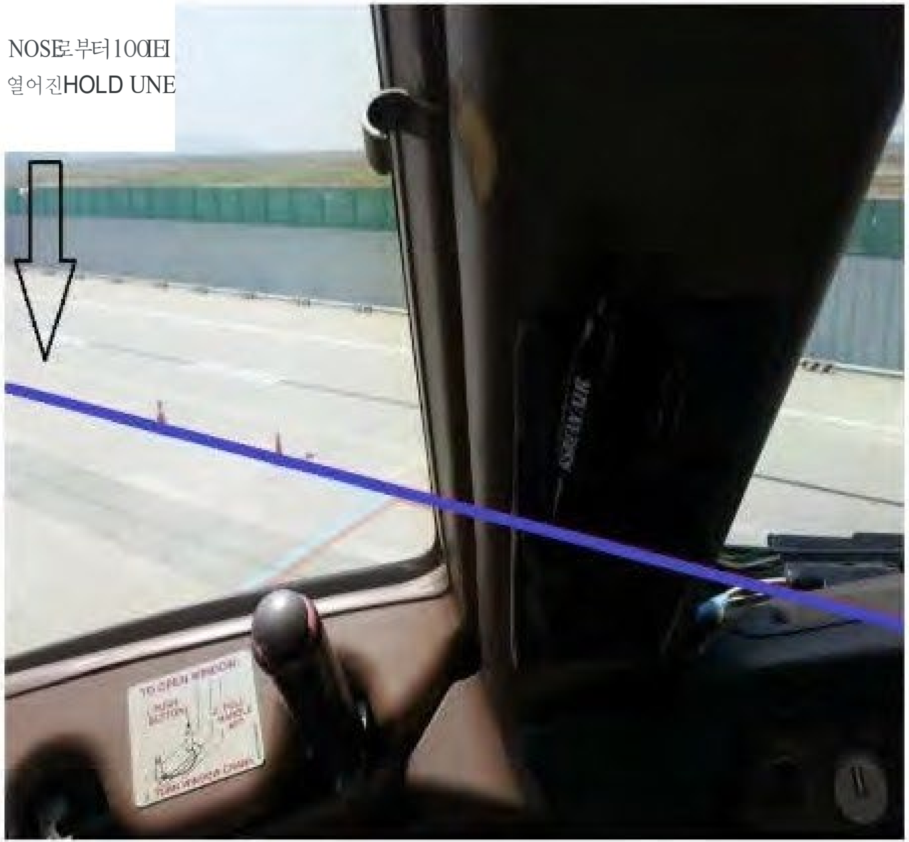
■ Sample of Placard



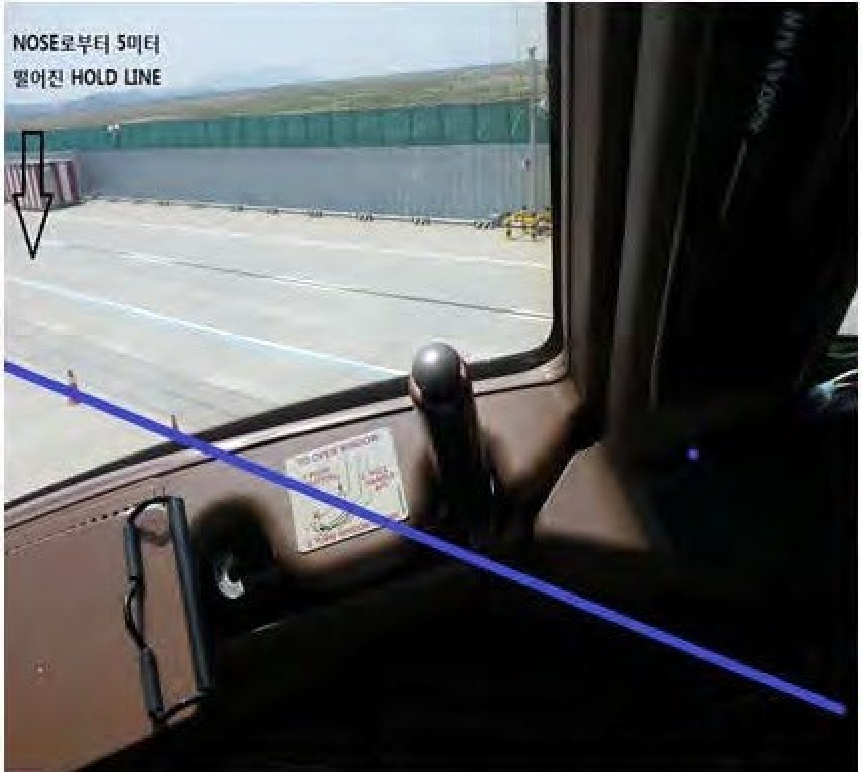
■ Cockpit View Reference: 12.54 M from hold line to Nose



■ Cockpit View Reference: 10 M from hold line to Nose

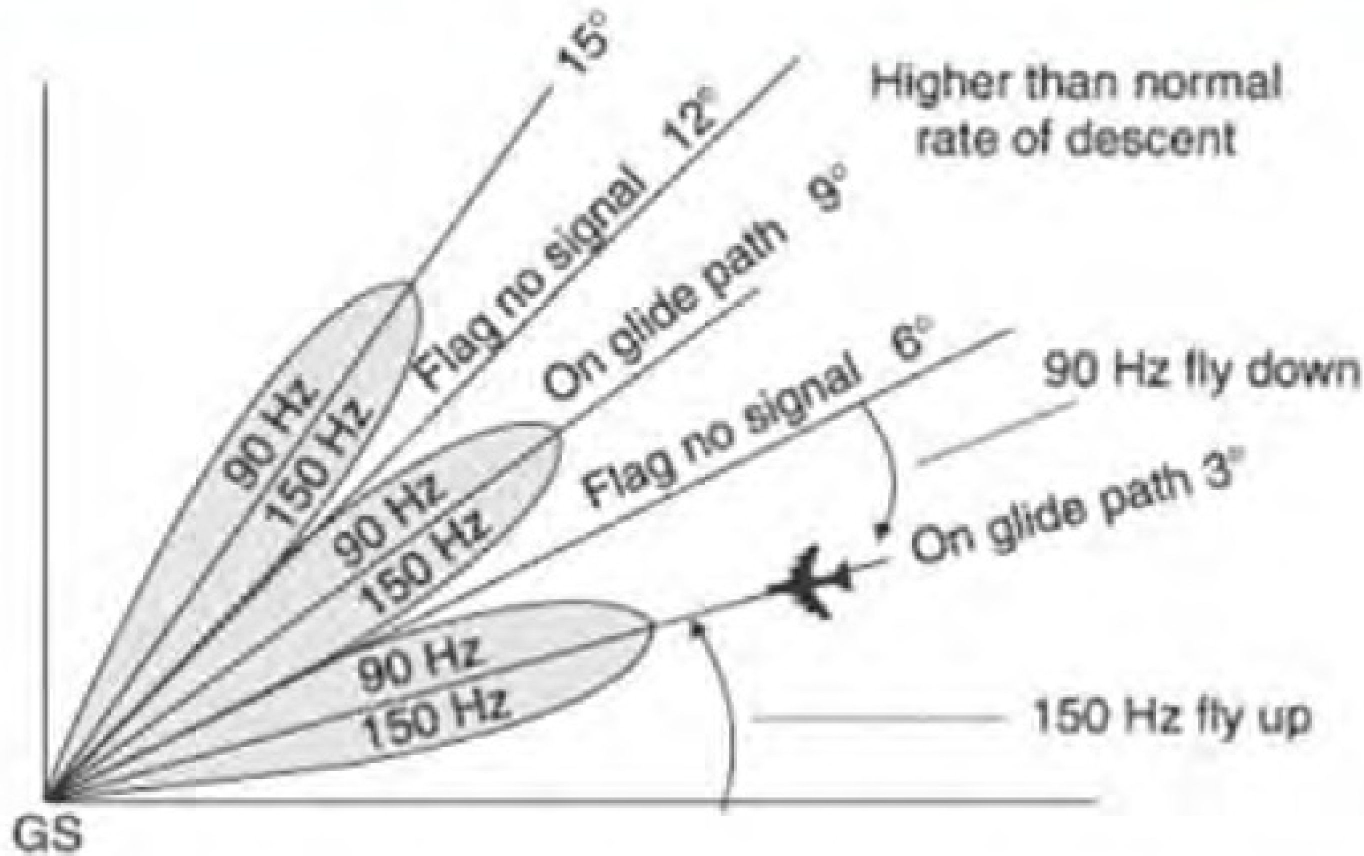


■ Cockpit View Reference: 5 M from hold line to Nose



- Since the cockpit visual references above are the standards when eye reference is set up correctly, there might be differences depending on individual seat adjustment and seating posture of each pilot.
- Any part of the aircraft shall not cross the hold line marking when a holding short clearance has been given.

FALSE GLIDE-SLOPE



- A pilot can easily recognize this false indication by the steeper-than-normal rate of descent.
- Pilots will not experience false glide-slopes below the true glide-slope angle.

Entry Door Mode Select Levers ......Confirm CAP & DISARMED F/0

After visual confirmation by PIC,
set the Door Mode Select Levers to
DISARMED position by First Officer.

When using VNAV, if altitude constraints are closely spaced to the extent that crew workload is adversely affected and unwanted level-offs are a concern, the alternate MCP altitude setting technique can be used with operator approval. Refer to Chapter 1, MCP Altitude Setting Techniques Using VNAV for more information on this subject.

Note: When the alternate MCP altitude setting technique using VNAV is used, the selection of a pitch mode other than VNAV SPD for climbs results in a risk of violating altitude constraints.

For climbs in pitch modes other than VNAV SPD, set the MCP altitude to the next altitude constraint or the clearance altitude, whichever is lower. For altitude constraints that are "at or above" set the clearance altitude.

When relieved of constraints by ATC, use of FLCH or VNAV with MCP altitude intervention is recommended in congested areas, or during times of high workload. Altitude intervention is accomplished by selecting the next desired altitude in the MCP altitude window, pushing the MCP altitude selector which deletes the altitude constraint and allows the airplane to climb to the MCP altitude.

Low Altitude Level Off

Occasionally a low altitude climb restriction is required after takeoff. This altitude restriction should be set in the MCP altitude window. When the airplane approaches this altitude, the mode annunciation changes to ALT or VNAV ALT and the airplane levels off. The autothrottle SPD mode engages and controls to the target speed. If altitude capture occurs while still in the TO/GA pitch mode, confirm the SPD autothrottle mode engages and set the desired command speed at level off.

High Takeoff Thrust - Low Gross Weight

When accomplishing a low altitude level off following a takeoff using high takeoff thrust and at a low gross weight, the crew should consider the following factors:

- altitude capture can occur just after liftoff due to the proximity of the level off altitude and the high climb rate of the airplane
- the AFDS control laws limit F/D and autopilot pitch commands for passenger comfort
- there may not be enough altitude below the intended level off altitude to complete the normal capture profile and an overshoot may occur unless crew action is taken.

To prevent an altitude and/or airspeed overshoot, the crew should consider doing one or more of the following:

- use reduced thrust for takeoff at low weights whenever possible
- reduce from takeoff to climb thrust earlier than normal

- disengage the AFDS and complete the level off manually if there is a possibility of an overshoot
- use manual thrust control as needed to manage speed and prevent flap overspeeds.

Transition to Climb

Maintain flaps up maneuver speed until clear of obstacles or above minimum crossing altitudes. If there are no altitude or airspeed restrictions, accelerate to the desired climb speed schedule. The sooner the airplane can be accelerated to the climb speed schedule, the more time and fuel efficient the flight.

Climb Speed Determination

Enroute climb speed is automatically computed by the FMC and displayed on the climb and progress pages. It is also displayed as command speed when VNAV is engaged. Below the speed transition altitude the FMC targets the transition speed limit stored in the navigation database for the departure airport (250 knots below 10,000 feet MSL in FAA airspace), or flaps up maneuver speed, whichever is higher. The FMC applies waypoint-related speed restrictions displayed on the LEGS pages, and altitude-related speed restrictions displayed on the CLB page.

The FMC provides optimum climb speed modes for economy (ECON) operation and engine out (ENG OUT) operation. These optimum speeds can be changed before or during the climb. Reference speeds are also provided for maximum angle climb (MAX ANGLE) operation.

The ECON climb speed is a constant speed/constant Mach schedule optimized to obtain the minimum airplane operating cost. The constant Mach value is set equal to the economy cruise Mach calculated for the cruise altitude entered in the FMC.

For very low cruise altitudes the economy climb speed is increased above normal values to match the economy cruise speed at the entered cruise altitude. For ECON climb, the speed is a function of predicted gross weight at top of climb, predicted wind at top of climb, predicted temperature deviation from ISA at top of climb, and cost index entered into FMC.

Engine Icing During Climb

Engine icing may form when not expected and may occur when there is no evidence of icing on the windshield or other parts of the airplane. Once ice starts to form, accumulation can build very rapidly. Although one bank of clouds may not cause icing, another bank, which is similar, may cause icing.

Note: The engine anti-icing system should be AUTO or ON whenever icing conditions exist or are anticipated. Failure to follow the recommended anti-ice procedures can result in engine stall, overtemperature or engine damage.


ACT RTE 1
1/6
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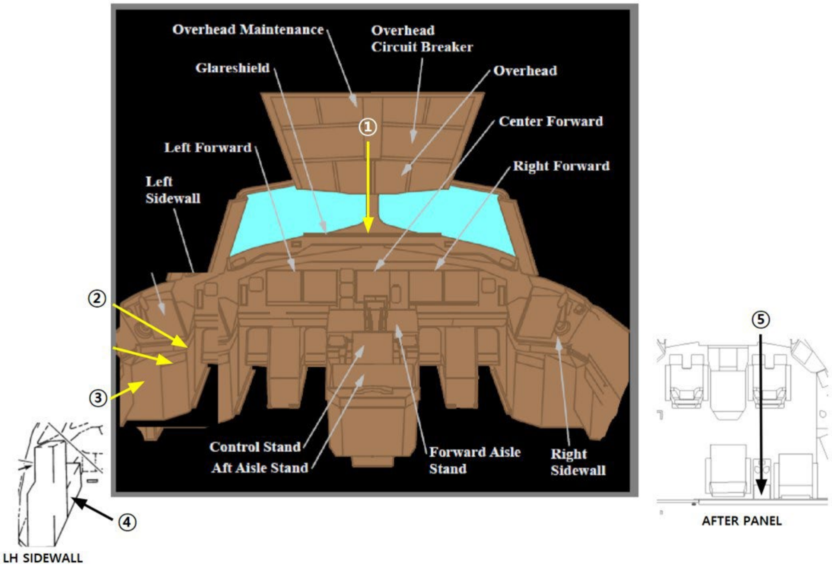
Locations for each Publication of B777

GENERAL INFORMATION

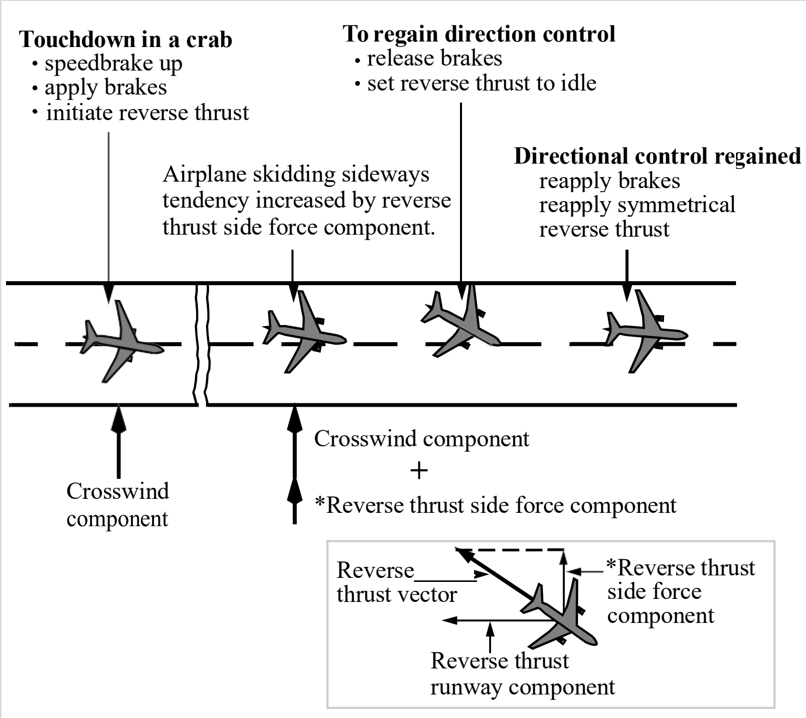
- After using any manual or document, please put it back to the designated location.
- For any inquiries about damage, missing, or quality of the publication material, please contact:
  - Flight Operations Technical Support.
  - TEL: ICN / (+82)-32-744-2767



LOCATIONS OF ALL PUBLICATIONS AND CHECKLISTS ONBOARD

Location	Name of Publication	Note
①	Freighter Reference Card	Freighter Only
	Freighter Cabin Occupant Briefing Instruction	Freighter Only
② (both side)	Crew Briefing, Reference Items	
③ (both side)	QRH	
⑤	Air Operator Certificate	Binder (Operational Documents on Onboard)
	Emergency Response Guidance for Aircraft Incidents Involving Dangerous Good	
④	MEL/CDL	

Reverse Thrust and Crosswind (All Engines)



This figure shows a directional control problem during a landing rollout on a slippery runway with a crosswind. As the airplane starts to weathervane into the wind, the reverse thrust side force component adds to the crosswind component and drifts the airplane to the downwind side of the runway. Also, high braking forces reduce the capability of the tires to corner.

To correct back to the centerline, release the brakes and reduce reverse thrust to reverse idle. Releasing the brakes increases the tire-cornering capability and contributes to maintaining or regaining directional control. Setting reverse idle reduces the reverse thrust side force component without the requirement to go through a full reverser actuation cycle. Use rudder pedal steering and differential braking as required, to prevent over correcting past the runway centerline. When directional control is regained and the airplane is correcting toward the runway centerline, apply maximum braking and symmetrical reverse thrust to stop the airplane.

Note: Use of this technique increases the required landing distance.