This FOEI is prepared by Flight Operations Engineering

B777

FOEI

(Flight Operations Engineering Information)

ASIANA AIRLINES

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ASIANA AIRLINES	PRELIMINARY PAGES
B777 FOEI	*RECORD OF REVISION*

In charge of	Flight Operations Engineering	Registration	Classification No.	Not applicable
Authority	GM, Flight Operations Engineering		Date	15 NOV 2024
Effective Date	27 NOV 2024	Declaration Date		15 NOV 2024

REV No.	Date	Contents of the Change
Rev.0	15 NOV 2024	Entire Revision for the same POM format - Changed numbering - Changed to categorize the information

INTRODUCTION

GENERAL

The Flight Operations Engineering Information (FOEI) has been prepared by Flight Operations Engineering Team.

The FOEI is based on the Boeing's and Airbus's performance philosophy.

The purpose of the FOEI is to:

- Supplement the Airplane Flight Manual (AFM, Airplane Manual), FCOM (Flight Crew Operations Manual), Quick Reference Handbook (QRH), Flight Planning and Performance Manual (FPPM), Performance Engineers Program (PEP) or equivalent
- Provide flight crew and flight dispatcher with the necessary information/ data for the aircraft performance

EFFECTIVENESS

The Flight Operations Engineering Information (FOEI) should be regarded as a reference and a training materials.

In the event of any conflict between data presented in the FOEI and those contained in the following Documents, the latter shall always take precedence.

- Airplane Flight Manual (AFM, Airplane Manual)
- Flight Crew Operations Manual (FCOM)
- Quick Reference Handbook (QRH)
- Flight Crew Training Manual (FCTM) or equivalent
- Flight Planning and Performance Manual (FPPM) – Boeing Aircraft
- Flight Operations Manual (FOM) or equivalent
- Pilot Operations Manual (POM) or equivalent

APPROVAL

This FOEI is published under the approval of the General Manager of Flight Operations Engineering Team.

DUTY

The General Manager of Flight Operations Engineering Team is responsible for keeping the FOEI up to date with amendment as necessary. This FOEI will be managed in the EFB (if applicable) and E-Doc.

OTHERS

If you have any inquiries or comments for contents of the Flight Operations Engineering Information, contact "Flight Operations Engineering Team".

The end of section

PROPER TAKEOFF SPEEDS

FMC OR QRH (OR PERFORMANCE DISPATCH IN FCOM)

- Speed which is connected with Weight (not connected with Runway length).
- Speed on which Balanced Field Length based.

Note) Balanced Field Length: Accelerate-Go distance equals Accelerate-Stop distance at the one engine inoperative takeoff.

TAKEOFF ANALYSIS CHARTS

Speed which Airport Characteristics are calculated. [Takeoff weight, EPR (Pressure Altitude & OAT), Runway Slope, Clearway/ Stopway].

Note) Flight crew may use one of 3 methods mentioned above at his/ her own convenience.

SAMPLE TAKEOFF ANALYSIS CHART FOR Q & A

PW4090 LB-C UNIT, ZERO WIND CONDITION

TAKEOFF EPR	OAT DEG C	CLIMB LIMIT	** FWV WEIGHT	05L V1	VR	** V2
1.26	62A	435600	437800*	131	132	136
1.27	60A	446400	448900*	132	134	138
1.28	58A	457200	459900*	134	136	140
1.30	56A	468200	471300*	135	137	141
1.31	54	480700	484100*	137	139	143
1.32	52	494800	498600*	138	141	145
1.34	50	508700	512800*	140	143	147
1.35	48	524000	528400*	141	145	150
1.37	46	538500	543200*	143	147	152
1.38	44	552100	557000*	144	148	154
1.40	42	565500	567700*	146	150	155
1.41	40	578300	577700*	147	152	157
1.43	38	592300	587200*	147	153	158
1.45	36	604700	595500*	148	154	160
1.47	34	614600	602400*	149	154	161
1.49	32	623300	608400*	149	155	161

Q1) Takeoff speeds (OAT: 32°C, Actual Takeoff Weight: 608,400 lb, No Assumed Temperature selected)

A1) 149 / 155 / 161 (using Takeoff Analysis Chart)

Q2) Takeoff speeds (OAT: 32°C, Actual Takeoff Weight: 468,200 lb, selecting 56°C as Assumed Temperature: Maximum Assumed Temperature)

A2) 135 / 137 / 141 (using Takeoff Analysis Chart)

Q3) Takeoff speeds (OAT: 32°C, Actual Takeoff Weight: 468,200 lb, selecting 50°C as Assumed Temperature: Below Maximum Assumed Temperature)

A3) Flight crew can obtain the proper takeoff speeds from the FMC (or Performance Dispatch in FCOM) at 468,200 lb combined with 50°C.

The end of section

REDUCED THRUST TAKEOFF

GENERAL

- The term “Reduced Thrust” implies any Takeoff/ Climb using less than the maximum thrust.
- The procedure is to reduce engine wear associated with maximum thrust operation.
- There are 3 different ways to achieve “Reduced Takeoff Thrust”.
  - ✓ Derates (TO1, TO2)
  - ✓ Assumed Temperature Method (ATM)
  - ✓ Derates + Assumed Temperature method combined

DERATES (TO1, TO2) PROCEDURE

- Derated takeoff is similar to having a different engine with a lower thrust rating.
- The reduced thrust method with assumed temperature is the same as using a lower power setting on the same engine. Therefore, you can use derated takeoff thrust with an Assumed Temperature.
- Performance adjustments are provided for Derates 1 (TO1) and Derate 2 (TO2) operation.
- In both cases the thrust setting parameter (N1) is considered as a limitation for takeoff.
- Therefore, throttles should not be advanced further, except in an emergency.

Note)

1. ***Emergency would be defined as a situation where the pilot believes a life threatening situation.***
2. ***Derated Takeoff Thrust can be used under wet or contaminated runway conditions.***
3. ***When using Derated Thrust, the pilot is authorized to reduce the thrust further by using the Assumed Temperature method.***

4. Derated Takeoff Thrust is prohibited when a Derated Takeoff Thrust page in the Takeoff Analysis Chart is not available for the runway in use.

ASSUMED TEMPERATURE METHOD (ATM)

- There is no takeoff restriction on a wet runway using the reduced thrust with Assumed Temperature (ATM).
- The lower of the two parameters from “RUNWAY” limited and “CLIMB” limited weight is the Assumed Temperature upon which reduced takeoff thrust may be based.
- Select a desired assumed temperature greater than actual ambient temperature.

SPEED SELECTION FOR TAKEOFF ANALYSIS CHART

- From a chosen Assumed Temperature, move along the same line to the T/O Weight and record the T/O Speeds.
- If the actual T/O weight is lower than the weight for the Maximum Authorized Assumed Temperature, find the speeds from QRH or FMC.

ASSUMED TEMPERATURE FOR TAKEOFF IS PROHIBITED IF ANY OF THE FOLLOWING CONDITIONS EXIST

- Takeoff runway is contaminated with standing water, ice, slush or snow
- Anti-skid inoperative
- Reported or anticipated windshear
- Takeoff Analysis Chart is not available
- Alternate EEC Mode Operation
- MEL/CDL states “Reduced thrust takeoff using the assumed temperature method is not permitted”.

Note)

1. The maximum thrust reduction authorized by the FAA is 25% below any certified rating (MAX, TO1, TO2).

2. *If an Assumed Temperature that is too high is entered in the FMC, it will automatically limit the Assumed Temperature Reduced Thrust to 25% limit.*

3. *If a temperature beyond the limit of the data base is selected the unit will display "INVALID ENTRY".*

The end of section

ATM WITH PERFORMANCE ADJUSTMENTS

INITIAL CONDITIONS

- OAT = 20°C
- Actual Takeoff Weight = 550,000 lb
- Allowable Max Assumed Temperature = 48°C (Refer to takeoff chart sample below)

TAKEOFF EPR	OAT DEG C	CLIMB LIMIT	RWY/OBSTACLE LIMIT	V1	VR	V2
1.35	48	550000	550000F			
1.36	46	560000	560000F			
1.37	44	570000	570000F			
1.4	42	590000	590000F			

- Current Allowable Maximum Assumed Temperature @550,000 lb = 48°C

PERFORMANCE ADJUSTMENT CONDITIONS

With MEL performance penalty

- Decrease 20,000 lb for climb limit.
- Decrease 10,000 lb for runway/obstacle limit should be applied.

DETERMINATION PROCEDURES FOR New ATM

Step 1

To obtain a new climb limit weight, “Add 20,000 lb to the actual takeoff weight”: 550,000 + 20,000 = 570,000 lb

Step 2

Read maximum allowable Assumed Temperature for the new climb limit weight in the takeoff chart: 44°C

Step 3

To obtain a new Runway/Obstacle limit weight, “Add 10,000 lb to the actual takeoff weight”: 550,000 + 10,000 = 560,000 lb

Step 4

Read maximum allowable Assumed Temperature for the new Runway/ Obstacle limit weight in the takeoff chart: 46°C

Step 5

- Between Step 2 and Step 4, the lower is the new max Assumed Temperature: 44°C

TAKEOFF EPR	OAT DEG C	CLIMB LIMIT	RWY/OBSTACLE LIMIT	V1	VR	V2
1.35	48	550000	550000F			
1.36	46	560000	560000F			
1.37	44	570000	570000F			
1.4	42	590000	590000F			

- New Allowable Max Assumed Temperature @550,000 lb with Performance Adjustment = 44°C

The end of section

DETERMINATION OF PACKS-OFF TAKEOFF PERFORMANCE

BACKGROUND INFORMATION

PACKS-OFF TAKEOFF ANALYSIS CHARTS are generally provided only if the following conditions exist;

- Packs-on takeoff performance limit weight is not greater than Maximum Takeoff Weight under conditions of Maximum Thrust, OAT 30°C
- Maximum payload operation is not expected. However, in case of some MEL items, performance penalty for packs-off is much lower than that for packs-on. Which means higher performance penalty should be applied when packs-off takeoff analysis chart is not available. Therefore, this engineering information presents the method to calculate packs-off performance from the packs-on takeoff analysis charts so that the lower performance penalty may be applied.

HOW TO DETERMINE PACKS-OFF TAKEOFF PERFORMANCE

Step 1

Find the climb limit weight and field/obstacle limit weight for OAT in the packs-on takeoff chart.

Step 2

Adjust packs-on limit weights as described in the table below.

Limiting Factor	Weight Increment (lb)
Climb Limit	+4,410
Field/ Obstacle Limit	+1,500

Step 3

The lower of the adjusted limit weights from step 2 is the packs-off performance limit weight.

EXAMPLE

[Packs-on takeoff chart sample]

OAT DEG C	CLIMB LIMIT	RWY/OBSTACLE LIMIT	V1	VR	V2
32	621300	624600*			
30	623400	627500F			

- PACKS-OFF PERFORMANCE @ 30°C

Step 1. Find the limits weights

- Climb limit = 623,400 lb
- Field/Obstacle limit = 627,500 lb

Step 2. Adjust weights

- Climb limit = 623,400 lb + 4,410 lb = 627,810 lb
- Field/Obstacle limit = 627,500 lb + 1,500 lb = 629,000 lb

Step 3. Select the lower from Step 2

- Packs-off Performance Limit Weight = 627,810 lb

The end of section

PERFORMANCE LIMITED WEIGHT

GENERAL

Maximum Performance Limited Takeoff Weight

Maximum performance limited takeoff weight is the least of the filed length, climb requirements, obstacle clearance, tire speed and brake energy limit weight.

Note) DO NOT exceed maximum structural/ certified takeoff weight.

Maximum Performance Limited Landing Weight

Maximum performance limited landing weight is the smaller of the field length limit weight and climb requirements limit weight (approach climb, landing climb).

Note) DO NOT exceed maximum structural/ certified landing weight.

CASE STUDY

It is important for the crew to understand the basic principles of “Performance Limited Weight” and “AGTOW (Allowable Gross Takeoff Weight)”.

Refer to the following case studies.

[SAMPLE: TAKEOFF ANALYSIS CHART]

OAT	CLIMB	** RUNWAY 16R **			
DEG C	LIMIT	WEIGHT	V1	VR	V2
30	659100	651200*	159	166	171

Case Study 1

Step 1 Performance Limited Takeoff Weight: 651,200 lb (Minimum of 659,100 and 651,200 lb)
Step 2 Compare Maximum Takeoff Weight: 632,500 lb

Step 3 Compare MLDW + TIF, MZFW + TOF
- ✓ 615,000 lb (460,000 + 155,000)
- ✓ 620,000 lb (430,000 + 190,000)

Step 4 Least of Step 1, 2 and 3: 615,000 lb (AGTOW)

Note)

1. ***MLDW is the less weight of structural/ certified landing weight and performance limited landing weight.***

2. ***Takeoff Weight might be limited by en-route climb limited weight.***

Case Study 2

[Example: MEL 36-11-5]

Reduce performance limited weights by the appropriate adjustments;
- ✓ Takeoff: 6,100 lb
- ✓ Landing: 6,100 lb
- ✓ En-route Climb: 7,200 lb

Step 1a Performance Limited Takeoff Weight: 651,200 lb (Minimum of 659,100 and 651,200)
Step 1b NEW Performance Limited Takeoff Weight: 645,100 lb (651,200 – 6,100)

Step 2 Compare Maximum Takeoff Weight: 632,500 lb

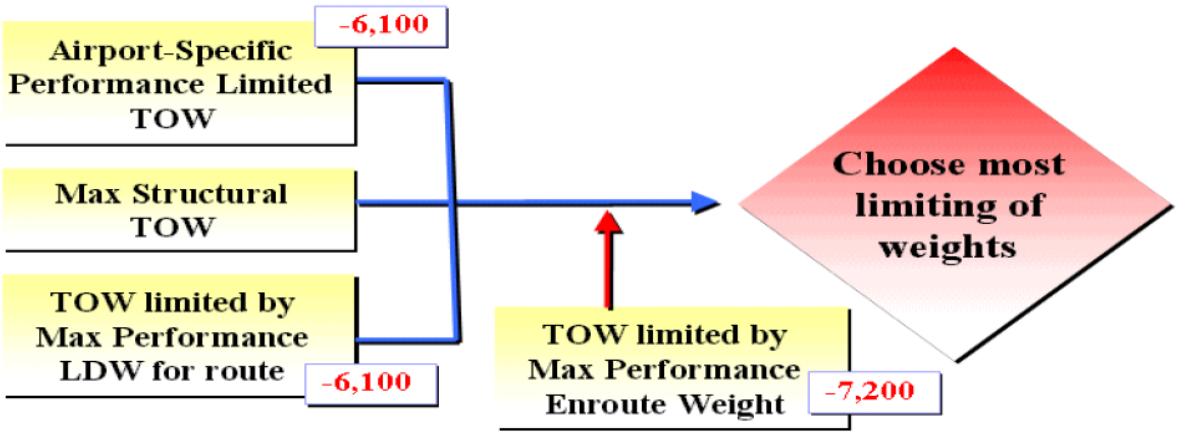
Step 3 Compare MLDW + TIF, MZFW + TOF
- ✓ 615,000 lb (460,000 + 155,000)
- ✓ 620,000 lb (430,000 + 190,000)

Step 4 Least of Step 1b, 2 and 3: 615,000 lb (AGTOW)

Note)

1. ***MLDW is the less weight of structural/ certified landing weight and performance limited landing weight. NEW performance limited landing weight should be calculated by reducing 6,100 pounds.***

2. ***Takeoff Weight might be limited by en-route Climb Limited Weight. NEW performance en-route climb limited weight is calculated by reducing 7,200 pounds.***



Case Study 3

[Example: MEL 29-11-3]

Reduce performance limited weights by the appropriate adjustments;

- ✓ Takeoff Runway/ Obstacle: 9,600 lb
- ✓ Takeoff Climb: 1,400 lb

[SAMPLE: TAKEOFF ANALYSIS CHART]

OAT	CLIMB	** RUNWAY 16R **			
DEG C	LIMIT	WEIGHT	V1	VR	V2
30	659100	651200*	159	166	171

Step 1a New Takeoff Runway/ Obstacle Limit Weight: 641,600 lb (651,200 – 9,600)

Step 1b New Takeoff Climb Limit Weight: 657,700 lb (659,100 – 1,400)

Step 1c New Performance Limited Takeoff Weight: 641,600 lb (Minimum of 641,600 and 657,700)

Step 2 Compare Maximum Takeoff Weight: 632,500 lb

Step 3 Compare MLDW + TIF, MZFW + TOF

- ✓ 615,000 lb (460,000 + 155,000)
- ✓ 620,000 lb (430,000 + 190,000)

Step 4 Least of Step 1c, 2 and 3: 615,000 lb (AGTOW)

The end of section

L/G EXTENDED TAKEOFF

GENERAL

"Landing Gear Extended Takeoff Performance" should be considered in order to determine the appropriate performance penalties for the MEL items such as MEL 32-08-1, 32-42-1, 32-44-2, 32-45-1/-4.

TAKEOFF ANALYSIS CHART

The "Landing Gear Extended Takeoff Analysis Chart" will be provided in the cockpit for a reference on purpose to discuss with dispatcher.

Refer to the "1 Engine Inoperative T/O Procedure", if any.

B777-200ER **L/G EXTENDED** **MAX**

FLAP05 **AKL** **05R/23L**

ELEVATION 23 FT AKL

*** FLAPS 05 *** AIR COND ON ANTI-ICE OFF AUCKLAND
NZAA
777-200 PW4090 VTR DATED 11-MAR-2004
A INDICATES OAT OUTSIDE ENVIRONMENTAL ENVELOPE
MAX BRAKE RELEASE WT-LB, LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

TAKEOFF EPR	OAT DEG C	CLIMB LIMIT	** RWY 05R WEIGHT	V1	VR	V2	** RWY 23L WEIGHT	V1	VR	V2
1.45	36	459300	458300*	131	138	147	458300*	131	138	147
1.47	34	468600	467700*	133	140	149	467700*	132	140	149
1.49	32	477700	478200*	134	141	150	478300*	134	141	150
1.50	30	486600	488700*	135	143	152	488700*	135	143	152
1.50	28	496000	499800*	137	144	153	499800*	136	144	153
1.50	26	504700	510800*	138	146	154	510800*	138	146	154

CONCEPT

"Landing Gear Extended Takeoff" concept is a totally different one from "Landing Gear Extended Dispatch". Refer to the following description.

LANDING GEAR EXTENDED TAKEOFF

The sentence "**Takeoff Performance** is based on landing gear extended" means that **the second segment flight path analysis** and **obstacle clearance analysis** must be calculated assuming landing gear extended.

Example: MEL 32-45-4

ATA 32
Landing Gear

ITEM	32-45-4	Nose Gear Spin Brakes	
REPAIR INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH	PROCEDURES
C	2	0	(M) (O)
REMARKS OR EXCEPTIONS	May be inoperative provided : a. All cleats are verified not missing on both spin brakes before each departure, b. After takeoff, gear remains down for two minutes before retraction, c. Takeoff performance is based on landing gear extended.		

Note) In case of landing gear extended takeoff, all engine climb performance would be affected. The gradient decrement is 2.1% (Based on Flaps 15, A/C Bleed On, A/I Bleed Off, 500,000 pounds for takeoff weight). After the landing gear is retracted, the acceleration initiation (while retracting the flaps) would be recommended.

LANDING GEAR EXTENDED DISPATCH

The performance configuration of Appendix is assumed to be landing gear extended, regardless of the actual position (It is assumed that the landing gear is going to remain extended for the entire flight).

Example: MEL 32-35-2

ATA 32
Landing Gear

ITEM	32-35-2-B	Ground Door Release Control System - Door Open Control Switches	
REPAIR INTERVAL	**NUMBER INSTALLED**	**NUMBER REQUIRED FOR DISPATCH**	**PROCEDURES**
B	2	0	(M) (O)
REMARKS OR EXCEPTIONS	May be inoperative closed provided : a) Landing gear are secured in the down position, b) Landing gear alternate extend system is deactivated, c) Airplane is dispatched in accordance with the appropriate AFM Gear Extended Appendix.		

The end of section

WIND, CLEARWAY AND STOPWAY ADJUSTMENT TO V1

FACTORS CONSIDERED IN DETERMINATION OF TAKEOFF SPEEDS

Factors		Speed Source	
		Takeoff Chart	FMC
Basic	Weight	O	O
	Pressure Altitude	O	O
	OAT	O	O
Adjustment	Wind	-	O*
	Slope	O	O*
	Clearway & Stopway	O	-

* Flight crew input is necessary

SPEEDS FROM TAKEOFF CHART

When the takeoff speeds from takeoff chart are used, flight crew need to apply the wind adjustment to V1 only. It is because those speeds have already adjusted for slope, clearway and stopway.

Table 1-1: Wind adjustment to V1 (Max Thrust)

Weight (lb)	Wind (KTS)				
	-10	-5	0	20	40
680,000	-1	-1	0	1	2
640,000	-1	0	0	1	2
600,000	-1	0	0	1	2
560,000	-1	0	0	1	2
520,000	-1	0	0	1	2
480,000	-1	0	0	1	2
440,000	-1	0	0	1	2
400,000	-1	0	0	1	2
360,000	-1	0	0	1	2
320,000	-1	0	0	1	2

Table 1-2: Wind adjustment to V1 (TO1 Thrust)

Weight (lb)	Wind (KTS)				
	-10	-5	0	20	40
640,000	-1	0	0	1	2
600,000	-1	0	0	1	2
560,000	-1	0	0	1	2
520,000	-1	0	0	1	2
480,000	-1	0	0	1	2
440,000	-1	0	0	1	2
400,000	-1	0	0	1	2
360,000	-1	0	0	1	2
320,000	-1	0	0	2	2

Table 1-3: Wind adjustment to V1 (TO2 Thrust)

Weight (lb)	Wind (KTS)						
	-10	-5	0	10	20	30	40
560,000	-1	0	0	0	1	1	2
520,000	-1	0	0	0	1	1	2
480,000	-1	0	0	0	1	1	2
440,000	-1	0	0	0	1	1	2
400,000	-1	0	0	1	1	1	2
360,000	-1	0	0	1	1	2	2
320,000	-1	0	0	1	1	2	2

SPEEDS FROM FMC

On the other hand, even though FMC also provides the takeoff speeds, these speeds are not adjusted for any of wind, slope, and clearway and stopway.

Which means flight crew should adjust V1 speed by entering FMC with wind and runway slope firstly. In addition, it is also needed to apply the clearway and stopway adjustment to V1.

However, FMC does not have the function to calculate the clearway and stopway adjustment to V1 speed, hence, flight crew must manually apply the clearway and stopway adjustment to V1 by using following tables.

Table 2: Maximum Allowable Clearway for V1 Adjustment (feet)

Field Length	6,000	8,000	10,000	12,000	14,000
Maximum Allowable Clearway	600	800	900	1,100	1,300

Table 3: Clearway and Stopway Adjustment to V1

Normal V1 (KIAS)	Clearway minus Stopway								
	800	600	400	200	0	-200	-400	-600	-800
160	-3	-2	-1	0	0	1	2	3	4
140	-3	-3	-2	-1	0	1	2	3	4
120	-3	-2	-1	0	0	2	3	4	4
100	-2	-1	-1	0	0	2	3	4	5

EXAMPLE: CLEARWAY AND STOPWAY ADJUSTMENT TO V1

- Field Length: 10,000 ft
- Clearway: 987 ft
- Stopway: 300 ft
- Normal V1: 160 KIAS (wind and slope adjustment applied by FMC)
  - ✓ Maximum Allowable Clearway = 900 ft (from Table 1)
  - ✓ Clearway minus Stopway = 900 – 300 = 600 ft
  - ✓ V1 Adjustment = -2 KIAS (from Table 2)
  - ✓ Final V1 = 160 – 2 = 158 KIAS

The end of section

TAKEOFF ANALYSIS CHART GUIDE

GENERAL

This content guides you on how to interpret the Takeoff Analysis Chart.

After the introduction of portable EFB(iPad), the Takeoff Analysis Chart is no longer loaded on the aircraft. Therefore, in order to calculate take-off performance, OPT APP or TODC ACARS must be used.

There is no hard-copy version of Takeoff Analysis Chart in cockpit, but digital version can be downloaded from e-Doc System. However, it must always be kept up to date, and the company is not responsible for using it which is not the latest version.

Therefore, if you plan to use the Takeoff Analysis Chart, it is recommended that you download Takeoff Analysis Chart during the flight briefing.

OPT APP is primary use for calculating performance data, back-up is TODC ACARS.

TAKEOFF ANALYSIS CHART DESCRIPTION

The charts show takeoff performance data for the given runway characteristics and given configuration (Thrust, Flap, Packs etc).

Followings can be determined from the takeoff analysis chart.

- ✓ The maximum Performance Limited Takeoff Weight for the ambient temperature
- ✓ The takeoff N1 setting and takeoff speeds for the most limiting weight among the Climb, Runway or Structural Limit, for the ambient temperature
- ✓ Maximum usable Assumed Temperature for a given weight

In this guide, the term “Runway Limit Weight” refers to the most limiting weight among the field length, obstacle, brake energy and tire speed limit weight.

BASIC CONDITIONS OF TAKEOFF ANALYSIS CHART

- Flaps Setting: FLAPS 05 / 15
- Wind Component: Calm
  - Wind correction should be applied for runway limited weight.
  - No wind correction should be applied to climb limited weight.
- Pressure Altitude: airport elevation
  - QNH correction should be applied to runway and climb limited weight.
- Runway Condition: Dry
- Tire speed Capability: 235 MPH
- Anti-ice Configuration: ENGINE AND WING AUTO
- Braking Configuration: Anti-skid ON
- A/C Packs Configuration: AUTO or OFF
- Line-Up Effect

The distance for 90 degree or 180 degree turn to align the airplane on the runway has been taken into account. Accordingly, the field length available has been adjusted.

EXPLANATION OF TAKEOFF ANALYSIS CHART

ONE ENGINE INOP. PROCEDURES

RWY 33R: MAINTAIN EXTENDED RWY CENTERLINE. THEN, COMMENCE A 15 DEGREE BANKED CLIMBING – LEFT – TURN AT D5.0 NCN VOR/DME TO A MAG HEADING OF 242 DEGREES.

B777-200 MAX

FLAP 15 ICN 15L/33R

SEOUL INCHEON INTL RKSI ELEVATION: 23FT

MAX BRAKE RELEASE WT-LB, LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

TAKEOFF EPR	OAT DEG C	CLIMB LIMIT	** RWY 15L ** WEIGHT	V1	VR	V2	** RWY 33R ** WEIGHT	V1	VR	V2
1.26	62A	454400	457900*	141	142	145	444900*	139	140	143
1.27	60A	465600	469000*	142	144	147	455400*	140	142	145
1.28	58A	477000	480600*	143	145	148	465900*	142	143	147
1.30	56A	488400	492300*	145	147	150	476600*	143	145	149
1.31	54	501300	505600*	146	149	152	488600*	144	147	150
1.32	52	515800	520500*	148	151	154	502200*	146	149	153
1.34	50	530000	535100*	150	153	157	515400*	147	150	155
.										
1.50	20	659000	666600*	159	166	171	632300*	159	166	171
1.50	18	659100	666800*	159	166	171	632600*	159	166	171
1.50	16	659200	666900*	159	166	171	633000*	159	166	171
1.50	14	659300	667100*	159	166	171	633300*	159	166	171
1.50	12	659400	667300*	159	166	171	633600*	159	166	171
1.50	10	659500	667400*	159	166	171	633900*	159	166	171
1.50	5	659700	667700*	159	166	171	634600*	159	166	171
1.50	0	659900	668000*	159	166	171	635400*	159	166	171
1.50	-5	660000	668300*	159	166	171	636100*	159	166	171
1.50	-10	660100	668500*	159	166	171	636700*	159	166	171

ADD LB/KT HEADWIND	40	360
SUB LB/KT TAILWIND	3580	1830
MIN FLAP RET. HT-FT	800	800
RUNWAY-FT	12303	12303
SLOPE (GO/STOP)-PCT	0.00/ 0.00	0.00/ 0.00
CLEARWAY/STOPWAY-FT	984/ 394	984/ 394
LOW QNH -LB/mBar	704	743	688
HIGH QNH +LB/mBar	164	163	187

MAX BRAKE RELEASE WT MUST NOT EXCEED MAX CERT TAKEOFF WT OF 632500 lb

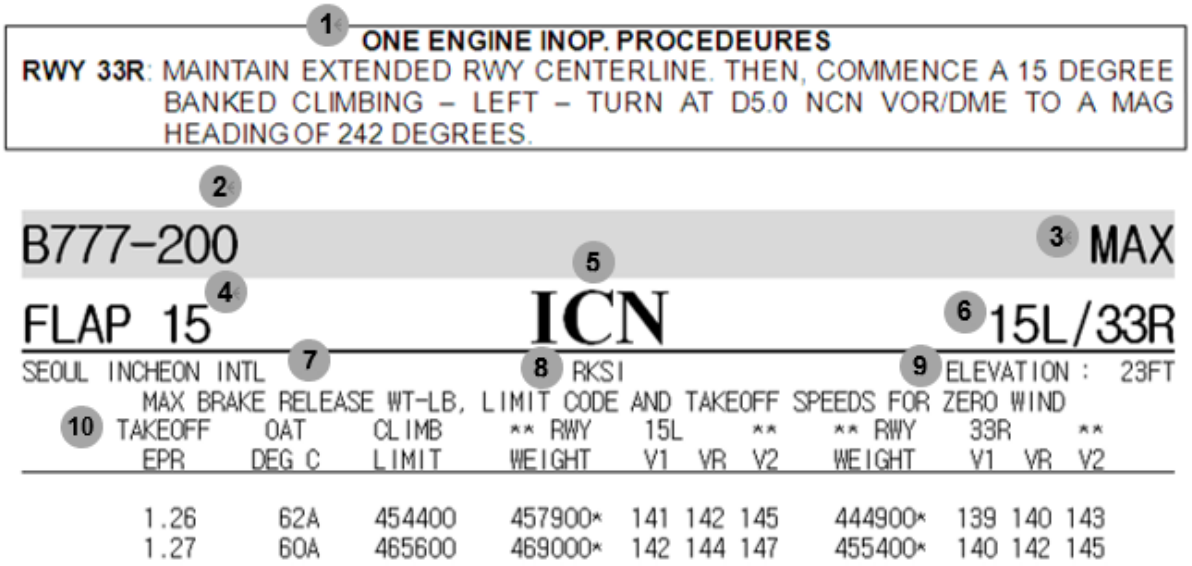
LIMIT CODE IS F=FIELD, T=TIRE SPEED, B=BRAKE ENERGY, V=VMCG

*=OBSTACLE/LEVEL-OFF, W=TAILWIND TAKEOFF NOT ALLOWED

OBSTACLES CONSIDERED ARE (FROM LIFTOFF END OF RUNWAY, HT/DIST IN FT/FT):

RUNWAY	HT	DIST	HT	DIST	HT	DIST	HT	DIST	HT	DIST
15L	3	988								
33R	77	4749	377	19479	461	21877				

Header



Item	Description
1	One engine out turning procedure, or comments or remarks in line with the weight limitations.
2	Aircraft type
3	Thrust ratings MAX: 90,000 lb; TO1: 10% derate; TO2: 18% derate
4	Takeoff flap configuration
5	Airport designator – IATA code
6	Runway designation
7	Airport name
8	Airport designator – ICAO code
9	Airport elevation
10	Unit for maximum brake release weight is in pounds. Limit code and takeoff speeds are valid for zero wind. Otherwise, adjustments should be applied.

Table

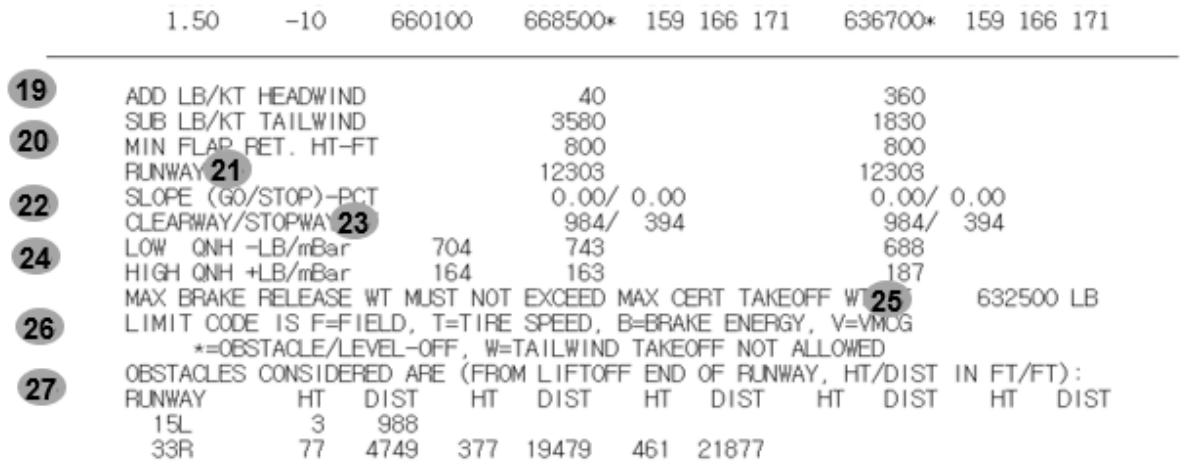
SEOUL INCHEON INTL RKSI ELEVATION : 23FT

MAX BRAKE RELEASE WT-LB, LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

11 TAKEOFF EPR	12 OAT DEG C	13 CLIMB LIMIT	14 * RWY 15L WEIGHT	** V1	** VR	** V2	15 ** RWY 33R WEIGHT	** V1	** VR	** V2
			17	18						
1.26	16 62A	454400	457900*	141	142	145	444900*	139	140	143
1.27	60A	465600	469000*	142	144	147	455400*	140	142	145
1.28	58A	477000	480600*	143	145	148	465900*	142	143	147
1.30	56A	488400	492300*	145	147	150	476600*	143	145	149
1.31	54	501300	505600*	146	149	152	488600*	144	147	150
1.32	52	515800	520500*	148	151	154	502200*	146	149	153

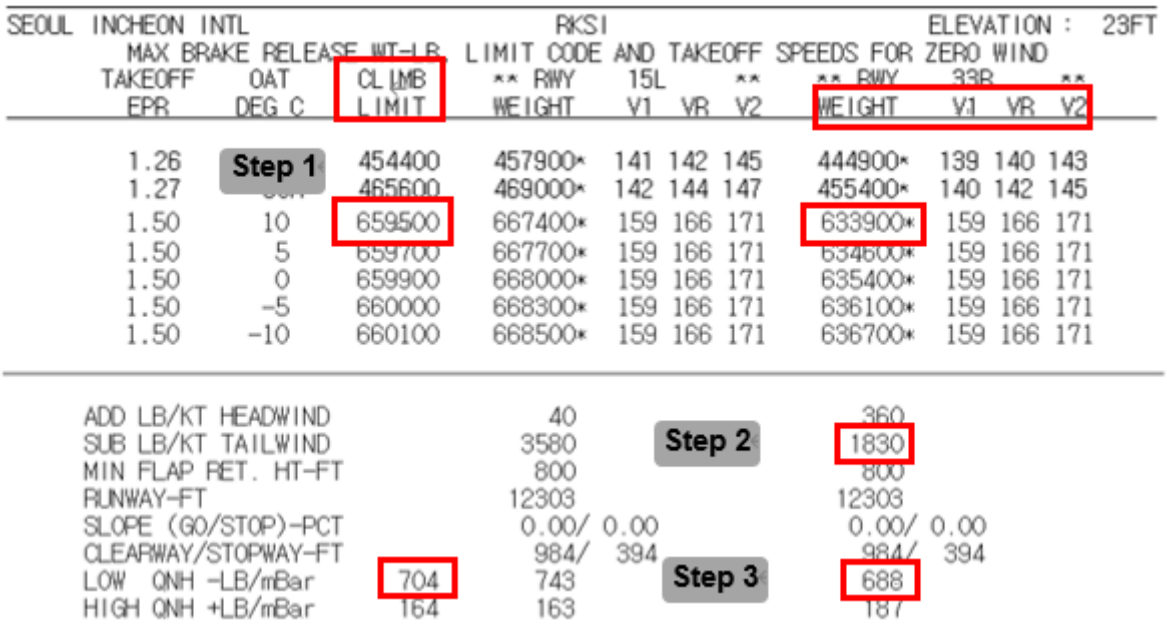
Item	Description
11	Maximum takeoff %N1 for each OAT under standard atmospheric pressure.
12	Outside ambient temperature in Celsius degree.
13	Climb limit weight column.
14	Runway limit weight and takeoff speeds column for RWY 15L.
15	Runway limit weight and takeoff speeds column for RWY 33R.
16	'A' sign shown next to OAT means "Outside Environmental Envelope". When actual OAT is in this region, takeoff is not allowed. However, these temperatures can be selected as assumed temperature.
17	Runway limit weight and its limit code. For the limiting code, refer to footer.
18	Takeoff speeds. These speeds are valid only for the lowest weight among climb limit weight, runway limit weight, and certified maximum takeoff weight.

Footer



Item	Description
19	Wind adjustment: • Increase/Decrease runway limit weights as much as shown to the right per 1 knot of head/tail wind. ***Note: Do not apply the wind correction to climb limit weight.***
20	Minimum flap retraction height above ground level. (= the height for acceleration)
21	Field length in feet.
22	Runway slope of accelerate go distance / accelerate stop distance in percent.
23	Length of clearway / stop way in feet.
24	QNH adjustment: • Increase/Decrease climb limit weight and runway limit weights respectively as much as shown to the right per 1 mbar above/below standard atmospheric pressure, 1013.25 hPa
25	Certified maximum takeoff weight.
26	Limit code for runway limit weight.
27	Obstacle information along the flight path.

Sample Takeoff Analysis Chart



SEOUL INCHEON INTL RKSI ELEVATION : 23FT

MAX BRAKE RELEASE WT-LB LIMIT CODE AND TAKEOFF SPEEDS FOR ZERO WIND

TAKEOFF EPR	OAT DEG C	CLIMB LIMIT	** RWY 15L WEIGHT	V1	VR	V2	** RWY 33R WEIGHT	V1	VR	V2
1.26	Step 1	454400	457900*	141	142	145	444900*	139	140	143
1.27		465600	469000*	142	144	147	455400*	140	142	145
1.50	10	659500	667400*	159	166	171	633900*	159	166	171
1.50	5	659700	667700*	159	166	171	634600*	159	166	171
1.50	0	659900	668000*	159	166	171	635400*	159	166	171
1.50	-5	660000	668300*	159	166	171	636100*	159	166	171
1.50	-10	660100	668500*	159	166	171	636700*	159	166	171

ADD LB/KT HEADWIND		40		360
SUB LB/KT TAILWIND		3580	Step 2	1830
MIN FLAP RET. HT-FT		800		800
RUNWAY-FT		12303		12303
SLOPE (GO/STOP)-PCT		0.00/ 0.00		0.00/ 0.00
CLEARWAY/STOPWAY-FT		984/ 394		984/ 394
LOW QNH -LB/mBar	704	743	Step 3	688
HIGH QNH +LB/mBar	164	163		187

- Given Conditions

Runway in Use	OAT	Reported Wind	QNH
RWY 33R	10℃	- 5 knots	1003.25 hPa

- Calculation of Performance Limited Weights

Step 1. Find the climb limit weight and runway limit weight for RWY 33R at OAT = 10℃.

- Climb limit weight = 659,500 lb
- Runway limit weight = 633,900 lb

Step 2. Apply wind correction to runway limit weight only

- Wind corrected Runway limit weight
  = 659,500 lb – 1,830 x 5
  = 624,750 lb

Step 3. Apply QNH correction to climb limit weight from step 1 and wind corrected runway limit weight from step 2.

- QNH corrected Climb limit weight
  = 659,500 lb – 704 x 10
  = 652,460 lb
- QNH & Wind corrected Runway limit weight
  = 624,750 lb – 668 x 10
  = 617,870 lb

Step 4. From step 3,
The lower is the Performance Limited Takeoff Weight: 617,870 lb

CAUTION	In certain cases, the performance limit weight can be higher than the certified maximum takeoff weight (MTOW), however, taking off with the weight higher than its certified MTOW is not allowed.

The end of section

APMS AND PERFORMANCE DEVIATION ALLOWANCES

- The performance data contained in appropriate Operations Manual is derived from the flight test result at the time of manufacturing.
- APMS (Airplane Performance Monitoring System) is the program and procedure for calculating Performance Deviation Allowances from the performance in Operations Manual, considering the aircraft performance deterioration.
- There are no regulations that state an operator must apply the Performance Deviation Allowances (PDA) to flight plans.
- However, accounting for the PDA in the flight plan will help to increase flight crew confidence in the flight plan because the actual fuel consumption will more closely match the flight plan.
- Having flight plans that closely match actual airplane performance will enhance safe and efficient operation of the airplane.

Note) The trip fuel quantity in flight plan is already adjusted for the Performance Deviation Allowances (APMS value).

235,200 + (235,200 × 1.7%) = 239,200

The end of section

ECON SPEED: SELECTING THE BEST COST INDEX

There are many factors involved in selecting the Best Cost Index for use by the Airplane's FMC.

Direct Airplane Operating Costs are affected by Fuel Cost and Flight Time Cost (Flight Crew, Cabin Crew, Maintenance, etc.)

We have calculated the Best Cost Index after full analysis over the Asiana Operating Costs.

The Applicable Cost Index is as follows. (The Cost Index will be revised frequently after full analysis over the present operating cost.)

Aircraft types	B747-400	B777-200ER	B767-300	A330-300	A321
Cost Index	Variable (Refer to the Operations Flight Plan or Notice)				

Cruise "managed" versus cruise "selected"

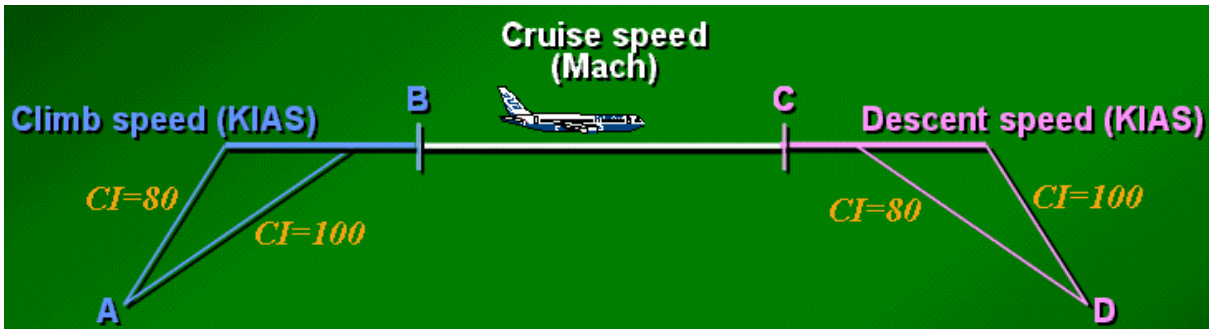
A. Flying at a given cost index rather than at a given Mach Number provides the added advantage of always benefiting from the optimum Mach Number as a function of aircraft gross weight, flight level and head/ tailwind component.

   This means Econ Mode ("managed" speed) can save fuel relative to fixed Mach schedules ("selected" speed) and for an identical block time.

✓ Contrary to the common belief of many pilots, the variation of Econ Mach with gross weight variation (due to fuel burn) at a given flight level is very small. It is hence always possible to fly at a fixed cost index which results in a negligible speed variation.

However, since use of the cost index as a speed control is not recommended, pilots should select the necessary Mach Number via the FCU, in case of ATC speed request prior to recovering "managed" speed if constraints are subsequently released.

For reference, following figure shows how economy speed is determined for all phases of flight (climb, cruise and descent).



Climb	Cruise	Descent
Economy speed is the speed at which the fuel cost plus time cost from "A" to "B" is minimized.	Economy speed is the speed at which the fuel cost plus time cost from "B" to "C" is minimized.	Economy speed is the speed at which the fuel cost plus time cost from "C" to "D" is minimized.
Includes some cruise operation.		Includes some cruise operation.
A fixed climb speed is used (does not change as fuel burns off)	Speed changes as fuel burns off	A fixed descent speed is used (does not change as fuel burns off)

- **The higher the cost index**: the higher the speed, the lower the climb path, the longer the climb distance (in Climb).
- **The higher the cost index**: the higher the speed, the steeper the flight path (in Descent).

The end of section

CORRECT WEIGHT INPUT INTO FMC

GENERAL

Correct Weight Balance Data Input into FMC as follows:

- Be aware that the FMC does not consider any limitation on landing weight.
- Except for takeoff and landing performance, **any input that results in an FMC gross weight greater than actual** will result in conservative predictions.
- This will include fuel burn, climb performance, initial buffet boundary, and maximum altitudes.

PERFORMANCE

Takeoff Performance

- For takeoff, weights other than actual will result in un-conservative performance.
- Weights that increase VR and V2 may increase takeoff climb gradient, but will result in filed length and close in obstacle clearance penalties.
- Reduced VR and V2 reduce margin to stall and tail strike.
- Any error in V1 results in a penalty to either the stop or go performance of the airplane.

Landing Performance

- As far as landing performance, gross weights higher than actual will increase the landing speeds, with possible adverse impacts landing field lengths.
- Gross weights lower than actual, reducing the landing speeds, will reduce margins to stall and tail strike.

Note) Do not enter the ZFW into the GR WT boxes.

The end of section

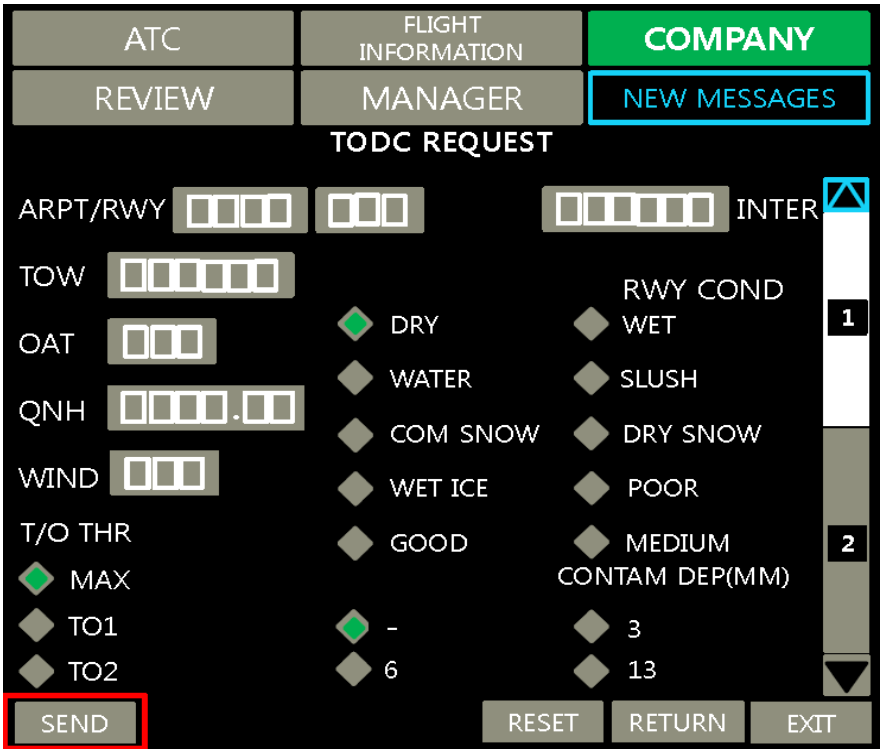
TODC (TAKE-OFF DATA CALCULATION) SYSTEM

SYSTEM CONCEPT

- Take-Off Data Calculation (TODC) System is developed for substituting hard-copy Take-Off Chart.
- New system provides take-off performance data in real time using Datalink (ACARS).
- TODC system calculates performance data based on its specific conditions which pilot enters through MCDU.
- In case of released NOTAM affecting performance, Flight Operations Engineers analyze and save its information in TODC DB. So, TODC system provides accurate take-off performance applied its NOTAM in real time.
- TODC system is developed with STAS which BOEING provides airlines for performance calculation.
- All TODC data is proved by Flight Operations Engineers and confirmed by Boeing.
- OPT App is primary, TODC ACARS is back-up.

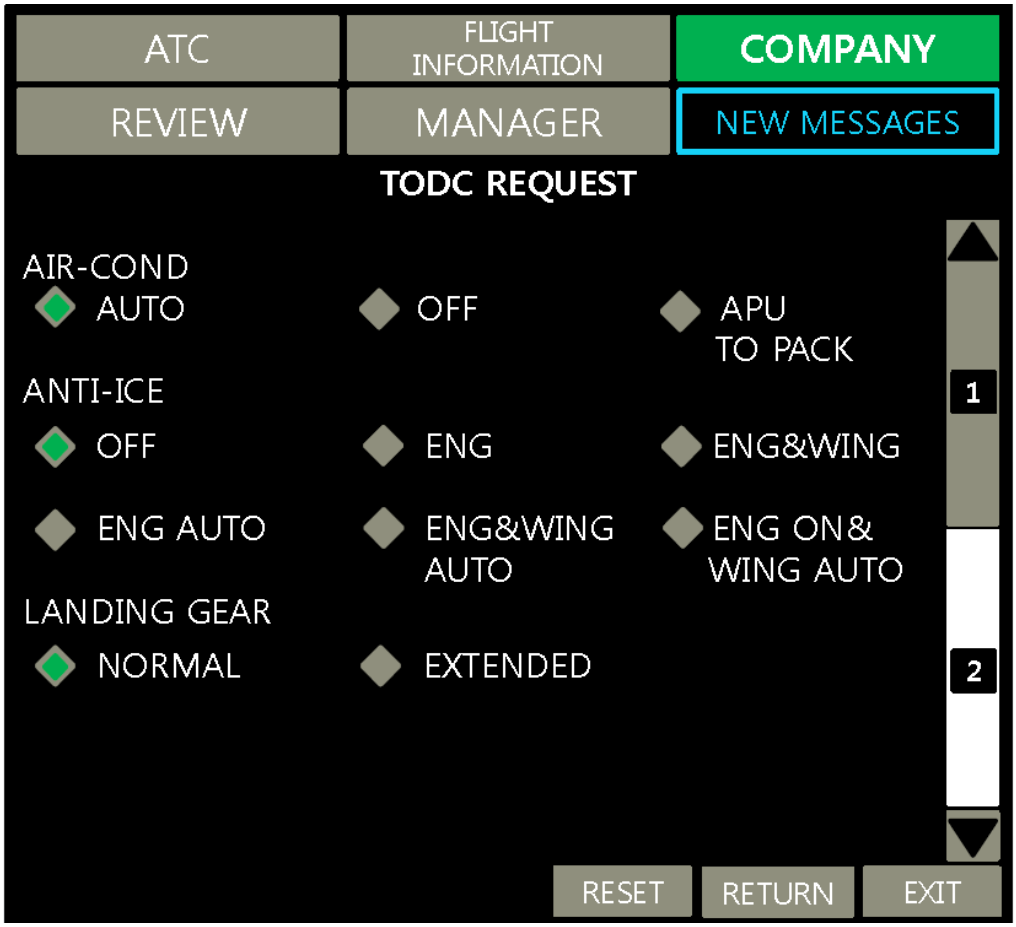
TODC REQUEST PAGE IN MCDU

1st Page: Airport and Aircraft conditions



ARPT/RWY	Enter Airport and Runway (4 letters (ICAO) / 3 letters)
TOW (LB)	Actual Takeoff Weight ***Note) Do not enter the ZFW into the [2L] TOW.***
OAT (°C)	
Wind (+/-)	Wind value with direction using + (head) or – (tail)
QNH (hPa)	***Note) Do not enter QNH as inch-Hg.***
INTER	***Note) Enter Intersection Name exactly same as Jeppesen Chart name.***
RWY COND	Select Contaminated Runway Options
CONTAM DEP	Select Contaminated Depth according to FCOM
TO THR	Select Takeoff Thrust (MAX / TO1 / TO2)

2nd Page: Aircraft Configuration Setting



AIR-COND	Select Air-Conditioning options (ON / OFF)
ANTI-ICE	Select Anti-Ice options (OFF / ENG / WING & ENG)
LANDING GEAR	Selected Landing Gear Extended options (NORMAL / EXTENDED)

TODC REPORT

```
     /TODC Report/
(1)  2018-06-01 04:51:08 UTC
(2)  TAIL NO: 7413        (3) AC TYPE:B747-400
(4)  APO: RKSI / ICN      (5) ELEV(FT): 23
(6)  RWY: 33L
(7)  LTH/CWY/SWY(FT): 12303/983/394
(8)  TOW(LB): 600000      (9) OAT(C): 30
(10) WIND(KTS): 0         (11) QNH(hPa): 1017
(12) RWY COND: DRY        (13) T/O THRUST: MAX
(14) AIR COND: ON         (15) ANTI-ICE: OFF
(16) SPECIAL CASES: NONE
     >>
(17) >>PERFORMANCE LIMITED TOW AT OAT (30)<<
(18) FLAP   PLTOW (19) V1/VR/V2   (20)ACC_HEIGHT (21) N1(EPR)
      10   890700     159/177/188         800            107
      20   921800     153/171/181         800            107

(22) >>MAX T/O THRUST AND SPD WITH OAT,TOW (30,600000)<<
     FLAP   ATOW       V1/VR/V2      ACC_HEIGHT       N1(EPR)
      10   600000     125/137/156         800            107
      20   600000     125/132/150         800            107

(23) >>MAX ASSUMED TEMP AND SPD WITH ACTUAL TOW (600000)<<
(24) FLAP   TEMP       V1/VR/V2      ACC_HEIGHT       N1(EPR)
      10     64       135/145/155         800             97
      20     64       130/139/150         800             97
     >>
(25) >>ENGINE OUT DEPARTURE PROCEDURE
     TAKEOFF BASED ON CLIMBING ON EXTENDED RUNWAY
     CENTERLINE
```

Figure 1. TODC Report sample message

TODC REPORT DESCRIPTION

(1)	TODC Report uplink date and time as UTC
(2)	Aircraft registration number
(3)	Aircraft type
(4)	Departure airport (ICAO Code / IATA Code)
(5)	Airport elevation in feet
(6)	Takeoff runway and Intersection name (if entered)
(7)	Takeoff runway available in feet / Distance of clearway / Distance of stopway
(8)	Actual takeoff weight in LB (entered parameter)
(9)	Outside Air Temperature in °C (entered parameter)
(10)	Entered wind direction and speed (minus sign "-" for tail wind)
(11)	QNH in hPa (entered parameter)
(12)	Selected Runway condition
(13)	Selected Take-off Thrust setting
(14)	Selected Air condition setting
(15)	Selected Anti ice setting
(16)	Selected Inoperative items (MEL)
(17)	Takeoff performance data based on the calculated Maximum Performance Limited Takeoff Weight (PLTOW) at the entered OAT (°C)
(18)	Calculated PLTOW per each FLAP configuration setting
(19)	Calculated takeoff V speeds
(20)	Minimum acceleration height based on One Engine Out in feet
(21)	Calculated takeoff EPR (Engine Pressure Ratio)
(22)	Takeoff performance data based on the entered Actual Takeoff Weight and entered OAT (°C) (Data will be displayed if the entered Actual Takeoff Weight is less than the PLTOW)
(23)	Takeoff performance data based on entered Actual Takeoff Weight and the Maximum allowable Assumed temperature
(24)	The maximum allowable Assumed temperature per FLAP configuration setting
(25)	One Engine Out departure procedure for the entered runway

CONTAMINATED RUNWAY IN TODC

- Boeing defines contaminated Runway in FCOM (SP.16.1)
- Also, in contaminated Runway, takeoff performance must be calculated by FCOM Chapter Performance Inflight (PI) manually.
- If pilot chooses [2R] runway condition as water or slush, [3R] contaminated depth must be selected. (Refer to below Table 1-A)
- TODC system calculates takeoff performance adjustment automatically.
- Assumed temperature is not available in WATER / SLUSH.

<table>
<tr><th>Contaminated Runway</th><th>Contaminated Depth</th><th>Available Assumed Temp</th></tr>
<tr><td rowspan="3">WATER</td><td>3 mm</td><td rowspan="6">Not Available</td></tr>
<tr><td>6 mm</td></tr>
<tr><td>9 mm</td></tr>
<tr><td rowspan="3">SLUSH</td><td>3 mm</td></tr>
<tr><td>6 mm</td></tr>
<tr><td>9 mm</td></tr>
<tr><td>GOOD</td><td rowspan="5">- (Not Select)</td><td rowspan="3">Available</td></tr>
<tr><td>MEDIUM</td></tr>
<tr><td>POOR</td></tr>
<tr><td>COMPACTED SNOW</td><td rowspan="2">Not Available</td></tr>
<tr><td>WET ICE</td></tr>
</table>

<Table 1-A. How to select contaminated runway>

MINIMUM FLAP RETRACTION HEIGHT

>>PERFORMANCE LIMITED TOW AT OAT (30)<<

FLAP	PLTOW	V1/VR/V2	**ACC HEIGHT**	N1 (EPR)
5	526400	143/152/156	**800**	1.33
15	505100	132/142/147	**800**	1.33

- TODC system calculates Flap Retraction Height(Acceleration Height) at only specific condition which pilots input.
  ※ All data is based on Thrust Power which is selected.
- ACC HEIGHT in TODC Report are not compared with TO CHART's data.
- TO CHART provides maximum value among various minimum ACC Height. At the bottom of TO CHART, minimum values could be displayed.

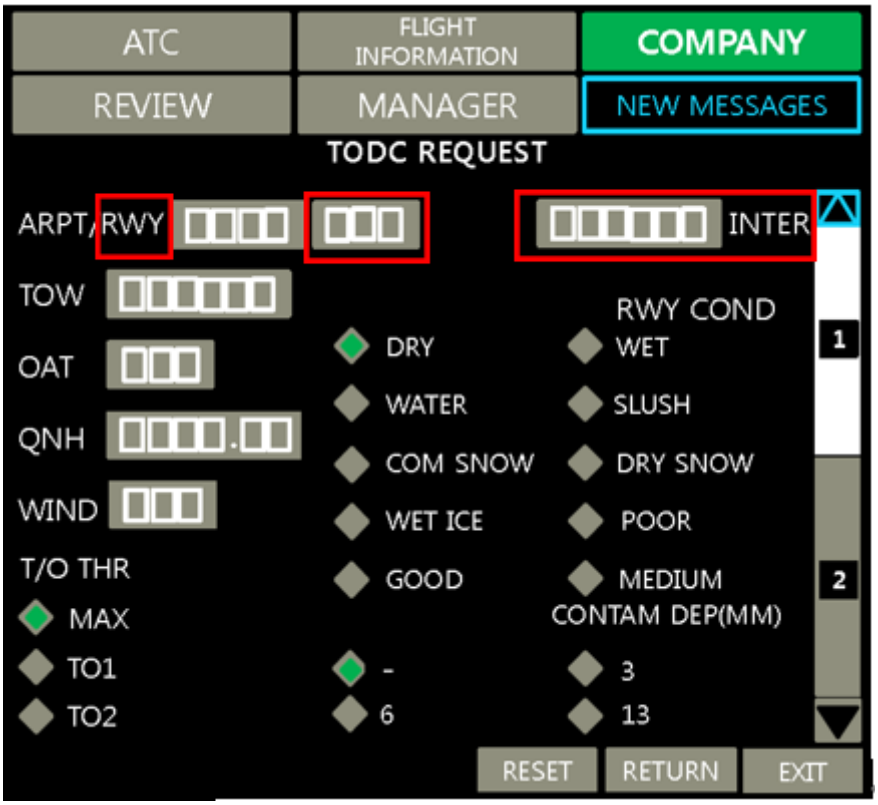
TODC ERROR MESSAGES

When TODC entered data are incorrect, TODC system uplinks Error message.

Runway / Intersection

Refer to Jeppesen Chart when pilot enters runway or intersection name.

- Runway / Intersection Input Line



- Error Message

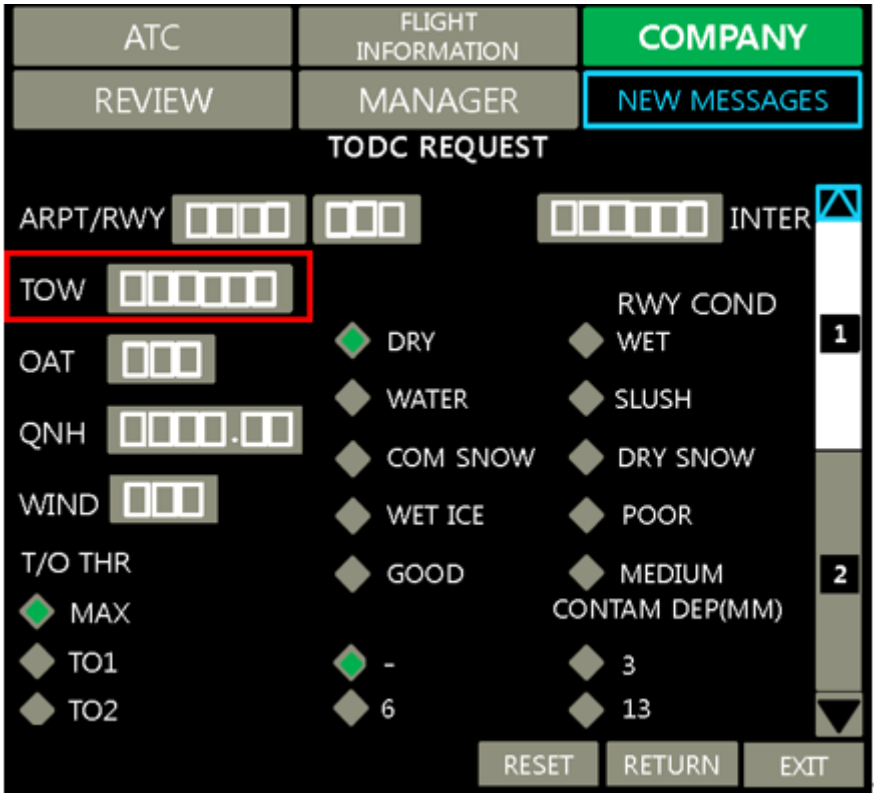
ERROR: NO INTERSECTION IN TODC DB
CHECK INTERSECTION NAME
ERROR: NO INTERSECTION IN TODC DB
CHECK INTERSECTION NAME

- Case Study: MNL – RWY 06 – Intersection E5

[1L]	**RPLL** / **06**
	Note) Do not enter only 6 in Runway section.
[1R]	**E5**
	Note) Do not enter E5 in [1L] Runway section.

TAKEOFF WEIGHT

- Actual Takeoff Weight Input Line: [2L]
  Note) Do not enter the ZFW into the [2L] TOW.



- Error Message: It depends on aircraft specification.

Error Message
ERROR: CHECK TOW FROM 266,100 TO 656,000

TODC Q & A

Q1. Is it correct that pilots always request TODC only after ATC Clearance?

A1. Anytime is okay for TODC request after FMC FLT INIT. For example, you can receive TODC based on estimated takeoff weight of flight plan in advance.

After receiving Load sheet, you can request TODC again in case of much difference between estimated TOW and actual TOW.

Additionally, in case of Boeing aircrafts, you can receive TODC report applied DERATE thrust in advance for checking maximum performance limited weight.

Q2. Why does it take 2 minutes for uplink TODC?

A2. Because of the number of letters. First, you should understand the process of aircraft's ACARS message transmission.

Datalink Service Provider, ARINC or SITA, divides message if exceeded over the standard number of letters first, and then send to aircraft. Last, aircraft integrates each messages as one and display or print it.

TODC system takes only about 5 seconds for calculating, but aircrafts take much time for receiving and integrating message.

Flight Operations Engineering team is reviewing for reducing TODC uplink time consistently.

Q3. TODC report provides 3 sections results, is it possible to use 2nd data for actual operations? (Due to the speed difference between 2nd data and 1st, 3rd data)

A3. 1st section data is calculated based on OAT. It means PLTOW (Maximum Performance Limited Weight) and its speeds. You can also check same data in Takeoff Chart in case of same conditions.

2nd section data is based on both OAT and actual TOW. Its data are new, not in current Takeoff chart. Also it is most accurate data based on input conditions.

The main reason of speed difference between 2nd and 1st/3rd is Actual TOW. 2nd data is related to Actual TOW with OAT as mentioned. So, 2nd data speeds increase as actual TOW increases. (Refer to below table.)

All of TODC data were proved by flight operations engineers and confirmed by AIRBUS/BOEING. Again, 2nd line data is recommended to use in actual operations.

The much difference between ATOW and PLTOW	The less difference between ATOW and PLTOW
>>PERFORMANCE LIMITED TOW AT OAT (30)<<	>>>>PERFORMANCE LIMITED TOW AT OAT (30)<<
FLAP PLTOW V1/VR/V2 ACC_HEIGHT N1(EPR)	FLAP PLTOW V1/VR/V2 ACC_HEIGHT N1(EPR)
5 586300 156/160/165 800 1.39	5 586300 156/160/165 800 1.39
15 562100 145/150/155 800 1.39	15 562100 145/150/155 800 1.39
>>MAX T/O THRUST AND SPD WITH OAT,TOW (30,450000)<<	>>MAX T/O THRUST AND SPD WITH OAT,TOW (30,560000)<<
FLAP ATOW V1/VR/V2 ACC_HEIGHT N1(EPR)	FLAP ATOW V1/VR/V2 ACC_HEIGHT N1(EPR)
5 450000 132/138/146 800 1.39	5 560000 151/156/161 800 1.39
15 450000 126/132/140 800 1.39	15 560000 145/149/155 800 1.39
>>MAX ASSUMED TEMP AND SPD WITH ACTUAL TOW (450000)<<	>>MAX ASSUMED TEMP AND SPD WITH ACTUAL TOW (560000)<<
FLAP TEMP V1/VR/V2 ACC_HEIGHT N1(EPR)	FLAP TEMP V1/VR/V2 ACC_HEIGHT N1(EPR)
5 54 140/141/144 800 1.26	5 34 153/157/161 800 1.37
15 50 133/134/139 800 1.28	15 30 145/149/155 800 1.39

Q4. After TODC request, all data entered are reset. Is it possible to remain all data?

A4. It is possible. It will be changed in the second half of the year. First, MCDU TODC page will be changed using AOC software. And then, aircraft test and loading software take much time for application. Later, it will be noticed on CREWORLD.

The end of section

OPT (ONBOARD PERFORMANCE TOOL) REMINDER

GENERAL

This information is published to provide you with useful information you may need while using the OPT feature.

PLTOW

PLTOW is the Performance Limited Takeoff Weight which has nothing to do with AFM certified maximum takeoff weight.

PLTOW can be found by leaving the TOW input window blank and running calculation. (V speeds are not displayed)

ATM UNDER RUNWAY WET CONDITION

In accordance with Runway Condition Assessment Matrix (RCAM) in FOM 2.5.7.5, OPT classifies Runway Condition into 6 categories when calculating takeoff performance.

In case of the runway WET condition ATM can be used.

▶ Runway condition selection should be "5-GOOD (ATM O) WET"

In case of the runway slippery/contaminated condition ATM can NOT be used.

▶ Runway condition selection should be "5-GOOD (ATM X)"

RUNWAY CONDITION “2-MEDIUM TO POOR” FOR TAKEOFF

When RUNWAY condition selected as “2-MEDIUM TO POOR” for takeoff performance, depth input window shall be appeared. Slush or Standing Water depth should be input. (It is only applicable to takeoff performance calculation)

TAKEOFF EPR

Takeoff EPR for MAX/TO1/TO2 varies depending on OAT, Airport Pressure Altitude, Engine Bleed, which can be found in FPPM Takeoff Section.

Note) FPPM (Flight Planning and Performance Manual) can be found in the Portable EFB content.

Takeoff EPR value provided by OPT may differ from the EPR value of FMC due to difference between ①OPT OAT input value and FMC TAT sensing value or ②OPT and FMC calculation implementation method.

Before engine starting, since FMC cannot calculate the engine bleed configuration, it is normal for differences to occur between OPT EPR and FMC EPR.

Boeing recommends flight crews do not need to override the FMC calculated EPR with the OPT calculated EPR when the difference is very small.

FACTORED/ UNFACTORED LANDING DISTANCE

Factored Landing Distance: 15% added to Actual Landing Distance, which used for calculating Normal Configuration Landing Distance

Note) Refer to; QRH ▶Performance Inflight ▶Advisory Information▶Normal Landing Distance

Unfactored Landing Distance: Actual Landing Distance, which used for calculating Non-normal Configuration Landing Distance

Note) Refer to; QRH ▶Performance Inflight ▶Advisory Information▶Non-normal Landing Distance

OPT provides,,

- For Normal landing, Factored/Unfactored switching function provided
- For Non-Normal Landing, only Unfactored Landing Distance displayed

COMPARE CALCULATION FUNCTION

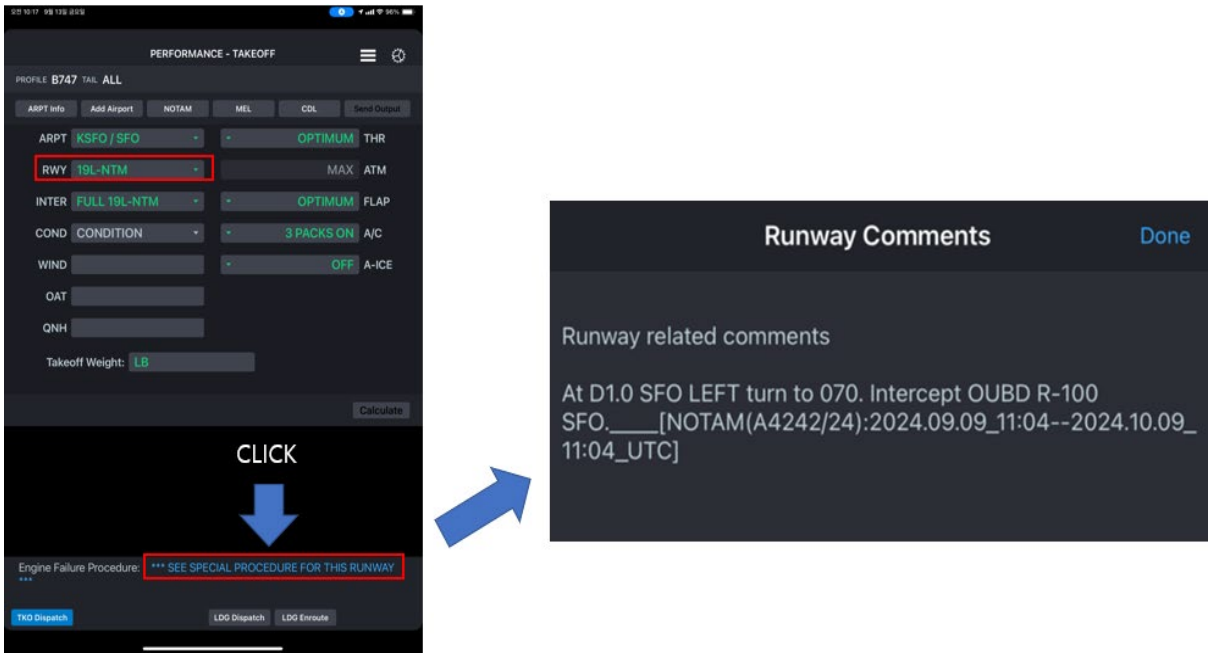
Takeoff, Landing calculation result can be compared between nearby OPTs. This function provides INPUT & OUTPUT difference summary.

OPT TOLDC Calculation screen Comparison PDF file provides details with screenshots. (Refer to below 'Reference' section)

HOW TO CHECK THE NOTAM INFORMATION

Flight Operations Engineering team receives all NOTAMs that affect aircraft performance and conducts performance analysis. If there is an impact on performance, Flight Operations Engineering team will normally reflect the NOTAM in the OPT, but in an emergency the flight crew may need to enter it themselves. Even if a NOTAM is issued, if the performance analysis resulted that there is no impact on existing performance, it will not be reflected in the OPT.

Flight crew can check the "NOTAM Number" and "NOTAM Validity Period" by selecting the runway to which the NOTAM is applied, and clicking the Engine Failure procedure at the bottom as shown below.



REFERENCE

If you need more details, OPT guidance materials are available in the Content App within the Portable EFB as below.

Note) OPT Installation & Registration

☞ ***Portable EFB guide (folder) ▶ USER GUIDE (folder) ▶ OPT/TOLDC User Guide (folder)***

▶ ***OPT Installation guide (PDF file)***

Note) Comparative information between OPT↔TOLDC

☞ ***Portable EFB guide (folder) ▶ USER GUIDE (folder) ▶ OPT/TOLDC User Guide (folder)***

▶ ***OPT TOLDC Calculation screen Comparison.pdf***

The end of section

SELECTION OF TAKEOFF FLAPS

- There are 5 factors to determine Performance Limited Takeoff Gross Weight as follows.
  - ✓ Field Length
  - ✓ Climb
  - ✓ Obstacle
  - ✓ Tire Speed
  - ✓ Brake Energy
- Performance Limited Takeoff Gross Weight (based on 1 Engine Inoperative) is mainly restricted by Field Limited and Climb Limited.
- According to Takeoff Flaps, Field Length Limited and Climb Limited show different feature.
- It is up to flight crew to select flaps (provided the actual takeoff weight is less than or equal to Allowable Gross Takeoff Weight).

GENERAL CHARACTERICTICS OF LARGER T/O FLAP

(Versus less takeoff flap)

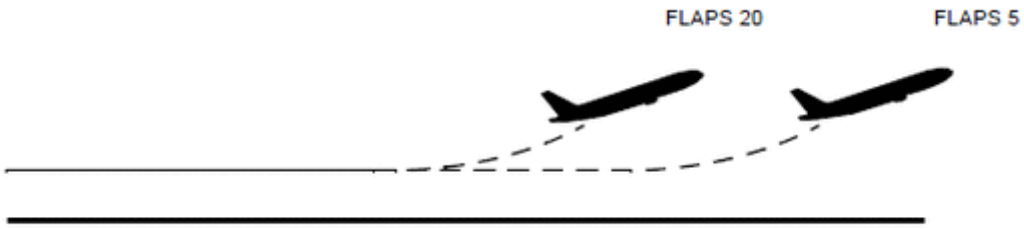
Benefits

- Reduced Takeoff Speed (Stall Speed, VR, V2, Balanced V1)
- Reduced Takeoff Distance
  - ✓ Increased margin for accelerate stop distance
  - ✓ Increased close-in obstacle clearance
- Increased tail clearance at lift-off

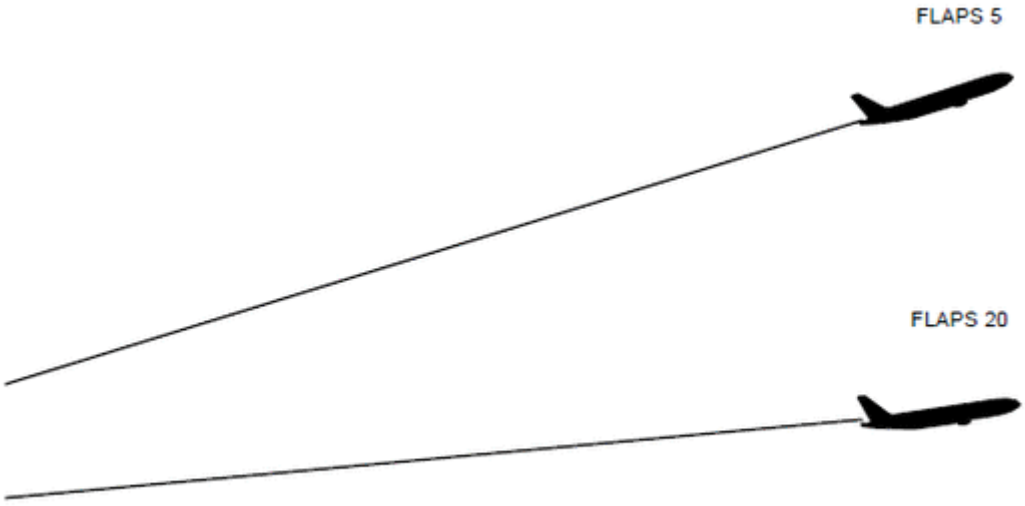
Drawbacks

- Reduced Available Gradient
  - ✓ Less distant obstacle clearance
- Increased Noise
- Increased Fuel Consumption
- Increased Flap Wear

Effect of Flap Position on Takeoff – Takeoff Distance



Effect of Flap Position on Takeoff – Climb Gradient



The end of section

IDLE ENGINE REVERSE ON LANDING

If the landing runway condition is DRY GOOD and aircraft performance permits, it is recommended to use Idle Engine Reverse on Landing for fuel saving.

Considerations of using IDLE ENGINE REVERSE on landing at DRY GOOD condition

- Aircraft Landing Weight
- Runway Length
- Runway Surface Condition
- Tailwind
- Touchdown Point
- Outside Air Temperature (Hot Weather Operations)

ADVANTAGES OF USING IDLE ENGINE REVERSE ON LANDING AT DRY GOOD condition

- Saving Fuel
- Saving Maintenance Cost
- Reducing Noise Emissions
- Reducing Foreign Object Damage
- Passenger Comfortable
- Reduce adverse effect in case of abnormal reverser thrust operation (asymmetry operation)

Note)

1. ***When landing on other than DRY runway and braking action is GOOD, higher reverse thrust than idle must be used since wheel brakes efficiency decreases due to antiskid system operation.***

2. *The captain has the final authority of using reverse thrust after landing. Therefore, L/D weight and OAT affecting temperature of the brakes should be taken into account.*

3. *Wear on carbon brakes is mainly a function of how many times the brakes are applied and released. So if two similar flight cycles are compared, one using reverse thrust and one not using reverse thrust, the total amount of brake wear will be essentially the same.*

The end of section

NADP (NOISE ABATEMENT DEPARTURE PROCEDURE)

BACKGROUND OF NADP 1 & 2

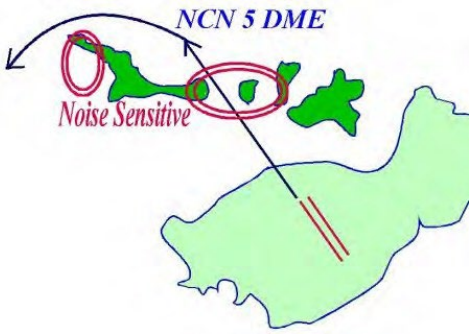
- The intent of the ICAO Noise Abatement Procedures 1 & 2 is to allow greater flexibility as compared to the older procedures.
- The new procedures allow operators to choose different heights for cutback and flap retraction if they want to.
- The older procedures have essentially become subsets of the new NADP 1 & 2, respectively. (The new procedures do NOT require thrust cutback at 800 feet. Rather they simply allow it)

INCHEON AIRPORT

The following procedures are recommended as “Noise Abatement Departure Procedure” for Incheon international airport (RKSI/ICN). (Refer to the Airway Manual)

ICN Runway 33L/R, 34: NADP 1

Thrust Reduction: 1,500 FT



The NADP 1 Procedure (in which the thrust cutback occurs at 1,500 FT AAL) results in better noise relief during the Noise-Sensitive Area (2.9 ~ 4.1 NM from lift off end of runway).

The procedure NADP 1 is alleviating the noise close to airport. The effectiveness of the procedure depends on the Noise-Sensitive Area Locations. If the Noise-Sensitive Area is approaching to the runway, the thrust cutback height might be adjusted lower.

ICN Runway 15 L/R, 16: NADP 1 or NADP 2

- Thrust Reduction: 1,500FT (NADP 1) or

- Initiate Flap Retraction: 1,000 FT

The NADP 2 Procedure (in which the flap retraction initiation occurs at 1,000 FT AAL) results in Better Noise Relief during the Noise-Sensitive Area (16 ~ 17 NM from lift off end of runway).

For noise abatement and CO_2 reduction, using a NADP 2 is recommended. If for safety reasons (prevention of bird strike), compliance with the recommended procedure is not possible, NADP 1 may be used.

The procedure NADP 2 is alleviating noise distant from airport (approximately 9 NM from lift of end of runway).

Typically NADP 2 will be more fuel efficient than NADP 1 because flap retraction will usually occur sooner with NADP 2 than NADP 1.

The end of section

INADVERTENT OVERSPEED

Following is excerpted from “Flight Operations Technical Bulletin” provided by the Boeing Company. (Number: 777-11, Date: December 2, 2002)

BACKGROUND INFORMATION

- Several 777 operators have reported inadvertent overspeed occurrences during the cruise and descent phases of flight.
- In the cruise phase of flight, the typical causes of overspeed events are wind shear encounters or high altitude wave activity. Operators that routinely fly in and out of these weather phenomena encounter overspeeds more frequently.
- Although 777 autothrottle logic provides for more aggressive control of speed as the airplane approaches Vmo or Mmo, there are some wind shears and wave activity speed changes that are beyond the capability of the autothrottle system to prevent short term overspeeds.
- An overspeed protection function currently exists in the 777 autopilot control law that activates once the airplane exceeds Vmo + 20 knots or Mmo + .03 Mach.
- Autopilot overspeed protection is not intended to protect Mmo/ Vmo, rather the function is intended to protect against large overspeeds. If the airplane exceeds the parameters above with the autopilot engaged, it will leave level flight and attempt to attain Vmo -5 knots until disengaged by the flight crew.
- During descents at or near Mmo/ Vmo, most overspeeds are encountered after the AFDS initiates capture of the VNAV path from above or during a level-off. If the speed brakes are retracted prior to completion of path or altitude capture, the airplane can overspeed momentarily.
- During normal descents at speeds near Vmo/ Mmo, windshear encounters can also result in an exceedance of Vmo or MMO.
- With the Block point 99 update (and on) to the AIMS software [Asiana 777 Fleet], the VNAV control laws were enhanced to provide more aggressive pitch control when capturing the descent path or an altitude. This is accomplished primarily by allowing climbing flight to be commanded if necessary to arrest a speed excursion while flying near a maximum limit operating speed.

- VNAV automatically resumes the capture maneuver at the appropriate point after the airspeed recovery maneuver is completed. During a level off, the VNAV transition between this enhanced overspeed protection and the altitude capture control is transparent, with the autoflight mode annunciation remaining VNAV ALT or VNAV PTH and autothrottle SPD.

- Data has shown that for some of the overspeed events, flight crews have disengaged VNAV prior to the point where VNAV enhancements introduced in the AIMS Blockpoint 99 software would have activated to arrest the overspeed.

- Operators should be aware that inspection criteria for overspeed events more than the design limits do not begin until Mmo + .05 or Vmo + 20 knots. Only two overspeed events reported to Boeing, one during cruise and one during descent, required inspections.

OPERATING INFORMATION

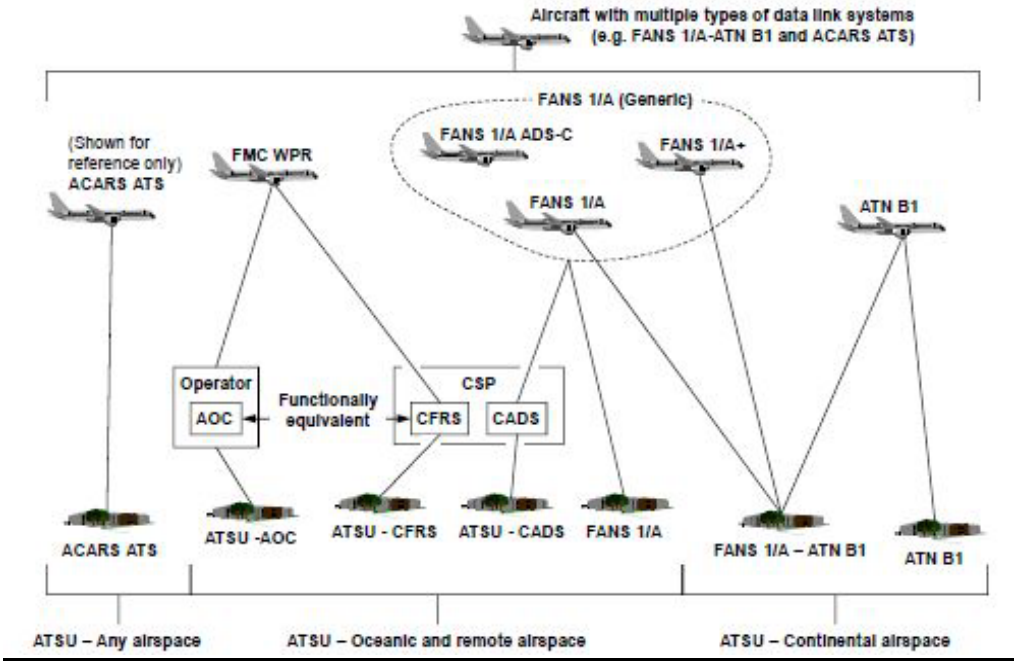
- When encountering an inadvertent over speed condition, crews should leave the AFDS engaged unless it is apparent that a significant overspeed will occur (Mmo + 0.05 / Vmo + 20 kts) and the AFDS is not correcting.
- During climbs or descents, if VNAV pitch control is not correcting satisfactorily, switching temporarily to V/S mode may be helpful in controlling speed, since speed control reverts to the autothrottle and the selected vertical speed can be adjusted slightly to increase the pitch attitude thus helping to correct the overspeed. As soon as the speed is below Vmo/ Mmo, VNAV may be re-selected.
- During descents using speed brakes near Vmo/ Mmo, delay retraction of the speed brakes until after VNAV path or altitude capture is complete.
- Operators routinely climbing or descending in windshear conditions may wish to consider a 5-10 knot reduction in climb or descent speeds to reduce overspeed occurrences. This will have a minimal effect on fuel consumption and total trip time.
- During cruise at high altitudes, avoid reducing thrust to idle since that may result in a slow engine acceleration back to cruise thrust and potentially result in over controlling the airspeed or a loss of altitude.
- If autothrottle corrections are not satisfactory, temporarily deploying partial speed brakes can assist in reducing speed and avoid the need for idle thrust. If the speed brakes are extended more than 15 seconds with the thrust above idle, there may be a momentary activation of the SPEED BRAKE caution alert.

The end of section

CPDLC OPERATIONAL INFORMATION

OPERATIONAL CONCEPT

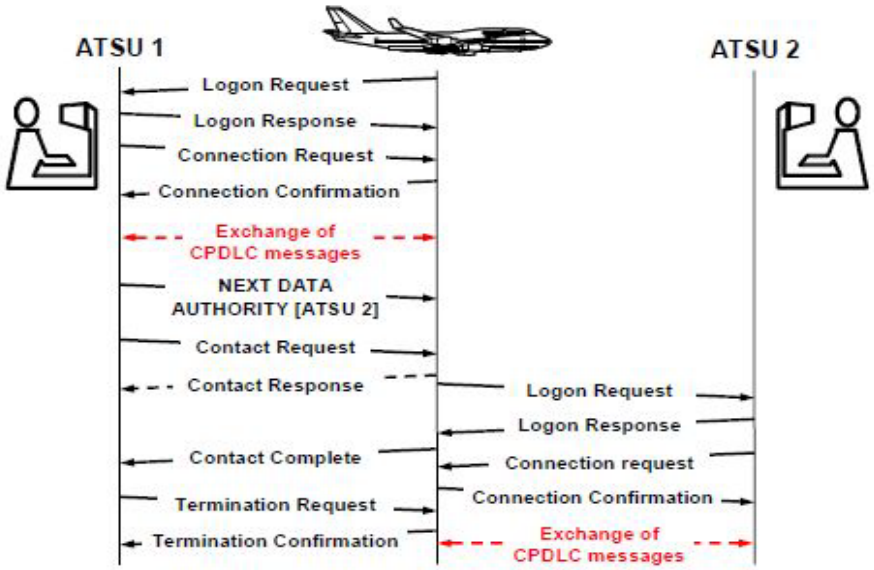
- CPDLC improves communication capabilities by reducing voice channel congestion and enabling the use of CPDLC-related automation.
- The applicable interoperability standards for each type of data link system and each type of subnetwork allocate requirements to the operator, the aircraft data link system, and the ANSP to ensure that the aircraft system, the ATSU ground system, and subnetworks are compatible.



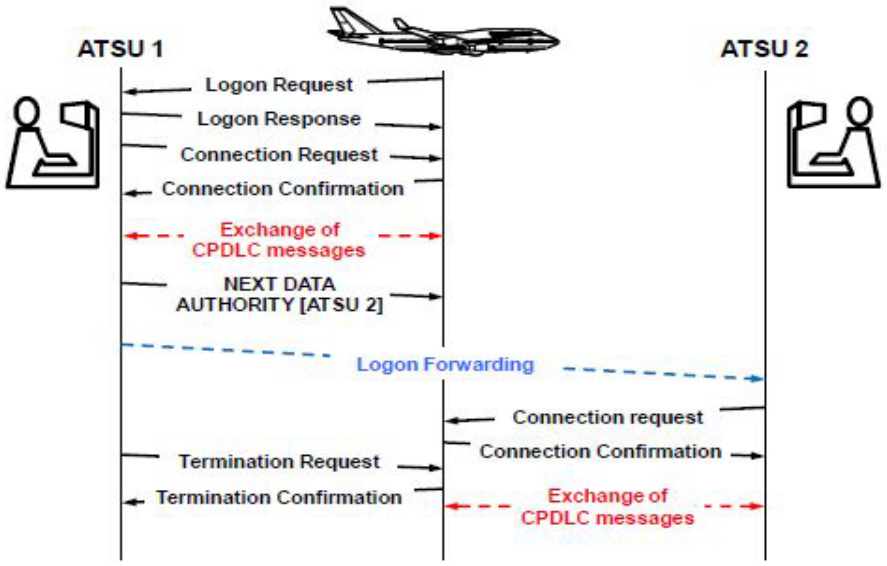
Note)

- ***ANSP: Air Navigation Services Provider***
- ***AOC: Aeronautical Operational Control***
- ***CSP: Communication Service Provider***
- ***CADS: CSP's centralized ADS-C System***
- ***CFRS: CSP's centralized Flight management computer waypoint Reporting system***

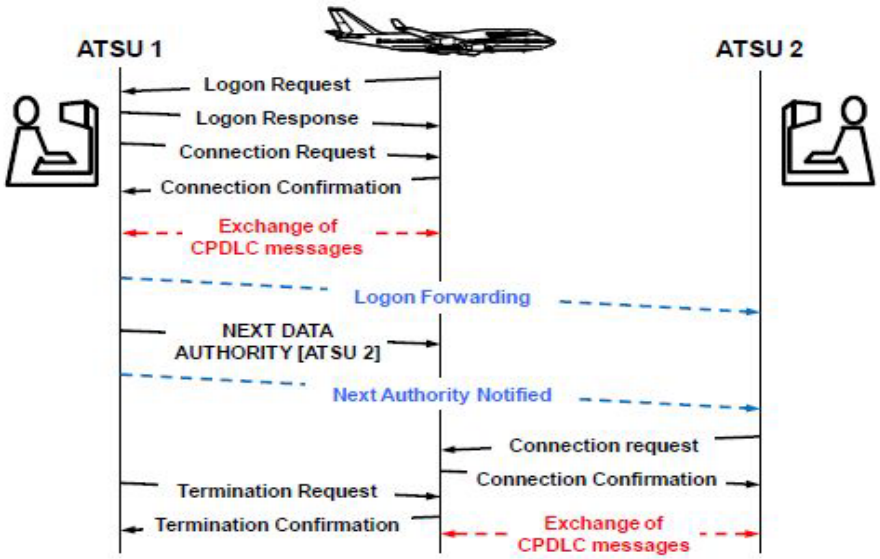
- Nominal sequence for initial CPDLC connection establishment and transfer of CPDLC connecting air-ground address forwarding.



- Nominal sequence for initial CPDLC connection establishment and transfer of CPDLC connection using ground-ground address forwarding. (No use of Next Authority Notified)



- Nominal sequence for initial CPDLC connection establishment and transfer of CPDLC connection using ground-ground address forwarding. (Use of Next Authority Notified)



Note) Next Authority Notified: To provide the receiving ATSU with the information that the aircraft has been notified about its next data authority.

ADVICE TIP

- En-route chart should be carefully confirmed during the flight. (Make sure Next FIR and applicable ARTCC/HF RADIO): Appropriate ATC control auto-forwarding should be carefully monitored.

  Example)

  Even though the FUKUOKA FIR (RJJJ) should be forward ATC control to the Anchorage FIR (PAZA) by the Flight Plan, SFO RADIO Oakland FIR (KZAK) might be the next ATC center by Tokyo ATC mistakes. Flight crew shall make sure if it is the correct ATC center. (In case of ATC difference compared to filed Flight Plan, CPDLC shall not be available.)

- NEXT ATC CENTER should be always monitored in case of FIR transition. If there is a difference occurred, flight crew shall clarify and confirm the ATC center. (Reject Key can be available for the case)

REFERENCE TIP

ATC UPLINK MSG CONFIRM

- Confirm the color change of white to green for ACCEPT key (777).
- Confirm the color change of white to green for numeric value when MCP or RADIO ACTIVE FREQUENCY sets correctly before selecting CANCEL button. (777)
- After confirming, activate the ATC uplink message.

POSITION REPORT

- Initial position report (Mandatory Point)
  - ✓ Right after CPDLC LOGON established, regardless of the current position and ADS operation.
  - ✓ CPDLC connection transfer or crossing FIR boundary.
- Any position in FMC ACTIVE RTE can be inputted.
- Input ALONG TRACK is prohibited.
- Speed for REPORT is COMMAND A/S (MCP A/S or FMC (if used)).
- If Ensuing or NEXT POSITION is not changed correctly, select another ATC menu and then return to the POSITION REPORT menu.
- HF radio initial contact for KZAK FIR: Proceed 1) Confirmation of CPDLC established, 2) A/C type, 3) Registration Number, 4) DEP & DES, 5) SELCAL CHECK. (In case of HF radio contact for frequency change: Only SELCAL check would be necessary.)

ADS INFORMATION

Auto Reporting

ADS (Automatic Dependent Surveillance) shall be used when ATC requires. An event contact specifies a request for reports to be transmitted by the aircraft whenever a defined “event” occurs as follows.

- The periodic contract allows an ATSU to specify the reporting frequency.

- The waypoint change event is triggered by a change to the next or the next-plus-one waypoints.
- The Lateral Deviation Change Event.
- The Vertical Rate Change.
- The Altitude Range Change Event.

OPERATIONAL TIP

- ADS will not be operating prior to CPDLC LOGON.
- When reporting by ADS, position report shall be automatically down linked at each FMC position.
- The flight crew should include only ATC waypoints in cleared segments of the aircraft active flight plan.
  Note) If flight crew inserts non-ATC waypoints (e.q. mid-points) into the aircraft active flight plan and activates the change, the aircraft system may trigger an ADS-C waypoint change event report at the non-ATC waypoint. As a result, the ADS-C report will include information about the non-ATC waypoint, which is not expected by the ATC ground system.
- The flight crew should maintain the active route in the aircraft system to be the same as the ATC cleared route of flight.
- When reporting by ADS-C only, the flight crew should include ATC waypoints in the aircraft active flight plan even if they are not compulsory reporting points.
- It is the pilot's responsibility to report only at ATC waypoint.

REFERENCE TIP FOR D-ATIS

- If D-ATIS except Japanese airports is not up linked for the airplane flying over Japanese airspace, Select SATCOM MODE on MANAGER menu in COMM page or change the active frequency from DATA to voice frequency on center audio panel. (Change to SATCOM MODE from Auto mode) After receiving uplink message, return to normal position such as AUTO for COMM page or DATA for center audio panel.
- Most Japan airports do not provide D-ATIS.

REGIONAL/STATE-SPECIFIC INFORMATION

(ICAO GOLD: Global Operational Data Link Document / 2nd Edition-26 April 2013 Appendix E)

This Appendix provides Regional/State specific information grouped per ICAO Regions pertaining to the data link operations.

1. Africa-Indian Ocean (AFI) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Antananarivo (Madagascar)	O	O	N	FMMM		
Canarias				GCCC		
Johannesburg Oceanic	O	O	N	FAJO	JNBCAYA	Confirm CPDLC CDA: One CPDLC position report at boundary.
Mauritius	O	O	N	FIMM		Confirm CPDLC CDA: One CPDLC position report at boundary.

O: Operational / T: Trial / N: Not Available

2. Caribbean (CAR) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
New York Oceanic (south of 27N)	O	O	N	KZWY	NYCODYA	DO NOT use CPDLC for position reporting. Use ADS-C or voice only. SELCAL check via HF are required for all FANS connected aircraft prior to entering the CTA/FIR. DO NOT send a CPDLC position report to confirm CDA prior to,

						or upon crossing the FIR.

O: Operational / T: Trial / N: Not Available

3. European (EUR) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Bucuresti FIR	O	N	N	LRBB	N/A	ATN B1
Budapest FIR	O	N	N	LHCC	N/A	ATN B1
Barcelona UIR	O	N	N	LECB	N/A	ATN B1
Bordeaux UAC	O	N	N	LFBB	N/A	ATN B1
Brest UAC	O	N	N	LFRR	N/A	ATN B1
Brindisi FIR	O	N	N	LIBB	N/A	ATN B1
Canarias UIR	O	N	N	GCCC	N/A	ATN B1
Finland UIR	O	N	N	EFIN	N/A	ATN B1 Only in the area south of 61°30'N
Geneva UIR	O	N	N	LSAG	N/A	ATN B1
Hellas UIR	O	N	N	LGGG	N/A	ATN B1
Kobenhavn FIR	O	N	N	EKDK	N/A	ATN B1
Lisboa UIR	O	N	N	LPPC	TBD	ATN B1 FANS 1/A
Ljubljana FIR	O	N	N	LJLA	N/A	ATN B1
London FIR	O	O	N	EGTT	TBD	ATN B1 FANS 1/A
Madrid UIR	O	N	N	LECM	N/A	ATN B1
Magadan(Russia)	O	O	N	GDXB		FANS 1/A
Malta UIR	O	N	N	LMMM	N/A	ATN B1
MUAC (Amsterdam FIR, Brussels FIR, Hannover FIR)	O	O	N	EDYY	TBD	ATN B1 FANS 1/A
Marseille UAC	O	N	N	LFMM	N/A	ATN B1

Milano ACC	O	N	N	LIMM	N/A	ATN B1
Nicosia FIR	O	N	N	LCCC	N/A	ATN B1
Oslo FIR	O	N	N	ENOS	N/A	ATN B1
Padova ACC	O	N	N	LIPP	N/A	ATN B1
Paris UAC	O	N	N	LFFF	N/A	ATN B1
Praha FIR	O	N	N	LKAA	N/A	ATN B1
Reims UAC	O	N	N	LFEE	N/A	ATN B1
Rhein UIR	O	N	N	EDMM	N/A	ATN B1
Riga UIR	O	N	N	EVRR	N/A	ATN B1
Roma FIR	O	N	N	LIRR	N/A	ATN B1
Scottish UIR	O	O	O	EGPX	TBD	ATN B1 FANS 1/A
Shannon UIR	O	O	O	EISN	TBD	ATN B1 FANS 1/A
Sofia FIR	O	N	N	LBSR	N/A	ATN B1
Sweden UIR	O	N	N	ESAA	N/A	ATN B1 Only in the area south of 61°30'N
Tallinn UIR	O	N	N	EETT	N/A	ATN B1
Vilnius UIR	O	N	N	EYVC	N/A	ATN B1
Warszaw FIR	O	N	N	EPWW	N/A	ATN B1
Wien FIR	O	N	N	LOVV	N/A	ATN B1
Zurich UIR	O	N	N	LSAZ	N/A	ATN B1

O: Operational / T: Trial / N: Not Available

4. Middle East/Asia (MID/ASIA) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Ho Chi Minh				VVTS		
Kuala Limpur				WMFC		

O: Operational / T: Trial / N: Not Available

5. North-America (NAM) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Edmonton (Canada)	O	O	N	CZEG	YEGE2YA for CPDLC and YEGCDYA for ADS-C	
Gander Domestic	O	N	N	CDQX	YQXD2YA	
Anchorage and Anchorage Arctic	O	N	N	PAZA	ANCXFXA	CPDLC voice transfer: CONTACT PAZA CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at FIR boundary.
Anchorage Continental Oceanic (South of N63 and west of W165)	O	O	N	PAZN	ANCATYA	CPDLC voice transfer: CONTACT PAZA CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at FIR boundary.
New York	O	O	N	KZWY	NYCODYA	DO NOT use CPDLC for position reporting. Use ADS-C or voice only. SELCAL check via HF are required for all FANS connected aircraft prior to entering the CTA/FIR. Do not send a CPDLC position report to confirm CDA prior to, or upon crossing the FIR.
Oakland	O	O	N	KZAK	OAKODYA	CPDLC voice transfer: CONTACT KSFO CENTER [frequency] KSFO (San Francisco Radio) will provide all primary and secondary HF frequencies, and HF transfer points along the route of flight.

						Confirm CPDLC CDA: One CPDLC position report at FIR boundary.

O: Operational / T: Trial / N: Not Available

6. North Atlantic (NAT) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Edmonton (Canada)	O	O	N	CZEG	YEGE2YA for CPDLC and YEGCDYA for ADS-C	
Gander Oceanic	O	O	O	CZQX	YQXE2YA	Report revised ETA: Next waypoint ETA error 3 minutes or more, use free text DM 67k REVISED ETA [position] [time]. See paragraph GOLD E.7.1.4
Gander Domestic	O	N	N	CDQX	YQXD2YA	
New York	O	O	N	KZWY	NYCODYA	DO NOT use CPDLC for position reporting. Use ADS-C or voice only. SELCAL check via HF is required for all FANS connected aircraft prior to entering the New York CTA. Do NOT send a CPDLC position report to confirm CDA prior to, or upon crossing the New York CTA.
Reykjavik	O	O	O	BIRD	REKCAYA	Confirm CPDLC CDA: Free text uplink message. Report revised ETA: Next waypoint ETA

						error 3 minutes or more, use free text DM 67k REVISED ETA [position] [time]. See paragraph GOLD E.7.1.4
Santa Maria	O	O	O	LPPO	SMACAYA	Confirm CPDLC CDA: CPDLC UM 160 (NDA). Report revised ETA: Next waypoint ETA error 3 minutes or more, use free text DM 67k REVISED ETA [position] [time]. See paragraph GOLD E.7.1.4
Shanwick	O	O	O	EGGX	PIKCPYA	Report revised ETA: Next waypoint ETA error 3 minutes or more, use free text DM 67k REVISED ETA [position] [time]. See paragraph GOLD E.7.1.4 Respond with immediate STANDBY to acknowledge receipt of downlink message.

O: Operational / T: Trial / N: Not Available

7. Pacific (PAC) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Anchorage and Anchorage Arctic (north of N63 and east of W165)	O	N	N	PAZA	ANCXFXA	CPDLC voice transfer: CONTACT PAZA CENTER [frequency] Confirm CPDLC CDA: One CPDLC position

						report at FIR boundary.
Anchorage Oceanic (south of N63 and west of W165)	O	O	N	PAZN	ANCATYA	CPDLC voice transfer: CONTACT PAZA CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at FIR boundary.
Auckland Oceanic	O	O	O	NZZO	AKLCDYA	CPDLC voice transfer: MONITOR NZZO CENTER [frequency] SELCAL check by CPDLC equipped aircraft is not required on entering NZZO CTA. Aircraft filling a SELCAL code in FPL Item 18 will be assumed to have serviceable SELCAL and be maintaining a SELCAL watch on the HF frequency advised in the monitor instruction passed by the transferring CPDLC authority. Confirm CPDLC CDA: One CPDLC Position report at boundary.
Bangkok	O	O	O	VTBB	BKKGWXA	Confirm CPDLC CDA: CPDLC UM 160 (NDA)
Brisbane	O	O	T	YBBB	BNECAYA	CPDLC voice transfer: MONITOR BRISBANE CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at FIR boundary.
Chengdu (China)	O	O	N	ZUUU	CTUGWYA	
Chennai (India)	O	O	N	VOMF	MAACAYA	

Delhi (India)	N	O	N	VIDF		
Fukuoka	O	O	N	RJJJ	FUKJJYA	CPDLC voice transfer: CONTACT TOKYO CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at boundary.
Honiara	O	O	N	YBBB	BNECAYA	
Kolkata (India)	O	O	N	VECF		
Kunming (China)	O	O	N	ZPPP	KMGGWYA	
Lanzhou (China)	O	O	N	ZLLL	LHWGWYA	
Mauritius	O	O	N	FIMM		Confirm CPDLC CDA: One CPDLC position report at boundary.
Melbourne	O	O	N	YMMM	MELCAYA	CPDLC voice transfer: MONITOR MELBOURNE CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at boundary.
Mumbai (India)	O	O	N	VABF	BOMCAYA	
Nadi	O	O	N	NFFF	NANCDYA	CPDLC voice transfer: MONITOR NFFF CENTER [frequency] Confirm CPDLC CDA: One CPDLC position report at boundary.
Oakland	O	O	N	KZAK	OAKODYA	CPDLC voice transfer: CONTACT KSFO CENTER [frequency] ***Note) KSFO (San Francisco Radio) will provide all primary and secondary HF frequencies, and HF transfer points along the route of flight.***

						Confirm CPDLC CDA: One CPDLC position report at boundary.
Seychelles	O	O	N	FSSS		
Singapore	O	O	O	WSJC	SINCDYA	Confirm CPDLC CDA: One CPDLC position report at boundary.
Tahiti	O	O	N	NTTT	PPTCDYA	CPDLC voice transfer: MONITOR NTTT CENTER [frequency] ***Note) A SELCAL check is required.*** Confirm CPDLC CDA: One CPDLC position report at boundary.
Ujung Pandang (Makassar) (Indonesia)	T	T	N	WAAF	UPGCAYA	Position reporting: CPDLC position report at each waypoint. ***Note) Currently trialing ADS-C and CPDLC.***
Ulan Bator (Mongolia)	O	O	N	ZMUA		
Urumqi (China)	O	O	N	ZWWW		
Colombo	T	T	N	VCCC		Position reporting: CPDLC position report at each waypoint. ***Note) Currently trialing ADS-C and CPDLC. Primary communication via voice. Full HF reporting still required.***
Yangon (Myanmar)	O	O	N	VYYF		

O: Operational / T: Trial / N: Not Available

8. South America (SAM) Region

CONTROL AREA (CTA)	CPDLC	ADS-C	FMC WPR	AFN ADDRESS	ATSU ACARS ADDRESS	REMARKS
Atlantico (Brazil)	O	O	N	SBAO	RECOEYA	
Cayenne (French Guiana)	O	O	N	SOOO	CAYCAYA	CPDLC voice transfer: MONITOR SOOO CENTER [frequency] SELCAL check by CPDLC equipped aircraft is not required on entering SOOO FIR. Aircraft filing a SELCAL code in FPL Item 18 will be assumed to have serviceable SELCAL and be maintaining a SELCAL watch on the HF frequency advised in the monitor instruction passed by the transferring authority. Confirm CPDLC CDA: One CPDLC position report at SOOO boundary entry point.

O: Operational / T: Trial / N: Not Available

Note)

- ***WPR: Waypoint Position Reporting.***
- ***CDA: Current Data Authority.***
- ***ATN B1: Aeronautical Telecommunication Network Baseline 1.***
- ***AFN: ATS Facilities Notification.***

PHRASEOLOGY

CIRCUMSTANCES	CONTROLLER	PILOT
Initial contact to HF radio after CPDLC connection.		WE HAVE CPDLC CONNECTION. REQUEST SELCAL CHECK.
Unsuccessful NDA delivery (CPDLC or voice).	CONTACT [ICAO UNIT NAME] [FREQUENCY]. SELECT ATC COM OFF. THEN LOG ON TO [ATSU]	WILCO.
NON-delivery of END service message	SELECT ATC COM OFF THEN LOG ON TO [ATSU]	ROGER
Advising a wake turbulence offset (Wake turbulence offset in RVSM: up to 2 NM either side of track)		WAKE DEV [direction] – DIRECTION: L OR R
Data link connection failures detected by the controller	DATA LINK FAILED SELECT ATC COM OFF THEN LOG ON TO {ATSU}	ROGER
Unexpected data link shutdown	DATA LINK FAILED SELECT ATC COM OFF CONTINUE ON VOICE	ROGER
Planned data link shutdown (The pilot shall select ATC COM OFF when the message is received)	DATA LINK WILL BE SHUTDOWN SELECT ATC COM OFF CONTINUE ON VOICE	ROGER
Resumption of data link operation	DATA LINK OPERATIONAL LOG ON TO [ATSU NAME]	LOG ON [ATSU NAME]
ADS only failure	ADS SHUTDOWN REVERT TO ATC DATA LINK POSITION REPORT	ROGER
Unexpected communication service provider shutdown	DATA LINK FAILED SELECT ATC COM OFF CONTINUE ON VOICE	ROGER
Unexpected avionics system shutdown	ROGER CONTINUE ON VOICE	DATA LINK FAILED SELECT ATC COM OFF CONTINUE ON VOICE
Using CPDLC to relay message (ex) Only a free text message shall be used	RELAY [ATSU] CLEARS [CALL SIGN] CLIMB TO MAINTAIN FL340 (ALL FREE TEXT)	RELAY TO [CALL SIGN] CLIMBING FL340 (ALL FREE TEXT)

The first word in the message shall be “RELAY”		

The end of section

OXYGEN REQUIREMENT

FLIGHT CREW OXYGEN MINIMUM REQUIREMENT

- Tables are provided to determine the Minimum Dispatch Crew Oxygen Pressure.

Note) When the size of bottle is not confirmed, contact the maintenance personnel and/or the dispatcher.

- For determination, enter with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature and size.

Required Pressure (PSI)

Bottle Temperature (Degree C)	114 Cuft Bottle		
	Number of Crew Using Oxygen		
	2	3	4
50 45 40	530 520 510	735 725 715	945 930 915
35 30 25	505 495 485	700 690 680	900 885 870
20 15 10	480 470 460	670 655 645	860 840 830
5 0 -5 -10	455 445 440 430	635 620 610 600	815 800 785 770

- Additional quantity of oxygen is required for more extensive normal crew usage (i.e. if one pilot is on oxygen while flying above 41,000 feet or a single pilot is at the flight controls) for an extended duration during flight.

- The additional quantity of oxygen required is 2.05 liters/man/minute. This is equivalent to 1.2 psi/man/minute for the single cylinder system.

PASSENGER OXYGEN MINIMUM REQUIREMENTS

For passenger oxygen supply, all B777 airplanes are equipped with chemical oxygen generator which can supply oxygen for 22 minutes in case of activation.

The end of section

SAT/TAT CONVERSION

- The purpose of this is to provide the conversion table for SAT (Static Air Temperature) to TAT (Total Air Temperature).
- Use TAT for fuel temperature with the “FUEL TEMP Indicating system” in-operation.

SAT degrees Celsius	Indicated Mach Number												
	.50	.60	.70	.74	.78	.80	.82	.83	.84	.85	.86	.87	.88
	Total Air Temperature (TAT) degrees Celsius												
-75	-65	-61	-56	-53	-51	-50	-48	-48	-47	-46	-46	-45	-44
-70	-60	-55	-50	-48	-45	-44	-43	-42	-41	-41	-40	-39	-39
-68	-58	-53	-48	-46	-43	-42	-40	-40	-39	-38	-38	-37	-36
-66	-56	-51	-46	-43	-41	-39	-38	-37	-37	-36	-35	-35	-34
-64	-54	-49	-44	-41	-39	-37	-36	-35	-34	-34	-33	-32	-32
-62	-51	-47	-41	-39	-36	-35	-34	-33	-32	-31	-31	-30	-29
-60	-49	-45	-39	-37	-34	-33	-31	-31	-30	-29	-28	-28	-27
-58	-47	-43	-37	-34	-32	-30	-29	-28	-28	-27	-26	-25	-25
-56	-45	-40	-35	-32	-30	-28	-27	-26	-25	-25	-24	-23	-22
-54	-43	-38	-33	-30	-27	-26	-25	-24	-23	-22	-22	-21	-20
-52	-41	-36	-30	-28	-25	-24	-22	-22	-21	-20	-19	-19	-18
-50	-39	-34	-28	-26	-23	-21	-20	-19	-19	-18	-17	-16	-15
-45	-34	-29	-23	-20	-17	-16	-14	-14	-13	-12	-11	-10	-10
-40	-28	-23	-17	-14	-12	-10	-9	-8	-7	-6	-6	-5	-4
-35	-23	-18	-12	-9	-6	-5	-3	-2	-1	-1	0	1	2
-30	-18	-12	-6	-3	0	1	3	4	4	5	6	7	8
-25	-13	-7	-1	2	5	7	8	9	10	11	12	13	13
-20	-7	-2	5	8	11	12	14	15	16	17	17	18	19
-15	-2	4	10	13	16	18	20	21	21	22	23	24	25
-10	3	9	16	19	22	24	25	26	27	28	29	30	31
-5	8	14	21	24	28	29	31	32	33	34	35	36	37

Note) In shaded area, fuel freezing point should be considered.

The end of section

ESTIMATION OF FREEZING POINTS OF JET A/ JET A-1 FUEL BLENDS

DEPARTING US AIRPORTS WITH JET A

- Flight Planning Stage: Use total air temperature (TAT) as an indication of fuel temperature. In case that OAT is expected to be below -66 degree C (for 747-400 aircraft), Dispatcher have to take actions such as route and/or altitude change and extra fuel uplift.

- Actual Flight: If the fuel temperature approaching -37 degree C (Fuel freeing point of Jet A + 3 degree C), increase speed, change altitude, and/or deviate to a warmer air mass to achieve a TAT equal to or higher than -37 degree C.

DEPARTING NON-US AIRPORTS WITH JET A1

- Flight Planning Stage: Use total air temperature (TAT) as an indication of fuel temperature. In case that OAT is expected to be below -70 degree C (for 747-400 aircraft), Dispatcher have to take actions such as route and/or altitude change and extra fuel uplift.

- Actual Flight: When fuel temperature decreases to -37 degree C, a message of FUEL TEMP LOW displays in the flight decks. When the EICAS message trips, the pilots will actively monitor the fuel temperature and calculate the fuel freezing point considering the type of actual fuel lift. Take actions to increase TAT if or when the fuel temperature drops to the calculated fuel freezing point + 3 degree C.

  ✓ 3 consecutive refuelings with Jet A1 → use the fuel freezing point of Jet A1.

  ✓ For blends of fuels with Jet A and Jet A1 → use the freezing point of Jet A/ Jet A1 fuel blends.

- We published a procedure for estimating the freezing points of blends of Jet A and Jet A-1 fuel. (This is from Boeing's service letter dated 4 August 2004)

Note)

1. ***The Jet A fuel specification limits the freezing point to a maximum of -40 degree C; the Jet A-1 limit is -47 degree C maximum.***

2. *Some operators in the U.S. measure the actual freezing point of delivered Jet A fuel at the time of dispatch.*

3. *When the fuel temperature on the aircraft reaches -37 degree C, a FUEL TEMP LOW message is activated, and the fuel temperature displayed on the EICAS changes color from white to amber.*

4. *Initially, TAT is much lower than the fuel probe temperature because of the thermal lag of the fuel.*

BOEING

Commercial Aviation Services

SERVICE LETTER

SERVICE ENGINEERING • BOEING COMMERCIAL AIRPLANES • P.O. BOX 3707 • SEATTLE • WASHINGTON 98124-2207

737-SL-28-061-B
747-SL-28-068-B
757-SL-28-036-B
767-SL-28-009-B
777-SL-28-010-B

ATA: 2820-00
4 August 2004

SUMMARY

This service letter provides a procedure, developed by Air Canada, for determining the freezing point of Jet A and Jet A-1 fuel blends.

BACKGROUND

The 737, 747, 767 and 777 AFM require that fuel temperatures are at least 3 degree C above the specified maximum freezing point for the type of fuel being used. (i.e. -40C° for Jet A and -47C° for Jet A-1)

SUGGESTED OPERATOR ACTION

Operators may use the attached Air Canada procedure to estimate the freezing point of fuel consisting of a blend of Jet A and Jet A-1 fuels in all models.

< Attachment >

The accompanying table provides a method of determining the freezing point of Jet A fuel diluted with Jet A-1 fuel. (The fuel in the tank before refueling must be considered to be Jet A if Jet A had been loaded during either of the two previous refueling)

The freezing points must be assumed to be at their specification maximum. (i.e. -40 C° for Jet A and -47C° for Jet A-1)

The following examples illustrate how the table is to be used:

Example 1

- Before refuel qty: 900 kg
- After refuel qty: 5,000 kg

To determine entry into the table:

- ✓ Consider 900 as 9 (row bracketed by 9 and 10)
- ✓ 5,000 as 50 (column bracketed by 50 and 60)
- ✓ Freezing point of mixture: -45 degree C

Example 2

- Before refuel qty: 5,200 kg
- After refuel qty: 18,700 kg

To determine entry into the table:

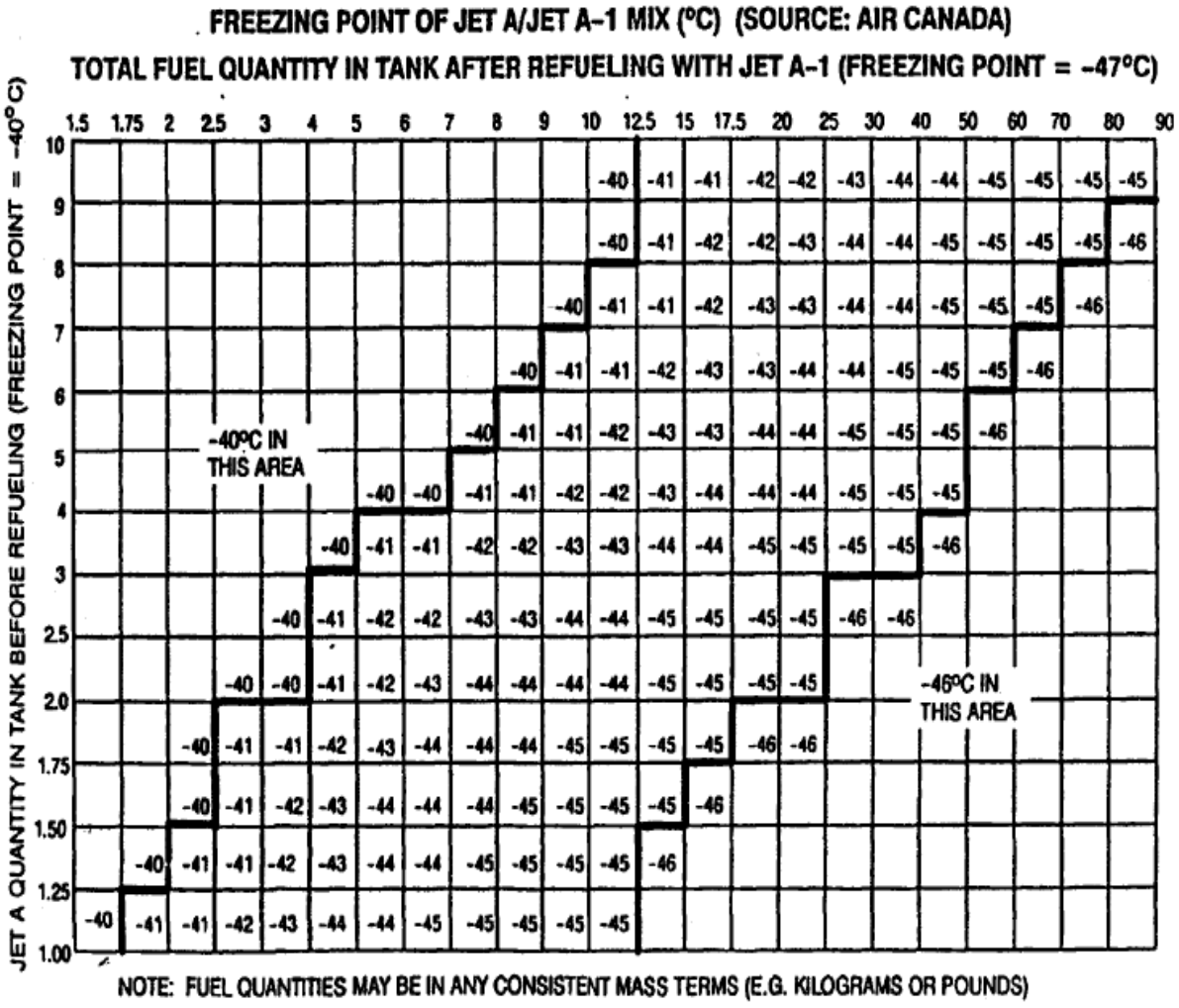
- ✓ Consider 5,200 as 5.20 (row bracketed by 5 and 6)
- ✓ 18,700 as 18.70 (column bracketed by 17.5 and 20)
- ✓ Freezing point of mixture: -44 degree C

Example 3

- Before refuel qty: 1,500 kg
- After refuel qty: 35,000 kg

To determine entry into the table:

- ✓ Consider 1,500 as 1.5 (row bracketed by 1.5 and 1.75)
- ✓ 35,000 as 35.0 (column bracketed by 30 and 40)
- ✓ Freezing point of mixture: -46 degree C



The end of section

WEATHER RADAR GUIDE

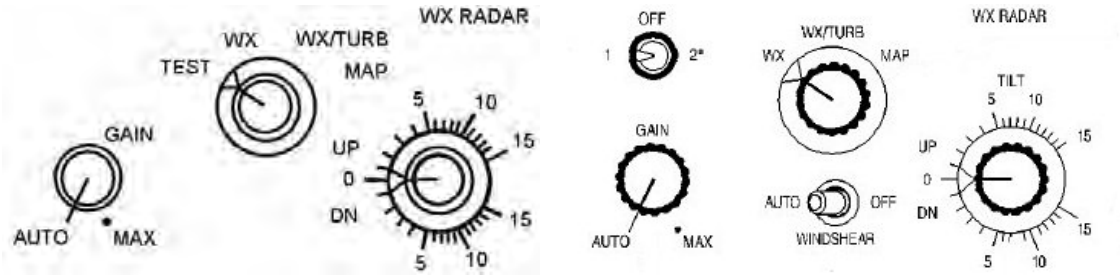
INTRODUCTION

This pilot's manual has been prepared as an easy to reference for use the operation of the WXR Radar RDR-4A/B System on our fleet. Remember the RDR-4A/B does not detect clouds. However, it can detect moisture laden weather formations which usually do have turbulence and windshear associated with them. When properly used, radar becomes a powerful aid in avoiding or reducing the hazards of inadvertent penetration of storm areas and associated turbulence.

KEY POINT

- Weather radars are designed for active detection of adverse weather conditions.
- Antenna tilt, range management and gain function need to be fully understood to use the weather radar effectively.
- Radar display colors reflect humidity in the air and not necessarily turbulence intensity: A red cell in a humid atmosphere may be less turbulent than a yellow one in dry air.
- The TURB function should be used to identify the most turbulent cells within 40 NM.

<Sample Control Panels>



- **WX**: Provides 180° of continuously updated weather information on the radar display, weather returns will vary from green to yellow to red increasing intensity. Gain Control is operational.
- **TURB or WX/TURB**: Provides 180° display of weather and Turbulence up to 40 NM and weather only beyond 40NM. Turbulence areas will appear magenta colored. Gain control will affect weather but not turbulence.

- **MAP**: Displays Terrain Mapping. Gain Control is operational.
- **GAIN CONTROL**: Controls receiver gain. Rotate fully counter clockwise for automatic gain.

Note) This FOEI only provides brief concept. For details, refer to "Weather Radar PILOT USER GUIDE" which is provided through Portable EFB

- ***Example)*** *Portable EFB: Content App ▶ FOEI ▶ Weather Radar*

The end of section

LANDING GEAR DOWN LIGHT FAILURE TO ILLUMINATE AFTER LANDING GEAR DOWN

(Reference: Boeing Letter AAR-AAR-16-0421-02B)

OPERATION INFORMATION

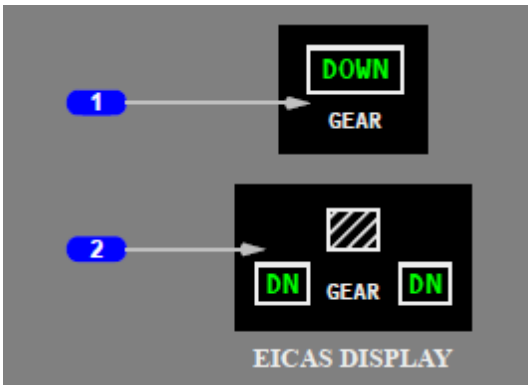
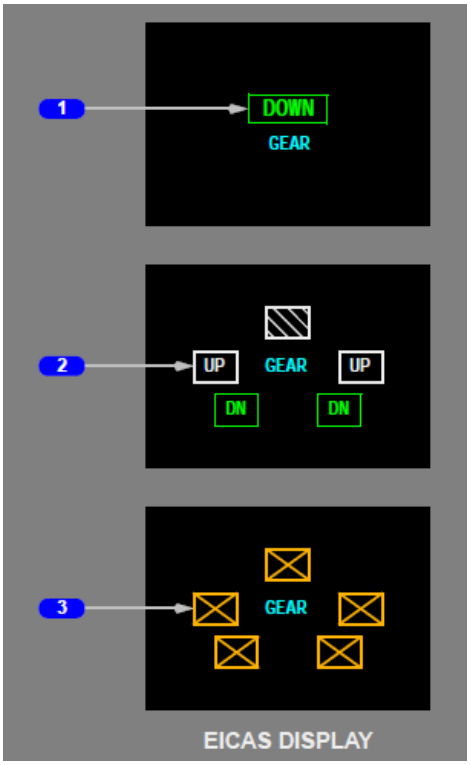
- B777/B747: False Alert not Possible.

Boeing Msg: Since the 747-400 and the 777 do not use light bulb to show landing gear position, the event of both bulb inoperative on the 767 would not occur on the 747/777.

We do not know of any failure condition that could result in a non-normal indication when all gears are down and locked normally and the proximity sensing system including sensors, wiring and PSEU are functioning normally with no WARNING or CAUTION message displayed on EICAS.

EICAS display and message (B747/B777) by PSU (Proximity Sensor Unit)

- GEAR DISAGREE Caution / Beeper

B777	B747
	

** In such a case that a loss of data, due to a wiring issue in the PSEU data bus, would result in a no computed data condition, the display logic will revert to blank landing gear indication.

FCOM QRH contents, related to EICAS MSG, show the checklist which would be followed in such a case (blank landing gear indication) – Reference: Boeing Letter: AAR-AAR-16-0532-07B.

The end of section

EGPWS

BACKGROUND

The purpose of this information is to provide the information for GPWS basic functions as well as Enhanced Function.

ENHANCED FUNTION

EGPWS

EGPWS = E (Enhanced function) + GPWS

Enhanced function

The EGPWS can provide additional alerting and display capabilities by comparing internal TDB (Terrain Data Base) with FMC position data.

The enhance function mainly consists of followings.

- Terrain Awareness Alerting and Display (TAAD)
- Terrain Clearance Floor (TCF)
- Terrain Data Base (TDB)

Note)

1. ***Terrain nuisance alerts can be triggered by the FMS position errors (MAP Shift). These could be reduced by GPS installation.***
2. ***TAAD/TCF functions must be prohibited during QFE operations by selection of a cockpit "TERR OVRD (TERR OFF) S/W" because TDB (Terrain Data Base)'s based on QNH value.***
   - ☞ ***Even though flight crew selects TERR OVRD (TERR OFF), basic GPWS (Mode 1 ~ 7) is still available.***
3. ***TERR OVRD INOP (TERR FAULT) light indicates TAAD and TCF are inoperative.***
   - ☞ ***Basic GPWS (Mode 1 ~ 7) is still available.***

GPWS BASIC MODE

Mode 1	Excessive descent rate
Mode 2	Excessive terrain closure rate
Mode 3	Altitude loss after takeoff or go-around
Mode 4	Unsafe terrain clearance when not in the landing configuration
Mode 5	Excessive deviation below an ILS glide slope
Mode 6	- Descent below specific radio altitudes - Descent below selected minimum radio altitude - Excessive bank angle
Mode 7	Windshear condition encounter

Note) The GPWS will not provide a warning/alert of flight toward vertically sheer terrain, or of slow descents into unprepared terrain while in the landing configuration.

Note) This FOEI only provides brief concept. For details, refer to "EGPWS PILOT USER GUIDE" which is provided through Portable EFB

- ***Example)*** *Portable EFB : Content App ▶ FOEI ▶ EGPWS*

The end of section

ONE ENGINE SHUTDOWN TAXI-IN

WARNING	An incident of both engines shutdown could be occurred inadvertently. PF should do clearly designate which engine to be shutdown.

GENERAL

- If one engine is shutdown during taxi in after flight, the crew must be aware of hydraulic, electrical, and braking system requirements, **particularly any degraded system operation due to enroute failures**.
- **The APU should be operating while taxiing with an engine shutdown**.
- Consideration should be given to the fact that high bypass ratio engines require cool down prior to shutting down.
  - ✓ Do not shut down the engine too quickly. If you shut down the engine before it is thermally stabilized, you can cause serious damage to the engine.
  - ✓ **Permit the engine to operate at minimum idle for 5 (five) minutes (minimum)**.
- If possible, make minimum radius turns in a direction that puts the operating engine on the outside of the turn.
- **One Engine Shutdown Taxi In is recommended if the landing weight is 440,000 pounds or less.**

Note) Expected Fuel Saving (through One Engine Shutdown Taxi In): 28 pounds per minute.

OTHER CONSIDERATIONS

- In operational environments such as uphill slope, soft asphalt, high gross weights, congested ramp areas, and wet/slippery ramps and taxiways, taxi with both engines operating.
- **The final decision whether to incorporate Engine Shutdown Taxi-In procedures must be based on an assessment of not only fuel conservation & brake life improvement considerations but on safety considerations as well.**
- Because of additional operational procedural requirements and crew workload, **taxiing out for flight with an engine shutdown is not recommended**.

The end of section

PERIODIC AUTOLAND PRACTICE

REFERENCE

A. Guideline for All Weather Operations (KCAB)

B. FAA AC120-29A
(Criteria for Approval of CAT I/II Weather Minima for Approach)

C. FAA AC120-28D
(Criteria for Approval of CAT III Weather Minima for Takeoff, Landing, and Rollout)

D. FAA AC120-118
(Criteria for Approval/Authorization of All Weather Operations (AWO) for Takeoff, Landing, and Rollout)

BACKGROUND

A. AUTOLAND system performance should be checked periodically by the KCAB regulation.

B. The regulation requirements are:

- For CAT-II system, at least one satisfactory AUTOLAND system operational use should be accomplished within 6 months for an aircraft to remain in CAT-II status.
- For CAT-III system, at least one satisfactory AUTOLAND system operational use within 30 days, for an aircraft to remain in CAT-III status.

ACARS MESSAGES, REPORTS AND AUTOLAND SYSTEM ELIGIBILITY

A. On the 1st and 15th of every month, practice AUTOLAND operation is recommended. (Refer to POM)

B. ACARS messages are uplinked automatically to remind the aircraft status and to ask AUTOLAND when conditions permit. (Refer to attached message description)

C. After landing, log entry for the L/D type is essential for AUTOLAND system status control.

D. CAT-II or CAT-III approach and landing is not allowed if above regulation requirement does not meet. The CAT-II/III restriction is removed by the completion of an AUTOLAND performance check. (BY the report of a successful AUTOLAND practice)

※ AUTOLAND system eligibility can be confirmed by an ACARS message. (Refer to attached message description)

Note) If there is any malfunction of AUTOLAND system, CAT-II/III AUTOLAND must not be conducted until AUTOLAND system eligible for AUTOLAND by a successful AUTOLAND practice.

FLIGHT CREW ACTION ITEM

A. Practice AUTOLAND when conditions permit, especially if there is an ACARS uplink message regarding AUTOLAND.

- To prevent potential CAT-III restriction due to long heavy maintenance, AUTOLAND practice is recommended during test flight and/or base return flight.

B. The log entry for the L/D type is necessary whenever AUTOLAND conducted as well as CAT-II and CAT-III AUTOLANDING.

- For immediate application of the AUTOLAND report, provisional reports for can be done by ACARS, but a log entry is necessary for permanent effect. (For A321/A330 fleet, an ACARS report page has been added. For the other type, ACARS will be upgraded during 2019)

C. AUTOLAND system eligibility should be confirmed before conducting CAT-II/III AUTOLAND.

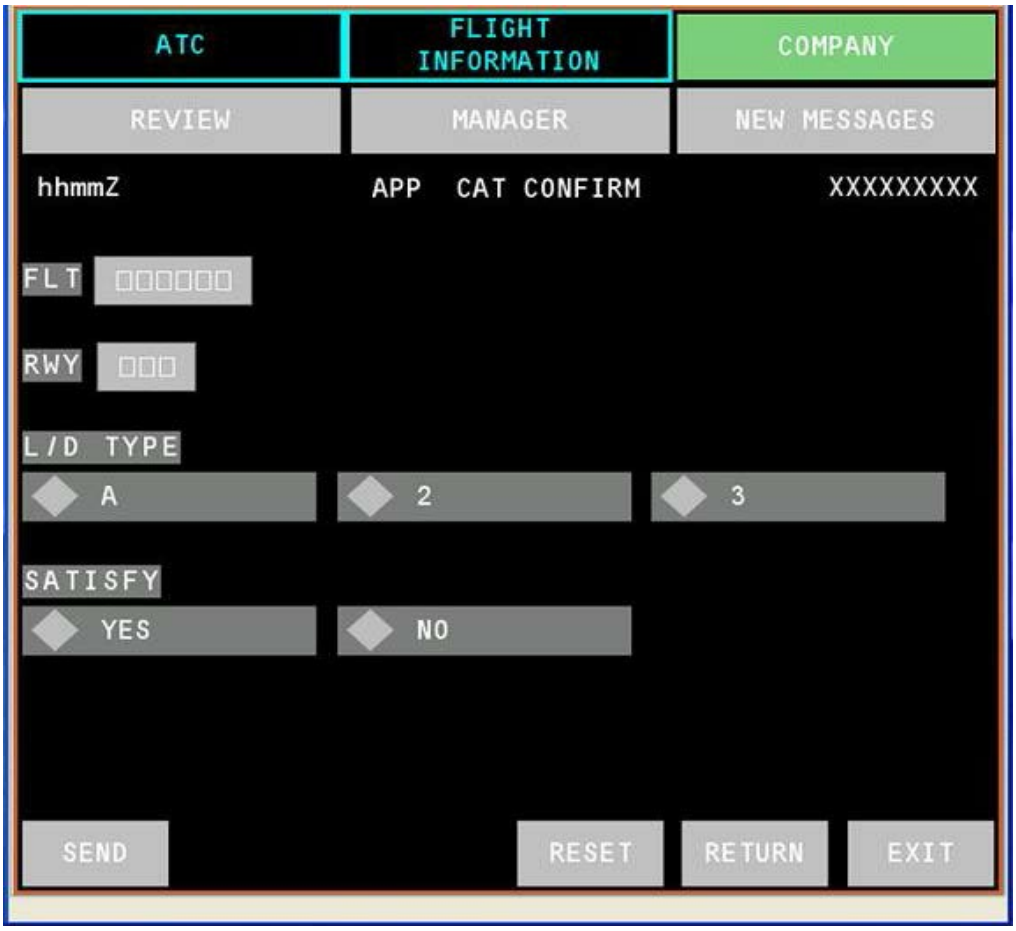
※ **Attachment**

a. ACARS display for approach CAT confirm and AUTOLAND report.
(for A321/A330/B777, an ACARS page will be added for the other models)

b. A table for AUTOLAND message description.

ATTACHMENT a. ACARS DISPLAY FOR APPRAOCH CAT CONFIRM AND AUTOLAND REPORT

- B777 MFD: Company → APP CAT CONFIRM



- **The provisional report may be effective by end of Feb. 2019 after related ground system upgraded.**

  - **1L: Enter FLT NO if no auto display**
  - **2L: Enter L/D Runway**
  - **3L: Enter L/D Type or Confirm AUTOLAND system eligibility**

    - Report Autoland Type: ‘A’ Autoland, ‘2’ CAT-II, ‘3’ CAT-III.
    - This report is provisional for immediate ACARS message control. Log entry after landing is necessary for permanent effect.
    - Confirm AUTOLAND Sys eligibility: ‘C’ Confirm – a status notification message will be uplinked automatically.

  - **4L: Select Yes if successful L/D**

ATTACHMENT b. ACARS MESSAGES RELEATED TO AUTOLAND

Conditions	Contents
On the 1st and 15th of the every month. Uplink trigger: W&B Msg DN	- QDSELFAOZ~1 FREE TEXT DEAR CAPT, 1ST and 15TH DAY, PRACTICE AUTOLAND if possible. This is an Auto-generated message to remind CAT-II/III system Check requirement of POM. No Ack needed. REGARDS FLT OPS ENGER
Within 15 days remain for CAT-III due date (30 days).*	- QDSELFAOZ~1 FREE TEXT PRACTICE AUTO LAND This is an auto generated msg regarding CAT 2 and 3. CAT 3 valid until 2018/08/13. PLS AUTOLAND If the captain decide it is practicable for AUTO sys check.
Overdue CAT-III requirement (30 days).*	- QDSELFAOZ~1 FREE TEXT PRACTICE AUTO LAND This is an auto generated msg regarding CAT 2 and 3. CAT 3 Prohibited because of AUTO SYS CHECK PERIOD OVERDUE. PLS AUTOLAND If the captain decide it is practicable for AUTO sys check.
Overdue CAT-II requirement (6 months).*	- QDSELFAOZ~1 FREE TEXT PRACTICE AUTO LAND This is an auto generated msg regarding CAT 2 and 3. CAT 2 & 3 Prohibited. PLS AUTOLAND If the captain decide it is practicable for AUTO sys check.

- (*): Uplink trigger: Before ETD 15 minutes, ETA message downlink and APP CAT Confirm message downlink.

Note) There will be an uplink message "CAT-II/III Okay" if APP CAT confirm message is downlinked and CAT-II/III is valid for more than 15 days.

Note) Any comment and suggestion would be welcomed for the continued airworthiness of CAT-II/III AUTOLAND system to Flight Operations Engineering Team.

The end of section

NAVIGATION DATABASE (NavData)

INTRODUCTION

The navigation database contains the elements as below which are displayed on FMC.

- Waypoints/Intersection
- Airways
- DME, VOR, NDB, ILS
- Airports
- Runways
- Procedures (SID, STAR, APP)
- Holding patterns and so on

The navigation database is normally updated every 28 days (AIRAC System / ICAO Standard) in order to ensure that its contents are current after receiving the NavData from the NavData production company (Jeppesen, Lido...).

LIMITATION OF NavDATA

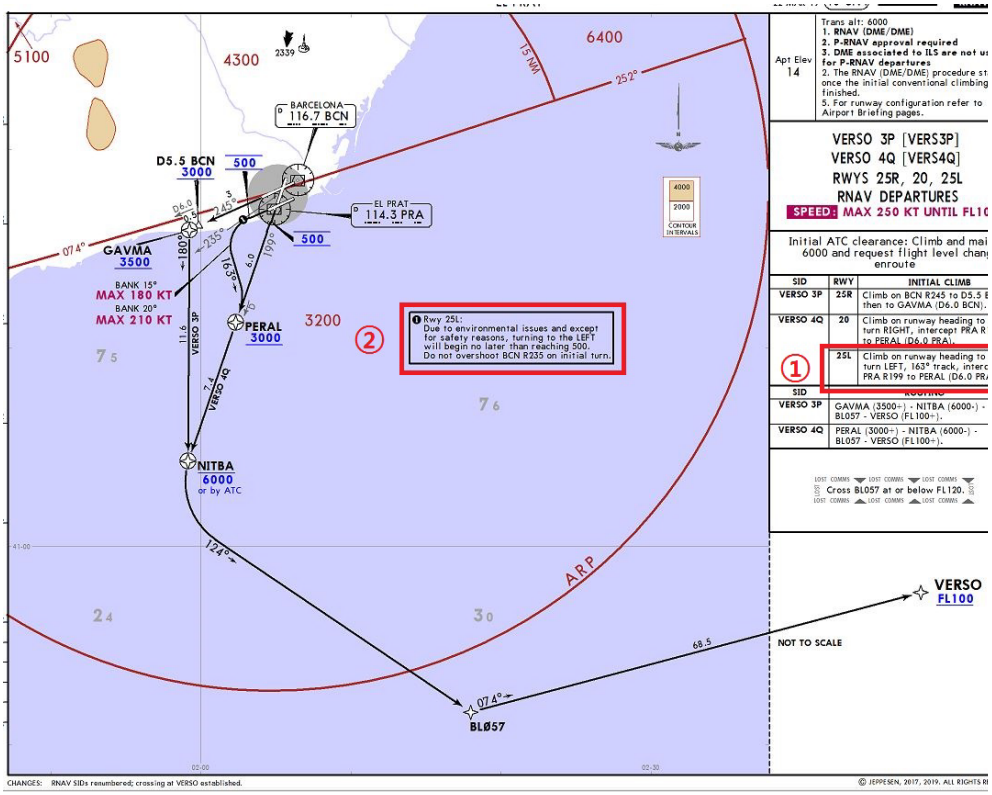
There are some differences between charts and databases because there is no international standard and technical methods in order to convert pictures & text (charts) into database (NavData) perfectly.

In addition, The same database information may be displayed differently on FMC according to different types of avionics equipment. Some of the equipment affects limitation of specific types of airport procedures.

The following is the contents which may affect flight operations or flight safety for a long period. This can be different according to aircrafts' Model and avionics equipment.

NDB-LIM_19-3

Aircraft	All
Subject	Difference between Jeppesen chart (at) and NavData (at or above)
Contents	**1. Outline** Some of the Airports' procedures have the following statement in the legs : *"heading to altitude(at)"* Such legs (*"heading to altitude(at)"*) have to be coded 'at or above altitude' in the NavData based on NavData international rule (ARINC424). Please see below example of captured Jeppesen Chart. [BCN departure procedure / VERSO4Q]



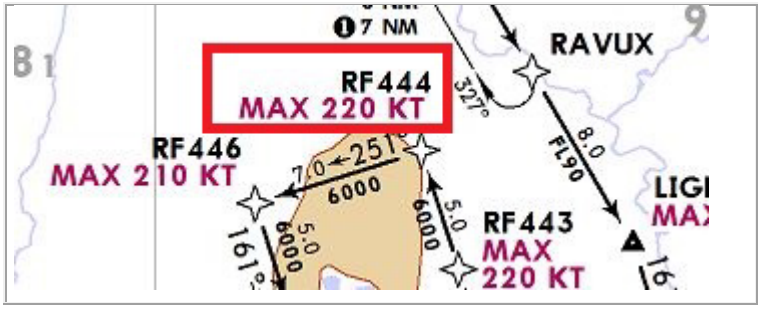
① "25L: *Climb on runway heading to 500, turn LEFT ~*"

- ▶ Jeppesen Chart: at 500 ft
- ▶ NavData: at or above 500 ft (according to NavData International Rule)

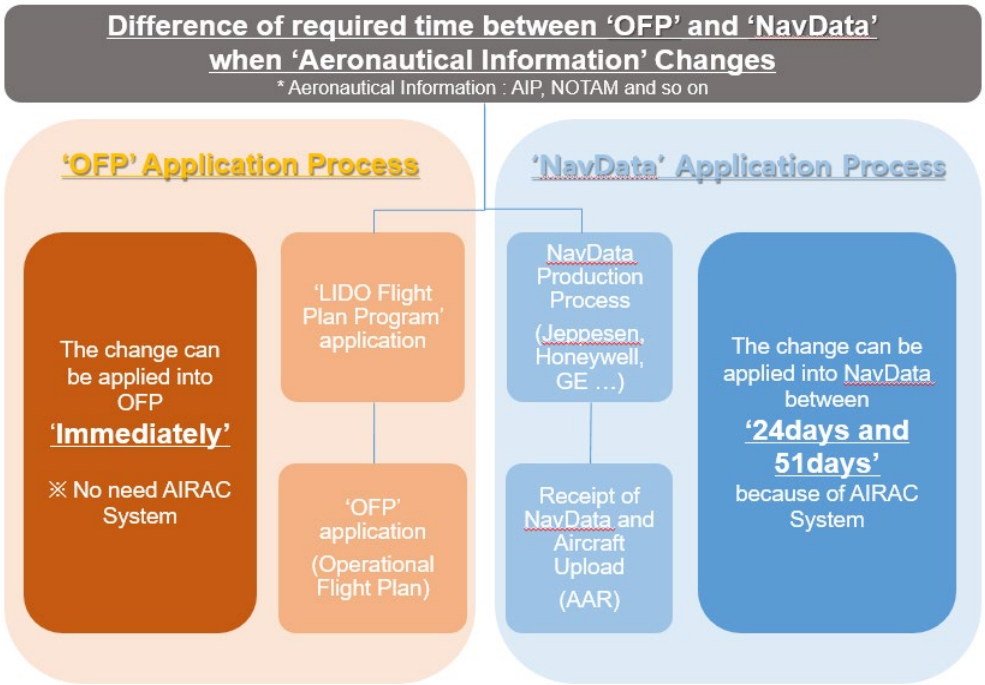
The Jeppesen Chart describes "at 500ft" for the initial altitude of 25L Dep'. However, the altitude has to be coded as "at or above 500ft" into the NavData according to NavData international rule. This is the uncommon case, and there is no other coding option unless BCN's Aviation Authority changes the description (heading to at altitude). However, BCN's Aviation

	Authority has no plan to change the description, and said that the procedure is clear and official procedure for safety. **2. Required Action:** Jeppesen Chart is our Route Guide according to FOM so please note such difference and operate based on Jeppesen Chart when such difference between Jeppesen Chart and NavData occurs. **3. Reference** BCN VERSO4Q 24L departure especially states that aircrafts must turn to left no later than 500ft on the Jeppesen Chart (refer to the above captured Jeppesen Chart and below statement). ② *"Rwy 25L: Due to environmental issues and except for safety reasons, turning to the LEFT will begin no later than reaching 500. Do not overshoot BCN R235 on initial turn."* The statement is just notification not the procedure legs. It couldn't be coded into the NavData. Flight crews have to apply such notification to the operation in order to avoid violation of the notification.

NDB-LIM_20-1

Aircraft	B747, B767, B777
Subject	Fixs having only speed limitation without altitude limitation are not applied into FMC database for Boeing Fleets
Contents	**1. Outline** Because of FMS performance limitation of Boeing, Fixs having only speed limitation without altitude limitation is not applied into FMC database (only for Boeing fleets). ※ Refer to the following example: Fix 'RF444' (FCO / RITEB 2A ARR) - Waypoint having only speed limitation without altitude limitation  **2. Required Action** This speed limitation may be added into FMC by manual input. Please refer to related flight manual of FMC in order to add such speed limitation. In addition, please note that all procedures have to applied info FMC based on Jeppesen Chart.

NDB-LIM_20-2

Aircraft	All aircrafts
Subject	Difference between 'OFP' and 'NavData' from the perspective of required time to apply Aeronautical Information change
Contents	**1. Outline** NavData production process is the works to convert pictures & text (charts) into database (NavData). Some differences may be occur between OFP and NavData when Aeronautical Information changes in the process. There are a lot of reasons why such differences occur, but the main reason is 'AIRAC System' of ICAO. 'LIDO Flight Plan Program' which makes 'OFP' doesn't need AIRAC System whereas 'NavData Production Process' needs. When aeronautical information such as AIP Amendment publication or NOTAM changes, the changes can be applied into OFP **immediately**, but NavData needs between **24days and 51days** (refer to below reference*). In addition, some NOTAMs' effective period occasionally doesn't comply with AIRAC system. NavData couldn't apply such NOTAMs' contents In such cases. For these reasons, there can be a lot of differences between OFP and NavData. * Reference (Difference between 'OFP' and 'NavData')  **2. Required Action** Flight crews have to comply with OFP according to FOM. FOM states as below regarding flight crews' required action in order to confirm Data and Legs of FMC.

	※ *Part of the FOM (3.1.12 Data and Legs Confirmation)* *a. Captain and First Officer shall confirm flight data in OFP and FMS(FMGS) in the following manner.* *1) Each pilot shall compare waypoints, headings and distances in FMSCDU LegPages with those in OFP.* *2) When new waypoints (which are not included in Navdata) are manually input, first officer shall read the waypoints, headings and distances in FMS-CDU Leg Pages and Captain shall check them by comparing data with those of OFP.* *b. If there are differences between FMS-CDU and OFP, OFP takes priority over FMS-CDU.* Please note OFP takes priority over NavData for various reasons so comply with OFP according to FOM and related flight manuals when there are differences between OFP and NavData.

The end of section

WEIGHT & BALANCE GUIDANCE: SOW BUILD UP

WHY A "WEIGHT & BALANCE" IS IMPORTANT

- Ensures that the certified weight and center of gravity limits are not exceeded
- Ensures that loading limitations are not exceeded
- Provides accurate weight and C.G. for proper selection of takeoff horizontal stabilizer trim setting
- Provides accurate takeoff weight for determination of takeoff speeds (V1, VR, V2) and required takeoff field length

BASIC RULES OF SOW DETERMINATION

- SOW (Standard Operating Weight) is the sum of the Basic Empty Weight (BEW) of the airplane and operational items, including Cockpit Crews, Cabin Crews, Catering Items, Cabin Service Items, Potable Water, and Fly Away Kit.
- SOW is the takeoff weight of the airplane, except for usable fuel and payload. It is also called DOW (Dry Operating Weight) or OEW (Operating Empty Weight)

STANDARD NUMBER OF CREWS

- Standard numbers of cockpit and cabin crews vary based on the aircraft type and whether the flight is international or domestic.

International		A/C Type	Domestic	
Cockpit Crew	Cabin Crew		Cockpit Crew	Cabin Crew
2	5	A320	2	4
	7	A321		4
	12	A333		8
	13	A350		8
	24	A380		18
	-	B767		7
	13	B777		8
	18	B747P		10

- Freighter and test flights with passenger/ freighter airplanes consider only 2 cockpit crews

* The above information is for reference only and is subject to change depending on daily operations.

CREW WEIGHTS

- Cockpit crew: 210 lb
- Cabin crew: 180 lb

PANTRY CODE

- Weight of catering items, defined by the standard cabin service plan, is included in the SOW as “Pantry Code.” (Refer to the Reference 1)

POTABLE WATER LOADING

- Different loading percentages based on pantry codes and routes
- Potable water loading differences aim for fuel efficiency

DISCREPANCY OF SOW BETWEEN OFP AND LOAD SHEET

- OFP (Operational Flight Plan) considers standard SOW determined by basic rules
- Load Sheet's SOW accounts for all adjustments, making it the practical weight point
- Flight crew notes any SOW discrepancies between OFP and Load Sheet but considers Load Sheet SOW as the precise value.

WEIGHT & BALANCE BUILD UP FLOW

- By adhering to these Weight & Balance procedures, we ensure the safety and efficiency of aircraft operations. The comprehensive approach covers all aspects, from initial weight determination to real-time adjustments during flight operations. (Refer to the Reference 2.)

< Reference 1. Pantry Code / Jan 2024 >

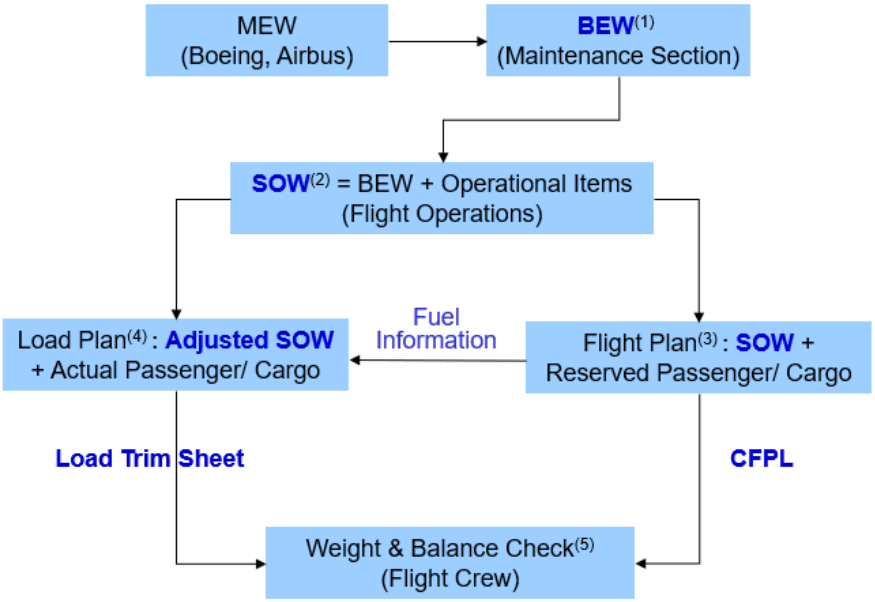
Pantry Code	Potable Water	Route
D00	75%	Domestic
G01	70%	HGH(O), NKG(O), NRT(O), KIX(O), PEK(O), PVG(O), SHA(O), YNJ(O), CGQ(O)
G02	50%	HGH(I), NKG(I), NRT(I), KIX(I), PEK(I), PVG(I), SHA(I), YNJ(I), CGQ(I)
K00	100%	CAN, CRK, CTU, TFU, FSZ, HIJ, HKD, HKG, IBR, KCZ, KHH, KKJ, KMJ, MNL, MYJ, REP, SHM, SIA, TAK, TKS, TNA, TPE, TTJ, YGJ, XIY
K01	70%	DLC(O), FUK(O), HND(O), KMI(O), NGO(O), OKA(O), SDJ(O), SHE(O),TAO(O), TSN(O), WEH(O), YNZ(O), YNT(O), SYO(O), TOY(O)
K02	50%	DLC(I), FUK(I), HND(I), KMI(I), NGO(I), OKA(I), SDJ(I), SHE(I), TAO(I), TSN(I), WEH(I), YNZ(I), YNT(I), SYO(I), TOY(I)
Q00	100%	BKI, BLR, BOM, CKG, CNX, CSX, DAD, TAG, DYG, FOC, HAK, KWL, HNA, JHB, KHN, KHV, LAO, MAA, MDG, MMB, NGB, NNG, RMQ, ROR, PQC, SYX, SZX, TXN, TYN, UUS,UBN, ULN, VVO, XUZ, DLI
Q01	70%	AKJ(O), CTS(O), HRB(O), CGQ(O), NKG(O), PEK(O)
Q02	50%	AKJ(I), CTS(I), HRB(I), CGQ(I), NKG(I), PEK(I)
R00	100%	BKK, BWN, CEB, CXR, DEL, HAN, HKT, PNH, SIN, SGN, SPN (for A321, R00SPN), RGN, KIX-SPN V.V, NRT-SPN V.V, HIJ-SPN V.V
S00	100%	ALA, CEI, CGK, DAC, DPS, TAS, TSE, UTP
U00	100%	BCN, BUD, CAI, CDG, FCO, FRA, HNL, IST, JFK, LAX, LHR, LIS, ORD, SEA, SFO, SYD, VCE, MEL
T00	30%	TEST & FERRY FLT

* O: Outbound, I: Inbound

* No Pantry Code is assigned for Freighter Flight

* The above information is for reference only and is subject to change depending on daily operations.

<Reference 2. Weight & Balance Build Up Flow Chart >



(1) BEW: Measured at least once every two years

(2) SOW: Reflects BEW with operational items.

(3) Flight Plan: Reflects SOW and reserved passenger/cargo loads for flight planning. Fuel information is reflected in Load Plan creation

(4) Load Plan: Reflects actual passenger/cargo loads on Adjusted SOW, considering daily operational items

(5) Weight & Balance Check: Ensures compliance with weight and balance limits

The end of section