海 南 航 空
Hainan Airlines

Standard Flight Operating Manual

SOP 737-800

Hainan Airlines Company Limited

Hai Nan Airlines Co. Ltd

Flight Crew Standard Operating Manual

SOP

737-800

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Preface

The aim of this Hanain Airlines (HNA) Standard Operating Procedure (SOP) is to enhance the flight technique management of the company, to enhance training quality and technical level of the flight crew, for the flight crew to achieve the required level of standard operation according to the company procedures Application of this manual’s content is to: strengthen the concept of crew cooperation, enhance the level of CRM, quality of flight operation and increase flight safety.

This manual is compiled strictly in accordance with the following manuals: “Operation Regulation”, “Flight Operation Manual”, “Flight Crew Operation Manual”, “Aircraft Flight Manual”, “Flight Crew Training Manual”, “Quick Reference Handbook” and other related manuals issued by the company.

The Flight Department is responsible for the compilation, revision, printing and management of this manual. Personnel are specially assigned for the revision of this manual, according to the latest materials from Boeing and the suggestions of Flight Department. After been examined and approved by the Flight Technique Committee, this manual is then distributed to all B737 pilots. The Flight Department then publishes the updates of the manual into the operational net to announce changes,and to allow the manual holders to take note of related changes in time, so as to keep the validity of the manual.

This “Standard Operation Procedure” (Revision 2) has corrected previous statements and data, revised related procedures according to the latest “Flight Crew Operation Manual”, optimized the procedures according to the latest requirements of the authority and of the company.

Compiling consultant:

牟伟刚　关磊　丁欣　吴浩

Compiling group:

靳聪力　黄道春　翟甲新　贾陈生　张敢　高翼
张跃昌　岑明辉

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0.1 General Table of Content

1. General Principles

1 General Principle

1.1 General Description:

This manual introduces normal and abnormal procedures, recommends concepts and methods of flight and airplane operation, including flight techniques and flight management.

This manual is compiled strictly according to *Operation Regulation, Flight Operation Manual, Flight Crew Operation Manual, Aircraft Flight Manual, Flight Crew Training Manual, Quick Reference Handbook and other manuals published by the company.* The Flight Crew should operate according to the recommended procedures, while the Captain may have to make safe decisions for real-time situations that cannot be covered by current published documentation.

In general, good judgment and logical reasoning can not be replaced by manuals.

1.2 Usage Principle:

Operational procedures, guidance and skills are recommended to the Flight Crew in this manual. The Flight Crew must understand, be proficient and correctly apply all the contents of *Flight Operation Manual, Airplane Flight Manual, Flight Crew Operation Manual, Flight Crew Training Manual, Quick Reference Handbook* prior to the usage of this manual.

The Normal Procedure is used by the trained Flight Crew. Every Flight Crew Member should complete a flow scan according to respective area of responsibility **by memory**. The related Checklist is used to confirm that the critical operation is definitely correct and associated Normal Procedure is completed.

The Non-normal Procedures are used to handle the abnormal situations on the ground and/or in air. If the abnormal situation/s occur, first check if the system control devices are in the proper position, then check relevant Circuit Breaker and test corresponding system lights (if needed). Before engine start, verify system condition through respective system lights. After engine start, use the Master Caution system, relavent system lights, or alerts as primary method to remind the Crew of certain abnormal system condition/s. If Master Caution or system signal light/s is illuminated, the corresponding abnormal procedure must be completed. Do the Non-normal Checklist after all memory items are completed, the aircraft is under control and not in a critical phase of flight.

For procedures or training courses not covered in this manual, refer to the latest Flight Crew Operation Manual (FCOM), Flight Crew Training Manual (FCTM), and Quick Reference Handbook (QRH).

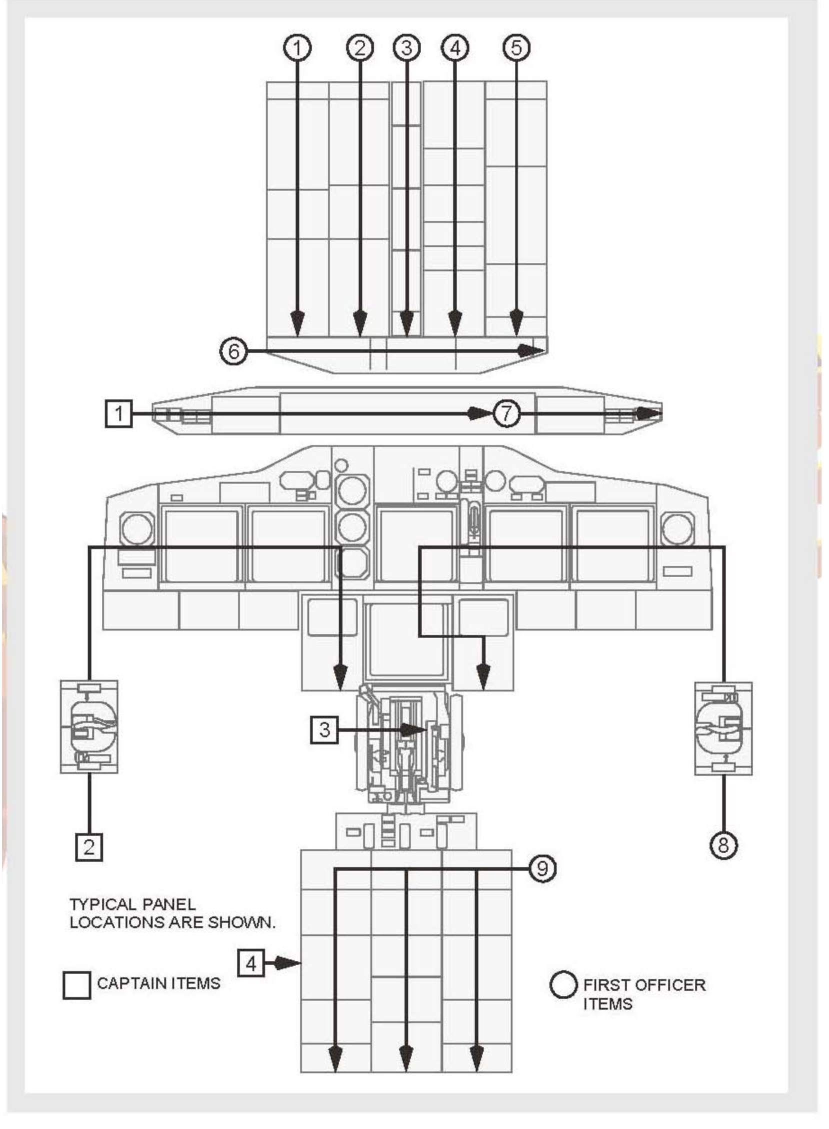
1.3 Flight Crew Responsibility

The responsibilities before or after flight are divided into that of Captain (left seat) and First Officer (right seat). The responsibility in each flight phase is divided according to Pilot Flying (PF) and Pilot Monitoring (PM).

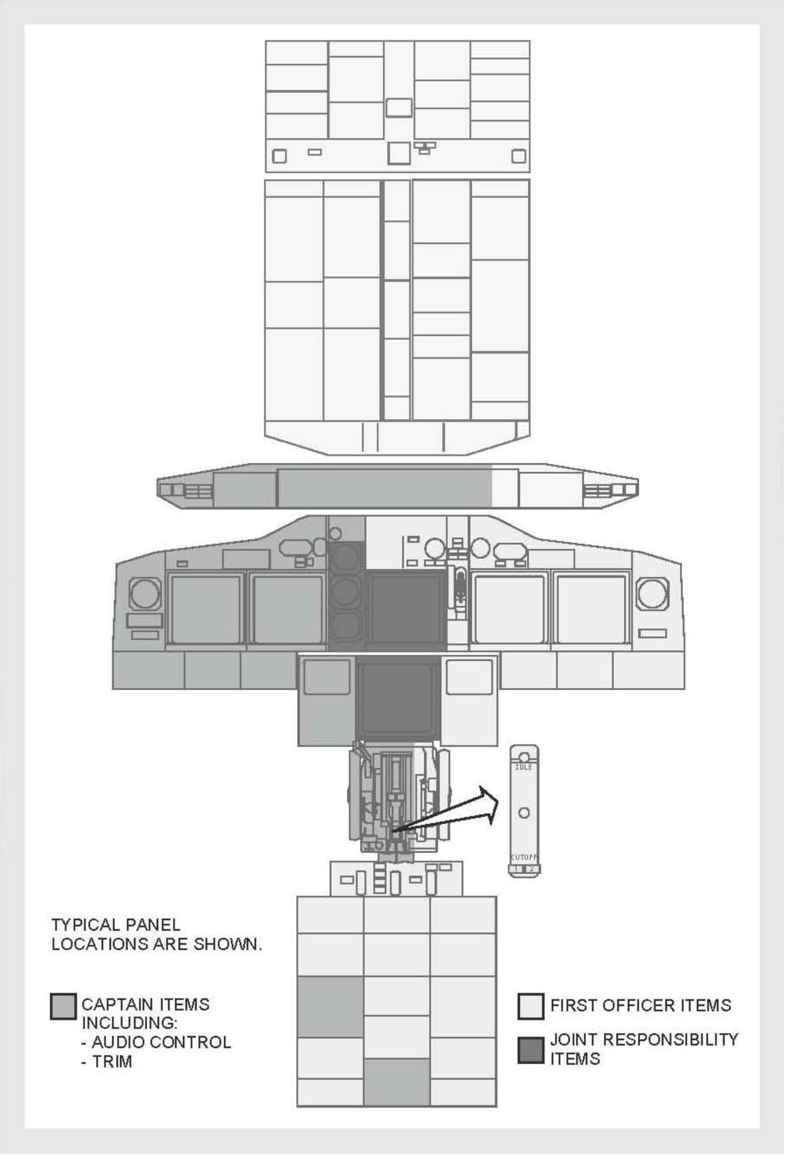
Every Flight Crew Member is responsible for his respective control/s and/or switches in his area of responsibility. The Responsibility Panel Diagram displays the normal and abnormal situation responsibility area and shows the typical panel position.

The Captain could guide the Flight Crew Member to execute actions out of the area of responsibility.

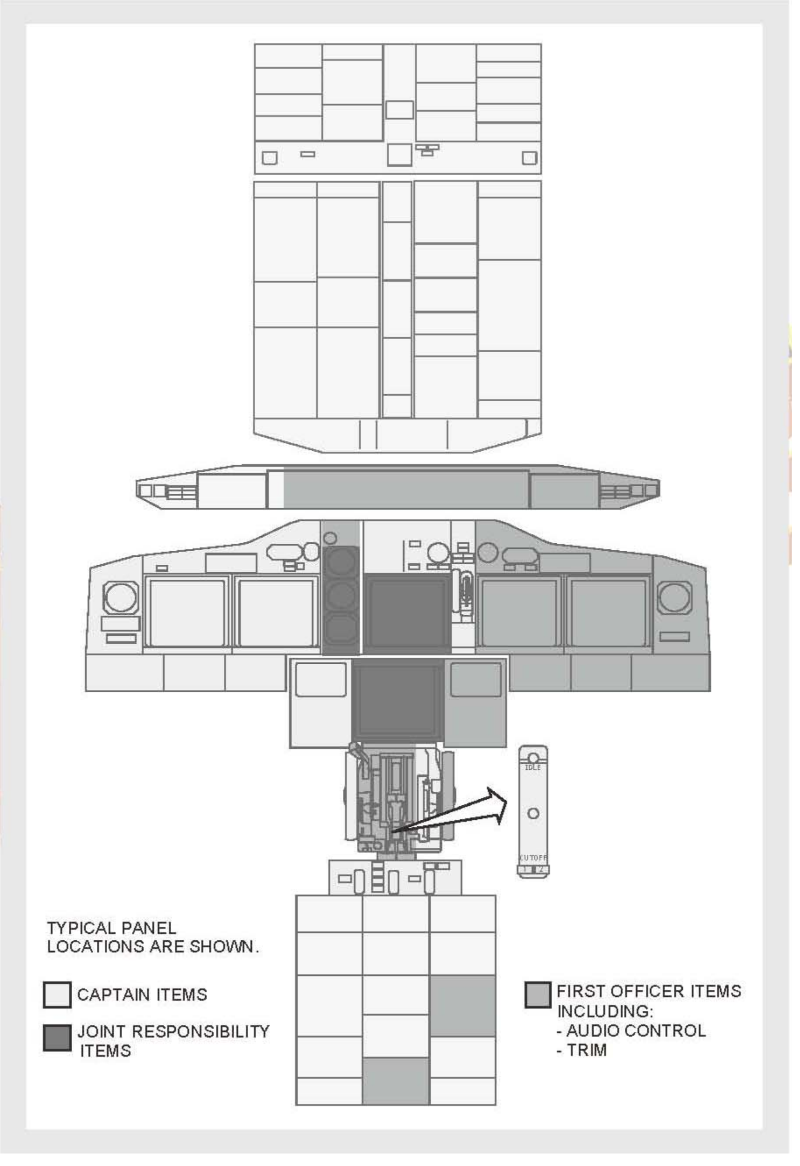
Preflight and Postflight Scan Flow



Areas of Responsibility - Captain as Pilot Flying or Taxiing



Areas of Responsibility - First Officer as Pilot Flying or Taxiing



The normal responsibilities of PF in the following flight phases:

- Taxi.
- Flight track and airspeed control.
- Airplane configuration.
- Navigation.

The normal responsibilities of PM in the following flight phases:

- Read the appropriate Checklist.
- Communication (ATC, Company, Cabin Crew as directed by the PF or Captain).
- The assigned task/s as required by the PF.
- Monitor taxi, flight path, airspeed, aircraft configuration and navigation.

The responsibility of PF and PM could be changed during flight. For example: the Captain could be PF as required during taxi, and could be PM from takeoff to landing.

The normal procedure indicates which pilot (C, F/O, or PF, PM) takes the action:

- As the procedure name, or
- At the last column, or
- As the diagram or table name

MCP is the area of responsibility of PF. During manual flight, PF will advise the PM to make changes in the MCP as required.

The Captain makes the final decision to the execution and correct completion of the responsibilities.

Automatic Flight Director System (AFDS) procedure

Flight Crew should always monitor:

- Airplane course
- Vertical path
- Speed

When an MCP selection is made, confirm with the flight mode annunciation (FMA) and related instruments.

Flight Crew must confirm manual selection of the flight mode or the AFDS automatic change. Confirm the correct changes by referring to the FMA:

- Autopilot.
- Flight Director.
- Autothrottle.

During the operation of LNAV and VNAV, verify all the changes of the airplanes:

- Flight course.
- Vertical path.
- Thrust.
- Speed.

Good CRM practice requires that callouts should be made when FMA and thrust mode have been displayed or changed.

1.4 Quick Reference Handbook (QRH) Checklist

The QRH is divided into three parts: Normal Non-normal and Performance sections which are used in all flight phases.

In normal situations, the Flight Crew should complete the Checklist according to the requirements of the FCOM and this SOP manual.

In abnormal situations, the Flight Crew must complete the relavent Non-normal Checklist after establishing positive control over the airplane.

In emergency situations, the Flight Crew must complete relavent Recall Items after establishing positive control over the airplane and when the situation safely permits.

Principles of usage of the Normal Checklist.

The Normal Checklist can be used when the relavent procedural steps have been completed.

The table below shows Pilots' task sharing of reading the Checklist and answering the Checklist. Both pilots should visually check that the required items and steps are completed. The right column refers to the pilot who answers the Checklist. This is different from the right column shown in the normal procedures, which shows which steps are done by which pilot.

Checklist	Required Checklist called by	Checklist read by	Confirmed or verified by	Pilots responding
Preflight	Captain	F/O	Both pilots	Both pilots
Before Start	Captain	F/O	Both pilots	Both pilots
Before Taxi	Captain	F/O	Both pilots	Both pilots
Before takeoff	PF	PM	Both pilots	Both pilots
After Takeoff	PF	PM	Both pilots	PM
Descent	PF	PM	Both pilots	Both pilots
Approach	PF	PM	Both pilots	Both pilots
Landing	PF	PM	Both pilots	Both pilots
Shutdown	Captain	F/O	Both pilots	Both pilots
Secure	Captain	F/O	Both pilots	Both pilots

If the airplane configuration is different from the configuration currently required:

- Stop the checklist
- Complete the associated procedural steps.
- Continue the Checklist.

If the whole procedure is not completed:

- Stop the Checklist.
- Complete the whole procedure.
- Start the Checklist from the beginning.

Try to do Checklists before or after high work loads. The Crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If the Crew is not sure where the checklist was stopped, do the Checklist from the beginning. If the Checklist is stopped for a long time, also do the Checklist from the beginning.

Method of the Checklist usage.

Strictly execute the Checklist operation procedure according to the Checklist operation guide and pay attention to the following:

1) Except Recall Items specified by QRH and SOP, Checklists must not be done by memory.

2) Pilot Flying (PF) or the captain must correctly call out the full name of the Checklist, while PM or F/O reads the Checklist. The Crew verify and respond as required. PM must announce "xxx Checklist completed" after the Checklist has been completed.

3) While doing the Checklist, if a certain item can not be carried out immediately, the checklist should be stopped at this item until this item has been completed.

4) When the airplane is on the ground, and Ground Maintenance Personnel or any other Flight Crew Members perform a maintenance test or operate certain equipment, the Checklist must be started again from the beginning.

5) If the Checklist reading is interrupted (such as ATC communication), the Checklist should be continued from the break/interruption position.

6) Prior to airplane movement, if both Flight Crew Members have been out of their operating position, the Checklist must be started again from the beginning. .

7) Other Crew Members or Observers in the cockpit must monitor the execution of the Checklists.

1.5 MEL/CDL usage:

1) Prior to departure, the Flight Crew has the responsibility to check that the airplane has equipped with an MEL manual (English paper or electronic version if Foreign Captain operating).

2) If the aircraft has a known fault, the Dispatchers will inform the Flight Crew, who must carry out pre-flight preparation according to MEL/CDL regulation.

3) If a fault occurs before the airplane moves under its own power, the Flight Crew must refer to the Flight logbook. The Flight Crew must refer to the MEL to confirm any applicable Operating Procedures have to be carried out.

4) If the airplane malfunction (MEL/CDL) influences the dispatched flight plan operation, the Captain should report to the Dispatcher to revise the Dispatch or Redispatch Plan. This new Dispatch Plan must include the limitation/s or penalties of the airplane inoperative item/s .

5) Once the airplane moves with its own power (and has not begun the take off roll), the Flight Crew must handle the equipment failure according to QRH and then refer to MEL. If it is clearly stated in the MEL that the airplane can not be dispatched or can be dispatched but requires that a systems test or Maintanence Procedure be carried out by the ground personnel, the airplane should be taxied back to a parking gate or position and shutdown..

1.6 Airplane Record

The Flight Logbook and Cabin Logbook must be onboard during the flight operation, for the Crew, to record fight data and malfunctions, etc. The malfunction, failed equipment record and adopted maintenance measurement should be reviewed by the Flight Crew and any new malfunction shall be recorded in the Flight Logbook (except during critical flight phases) with an ink pen making sure the letters are clear.

For any malfunction entered into the Flight Logbook by the Flight Crew, the Maintenance Personnel should fill in the detailed malfunction record listing actions taken for malfunction removal and handling.

The malfunction record should be filled in English during international operation.

1.6.1 Flight Logbook

The content of a Flight Logbook includes aircraft model number, Registration Number, aircraft type, Flight Number, route segments, takeoff/landing cycle information on training, and should been signed by the Captain after the Captain confirmed the dispatch opinion of the maintenance airworthiness dispatch personnel. When a malfunction occurs, the Crew should describe the malfunction in detail and make a record in the malfunction record column. When de-icing is needed and being done, the type of deicing fluid, density portion, the beginning and Holdover time of de-icing, should be recorded by the Crew.

1.6.2 Filling in a Flight Logbook

(1) The Flight Crew Member shall ensure that the previous page has been correctly filled in with indication of corresponding airworthiness dispatch record prior to using a new page in a Logbook

(2) The date and time in the logbook is the international standard time or Beijing time.

(3) No page in the Logbook shall be damaged or torn and each entry shall be complete;

(4) If a page has become obsolete due to wrong entry, an indication in capital letter OBSOLETE shall be written on the page followed by Flight Number and date and the page shall be retained in the Logbook;

(5) No one is allowed to remove or strike out a record or signature in the Logbook in any manner and application of correction liquid is not permitted;

(6) The Flight Crew Members shall sign his name after completion of all entries in the Logbook;

(7) Only one fault should be recorded in each record column.

1.7 Airborne Document

1. Registration Certificate of Civil Aviation airplane nationality registry.
2. Airworthiness Certificate of Civil Aviation Airplane.
3. Radio Station License of civil aviation airplane.
4. AFM..
5. FCOM.
6. QRH.
7. Normal Checklist.
8. Airport Take Off Performance analysis manual.
9. Flight Logbook.
10. Cabin logbook.
11. MEL- English version from Dispatch or Electronic version.
12. CDL.
13. Reserved Faults Items Logbook（fault sheet、defect sheet）.
14. Operation Specifications.
15. FOM.
16. Aviation Security Manual.
17. Backup Weight and Balance table (one set).

When checking whether the above documents are all on board, the Flight Crew can use airborne Simple Normal Checklist of the company to check.

1.8 Flight Documents:

1. Flight Log (Crew names and operating positions).
2. Flight Plan.
3. Weather information data (the current and forecast weather of the Destination airport, Alternate airports).
4. NOTAMs.
5. Dispatch Sheet.
6. If applicable a special telex or special loading notification sheet (as available).
7. Load sheet and weight and balance table.

   The airplane can only be operated if the airplane loading is within the scope of C/G limitation and maximum allowable weight, airplane structure and performance limitation weight. After the Loadsheet has been received, the Flight Crew Members should check and confirm. The Captain should check the calculation result on the weight and balance sheet and make sure the actual takeoff weight and C/G of the airplane is within the allowable limitation scope. Then the Captain should sign and approve that:

   1) Zero Fuel Weight of the flight.
   2) Takeoff Weight and estimated Landing Weight of the flight.
   3) Takeoff C/G and estimated landing C/G of the flight.
   4) Actual fuel quantity (weight) of the flight.
   5) When the actual data differs from Loadsheet, inform the Load Office or Agent.

8. Passenger Information Sheet, Cargo Manifest and Declaration sheet.
9. General Declaration (GD) Sheet (international or regional airline flight); Customs Seal (domestic part of international and area flight) and Quarantine Certificate.

1.9 Flight Crew Coordination.

Flight Crew coordination is the guarantee to flight safety; one flight Crew Member should be the supplementary and backup for the other Crew Member. Good flight crew coordination and crew resource management reduces the work load and enhances flight safety.

The Flight Crew Members duties could be as PF, PM and Observer. When the airplane is operated by the F/O (under Supervision of an Instructor), the F/O acts as PF and the Captain (Instructor) takes the responsibility of the PM.

During the takeoff, the Thrust Lever shall be always under the control of the Left Seat. But the decision of RTO **MUST** be executed by the Captain (unless incapaciatated).

During auto flight, ATC cleared attitude, speed and heading directives, PF set MCP panel and call it out which should be checked by PM. During manual operation, PF commands and PM sets MCP panel which should be checked by PF.

After PF has completed the actions, report to the PM. The actions beyond the area of responsibility should be commanded by the PF, even when PM is the instructor and PF is a student pilot. (special and emergency are the exception).

The captain (Instructor) reserves the final right to all the action command and execution.

1.10 Standard Callouts:

One basic principle of CRM is to assist the flight crew member to act as a backup for the other flight crew member. Good standard callouts is an important tool to guarantee flight safety and improve the cockpit resource management.

All flight crew members should be aware of the altitude, position and status of the airplane. The content of the standard callout contains: critical data, ATC clearance, flight mode change, indications and caution callouts, etc.

Standard callouts must be simple, generalized, standard, clear, understandable, and answer as required.

Standard callouts provide the pilots with the airplane system status and the required information for the other flight crew to take part in. PM calls out according to instrument indication or observation. The command speed or the obvious deviation from flight path should be reported. PF should check the condition, position on the instruments and make responses. If the PM does not make the required callout, PF should make the callout.

Any pilot should report any abnormal display of the flight instrument (flags, deviation, pointer loss, etc).

PF should be aware of the aural callout of the GPWS during approach. If the automatic electronic aural callout is not heard, PM should report the callout (i.e. MINIMUMS).

Note: If there is no automatic callout, PM should assist to establish the touchdown and flare using the radio altimeter and calling out “100 FT, 50FT, 30FT, 20FT, 10FT (other data as required)”.

If there is no standard callout during the associated flight phase, it may indicate a fault has occurred in airplane system or an indication of pilots incapacitation.

During critical flight phases, avoid unnecessary talk during taxi, takeoff, approach and landing. Unnecessary talk does reduce the flight crew work efficiency and awareness. Therefore talk not related with flight is inhibited under 10,000FT (AGL).

B737 standard callout

Phase , condition, position	PF (CM1)	PM (CM2)
Line up/takeoff		
Advance thrust levers to N1: 40%-50% TO/GA After the takeoff thrust has been set.	"Set Takeoff Thrust"	"Stable" "Takeoff Thrust Set"
Speed is 80 knots.	"Check"	"80" "Thrust Hold"
Speed V1-3kts Speed VR		"V1" "Rotate"
After lift off, positive vertical speed indicated.	"Gear Up"	"Positive Rate" "Gear Up" when selecting.
400 feet (AGL).	"Heading Select/LNAV"	"400" "Heading Select/LNAV mode alive" when illuminated in the FMA.

1500 feet (AGL)/clearance altitude(as procedure required)	"N1, UP speed"	"1500/XX(clearance altitude)" "N1 mode alive, Up Speed Set" when illuminated in the FMA.
More than V2+15 speed.	"Flap 1"	"Speed Above V2+15" "Flap 1" when selecting the Flap Lever.
More than Flap 1 speed	"Flap UP"	"Flap 1 Speed" "Flap UP" when selecting the Flap Lever.
Clean configuration.	"VNAV/ Level Change"	"Flap UP Transit Light OFF" "VNAV/ Level Change mode alive" when illuminated in the FMA.
Climb		
Stable climb,	"After Takeoff Checklist"	"After Takeoff Checklist to Transition Height"

Through Transition Height (altitude).	"Altimeter Set, STD Continue After Takeoff Checklist"	"Transition Height (altitude)" "After Takeoff Checklist Completed"
Cruise		
Before entering RVSM airspace.(through 8,400 Meters).	"Before Entering RVSM Airspace Checklist"	"Before Entering RVSM Airspace Checklist Completed"
Descent		
Before descent (approach preparation and approach briefing completed)	"Descent Checklist"	"Descent Checklist Completed"
Through Transition Level	"Altimeter Set To XXXX Approach Checklist"	"Transition Level" "Approach Checklist Completed"
10000 feet (AGL).	"Check"	"10000 feet"
VOR or Localizer Course movement.		"Course movement"

	"Check".	
Course capture.	"Check"	"Localizer Captured"
Glide slope movement (ILS) / 2nm before initial descent point.	"Check, Gear Down, Flap 15"	"Glide Slope Alive" "Gear Down, Flap 15"
Landing Gear extended, Flap 15 on position green light.		"Landing Gear Extended Three Green Lights, Flap 15 Green Light"
Glide Slope capture (only ILS).	"Check, Flap 30/40" "Landing Checklist"	"Glide Slope Capture (only ILS)" "Flap 30/40" watch Placard speeds. "Landing Checklist Completed"
Pass outer marker/outer station/ final approach fix.	"Check"	"Passing Outer Marker /Outer Station/ Final Approach Fix Altitude xxxx"
1000 feet（AGL）.	"Check, switch lights on"	"1000, Landing Configuration Completed, Go Around N1 XX"

500 feet (AGL).	"Check"	"500"
D A（H）/MDA+100 feet.	"Continue Approach"	"100 to Decision/Minimum"
DA（H）/MDA Establish suitable visual reference.	"Continue"	"DA" "Visible, (runway position)"
During Landing roll.		"Speed Brakes Up, Reverse Thrust Unlocked, N1 XX"
60 knots.		"60"
When Autobrake disarmed.		"Automatic Brake Disarmed"
Go around		
DA(H)/MDA+100 feet.	"Continue Approach"	"100 to Decision/Minimum"
DA（H）, MDA(H) or MAP. Suitable visual reference can not be established, then Go Around	"Go Around, Flap 15, Set Go Around Thrust"	"Negative Contact" "Flap 15, Go Around Thrust Set"
positive vertical speed altimeter	"Gear Up"	"Positive Rate"

		"Gear Up"
400 feet (AGL).	"Heading Select/LNAV"	"400" if applicable. "Heading Select/LNAV Mode Alive" when illuminated in the FMA.
Speed more than VREF+15.	"Flaps 5"	"Speed above VREF+15" "Flaps 5" when selecting the Flap Lever.
Speed above Flap 5 Speed.	"Flap 1"	"Flap 5 speed" "Flap 1" when selecting the Flap Lever.
Speed above Flap 1 Speed.	"Flap up"	"Flap 1 Speed" "Flap UP" when selecting the Flap Lever.
The following procedures and callouts are the same as those of takeoff phase.		

Note: 1. CATII/CATIII callout is not included in the precision approach standard callout.

2. Visibility: Except CATII/CATIII approach(whose required visual reference is specifically prescribed in approval document of CAAC) , pilots should at least see and recognize clearly one of the following visual references of the planned runway (if the

pilot uses the approach lighting as a reference, he/she should clearly see and recognize the red terminal barrette）, otherwise the aircraft is not allowed to descend below 30 meters (100 feet) above the touchdown zone elevation (TZE).

A- runway threshold
B- runway threshold sign;
C- runway threshold light;
D- runway terminal identifying light;
E- precision approach path indicator (PAPI) light;
F- touchdown zone or touchdown zone sign;
G- touchdown zone light;
H- runway or runway sign;
I- runway light。

3. At 80 knots, during the take off roll, the PM will call “80”. PF will briefly look at his/her Speed Tape and Standby Airspeed Indicator and confirm with “Check” and that “ THR HLD” is indicated on the FMA.
4. During takeoff and climbout below 400FT (AGL), the Crew is only allowed to do related standard callouts and operations (i.e. selecting Gear Up) and actions of their areas of responsibility. No ATC communication is allowed below this height.
5. When an action such as selecting the Flap Handle, Landing Gear Lever or Parking Brake, the Crew **must** verify its position or status according to the indication of related instruments and/or lights, and then call it out.

The callout table does not include the following content, but the following situations **must** be clearly called out:

- You/I have control: ”You have control” “I have control”.;
- Any FMA mode changes.
- Altitude, speed and heading changes on the MCP panel.
- When the autopilot/auto-throttle has been disconnected or engaged;.
- Critical equipment has been switched.

- When abnormal situations occur.
- 1000 feet to level off .
- When any configuration has been changed.

NOTE: when the MCP mode changes are selected, the crew must verify the mode change in FMA and call it out.

Standard phraseology:

Some recommended wording and phraseology:

Thrust settings:

Takeoff Thrust Set

Go around Thrust Set

Maximum Continuous Thrust Set

Climb Thrust Set

Cruise Thrust Set

Flap settings:

Flaps UP

Flap 1

Flap 5

Flap 15

Flap 25

Flap 30

Flap 40

Airspeed settings:

80

V1

Rotate

Set speed__

Set Flaps __ speed

Set VREF plus__ (increment)

Deviation or abnormal situation Calls:

Situations	PM callouts
VOR approach, 1 dot deviating from the course	“Course”
ILS/LOC approach, PFD indicates that LOC is 1 dot deviating from the normal mode or below DA(H)/MDA+300 feet, deviation of more than 1 dot in the expanded mode	“Localizer”
NDB approach, ADF pointer is 5 degrees deviating from the planned heading	“Position”
DME arc approach, DME distance of 2nm deviation	“DME__”
ILS approach, G/S deviation of 1 dot	“Glide Slope”
During approach, below command speed or above VREF+20kts	“Speed”
Altitude below 1000FT, sink rate above 1000FPM	“Sink Rate”
Altitude deviation of 100FT or more	“Altitude”
Bank angle more than 30°	“Bank Angle”
PF commands to retract flaps, but the speed is below current flaps maneuvering speed.	“Speed“
PF commands to extend the landing gear or flaps, but the speed is above limitation speed.	“Speed“
After takeoff or Go Around, PF does not command to retract the landing gear	“Gear Up“
Speed above current flaps maneuvering speed+10kts, PF not commands to retract the flaps	“Flap Retraction“
After liftoff, speed is below V2	“Speed“
Speed is above command speed+10kts or below command speed-5kts	“Speed”
Too low engine thrust setting or parameters exceed the limitation	“Thrust“
Cabin altitude descends to 10000FT below	“Remove Oxygen Masks” （C －Cabin）
Reject the takeoff	“Reject Takeoff”
Special situations occur after V1, and the crew decides to continue the takeoff	“Continue Take Off”

When GPWS warning, windshear warning occur, the Crew executes terrain avoidance, windshear recovery maneuvering; or when Going Around.	“Retract Speedbrake”

Note: When any of the above deviation calls is made by the PM, the PF should answer and respond to show his awareness and control ability by making corrections. No response or no actions by the PF could indicate an incapacitation,.

1.11 Communication:

1) The Flight Crew should keep effective communication during flight. The Flight Crew Members should keep radio monitoring (flight interphone when using boom). Headsets must be used before taxi-out, takeoff, climb and cruise, descent from the cruise altitude until parked on the apron. If the cruise altitude is below 3000 meters (10000 feet), use the Headsets during the entire flight. The pilot responsible for communication must use Headset for radio communication, do not use loudspeaker as a replacement. Other members must monitor the communication content to make sure the crew executes the ATC command correctly. The Pilot as an Observer must wear the Headset during climb and descent to monitor and check the radio communication. If either member of the Crew has any doubts about the ATC clearance, he/she must verify the clearance from ATC.
2) During flight, VHF 1 must always be set to the frequency currently being used by the ATC. VHF 2 should be set to 121.5 (when not being used), the Pilot should always monitor on this frequency.
3） Communication with ATC: under normal situations, PM (F/O when the airplane moves not by its own power) is responsible for the communication. Important ATC Clearancess (altitude, heading) must be read back in English if flying with a Foreign Pilot. When the Clearance is not clear or part of the clearance is lost, it must be clarified. When the ATIS is being copied down onto the CFP, the PF will also monitor VHF 1. At no time should both Flight Crew Members listen to VHF 2 and risk missing any ATC Clearances on VHF 1
4） When the hand microphone is used, select the loudspeaker and use the suitable volume. Maintain the normal communications between the Flight Crew. When the Oxygen Mask is used, the Flight Crew should use the Interphone and open the loudspeaker, using a suitable volume to communicate. Maintain the normal communication between the Flight Crew and with ATC. When the Oxygen Mask is removed to resume crew communication, but the cover of the Mask Well should be closed and then pull the Reset Test Lever to retract the

OXY ON indication.

5) Communication with Ground Maintenance should be performed by the Captain using the Interphone. It is allowed for the First Officer to speak in Chinese, however important to confirm all commands in English. If this is not possible then Hand Signals should be used.

6) Communication with the Cabin Crew : the Flight Crew communicates with the Purser (Flight Attendant) by Service Interphone, when this is not possible or practical, cycle the Seat Belt signs to indicate to the Cabin Crew that Departure or Landing will be shortly. During an emergency situation, use the Passenger PA to send command to the flight attendant or use the following signals:

① Cockpit to Cabin: one chime, if the Flight Attendant does not respond, the Flight Attendant should request to enter the cockpit without delay.

② When the emergency situation occurs in the Cabin, the Purser / Flight Attendant will use the Cabin Handphone, pressing 2 Button 3 times and repeating to request entry into the Cockpit.

③ When an emergency arises or develops, if the Cockpit needs to inform the Cabin Crew, the Cockpit Crew will cycle the Seat Belts Signs switch ,from On to Off 3 times to produce 6 chime.

④ When a Hi-jacking situation occurs in the Cabin, the Purser / Flight Attendant will use the Cabin Handphone, pressing 2 Button 5 times. No entry into the Cockpit is allowed!

NOTE: Any deviation from the above signals should be briefed by the Captain to all Crew Members.

⑤ For added security, the Flight Crew and cabin crew could adopt a temporary. special code word.

Emergency and Distress Communication Procedure:

①Emergency means the aircraft is in severe threat or a threat is going to happen and immediate help is needed.

Emergency information is sent through current air-ground frequency or other suitable frequency,containing the following information:

MAYDAY（three times）or SOS（three times）.

Callsign of the Station i.e. Beijing Control（if time and condition permit）.

Aircraft Callsign and Flight Number.

Nature of the emergency condition.
Captains intentions.
Current position, Flight Level（altitude）， Heading
These requirements are not to be avoided.
1) If needed, emergency signal MAYDAY should be used before other communication content.
2) If time permits, emergency information should be sent.
3) Any aircraft in danger may draw attention in any way according to its own condition, to make its position known, so as to get assistance.
Usage of frequency:
121.5KHZ， 243.0KHZ. Flight information emergency condition.
500KHZ， 2182KHZ. International danger.
8364KHZ， life raft.
If instruction is received, aircraft with transponder should select code 7700, mode C..
②Distress condition - means condition that may affect security or safety of the aircraft, people on board or in the vacinity but immediate assistance is not required.
Emergency information - send through current air-ground frequency, but sending emergency information is not precluded, if needed.
Send the following information PAN PAN (three times).
Aircraft Callsign and Flight Number.
Nature of the emergency condition.
Captains intentions.
Current position, Flight Level（altitude）， Heading

Other useful information

1.12 The requirement to the Flight Crew Member in Critical Flight Phases:

Critical flight phase refers to taxi, takeoff, climb, landing and flight below 10000 feet AGL other than cruise. It is a must during these phases that:

(1) The Flight Crew Member in the cockpit should remain in their respective seats except for the reason of fulfilling the flight operation responsibility or physical need; the Flight Crew must use Headsets to communicate.

(2) The Flight Crew Member must fasten their Seat Belt including the Shoulder Harness and waist belt except when the seat does not have one installed or may affect his responsibility and task fulfillment.

(3) No Flight Crew should negatively influence or distract the concentration of other Flight Crew members, or perform activities not related with aircrafts safe operation. The Captain is responsible for the monitoring and ensuring good cockpit order. The Flight Crew Member must avoid non-essential tasks (i.e. read the publications not directly related to the normal flight, confirm passengers connecting flight, advertise to the passengers, irrelevant communication, introduction to the passengers of the places and interest, filling in the report table, report and related document). or discussions between themselves or the Cabin Crew.

(4) At altitude below 10,000FT(AGL), the hands of PF must not be off from the Control Wheel and Thrust Lever, while his feet must not be off from the rudder pedals, regardless of whether the autopilot is engaged or not.

1.13 The Requirement to the Captain for Airplane Takeoff and Land

The Captain complete all takeoff and landing under the following situations:

1. Special airports regulated by CAAC or the company.
2. The effective visibility in the latest weather report equals to or less than 1,200 meters (3/4 miles), or RVR equals to or less than 1,200 meters (4,000 miles).
3. Water, snow, slush or situations severely influence the airplane performance on the runway to be used.
4. The braking action of the runway in use is reported less than “Good”.
5. The crosswind for the the runway in use is more than 7m/s or 15 kts..
6. Windshear is reported near or at the airport.
7. Any other situations that the Captain considers that he should be PF.

1.14 CRM and training:

1. The purpose of Crew Resouce Management (CRM) is to effectively use and manage the available resources including information, equipment and personnel to reach the purpose of safe and effective flight;
2. Company CRM courses provide practical skill training to the trainees, its purpose is to improve crew communication and cooperation and consolidate the group awareness. CRM is helpful for the Flight Crew to correctly recognize and understand the task and responsibility of the cooperator, its ultimate purpose is to make the safe, effective and comfortable flight.
3. Emphasizing CRM is not intended to reduce the authority of the Captain. Its purpose is to increase the support ability from different aspects of the Flight Crew Members to the Leader, enhance the whole level of the Flight Crew.
4. CRM do not encourage and allow the deviation from the company SOP, and, instead, emphasize that the Flight Crew should adhere to these procedures.
5. Every Flight Crew Member in the training course has the responsibility to complete their duties to obtain the highest standard according to CRM requirement. Every Flight Crew Member also has the right to ask for cooperation from other members to perform at the highest standard.

1.15 LOFT

LOFT（Line Oriented Flight Training）is line training that is conducted in the simulator. Its purpose is to simulate the special situations during flight, increase the Flight Crew situation awareness and handling ability, improve the comprehensive judgment and reasonable decision ability, enhance CRM management, to ensure the purpose of flight safety can be reached.

1. LOFT refers to the flight Crew training of a typical and complete flight task simulation which related to line operation condition, it specially emphasizes on communication, management and leadership skills. LOFT is real, timely and complete flight task training.
2. LOFT has an important impact on the aviation safety through improving training and operation procedure. LOFT could provide the typical daily flight situations and accompany by reasonable and practical difficulties and emergency situations, so that the training would be provided and evaluate whether the cockpit management is proper. Through this form of training, the Airline can evaluate whether: 1. Any shortfalls in the line operation exits. 2. Any shortfalls in current procedures or instrument use exists. 3. To evaluate the Flight Crews training and effeciency.
3. The LOFT scenario can be started from any simulated phase of the Airline operation. Correct execution of the LOFT plan will provide the Airline with the oportuniyty to evaluate if current training programs are suffienct and where if needed, improvement area should be introduced. The reasons are as follows:
   a） If similar mistakes repetitively appear, the underlying problems may be caused by the following reasons:
      - Procedure error/s.
      - The conflicts or errors among Manuals and publications.
      - Shortages in other operational aspects.

   b） The weak points could be exposed in the Flight Crew training plan or other noticeable phases.

c） Installation and location deficits of flight instruments or the current cockpit layout may be exposed as not being installed in optimum locations..

d） It is used to test and check cockpit operational procedures for the Airline.

4. LOFT is not used to check the individuals ability. On the contrary, it is the confirmation of the training plan and operation procedure. If additional training is needed for the individual or Flight crew after LOFT training, opportunity should be provided for them, prejudice and accusation should not exist.
5. Except in an extreme or abnormal situation occurs, LOFT should not be interrupted. Resetting the simulator and repeating setting the problems disagrees with LOFT principle. The good advantages of LOFT are: the individual and Flight Crew could know the operation result no matter good or bad. After completing the course, comment on any details. Self evaluation of the Flight Crew and comment by the Inspector or Instructor. This instruction method also should use some auxiliary equipment such as tape or video cassette recorder and notes.

1.16 Fuel Monitoring:

1. After takeoff, Flight Crew must monitor the fuel consumption on board, and compare with the remaining fuel quantity in the Computer Flight Plan, in order to ensure that there is enough fuel to complete the flight safely and to find out abnormal fuel consumption timely(such as engine or aircraft fuel leak).
2. Flight crew should monitor the fuel balance on board at all times.
3. Flight Crew should monitor the fuel temperature at any moment. Fuel temperature is affected by the Outside Air Temperature (OAT). For example, high cruise flight level will cool the fuel. In some circumstances, fuel temperature may approach the minimum fuel temperature limitation.
4. After a long flight in high altitude under low temperature, if landing on the airport of lower temperature and higher air humidity, the Crew should consider disadvantages to flight safety caused by frost/icing on the wing surfaces.

The fuel freezing point should not be confused with the ice caused by super cooled rain/frozen water pellets. The fuel freezing point is a temperature, at which the fuel becomes wax like. In the regulations of Jet-A fuel, the freezing point is limited to the maximum of -40℃ and the maximum of JetA-1 is -47℃. In former USSR, the fuel is TS-1 or RT whose maximum freezing point can reach -50℃, or lower in some areas. The actual fuel freezing point varies depending on suppliers.

The regulated maximum fuel freezing point must be used unless Airline has measured the loaded fuel freezing point at the Dispatcher Station. In most airports, the measured freezing point may stand a lower temperature than the regulated maximum one. If known, the actual freezing point may be used. The fuel may approach the minimum allowable value before loading if the fuel is stowed on the ground with an extreme low temperature in some airports, and pilots must keep this in mind.

For the mixed fuel, use the most conservative freezing point of mixed fuels being used. Do this procedure until fill the lower freezing point fuel for three times. Then use a lower freezing point again. If the fuel freezing point is very important to the next leg, the fuel in wing tank should be transferred to center tank before refueling. The freezing point of the transferred fuel is available for the next leg.

The fuel temperature should be maintained within the AFM limits regulated by Operation Manual.

Flight Crews should respect minimum fuel temperature when it has decreased to or approaches the minimum limit. Fuel cooling rate is about 3℃/hr. The maximum is 12℃/hr in extreme cold weather condition.

The TAT may be increased by using the following three ways (these three ways can be used separately or together)

- Climb or descend to a warmer temperature.
- Divert to a warmer temperature.
- Increase Mach number.

Note: In most cases, the warmer temperature may be reached by descending, but some reports point out that there is warm temperature in a higher flight level. Evaluate the temperature report seriously if the temperature is lower than normal situations.

It will take 15-60 minutes to stabilize fuel temperature. In most cases, descend to an altitude of 3000-5000 feet lower than the optimum altitude. Descending to 25,000-30,000 feet may be required in more serious situations. The TAT may increase 0.5℃-0.7℃ if Mach number increases by 0.01.

1.17. The Emergency Fuel Quantity Remaining Announcement

The Emergency Fuel Remaining operation assumes that the aircraft is flying to the nearest Auitable Airport, and there is no other airports or procedures to use by the Captain.
If the following conditions occur, the aircraft is at the lowest fuel quantity:
(1) The estimated fuel quantity at arrival (EFOA) at the planned landing Airport is less than the minimum fuel quantity regulated by CCAR-121.555.
(2) All available methods of reducing the fuel consumption has been adopted to complete the flight and no other delays are permitted.
The lowest fuel quantity refers to a specific fuel quantity which is the minimum at which pilots must report to ATC to allow them to take appropriate action. This fuel quantity (included indication errors) is used to supply the airplane at Holding Airspeed (at altitude of 450m(1500feet) above the airport elevation) for 30 minutes at most when the airplane arrives at the Airport.

Captains should comply with the following regulations when Emergency Fuel Quantity Remaining is expected or exists:
(1) Advise ATC “Emergency Fuel Quantity Remaining ”.
(2) Count the remaining fuel available in minute.s
(3) Continue the flight route approved by ATC.
(4) Advise Flight Dispatcher that the Emergency Fuel Quantity Remaining has been declared.
(5) Report current position and ETA when you operate according to VFR or when you operate in non-radar area.

Specific explain to B-737 series aircraft
(1)B-737 aircraft（include 737-300/400/700/800/800W）Flight Crew will announce the Emergency Fuel Quantity Remaining condition when actual or anticipated fuel at Destination is 3000 lb.
(2)B-737 aircraft（include 737-300/400/700/800/800W）Flight Crew will announce the Emergency Fuel Quantity Remaining condition when the following senarios occur:
If the aircraft cannot land on the destination airport due to weather, airport, ATC, or conditions that lead to a long time holding near the airport, the aircrew should consider making an alternate plan as soon as

possible using FMC (include using reasonable flight route plan, approach procedure and appropriate route altitude), and acquire remaining fuel quantity through performance calculation.

If the calculated remaining fuel quantity of flying to the nearest suitable airport is very close to or equal to the lowest fuel quantity, the Flight Crew should consider applying to ATC for direct routing or changing flight altitude, then report to ATC.

If measures above cannot be taken to decrease fuel consumption, aircraft may be or shortly enter into an emergency fuel condition, assume that the aircraft will fly to the nearest suitable airport in the most direct route and approach with the shortest approach procedure, if its remaining fuel is less or equal to the lowest fuel quantity upon landing you will have no choice but to Announce...

Note: ① Holding means that with clean configuration and Flap Up Maneuvering Speed.

② Delay the flaps and gear extension as long as possible, safety permitting.

1.18 Fuel Balancing

The life of fuselage structure rather than controlling ability limit is mainly considered for the fuel balancing limit/warning on the airplane. There is no significant influence on horizontal control for the operation which exceeds normal fuel balance limit.

When fuel balanced, reset Master Caution..

Note: Fuel balancing should be completed during non-critical flight phases (except engine out). You must switch on all fuel pumps and close Crossfeed Valve before landing, no matter whether the fuel is balanced or not.

1.19 CDU Usage:

1) CDU input can be done by the Captain or First Officer prior to taxi, while the other Pilot is responsible for checking and verifying.
2) CDU input should be done prior to taxi or when the aircraft is not moving. If CDU input must be done during taxi, it should only be done by PM when the aircraft is taxiing along straight and non-congested areas and flight safety won’t be affected.
3) Generally, during flight, CDU input should be done by PM. If workload permits, PF could do simple CDU input during non-critical flight phases. Pilot, who enters the CDU input, can execute it only when the other pilot has verified the input and confirmed.
4) At flight phases with high workloads, such as Departure or Approach, reduce the CDU input as much as possible. The aircraft can be controlled through MCP Heading, Altitude and speed control. Using MCP is simpler than entering complex route in CDU.

CDU page selection:

① Before Takeoff: PF: ”Takeoff” page。PM: “Legs” page.

② During flight: PF: select the page matching flight situation ,PM: ”Progress” page , “Legs” page or the pages commanded by PF。

③ After ILS established, PF select “Approach Ref” page and PM selects “Leg” page or the pages commanded by PF.

1.20 Exterior Lighting Usage

Generally, exterior lighting is operated by PM

1) Taxi Light usage: When taxiing on the ground, turn on Laxi light. When the aircraft comes to a stop, turn off Taxi light.
2) Strobe Light usage: Strobe Light should be used when crossing or entering and occupying the runway for take off or landing. and during flights. Can be selected off if it distracts the Flight Crew on landing.
3) Anti-collision Light usage: Anti-collision Light should be turned on from the time flight crew receives Pushback and Startup clearance to that the airplane taxis to gate and engine shutdown is completed. The Anti-collision light should also be turned on at the Gate during engine motoring, run-ups and flaps retracting/extending or when under tow.
4) Landing Light usage: The function of Landing Light is for illumination, anti-collision and airplane position display. From when cleared for take off to FL100 or descending to a height below FL100, Fixed Landing light should be turned on. Turn off Landing Light as needed when the reflection of the light distracts in cloud. During night flight Approach, turn on all Landing Lights at specified height. Turn off Landing Light as needed after vacating runway.
   Turn on all Landing lights during Emergency Descent.
5) Position light usage: During flight operation (including airplane towing), switch on Position Light.
6) Wing Lights usage: during night flight, Wing Lights may help pilots observe ice accumulation condition on wings. Wing lights should be turned on when exterior check is carried out in night flight.

Turn on all exterior lights when deviation from planned flight route is needed during RVSM flight.

1.21 Airborne Weather Radar Usage

1 Dispatching requirements

The function of the airborne Weather Radar must be normal for dispatching in IFR condition as long as weather report indicates or system detects that adverse weather condition exists. The MEL for this type of airplane must be met when dispatching when weather radar is inoperative.

Weather radar usage limit on ground:
Observe the following operation rules when you use weather radar on ground

(1) Radar sector beam must keep 37 meters (120 feet) at least from the following equipments and personnel; otherwise the radar cannot be turned on at normal mode (radar antenna can rotate).
  ① The airplanes which are fueling on the ground.
  ② Fuel truck and fuel truck Driver, fuel tank and fuel storage area.
  ③ Ground Staff and Cargo.
  ④ Any airplane or hangar.

(2) Maintain 60 meters (200 feet) at least from item (1) above, otherwise radar cannot operate at shallow sector beam mode and facing item (1).

(3) The distance in item (1) and (2) above may be reduced by 70% if approved radar beam weaken device is used between weather radar and Item (1).

(4) The use of airborne Weather Radar is prohibited when airplane is fueling on the ground.

(5) The airplanes parking in hanger or other closed parking area are prohibited to use weather radar unless there is a suitable microwave energy absorbing cover which can block at the weather radar antenna position effectively.

2 En Route

Airborne Weather Radar is used to avoid thunderstorm rather than go through it. Airborne Weather Radar may be used to observe and select a weak thunderstorm area to go through only when the Flight Crew has no other options.
If the weather radar should fail in IMC/near thunderstorm, the Flight

Crew should deviate from planned track, divert and change Flight Level to avoid thunderstorm. They should also observe the speed regulations and other operation limits in adverse weather area.

1.22 Radio Altimeter Usage

Use barometric Altimeter except when Radio Altimeter usage is prescribed for the airport approach procedure. Compare the barometric Altimeter readout to Radio Altimeter. This method can also be used to cross check the main altimeter when the airplanes fly over the known terrain in the airport area. Radio altimeter should be used for CATⅡ ILS and CATⅢ ILS.

1.23 Altimeter Setting Procedure

1 Takeoff, climb:

-Set the altimeter to QNH or QFE before takeoff (according to airport procedure requirements)

-When crossing the Transition Altitude, set the altimeter to Standard (1013.25 hpa) .

2 Cruise:

-If the cruise altitude is lower or equal to the Transition Altitude, all altimeters should be set to QNH reported or of the nearest airport.

-If the cruise altitude is higher than the Transition Altitude, all altimeters should be set to the Standard (1013.25 hpa).

3 Descent:

When crossing the Transition Level during descent, both pilots set the Altimeter to published QNH or QFE, and do crosscheck.

Note: set the Altimeter according to ATC clearance if there is no published transition level for the airport.

1.24 QFE usage

LNAV and VNAV are prohibited to use when QFE is selected. The altitude in the navigation data base is not based on QFE. You can only use raw data navigation.

The QFE altitude reference on PFD must be selected in FMS as long as QFE is used, not QNH.

If the setting of QFE altimeter exceeds altimeter range, the QNH procedure must be used.

1.25 Safety Belt Usage:

1. During flight the pilots should sit in the designated duty position and fasten the Safety Belt.
2. For two pilots' Flight Crew when one pilot leave seat, the other pilot must fasten Safety Belt and Shoulder Harness above flight level 7600 meters (25,000 feet).
3. Shoulder Harness may be loosened when there is no more than moderate turbulence in cruise or above 10,000 feet.
4. During critical flight phases, the Flight Crew Members who are on duty in the cockpit should sit in the designated duty positions and Fasten Safety Belt and Shoulder Harness. For the Flight Crew other than pilots, they may loosen their shoulder harness when performing their normal responsibilities.

1.26 Oxygen usage

1) If flight altitude exceeds 7600 meters (25,000feet), Flight Crew must make sure the Oxygen Masks can be used anytime.
2) If cabin pressure altitude exceeds 3000 meters (10,000 feet), Flight Crew must use oxygen.
3) If the Oxygen Masks are used due to altitude requirements, this system should be used according to normal regulations, and the oxygen cannot be overused. If there is smoke in the cockpit, you must set the system to 100%. You also must set it to 100% after using oxygen mask.
4) When operating above flight altitude 7600 meters (25,000feet), if there is only one pilot in the control seat for any reason or at any time, this pilot should don and use oxygen mask.

1.27 Time and Clock:

1. The Left Seat chronograhp on the airplane must be set to UTC time during flight operation.
2. Use UTC or Beijing local time to report time in the air.
3. The error of reporting time should not exceed 3 minutes (if not, update the position report in time).

1.28 ATC Clearance:

1) Comply with ATC clearance anytime in the flight.
2) When ATC clearance cannot be met due to airplane performance limitations or weather, the Flight Crew must notify ATC in time and request another Clearance.
3) Flight Crew should verify in time if there are any doubts to ATC Clearance.
   1. ATC Clearances should be recorded in the form which can be understood by both Pilots and they should be kept in the place easy to find out, in order that there is a clarified record when needed.
   2. Before departure, ATC Clearance should be consistent with not only the planned departure and initial track, but also all the flight legs in the whole plan. This is in the Takeoff Briefing, and also can be taken as an important means to check takeoff data. Read related maps and manuals if there is any serious terrain clearance problem.
   3. After received ATC Clearance, you need to take further step to verify that navigation data is consistent with actual clearance. Check overflight navigation facilities and waypoints to make sure that planned route is consistent with ATC clearance.
4） All Flight Crew Members should make sure that they can receive and understand ATC Departure and Landing Clearance. Crosscheck the clearance before takeoff and landing.

1.29 Autoflight

Autoflight system may lighten the workload of Flight Crew, so the Flight Crew can have more time and energy to monitor flight track and progress. Both Pilots must monitor AFDS mode annunciator and current FMC flight plan. PF is responsible for selecting AFDS mode and PM verifies it when Autopilot is used in flight.

Pilots must fly manually any time the Autoflight system does not operate in the anticipated way. Take measures to solve the problem of Autopilot only when the airplane is flied manually and you are sure that the airplane is under control.

LNAV and VNAV flight are prohibited to use below transition altitude/level during takeoff and approach in airport using QFE.

1.30 Autopilot:

1) The minimum altitude recommended by company to engage Autopilot after takeoff is 1000 feet (AGL). The minimum altitude to disengage autopilot should comply with the limitation in FCOM L10.4.
2) Autopilot should be disengaged and the airplane should be flied manually anytime there is a situation which is out of the control performance range of the autopilot, or during instrument approach the autopilot can not maintain the airplane in the anticipated track.

The following conditions are recommended to use Autopilot:

① Fight Crew should try their best to use Autopilot during climbing/cruising/descending.

② Autopilot should be used during Non-precision / Precision Approach.

③ In marginal weather condition, Autopilot should be used during approach.

④ The use of Autopilot is recommended in the following cases when pilots are under heavy workload. (Observe the limit of each type airplane's Operation Manual strictly):
1. Pilots incapacitation.
2. Emergency Descent.
3. Non-normal situations appear on the airplane.

1.31 Autoland system usage

Generally, sensitive area will not be protected when airplanes make CATI ILS approach. ILS signals can be affected by ground vehicles, aircraft of other influences. CAT I ILS approach systems are not usually flight checked or certified within the threshold. Based on this, the ILS beam quality in these positions is unknown. Unexpected flight control actions may occur at very low altitude or when autopilot tries to track the incorrect beam during landing.

1) Autoland is not recommended for CAT I ILS.
2) Before Autoland with Autopilot, confirm that the control system of the airplane has completed the regulated maintenance, and the operation condition of the airport meet the regulated requirements.
3) During Autoland with Autopilot, pilots must maintain and control the airplane at any time. Flight Crew must keep very alert all the time, and their hands and feet can not leave control wheel, pedals and Thrust Lever during the whole automatic Approach and Landing. They should be prepared to disengage Autopilot (A/P) and do manual landing or go-around at any moment.
4) Autoland Crosswind capability:

	Headwind	Crosswind	Tailwind
B737-800	25kts（13m/s）	20kts（10 m/s）	10kts（5 m/s）

1.32 The Engagement and Disengagement of Autopilot/autothrottle

Autopilot Engagement Method:

Follow F/D closely, maintain the aircraft control and trim is proper. Make sure that there is no force on the control wheel. Engage the Autopilot needed. Observe CMD is displayed on FMA. PF call out autopilot A or B engaged (A for Left seat, B for Right seat), PM verified it. (Note: If there is a force on control wheel, AP cannot be engaged. There will be a significant attitude change if the airplane is not trimmed properly. If F/D disappears after A/P engaged and CWS mode appears, the needed command mode should be engaged immediately)

Autopilot and Autothrottle Disengagement Method ：

PF announce "Disengage Autopilot". Hold the Control Wheel by two hands; push the A/P button on the Control Wheel twice. (The interval is 1 second， for the first time disengage A/P, for the second time silence the warning)。 Then put one hand on the Thrust Lever and call out "Disengage Autothrottle". Push the A/T Disengagement button twice (Note: A/T may be used during takeoff, climb and manual flight cruise. A/T should be disconnected during Approach and Landing phases when the airplane is flied manually)

1.33 Manual Flight

1. During manual flight, the heading, altitude, speed change, speed selection related to flaps and AFDS mode selection cleared by ATC are commanded by PF, and PM take the actions. For example, PF commands “Set Heading 170”. PM reports “Heading 170 Set”, and PF “Check”.
2. The PF can consider to fly manually according to weather condition. Manual flight is not permitted in marginal weather and flight conditions..
3. The Flight Crew is prohibited to control the airplanes in a careless and reckless way.
4. Do not give the commands or take the actions which will endanger flight safety.
5. Bank angle should not exceed 30 degrees (25 degrees for normal situations) when airplanes are in normal flights.

1.34 Control Transferring

During control transferring, the PF must call “You Have Control” and the PM will respond “I Have Control” after the actions has been taken. During manual flight, the accepting Pilot will place his/her hands on the Control Column and feet on the Rudder Pedals, and then respond “I Have Control”.

1.35 Flight Director

Flight Director should be turned on in all flight phases as long as it is available and indicating correctly. The Flight Crew should cycle the Flight Director during a Non-precision Approach when the aircraft is stabilized, Auto Pilot has been dis-engaged and the required visual reference have been established.
Flight Director may not be used during training flights.

1.36 Flap Setting

Use Flap setting 5 for normal takeoff. Flaps 1 if and when approved.
Tail clearance during takeoff:

Airplane type	Flap setting	Liftoff attitude (degree)	Tail clearance (feet)	Tailstrike pitch attitude (degree)
B737-800	1 5 15 25	8.5 8.0 7.3 7.0	13(33) 20(51) 25(64) 29(73)	11

Use Flap 30 for normal landing. If condition permitted, use Flap 40 in order to reduce the landing distance to minimum, and reduce the landing speed to minimum.

When selecting any flap position, Flight Crew must comply with Flap Placard Speed and the altitude limit of 20,000 feet.

Flight Crew should select a Landing Flap setting according to landing airport, weather and aircraft conditions.

1.37 Speedbrake Usage

Speedbrake system is comprised of spoilers. These spoilers may be extended and retracted by moving Speedbrake Lever. Speedbrakes may reduce deceleration time and distance by 50%. When using the Speedbrakes in the air, PF should put one hand on the Speedbrake Lever all the time, which help to prevent the Speedbrakes being deployed when no longer required. When using Speedbrakes use Flight Detent and no intermediate positions to avoid unexpected roll rates. Airplane may have an increased roll rate when extended during turns. “Up” position is prohibited to use during flight. During descent, the airplane should have sufficient altitude and speed margin to level off smoothly. Retract Speed-brake before the A/T increases thrust.
Note: Speedbrake Lever can not be deployed beyond Flight Detent in the air.
The rapid retraction of speed brake could increase the airspeed to above VMO/MMO when airplane is descending with Autopilot engaged and the Speedbrake extended when close to VMO/MMO. In order to avoid this situation, retract Speedbrake smoothly, which allows the Autopilot to have enough time to adjust pitch attitude and keep the airspeed within the limit.

If possible, avoid using Speedbrake during flaps extension. Retract Speed- brake if flap setting is more than 15. Excess sink rate should be avoided during approach if speed brake should be used during flap extension. Final Approach with Speedbrake extended below 2000 feet AGL is not permitted.

Spoiler extension will reduce the wing lift, and press the main gears with airplane weight in order to provide improved braking action. If the Speed brake is not extended at touchdown, the braking action will be reduced by

60%. This is because the full weight of the aircraft is not being transferred to the wheels for the braking/anti-skid system to work effeciently.

In normal situations, on Final Approach, Speedbrake should be Armed and extends automatically at touchdown. After touchdown, both Pilots should monitor the extension of Speedbrake. If automatic extension fails, PM shall call it out “Speedbrakes not UP”, and PF should manually set the speed brake lever to UP immediately.

1.38 ND Display Mode Selection

Select MAP mode for PM’s ND when the Approach starts from Initial Approach Fix (IAF). PF may also use MAP mode but should monitor raw data at the same time. When making an Approach into an Airport with complex or mountainous terrain, PM should select TERRAN display switch on his ND; when both complex or mountainous terrain and potential hazardous weather exist, the PF should select WX display switch and the PM will select the TERRAN display switch.

1.39 Use GPS in non-WGS-84 Reference Data Airspace

The local data (based on position) used to determine the navigation data base position information may have a significant position error or shift with the investigation done by using WGS-84 data during flight, because China belongs to non-WGS-84 reference data coordinate country. For Pilots, this means that positions of runway, airport waypoint and Navaids may not be as accurate as the position described on the maps, and they may also be inconsistent with GPS position. Flight Crew should refer to the data provided by CAAC to determine the current situation of the flight airspace.

A worldwide reconnaissance determines that using the FMC to receive GPS position is in compliance with non-WGS-84 airspace navigation accuracy tolerance for use on SIDS, STARS and Enroute navigation. This navigation position accuracy may not be very accurate for approach, so the Flight Crew is required by AFM to inhibit GPS position updating in non-WGS-84 airspace during Approach, “unless other proper procedures are used”

The following points are recommended by Boeing Company:

- RNAV approach can be carried out when GPS can be updated as long as they have received the operational certificate and take measures to guarantee its accuracy. Operators have several choices including that investigate the published approach procedure in order to determine whether there is a significant difference or position error, establish the special RNAV procedure which is compliance with WGS-84 or equivalent airspace, or inhibit GPS updating. (The domestic use of RNAV approach has not been approved by CAAC now.)
- For the approach based on ground Navaids, for example ILS, VOR, LOC, NDB etc., as long as you use proper raw data back-up as the main navigation reference, the inhibiting of GPS updating is not required. LNAV and VNAV (not beyond the IAF) may be used. When there is a big difference among aircraft position, raw data route, DME and/or position information, the use of LNAV and VNAV is not allowed. If the FMC is not used as the main navigation mode, this Raw Data navigation method may be used as “other proper procedures” to inhibit GPS updating.

1.40 RNP Operation

RNP specifies the navigation accuracy of the special routes or airport area procedure requirements. The unit of this accuracy is nautical miles (for example, RNP 0.3 means that the required accuracy is within 0.3 nm). Normally, the RNP in airport area procedure (SID, STARS, Approach Transition and Approach) is less than the one in route procedure. Lower RNP values can require that the navigation accuracy is more accurate than the current VOR/ADF navigation, so during Arrival and/or Approach the lower Minimum may be used.
If there is a RNP related to the current procedure or route, or the RNP comes from the current flight phase, the RNP will be set automatically in the navigation data base and displayed on CDU. Flight Crew may input an RNP value manually, if the automatically set RNP is incorrect for current Route or airport area procedure.
The Flight Crew will be alerted if the RNP is set below the one regulated by Procedure, Airspace or Route. Flight Crew may refer to the published area procedure, route or airspace in order to determine the appropriate RNP. If there is no published RNP, it should not be used.
FMC calculates the actual RNP and this performance is displayed as the Actual Navigation Performance (ANP). ANP is displayed and confirms the accuracy related to FMC position by the unit of “nm”. This accuracy is based on the FMC position which is within the 95% possibility of ANP value. This calculation is based on updating source (GPS, DME—DME, VOR—DME, LOC—GPS, LOC—DME—DME, LOC / VOR—DME or LOC) where one of these sources will update the FMC position. When the FMC is not updated by one of these sources, the indicated mode is IRS NAV ONLY. When there is a more accurate updating source, ANP value will be upgraded and indicated as lower. At the same time, IRS updating provides the highest ANP value and the lowest position accuracy.
When the ANP exceeds RNP, the alert information will be provided to Flight Crew. When this case occurs in the published RNP Route or airport area procedure, Flight Crew should verify the position and consider to request divert clearance. This may require the Crew to use non-RNP contingency procedures, routes, or transit to a procedure or route for

which RNP value is larger than ANP value.
Flight Crew should know that the ANP is only related to FMC position accuracy. XTK ERROR on FMC will indicate the horizontal deviation from route or procedure track. Use LNAV to reduce XTK ERROR when the autopilot is on. Excess XTK ERROR will not arouse Flight Crew alert information.

RNP Approach Requirement

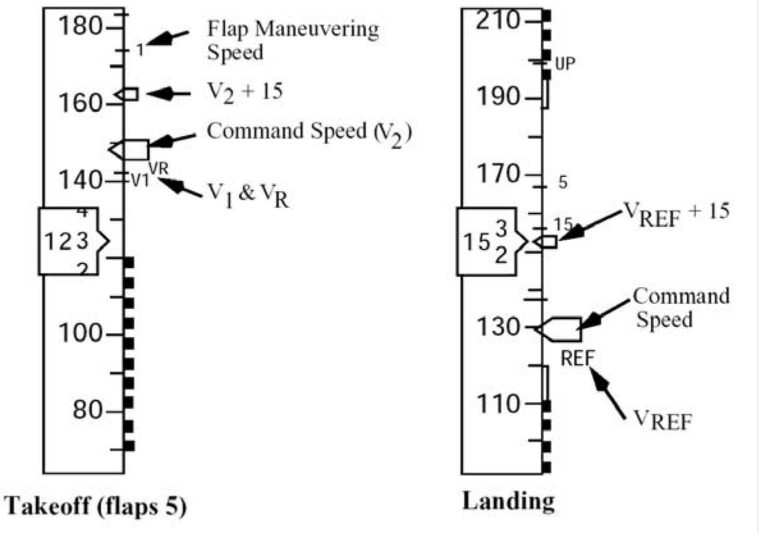
When cleared to operate, the approach with RNP Alerting may be carried out according to the following items:

- AFM indicate that the airplane has confirmed the selected RNP.
- At least one GPS or one DME is available
- Any additional GPS or DME requirements regulated by operation instruction or selected by airport area procedure must be met
- When operate with the following RNP or lower value:

Approach Type	RNP
NDB,NDB/DME	0.6NM
VOR,VOR/DME	0.5NM
RNAV	0.5NM
GPS	0.3NM

- During approach, UNABLE REQD NAV PERF—RNP alert information will not be displayed.

1.41 Takeoff and Landing Speed Bug Setting:



1.42 Noise Abatement Procedure:

The flight path may be strictly required in a certain phase of Approach or Departure. Generally the departure design has already taken the noise factor into account, and the Pilots just need to execute the required standard departure requirements strictly. The approaching aircraft should not operate below the visual or Glide Slope guidance, and they should follow the Noise Abatement flight track strictly. Of course, this flight track regulated may also be designed because of the requirements of ATC according to the operation, weather or traffic. Some airports require that during Approach, a reduced flap setting or delay flaps extension, and the Captain should consider the airplanes performance and runway surface condition, whether they meet the requirements or not.
The normal takeoff procedure of the Boeing 737 conforms to the Noise Abatement requirements. Maintain maneuver speed with flap up before the noise abatement profile is met till the aircraft reach terrain clearance or the minimum overfly height.

Note: Observe the specific procedure of the local airport.

Pilots should observe the regulated Noise Abatement Procedures when doing takeoff and landing in the noise limit airports except if anyone of the following conditions exists.

(1) Low ceiling, thunderstorm and/or low visibility exists.
(2) Dry runway surface
  ① If the crosswind (including gust wind) exceeds 20kts
  ② If tailwind (including gust wind) exceeds 5KTs
(3) Wet runway surface.
  ① If the crosswind (including gust wind) exceeds 20kts
  ② If the tailwind exists.
(4) If the possibility of Windshear exists.
(5) When the Captain considers the safety problem because of runway condition and other factors.

For the takeoff on the designated runway, the normal noise abatement procedure is:

(1) Climb at a speed between V2+10KT and V2+20KT, or the speed for the maximum climb angle.
(2) Maintain takeoff thrust and climb to 1500 feet AGL.

(3) Then, adjust thrust not lower than Climb Thrust. Climb at a speed between V2+10KT and V2+20KT, and climb to 3000 ft AGL.
(4) Accelerate to enroute climb speed, retract flaps as planned, and
(5) Maintain runway direction unless there is a standard departure procedure and definite ATC clearance.

If the airplane's high bypass ratio is higher than 3.5, you can execute the following alternate procedure except the above procedure.

(1) Climb at a speed between V2+10KT and V2+20KT, or the speed for the maximum climb angle, and
(2) Maintain takeoff thrust till climbing to 1000FT AGL.
(3) Then accelerate to Vzf (the minimum safety maneuver speed) when flap up and retract flap as planned.
(4) Adjust thrust to normal climb thrust, and
(5) Climb to the height 3000 AGL at a speed not more than Vzf+10KT.
(6) Accelerate to enroute climb speed. Retract flap as planned, and
(7) Maintain runway direction unless there is a standard departure procedure and definite ATC clearance.

Execute the noise abasement procedure published by airport strictly.

1.43 Avoid Wake Turbulence

Every aircraft in flight generates wake turbulence caused primarily by a pair of counter rotating vortices trailing from the wing tips. Wake turbulence generated from heavy aircraft, even from those fitted with wing tip fences/winglets, can create potentially serious hazards to following aircraft. Vortices generated in the wake of large aircraft can impose rolling movements exceeding the counter-roll capability of small aircraft. This wake turbulence may cause potential threat to the following aircraft.

Division:

Wake turbulence separation minima shall be decided by aircraft type classification, and aircraft type classification is divided into three types according to the maximum takeoff weight:

(H) Heavy:: Aircraft with maximum allowed takeoff weight is equal to or above 136,000 kilograms;

(M) Medium: Aircraft with maximum takeoff weight is above 7,000 kilograms and less than 136,000 kilograms;

(L) Light: Aircraft with maximum takeoff weight is equal to or less than 7,000 kilograms.

Note: When the medium or light aircraft flies following B757, B757 wake turbulence is heavy; when the heavy flies following B757, B757 wake turbulence is medium.

Criteria:

Time Separation (no radar vector)

The minimum wake turbulence separation of takeoff and landing of two aircraft should refer to the following minimum wake turbulence time separation criteria (no radar vector).

Inbound aircraft:

-medium after heavy: 2 min

-light after medium or heavy: 3 min

Outbound aircraft:

The minimum time separation of light or medium after heavy or light after medium is 2 minutes（if takeoff starts from the runway centerline, the separation is 3 minutes）.

If taking off from two runways with a separation of at least 760m and do not interfere each other, the following aircraft shall not fly across the leading aircraft with a separation of less than 300m.

Takeoff and landing to opposite directions: 2 min

Radar separation

Leading aircraft	Following aircraft	Minimum separation
Heavy	Heavy	4NM
Heavy	Medium	5 NM
Heavy	Light	6 NM
Medium	Heavy	3 NM
Medium	Medium	3 NM
Medium	Light	4 NM
Light	Heavy	3 NM
Light	Medium	3 NM
Light	Light	3 NM

1.44 Liquid Protection

1. The beverage handed to the seated Pilots in the Cockpit should avoid any electronic equipment, not be passed over the Central Contsole.
2. The cup that Pilots use should be put in the fixed place. The cup with water in it which has no cover should not be put in the cockpit during Takeoff and Landing.

1.45 Takeoff Briefing:

The Takeoff Briefing should be accomplished before engine start, and can be updated during the taxi before takeoff, in the premise of not affecting flight safety.

The Takeoff Briefing should include at least the following items:

- Expected Taxi route planned.
- Applicable NOTAM (including affection from construction).
- Adverse weather and runway conditions.
- Dispatch using the MEL.
- Departure flight path or SID, emphasize estimated flight path and altitude limitation/s.
- Special Noise Abatement Requirements (NADP 1, NADP 2).
- Rejected takeoff.
- Methods of establishing route, return or alternate with engine failure after V1 (if applicable).
- Any other situation where it is necessary to review or define crew responsibilities.

Takeoff briefing（example）:

Plan to take off at ____runway，turn left(right) to heading ____to join the route after takeoff，____procedure departure，initial altitude ____meters，transition altitude ____meters，airway altitude ____meters，full（derated）thrust，flap 5.V1____、VR____、V2____。

Engine failure before V1 /severe damage，rejected takeoff: retard the throttle、disengage A/T、extend speedbrake lever、reverse thrust as required、use the brakes according to the speed（RTO）.

Continue the takeoff when engine fails or is severely damaged after V1. Climb and maintain the speed over V2, report to the Tower to return landing / or a new Clearance and complete the appropriate Checklist.

The Takeoff Briefing is completed.

1.46 Approach Briefing

Before the start of an instrument Approach, the PF should brief the PM of his intentions in conducting the Approach. Both Pilots should review the approach procedure. All pertinent approach information, including minimums and Missed Approach procedures, should be reviewed and alternate courses of action considered.

As a guide, the Approach Briefing should include at least the following:

- Weather and NOTAMS at Destination and Alternate, as applicable.
- Approach type and the validity of the charts to be used.
- Navigation and communication frequencies to be used.
- MSA altitudes for that airport.
- Approach procedure including courses and heading.
- Vertical profile of the approach (non-precision approach should clarify VDP).
- Go-around procedure review (including height and position of important obstacles, affection of adverse weather to the path of go around).
- Taxi route to expected Parking Bay.
- Any appropriate information related to a non-normal procedure.
- Management of AFDS .

Approach Briefing (example):

（Precision Approach）Plan to approach at ____runway， transition altitude ____meters，course____、A/P_____，QNH（QFE）____、DA（H）____，Autobrake select ____，Flap____、Landing Weight_____、VREF____. The first VHF navigation____、Standby____， the second VHF____、Standby____，ADF1____、ADF2____. Descend to DA（H）____， if the required visual reference – I will “Continue”. If not, will call “Go-around” and perform the Go-around procedure (read according to the approach map) or follow the ATC instructions. Go-around action: advance the Thrust Lever, press TO/GA, Flap 15, positive climb rate Gear Up, 400 feet HDG SEL or LNAV, Flap retraction on schedule.

1.47 Diversion and Diverting to the Alternate:

Diversion means that the airplane does not fly to the Destination Airport or the designated Alternate Airport appointed by Dispatch list (not including the pre-planned Redispatch), and the diverting to airport is called "Divert Alternate Airport". When the airplane, airborne equipment, ground navigation equipment failed, or the airway and destination airport weather influence flight safety, passengers' life or some emergencies happen, the Captain should divert to the alternate.

1.47.1 The Choice of Alternate Airport (as per Dispatch/Redispatch List)

The choice of Alternate Airport must take into consideration: remaining fuel, airport facilities, weather conditions and passengers servicing. If airplane systems fail or performance is downgraed during flight, the Flight Crew should operate as the procedures in the FCOM and QRH.

When the procedure requires an immediate landing, the Flight Crew should choose a suitable landing Airport according to the situation severity. In general the Captain should not choose the airport other than the nearest suitbale Airport unless he thinks the chosen Airport is as safe as the nearest suitable Airport and takes all factors influencing flight safety into account.

Note: For more information about the choice principle of alternate airport, refer to the Operational Manual section 9 9-43.

1.47.2 The Minimum Required Fuel for Diversion.

The minimum required fuel for diversion includes the diversion fuel consumption and the final remaining fuel at the diversion alternate (the fuel needed for holding airspeed flying for 30 minutes at 450 meters/1,500 feet over the airport in standard temperature).

1.47.3 Flight Plan and ATC Clearance.

Prior to an Aircraft diversion, a new ATC clearance is required, and before diverting the Captain shall communicate the following to ATC:

a) The alternate Airport.
b) Flight route.
c) Flight altitude.
d) Estimated flight time.
e) The endurance（hours and minutes）.
f) Inform the Flight Dispatcher as soon as possible. After the Flight Dispatcher receives the Captains message (ACARS for example), he should offer the alternate airport weather, correct the Dispatch List, and inform the alternate airport to allow for arrival preparation.

1.47.4 Inform Flight Attendants and Passengers

After the Captain makes a decision to divert, he should immediately inform the Purser about the decision so that the Purser can have enough time to arrange cabin service and safety matters, and as necessary inform the passengers about the conditions of diversion.

1.47.5 Flight Crew's Duty after Landing

The Captain is responsible for the safety of airplane, passengers, airborne luggage, cargo, dangerous goods and mail to avoid any danger and accidents.
The Captain should help the local agency, airport management department, and the maintenance department to set the passengers and airplane maintenance & servicing.
The Captain should get in touch with company Dispatchers as soon as possible, discuss the Flight Plan, Clearance, fuel quantity and weather, and prepare to take off again. The Purser should ensure the good service offered to the onboard passengers.

1.48 Landing at the Nearest Suitable Airport

"Plan to land at the nearest suitable airport" is a phrase used in Boeing manuals.

In a non-normal situations, the Captain, having the authority and responsibility for operation and safety of the flight, must make the decision to continue the flight as planned or divert. In an emergency situation, this authority may include necessary deviations from any regulation to meet the emergency. In all cases, the Captain is expected to take a safe course of action.

The QRH assists Flight Crews in the decision making process by indicating those situations where "landing at the nearest suitable airport" is required. These situations include but are not limited to the following:

- Non-normal checklist containing "landing at the nearest suitable airport".
- The continual smoke or fire in the cabin.
- Only one remained main AC power (such as engine or APU).
- Only one remained hydraulic system (consider using standby system as hydraulic system), or
- Other situations that need the crew to make a decision, and in these situations the continuing flying will have bad effects on the safety.

It should be emphasized that for persistent smoke or a fire which cannot positively be confirmed to be completely extinguished, the safest course of action typically requires the earliest possible descent, landing and passenger evacuation.

The regulations regarding an engine failure are specific. FARs specify that the Captain of a twin engine airplane that has an engine failure or engine shutdown, shall land at the nearest suitable airport at which a safe landing can be made.

NOTE: If the Captain doesn't land at the nearest suitable airport, in terms of time the Captain should write a report to the company to clarify that not choosing the nearest airport is as safe as choosing the nearest appropriate airport.

A suitable airport is defined by the operating authority for the operator based on guidance material, but in general must have adequate facilities and meet certain minimum weather and field conditions. If required to divert to the nearest suitable airport, the guidance material also typically specifies that the pilot should select the nearest suitable airport “in point of time” or “in terms of time”. In selecting the nearest suitable airport the Captain should consider the suitability of nearby airports in terms of facilities and weather and their proximity to the airplane position. The Captain may determine, based on the nature of the situation and an examination of the relevant factors that the safest course of action is to divert to a more distant airport than the nearest airport. For example, there is not necessarily a requirement to spiral down to the airport nearest the airplane’s present position if, in the judgment of the captain, it would require equal or less time to continue to another nearby airport.

For persistent smoke or a fire which cannot positively be confirmed to be completely extinguished, the safest course of action typically requires the earliest possible descent, landing and passenger Evacuation. This may dictate landing at the nearest airport appropriate for the airplane type, rather than at the nearest suitable airport normally used for the route segment where the incident occurs.

1.49 Stabilized Approach

When the aircraft maintains a planned configuration, attitude, airspeed or corresponding power plant in the planned flight route, the approach is commonly referred to as the stabilized approach concept. Stabilized approach includes:

- The airplane is on the correct flight path.
- Only small changes in heading/pitch are required to maintain the correct flight path.
- The airplane indicated airspeed is not less than VREF and not more than VREF+20 knots or current flap placard speed, whichever is lower.
- The airplane is in the correct landing configuration.
- Sink rate is not greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted.
- Power setting is appropriate for the airplane configuration.
- All briefings and checklists have been conducted..

Specific types of approaches are stabilized if they also fulfill the following:

- ILS approaches should be flown within one dot of the Glide Slope and Localizer.
- During a Circling Approach, wings should be level on Final and the aircraft is stabilized prior 300 feet AGL.

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

Stabilized Approach Requirements:

ILS approach: the airplane is below 1,000 feet above threshold elevation; Visual approach: when the airplane is below 500 feet above treshold elevation, the airplane must be stabilized at the final approach speed or final landing configuration, or it must initiate a Go-around.

At 100 feet HAT for all visual approaches, the airplane should be positioned so the Flight Deck is within, and tracking to remain within, the lateral confines of the extended runway edges.

As the airplane crosses the runway threshold it should be:

- Stabilized on target airspeed to within +10 knots until arresting descent rate at Flare.
- On a stabilized flight path using normal maneuvering.
- Positioned to make a normal landing in the touchdown zone(the first 3,000 feet or first third of the runway, whichever is less).

Maneuvering: (including runway changes and circling)

When maneuvering below 500 feet, be cautious of the following:

- Descent rate change to acquire glide path.
- Lateral displacement from the Runway Centerline.
- Tailwind/crosswind components.
- Runway length available.

The stabilized configuration should be established as early as possible during every approach to provide the Flight Crew with more situational to be aware influences like windshear or other situations that could cause deviations from the stabilized appraoch profile. So, before descending to the minimum stabilized approach altitude, the stabilized approach must be established:

(1) In VMC or Straight-In by 500 feet AGL above the runway threshold.

(2) During a Circling Approach by 300 feet AGL above the runway threshold or the MDA whichever is higher..

(3) In IMC using on an Instrument Appraoch 1,000 feet AGL above the runway threshold.

(4) The maneuvering of above 20 degree bank is forbidden when the airplane is below 500 feet above airport elevation.

(5) Initiate a Go-around if the above criteria cannot be maintained.

1.50 Discontinued Approach:

From the IAF to 1,000 feet AGL, the Captain should discontinue the Approach when the airborne equipment, ground navigation equipment fails and cannot continue the approach and landing safely.

The Captain cannot continue the approach if the received weather condition is below landing minimum standard before the airplane flies over the Final Approach Fix (FAF) or Final Approach Point (FAP).

The Captain can continue the approach to DA/DH or MDA/MDH if the received weather condition is below landing minimum standard after the airplane flies over the final approach fix (FAF) or final approach point (FAP).

If there is no regulated FAF, and the received weather condition is below the regulated landing minimum standard, the Captain cannot begin the flight of last phase.

1.51 Landing Conditions

Before landing the Captain should judge whether the landing distance meets the following condition according to the airplane conditions and surface conditions:

1. Received ATC landing clearance.
2. Verify the landing weight is not more than critical landing maximum weight (configuration limits, performance limits) under normal flight conditions.
3. Confirm the runway used.
4. Autobrake is selected according to airplane weight, surface conditions, weather conditions. Autobrake should be selected before touchdown if operable.
5. Landing flaps are selected according to the flying conditions and airplane conditions.
6. Take into consideration the affects of the wind to landing.
7. Take into consideration the affects of wake turbulence.
8. Take into consideration the affects of birds and other threats on landing.

1.52 Landing Minima

There are required limits on how low an airplane can descend on Final without visual contact with the runway environment when making an Approach. Descent limits are based on a Decision Altitude (DA) (ILS OR PAR) for approaches using a Glide Slope or certain approaches using a VNAV path, or a MDA for Non-precision Approaches without a Glide Slope.

Note: Approach charts use the abbreviation DA (H) or MDA (H). The Decision Altitude (DA) or Minimum Descent Altitude (MDA) is referenced to MSL, and the parenthetical height (H) is referenced to Touchdown Zone Elevation (TDZE) or Runway Threshold Elevation. For example, A DA (H) of 1,440 feet (200 feet) is a DA of 1,440 feet with a corresponding decision height of 200 feet.

When RVR is reported for the landing runway, it typically is used in lieu of the reported meteorological visibility.

When descending to the MDA and passing the VDP or descending to the DA and in-sufficient visual reference is established the Flight Crew must commence Go-around, follow published procedures, advise ATC and follow the new Clearance.

1.53 Landing Runway Visual Reference:

Visual Reference

Visual reference at or below the DH is described as visibility or RVR. Meanwhile, the distance that pilots need to see (required side-glance distance) is determined by pilot's eye height, downwards observation angle (end angle) and type of ground visual navaids facility. The higher the DH is, and the larger the aircraft, then the higher the distance between the eyes of pilots and ground, the longer the side-glance distance. Instead, the bigger the downwards observation angle is, the longer the approach lighting system is, and the shorter the side-glance distance is.

For visual reference of the company, refer to description in "Aircraft Operation Manual" Section 9.1.2.5.

1.54 Rejected Landing:

Below 1,000 feet AGL above the TDZE, the Captain should consider rejected landing in the following conditions:

(1) ATC clearance not received.
(2) The RVR cannot meet the landing requirements during landing such as the affects of advection fog.
(3) Runway environment cause safety issues or damage such staff, traffic, animals, obstacles, surface damage and so on.
(4) Landing Gear warning .
(5) Runway is occupied or blocked.
(6) Incorrect control inputs leading to an un-stabilized Appraoch.
(7) When the Captain thinks it is necessary.

The rejected landing procedure is the same as the Go-around procedure. Press TO/GA switch or manually set Go-around thrust,, select Go-around flaps, and pitch the nose up to the correct missed approach attitude simultaneously. Retract the Landing Gear after establishing the positive climb rate. Set the command speed as the flaps retraction operation speed or other required speed at the safety altitude, and retract the flaps as planned. If a rejected landing is initiated after touchdown, auto spoilers retract and Autobrakes disarm as thrust levers are advanced.

Warning: Once Reverse Thrust is deployed, a full stop landing must be made. Factors dictating this are:

- Five seconds are required for a Reverser to transition to the forward position.
- A possibility exists that a Reverser may not stow in the forward thrust position.

A Go-around in flare or after touchdown increases the possibility of a Tailstrike. When a missed approach mode is initiated, the FD immediately indicates the pitch attitude of missed approach. If the Pilot applies the wrong or aggressive pitch attitude this increases the possibility of tailstrike before the airplane reacts and begins climbing out of Ground Effect. A Go-around requires application of both the correct pitch attitude and required thrust. If the pitch attitude increases but the thrust doesn’t increase enough, it will cause the decreasing of airspeed and possible Tailstrike. When a late Go-around is initiated in Ground Effect the Flight

Crew may want to avoid Main Gear touch and thus cause a Tailstrike. In this case, wheel contact should not be a concern and the Flight Crew should concentrate on Tailstrike avoidance.

1.55 Overweight Landing

The actual landing weight should not exceed the maximum landing weight limit unless in emergency.

1. **Situations Needing Overweight Landing:**
   1) The airplane cannot continue flying safely and needs immediate landing.
   (1) There is uncontained fire, not localized fire, fire warning or smoke/ toxic fumes in the airplane.
   (2) The fuselage or parts thereof are severely damaged.
   (3) Airplane control, hydraulic, electric, fuel systems have severe problems.
   (4) Damage of communication or navigation equipment might affect the Approach and Landing procedures.
   (5) A bomb, terrorist threat, unknown dangerous goods or dangerous goods leakage might affect the Passengers, Crew and flight safety.
   (6) Passengers or Flight Crew have severe illnesses that will affect life and needs immediate hospitalizing.
   (7) QRH Checklist requires other emergency situations to land at the nearest suitable airport.
   (8) ATC requires immediate landing.
   (9) Immediate landing may help ease other situations that might influence or threat flight safety.
   2) Single engine operation.

2. The following factors should be considered for assessing whether an overweight landing is required:

1) When this aircraft type gets certificated during flight it should be satisfied to touch down at 600 FPM vertical speed with the maximum allowable landing weight. The airplane can fly at 360 FPM vertical speed with no damage of the structure with the maximum allowable takeoff weight. So, the descent rate of 200-300FPM（2.0G）during normal touchdown will not cause any damage to the airplane structure.
2) This aircraft type is suitable to land in the nearby airport.
3) The low circling consuming fuel may get the situation worse.

4) Long time circling consuming fuel might get the media to give more negative report about airlines.
5) The low circling consuming fuel will cause unnecessary economy loss.

Flight Dispatcher and the Captains are responsible to ensure that the aircraft weight is less than the maximum landing weight when the aircraft lands at the airport. When it needs to return landing in emergency the Captain should consider consuming the fuel (if possible) and some related factors such as the pavement classification Nr.（PCN）, surface condition, landing distance required. The Captain should control the airplane smoothly to avoid hard (high G-load) landing after completing the Checklist (if any). The Captain should immediately report to the Maintenance and the company Dispatcher and record the landing weight in the Flight Log after landing.

1.56 Go-around Requirements:

Go-around is the final action to correct an unstabilized Appraoch and an important strategy to ensure flight safety. 737 has the ability to Go around at any altitude. So long as the Crew do not use the Reverse Thrust, they can initiate go-around according to the procedures.

(1) Go around must be initiated in the below situations.

① The airplane cannot satisfy the normal navigation precision according to airborne or ground navigation equipment during instrument approach to final.

② Airborne or ground radio navigation equipment is not reliable or fully fail when the instrument approach is below MSA.

③ The visual reference cannot be established when reaching VDP (non-precision approach) or DA/DH (precision approach).

④ The stable approach procedure requirements cannot be satisfied.

⑤ The normal landing cannot be completed.

⑥ Visual reference is lost during instrument approach circling maneuver landing.

(2) When the Go-around procedure is executed, the Pilots must comply to the Go-around procedure regulated in the instrument approach map. If the missed approach is needed before it reaches the Missed Approach Point (MAP), the pilots must first fly to MAP. The MAP may be:

In precision approach, fly along the glide slope to the DA position;

Over one navigation stand.

One appointed position point.

One appointed point near FAF position.

（3） Go-around during Circling Approach, Pilots should turn to the landing runway during climbing and join the Go-around procedure track after flying across the above area.

1.57 Mandatory Missed Approach:

On all Instrument Approaches, execute an immediate Missed Approach when:

- A ground navigation radio or flight instrument failure occurs which affects the ability to safely complete the approach during instrument flight.
- On ILS final approach and either the Localizer or the Glide Slope indicator shows beyond allowable deflection.
- The navigation instruments show significant disagreement and the landing runway environement cannot be seen for confirmation.
- On an RNP based approach and an alert message of FMC indicates that ANP exceeds RNP.
- On a radar approach and radio communication is lost.

Fly strictly according to the Standard Instrument Approach procedure, single engine procedure if performance penalties or ATC Clearance.

1.58 Rejection system of approach landing:

During approach and landing, due to weather standard and A/C unstable condition etc, under the condition that not against emergency situation disposition requirements of related manual, when anyone of the necessary crew member advance the go around command definitely, the whole crew should execute go around procedure. (go around command equals captain decision.)

Note: the flight crew must abide go around condition requirements strictly, and be responsible for the command issued by himselves.

2 Normal Procedure

2.1 Preliminary Preflight Procedure – Captain or First Officer

The Preliminary Preflight Procedure assumes that the Electrical Power Up supplementary procedure is completed.

A full IRS alignment is recommended before each flight. If time does not allow a full alignment, do the Fast Realignment supplementary procedure.

IRS mode selectors ....OFF, then NAV
Verify that the ON DC lights illuminate then extinguish.
Verify that the ALIGN lights are illuminated.
VOICE RECORDER switch.. AUTO

Verify that the following are sufficient for flight:
- Oxygen pressure
- Hydraulic quantity (not less than 76%, no RF indication)
- Engine oil quantity (not less than 12 quart)

Do the remaining actions after a crew change or maintenance action.
Maintenance documents... Check
FLIGHT DECK ACCESS SYSTEM switch..........Guard closed

Emergency equipment.. Check

Fire extinguisher – Checked and stowed

Crash axe – Stowed

Escape ropes – Stowed

Other needed equipment – Checked and stowed

PSEU light.. Verify extinguished
GPS light ....Verify extinguished
SERVICE INTERPHONE switch... OFF
ENGINE panel.. Set
Verify that the REVERSER lights are extinguished.

Verify that the ENGINE CONTROL lights are extinguished.
EEC switches – ON
Verify ALTN lights are extinguished.

Oxygen panel .... Set

Crew Oxygen pressure indication ---check

Verify pressure comply with the requirement of dispatch.

Note: PASSENGER OXYGEN switch activation causes deployment of the passenger oxygen masks.

PASSENGER OXYGEN switch - Guard closed

Verify that the PASS OXY ON light is extinguished.

Landing gear indicator lights .... Verify illuminated

Flight recorder switch .... Guard closed

Circuit breakers (P6 panel) .... Check
Manual gear extension access door .... Closed
Circuit breakers (P18 panel) .... Check

Parking brake .... As needed

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

2.1.1 CDU Preflight Procedure - Captain and First Officer

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

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

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

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

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

Initial Data ....Set

IDENT page:

Verify that the MODEL is correct.

Verify that the ENG RATING is correct.

Verify that the navigation data base ACTIVE date range is current.

POS INIT page:

Verify that the time is correct.

Enter the present position on the SET IRS POS line. Use the most accurate latitude and longitude.

Navigation Data ....Set

ROUTE page:

Enter the ORIGIN.

Enter the route.

Enter the FLIGHT NUMBER.

Activate and execute the route.

DEPARTURES page:

Select the runway and departure routing.

Execute the runway and departure routing.

Verify the RTE and LEG pages are correct

Performance Data .... Set

PERF INIT page:

Enter the ZFW.

Verify that the FUEL on the CDU, the dispatch papers, and the fuel quantity indicators agree.

If refueling is not complete, enter the PLAN trip fuel as needed.

Verify that the fuel is sufficient for flight.

Verify that the gross weight and cruise CG (GW/CRZ CG) on the CDU and the dispatch papers agree.

Thrust mode display:

Verify that TO or dashes are shows.

N1 LIMIT page:

Select an assumed temperature,

Select a full or a derated climb thrust as needed.

TAKEOFF REF page:

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

Enter the CG.

Verify that a trim value is shown.

Enter the takeoff V speeds.

Verify that the preflight is completed.

2.1.2 Exterior Inspection

Before each flight the captain, first officer, or maintenance crew must verify that the airplane is satisfactory for flight.

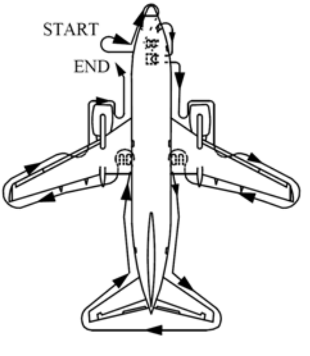
Items at each location may be checked in any sequence.

Use the detailed inspection route below to check that:

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

For cold weather operations see the Supplementary Procedures.

Inspection Route



Left Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable)........... Check

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

Nose

Radome.. Check

Conductor straps - Secure

Forward E and E door .... Secure

Nose Wheel Well

Tires and wheels.. Check

Exterior light .... Check

Gear strut and doors .... Check

Nose wheel steering assembly .... Check

Nose gear steering lockout pin .... As needed

Gear pin .... As needed

Nose wheel spin brake (snubbers).. In place

Right Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable)............ Check

Oxygen pressure relief green disc ....In place

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

Right Wing Root, Pack, and Lower Fuselage

Ram air deflector door ....Extended

Pack and pneumatic access doors.. Secure

Probes, sensors, ports, vents, and drains (as applicable) .... Check

Exterior lights .... Check
Leading edge flaps .... Check

Number 2 Engine

Access panels... Latched
Probes, sensors, ports, vents, and drains (as applicable) .... Check
Fan blades, probes, and spinner .... Check
Thrust reverser.. Stowed
Exhaust area and tailcone .... Check

Right Wing and Leading Edge

Access panels... Latched
Leading edge flaps and slats .... Check
Fuel measuring sticks .... Flush and secure
Wing Surfaces.. Check
Fuel tank vent .... Check

Right Wing Tip and Trailing Edge

Position and strobe lights... Check
Static discharge wicks.. Check
Aileron and trailing edge flaps... Check

Right Main Gear

Tires, brakes and wheels... Check

Verify that the wheel chocks are in place as needed.

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

Gear strut, actuators, and doors.. Check

Hydraulic lines .... Secure

Gear pin .... remove

Right Main Wheel Well

APU FIRE CONTROL handle.. Up

NGS operability indicator light... Check

Wheel well.. Check

Right Aft Fuselage

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

Negative pressure relief door ....Closed

Outflow valve ....Check

Probes, sensors, ports, vents, and drains (as applicable)................Check

APU air inlet ....Open

Tail

Vertical stabilizer and rudder... Check

Elevator feel probes... Check

Tail skid .... Check

Verify that the tail skid is not damaged.

Horizontal stabilizer and elevator.. Check

Static discharge wicks... Check

Strobe light... Check

APU cooling air inlet and exhaust outlet.. Check

Left Aft Fuselage

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

Probes, sensors, ports, vents, and drains (as applicable)......... Check

Left Main Gear

Tires, brakes and wheels.. Check

Verify that the wheel chocks are in place as needed.

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

Gear strut, actuators, and doors... Check

Hydraulic lines.. Secure

Gear pin...remove

Left Main Wheel Well

Wheel well.. Check

Engine fire bottle pressure.. Check

Left Wing Tip and Trailing Edge

Aileron and trailing edge flaps.. Check

Static discharge wicks.. Check

Position and strobe lights.. Check

Left Wing and Leading Edge

Fuel tank vent.. Check

Wing Surfaces.. Check

Fuel measuring sticks... Flush and secure

Leading edge flaps and slats..Check

Access panels... Latched

Number 1 Engine

Exhaust area and tailcone...Check

Thrust reverser.. Stowed

Fan blades, probes, and spinner..Check

Probes, sensors, ports, vents, and drains (as applicable).............Check

Access panels..Latched

Left Wing Root, Pack, and Lower Fuselage

Leading edge flaps ....Check

Probes, sensors, ports, vents, and drains (as applicable)............Check

Exterior lights ....Check

Pack and pneumatic access doors .... Secure

Ram air deflector door ....Extended

2.2 Preflight Procedure – First Officer

The first officer normally does this procedure. The captain may do this procedure as needed.

Flight control panel ....Check

FLIGHT CONTROL switches – Guards closed

Verify that the flight control LOW PRESSURE lights are illuminated.

Flight SPOILER switches – Guards closed

YAW DAMPER switch – ON

Verify that the YAW DAMPER light is extinguished.
Verify that the standby hydraulic LOW QUANTITY light is extinguished.

Verify that the standby hydraulic LOW PRESSURE light is extinguished.

YK701-YK704
（SB changes YC126-YC978）

Verify that the STBY RUD ON light(as installed) is extinguished.
ALTERNATE FLAPS master switch – Guard closed
ALTERNATE FLAPS position switch – OFF
Verify that the FEEL DIFF PRESS light is extinguished.
Verify that the SPEED TRIM FAIL light is extinguished.
Verify that the MACH TRIM FAIL light is extinguished.
Verify that the AUTO SLAT FAIL light is extinguished.

NAVIGATION panel ....Set

VHF NAV transfer switch – NORMAL
IRS transfer switch – NORMAL
FMC transfer switch – NORMAL

DISPLAYS panel ....Set

SOURCE selector – AUTO

CONTROL PANEL select switch – NORMAL

Fuel panel ....Set
Verify that the ENG VALVE CLOSED lights are illuminated dim.
Verify that the SPAR VALVE CLOSED lights are illuminated dim.
Verify that the FILTER BYPASS lights are extinguished.
CROSSFEED selector – Closed
Verify that the VALVE OPEN light is extinguished.

FUEL PUMP switches – OFF

Verify that the center tank fuel pump LOW PRESSURE lights are extinguished.

Verify that the main tank fuel pump LOW PRESSURE lights are illuminated.

Electrical panel .... Set

BATTERY switch – Guard closed

CAB/UTIL power switch (as installed) – ON

IFE/PASS SEAT power switch (as installed) – ON

GALLEY power switch – ON

STANDBY POWER switch – Guard closed

Verify that the STANDBY PWR OFF light is extinguished.

Verify that the BAT DISCHARGE light is extinguished.

Verify that the TR UNIT light is extinguished.

Verify that the ELEC light is extinguished.

Generator drive DISCONNECT switches – Guards closed

Verify that the DRIVE lights are illuminated.

BUS TRANSFER switch – Guard closed

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the SOURCE OFF lights are extinguished.

Verify that the GEN OFF BUS lights are illuminated.

Overheat and fire protection panel .... Check

Do this check if the flight crew did not do the Electrical Power Up supplementary procedure. This check is needed once per flight day.

Verify that the engine No. 1, APU, and engine No. 2 fire switches are in.

Alert ground personnel before the following test is accomplished:
OVERHEAT DETECTOR switches – NORMAL
TEST switch – Hold to FAULT/INOP

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Verify that the FAULT light is illuminated.

If the FAULT light fails to illuminate, the fault monitoring system is inoperative.

Verify that the APU DET INOP light is illuminated.

Do not run the APU if the APU DET INOP light does not illuminate.

Note: The fire warning light flashes and the horn sounds on the APU ground control panel when this test is done with the APU running. This can be mistaken by the ground crew as an APU fire.

TEST switch – Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.
Verify that the OVHT/DET annunciator is illuminated.
Master FIRE WARN light – Push
Verify that the master FIRE WARN lights are extinguished.
Verify that the fire warning bell cancels.
Verify that the engine No. 1, APU and engine No. 2 fire switches stay illuminated.
Verify that the ENG 1 OVERHEAT and ENG 2 OVERHEAT lights stay illuminated.
Verify that the WHEEL WELL light stays illuminated.

EXTINGUISHER TEST switch – Check
TEST switch – Position to 1 and hold.
Verify that the three green extinguisher test lights are illuminated.
TEST switch – Release
Verify that the three green extinguisher test lights are extinguished.
Repeat for test position 2.

APU switch (as needed) .... START

Note:

1. if ground power is used during preflight operation, APU start should not be 5 minutes earier than passenger embark and 5 minutes later than push back start.
2. If extended APU operation is needed on the ground, position an AC operated fuel pump ON. If fuel is loaded in the center tank, position the left center tank fuel pump switch ON to prevent a fuel imbalance before takeoff.

CAUTION: Center tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 1000 lbs(453 kgs).

CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.

Note: Whenever the APU is operating and AC electrical power is on the airplane busses, operate at least one fuel boost pump to supply fuel under pressure to the APU to extend the service life of the APU fuel control unit.

When the APU GEN OFF BUS light is illuminated:
APU GENERATOR bus switches – ON（from R to L for recommadation）
Verify that the SOURCE OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.
EQUIPMENT COOLING switches ....NORM
Verify that the OFF lights are extinguished.

EMERGENCY EXIT LIGHTS switch..................................Guard closed

Verify that the NOT ARMED light is extinguished.

Passenger signs ....Set

NO SMOKING switch –ON
FASTEN BELTS switch –OFF
Windshield WIPER selectors ....PARK
Verify that the windshield wipers are stowed.
WINDOW HEAT switches .... ON
Position switches ON at least 10 minutes before takeoff.
Verify that the OVERHEAT lights are extinguished.

Verify that the ON lights are illuminated (except at high ambient temperatures.)

PROBE HEAT switches ....OFF
Verify that all lights are illuminated.
WING ANTI–ICE switch ....OFF
Verify that the VALVE OPEN lights are extinguished.
ENGINE ANTI–ICE switches ....OFF
Verify that the COWL ANTI–ICE lights are extinguished.

Verify that the COWL VALVE OPEN lights are extinguished.

Hydraulic panel .... Set

ENGINE HYDRAULIC PUMPS switches – ON

Verify that the LOW PRESSURE lights are illuminated.

ELECTRIC HYDRAULIC PUMPS switches – OFF

Verify that the OVERHEAT lights are extinguished.

Verify that the LOW PRESSURE lights are illuminated.

Air conditioning panel .... Set

AIR TEMPERATURE source selector – As needed

TRIM AIR switch – ON

Verify that the ZONE TEMP lights are extinguished.

Temperature selectors – As needed

Verify that the RAM DOOR FULL OPEN lights are illuminated.

RECIRCULATION FAN switches – AUTO

Air conditioning PACK switches – AUTO or HIGH

ISOLATION VALVE switch – OPEN

Engine BLEED air switches – ON

APU BLEED air switch – ON

Verify that the DUAL BLEED light is illuminated.

Verify that the PACK lights are extinguished.

Verify that the WING–BODY OVERHEAT lights are extinguished.

Verify that the BLEED TRIP OFF lights are extinguished.

Cabin pressurization panel...Set

Verify that the AUTO FAIL light is extinguished.

Verify that the OFF SCHED DESCENT light is extinguished.

FLIGHT ALTITUDE indicator – Cruise altitude

LANDING ALTITUDE indicator – Destination field elevation (0 for QFE setting)

Pressurization mode selector – AUTO

Lighting panel ....Set

LANDING light switches – RETRACT and OFF

RUNWAY TURNOFF light switches – OFF

TAXI light switch – OFF

Ignition select switch ....IGN L or R

Sselect IGN R for the first flight per day and alternate the ignition select switch position on subsequent starts.

ENGINE START switches ....OFF

Lighting panel ....Set

LOGO light switch – As needed

POSITION light switch – As needed

ANTI–COLLISION light switch – OFF

WING illumination switch – As needed

WHEEL WELL light switch – As needed

Mode control panel ....Set

COURSE(S) – Set

FLIGHT DIRECTOR switch – ON

Move the switch for the pilot flying to ON first.

EFIS control panel ....Set

MINIMUMS reference selector – RADIO or BARO

MINIMUMS selector – Set decision height or altitude reference

FLIGHT PATH VECTOR switch – As needed

METERS switch – ON

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting
VOR/ADF switches – As needed
Mode selector – MAP
CENTER switch – As needed
Range selector – As needed
TFC (TRAFFIC)switch – ON(check diatance arc displayed on both NDs)
WEATHER RADAR – Off

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

Map switches – As needed

Oxygen ....Test and set

Oxygen mask – Stowed and doors closed
RESET/TEST switch – Push and hold
Continue to hold the RESET/TEST switch down and push the EMERGENCY/Test selector for 5 seconds. Verify that the yellow cross shows continuously in the flow indicator.

Verify that the crew oxygen pressure does not decrease more than 100 psig.

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

- decrease rapidly, or
- decrease more than 100 psig, or
- increase slowly back to normal.

Release the RESET/TEST switch and the EMERGENCY/Test selector. Verify that the yellow does not show in the flow indicator.
Normal/100% switch – 100%

Clock...Set

TIME/DATE pushbutton - UTC time

Display select panel ....Set

MAIN PANEL DISPLAY UNITS selector – NORM

LOWER DISPLAY UNIT selector – NORM

Disengage light TEST switch ....Hold to 1

Verify that the A/P light is illuminated steady amber.

Verify that the A/T light is illuminated steady amber.

Verify that the FMC light is illuminated steady amber.

Disengage light TEST switch ....Hold to 2

Verify that the A/P light is illuminated steady red.

Verify that the A/T light is illuminated steady red.

Verify that the FMC light is illuminated steady amber.

Do the Initial Data and Navigation Data steps from the CDU Preflight Procedure and verify that the IRS alignment is complete before checking the flight instruments.

Flight instruments ....Check

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- TCAS OFF
- NO VSPD until V–speeds are selected
- expected RMI flags

Verify that the flight mode annunciations are correct:

Note：A/T and AFDS status are as follow before MCP has been set in captain preflight procedures.

- autothrottle mode is blank
- roll mode is blank
- pitch mode is blank

- AFDS status is FD

Select the map mode.

GROUND PROXIMITY panel .... Check

FLAP INHIBIT switch – Guard closed

GEAR INHIBIT switch – Guard closed

TERRAIN INHIBIT switch(as installed) – Guard closed

Verify that the INOP light is extinguished.

Landing gear panel .... Set

LANDING GEAR lever – DN

Verify that the green landing gear indicator lights are illuminated.

Verify that the red landing gear indicator lights are extinguished.

AUTO BRAKE select switch .... RTO

Verify that the AUTO BRAKE DISARM light is extinguished

ANTISKID INOP light .... Verify extinguished

Engine display control panel .... Set

N1 SET selector – AUTO

SPEED REFERENCE selector – AUTO

FUEL FLOW switch –RESET, then RATE

Move switch to.

Engine instruments .... Check

Verify that the primary and secondary engine indications show existing conditions.

Verify that no exceedance is shown.

Verify that the hydraulic quantity indications do not show RF.

CARGO FIRE panel .... Check

This check is needed once per flight day or following a flight crew change.

DETECTOR SELECT switches – NORM
TEST switch – Push
Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.
Master FIRE WARN light – Push
Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

Verify that the FWD and AFT lights stay illuminated.
Verify that the DETECTOR FAULT light stays extinguished.
Verify that the green EXTINGUISHER test lights stay illuminated.

Verify that the DISCH light stays illuminated.

Radio tuning panel(as installed) .... Set

WARNING: Do not key HF radio while airplane is being fueled. Injury to personnel or fire may result.

Verify that the OFF light is extinguished.

VHF communications radios .... Set

VHF NAVIGATION radios .... Set for departure
Audio control panel .... Set
ADF radios .... Set
WEATHER RADAR panel .... Set
Transponder panel .... Set
STABILIZER TRIM override switch .... Guard closed
WARNING: Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.

Seat .... Adjust

Adjust the seat for optimum eye reference.

Verify a positive horizontal (fore and aft) seat lock.

Rudder pedals... Adjust

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

Seat belt and shoulder harness.. Adjust

Do the PREFLIGHT checklist on the captain’s command.

2.3 Preflight Procedure – Captain

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

Lights ....Test

Master LIGHTS TEST and DIM switch – TEST

The fire warning lights are not checked during this test. Use individual test switches or push to test features to check lights which do not illuminate during the light test. Use scan flow to verify that all other lights are flashing or illuminated. Verify that all system annunciator panel lights are illuminated.

Master LIGHTS TEST and DIM switch – As needed

EFIS control panel ....Set

MINIMUMS reference selector – RADIO or BARO

MINIMUMS selector – Set decision height or altitude reference

FLIGHT PATH VECTOR switch – As needed

METERS switch – As needed

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting

VOR/ADF switches – As needed

Mode selector – MAP

CENTER switch – As needed

Range selector – As needed

TFC(TRAFFIC) switch – As needed(check distance arc displayed on both NDs)

WEATHER RADAR – Off

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

Map switches – As needed

Mode control panel ....Set

COURSE(S) – Set

FLIGHT DIRECTOR switch – ON

Move the switch for the pilot flying to ON first.

Bank angle selector – As needed

Autopilot DISENGAGE bar – UP

Oxygen .... Test and set

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/Test selector – Push and hold

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

Verify that the crew oxygen pressure does not decrease more than 100 psig.

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

- decrease rapidly, or
- decrease more than 100 psig, or
- increase slowly back to normal.

Release the RESET/TEST switch and the EMERGENCY/Test selector. Verify that the yellow does not show in the flow indicator.

Normal/100% switch – 100%

Clock .... Set

TIME/DATE pushbutton - UTC time

NOSE WHEEL STEERING switch .... Guard closed

Display select panel .... Set

MAIN PANEL DISPLAY UNITS selector – NORM

LOWER DISPLAY UNIT selector – NORM

Disengage light TEST switch .... Hold to 1

Verify that the A/P light is illuminated steady amber.

Verify that the A/T light is illuminated steady amber.

Verify that the FMC light is illuminated steady amber.

Disengage light TEST switch .... Hold to 2

Verify that the A/P light is illuminated steady red.

Verify that the A/T light is illuminated steady red.

Verify that the FMC light is illuminated steady amber.

STAB OUT OF TRIM light ....Verify extinguished

Do the Initial Data and Navigation Data steps from the CDU Preflight Procedure and verify that the IRS alignment is complete before checking the flight instruments.

Flight instruments ....Check

Verify that the flight instrument indications are correct

Verify that only these flags are shown:

- TCAS OFF
- NO VSPD until V–speeds are selected
- expected RMI flags

Verify that the flight mode annunciations are correct:

Note: A/T and AFDS status are as follow before MCP has been set in captain preflight procedures.

- autothrottle mode is blank
- roll mode is blank

- pitch mode is blank
- AFDS status is FD

Select the map mode.

Standby instruments(as installed) .... Check

Standby horizon – Set

Gyro caging control – Pull, then release

Approach mode selector – OFF

Verify that the flight instrument indications are correct.
Verify that no flags are shown.

Standby altimeter – Set

Verify that the flight instrument indications are correct.
Verify that no flags are shown.

Integrated standby flight display(as installed) ....Set

Verify that the approach mode display is blank.
Set the altimeter.(QFE or QNH)
Verify that the flight instrument indications are correct.
Verify that no flags or messages are shown.

Standby RMI ....Set

Select either VOR or ADF.

SPEED BRAKE lever ....DOWN detent

Verify that the SPEED BRAKE ARMED light is extinguished.
Verify that the SPEED BRAKE DO NOT ARM light is extinguished.
Verify that the SPEEDBRAKES EXTENDED light is extinguished.

Reverse thrust levers .... Down

Forward thrust levers .... Closed

FLAP lever ....Set

Set the flap lever to agree with the flap position.

Parking brake .... Set

Verify that the parking brake warning light is illuminated

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

Engine start levers ....CUTOFF

STABILIZER TRIM cutout switches ....NORMAL

Radio tuning panel (as installed).. Set

WARNING: Do not key the HF radio when the airplane is being refueled. Injury to personnel or fire can occur.

Verify that the OFF light is extinguished.

VHF communications radios .... Set

VHF NAVIGATION radios... Set for departure

Audio control panel .... Set

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

Seat .... Adjust

Adjust the seat for optimum eye reference.

Verify a positive horizontal (fore and aft) seat lock.

Rudder pedals .... Adjust

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

Seat belt and shoulder harness .... Adjust

Call “PREFLIGHT CHECKLIST.”

Switch on passenger signs when passengers on board.

2. 4 Before Start Procedure

Start the Before Start Procedure after passengers are on board.

Passenger signs…………………………………………………..ON

Parking brake……………………………………………………Set

After papers are on board, start the Befor Start Procedures:

Delivery clearance………………………………Obtain C, F/O

(Verify transponder setting, departure route, frequecies and altitude)

Flight deck door .... Closed and locked F/O

Verify that the LOCK FAIL light is extinguished.

Do the CDU Preflight Procedure – Performance Data steps before completing this procedure.

CDU display .... Set C, F/O

Normally the PF selects the TAKEOFF REF page.

Normally the PM selects the LEGS page.

N1 bugs .... Check C, F/O

Verify that the N1 reference bugs are correct.

IAS bugs .... Set C, F/O

MCP .... Set and call C

AUTOTHROTTLE ARM switch – ARM
IAS/MACH selector – Set V2
Arm LNAV as needed
Initial heading – Set
Initial altitude – Set

Taxi and Takeoff briefings .... Complete C, F/O

The pilot who will do the takeoff does the taxi and takeoff briefings.

Exterior doors .... Verify closed F/O

Flight deck windows .... Closed and locked C, F/O

ATC Start clearance .... Obtain   C, F/O

GND Start clearance .... Obtain   C, F/O

Obtain a clearance to pressurize the hydraulic systems.

Obtain a clearance to start the engines. If pushback is needed:

Verify that the nose gear steering lockout pin is installed, or, if the nose gear steering lockout pin is not used, depressurize hydraulic system A during the hydraulic panel set step   C,   F/O

Fuel panel .... Set ..... …F/O

If the center tank fuel quantity exceeds 1,000 pounds（460kg）(comply with relative ADs):

LEFT and RIGHT CENTER FUEL PUMPS switches – ON

Verify that the LOW PRESSURE lights illuminate momentarily and then extinguish.

If the LOW PRESSURE light stays illuminated turn off the CENTER FUEL PUMPS switch.

AFT and FORWARD FUEL PUMPS switches – ON

Verify that the LOW PRESSURE lights are extinguished.

Hydraulic panel... Set   F/O

If pushback is needed:

System A HYDRAULIC PUMP switches – OFF

Verify that the system A pump LOW PRESSURE lights are illuminated.

System B electric HYDRAULIC PUMP switch – ON

Verify that the system B electric pump LOW PRESSURE light is extinguished.

WARNING: Do not pressurize hydraulic system A. Unwanted tow bar movement can occur.

If pushback is not needed:

Electric HYDRAULIC PUMP switches – ON

Verify that the electric pump LOW PRESSURE lights are extinguished.

Verify that the brake pressure is 2,800 psi minimum.

Verify that the system A and B pressures are 2,800 psi minimum.

ANTI COLLISION light switch....................................ON F/O

Trim...Set C

Check each trim for freedom of movement.

Stabilizer trim – ___ UNITS

Set the trim for takeoff.

Verify that the trim is in the green band.

Aileron trim – 0 units

Rudder trim – 0 units

Call “BEFORE START CHECKLIST.” C

Do the BEFORE START checklist. .... F/O

2. 5 Pushback or Towing Procedure

The Engine Start procedure may be done during pushback or towing.

Establish communications with ground handling personnel. C

CAUTION: Do not hold or turn the nose wheel steering wheel during pushback or towing. This can damage the nose gear or the tow bar.

CAUTION: Do not use airplane brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.

Set or release the parking brake as directed by ground handling personnel C

Note: notify ground handling personnel to avoid the tailwind startup if possible.

When pushback or towing is complete:

Verify that the tow bar is disconnected C

Verify that the nose gear steering lockout pin is removed C

System A HYDRAULIC PUMPS switches – ON F/O

2.6 Engine Start Procedure

Select the secondary engine indications. F/O

Air conditioning PACK switches.................................... OFF F/O

Start sequence .... Announce C

Call "START ___ ENGINE" C

ENGINE START switch .... GRD F/O

Verify that the N2 RPM increases. C, F/O

When N1 rotation is seen and N2 is at 25%, or (if 25% N2 is not possible), at maximum motoring and a minimum of 20% N2:

Engine start lever .... IDLE C
Monitor fuel flow and EGT indications………………. C, F/O
At 56% N2, verify that the ENGINE START switch moves to OFF. If not, move the ENGINE START switch to OFF. F/O

Verify that the START VALVE OPEN alert extinguishes when the ENGINE START switch moves to OFF. F/O

Call "STARTER CUTOUT." F/O

Monitor N1, N2, EGT, fuel flow and oil pressure for normal indications while the engine accelerates to a stable idle. C, F/O

After the engine is stable at idle, start the other engine.

Starter duty cycle:
- Do not exceed 2 minutes during each start attempt
- A minimum of 10 seconds is needed between start attempts

Normal engine start considerations:
- do not move an engine start lever to idle early or a hot start can occur

- keep a hand on the engine start lever while monitoring RPM, EGT and fuel flow until stable
- if fuel is shutoff accidentally (by closing the engine start lever) do not reopen the engine start lever in an attempt to restart the engine
- failure of the ENGINE START switch to stay in GRD until the starter cutout RPM can cause a hot start.

Do the ABORTED ENGINE START checklist for one or more of the following abort start conditions:

- No N1 indication before engine start lever is moved to IDLE.
- EGT does not increase by 10 seconds on ground after the engine start lever is moved to IDLE(30 seconds in flight)
- the N1 or N2 does not increase or increases very slowly after the EGT increases
- the EGT quickly nears or exceeds the start limit
- there is no oil pressure indication by the time that the engine is stable at idle
- Abnormal start advisory is triggered.
- Other conditions need aborted start.

Note: flight deck to ground communication should be completed only after all engines are stable at IDLE.

2.7 Before Taxi Procedure

GENERATOR 1 and 2 switches .... ON......F/O
PROBE HEAT switches .... ON ...F/O
WING ANTI–ICE switch .... As needed ...F/O

ENGINE ANTI–ICE switches................................As needed F/O

Hydralic pumps……………………………………….ON F/O

PACK switches .... AUTO F/O

ISOLATION VALVE switch .... AUTO F/O

APU BLEED air switch... OFF F/O

APU switch .... OFF F/O

ENGINE START switches ....CONT F/O

Verify that the brake pressure is 2,800 psi minimum. Verify that the system A and B pressures are 2,800 psi minimum. F/O
Lower DU Blank F/O

Engine start levers ....IDLE detent C

Verify that the ground equipment is clear. C, F/O

Call “FLAPS ___” as needed for takeoff. . C

Flap lever .... Set takeoff flaps F/O

Verify that the LE FLAPS EXT green light is illuminated.

Flight controls .... Check C

Move the control wheel and the control column to full travel in both directions and verify:

- freedom of movement
- that the controls return to center

Hold the nose wheel steering wheel during the rudder check to prevent nose wheel movement.

Move the rudder pedals to full travel in both directions and verify:

- freedom of movement
- that the rudder pedals return to center

Transponder ....As needed F/O

At airports where ground tracking is not available, select STBY. At airports equipped to track airplanes on the ground, select an active transponder setting, but not a TCAS mode.

Recall .... CheckC, F/O

Verify that all system annunciator panel lights illuminate and then extinguish.

Update changes to the taxi briefing, as needed. .... C or PF

Call “BEFORE TAXI CHECKLIST.” C

Do the BEFORE TAXI checklist. .... F/O

2.8 Taxi Procedure

Captain（Left Seat）	F/O（Right Seat）
Do before taxi procedure and before taxi checklist	
Monitor, and readback the clearance such as “HOLD short of XXX”	Obtain ATC taxi clearance, readback and copy
Update taxi briefing as needed.	
Check whether there is anyobstacle or intruding aircraft on the left side, which may influence taxi. Ensure the ground personnel and equipment clear. Call “LEFT SIDE CLEAR”.	Check whether there is any obstacle or intruding aircraft on the right side, which may influence the taxi. Ensure the ground personnel and equipment clear. Call “RIGHT SIDE CLEAR”.
Call “TAXI LIGHTS ON”	switch on taxi lights.
Signal(on the left)	Signal(on the right)
Check ground personnel signals	
	switch on the transponder as needed.
Track the taxi prescribed route.	Maintain a continues monitor on the current radio frequency. If FMC inputs or radio communication with the company is needed, do it only the aircraft is taxiing straight ahead or the aircraft is stopped.
On unfamiliar airports , the crew will consider a FOLLOW ME CAR, or request more detailed taxi clearance.	
If anyone in the cockpit has doubts about the taxi routes, stop the aircraft and confirm it.	
	Under low visibility (RVR is less than 1200 feet), report all signs which will help confirming the position of the aircraft. If there is low visibility taxi procedure in the airport, apply the procedures, and do the checklist only when the aircraft is stopped.

If taxiing in airports with complex taxi routes, the crew shall cross check the heading indications, airport map and signs to verify the current position.	
When the aircraft approaches intersections of complex taxiways, or before crossing the runway, the crew shall verify ATC clearances (HOLD SHORT OF XXX or CLEAR TO ACROSS THE RUNWAY) and observe the outside. Observe the whole runway and approach direction before crossing the runway to make sure there is no intruding aircraft.	
Clear to Cross the Runway	
	set the all exterior light switches to ON
Monitor taxi speed and separation to the preceding aircraft.	Monitor taxi speed and separation to the preceding aircraft.
Verify the frequency is correct.	Switch frequency between tower and ground, according to ATC clearance. Contact ATC and report the present position.
Approaching runway holding point	
	Request line up.
Cleared line up	
Visually confirm that there is no intruding aircraft from the inbound/outbound direction, call “LEFT SIDE CLEAR”	Visually confirm that there is no intruding aircraft from the inbound/outbound direction, call “RIGHT SIDE CLEAR”
	set the all exterior light switches to ON
	Set transponder to TA/RA
Call “BEFORE TAKEOFF CHECKLIST”	Do “BEFORE TAKEOFF CHECKLIST”
If ATC cleared line up and hold	
	Timing
If the time exceeds 2 minutes and there is no further instruction from ATC.	
	Contact ATC for further instruction.

2.9 Before Takeoff Procedure

The pilot who will do the takeoff updates changes to the takeoff briefing as needed.	
Set the weather radar display as needed. Set the terrain display as needed.	
Call “BEFORE TAKEOFF CHECKLIST.”	Do “BEFORE TAKEOFF” checklist.

2.10 Takeoff Procedure

<table>
<tr><th>PF</th><th>PM</th></tr>
<tr><td></td><td>When cleared for takeoff,
Notify the cabin crew to prepare for takeoff(one chime)
STROBE light switch to ON.</td></tr>
<tr><td></td><td>Enter the runway offset on the CDU TAKEOFF REF page or update runway position as needed.</td></tr>
<tr><td>Align the airplane with the runway.
Verify that the brakes are released.</td><td>When cleared for takeoff,
All exterior lights --------------ON
Transponder mode selector-----------------------TA/RA</td></tr>
<tr><td>Advance the thrust levers to approximately 40% N1.
Allow the engines to stabilize.</td><td></td></tr>
<tr><td>Push the TO/GA switch.</td><td></td></tr>
<tr><td colspan="2">Verify that the correct takeoff thrust is set.</td></tr>
<tr><td></td><td>Monitor the engine instruments during the takeoff. Call out any abnormal indications.
Adjust takeoff thrust before 60 knots as needed.
During strong headwinds, if the thrust levers do not advance to the planned takeoff thrust by 60 knots, manually advance the thrust levers.</td></tr>
<tr><td colspan="2">After takeoff thrust is set, the captain’s hand must be on the thrust levers until V1.</td></tr>
<tr><td>Monitor airspeed.
Maintain light forward pressure on the control column.</td><td>Monitor airspeed and call out any abnormal indications.</td></tr>
<tr><td>Verify 80 knots and call “CHECK.”</td><td>Call “80 KNOTS.”</td></tr>
<tr><td></td><td>Call “ V1.”</td></tr>
</table>

Verify V1 speed.	
At VR, rotate toward 15° pitch attitude. After liftoff, follow F/D commands. Establish a positive rate of climb.	At VR, call "ROTATES." Monitor airspeed and vertical speed.
Verify a positive rate of climb on the altimeter and call "GEAR UP."	Verify a positive rate of climb on the altimeter and call "POSITIVE RATE." Set the landing gear lever to UP.
Above 400 feet radio altitude, call for a roll mode as needed.	Call "400" at 400 feet AGL Select or verify the roll mode.
At 1500FT(AGL)(thrust reduction /acceleration height), call "N1", "UP SPEED"	At 1500FT(AGL) call "1500" Push N1 switch. Set flap up maneuver speed.
Verify that climb thrust is set.	
Verify acceleration. Call "FLAPS-----" according to the flap retraction schedule.	Set the FLAP lever as directed. Monitor flaps and slats retraction.
After flaps and slats retraction is complete, call "VNAV."	switch on VNAV
Engage the autopilot when above the minimum altitude for autopilot engagement.	
Stablized climb	
	• Set the AUTO BRAKE select switch to OFF • Set the landing gear lever to OFF after landing gear retraction is complete. • After the gear lever to OFF , switch the Retractable Landing Lights to RETRACT, switch off TAXI light, RUNWAY TURNOFF lights, and Wing Illumination Lights and Wheel Well Lights
Call "AFTER TAKEOFF CHECKLIST."	

	•Set or verify engine bleeds and air conditioning packs are operating normally. •Set the engine start switches as needed • Do the AFTER TAKEOFF checklist.
Transition altitude, altimeter set, complete “After takeoff checklist”.	Do the After takeoff checklist. deferred items.

CAUTION: Do not allow the shoulder harness straps to retract quickly. Buckles can pull or damage circuit breakers.
Note: the left seat pilot should control the throttles from airplane line up till 400 feet (AGL) nevertheless which pilot as pilot flying (left seat pilot or right seat pilot); at V1, PF must remove his hand from the throttles. After 400feet, PF controls the throttles.

Note: for flap retraction schedule, HNA requires retract flaps according to schedule after reaching 1500 feet AGL in normal operations. And flight crew should observe the specific procedures in HNA defined special airport operations.

Takeoff Flap Retraction Speed Schedule

Takeoff Flaps	At Speed (display)	Select Flaps
5	V2+15 “1”	1 UP
Limit bank angle to 15° until reaching V2 + 15		

2.11 Climb and Cruise Procedure

Complete the After Takeoff Checklist before starting the Climb and Cruise Procedure.

PF	PM
	At or above 10000FT（AGL）, set LANDING light switch to OFF.
Check pressurization, crosscheck altimeter indication.	
	Set passenger signal as needed.
At transition altitude, set altimeter to standard and complete deferred items of after takeoff checklist.	
	Before top of descent point, change active route as needed to complete approach.
NOTE: when changing altitude within RVSM airspace, the vertical speed shall not be above 1500 fpm, and within 1000FT from the target, the vertical speed shall not be above 1000fpm.	

2.12 Descent Procedure

Start Descent preparations and do descent procedures by 40 NMs to the top of descent.
Complete the Descent Procedure by 10,000 feet MSL

PF	PM
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
Set VREF and verify landing weight, QNH/QFE on the APPROACH REF page.	
Set the RADIO/BARO minimums as needed for the approach.	
Set or verify the navigation radios and course for the approach.	
Set the AUTO BRAKE select switch to the needed brake setting	
Do the approach briefing.	
Call “DESCENT CHECKLIST.”	Do the DESCENT checklist.

2.13 Approach Procedure

The Approach Procedure is normally started at transition level.

Complete the Approach Procedure before:

- The initial approach fix, or
- The start of radar vectors to the final approach course, or
- The start of a visual approach

For a BCRS approach, enter the front course in the Mode Control Panel COURSE window. Do not select VOR/LOC.

If a flaps 15 landing is needed because of performance:
GROUND PROXIMITY flap inhibit switch....... FLAP INHIBIT F/O

PF	PM
	Set the passenger signs as needed.
	At or above 10,000 feet MSL, set the FIXED LANDING light switches to ON.
At transition level, set and crosscheck the altimeters.	
Update the arrival and approach procedures as needed.	
Update the approach briefing as needed.	
Call "APPROACH CHECKLIST."	Do the APPROACH checklist.

Note: Within non WGS-84 reference data airspace, use HDG SEL mode, refer to raw data, enter final approach course.

Flap Extension Schedule

Current Flap Position	At Speed tape "Display"	Select Flaps	Command Speed for Selected Flaps
UP	"UP"	1	"1"
1	"1"	5	"5"
5	"5"	15	"15"
15	"15"	30 or 40	(VREF30 or VREF40) + wind additives

2.14 Landing Procedure

PF	PM
	Notify the cabin crew to prepare for landing. Verify that the cabin is
Call “FLAPS ___” according to the flap extension schedule.	Set the flap lever as directed. Monitor flaps and slats extension.
When on localizer intercept heading: • verify that the ILS is tuned and identified • verify that the LOC and G/S pointers are shown	
Use HDG SEL to intercept the final approach course as needed. ARM VOR/LOC	
Verify that the localizer is captured.and Arm the APP mode*. Engage the other autopilot.	
	Call “GLIDE SLOPE ALIVE.”
At glide slope alive, call: • “GEAR DOWN” • “FLAPS 15”	Set the landing gear lever to DN. Verify that the green landing gear indicator lights are illuminated. Set the flap lever to 15.
Set the speed brake lever to ARM.(left seat pilot) Verify that the SPEED BRAKE ARMED light is illuminated.	
At glide slope capture, call “FLAPS ___” as needed for landing.	Set the flap lever as directed.
Set the missed approach altitude on the MCP.	
Call “LANDING CHECKLIST.”	Do the LANDING checklist. When the LANDING checklist is completed, set go around heading, and altitude, verify landing flaps.

At the final approach fix or OM, verify the crossing altitude.	
1000FT AGL	Verify landing configuration, notify the cabin crew (chime), and switch on the landing lights in night operations.
Monitor the approach. Verify the AFDS status at 500 feet radio altitude.	

* Flight crew should strictly observe the published altitude to capture glideslope; APP mode can not be armed too earlier to avoid capture unreliable signals due terrain or other airplanes influence.if captured altitude is above the published captured altitude, V/S can be used as needed, refer glideslope indication to the published captured altitude.

2.15 Go–Around and Missed Approach Procedure

PF	PM
At the same time: • push the TO/GA switch • call "FLAPS 15."	Position the FLAP lever to 15 and monitor flap retraction
Verify: • the rotation to go–around attitude • That the thrust increases.	
	Verify that the thrust is sufficient for the go-around or adjust as needed.
Verify a positive rate of climb on the altimeter and call "GEAR UP."	Verify a positive rate of climb on the altimeter and call "POSITIVE RATE." Set the landing gear lever to UP.
	Verify that the missed approach altitude is set.
Above 400 feet, select appropriate roll Mode and verify proper mode annunciation.	Observe mode annunciation.
Verify that the missed approach route is tracked.	
Above VREF+15 CALL "FLAP 5"	FLAP 5
At acceleration height, call "FLAPS---" according to the flap retraction Schedule.	Set the FLAP lever as directed. Monitor flaps and slats retraction.
After flap retraction to the planned flap setting, select LVL CHG. VNAV may be selected if the flaps are up.	

Verify that climb thrust is set.	
Verify that the missed approach altitude is captured.	
Call "AFTER TAKEOFF CHECKLIST."	Set the landing gear lever to OFF after landing gear retraction is complete. Set the engine start switches as needed.
	Do the AFTER TAKEOFF checklist.

2.16 Landing Roll Procedure

Pilot Flying	Pilot Monitoring
Disengage the autopilot. Control the airplane manually.	
Verify that the thrust levers are closed. Verify that the SPEED BRAKE lever is UP.	Verify that the SPEED BRAKE lever is UP. Call "SPEED BRAKES UP." If the SPEED BRAKE lever is not UP, call "SPEED BRAKES NOT UP."
Verify correct autobrake operation.	
WARNING: After the reverse thrust levers are moved, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.	
Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release. Then apply reverse thrust as needed.	Call "reverse unlocked"
By 60 knots, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed.	Call "60 KNOTS."
After the engines are at reverse idle, move the reverse thrust levers full down.	
Before taxi speed, disarm the autobrake. Use manual braking as needed.	
The nose wheel steering may be used only when taxi speed is below 30kts. Use steering cafully when speed is above 20 kts to avoid abrupt inputs.	

2.17 After Landing Procedure

Start the After Landing Procedure when clear of the active runway.

Captain(left seat)	First Officer(right seat)
The captain moves or verifies that the SPEED BRAKE lever is DOWN.	
	Set the PROBE HEAT switches to OFF.
	Set the landing lights as needed. Switch on taxi light. Set the ENGINE START switches to OFF. Set the STROBE lights to STEADY.
Set the weather radar to OFF.	
	Set the AUTO BRAKE select switch to OFF. Lower DU display ENG Set the flap lever to UP.
	Set the transponder mode selector as needed. At airports where ground tracking is not available, select STBY. At airports equipped to track airplanes on the ground, select an active transponder setting, but not a TCAS mode.

Approaching parking area:

	If weather condition permits, and APU is not needed after landing, shut down ENG 1, connect GPU before shut down all engines; otherwise start APU 2 minutes before the airplane taxi in the stand.
	Switch off the taxi light at the stand

Note: the first officer (right seat pilot) should monitor the roll out, deceleration and turnoff process, and inform the captain without delay in abnormal conditions before the airplane turnoff the runway. When runway is vacated, do the “after landing” checklist after ground communication is established.

2.18 Shutdown Procedure

Start the Shutdown Procedure after taxi is complete.

Parking brake…………………………………………………… Set C

Verify that the parking brake warning light is illuminated.

Electrical power ....Set............F/O

If APU power is needed:

Verify that the APU GENERATOR OFF BUS light is illuminated.

APU GENERATOR bus switches – ON F/O

Verify that the SOURCE OFF lights are extinguished.

If external power is needed:

Verify that the GRD POWER AVAILABLE light is illuminated.

GRD POWER switch – ON

Verify that the SOURCE OFF lights are extinguished.

Engine start levers…………………………………… CUTOFF C

Operate the engines at or near idle thrust for a minimum of three

If possible, after high thrust operation, including reverse thrust, run the engines at or near idle for three minutes before shutdown to cool the engine hot sections. Time at or near idle, such as taxiing before shutdown, is applicable to this three minute period. If needed, the engines may be shut down with a one minute cooling period. Routine cool down times of less than three minutes before shutdown are notrecommended.

If towing is needed:

Establish communications with ground handling personnel C

WARNING: If the nose gear steering lockout pin is not installed and hydraulic system A is pressurized, any change to electrical or hydraulic power with the tow bar connected may cause unwanted tow bar movement.

System A HYDRAULIC PUMP switches – OFF

Verify that the system A pump LOW PRESSURE lights are illuminated.

CAUTION: Do not hold or turn the nose wheel steering wheel during pushback or towing. This can damage the nose gear or the tow bar.

CAUTION: Do not use airplane brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.

Set or release the parking brake as directed by ground handling personnel. C

If towing is not needed:

FASTEN BELTS switch..OFF F/O
ANTI COLLISION light switch ....OFF F/O
FUEL PUMP switches ....OFF F/O

CAUTION: Do not use the center tank fuel pumps with theflight deck unattended.

CAB/UTIL power switch(as installed)................................As needed F/O

IFE/PASS SEAT power switch(as installed)……….As needed F/O

GALLEY power switch(as installed)…………………. As needed F/O

WING ANTI–ICE switch ....OFF F/O
ENGINE ANTI–ICE switches ....OFF F/O
Hydraulic panel... Set F/O
ELECTRIC HYDRAULIC PUMPS switches - OFF
ENGINE HYDRAULIC PUMPS switches - ON
RECIRCULATION FAN switches.………………… As needed F/O
Air conditioning PACK switches.............................. AUTO F/O
ISOLATION VALVE switch..OPEN F/O
Engine BLEED air switches________ON F/O
APU BLEED air switch..ON F/O
Exterior lights switches ....As needed F/O
FLIGHT DIRECTOR switches................................... OFF F/O

After the wheel chocks are in place:

Parking brake – Release C

APU switch...As needed F/O

Call “SHUTDOWN CHECKLIST.”.. C

Do the SHUTDOWN checklist. ....F/O

2.19 Secure Procedure

IRS mode selectors.. OFF ....F/O

EMERGENCY EXIT LIGHTS switch——OFF ....F/O

Note: in dark atmosphere conditions, DO NOT SWITCH OFF THE EMERGENCY EXIT LIGHTS before all the passenger disembark.

WINDOW HEAT switches————OFF............................F/O

Air conditioning PACK switches———OFF ....F/O

Call “SECURE CHECKLIST.” C

Do the SECURE checklist. ....F/O

App：Non-precision approach (NPA) TECHNIQUE

Non-precision approach is considered a normal instrument approach in flight approach procedure in which lateral guidance is provided only other than electronic glide slope information.

HNA recommands the following methords in non-precision approach profile for pilots consideration.

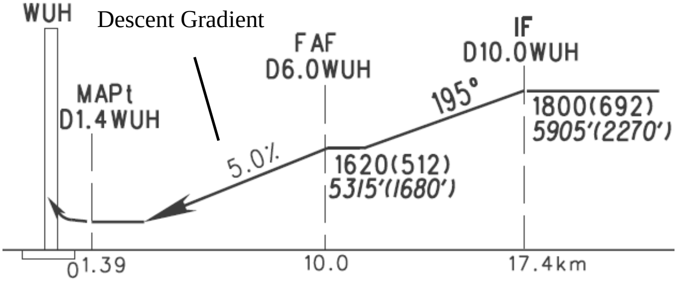
Definitions:

Descent Gradient: ratio , expressed as percentage of the descent change in geometric height divided by the horizontal distance traveled in a given time.

VDP(Visual descent point): A defined point on the final approach course of a nonprecision straight-in approach procedure from which normal descent from the MDA(H) to the runway touchdown point may be commenced, provided the suitable visual reference is established to the pilot. At VDP, little flight path adjustment may be needed until touch down, thus the stable visual segment will be achieved.

MAPt：(Missed Approach Point)

Typical VOR/DME approach example:



During non-precision approach, at FAF, normal landing profile should be considered. Select V/S mode with appropriate vertical speed to descend to VDP prior to the MDA(H)

Principle and methord to decide VDP ：

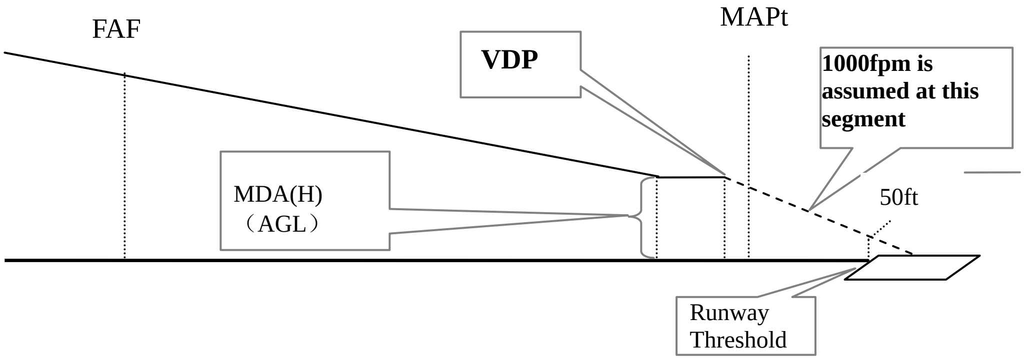
VDP is based on stabilized approach criteria, it means, using published descent gradient from FAF to MDA (H), level off prior to the VDP, in which further descent would be commenced for establishing a visual contact. The crew should verify 1000 (fpm) descent rate must not be exceed before landing. If stuffiest visual contact is established before this point, the flight crew may continue to landing using normal descent profile, otherwise, go around is mandatory. During missed approach, lateral track should be precisely through MAPt prior published procedure maneuvers.

The following illustration is clarified the relationship between VDP and MAPt, and the calculation method of DME distance to VDP:

Note: 1、MDA(H) is based on field elevation ;

2、ground speed is divided by minute, e.g., indicated ground speed/60;

3、the distance to the runway threshold from DME. Minus this distances provided the DME is between FAF and threshold; otherwise, plus these distances provided the DME is not between FAF and threshold.



DME distance to VDP:

$$\frac{\text{MDA on MCP (field elevation）-50ft}}{\text{1000fpm}} \times \text{GS（nm/min）} \pm \text{DMEto Threshold（nm）} = \text{DME distance to VDP（nm）}$$

3 Non-normal Operations

3.0 Preface

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

- ♦ NON-NORMAL RECOGNITION: The Crew Member recognizing the malfunction calls it out clearly and precisely.
- ♦ MAINTAIN AIRPLANE CONTROL: It is mandatory for one pilot (PF) to fly the airplane while the non-flying pilot (PM) accomplished the non-normal checklist. Maximum use of Autoflight system is recommended to reduce crew workload.
- ♦ ANALYSE THE SITUATION: Non-normal Checklists should be accomplished only after the malfunctioning system has been positively identified.

Note: Pilots should don Oxygen Masks and establish communications any time oxygen deprivation or air contamination is suspected, even though an associated warning has not occurred.

- ♦ TAKE THE PROPER ACTION: Although many in-flight non-normal situations require immediate corrective action, difficulties can be compounded by the rate the PF issues commands and speed of execution by the PM. Commands must be clear and concise. The PF must exercise positive control allowing time for acknowledgment and execution. The other Crew Members must make sure their reports to the PF are clear and concise, neither exaggerating nor understating the nature of the non-normal situation. This eliminates confusion and ensures efficient, effective, and expeditious handling of the non-normal situation.
- ♦ EVALUATE THE NEED TO LAND: If the NNC directs the Crew to land at the nearest suitable airport, diversion to the nearest airport where a safe landing can be accomplished is required. If NNC does not direct landing at the nearest suitable airport, the pilot must determine if continued flight to destination is a compromise to safety.

3.1 Rejected takeoff

Principle:

Rejected takeoff decision must be made by Captain, and he should announce “**REJECT TAKEOFF**”. If the First Officer is making the takeoff, the First Officer must maintain control of the airplane until the Captain (Instructor) makes a positive input to the controls.

Prior to 80 knots, the takeoff **MUST** be rejected for any of the following:

A.Activation of the Master Caution system
B. System failure(s)
C. Unusual noise or vibration
D. Tire failure
E. Abnormally slow acceleration
F. Takeoff configuration warning
G. Fire or fire warning
H. Engine failure
I. Engine limitation exceedence
J. Predictive Windshear Warning
K. If the airplane is unsafe or unable to fly.

Between 80 kts and V1, if one of the following situations occurs, a rejected takeoff **MUST** be made:

A. Fire or fire warning
B. Engine failure
C. Predictive windshear warning
D. If the airplane is unsafe or unable to fly.

Operation procedures:

Condition	Captain (CM1）	First Officer (CM2）
Prior to 80 kts, during takeoff if system failure(s), unsafe warning or any failure indication occurs; Between 80 KTs to V1 if engine failure, fire warning, predictive windshear warning or If the captain thinks the airplane is unsafe or unable to fly.	♦ Judge it and make decision ♦ Call "REJECT TAKEOFF" and simultaneously: ♦ Close both thrust levers. ♦ Disengage the autothrottle. ♦ Raise Speed Brake Lever to UP. ♦ Apply maximum reverse thrust (Do Not deploy reverser on the engine which indicates a fire). ♦ If RTO autobrakes is engaged, monitor system performance and apply manual braking if the AUTO BRAKE DISARM light illuminates or deceleration is not adequate. ♦ Continue maximum braking until certain the airplane will stop on the runway. Field length permitting: ♦ Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.	♦ Call out the failure or non-normal indication. Verify actions as follows: ♦ Thrust levers closed. ♦ Autothrottles disengaged. ♦ Verify Speed Brake lever UP and call "Speed Brake UP." If Speed Brake lever is not UP, call "Speed Brakes NOT UP." ♦ Reverse thrust applied ♦ Maximum brakes are applied, AUTOBRAKE DISARM light illuminated, call out "Auto Brake Disarmed". ♦ Call out any omitted action items. ♦ Call out 60 kts "60".

Engine fire	♦ Stop the airplane as soon as possible, set parking brake, announce and complete "Engine Fire, Severe Damage or Separation Recall Items".	♦ After the airplane has come a stop, verify and complete "Engine Fire, Severe Damage or Separation Recall Items". ♦ Notify ATC
If smoke or fire **cannot be controlled** or safety is compromised and the Captain thinks **evacuation is needed**.	♦ Announce evacuation, then complete "Evacuation Checklist Recall Items", and related procedures and announce Evacuation Checklist.	♦ Complete related procedures, and read "Evacuation Checklist".
If the failure **does not compromise aircraft safety** and **evacuation is not needed**.	♦ Attempt to vacate the runway and park on the taxiway and perform related procedures..	♦ Notify ATC, Cabin Crew and eventually the Dispatcher (report rejected takeoff decision). ♦ After the airplane has parked, complete related Checklist/s.

Notes:

1. The Captain has the sole responsibility for the decision to reject the takeoff, and the rejected takeoff procedure should be completed by PF (CM1). During RTO, use autobrake, as possible. Anytime when the autobrake cannot meet the requirement of rejected takeoff, use manual brake immediately.
2. When the aircraft is parked after the rejected takeoff, deal with the system fault. If the fault is resettable then review Brake Cooling Schedule for brake cooling time to meet the next takeoff requirements after takeoff rejected and parking.
3. Consider the possibility of wheel fuse plugs melting. As long as

the airplane is confirmed not to move, don’t apply parking brake, and maintain the anti-collision light on.

4. If tire fire is reported, complete evacuation procedures as soon as possible. Note: Do not use overwing exits.
5. Consider whether it is necessary to vacate the runway. All recall items **MUST** be completed on the runway (considier putting the engine with the fire in the downwind side when the wind speed is more than 5m/s).
6. The success and safety of a rejected takeoff before V1 depends on in timely judgement, good crew coordination and quick action.
7. Reject takeoff at a speed less than 90 kts, Autobrake is inoperative and Autobrake Disarm light will **not** illuminate.
8. NOTE: It is HNA’s policy to initiate the Evacuation Recall Items and verify the discharge light is on, without delay when the 2nd Fire Extinguisher has been discharged. Do not wait the 30 seconds to begin the Recall Items and evacuate the airplane!

3.2 Tail strike at takeoff

Phenomenon:

Tail strike occurs when an airplane tail section or lower aft fuselage contacts the runway during takeoff. Anytime fuselage contact is suspected or known to have occurred, accomplish the appropriate non-normal checklist.

Operation procedure:

Condition	PF	PM
Tail strike on takeoff	♦ Control the airplane to avoid excess maneuvering load. ♦ "Tailstrike On Takeoff Checklist"	♦ Notify ATC return of decision to land and no assistance required. ♦ Do Tailstrike On Takeoff checklist
	Notify Cabin Crew of decision to return to the airport.	
After landing	Determine taxi route and park according to the situation.	

Notes: the following situations may result in tailstrike during takeoff:

1. Wrong stabilizer trim is entered.
2. Rotating at too low airspeed.
3. Excessive rotation rate.
4. Use of flight director during rotation.
5. Excessive use of control wheel during crosswind takeoffs may result in spoiler deflection. At this time tail strike may occur if airplane is at normal rotation rate.

3.3 Pneumatic system

3.3.1 AUTO FAIL/UNSCHEDULED PRESSURIZATION CHANGE

Judgement and decision:

When the Flight Crew detects an auto pressurization failure light/s or abnormal differential pressure with pressurization change, execute Auto Fail/Unscheduled Pressurization Change Checklist

Operation procedure:

Condition	PF	PM
Auto fail/unscheduled pressurization change	♦ Control the airplane status,"Auto Fail /Unscheduled Pressurization Change Checklist".	Perform the Auto Fail/Unscheduled Pressurization Change Checklist. (If standby mode does not operate or cabin altitude can not be controlled, select MAN on the pressurization mode selector to control the outflow valve and cabin altitude as a RECALL ITEM)
The pressurization **can be controlled** (Standby or MAN)		♦ Monitor or control cabin altitude, continue flight.
The pressurization **cannot be controlled**	♦ Advise ATC the intension of the crew (may perform the depressurization procedure of the company)	

Notice:

1. If the cabin altitude is more than 10,000 feet, the Flight Crew **must** use oxygen. When the cabin altitude is 10,000 feet, the normal/100% position should be put on the normal position to save the oxygen.
2. The Flight Crew should consider slower climb rates when

controlling the cabin altitude manually.

3. When the cabin altitude is uncontrollable, the Captain should choose the suitable descent rate (no or structural failure) and speed according to the situation.
4. When a high descent rate is used, the Flight Crew should monitor the speed and recommended to use the Level Change mode.
5. When the pressurization mode is changed from automatic to manual, the Flight Crew should react timely because the cabin rate could change excessively in a very short time.

3.3.2 CABIN RAPID DEPRESSURIZATION AND EMERGENCY DECENT

Judgement and decision:

When the plane altitude is more than 14,000 feet MSL, the cabin differential pressure will cause equalization quickly if allowed. Ear equalization discomfort and difficulty in breathing will occur, both cabin altitude will increase and differential pressure will decrease rapidly, cabin climb rate may indicate maximum. When the cabin altitude has passed 10,000 feet, the Cabin Altitude aural warning sounds. The flight crew completes the checklist Recall Items, if the cabin pressure cannot be controlled. The Flight Crew completes the Emergency Descent Checklist and notify ATC.

Cabin Altitude	Symptoms
10000 feet	Headache, fatigue.
14000 feet	Sleepiness, headache, syncope, eyesight weakness, musle incoordination, nails turning purple.
18000 feet	The memory declines, the similar symptoms worsen.
22000 feet	convulsion、prostration、obfuscation、shock
28000 feet	Prostration and loss of consciousness occurs in 5 minutes

Effective awareness time

Altitude	Awareness time:
22000 feet	5-10 minutes
25000 feet	3-5 minutes
30000 feet	1-2 minutes
35000 feet	30 seconds
40000 feet	15 seconds

For persons who are unfit, smoke, stressed,etc., the reaction may be more severe and the effetive TUC (time of useful consciousness) will be less.

The Rapid Depressurization Phenomenon

The rapid depressurization phenomenon refers to a rapid cabin pressure loss. It maybe because of airframe damage, duct leaks or breaks, any door,/window failure, explosion or weapon discharge, damaging the pressurized fuselage and signs as follows:

1. Cabin climb rate increases rapidly.
2. Cabin altitude increases rapidly.
3. The body feels expanded with ear drum equalization problems.
4. If the airframe is visibly damage and cabin air turbulence occurs.
5. Cold air enters into the cabin, the temperature decreases rapidly.
6. Strong airflow, fog/misting of the cabin air may be produced.
7. When the cabin altitude passes 10,000 feet, the cabin altitude aural warning sounds.
8. When the cabin altitude is 14,000 feet, the Passenger Oxygen mask deploys automatically.

Operation proceudure:

Condition	PF (CM1)	PM (CM2)
Cabin rapid depressurization	♦ The Captain, First Officer should immediately remove the headset/boom mic and set Regulator to 100% and establish flight crew communication (check SPK, INT receiver switch, press and tune to a suitable volume, select the MASK position]. (if installed)].	

Handling	♦ Hold and monitor the airplane status.	♦ Cut off/cancel the Cabin Altitude Aural warning, select manual (MAN) position for Pressurization Mode Selector and close the outflow valve, check if the pressurization has been controlled.
The cabin pressure **can be controlled** (the cabin rate changes to descend and the cabin altitude does not increase).	♦ Manually control the cabin pressure using the Outflow Valve Position switch and continue the flight.	
The cabin rapidly depressurizes, or the cabin pressure **can not be controlled**, begin emgergency descent (if the cabin rate does not decrease, but the cabin altitude continue to increase).	♦ Call "Emergency Descent Checklist Recall Items" ♦ Notify the cabin with PA to carry out the emergency descent	♦ Passenger Signs - ON. ♦ Passenger Oxygen Switch – ON (if cabin altitude exceeds or is estimated to exceeds 14000 FT) ♦ Engine Start switches select CONT. ♦ Notify ATC of MAYDAY and acquire the altimeter settings ♦ Transponder 7700

Emergency descent:

	♦ Follow ATC directives or select heading and turn right/left 30 degrees (or follow the emergency procedure in RVSM airspace). ♦ Set lower altitude in the altimeter window. ♦ Select LVL CHG ♦ Thrust Levers - idle ♦ Speed Brake Lever - Flight Detent. ♦ Reset the speed to just below MMO/VMO (if the structural damage is suspected, limit the speed to 280 KTS or below and avoid excessive maneuvering loads) ♦ Set the minimum safety altitude or 10000 feet, whichever is higher in the MCP altimeter window. ♦ Deviation 6-8 NM, parallel to the flight plan route	♦ Check the route safety altitude and report to the captain ♦ Confirm that the Recall Items have been completed ♦ Check the deviation distance in Progress Page 3 or select deviation distance in OFFSET page and execute (if installed) ♦ Use the current frequency and 121.5 to transmit the emergency situation (MAYDAY MAYDAY MAYDAY). ♦ Transponder （7700） ♦ Monitor the airplane status ♦ Observe other aircraft traffic. ♦ Report the deviation situation (if necessary) ♦ Confirm with Cabin Crew on damage or injuries.

	♦ When the situation permits, call "Cabin Altitude Warning and Emergency Descent Checklist" ♦ Monitor the airplane status	♦ When the situation permits, complete the "Cabin Altitude Warning and Emergency Descent Checklist
♦ 2000 feet to level off	♦ Monitor airplane status ♦ Reduce the speed to 250 kts (or follow the depressurization procedure required by the company)	♦ "2000 feet to level off".
♦ 1000 feet to level off	♦ Retract the Speed Brake Lever smoothly.	♦ "1000 feet to level off".
♦ Level off altitude	♦ Maitain the level off altitude and confirm that ALT HOLD is displayed on the FMA. Remove the Oxygen Mask and resume the flight crew communication BOOM, reset TEST/REST bar (if installed). Oxygen must be used when the cabin altitude is above 10,000 feet. Put the Normal/100% selector to Normal position to save oxygen.	

	♦ If the Checklist is not completed, announce "continue Emergency Descent Checklist" ♦ Adivse Cabin Crew and passengers to remove Oxygen Masks. ♦ Review fuel status. ♦ Search for the nearest suitable airport. ♦ Decide and announce the flight intentions.	♦ Continue to complete the Emergency Descent Checklist ♦ Level off altitude and flight speed should be inserted into the CDU as required. ♦ Confirm with Cabin Crew on damage or injuries. ♦ Notify the Captains intention to ATC.
♦ Fly to the nearest suitable airport to land according to the airplane status and route altitude limit.		

Notes:

1. When the right seat is PF, he/she should hand over the flight controls to the Captain in the left seat (CM1) for the eventual rapid depressurization and emergency descent.
2. The purpose of rapid depressurization is to make the airplane descend to a safe altitude in the shortest time and reduce the hypoxia risk to the passengers and crew as much as possible. Do not panic and perform the procedures in an orderly way.
3. The Flight Crew should immediately put on the Oxygen Mask and establish flight crew communication during cabin rapid depressurization or CABIN ALTITUDE WARNING. Select both speakers and a suitable volume.
4. The Flight Crew should continue to communicate with each other during the emergency descent to verify that a crew member incapacitation (caused by lack of oxygen (hypoxia)) has not occurred.
5. Fly parallel with the planned/cleared Airways/Route. If it is

necessary to deviate beyond 25 km, advise ATC and use the High Altitude Charts to determine the minimum safe altitude.

6. Use Engine Anti-ice and adjust the thrust as necessary when in icing conditions.
7. Select Weather Radar to avoid adverse weather.
8. Keep or re-engage autopilot and autothrottle, and keep the landing gear retracted during the emergency descent.
9. The Flight Crew should control the aircraft with smooth control inputs and the PF should keep his/her hand on the Speedbrake Lever when the Speedbrakes are extended.
10. Set the heading and altitude window roughly during the initial descent. Correct in a timely manner.
11. Prior to leveling off with the airspeed close to VMO, reduce speed and slowly retract the Speedbrakes to avoid airspeed exceedences.
12. Further descent planning to be adjusted to avoid high cabin altitude/pressure changes (passenger and crew discomfort)

3.3.3 SMOKE, FIRE OR FUMES

Judgement and decision making:

When the cockpit or cabin is found or reported to have smoke, fire or fumes, the Flight Crew should immediately don Oxygen Masks and Smoke Goggles (if necessary) and establish flight crew communication and the cockpit door should be kept closed. Use the interphone to communicate with the Cabin Crew and advise ATC. Execute the Smoke, Fire or Fumes QRH Checklist.

Note:

1. When the Flight Crew suspects hypoxia, they should don Oxygen Masks and establish flight crew communication. Put on the Oxygen Mask and smoke goggle (if necessary). If there is smoke in the Mask or Goggles, press the Emergency Button to purge the smoke.
2. If it is necessary to open the PM's side window (Nr.3) in the Cockpit to remove the smoke (it may be unable to open the side window when airspeed is too high), advise ATC and maintain normal communication in the cockpit because of very high noise.
3. When the Cabin has on fire or there is smoke in the cabin, it is forbidden to select the Passenger Oxygen switch to ON.

3.4 Electrical

3.4.1 LOSS OF BOTH ENGINE DRIVEN GENERATORS

Judgement and decision making:

If the two engine driven generators fail together, PF (CM1) should control the airplane using standby instrumentation. The VHF 1 NAV and COMM 1 and ADF 1 are all operative on Standby Power. When the flight altitude is very high (above FL300), make ATC request to descend as soon as possible because of possible thrust deterioration (due to fuel gravity feeding) or engine flame out may occur. Attempt to restore at least one Generator to normal to maintain the normal flight condition. Complete Loss of Both Engine Driven Generators Checklist.

Operational procedure

Condition	PF (CM1)	PM (First Officer)
Generator failure of engine driven.	♦ Control the aircraft condition with PFD, ND on the left side and the Standby Instrument. ♦ If the flight altitude is too high, call "Request Descent" ♦ "Loss of Both Engine Driven Generators Checklist"	♦ Monitor engine parameters. ♦ Use the VHF 1 for navigation, the COMM 1 for communication and the ADF 1 frequency. ♦ Request descent. ♦ Complete Loss of Both Engine Driven Generators checklist

NOTE:

1. When the Right Seat pilot acts as PF and the both engine driven generators are off line (APU not running), the Right Seat should hand over the flight controls to the Left Seat and the Left Seat becomes PF as CM1.
2. When the flight altitude/level is very high (>FL300), descend as soon as possible as all fuel pumps are inoperative, the thrust may deteriorate or an engine flame out may occur.
3. Control the pressurization as needed.

4. APU starts are not recommended above 25,000 feet (especially with aircraft having only one Battery). Watch the NNC Notes on the RCCB Remote.
5. Avoid flights into icing areas because inoperative probe heating may cause unreliable airspeed indications.
6. Until at least one AC Generator source is restored and on bus, use manual trimming technique.
7. Select the Right Ignitor when the standby electricity is in use.
8. When both Engine Driven Generators fail, PM should attempt to reset the switches first.

3.4.2 TR FAILURE:

TR Failure Phenomenon and Handling:

When any TR fails on ground, TR UNIT light is illuminated. Only when TR1 fails or both TR2 and TR3 fail in air, does TR UNIT light illuminate. There is no influence to most flight phases when only one TR fails.

Note: TR UNIT light illuminates in air, AFDS approach is not recommended to use (not selecting APP mode）.

When using AFDS for approach, the following failures display will appear during capturing the glide slope.

	TR1 failure	TR2 and TR3 failure
phenomenon	♦ The Yaw Damper cut off. ♦ Electric 1 motor driven Hydraulic Pump is inoperative. ♦ Equipment Cooling Normal Exhaust fan is inoperative. ♦ Autobrake Disarm light illuminated. ♦ Pressurization system Auto- Fail light illuminated, Standby Light on.	♦ Right seat PFD、ND and the lower DU are inoperative. ♦ Electric 2 motor driven Hydraulic Pump is inoperative. ♦ Equipment cooling Normal SUPPLY exhaust fan is inoperative. ♦ Pressurization system Auto- Failure light is illuminated, standby

	♦ Flight Recorder inoperative light on.	light on. ♦ Autobrake disarming light on. ♦ EEC standby light On.
handling	♦ PF: manual flight control ♦ PM: reset flight director (FD), reset Autobrake, and re-engage Yaw Damper. ♦ "TR Unit Checklist "	♦ PF: manual flight control. ♦ PM: reset flight director (FD) and reset autobrake ♦ "TR Unit Checklist "

Note:

1. When the Right Seat pilot acts as PF, and both TR2 and TR3 are inoperative, the Right Seat should hand over the flight control to the Left Seat and takes responsibility as PF (CM1).
2. The Flight Crew should maintain the control over the airplane. Localizer capture and use is available . V/S can be used for vertical descent profile (iso. APP mode). It is not recommended to fly without the Flight Directors. PM should reset Autobrakes and re-engage yaw damper.

3.5 Engine

3.5.1 ABORTED ENGINE START:

Judgement and decision making:

The Flight Crew should abort the start when the following situations exist during engine startup:

- No N1 indication before Engine Start Lever is moved to Idle.
- No increase in EGT within 10 seconds on ground or 30 seconds in the air after Engine Start Lever is moved to Idle.
- No N1 or N2 increase or the increase is slow after EGT indication.
- EGT quickly approaches or will exceed the start limit.
- No indication of oil pressure when the engine is stable at Idle.
- Trigger of an Abnormal Start advisory.
- Other situations that require an aborted engine start.

Operation procedrue

Conditions	Captain (CM1）	F/O (CM）
♦ EGT does not increase within 10 sec. on ground or 30 sec. in air after the Engine Start Lever is raised to IDLE. ♦ No increase in, or a very slow increase in N1 or N2 after EGT indicaton. ♦ EGT rapidly approaching or exceeding the start limit. ♦ No oil pressure indication by the time the engine is stabilized at Idle. ♦ Trigger the Abonormal Start Advisory. ♦ Other conditions causing an aborted start.	♦ Call "Aborted Engine Start Checklist Recall Items, cut off affected Engine Start Lever ♦ Call "Aborted Engine Start Checklist"	♦ Call out failure or abnormal indication. ♦ Complete Aborted Engine Start Checklist. ♦ Advise Gnd Engineering Staff. ♦ Advise ATC and Dispatch Office.

Considerations:

1. During engine start, the CP and F/O should monitor the engine indications closely, and call out any abonormal indications.
2. Starter duty cycles shall be strictly followed before any further start attempts..
3. For EGT approaching limits, no oil pressure indication when the engine is stabilized at Idle, or the trigger of Abnormal Start Advisory, then a further restart is prohibited before the fault/s are removed.
4. In case of rapidly increasing EGT, the CP should select the

Engine Start Lever to Cutoff without delay to avoid EGT start limit exceedances.

5. Two-way communitation should be held with Ground Maintenance during engine start.
6. If engine limit occurs, it should be recorded in "Flight Log-book".

3.5.2 ENGINE FAILURE

During takeoff

Judgement and decision

Engine failure during takeoff roll and possibly accompanied with direction yaw, noise changes and/or vibrations of the aircraft.

Engine Failure before V1

Perform rejected takeoff procedure

Engine Failure after V1

Procedure:

Condition	PF	PM
Flaps 5 takeoff. Engine failure **after** V1.	♦ "Continue Takeoff' ♦ Control centerline tracking using rudder inputs. ♦ Verify failure, "Reset Master Caution"	♦ Verify failure, call out "X Engine Failure". ♦ Reset Master Caution
VR	♦ Rotate smoothly to 12 − 13° pitch to maintain airspeed V2 − V2+20 and use rudder as required to control the track and center the Control Wheel.	♦ "Rotate"

Positive rate.	♦ Verify positive rate of climb and call "Gear up"..	♦ "Positive Rate" ♦ "Gear up" when selecting the Gear Lever.
400feet AGL.	♦ "Heading Select, Correct Track, Advise ATC" ♦ Confirm with PM the Engine Out Procedure and altitude.	♦ "400" ♦ "HDG SEL, Mode Alive" when read on the FMA. ♦ Report to ATC "PAN PAN" 3x with related malfunction, the single engine procedure and the Crew's intention.
Climb to safe altitude according to normal takeoff profile or published Engine Failure procedure. During the climb, use correct flap setting, gradient, speed and MCT according to engine failure departure procedure. After proper triming of the aircraft, engage Autopilot A or B (as required). Plan to land at the nearest suitable airport.		
When A/C is stable.	♦ "Engine Failure or Shut Down Checklist" ♦ Continue to climb to ATC assigned altitude.	♦ Complete Engine Failure or Shutdown Checklist.
After Engine Failure or Shutdown Checklist.	♦ "After Takeoff Checklist".	♦ Complete After Takeoff Checklist ♦ Advise Cabin Crew of the aircraft status and

		intension of the crew.
Landing		
Landing rollout.	♦ Use operating engine's Reverser only. ♦ Check Speed Brake extended. ♦ Control aircraft direction.	♦ Report "Speedbrake Up, "Reverser Thrust Unlocked" and Autobrake.
Parking.	♦ Vacate runway as appropriate, complete Engine Shut Down Checklist as appropriate after engine shut down.	♦ Shut down engines and complete Engine Shutdown Checklist as appropriate.

737-800 Engine Failure Rotation Attitude:

Model	Flaps	Lift off attitude (degrees).	Minimum tail clearance inches (cm).
800	1	9.0	8(20)
	5	8.7	11(28)
	10	8.4	14(36)
	15	8.2	15(38)
	25	8.0	17(43)

Considerations:

1. During takeoff roll, PM should callout "X Engine Failure.
2. Take caution in case of engine failure on takeoff, the range of travel the column control wheel is higher than normal.
3. During flaps retraction, if no F/D selected ON, the airspeed and attitude are the main reference for maintaining pitch attitude; reduce pitch to 7-8° and maintain 0—200FT/min climb rate.
4. Adjust Rudder Trim to center the Control Wheel based on the speed, thrust and configuration changes.

5. Limit bank angle to 15 degrees using takeoff flaps and until reaching V2+15 kts. Limit bank angle to maximum 30 degrees when maintaining V2+15 kts or greater.
6. Noise Abatement Takeoff is not followed in case of an engine failure.
7. In case of engine failure when using Reduced Thrust takeoff, full thrust may be used based on aircraft performance. If it is required, set to full thrust manually and monitor max EGT.
8. Rudder trim should be used above 400ft AGL and aircraft is under control. A/P engagement is recommended after clean up. The PF should engage corresponding A/P.
9. During engine shutdown using non-recall items found in the QRH, **PF guards the operating Engine Thrust Lever and Start Lever**, PM will perform movements (Thrust Lever to Idle, Engine Start Lever to Cutoff) of the affected Thrust Lever, Engine Start Lever under the confirmation of the PF.
10. Fuel Crossfeed Valve should be closed during approach and landing
11. Auto land is prohibited for single engine Approaches and landing.
12. Set Rudder Trim to 0 before landing to provide full Rudder authority during and after landing. However, this can be performed by the PM above 500 ft (above landing elevation) under PF’s order. When rudder trim is not selected to 0 before landing, it requires high force to maintain runway centerline by using rudder (recommended set back to 0 on slippery and wet runway)
13. After landing, it is recommended to park the aircraft on the runway for Engine Fire, Severe Damage or landing gear problems for the eventual Passenger Evacuation. If an **evacuation is not required** the Captain should consider vacating the active runway. In the case of single engine operation, vacate at the nearest exit only (no backtracking with single engine) and perform the required Checklist and Shutdown Checklist and have the airplane towed to the Gate or Parking Stand.
14. When fuel balancing is required, standard procedure shall be performed (switching of crossfeed valve to open ONLY without fuel pump switching is prohibited).

15. During single engine operation, flaps may be retracted as required depending on final decision for diversion/landing.

3.5.3 SINGLE ENGINE MISSED APPROACH

Judgement and Decision:

The missed approach requirement is the same as with all engines, the Captain should go around immediately when; visual reference is not sufficient when reaching minimums, deviation exceeds limit or not within standlized approach criteria.

Operation procedure :

Condition	PF (CM1)	PM(CM2)
Captain must go around immediately when approach lights can not be contacted or a stable approach is not established.	♦ "Go Around, Flap1, Set Go Around Thrust". ♦ Press TO/GA switches, and at the same time manually advance Thrust Levers and adjust go around attitude (pitch up 13 degrees), follow F/D, maintain target speed, use rudder pedals or electric rudder trim to control A/C track and keep control wheel as neutral as possible	♦ "DA/MDA, Negative contact (runway environment is not in sight)". ♦ "Flap 1" Retract flap to 1, check indication. ♦ Set go around N1, ♦ Monitor A/C status and engine parameters.
Positive rate of climb	♦ Verify positive rate "Gear Up"	♦ "Positive Rate "

		♦ "Gear Up" when selecting Lever.
400feet AGL	♦ "HDG Select (if missed approach is in FMC, LNAV could be used), Correct Track/ LNAV, advise ATC"	♦ "400" ♦ "HDG SEL/LNAV mode alive" ♦ Report ATC
Climb to safe altitude according to normal takeoff profile or published engine failure procedure. During the climb, use correct flap setting, gradient, speed and MCT according to engine failure departure procedure. After proper trimming of the aircraft, engage autopilot A or B (as required). Plan to land at the nearest suitable airport.		
A/C is under control.	♦ "After Takeoff Checklist"	♦ Put Landing Gear Lever to OFF, Speed Brake Down Detent. ♦ Perform After Takeoff Checklist

Considerations:

1. Good teamwork/CRM and effective A/C control is required for single engine Go Around.
2. During missed approach, PM MUST monitor engine parameters and set N1 to missed approach limit promptly.
3. When go around thrust is applied, the direction of A/C shall be controlled by proper and smooth rudder inputs and the Control Wheel kept as neutral as possible.

3.5.4 ENGINE FAILURE ON FINAL

Judgement and Decision.

Engine failure on final is a rare occurance, the Flight Crew must monitor engine parameters during each approach. When an engine fails with a thrust loss, unexpected yaw happens (as apposed to an engine fire), speed decreases if no corrections are made and usually pilots have a tendancy to sink below the glide slope initially, and Master Caution is illuminated. **Captain takes control and becomes PF** and **must** control the A/C immediately. The decision for continuing approach or performing a Missed Approach is very important. HNA recommends above 1000 ft AGL (Operational Procedure 1) to configure for Flaps 15. If below 1000ft AGL (Operational Procedure 2), and an engine fails, overheats, surges or stalls, the Captain shall make his/her decision based on the situation and declare whether to continue approach and attempt to land or Go Around.

Operational Procedure 1:

Conditions	PF (CM1)	PM (CM2)
Engine fails / flames out /surges or stalls when A/C is in landing configuration, Captain decides to continue the Approach.	♦ Controls the A/C, verify failure, "Reset Master Caution" ♦ "Continue Approach" ♦ "Flaps 15， set VREF15+corrections， Ground Proximaty Flap Inhibit Switch Flap Inhibit"	♦ Verify failure， "X Engine Failure". ♦ Reset Master-Caution. ♦ Set Flaps 15，set MCP VREF15+corr-ections.，
Continue Approach.		
Landing rollout and stop.	♦ Vacate runway and stop when clear, "Engine Failure or Shutdown Checklist" ♦ Advise Cabin Crew and Passengers.	♦ Perform Engine Failure or Shutdown Checklist ♦ Advice ATC and HNA Dispatch Office, arrange towing truck.

When runway is vacated.	♦ Perform engine shutdown procedure, "Shutdown Checklist"	♦ Once runway vacated ♦ "Shutdown Checklist"

Operational Procedure 2:

Conditions	PF(CM1)	PM(CM2)
Engine fails / flames out /surges or stalls when A/C is in landing configuration and Captain **decides to continue to approach**.	♦ Verify failure, "Reset Master Caution" ♦ "Continue Approach"， control A/C immediately, apply thrust, use rudder, adjust pitch attitude.	♦ Verify failure， "X Engine Failure" ♦ Reset Master Caution ♦ Monitor A/C status and engine parameters. ♦ Advise ATC.。
Continue approach.		
Landing rollout and stop.	♦ Vacate runway and stop when clear, "Engine Failure or Shutdown Checklist"	♦ Perform Engine Failure or Shutdown Checklist ♦ Advice ATC and HNA Dispatch Office arranging towing truck.
When runway is vacated.	♦ Perform engine shutdown procedure, "Shutdown Checklist"	♦ Once runway vacated ♦ "Shutdown Checklist"

Considerations:

1. In case of engine failure on final approach, Flight Crew should judge properly and correctly, make decision of continuing or performing a Go Around promptly.

2. When an engine failure occurs, it is most important to control the aircraft and to land safely as soon as possible.
3. If time permits, complete Engine Failure or Shutdown Checklist.
4. Incase of an engine failure on Final, two thrust levers (except with a fire indication) should be controlled together to allow automatic Speedbrake and Auto Brake operation after landing.
5. Auto Land Approaches and Landings are prohibited in case of engine failure.
6. Incase of engine failure on Final, when aircraft is not stabilized, a Go Around **must** be made.
7. At low altitude, when landing with Flaps 30, missed approach Flaps is 15; when landing with Flaps 15, Missed Approach Flaps is 1.

3.5.5 ENGINE FAILURE DURING MISSED APPROACH

Judgement and Decision

In case of an engine failure during the missed approach, normal Missed Approach Procedure shall be followed (if no performance issues exist) to control aircraft and standard callouts made. Also monitor lateral deviation and pitch changes to control missed approach track using proper aileron and rudder trimming, Rely on F/D commands and follow by cross-checking for correct indications. Monitor and check FMA until above initial maneuvering and safety altitude. PM should call out “X Engine Failure” promptly and correctly, at the same time, confirm Go Around N1 is set, monitors A/C control by the PF and engine parameters.

Operation procedure:

Conditions	PF(CM1)	PM(CM2)
Engine failure during missed approach or		

unexpected thrust reduction (gear has already been retracted and Flap 15).	♦ Verify failure. ♦ "Set Go Around Thrust" ♦ Use rudder, control A/C and missed approach track. Follow F/D, adjust pitch attitude, maintain the required airspeed. ♦ "Reset Master Caution".	♦ Verify failure, "X Engine Failure" ♦ Set go around thrust, and call:"Go Around Thrust Set" ♦ Monitor aircraft and flight track, call out any deviation timely and correctly and any abnormal indication. ♦ Reset Master Caution.
400ft AGL	♦ "HDG select（LNAV is recommended if missed approach procedure stored in FMC）,Correct Track, notify ATC"	♦ "400" ♦ "HDG SEL or LNAV Mode Alive" ♦ Report ATC and dispatcher.
Climb to safe altitude according to normal go around profile or published go around procedure. During the climb, use correct flap setting, gradient, speed and MCT according to engine failure departure procedure. After proper trim of the aircraft, engage autopilot A or B (as required). Plan to land at the nearest suitable airport. After landing, vacate the runway and stop on the Taxiway		
Aircraft is under control and reaching assigned altitude.	♦ "Complete Engine Failure or Shut down Checklist"	♦ Read and perform Engine Failure or Shut down Checklist.

Consideratons:

1. During a missed approach, in addition to the normal Missed Approach procedure, the A/C shall be controlled by PF with

proper and smooth Rudder inputs, and neutral Control Wheel (as close to as possible), and maintain Missed Approach track, ensuring meeting the requirement of Missed Approach Climb Gradient and eventual obstacles.

2. During Missed Approach, the Flight Crew should follow the F/D commands, monitor airspeed, check FMA indications and confirm correct.
3. Missed Approach shall be conducted by following the published Missed Approach procedure (performance permitting) or ATC's Clearance.
4. Since the thurst available changes because of an engine failure, the pitch attitude must be adjusted promptly when an engine fails to avoid high pitch and low airspeed situations.
5. Maintain Flaps 15, follow pitch commands, limit bank angle to 15 degrees until reaching Flap 15 Maneuvering Speed while maneuvering and climbing to reach the MSA.

3.5.6 ENGINE FAILURE IN FLIGHT (climb, cruising, descent)

Judgement and Decision:

In flight, it is important for the Flight Crew to maintain aircraft control and monitor flight instrument indications. The aircraft control in climb, cruise and descent with an engine failure is different from engine failure during takeoff. The aircrafts single engine altitude capability is very important to consider. The Pilot should try to use rudder trim and autopilot, and all the available resourses to manage the flight path. Determine the engine failure altitude by using FMC CDU Engine Out advisory page, execute Engine Failure Drift Down procedure as required, select the nearest suitable alternate, check the En-route Safety Altitude, remaining fuel, report to ATC your intentions, report the ETA, **do not use** FMC fuel predictions. Maintaining correct flight track and airspeed is the most important thing in case of an engine failure. Good teamwork and effective CRM is is one of the keys to guarantee flight safety.

Operation procedure:

Condit-ions	PF	PM
Engine failure.	♦ Verify failure, "Reset Master Caution" ♦ Control A/C and trim the aircraft. ♦ Check and confirm AP is engaged on the associated operating engine side.	♦ Verify failure, "1(L) or 2(R) Engine Failure" ♦ Reset Master Caution. ♦ Advise ATC of flight altitude performance capability. ♦ Squak 7700.
	♦ "Select MCT N1",dis-engage Auto Throttle, manually set MCT N1. ♦ "Select CDU Engine Out page, notify ATC". ♦ Maintain cleared FL/altitude for as long as possible until new descent clearance is received. If ATC cannot be contacted or no new clearance is received, engage HDG SEL, turning 30° right, fly parallel to original route 6－8 NM offset right (perform RVSM Emergency Procedures).	♦ Select N1 CON limit on CDU. ♦ Check FMA. ♦ Select CDU, check Engine Failure altitude, safety altitudes and special procedures and report to PF ♦ Advise ATC Engine Out ceiling, request for desent. ♦ If no ATC contact, broadcast intentions on 121.50.

	♦ Set the new altitude in the MCP panel to that lower than One Engine Out maximum altitude and comply with the route altitude. ♦ Set the speed window to required One Engine Drift Down target speed shown in the CDU page, then select LVL CHG。 ♦ Complete Engine Failure or Shutdown Checklist.	♦ Complete Engine Failure or Shutdown Checklist.
	♦ Prepare to divert to the nearest suitable airport. ♦ Adjust the required airspeed. ♦ Consider an inflight start as required. ♦ Complete the Approach Briefing and One Engine Inoperative Landing Checklist, land as soon as possible.	♦ Notify ATC the Captain's intention. ♦ Carry out CDU input to change destination and route planning. ♦ Coordinate with the Captain to complete approach and landing.
♦ Complete the single engine approach, landing and shutdown procedure.		

Notices:

1. Engage or re-engage the Autopilot when an engine failure occurs, provides more situational awareness to handle the malfunction and carry out more effective management.

2. Land at nearest suitable airport when an engine failure occurs.
3. Attempt an inflight start if applicable.

3.5.7 In-Flight Start

Judgement and Decision:

The Flight Crew must confirm that the failed engine is not damaged or the shutdown was intentional by theFlight Crew (example - low oil pressure) with no further damage resulting from an inflight start. In-flight Start could be considered after completing the Engine Failure or Shutdown Checklist. If the decision is made, the PM shall perform the Engine In-Flight Start Checklist when the altitude and airspeed is within the envelope. It should be supervised and confirmed by the PF (CM1). PF should always monitor the airplane status, answer the checklist content and monitor the engine start. Abort the In-flight Start when the engine indications are abnormal.

Operation procedure:

Condition	PF(CM1)	PM(CM2)
After executing the Engine Failure or Shutdown Checklist, make sure that the engine is not damaged or has been shut down intentionally.	♦ "Engine In-flight Start Checklist"	♦ Carry out Engine In-flight Start Checklist ♦ When the engine parameter is abnormal, abort the start attempt immediately
Engine start successfully	♦ Check that the engine has stabilized at Flight Idle and indicates normal parameters. ♦ Adjust the thrust	♦ Report engine parameters are stable "Engine Stabilized at Flight Idle". ♦ Monitor the airplane

	lever slowly while, retrimming the airplane. ♦ Select the flight altitude, make the decision and notify ATC of new decision	condition and engine parameters. ♦ Notify ATC of new decision and cancel the PAN situation.
♦ Select the nearest suitable airport to land.		

Notices:

1. Complete the Engine Failure or Shutdown Checklist prior to the Engine In-flight start.
2. Make sure that the engine to be started shows no signs of damage or further damage occuring.
3. Satisfy the inflight engine start requirement before the Engine In-flight Start attempt is made.
4. Engine accelerates slowly during heavy rain ingestion..

3.5.8 Loss of Thrust on Both Engines

Judgment and Decision:

Take immediate actions when both engines have lost thrust no matter what altitude or speed. Complete the Loss Of Thrust On Both Engines Recall Items and establish a higher airspeed to aid in a possible windmilling start of the engines. The Flight Crew shall use the standby power driven instruments and start the APU (watch starting limitations) to establish the power (electrical and/or bleed) and satisfy the starter assisted requirement.

Operation procedure:

Condition 1	PF (CM1)	PM (CM2)
Loss thrust on both engines.	♦ Use both hands, and adjust bank and pitch to mainain a higher airspeed to aid in a possible windmilling start of the engines ♦ "Loss Of Thrust On Both Engines Recall Items" ♦ "Notify ATC"	♦ Monitor the airplane condition. ♦ Carry out the Loss Of Thrust On Both Engines Recall Items ♦ Start APU, power ON ♦ Notify ATC of MAYDAY(use the NO.1 VHF communication before APU power is on) ♦ Squawk 7700. MAYDAY message.
APU power available.	♦ "Apu on-line re-engage Yaw Damper switch"	♦ BUS power on ♦ Re-connect the Yaw Damper switch
Two engines re-start successfully.	♦ Resume automatic flight with A/P. ♦ "Continue Loss Of Thrust On Both Engines Checklist " ♦ "Advise ATC"	♦ Carry out Loss Of Thrust On Both Engines Checklist.

		♦ Notify ATC of the Captain's intentions.
Condition 2	PF (CM1)	PM (CM2)
If one engine starts successfully.	♦ Control status of the aircraft (maintain altitude or driftdown), engage A/P when proper. ♦ Engine In-flight Start Checklist. Start the other engine.	♦ Notify ATC and obtain a new clearance for single engine operation. ♦ Complete Engine In-flight Start Checklist ♦ Resume Cabin Pressurization as required.

Notices:

1. When the Right Seat is the PF, the control should be handed over to the Left Seat (CM1) when thrust on both engines is lost, and becomes the Left Seat Pilot becomes the PF.
2. Use the instrument available on Standby Power to manually control the airplane and use manual stabilizer trim when both engines have lost thrust.
3. Start the APU (watch start limitations) to restore electrical power (no need to wait for the engine start).
4. After a successful windmilling or APU bleed start, allow the engine to stablize at Flight Idle before advancing the Thrust Lever.
5. Because the airplane is in slow depressurization status with a dual engine failure, the Flight Crew must use the oxygen when the cabin altitudes reaches or exceeds 10,000 ft. Passenger

Oxygen Switch must be selected to ON (even if automatically deployed) when the cabin altitude reaches or exceeds 14000 feet.

6. If neither windmilling engine starts successfully, the Thrust Levers should be retarded to Closed when performing the Starter Assisted start. .
7. Usually when RPM rises slowly and EGT rises rapidly, this could indicate an inflight hung start or stall.

3.5.9 Engine Limit/Surge/Stall

Judgment and Decision:

When RPM/EGT is unusual, rapidly approaching or exceeding limits, unusual engine noises are heard, or there is no response to Thrust Lever movement - that could indicate a engine limit/surge/stall. The Flight Crew should control the airplane and carry out the Recall Items, plan to land at the suitable airport.

Operation procedure:

Condition	PF (CM1)	PM (CM2)
Engine limit/surge/stall.	♦ Control the airplane. ♦ Carry out Engine Limit or Surge or Stall Recall Items ♦ "Engine Limit or Surge or Stall Checklist"	♦ Monitor the engine parameters. ♦ Check Engine Limit or Surge or Stall Recall Iitems are completed ♦ Carry out Engine Limit or Surge or Stall Checklist
	♦ Based on the engine condition and parameters : decide to land at the nearest airport and notify ATC	♦ Notify ATC Captain's intentions. ♦ Notify Dispatchers of the company. ♦ Monitor the engine parameters.

Notices:

1. Engine limit/surge/stall after lift off, PF should call out Engine Limit or Surge or Stall Checklist Recall Items after the airplane has been controlled and above 400 feet AGL.
2. PF/PM will both confirm the failed engine Thrust Lever, PF retards the thrust and PM guards the operating engine Thrust Lever.

3. Once engine indications are stabilized and EGT decreases, the PM will advance the Thrust Lever slowly while checking RPM, EGT, vibration with thrust lever movement. The PM will advise the PF verbally of his observations.

3.5.10 Engine Oil Low Pressure

Judgment and Decision:

During flight, if engine oil pressure is at or below red line and oil pressure indication is lower than 13PSI, in the premise of good control of the aircraft status, the Crew should promptly complete the following Recall Items to the affected engine above 400FT(AGL): Autothrottle (if engaged) disengage---PF; close affected Thrust Lever (help to identify affected engine)---PF,(PM guards non-affected Thrust Lever) Engine Start Lever to Cut Off---PM (PF guards Start Lever of the normal operating engine); then complete Engine Oil Low Pressure Checklist.

Operational Procedure 1:

Condition	PF	PM
During takeoff, engine oil pressure is at or below red line, and oil pressure indication is below 13 PSI.	Maintain A/C status.	Verify the malfunction, and report to PF “1(L)/2(R) Engine Low Oil Pressure”.
Above 400FT（AGL）	♦ Verify affected engine, “Engine Low Oil Pressure Checklist Recall Items”, close affected Thrust Lever. ♦ Guard Engine Start Lever of the normal operating engine. ♦ “Engine Low Oil Pressure Checklist”	♦ Verify affected engine, guard Thrust Lever of the normal operating engine. ♦ Verify and Cut Off Engine Start Lever of the affected engine. ♦ Complete Engine Low Oil Pressure Checklist.
	Plan to land at the nearest suitable airport.	Report ATC the Captain’s intentions.

Operational Procedure 2:

Condition.	PF	PM
Final approach, altitude above 1000FT (AGL),	Maintain A/C status.	Verify the malfunction, and report to PF “1(L)/2®

engine oil pressure is at or below red line, and oil pressure indication is below 13 PSI.		engine low oil pressure”
The Captain decides to shut down the affected engine by memory, and set one engine inoperative landing configuration.	♦ “Continue, Engine Low Oil Pressure Checklist Recall Items”, close affected Thrust Lever. Adjust engine thrust of the operating engine, (approximately 10-20% more than normal N1) ♦ Guard Engine Start Lever of the normal operating engine. “Flap 15, adjust speed VREF15+5（or VREF ICE+5）, Ground Proximity Flap Inhibit Switch to INHIBIT, set required Autobrake, verify Go Around thrust” . Announce Engine Low Oil Pressure Checklist according to the condition. Land smoothly.	Guard Thrust Lever of the normal operating engine, verify PF’s action. Monitor A/C status. ♦ Verify and Engine Start Lever to Cutoff on the affected engine. Set Flap to 15, and monitor flap indication, set MCP speed bug to command speed, set Ground Proximity Inhibit Switch to INHIBIT, set Auto Brake as required, verify and report Go Around thrust. Advise ATC (including PANPAN 3x）

		Complete Engine Low Oil Pressure Checklist according to the condition.
Execute <u>One Engine Inoperative Landing</u> Checklist according to the condition, all Checklists should be completed above 1000FT（AGL）, to allow the Flight Crew to concentrate on a stable approach. Vacate or remain on the runway after landing according to the condition, advise ATC, consider one engine taxi (180 degree turn/Backtrack is forbidden), stop the A/C after vacating, shut down the operating engine, complete related Checklists and advise the Passengers and Cabin Crew.		

Operation procedure 3:

Condition	PF	PM
On Approach 1000FT - 500FT（AGL）, engine oil pressure is at or below red line, and oil pressure indication is below 13 PSI.	Verify the malfunction. Call out "Continue the approach, set required Auto Brake, Close Thrust Lever of the affected engine" Verify and close the Thrust Lever of the affected engine. Adjust thrust of the operating engine, (approximately 10-20% more than normal N1). Land smoothly.	Verify malfunction, "1(L)/2® Engine Low Oil Pressure" Set required Auto Brake. Verify and guard Thrust Lever of the operating engine. Monitor A/C status. Advise ATC (including PANPAN 3x).
The oil low pressure should be handled as a Recall Item once on the runway to avoid damage to the affected engine. If the runway can be vacated without delay (minimum engine operation), perform the shut down as a Recall Item once vacated. If unable to vacate the runway due to a Backtrack or distant Taxiway, stop the aircraft and perform the remaining Recall Item. Vacate or stay on the runway depending on the situation, advise ATC, consider one engine taxi (180 degree turn/Backtrack is forbidden), stop the A/C after vacating the runway, shut		

down the engine/s, complete related Checklists and advise the Passengers and Cabin Crew.

Operation procedure 4:

<table>
<tr><th>Condition</th><th>PF</th><th>PM</th></tr>
<tr><td>During approach, below 500FT (AGL), engine oil pressure is at or below red line, and oil pressure indication is below 13 PSI.</td><td>Verify malfunction
Call out “Continue Approach”

Land smoothly.</td><td>Verify malfunction, “1(L)/2® Engine Low Oil Pressure”

Advise ATC (including PANPAN 3x) if possible.</td></tr>
<tr><td colspan="3">The oil low pressure should be handled as a Recall Item once on the runway to avoid damage to the affected engine. If the runway can be vacated without delay (minimum engine operation), perform the shut down as a Recall Item once vacated. If unable to vacate the runway due to a Backtrack or distant Taxiway, stop the aircraft and perform the remaining Recall Item. Vacate or stay on the runway depending on the situation, advise ATC, consider one engine taxi (180 degree turn/Backtrack is forbidden), stop the A/C after vacating the runway, shut down the engine/s, complete related Checklists and advise the Passengers and Cabin Crew.</td></tr>
</table>

NOTICE:

1. Once it is confirmed that oil pressure is lower than the red line, the Crew shall shut down the engine as soon as possible, otherwise the affected engine may be severely damaged. This affected engine is forbidden to be restarted.
2. During approach, below 500FT (AGL), engine oil pressure is at or below red line, and oil pressure indication is below 13 PSI, **MUST NOT** use the thrust reverser of the affected engine.

3.6 Fire

3.6.1 Engine Fire

3.6.1.1 Engine Fire

Judgment and Decision:

Engine Fire could happen in any flight phase. The Flight Crew can confirm this through the Engine Fire Warning lights and Fire Bell. Carry out the <u>Engine Fire, Severe Damage or Separation</u> Checklist Recall Items when the airplane is stabilized, above 400 feet AGL. Notify ATC (transmit the MAYDAY call), select squawk 7700 (if required), plan to land at the nearest suitable airport, time permitting noitify ATC and dispatcher of the company (passenger numbers, remaining fuel quantity, dangerous goods position and nature). Notify ATC and Cabin Crew if the evacuation is needed.

Engine Fire Before V1:

Judgment and Decision:

When the Fire Bell is heard and the Fire Warning lights illuminate during takeoff rollout, the Captain should reject takeoff before V1. After the airplane has been stopped, carry out the <u>Engine Fire, Severe Damage or Separation</u> Checklist Recall Items.

Operation procedure

Condition	Captain (CM1)	First Officer (CM2)
Engine fire warning before V1.	♦ Call "Reject Takeoff" carry out rejected takeoff procedure ♦ Set the Parking Brake. ♦ Carry out Engine Fire, Severe Damage or Separation Checklist Recall Items ♦ Make PA "Passenger Evacuation Preparation" after the 1st Fire Extinguisher is discharged.	♦ Announce "X Engine Fire", cancel fire warning bell. ♦ Check the rejected takeoff procedure is completed. ♦ Monitor and check Engine Fire, Severe Damage or Separation Checklist Recall Items. ♦ Complete Evacuation Checklist Items 3,4 and 5.. ♦ Notify ATC.
Fire warning lights or overheat lights extinguish within 30 sec. on 1st Bottle or the **Captain considers that evacutation is not needed**.	♦ Check that the warning lights or overheat lights are extinguished. ♦ Call "Engine Fire, Severe Damage or Separation Checklist "	♦ "Fire Warning Lights or Overheat Lights extinguish" ♦ Advise the latest information. ♦ Carry out Engine Fire, Severe Damage or Separation Checklist

Fire warning lights or overheat lights do not extinguish and the 2nd Halon Bottle is discharged or the **Captain considers that evacuation is needed**.	♦ "Evacuation Checklist Recall Items" ♦ Call and complete "Evacuation Checklist"	♦ Complete the Evacuation Checklist recall items ♦ Do the Evacuation Checklist.

Notices:

1. PM must report to the PF "X Engine Fire" and cancels the Fire warning Bell and Master Caution.
2. Do not deploy the engine reverse thrust on the affected engine during rejected takeoff.
3. Stop the airplane on the runway as soon as possible and consider the effect of the crosswind and danger of flames and smoke during an evacuation.
4. After "Passenger Evacuation Preparation" call, the Captain makes the PA "Evacuate Immediately through Right/Left exits " is very important for an un-prepared evacuation, this broadcast must be clear, specific and calm.
5. NOTE: It is HNA's policy to initiate the Evacuation Recall Items without delay when the 2nd Fire Extinguisher has been discharged. Do not wait the 30 seconds to begin the Recall Items and evacuate the airplane

Engine Fire Instrument Approach Procedure after V1

The Captain must continue the takeoff for an engine fire after V1. PM should report “X Engine Fire” when the fire bell rings and warning lights illuminate. When safe, the Instructor shall take control if not PF. PF controls the airplane and continues climbout. PF calls for the “Engine Fire, Severe Damage or Separation Checklist Recall Items” after passing a minimum of 400 feet AGL. PM shall notify ATC of intentions of returning or diverting to the nearest suitable airport. Complete the Engine Fire, Severe Damage or Separation Checklist 。 If a Passenger Evacuation may be required later, notify the Cabin Crew “Passenger Evacuation Preparation”.

Operation Procedure:

Condition	PF	PM
Engine fire after V1.	♦ “Continue Takeoff” ♦ Check malfunction，“Cancel Warning Bell, Reset Master Caution”	♦ Confirm and call “X Engine Fire” ♦ Cancel Fire Warning Bell, reset Master Caution

400 feet AGL	♦ "Heading Select, Correct Track, <u>Engine Fire, Severe Damage or Separation</u> Checklist Recall Items" ♦ Confirm with PM and close the affected Engine Thrust Lever ♦ Guard the normal operating Engine Start Lever and command PM to cut off the affected Engine Start Lever. ♦ Guard the normal operating engine and APU Fire Warning Switch and command PM to pull the Engine Fire Switch and Rotate.	♦ "400 feet" ♦ "HDG SEL mode alive". ♦ Carry out <u>Engine Fire, Severe Damage or Separation</u> Checklist Recall Items ♦ Confirm the PF action and guard the normal operating Engine Thrust Lever ♦ Confirm with PM and Cut Off the affected Engine Start Lever. ♦ Confirm and pull the Engine Fire Switch and rotate. ♦ Monitor and report the situation to PF. ♦ Advise ATC the Captain's intensions.
Climb to safe altitude according to normal take off profile or published engine out procedure. During the climb, use correct flap setting, bank limit, speed and MCT according to engine failure departure procedure. After proper trimming of the aircraft, engage autopilot A or B (as required). Plan to land at the nearest suitable airport. After full stop on the runway, evacuate the Passengers (if needed).		

When work load permits.		
	♦ Call "Engine Fire, Severe Damage or Separation Checklist ".	♦ Carry out Engine Fire, Severe Damage or Separation Checklist ♦ Notify the Cabin Crew "Passenger Evacuation Preparation" if an evacuation may be required after landing. ♦ Notify ATC, request ground assistance. ♦ Notify the company dispatchers.

Notices:

1. The Flight Crew should carry out the Engine Fire, Severe Damage or Separation Checklist Recall Items after the airplane is under positive control, the gear is retracted and has reached the minimum 400 feet AGL.
2. PF (Captain/Instructor) closes the affected Engine Thrust Lever after confirmation from the PM, and PM selects the affected Engine Start Lever to Cutoff after confirmation from the PF, PM pulls and rotates (if a warning still exists) and holds for 1 sec. (confirm Bottle discharge) the affected Engine Fire Switch after the confirmation from the PF. If the Engine Fire Switch or Overheat light remains illuminated, the PM with confirmation from the PF will rotate the Fire Switch to other side after 30 seconds have passed since the 1st discharge.
3. The Flight Crew must land at the nearest suitable airport after an engine fire or overheat event regardless whether extinguished successfully or not.
4. If the fire can not be extinguished, notify ATC with an update

of an uncontained (uncontrollable) engine fire to make nessessary preparations for the emergency situation.

5. If the fire can not be extinguished, notify the Cabin Crew as soon as possible with the expected evacuation route, and provide enough time to prepare the passengers and Cabin for the evacuation.
6. If the fire can not be extinguished, consider to select maximum auto brake, bring the airplane to a standstill on the runway, consider the effect of a crosswind, carry out the Evacuation Checklist as recall items without delay followed by the Evacuation Checklist.
7. Execute the above procedure in the event of an Engine Severe Damage or separation.
8. Use normal fuel balancing procedure and it is prohibited to open only the crossfeed valve (leaving all Main Tank Fuel Pumps ON). .

Engine Fire on Final

Judgment and Decision:

Engine fire on Final Approach is divided into two procedures**- above** 1000 ft AGL (Procedure 1) and **below** 1000 ft AGL (Procedure 2):

In either case, the Captain must always control the airplane first. Once the aircraft is stabilized after the fire occurs, the Captain should make the decision and announce whether the Recall Items are to be done or delayed.

Procedure 1. If this is the case, carry out Engine Fire, Severe Damage or Separation Checklist Recall Items during approach when the aircraft is stabilzed, notify ATC and carry out the Passenger Evacuation and Evacuation Checklist according to the condition after landing.

Procedure 2. The Captain must always control the airplane first, land and stop the airplane on the runway, then carry out the Engine Fire, Severe Damage or Separation Checklist Recall Items

Operation Procedure:

Operational Procedure 1.

Condition	PF (CM1)	PM (CM2)

The Captain decides to perform the Recall Items during Final Approach when landing configuraton has been established.	♦ Check failure, "Cancel Fire Warning Bell, Reset Master Caution" ♦ "Continue", Engine Fire, Severe Damage or Separation Checklist Recall Items", ♦ Check and confirm with the PM and close affected Thrust Lever. ♦ Adjust engine thrust of the operating engine, (approximately 10-20% more than normal N1) ♦ Guard Engine Start Lever of the normal operating engine and command the PM to Cutoff the affected Engine Start Lever. ♦ If the Fire Warning or Overheat light is illuminated, guard APU and normal operating engine Fire Switch while the PM pulls and if required rotates the affected Fire Switch. ♦ "Flap 15, adjust speed VREF15+5（or VREF ICE+5）, Ground Proximity Flap Inhibit Switch to INHIBIT, set MAX Autobrake, verify Go Around thrust" .	♦ Announce the failure, "X Engine Fire" ♦ Cancel the Fire Warning Bell, reset the Master Caution. ♦ Guard the normal operating Engine Thrust Lever and confirm PF actions. ♦ Monitor the airplane status and continue with Recall Items as required. ♦ Confirm with the PF and select Engine Start Lever to Cutoff. ♦ Confirm and pull the illuminated Engine Fire Switch and rotate if required. After the discharge light illuminates begin timing. Retract the Flaps Lever to 15 and monitor flaps indicator, adjust MCP speed bug to Vref15+correction, , select Ground Proximity Flap Inhibit Switch to Flap Inhibit position, and select Vref15 CDU approach page.

	♦ Monitor engine fire extinguishing. ♦ Call Engine Fire, Severe Damage or Separation Checklist according to time available. ♦ Stabilze the airplane for landing.	♦ Notify ATC with a MAYDAY 3x, request Fire Services. ♦ Check completing all the Recall items. ♦ Carry out Engine Fire, Severe Damage or Separation Checklist according to time available. ♦ Notify the Cabin Crew "Passenger Evacuation Preparation".
♦ Carry out the One Engine Inoperative Landing Checklist according to the situation and time available so that all Checklists are completed by 1000 ft AGL and both Fligh Crew can concentrate fully to avoid unstabilzed flight. ♦ After landing, bring the aircraft to a stop, complete remaining Recall Items if applicable, determine if there is a need to evacuate or not? If not advise ATC, continue with a one engine taxi only to vacate the runway if possible. Shutdown the aircraft and complete the applicable Checklist, advise Cabin Crew and Passengers. If yes, announce "Evacuation Checklist Recall Items" followed by the Evacuation Checklist and evacuate on the runway.		

Operational Procedure 2.

Condition	PF (CM1)	PM (CM2)
The Captain decides to continue the approach without doing any Recall Items or configuration changes.	♦ Confirm failure, "Cancel Fire Warning Bell, Reset Master Caution" ♦ "Continue Approach Set MAX Autobrake", maintain a stabilized approach and landing.	♦ Check failure, "X Engine Fire" ♦ Cancel Fire Warning, Bell Reset Master Caution. ♦ Notify ATC with a MAYDAY 3x call, request Fire Services assistance. ♦ If possible, notify Cabin Crew to "Prepare Passenger Evacuation" ♦ Set Maximum Autobrake.
♦ Plan and use maximum braking to stop the aircraft on the runway after landing. Complete Engine Fire, Severe Damage or Separation Checklist Recall Items. ♦ Announce and carry out passenger Evacuation according to the condition.		

Notices:

1. The Captain should carefully consider the airplanes position, distance, altitude to the runway to decide whether to carry out the Engine Fire, Severe Damage or Separation Checklist and One Engine Inoperative Landing Checklist.
2. In a short final, if an engine fire occurs after passing 1000 ft AGL, the Flight Crew is recommended to maintain the current airplane configuration, land and stop as soon as possible, carry out the Recall Items, notify ATC and Cabin Crew, to Evacuate the passengers as required.
3. If the PF does not require any assistance or call outs to help maintain a stabilized approach, the PF could command the PM

to select the Engine Bleed Switches to Off, to depressurize the airplane and provide a better climb gradient incase of a Go Around.

4. Use the the normal operating Engine Reverse Thrust during landing roll-out. The affected Engine Reverser shall not be deployed.
5. Conditions permitting, notify the Cabin Crew and the expected evacuation route, with enough time to prepare for a possible passenger evacuation.
6. At any time during the approach, regardless of whether Recall Items have been completed or not, the Flight Crew should focus on a successful landing, however when the approach becomes unstabilized, a Go Around must be initiated..

Engine Fire on the Ground

Judgment and Decision:

An engine fire warning may occur while parked, during engine starting, taxiing, take off or landing roll. If an engine fire warning occurs, the Captain should stop taxiing/cancel pushback without delay, set the Parking Brake and carry out the Engine Fire, Severe Damage or Separation Checklist Recall Items. After 1st HALON bottle has been discharged, the Captain advises the Cabin Crew with a PA "Passenger Evacuation Preparation" and calls for the "Evacuation Checklist Recall Items". The First Officer completes his/her required Recall Items (FLAP LEVER to 40, Pressurization Mode Selector to MANUAL, Outflow Valve switch to OPEN) and advises ATC/Fire Sevices of an updated situation . The First Officer will confirm the Captains Recall actions have been completed and waits. If the Engine Fire switch or OVERHEAT light remains illuminated after 30 seconds, the Captain will rotate the Fire Switch to other side and hold for 1 second. Then the Captain will select the still running Engine Start Lever to Cutoff and speedbrake lever to down detent, and then make a PA" Evacuate Immediately through Right/Left exits" **after both engine start levers are selected to cutoff.** The Captain will override and pull the APU and remaining Engine Fire Switch. The Captain will confirm on the overhead panel that the evacuation has begun by observing the correct door indications.

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Notices:

The Flight Crew shall consider to stay far away from the Terminal or crowded areas and effect of the crosswind (>5 m/s) pushing flames and smoke towards the evacuation route/s, place the engine on fire in a downwind position.

The Captain carries out a brief PA, explain the evacuation route in details. F/O notifys ATC and requires ground assistance.

3.6.2 APU fire

Judgment and decision:

When an APU fire occurs on ground, the Flight Crew should quickly carry out the APU Fire Checklist Recall Items and notify ATC/Fire Services.. The Captain should make the PA "Passenger Evacuation Preparation" , announce and perform the Evacuation Checklist Recall Items. The Captain should make the PA "Evacuate Immediately through Front and Overwing Exits". The First Officer will notify ATC about the current situation and request assistance. The Evacuation Checklist shall be read and confirmed all actions have been done.

When APU Fire appears in air, the Flight Crew should quickly carry out APU Fire Checklist Recall Items. Land at the nearest suitable airport. If APU Fire Warning remains illuminated after the APU Fire Switch has been rotated (Bottle discharge) and 30 seconds has passed, declare an Emergency and advise ATC , notify the company and the Cabin Crew "Prepared Passenger Evacuation".

Operation procedure:

<table>
<tr><th>condition</th><th>PF (CM1)</th><th>PM (CM2)</th></tr>
<tr><td>APU fire on ground</td><td colspan="2">♦ Complete APU Fire Checklist Recall Items
♦ Complete Evacuation Checklist Recall Items
♦ Evacuate the passengers as required through Forward and Overwing Exits..
♦ Read the Evacuation Checklist.</td></tr>
<tr><td rowspan="2">APU fire airborne and airplane condition is stable</td><td>♦ "APU Fire Checklist Recall Items"
♦ Complete APU Fire Checklist</td><td>♦ Carry out APU Fire Checklist Recall Items
♦ Notify ATC with MAYDAY 3x.
♦ Carry out APU Fire Checklist</td></tr>
<tr><td colspan="2">♦ Land at the nearest suitable airport.</td></tr>
</table>

Notices:

Only one Halon fire extinguishing bottle is available, pull the APU Fire switch and rotate to the stop and hold for 1 second, confirm the DISCHARGE light has illuminted.

When fire warning occurs in the air, be aware of the influence to electrical system or pressurization system after APU shutdown.

3.6.3 Wheel Well Fire

Judgment and Decision:

If Wheel Well Fire warning occurs during flight, the Captain calls for the Wheel Well Fire Checklist and observes landing gear extension and retraction speed limitations. Airplane performance permitting (fuel remaining, route safety altitude, weather, single engine performance with gear extended), do not retract the landing gear and land at the nearest suitable airport. Request ground emergency assistance for possible tire damaged or gear extension problems and notify the Cabin Crew "Passenger Evacuation Preparation".

Operation procedure:

Condition	PF (CM1)	PM (CM2)
Wheel Well Fire warning in air	♦ "Cancel Warning Bell" ♦ Set MCP speed below 270 kts/M0.82 ♦ "Wheel Well Fire Checklist" ♦ Command PM to calculate inflight performance for landing gear extension in Performance Chapter and decide the flight altitude.	♦ Cancel warning bell "Wheel Well Fire" ♦ Carry out Wheel well Fire Checklist and begin timing. ♦ Notify ATC. ♦ Monitor that the Wheel Well Fire Warning light extinguishes, report to PF and time as required. ♦ Calculate the in-flight altitude and speed for landing gear extension in the FCOM/QRH Performance In-flight chapter and report to PF. ♦ Notify Captains intention to ATC. ♦ Notify the Cabin Crew "Passenger Evacuation Preparation"。
Approach and landing	♦ Prepare for passenger evacuation during normal approach landing. Focus on the control of the direction of the aircraft during landing roll. Evacuate the passengers as required. ♦ Advise ATC of the possibility of a blocked runway.	

Notices:

1. Observe the Landing Gear Extension speed limit （270K －.82M, whichever is lower）
2. During climb , descent, use: LVL CHG and not VNAV.
3. Consider the FCOM/QRH Performance In-flight Chapter for Flight with Gear Down Long Range Cruise Altitude Capability and Gear Down Engine Inop. . Adjust the flight altitude, routing to satisfy terrain clearances. Do not retract the landing gear except unless fuel remaining, terrain/obstacle clearance, weather become safety issues.
4. Do not use FMC fuel predictions because flight with the gear extended dramatically increases fuel flow which reduces range.
5. Do not use Auto Brake during landing. Use manual and aerodynamic braking during landing rollout together with maximum reverse thrust and Flaps 40 if possible.
6. Notify the Cabin Crew to prepare for possible Passenger Evacuation.

3.6.4 Cargo Fire

Judgment and decision:

If fire is detected in the associated cargo hold, the Flight Crew **must** carry out the Cargo Fire Checklist and land at the nearest suitable airport. Notify ATC about the nature of the dangerous goods if loaded, quantity and location . Carry out Passenger Evacuation as required

Operation procedure:

Condition	PF	PM
Cargo fire warning, airplane condition stable.	♦ "Cancel Warning, Reset Master Caution" ♦ Control the airplane. condition，"Cargo Fire Checklist" ♦ Divert to the nearest suitable airport. ♦ Land as soon as	♦ Cancel warning，"X Cargo Fire" ♦ Carry out Cargo Fire Checklist ♦ Notify the ATC Captains intentions. ♦ Notify the Cabin Crew of "Prepare Passenger

	possible. Evacuate the passengers if required.	Evacuation”.
If smoke, fumes or fire are reported to exist in the cabin	♦ Wear the oxygen masks 100%, establish crew communication ♦ Carry out Smoke, Fire or Fumes Checklist ♦ Land as soon as possible and carry out passenger evacuation as required	

Notes:

1. Cargo fire is **not a recall item**, but it requires Flight Crew to complete the Checklist as soon as possible.
2. Push Cargo Fire Discharge Switch, and the discharge light may take 30 seconds to illuminate. After the discharging, cargo halon concentration should be sufficient to supress a fire long enough to land at the nearest suitable airport.
3. If there is smoke or fumes in the cabin, do Smoke, Fire or Fumes Checklist.
4. If passenger evacuation is required, advise Cabin Crew as early as possible for the preparation. After landing, park the airplane as soon as possible, and do Evacuation Checklist Recall Items.
5. The cargo door/s are not allowed to be opened before the Passengers have left the aircraft.

3.7 Flight Control

3.7.1 Stabilizer Out of Trim, Stabilizer Trim inoperative

Judgement and decision:

During flight, if the stabilizer fails to respond to electric trim inputs or stabilizer trim is inoperative. A maximum two-pilot effort on the trim wheels to disengage the clutch can be made in order achieve an in-trimmed speed as the Flight Crew has no A/P and Autothrottle is **not** recommended. Establish approach landing configuration as early as possible when on final.

Operation procedures:

Condition	PF	PM
With A/P on, STAB OUT OF TRIM light may remain illuminated.	♦ "Stabilizer Out Of Trim Checklist" ♦ Disengage A/P, and apply main electric trim as needed.	♦ Do Stabilizer Out Of Trim Checklist.
During flight, when the stabilizer fails to respond to electric trim inputs.	♦ Hold the control column firmly to maintain the aircraft under control ♦ "Stabilizer Trim Inoperative Checklist"	♦ Monitor the aircraft ♦ Do the Stabilizer Trim Inoperative Checklist. ♦ Advise ATC .

Notes:

1. If the stabilizer jammed at higher altitude, which could be due to ice accumulation, descend to a warmer temperature and attempt again.
2. Maintain in-trim airspeed until the beginning of the Approach.
3. Establish landing configuration early, and anticipate higher than normal Elevator forces. Try to maintain stable speed and thrust setting. Avoid excessive control and changing of thrust in order to reduce manual trimming required.
4. PM may operate the manual trim wheel and Thrust Lever position under PF's command if needed. Attempt to maintain an in-trim speed by acceleration or deceleration in order to reduce manual trim forces.

3.7.2 RUNAWAY STABILIZER

Judgement and Decision

Continous rotation of the Stabilizer Trim Wheel in a manner not appropriate for flight conditions. Flight Crew must get the airplane under control as quickly as possible, and do the Checklist Recall tems.

Operation procedures:

Condition	PF	PM
Runaway stabilizer	♦ Hold the control wheel firmly. Get the airplane under control. Disengage A/P (if engaged). ♦ "Runaway Stabilizer Checklist Recall Items". ♦ "Runaway Stabilizer Checklist" . ♦ "Advise ATC".	♦ Monitor the aircraft. ♦ Do Runaway Stabilizer Checklist Recall Items. ♦ Complete Runaway Stabilizer Checklist. ♦ Advise ATC with a PAN PAN 3x call.

Notes:

1. Hold the Control Control column firmly in order to maintain required pitch attitude. If runaway continues, moving the Control Column in the opposite direction may interrupt stabilizer trim command. If the trimming does not stop- select the Stab Trim Cutout Switches to Cutoff (PM).
2. If runaway continues after Stabilizer Trim Cutoff Switches are selected to Cutoff, grasp and hold the Stabilizer Trim Wheel.
3. Controlling thrust manually may help the control of the aircraft.
4. RVSM operation requirements are no longer fulfilled.

3.7.3 TRAILING EDGE FLAP DISAGREE

Judgement and Decision

After a flap selection, the Flap Position Indicators disagree with Flap Handle position and no asymmetry is indicated. Flight Crew should do Trailing Edge Flap Disagree Checklist if no Load Relief light is illuminated.

Operation procedures:

Condition	PF	PM
After flap selection, the flap position indicators disagree with Flap Handle position and no asymmetry is indicated. Flight Crew should do Trailing Edge Flap Disagree Checklist.	♦ Verify the indication on the Trailing Edge Flap indicator. ♦ Maintain the Flap Maneuver speed corresponding to the previous Flap Lever position. ♦ Call "Trailing Edge Flap Disagree Checklist"	♦ Advise PF of a Trailing Edge Flap Disagree. ♦ Do Trailing Edge Flap Disagree Checklist. ♦ Advise ATC the Captain's intentions.

Notices:

1. Do Trailing Edge Flap Disagree Checklist, change arrival plan as needed.
2. Set Flap Lever to the nearest Flap Detent/Gate, which allow the Speed Tape to indicate the corresponding Flap Speed Bugs.
3. If the Alternate Flap Extension method is used, adjust the speed curser to the final indicated flap position plus corrections.
4. During the Alternate Flap extension, continuously monitor the Trailing Edge Flap (TEF) Position Indicator. If there is an asymmetry indication, immediately stop the alternate extension. Note; It is normal that LE Flaps Transit Light remain illuminated before Flaps reach Flap 10. Amber airspeed tape operation may be used before LE Flaps Transit Light extinguished.
5. During the Alternate Flap Extension method, set Flap 10 first, extend Landing Gear and when the aircraft is stabilized continue and set Flaps15.

6. During a go-around is required. The Trailing Edge Flaps can be retracted using the Alternate Flap Extension Switch. However the Leading Edge Slats and Flaps can not be retracted. Limitations are: maximum 230 kts. below 20,000 feet. The drag penalty with the leading edge devices extended may make it impossible to reach an Alternate Field due to higher fuel consumption.

3.7.4 LEADING EDGE （LE）FLAPS TRANSIT

Judgement and Decision:

After the retraction and extension of the Flaps during takeoff and approach, the LE FLAPS TRANSIT light remains illuminated to indicate asymmetrical or skewed leading edge devices (LED) or leading edge devices not in the correct position. Flight Crew should make sure the airplane is under control. Check the LE DEVICES ANNUNCIATOR on the aft overhead panel. Be aware of the extension of LE DEVICES. Complete Leading Edge Flaps Transit Checklist.

Operation procedures:

Condition 1	PF	PM
After the retraction of the flaps during takeoff, the LE FLAPS TRANSIT light remains illuminated.	♦ Verify LE flaps transit light illuminated and LE device position indicator. Maintain positive control of the aircraft and maintain UP speed. ♦ Call “Leading Edge Flaps Transit Checklist”.	♦ Call “LE Flaps Transit”. ♦ Verify LE device annunciator. ♦ Monitor the aircraft status. ♦ Do Leading Edge Flaps Transit Checklist. ♦ Advise ATC.
Condition 2	PF	PM

Flaps extension during approach, LE Flaps Transit light remains illuminated.	♦ Maintain positive control of the aircraft。 ♦ Verify LE Flaps Transit light is illuminated, and confirm on overhead panel. Maintain the last Flap Maneuver Speed. ♦ "LE Flaps Transit Checklist". ♦ Update briefing.	♦ Call "LE Flaps Transit"。 ♦ Verify LE device annunciator。 ♦ Monitor the aircraft status. ♦ Advise ATC of technical problem and request Holding Pattern. Enter into FMC, execute after confirmation from PF. ♦ Do LE Flaps Transit Checklist ♦ Check Non-normal Configuration Landing Distance chart as needed.
Approach and Landing.	♦ Continue LE Flaps Transit Checklist at DEFERRED ITEMS.	

Notes:

1. The LE Flaps Transit ight illuminates during flap retraction, Flight Crew needs to maintain flap UP airspeed and complete the Checklist.
2. Use Flap 15 for landing VREF=VREF15+15. Maintain VREF+ correction on Final.
3. Limit bank angle to 15° until reaching Flaps UP maneuvering speed. A long Final is recommended and after LOC established, continue with the further extension of flaps.
4. Due to the higher approach speed, **do not** allow the airplane to float during the Flare. Floating during the Flare to deplete the additional airspeed reduces remaining runway for braking and increases the possibility of a tail strike.

3.7.5 TRAILING EDGE FLAP (TEF) ASYMMETRY

Judgement and Decision:

An uncommanded roll occurs when a new flap selection is made and/or a differernce between the left and right Flap Indication (TEF) is observed. The Flight Crew must control the aircraft status and maintain the minimum maneuver speed for the **actual flap postion**（not intended）. Even with the maximum flap asymmetry, the airplane has enough roll control capability to counteract. Do Trailing Edge Flaps Asymmetry Checklist.

Operation procedures:

Condition	PF	PM
A differernce between the left and right TE Flap indication is observed.	♦ Control airplane roll, and verify flap position indicator. ♦ Maintain the correct maneuvering speed. ♦ “Trailing Edge Flap Asymmetry Checklist. ♦ Adjust arrival plan again, and join Holding Pattern to burn off fuel and plan Approach.	♦ Advise Trailing Edge Asymmetry。 ♦ Monitor airplane status。 ♦ Do Trailing Edge Flap Asymmetry Checklist. ♦ Advise ATC. ♦ Check airplane landing weight and distance.
Approach and Landing if condition permitted.	Maintain accurate airspeed during Approach and Landing.	

Notes:

1. **Do not** attempt to move the Trailing Edge Flaps with the Alternate Flaps extension method switch as there is **no asymmetry protection** when there is a Trailing Edge Flap asymmetry.
2. Use rudder to trim the airplane, and Autopilot.
3. Consider to burn off excessive fuel to reduce landing weight and approach airspeed however monitor diversion

requirements.
4. Select landing Speed Reference according to flap settings. At lesser flap settings, anticipate the difficulty in reducing excess airspeed on Final Approach and during the Flare.
5. **Do not** attempt to bleed of excessive airspeed during the Flare. Pay attention to visual references and avoid a tailstrike.
6. If the gear is retracted during a Go-Around and flap position is greater than 25, Landing Configuration warning occurs.

3.7.6 TRAILING EDGE FLAPS (TEF) UP LANDING, ALL FLAPS UP LANDING

Judgement and Deision making

The Flaps Indicator remains in the 0 (UP) position or less than Flaps 1 after the Flight Crew has selected Flaps 1. First do Trailing Edge Flap Disagree Checklist, then if the TE Flaps cannot be extended by Alternate Method, do Trailing Edge Flaps UP Landing Checklist. When doing the Trailing Edge Flaps UP Landing Checklist, if you find one or more Leading Edge Devices are not fully extended, do All Flaps UP Landing Checklist.

Refer to Non-Normal Configuration Landing Distance in Performance Inflight (PI) chapter of the QRH. Burn off excessive fuel to reduce landing weight and approach speed.

Notes:

1. Flap UP maneuvering speed produces a larger turning radius and more track miles. Make sure that there is enough width and length to establish flight route. Limit bank angle to 15° if airspeed is less than Flap UP Maneuver Speed.
2. Select Alternate Flaps position switch momentarily to DOWN when LE devices are extended by the Alternate Mode. Verify that LE devices annunciator indicates Fully Extended (about 1 minute) for Slats and Flaps. The illumination of LE Flaps Transit light is normal.
3. With this configuration expect a higher pitch on Final and less thrust requirements (due to lower drag).
4. The sink rate is higher than normal during landing Flare. **Do not** allow the airplane to float. Floating during the Flare to deplete additional speed reduces available runway for landing

and increases the possibility of a tail strike.

5. Refer to Non-Normal Configuration Landing Distance in PI section of the QRH and select Autobrake as required.
6. Confirm Spoiler extension and initiate maximum Reverse Thrust immediately with main gear touchdown and maintain forward pressure on the control column.
7. Consider checking Brake Cooling Schedule after landing.

3.8 Flight Instrument, Display

AIRSPEED UNRELIABLE

Judgement and Decision:

Erroneous or unreliable airspeed indications may be caused by blocked or frozen pitot-static system (s), or a severely damaged or missing radome. If Flight Crew finds that the pitch attitude is not consistent with the phase of flight, altitude, thrust, and weight, and/or noise or low frequency buffeting is experienced, - an airspeed unreliable can be assumed. Flight Crew should be familiar with airplane attitude and the relationship between configuration, thrust setting and airspeed. Identify it as early as possible and get the airplane under control. Complete Airspeed Unreliable Checklist Recall items.

Operation procedures:

Condition	PF	PM
Airspeed unreliable.	♦ Adjust airplane attitude and thrust, announce "Airspeed Unreliable Checklist Recall Items". ♦ Cross-check Mach / Airspeed Indicators. ♦ "Airspeed Unreliable Checklist".	♦ Monitor airplane status and engine parameters. ♦ Verify "Airspeed Unreliable Checklist Recall Items" have been completed. ♦ Check Probe Heat is On. ♦ Cross check Mach / Airspeed Indicators. ♦ Obtain the data from FCOM/QRH and report it to PF. ♦ Advise ATC. ♦ Do Airspeed Unreliable Checklist.
Descent	♦ Check descent rate by determining attitude and referring to FCOM/QRH. ♦ Apply idle thrust.	♦ Obtain the data from the FCOM and report it to PF.

Approach	♦ Establish landing configuration on Final as soon as possible. ♦ Set thrust and attitude when intercepting Glideslope or initiating descent.	♦ Obtain the data from the FCOM/QRH and report it to PF.
landing	♦ Land by normal procedure.	

Note:

1. Refer to the ground speed information on ADI and request ATC to advise radar measured ground speed.
2. Adjust arrival plan according to performance advisory data.
3. Allow the airplane to stabilize before and after changing configuration and altitude.
4. Pilots should be familiar with the approximate pitch attitude for each flight maneuver.
5. If continuous Stick Shaker or Overspeed Warning appears, Flight Crew **may** pull the associated Circuit Breaker.
   Stick Shaker warning: Left seat P18-2-E-2 Right seat P6-1-B-7
   Overspeed Warning: Leftseat: P18-2-E-4/5/6
   rightseat:P6-1-B-4/5/6.
6. Refer to pitch attitude using FPV as an additional reference.
7. Flight Crew should do instrument cross checks promptly when Airspeed Unreliable is suspected. If the airspeed on one side is confirmed unreliable, the pilot on the operative side should control the airplane.

3.9 FUEL

LOW

Judgement and Decision:

When any one of main tanks indicates LOW, it is low fuel operation. Do Low Checklist.

Operation procedures:

Condition	PF	PM
Any one of the main tanks indicates LOW.	♦ Control the airplane pitch change smoothly. ♦ Change thrust slowly and smoothly. ♦ “Low Checklist”.	♦ Monitor the airplane status and engine parameters. ♦ Advise ATC and announce minimum fuel status. ♦ Do Low Checklist.

Notes:

1. The clean configuration should be maintained as long as possible during the descent and approach to conserve fuel. However, initiate configuration change early enough to provide a smooth, slow deceleration to final approach speed to prevent fuel running forward in the tanks.
2. A normal landing configuration and appropriate airspeed for the wind conditions are remmended.
3. Heavy braking and high levels of reverse thrust should be avoided to prevent uncovering all fuel pumps and possible engine flameout during landing roll.
4. If a Go-Around is necessary, apply thrust slowly. Control the airplane pitch change smoothly and not too rapidly. Avoid rapid acceleration of the airplane and rapid nose up. If any wing tank Fuel Pump Low Pressure light illuminates, **do not** turn off fuel pump switches.

3.10 HYDRAULICS
MANUAL REVERSION
Judgement and Decision:

Loss of Hydraulic System A and B, when controlling the ailerons manually more control column force required during turning, rudder is pressurized by the Alternate Hydraulic System, **do not** apply excessive force to it. Control the Elevator manually, electric and manual trim are both available. Alternate Yaw Damper may be engaged. Do Manual Reversion Checklist. Land at the nearest suitable airport. Crosswind capability will be degraded significantly.

Operation procedures:

Condition	PF	PM
Loss of hydraulic system A and B	♦ Verify A and B system failure. ♦ Control the airplane status, "Manual Reversion Checklist". ♦ Land at the nearest Suitable Airport.	♦ "System A and B Failure". ♦ Monitor airplane status. ♦ Do Manual Reversion Checklist. ♦ Advise ATC the Captain's intentions.

Notes:

1. Limit airplane turning bank to 15°, and establish a long Final.
2. Move the Thrust Lever slowly for smaller pitch trim changes. Establish landing configuration and approach speed as soon as possible to be stabilized on the extended Final.
3. Increase the Thrust Lever slowly during Go-around. Advancing Thrust Levers too rapidly will cause excessive nose-up moment.
4. When the Landing Gear has been lowered manually, it cannot be retracted during or after the Go-around. The drag penalty with gear extended may make it impossible to reach an

Alternate Field.
5. Avoid floating during Landing Flare.
6. After landing, apply steady brake pressure (to avoid brakes locking up), and Reverser Thrust Translation Sleve deployment will be slower due to standby hydraulic operation.
7. Advise ATC that the airplane will not be able to vacate the runway. Do not try to taxi!

3.11 Landing Gear

3.11.1 Manual Gear Extension:

Judgement and Decision

When the landing gear lever is selected to the DOWN position during approach but all the landing gear indicating lights have no indication that the landing gear has been extended. The flight crew should advise, ATC and break off Approach/perform a Go-Around and replan the Approach.

situation	PF	PM
The landing gear cannot be extended.	♦ Check the landing gear indications. ♦ Maintain control of the aircraft and/or climb to the minimum safe altitude. ♦ Announce when ready "Manual Gear Extension Checklist".	♦ Call "left/right/ forward landing gear not extended" ♦ Notify ATC, and report the failure. ♦ Perform Manual Gear Extension Checklist.
All the landing gears extended and make a second approach landing	♦ Complete the Approach briefing again, check fuel remaining. ♦ Make a normal Approach to Landing.	

Note:

1. When the Landing Gear **cannot** be all extended, check if all the Landing Gear indicating lights work normally. It's all right if either set of indicating system indicates that all the landing gears have been extended.
2. Check if "A" Hydraulic System pressure is operative and sufficient.

3.11.2 Partial or Gear Up Landing

Judgement and Decision:

After Flight Crew perform Manual extension of the Landing Gear and still partial or all Landing Gears **cannot** be extended, the Crew should notify ATC and consider landing at the most Suitable Airport with suficient runway length, adequate Rescue Facilities and acceptable/good weather conditions. Reduce landing weight as much as possible by burning off excssive fuel to reduce the touchdown speed. Advise the Cabin Crew of the situation as early as possible and to brief passengers on Evacuation procedures.

Operational procedure:

Condition	PF（CM1）	PM（CM2)
Partial or all landing gear cannot be extended armed.	♦ Join the holding pattern. ♦ Check the remaining fuel, estimated holding time, burn off ecessive fuel to reduce the landing weight.	♦ Advise ATC of the number of passengers, estimated second approach time, a passenger evacuation will be preformed with Fire Services . ♦ Advise the Cabin Crew of a Passenger Evacuation. ♦ Notify Company Dispatchers.
Approach & holding.	♦ "Partial Or All Gear Up Landing Checklist" ♦ Advise " Passenger Evacuation Preparation", brief Cabin Crew on expected evacuation route/s.	♦ Accomplish Partial Or All Gear Up Landing Checklist ♦ Coordinate with Cabin Crew to adjust the passengers as required.

Landing roll	♦ Accomplish a Passenger Evacuation immediately after the aircraft comes to a standstill.

Note:

1. Choose the most Suitable Airport to land.
2. Accomplish a normal approach procedure, use flap 40, normal sink rate, and normal wind correction.

Two main gears only extended: After landing, extend Speedbrakes manually, normal Reverse Thrust, apply brakes and pull the Control Column appropriately until the Elevator surface loses effect.

One Main Gear Only Extended: Land the airplane on the side of the runway that corresponds to the extended Main Gear. **Do not** use Speedbrakes/spoilers. During rollout, maintain wings level as long as possible. Use Rudder, Reverse Thrust, brakes for directional control. The First Officer should select the Engine Start Lever to Cutoff before the corresponding engine contacts the runway.

Two main gears not extended: when in the Flare the pilots should pull the Control Column fully aft to make the two engines touch the ground and extend the Speedbrakes manually after touchdown.

One Main Gear and Nose Gear Extended: during the landing roll, maintain wings level for as long as possible. **Do not** use Speedbrakes. Use Rudder, Nose Gear Steering, brakes and Reverse Thrust for directional control. The First Officer should select the Engine Start Lever to Cutoff before the corresponding engine contacts the runway

All Gear Up: Use the normal approach and level off attitude. The engines will contact the runway first. There is adequate rudder available to maintain directional control during the initial portion of the ground slide.

3.11.3 Landing Gear Lever Will Not Move Up (Retracted) after Takeoff

Judgement and Decision Making:

If the gear lever cannot be retracted to UP after takeoff, the Flight Crew should place the Landing Gear Lever to down (DN). Perform Landing Gear Lever Will Not Move Up After Takeoff Checklist. If the gear cannot be retracted, the Flight Crew should return to the airport of

Departure to land.

Operational procedure:

Condition	PF	PM
The gear lever cannot be moved to UP after takeoff	♦ Maintain control of the airplane and continue to depart according to the flight plan. ♦ Maintain the Flap Up Maneuvering Speed after flaps are retracted. ♦ "Landing Gear Lever Will Not Move Up After Takeoff Checklist"	♦ Call "Landing Gear Lever wWll Not Move Up". ♦ Notify ATC. ♦ Perform Landing Gear Lever Will Not Move Up After Takeoff Checklist
If there is **no** takeoff configuration warning.	♦ Continue the flight plan route after retracting the Landing Gear using the Override Trigger。	
If there **is** takeoff configuration warning	♦ Maintain the altitude and the speed, check the landing weight and prepare to return.	♦ Assist the Captain to complete the Checklist。 ♦ Notify ATC and Company Dispatchers.

Note:

1. When the Air-ground Switch fails, air-ground sensor is in Ground Mode after lift off.
2. It is **forbidden** to use Speedbrakes in air to prevent the Ground Spoilers from extending.
3. As the engine will be commanded to Ground Idle and **not** Flight Idle, avoid retarding the Thrust Levers to idle. This will allow for adequate engine acceleration.

4. When air-ground switch is at Ground Mode and VREF is set, the Flight Crew should first select INDEX page to find APPROACH REF page and use SPEED REF to set VREF.
5. The First Officer should monitor outside traffic closely as the TCAS system is inoperative in RA Mode.
6. Wing Anti-icing system is inoperative.
7. Autothrottle is at THR HOLD.
8. The Cabin Pressurization is inoperative unless Manual selected.
9. Extend the Speedbrake manually and use manual braking **after** landing.
10. The Reverse Thrust selection is forbidden when airborne.
11. IRS displays 38.
12. No Aural warning when disengaging the Autopilot.
13. Takeoff Warning Cutoff circuit breaker is P6-3.

3.11.4 Flat Tire

Judgment and Decision Making:

A flat tire during high speed takeoff phase may cause yawing and vibration. **Do not** retract the Landing Gear after lifting off. It's **not** recommended to retract the flaps unless performance issues arise. Join the Holding Pattern, check the landing weight, burn off extra fuel, and **do not** select Autobrake for landing. Prepare for a Passenger Evacuation by advising the Cabin Crew "Passenger Evacuaton Preparation". After touchdown decide whether to use the manual braking or Reverse Thrust according to the airplane and runway conditions.

Operational procedure:

Condition	PF	PM
Tire/s burst during high speed (above 80kts) takeoff.	♦ Control the rolling direction "Continue Takeoff". ♦ Join the Holding Pattern, burn off excessive fuel to prepare for landing. ♦ Review the Approach Briefing.	♦ Report any deviation and airplane abnormal indication. ♦ Advise ATC of the Captains intentions. ♦ Notify Company Dispatchers.

Flat tire landing.	♦ Make a normal Approach and Landing. ♦ Use brakes and Reverse Thrust to stop the airplane as required after touchdown.	♦ Report any deviations and abnormal indications of the airplane. ♦ **Do not** retract the flaps after landing.
After the airplane has come to a stop.	♦ Perform a Passenger Evacuation as required.	

Note:

1**. Do not** retract Landing Gear, as the tire might cause damage to the flaps and wings structure. Retraction of flaps and slats is **not** recommended, and it depends to use brakes to stop the wheels.

2. Burn off fuel as much as possible to reduce the landing weight.

Flat Nose Wheel Tire: slowly and gently lower the nose wheel to on runway while braking lightly. Runway length permitting, use idle Reverse Thrust. Autobrakes may be used at the lower settings. Once the nose wheel has contacted the runway, vibration levels may be affected by increasing or decreasing control column back pressure. Differential braking may be used for direction control.

Flat Main Wheel Tire: Use maximum/differential Reverse Thrust as required when the airplane touches down. **Do not** use autobrakes. Flat main gear tire causes a loss of braking effectiveness and a yawing moment toward the flat tire with light or no braking. An increasing yaw moment can be expected if heavier braking is applied.

Uncertain whether a nose tire or a main tire has failed: **Do not** use Autobrakes, lower the nose wheel slowly and gently to the runway. Flight Crews should use differential braking and Reverse Thrust to stop the airplane during landing roll out according to the airplane direction and the remaining runway conditions.

3.12 Emergency Evacuation

Principle of Emergency Evacuation:

Flight Crew should execute Emergency Evacuation under the following conditions: Engine Fire Warning on ground, APU Fire Warning on ground, overrunning/deflecting the runway, partial gear up landing, or landing gear collapse, severe aircraft structure damage, cabin fire, uncontrollable smoke, credible reported bomb on airplane or other emergency situations that might threaten Passengers and Flight Crew' life.

Judging and Decision Making:

Evacuation is divided into the **Prepared** and **Unprepared Evacuation**. The Cabin Crew and ATC should be advised as early as possible when the evacuation has been decided. A clear briefing and a full preparation is the key to a successful evacuation.

Operational Procedure:

Situation	Captain (CM1)	First Officer (CM2)
Evacuation is needed in emergency.	♦ Parking brake set. ♦ Speedbrakes---down Detent. ♦ Call "Evacuation Checklist Recall Items" ♦ Engine Start Levers ---Cut Off. ♦ Make a PA "Evacuate Immediately from Left/Right Exits" ♦ Engine and APU Fire Warning Switches (All) Override, and Pulled. ♦ Check that all the Recall Items have been completed and announce the "Evacuation Checklist". ♦ Monitor the doors, radio, and do the final check.	♦ Flap 40. ♦ Pressurization Mode Selector to MAN and OPEN the Ouflow Valve. ♦ Notify ATC (report the passenger Nr. and fuel quantity) ♦ Check that all the Recall Items have been completed and read the Evacuation Checklist. ♦ Wear the Smoke Goggle, bring the Flashlight, Fire

		Extinguisher to help with the Cabin evacuation if necessary.

NOTE: When an engine fire occurs on both engines, perform the Evacuation Recall items without delay on the ground.

Notices:
1. The Flight Crew must advise ATC the nature of the emergency and update when possible so that Fire Services will have an overview of the currnet situation.
2. Advise the Cabin Crew as early as possible “Prepared Passenger Evacuation” so that they can have adequate time to make preparations for Evacuation.
3. The Captain dictates to extra crew members their role during an Evacuation.
4. Stop the airplane as soon as possible.
5. The Flight Crew should organize the Passengers together after the Evacuation from the airplane and select the safety area in the upwind side of the airplane which is at least 100 meters from the airplane.

Captain Address (tim permitting):

“Ladies and Gentlemen， this is Captain speaking. airplane has a problem. We will evacuate after landing. Our Crew Members have been well trained, they have good experience; and ground staffs will be ready. To be safe, you must follow Flight Attendants' instructions and prepare. Your cooperation is very important. Thank you!”

”

3.13 Ditching

Policy

A situation may arise where the Captain and Flight Crew judge and evaluate that ditching is the only emergency action available.. Especially when flying over water, water conditions (swells) and surface winds have a great influence on the aircrafts water impact. The evacuation to the Life Rafts also have certain dangers The Flight Crew should not only know the influence of sea conditions but also grasp the procedure and control skills of ditching. The Flight Crew must have enough preparations and a thoughtful plan.

Ditching Factors

Successful ditching lies in three main factors. It can be divided into the following according to its importance:

The sea condition and the wind.

The airplane type.

The skill and technique of the pilots.

Common Oceanography Terminology

Seaface: Can produce the surface of the wave

billow: The surface condition produced by partial wind

Wave: The surface condition produced by long distance welter

The wave surface: The wave faces the observer, the wave surface is opposite to the observer. This definition is applicable whichever the orientation the wave moves.

Main wave: The series of waves with maximum height from the wave apex to wave vale.

Auxiliary wave: The series of waves below the height of the main wave.

Voyage: The passing distance of the wind without obstruction which is blown by the constant wind.

Wave cycle: The time cost of some point in the water passing through two continuous wave apex.(calculated by second).

Speed vector of wave: The magnitude and orientation is usually calculated by NM/h to a fixed reference substance. There is small variation in the horizontal orientation. The wave moves in the vertical orientation like the movement of the blanket which has been vibrated.

Wave Orientation: Refers to the moving orientation of wave, this orientation is not always the certain result caused by spot wind. The wave may be involved in or overpass partial wind. Once the wave is formed, it will move ahead along the forming orientation. It will not stop moving only the deep water stops moving, no matter what the wind orientation altered.

The wave height: Wave apex and wave vale is accounted by feet, mostof wave is lower than 12 and 15 feet, the wave higher than 25 feet. Continous wave has distinctively variation in height.

The best altitude to observe the primary swells is 2,000 feet or above 2,000 feet. The best altitude to observe the secondary is above the water surface altitude.

The influence of sea breeze decides the water direction

The swell's condition decides the direction of touching water regardless of the wind direction when the wind speed is between 0 and 25 KTS. Generally the airplane should touch water parallel with the swells and select the upwind direction to touch water.

When the wind speed is above 25KTS, the middle direction should be selected. It is the safest to touch water with the attitude at a certain angel to the swells and wind band which is not parallel with the swells or towards the upwind direction. When the swells are very high and the airplane is greatly influenced by crosswind, the airplane should also touch water almost parallel with the swells.

The floating time after the airplane touches the water

The airplane's tail first slides into the water at the attitude of 8-12°when the airplane touches the water. Normally the head is high and the tail is low after the airplane stops stable. The floating time in water is not more than 60 min at most. Generally it is 20 min and 13 at least. The people on the airplane should evacuate from the airplane within 13 min.

Life boat evacuation sequence

Generally, the boats besides L1 door and aft doow have precedence to evacuate.

The boat besides R1 door is the last to evacuate;

The other boats can evacuate when they are full of people.

The organization after the life boat off the plane

The flight crew are responsible to set free the people on the life boat and cut off the connecting line between the boats and the airplane immediately to get the life boats leaving the airplane as soon as possible.

After the life boats leave the airplane, the survivals falling into water should be immediately searched and be rescued to the life boat with rescuing equipment. The severely indured should be immediately rescued.

The life boats should avoid the fuel leaking area and the burning area after leaving the airplane. Connect all the life boats, shoot off the sea anchor to reduce the float , get out the life vast and use it.

The position of life boats should keep a certain distance from the airplane but should not be too far because most rescue work is in the place of the air disaster, so they can be easily found.

The load and balance of the life boat

The load of life boat

B737-800

Type	Number	Position	Normal Load	Overloading capacity
Round life boat	4	One on the forward rack, the other three on the overwing exit	46 people	59 people

Note: generally the round life boats are not equipped on the B737 airplane. They are loaded on the airplane by the maintenance when the pilot flies across the sea.

Evacuation for ditching

Flight crew procedures

（1）after the captain makes the decision of ditching:

Arrange for the best strength of flight crew

Investigate all the factors and avoidance measures for ditching.

Carry out the related items (5,000 feet) of dithing checklist.

Select the ditching area and transmit the final position of the airplane(selecting the latitude and longitude).

The flight crew should reserve enough maneuvering fuel for approach, and try to burn off the unwanted fuel to reduce the airplane ditching weight and increase the airplane float time on water.

（2）advise the purser, explain the captain decision briefly , and commands the following:

The type and grade of the emergency.

The action plan flight crew decide to take.

The estimated remained time for the ditching.

All the factors that may influence the emergency evacuation.

Cabin crew are required to make preparations for the cabin and check all the emergency equipments on the airplane are in good condition.

The purser should report to the captain when all the cabin preparations have been finished.

（3）selecting the ditching area

Try to get close to the coastline or the water surface with islands to facilitate rescue and increase living chance.

In order to make the airplane ditching safe, make a basic estimate and select the excellent ditching direction according to the above influence of sea and wind, which can reduce the damage to the airplane and death of people greatly.

（4）emergency situation announcement

Once the ditching area is decided, the captain commands the first officer or navigator to transmit the telex of distress to attract the attention of each side and get the rescue as early as possible. Use radio emergency call “MAYDAY” three times or send the following after transmitting SOS by radio telex:

- ♦ The name of the called station
- ♦ Call sign
- ♦ The nature of emergency
- ♦ Captain purpose
- ♦ The present position

Used frequency

121.5MHZ	aviation emergency frequency
2182KHZ	international distress frequency
8364KHZ	life boat frequency

The transponder coding selects 7700.

（5）when the captain broadcast to the passengers, all the cabin crew should immediately return to their appointed area and console the passengers. The contents of the captain broadcasting are:

"Ladies and gentlemen:"

I am the captain of this flight. There are some abnormal situations happening on the airplane. We prepare to perform ditching and evacuation for your safety. Cabin crew will give you instructions about the preparation work and some notes. Please follow our cabin crew's commands. It is essential to have your cooperation."

（6）final approach

The captain adjusts for the best grouping of the flightcrew and prepare for the division of the work. The captain should commands the crew members that if the autopilot is operative, the members should use the autopilot to approach until the airplane touches the water.

In the final approach, the best observation time is at about 500 feet. The captain watches the forward and observe the sea surface situations. There may be shadow and white peak, which is a sign of broad sea surface. If the shadow and white wave peak are very close to each other which indicates that the sea surface is narrow and surges, the flight crew should avoid touching water at such area and choose the area with less shadow and white peak to touch water.

During approach it is very important to use power correctly, so the necessary fuel quantity should be assured for approach. It is better to use the descent speed a little more than normal and the lesser descent rate to assure the good controllability of the airplane.It is more important to use power during night approach than during daytime.

In order to assure the airplane controllability and reduce the impact of touching water, the captain should use power to maintain noseup attitude at 8° − 10°and reduce the speed to about 10 KTS above the stall speed using the least descent rate to avoid the hard touching water at stall speed. The crew should also avoid the bouncing after the airplane touches water caused by the rude control action and should pay attention to:

It is hard to control the airplane conditions once the airplane has the first impact.

It is more difficult for ditching at night because there is no enough lighting. The airplane is easy to have 50 feet or more error at the judging of altitude before touching water, so the captain should strictly perform instrument approach. Refer to the air pressure altimetre and judge the occasion of airplane touching water according to the radio altitude control.

（7）Operational outlines

When the altitude is below 50,000 feet, the flight crew perform the ditching checklist (refer to the quick reference handbook “ditching”). The captain commands the first officer or the navigator to transmit the final ditching position.

When the altitude is 1,500 feet, the flight crew completethe last section of the “ditching” checklist and all the approach ditching preparation work.

When the altitude is 500 feet, the captain commands the first officer or the navigator to broadcast “500 feet” and the first officer reports the altitude every 100 feet according to the radio altitude.

When the altitude is 100 feet, the captain commands the first officer or the navigator to broadcast “100 feet” and the first officer reports the altitude every 10 feet.

The speed maintains at the critical speed adding 5-10KTS, and sink rate maintains at 200-300 feet/min. The airplane attitude of about 8°-12°will be good for ditching. Keep the wings parallel with the sea level rather than the horizontal indicator.

If there is one side power failure, the approach speed may be higher than normal to assure the smaller thrust, reduce the rotating strength and the good operational performance during level off.

When the airplane touches the water, the flight crew perform the shutdown recall items. The captain sends out the emergency evacuation command after the airplane is comparatively stable because the airplane may meet many impact.

After the captain commands the evacuation, the first officer put on the life vest, take the torch , leave the cockpit quickly and enter the cabin, commands and help the cabin crew to perform passenger evacuation from the airplane.

The other flight crew put on the life vest, take the torch and leave the cockpit, enter the cabin quickly to help cabin crew perform passenger evacuation and get on the ship. If it is necessary to get on the appointed life boat precedently, arrange and adjust the boarding passengers.

The first officer or other flight crew members help passengers to evacuate from the appointed exit.

The captain and purser get off from R1 door and get on the life boat after checking and verifying all the passengers have evacuated.

Connect the boats and collects them to the safety area, and count the passengers and crew members after evacuating from the airplane.

Use the emergency equipment and send out rescue signals.

3.14 Forced landing

When the flight crew can not safely land according to normal procedure, the captain could determine to force landing. The captain makes his best to select the forced landing at the airport. The captain can select landing outside the airport if it is not possible to land at the airport. If one or more landing gears cannot be extended, the remained gears should be used to land. It is forbidden to use any partial-extended landing gear and the wing/fuselage with the landing gear not extended to touch the ground. This kind of landing must be performed on the paved surface, and cannot be performed on the grass or soft surface. Before execution, the force landing position (if possible) should be reported to the ATC and HNA operation command center to ask for airport rescue. Before force landing, the captain should command the flight attendant crew to prepare for the cabin safety and the emergency evacuation.

The choice of the forced landing places

The captain should try to select the paved surface to force landing, and the captain can select landing outside the airport if the conditions are not possible for landing at the airport. The following factors should be considered if landing outside the airport:

In the less populated area: make best to close to the residence area, road and lake, carry out upwind.

In the marsh and forest area: choose floral denseness area, keep the minimum allowable speed process upwind.

In the frozen lack surface or river areas: choosethe area which is close to bank without snow pile, drumlin or moves to the orientation of drumlin.

In the dune area: keep the minimum allowable speed along the ridge line of the dune.

In the mountainous area: moves slantingly up to the hillside.

Forced landing preparation and procedure

Advise ATC and company dispatchers of the captain purpose and requirements;

Try to burn off fuel or perform the emergency defueling to reduce the landing weight;

Before the force landing, pay attention to keep some fuel for the observation of terrain and go around.

Make the preparation of division of the work and reinforce the crew cooperation;

Carry out the landing checklist;

If possible, the captain should appoint one flight crew member who do not participate in the flight control to assist the cabin crew to prepare for the forced landing safety;

The captain should broadcast to the passengers if it is possible;

After forced landing the passenger evacuation procedures should be performed.

3.15 Pilot incapacitation

Judging and Decision Making

Pilot Incapacitation can happen at any age and during any phase of flight. Incapacitation can happen in many forms in an obvious or subtle manner; terminally ill, shock, death, partial loss of physical strength and/or mental functions. Shock and incapacitation are the most dangerous.

The key to recognizing Pilot Incapacitation early is to use the “crew concept” and standard callout procedure often during flight operations. The right crew cooperation, communication and use of Standard Operational Procedures (SOP) helps to determine if an incapacitation has or is occuring.

A two-challenge communication call is used. When one Crew Member **cannot or does not** answer a Standard Callout, react correctly to the related standard procedure or current flight phase, the suspecting Pilot should consider if the crew is Incapacitated. If the suspected Crew Member **does not** answer timely for the second time, he/she should be considered incapacitated. The Pilot should announce “I HAVE CONTROL” take over the flight controls immediately.

If one Pilot (PF) does not feel well, he should advise other pilot, (PM) and hand over contol of flight.

Chain of Command

1) **Two-pilot Crew**

If the Captain becomes incapacitated, the First Officer will assume control and take over command responsibility for the duration of flight, or until the Captain recovers.

2) **More-than-Two-pilot Crew**

If the Captain becomes incapacitated, the First Officer will assume and take control and take over command responsibility until the more Senior First Officer arrives in the Cockpit. If a second HNA 737 rated Captain is on board, he/she will then take over Command. Command transfer sequence is normally in the following order; Captain, Senior First Officer, First Officer and Second Officer.

If the previous Captain in command remains incapacitated, the airplane **cannot take off**. If there is any incapacitation during flight, the airplane **cannot take off again** after landing until another qualified replacement Captain for this aircraft type joins the Flight Crew.

Operational procedure:

If a Pilot becomes incapacitated during flight, the other Pilot should take over to control the airplane and check the controls and switch position, and:

Declare the Emergency and advise “Single Pilot Operation Due To Incapacitation”, engage the Autopilot to reduce the work load;

Advise ATC to provide assistance.

Advise Cabin Crew to move the incapacitated Pilot out of the Cockpit as soon as possible after the airplane is controlled. If there is any difficulty, the seat can be moved back to the end and restrain the Pilot well with the seatbelts and move feet away from the rudder pedals.

Organize the Cockpit workload, make preparations for the Approach and Landing, and ask the Purser to check if any Pilots are on board as Passengers who could help if necessary;

When the Captain is incapacitated, First Officer acts as PF and PM for the flight, advise ATC to provide the necessary assistance and ask for radar guidance, and use Autolanding as necessary. The First Officer **shall not** taxi the aircraft after landing (runway will be blocked).

Advise the ATC or Company Dispatchers arrange for stairs and an Ambulance to be available and waiting after landing to allow for the incapacitated Crew Member to provided with medical attention as soon as possible.,

3.16 Bomb threat procedure in air:

- Advise ATC, set Transponder to 7700.
- Descend to 8,000 feet or minimum safety altitude immediately.
- Select No Smoking and Fasten the Seat Belt switch ON.
- Turn off non-essential electrics in area (ask the Cabin Crew to help).
- Ask the Explosives Expert (if any) to help if onboard.
- If possible, place the explosives beside the right Aft Service Door
- Land at the nearest Suitable Airport.
- Prepare for evacuation and advise Cabin Crew “Passenger Evacuation Preparation”.
- Ask for Fire Fighting and Rescue Facilities.

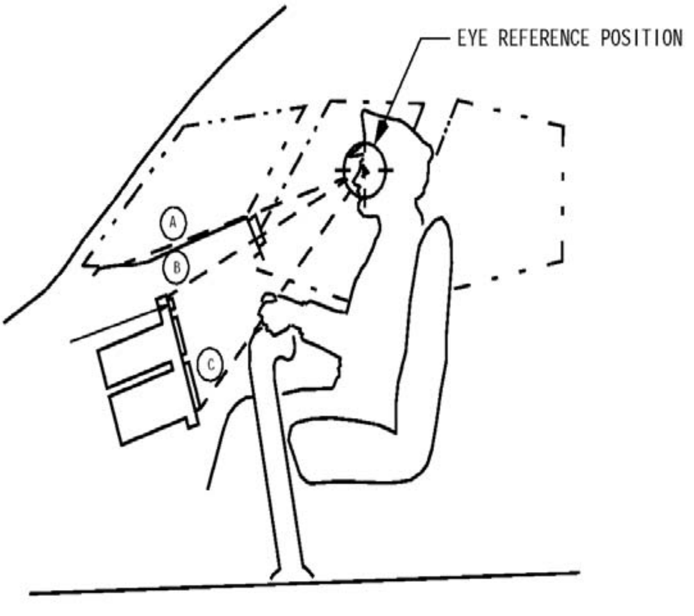
After landing-

- Taxi to the Safe Zone time permitting.
- Perform the Evacuation Checklist Recall Items..
- Forbid the Passengers to Evacuate of the airplane with personal articles (handbags).

Chapter4 Operation technique and instruction

4.1 Taxi

4.1.1 Pilot's seat adjustment



4.1.2 Cockpit's view

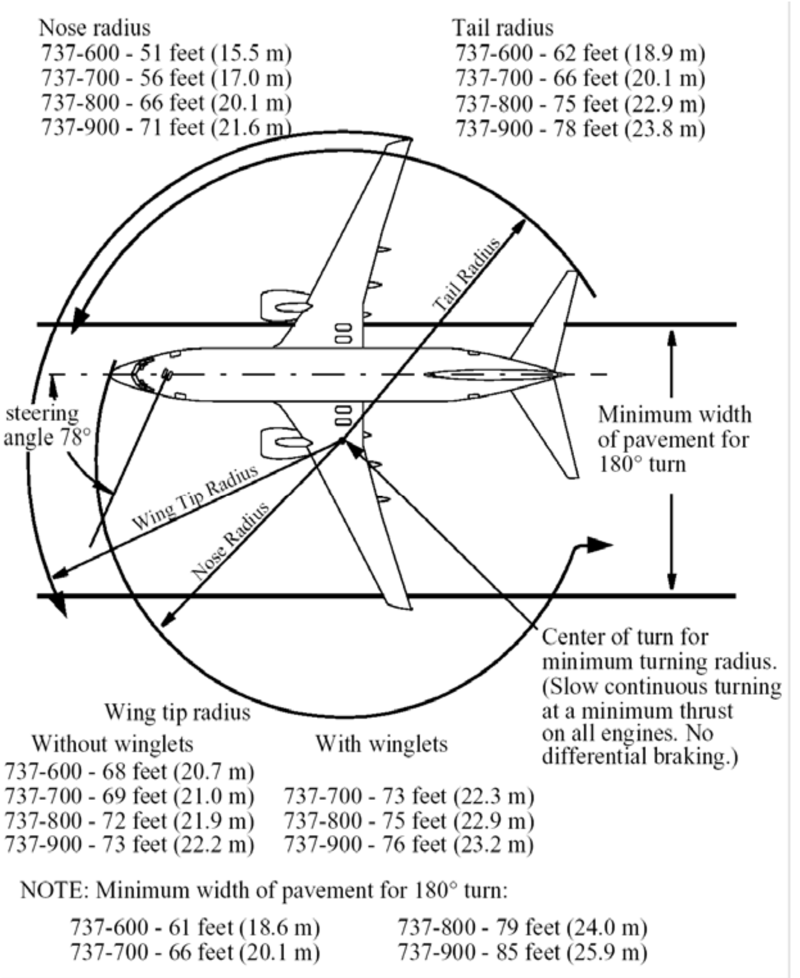
There is a large area near the airplane where personnel, obstacles or guidelines on the ground cannot be seen, particularly in the oblique view across the flight deck. Special care must be exercised in the parking area and while taxiing. When parked, the pilot should rely on ground crew communication to a greater extent to ensure a safe, coordinated operation. The pilot's seat should be adjusted for optimum eye position. The rudder pedals should be adjusted so that it is possible to apply maximum braking with full rudder deflection.
During taxiing, the pilot's heels should be on the floor, sliding the feet up on the rudder pedals only when required to apply brakes to slow the taxi

speed, or when maneuvering in close quarters on the parking ramp.

4.1.3 The relationship of pilot’s seat between nose wheel and main wheels:

A/C Type	Pilot’s seat (before nose wheel)ft(m)	Pilot’s seat (before main wheel)ft(m)
B737-700	5.25(1.6)	47(14.3)
B737-800	5.25(1.6)	56(17.1)

4.1.4 Taxi Turning Radius



Caution:

Do not try to make a turn away from the obstacles within 15 ft(4.6m) of the wing tip or within 32 ft(9.8m) of the nose for 737-700, or from the obstacles within 24 ft(7.3m) for 737-800/900.

4.1.5 Thrust use

Thrust use during ground operation demands sound judgment and technique. Even at relatively low thrust the air blast effects from the large, high bypass engines can be destructive and cause injury. Airplane response to thrust lever movement is slow, particularly at high gross eights. Engines noise level in the flight deck is low and not indicative of thrust output. Idle thrust is adequate for taxiing under most conditions. A slightly higher thrust setting is required to begin taxiing. Allow time for airplane response before increasing thrust further.
Excess thrust while taxiing may cause foreign objects to deflect into the lower aft fuselage, stabilizer, or elevators, especially when the engines are over an unimproved surface. Run-ups and taxi operations should only be conducted over well maintained paved surfaces and runways.

4.1.6 Taxi speed and Braking

To begin taxi, release brakes, smoothly increase thrust to minimum required for the airplane to roll forward, and then reduce thrust as required to maintain normal taxi speed. A turn should normally not be started until sufficient forward speed has been attained to carry the airplane through the turn at idle thrust.
The airplane may appear to be moving slower than it actually is due to the flight deck height above ground. Consequently, the tendency may be to taxi faster than desired. This is particularly true during runway turnoff after landing. The ground speed display (as installed) on the flight instruments may be used to determine actual taxi speed. The appropriate taxi speed depends on turn radius and surface condition.
Note: Some taxi speeds, usually between 10 and 20kts, can cause an increase in airplane vibration, especially on rough taxiways. If this occurs, a slight increase or decrease in speed reduces or eliminates the vibration and increases passenger comfort.
Taxi speed should be closely monitored during taxi out, particularly when the active runway is some distance from the departure gate. Normal taxi speed is approximately 20 knots, adjusted for condition. On long straight taxi routes, however at speeds greater than 20 knots use caution when using the nose wheel steering wheel to avoid overcontrolling the nose

wheels. When approaching a turn, seed should be slowed to an appropriate speed for conditions. On a dry surface, use approximately 10 knots for turn angles greater than those typically required for high speed runway turnoffs.

Note: High taxi speed combined with heavy gross weight and a long taxi distance can result in tire sidewall overheating.

Avoid prolonged brake application to control taxi speed as this causes high brake temperatures and increased wear of brakes. If taxi speed is too high, reduce speed with a steady brake application and then release the brakes to allow them to cool. Braking to approximately 10 knots and subsequence release of the brakes results in less heat build-up in the tires and brakes than when the brakes are constantly applied.

Under normal conditions, differential braking and braking while turning should be avoided. Allow for decreased braking effectiveness on slippery surfaces.

Avoid following other airplanes too closely. Jet blast is a major cause of foreign object damage.

Note: When taxi or landing rolling out speed is below 60kts, the use of reverse thrust above reverse idle is not recommended due to the possibility of foreign object damage and engine surge. Use of idle reverse thrust may be necessary on slippery surfaces for airplane control while taxiing.

4.1.7 Life of the carbon brakes

The wear of the brake depends on the times used for the brakes. For example, a steady brake will have low wear than times of light brakes. Long time and continuous light brakes will make aircraft stop accelerating and taxi with constant speed, thus make more brakes wearing than normal brakes.

The correct brake during taxi should include: slow down aircraft by brakes and release brakes at low speed, and repeat then.

During landing, the wearing of the light brake with long time high energy is the same as the light brakes with short time low energy. This is different from steel brakes, the wearing of the steel brakes varies with the energy during deacceleration.

4.1.8 Antiskid Inoperative

With antiskid inoperative, tire damage or blowouts can occur if moderate to heavy braking is used. With this condition, it is recommended that taxi speed be adjusted to allow for very light braking.

4.1.9 Nose Wheel/Rudder Pedal Steering

The captain's and first officer's(installed)positions are equipped with a nose wheel steering wheel. The nose wheel steering wheel is used to turn the nosewheel through the full range of travel at low taxi speeds.
Maintain positive pressure on the nose wheel steering wheel at all times during a turn to prevent the nose wheels form abruptly returning to center.
Rudder pedal steering turns the nose wheels through a limited range of travel. Straight ahead steering and large radius turns may be accomplished with rudder pedal steering.
If nose wheel "scrubbing" occurs while turning, reduce steering angle and/or taxi speed. Avoid stopping the airplane in a turn as excessive thrust is required to start taxiing again.
Differential thrust may be required at high weights during tight turns. This should only be used as required to maintain the desired speed in the turn. After completing a turn, center the nose wheels and allow the airplane to roll straight ahead. This relieves stresses in the main and nose gear structure prior to stopping.

4.1.10 Taxi – Adverse Weather

During cold weather operations, nose gear steering should be exercised in both directions during taxi. This circulates warm hydraulic fluid through the steering cylinders and minimizes the steering lag caused by low temperatures. If icing conditions are present, use anti-ice as required by the procedures.
During prolonged ground operations, periodic engine run-ups should be accomplished to minimize ice build-up. These engine run-ups should be performed according to the chapter SP, section 16 as defined in FCOM.
Engine exhaust may form ice on the ramp and takeoff areas of the runway, or blow snow or slush which may freeze on airplane

surfaces. If the taxi route is through slush or standing water in low temperatures, or if precipitation is falling with temperatures below freezing, taxi with flaps up. Extended or prolonged taxi times in heavy snow may necessitate de-icing prior to takeoff.

To reduce the possibility of flap damage after making an approach in icing conditions or landing on a runway covered with snow or slush, do not retract the flaps to less than 15 until the flap area has been checked for debris by maintenance.

When taxiing on a slippery or contaminated surface, particularly with strong crosswinds, use reduced speeds. Use of differential engine thrust assists in maintaining airplane momentum through the turn. When nearing turn completion, placing both engines to idle thrust reduces the potential for nose gear skidding. Avoid using large nose wheel steering inputs to correct for skidding. Differential braking may be more effective than nose wheel steering on slippery or contaminated surfaces. If speed is excessive, reduce speed prior to initiating a turn.

Note: A slippery surface is any surface where the braking capability is less than that on a dry surface. Therefore, a surface is considered "slippery" when it is wet or contaminated with ice, standing water, slush, snow or any other deposit that results in reduced braking capability.

4.1.11 Taxi Consideration

1. progressively follow taxi position on the airport diagram, and know the related NOTAMS. Assuring all crew members know the expected taxi way.
2. Making sure all the ground personnel and equipments are removed.
3. during low visibility conditions, call out all signs to verify position
4. if unfamiliar with the airport consider requesting a FOLLOW ME vehicle or progressive taxi instructions.
5. use standard radio phraseology
6. read back all clearance. If any crewmember is in doubt regarding the clearance, verify taxi routing with the written clearance or with ATC. Stop the airplane if the clearance is in doubt.
7. when ground/obstruction clearance is in doubt, stop the airplane and obtain a wing-walker.

8. switching on taxi lights when taxiing in daytime or night. During taxi, switch off taxi light in case of stopping taxiing; all required lightings shall be used during taxi in the evening, and turn off all exterior lightings in case of stopping taxi.
9. avoid distractions during critical taxi phases; plan ahead for checklist accomplishment and company communications
10. consider delaying checklist accomplishment until stopped during low visibility operations.
11. when taxiing in the busy area, observation of the aircrafts shall be made to avoid conflict; the taxi speed shall be below 8kts when taxiing close to obstacles.
12. when conflict during taxi, ATC clearance shall be followed strictly; when ATC clearance is not possible, the pilot seeing the conflict aircraft from the left cockpit side shall stop taxiing.
13. the distance between big aircrafts is 200m and 300m for heavy aircrafts during proceeding taxi.

4.2 Takeoff

4.2.1 Initiating Takeoff Roll

Autothrottle and F/D use is recommended for all takeoffs. However, do not follow F/D commands until liftoff.

A rolling takeoff procedure is recommended for setting takeoff thrust. It expedites the takeoff and reduce the risk of foreign object damage or engine surge/stall due to a tailwind or crosswind. Flight test and analysis prove that the change in takeoff roll distance due to the rolling takeoff procedure is negligible when compared to a standing takeoff.

Rolling takeoffs are accomplished in two ways:

- If cleared for takeoff before or while entering the runway, maintain normal taxi speed. When the airplane is aligned with the runway centerline ensure the nose wheel steering wheel is released and apply takeoff thrust by advancing the thrust levers to just above idle（40%N1）.Allow the engines to stabilize momentarily then promptly advance the thrust levers to takeoff thrust (antothrottle TO/GA). There is no need to stop the airplane before increasing thrust.
- If holding in position on the runway, ensure the nose wheel steering wheel is released, release brakes, then apply takeoff thrust as described above.

Note: Brakes are not normally held with thrust above idle unless a static run-up in icing conditions is required.

A standing takeoff procedure may be accomplished by holding the brakes until the engines are stabilized, ensure the nose wheel steering wheel is released, then release the brakes and promptly advance the thrust levers to takeoff thrust (antothrottle TO/GA).

Allowing the engines to stabilize provides uniform engine acceleration to takeoff thrust and minimize directional control problems. This is particularly important if crosswinds exist or the runway surface is slippery. The exact initial setting is not as important as setting symmetrical thrust.

Note: Allowing the engines to stabilize for more than approximately 2 seconds before advancing thrust levers to takeoff thrust may adversely

affect takeoff distance.
If thrust is to be set manually, smoothly advance thrust levers toward takeoff thrust. Final thrust adjustments should be made, with reference to the digital readouts, by 60 knots.
During takeoff, if an engine exceedance occurs after thrust is set and the decision is made to continue the takeoff, do not retard the thrust lever in an attempt to control the exceedance. Retarding the thrust levers after thrust is set invalidates takeoff performance. When the PF judges that altitude(minimum 400 feet AGL) and airspeed are acceptable, the thrust lever should be retarded until the exceedance is within limits and the appropriate NNC accomplished.
Use of nose wheel steering wheel is not recommended above 20 knots. However, pilots must use caution when using the nose wheel steering wheel above 20 knots to avoid over-controlling the nose wheels resulting in possible loss of directional control. Limited circumstances such as inoperative rudder pedal steering may require the use of the nose wheel steering wheel at low speeds during takeoff and landing when the rudder is not effective.
Light forward pressure is held on the control column. Keep the airplane on centerline with rudder pedal steering and rudder. The rudder becomes effective between 40 and 60 knots. Maximum nose wheel steering effectiveness is available when above taxi speeds by using rudder pedal steering.
Regardless of which pilot is making the takeoff, the captain should keep one hand on the thrust levers until V1 in order to respond quickly to a rejected takeoff condition. After V1, the captain’s hand should be removed from the thrust levers.
The PM should monitor engine instruments and airspeed indications during the takeoff roll and announce any abnormalities. The PM should announce “80, power stabilized” when passing 80 knots and PF should verify that his airspeed indicator is in agreement. PM should verify that takeoff thrust has been set and the throttle hold mode(THR HLD) is engaged. A momentary autothrottle overshoot of 4% N1 may occur but thrust should stabilized at +/-2%N1, after THR HLD. Thrust should be adjusted by the PM, if required, to –0%+1% target N1.
A pitot system blocked by protective covers or foreign objects can result in no airspeed indication, or airspeed indications that vary between instruments. It is important that aircrews ensure airspeed indicators are

functioning and reasonable at the 80 knot callout. If the accuracy of either primary airspeed indication is in question, reference the standby airspeed indicator. Another source of speed information is the ground speed indication. Early recognition of a malfunction is important in making a sound go/stop decision.

When THR HLD mode is displayed, A/T can not change the position of the thrust lever. THR HLD mode keeps engaged until another mode is selected.

Note: Takeoff into headwind of 20 knots or greater may result in THR HLD before the auto throttle can make final thrust adjustments.

The THR HLD mode protects against thrust lever movement if a system fault occurs. Lack of the THR HLD annunciation means the protective feature may not be active. If THR HLD annunciation does not appear, no crew action is required unless a subsequent system fault causes unwanted thrust lever movement. As with any autothrottle malfunction, the autothrottle should then be disconnected and desired thrust set manually.

If full thrust is desired when THR HLD mode is displayed, the thrust levers must be manually advanced. When making a v1(MCG)-limited takeoff, do not exceed the fixed derate thrust limit except in an emergency.

After the airplane is in the air, pushing a TO/GA switch advances the thrust to maximum available thrust and TO/GA is annunciated.

4.2.2 Rotation and Liftoff

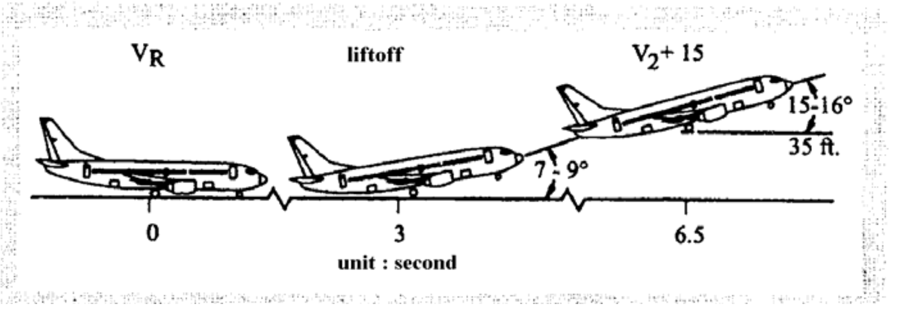
Takeoff speeds are established based on minimum control speed, stall, and tail clearance margins. Shorter bodied airplanes are normally governed by stall speed margin while longer bodied airplanes are normally limited by tail clearance margin. When a smooth continuous rotation is initiated at VR, tail clearance margin is assured because computed takeoff speeds depicted in the QRH, airport analysis, or FMC, are developed to provide adequate tail clearance.

Above 80 knots, relax the forward control column pressure to the neutral position. For optimum takeoff and initial climb performance, initiate a smooth continuous rotation at VR toward 15º of pitch attitude. The use of stabilizer trim during rotation is not recommended. After liftoff use the FD as the primary pitch reference cross checking indicated airspeed and

other flight instruments.
Note: Do not adjust takeoff speeds or rotation rates to compensate for increased body length.
With a consistent rotation technique, where the pilot uses approximately equal control forces and similar visual cues, the resultant rotation rate differs slightly depending upon airplane body length.
Using the technique above, liftoff attitude is achieved in approximately 3 to 4 seconds. Resultant rotation rates vary from 2 to 3 degrees/second with rates being lowest on longer airplanes.
Note: The F/D pitch command is not used for rotation.

Typical Rotation, All Engines

737-600—737-900



Takeoff Tail Clearance

Type	Flaps	Pitch attitude (degree)	Tail minimum clearance from the ground inch(cm)	Tail strike pitch attitude (degree)
B737-700	1 5 10 15	9.1 9.1 8.9 8.7	29 (73) 29 (73) 30 (76) 31 (79)	14.7
B737-800	1 5 15	8.2 8.2 7.8	20 (51) 20 (51) 23 (58)	11

Note: Flaps1 and flaps 5(800/900) takeoffs have the least clearance. Consider using a larger flap setting for takeoffs at light gross weights.

4.2.3 Crosswind Takeoff

Airplane has very good crosswind capability. Initial runway alignment and smooth symmetrical thrust application result in good crosswind control capability during takeoff. A smooth and positive correction shall be made for direction deviation.

Note: Engine surge may occur when takeoff thrust is set before brake is released during strong crosswind condition. So, rolling out takeoff is recommended when crosswind is above 20 knots.

Any deviation from the centerline during thrust application should be countered with immediate smooth and positive control inputs. With wet or slippery runway conditions, the PM should give special attention to ensuring the engines have symmetrically balanced thrust indications. During initial phase of the takeoff roll(below 80kts), slight forward pressure on control conlumn may improve the effectiveness of the nose wheel steering. Above 80kts, release pressure on control column and make it center.

Directional Control
Smooth rudder control inputs combined with small control wheel inputs result in a normal takeoff with no overcontrolling. Large control wheel inputs can have an adverse effect on directional control near V1(MCG) due to the additional drag of the extended spoilers.

Wind correction
It is not necessary to correct wind for VR and V2. The correction for V1 and runway slope may be made according to AFM and QRH.
Rotation and Takeoff
Maintain wings level during the takeoff roll b applying control wheel displacement into the wind. During rotation continue to apply control wheel in the displaced position to keep the wings level during liftoff. The airplane is in a sideslip with crossed controls at this point. A slow, smooth recovery form this sideslip is accomplished after liftoff by slowly neutralizing the control wheel and rudder pedals.
Gusty Wind and Strong Crosswind Condition
For takeoff in gusty or strong crosswind conditions, use of a higher thrust setting than the minimum required is recommended. When the prevailing wind is at or near 90° to the runway, the possibility of wind shifts resulting in gusty tailwind components during rotation or liftoff increases. During this condition, consider the use of thrust settings close to or at maximum takeoff thrust. The use of a higher takeoff thrust setting reduces the required runway length and minimizes the airplane exposure to gusty conditions during rotation, liftoff, and initial climb.
B737-700/800 crosswind takeoff standard（unit kts）

	90° tailwind	45° crosswind	headwind	tailwind
Dry runway	30 (15m/s)	35 (18 m/s)	50 (25 m/s)	10 (5 m/s)
Wet runway	23 (12 m/s)	30 (15 m/s)	50 (25 m/s)	6 (3 m/s)
Ice/snow	15 (8 m/s)	20 (10 m/s)	50 (25 m/s)	6 (3 m/s)

Note:

1. In the strong gust, crosswind limit is based on the steady crosswind components.
2. If asymmetrical thrust is used, the crosswind guidance is reduced by 5kts on wet or contaminated runway.
3. On slippery runway, crosswind capability depends on the surface conditions, aircraft loading and pilot's technique.

4.2.4 Reduced Thrust Takeoff

Many operator prefer a less than maximum thrust takeoff whenever performance limits and noise abatement procedures permit. The reduced thrust takeoff lowers EGT and extends engine life.

Assumed Temperature Method

The reduced thrust takeoff may be done using the Assumed Temperature Method, a Fixed Derate, or a combination of both. Regardless of the method, use the takeoff speeds provided by the airport analysis, FMC(if available), QRH(PI chapter), Flight Planning and Performance Manual(FPPM), AFM, or other approved source corresponding to the assumed(higher) temperature and/or selected derate.

The primary thrust setting parameter(N1) is not considered a limitation. If conditions are encountered during the takeoff where additional thrust is desired, such as windshear, the crew should not hesitate to manually advance thrust levers to maximum takeoff thrust.

Do not use ATM if conditions that affect braking such as a runway contaminated by slush, snow, standing water, or ice exist, or if potential windshear conditions exist. ATM procedures are allowed on a wet runway if suitable performance accountability is made for the increased stopping distance on a wet surface.

Note: An increase in elevator column force during rotation and initial climb may be required for ATM takeoffs.

4.2.5 Improved Climb Performance Takeoff

When not field length limited, an increased climb limit weight is achieved by using the excess field length to accelerate to higher takeoff and climb speeds. This improves the climb gradient, thereby raising the climb limit and obstacle limited weights. V1,VR and V2 must be obtained from dispatch or the airport analysis.

4.2.6 Initial Climb

After liftoff use the flight director as the primary pitch reference cross checking indicated airspeed and other flight instrument. If the F/D is not used, indicated airspeed and attitude become the primary pitch reference. After liftoff, the F/D commands pitch to maintain an airspeed of V2+20 knots until another pitch mode is engaged.
V2+20 is the optimum climb speed with takeoff flaps. It results in the maximum altitude gain in the shortest distance form takeoff. Acceleration to higher speeds reduces the altitude gain. If airspeed exceeds V2+20 during the initial climb, stop the acceleration but do not attempt to reduce airspeed to V2+20. Any speed between V2+10 and V2+25 knots results in approximately the same takeoff profile. Crosscheck indicated airspeed for proper initial climb speed.

Retract the landing gear after a positive rate of climb is indicated on the altimeter. Do not apply brakes after becoming airborne. Braking is automatically applied when the landing gear lever is placed in the upper position. After gear and flaps are retracted, the PM should verify the gear and flaps indications are normal.

4.2.7 Takeoff flaps retraction schedules B737-700/800

Takeoff flaps	Selected flaps	All weights
15	5 1 UP	V_2+15 “5” “1”
10	5 1 UP	V_2+15 “5” “1”
5	1 UP	V_2+15 “1”
1	UP	“1”

4.3 Climb

4.3.1 Climb Thrust

Once climb thrust is set, PMC will compensate for the thrust change and maintain climb thrust according to the ambient condition automatically during climb out.

Reduced Thrust Climb

Engine service life may be extended by operating the engines at less than full climb rated thrust.

FMC provides two reduced thrust climb selections on the N1 LIMIT page:

- CLB1 is approximately a 10% derate of climb thrust
- CLB1 is approximately a 20% derate of climb thrust
- Reduced thrust climb may be automatically selected by the FMC depending upon the amount of thrust reduction made for takeoff.
- Climb thrust reductions are gradually removed as the airplane climbs until full climb thrust is restored. If rate of climb should drop below approximately 500 feet per minute, the next higher climb rating should be selected.
- Prior to takeoff, the pilot may override the automatically selected climb thrust limit after the takeoff selection has been completed by selecting another climb thrust limit on the N1 LIMIT page.

Note: Use of reduced thrust for climb increases total trip fuel.

4.3.3 Low Altitude Level Off

Occasionally a low altitude climb restriction is required after takeoff. This altitude restriction should be set in the MCP altitude window. When the airplane approaches this altitude, the mode annunciation changes to ALT ACQ; the mode annunciation changes to ALT HOLD when the airplane levels off.

Note: If ALT ACQ occurs before N1 is selected, automatic thrust reduction occurs and the autothrottle speed mode engages.

4.3.4 Climb Modes

1) **Economy Climb:** The normal economy climb speed schedule of the FMC minimizes trip cost. It varies with gross weight and is influenced by cost index. The FMC performance data is inoperative, when below 10000ft, maintain the higher value of 250kts/Vref40+70, when above 10000, maintain 280kts/.76 mach.
2) **Maximum Rate Climb**: A maximum rate climb provides both high climb rates and minimum time to cruise altitude. When FMC data is not available, flaps up maneuver speed+50 knots until intercepting 0.76M may be used.
3) **Maximum Angle Climb**: The FMC provides maximum angle climb speeds. Maximum angle climb speed is normally used for obstacle clearance, minimum crossing altitude or to reach a specified altitude in a minimum distance. It varies with gross weight and provides approximately the same gradient as flaps up maneuvering speed

4.4 Cruise

4.4.1 Maximum Altitude

Maximum altitude is the highest altitude at which the airplane can be operated. It is determined by three characteristics, which are unique to each airplane model. The FMC predicted maximum altitude is the lowest of:

- maximum certified altitude(structural)-determined during certification and is usually set by the pressurization load limits on the fuselage.
- thrust limited altitude- the altitude at which sufficient thrust is available to provide a specific minimum rate of climb.(Refer the long range cruise maximum operating altitude table in the PI chapter of the QRH). Depending on the thrust rating of the engines, the thrust limited altitude may be above or below the maneuver altitude capability.
- buffet or maneuver limited altitude- the altitude at which a specific maneuver margin exists prior to buffet onset. This altitude provides at least a 0.2 margin(33° bank) for FAA operations or a 0.3g(33° bank) for CAA/JAA operations prior to buffet.

Although each of these limits are checked by the FMC, available thrust may limit the ability to accomplish anything other than relatively minor maneuvering. The amber band limits do not provide an indication of maneuver capability as limited by available thrust.

When at or approaching FMC maximum altitude, the entry of LNAV may exceed the aircraft’s capability and make aircraft not possible to maintain speed and/or altitude, because drag may exceed the available thrust with the speed decreasing, especially during turning. The risk may be reduced by changing FMC parameter to meet customer’s requirement.

FMC fuel predictions are not available above the FMC maximum altitude and are not displayed in the CDU. VNAV is not available above FMC maximum altitude. Fuel burn at or above maximum altitude increases. Flight above this altitude is not recommended.

The maneuvering speed indication on speed tape(if installed) can not guarantee flying with this speed. Reducing speed to the amber area may cause aircraft not able to maintain speed and/or altitude, because drag may exceed the available thrust with the speed decreasing, especially during turning.

4.4.2 Optimum Altitude

Optimum altitude is the cruise altitude for minimum cost when operating in the ECON mode, and for minimum fuel burn when in the LRC or pilot-selected speed modes. In ECON mode, optimum altitude increases as either airplane weight or cost index decreases. In LRC or selected speed modes, optimum altitude increases as either airplane weight or speed decreases. On each flight, optimum altitude continues to increase as weight decreases during the flight.
For shorter trips, optimum altitude as defined above may not be achievable since the top of descent (T/D) point occurs prior to completing the climb to optimum altitude.
Trip altitude, as defined on the FMC PERF INIT page, further constrains optimum altitude by reducing the altitude for short trips until minimum cruise segment time is satisfied. This cruise time is typically one minute, but is operator selectable in the FMC by maintenance action. For short trips, operation at the trip altitude results in the minimum fuel/cost while also satisfying the minimum cruise time requirement.
Flight plans not constrained by short trip distance are typically based on conducting the cruise portion of the flight within plus or minus 2000 feet of optimum altitude. Since the optimum altitude increases as fuel is consumed during the flight, it is necessary to climb to a higher cruise altitude every few hours to achieve the flight plan fuel burn. This technique, referred to as step climb cruise, is typically accomplished by initially climbing 2000 feet below optimum. For most flights, one or more step climbs may be required before reaching T/D. It may be especially advantageous to request an initial cruise altitude above optimum if altitude changes are difficult to obtain on specific routes. This minimizes the possibility of being held at a low altitude/high fuel consumption condition for long periods of time. The request/accepted initial cruise altitude should be compared to the thrust limited or the maneuver margin limited altitudes. Remember, a cruise thrust limited altitude is dependent

upon the cruise level temperature. If the cruise level temperature increases above the chart value for gross weight, maximum cruise thrust will not maintain desired cruise speed.
The selected cruise altitude should normally be as close to optimum as possible. Optimum altitude is the altitude that gives the minimum trip cost for a given trip length, cost index, and gross weight. It provides approximately a 1.5 load factor (approximately 48º bank to buffet onset) or better buffet margin. As deviation from optimum cruise altitude increases, performance economy deteriorates.
Some loss of thrust limited maneuver margin can be expected above optimum altitude. Levels 2000 feet above optimum altitude normally allows approximately 45º bank prior to buffet onset. The higher the airplane flies above optimum altitude, the more the thrust margin is reduced. Before accepting an altitude above optimum, determine that it will continue to be acceptable as the flight progresses under projected conditions of the temperature and turbulence.
On airplanes with higher thrust engines, the altitude selection is most likely limited by maneuver margin to initial buffet. Projected temperature and turbulence conditions along the route of flight should be reviewed when requesting/accepting initial cruise altitudes as well as subsequent step climbs.

Step Climb

Step altitude may be planned to be step up or step down. Optimum step points are a function of the route length, flight condition, speed mode, present airplane altitude, step to altitude and gross weight.
FMC does not compute an optimum step point. The crew must enter a STEP to altitude. The FMC then computes the ETA and distance to step climb point based upon gross weight. A fuel savings or penalty to destination is computed assuming the step climb is performed. Initiate a cruise climb to the new altitude as close as practicable to the step climb point.

4.4.3 Cruise Speed

Cruise speed is automatically computed by the FMC and displayed on the CRZ page. It is also displayed by the command air speed when VNAV is

engaged. The default cruise speed mode is ECON cruise. The pilot can also select LRC, engine out modes, or overwrite fixed Mach or CAS values on the CRZ page target speed line.
ECON cruise is a variable speed schedule that is a function of gross weight, cruise altitude, cost index, and headwind component. It is calculated to provide minimum operating cost for the entered cost index. Entry of zero for cost index results in maximum range cruise.
Headwinds increase the ECON CRZ speed. Tailwinds decrease ECON CRZ speed, but not below the zero wind maximum range cruise airspeed.
LRC is a variable speed schedule providing fuel mileage 1% less than the maximum available. LRC wind correction is not necessary.
Required Time of Arrival(RTA) speed is generated to meet a time required at an RTA specified waypoint on the FMC LEGS page.

Cruise Performance Economy
The flight plan fuel burn from departure to destination is based on certain assumed conditions. These include takeoff gross weight, cruise altitude, route of flight, temperature, enroute winds, and cruise speed.
Actual fuel burn should be compared to the flight plan fuel burn throughout the flight.
The planned fuel burn can increase due to:

- temperature above planned
- a lower cruise altitude than planned
- cruise altitude more than 2000 feet above optimum altitude
- speed faster than planned or appreciably slower than long range cruise speed when long range cruise was planned
- stronger headwind component
- fuel imbalance
- improperly trimmed airplane
- excessive thrust lever adjustments

Cruise fuel penalties include:

- ISA+10℃: 1% increase in trip fuel
- 2000 feet above/below optimum altitude: 1% to 2% increase in trip fuel
- 4000 feet below optimum altitude: 3% to 5% increase in trip fuel
- 8000 feet below optimum altitude: 8% to 14% increase in trip

fuel

- cruise speed 0.01M above LRC: 1% to 2% increase in trip fuel

For cruise within 2000 feet of optimum, long range cruise speed can be approximated by using 0.74M. Long range cruise also provides the best buffet margin at all cruise altitudes.

Note: if a discrepancy is discovered between actual fuel burn and flight plan fuel burn that cannot be explained by one of the items above, a fuel leak should be considered. Accomplish the applicable non-normal checklist.

4.5 Descent

4.5.1 Descent Planning

Flight deck workload typically increases as the airplane descends into the terminal area. Distractions must be minimized and administrative and nonessential duties completed before descent or postponed until after landing. Perform essential duties early in the descent so more time is available during the critical approach and landing phases.
Operational factors and/or terminal area requirements may not allow following the optimum descent schedule. Terminal area requirements can be incorporated into basic flight planning but ATC, weather, icing and other traffic may require adjustments to the planned descent schedule.
Proper descent planning is necessary to arrive at the desired altitude at the proper speed and configuration. The distance required for the descent is approximately 3 NM/1000 feet altitude loss for no wind correction using ECON speed. Rate of descent is dependent upon thrust, drag, airspeed schedule and gross weight.

4.5.2 Descent Speed

The default FMC descent speed schedule is an economy descent from cruise altitude to the airport speed transition altitude followed by a descent at ten knots less than this speed. The speed schedule is adjusted to accommodate waypoint speed/altitude constraints displayed in the LEGS pages, and speed/altitude constraints displayed on the DES page. If desired, the ECON speed schedule can be modified by alternate Mach, Mach/IAS, or IAS values on the DES page target speed line. If the FMC information is not available, use target speeds from the Descent Rates table in this chapter.

4.5.3 Descent Path

An FMC path descent is the most economical descent method. At least one waypoint-related altitude constraint below cruise altitude on a LEGS page generates a descent guidance path. The path is built form the lowest constraint upward, assuming idle thrust, or approach idle below the

anti-ice altitude entered on the DESCENT FORECAST page.
The path is based on the descent speed schedule, any entered speed/altitude constraints or forecast use anti-ice. The path reflects descent wind values entered on the DESCENT FORECAST page.

4.5.4 Descent Constraints

Descent constraints may be automatically entered in the route when selecting an arrival procedure, or manually entered through the CDU.
Set all mandatory altitude restrictions and "at or above" constraints in the Mode Control Panel(MCP) altitude window. The next altitude may be set when the restriction has been assured or further clearance has been received.
Shallow vertical path segments may result in the autothrottle supplying partial power to maintain the target speed. Vertical path segments steeper than an idle descent may require the use of speedbrakes for speed control.
Deceleration requirements below cruise altitude(such as at 10000MSL) are accomplished based on a rate of descent of approximately 500 fpm.
When a deceleration is required at top of descent, it is performed in level flight.

4.5.5 Descent Rate

Descent rate tables provide typical rates of descent below 20000 feet with idle thrust and speedbrakes extended or retracted.

Target speed	Descent rate（FPM）	
	Clean configuration	With speedbrake
M0.74/280KTs	2200	3100
250KTs	1700	2300
210KTs	1100	1400

Normally, descent with idle thrust and in clean configuration(no speedbrakes). Maintain cruise altitude until the proper distance or time out for the planned descent and then hold the selected airspeed schedule

during descent. Deviations from this schedule may result in arriving too high at destination and require circling to descend, or arriving too low and far out requiring extra time and fuel to reach destination.
The speedbrake may be used to correct the descent profile if arriving too high or too fast. The descent procedure is normally initiated before the airplane descends below the cruise altitude for arrival at destination, and should be completed by 10000 feet MSL. The approach procedure is normally started at transition level.
Maintaining the desired descent profile and using the map mode to maintain awareness of position ensures a more efficient operation. Maintain awareness of the destination weather and traffic conditions, and consider the requirements of a potential diversion. Review the airport approach charts and discuss the plan for the approach, landing, and taxi routing to parking. Complete the approach briefing as soon as practical, preferably before arriving at top of descent. This allows full attention to be given to airplane control.

4.5.6 Speed setting principle:

According to the altitude and speed restriction of the E/D or IAF in the STAR and instrument approach chart, VNAV descent for auto speed setting is recommended. When VNAV is unavailable or ATC clears for step descent, speed may be set during descent according to the sector safety altitude. When it is difficult to slow down, it is necessary to level off for a while. It takes about 3 nautical miles from 280 to 250kts without using speedbrakes. It takes another 35 seconds and 3 miles from 250kts to flaps up speed, this is based on mean weight. Using speedbrakes may save 50% time.
According to the STAR, flaps up speed should be maintained at IAF. When passing through IAF, select flap 1, select flaps 5 not late than intercepting final. It is recommended when there is no published IAF: DME12 for straight approach, DME 8 for joining downwind, keeping flaps up manuvering speed. Select flaps 5 not late than intercepting final and maintain flaps 5 manuvering speed.

4.6 Approach

4.6.1 Instrument Approaches

Complete the approach preparations before arrival in the terminal area.
Set decision altitude/height DA(H) or minimum descent altitude/height MDA(H). crosscheck radio and pressure altimeters whenever practical.
Do not completely abandon enroute navigation procedures even though air traffic is providing radar vectors to the initial or final approach fix.
Check ADF/VOR selector set to the proper position. Verify ILS, VOR and ADF are tuned and identified if required for the approach.
Check that the marker beacon is selected on the audio panel. The course and glide slope signals are reliable only when their warning flags are not displayed, localizer and glide slope pointers are in view, and the ILS identifier is received. Confirmed the published approach inboud course is set or displayed.
Do not use radio navigation aid facilities that are out of service even though flight deck indications appear normal. Radio navigation aids that are out of service may have erroneous transmissions that are not detected by airplane receivers and no flight deck warning is provided to the crew.

4.6.2 Approach Category

For straight approach, B737 is classified to category “C”, the circling approach minimums should be used for circling approach.

FAA Category	Speed
C	121KTs or more but less than 141KTs
D	141KTs or more but less than 166KTs
Speed—based upon a speed of VREF in the landing configuration at maximum certificated landing weight.	

ICAO Category	V_{AT}	Range of speeds for initial approach	Range of speed for final approach	Max speed for visual maneuvering (circling)	Max speed for missed approach	
					Interm -ediate	fina l
C	121/140	160/240	115/160	180	160	240
D	141/165	185/250	130/185	205	185	265
Vat—Speed at threshold, based on the landing configuration at maximum certificated landing weight, 1.23 or 1.3 stall speed(this speed is based on the aircraft certification).						

4.6.3 Initial approach

When flying with QNH, the initial approach phase may be completed by using LANV and VANV if course and glide slope was selected via CDU for an entire approach procedure. Ensuring the sequence of the LEG pages, altitude constraints and MAP display is complying with ATC's clearance. For ATC's final clearance change or limitations, HDG SEL, altitude window and knobs and proper VS modes may be used to change. The sequence of the legs can only be changed when time permits.

Caution: When LNAV is used to intercept the final course, ensuring the information from raw data is correct for intercepting course to avoid descent before LOC is captured. If required, use HDG SEL to intercept the final course heading.

4.6.4 Delayed Flap Approach (Noise Abatement)

If the approach is not being conducted in adverse conditions that would make it difficult achieve a stabilized approach, the final flap selection may be delayed to conserve fuel or to accommodate speed requests by air traffic.

Intercept the glide slope with gear down and flaps 15 at flaps 15 speed. The thrust required to descend on the glide slope may be near idle. Approaching 1000 feet AFE, select landing flaps, allow the speed to bleed off to the final approach speed, then adjust thrust to maintain it. Do the landing checklist.

4.6.5 Missed Approach

If a missed approach is required following a dual autopilot approach with FLARE arm annunciated, leave the autopilots engaged. Push either TO/GA switch, call for flaps 15, ensure go-around thrust for the nominal climb rate is set and monitor autopilot performance. Retract the landing gear after a positive rate of climb is indicated on the altimeter.
At typical landing weights, actual thrust required for a normal go-around is usually considerably less than maximum go-around thrust. This provides a thrust margin for windshear or other situations requiring maximum thrust. If full thrust is desired after thrust for the nominal climb rate has been established, press TO/GA a second time.
If a missed approach is required following a single autopilot or manual instrument approach, or a visual approach, push either TO/GA switch, call for flaps 15, ensure set go-around thrust, and rotate smoothly toward 15 degrees pitch attitude. Then follow flight director commands and retract the landing gear after a positive rate of climb is indicated on the altimeter.
Note: An automatic go-around cannot be initiated after touchdown.
During an automatic go-around initiated at 50 feet, approximately 30 feet of altitude is lost. If touchdown occurs after a go-around is initiated, the go-around continues. Observe that the autothrottles apply go-around thrust or manually apply go-around thrust as the airplane rotates to the go-around attitude.
The TO/GA pitch mode initially commands a go-around attitude and then transitions to speed as the rate of climb increases. Command speed automatically moves to a target airspeed for the existing flap position.
The TO/GA roll mode maintains existing ground track. Above 400 feet AGL, select a roll mode as appropriate.
The minimum altitude for flap retraction during a normal takeoff is not normally applicable to a missed approach procedure. However, obstacles in the missed approach flight path must be taken into consideration.
During training, use 1000 feet AGL to initiate acceleration for flap retraction, as during the takeoff procedure.

Note: Selection of pitch and roll modes below 400 feet AGL does not change the autopilot and flight director modes.

When accomplishing a missed approach from a dual-autopilot approach, initial selection of a pitch mode, or when altitude capture occurs above

400 feet AGL the autopilot reverts to single autopilot operation.
If initial maneuvering is required during the missed approach, accomplish the missed approach procedure through gear up before initiating the turn. Delay further flap retraction until initial maneuvering is complete and a safe altitude and appropriate speeds are attained.
Command speed automatically increases to maneuvering speed for the existing flap position. Retract flaps on the normal flap speed schedule. When the flaps are retracted to the desired position and the airspeed approaches maneuvering speed.
Select LVL CHG and ensure climb thrust is set. VNAV may be selected if the flaps are up. Verify the airplane levels off at selected altitude and proper speed is maintained.
If VNAV is used during go-around, a premature level off may occur and selection of LVL CHG may be required to complete the climb to the missed approach altitude, the FMC missed approach profile should contain the appropriate holding speeds and altitudes.
If a diversion to an alternate airport is required, delay use of VNAV until appropriate FMC entries are completed.

Note: FMC speeds may not comply with speed/altitude restrictions when using VNAV at low altitude.。

4.7 Landing

4.7.1 Crosswind Landing Correction

When autothrottle is used for autolanding, the speed will be set to V_{REF}+5KTs. Keeping autothrootle on will make aircraft provide sufficient protection for wind and gust. When autothrottle is disengaged or plan to be disengaged before landing, the approach speed correction for approach is: add 1/2 reported headwind on basis of the Vref, and add the total gust for reported wind.
When speed is corrected based on the wind, the maximum command speed should not exceed V_{REF}+20KTs, or landing flaps placard speed minus 5KTs, this not only provides sufficient low maneuvering speed margin, but also reduces the possibility of flaps load reliefing. Using the reduced landing flaps setting(flaps 30) also may increase the flaps load reliefing margin. The following table present the example of the wind increment for runway heading 360:

Reported wind（kts）	Wind increment	Approach speed（kts）
360° /16	8	V_{REF}+8
Wind calm	0	V_{REF}+5
360° /20 gust30	10+10	V_{REF}+20
060° /24	6	V_{REF}+6
090° /15	0	V_{REF}+5
090° /l5 gust25	0+10	V_{REF}+10

If V_{REF}+20KTs exceeds landing flaps placard speed minus 5KTs, using landing flaps placard speed minus 5KTs.
When autothrottle is disengaged, the minimum speed is set V_{REF}+5 KTs. The correction of the gust shall be made until landing, the steady headwind correction will disappear with the airplane touch the runway.
Note: No wind correction for tailwind.

The relationship between wind angle and the target speed (unit: kts)

Wind angle	Wind correction	Speed cursor
Below 30 degrees	1/2	V_{REF}+1/2 wind
45 degrees	1/3	V_{REF}+1/3 wind
60 degrees	1/4	V_{REF}+1/4 wind
90 degrees	0	V_{REF}+5

4.7.2 Crosswind landing

Four ways of crosswind landing:

- Sideslip;
- De-crab(de-crab during flare);
- Crab;
- Combination of sideslip and crab

During crosswind landing and maintain crab, make cockpit on the upper wind of the centerline, ensuring main landing gear on the centerline when touchdown.

Crosswind capability

After studying the aerodynamic of the normal landing configuration, dry runway, double engine and single engine condition, the table below present the crosswind guidance:

B737-700/800 auto landing for crosswind crieatia（unit: kts）

	Headwind	crosswind	tailwind
737/8	25 (13m/s)	20 (10 m/s)	10 (5 m/s)

B737-700/800 crosswind landing crieatia（unit: kts）

	90° crosswind	45° crosswind	headwind	tailwind
Dry runway	30 (15 m/s)	35 (18 m/s)	50 (25 m/s)	10 (5 m/s)
Wet runway	23 (12 m/s)	30 (15 m/s)	50 (25 m/s)	6 (3 m/s)

Ice/snow	15 (8 m/s)	20 (10 m/s)	50 (25 m/s)	6 (3 m/s)

Low visibility crosswind crieatia（unit: kts）

	90° crosswind	45° crosswind	headwind	tailwind
Visibility below 3KM	30 (15 m/s)	35 (18 m/s)	50 (25 m/s)	10 (5 m/s)
Visibility below 2KM	23 (12 m/s)	30 (15 m/s)	50 (25 m/s)	6 (3 m/s)
Visibility below 1KM	15 (8 m/s)	20 (10 m/s)	50 (25 m/s)	6 (3 m/s)

Note:

1. In strong wind condition, the crosswind crieatia is based on the steady crosswind crosswind component, below 200 feet from the threshold elevation. A go around must be performed if onboard equipment detects the crosswind is beyond the limit or ATC reported crosswind exceed the limt.
2. If asymmetry thrust is used, crosswind guidance should minus 5kts on wet or contaminated runway.
3. On slippery runway, crosswind capability is based on the runway surface condition, aircraft loading and pilot’s flying technique.
4. When autothrottle is used for landing, Vtarger= Vref+5， no wind correction is required.
5. When manual thrust is used for landing, Vtarger= Vref+wind correction
6. Wind correction=1/2 crosswind component+(gust-total steady wind value)

7. Note: wind unit is kts（1m/s ≈ 2kts）
8. Maximum wind correction is 20Kt， minimum is 5Kt
9. Wind direction is based on the runway direction.
10. When non normal checklist is used for landing speed correction, wind correction must be corrected if autothrust is not used.(the same as step 4).

Sideslip(Wing Low)

The sideslip crosswind technique aligns the airplane with the extended runway centerline so that main gear touchdown occurs on the runway centerline.

The initial phase of the approach to landing is flown using the crab method to correct for drift. Prior to the flare the airplane centerline is aligned on or parallel to the runway centerline. Downwind rudder is used to align the longitudinal axis to the desired track as aileron is used to lower the wing into the wind to prevent drift. As steady sideslip is established with opposite rudder and low wing into the wind to hold the desired course.

Touchdown is accomplished with the upwind wheels touching just before the downwind wheels. Overcontrolling the roll axis must be avoided because overbanking could cause the engine nacelle or outboard wing flap to contact the runway.

Properly coordinated, this maneuver results in nearly fixed rudder and aileron control positions during the final phase of the approach, touchdown, and beginning of the landing roll.

De-crab during flare

The objective of this technique is to maintain wings level throughout the approach, flare, and touchdown.

On final approach, a crab angle is established with wings level to maintain the desired track. Just prior to touchdown while flaring the airplane, downwind rudder is applied to eliminate the crab and align the airplane with the runway centerline.

As rudder is applied, the upwind wing sweeps forward developing roll. Hold wings level with simultaneous application of aileron control into the wind. The touchdown is made with cross controls and both gear touching down simultaneously. Throughout the touchdown phase upwind aileron application is utilized to keep the wings level.

Touchdown In Crab

On very slippery runways, landing the airplane using crab only reduces drift toward the downwind side at touchdown, permits raped operation of spoilers and autobrakes because all main gears touchdown simultaneously, and may reduce pilot workload since the airplane does not have to be de-crabbed before touchdown. However, proper rudder and upwind

aileron must be applied after touchdown to ensure directional control is maintained.
On slippery runway, crosswind capacity is based on runway surface condition, aircraft load and pilot's technique.

Combination of sideslip and crab
If the crew elects to fly the sideslip to touchdown, it may be necessary to add a crab during strong crosswinds. Main gear touchdown is made with the upwind wing low and crab angle applied. As the upwind gear touches first, a slight increase in downwind rudder is applied to align the airplane with the runway centerline. At touchdown, increased application of upwind aileron should be applied to maintain wings level.

4.7.3 Flare and Touchdown

Unless an unexpected or sudden event occurs, such as windshear or collision avoidance situation, it is not appropriate to use sudden, violent or abrupt control inputs during landing. Begin with a stabilized approach on speed, in trim and on glide path.
When the threshold passes under the airplane nose and out of sight, shift the visual sighting point to approximately 3/4 the runway length. Shifting the visual sighting point assists in controlling the pitch attitude during the flare. Maintaining a constant airspeed and descent rate assists in determining the flare point. Initiate the flare when the main gear is approximately 15 feet above the runway by increasing pitch attitude approximately 2º-3º. This slow the rate of descent.
After the flare is initiated, smoothly retard the thrust levers to idle, and make small pitch attitude adjustments to maintain the desired descent rate to the runway. Ideally, main gear touchdown should occurs simultaneously with thrust levers reaching idle. A smooth power reduction to idle also assists in controlling the natural nose-down pitch change associated with thrust reduction. Hold sufficient back pressure on the control column to keep the pitch attitude constant. A touchdown attitude as depicted in the figure below is normal with an airspeed of approximately VREF plus any gust correction.
Do not trim during the flare or after touchdown. Trimming in the flare increases the possibility of a tail strike.

Typically, the pitch attitude increases slightly during the actual landing, but avoid over-rotating. Do not increase the pitch attitude after touchdown; this could lead to a tail strike.

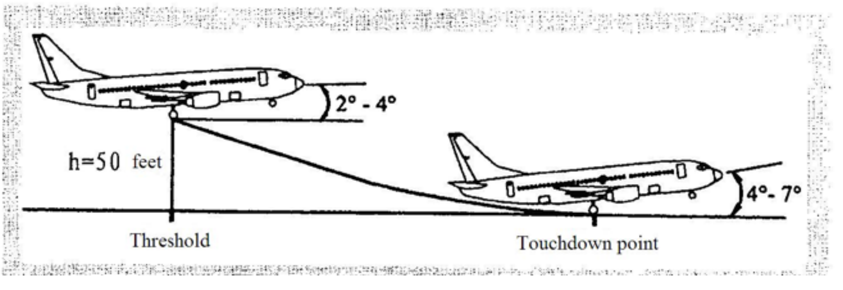
Avoid rapid control column movements during the flare. Do not allow the airplane to float; fly the airplane onto the runway. Do not extend the flare by increasing pitch attitude in an attempt to achieve a perfectly smooth touchdown. Do not attempt to hold the nose wheels off the runway.

4.7.4 Normal Touchdown Attitude

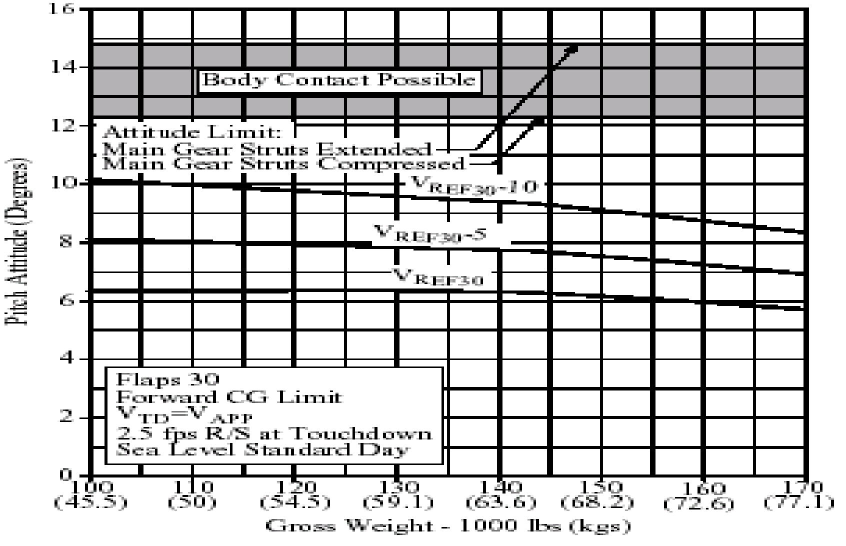
The following figures illustrate the effect of airspeed on body attitude on touchdown. It shows normal touchdown attitude for flaps 30. If flare control and thrust are excessive near touchdown, the airplane tends to float in ground effect.

With proper airspeed control and thrust management, touchdown occurs at no less than VREF-5. The illustration shows that touchdown at a speed significantly below VREF seriously reduces aft fuselage-runway clearance.

737-600—737-900



B737−700



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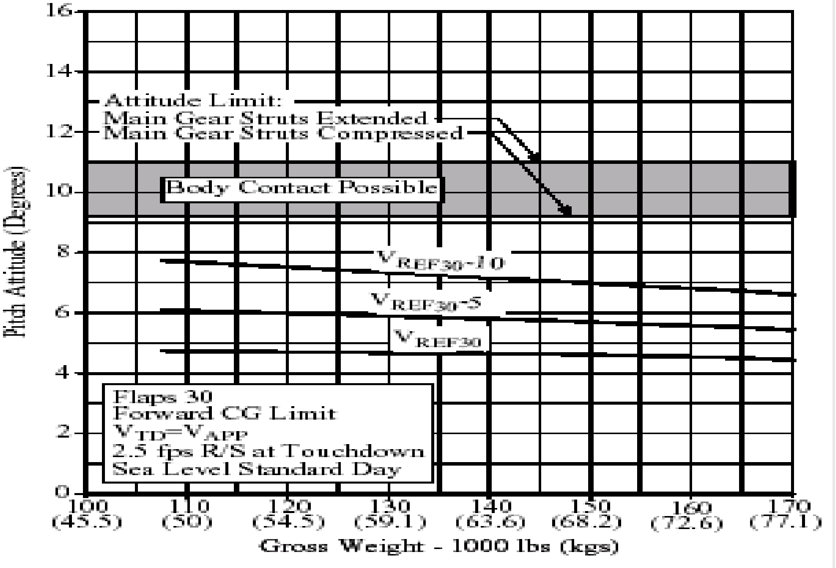


4.7.5 Avoid Tail Strike

A tail strike on landing tends to cause more serious damage than the same event during takeoff and is usually more expensive and time consuming to repair. In the worst case, the tail can strike the runway before the landing gear, thus absorbing large amounts of energy for which it is not designed. The aft pressure bulkhead is often damaged as a result.
Any one of the following risk factors may precede a tail strike:

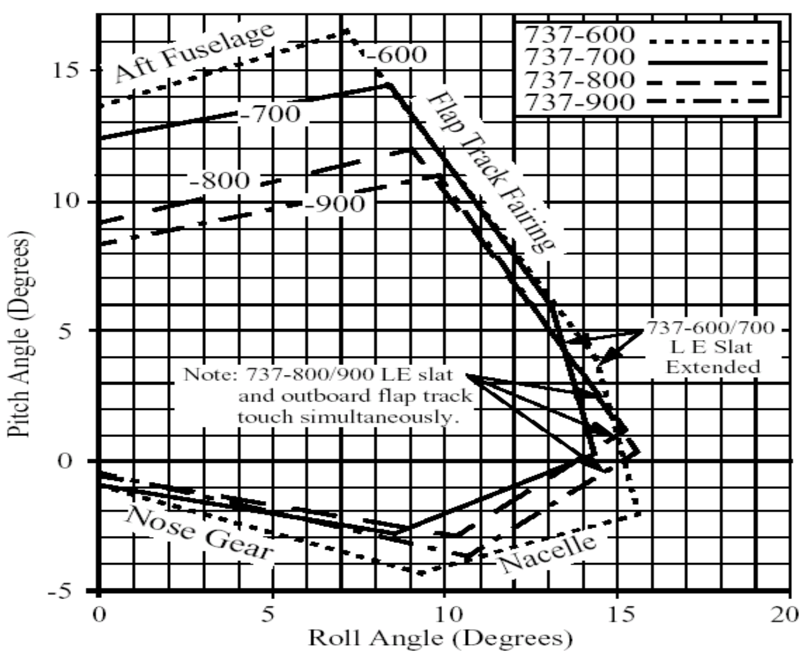
Unstabilized Approach
An unstabilized approach is the biggest single cause of tail strike. Flight crews should stabilize all approach variables-on centerline, on approach path, on speed, and in the final landing configuration-by the time the airplane descends through 1000feet above ground level. This is not always possible. Under normal conditions, if the airplane descends through 1000 feet AGL(IMC), or 500 feet AGL(VMC), with these approach variables not stabilized, a go-around should be considered. Flight recorder data show that flight crews who continue with an unstabilized condition below 500 feet seldom stabilize the approach. When the airplane arrives in the flare, it often has either excessive or insufficient airspeed. The result is a tendency toward large power and pitch corrections in the flare, often culminating in a vigorous pitch change at touchdown resulting in tail strike shortly thereafter. If the pitch is increased rapidly when touchdown occurs as ground spoilers deploy, the spoilers add additional nose up pitch force, reducing pitch authority, which increases the possibility of tail strike. Conversely, if the airplane is slow, increasing the pitch attitude in the flare does not effectively reduce the sink rate; and in some cases, may increase it.
A firm touchdown on the main gear is often preferable to a soft touchdown with the nose rising rapidly. In this case, the momentary addition of power may aid in preventing the tail strike. In addition, unstabilized approaches can result in landing long or a runway over run.
Holding Off in the Flare
The second most common cause of a landing tail strike is an extended flare, with a loss in airspeed that results in a rapid loss of altitude, (a dropped-in touchdown). This condition is often precipitated by a desire to achieve an extremely smooth/soft landing. A very smooth/soft touchdown is not essential, nor even desired, particularly if the runway is wet.

Trimming in the Flare
Trimming the stabilizer in the flare may contribute to a tail strike. The FP may easily lose the feel of the elevator while the trim is running. Too much trim can raise the nose, even when this reaction is not desired. The pitch up can cause a balloon, followed either by dropping in or pitching over and landing in a three-point attitude. Flight crews should trim the airplane during the approach, but not in the flare.
Mishandling of Crosswinds
When the airplane is placed in a forward slip attitude to compensate for the wind effects, this cross-control maneuver reduces lift, increases drag, and may increase the rate of descent. If the airplane then descends into a turbulent surface layer, particularly if the wind is shifting toward the tail, the stage is set for tail strike.
The combined effects of high closure rate, shifting winds with the potential for a quartering tail wind, can result in a sudden drop in wind velocity commonly found below 100 feet. Combining this with turbulence can make the timing of the flare very difficult. The PF can best handle the situation by using additional thrust, if required, and by using an appropriate pitch change to keep the descent rate stable until initiation of the flare. Flight crews should clearly understand the criteria for initiating a go-around and plan to use this time-honored avoidance maneuver when needed.
Over-Rotation during Go-Around
Go-around is initiated very late in the approach, such as during the landing flare or after touching down, are a common cause of tail strikes. When then go-around mode is initiated, the flight director immediately commands a go-around pitch attitude. If the FP abruptly rotates up to the pitch command bar, a tail strike can occur before the airplane responds and begins climbing. During a go-around, an increase in thrust as well as a positive pitch attitude is needed. If the thrust increase is not adequate for the increased pitch attitude, the resulting speed decay will likely result in a tail strike. Another contributing factor in tail strikes may be a strong desire by the flight crew to avoid landing gear contact after initiating a late go-around when the airplane is still over the runway. In general, this concern is not warranted because a brief landing gear touchdown during a late go-around is acceptable. This hand been demonstrated during autoland and go-around certification program.

4.7.6 Pitch and Roll Condition

The ground contact angles-normal landing figure illustrates body roll angle/pitch angles at which the airplane structure contacts the runway. Prolonged flare increases the body pitch attitude 2 to 3 degrees. When prolonged flare is coupled with a misjudged height above the runway aft body contact is possible.
Fly the airplane onto the runway at the desired touchdown point and at the desired airspeed. Do not hold it off and risk the possibility of a tailstrike.
Note: A smooth touchdown is not the criterion for a safe landing.
Conditions:

Pitch about main gear centerline/Slats fully extended/Aileron full down/Roll about outer tire centerline/Stabilizer full nose up/Elevator full down/Struts compressed/Flaps 40



4.7.7 Bounced Landing Recovery

If the airplane should bounce, hold or re-establish a normal landing attitude and add thrust as necessary to control the rate of descent. Thrust need not be added for a shallow bounce or skip. When a high, hard bounce occurs, initiate a go-around. Apply go-around thrust and use normal go-around procedures. Do not retract the lading gear until a positive rate of climb is established because a second touchdown may occur during the go-around.
Bounced landings can occur because higher than idle power is maintained through initial touchdown, disabling the automatic speedbrake deployment even when the speedbrakes are armed. During the resultant bounce, if the thrust levers are then retarded to idle, automatic speedbrake deployment can occur resulting in a loss of lift and nose up pitching moment which can result in a tail strike or hard landing on a subsequent touchdown.

4.7.8 After Touchdown And Landing Roll

Avoid touching down with thrust above idle since this may establish an airplane nose up pitch tendency and increases landing roll.
After main gear touchdown, initiate the landing roll procedure. If the speedbrakes do not extend automatically move the spedbrake lever to the UP position without delay. Fly the nosewheel onto the runway smoothly by relaxing aft control column pressure. Control column movement forward of neutral should not be required. Do not attempt to hold the nosewheel off the runway. Holding the nose up after touchdown for aerodynamic braking is not an effective braking technique.

Note: To avoid possible airplane structural damage, do not make large nose down control column movements before the nose wheels are lowered to the runway.

To avoid the risk of tailstrike, do not allow the pitch attitude to increase after touchdown, however, applying excessive nose down elevator during landing can result in substantial forward fuselage damage. Do not use full down elevator. Use an appropriate autobrake setting or manually apply wheel brakes smoothly with steadily increasing pedal pressure as required for runway conditon or runway length available. Maintain deceleration rate with constant or increasing brake pressure as required until stopped or desired taxi speed is reached.

4.7.9 Directional Control and Braking during Landing Roll

If the nose wheels are not promptly lowered to the runway, braking and steering capabilities are significantly degraded and no drag benefit is gained. Rudder control is effective to approximately 60 knots. Rudder pedal steering is sufficient for maintaining directional control during the rollout. Do not use the nose steering wheel until reaching taxi speed. In a crosswind, displace the control wheel into the wind to maintain wings level which aids directional control. Perform the landing roll procedure immediately after touchdown. Any delay markedly increases the stopping distance. Stopping distance varies with wind conditions and any deviation from recommended approach speeds.

4.7.10 Automatic Brakes Use

1) Recommended: whenever runway limited, using higher than normal approach speeds, landing on slippery runways or landing in a crosswind, the autobrake system be used.
2) For normal operation of the autobrake system select a deceleration setting.
   - MAX: Used when minimum stopping distance is required. Deceleration rate is less than that produced by full manual braking
   - MED(2or3): Should be used for wet or slippery runways or when landing rollout distance is limited
   - MIN(1): These settings provide a moderate deceleration effect suitable for all routine operations.
3) Immediate initiation of reverse thrust at main gear touchdown and full reverse thrust allow the autobrake system to reduce brake pressure to the minimum level. Since the autobrake system senses deceleration and modulated brake pressure accordingly, the proper application of reverse thrust results in reduced braking for a large portion of the landing roll.
4) Immediate initiation of reverse thrust minimizes brake

temperatures and tire and brake wear and reduces stopping distance on very slippery runways.

5) The use of minimum reverse thrust almost doubles the brake energy requirements and can result in brake temperatures much higher than normal.
6) If stopping distance is not assured with autobrakes engaged, the PF should immediately apply manual braking sufficient to assure deceleration to a safe taxi speed within the remaining runway.
7) During normal deceleration, auto brake should be disarmed by smooth pressure on pedals before auto brake is disarmed. After autobrake is disarmed, release the pedals smoothly. Disarming autobrake before stopping using reverse thrust may provide smooth transition to manual brakes.
8) During landing rollout, crewmembers should be alert for autobrake disengagement annunciations. The PM should notify the PF anytime the autobrakes disengage.
9) The time to switch autobrake to manual brake should be determined according to decelerate rate and required stop distance of the aircraft. For runway that can produce good decelerate rate, the speed of switching autobrake to manual brake is 60kts. For extreme slippery runway or length restricted runway, the speed should be approximately safe taxi speed. During switching from autobrake to manual brake, keep speedbrake extended and use thrust reverser as required before taxi speed. This is especially important when approaching runway end because rubber sediment may influence the stop capability.
10) Refer to related advisory information in chapter PI of QRH.
11) PF should report to PM of the switching from autobrake to manual brake. The technic of releasing the brake will affect the comfort of passengers and the stop distance. These technics are as follws:
    - Retard speedbrake lever. When it is confirmed that the stop distance will not exceed the rest of the runway, use this method to complete a smooth transit from autobrake to manual brake. It is effective before or after thrust reverser is retarded and no need for more manual brake technic.
    - Manually and smoothly push on the brake till autobrake

disarmed. After its disarm, smoothly use manual brake. Disarm autobrake before thrust reverser is retarded. This will make the transit more smooth.

- Manually select autobrake selector to OFF.(PF commands and PM complete the action)

4.7.11 Usage of Manual Brake:

The following technics of manual braking is recommended as to obtain optimum braking effect on all runway conditions:

Pilots' seats and rudder pedals should be adjusted to provide maximum braking while fully treaded.

After touchdown of the main gears, rapidly, smoothly and stably tread the brake pedal to provide required brake pressure. For short runway or slippery runway, fully tread brake pedal.

- Do not attempt to adjust brake pressure or use other technics to enhance braking effect.
- Do not release the brake before the aircraft has decelerated to safe taxi speed.
- In all runway conditions, the use of anti-skid system will make a shorter stop distance than anti-skid not engaged or use of brake pedal.

Anti-skid system adjusts brake pressure of every wheel to fit for the runway condition according to detected anti-skid condition, so as to obtain maximum braking effect. When use brake on slippery runway, skid may occur several times before appropriate brake pressure is provided through anti-skid system and maximum brake effect is obtained.

If the pilot continuously adjusts the strength on brake pedal, anti-skid system will readjust brake pressure to establish optimum braking effect and during this phase the braking effect will be wasted.

Because of low braking friction factor on extreme slippery runway or under high speed, pilots may regard it as anti-skid failure and then repeat using brake pedal or disengage anti-skid system, which will decrease brake effect. Stable increase of brake pressure will make an optimum performance of anti-skid system.

The use of manual brake usually has a delay of 4 to 5 seconds from main gear touchdown to manual braking. This delay of braking will waste

800FT to 1000FT of the runway. Crosswind and direction control under low visibility will increase the delay. Problem of thrust reversers will distract attention and cause a delay of manual braking.

4.7.12 Braking when anti-skid is inoperative

When anti-skid system is inoperative, use the following technics:

- Make sure that the nose gear has touched down and speedbrake is extended before using brake.
- Initially use very slight push on brake pedals and then increase brake pressure gradually as the ground speed decreases.
- Maintain stable brake pressure.

Simulated flight shows that brake effect of slippery runway with groove is almost the same as that of dry runway. But when anti-skid system is inoperative, be careful of braking on slippery runway without groove to avoid flat tyre.

4.7.13 Braking Cooling

A series of taxi-back or stop and go landings without additional in-flight brake cooling can cause excessive brake temperatures. The energy absorbed by the brakes from each landing is cumulative.
Extending the gear a few minutes early in the approach normally provides sufficient cooling for a landing. Total in-flight cooling time can be determined form the PI section in QRH.

4.7.14 Reverse Thrust Operation

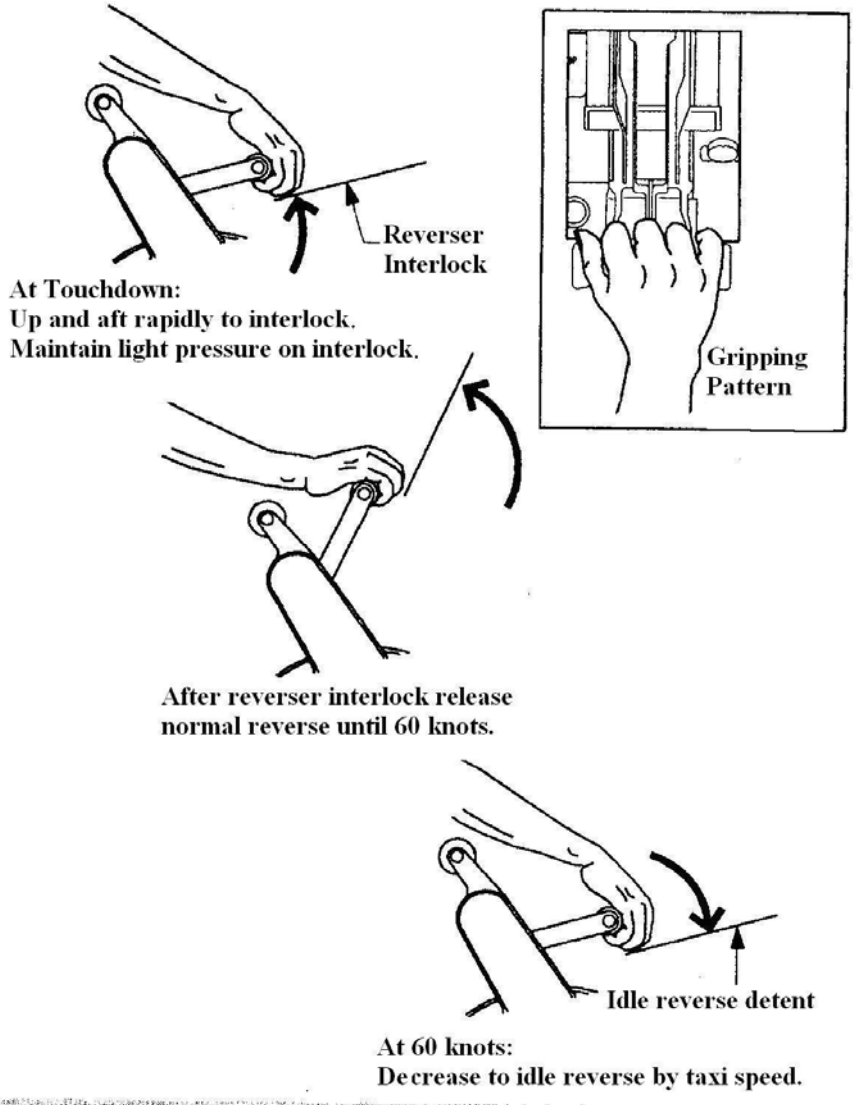
1) Awareness of the position of the forward and reverse trust levers must be maintained during the landing phase. Improper seat position as well as long sleeved apparel may cause inadvertent advancement of the forward thrust levers, preventing movement of the reverse thrust levers.
2) The position of the hand should be comfortable, permit easy access to the autothrottle disconnect switch, and allow control of all thrust levers, forward and reverse, through full range of

motion.

Note: Reverse thrust always reduces the “brake only” stopping distance, brake and tire wear. Reverse thrust is most effective at high speeds.

3) After touchdown, with the thrust levers at idle, rapidly raise the reverse thrust levers up and aft to the interlock position, then to the number 2 reverse thrust detent. Conditions permitting, limit reverse thrust to the number 2 detent. The PM should monitor engine operating limits and call out any engine operational limits being approached or exceeded, any thrust reverser failure, or any other abnormalities.

4) Maintain reverse thrust as required, up to maximum, until the airspeed approaches 60 knots. At this point start reducing the reverse thrust so that the reverse thrust levers are moving down at a rate commensurate with the deceleration rate of the airplane. The thrust levers should be positioned to reverse idle by taxi speed, then to full down after the engines have decelerated to idle. The PM should call out 60 knots to assist the PF in scheduling the reverse thrust. The PM should also call out any inadvertent selection of forward thrust as reverse thrust is cancelled. If an engine surges during reverse thrust operation, quickly select reverse idle on all engines.


Reverser
Interlock
At Touchdown:
Up and aft rapidly to interlock.
Maintain light pressure on interlock.
Gripping
Pattern
After reverser interlock release
normal reverse until 60 knots.
Idle reverse detent
At 60 knots:
Decrease to idle reverse by taxi speed.

4.7.15 Overweight Landing

The actual landing weight should not exceed the maximum limited landing weight unless in emergency situation.
Flight dispatchers and captain have the responsibility to ensure the landing weight in destination airport should be below maximum landing weight. In emergency situation, if urgent return is required, captain should consider fuel burning off(if applicable), PCN, runway surface, landing distance, and complete related checklist. Then, control the aircraft smoothly and avoid hard landing. Report shall be made to ground maintenance and dispatch office immediately after landing, and make a note on the log book.

Operation Instruction
Overweight landings may be safely accomplished by using normal landing procedures and techniques. There are no adverse handling characteristics associated with overweight landings. Landing distance is normally less than takeoff distance for flaps 30 or 40 landings at all gross weight. However, wet or slippery runway field length requirements should be verified from the landing distance charts in the PI chapter of the QRH. Brake energy limits will not be exceeded for flaps 30 or 40 landings at all gross weights.
Note: Use of flaps 30 rather than flaps 40 is recommended to provide increased margin to flap placard speed.
If stopping distance is a concern reduce the landing weight as much as possible. At the captain’s discretion, reduce weight by holding at low altitude with a high drag configuration(gear down) to achieve maximum fuel burn-off.
Analysis has determined that, when landing at high gross weight at speeds associated with non-normal procedures requiring flaps set at 15 or less, maximum effort stops may exceed the brake energy limits. The gross weights where this condition can occur are well above maximum landing weights. For these nor-normal landing, maximize use of the available runway for stopping.
Observe flap placard speeds during flap extension and on final approach. In the holding and approach patterns, maneuvers should be flown at the normal maneuver speeds. During flaps extension, airspeed can be reduced by as much as 20 knots below normal maneuver speeds before extending

to the next flap position. These lower speeds result in larger margins to the flap placards, while still providing normal bank angle maneuvering capability, but do not allow for a 15º overshoot margin in call cases.
Use the longest available runway, and consider wind and slope effects. Where possible avoid landing in tailwinds, on runways with negative slope, or on runways with less normal braking conditions. Do not carry excess airspeed on final. This is especially important when landing during an engine inoperative or other non-normal condition. At weight above the maximum landing weight, the final approach maximum wind correction may be limited by the flap placards and load relief system.
Fly a normal profile. Ensure that a higher than normal rate of descent does not develop. Do not hold the airplane off waiting for a smooth landing. Fly the airplane onto the runway at the normal touchdown point. If a long landing is likely to occur, go-around. After touchdown, immediately apply maximum reverse thrust using all of the available runway for stopping to minimize brake temperatures. Do not attempt to make an early runway turnoff.
Autobrake stopping distance guidance is contained in the PI section of QRH. If adequate stopping distance is available based upon approach speed, runway conditions, and runway length, the recommended autobrake setting should be use.

Overweight Autolands Policy
Boeing does not recommend overweight autolands. Autopilots on Boeing airplanes are not certified for automatic landings above maximum landing weight. At higher than normal speeds and weights, the performance of these systems may not be satisfactory, and has not been thoroughly tested. An automatic approach may be attempted, however the pilot should disengage the autopilot prior to flare height and accomplish a manual landing.
In an emergency, should the pilot determining that an overweight autoland is the safest course of action, the approach and landing should be closely monitored by the pilot and the following factors considered:

- touchdown may be beyond the normal touchdown zone; allow for additional landing distance.
- touchdown at higher than normal sink rates may result in exceeding structural limits.
- plan for a go-around or manual landing if autoland

performance is unsatisfactory; automatic go-arounds can be initiated until just prior to touchdown, and can be continued even if the airplane touches down after initiation of the go-around.

4.7.16 Controlled Flight Into Terrain （CFIT）

Information on CFIT accidents provided by ICAO reveals the existence of some other important factors other than their relevance with GPWS. For this reason, all flight crew members have the responsibility and obligation to observe the following regulations to prevent the occurrence of CFIT accidents:

(1) The regulation on minimum safe altitude shall not be violated;
(2) Flight crew shall correctly select flight guidance system and auto-pilot/auto-flight function;
(3) Wrong navigation shall be avoided and the accuracy of NAVIDS shall be crosschecked;
(4) ATC instruction shall be correctly understood and any doubt thereof confirmed;
(5) The requirements of approach and departure procedures shall be followed and their standards strictly executed;
(6) IFR altitude descent shall not be done visually;
(7) Flight altimeter setting shall be crosschecked to avoid wrong setting;
(8) Aircraft banding turn shall not be bigger than 30 under normal condition.
(9) Full understanding of operational environment is necessary prior to conducting a flight especially when it concerns the terrain conditions at terminal area and sector safety altitude.

Appendix Previous Technical Advisory compilation

App1 HNA MEBU Technical Advisory “pane cracking recognitions on Boeing 737 No 1 and 2 windows”

1. Filing No:
   [2005]12
2. General Contents:
   To all B737 pilots:
   HNA MEBU MENO “pane cracking recognitions on Boeing 737 No 1 and 2 windows” should be informed to all 737 pilots, and be acknowledged through fault recognition to prevent unnecessary damage to the aircraft.

“Pane cracking recognitions on Boeing 737 No 1 and 2 windows”

references:

AFM Section2

AMM 56

Back ground:

Frequently, HNA 737 aircraft were returned caused by No. 1 and/or No 2 window panes cracking. This MENO intends to clarify glass pane structure, cracking characters, and consequent effect to the flight and visual inspections which may minimize aircraft returns due to the outer pane cracking only.

Text:

1. Windshield structure:
   The structure of cockpit No 1 and No 2 windshield are the same. Each windshield includes three plies, which called outer pane, interlayer and structural pane, all the three panes are adhesive by vinyl or PPG 112 urethane. Most windshield of Boeing 737 aircraft

in China are produced by PPG, and the structure character is described as followed fig.1.

Inner pane is the main structural ply for the cockpit pressurization. The structural pane is the thickest ply and made of thermal tempered glass. if the structural pane is cracked only, the cabin differential pressure should not exceed 5 psi and if both inner outer panes are fractured, cabin differential pressure should not exceed 2 psi.

The interlayer is “fail-safe” designed structure, and it still can provide cockpit pressurization and continuous airworthiness in flight if the structural pane is cracked. The vinyl interlayer has low frequency crack occurrence in flight.

The outer pane is non-structural and has bird impact capacity to prevent main structure plies (interlayer and inner pane) from fracture. The outer pane is thermal tempered glass also. A very thin conductive film which has de-ice/de-fog function by electrical heating is under the inner surface. If only one outer ply is cracked, dispatch may be allowed according to MEL provided vision thru affected window is acceptable.

The conductive heating film is located under the outer pane. Delaminating at urethane interlayer will occur because of the different coefficient of thermal expansion. Moisture ingress into window laminate will cause window heat short circuit and consequently lead to outer ply broken. Normally, the outer pane cracking is most frequently occurrence in No 1 and 2 windshield.

2. Cockpit windshield pane cracking characters:

Note: penetrating cracking/fracture profiles:

1) Outer pane cracking (see fig 2)

- penetrating
- long
- Extensive
- Less quantity

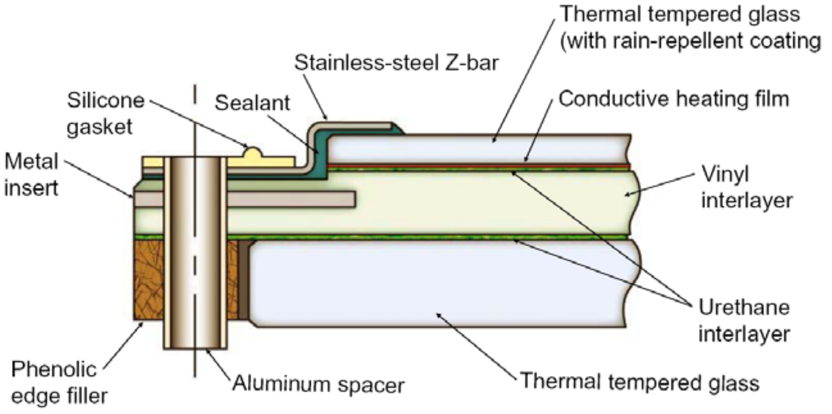
note: Continued flight is allowed if only one outer ply was cracked, provided vision thru affected window is acceptable.

2） Interlayer cracking

- non-penetrating
- short
- non-continuous
- Yellow appearance due to degrade.

3） Structural pane cracking（see fig 3）

- Penetration. Tiny fracture will cover the whole surface of the pane, the maximum size will net exceed 10mm.
- The whole surface normally cracks simultaneously.



■ **Cross Section of 737 No.1 Windshield**

Fig 2. No 1 outer ply fractures

Fig 3: Structure ply fracture

App2 Procedures and Specifications in ZPLJ ZPDL and ZPJH

1. Filing No:
   [2005]26
2. General Contents:
   To all B737 pilots:
   The chief pilot study group in flight department has researched flight procedures about the ZPLJ, ZPDL and ZPJH in Yunnan province, and the following specifications are provided to all B737 pilot for reference. All pilots should be acknowledged and strictly observe it.

Procedures and Specifications in ZPLJ

A Airport General:

1. RW ELV 2242.6m，RW HDG 017°-197°，Runway 20ILS only；
2. RW DIM 2500*45，takeoff rolling distance available is 2500m，landing distance available is 2445m，RW slope 0.53%；
3. Terrain character：It positions at southeast edge of Qinghai-Tibet Plateau, Higher in northwest and lower in southeast, all the mountains are high and steep, perpendicular cliff is cut by a deep river valley which develops a wide altitude difference. The airport is surrounded by mountains, east to west sides of the airport are blocked by a north-south orientated mountain, thereafter, clearway on that directions are not satisfied, where are available from south to north orientation.
4. Meteorology character：Airport locates at South-Asia monsoon area, and is low Latitudes mountain climate. prevailing wind direction is southwest（24.9%），west- southwest（13.3%）and south- southwest（12.1%）. May to December is the main rain season, and it is mostly downward transport of momentum which makes the surface gale from November to the next April. A wind direction is variable day by day because of terrain. Normally expressed as northeast wind and tailwind in the morning, southwest wind and headwind in the afternoon.

B Procedures

1. Strictly follow the instrument landing procedures, maintain flap 5 at W（381），set flap 5 maneuver speed plus 10 knots at LJA-DME8 NM gear down , flap 15 before procedure turn, maintain 12500ft (QNH). LOC captured, and do not ARM APP until 11500ft, and intercept G/S LJA-DME5.4 NM.
2. Final ＧＰ is ３.５°，descent gradient is large. And due to high ground speed at high altitude airport, flight crew should follow the required descent rate (900-1000 ft/min), and touchdown zone should be limited after visual contact to avoid floating.
3. Landing roll: AUTO brake set 3，thrust reverser should be used immediately after touchdown. Manual brake or maximum reverser should be considered as necessary.

C NOTE:

1. Flight crew should focus on preflight preparations and crew cooperation. Be aware of flight technique, instrument procedures and abnormal procedures (one engine inoperative and emergency descent especially).
2. Be familiar with appropriate NOTAMs, acknowledge in-time weather conditions, and particularly pay attention to turbulence on final. Use throttles properly and gently.
3. Perform standard callout. Inform and correct any deviation, the first officer should call out wind per CDU indication.
4. Moderate to heavy rain landing is prohibited in all day operations.
5. Expect any potential windshear or any other sudden change.
6. Dispatch requirement: strictly observe the dispatch criteria(one reverser inop, anti-skid inop, speedbrake inop, pay load over limits or runway severe contaminated can not be dispatched)
7. Do not shut down APU after takeoff, stop takeoff. Is recommended.

Procedures and Specifications in ZPDL

A Airport General:

1. RW ELV 2155.38m，RW HDG 168°-348°，Runway 17ILS only；
2. RW DIM 2500*45，takeoff rolling distance available is 2600m，landing distance available is 2600m，RW slope 0.8%；
3. Terrain character：Higher in northwest and lower in southeast, all the mountains are high and steep, perpendicular cliff is cut by a deep river valley which develops a wide altitude difference. The airport is surrounded by mountains. DaQing Mountain (035° position: 4800m to airport) affects to the aircraft landing which is 2603m above sea level. MaLong Peak of Cang Mountain is the highest obstacle within airfield 50Km.
4. Meteorology character：Airport area is low Latitudes mountain climate. Normally is cloudless with very good visibility. Thunderstorm occurs at afternoon and occasionally or sometime happens in November to the next April. Prevailing wind direction is south to southeast or south. 5.2m/s average in the year. Maximum gusting is 31.0m/s. Because of the mountains and lake surrounded, turbulence and local gusting generated by special terrain is the important factor to affect the flight.

B Procedures

1. Strictly follow the instrument landing procedures, maintain flap 5 at DAL-DME，set flap 5 maneuver speed plus 10 knots and maintain 3000m(QNH) at DAL-DME8 NM gear down , flap 15 before procedure turn, DAL-DME10 procedure turn, use track 118 to intercept LOC and G/S captured.
2. Final ＧＰ is ３.2°，descent gradient is large. And due to high ground speed at high altitude airport, flight crew should follow the required descent rate (800-900 ft/min), and touchdown zone should be limited after visual contact to avoid floating.
3. Landing roll: AUTO brake set 3，thrust reverser should be used immediately after touchdown. Manual brake or maximum reverser should be considered as necessary.

C NOTE:

1. Flight crew should focus on preflight preparations and crew cooperation. Be aware of flight technique, instrument procedures and abnormal procedures (one engine inoperative and emergency

descent especially).

2. Be familiar with appropriate NOTAMs, acknowledge in-time weather conditions, and particularly pay attention to downstream around MM, control the airspeed and altitude, use correct visual point. Use throttles properly and gently.
3. Perform standard callout. Inform and correct any deviation, the first officer should call out wind per CDU indication.
4. Moderate to heavy rain landing is prohibited in all day operations.
5. Expect any potential windshear or any other sudden change.
6. Dispatch requirement: strictly observe the dispatch criteria (one reverser inop, anti-skid inop, speedbrake inop, pay load over limits or runway severe contaminated can not be dispatched)
7. Do not shut down APU after takeoff, stop takeoff is recommended.

Procedures and Specifications in ZPJH

A Airport General:

1. RW ELV 553m，RW HDG 160°-341°，Runway 34ILS；
2. RW DIM 2200*45，takeoff rolling distance available is 2200m，landing distance available is 2200m，RW slope 0.08%；;
3. Terrain character：Clear ways in southwest and south east directions are not satisfied. Some peaks are 2100-2200m above sea level. The terrain affects flight operations. It is spacious in northeast, it is acceptable in southeast. Lianzi Mountain (308° position: 3000m to airport) is 2429m above sea level, Mei Mountain(220° position: 1750m to airport) is 2196m above sea level，North east to the airport, Lan Cang River is obviously observed adjacent to the boundary 1700m south of the NAV aid.
4. Meteorology character：Located at low- latitudes area. Affected by the combinations of terrain and SoWMEX/SoEMEX influence，calm wind condition is prevalent, sometimes subjected to southeast wind. March to May is dry season, and abrupt gusting always occurs before thunderstorm. June to December is rain season with frequent thunderstorm happening with very low cloud base about 600-1000m.

B Procedures

1. At JHG VOR maintain flap 5ºand flap5ºmanuveur speed，maintain heading 226 after JHG，2.5NM to JHG gear down and flap15º，maintain flap15ºmanuveur speed，strictly observe the intercept LOC because of the high peaks on the left of the RW34.;

C NOTE:

1. Flight crew should focus on preflight preparations and crew cooperation. Be aware of flight technique, instrument procedures and abnormal procedures (one engine inoperative and emergency descent especially).
2. Be familiar with appropriate NOTAMs, acknowledge in-time weather conditions.
3. Avoid overshoot above the runway threshold and too high speed to run over the runway because of the smooth surface.
4. Forbidden to turn round to the south to exceed the boundary.
5. Caution: when RW16 is used for landing, pay attention to the

downstream 1000-2000m north of the runway end.

6. Perform standard callout. Inform and correct any deviation, the first officer should call out wind per CDU indication.
7. Moderate to heavy rain landing is prohibited in all day operations.
8. Dispatch requirement: strictly observe the dispatch criteria (one reverser inop, anti-skid inop, speedbrake inop, pay load over limits or runway severe contaminated can not be dispatched)

App 3 Chief Pilot Alert About the Autothruttle Use

1. Filing No:

 [2009]015

2. General Contents:

During approach, A/T is mandatory to set DISENGAGE (other than ARM) if A/P was disconnected. Additionally, flight crew should strictly observe associate SOP requirements, applying standard callout during all flight phases, and enhance concentrations to FMA indications, as to take aircraft control immediately in the event of A/P or A/T failed.

App4 On the Explanation of the B737-700/800 Engine Combustion Chamber Configuration

1. Filing No:
   [2006]010

2. General Contents:
   All B737 Pilots:
   Technology bulletin from engineering department, the B737-700/800 airplanes engine combustion chamber in our company right now are single loop combustion chambers. Right choice of the checklist should be noticeable for all the pilots.

   This bulletin is suitable for: B737-700/800 airplanes
   Background: There are two combustion chamber configurations for CFM56-7B engines: one is single loop combustion chamber, the other is double loop combustion chamber. Due to the different operation procedures for the two combustion chambers, it is necessary for our company fleet to explain the engine combustion chamber.

App5 737 airplane handling measures when landing gear control lever is in the "DOWN" position and illumination of three red indication lights and three green indication lights.

1. Filing No:
   [2006]013
2. General Contents:
   All B737 Pilots,
   Recently the go-around events happen because the landing gear control lever is in the "DOWN" position and three red warning lights and the three green indication lights both illuminate in the 737-300/400 fleet of our company. Similar events have been happened to the B737-700/800 fleet. The engineering department has published TA737-32-010R2, at the same time the R1 is expired.
   The landing gear position indication and warning system is mainly combined with 3 red warning lights and green indication lights
   When the airplane is in any of the situations, the red warning lights illuminate(chart 1)
   (1) When the landing control gear lever is not in the DOWN position, the related landing gear does not retract or locked;
   (2) When the landing control lever is in the DOWN position, the related landing gear does not extend and locked;
   (3) When any of the engine throttle is retracted, the landing gear does not extend or locked.
   The red warning lights are controlled by landing gear control lever position switch, landing gear locking and position sensor and related circuits. The landing gear control lever position switch is installed after the control lever. It provides a signal in WN position or out of DOWN position for the landing gear position indication and warning system, chart 2. When the control lever is in the DOWN position and the control lever can be fully reset, the switch actuator can actuate the position switch to provide signal that the control lever is in the DOWN position. When the flight crew put the

landing gear control lever in the DOWN position, the green indication lights illumination means that the landing gear properly put and locked; At this time, if the landing gear can not fully reset, the position switch can not be actuated and provides the signal that the landing gear is not in DOWN position. But the landing gear condition is extended and locked (i.e. the landing gear is not retractable and locked), that conforms to the first condition of red warning lights illumination So the phenomenon of illumination of both red warning lights and green indication lights.

The phenomenon extension position can not be fully reset is existed in the 737-300/400 and 737-700/800. The reason is the profile friction is two excessive. Our company has been carrying out the refit to reduce the friction and phenomenon of not fully resetting according to service bulletin 737-SL-121-A by Boeing. The refit operation is under way. For the non-refit aircrafts, the flight crew indication placard is needed near the lever.

Therefore, when the landing gear is in the “DOWN” position and the phenomenon both the red and green lights illumination, it is recommended that the flight crew should lower the lever or gently sway the lever to fully reset the control lever or cycle the operation lever, to extinguish the red lights. If the red lights do not extinguish after the above measures have been taken. That can be judged as the not fully resetting of landing gear lever, the flight crew can normally land..

This bulletin is suitable for: 737-300/400 737-700/800

Advise herein specially.

Appendix: Maintenance Engineering Department <TA737-32-10>

编码：3105-01

海航维修工程部 HAINAN AIRLINES Co. Ltd. MED

TECHNICAL ADVISORY 技术通告

TA NO. 编号	REVISION 版次	EFFECT DATE 生效日期	PREPARED 编写	REVIEWED 审核	APPROVED 批准	PAGE 页码	OF 总页
TA 737-32-010	2	2006-3-16	湛贵才	[illegible]	[illegible]	1	4

SUBJECT:
题目： 737 飞机起落架控制手柄在"DOWN"位，三个红色指示灯和三个绿色指示灯皆亮时的处理措施

DESCRIPTION:
内容:

本通告适用于：737-300/400 737-700/800

参考资料：737-SL-32-121-A

背景：

我司 737-300/400 机队最近出现几次因起落架控制手柄在"DOWN"位时，三个红色警告灯和三个绿色指示灯都亮而复飞的事件。类似的事件在 737-700/800 机队也出现过。为尽量避免类似事件的再次发生，特颁发 TA737-32-010。

起落架位置指示和警告系统主要由指示三个起落架状态的红色警告灯和绿色指示灯等组成。绿色指示灯只有相应的起落架放下和锁好时才能亮。

当飞机处于以下任何一种情况时，红色警告灯点亮（参考图 1）：

（1）起落架控制手柄不在 DOWN 位，相应的起落架未收上和锁好；

（2）起落架控制手柄在 DOWN 位，相应的起落架未放下和锁好；

（3）任何一台发动机收回油门时，起落架未放下和锁好。

红色警告灯由起落架控制手柄位置电门、起落架的锁上和位置传感器及相关的电路控制。起落架控制手柄位置电门安装在控制手柄后，它给起落架位置指示和警告系统提供一个控制手柄在 DOWN 位或不在 DOWN 位的信号，参考图 2。当控制手柄卡进 DOWN 位时，如果控制手柄能充分复位，则电门作动器就能作动位置电门而提供控制手柄在 DOWN 位的信号；反之，如果控制手柄不能充分复位，则电门作动器就不能作动位置电门而提供控制手柄不在 DOWN 位的信号。所以当机组把起落架控制手柄放到 DOWN 位时，绿色指示灯亮说明起落架已经放下和锁好；但此时如果控制手柄不能充分复位，则位置电门无法被作动就提供控制手柄不在 DOWN 位的信号，可起落架的状态是已放下和锁好（即起落架未收上和锁好），符合红色警告灯亮的第一个条件，所以出现红色警告灯和绿色指示灯都亮的现象。根据地面检查，我司所出现的情况是由于控制手柄不能充分复位而造成的。

起落架手柄在放下位不能充分复位现象在 737-300/400 和 737-700/800 机队都存在，原因是手柄侧面摩擦力较大所致，我公司已经根据波音颁发的服务信函 737-SL-32-121-A 颁发工程指令执行手柄的改装工作，以减小手柄的摩擦力，避免不能充分复位的现象发生。目前改装工作进行中。

TA737-32-010R1 修改适用性和参考文件，说明机队手柄组件目前改装现状，并修改了分发单位。

TA737-32-010R2 要求在手柄附近加装机组操作提示标牌。

此前技术通告： TA737-32-010R2 代替 TA737-32-010R0/R1。收到 TA737-32-010R2 后，TA737-32-010R0/R1 作废。

正文：

一、飞行部：当起落架控制手柄在"DOWN(放下)"位时，如果出现红灯和绿灯都亮的现象，建议机组先把手柄稍往下按同时往前推一下或者轻晃手柄使控制手柄能充分复位，或循环操作手柄，使红灯熄灭。采取以上措施后如果红灯仍不熄灭，按照检查单执行。

二、工程部：在所有 737 飞机起落架手柄附近合适位置粘贴提示标牌，标牌内容、安装位置及件号参考图 3。

受影响的相关手册：[无]

受影响的相关工卡：[无]

本 TA 发送至：						
	股份采购部		各维修分部	✓	各机型过夜外站	
	飞行部	✓	机务训练中心	✓	各机型过站外站	
	运行控制部	✓	质量中心	✓	公务机工程部	✓
	安全运行监察部		计划中心			
	客舱与地面服务部		市场部			

海航维修工程部　　编码：3105-01
HAINAN AIRLINES Co.Ltd.MED

TECHNICAL ADVISORY 技术通告

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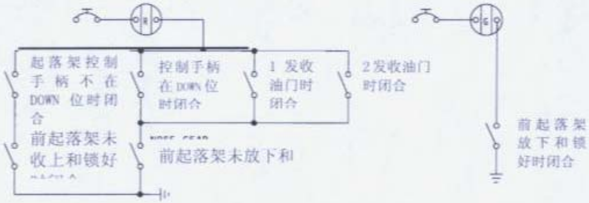
内容:



前起落架控制线路

主起落架控制线路

图 1

海航维修工程部

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TECHNICAL ADVISORY 技术通告

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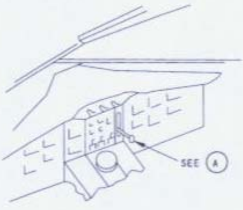
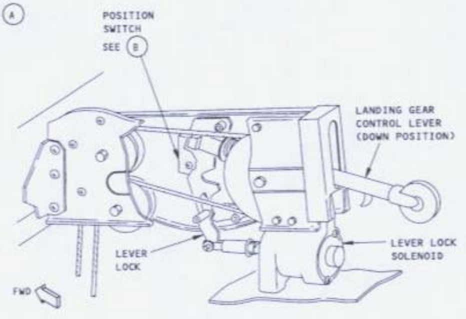
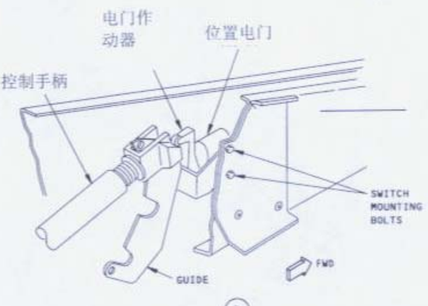
DESCRIPTION:
内容:



前仪表板



A



B

图 2

编码：3105-01
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海航维修工程部

TECHNICAL ADVISORY 技术通告

SUBJECT: 题目:	PAGE 页数	OF 总页
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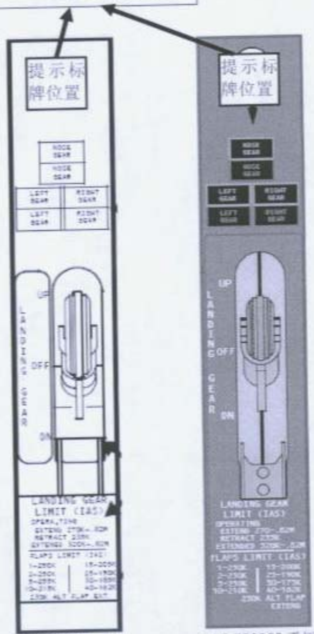
DESCRIPTION:
内容:

手柄在 DOWN 位时，若红灯和绿灯全亮，下按并前推或循环操作手柄直到红灯熄灭。若循环操作 6 次红灯仍亮，按检查单处理。
P/N: ZZ737326100



737-300400 手柄　　737-700800 手柄

注：标牌件号：ZZ737326100，双向互换件号为： SHJH774950。

图 3　提示标牌及标牌安装位置示意图

App6 on measures for APU bleed abnormal in cold weather

1. Filing No:
   [2007]004

2. General Contents:
   All 737 pilots:
   According to TA737-49-008 of maintenance and engineering department: with low outer temperature and high humidity, no APU bleed and low bleed pressure may occur on 737 NG aircraft; in such situation, disengage APU bleed switch then engage it, or restart APU can make APU provide bleed normally. When recording malfunctions, be sure to write down weather conditions like temperature (better to include humidity), rain, snow and so on.
   Hope all pilots pay attention to above information.

App7：Notice about the use of steering wheel after landing

1. Filing No:
   [2007]028

2. General Contents:
   All B737pilots：
   According to the flight crew training manuals, rudder control is effective until 60KTS. During rolling, turn the rudder pedals is enough to maintain directional control. Do not use nose wheel steering wheel before reaching taxi speed.
   Under normal conditions we declare that after touchdown only when the aircraft speed is below 30KTS it is allowed to put hands on the steering wheel and use them. However when the aircraft speed is greater than 20KTS use nose wheel steering wheel with caution to avoid excessive manipulation of nose wheel.

App8 Information about PSEU dispatch clearance for737-700/800

1. Filing No:
   [2007]052
2. General Contents:
   All pilots:

   According to Maintenance and Engineering Department (instructions about PSEU dispatch clearance for 737-700800):

   Information provided here:

   The numbers of PSEU presently or later installed by the 737 NG fleet of our company are 285A1600-4, 285A1600-5 or a number after -5.

   In case PSEU light illuminates, check PSEU number according to placard of P5 aft overhead panel, and make sure if flight can be carried on by referring to MEL 32-17-01B or MEL 32-17-01C as required. The reference content of MEL is listed as follows (MEL shall take precedence for detailed information):

   If PESU number is 285A1600-4 and pressing master warning light can make PSEU light extinguish, the airplane can continue to execute flight and doesn't need to taxi back.(MEL 32-17-01B shall take precedence for detailed information).

   If PESU number is 285A1600-5 or a number after -5 and setting parking brake or shutting down both engines can make PESU light extinguish, the airplane can continue to execute flight (MEL 32-17-01 shall take precedence for detailed information).