# THE UNOFFICIAL BOEING 747-400

## SIMULATOR AND CHECKRIDE PROCEDURES MANUAL

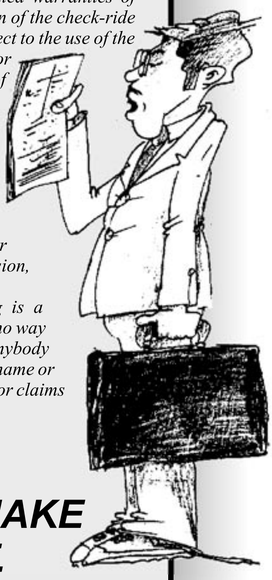
PUT TOGETHER BY
MIKE RAY
CAPTAIN UAL

MY LAWYER WANTS TO TELL YOU SOMETHING (probably worthless) ...

# THE LEGAL THREAT

***To be read aloud as rapidly as possible!***





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# DISCLAIMERS

**SERIOUS STUFF**

*Of course, I wouldn't deliberately put anything in a book like this that I didn't think was pretty close to being the truth and in pretty good agreement with every jot and tittle of the documents from people who are in charge; but, hey, I am only an ex-airline pilot. My intentions are that everything written here is to be considered subordinate to and subject to correction by reference to the plethora of "OFFICIAL" publications and documentation available from the Company, the FAA, Boeing Airplane Company, your Mother, or anybody else that has jurisdiction or oversight in these matters.*

*Those guys represent the "**right stuff**," not me! PERIOD!*

## REMINDER!

*This material is written for and intended to be used in the **SIMULATOR ONLY**. It does not imply or suggest that there is any carry over value to the operation of the "REAL" airplane. Of course, current company SOPs and FAA mandated procedures and operational guidelines **ALWAYS** supercede this information. Remember, this material is **STRICTLY** for study and review in preparation for the SIMULATOR CHECKRIDE and the ORAL EXAM. **PERIOD**!*

## WARNING:

**THIS DOCUMENT IS NOT INTENDED TO BE A SUBSTITUTE FOR APPROPRIATE OFFICIAL MATERIALS AND GUIDELINES!**

# a probably totally worthless DISCLAIMER

by the editor

***Mike Ray***

*What arrogant moron would somehow think in his wildest imaginations that he in any way had the authority or knowledge to write a manual about how to pass a check-ride on the Fabulous Boeing 747-400 Monster-Jet. Only an egotistical ex-airline pilot, with time on his hands, would wade into that forbidden territory, a no-man's land that even the engineers and test pilots would not venture to tread. Fearlessly, it is I (the fool that I am) that is willing to put down my meager and limited (sometimes outright wrong) knowledge into a book that preserves my ignorance for all posterity.*

*If past experience is any indication, there are a whole lot of you out there that are a lot smarter than I am, ...and are more than willing to tell me so ... but, bring it on. I welcome your comments, vituperating, yelling and screaming.*

*The whole notion here is that a bunch of ordinary, garden variety airline pilots can get together and pool their knowledge in some place where we can all benefit from each others comments and experiences. If I hear from you about how we can make this book better or how to change it to make it "right-er," then I will do it.*

*My plan is to make a series of "short" printing runs, attempting to keep the book up to date and continually improving ... but,* ***what is desperately needed is input from the troopers out in the trenches****.*

*Let's keep those cards and letters coming in.*

## the boring BIO

*Tall guy, bald head, mustache ... worked for United Airlines for over 32 years. Retired now. Married forever to his teenage sweetheart. Two gorgeous daughters and three angelic granddaughters. He is a fulfilled and happy man.*


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CAPTAIN, UAL ret.

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# ACKNOWLEDGEMENTS

## THESE GUYS HELPED ME!

*Of course,  I wouldn't want to tell you the names of all the people who helped me out here, because then this would turn into some kinda written grammy awards thing.
I'd like to than God, my Mother, etc.
So here are the people who spent a lot of their own precious time looking over the raw material and actually getting involved in the preparation of this manual.*

*First, there wouldn't be a 747-400 manual if Captain Jim Marshall hadn't kept up the pressure. This guy was always asking me when it would be ready and how was I doing.*

*Dr. Jack Rubino, who is a long-long time friend and probably has more knowledge and training in jet airplanes than most full time line pilots. I don't know what I would have done without his willingness to be a part of this process.*

*Capt. Bill Dobbs who took time to spend with me on all those details that I couldn't understand.*

*My readers and proofers who spent their layovers and potential TV watching time to pore over the drafts and present their corrections and additions.*

*Capt. Jim Marshall,
Dr. Jack Rubino
Capt. Bill Dobbs,
Capt. Ernie Yoshimoto,
Capt. Don Weber,
Capt. Rob Toro.*

*If you see these guys around, tell them thank you for me.*

*My Editor, Teri Lee VanNyhuis who waded through material of which she had no knowledge. Keeping me straight on my punctuation and spelling.*

*My printer, and longtime friend, David Marlow for all his assistance in making ideas become reality.*

*My wonderful, understanding wife, Midge, for all  her assistance in making this "manual" business operate smoothly.*

*Thank you to you all,*

*Mike*

*Captain Michael J. Ray, President
University of Temecula Press, Inc.*

# DEDICATION

This book is dedicated to
my two beautiful daughters:

**Shannon Lynne**
and
**Teri Lee**

*"They made those thousands of hours commuting to work all worthwhile."*

***I KNOW there is a GOD, because there is YOU!***

*Some personal thoughts about...*

# *FLYING THE BOEING 747-400*

*There is a certain amount of arrogance for a mere human being to assume that somehow they can actually control what is arguably the largest and most complicated flying machine ever to achieve airliner status. It was my personal great fortune to have been among the chosen few to actually be a Captain on this incredible airplane.*

*Without a doubt, it is the most pilot friendly flight deck I ever sat in. She has the most powerful set of throttles I have ever pushed. The comfortable yoke had the silky smooth feel of a race car and the airplane responds like a gazelle. In short, the airplane is a wonder.*

*The downside of the whole -400 operation was the long range mission. Take-off is made at incredibly heavy gross weights and the flight plans require that we fly for hours in cruise using automated flight controls and navigation aids and once we burn down the fuel and get to destination, only get to land the light and extremely responsive airplane once or twice a month.*

*Even though the heavy airplane (some models up to 1.2 million pounds gross) handles nicely and has plenty of power margin for engine failure; it literally dances when it is light. A light -400 will leap forward and upward when the power is even lightly pushed forward. Truly amazing. And with all those tires and articulated trucks on the undercarriage, it is very difficult to make a bad landing.*

*I have a friend who used to say, "You love the airplane; but you hate the mission."*

Mike

# *A note about the differences you will encounter between this manual and your specific airplane/simulation.*

*The layout of the cockpit, the way the material is presented, and the verbiage used may, in fact, differ from airline to airline and from flight simulation to flight simulation. It is a fact that this is a problem for Mr. Boeing and he would much prefer it if everyone had the exact same cockpit set-up. This doesn't happen for several reasons.*
*One reason is that the "experts" at the various airlines have differing views as to what is important and what is not. As incredible as it may seem, these "customers" are willing to pay considerable sums of money to Mr. Boeing to move and alter the basic design to accommodate their individual desires. They will demand that Mr. Boeing rewire and move basic items from the Boeing original design for, what I consider usually to be petty considerations.*
*Then what happens when airline "A" buys a used airplane from airline "B" is that the differences become glaring and annoying when a pilot flies the different airplanes. What you will notice, if you are working for a large airline, is that eventually that airline will acquire a "fleet" of airplanes with many differing and unique cockpit and system layouts.*

*So, when you read this book, you will try and compare the systems controls and layout with what you are familiar with ... and you will notice that there are probably lots of those differences. This DOES NOT negate the value of this manual. These differences to be expected.*

*It should be noted, that when the simulations or manuals (such as this one) are developed, the writers seek to display a "common" or representative cockpit layout that is useful to the most situations .*

*That is what I have tried to do in this presentation. The basic procedures and airplane layout presented here is from my experience at a major airline. I consider it to be a good representation and represents a very basic set of procedures that should be applicable to whatever airplane or simulation you are flying.*

*Here is what I suggest you do when you notice that there are some significant differences between what you are looking at in this book and what you are seeing in your specific personal airline/simulation ...*

***USE THE INFORMATION WHERE YOU CAN**.*
*It never hurts to take another point of view and understand it.*



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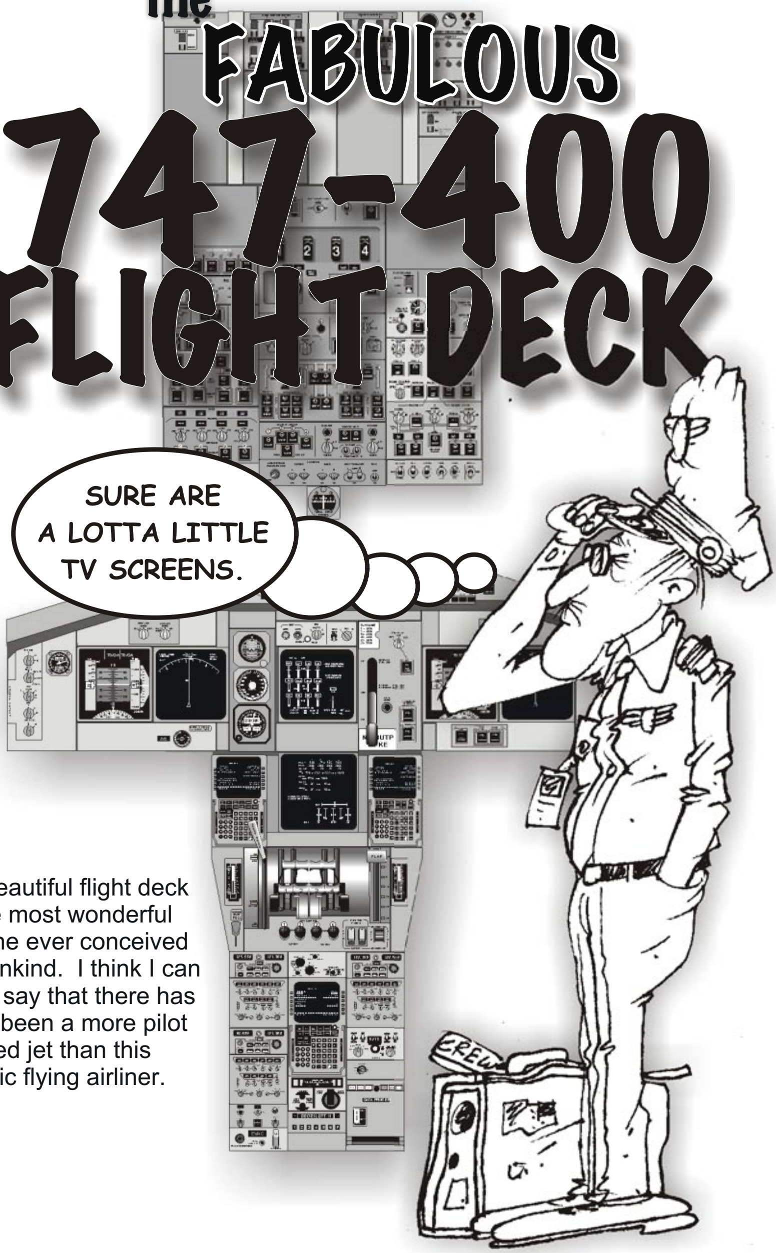
# INTRODUCING the FABULOUS 747-400 FLIGHT DECK




The beautiful flight deck for the most wonderful airplane ever conceived by mankind. I think I can safely say that there has never been a more pilot oriented jet than this gigantic flying airliner.





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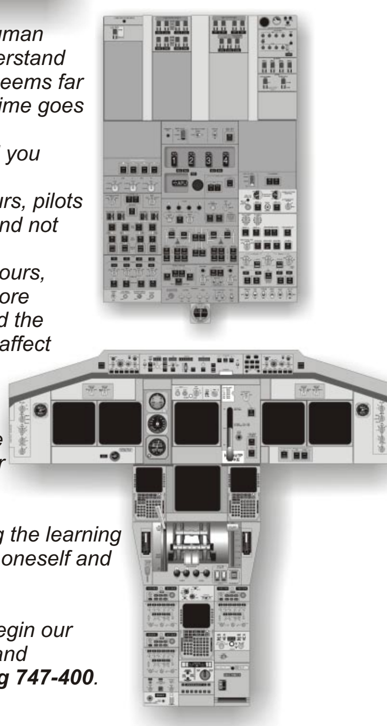
*The first time a pilot climbs up the stairs and onto the flight-deck, the cockpit seems incredibly complex. It was my experience, however, that it becomes something intensely beautiful and extremely functional, and the more you use it, the more you get used to it. While there is a fairly steep learning curve, it eventually becomes a part of you. As a pilot, you will find that those Boeing master craftsmen who created it had magic in their minds.*

*So, in order to achieve the level of understanding and familiarity with it, we must start with the basics. To help you start to begin to assimilate the diverse collection of strange and unknown dials and gauges, I have broken the 747-400 universe into 9 separate domains:*

**UPPER OVERHEAD PANEL**
**MAIN OVERHEAD PANEL**
**MCP PANEL**
**LEFT FORWARD PANEL**
**CENTER FORWARD PANEL**
**RIGHT FORWARD PANEL**
**CDU PANEL**
**THROTTLE QUADRANT**
**LOWER CONSOLE**

**LIVE IT,
FEEL IT,
KNOW IT,
LOVE IT.**



*It seems impossible, at first, that a mere human being could come to comprehend and understand the totality of the -400 electronics suite. It seems far too complex to grasp; but I assure you as time goes by, more and more of the operational understanding penetrates your psyche and you begin to “get it.”*
*I personally feel that up until about 100 hours, pilots will be operating on mostly “conditioning” and not true “learning.”*
*Then, magically, somewhere around 300 hours, they begin to operate the airplane with a more complete understanding of the systems and the way seemingly unrelated systems actually affect each other. They begin to “learn’ and actually reach “habituation” in more and more areas.*
*However, there is an inherent desire on the part of pilots to reach a certain point in their learning and to stagnate at that “comfort zone.” I suggest that the student pilot must ALWAYS remain a student, always pushing the learning envelope and continue to demand more of oneself and ones information bank.*

*To that end, let’s begin our journey. Let’s begin our romance and love affair with our beautiful and demanding mistress: **The fabulous Boeing 747-400**.*

*Behold; She waits.*



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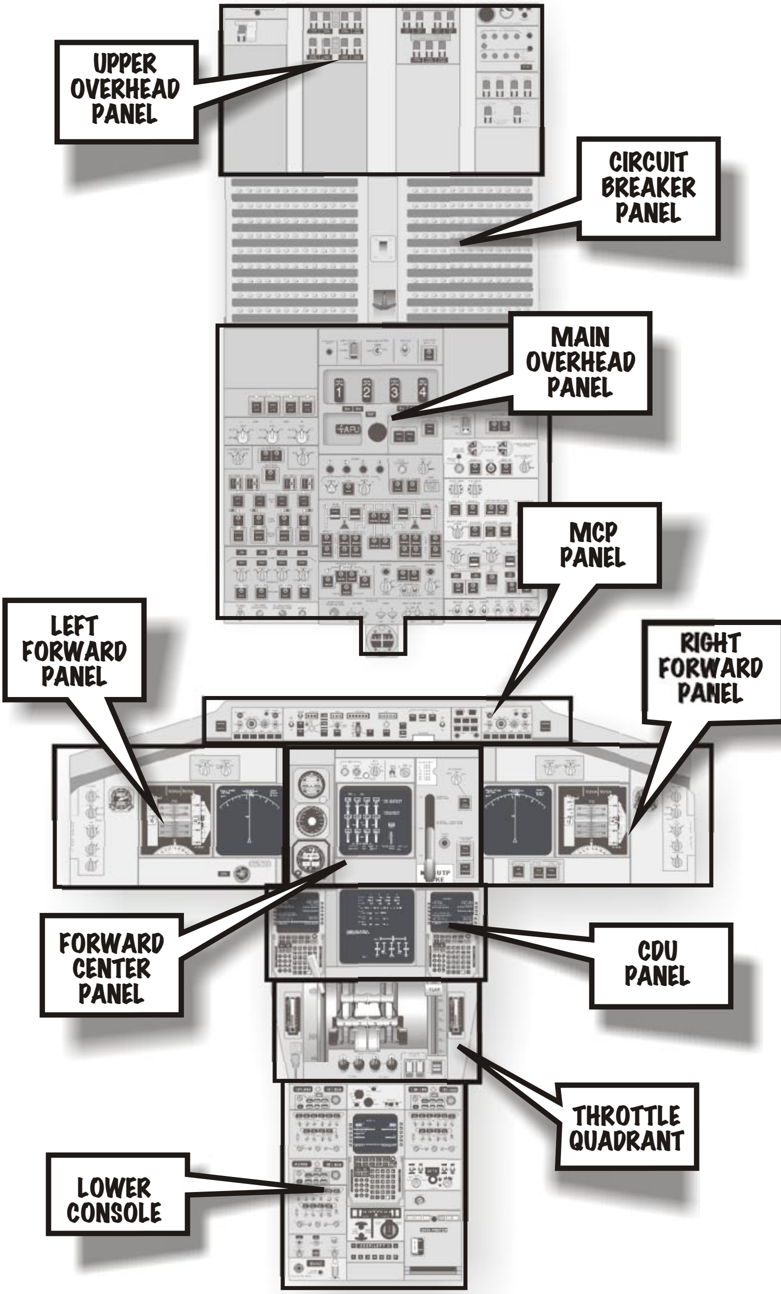
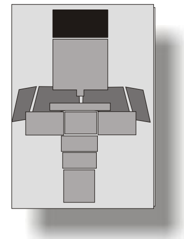
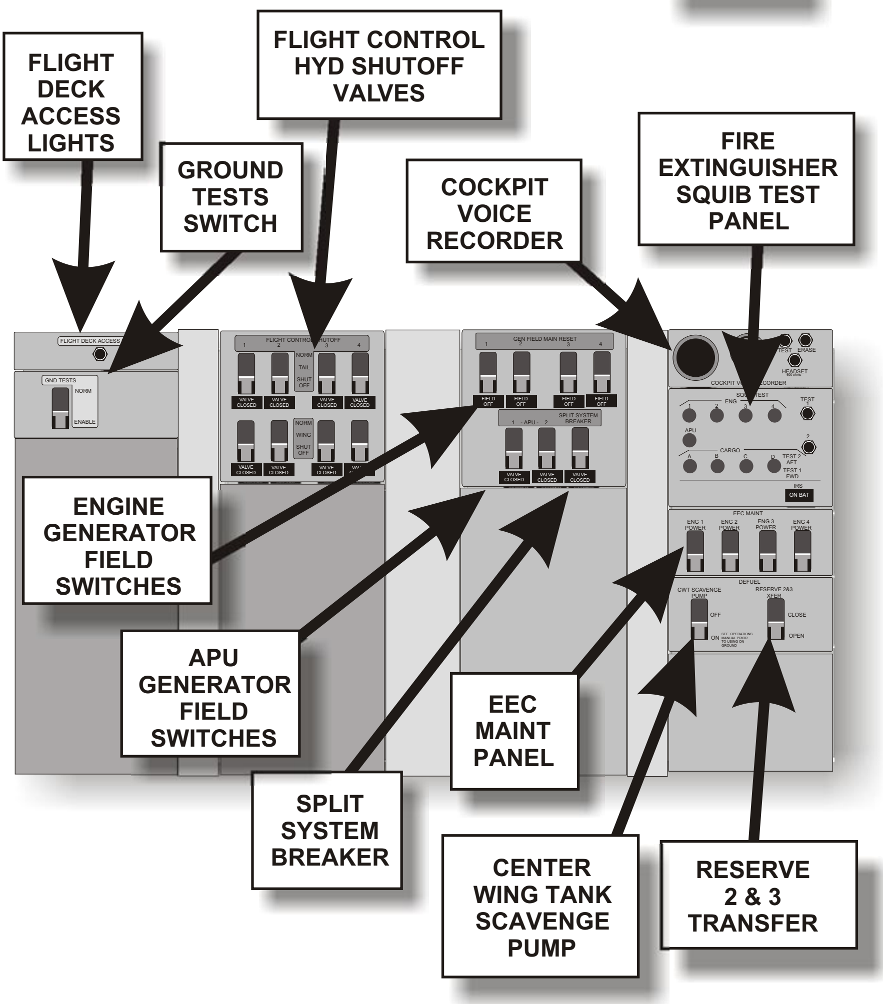
## The 10 parts of

# the 747-400 universe



# UPPER OVERHEAD PANEL







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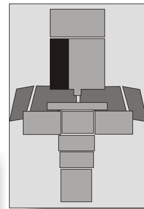
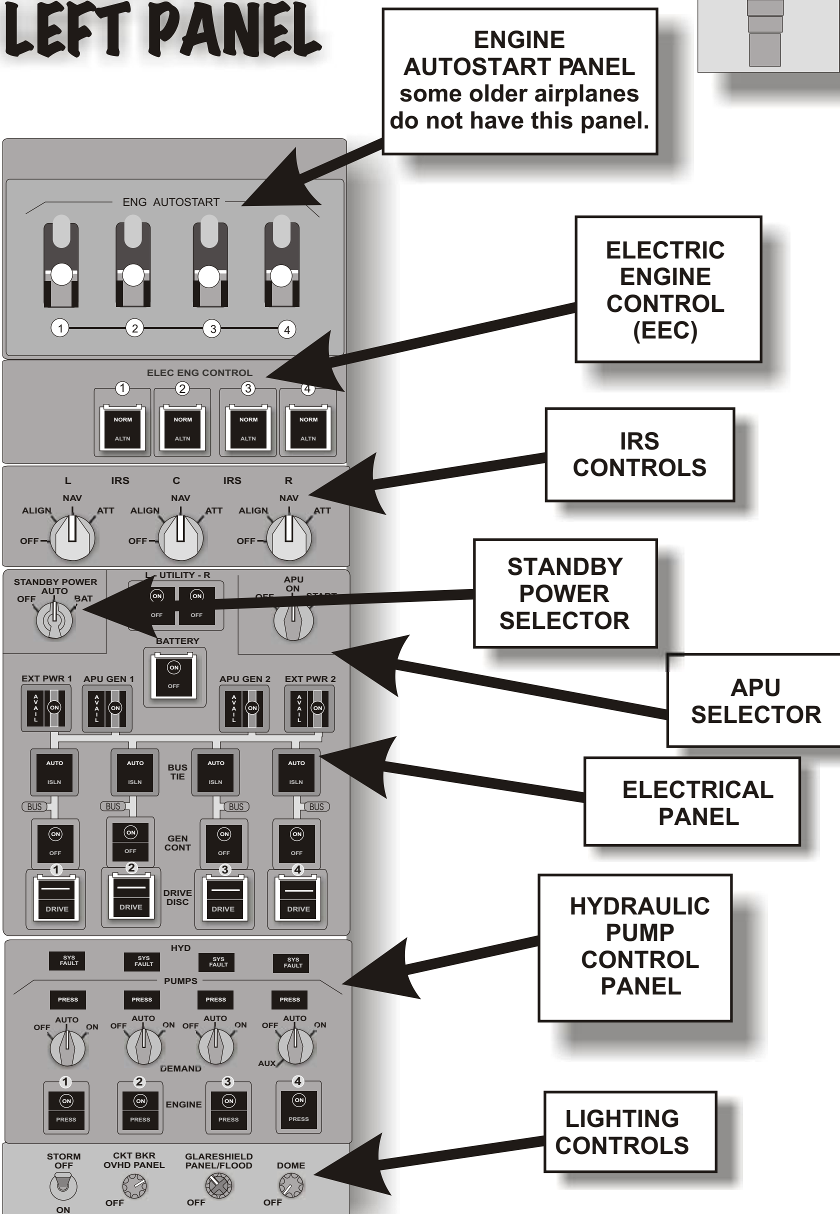
# MAIN OVERHEAD LEFT PANEL





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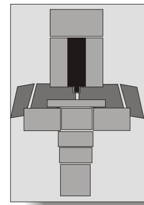
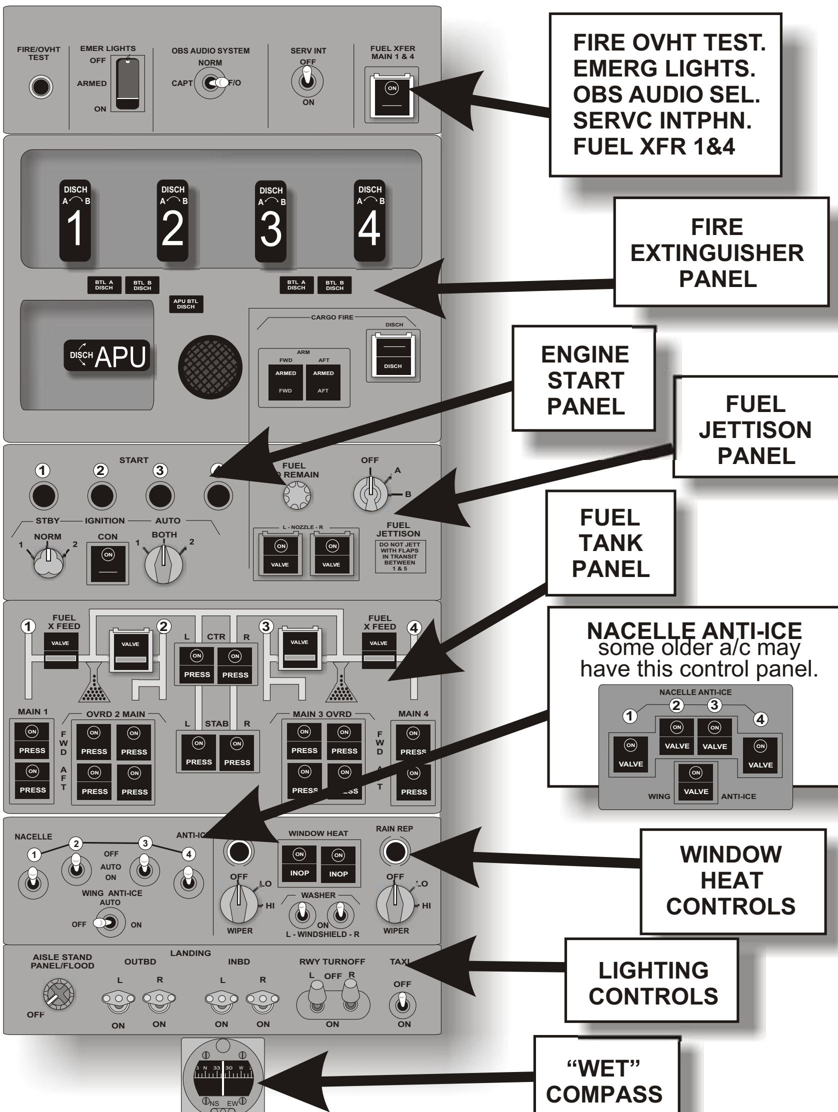


# MAIN OVERHEAD CENTER PANEL





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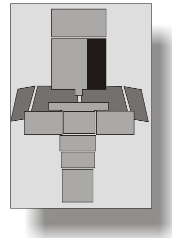
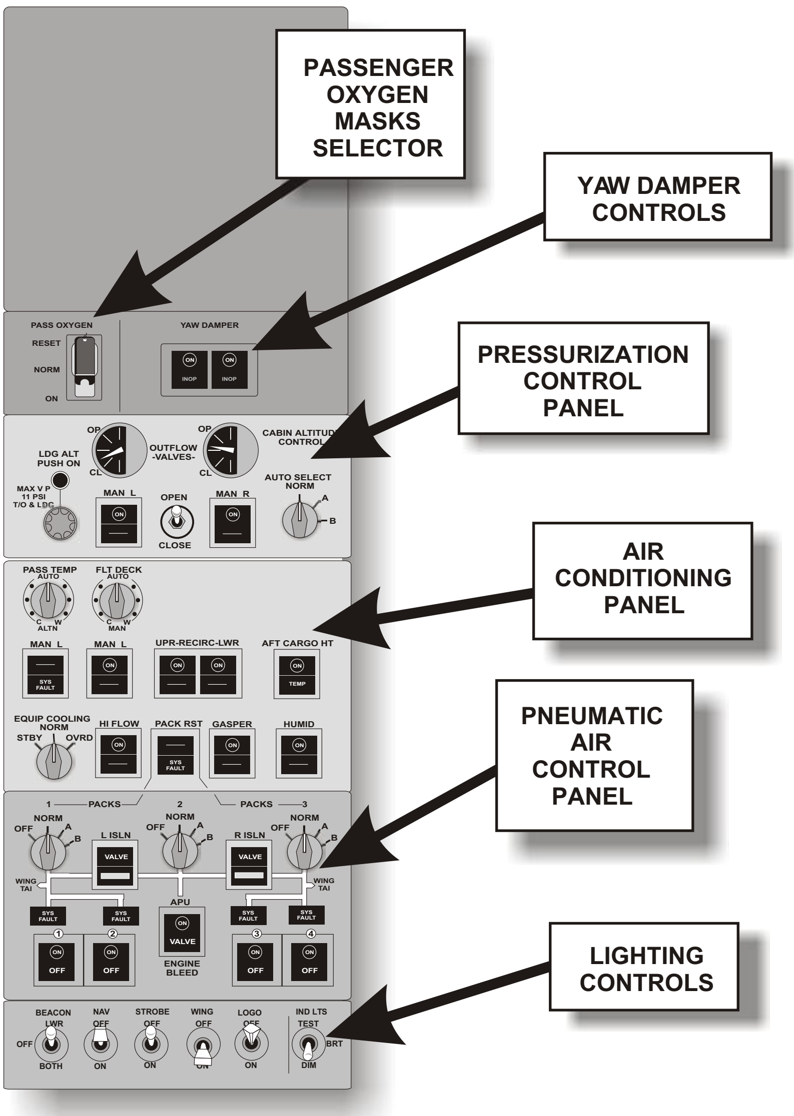
# MAIN OVERHEAD RIGHT PANEL





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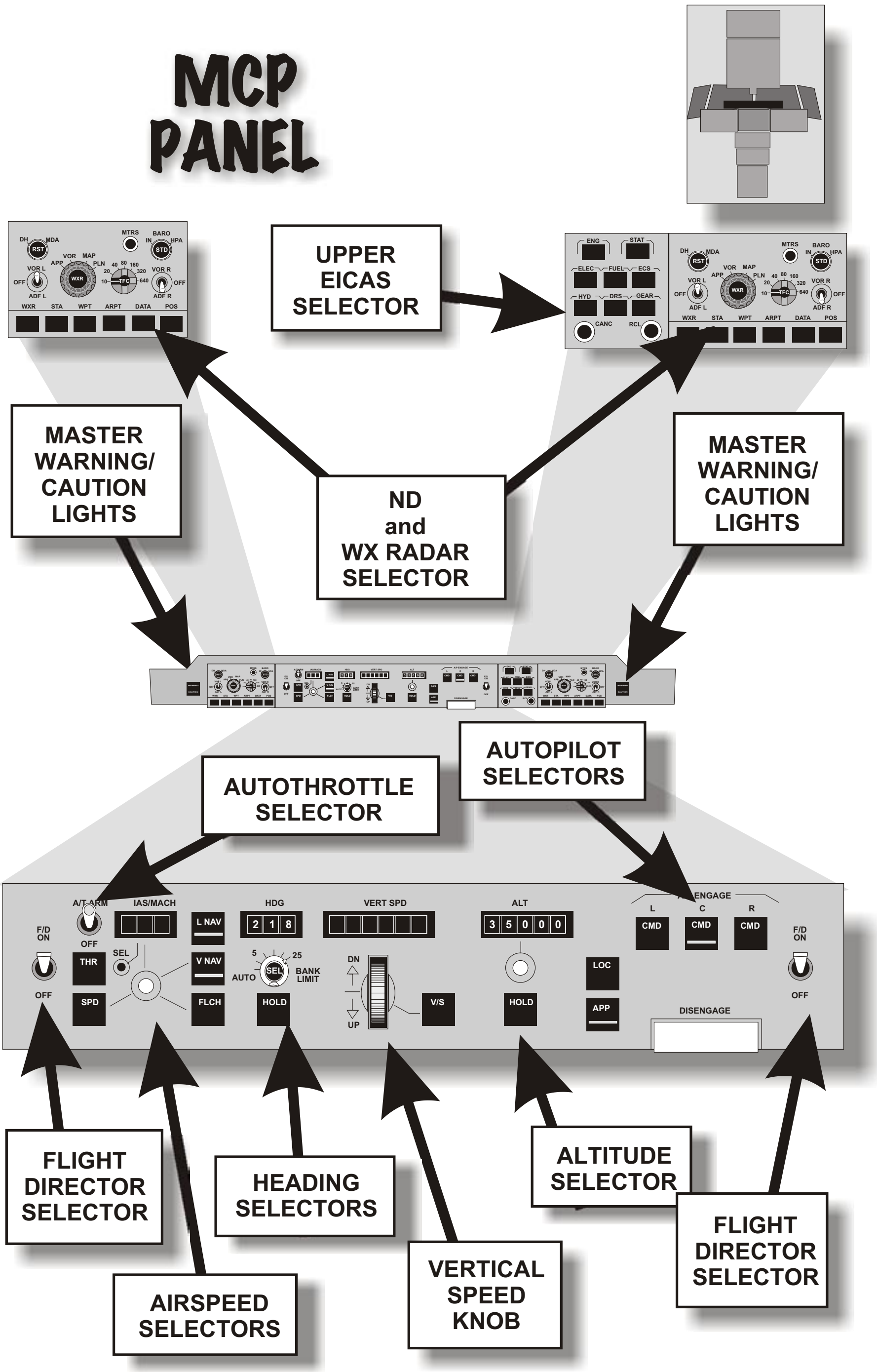
# MCP PANEL





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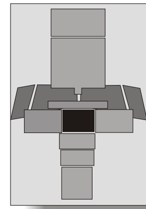
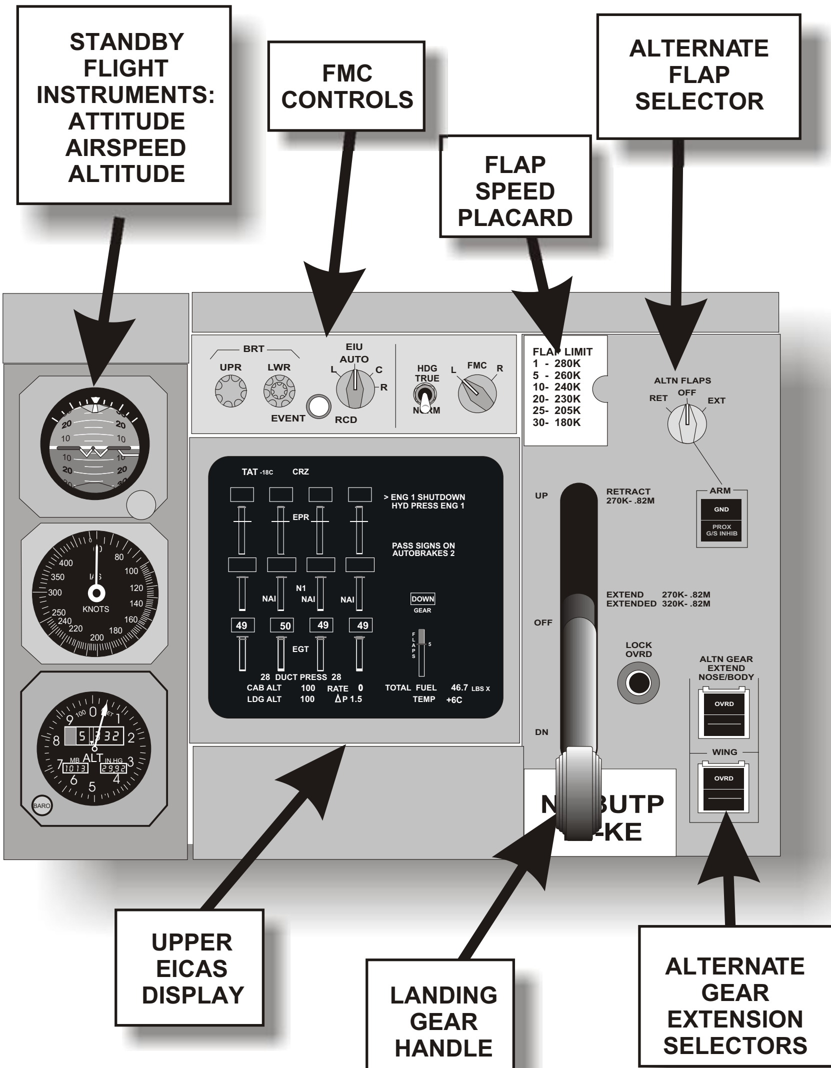
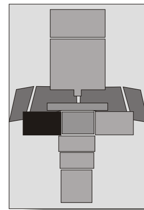
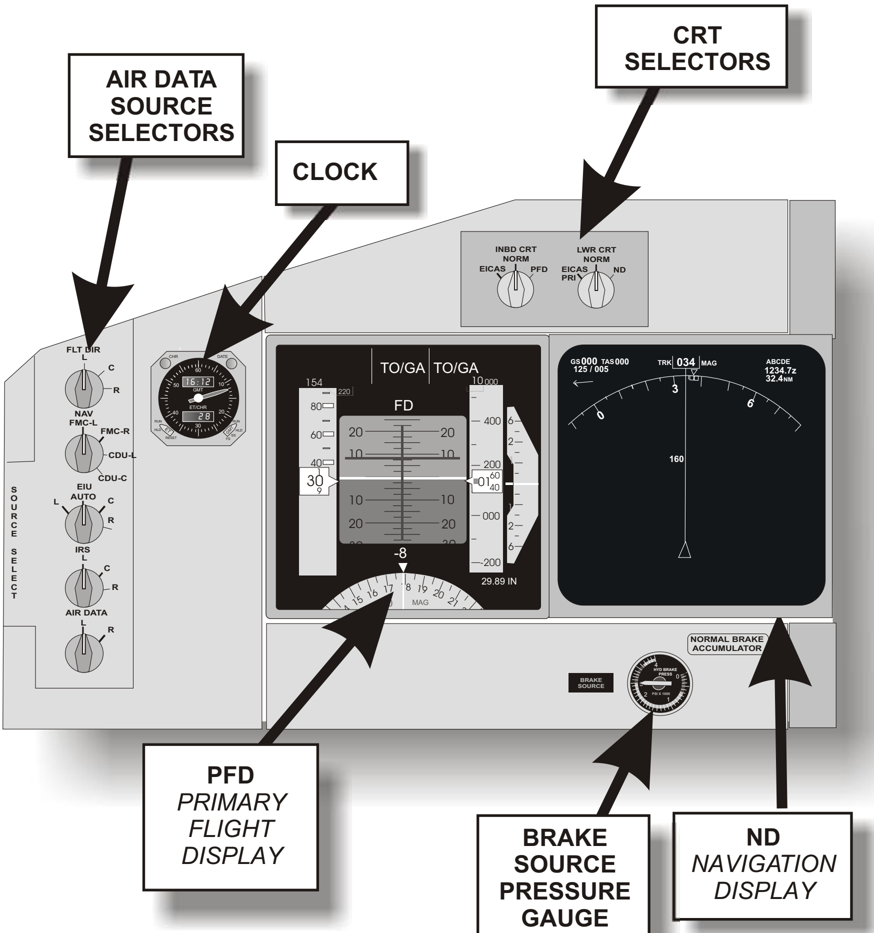


# FORWARD INSTRUMENT PANEL





# LEFT FORWARD INSTRUMENT PANEL (CAPTAIN'S)





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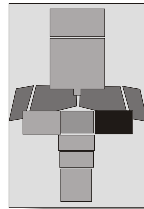
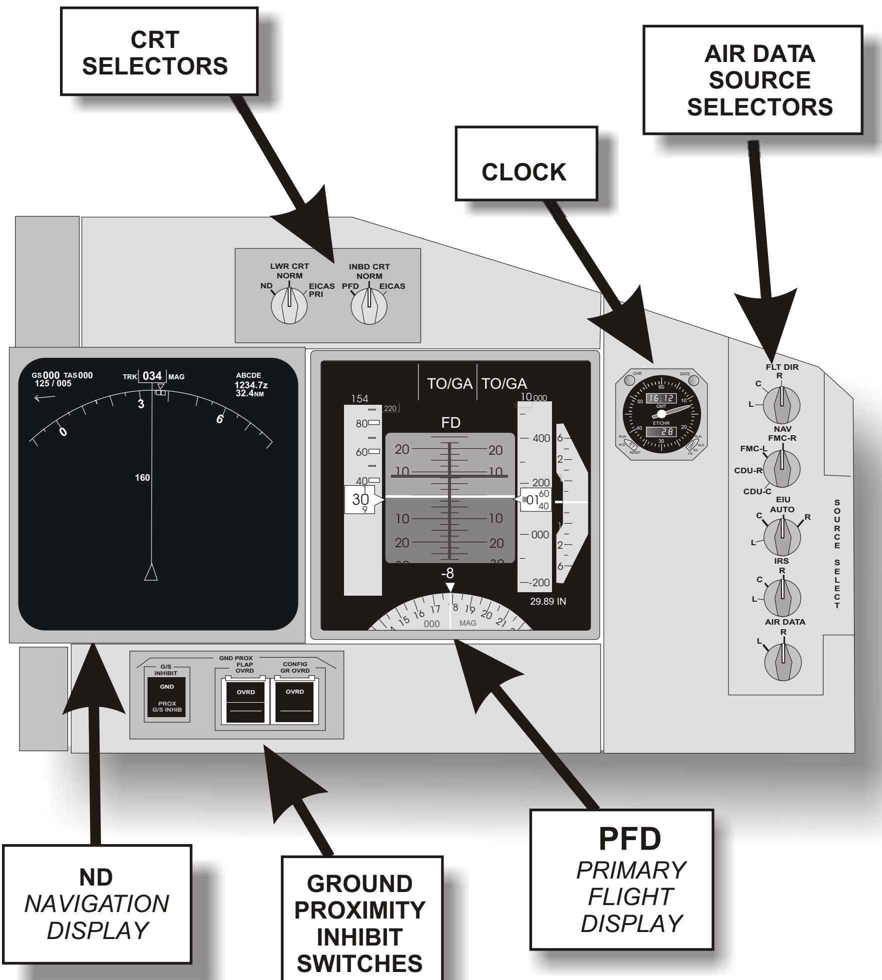
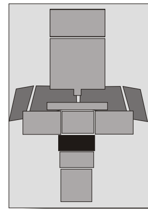
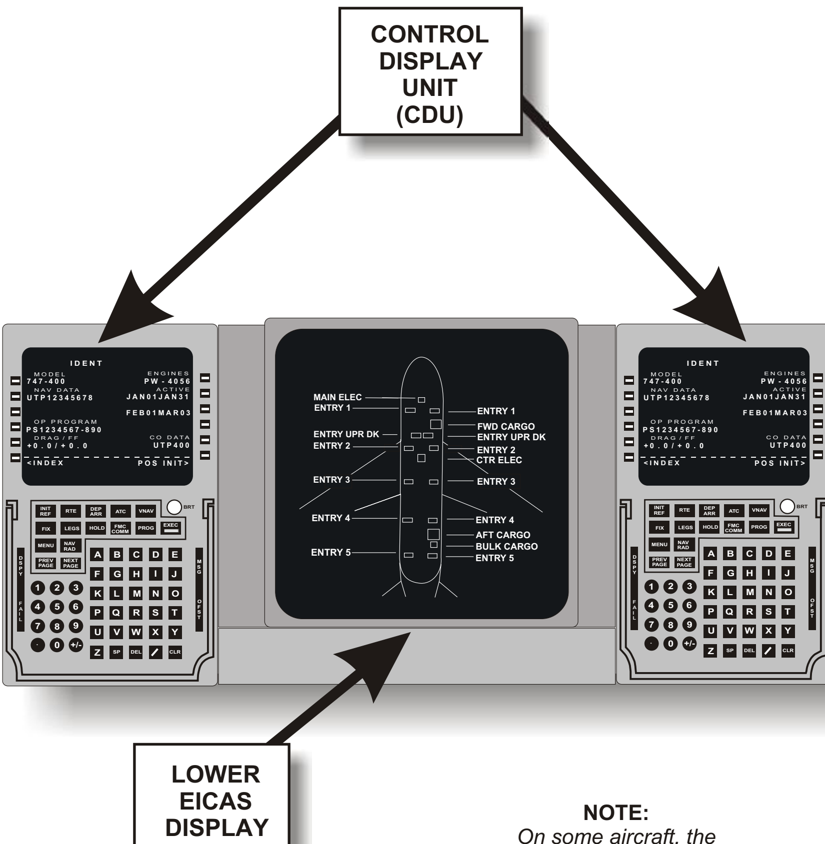
# RIGHT FORWARD INSTRUMENT PANEL (First Officer's)







# CDU PANEL




**NOTE:**

*On some aircraft, the overhead hatch is represented by a symbol on the "doors" synoptic..*





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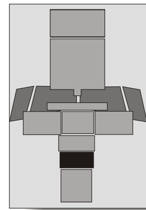
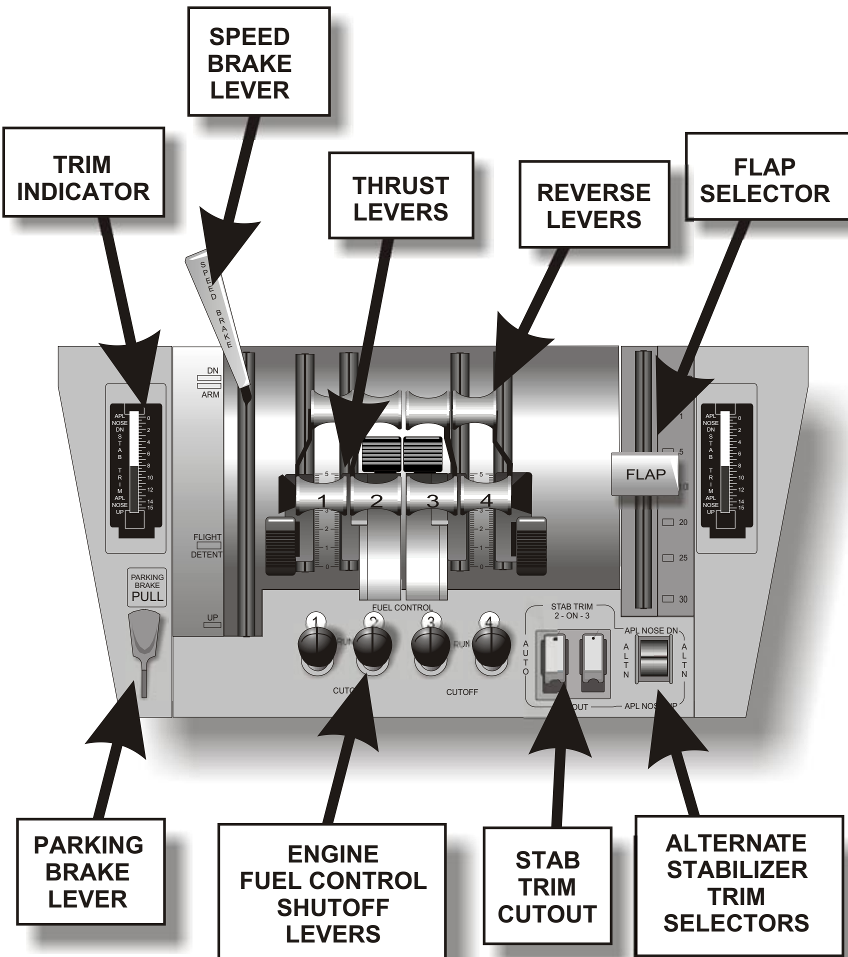


# THROTTLE QUADRANT



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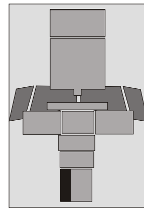
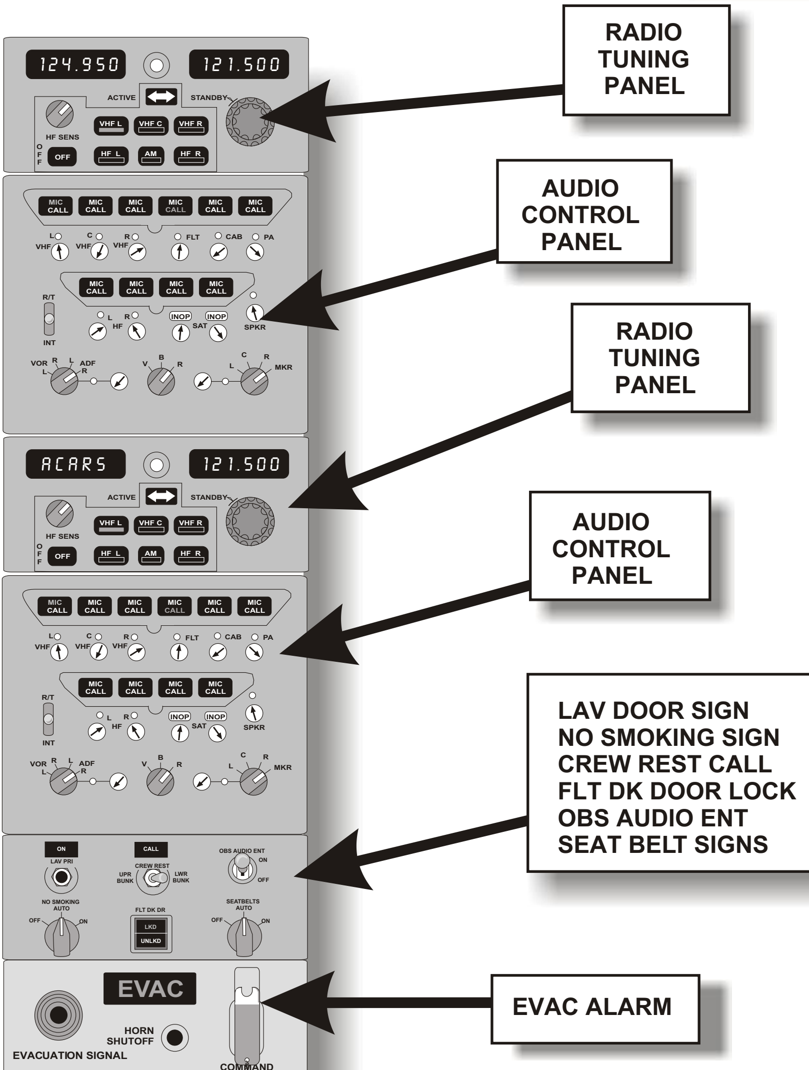
# LOWER CONSOLE (LEFT PANEL)







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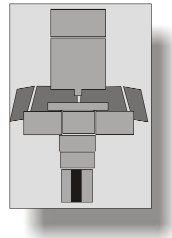
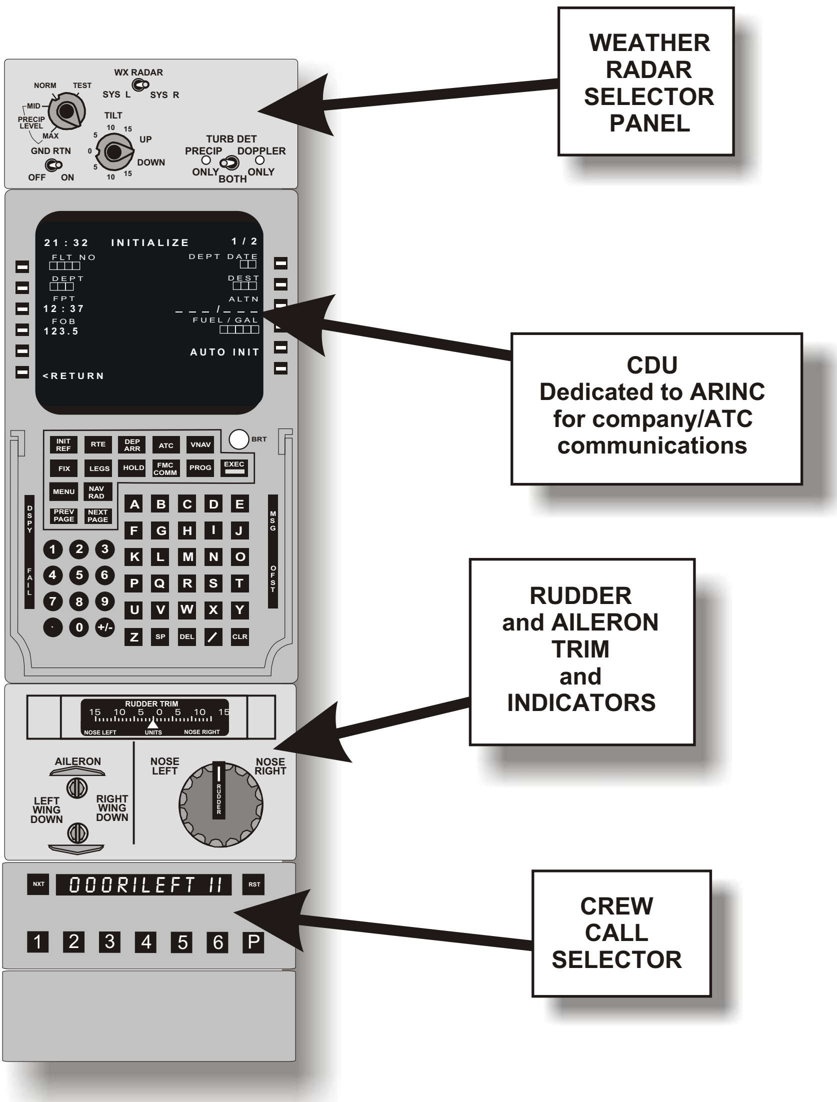
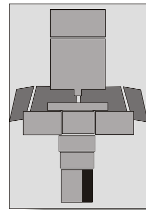
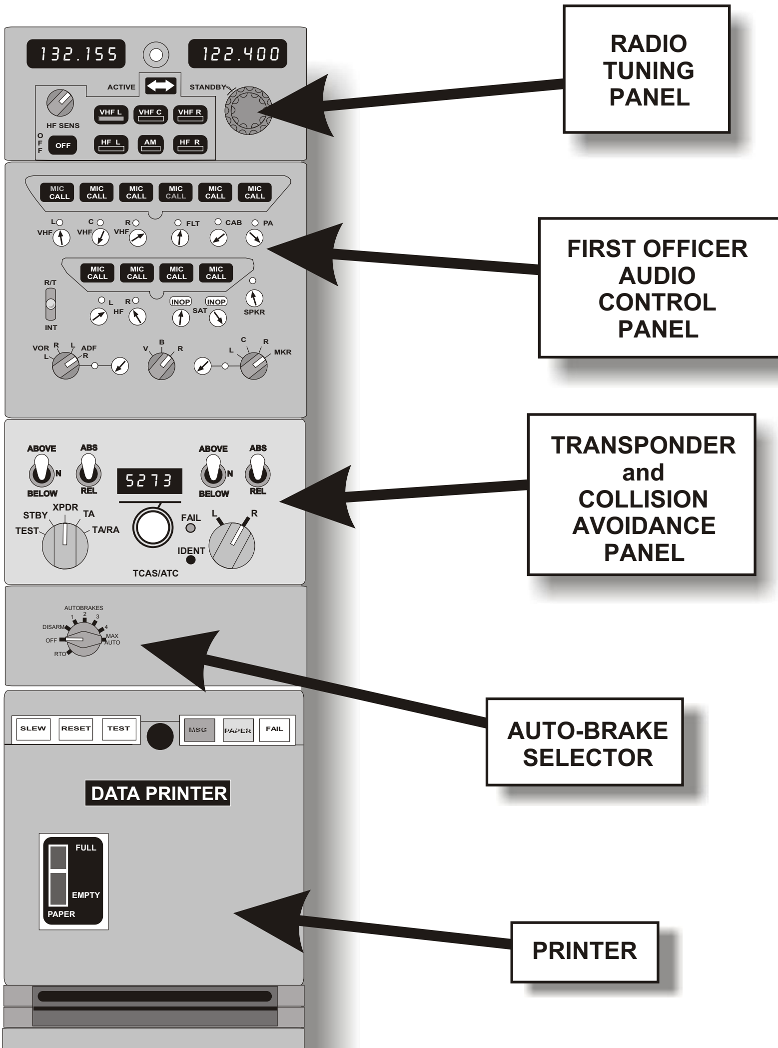
# LOWER CONSOLE (CENTER PANEL)





# LOWER CONSOLE (RIGHT PANEL)







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747v1intro02

# the incredible BOEING 747-400 GLASS

## Some boring introductory comments

What makes the Boeing 747-400 different from earlier jurassic versions of this fabulous flying machine? The answer lies in the way that modern technology has been integrated into the pilot-airplane interface. It has completely altered the view of the relationship between the pilot and the operating systems of the airplane. While this Boeing masterpiece may be the most complex air machine ever to be operated in the public sector … the onboard computers and control manipulation devices have come together to create an absolutely fantastic blending of man and machine. While initially, for the pilot who is new to "glass," the learning curve seems steep, as the whole concept becomes more clear, the sheer genius of the displays and the knobs and buttons becomes clear.
This system; referred to as the "glass" (EFIS-Electronic Flight Instrument System) has proven to be far superior to the old "steam" gauges of the past.

## *How the mere human pilot operates the 747-400*

The pilot uses four BASIC tools:

There are two ***DISPLAY*** tools:
- The PFD (Primary Flight Display)
- The ND (Navigation Display Unit).

There are two ***CONTROL*** tools:
- The CDU (Control Display Unit)
- The MCP (Mode Control Panel)

These send information to the FMC (Flight Management Computer) which also receives input from the IRS' (Inertial Reference System) and sends the appropriate signals to the control surface and the engines to accomplish the desired flight path.

## Let's break these components out and look at them one at a time:



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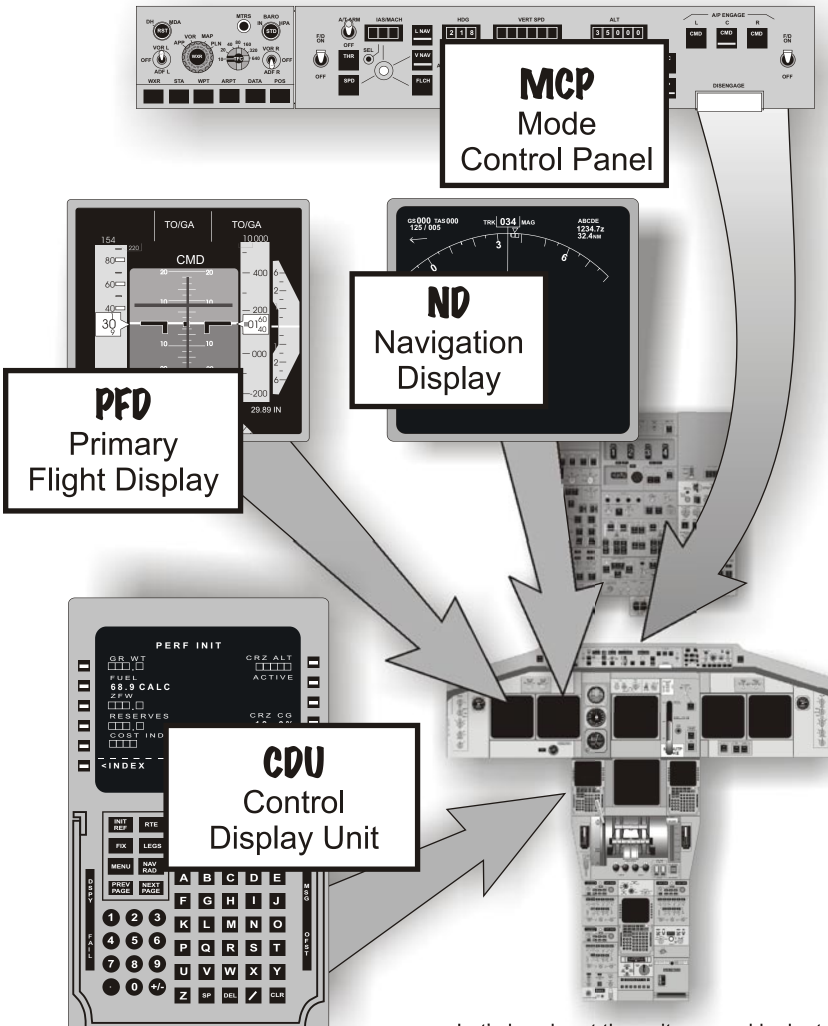
Initially the TOTALLY BAFFLING glass cockpit seems impossible, but it is actually "SIMPLE" … once you know what makes it work.  The Boeing system has a "common" design concept that is used on all their glass airplanes and here is a very brief description of that EFIS system in it's *SIMPLIFIED* bare bones.

# The **BIG FOUR** of the "**GLASS**" flightdeck.

There are four **BASIC** parts to the system. Here are those fundamental "cockpit" parts that the pilot must learn to manipulate to "*fly the glass*."




Let's break out these items and look at them in isolation; one at a time.

# The CDU

Control Display Unit

This is the pilot's access port to the very heart of the computerized control mechanisms of the Boeing 747-400. It is the interface between the human and the Flight Management Computer (FMC). This is the device that we use to talk to the airplane and tell it what we want it to do.

Let's understand some of the very basic things about how to operate this simple unit.

Before we get to the content of the screens, let's understand how to manipulate the controls on the CDU itself. Here are 5 areas we will cover initially:

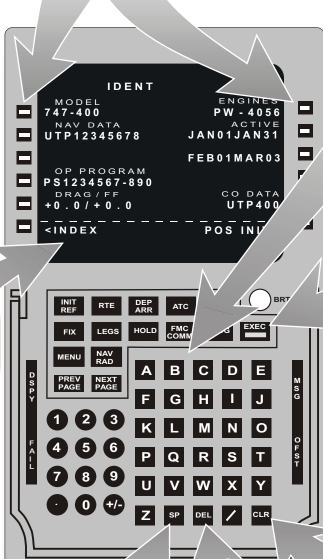
## LINE SELECT KEYS

These are the twelve little buttons running down both sides of the screen.

*They are numbered from the top down; for example if I said, "Line select four right," I would mean push the fourth button from the top on the right side.*

## INPUT KEYPAD

This is like the "keyboard" of the computer. when we type in information, it goes onto the "**SCRATCH PAD.**"




## EXECUTE KEY

This is the key that sends the information that is input to the **CDU,** to the **FMC** or **F**light **M**anangement **C**omputer

***Probably the MOST IMPORTANT key on the CDU***. It is considered GOOD FORM to have BOTH pilots agree with the information on the screen **BEFORE** the ***EXEC*** BUTTON is pushed.

## SCRATCH PAD

This is the "empty" area below the word "index."

*Entries can be made using the "INPUT KEYS" or can come from the FMC.*

Some care MUST be shown if there are two pilots, because inputting conflicting information to the FMC can cause problems.

***BECAUSE OF THAT, IT IS GENERALLY CONSIDERED BAD FORM FOR BOTH PILOTS TO BE INPUTTING DATA INTO THE COMPUTER AT THE SAME TIME.***

## SP and DELETE and CLEAR keys

**DEL** key places the word DELETE in the scratchpad, and when Line Selected will delete that selected line on the screen, IF the information is deletable.
**CLR** key simply removes the last letter of the scratch pad entry (whole entry if held down long enough).
**SP** key enters a space in the scratchpad when using the CDU for ACARS or SATCOM





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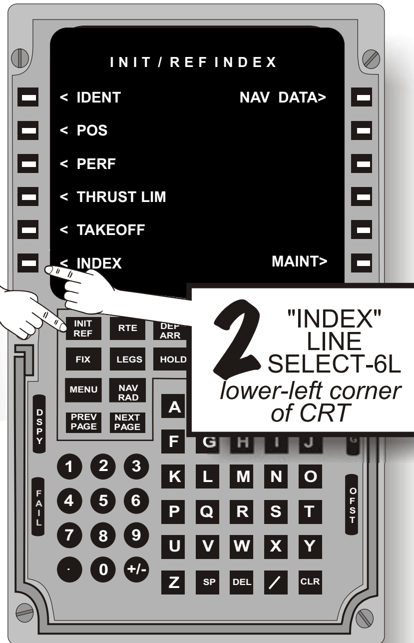
# The CDU

**1** INIT REF button
*upper-left corner of keypad*




**2** "INDEX" LINE SELECT-6L
*lower-left corner of CRT*

Simply do these **2** KEYSTROKES !

## THE SIMPLE SECRET of getting into THE "GLASS"

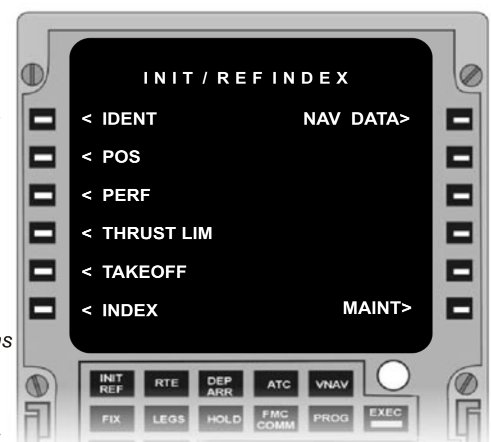
There are TWO SIMPLE KEYSTROKES that will give you access to the whole GUTS of the FMC/CDU. ANYTIME you want to go into the very heart of the "MAGIC BOX,"


***which causes the CDU "BOX" to reveal ...***

## "The 20"

***CDU/FMC pages***

**12 CDU KEYS** **PLUS** **8 CRT PAGES**




*Each of these pages may have additional related pages so that there are a large total number of actual pages available for the pilot to use.*

*Getting familiar with all the options available and using the FMC to it's maximum potential requires numerous hours of actual hands on operation. In this book, we will only expose the reader to a very few of the operations for flight.*

The **CDU** continued ...

Here is a simple sample problem to demonstrate how to enter data into the CDU using the keypad.

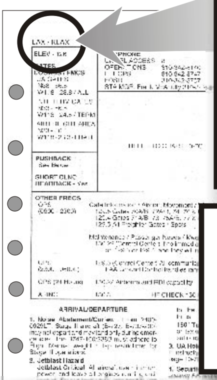
# THE KEYPAD TECHNIQUE

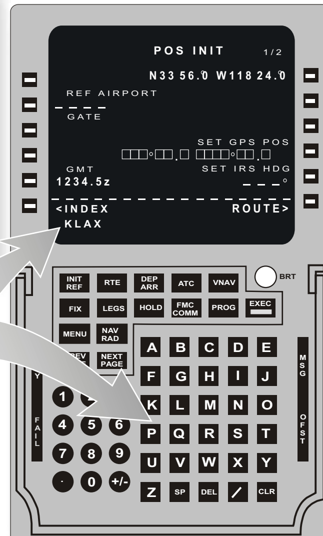
## HOW TO ...
***use the CDU to input data to FMC.***

*NOTE:*
*This is just an aside at this time, but notice:*
*1. DASHED lines indicate data entry is OPTIONAL.*
*2. BOX prompts indicate that data entry is REQUIRED.*

In our example, we wish to tell the computer where the starting airport is. For our example, let's assume that we are at Los Angeles International Airport.

***Step 1***: Get valid information. For this, we look at our 10-7 chart (or other suitable source) and see at the top portion that the international symbol for Los Angeles International Airport is : **KLAX**

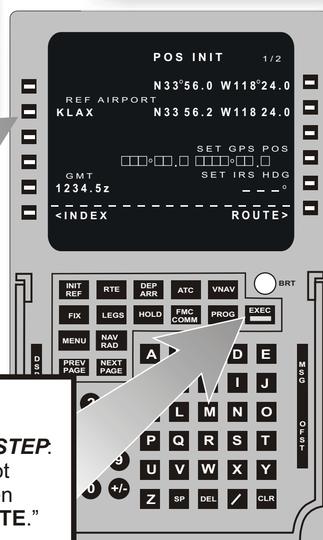



***Step 2***: We use the keypad to type KLAX and notice that it appears in the scratchpad.

***Step 3***: We ***CONFIRM THAT IT IS THE CORRECT*** spelling. If it is not, we can either "tap" the **CLR** key and "erase" the word for the end and then type in the correct spelling, or we can hold down the **CLR** key until the whole word is erased and start over.

***Step 4***: "LINE SELECT 2L." That means push the second button from the top (the one that is opposite the dashed line where we want our entry to go).
***CONFIRM*** that the entry has been placed where the dashed line was.




***Step 5***: ***MOST IMPORTANT STEP***. Have other pilot **CONFIRM**, then press "**EXECUTE**."

The **CDU** continued ...

***HOW TO ...***
***use the CDU to input data to FMC.***

# *THE LINE SELECT KEY TECHNIQUE*


***Step 1***: Get valid information. We can see that the "LAST POS" is very close to the "AIRPORT" longitude and latitude. It is a valid check that the airplane last position should be on the airport we have selected.
***NOTE****: It "could" be that the IRS itself was replaced with an IRS unit flown in from another station and may have not been updated, for example.*

***Step 2***: LIne select the information you wish to place in the scratchpad. In our example, we have elected to tell the IRS to use our "LAST POS" for our "SET IRS POS" position.
***NOTE****: It is NOT required for the IRS to know the exact position of the airplane. It could have been towed from a remote parking area without power, for example.*

***Step 3***: ***CONFIRM THAT THE CORRECT INFORMATION*** *is placed in the scratchpad*.

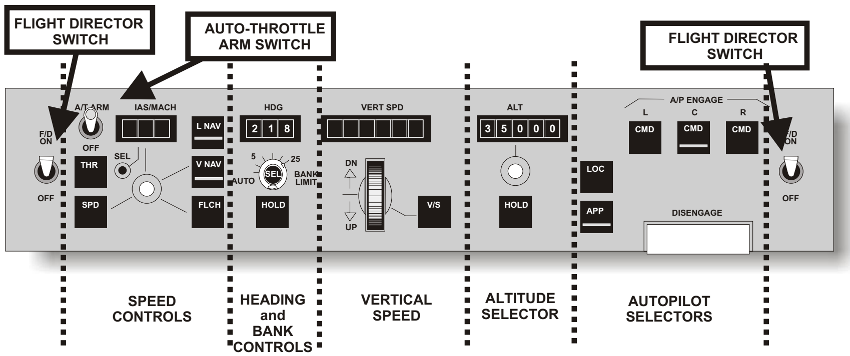
***Step 4***: **LINE SELECT 4R**
… that is, push the button abeam the boxes labelled "**SET IRS POS**" and observe the boxes replaced with the position selected. **EXECUTE** light should come on.

***Step 5***: ***MOST IMPORTANT STEP***: Have other pilot **CONFIRM**, then press "**EXECUTE**" button. Light should go out. Information is now sent to the FMC.

*The second part of the EFIS that we want to look at is:*

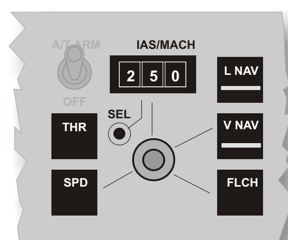
# MCP
## Mode Control Panel

*You will quickly become used to integrating these various units into your flight management flows and your hands and eyes will be darting from one place to another in an appropriate manner. However, at this point, while you are still new to the systems, it will be useful to break out the various features of the MCP and analyze each one in cursory detail.*



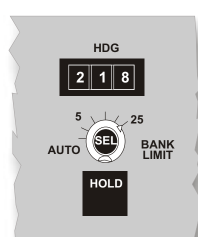

*There are 5 sections of the MCP. They can be used independently or as an integrated suite, with or without the autopilot. They provide input to both the autopilot and the PFD and can be used to actually control the airplane or merely as advisory indicators.*

## SPEED CONTROLS




*The 5 different speed selections each have their own venue of operation. We will discuss them more in detail later in the text.*
*The window can be set using the selector knob and is tied directly to the "COMMAND SPEED BUG" on the AIRSPEED INDICATOR.*

## HEADING and BANK CONTROLS




*The* ***HEADING KNOB*** *inserts the desired heading into the indicator on the MCP … it also slews the heading on the ND (NAVIGATION DISPLAY) and represents (usually) the heading that the pilot desires the airplane to turn towards. If the airplane is operating in modes other than "heading select," the heading selector is de-activated even though the "buck teeth" and the dashed course line are still displayed on the ND..*
*There'll be more to say about this later.*

***BANK ANGLES*** *are critical at altitude where excessive bank angles "may" compromise the airplane's stall margin during rough air operations. Further, during turns at lower altitudes when under the control of ATC, their expectation will be that the pilot will use 25 degree bank turns.*
*Once again, the bank angle limiter only works in the heading select mode.*



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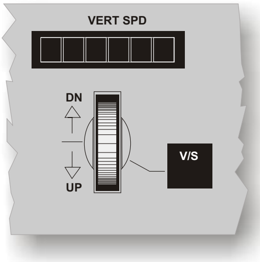
## VERTICAL SPEED CONTROLS

*Pushing the selector and "rolling" the thumb wheel will induce a vertical speed indication on the PFD. If on autopilot, the airplane will attempt to pitch up or down to meet the selected vertical speed.*

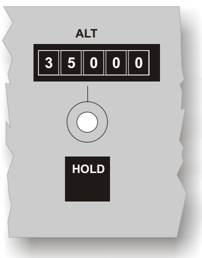



*If manually flown, the pitch bar on the PFD will indicate the appropriate pitch for the pilot to use.*

*If V/S is selected when FLCH or VNAV is engaged, then (if the AUTO-THROTTLES are engaged) the throttle will retard or increase so as to maintain the speed indicated on the SPEED SELECTOR.*

## ALTITUDE SELECTOR

*With a target altitude set in this window, and using the FLCH (referred to as "FLITCH"), the airplane will attempt to go to that altitude.*
*If the AUTO-THROTTLES are engaged, it will use whatever power is necessary up to "CLIMB POWER" or (if descending) retards the throttles to IDLE.*

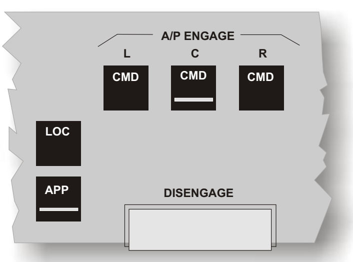



*The FLCH speed is displayed in each PFD, and*
*SPD window opens, and*
*FLCH SPD opens in FMA (PITCH WINDOW).*

***DETAIL**: If the aircraft thinks it can complete the altitude change in less than two minutes, it uses the THR mode.*
*If it thinks it will take more than two minutes, it goes to THR REF but does not display that as an FMA.*

## AUTOPILOT SELECTORS

*There are three (3) different autopilots on the airplane and they can be engaged once the airplane has climbed above 250 feet AGL (SOP dictates 800 feet AGL) after Take-off and are capable (if appropriate airport conditions and equipment exists) to fly rest of the whole flight, make the approach, land and roll-out without being dis-engaged. Truly amazing … and really accurate.*




*This comprises the **AFDS** or "AUTO FLIGHT DIRECTOR SYSTEM."*
*The FMCs (FLIGHT MANAGEMENT COMPUTERS) automatically maintain pitch, roll, and thrust when both the autopilots and the auto-throttles are engaged.*

# The PFD

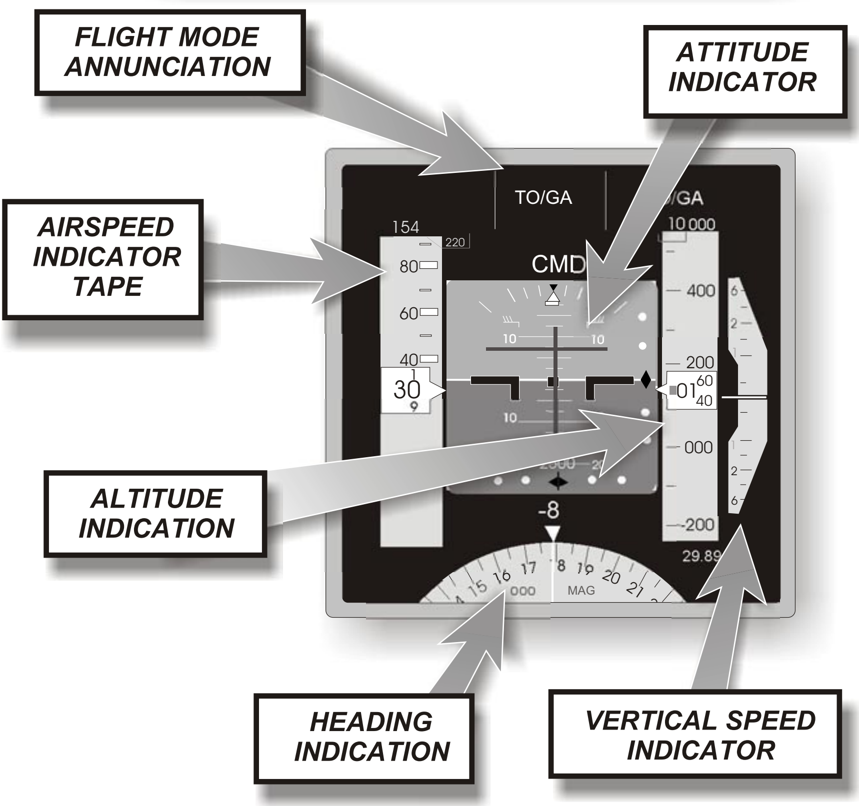
**P**rimary **F**light **D**isplay

Mr. Boeing decided that pilots needed only one instrument to stare at when they were flying. So, he created the PFD. It is virtually encrusted with information. Some of the information is non-critical … some is absolutely essential.
So, here is an attempt to show the various things about the PFD that we should know about.

***Remember**: This is only a cursory once over. Learning the PFD takes many many hours of useage.*

***The PFD is laid out in six (6) different sections:***

- ***ATTITUDE INDICATOR***
- ***FLIGHT MODE ANNUNCIATION***
- ***AIRSPEED INDICATOR TAPE***
- ***ALTITUDE INDICATOR***
- ***HEADING INDICATOR***
- ***VERTICAL SPEED INDICATOR***

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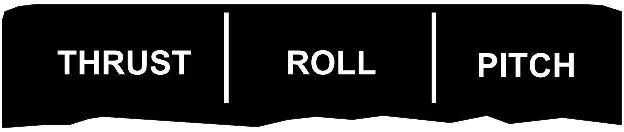
# The FLIGHT MODE ANNUNCIATORS

At the top of the PFD are three boxes. These are the Flight Mode Annunciators.




Here are the possible annunciations for the three modes:

**THRUST MODE**

**THR REF** - *Thrust is set to the "selected" limit on the EICAS.*
**HOLD** - *Throttles are disconnected and can be set manually.*
**SPD** - *Autothrottle commands the speed indicated on the PFD. That speed can be set by the SPEED KNOB on the MCP or by using the CDU.*
**IDLE** - *Displayed only when throttles are moving to idle. When they get to idle they will display HOLD.*
**THR** - *Applies thrust necessary to maintain requested vertical speed.*

**ROLL MODE**

## ARMED (WHITE) indications:

**LNAV** - *Above 50 feet, will engage at "capture" point for active leg.*
**LOC** - *If within 120 degrees of track, indicates AFDS will capture.*
**ROLLOUT** - *appears below 1500 feet and engages at 5 feet RADALT.*
**TO/GA** - *On the ground: armed when a single Flight Director turned ON.*

## ENGAGED (GREEN) indications:

**TO/GA** - *Maintains GROUND TRACK.*
**LNAV** - *If above 50 feet, within 2 ½ miles of active leg; will capture active leg displayed on ND.*
**HDG SEL** - *AFDS will turn to maintain heading selected on MCP.*
**LOC** - *AFDS will follow LOC course inbound.*
**ROLLOUT** - *Airplane will track runway centerline after touchdown.*
**HDG HOLD** - *Holds the present heading. If in turn, it will hold the heading AFTER rollout. Does not "correct back."*
**ATT** - *Holds existing bank angle IF greater than 5 degrees.*

**PITCH MODE**

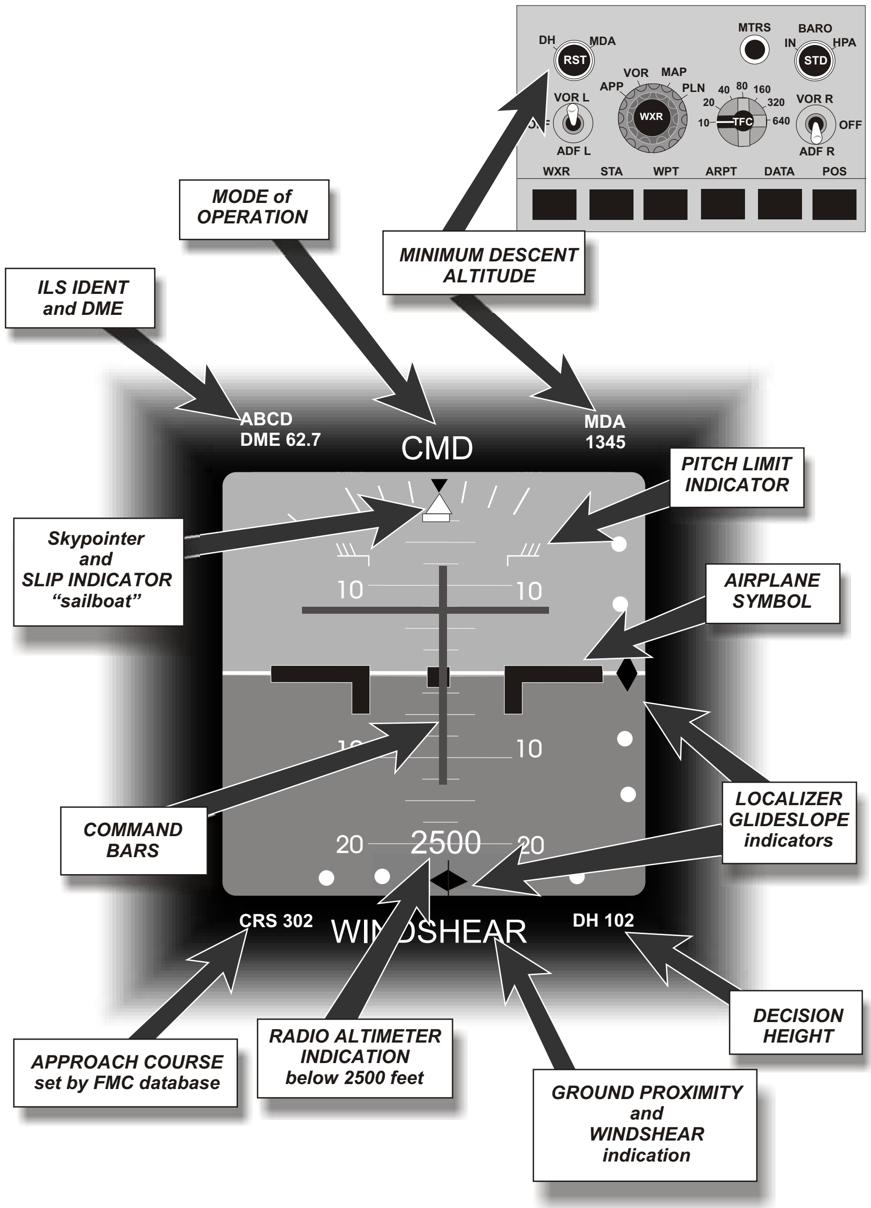
## ARMED (WHITE) indications:

**VNAV** - *Will engage above 400 feet. Will Follow vertical commands set in CDU.*
**G/S** - *Glide slope armed for capture.*
**FLARE** - *Appears below 1500 feet RADALT, engages at 50 feet.*
**TO/GA** - *On ground, a single Flight Director will arm.*
*In Air - Glide slope capture or FLAPS not up.*

## ENGAGED (GREEN) indications:

**TO/GA** - *On ground gives 8 degree pitch up signal.*
*In flight; the AFDS commands the lesser of 15 degrees or below pitch limit whiskers. As the rate of climb increases, the indication transitions to AIRSPEED.*
**VNAV SPD** - *Maintains FMC selected airspeed. If "SPEED INTERVENE" (that is selected by pushing the speed selector knob on the MCP) maintains the MCP selected speed.*
**VNAV ALT** - *Airplane is being held at the altitude selected in the MCP.*
**VNAV PATH** - *Airplane is following the path calculated by the FMC. See the "LEGS" indication on the CDU.*
**FLCH SPD** - *Maintains the MCP selected airspeed.*
**ALT** - *airplane is holding or capturing the altitude set on the MCP.*
**V/S** - *Maintains the selected vertical speed on the MCP.*
*NOTE: Airplanes CAN fly away from selected altitude.*
**G/S** - Follows Glide Slope.
**FLARE** - *Starts flare maneuver at 50*

# The ATTITUDE INDICATOR



## *MODE of OPERATION:*

*This is a **VERY IMPORTANT** indication. If at any time you wish to know if the Autopilot is controlling the airplane... **LOOK HERE**:*
**CMD** (green)means the autopilot is engaged.
**FD** (green) means ONLY the Flight Directors are engaged.
During the auto-coupled approach, you wil see either:
**LAND** 3 (green)
**LAND** 2 (green)
**NO AUTOLAND** (amber)

## *MINIMUM DESCENT ALTITUDE and DECISION HEIGHT:*

An "MDA" or "DH" is set on the PFD using the EFIS panel.
The DH/MDA selector has three knobs:
OUTER knob selects either DH or MDA,
MIDDLE knob rotates to select the appropriate value,
INNER knob is a push to reset the DH alert.


## *PITCH LIMIT INDICATOR:*

Only displayed IF the flaps are extended. Indicates the PITCH at which the STALL SHAKER will activate. It calculates the pitch based on existing flight conditions.

## *AIRPLANE SYMBOL:*

This symbol is fixed in the instrument and does not move. Some airlines use the "FLY-BAR" indication. I have flown both and can attest to the fact that the fixed bars are far superior.

## *LOCALIZER and GLIDESLOPE indicators:*

**ONLY displayed when ILS in use**.
The "diamonds" respond to the airplane's position relative to the ground generated signal.
When within 2 1/3 dots of center, diamond turns black.
At low altitudes, indicators flash when excessive deviation.
IF (God forbid) the airplane gets to a low altitude with LNAV engaged, but LOC armed but not captured; the LOCALIZER scale changes to amber and the indicator flashes. This is your "***LOCALIZER NOT CAPTURED***" signal. ***HELLO!!!***

## *GROUND PROXIMITY and WINDSHEAR indication:*

To be discussed later, but if you have this indication; you will also hear "***WHOOP WHOOP PULL UP***." It is time to "*GET OUTA THERE*!!!"
***CRAM THROTTLES TO THE STOPS, and aggressively***
***PULL NOSE UP TOWARDS 20 degrees.***
We will discuss the procedure in greater detail later in the book.

## *RADIO ALTIMETER INDICATION:*

Below 2500, the Radio Altimeter indication is annunciated.
Below 200 feet, the indicator rises to meet the airplane symbol.

## *APPROACH COURSE:*

This course information is set "automatically" and indicates the approach course from the FMC database.

## *COMMAND BARS:*

These provide information from the FMC and indicate the roll and pitch recommended to achieve the flight profile calculated by the FMC. The idea is for the pilot to "fly" the airplane so as to place the indicator square on the intersection of the command bars.

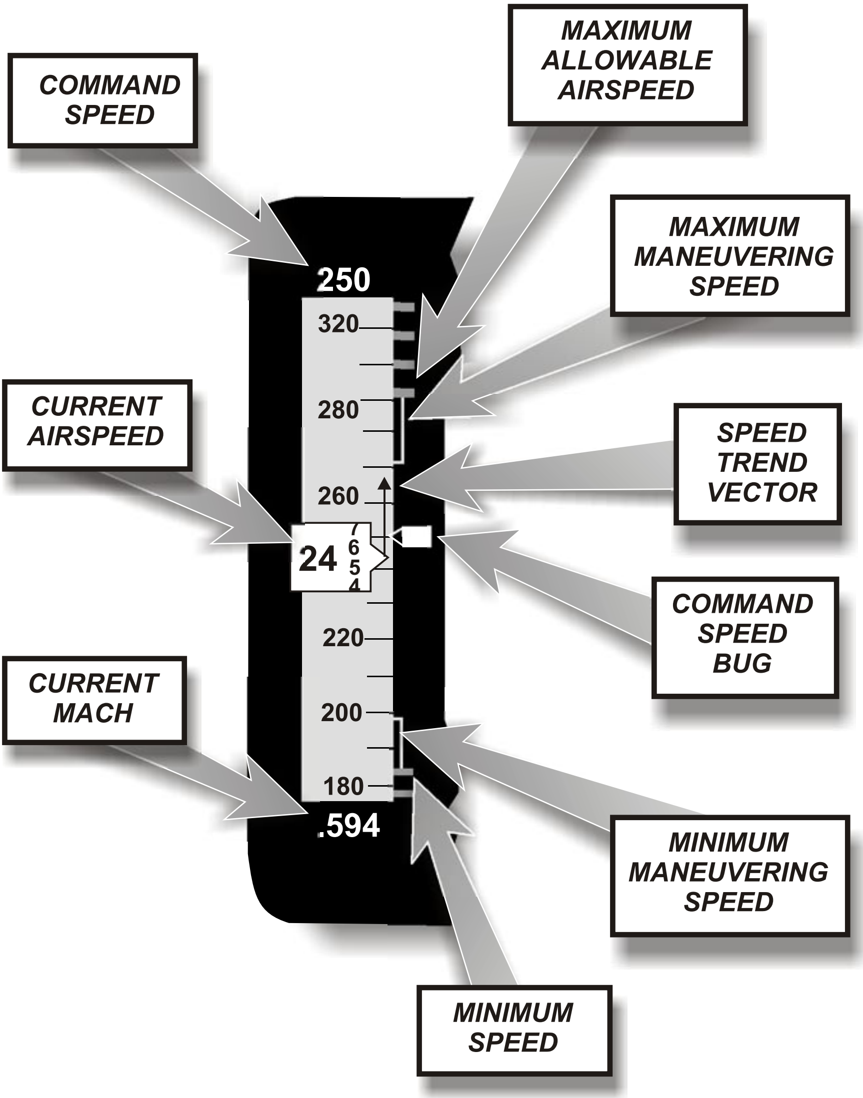
## *ILS IDENT and DME:*

Either from it's database or from pilot insert from the CDU; the FMC tunes the desired ILS frequency. If it CANNOT get a ident, it displays the frequency. If it is able to identify the ILS, it will display the identifier.
If DME available, it will be displayed.

## *SKYPOINTER and SLIP INDICATOR:*

The "TEEPEE" will ALWAYS point directly UP, regardless of the airplanes orientation. The bottom "RECTANGLE" is the slip indicator. Together, they are called the "SAILBOAT."
You use the rudder to keep the rectangle below the sail.

# The AIRSPEED INDICATOR TAPE





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### *COMMAND SPEED:*

This number is the same as that set in the MCP, OR it is the FMC computed airspeed/Mach when the MCP SPD window is blank.

### *MAXIMUM ALLOWABLE AIRSPEED:*

This will display the LOWEST of the following:
Vmo
Landing gear placard speed
Flap placard speed

### *MAXIMUM MANEUVERING SPEED:*

This will display the maneuvering “MARGIN” before buffet begins.

### *SPEED TREND VECTOR:*

This indicates what the airspeed will be in 10 seconds as acceleration or deceleration changes.

### *COMMAND BUG SPEED:*

This number is the same as that set in the MCP, OR it is the FMC computed airspeed/Mach when the MCP SPD window is blank.

### *MINIMUM MANEUVERING SPEED:*

This indicates the maneuver margin to stick shaker or low speed buffet. If there isn’t any computed data available or if it is invalid; then this indication is removed.

### *MINIMUM SPEED:*

This indicates the speed at which ***STICK SHAKER or LOW SPEED BUFFET*** occurs. YIPES!

### *CURRENT MACH:*

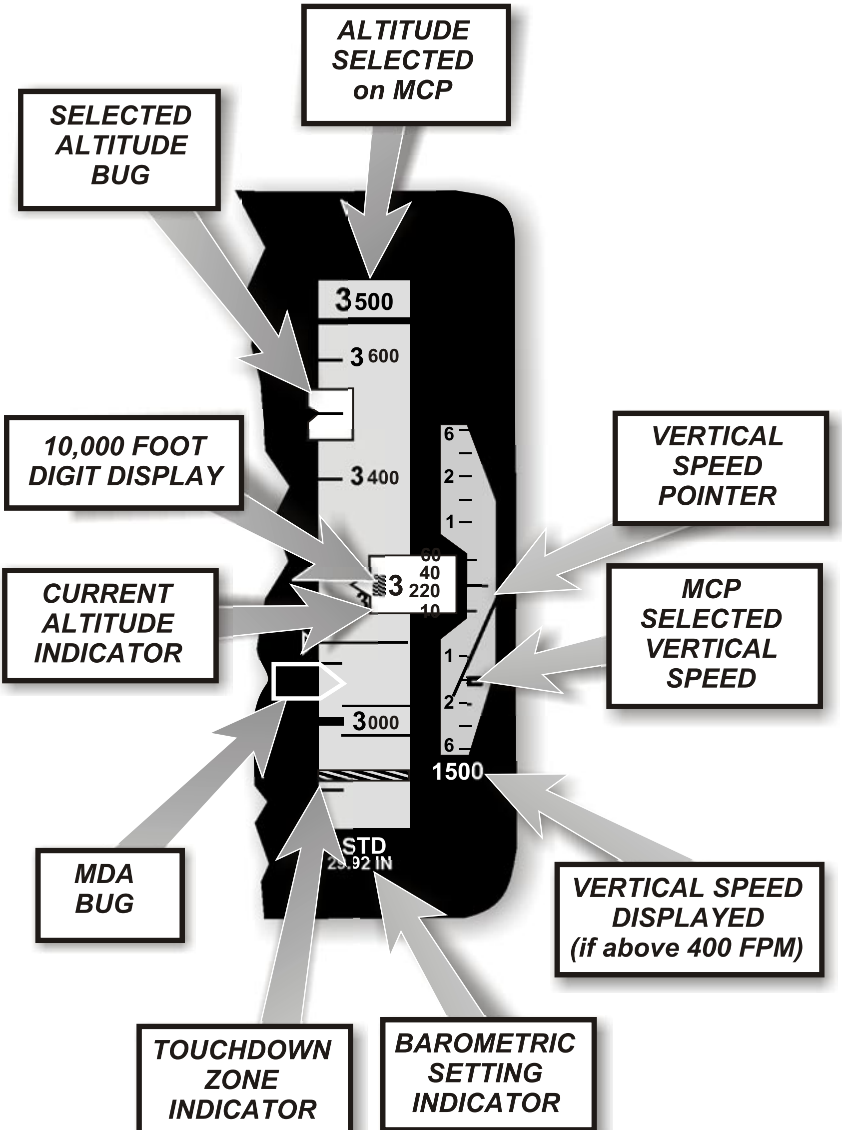
This indicates the current COMPUTED MACH. If the computer has no data, the signal is removed. If the MACH number is invalid, then a MACH flag is displayed.

### *CURRENT AIRSPEED:*

This indicates the current AIR DATA computed airspeed. If it is missing, that means that the associated AIR DATA COMPUTER has failed.

The

# ALTITUDE INDICATOR TAPE





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# The ALTITUDE INDICATOR TAPE

### *ALTITUDE SELECTED ON MCP:*

This number is the same as that set in the MCP. The information will appear in a box IF the altitude is within 900 to 300 feet of the selected altitude.

### *ALTITUDE SELECTED BUG:*

This indicator box shows the altitude set in the MCP.
When the selected altitude is offscale, the little box will rest at the top or bottom of the tape.
FYI: The BUG is 100 feet wide.

### *10,000 FOOT DIGITAL DISPLAY:*

When the airplane is below 10,000 feet, the crosshatched box appears.

### *CURRENT ALTITUDE INDICATOR:*

The box indicates the Air Data altitude.
When within 900 to 300 feet of the altitude selected on the MCP, the ALTITUDE BOX will switch to WHITE.
Once within those parametrs, if you should deviate from them by 900 to 300 feet, then the box will turn to AMBER.

### *TOUCHDOWN ZONE INDICATOR:*

An amber rectangle with stripes appears that represents the touchdown zone for the airport selected by the FMC runway.
The upper edge represents the landing altitude.

During cockpit setup (This would be before the runway is entered or the FMC information is available) a “NO TDZ” flag will be displayed to the right and below the altitude tape.

### *BAROMETRIC SETTING INDICATOR:*

This indicates the BAROMETRIC SETTING that is dialed into the EFIS control panel.
This airplane has a great feature that allows the altitude setting (QNH) to be entered before leaving QNE.
If you selected BARO STD on the EFIS, the “STD” is displayed and the preset altimeter setting is displayed in white below the STD.

### *VERTICAL SPEED DISPLAY:*

If vertical speed is greater than 400 FPM, then it will be displayed below the indicator.

### *MCP selected VERTICAL SPEED:*

a “buck tooth” displays the selected Vertcal Speed from the MCP if the V/S mode is engaged.

### *VERTICAL SPEED POINTER:*

The swinging bar indicates the current IRS vertical speed indication.


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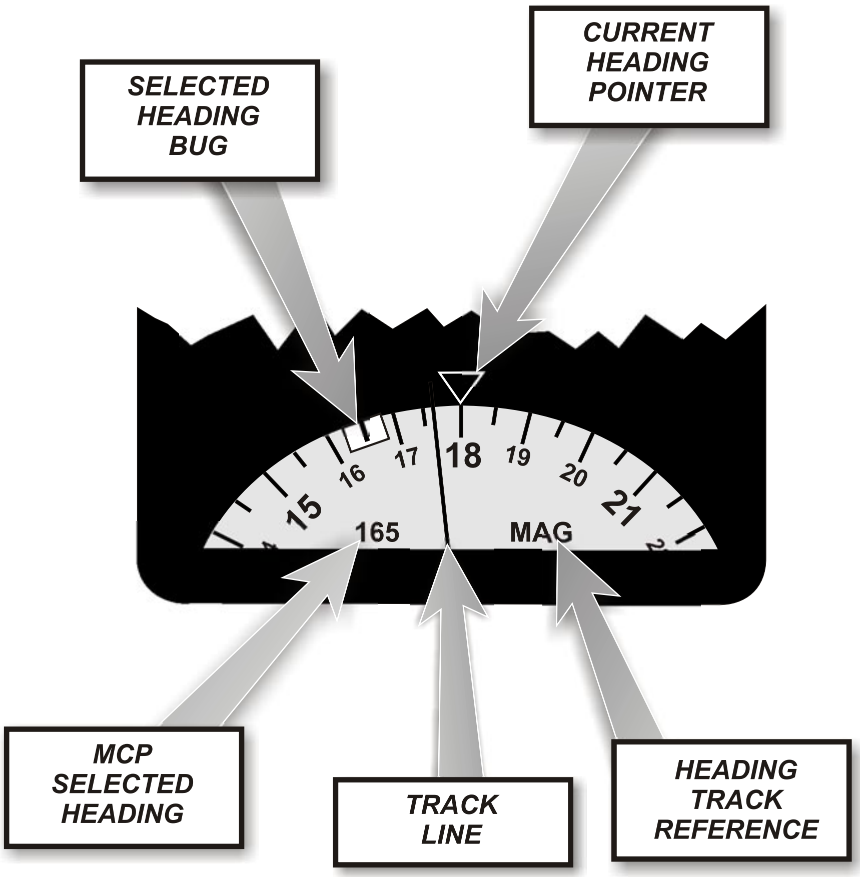
# The PFD HEADING / TRACK INDICATIONS





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# The PFD HEADING / TRACK INDICATIONS

### CURRENT HEADING POINTER:

This number is the current IRS heading. It represents the direction that the axis of the airplane is pointing.

### SELECTED HEADING BUG:

This is the heading selected on the MCP. If you have selected a heading outside of the visible limits of the compass rose, the indicator will slew to the side of the instrument that represents the direction of the shortest turn to get to the heading.

This is referred to as the “BUCK-TEETH.” When you have the airplane operating on autopilot and operating in HDG SEL, the airplane will try and turn so that the HEADING POINTER will rest on the buckteeth.

### MCP SELECTED HEADING:

This is the numerical value of the heading selected on the MCP.

### TRACK LINE:

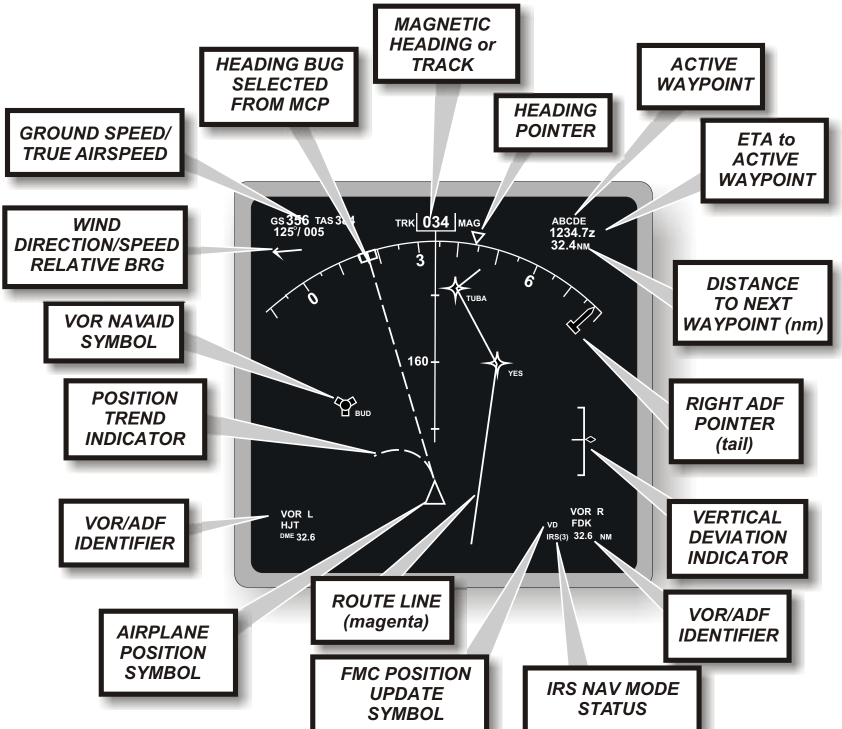
This indicates the TRACK of the airplane over the ground as indicated by the FMC.
The difference between the HEADING and the TRACK is the WIND DRIFT ANGLE. WE can use this information to our advantage when flying an NDB (ADF) or VOR approach.

### HEADING / TRACK REFERENCE:

Displays whether the system is operating in MAG (Magnetic North mode) or TRU (True North mode).

# The ND
## Navigation Display

*There is a lot of information displayed on the ND … and as long as I worked with the instrument, there always seemed to be something else that I learned. Each situation allows for a different set of symbols and data to show up on the screen. What we will do here is look at just some of the more common indications and identify them.*




## NAV AID SYMBOL:

When EFIS control panel STA light switch is selected, appropriate navaids are displayed.
If the computer has it selected, it turns GREEN.
When a navaid is manually tuned, the selected course and reciprocal are displayed.

## WIND DIRECTION and RELATIVE SPEED ARROW:

The greater the velocity, the longer the arrow. This is really useful when hand flying an approach. Works well during holding, also.
The WIND DIRECTION/SPEED is Magnetic if HDG/TRK is Magnetic;
The WIND DIRECTION/SPEED becomes True if HDG/TRK is True.

## GROUND SPEED/TRUE AIRSPEED.

Current groundspeed in knots. Current true airspeed displayed IF above 100 knots.

## HEADING BUG.

The “buck teeth” are set using the heading selector of the MCP. If operating in autopilot, and the HEADING SELECTOR is depressed, the airplane will turn so as to put the HEADING POINTER on the HEADING BUG.
The “BOAT” will dock in “BUCK TOOTH HARBOR.”



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# The ND

Navigation Display

### MAGNETIC HEADING or TRACK

IN MAP or PLN MODE: Indicates magnetic TRACK. This is called a track-up mode and is the usual operating situation.
in VOR or APP MODE: Indicates magnetic HEADING. This is called a heading mode and is used during approaches.

### HEADING POINTER:

Indicates airplane HEADING.

### ACTIVE WAYPOINT:

Indicates the ACTIVE WAYPOINT in MAP and PLN mode.
This will be the top waypoint on the LEGS page of the CDU.

### ETA TO ACTIVE WAYPOINT:

This is the time that the airplane will arrive at the active waypoint. Same value that is on the LEGS page of the CDU.

### DISTANCE TO ACTIVE WAYPOINT:

This is the distance to the active waypoint. Same value that is on the LEGS page of the CDU.

### RIGHT ADF POINTER:

There are four indicators that represent the heading to or from a VOR/ADF station. This pointer indicates the bearing from (TAIL) or the bearing to (HEAD) of the tuned ADF station.

### VERTICAL DEVIATION INDICATOR:

Displayed during descent ONLY. It shows if the relationship of the airplane to a computed “ideal” descent path. Also known as “*Flight Path Deviation Indicator*.” Are we LOW or HIGH on the descent? This little guy tells us.

### VOR/ADF IDENTIFIER:

VOR - Displays VOR frequency until station identified. It does this automatically.
Then it displays IDENTIFIER and raw data DME.
If only the DME is identified, the identifier is displayed in small font.
ADF - Displays ADF frequency until identified, then displays identifier.

### IRS NAVIGATION MODE STATUS:

Displayed when in MAP mode. Displays IRS mode status. If the system transitions to any other status, a green box will highlight the indication for 10 seconds.

### FMC POSITION UPDATE STATUS:

Displayed when in MAP mode. Indicates FMC updating status.
- DD: DME/DME
- VD: VOR/DME
- LOC: LOCALIZER

### ROUTE LINE:

The MAGENTA LINE indicates the active flight plan as set up in the CDU/FMC.
The DASHED WHITE LINE: It represents the route in the CDU has not been EXECUTED.
The BLUE LINE WITH LONG DASHES represents an “inactive” route.

### AIRPLANE POSITION SYMBOL:

The apex of the triangle represents the nose of the airplane. Note that the airplane HEADING will not align with the top of the display when operating in a “track up” mode.

### POSITION TREND INDICATOR:

Pilots call this the “SNAKE.” Each segment represents the heading of the aircraft in 30 second intervals IF the present “trend” is maintained.



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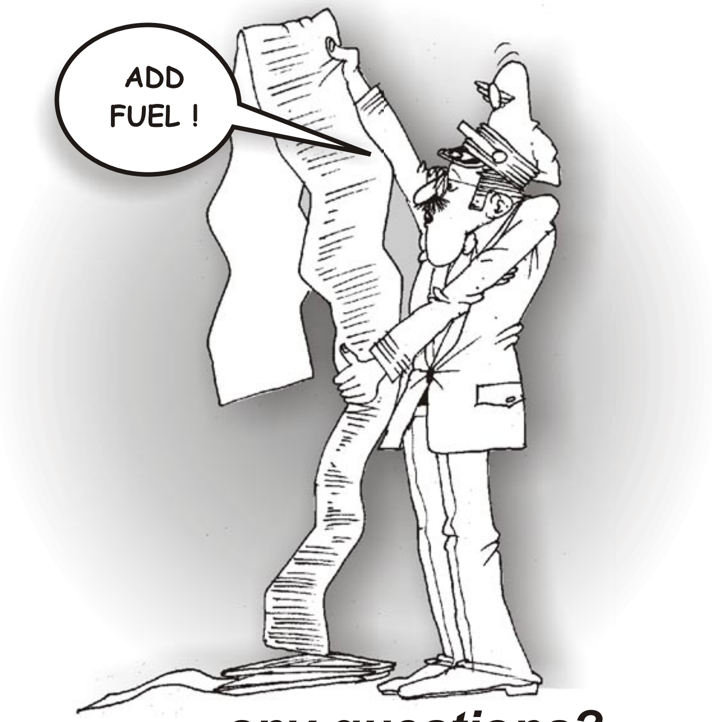
# THE PRE-FLIGHT SECTION




**any questions?**

**NOTE TO READERS***:*
*We will not get involved in a rigorous "FLIGHT PLANNING" section that would involve weather, various flight plan formats, fuel considerations, alternates, etc. etc. because each airline has it's own special set of rules and besides, it would take about 50 pages to make it all complete. Other volumes such as* ***Captain Mike Ray's*** *"****NEW GUY STUFF; OP GUIDE****" has a lot of that information.*

# EXTRA CREDIT STUFF

*How can you tell from outside the airplane if the GROUND HANDLING BUS is powered or if the APU is running and electrical power is available.*
*ANSWER: Determine if BAGGAGE LOADING or FUELING is underway.*
***NOTE**: Hearing the APU exhaust coming out the tail of the jet does not necessarily mean that the APU is producing electrical power.*

*FYI: This bus is powered from the "AVAIL" side of the APU or EXT power.*

*As you approach the jet, look up at the top of the cockpit bulge and ascertain that the **PILOT ESCAPE HATCH IS FLUSH**. It is a good idea for the Captain; because more than likely, in the real world, someone else will be doing the walk-around duties.*

*Make certain that the jet is chocked or otherwise hooked to something. Before you mount the steps, get that little chore taken care of. The Check person would be very impressed if you mention that in your oral.*

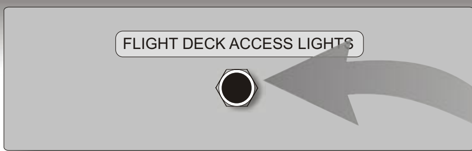
*If during flight planning, you changed the fuel load from the original "suggested" flight plan, it is useful to check with the fueler, if possible (and he speaks English) and determine if he has received the latest fuel load.*

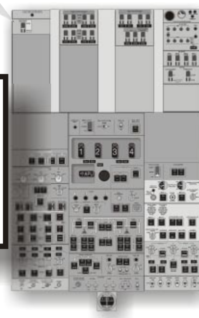
*For your information, once inside the Passenger Loading Bridge, it is customary for the pilots to enter the airplane using the mid-cabin door. Using the First Class door will definitely identify you as a rookie. Bad form!*

*Trying to enter through the First Class forward closet is a definite Boo-Boo!*

Picture of Mike Ray's private jet.

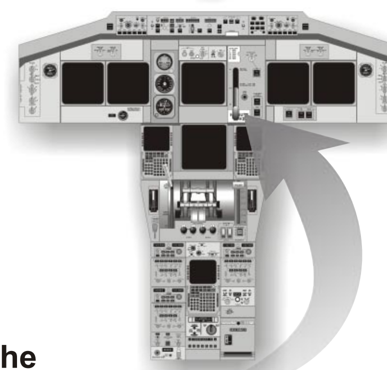
# You didn't tell me that it would be dark in here !



## FLIGHT DECK ACCESS LIGHTS

*When you enter the cold dark cockpit, here is where you turn on some lights. This switch is on the* **GROUND HANDLING BUS**. *Other lights, such as the* **THUNDERSTORM LIGHTS**, *are on other busses and may not be powered.*



And it is my opinion, that as soon as you can get the lights on, you should check and make certain that ...

# YOU ARE ON THE RIGHT JET !

## check the AIRCRAFT HULL NUMBER

*There are two reasons to check this:*
*First, to make certain that your flight papers have been prepared for the correct airplane; and*
*second, so you won't look like a geek by getting on the wrong airplane. Don't laugh, it happens. DUH!*

*Just a note here: This identification hull number should also be used to match up with the MAINTENANCE LOGBOOK and other related airplane documents. It is not good to get airborne with the "wrong" logbook.*



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# STEP 1

# THE GROUND HANDLING BUS

At this point in the check, there will be a discussion about The **GROUND HANDLING BUS**. Here are the things you should know about this bus:

It is powered _ANYTIME_ and _ONLY_ when:
A. ***EXTERNAL POWER*** plugged into #1 receptacle ...or
B. ***APU GEN #1*** *is* ***AVAILABLE***

Why do we care? ...because of some the items on that bus become unpowered if the Ground Handling Bus is not powered:

BIG THINGS ARE ON THIS BUS.

- **CARGO DOOR OPERATION**
- **CARGO HANDLING SYSTEMS**
- **CARGO COMPARTMENT LIGHTS**
- **FLIGHT DECK ACCESS LIGHTS**
- **FUELING SYSTEM**
- **#4 HYD AUX ELECTRIC PUMP**

but this is the BIGGIE

The cargo doors and fueling are certainly important, but the **#4 HYD AUX ELECTRIC PUMP** supplies the AUX BRAKE PRESSURE. That is ***VERY*** important because it is your ***ONLY*** active brake pressure source until the ENGINE DRIVEN HYD PUMPS start producing hydraulic pressure.

***The Checkguy wants to make certain that you know the following FACT:***

YIPE!

**If the ground Handling Bus is not powered, there is no active brake pressure source on the Boeing 747-400 without the engines running. (Accumulator doesn't count)**

There have been horror stories about a perfectly good 747-400 being parked on some lonely ramp, parking brakes set properly. About four hours later, the accumulator bleeds off and the big bird takes an unescorted roll down the ramp and rams the first thing it comes to.

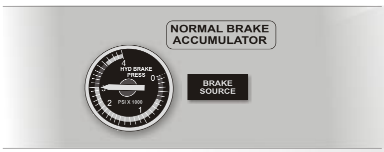
***GOOD CAPTAIN PRACTICE!***
**Always** *check that the jet is either attached to a tow tractor or chocked satisfactorily.*

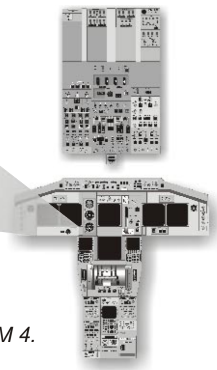
# ARE THE BRAKES SET???

## *Check and see if the PARKING BRAKE is set.*

*Even if the wheels were chocked when you arrived at the jet, if a ground person removes them ... you could be standing in the galley sipping your first cup of coffee when the jet starts rolling across the ramp.*

*Here are some PARKING BRAKE things.*



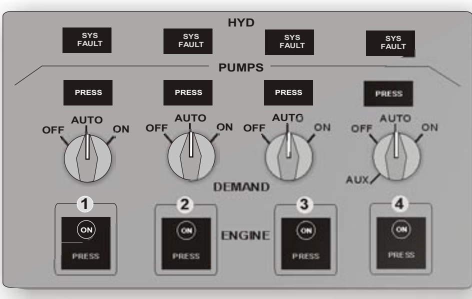



**This gauge reflects the "NORMAL BRAKE ACCUMULATOR" pressure.**

*If the normal and alternate brake systems are not pressurized, then brake pressure is maintained by the brake accumulator.*

*The brake accumulator is pressurized by HYDRAULIC SYSTEM 4.*

*Sufficient pressure may be stored in the accumulator to "**SET AND HOLD THE PARKING BRAKE; BUT THE ACCUMULATOR IS NOT DESIGNED TO STOP THE AIRPLANE**."*

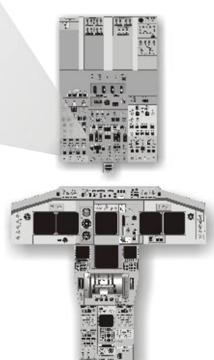



*The BRAKE ACCUMULATOR provides for Parking Brake "APPLICATION."*

*#4 HYDRAULIC AUX PUMP is powered by the GROUND HANDLING BUS, and one of the things it can do is provide pressure to the BRAKE ACCUMULATOR.*

Once the power is on the airplane and the GROUND HANDLING BUS is powered, some pilots will:

*Turn on the #4 AUX HYD PUMP switch, Monitor the BRAKE ACCUMULATOR gauge, and when the pressure gets in the green band, they will re-set the brakes.*





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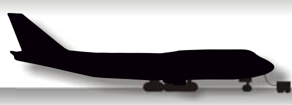
747v1intro02

# the FLIGHTDECK SETUP FLOWS

The whole Checkride Oral consists of you trying to convince the checkguy that you will be able to go out some dark night and figure out how to make a stone cold Boeing 747-400 work ... and do it safely. That's it. There are no right or wrong answers, there is no particularly exact way they are supposed to question you other than to convince themselves that you will be able to competently operate what is arguably one of the most complex machines ever conceived by mankind.



*For your Oral/checkride, you will be expected to make the assumption that you have been given the assignment to deadhead out to some obscure foreign location and fly a jet that has just undergone some really heavy maintenance by gremlins. You should assume you are about to enter a cold dark airplane in which the switches and levers may be in any meaningless and improper position.*

*The Check air-person will be expecting you to know where every switch should be, and in some cases why.*

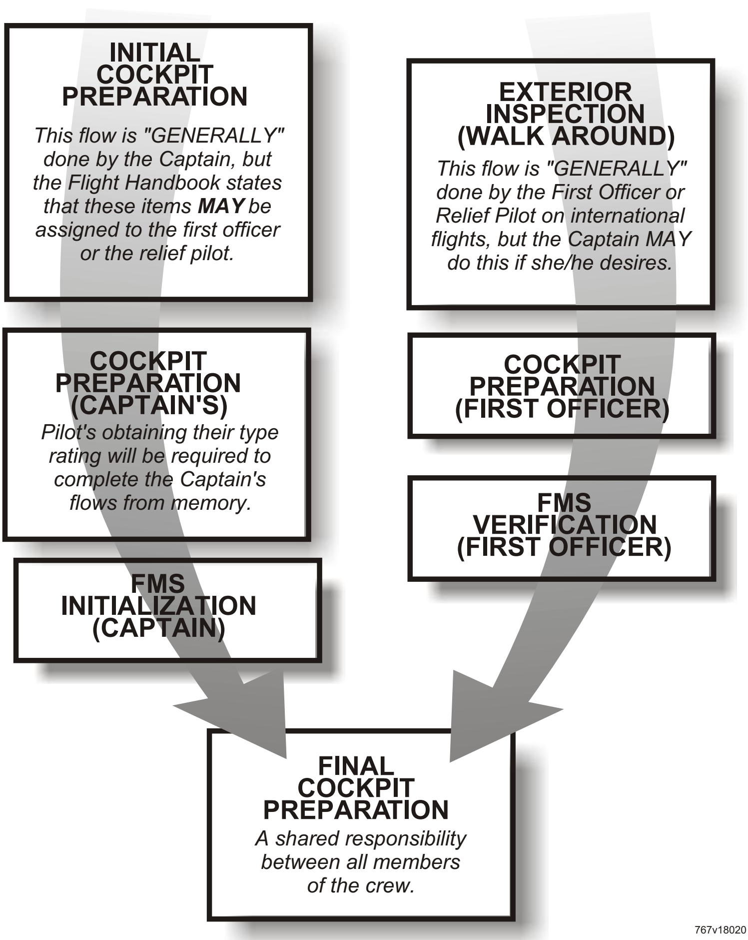
*That is the reason you bought this book, and that is why I am here.*

# WHAT ARE FLOWS ?

The whole concept of "FLOWS" is simply the grouping of activities in clusters, then naming them something appropriate to assist the pilot in remembering just "*WHAT AM I 'SPOSE TO DO?*" The flight handbook (while it doesn't use the term "flows") is written in a way that implies that there is a specific "litany" or routine in which the stuff on the flight deck ***MUST*** be done. The pattern that emerges as one reads the "NORMALS" section is what I am going to lay out for you now. These are called the "FLOWS."

When the crew arrives at the jet, here are the flow modules that need to be accomplished to complete the cockpit set-up.

## COCKPIT SET-UP FLOW MODULES



### SINCE EVERYTHING MUST BE DONE FROM MEMORY ...

*Around the Airline Training University, for years, there has been floating the famous "**SLUGOS**" and "**EGOS**" acronyms; invented by some ancient wiseman to help simple, human pilots in remembering "the famous flows." So, who am I to go against convention, so with a little embellishment, and apologies to the author, here are those famous gouges.*

# The CAPTAIN does the SLUGOS

S

***"S" stands for SAFETY SANDWICH.***

*I am suggesting a sandwich because the safety items are "sandwiched" between two sets of UP-DOWN-UP and UP-DOWN-UP-DOWN flows.*
*Completion of this "S" check ialso represents the end of the "***INITIAL COCKPIT PREPARATION***."*

L!!

***"L" IS SORTA THE SHAPE OF THE OVERHEAD PANEL AS YOU COME DOWN.***

*I have added TWO EXCLAMATION MARKS to emphasis that you has two little added things at the end.*

U

***"U" IS JUST LIKE THE "L".***

*Sorta the shape of the overhead panel as you pass over it.*

G

***"G" STANDS FOR GLARE-SHIELD.***

*Simply a sweep of the hand starting at the light panel on the left side of the glareshield and proceeding to the right end..*

O

***"O" REFERENCES THE OXYGEN PANEL.***

*This is where you start this specific string of items. From left to right, around the "SNAIL", over the "SNAKE", ending up at the "NOISE" overrides.*

S

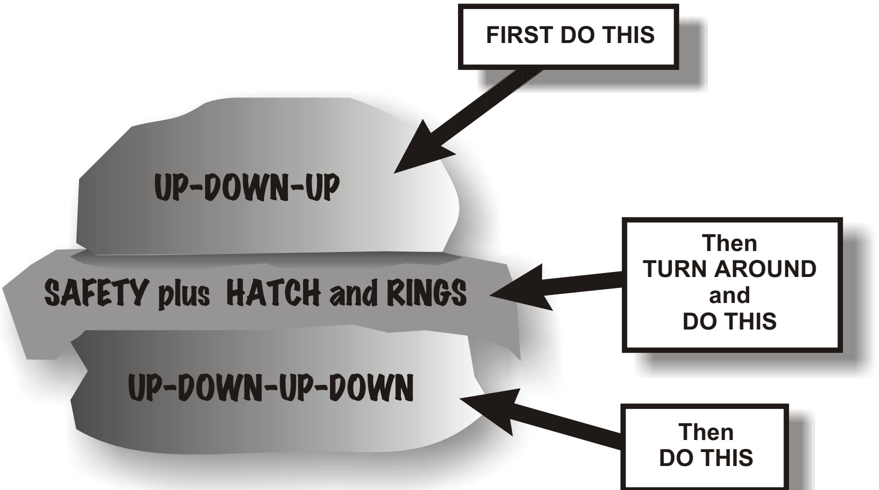
***"S" REFERS TO THE "SPEEDBRAKE."***

*This is where you begin your circle around the lower console ending up at the the WEATHER RADAR check.*

*So, if all this "SLUGOS" stuff seems hard to understand right now … just keep reading.*

# "S" stands for "SAFETY SANDWICH"

*This is called the*
**INITIAL COCKPIT PREPARATION**.
*We are calling it the "***S***" check or the "***SAFETY SANDWICH***."*
*I call it a sandwich, because the SAFETY part of the check is "sandwiched" between UP-DOWN-UP and UP-DOWN-UP-DOWN.*
*... OK, OK, just use your imagination.*

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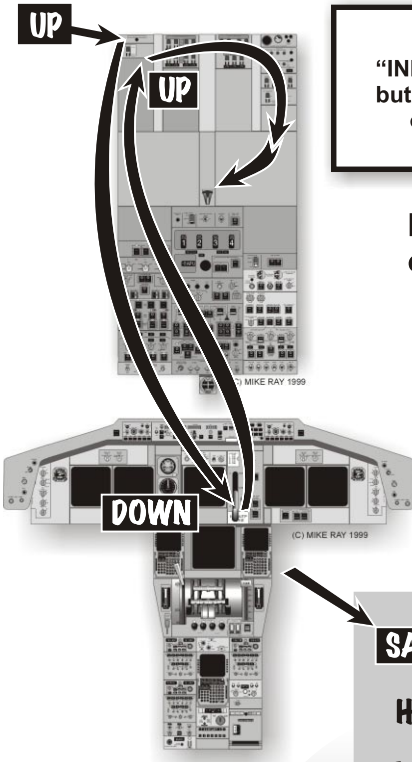
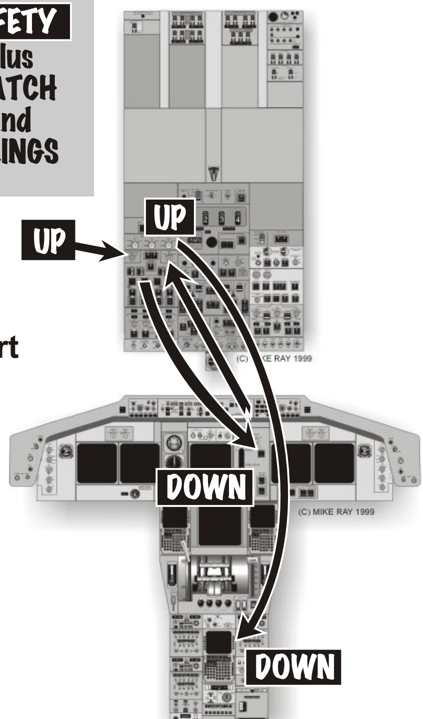



**Officially known as the**
**"INITIAL COCKPIT PREPARATION;"**
**but, called the "S" in "S-L-U-G-O-S"**
**or "The SAFETY SANDWICH"**

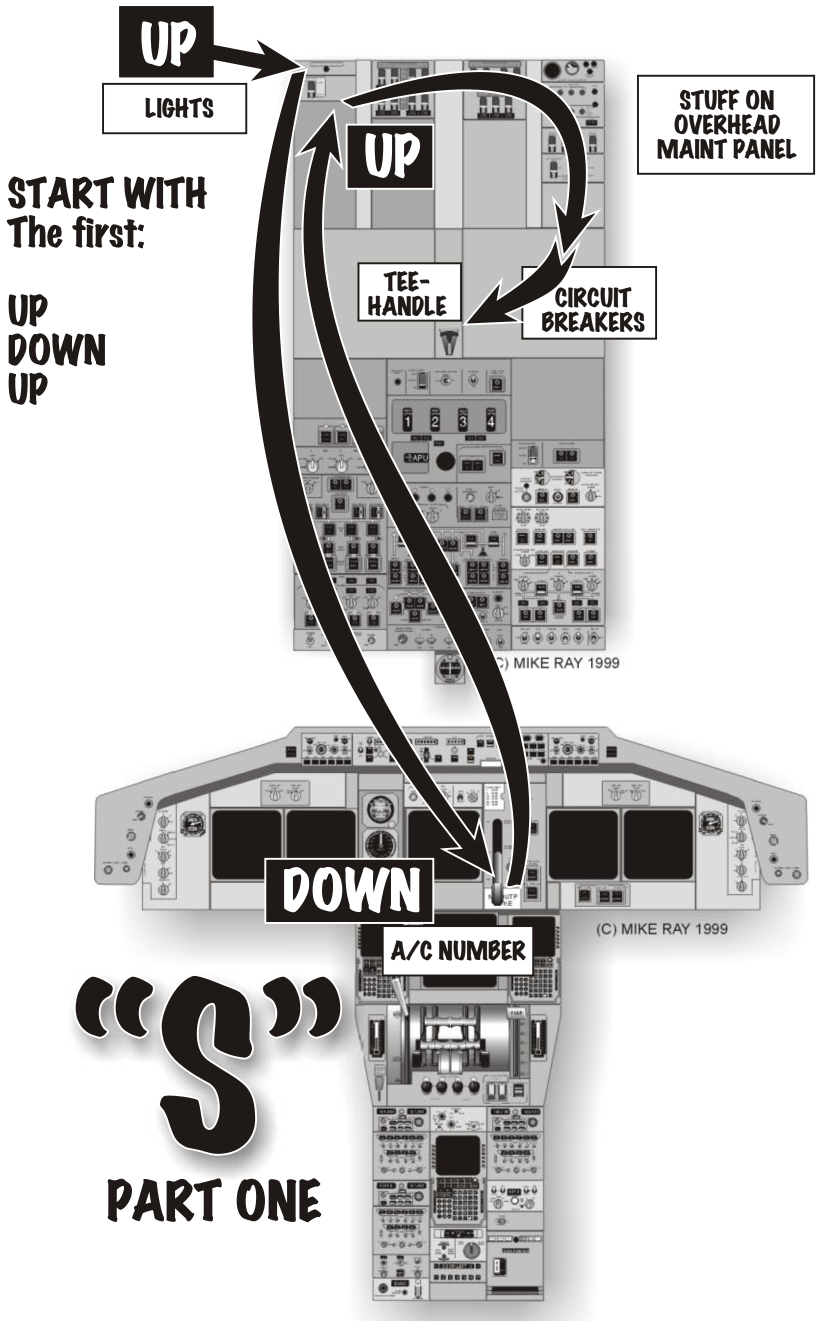
**Do the "TOP"**
**of the sandwich ...**

**... then do the**
**SAFETY STUFF**

**SAFETY**
**plus**
**HATCH**
**and**
**5 RINGS**




**... and then the bottom part**
**of the "sandwich."**

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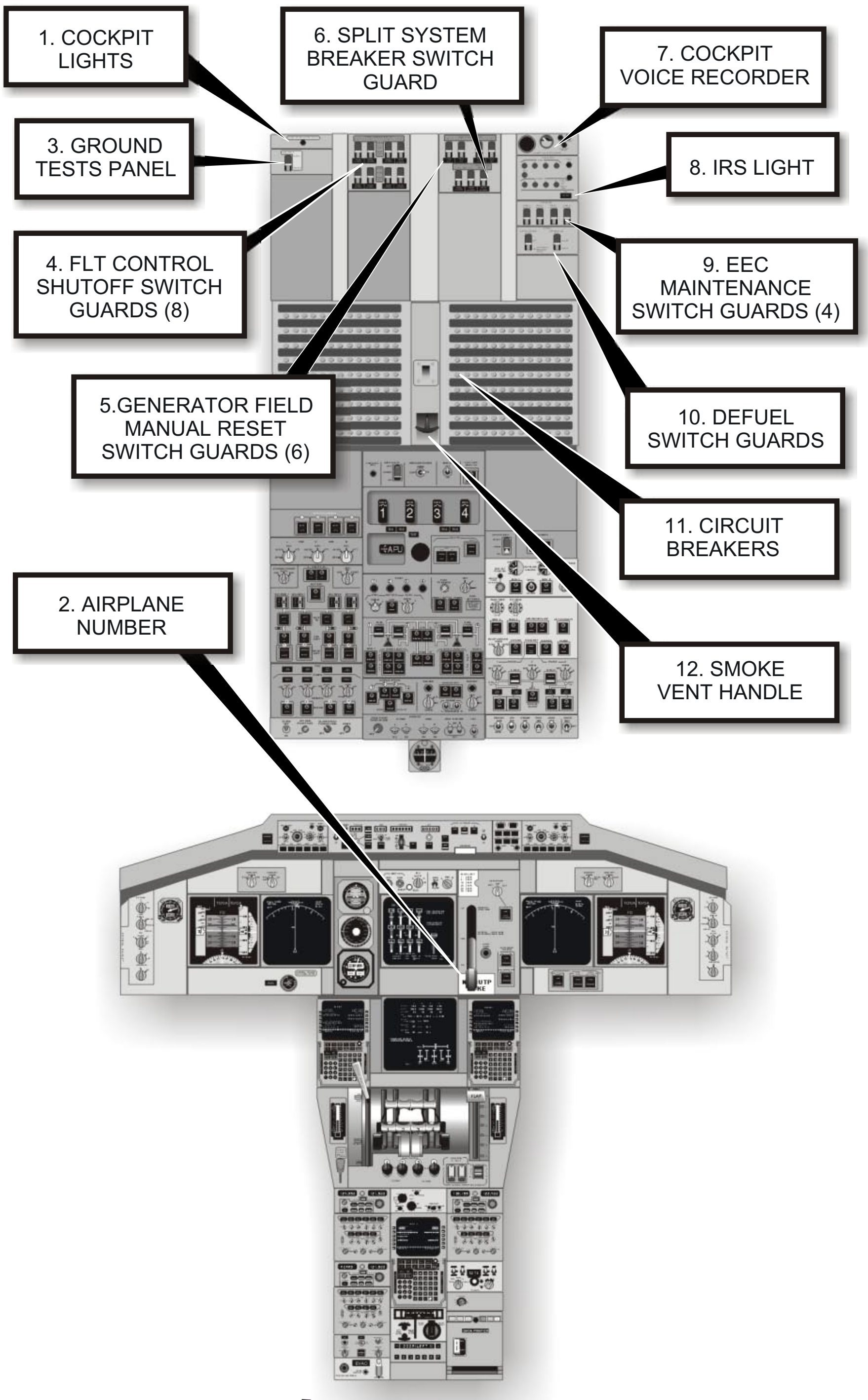
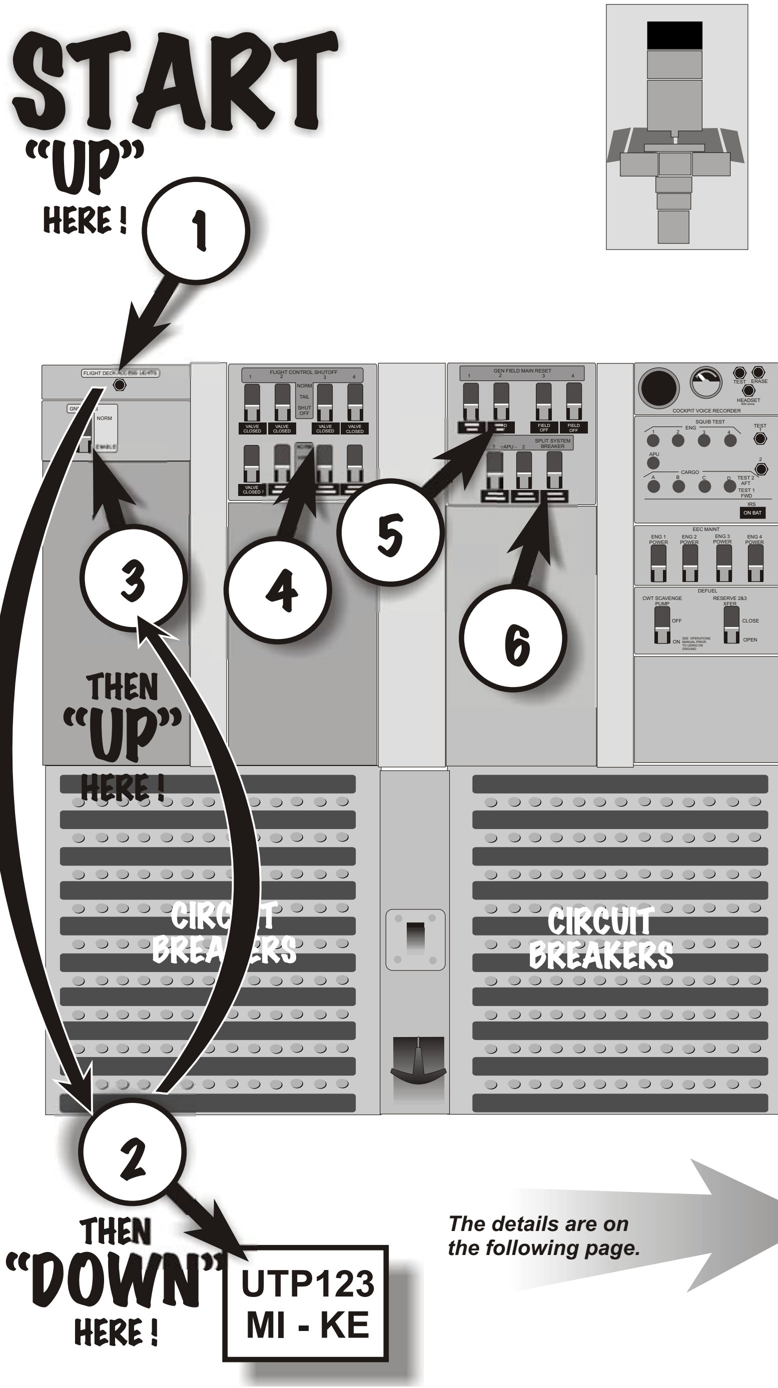

1. COCKPIT LIGHTS
6. SPLIT SYSTEM BREAKER SWITCH GUARD
7. COCKPIT VOICE RECORDER
3. GROUND TESTS PANEL
8. IRS LIGHT
4. FLT CONTROL SHUTOFF SWITCH GUARDS (8)
9. EEC MAINTENANCE SWITCH GUARDS (4)
5.GENERATOR FIELD MANUAL RESET SWITCH GUARDS (6)
10. DEFUEL SWITCH GUARDS
11. CIRCUIT BREAKERS
2. AIRPLANE NUMBER
12. SMOKE VENT HANDLE
APU
1
2
3
4




*The details are on the following page.*





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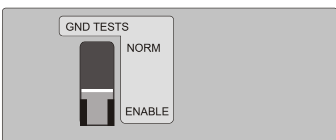
## 1 FLIGHT DECK ACCESS LIGHTS

*When you enter the cold dark cockpit, here is where you turn on some lights. This switch is on the* **GROUND HANDLING BUS**. *Other lights, such as the* **THUNDERSTORM LIGHTS**, *are on other busses and may not be powered.*


UTP123
MI - KE

## 2 AIRCRAFT HULL NUMBER

CHECKED. *There are two reasons to check this: First, to make certain that your flight papers have been prepared for the correct airplane; and secondly, so you won't look like a geek by getting on the wrong airplane. Don't laugh, it happens. DUH!*

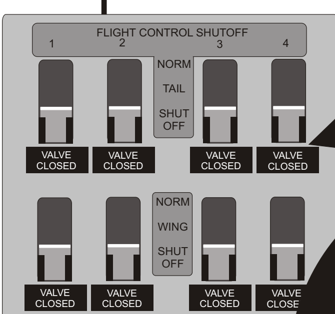


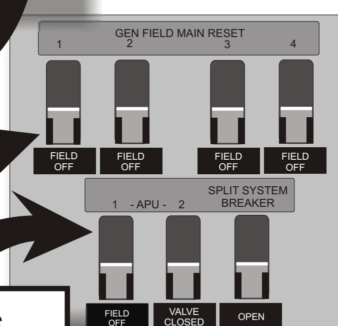

## 3 GROUND TEST SWITCH

CLOSED. Maintenance function only. There is no need to know anymore about this switch.

## 4 FLIGHT CONTROL SHUTOFFS

CLOSED.



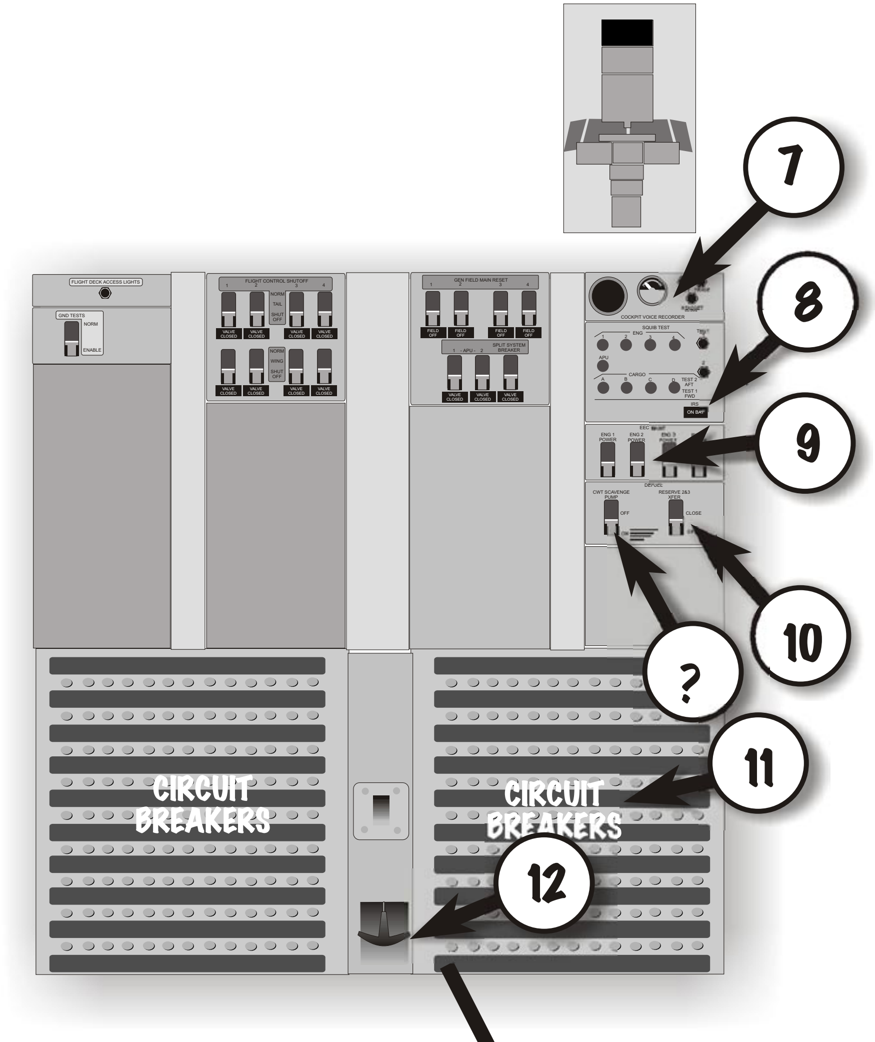




## 5 GEN FIELD RELAYS

CLOSED. There are 4 for the ENGINES and 2 for the APU for a total of 6 switches.

## 6 SPLIT SYSTEM BREAKER

CLOSED. This is the breaker that isolates the left and right electrical systems.




THEN DO ...

**SAFETY STUFF**

plus

**HATCH and RINGS**





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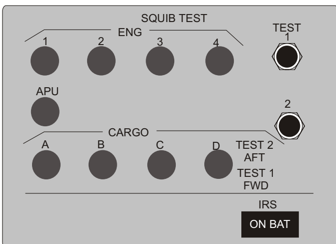
## 7 COCKPIT VOICE RECORDER

There are at least three different types floating around the system. Each has it's own idiosyncracies. In general, push the button and look for deflection, plug in headset and speak, listen for readback

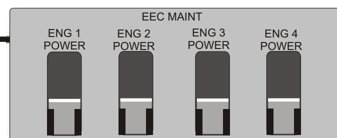



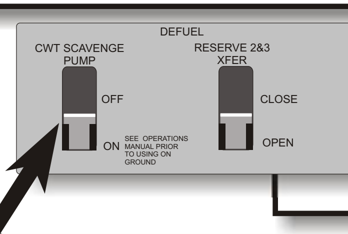

## 8 IRS "ON BAT" LIGHT

Could be ON. We expect it to be OFF. Maint function only.

## 9 EEC MAINT SWITCHES

CLOSED. Maintenance function only. There is no need to know any more about these switches.




## 10 RESERVE 2&3 TRSFR SWITCH

CLOSED.

## ? CWT SCAVENGE PUMPS

Some airplanes have electric scavenge pumps and some hydro-mechanical. How do you tell? If this switch is installed, then the hydro-mechanical pumps are installed. Why do we care? If this switch is NOT installed, then we have to place the #3 AFT FUEL PUMP on on the ground.

## 11 CIRCUIT BREAKERS

Check ALL in ... that includes those on the sidewall by the First Officers seat.

## 12 MANUAL COCKPIT EXHAUST

Check "TEE" handle stowed.



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# SAFETY STUFF

# plus HATCH and 5 RINGS



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## 13. CREW EMERGENCY EXIT HATCH

Since we checked the hatch flush when we approached the jet, all that needs be done is to pull the velcro cover loose in the corner and check the hatch lever is stowed properly.
**FYI**: *On "some" airplanes, the DRS synoptic includes this hatch.*

## 14. (5) ESCAPE REELS and "D" RINGS

They are in a plastic holder directly across from the hatch door at eye level. They can be checked without opening the door. Remember:

They are for ONE TIME USE (that is, you need one for each crewmember), and
Once used, the metal tape has sharp edges.

## 15. (6) SMOKE GOGGLES

CAPTAINS (Located in holder outboard and behind seat)
FIRST OFFICERS (Located in pocket behind seat)
OBSERVERS (4 other goggles located in cabinet in back)

## 16. (4) LIFE VESTS

There are 4; one for each position (seat). These are located in the seat back pouch on each seat. There rear seat has its vest in a pocket to the left of the left armrest.
The test "assumes" that the individual vests are actually ready for use and include ***ONLY*** a check to see that they are there.

## 17. OXYGEN MASKS

Only necessary to check the 2 Observers mask are actually on board. The Observer seat occupants are responsible for checking:

Mask, Hose,Regulator for the position.

Captain and First Officers check their own masks.

**NOTE**: *During the "BEFORE START CHECKLIST" it is expected that the Observers/Crew in the back audibly respond to the appropriate query.*

## 18. HALON FIRE EXTINGUISHER

Pressure should be NORMAL, seal INTACT

## 19. CRASH AXE

## 20. FIRST AID KIT

Seal INTACT

## 21. EMERGENCY MEDICAL KIT

*If seal is broken, there are situations where it can be used for dispatch ... see the FOM.*
*Also; there is a second MEDICAL KIT installed; but this kit is required ONLY if the primary kit has been depleted below FAR minimums following a MEDICAL DIVERSION.*

## 22. PROTECTIVE BREATHING EQUIPMENT

*Check for **FIRMNESS** and **BLUE DOT.***


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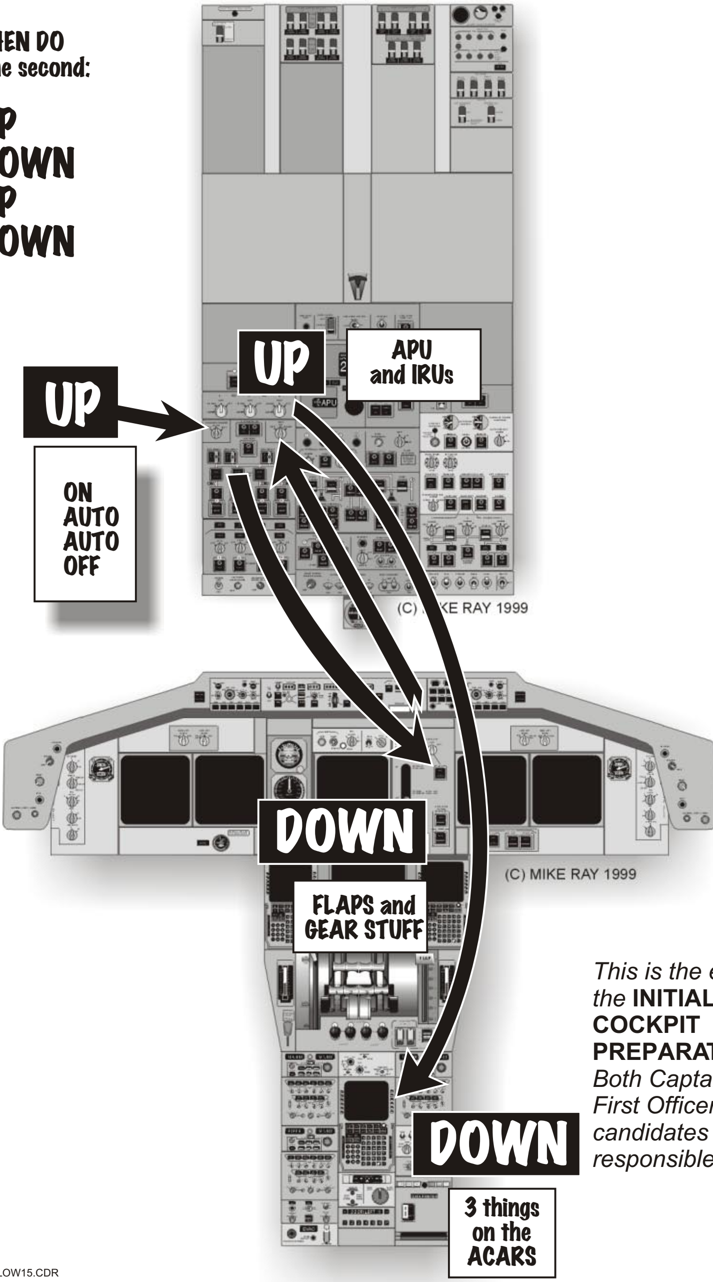
THEN DO
The second:

UP
DOWN
UP
DOWN




*This is the end of the* **INITIAL COCKPIT PREPARATION**. *Both Captain and First Officer candidates will be responsible for it.*

FLOW15.CDR





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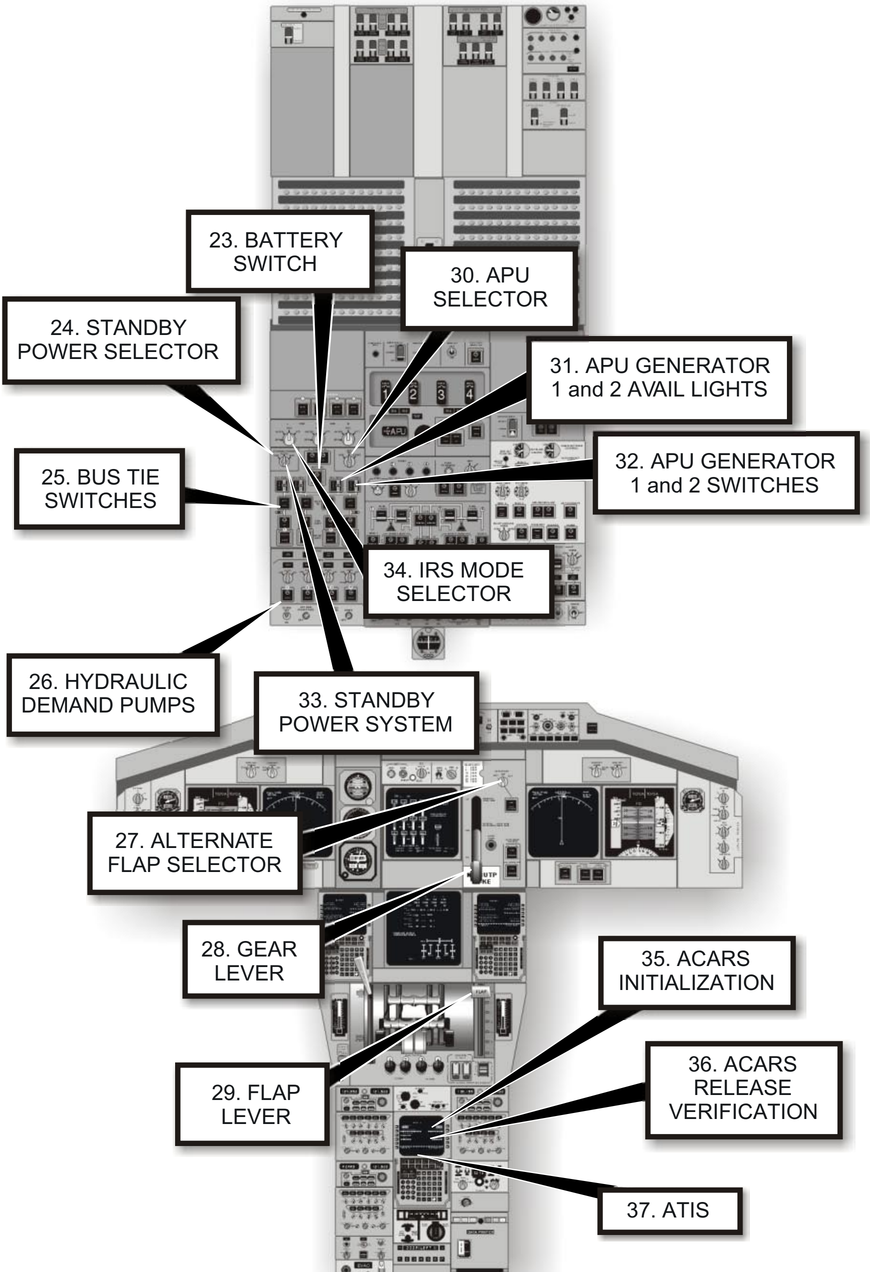
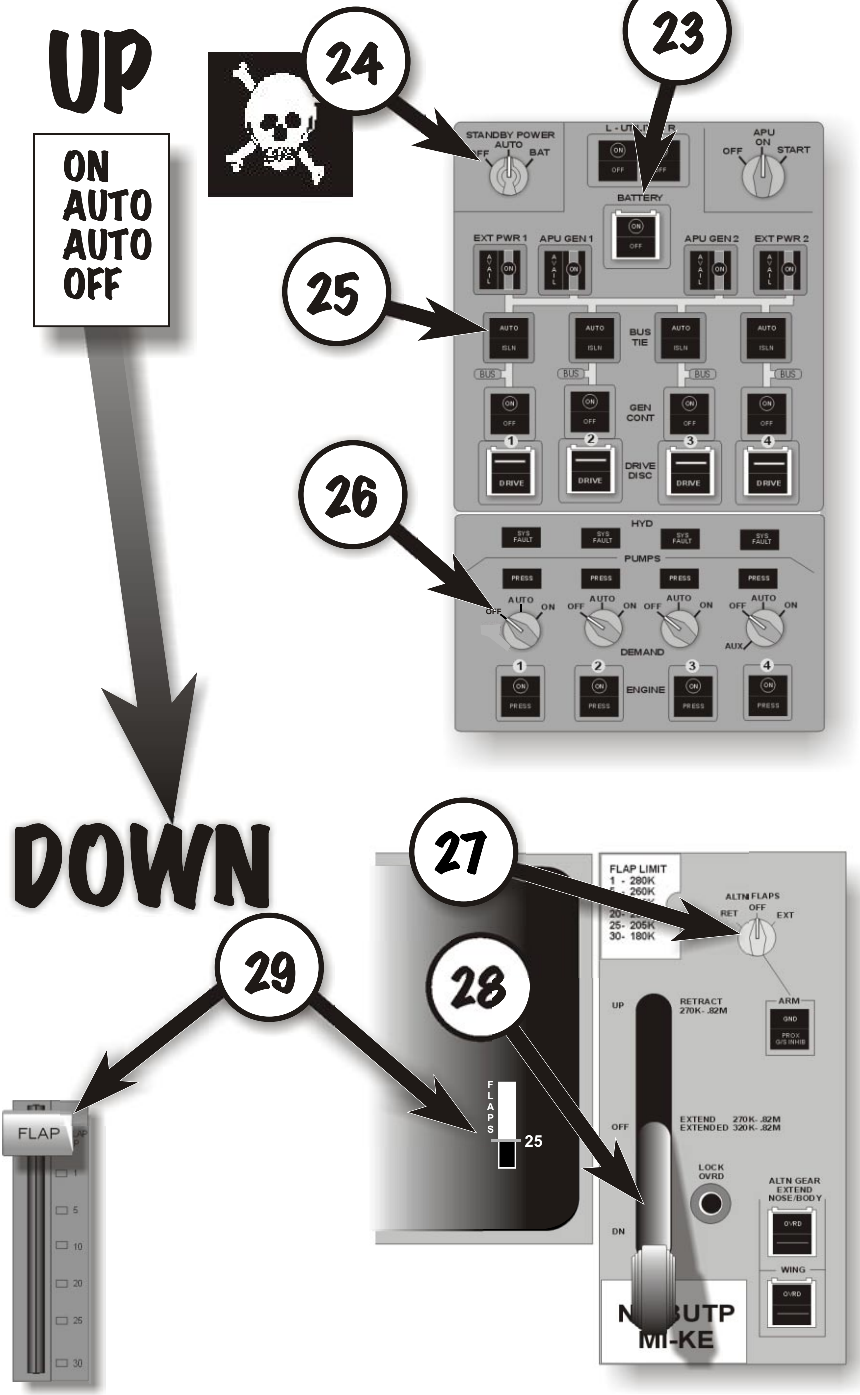
# INITIAL COCKPIT PREPARATION continued







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# UP (UPPER PART OF PANEL)

## 23 BATTERY SWITCH ........................................ ON

**NOTE**: Selecting the **BAT SWITCH** OFF will cause the **APU** to shut down. On some airplanes, the **APU** will continue to run for 90 seconds *WITHOUT FIRE DETECTION*. However, when using the "**SECURE CHECKLIST**" it is considered SOP to delay shutdown of the battery switch for a full **2 MINUTES** after the APU is shut down. This eliminates the fire detection problem.

## 24 STANDBY POWER SELECTOR ......... AUTO

This time we will ONLY check the switch in the AUTO position.

## 25 BUS TIE SWITCHES ................................. AUTO

If the ISLN is indicated in the light bar, pushing the light should re-select the AUTO position. If the will not reset the AUTO position, get maintenance involved.
If one of these remains in ISNL, dispatch is possible but requires coordination with SAM (maintenance).

## 26 HYDRAULIC DEMAND PUMPS ............. ALL OFF

We will visit the Hydraulic Pump switches several times during the set-up. This time ... ALL PUMPS OFF. Some pilots look at the brake press gauge, and if really low, they will turn on the #4 AUX position momentarily to get the parking brake pressure up to a "normal" indication.

# DOWN (LOWER PART OF PANEL)

## 27 ALTERNATE FLAP SELECTOR .................. OFF

The mistake that you could make is to have the switch indicating **RET**, a leftover from a previous crews problem.

## 28 GEAR LEVER .......................................... DOWN

Position of the GEAR LEVER may or may not indicate that the gear are actually down. The check here is to ensure that the gear ***LEVER*** is down ... since this is an EICAS driven machine, an appropriate EICAS indication is the ONLY indication as to where the gear are.

## 29 FLAP LEVER ...... AGREES with POS INDICATOR

Like the gear, the position of the handle may or may not indicate where the flaps are. It is the EICAS that is the definitive indicator as to flap position. We want to ensure that ***BOTH*** the **HANDLE** and the **EICAS** are showing the same indication.

FLOW17.CDR



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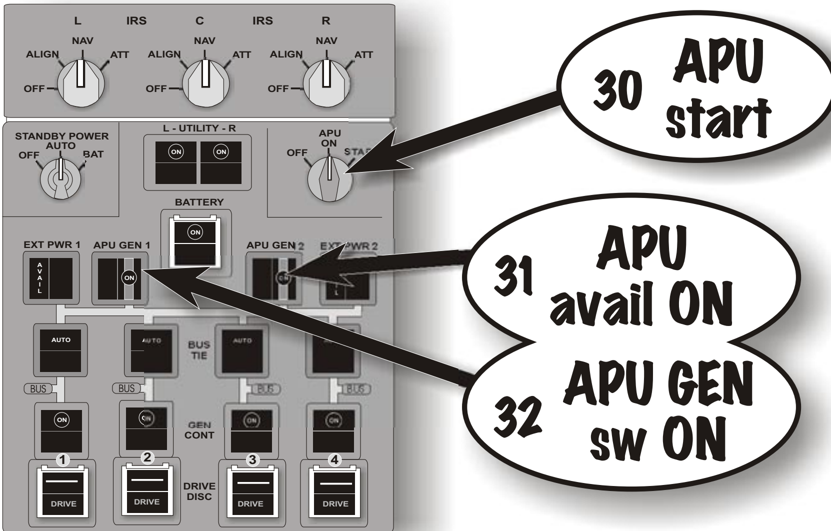
# UP




## 30 APU SELECTOR ............................ START/ON

Starting the APU on this airplane does ***NOT*** involve any fire test or additional checks. All you gotta do is turn the switch to ON and let it return to run. It is totally automatic and very reliable.

## *Some APU stuff:*

Fuel is obtained from the **#2 MAIN FUEL TANK**.
FUEL PRESSURE is supplied by either:
*__#2 AFT BOOST PUMP__ if AC is available, or*
*a dedicated __DC FUEL PUMP__ if required*.
It is common (and expected) that the #2 AFT BOOST pump light will be OFF on the overhead panel.
The **DC PUMP** is powered by the **APU BATTERY** and starts and stops automatically when required.

The **APU BATTERY** powers:
*STARTER*
*AIR INLET DOOR (opens and closes automatically)*
*APU CONTROLLER (STBY power is from MAIN BATTERY if needed).*
*DC FUEL PUMP*
*APU FIRE DETECTION CIRCUIT*
BUT ALSO supplies (And here is an ORAL QUESTION)
***<u>BACKUP ELECTRICAL for CAPTAIN'S INSTRUMENTS</u>***!

continued on next page ...



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### *Some more boring APU stuff:*

DELAY of 2 minutes after shutdown before shutting off the BATTERY SWITCH, ensures that the Fire Detection system is available during shutdown.
*On some airplanes (N171UA), if the battery switch is shut down, the APU has NO FIRE DETECTION during it's shutdown.*

## 31 APU GEN 1 & 2 AVAIL LIGHTS ..................... ON

These light bars are the ONLY indication that the electrical power from the APU has the proper VOLTAGE and FREQUENCY. The EICAS MSG (APU RUNNING) only indicates that the APU N1 RPM is greater than 95%.

## 32 APU 1 & 2 SWITCHES .............................. ON

Depressing the switches selects the APU power. It has been my experience that it takes about 3 seconds for the switch to react; and even then, additional attempts may be required. The right switch seems to react more easily, and if waiting to shut down the engines, the operation of one generator is sufficient to power the whole airplane.

## *A QUICK SYSTEM REVIEW*

**The AUXILIARY POWER UNIT**:

*A powerful jet engine (PW 901A) in its own right, the APU drives two (2) 90 KVA generators and a massive cooling air blower. The unit sits in the* ***UNPRESSURIZED*** *tail cone of the airplane. It is capable of providing electrical power for the entire airplane AND bleed air for such things as air conditioning.*

Here's the BAD NEWS about the APU:
***CANNOT BE STARTED IN FLIGHT***, but
If started on the ground, it may operate up to 20,000'.
In flight, it can supply ONE PACK up to 15,000'.
***APU SUPPLIED ELECTRICAL POWER***
***IS NOT AVAILABLE IN FLIGHT.***

**The APU STANDBY BUS**:

*This bus provides* ***BACK-UP POWER FOR THE CAPTAIN'S PFD, ND, and FMC****. Normally, these items are powered by the Captain's Transfer Bus, and if all power is lost to that bus; then the* ***APU STANDBY BUS*** *is automatically powered by the* ***APU BATTERY*** *through the* ***APU HOT BATTERY BUS*** *and the* ***APU STANDBY INVERTER****.*

***THE BATTERY SWITCH MUST BE ON FOR THIS TO OCCUR.***

*If the AC BUS #1 is also unpowered, the APU STANDBY BUS is now powered by the APU BATTERY and*

***CAN BE EXPECTED TO BE POWERED FOR AT LEAST 30 MINUTES.***

30 MIN


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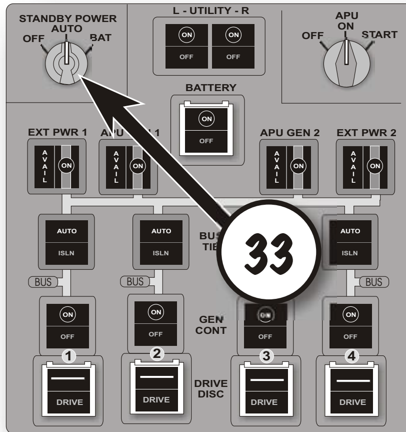
# STANDBY POWER SYSTEM CHECK

NOTE: Airplane MUST be on the ground with ***ALL*** busses powered.




**ALERT**:

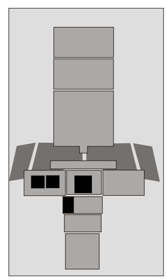
*If you are interrupted and inadvertently leave the switch in the BAT position, there is a possibility that, if the trickle charger isn't working properly, the battery will discharge about 30 minutes later.*

## 33a STANDBY POWER SELECTORS ............ BAT

VERIFY:

**CAPTAIN'S PFD**
**CAPTAIN'S ND**
**UPPER EICAS**
**LEFT CDU**

***REMAIN POWERED***



CHECK:
on primary (upper) EICAS the following messages appear:

**BAT DISCH**
**BAT DISCH MAIN**

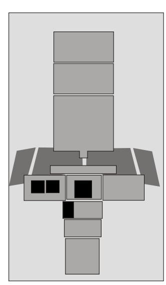
***MESSAGES APPEAR***

## 33b STANDBY POWER SELECTORS ......... AUTO

VERIFY:

**CAPTAIN'S PFD**
**CAPTAIN'S ND**
**UPPER EICAS**
**LEFT CDU**

***REMAIN POWERED***



CHECK:
on primary (upper) EICAS the following messages appear:

**BAT DISCH**
**BAT DISCH MAIN**

***MESSAGES DISAPPEAR***





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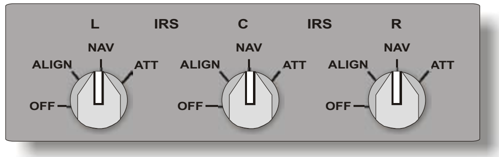
**IRUs also called IRS.**




## 34 IRS MODE SELECTORS (three) ................ NAV

All we do here is ... turn the switches to NAV.

There is no reason to pause at "ALIGN," ***BUT*** if you should accidently go to "ATT," Go all the way back to "OFF" and start over. The alignment process is advertised to take 10 minutes, but maybe I am wrong, it sometimes seems to take longer. *Be patient.*

***SOME IRU FACTS***:

*1. The IRS position can **ONLY** be updated (by pilot entry) **on the ground** through the **CDU**s.*

*2. There is NO capability (like some other IRSs) for the pilot to enter the position on the unit.*

*3. There is **NO** updating of the IRS position, once the units have entered the **NAV MODE**!*

*4. The IRS **DOES NOT NAVIGATE**! It only provides an inertial position input to the FMCs. The FMCs have navigational computers that use the information.*

*Some thoughts regarding ALIGNMENT:*

*The IRS **MUST** go through a **FULL ALIGNMENT** and **RECEIVE INITIAL POSITION** when first turned on.*

*When an IRS mode selector is moved from OFF through ALIGN to NAV:*
*IRS conducts 10 second self test (ON DC light will come on briefly).*
**IRS ALIGN MODE** *message displayed,*
**10 MINUTE** *alignment process starts.*

*There is a* **30 second FAST ALIGN** *feature that can be used on through flights. While parked, you go from **NAV** to **ALIGN** and back to **NAV.***

*If all three "stored positions" or if all three IRSs do not agree, a* **REENTER IRS POSITION** *message appears.*

*If IRS stored position differs by more than 6 nm from the entered position, the msg* **IRS POS/ORIGIN DISAGREE** *is displayed.*

*It may be necessary to input a correct* **INITIAL POSITION** *several times to overcome a* **POS/ORIGIN DISAGREE** *msg.*

***Here is the DANGER in all this.***
*If you decide to put in another initial position that disagrees with the IRS; after a coupla tries it WILL accept that input and agree with you. Make certain that you are inputting a CORRECT position.*





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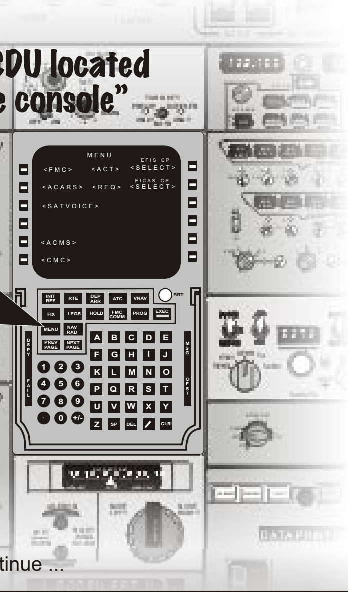
# DOWN it's the CDU located "on the console"

ACARS: do 3 things




## 35 ■ ACARS INITIALIZATION

## 36 ■ ACARS RELEASE VERIFICATION

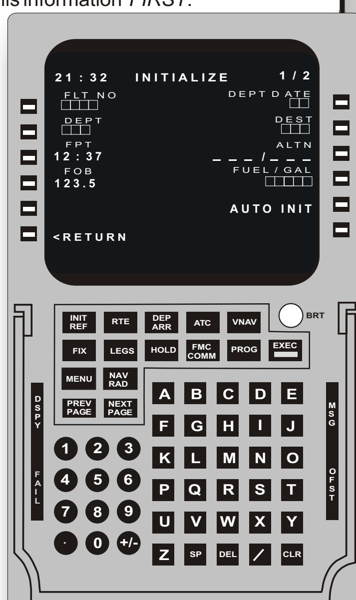
## 37 ■ ATIS

This thing has a bunch of modes, so when you first look at the little screen, it could have some confusing stuff on it. To get it where we can work with it:

***FIRST PUSH MENU KEY***; then we can continue ...

## 35 ACARS INITIALIZATION ................ COMPLETE

It will be necessary to complete the initialization before we go to the FMCS to load the flight data. The machine has to have this information *FIRST*.




After selecting MENU

SELECT: <ACARS> key 2L; then

SELECT: INITIALIZATION

Fill in the appropriate information. Be aware that there are 2 pages to the initialization portion.

There's nothing really tricky here, you may not have the fuel on board yet, so skip that and just fill in as much as you can.

The ***COMPULSORY FIELDS*** are:

FLIGHT NUMBER
DEPARTURE DATE
DEPARTURE AIRPORT
ARRIVAL AIRPORT
FUEL ON BOARD
FUEL/GALLONS BOARDED
CAPTAIN'S NAME/FILE NUMBER

***NON-COMPULSORY FIELDS*** are:

FLIGHT PLAN TIME
ALTERNATE AIRPORTS





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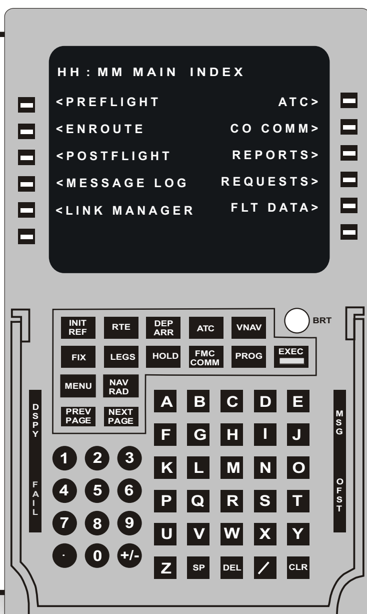
## 36 ACARS RELEASE VERIFICATION.... COMPLETE

SELECT: **REQUEST INDEX**; then

SELECT: **DISPATCH INDEX**; then

SELECT: **RELEASE VERIFY**.

*This will send a message to dispatch triggering a series of activities on their part. They will "eventually" send back a message to you on the ACARS. It will take several minutes.*


## 37 ATIS ............. OBTAIN

You may obtain the ATIS from the VHF radio ... OR you can obtain it through the ACARS:

SELECT: **PREFLIGHT MENU**

SELECT: **ATIS**

ENTER: **AIRPORT ID** (YYYY international, XXX domestic)

SELECT: **SEND.**

After a few minutes, expect a message via the printer.

*INTENTIONALLY LEFT BLACK*





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called the "WALK AROUND" by pilots

# EXTERIOR INSPECTION

The exterior inspection must be conducted by a "**QUALIFIED**" crewmember (such as a Captain, lowly Co-pilot, Other qualified First Officer, or Bunkie) prior to ***EVERY DEPARTURE***, except in the case of a diversion.

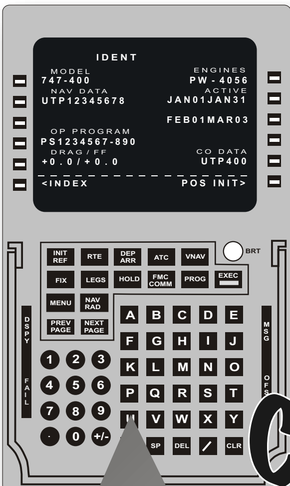
While the Captain, of course, bears ultimate responsibility for the thoroughness of the inspection, She/he does not actually have to conduct the inspection. Here is a thought, however, if you are a veteran Captain, and you are paired with a newby co-pilot ... it might be a good idea to do the walk-around and give the youngster an opportunity to take their time and do their cockpit set-up duties.

One truly significant part of the walkaround is to check that the static ports and the pitot tubes are ***NOT*** blocked. It is possible that it these were taped over and then the airplane was painted; as a result, it takes an incredible amount of attention to this detail to discern the camoflaged tape.

*There have been several colorfully painted jets get airborne because of this oversight … and they crashed.*

# more CAPTAIN'S SETUP STUFF

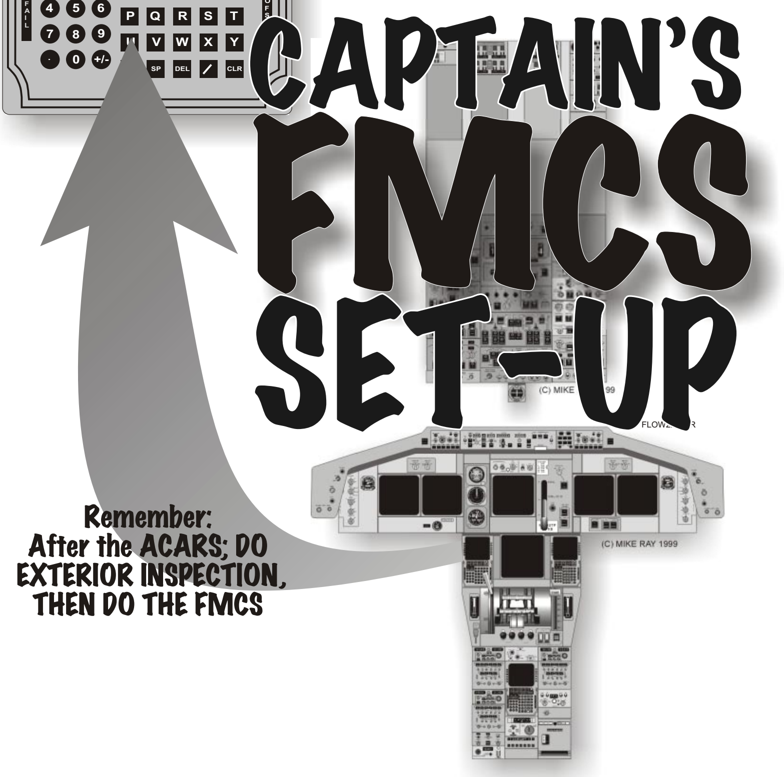
After the **ACARS** is complete, the Flight Handbook considers the **INITIAL COCKPIT SET-UP** as being complete. The very next thing listed in the book is the **EXTERIOR INSPECTION**; however, in the "real world" one can expect that the Initial Cockpit Set-up will be completed by the Captain, and the Exterior Inspection to be completed by another crewmember.




**Be alert**: *Here is where some confusion may occur in the flows.*

The next thing that the Captain does is the **CAPTAIN FMCS INITIALIZATION AND VERIFICATION**. So, more natural flow is to go right from the three things on the console CDU (ACARS) to the cdu (FMCS) on the throttle console. The Checkguy will be wanting you to tell him that you have completed the first flow and are ready to do the ***NEXT THING***, which is the *EXTERIOR INSPECTION*.

In the real world, perhaps you would just flow right up there and go from one thing to the other seamlessly, but on the check-ride, be certain that you are aware that there is a break in the flows.





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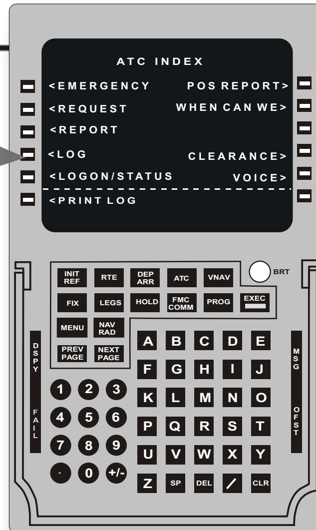
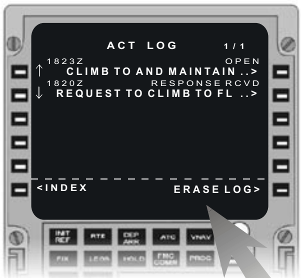
## 1 ATC LOG

Check that all previous messages are deleted.

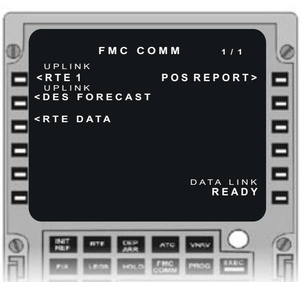



If messages exist, use the **ERASE LOG** prompt to remove them.

## 2 FMC COMM

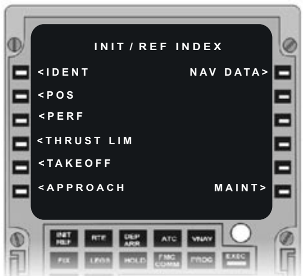
Check that there are **NO UPLINKS** remaining from previous flights.

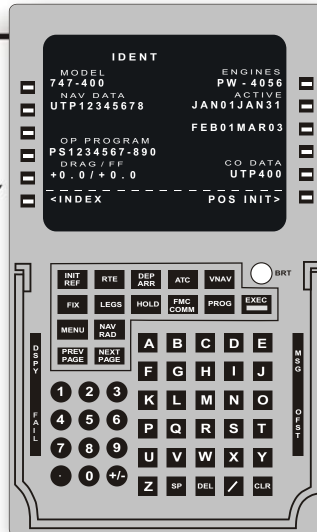




Select DELETE to scratchpad, depress appropriate LS button to remove the message.

## 3 ACTIVE NAV DATABASE

Verify correct
select:
IDENT page from the INIT / REF page.



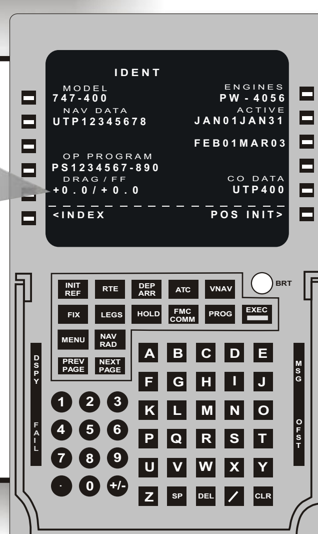

*The VALID NAVIGATION DATE begins at 0901 UTC on the first day of the 28 day navigation data cycle. The date and time should be valid at the time of departure. Changing the ACTIVE DATABASE can only be accomplished on the ground. If the effective ACTIVE DATABASE does not match the Captain's clock date, the message NAV DATA OUT OF DATE appears in the scratch pad.*

**TO UPDATE ACTIVE DATABASE DATE:**

**LS (3R) This will select new date to the scratch pad.**
**LS (2R) This will change the active date.**

## 4 PERFORMANCE FACTORS

The current BURN FACTORS (**DRAG/FF**) are listed on the FLIGHT PLAN. These should be compared with those on the CDU PAGE "**IDENT**."




To modify the factor if required.
From the **INIT/REF PAGE**:

**select MAINT prompt (6R)**
**select PERF FACTORS (2L)**
**type ARM into the scratch pad**
**Enter at (6R)**
**type NEW FACTOR in scratch pad**
**Enter at (2L)**.

Confirm NEW FUEL FACTOR (FF).



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# 5 complete POSITION INITIALIZATION


**REFERENCE AIRPORT ... ENTER**.
Enter the four letter ICAO departure airport identifier at (**LS2L**). For example: KLAX

**AIRPORT GATE**
Enter the airport identifier at **LS3L**, this will allow entry of the **GATE CODE** from the FOM AIRPORTS PAGE.

**IRS POSITION** (GPS preferred).
Select the IRS POS by this order of preference:
GPS (4R)
GATE (3R)
REF AIRPORT (2R)
LAT / LONG (last resort).

**NOTES:**

*The FMCS validates the integrity of the GPS signal source. A successful completion of the validation process results in the display of position data at 4R.*

*If the IRS POS/ORIGIN DISAGREE message appears in the scratchpad, it is likely that an incorrect position was entered. Re-check and re-enter ... prompt boxes not required for this second entry.*

**UTC (GPS) ........... verify**.

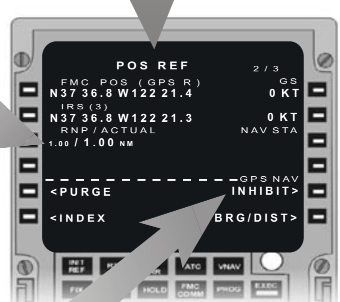
GPS is the primary time source for the FMCS. UTC (MAN) indicates that the FMCS is getting it's input from the Captain's clock.

*If the Captain's clock is more than 12 seconds from GPS time, a scratchpad message will appear:* ***SET CLOCK TO UTC TIME***.

Verify **RNP**
**(REQUIRED NAVIGATION PERFORMANCE)**.

Values in the small font at **LS3L** depict the normal default mode of operation for **RNP**. Deleting **MAN** at LS3L allows default RNP to be engaged.

*If the **RNP** value is different from the default value, a new RNP can be MANUALLY entered. Values that can be entered range from 0.01 to 99.9.*




**VERIFY GPS NAVIGATION HAS INHIBIT DISPLAYED.**

On LS(5R) of POS REF 2/3 the word **INHIBIT** should be visible.

## BORING AND EXTRA CURRICULAR MATERIAL.

I have been asked: Just what is "RNP?"

**REQUIRED NAVIGATIONAL PERFORMANCE**

Here's the boring story in a simple form. The Air Traffic Control (ATC) system has long wanted some standards on which to develop a more efficient system, called "*Communications Navigation surveillence/Air Traffic Management* (CNS/ATM). In order to do that, they have to have a "*realtime estimate of navigational certainties*" for airplanes operating in that system.

The criteria for *Total System Error*(TSE) is:
*"The TSE must not exceed the specified RNP value for 95% of the flight time on any part of any single flight."*

Example*: RNP-10 means TSE less than 10 NM fopr 95% of the flight time.*

The introduction of GPS and IRU equipment on the modern Boeing airplanes has provided the needed navigational accuracy and we have that information constantly available.

Different areas of operation in the attached demand different RNP values and range (currently) from .01 to 20, with .03 or .05 being the most commonly dictated RNP. The value for your flight will be indicated on your individual flight plan.

## 6 confirm ACARS initialized.

Verify correct. *Use the CDU down on the lower console*.

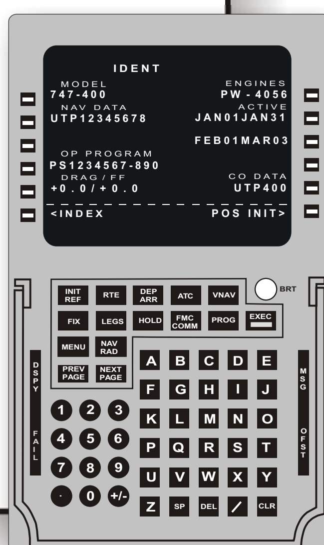
We have done the initialization earlier and now we simply see that the information is correct.

Compulsory information is:

*Flight Number*
*Departure date*
*Departure airport*
*Arrival airport*
*Fuel on board*
*Fuel/gallons loaded*
*Captain's name*
*Captain's file number*

Non-compulsory information includes:

*Flight plan time*
*Alternate airports*



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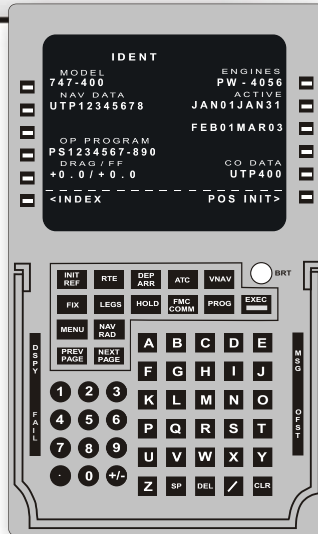
## 1 CAPTAIN enters ROUTE:




There are three techniques to enter the route:

1. DATALINK using Company Flight Plan computer(The easiest).
2. MANUAL entry from FPF
3. MANUAL entry from company database FMCS route.

*Of course, the route generally dictates the method used. For example, if you are going from Los Angeles to Beijing with a flight plan about 30 feet long, it is nice to use the datalink method. However, if you are going from Los Angeles to San Diego, a "simple" manual entry would make more sense.*

The route of flight is entered by the CAPTAIN and VERIFIED by the FIRST OFFICER.

***NOTE*:**

What is meant by "CAPTAIN ENTER" and "F/O VERIFY" is this. The intent is for the Captain to enter the flight plan entirely independent of the F/O. That is to say, even though it may make sense for the F/O to "read off" the fixes or "WATCH" the entry ... ***this is NOT ALLOWED***. ***THE CAPTAIN MUST DO THIS TASK UNASSISTED***!!!

## A BORING COMMENT

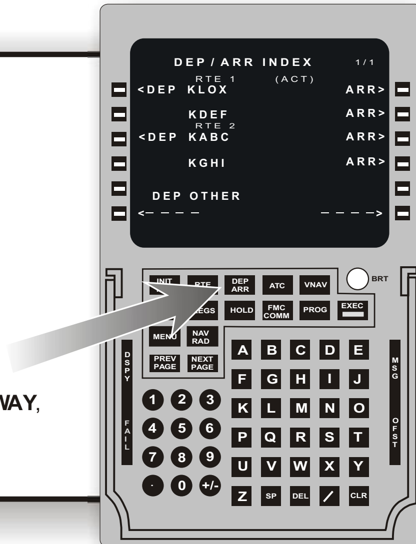
Here we have to make a clear distinction between "***PLANNED***" and "***CLEARED***" as it applies to flight plans. The original flight planning would have taken place hours before and perhaps would have been rendered inaccurate or unavailable at the time of actual flight. So, it is frequently true that actual flight clearances from ATC may differ from our flight plan. *The flight plan is actually under going continual alteration by ATC during the entire flight evolution and you can expect possible changes taxiing out or after takeoff or cruise or descent or anytime during the flight. We have to be able to make the appropriate changes in the CDU/FMC quickly and accurately AND complete the proper cross check to ensure that our flight profile EXACTLY matches the one that ATC expects.*

## 8 after ROUTE has been entered:

**The CAPTAIN does three 3 things:**

## 1. DEPARTURE/ARRIVAL ..... SELECT

Depress the **DEP/ARR** key to enter the:
**PLANNED DEPARTURE RUNWAY**,
**SID** (Departure), and
**TRANSITION** (if applicable).

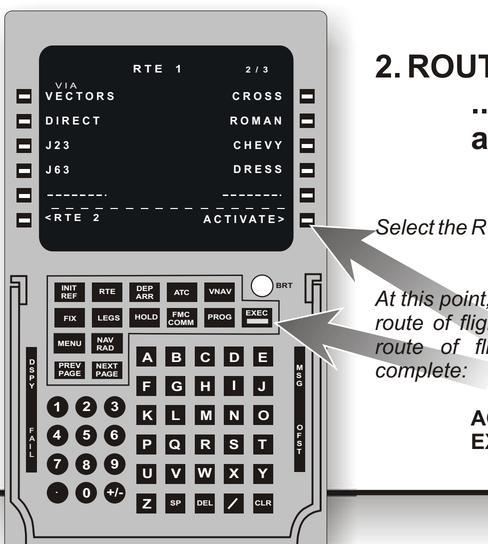



## 2. ROUTE ..... verify, activate, and execute

*Select the RTE key.*

*At this point, the Captain MUST verify the route of flight is IDENTICAL to the filed route of flight. AFTER verification is complete:*

**ACTIVATE, and**
**EXECUTE.**





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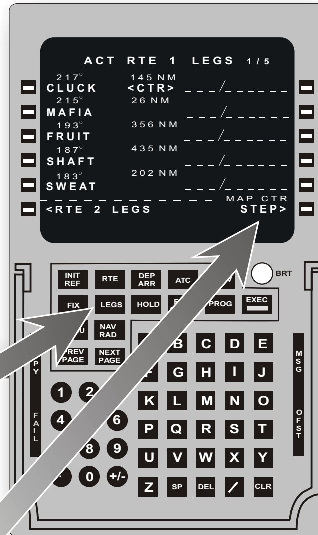
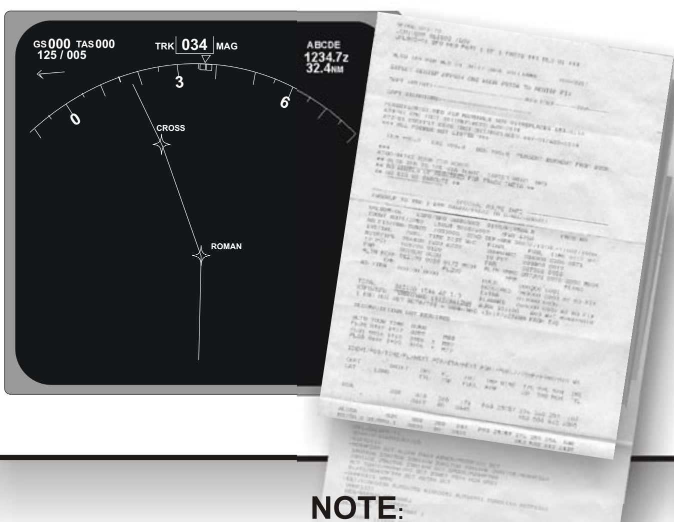



**CAUTION**:
The route **MUST BE IDENTICAL TO THE "*FILED*"** route. *Flights conducted on FLEX TRACK ROUTES also require cross checking the route with the track detail message.*

## 3. WAYPOINT verification:

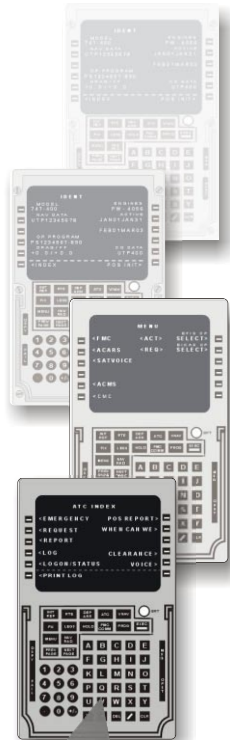
This is ESSENTIAL for a complete route check.
Here are the steps*:*

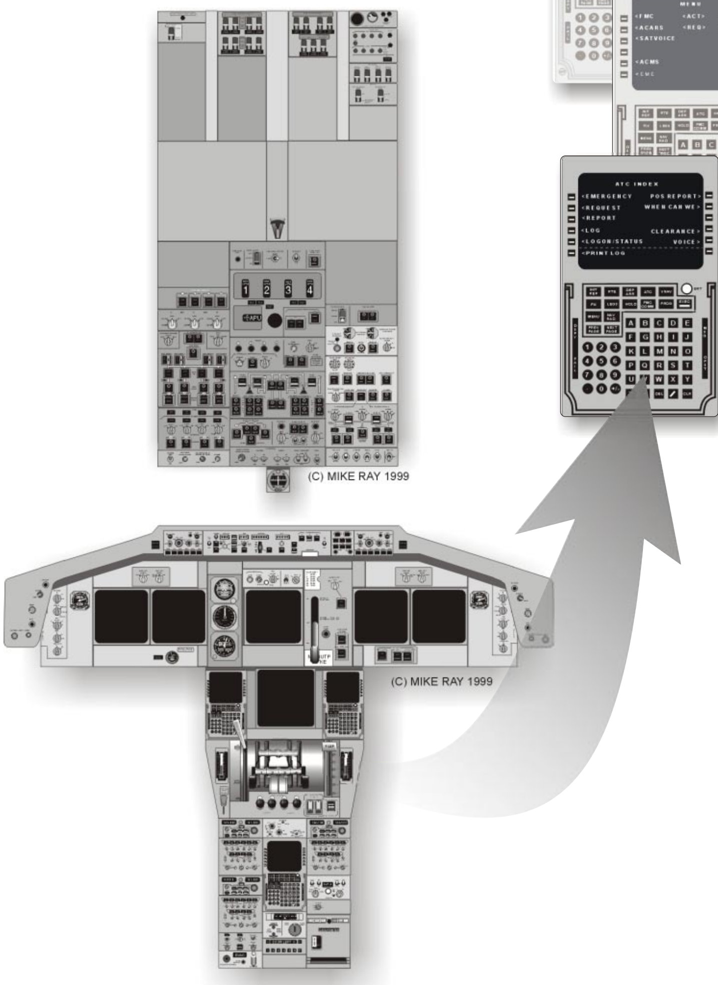
*1. Select* **LEGS** *page on the CDU.*
*2. Select* **PLN** *mode on the EICAS Control Panel.*
*3. Compare the* **MAGNETIC COURSE** *and* **DISTANCE** *between each waypoint of the FMC and the AFPAM.*
*4. Step through each waypoint at* **LS6R** *and verify.*
*5. The leg distances would be within 2nm of the FPF.*




**NOTE**:
*There are requirements to make notations on the* ***MASTER FLIGHT PLAN*** *during this evolution, but they are beyond the considerations of this manual. Pilot's going to "INTERNATIONAL" school will be introduced to those techniques.*

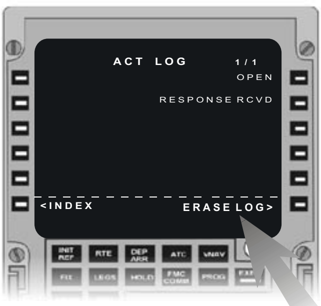
# FIRST OFFICER'S FMCS verification



## 1 ATC LOG

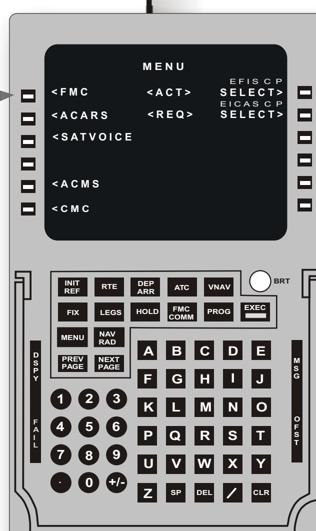
Check that all previous messages are deleted.

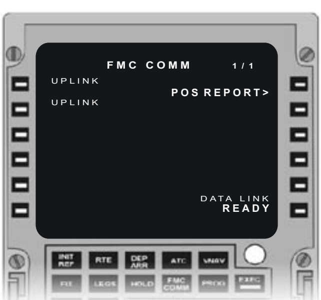




If messages exist, use the **ERASE LOG** prompt to remove them.

## 2 FMC COMM

Check that there are **NO UPLINKS** remaining from previous flights.




Select DELETE to scratchpad, depress appropriate LS button to remove the message.



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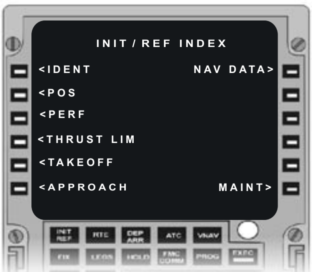
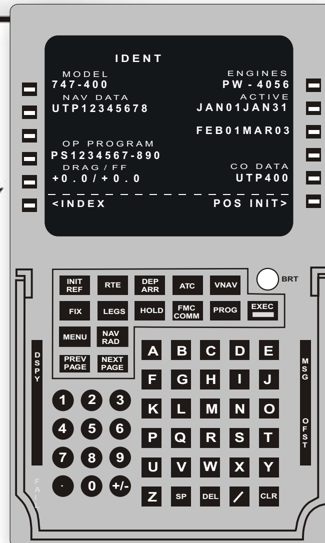
# 3 ACTIVE NAV DATABASE

Verify correct

select:
IDENT page from the INIT / REF page.




*The VALID NAVIGATION DATE begins at 0901 UTC on the first day of the 28 day navigation data cycle. The date and time should be valid at the time of departure.*
*Changing the ACTIVE DATABASE can only be accomplished on the ground.*
*If the effective ACTIVE DATABASE does not match the Captain's clock date, the message NAV DATA OUT OF DATE appears in the scratch pad.*

**TO UPDATE ACTIVE DATABASE DATE:**

**LS (3R) This will select new date to the scratch pad.**
**LS (2R) This will change the active date.**





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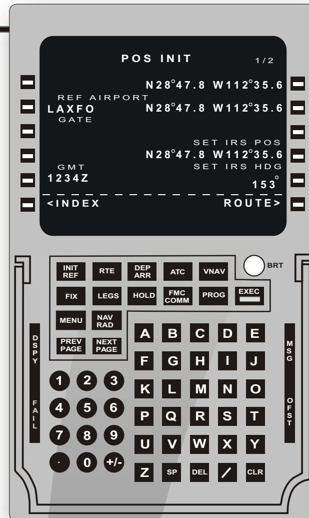
# 4 verify POSITION INITIALIZATION




**REFERENCE AIRPORT ... ENTER**.
Enter the four letter ICAO departure airport identifier at (**LS2L**). For example: KLAX

**AIRPORT GATE**
Enter the airport identifier at **LS3L**, this will allow entry of the **GATE CODE** from the FOM AIRPORTS PAGE.

**IRS POSITION** (GPS preferred).
Select the IRS POS by this order of preference:
GPS (4R)
GATE (3R)
REF AIRPORT (2R)
LAT / LONG (last resort).

**NOTES:**

*The FMCS validates the integrity of the GPS signal source. A successful completion of the validation process results in the display of position data at 4R.*

*If the IRS POS/ORIGIN DISAGREE message appears in the scratchpad, it is likely an incorrect position was entered. Re-check and re-enter ... prompt boxes not required for this second entry.*

**UTC (GPS) ........... verify**.

GPS is the primary time source for the FMCS. UTC (MAN) indicates that the FMCS is getting it's input from the Captain's clock.

*If the Captain's clock is more than 12 seconds from GPS time, a scratchpad message will appear: **SET CLOCK TO UTC TIME**.*

Verify **RNP**
**(REQUIRED NAVIGATION PERFORMANCE)**.


Values in the small font at **LS3L** depict the normal default mode of operation for **RNP**. Deleting **MAN** at LS3L allows default RNP to be engaged.

*If the **RNP** value is different from the default value, a new RNP can be MANUALLY entered. Values that can be entered range from 0.01 to 99.9.*

**VERIFY GPS NAVIGATION HAS INHIBIT DISPLAYED.**

On LS(5R) of POS REF 2/3 the word **INHIBIT** should be visible.



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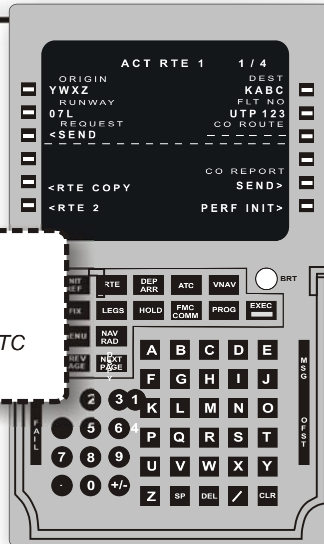
# 5 verify ROUTE:

On the ACT RTE page, verify the ATC FLIGHT NUMBER. Notice that the FLIGHT NUMBER depicted as part of the ICAO filed flight plan is the ***REQUIRED*** flight number.




**CAUTION**:

*The Improper flight number may inhibit CONTROLLER PILOT DATALINK COMMUNICATIONS (CPDLC) or establish ATC communications with the wrong airplane.*

On the ACT RTE page, verify that the route entered by the Captain is correct and agrees with the FPF, PDC, ATC clearance, and Charts.

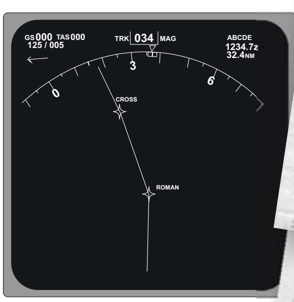
On the ACT RTE LEGS page, accomplish waypoint verification procedure as follows:

Select LEGS page on the CDU.

Select PLN mode on the EICAS Control Panel.

Compare the MAGNETIC COURSE and DISTANCE between each waypoint from the FMC and the AFPAM.

Step through each waypoint using LS6R to verify accuracy. The legs distances should be within 2 nm of the FPF.



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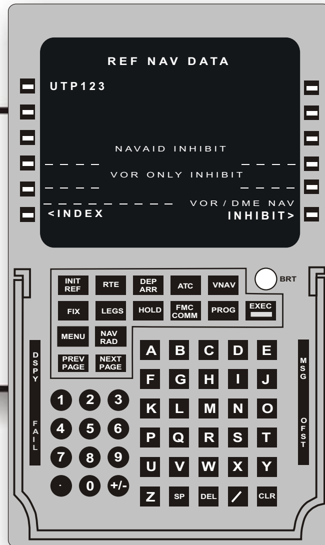



## 6 NAVAID inhibits

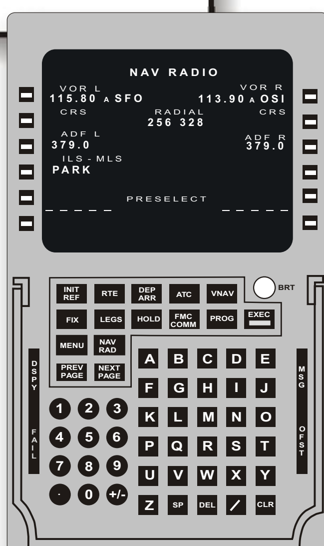
On the **REF NAV DATA** page, ensure no unwanted:

**NAVAID INHIBIT,**
**VOR ONLY INHIBIT,**
**VOR/DME NAV INHIBIT** exists.

## 7 Check VOR/ILS frequencies

On the **NAV RADIO** page, ensure no unwanted:

**VOR or ILS** frequencies are manually tuned**.**



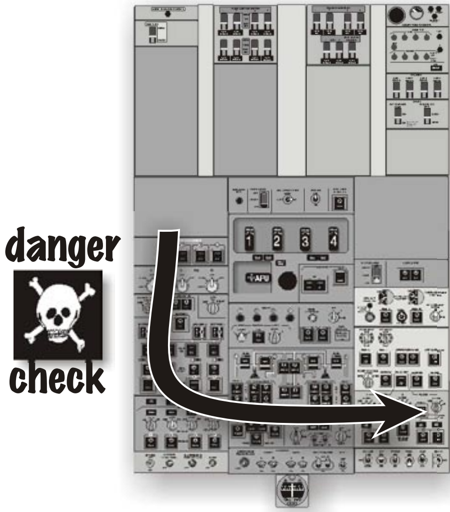

**DISCUSSION**:
**There are two VOR receivers. They are automatically tuned by the FMC.**

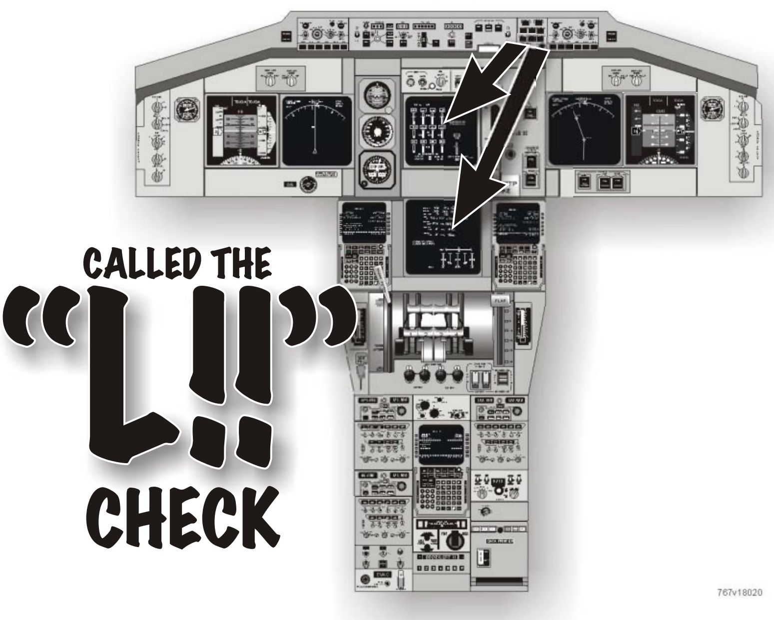
**There are three ILS receivers. They are also automatically tuned by the FMC.**

*If you have never seen this system operate, it is truly spooky. The problem, of course, is that it is so easy to not check on it and see that it is doing what it should do because it is truly fantastic. Here is where we check that it is tuning what we want it too, before we commit to takeoff.*

***END OF F/O's FMCS VERIFICATION***

# CAPTAIN'S COCKPIT PREPARATION





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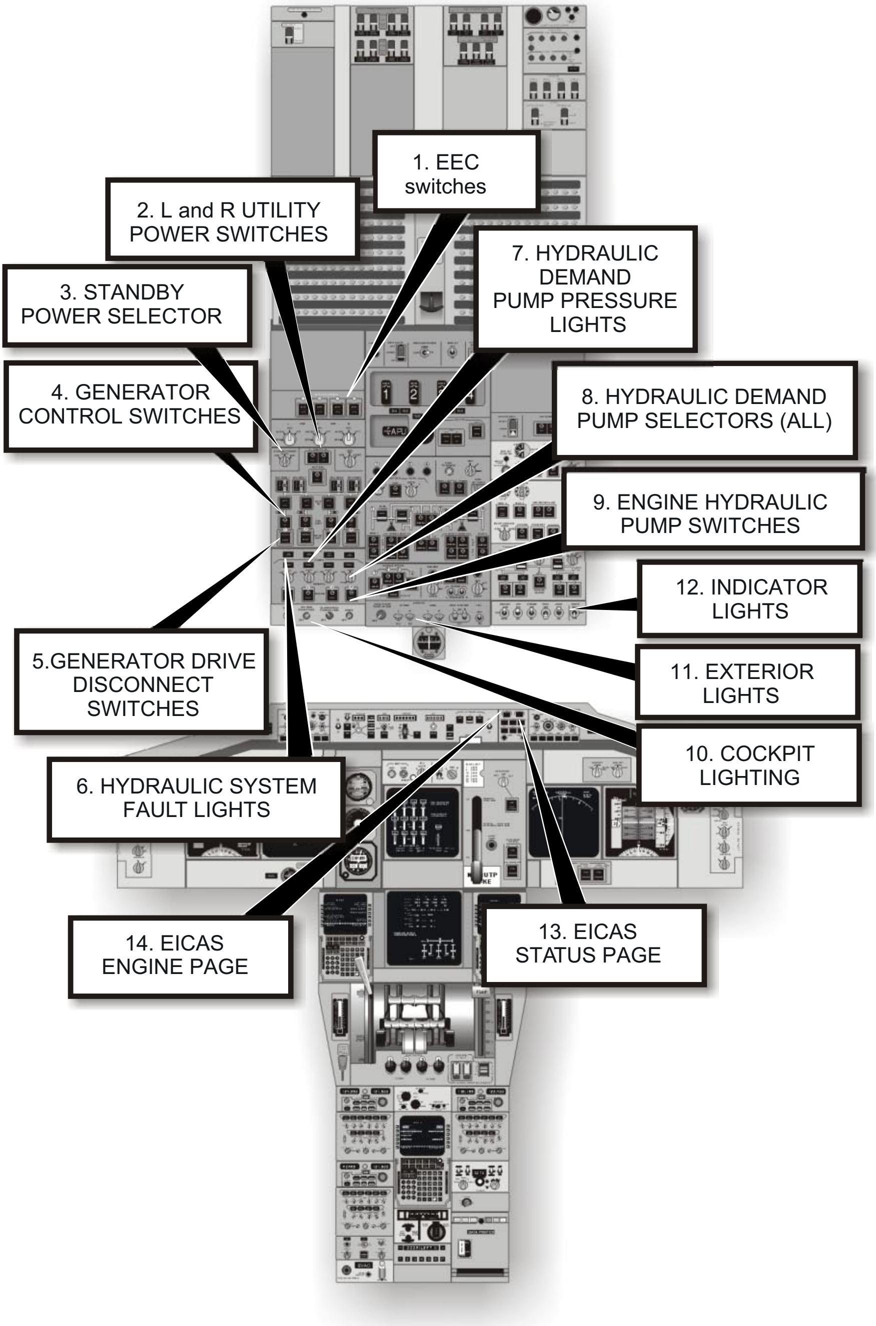
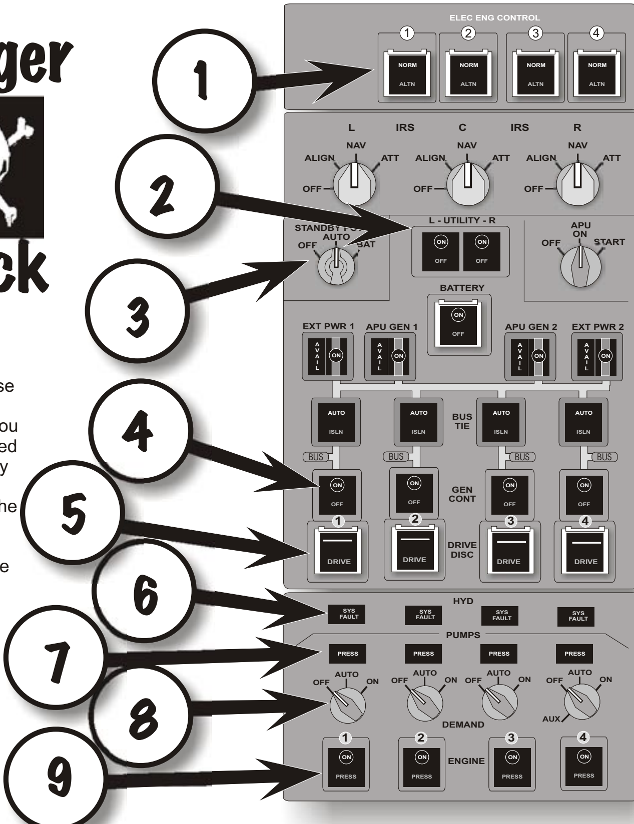

1. EEC switches
2. L and R UTILITY POWER SWITCHES
3. STANDBY POWER SELECTOR
4. GENERATOR CONTROL SWITCHES
5.GENERATOR DRIVE DISCONNECT SWITCHES
6. HYDRAULIC SYSTEM FAULT LIGHTS
7. HYDRAULIC DEMAND PUMP PRESSURE LIGHTS
8. HYDRAULIC DEMAND PUMP SELECTORS (ALL)
9. ENGINE HYDRAULIC PUMP SWITCHES
10. COCKPIT LIGHTING
11. EXTERIOR LIGHTS
12. INDICATOR LIGHTS
13. EICAS STATUS PAGE
14. EICAS ENGINE PAGE


I called this the "**DANGER CHECK**" because there is the possibility that you will get interrupted and inadvertently leave the STBY PWR switch in the BAT position. Then about 30 minutes later, the battery will be depleted. ***NOT PRETTY!***




## 1 EEC SWITCHES ....................... NORMAL

These switches have two modes:

PRIMARY uses EPR
SECONDARY uses N1 RPM

In PRIMARY MODE ... anytime you need MAX THRUST, just push the throttles to the stops. The thrust is continually adjusted automatically.

BUT: In secondary mode, it is possible to ***OVERBOOST*** the engines. If you manually select secondary mode, retard throttle to avoid overboost.
In secondary mode, continual adjustment of thrust is required during climb.
If one engine is in secondary, it is SOP to place ALL the engines in secondary.

***THE BIGGIE***!!! ***AUTO-THROTTLES DISCONNECT when using secondary mode***.

## 2 L and R UTILITY POWER SWITCHES...... ON

Main ELECTRICAL POWER users are the galleys.





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## 3 STBY POWER SELECTOR: BAT-TEST-AUTO

I call this the danger check because there is the possibility that during this test you can become distracted and ***leave the switch in BAT***. This is a NO-NO because the battery will become discharged in 30 minutes and it takes a long time to recharge ... and if you get airborne like that ... ***WHEEEEE***!


The concept here is to switch to BAT and observe four things and two EICAS msgs:

CAPTs PFD remains powered
CAPTs ND remains powered
PRIMARY EICAS remains powered
LEFT CDU remains powered
EICAS MSG: “BAT DISCH APU”
EICAS MSG: “BAT DISCH MAIN”

Then switch back to ON and observe these things remain powered and the EICAS msgs go away.

## 4 GEN CONT switches ....................... verify ON

There is no reason to expect that these would ever be de-selected. But it is extremely important that they are. Without these guys in the ON position, their respective generators cannot take the bus.

## 5 GEN DRIVE DISC switches ......... GUARDED

Once again, you are just checking to see that these disconnects have not been activated. They will disconnect the generator drive, and there is no way to reconnect them in the air. Be alert.

## 6 HYD SYS FAULT lights .................. ON

System not powered, no pressure: Lights ON.

## 7 HYD DEMAND PUMP PRESS lights .... ON

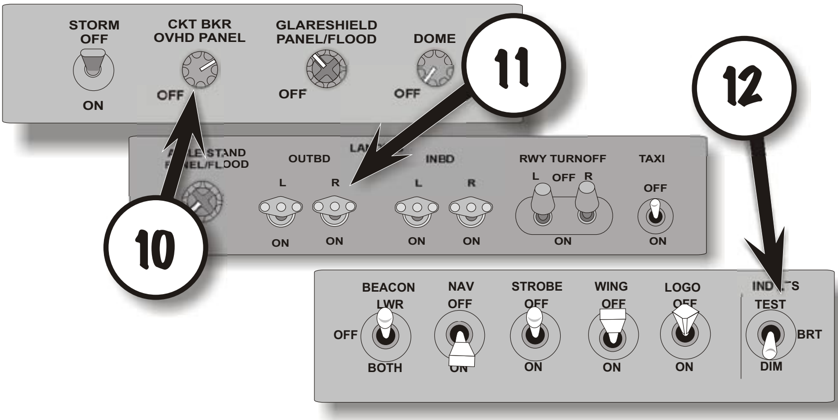
Pumps not powered, no pressure: Lights ON.

## 8 HYD DEMAND PUMP SELECTORS .... ALL OFF

This is the second time we have gone by this panel ... and left these guys unpowered.

## 9 ENG HYD PUMP switches ............ ON

Verify that the PRESS lights are ON




## 10 COCKPIT LIGHTING ................ ADJUST

## 11 EXTERIOR LIGHTS ..................... AS REQUIRED

Turn on the WING ILLUMINATION LIGHTS

*There is a lot of concern about leaving the wing illumination lights on with the passenger loading bridge up to the airplane. Gets hot so ... don't forget to turn them off.*

Turn on the LOGO lights at night only.
NAV LIGHTS are to remain ON at all times

## 12 INDICATOR LIGHTS ............................... TEST

You'll have to hold the switch in the test position. Usually you are leaning over the console and the other pilots are doing their thing, then just when you are at full body extension, you have to somehow bend around and check all those lights. wheeeew.

**NOTE**: *5 UP-5 DOWN rule*. There are 5 lights up and 5 down that do *NOT* come on. They are associated with the fire panels.



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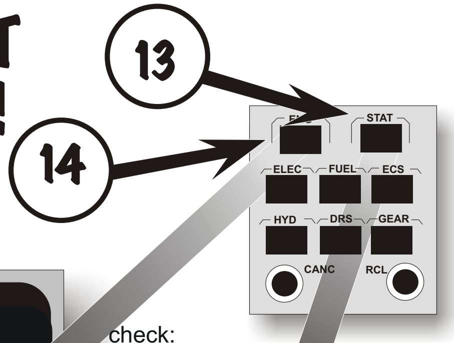
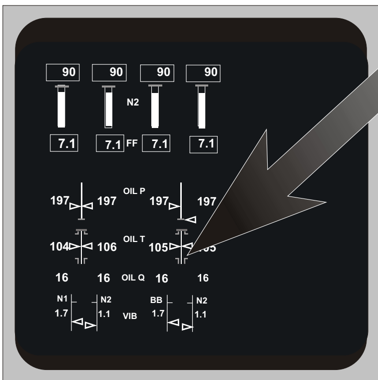
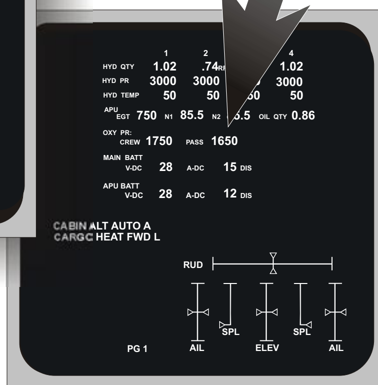
# DON'T FORGET THESE STEPS !

I have indicated these two steps with the two exclamation marks on the L!!




check:
ENG OIL >18 Qts.
ENG INDICATORS NORMAL




check:
STATUS MSGS
HYD QUANTITIES
BOTH O2 PRESS > 1650 psi

**NOTE:**
*Some instructors teach that F/Os should check these items when they first get to the cockpit to reduce departure delays; if service is required.*

## 13 EICAS STATUS PAGE ....................... SELECT

On the EICAS DISPLAY SELECTOR PANEL select STAT. Check the LOWER EICAS CRT FOR:

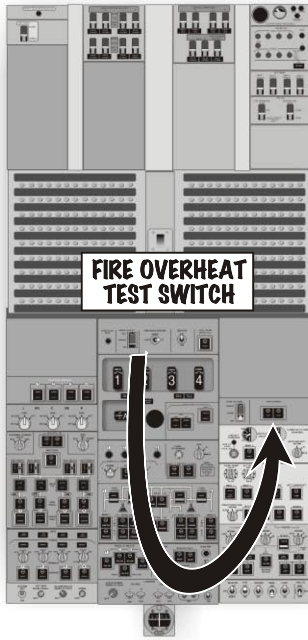
**NOTE ANY STATUS MSG and RESOLVE**
**HYD QUANT above RF (>74%)**
**BOTH OXYGEN PRESS above 1650 psi**

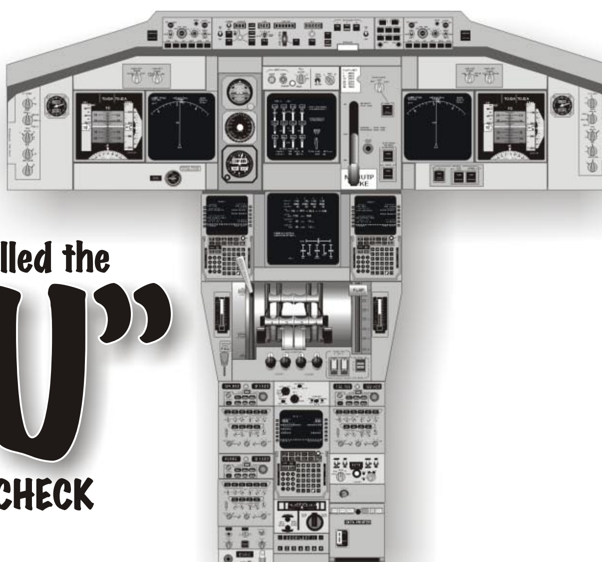
## 14 EICAS ENG PAGE ..................... CHECK

On the EICAS DISPLAY SELECTOR PANEL select ENG. Check the LOWER EICAS CRT FOR:

**ENG OIL QUANT ... >18 qts**
**ENG INDICATIONS NORMAL**

Start at top of center row and make a "U.".



Called the "U" CHECK





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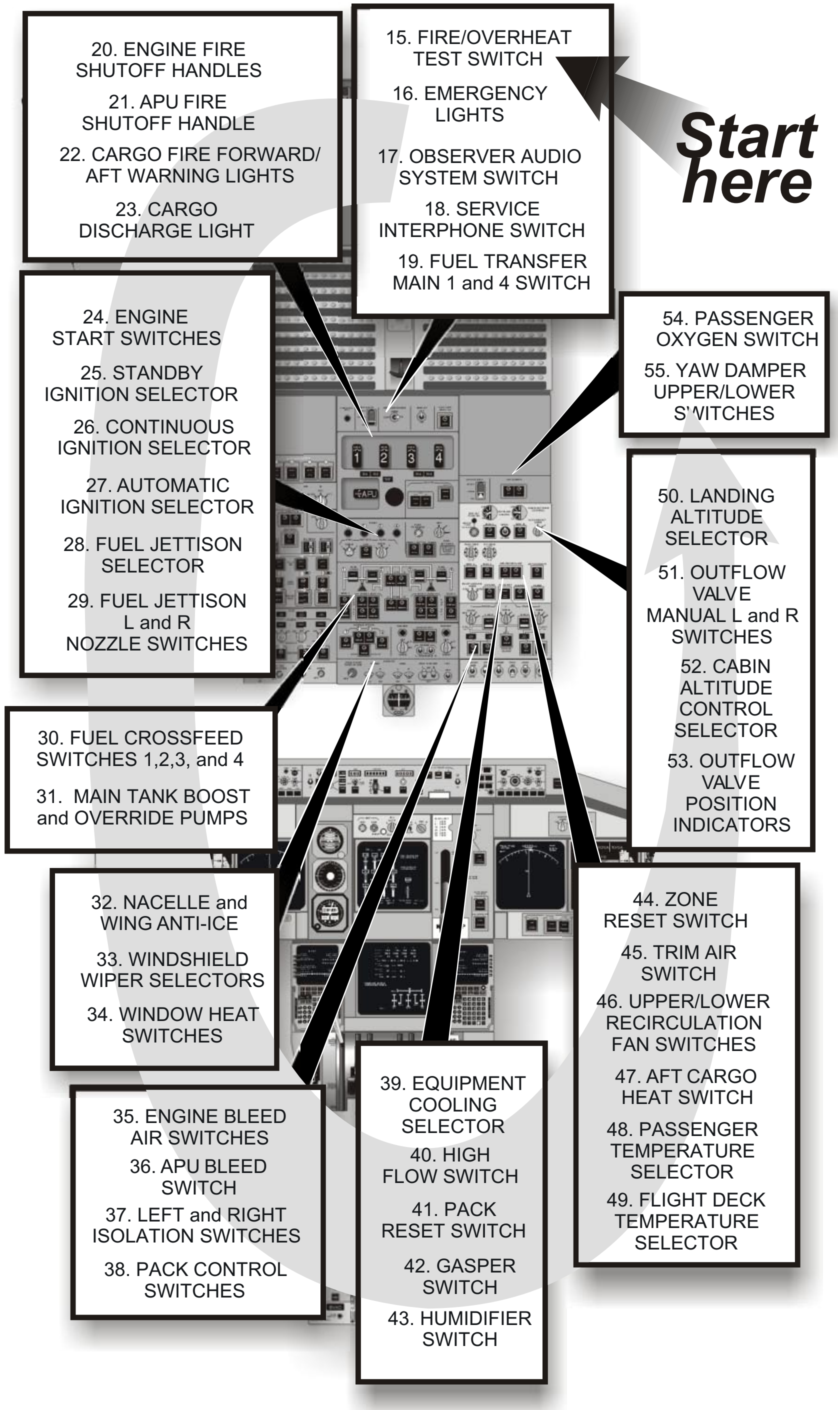
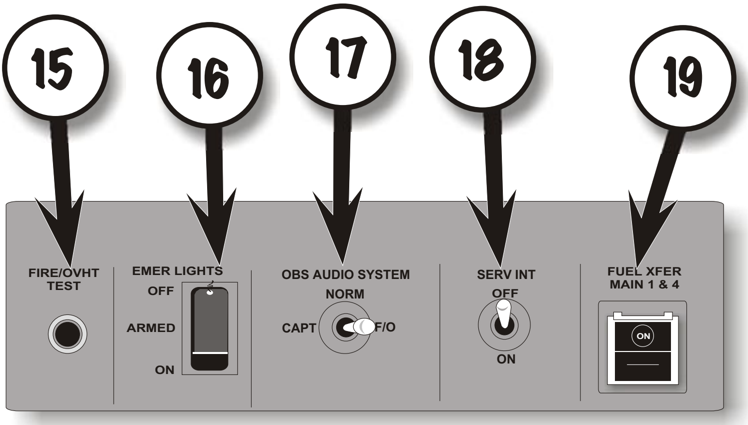

Start here
15. FIRE/OVERHEAT TEST SWITCH
16. EMERGENCY LIGHTS
17. OBSERVER AUDIO SYSTEM SWITCH
18. SERVICE INTERPHONE SWITCH
19. FUEL TRANSFER MAIN 1 and 4 SWITCH
20. ENGINE FIRE SHUTOFF HANDLES
21. APU FIRE SHUTOFF HANDLE
22. CARGO FIRE FORWARD/ AFT WARNING LIGHTS
23. CARGO DISCHARGE LIGHT
24. ENGINE START SWITCHES
25. STANDBY IGNITION SELECTOR
26. CONTINUOUS IGNITION SELECTOR
27. AUTOMATIC IGNITION SELECTOR
28. FUEL JETTISON SELECTOR
29. FUEL JETTISON L and R NOZZLE SWITCHES
30. FUEL CROSSFEED SWITCHES 1,2,3, and 4
31. MAIN TANK BOOST and OVERRIDE PUMPS
32. NACELLE and WING ANTI-ICE
33. WINDSHIELD WIPER SELECTORS
34. WINDOW HEAT SWITCHES
35. ENGINE BLEED AIR SWITCHES
36. APU BLEED SWITCH
37. LEFT and RIGHT ISOLATION SWITCHES
38. PACK CONTROL SWITCHES
39. EQUIPMENT COOLING SELECTOR
40. HIGH FLOW SWITCH
41. PACK RESET SWITCH
42. GASPER SWITCH
43. HUMIDIFIER SWITCH
44. ZONE RESET SWITCH
45. TRIM AIR SWITCH
46. UPPER/LOWER RECIRCULATION FAN SWITCHES
47. AFT CARGO HEAT SWITCH
48. PASSENGER TEMPERATURE SELECTOR
49. FLIGHT DECK TEMPERATURE SELECTOR
50. LANDING ALTITUDE SELECTOR
51. OUTFLOW VALVE MANUAL L and R SWITCHES
52. CABIN ALTITUDE CONTROL SELECTOR
53. OUTFLOW VALVE POSITION INDICATORS
54. PASSENGER OXYGEN SWITCH
55. YAW DAMPER UPPER/LOWER SWITCHES




## 15 FIRE/OVHT TEST switch ............ PUSH/HOLD

PUSH and HOLD until the EICAS changes from "**TEST IN PROG**" to "**FIRE TEST PASSED**"
OBSERVE THE FOLLOWING:
13 lights from the upper and lower fire/ovht panels and the Master Warning lights.

## 16 EMERGENCY LIGHTS switch ...... ARMED

There is a little "paper clip" under the guard and if that is bent or missing, when you close the guard the switch won't arm. So, the technique is to place the toggle switch to arm, and ***THEN*** close the guard.

## 17 OBS AUDIO switch ........................ NORMAL

This IS ***NOT*** the switch that hooks the radios up to the "entertainment" system. That switch is down on the console. This "OBS" refers to the cockpit observer.

## 18 SERVICE INTERPHONE switch .............. OFF

This has to do with maintenance.

## 19 FUEL XFER MAIN 1 and 4 switch ......... OFF

These switches are ***NOT*** part of the NORMAL fuel management system. New guys sometimes confuse this switch with the FUEL CROSSFEEDs selection which is located on the Fuel panel. These are not part of the pilots ***NORMAL*** cockpit operation.



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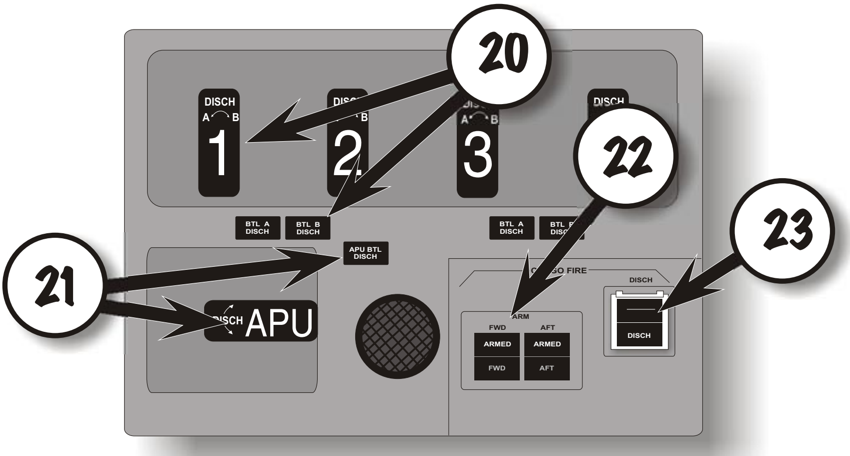


**20**

## ENG FIRE SHUTOFF handles .................. IN

There are actually three things to do:

HANDLES all the way in
LIGHTS in handles OUT
A and B BOTTLE low press (discharge) lights OFF

**21**

## APU FIRE SHUTOFF handle ........................... IN

Light in the handle should be OFF and
the APU bottle discharge light (low pressure) should be out

## CARGO FIRE FWD/AFT WARNING LIGHT ...... OFF

**22** The Checkguy LOVES this system. What are some questions he could ask? Here is a quick system review.

There are four bottles of extinguisher (A,B,C,and D). Each is armed with its own squib and has its separate discharge port. Pushing the **CARGO FIRE ARMED** switch selects either the fwd or aft cargo pit and arms all four bottles. Pushing the **CARGO FIRE DISCH** switch discharges bottles A and B into the selected cargo area.
The C and D bottles discharge ***AUTOMATICALLY 30 minutes*** later OR on landing. The bottles provide about ***2 hours and 30 minutes*** suppression time.

**23**

## CARGO DISCHARGE light ............................ OFF

The EICAS msg:
BTL LOW CGO Aand B; and/or
BTL LOW CGO C and D msg will be illuminated when the bottle pressures are LOW.



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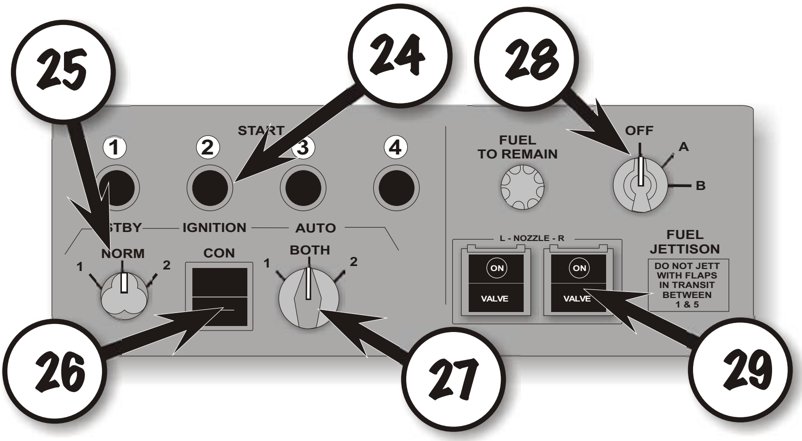


## 24 ENG START SWITCHES ................................ IN

Verify that the **START VALVE LIGHTS** are not illuminated.

*The start light illuminates whenever the START VALVE is open*. If this light is illuminated, then we must assume that the start valve is stuck open and contact maintenance.

## 25 STBY IGNITION SELECTOR ........... NORM

If this switch is in NORM and the entire system fails, then the MAIN STBY BUS will *CONTINUOUSLY* provide power to IGNITER 1 when the FUEL CONTROL SWITCH is in RUN.
*What that said was this ... in order for the automatic backup system to operate, this switch must be in NORM.*

## 26 CONTINUOUS IGNITION SELECTOR ..... OFF

This causes the igniters selected with the AUTO IGNITER switch to operate continuously, whenever the FUEL CONTROL SWITCHES are ON.
*This is used when penetrating weather, when you are using engine anti-ice, when encountering turbulence, or when ever you feel like it.*



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## 27 AUTO IGNITION SWITCH ..................... 1 or 2

SELECT IGNITER 1 for ODD FLIGHTS
SELECT IGNITER 2 for EVEN FLIGHTS.
*The concept here is to alternate use of the igniters so as to equalize wear cycles.*

What these guys do is just set up the automatic system. The ignition system isn't activated unless:

FUEL CONTROL SWITCH ... RUN
ENGINE IN START CYCLE (less than 50% N2)
TE FLAPS DOWN (or more correctly, not up)
NACELLE ANTI-ICE ... ON

Here's an ORAL QUESTION: *When do the engine igniters operate?*

## 28 FUEL JETTISON SELECTOR ...................... OFF

When A or B is selected; then the EICAS FUEL TO REMAIN display is displayed, and the JETTISON TIME is displayed on the FUEL SYNOPTIC.

## 29 FUEL JETTISON NOZZLE selectors ............ OFF

If this switch is pushed, the associated nozzle valve opens.

**CAUTION**

***The FUEL JETTISON VALVES can be opened with these switches even though the FUEL JETTISON selector is OFF.***

With the selector switch in either A or B and this switch is pushed, then a whole lot of other stuff happens. *You will not be required to recite them from memory, but here is the list FYI.*

6 OVERRIDE/JETTISON pumps are activated
in tanks 2 and 3 and CENTER TANK.
4 Jettison valves open.
2 STAB TRANSFER/JETTISON pumps.
4 STAB TRANSFER/JETTISON valves open.
ARMS 1 and 4 MAIN TRANSFER VALVES
(these guys open when tank 2 or 3 reach 20,000#)
Opens associated NOZZLE valve.


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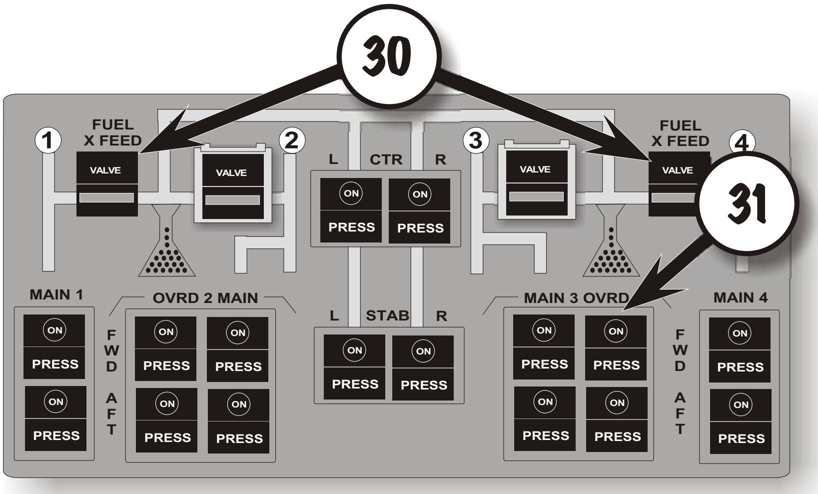


# the 120K switches

## 30 FUEL X-FEED SWITCHES 1 and 4 (2 and 3)

IF the fuel load is less than 120,000 pounds:
**1 and 4 X-FEEDs should be ..... CLOSED**
IF the fuel load is greater than 120,000 pounds:
**1 and 4 X-FEEDs should be .......OPEN**

Re: *2 and 3 X-FEEDS. I cannot think of a time when you will have to CLOSE them. It is **NOT** part of the normal fuel panel operations to **EVER** raise the guards and CLOSE those switches. If, of course, the plastic guards are open and the X-feeds are selected, they should be "OPENED" and the guards closed.*

## 31 MAIN TANK BOOST PUMPS and OVERRIDE PUMP SWITCHES (ALL) ... OFF

ALL the switches should be OUT (dark) at this point.

NOTE: *on AC# N105UA and N190UA the #3 AFT FUEL BOOST PUMP should be ON. The reason is that unwanted fuel transfer could occur. This will NOT be a required item on the checkride.*





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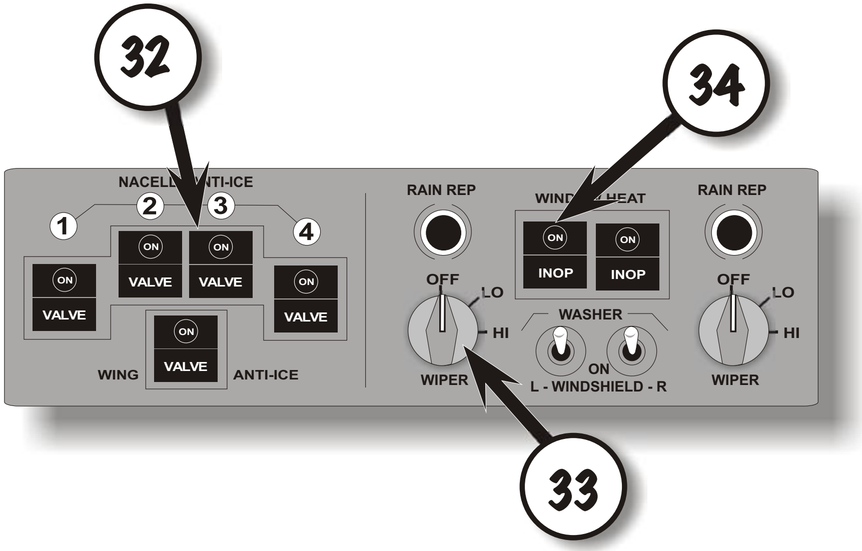



**32** **NACELLE and WING ANTI-ICE switches and VALVE LIGHTS ................ OFF**

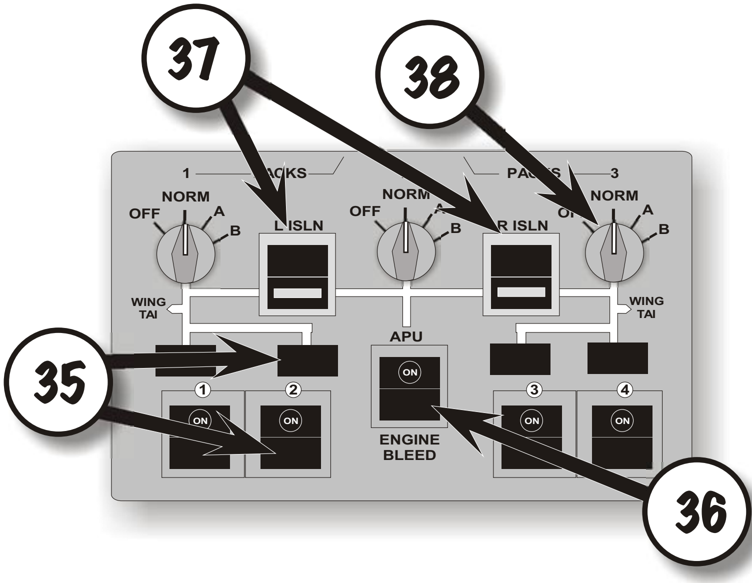
ENG NACELLE ANTI-ICE operates ONLY when the engine is running and causes continuous ignition to operate.
WING ANTI-ICE does NOT operate on the ground and is worthless whenever flaps are extended.

**33** **WINDSHIELD WIPER SEL ............. OFF**

**34** **WINDOW HEAT switches ...................... ON**

ONLY the forward windows (CAPT and F/O 1L and 1R) get anti-ice and anti-fog protection through these switches. The side windows (2L,2R,3L,3R) get anti-fog only and they are on anytime the airplane is powered.

*If the INOP light comes ON, cycle the switch OFF for 10 seconds to reset.*




| | |
|---|---|
| **35** | **ENG BLEED AIR switches ............ ON**<br>Verify that the **BLEED OFF** lights are **ON**, and **SYS FAULT** lights are **OFF.** |

| | |
|---|---|
| **36** | **APU BLEED switch ..................... ON**<br>Verify that the VALVE light is .... OFF (not illuminated) |

| | |
|---|---|
| **37** | **LEFT and RIGHT ISOLATION switches ..... OPEN**<br>Verify that the VALVE BARS are in view and that the VALVE lights are OFF. |

| | |
|---|---|
| **38** | **PACK CONTROL SELECTORS ...... NORMAL**<br>There are TWO CONTROLLERS for each pack. By selecting NORMAL, you have set the system up so that if one fails, the other takes over automatically. It automatically selects alternate controllers on alternate flights.<br>If we select A or B, then it becomes the primary controller and the automatic backup system selects the other one in the event of failure.<br>Going to OFF momentarily resets the protection logic in the event of a problem. |





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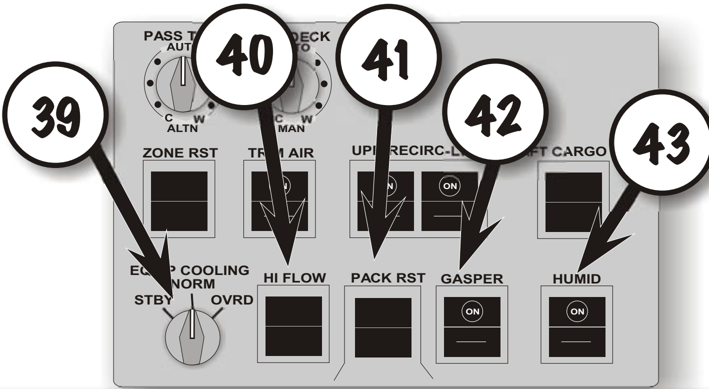


## 39 EQUIP COOLING SELECTOR ......... NORMAL

In the NORMAL position, prior to engine start, based on OAT, the cooling air is either exhausted overboard or into the forward cargo compartment.
With a "SINGLE INTERNAL FAULT," equipment cooling valves close to allow internal circulation of the air.

## 40 HIGH FLOW SWITCH ..... OFF

OFF allows PACK AIR to be controlled automatically.

## 41 PACK RESET SWITCH ........... OFF

Verify SYS FAULT light is OFF.

## 42 GASPER SWITCH ............................... ON

## 43 HUMIDIFIER SWITCH ...................... ON

Not available on N105UA and N106UA.
Water comes from the potable water system. The system automatically comes on at top of climb and shuts down 2 hours prior to top of descent.

*Here are a couple of things to be aware of:*
*(1) On some airplanes, shortly after takeoff, a strong odor can be detected near door 1L. It is usually associated with the humidifier and may be reported by the Flight Attendants as an "electrical" smell.*
*(2) Sometimes it makes a loud vibration or humming noise.*


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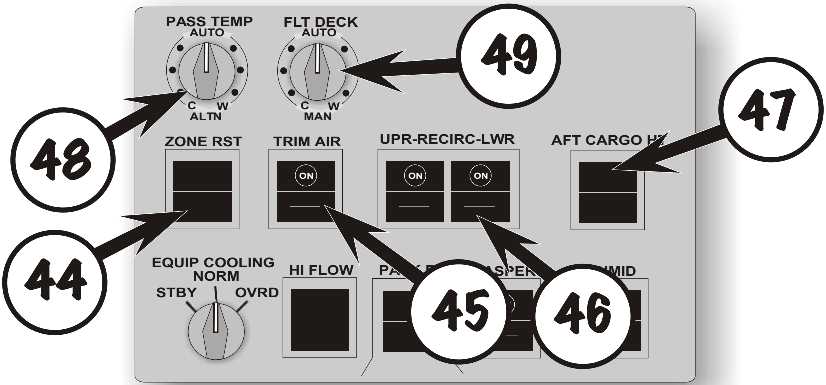


**44** **ZONE RESET SWITCH ............ OFF**

Verify SYS FAULT light is OFF

**45** **TRIM AIR SWITCH ..................... ON**

**46** **UPPER and LWR RECIRC FANS ......... ON**

There are 4 RECIRC FANS (2 overhead and 2 under floor). In cruise, when the packs go to normal flow, the LWR RECIRCS come on to supplement normal flow.

**47** **AFT CARGO HEAT switch ...................... OFF**

Aft cargo compartment temperature is controlled using BLEED AIR. OFF position shuts off air to the compartment. In ON position, the temperature is controlled automatically using bleed air.

**48** **PASSENGER TEMP SEL .............. AUTO**

Put the indicator straight up for new guys. You old timers, you know what you want to do.

**49** **FLIGHT DECK TEMP SEL ..................... AUTO**





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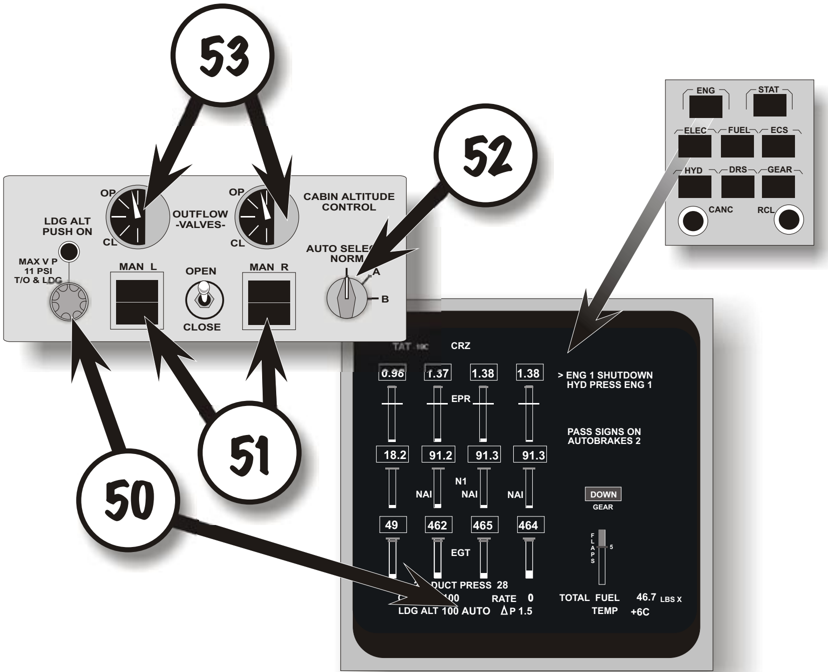


## 50 LANDING ALTITUDE SELECTOR ........ AUTO

Select ENG DISPLAY on the lower EICAS and
VERIFY that the word AUTO is annunciated in the lower part of the instrument.

## 51 OUTFLOW VALVE MAN L and R ........ OFF

## 52 CABIN ALTITUDE CONTROL SEL ........ NORM

Automatically selects A or B controller on alternate flights. Also automatically selects the secondary controller in the event of malfunction of the primary controller.

## 53 OUTFLOW VALVE INDICATORS ........ OPEN

The needles should be pointing UP.

*The OUTFLOW VALVE controllers read the landing airport from the airport entered in the CDU as destination, and calculates landing altitude from that. In the sim, when you divert ... remember to place the diversion airport in the CDU.*



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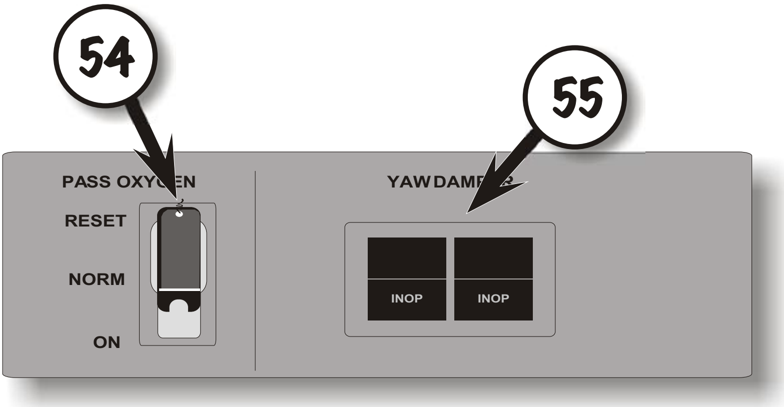


54 **PAX O2 SWITCH ........................... NORMAL**

Verify that the switch is:
GUARDED and
SAFETIED

55 **YAW DAMPER UP/LWR switches ........... ON**

The INOP lights will be illuminated until IRS alignment is complete. The first IRS to align will illuminate both YAW DAMPER "ON" lights and extinguish the "INOP" lights.



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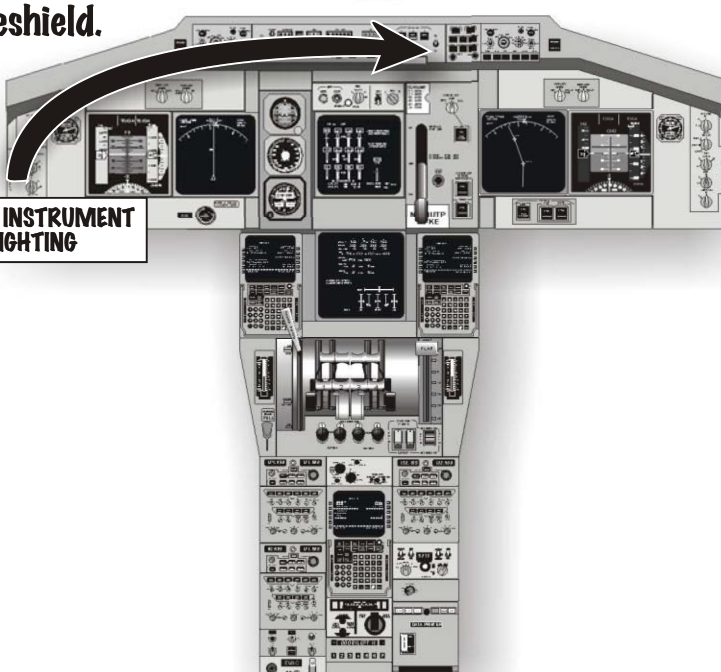
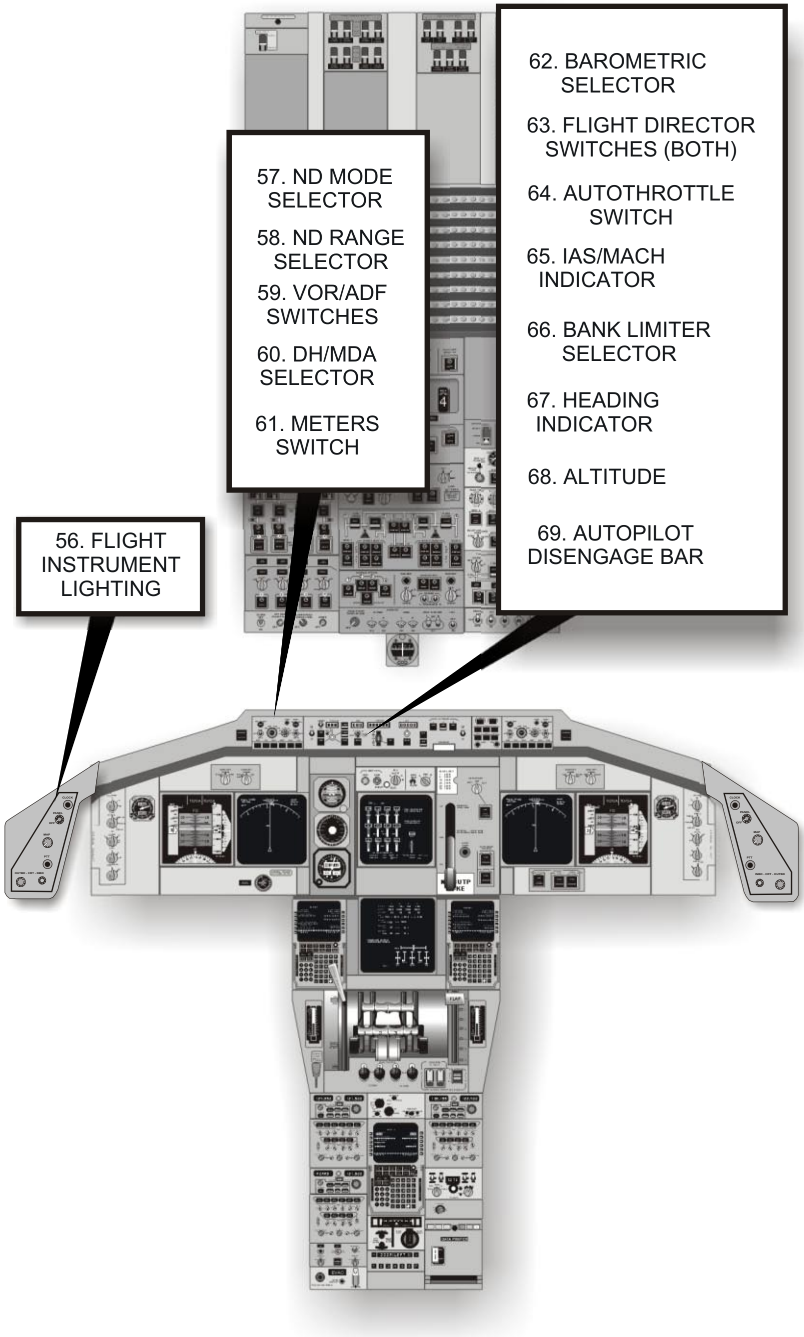
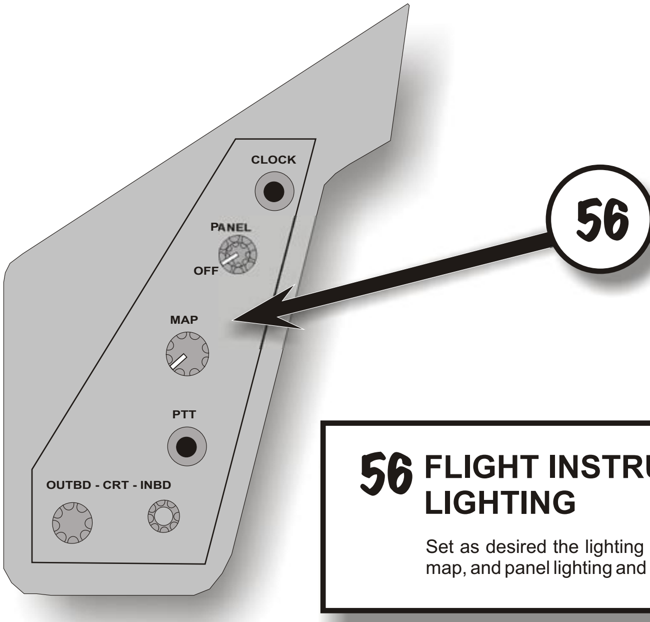
# "G"

# GLARESHIELD

Start at left end of the Glareshield.

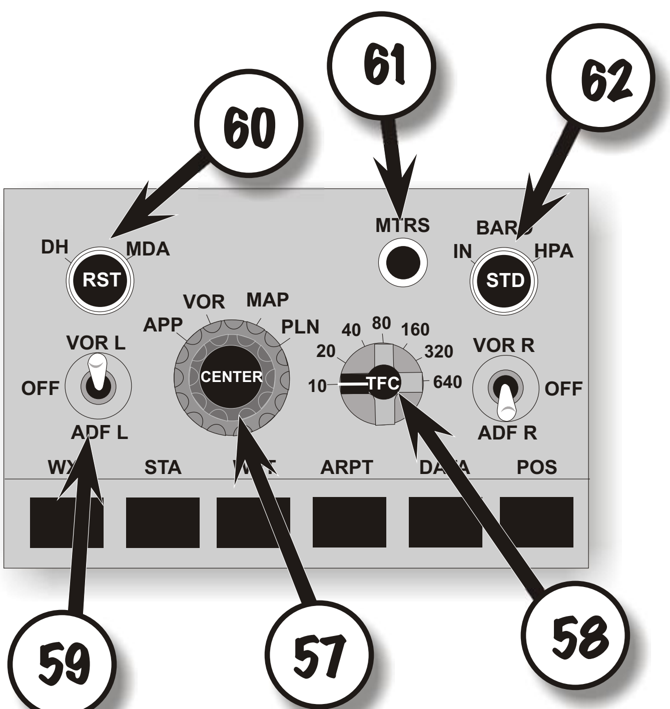



62. BAROMETRIC SELECTOR
63. FLIGHT DIRECTOR SWITCHES (BOTH)
64. AUTOTHROTTLE SWITCH
65. IAS/MACH INDICATOR
66. BANK LIMITER SELECTOR
67. HEADING INDICATOR
68. ALTITUDE
69. AUTOPILOT DISENGAGE BAR
57. ND MODE SELECTOR
58. ND RANGE SELECTOR
59. VOR/ADF SWITCHES
60. DH/MDA SELECTOR
61. METERS SWITCH
56. FLIGHT INSTRUMENT LIGHTING




## 56 FLIGHT INSTRUMENT LIGHTING

Set as desired the lighting on the PFD, ND, map, and panel lighting and brightness.





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## 57 ND MODE SELECTOR ......................... MAP

The ND controls are located on the **EFIS CONTROL PANEL**. The ND MODE Selector has the following features:

When inner knob pushed, **FULL COMPASS ROSE** displayed.
Pushing it again, restores **EXPANDED MODE**.
OUTER knob used to select MODE.
APP when selected sets up the displays for the approach; including ILS freq, identifier, course, and DME. Displays EXPANDED COMPASS MODE.
APP with CTR pushed ... restores COMPASS ROSE display.
VOR when selected sets up the displays for the VOR approach; including VOR freq, identifier, course, DME, and TO/FROM indication. Displays EXPANDED COMPASS MODE.
VOR with CTR pushed ... restores COMPASS ROSE display.
MAP Selects TRACK UP display, EXPANDED compass mode, FMC map information, airplane position and heading, active waypoints and vertical path deviation at T/D. This is the mode you will be operating in MOST of the time.
MAP with CTR pushed ... restores COMPASS ROSE display.
PLN selects a static TRUE NORTH up display. Good for route displays only.

## 58 ND RANGE SELECTOR ............ AS DESIRED

*Either 10 or 20 nm. This gives the best after takeoff information and allows display of the airport symbol.*

## 59 VOR/ADF SWITCHES ............. AS DESIRED

*Allows the VOR/ADF information to display on the ND.*

## 60 DH/MDA SELECTOR ........... AS REQUIRED

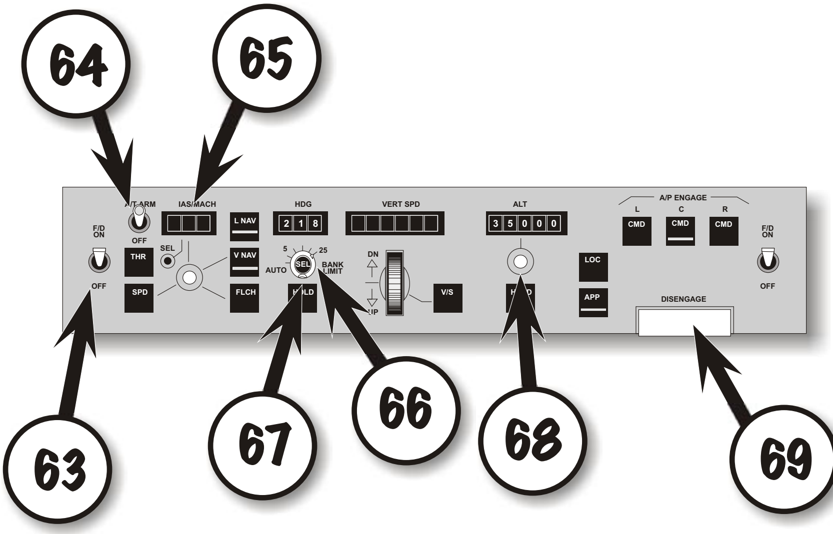
**OUTER** knob - *Selects either DH or MDA on PFD.*
**MIDDLE** knob - *Selects the ALTITUDE for the PFD display*.
**INNER** knob - *PUSH to reset the DH ALERT on the PFDS.*

## 61 MTRS SWITCH .................... AS REQUIRED

**PUSH** - *to display METERS on the PFD ALTITUDE display.*
*Second PUSH - Removes meters from the display.*

## 62 BARO SELECTOR ............... AS REQUIRED

**OUTER** knob - *Selects IN or HPA in the PFD.*
**MIDDLE** knob - *Selects the numerical barometric setting.*
**INNER** knob - *PUSH and STD is annunciated on the PFD. This allows the anticipated baromatric values to be preset while the unit displays 29.92*
*Push again, and the preset value is displayed..*




## 63 F/D SWITCHES ..................... BOTH ON

**ON** - allows diplay of the FLIGHT DIRECTOR COMMAND BARS under NORMAL conditions.
If they are already ON, cycle them OFF and then back ON.
**ON THE GROUND** - Turning one switch ON and the other switch OFF, activates **TO/GA** roll and pitch modes.
**IN FLIGHT** - The first switch ON, if no autopilot engaged, default modes are:
**HEADING HOLD**, and
**VERTICAL SPEED**, or
If bank angle greater than 5 degrees:
**ATTITUDE**, and
**VERTICAL SPEED**.

## 64 AUTOTHROTTLE SWITCH ..................... OFF

**A/T ARM** - *Arms the autothrottles for engaged if appropriate modes are operating.*
***NOTE***: *The autothrottle disconnects if:*
*more than one engine is inoperative,*
*a dual FMC failure, or*
*an EEC is in the ALT MODE.*
**OFF** - *Disarms autothrottle ... preventing engagement.*
*It also prevents ENGINE TRIM EQUALIZATION.*

## 65 IAS/MACH INDICATOR .............................. SET

**Set V2 if known, do not make rapid inputs when setting V2 for takeoff**.

It displays ***200 KTS*** when first powered on the ground. The selected speed shows up on the SPEED TAPE of the PFD.





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## 66 BANK LIMIT SELECTOR ................. AUTO

**AUTO** - *Limits the bank angles for the AFDS in HEADING SELECT MODE between 15-25 degrees, depending on the TAS, flap position, and V2.*
**5 - 10 - 15 - 20 - 25** - *Limits the bank angle regardless of AIRSPEED.*

**NOTES:**

*ATC expects that while in the terminal areas and below 18,000 feet that all turns will be made at 25 degrees. Checkpilots may FROWN on using the AUTO mode when working below 18,000 feet for that reason.*

*Bank angles at altitude are critical and can increase the airplane's susceptibility to "STALL." For that reason, large bank angles at altitude with a heavy airplane are to be avoided.*

## 67 HDG INDICATOR ...................... SET

*This knob has TWO functions.*
**FIRST**: *It can be rotated to set the desired HEADING. This will be displayed on the PFD, and on the ND as the "BUCK TEETH."*
**SECOND**: *When PUSHED in, the HEADING SELECT MODE is engaged and if the autopilot is engaged, the airplane will turn towards the selected heading.*

**CAUTION**:
**TO/GA roll mode should NOT BE USED AFTER TAKEOFF if the departure clearance specifies "MAINTAIN RUNWAY HEADING."**

## 68 ALTITUDE ...................... SET

*Set in the first restriction, if known. This would be on the SID, or assigned by ATC, or part of the clearance.*

## 69 AUTOPILOT DISENGAGE BAR ...... ARM (UP)

*Check that the bar is engaged in the UP position.*
*Would you believe it ... flights have departed and, being unable to engage the autopilots, were subjected to lots of stress ... until they realized that this "bar" was out of position.*


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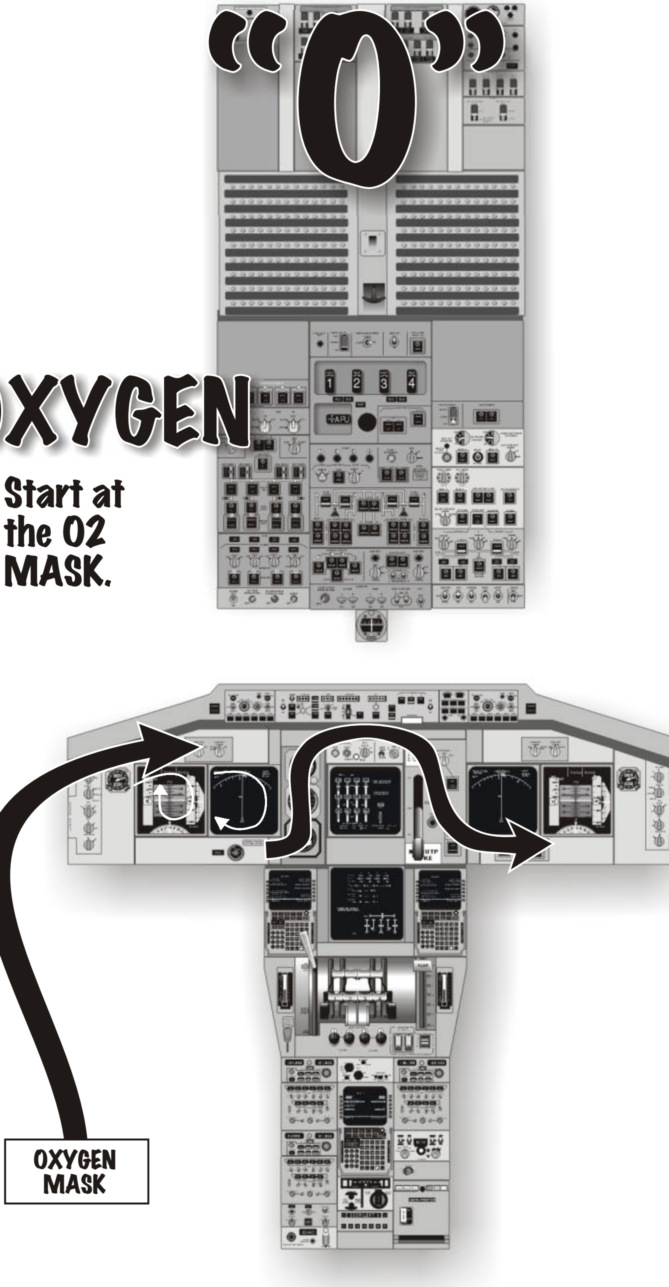
# "O"

# OXYGEN

**Start at the O2 MASK.**





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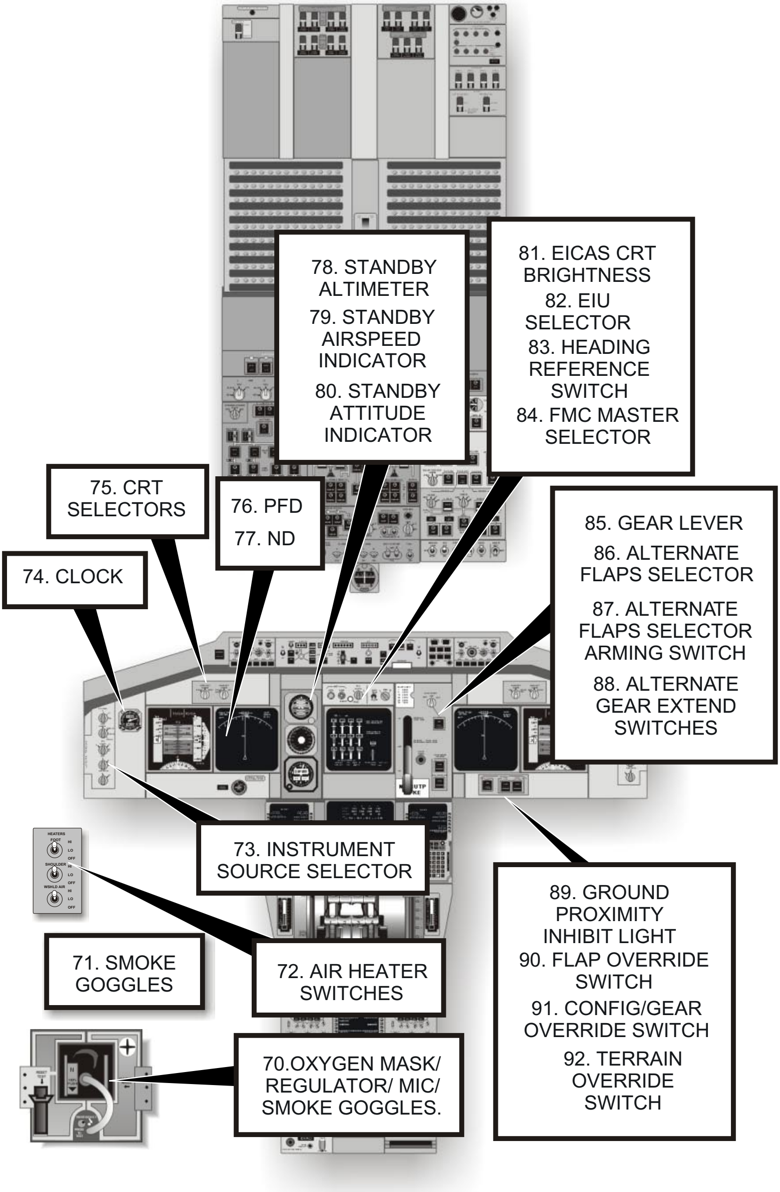
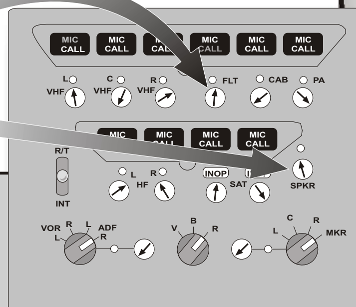

78. STANDBY ALTIMETER
79. STANDBY AIRSPEED INDICATOR
80. STANDBY ATTITUDE INDICATOR
81. EICAS CRT BRIGHTNESS
82. EIU SELECTOR
83. HEADING REFERENCE SWITCH
84. FMC MASTER SELECTOR
75. CRT SELECTORS
76. PFD
77. ND
74. CLOCK
85. GEAR LEVER
86. ALTERNATE FLAPS SELECTOR
87. ALTERNATE FLAPS SELECTOR ARMING SWITCH
88. ALTERNATE GEAR EXTEND SWITCHES
73. INSTRUMENT SOURCE SELECTOR
89. GROUND PROXIMITY INHIBIT LIGHT
90. FLAP OVERRIDE SWITCH
91. CONFIG/GEAR OVERRIDE SWITCH
92. TERRAIN OVERRIDE SWITCH
71. SMOKE GOGGLES
72. AIR HEATER SWITCHES
70.OXYGEN MASK/ REGULATOR/ MIC/ SMOKE GOGGLES.

## THE INCREDIBLY COMPLICATED OXYGEN MASK SET-UP

## 70 CHECK ....... OXYGEN MASK, REGULATOR, and MICROPHONE.

One of the MOST complicated procedures on the Set-up
is the Oxygen mask checkout.
In brief form, here is what to do:

Select FLT interphone
Select SPKR on
Adjust FLT and SPKR volume



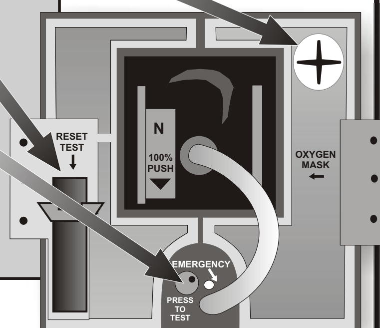

***Push and hold, and while holding RESET/TEST lever*:**
**Observe YELLOW CROSS flicker**

**Push and Hold EMER/TEST selector and observeYELLOW CROSS appear steadily;**

**Push the PTT (push to test) switch and verify the sound of O2 flowing across the mask mic.**

**then Release the EMER/TEST selector**
**Release RESET/TEST button:**
**Observe FLOW IND is BLANK**
**and O2 Flow stops.**

**Verify that the N/100% lever is in 100% position and**
**The container doors are closed.**




Now, put it all back together:

MASK O2 @ 100%
MASK HOLDER doors closed
MASK/BOOM switch to BOOM

## 71 CHECK ....................... SMOKE GOGGLES

*Check the SMOKE GOGGLES for clarity, glazing, proper fit, and serviceability. If they are wrapped in plastic, remove them and stow them for quick accessibility.*
*When you re-stow the goggles, make certain that they are within arms reach.*



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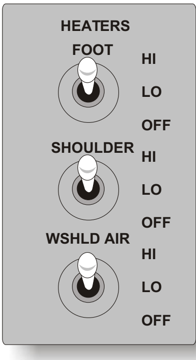
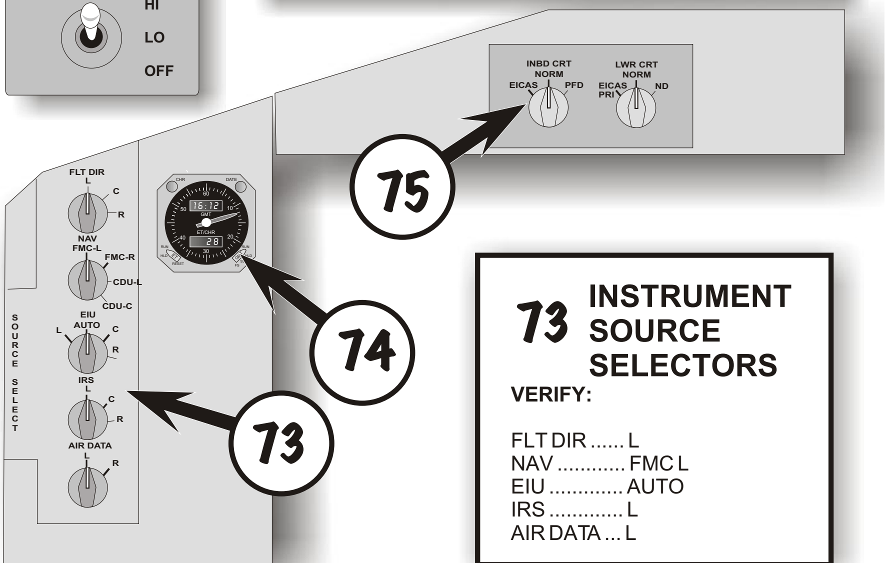



**72** FOOT, SHOULDER, and WNDSHLD HEAT SWITCHES ........ AS DESIRED




**73** INSTRUMENT SOURCE SELECTORS

VERIFY:

FLT DIR ...... L
NAV ............ FMC L
EIU ............. AUTO
IRS ............. L
AIR DATA ... L

**74** CLOCK ... CHECK/SET

OBSERVE ... Hrs and MINs correct
PUSH DATE SWITCH, observe correct
PUSH again, observe second hand at zero.
Position ET sel to RESET,
Release to HLD, observe ET/CHR display blanks

**75** CRT Selectors .... NORM

INBD CRT selector and LWR CRT selectors should be set to Norm.

**IRS ALIGNMENT MUST BE COMPLETE TO CONTINUE**



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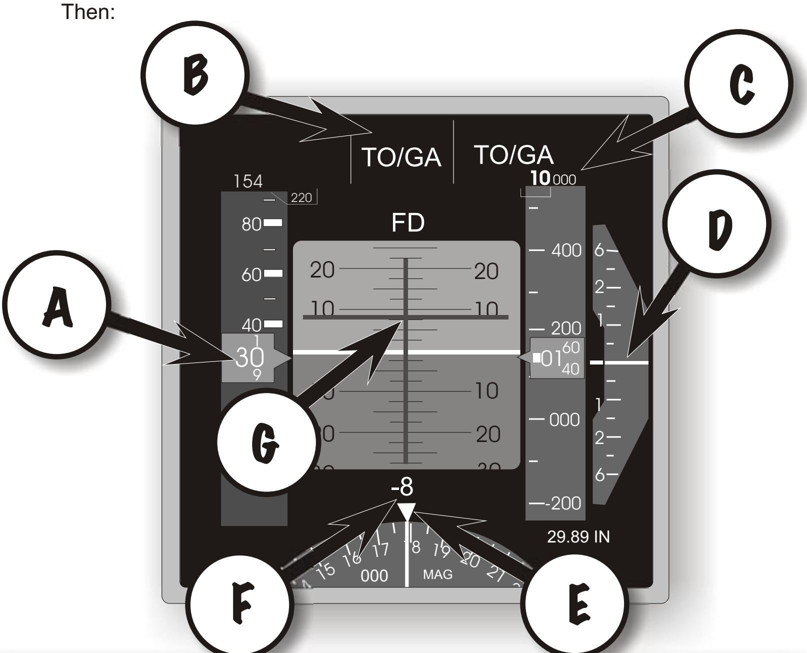
**IRS ALIGNMENT MUST BE COMPLETE TO CONTINUE**

## 76 PFD ................................ CHECK

Check PFD is displayed on the CRT and there are no flags.
Then:




**A** :AIRSPEED IND ................. 30 KTS

**B** :FD and TO/GA .................. Annunciated

**C** :ALTITUDE IND ...................... Alt set in MCP

**D** :VERTICAL SPEED ............ ZERO with NO FLAGS

**E** :HEADING .......................... Agrees with MCP

**F** :RADIO ALTITUDE ............. -8

**G** :ATT and COMD BARS ....... level and 8 deg UP





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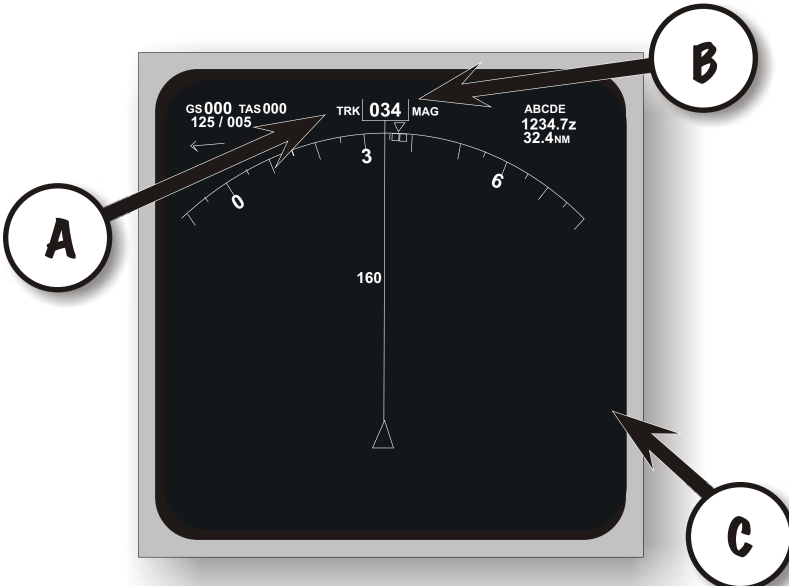
**IRS ALIGNMENT MUST BE COMPLETE TO CONTINUE**

**NOTE:**
PLAN MODE will work even if IRS' are NOT aligned.

## 77 ND .................... CHECK

Check ND is displayed on the appropriate CRT and there are no flags.
Then:




**A: PROPER HEADING AND TRACK**
**B: CHECK HEADING agrees with STBY COMPASS**
**C: Verify NO FLAGS showing.**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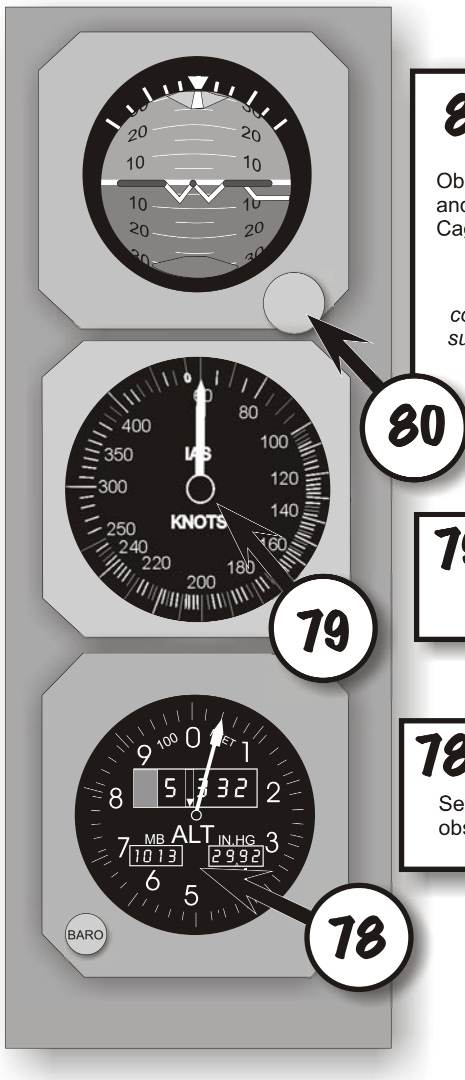
# the STANDBY INSTRUMENTS !

These three instruments can be expected to operate for 30 minutes when everything else fails.




**80** **STBY ATT IND ... CHECK**

Observe NO FLAGS
and LEVEL ATTITUDE.
Cage if necessary.

**NOTE**:

*If unable to cage, or attitude continually precesses after caging, suspect battery discharged and get maintenance involved.*

**79** **STBY IAS ... CHECK**

Observe “ZERO” indication.

**78** **STBY ALT.... CHECK**

Set current altimeter setting and observe “proper” altitude displayed.





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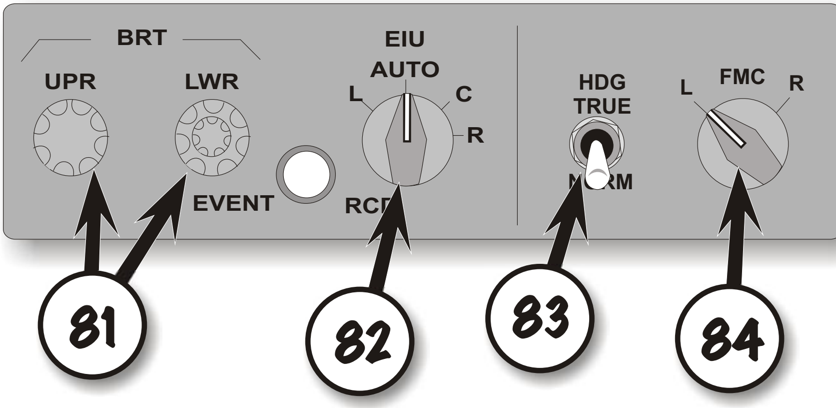



**81 EICAS CRT BRIGHTNESS .......... as desired**

The interior knob on the right CRT controls the WX display portion of the display.

**82 EIU Selector ............................ AUTO**

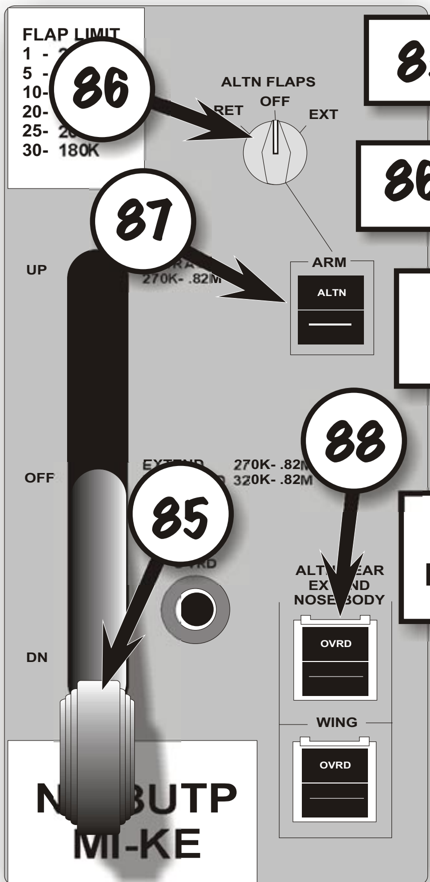
Selecting the AUTO position prepares the EIU to automatically shift to the other symbol generator should the original symbol generator fail. Without this in auto, the CRTs on the Captains side would go blank if the symbol generator failed. If, however, only one CRT fails, this is an indication of the failure of the CRT and there is no way to fix that in the air. Call SAMC and the other guy flies.

**83 HEADING REF switch ..................... NORM**

The TRUE setting is used only two times that I can think of:
(1) Vectors in NCA (Northern CanadianAirspace) are given in true, and
(2) Flying an approach in Greenland requires the use of 'true" headings.

**84 FMC MASTER selector ....... L**

**BIG DEAL**! This selects the Left FMC as master.

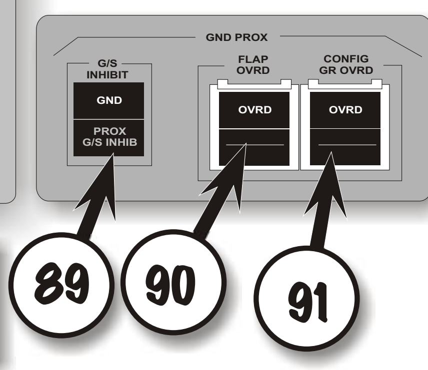



**85** GEAR lever ... DOWN

**86** ALT FLAPS sel ... OFF

**87** ALT FLAP selector
ARM switch ... OFF

**88** ALT GEAR
EXTEND switches.... OFF




**89** GRND PROX light
......... OUT

**90** FLAP OVERRIDE
switch ......... OFF

**91** CONFIG/GEAR
OVERRIDE switch ... OFF

**92** TERRAIN OVERRIDE switch ... OFF

Terrain depicting mod not yet installed on all aircraft.





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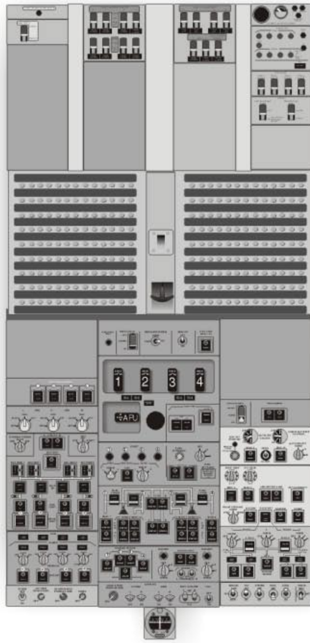

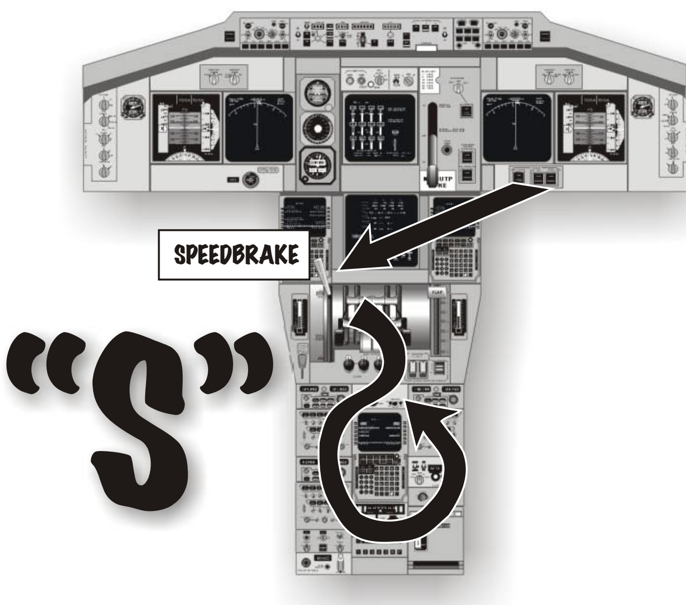
SPEEDBRAKE
"S"

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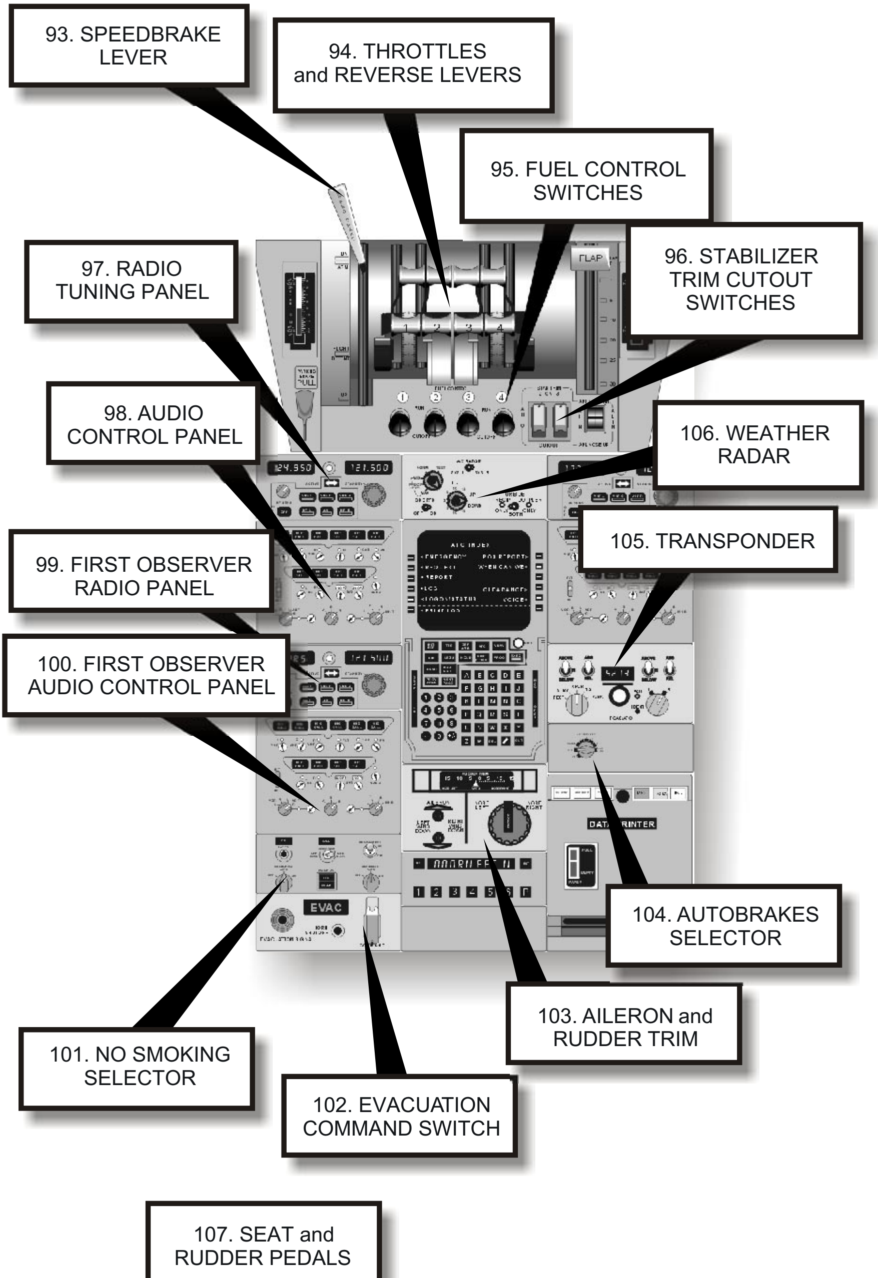
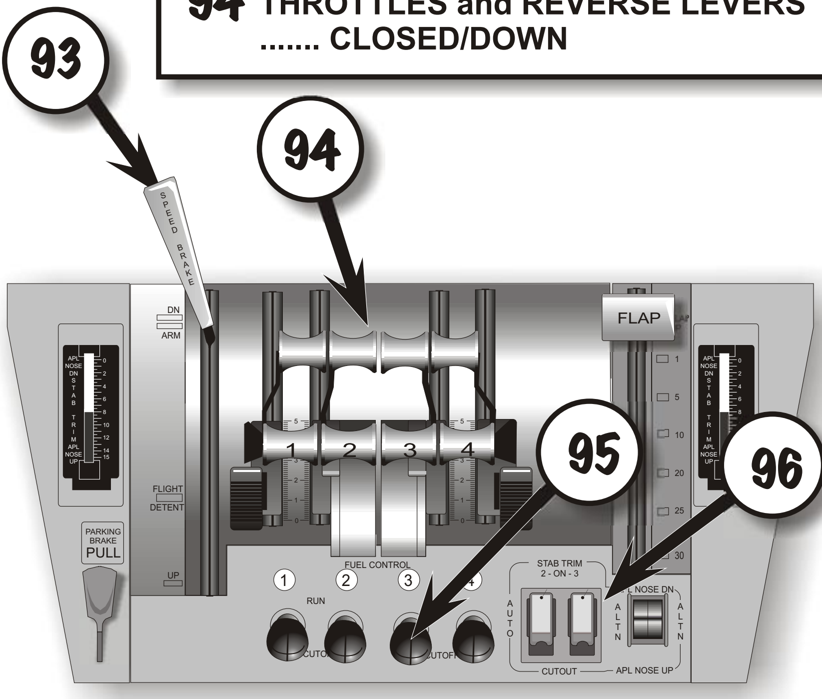

93. SPEEDBRAKE LEVER
94. THROTTLES and REVERSE LEVERS
95. FUEL CONTROL SWITCHES
96. STABILIZER TRIM CUTOUT SWITCHES
97. RADIO TUNING PANEL
98. AUDIO CONTROL PANEL
99. FIRST OBSERVER RADIO PANEL
100. FIRST OBSERVER AUDIO CONTROL PANEL
101. NO SMOKING SELECTOR
102. EVACUATION COMMAND SWITCH
103. AILERON and RUDDER TRIM
104. AUTOBRAKES SELECTOR
105. TRANSPONDER
106. WEATHER RADAR
107. SEAT and RUDDER PEDALS
EVAC
DATA PRINTER
FLAP

## 93 SPEED BRAKE LEVER ................ DETENT

*The lever MUST be full forward. Some pilots will bump the lever with the palm of their hand to ensure that it is seated.*
*If it is not, it will trigger the **TAKEOFF WARNING** horn when the throttles are advanced for takeoff.*

## 94 THROTTLES and REVERSE LEVERS ....... CLOSED/DOWN




## 95 FUEL CONTROL SWITCHES .... CUTOFF

*When the **FUEL CONTROL SWITCH** is in cutoff:*
*  **FUEL VALVE** and **SPAR VALVE** close,*
*  **IGNITION** discontinues,*
*  **HYDRAULIC DEMAND PUMP** operates (if selected)*

## 96 STAB TRIM CUTOUT switches ........... AUTO

Verify switch guards closed. On some of the airplanes, the guards are fitted with a safety wire. It is likely that, in the simulator, the wire will be broken.





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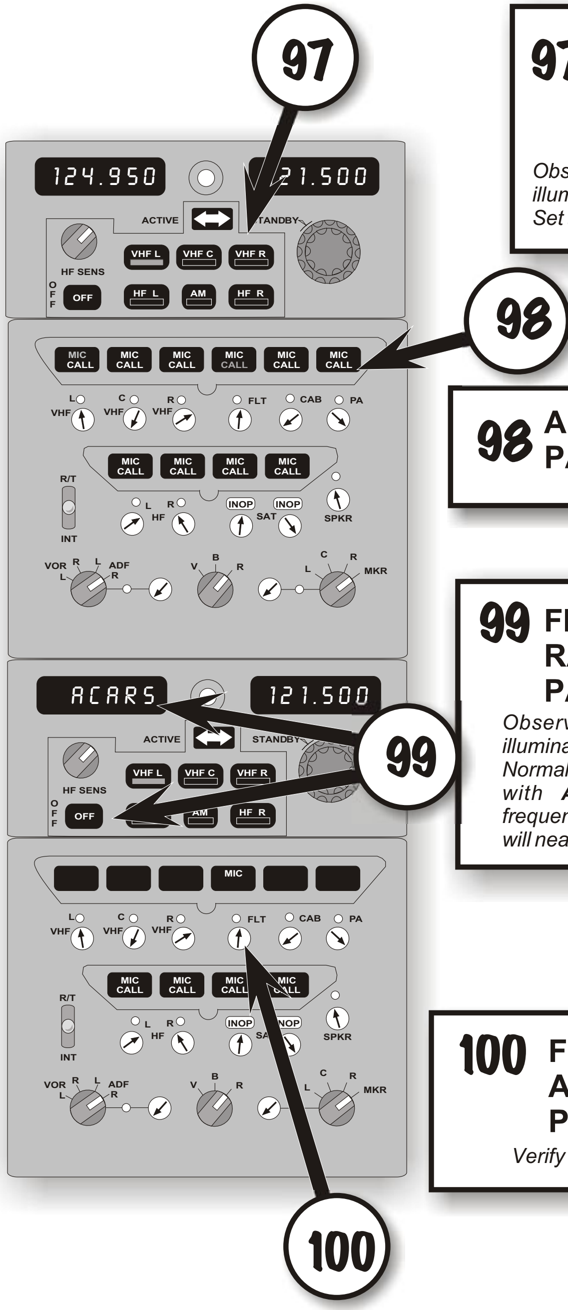


## 97 CAPT RADIO TUNING PANEL ... SET

*Observe the **OFF** light is **NOT** illuminated.*
*Set the radio panel as desired.*

## 98 AUDIO CONTROL PANEL ...... SET

## 99 FIRST OBSERVER RADIO TUNING PANEL ...... SET

*Observe **OFF** light is **NOT** illuminated.*
*Normally, this radio will be set up with **ACARS** in the active frequency window since ACARS will nearly always be used.*

## 100 FIRST OBSERVER AUDIO CONTROL PANEL .... SET

*Verify **FLT MIC** is selected.*



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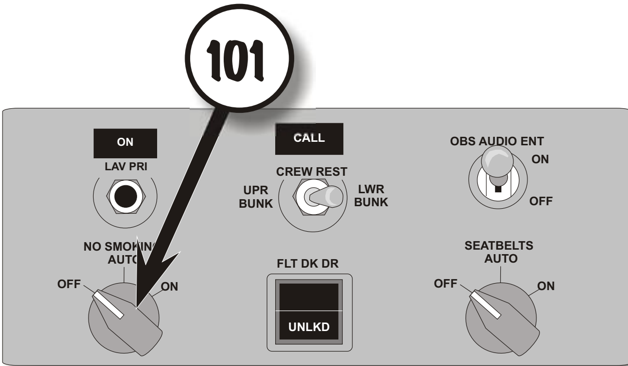
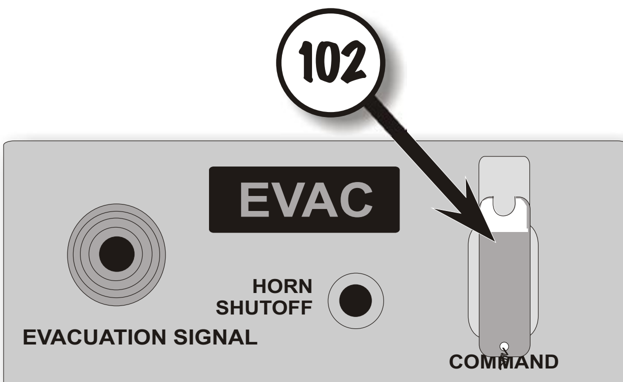



## 101 NO SMOKING SIGN selector .................... ON

ALL United Flights are designated as NON-SMOKING Flights.




## 102 EVAC COMMAND SWITCH .... OFF

Verify switch guard closed.

**SYSTEM STUFF**:

*Any station on the airplane with an alarm control panel can initiate an alarm. Once initiated, every alarm station on the airplane will sound. Each individual station can extinguish the alarm* ***AT THAT STATION ONLY****!*
*What that means to us as pilots is this. If we should initiate the alarm from the cockpit, we need only to let it sound only momentarily to confirm operation. We may then shut off the alarm using the switch and feel confident that the alarm will continue to sound throughout the airplane.*





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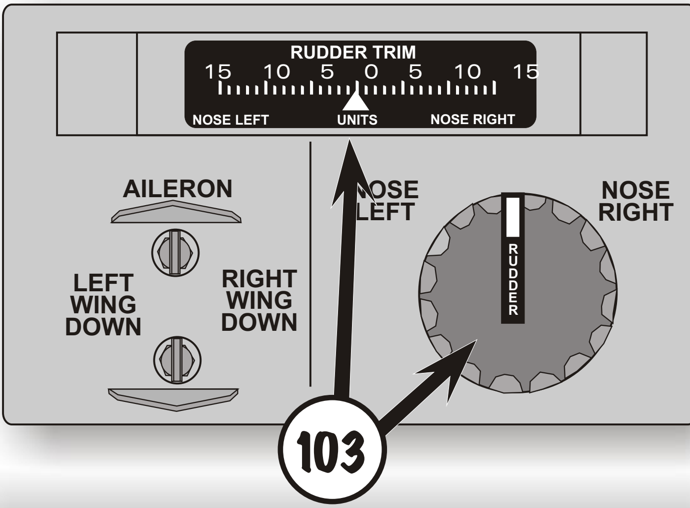


## 103 AILERON and RUDDER TRIM ....... ZERO

If the RUDDER TRIM indicator indices are not visible or are not working; reset the circuit breakers.If you look at the rudder trim left over from the last leg and see a coupla degrees; suspect that the trim will be needed and take out only about one half of the indicated trim.
To check the AILERON trim, use the yoke indices and operate the trim switch until the yoke indice matches the zero mark.

**DISCUSSION:**

*The rudder trim may be operated even when the AUTOPILOT is operating, and in the case of an engine out operation, it is essential that you continue to trim, even though you have the autopilot operating. The technique, in that case, is to "trim the sailboat" on the PFD. It is also desirable to use the foot pedals to "fly the sailboat" even with the autopilot engaged. If the "sailboat" is kept aligned, the yoke will be more or less level. The autopilot will not do it. This becomes critical during engine out turns using only the autopilot.*

***RUDDER BIAS**: During Auto-coupled approaches using multiple autopilots below 1500 feet, the rudder is engaged and operated by the autopilot. It is the ONLY regime when the autopilot operates the rudder.*

***SERIOUS PROBLEM** ! During the engine out go-around the autopilot will "kick off" rudder pressure that it had been holding and allow the rudder to center when:*

*-Above 400 feet and another roll mode selected*
*-when ALT capture annunciated*
*-when autopilot shut off.*


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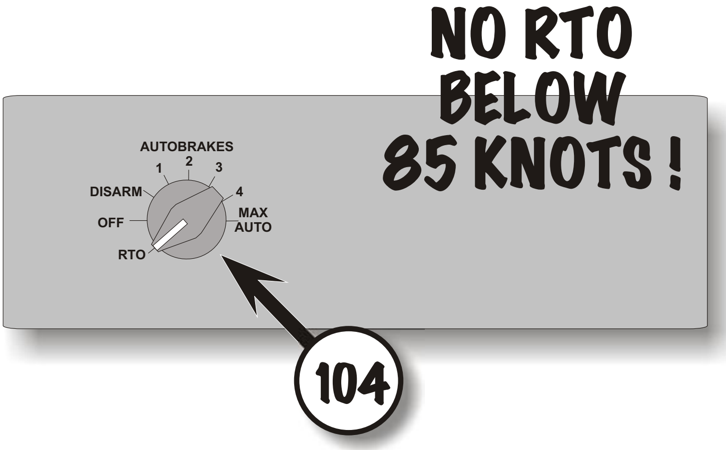


YIPE!

## 104 AUTOBRAKE SELECTOR ......... RTO

The RTO setting automatically applies **MAXIMUM BRAKING** when:

- THROTTLES moved to IDLE
- above 85 KNOTS
- AFTER take-off roll initiated.

**WARNING**: *Since the NORMAL BRAKES are supplied from the #4 HYDRAULIC SYSTEM, and the ALTERNATE BRAKES system has all the capabilities of the normal systems except AUTOBRAKES: It is IMPORTANT when you bring the hydraulic systems on line, that the #4 is allowed to pressurize the system before the #1 system is brought on line. A “shuttle valve” arrangement may allow the system to be pressurized by the #1 system, and therefore you would not have RTO and wouldn’t know it. Not good.*





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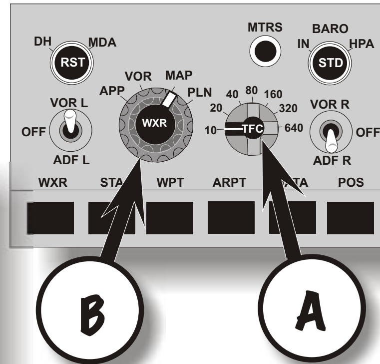
# 105 TRANSPONDER TEST AND SET-UP

A TCAS system test can only performed on the ground.
IRSs must be in the NAV mode.

Holding the switch in the test position will allow FAILED systems to be listed on the ND.



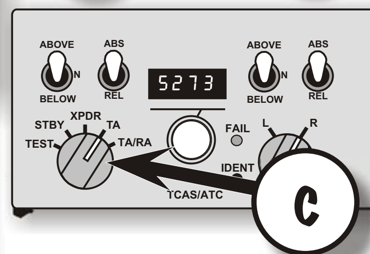

To set up for the **TCAS SYSTEM TEST:**

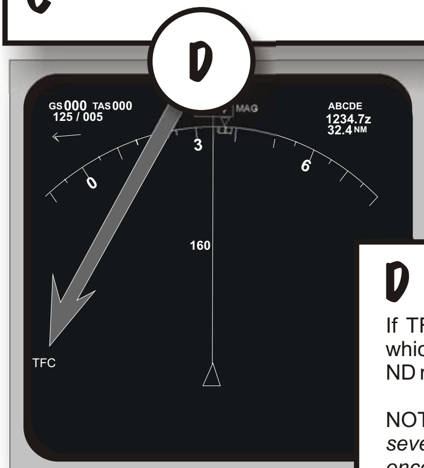
**A ND RANGE SEL-10 NM**

**B ND MODE SEL-MAP**

Observe the **OFF** light is ***NOT*** illuminated.
Set the radio panel as desired.

**C TCAS/ATC switch ..... TA**




After the TEST is completed

**D ND .... verify TFC displayed**

If TFC is not displayed, push the TFC button which is skillfully disguised as the center of the ND range selector knob.

NOTE: *The traffic display will be interrupted for several seconds after the TCAS/ATC selector is once again moved to TA or TA/RA.*

**E SET TRANSPONDER to NORMAL/ABOVE**

Consider using the ABOVE setting for departure. This accomplishes two things: it declutters the display, but more importantly, it allows to look ahead for traffic as we climb into it.

**DISCUSSION:**

If the TCAS/XPDR selector is held in "***TEST***" or positioned to "***TRANSPONDER, TA, or TA/RA***" after the test is started, the transponder function will be interrupted, but the test sequence will continue normally.
TCAS is inhibited any time the transponder is in the "***TEST, STANDBY, or TRANSPONDER MODE***."
The traffic display on the ND is inhibited for up to 12 seconds after the selector is moved to TA or TA/RA.

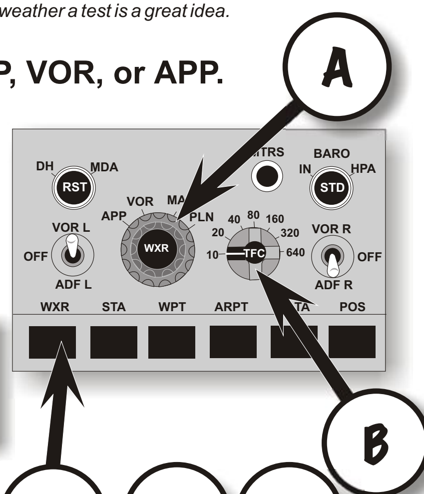
# 106 TEST THE WEATHER RADAR

*While it is strictly not required on ALL routes; some routes specifically require a weather radar test; and, of course, if there is potential weather a test is a great idea.*

**A. MODE selector to MAP, VOR, or APP.**

**B. RANGE SELECTOR as desired.**

Observe that the selected range mid-distance appears near the center of the ND track line.



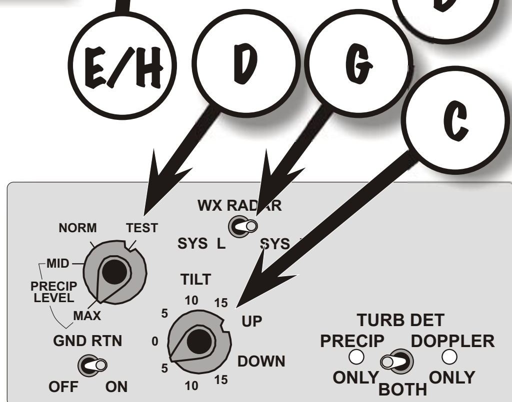

**NOTE:**
*Maximum range for weather radar operation is 320 nm.*

**C. TILT KNOB FULL UP.**

**D. FUNCTION SELECTOR TEST position.**

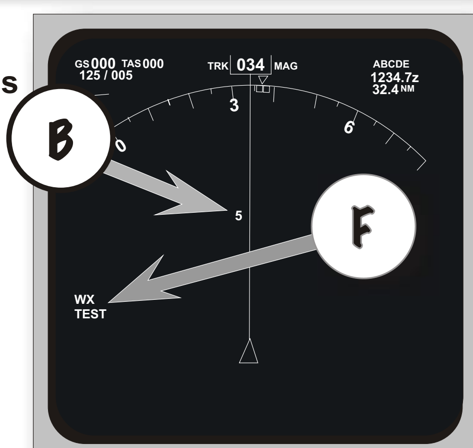
*Using the "TEST" position provides a more complete evaluation of the RADAR than NORM position.*

**E. WX RADAR switch ON (EFIS panel)**




**F. OBSERVE BOTH NDs**

Observe the green, yellow, magenta, and red test pattern, and that the word **WXR TEST** should be annunciated on the CRTs on both sides of the cockpit. AGAIN. *Having both EFIS selectors in WXR tests the "OTHER" radar head.*




**G. SYS TRANSFER SYS L or SYS R**

**H. WXR switch OFF**





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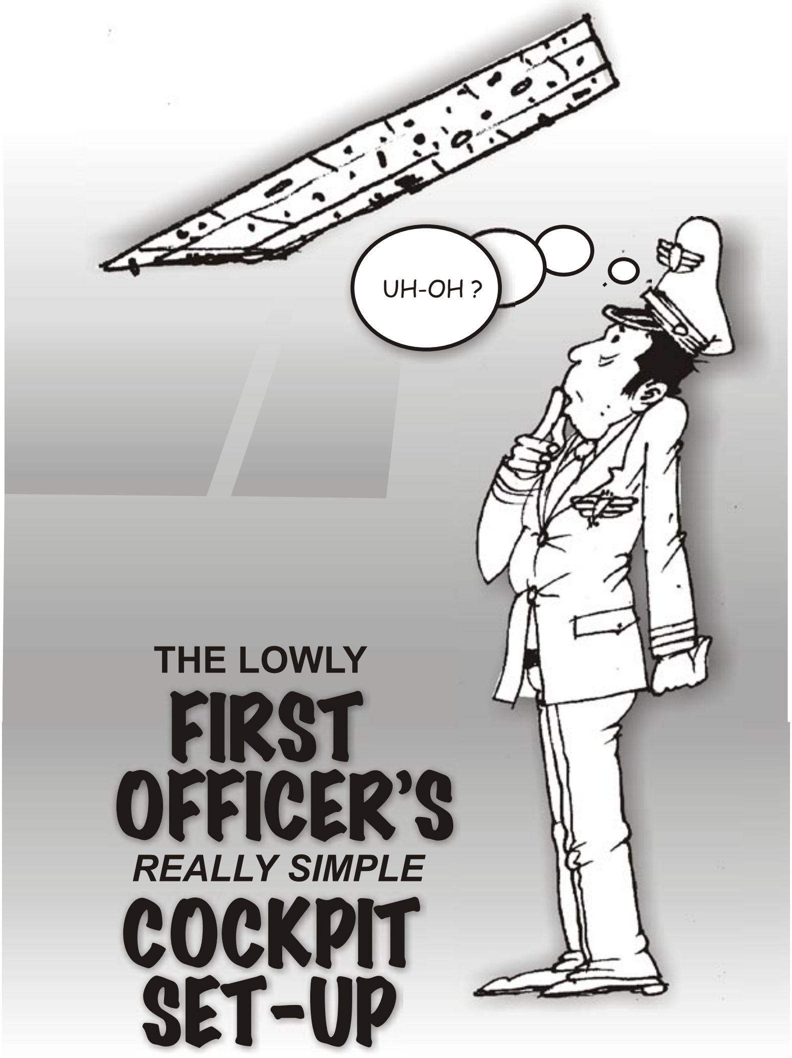


# THE LOWLY FIRST OFFICER'S *REALLY SIMPLE* COCKPIT SET-UP

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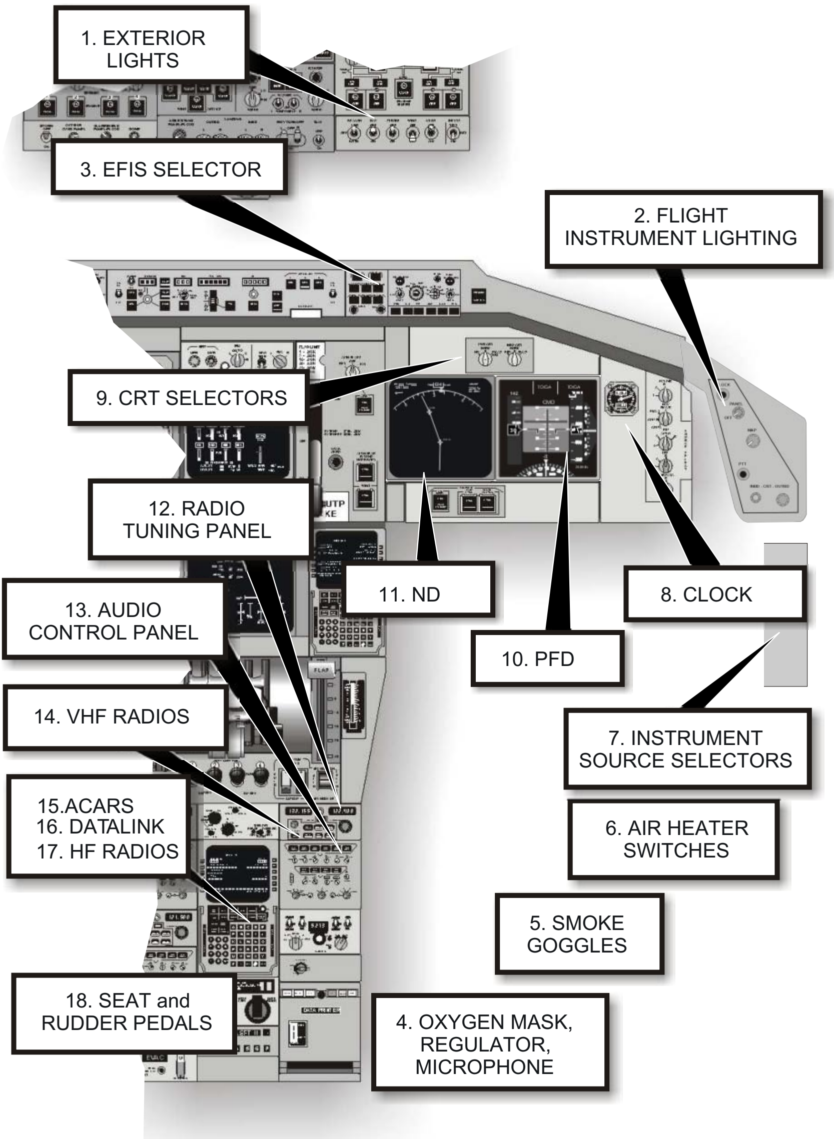
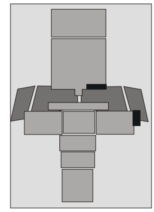
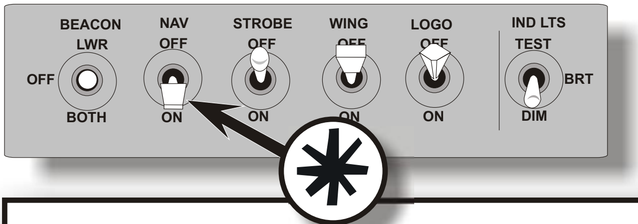
# FIRST OFFICER'S COCKPIT PREPARATION





AFTER RETURNING FROM THE EXTERIOR INSPECTION ...

# 1. EXTERIOR LIGHTS




## 1 EXTERIOR LIGHTS .................... as required

Here are the “LIGHT RULES.”

* 1. NAV lights ***MUST*** remain ON at all times.

2. BEACON (ANTI-COLLISION) lights ***MUST be ON*** when:
   ENGINES are RUNNING or
   AIRCRAFT is MOVING.

3. BEACON (ANTI-COLLISION) lights are ***NOT*** to be checked
   during the walk-around.
   Maintenance has the responsibility of checking them.

4. LOGO lights are usually turned on ONLY during after dark.

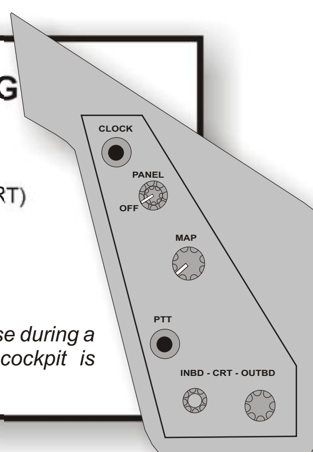
# 2. FLIGHT INSTRUMENT LIGHTING

## 2 FLIGHT INSTR. LIGHTING .................... SET

You set the:
- PFD (referred to as OUTBD CRT)
- ND (referred to as INBD CRT)
- map
- Panel lights

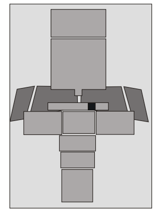
as desired.

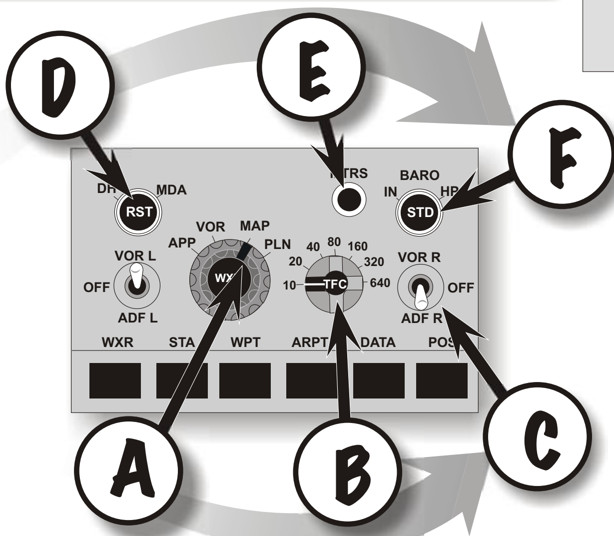
*I found that I would be continually changing these during a flight because the ambient lighting in the cockpit is constantly being altered.*




747FLOW079

# 3. EFIS CONTROL PANEL






## 3 EFIS CONTROL PANEL .................... SET

There are 6 things to set-up on this panel.

A. **ND MODE** selector ......................... **MAP**
B. **ND RANGE** selector ................ as required.
*Using 10 mile scale gives*
*the best information for single engine tracking.*
C. **VOR/ADF** switches .................. as required.
D. **DH / MDA** selector ................... as required.
E. **METERS** switch ....................... as required.
In some countries, meters ***IS*** the unit of measurement.
You MUST be aware of that information.
F. **BAROMETRIC** selector ............ as required.

*Domestically, IN HG (inches of mercury)is the standard.*
*At other places in the world it varies from country to country,*
*and may be hPa (hecto-pascals).*
***The difference could be disastrous.***

You ***MUST*** be alert. So, here is something very important. you should also:

***CHECK THE OTHER GUYS***
***EFIS CONTROL PANEL.***



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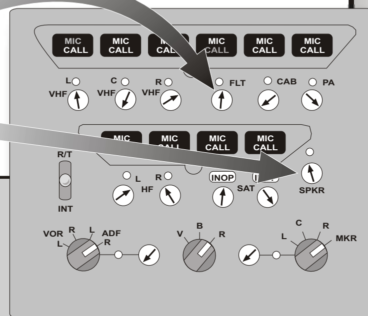
## THE INCREDIBLY COMPLICATED OXYGEN MASK SET-UP

### 4 CHECK ....... OXYGEN MASK, REGULATOR, and MICROPHONE.

One of the MOST complicated procedures on the Set-up
is the Oxygen mask checkout.
In brief form, here is what to do:

Select FLT interphone
Select SPKR on
Adjust FLT and SPKR volume



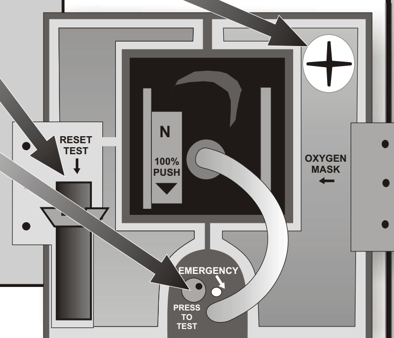

***Push and hold, and while holding RESET/TEST lever*:**
**Observe YELLOW CROSS flicker**

**Push and Hold EMER/TEST selector and observeYELLOW CROSS appear steadily;**

**Push the PTT (push to test) switch and verify the sound of O2 flowing across the mask mic.**

**then Release the EMER/TEST selector**
**Release RESET/TEST button:**
**Observe FLOW IND is BLANK**
**and O2 Flow stops.**

**Verify that the N/100% lever is in 100% position and**
**The container doors are closed.**




Now, put it all back together:

MASK O2 @ 100%
MASK HOLDER doors closed
MASK/BOOM switch to BOOM

### 5 CHECK ...................... SMOKE GOGGLES

*Check the SMOKE GOGGLES for clarity, glazing, proper fit, and serviceability. If they are wrapped in plastic, remove them and stow them for quick accessibility.*
*When you re-stow the goggles, make certain that they are within arms reach.*



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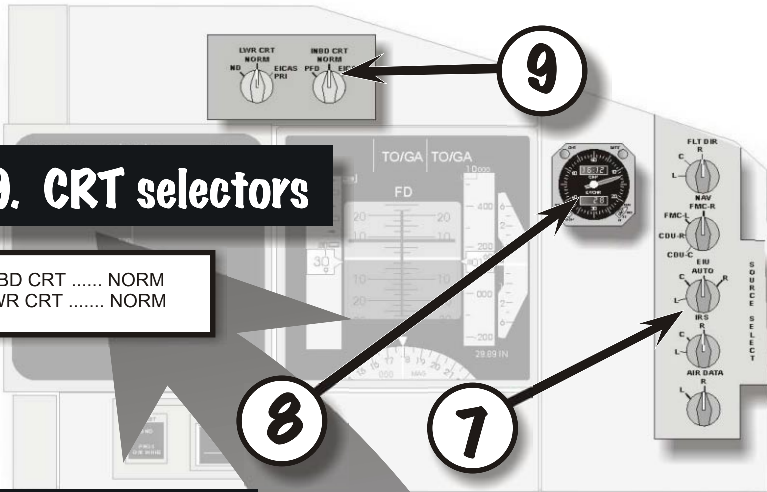



## 9. CRT selectors

INBD CRT ...... NORM
LWR CRT ....... NORM

## 8. CLOCK

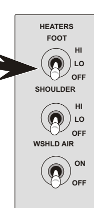
1. OBSERVE ... Hours and min correct
2. PUSH DATE switch ... observe correct date
3. PUSH again ... observe returns to TIME
4. OBSERVE ... second hand at 60 secs
5. POSITION ET switch .... RESET
6. RELEASE ET switch .... HLD
7. OBSERVE ...... ET/CHR display blanks

## 7. INSTRUMENT SOURCE selectors

Here are the settings:
**FLT DIR .......... R**
**NAV ........ FMC R**
**EIU ........... AUTO**
**IRS .................. R**
**AIR DATA ....... R**

## 6. HEATER switches

6




Set like you want, but be aware that the ***foot and shoulder heaters DO NOT WORK on the ground.***

## 5. SMOKE GOGGLES

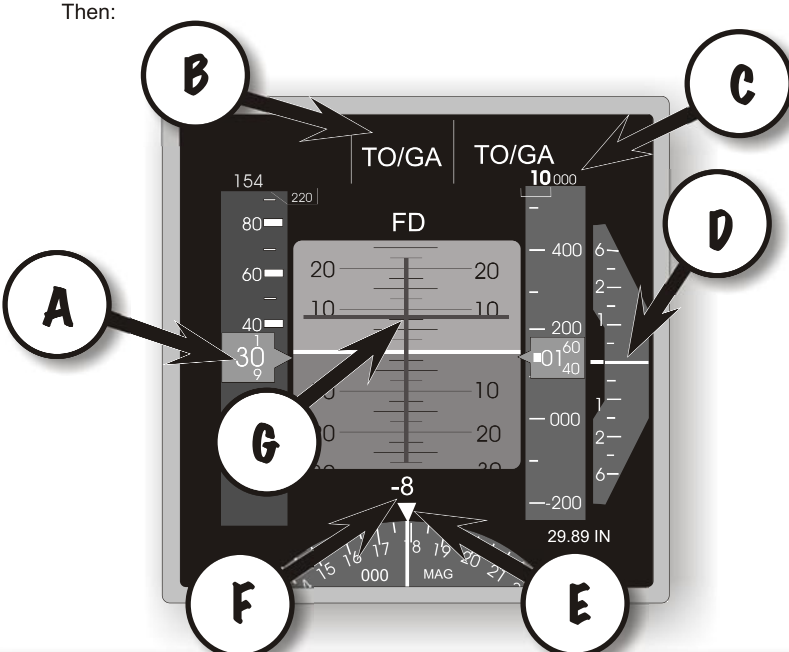
5

There are 2 things to look for:
1. Verify within reach
2. Make certain the mask is unwrapped.

**IRS ALIGNMENT MUST BE COMPLETE TO CONTINUE**

## 10 PFD ............................... CHECK

Check PFD is displayed on the CRT and there are no flags.
Then:




**A** :AIRSPEED IND ................ 30 KTS

**B** :FD and TO/GA .................. Annunciated

**C** :ALTITUDE IND ...................... Alt set in MCP

**D** :VERTICAL SPEED ............ ZERO with NO FLAGS

**E** :HEADING .......................... Agrees with MCP

**F** :RADIO ALTITUDE ............. -8

**G** :ATT and COMD BARS ....... level and 8 deg UP





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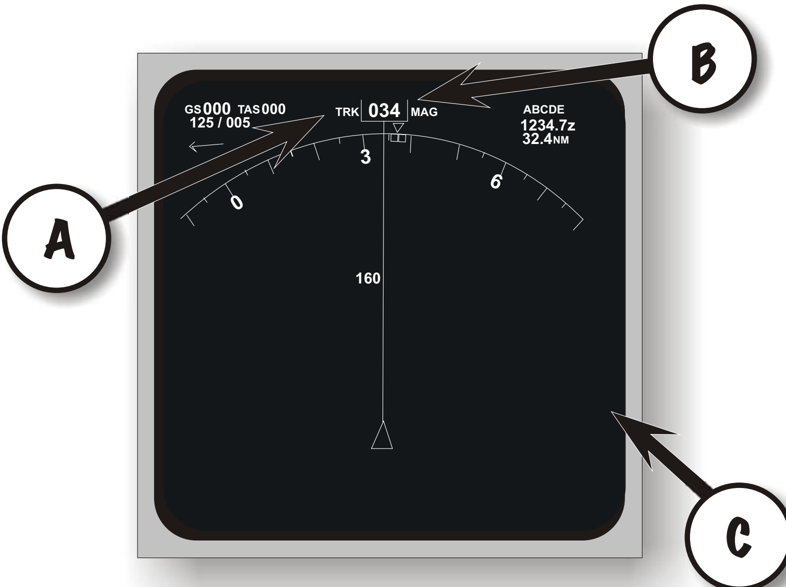
**IRS ALIGNMENT MUST BE COMPLETE TO CONTINUE**

**NOTE:**
PLAN MODE will work even if IRS' are NOT aligned.

## 11 ND .................... CHECK

Check ND is displayed on the appropriate CRT and there are no flags.
Then:




**A: PROPER HEADING AND TRACK**
**B: CHECK HEADING agrees with STBY COMPASS**
**C: Verify NO FLAGS showing.**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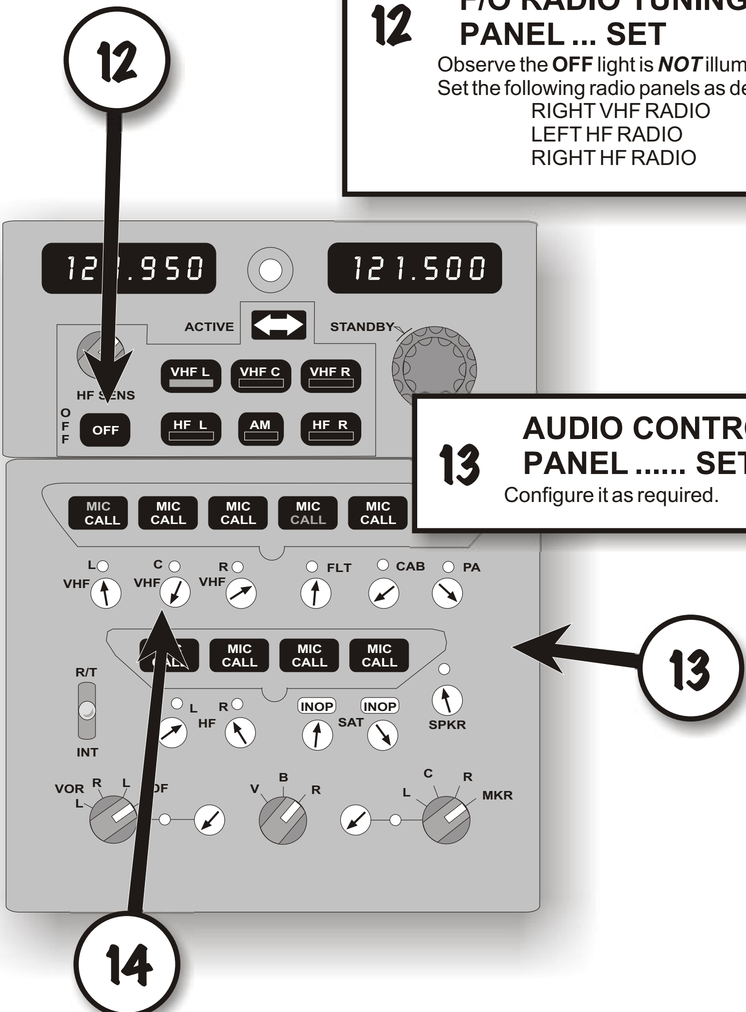
## 12 F/O RADIO TUNING PANEL ... SET

Observe the **OFF** light is ***NOT*** illuminated.
Set the following radio panels as desired:

RIGHT VHF RADIO
LEFT HF RADIO
RIGHT HF RADIO




## 13 AUDIO CONTROL PANEL ...... SET

Configure it as required.

## 14 LEFT and RIGHT VHF RADIOS ........... CHECK

Time permitting, check the left and right VHF radios as soon as practical.





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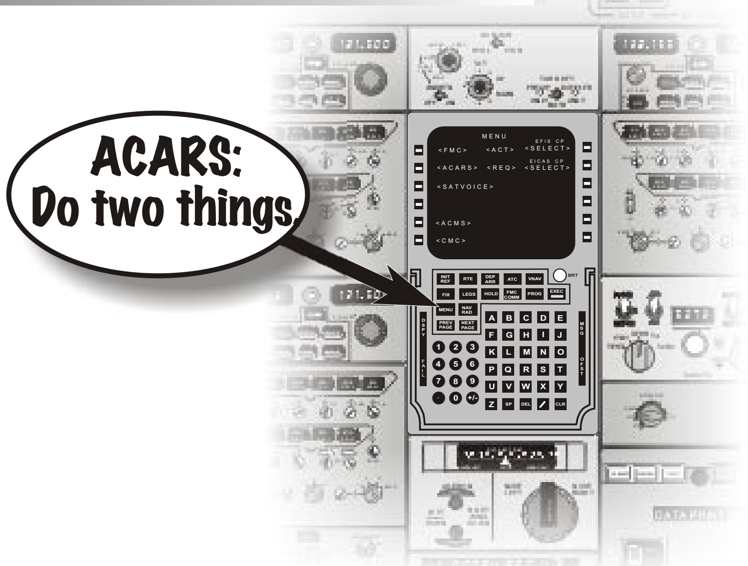



## 15 SATELLITE VOICE CALL setup ........... DO IT!

Select **MENU** on CENTER (CONSOLE) CDU.

SELECT: <SAT> ; then

LINE SELECT: DIRECTORY (LS2L for VOICE 1)

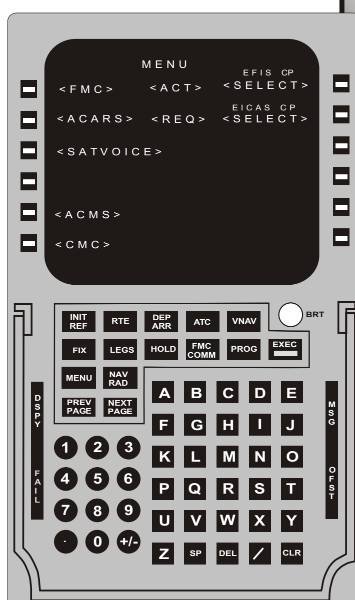
Select the first Attached FACILITY with SATCOM capability.

Repeat the procedure for VOICE 2 for DISPATCH in use.

## 16 DATALINK … CHECK

Select LINK MANAGER
on the center CDU.

Verify AVAIL status
is in view for VHF and SATCOM



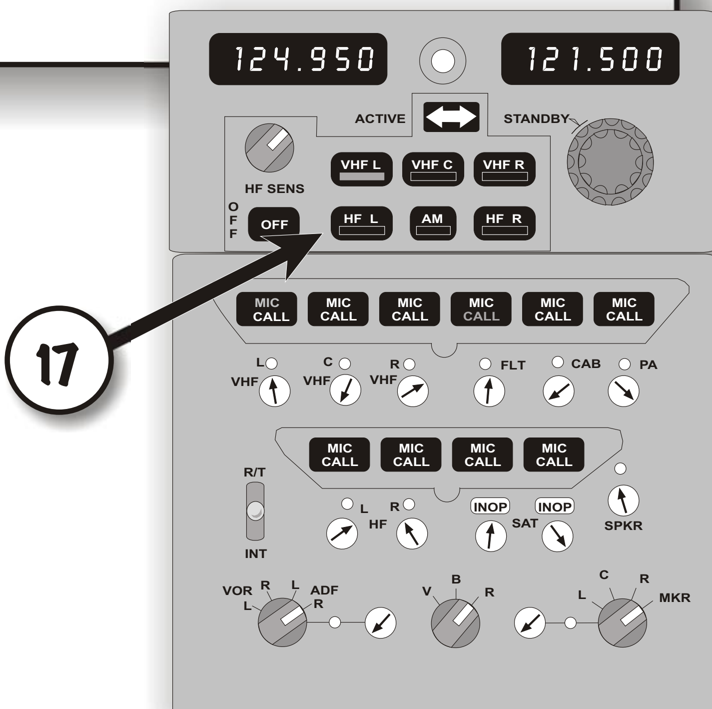

FLOW20.CDR

## 17 LEFT and RIGHT HF RADIOS ........... CHECK

If required, (see criteria outlined in the FOM):

TUNE HF radios,
select appropriate frequencies (normally on the 10-7 page) in the STANDBY frequency indicator and position frequency transfer switch to the ACTIVE frequency. Momentarily press a PTT switch (a piercing tone will be emitted while the HF transmitter is tuning. The tone IS NOT transmitted; only you can hear it.)

If these checks are required … they MUST be accomplished PRIOR to departure.




## 18 SEAT and RUDDER pedals .... adjust

**END of the First Officers Cockpit Set-up.**





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# FINAL COCKPIT PREP

# *A discussion about charts in general:*

The "Standard" by which most others are judged (and certainly the biggest supplier) are those charts developed by the ***JEPPESON COMPANY.*** As a result, I have selected those for inclusion in my examples and remarks. The "jeps" as they are called are similar enough to all the others as to make my comments and observations about them valid for virtually all charts.
Each airline, however, has the responsibility to select their own charts or chart manufacturing company.

Here are some of the representative pages:

## the 10-7 chart

Lists the available operations facilities, frequencies, and services available plus a treasure trove of other useful information. It may actually be several pages long. Generally used during the pre-departure phase.

9 JAN 98 10-7 BANGKOK, THAILAND
BKK / VTBD BANGKOK INTL

| | | |
|---|---|---|
| ELEV - 9<br>GATES COORDS / FMCS<br>N13 - 54.9<br>E100 - 36.5 / ALL | TELEPHONE<br>HOME 124-456-7890<br>PIZZA 234-567-8901 | UTC<br>LT - 7 = UTC |
| | See Chart 10-9B, 10-9E1, 10-9E2 | MAINT<br>Yes; see M/F/L chapter for details. |
| PUSHBACK<br>Request Clnc<br>ALTIMETRY<br>See Approach Chart | | |
| OTHER FREQS<br>ARINC 124-456-7890<br>HF CHECK 130.8/5547/5574 (LOW POWER) | | |

ARRIVAL/DEPARTURE

1. **Bird Hazard** Expect heavy concentrations of bird activity, especially during winter.

2. **Gnd Maneuvering Procedures** See pages 10-9D/E. Clearance is tight; follow taxiway center and apron lines as closely as possible.

3. **Jetblast Hazard** Use minimum thrust to avoid jetblast hazard to aircraft parked close to the northern end of taxiway B.

4. **Military Traffic Rwy** 3R/21L normally is used by military aircraft but may be made available to civil aircraft.

5. **Security Hot Spot** Bay 111 at taxiway X and Bay 222 at taxiway S (between the runways) for hijacking. Bay 333 at taxiway B (far north) for bomb threat.

ARRIVAL

1. **Airspeed Limitations** Observe the following maximum airspeeds at or below 10,000' unless waived by ATC:
- Between 35-15 miles - 250 knots
- Within 15 miles - 210 knots

2. **Parking System** The RLG parking system is in use for gates 11 to 47. See description in the TABLES / CODES / SIGNALS chapter.

DEPARTURE

1. **ATC Clncs** Request clearance from Bangkok Control (as described on page 10-9D) 5 minutes before startup. Include proposed flight level if different from the flight plan. If pushback is not within 5 minutes of acknowledging the ATC clearance, the clearance may be canceled.

2. **Engine Start / Pushback** Clearance is required for both engine start and pushback. Include the parking bay number with request for clearance. See page 10-9D for engine start and pushback procedures.

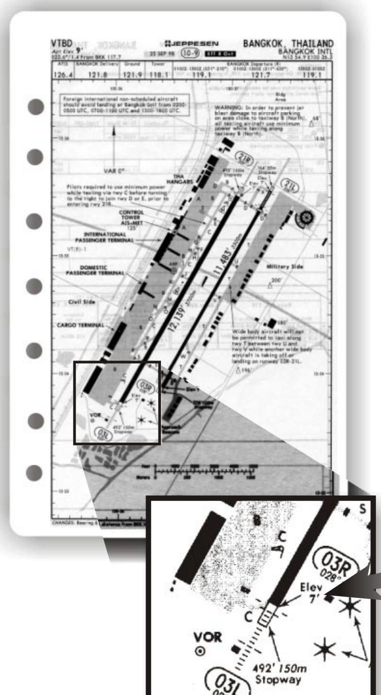
3. **Speed Restrictions** No speed restrictions for departing aircraft.

MISCELLANEOUS

1. **Flt Ops Location** Room 3210, 3rd floor, Central block.

## the 10-9 chart

Generally, a map of the airport. It contains taxi routes and general information regarding hazards and other considerations.
Also re-iterates frequencies, 4 letter identifier, lat/long, etc.




The approach end depiction contains some information that we need before departure:

**ELEVATION** at a specific point
-this is essential for checking the altimeter.

**MAGNETIC HEADING** of the runway.





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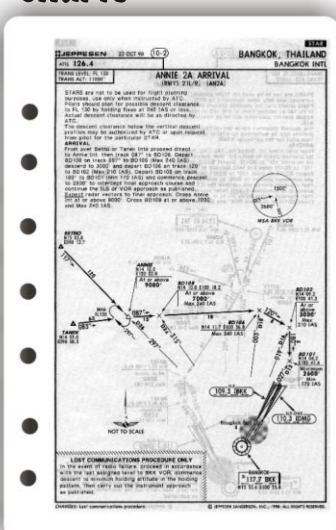
## the 11-1 chart

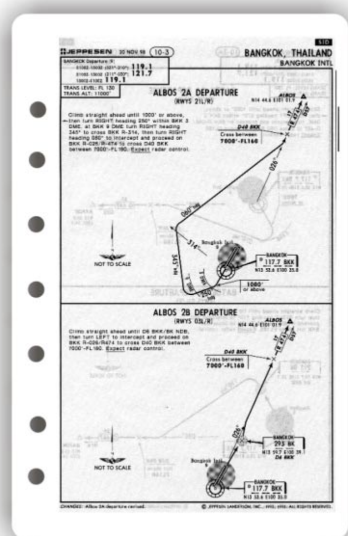
The FIRST of the "APPROACH" plates contains most of the information needed to fly the MOST desirable approach. By that I mean, generally speaking, the approach plates are grouped in the order which represents the "best" flyability, all things considered. You will find that CAT-III approaches sometimes occur at the end of the approach plates even though they may represent the most precise landing minimum.

At smaller airports, the information that we represented as being on the 10-9 page is actually placed on the back of the 11-1 page.

## the 10-2 and 10-3 charts

The 10-2 charts (***STAR***) ARRIVAL and the 10-3 (***SID***) STANDARD INSTRUMENT DEPARTURE charts. These present the specific details such as frequencies, radials, distances, altitude associated with the TITLES. That is, if you are assigned the "ALBOS 2A DEPARTURE," then ATC will expect that you will fly so as to conform to the specific decsription of that departure profile **WITHOUT** further clearance information.
Your clearance might be "... via the ALBOS 2A departure ...." and that would completely define all the details of your expected flight path after take-off.



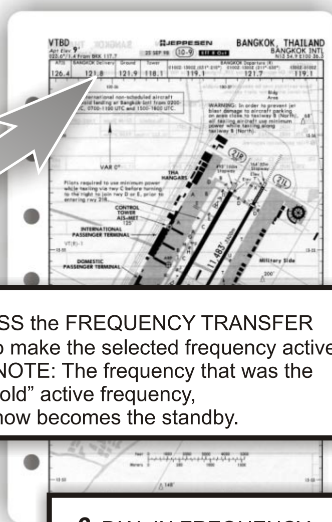
## *About 20 minutes prior to pushback …*
## *or as indicated on the airport information sheet ...*

# GET CLEARANCE

There are basically two ordinary ways to get the clearance.

Using the VHF radio, and
Using the center CDU and PDC
(Pre-departure clearance).

Here is a short primer on how to operate the radio head.

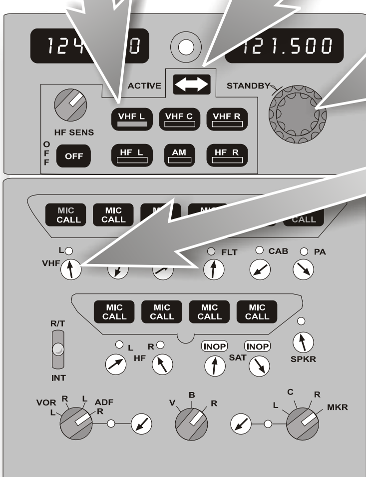



**1**: DETERMINE desired frequency ( In this case we will use the 10-9 page to obtain CLEARANCE DELIVERY frequency)

**2**. SELECT RADIO SWITCH for the radio to be tuned.

**4**. DEPRESS the FREQUENCY TRANSFER SWITCH to make the selected frequency active.
NOTE: The frequency that was the "old" active frequency, now becomes the standby.

**3**. DIAL IN FREQUENCY using the STANDBY FREQUENCY SELECTOR KNOB.




**5**. ADJUST associated receiver volume control knob.

**6**. PUSH appropriate button to select the appropriate transmitter.
NOTE: Only one switch can be selected at a time.

**7**. ***HAVE OTHER PILOT MONITOR*** the clearance.

**8**. Make tranmission and request clearance.
Use either:
YOKE switch,
REMOTE pendant, or
DEPRESS transmit switch on AUDIO CONTROL PANEL.

**9**. ***WRITE IT DOWN***. Be prepared for a rapid transmission from the controller. Sometimes the "Aviation English" will be difficult to interpret. Make certain that you understand and obtain a complete clearance.





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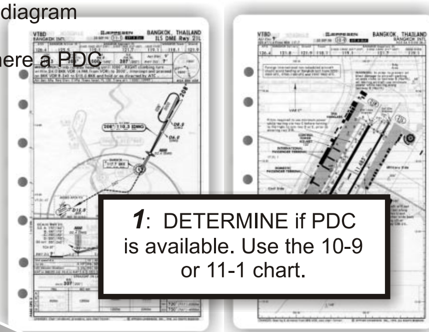
# GETTING THE CLEARANCE

Another (BETTER) way to get the clearance is using the ACARS CDU. Those airports where this service is available will be indicated on the 10-9 or 11-1 airport pages by the notation "PDC" in the legend of the airport diagram page.

The initial call-up frequency at a station where a PDC has been received will be either:

on ATIS, or
REMARKS on the PDC, or
by NOTAM.



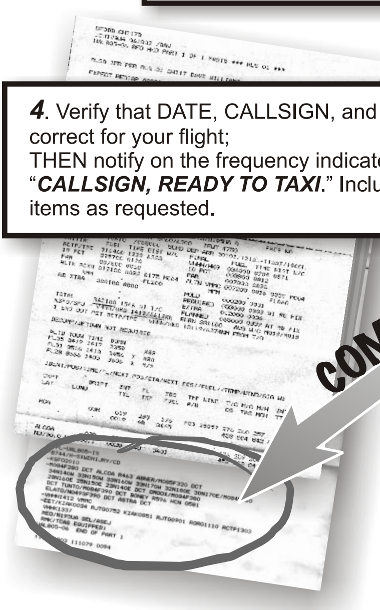

**1**: DETERMINE if PDC is available. Use the 10-9 or 11-1 chart.

**2**. Make appropriate input to console CDU:

SELECT ATC
SELECT CLEARANCE

**3**. When CLEARANCE is received, a bell rings and a note appears on the upper EICAS … "MSG."
Take hardcopy from DATA PRINTER.


**4**. Verify that DATE, CALLSIGN, and ROUTE are correct for your flight;
THEN notify on the frequency indicated:
"***CALLSIGN, READY TO TAXI***." Include other items as requested.



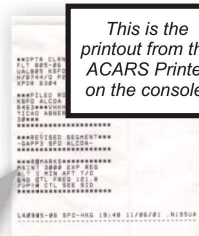
COMPARE

**5**. You MUST then compare it with your original "FLIGHT PLAN" and see if there are changes or alterations. The part of the Flight Plan document that we compare is the last part at the very bottom of the computer printout.

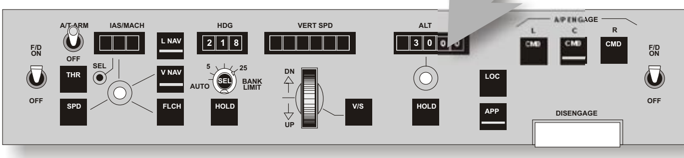
# SET INITIAL CLEARED ALTITUDE

Either the Captain or the F/O will set the initially assigned altitude into the MCP.
CROSS CHECK with the other crew member(s).
***THIS IS VERY IMPORTANT!!***

**NOTE**: *You will **NEVER** depart anywhere … ever … without an assigned altitude. If you are not certain what the assigned target altitude is; stop and find out.*



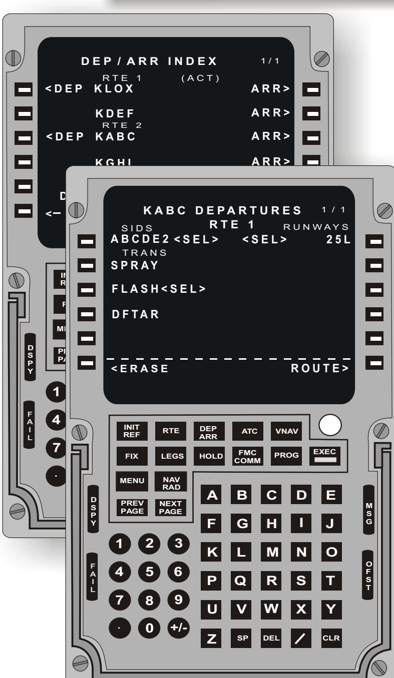
*This is the printout from the ACARS Printer on the console.*




# CAPTAIN: ENTER RUNWAY, SID, TRANSITION

The Captain is expected to make these entries … and the First Officer is to VERIFY that the entries made by the Captain are correct.

**NOTE**:
***ONLY SELECT THE RUNWAY ON THE DEP/ARR PAGE !!!***
***NEVER enter the runway on ROUTE PAGE 1.***




## HOW TO DO IT:

Start with the DEP/ARR key.

SELECT the RTE 1 DEP AIRPORT

It will automatically scroll to the DEPARTURE PAGES for that AIRPORT.

Then simply select the RUNWAY, SID, and the TRANSITION (if required).

The ORDER of the entries is ***IMPORTANT***: RUNWAY, SID, and then TRANSITION.

**NOTE**: *IF there is a runway change after the initial execution; You MUST re-enter the SID and TRANSITION also even though they may remain unchanged.*

# F/O VERIFY





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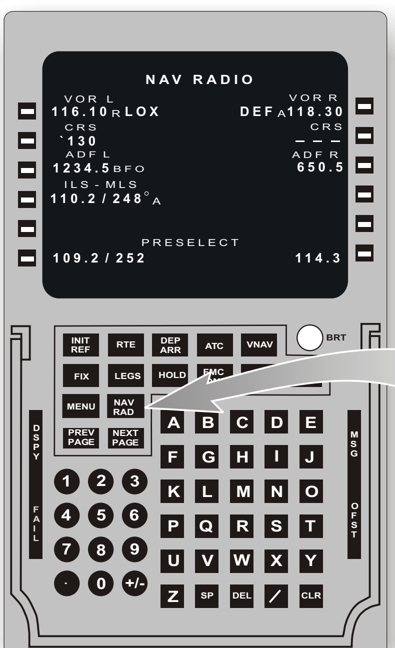
# F/O: WAYPOINT VERIFICATION

Any new waypoints resulting from changes or additions to the flight plan route ***MUST*** be checked by the First Officer using "***WAYPOINT VERIFICATION PROCEDURES***."
*ADDITIONALS 6-57*

1. SELECT LEGS PAGE ON THE CDU
2. SELECT PLN MODE ON THE EFIS CONTROL PANEL
3. COMPARE THE MAGNETIC COURSE AND DISTANCE BETWEEN EACH WAYPOINT FROM THE FMC AND THE AFPAM.
4. STEP THROUGH EACH WAYPOINT AT LS6R TO VERIFY ACCURACY.
5. LEG DISTANCE SHOULD BE WITHIN 2NM OF THE FPF.

# F/O: CDU NAVIGATION RADIOS CHECK




The Boeing guys decided that the pilots needed help, and so they have installed "***SELF TUNING RADIOS***" on this airplane. Sometimes, however, they tune the wrong radio. So, we have to check and see that the proper radios are tuned.
How do we "***MANUALLY TUNE***" the radios?

Select the **NAV/RAD** key and when the "NAV RADIO" page is displayed, fill in the appropriate blanks.

**NOTE**: *The **ADF** radios do NOT have an autotune capability and must ALWAYS be manually tuned, if needed.*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# F/O SET FMCS PERFORMANCE

To access this page:
LS **PERF INIT** (if displayed) or push **INIT REF** key.

## COST INDEX:

Type "100" to the Scratch Pad
Line Select 5L
( *A COST INDEX of 100 will give us VNAV climb and descent speeds compatible with ATC and Flight Manual data*).

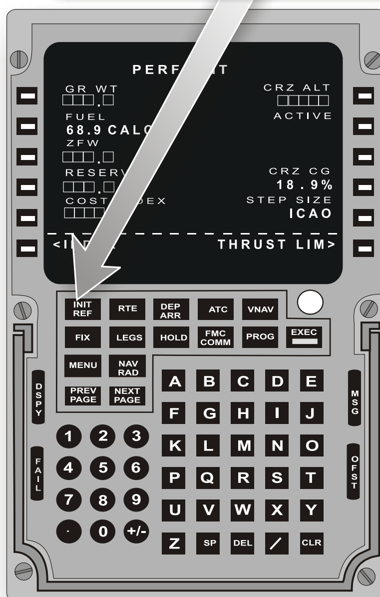
## RESERVES:

If "NO ALT" required; I suggest you enter MINIMUM PLANNED LANDING FUEL (MPLF) 19.0#.
*Just a comment here, your call, but it is OK to put in the MINIMUM DESIRED LANDING FUEL (MDLF) 11.1# .*

If "ALT" required enter burn to most distant alternate PLUS MDLF.

At certain airports which require a designated minimum arrival fuel, enter that value.

If ALT is deleted or added enroute; UPDATE the RESERVES fuel line.

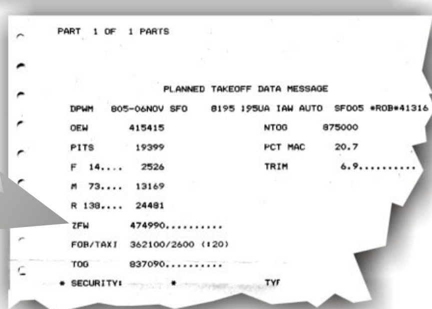



**NOTE**

*RESERVES fuel entry WILL NOT be less than those figures listed above ... however, the Captain may elect to choose a larger value, but should avoid values that result in "INSUFFICIENT FUEL" FMC messages.*

## ZFW (Zero Fuel Weight):

Get the ZFW from the PLANNED TAKEOFF DATA MESSAGE supplied from the flight planning materials. The GROSS WEIGHT will be automatically entered.



PART 1 OF 1 PARTS

PLANNED TAKEOFF DATA MESSAGE

DPWM 805-06NOV SFO 8195 195UA IAW AUTO SF005 *ROB*41316
OEW 415415 NTOG 875000
PITS 19399 PCT MAC 20.7
F 14.... 2526 TRIM 6.9..........
M 73.... 13169
R 138.... 24481
ZFW 474990..........
FOB/TAXI 362100/2600 (120)
TOG 837090..........
* SECURITY: * TYF

## CRZ ALT (Cruise Altitude):

Get the CRZ ALT from the Flight Plan.

## STEP SIZE :

As desired.

## CRZ CG :

DO NOT CONFUSE THIS WITH TO/CG (Take-off CG).
***DO NOT*** PLACE TO/CG HERE!!! ***<u>NEVER !!!</u>***





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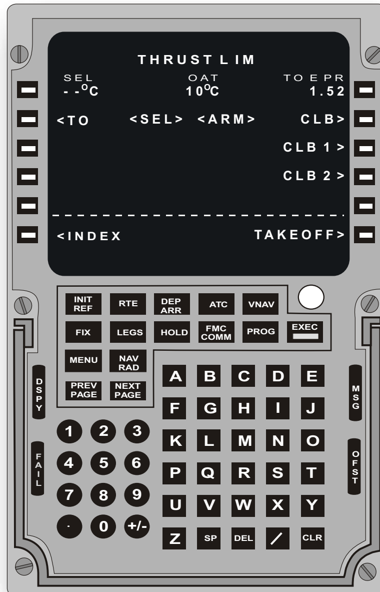
# F/O SET THRUST LIMIT DATA ENTRY

To access this page:
LS **THRUST LIM>** (key 6R)




If "REDUCED THRUST" is desired, a normal situation:

Type in the desired ASSUMED TEMPERATURE into the scratch pad and line select to 1L (SEL temp line).

**EXAMPLE**

*For a "C" degree entry, just type in the numeric value, such as 48. If you wish to insert fahrenheit, the entry must be followed by an "F" to distinguish it from centigrade.*

If "MAXIMUM RATED TAKEOFF THRUST" is desired, AFTER a reduced temperature has been set in the FMC:

PUSH the DELETE key and put "DELETE" in the scratch pad. Line selct 1L. then

Line select CLB> (Line select 2R). This will ensure that CLB is armed.

Either CLB 1 or CLB 2 may have been automatically selected by the FMC depending on the weight and assumed temperature. We want the most fuel efficient climb thrust setting, so...

Line select 2R.

# CAPT check THRUST LIMIT DATA

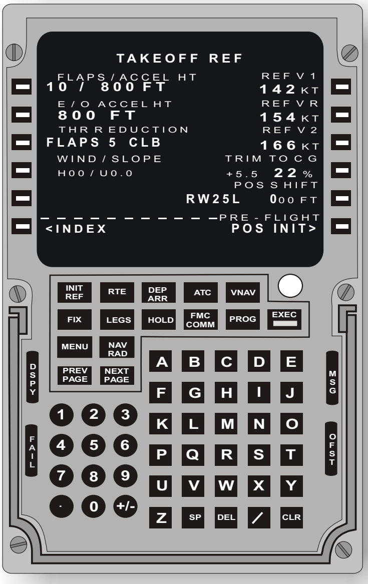
On the **THRUST LIM** page, the Captain is to verify the thrust limit entries, including the displayed EPR, and compare them with the *Planned Takeoff Data Message*.

# CAPT- F/O initialize TAKEOFF DATA

To access this page:
LS **TAKEOFF>** (key 6R)

> **NOTE**
> *Takeoffs made with flaps 10 will provide better acceleration, a higher climb rate, and earlier flap retraction; thereby improving overall fuel economy and cost of operation.*

The FIRST OFFICER will make the following entries:




**FLAP SETTING ACCELERATION HEIGHT**

**E/O ACCELERATION HEIGHT**

**THRUST REDUCTION**
*example: 5 for flaps 5 OR AGL altitude.*

**V SPEEDS**

NOTE: The "V speeds" will probably be displayed in "SMALL" font size. They should be made "**BOLD**" font size.
To do this, simply depress the key next to the item.

**TAKE-OFF CENTER OF GRAVITY**
Here is where the T/O CG ( Take-Off Center of Gravity) figure is selected by the pilot.

**TRIM SETTING**

This number should agree with the infoirmation that perhaps came with the flight papers. If there is a disagreement, further investigation (call to load planning) should result in the the conclusion that the CDU figure is correct. If not, then suspect that there is some improper input made to the CDU load information.

> **GOOD CAPTAIN HABIT**
>
> As a Pilot … *We must ALWAYS be suspicious of important information and ALWAYS seek to resolve ambiguity whenever possible.*

**POSITION SHIFT (if required)**



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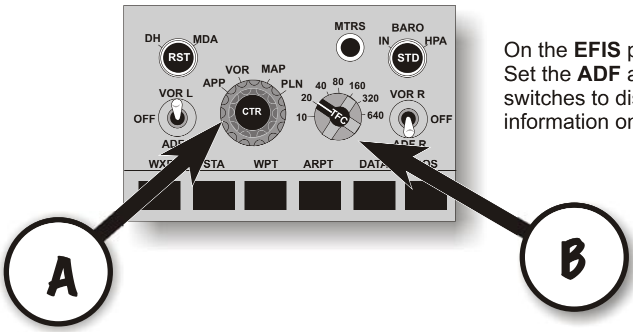
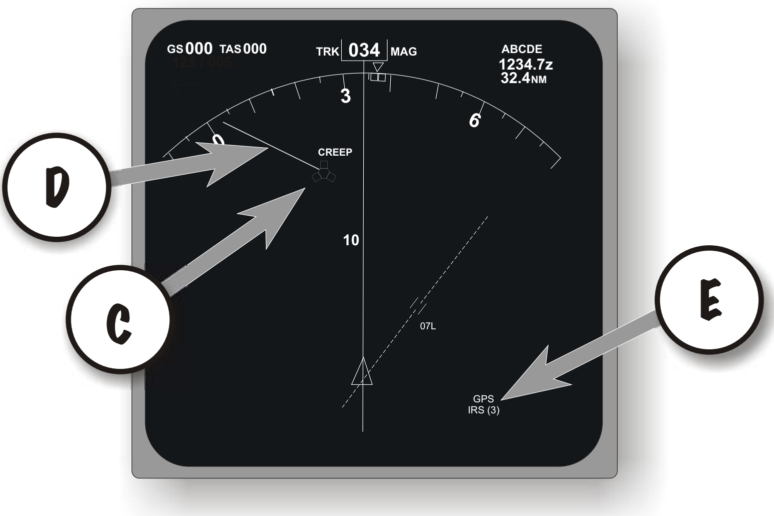
## CAPT - F/O VOR/ADF POINTERS




On the **EFIS** panel;
Set the **ADF** and **VOR** switches to display the desired information on the **ND**.

## CAPT - F/O check ND (NAV DISPLAY)




**VERIFY**:

A — the indicator is in the MAP mode,

B — scale set to 20 nm,

C — location of the tuned VOR/DME stations,

D — active route as a solid magenta line between waypoints,

E — GPS in small font above the IRS (3),

*The map display, map scale, and LEGS page sequence should be consistent with the departure procedure.*



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# F/O BOARDED FUEL QUANTITY check

*These procedures are discussed in greater detail in the FOM Maintenance/Fueling/Loading 7.20.6.*

**NOTE**:
*This check assumes that the crew has received an FSF (Fuel Service Form). If there is no FSF, then the boarded fuel check is not applicable.*

1. **VERIFY PRESERVICE FUEL FROM THE FSF BY COMPARING IT WITH THE ARRIVAL FUEL**.
   *PRESERVICE fuel may be less than the arrival fuel due to APU ground use, maintenance taxi, engine runs, etc.*

2. **CONVERT THE FSF FUEL ADDED FROM GALLONS TO POUNDS BY MULTIPLYING THE TTL (total fuel from trucks) BY THE FUEL DENSITY**.

3. **THE CALCULATED FUEL ON BOARD IS THE SUM OF STEPS 1 AND 2**.

4. **COMPARE THE CALCULATED FUEL ON BOARD FROM STEP 3 WITH THE TTL REQUESTED FUEL** (CLEARED fuel plus TAXI fuel).

5. **CALCULATED FUEL ON BOARD SHOULD EQUAL TTL REQUESTED FUEL PLUS OR MINUS THE ALLOWED TOLERANCE** (gallons converted to pounds).

**TECHNIQUE**
*Check the fuel load at the time the fueler delivers the FSF to the cockpit. Discuss any discrepancies at that time.*

**NOTE**
*If the calculated fuel on board is out of tolerance with the TTL requested fuel, then the FSF should be checked for errors and for indications of over servicing or under services. Check pre-service amounts, fuel density, math, TTL FROM TRUCKS, and for possible missing maintenance FSFs. If the discrepancy cannot be determined, the fueler should be notified and the fuel tanks dripsticked to confirm fuel on board.*

**AWARENESS NOTE**
*There is always the possibility that somewhere in your travels to some place on the earth unknown to you, they just might use Kgs (Kilograms) instead of Lbs (Pounds) to measure the fuel load.*
*IT HAS HAPPENED!!!*
*And if the crew is not vigilant, they will depart without enough fuel.*



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# *WHEN FUELING IS COMPLETE ...*

## CAPT sets up FUEL PANEL

### *The FABULOUS "NO-BRAINER" FUEL SET-UP RULE:*

*Some incredibly smart person (maybe it was a pilot) figured out a simple way to remember how to set up the fuel panel. These simple two situations cover the whole range of fuel loads from totally full to minimum fuel. That rule goes like this.*

***Some pilots call it the***

# 120 K

***RULE.***

IF there is more than 120,000 # of fuel on board, then:

Turn on ALL BOOST PUMPS, OVERRIDE PUMPS, CENTER WING PUMPS, and STABILIZER PUMPS that contain fuel.

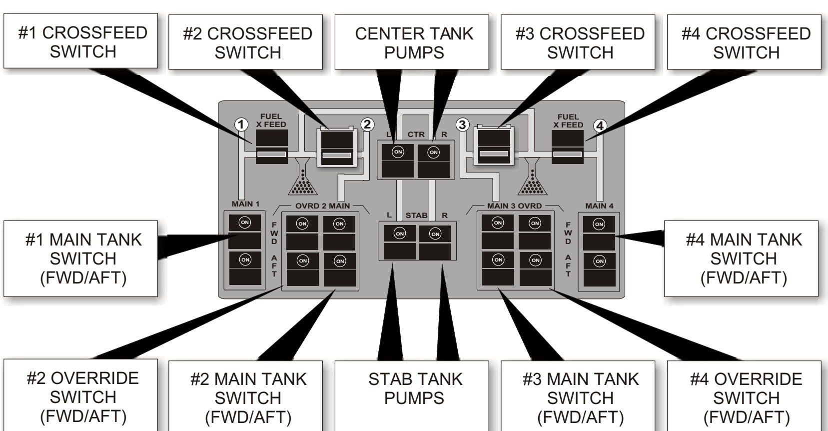
And, OPEN #1 and #4 CROSSFEEDS

***BUT***

IF there is less than 120,000 # of fuel on board, then:

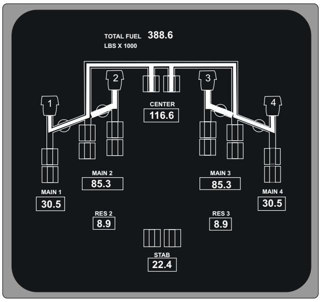
Turn on ALL MAIN TANK PUMPS,

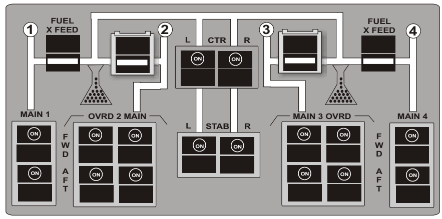
and CLOSE #1 and #4 CROSSFEEDS



# HOW THE FUEL SYSTEM WORKS:

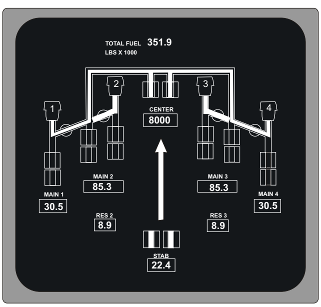
*In our example, we will start with FULL FUEL TANKS.*

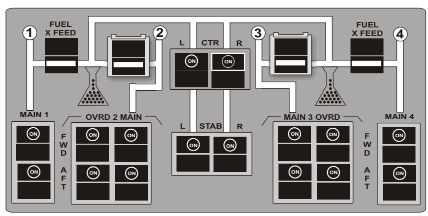


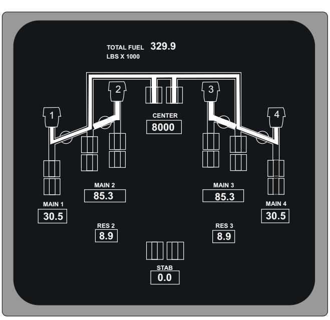

*Full fuel load of 388,600 #. All tanks are full. The setup is "ALL PUMPS ON, #1 and #4 X-FEEDS OPEN."*

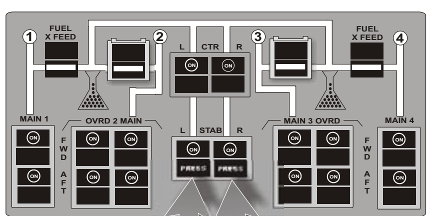
*FYI: Approximately 35 seconds after T/O Flaps have reached their selected position, the #2 and #3 X-FEED valves close, momentarily flashing yellow while intransit. After flaps are retracted, #2 and #3 X-FEED valves will reopen and we will have the selected situation shown above. So, and this would be a trick question, all take-offs are made TANK to ENGINE regardless of the fuel load.*




*When the CENTER TANK gets to 80,000 #, then fuel is automatically pumped from the STAB TANK to the SYSTEM.*




*When the STAB TANK gets EMPTY, the outline on the synoptic turns yellow, the PRESS lights illuminate on the FUEL PANEL, and ADVISORY MESSAGES display on the UPPER EICAS.*

***Pilot action is to SHUT OFF THE TWO STAB TANK FUEL PUMPS.***





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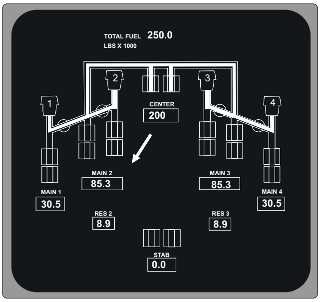
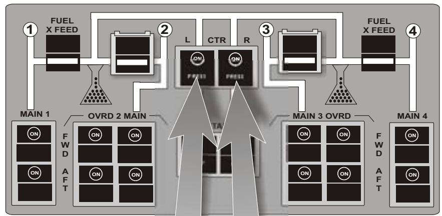
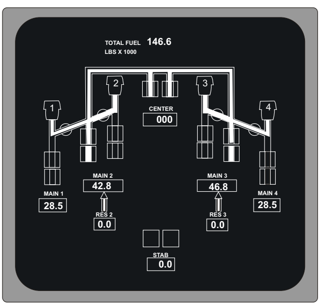
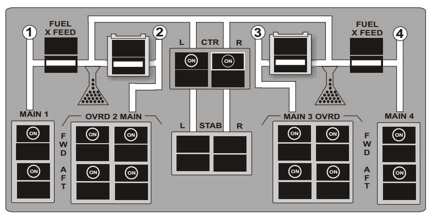


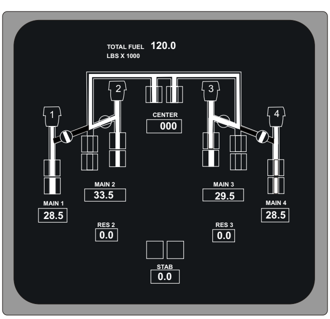

When the CENTER TANK gets to 2000#, the SYNOPTIC for those tanks turns yellow, an arrow appears indicating that the remainder of the fuel is draining into the #2 MAIN TANK. An EICAS message displays, and the LOW PRESS LIGHTS appear on the fuel panel.

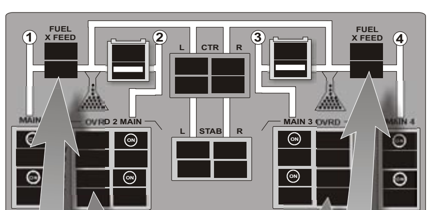
***PILOT ACTION:***
***TURN OFF THE CENTER TANK FUEL PUMP SWITCHES.***




When the fuel in MAIN TANK 2 or 3 decreases to less than 40,000#, fuel transfers automatically from the #2 and #3 RESERVE TANKS.




When the TOTAL FUEL drops to 120,000# or below, the OVERRIDE PUMPS on the SYNOPTIC turh yellow, the EICAS displays ADVISORY MESSAGES, LOW PRESS is illuminated in the OVERRIDE PUMP SWITCHES.

***PILOT ACTION:***
***1. CLOSE #1 and #2 FUEL X-FEED switches; and***
***2. SHUT OFF OVERRIDE PUMP SWITCHES.***

# BRIEFING THE FLIGHT

*At this point in the evolution of our "trip," we need to brief. It is suggested that there be two separate venues of briefing information. It is a good idea to break up the information so that the PF (Pilot Flying) does one list and the PNF (Pilot-Not-Flying) does the other. It is the Captains responsibility to ensure that all applicable items are completed prior to take-off.*

## *CAPT or F/O BRIEF* TAKEOFF DATA

**NOSE NUMBER / LOGBOOK / MRD**
**RELEASE NUMBER**
**ZFW / TOGW**
**TRIM**
**BLEED CONFIGURATION**
**ALTIMETER SETTING**
**TEMPERATURE**
**FLAP SETTING**
**EPR / N1**
**RUNWAY LIMIT / PERF LIMIT**
**WIND CORRECTION**
**AIRSPEED CORRECTIONS**
**T-PROCEDURES (DPWM)**

## *CAPT or F/O BRIEF* PRE-DEPARTURE BRIEF

**CREW DUTIES (Cockpit/cabin)**
**FLIGHT PLAN CHANGES**
**NOTAMS / POSBDs**
**WINDSHEAR / RUNWAY CONDITION**
**REJECTED TAKEOFF**
**ENGINE FAILURE PROFILE**
**T-PROCEDURE**
**TAKEOFF PROFILE**
**CLEARANCE / SID**
**TERRAIN / OBSTACLES**
**TRANSITION ALTITUDES**
**TRAFFIC WATCH**
**OMC BRIEFING**

A few comments regarding the importance of these briefs to the simulator check-ride. The instructor will want particularly to hear you articulate your plan for a potential engine failure on take-off, and the same, of course, would be true in the real world.

*For example, if a Thunderstorm is sitting on your potential "escape" routing (T page), but doesn't actually affect your planned departure routing. It would be "good practice" to delay your departure until both paths are acceptable.*





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# ABOUT 5 MINUTES BEFORE "P" TIME

*"**P**" time is right on your flight plan and represents the planned pushback time. If there is going to be a delay in the pushback, you should notify CLEARANCE DELIVERY, GROUND CONTROL, and/or COMPANY so that they can make the necessary adjustment to their plans.*

At this point in the flows, it is time to prepare for pushback. There is not a specific place where this evolution should start, and the Captain must use her/his judgement. Captain does five things:

**SEAT BELT SIGN ON**
**FLIGHT DECK DOOR LOCK**
**HYDRAULIC DEMAND PUMPS**
**HYDRAULIC PRESSURE INDICATOR**
**PARKING BRAKE**

When the First Officer sees the Captain start these 5 items, then she/he does the three items:

**SEND COMPANY REPORT**
**LOAD WINDS**
**ATC LOGON**


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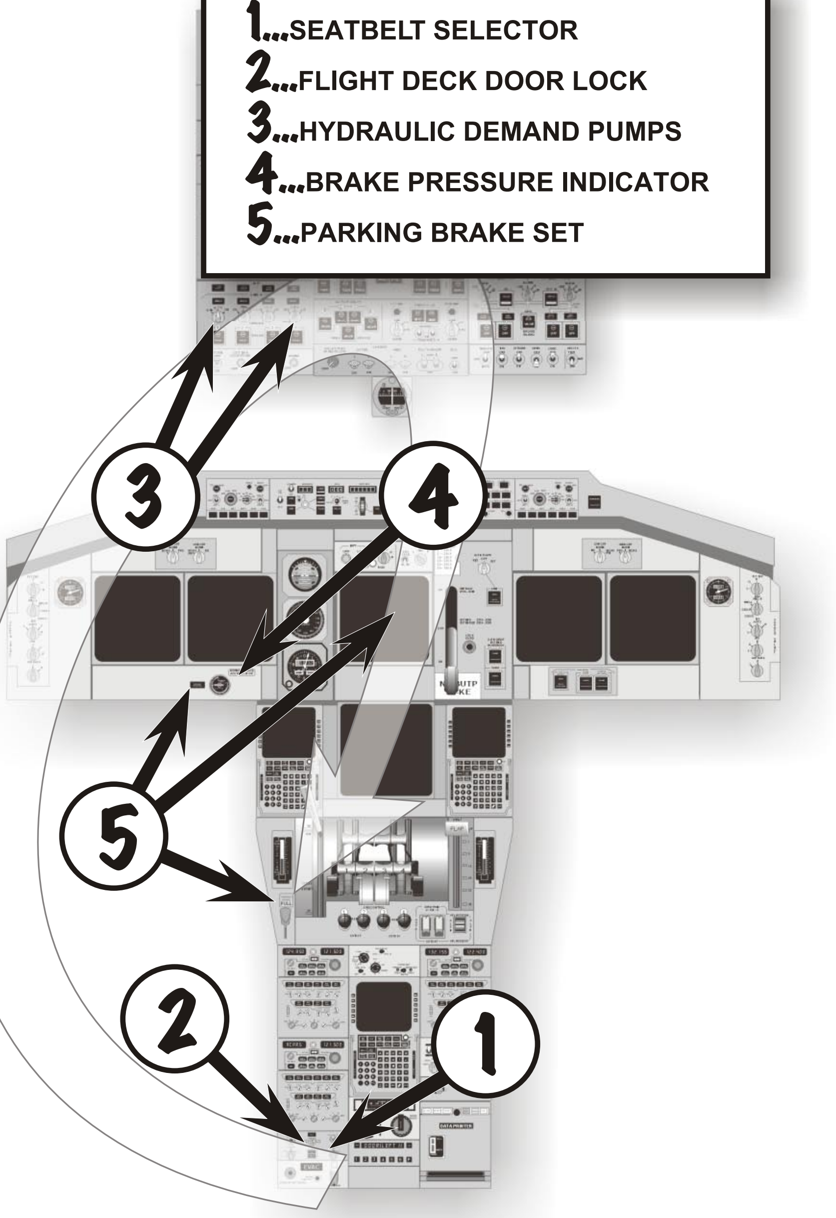
# CAPTAIN DOES 5 THINGS

1...SEATBELT SELECTOR
2...FLIGHT DECK DOOR LOCK
3...HYDRAULIC DEMAND PUMPS
4...BRAKE PRESSURE INDICATOR
5...PARKING BRAKE SET





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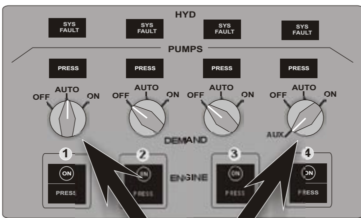
1

**SEATBELT SELECTOR ... ON**

2

**FLIGHT DECK DOOR LOCK**

PUSH the switch/light, and
OBSERVE the LKD light ON




3

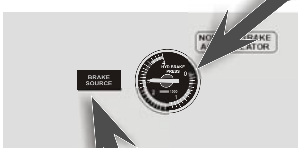
**HYDRAULIC DEMAND PUMP SELECTORS**

#4 selector ..... AUX
#1 selector ..... AUTO

4

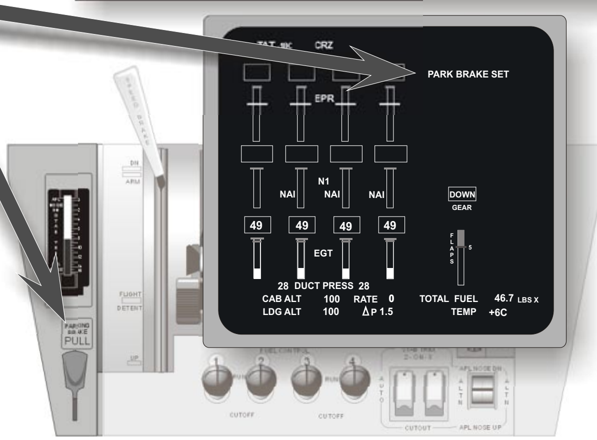
**HYDRAULIC PRESSURE INDICATOR**

OBSERVE ***3000*** PSI




Indicates HYD BRAKE PRESS available from the NORMAL BRAKE SYSTEM; however, when the normal system isn't available, it will indicate ACCUMULATOR pressure.
**NOTE 1**: *The accumulator can ONLY be pressurized by the #4 HYD System.*
**NOTE 2**: *The accumulator can SET AND HOLD the PARKING BRAKE.*
**NOTE 3**: *The accumulator is NOT designed to STOP THE A/C.*

5




**PARKING BRAKE**

while holding pressure on brake/rudder pedals, lift up parking brake lever. VERIFY lever remains locked UP.

EICAS msg
PARK BRAKE SET

BRAKE SOURCE
LIGHT ... OFF



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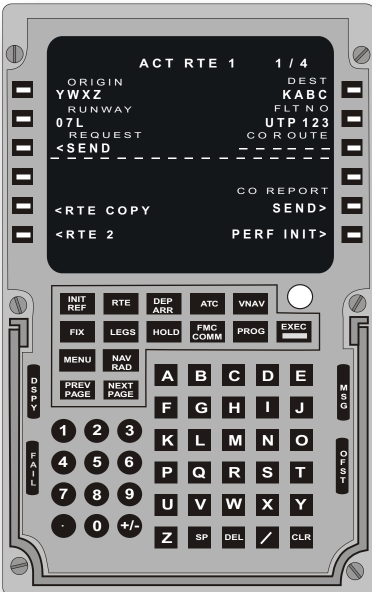
# F/O SEND COMPANY REPORT




After the route has been verified by the Captain and determined that it is identical to the filed route;
ACTIVATE ROUTE,
EXECUTE, then

**Line select "SEND>" (key 6R),**
*when illuminated*
**PUSH EXEC key.**

This will send the active route of flight to Dispatch.

In the flow of the set-up, at this point that should have been completed and now we are ready to tell DISPATCH that we are ready. We do this by sending the "ACTIVE ROUTE OF FLIGHT" to the dispatcher.

# F/O LOAD WINDS


Once the route of flight is activated, Request the WINDS.
push **LOAD> (6R**)

When the winds are loaded, the EXECUTE LIGHT illuminates.

Push EXECUTE and the data is loaded into the FMCS (onboard computer).

If there are a lot of pages, sometimes you will get a message **WIND DATA UPLINK READY**. You have to continue to load those pages until all the pages are loaded.

**CAUTION**
***DO NOT MAKE MORE THAN ONE WIND REQUEST*!**
*Here's the reason, Multiple wind requests may inhibit other datalink communications.*
*Normally, the uplink will take one to three minutes.*





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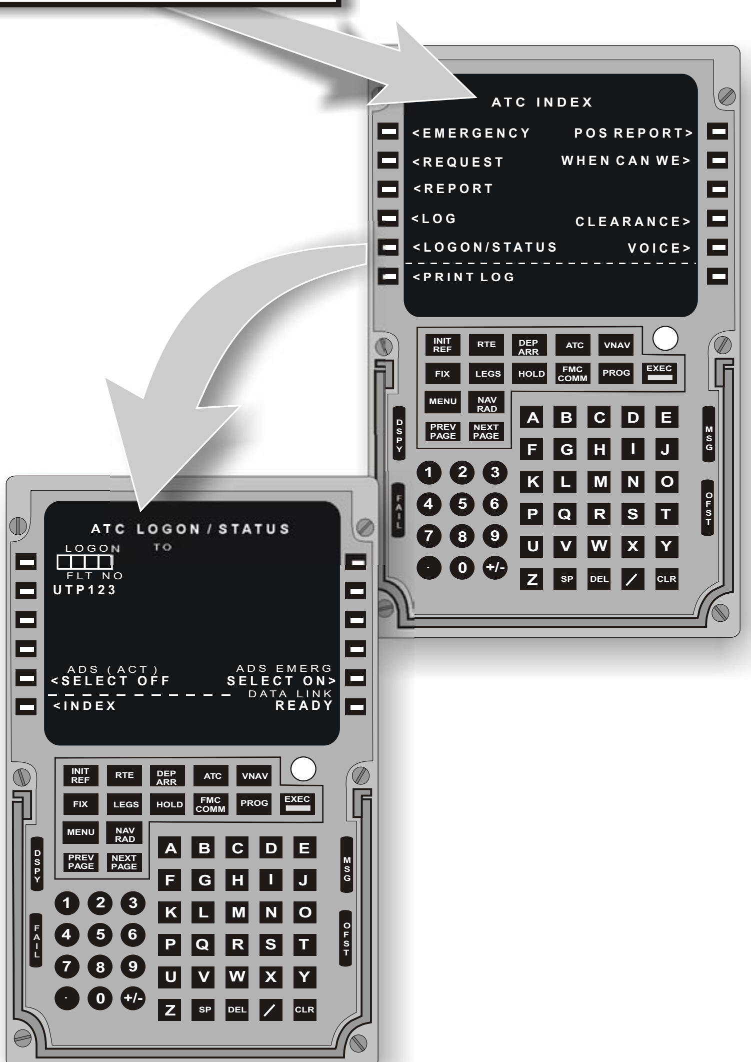
# F/O perform ATC LOGON

**NOTE**:

*The ATC LOGON needs to be established between 15 and 45 minutes prior to entering into the area providing ATC datalink services.*

To access this ATC INDEX page:
select ATC and you will get this page:



# CAPT - F/O complete BEFORE START CHECKLIST

## BEFORE START CHECKLIST

| CHALLENGE (F) | RESPONSE |
|---|---|
| Departure Briefing | Complete (C) |
| FMCs, radios | Programmed, set, verified (C,F) |
| IRSs | NAV, aligned (C) |
| Hydraulic demand pumps | No. 1 auto, No. 4 aux (C) |
| Fuel panel | _____Pumps on,_____crossfeeds opened (C) |
| Fuel quantity | _____Pounds, cleared with_____pounds (C) |
| Oil quantity | Normal (C) |
| Oxygen check | Complete (C,F) |
| Altimeters | _____,Set (C,F) (In/hPa) |
| Parking brake | Set, pressure normal (C) |
| Fuel control switches | Cutoff (C) |
| Autobrakes | RTO (C) |
| Cabin signs | On (C) |





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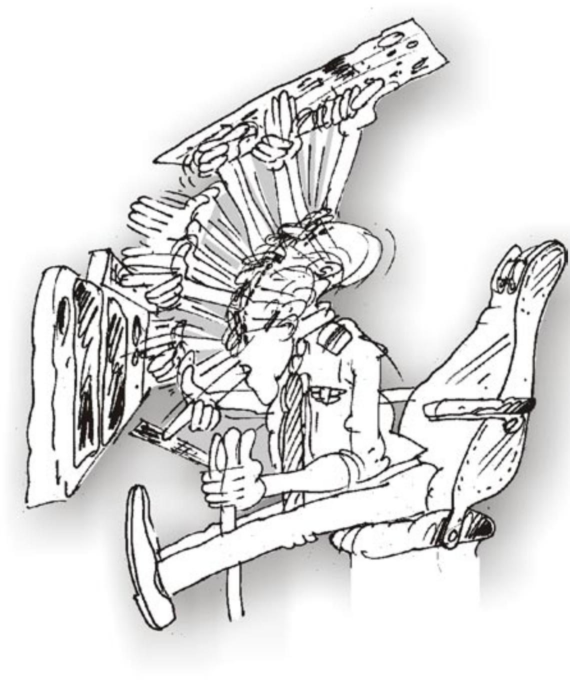
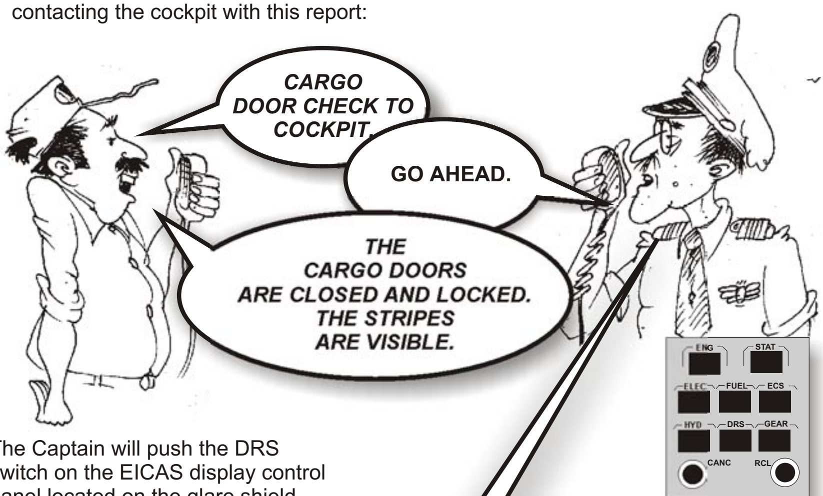
# *GETTING READY FOR ...*
# PUSHBACK

*This will be either HECTIC or relaxed ... and a lot of what is going on is outside the framework of the flight crew and the tasks it must perform. The Captain has got to be able to take control of the situation and create an environment where all the multitude of trivial and important things can be sorted out and completed.*

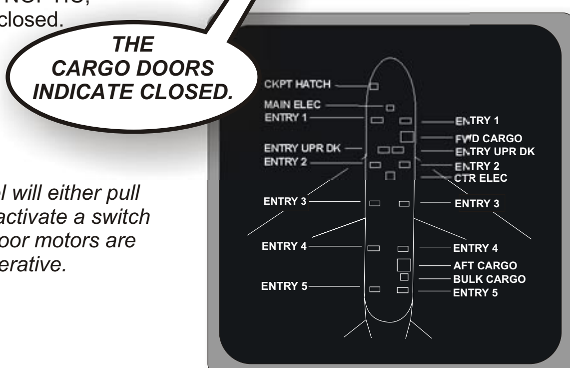


# CAPT confirms DOOR STATUS

Generally this procedure is initiated by the GROUND PUSHBACK PERSONNEL contacting the cockpit with this report:




The Captain will push the DRS switch on the EICAS display control panel located on the glare shield. Looking at the DOORS SYNOPTIC, He will observe the doors closed.




**NOTE**:
*THe ground personnel will either pull the circuit breakers or activate a switch and the main cargo door motors are rendered inoperative.*

# CAPT verifies CABIN READY


The **CHIEF PURSER** will advise the cockpit when ready either by:**INTERPHONE** using voice, or selecting **6P** on the **INTERPHONE** which creates a CABIN READY display on the INTERPHONE CONTROL PANEL.





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# CAPT - F/O BEFORE PUSHBACK CHECKLIST

## BEFORE PUSHBACK CHECKLIST

| CHALLENGE (F) | RESPONSE |
|---|---|
| Doors ........................................ | Closed (C) |
| Cabin Preparation ........................... | Complete (C) |

# CAPT - F/O BEFORE PUSHBACK CLEARANCE

Obtain a PUSHBACK CLEARANCE (if required). The information regarding pushback requirements will be found on the AIRPORT 10-7 pages.
The frequency for the controlling agency will be listed; however, GROUND CONTROL is normally the agency if no other information is listed.


UNITED 9 JAN 98 10-7 BANGKOK, THAILAND
BKK / VTBD BANGKOK INTL

| | | |
|---|---|---|
| ELEV - 9<br>GATES COORDS / FMCS<br>N13 - 54.9<br>E100 - 36.5 / ALL | TELEPHONE<br>MAINTENANCE 531-7207, 535-2239<br>OPERATIONS 531-4379, 535-2230, 535-2240 | UTC<br>LT - 7 = UTC |
| | See Chart 10-9B, 10-9E1, 10-9E2 | MAINT<br>Yes; see M/F/L chapter for details. |
| PUSHBACK<br>Request Clnc<br>ALTIMETRY<br>See Approach Chart | | |
| OTHER FREQS<br>OPERATIONS 131.6<br>BANGKOK RADIO 8942 (Primary) 13309 (Secondary) | | |

ARRIVAL/DEPARTURE

**1. Bird Hazard** Expect heavy concentrations of bird activity, especially during winter.

**2. Gnd Maneuvering Procedures** See pages 10-9D/E. Clearance is tight; follow taxiway center and apron lines as closely as possible.

**3. Jetblast Hazard** Use minimum thrust to avoid jetblast hazard to aircraft parked close to the northern end of taxiway B.

**4. Military Traffic Rwy** 3R/21L normally is used by military aircraft but may be made available to civil aircraft.

**5. Security Hot Spot** Bay 111 at taxiway X and Bay 222 at taxiway S (between the runways) for hijacking. Bay 333 at taxiway B (far north) for bomb threat.

ARRIVAL

**1. Airspeed Limitations** Observe the following maximum airspeeds at or below 10,000' unless waived by ATC:
- Between 36-15 miles - 250 knots
- Within 15 miles - 210 knots

**2. Parking System** The RLG parking system is in use for gates 11 to 47. See description in the TABLES / CODES / SIGNALS chapter.

DEPARTURE

**1. ATC Clncs** Request clearance from Bangkok Control (as described on page 10-9D) 5 minutes before startup. Include proposed flight level if different from the flight plan. If pushback is not within 5 minutes of acknowledging the ATC clearance, the clearance may be cancelled.

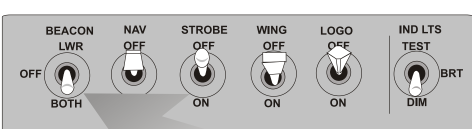
**2. Engine Start / Pushback** Clearance is required for both engine start and pushback. Include the parking bay number with request for clearance. See page 10-9D for engine start and pushback procedures.

**3. Speed Restrictions** No speed restrictions for departing aircraft.

MISCELLANEOUS

**1. Flt Ops Location** Room 3210, 3rd floor, Central block.

# F/O BEACON LIGHT SWITCH .... BOTH




The BEACON LIGHTS should be ON anytime the airplane is being moved or the engines are running or being started.



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# CAPT - F/O BEFORE PUSHBACK CHECKLIST

| GROUND | CAPTAIN |
|---|---|
| ***"Ground to cockpit: Pre-departure check complete. Ready for ___ person pushback."*** | |
| | ***"Standby for pushback clearance."*** |
| ***"Standing by for pushback clearance."*** | |
| | ***"Cleared to push, Brakes set."*** |
| ***"Roger, cleared to push. Release brakes."*** | |
| | ***"Brakes released."*** |
| ***"Cleared to start engines.."*** *This command "Cleared to start engines" and which engine will be started is to be given at the sole discretion of the ground crew.* | |
| | ***"Roger, cleared to start engines."*** |
| ***"Set brakes."*** | |
| | ***"Brakes set, pressure normal."*** |
| ***"Tow bar disconnected."*** | |
| | ***"Disconnect headset."*** *The Captain may desire for the ground crew to delay their disconnect, and they will not leave from under the nose of the aircraft until cleared to do so.* |
| ***"Disconnecting, watch for salute."*** *Ground will indicate location of the salute. If a delay is expected or incurred, he will state "standby" and give the reason.* | |
| *Ground guy stands at attention and then ... salutes.* | |
| | *Cockpit crew acknowledges salute by turning the RUNWAY TURNOFF light ON - OFF.* |
| *Ground guy gives the "RELEASE FROM GUIDANCE SIGNAL." He will extend both arms in the direction of the expected taxi.* | |





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# ENGINE START

## ENGINE TECHNICAL STUFF

The 747-400 that we are considering is powered by four colossal PRATT & WHITNEY PW-4056 engines. Each of these monster engines produces about 56,000 pounds thrust for a whopping total of 224,000 pounds of available thrust.
There are two rotating sections on this engine: an N1 rotor and an N2 rotor. The N1 rotor is that huge fan section that you see when you look into the front of the engine. It also is connected to a low pressure compressor and a low pressure turbine section.
The N2 rotor is the set of blades that you would see if you look into the tailpipe of the engine. It is considered the “HOT” section of the engine and consists of a high compression section and a high pressure turbine section. This is the section where the EGT (Exhaust Gas Temperature) is measured.
Interestingly, the N1 and N2 rotors are mechanically independent. It is almost like having two separate jet engines mounted in tandem. They create a very fuel efficient and powerful thrust team.The N2 rotor is used to drive the engine accessories.
The whole engine combination is “started” by a bleed air powered starter motor that can be engaged with the N2 rotor and cause it to spin with sufficient rotational velocity so that when the ignition cycle is started, the engine will operate on its own, and the starter will automatically disengage.
The start motor is normally powered by air from the APU; however, air from a ground cart or another running engine can be used. When using the air from another engine this is referred to as a “cross bleed start.”
When the START SWITCH is pulled by the pilot, a solenoid will hold it open. The action opens two valves; the START VALVE and the ENGINE BLEED AIR VALVE. Both MUST be open to operate the starter. The light in the switch indicates that the START VALVE has opened. This activity requires AC power.
Ignition is supplied by two igniters in each engine. They require AC power.
At the end of the start cycle (52% N2), the start switch snaps in and the light goes out indicating that the 2 valves have closed and the starter has disconnected.

*All that boring stuff is not specifically required, but is in here for your information in case some nosey passenger asks you some embarrassing question about the engines. Now you know.*



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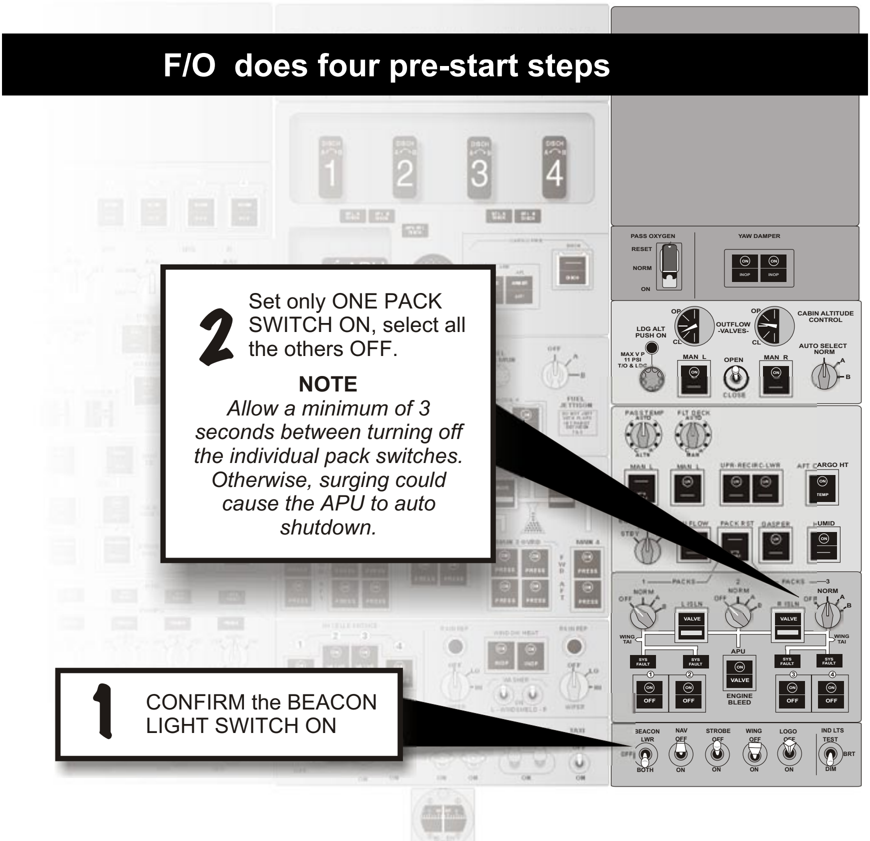
# After clearance to start engines is received:

## F/O does four pre-start steps

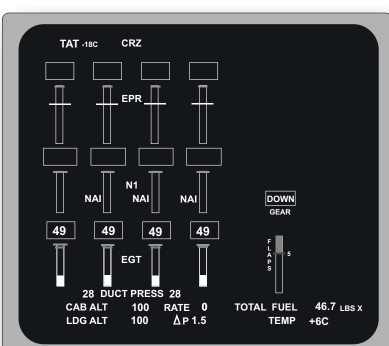


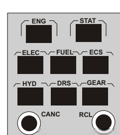

**2** Set only ONE PACK SWITCH ON, select all the others OFF.

**NOTE**

*Allow a minimum of 3 seconds between turning off the individual pack switches. Otherwise, surging could cause the APU to auto shutdown.*

**1** CONFIRM the BEACON LIGHT SWITCH ON




**3** CLEAR EICAS of MESSAGES

**4** ANNOUNCE: “Ready to start engines, Ma’am (or Sir).”





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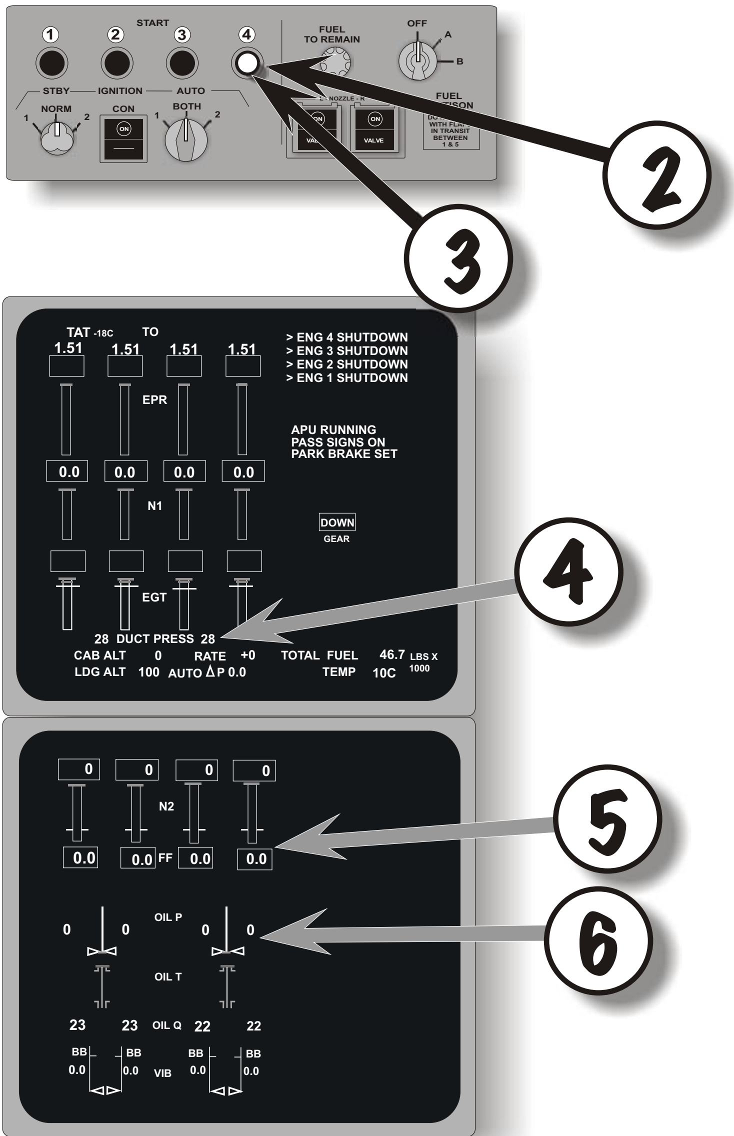
# ENGINE START





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# ENGINE START

Start sequence is normally 4 - 1 - 2 - 3 for a 4 engine taxi.

If the airplane weighs less than:

***700,000 # GW***

Taxi with less than four engines should be considered.
Start sequence for three engine taxi is: 4 - 1 - 2.
Start sequence for two engine taxi is: 4 - 1.

1. CAPT: states authoritatively, "***ENGINE START***."
or "start number 4," or "Let's do a three engine taxi, start number 4."

2. F/O: PULL appropriate ENGINE START SWITCH.
*Solenoid will hold switch out.*

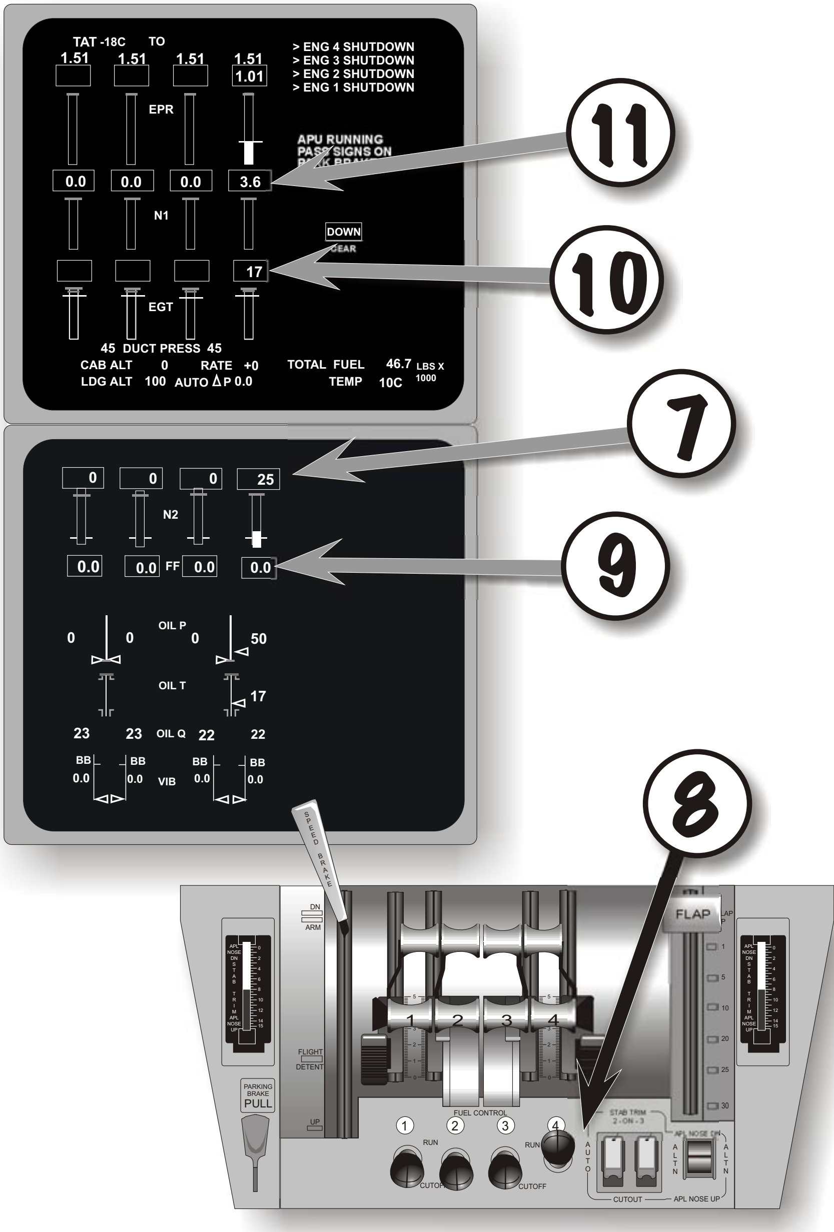
3. CAPT - F/O: OBSERVE Start valve light in switch illuminates.
*The light indicates that both START VALVE and the ENGINE BLEED AIR VALVE have opened.*

4. CAPT - F/O: OBSERVE DUCT PRESS initially rise.

5. CAPT - F/O: OBSERVE N2 increases.

6. CAPT - F/O: OBSERVE OIL pressure increases.

# ENGINE START





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# ENGINE START

**7** **At 25% N2 or MAXIMUM MOTORING**, whichever comes first, but not less than the **FUEL-ON INDICATOR**:

DEFINITION
The "FUEL-ON-COMMAND indicator" is the little horizontal tic mark on the Fuel Flow indicator of the lower EICAS. It indicates the minimum N2 RPM at which the FUEL CONTROL switch may be moved to RUN during start.

**8** F/O: FUEL CONTROL SWITCH; LOCK in RUN (UP) position.

**TECHNICAL INFO:**

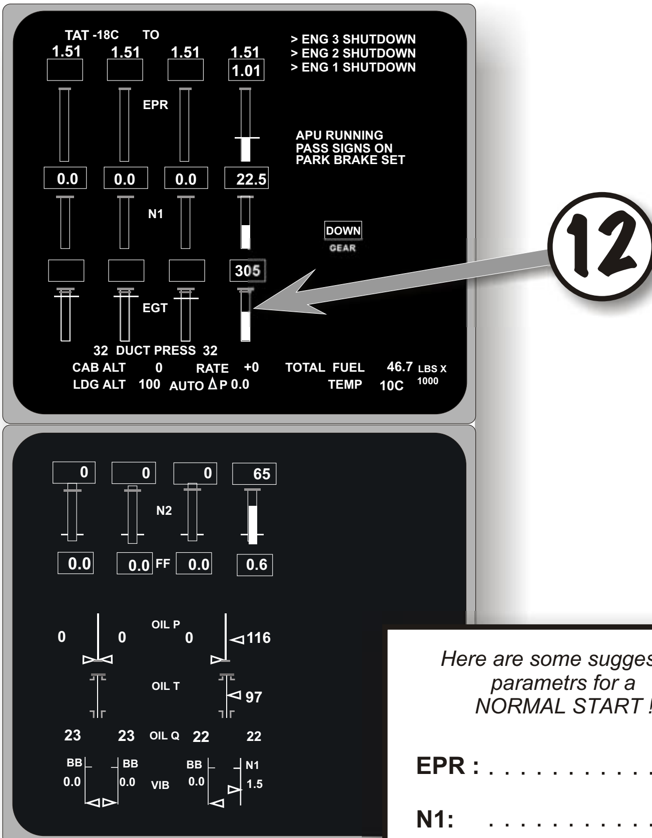
*When the START SWITCH is pulled, the selected ignitor on each engine energizes when the respective FUEL CONTROL switch is in the RUN position and N2 is less than 50%.*
*The selected ignitor de-energizes when the FUEL CONTROL switch is placed in CUT-OFF.*

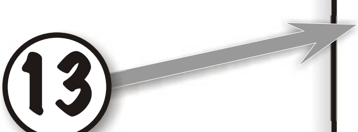
**9** CAPT - F/O: OBSERVE some FUEL FLOW

**10** CAPT - F/O: OBSERVE EGT rise within 20 seconds.

**11** CAPT - F/O: OBSERVE some N1 rotation prior to 40% N2.

# ENGINE START




*Here are some suggested parametrs for a NORMAL START !*

**EPR : . . . . . . . . . . . . 1.01**

**N1: . . . . . . . . . . . . 22.5**

**EGT: . . . . . . . . . . . . .305**

**N2:. . . . . . . . . . . . . . . 65**

**FF: . . . . . . . 0.6 (600 pph)**

**OIL PRESSURE:. . . . . .116**

**OIL TEMPERATURE: . . .97**

**OIL QUANTITY: . . . . . . 22**

**VIBRATION:. . . . . . . . .1.5**





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# ENGINE START

**12** CAPT - F/O: verify EGT START LIMIT RED LINE disappears when the engine has stabilized.
*This should have occurred within 2 minutes of moving the FUEL CONTROL SWITCH to RUN.*

**13** CAPT - F/O: Monitor the engine indications and EICAS for irregularity messages.

CAPT - F/O must be on the alert for an ABNORMAL ENGINE START.

HERE ARE
## *THE ABNORMAL CONDITIONS*
to look for:

NO EGT rise within 20 seconds after moving FUEL CONTROL SWITCH to RUN.

HIGH INITIAL FUEL FLOW.

EGT RAPIDLY approaching EGT start limit of 535 degrees C.

NO N1 increase by 40% N2.

NO OIL PRESSURE by 40% N2.

EGT start limit of 535 degrees C exceeded.

N2 fails to reach stabilized idle within 2 minutes after moving FUEL CONTROL SWITCH to RUN.

PNEUMATIC AIR interruption.

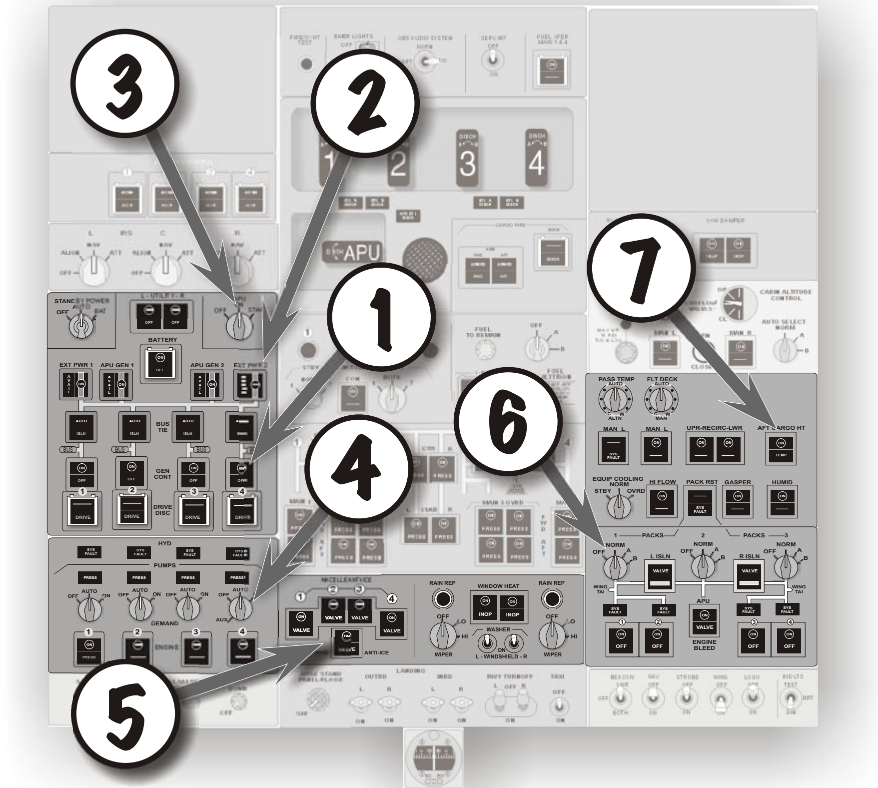
ELECTRICAL POWER supply interruption.

EICAS engine display disruption.

If you encounter these conditions:
The first step of the QRC is a memory item:

**FUEL CUTOFF SWITCH .......... CUTOFF**

# AFTER START STUFF




## CAPTAIN DOES 5 THINGS:

1. Verify ELECTRICAL TRANSFER.
2. Verify EXTERNAL POWER DISCONNECTED.
3. APU SELECTOR.
4. HYDRAULIC DEMAND PUMP SWITCHES ... ALL AUTO.
5. NACELLE ANTI-ICE as desired.

## F/O DOES 2 THINGS:

6. PACK CONTROL SELECTORS ... NORMAL.
7. AFT CARGO HEAT SWITCH ... ON..





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## AFTER START STUFF ... in detail.

**1**

**CAPT: ELECTRICAL TRANSFER ...................................... VERIFY ON.**

If indication is **"ON"**, then the GENERATOR FIELD is closed and the GENERATOR CONTROL BREAKER is allowed to close automatically ... when system logic permits. If the indication is "OFF," then ***BOTH*** the GENERATOR FIELD and GENERATOR CONTROL BREAKER are OPEN.
When an engine is started, with APU generators or external power sources powering the AC system and the respective engine generator control switch is ON and the bus tie switches are in AUTO, the respective IDG ***AUTOMATICALLY*** powers its side of the tie bus when the voltage and frequency are within limits.

**NOTE**: T*he previous APU or EXTERNAL power source is disconnected* ***AUTOMATICALLY***.

**2**

**CAPT: EXTERNAL POWER ...................................... DISCONNECT.**

The indication that the external power is connected is AVAIL being illuminated in the EXTERNAL POWER switches.

**NOTE**:
*It may be necessary to prompt the ground people when external power is no longer needed.*

**3**

**CAPT: APU SELECTOR ................................ OFF**

Once the GEN CONT OFF lights are extinguished, shut down the APUs.

**4**

**CAPT: HYDRAULIC DEMAND PUMP SELECTORS............................. ON**

The DEMAND PUMPS are operated by PNEUMATIC air.

**NOTE**:
*If the switches are ON, the ENGINE DRIVEN pumps operate continuously.*

**5**

**CAPT: NACELLE ANTI-ICE............................ ON / OFF**

If you need anti-ice for taxi or take-off, turn on now.

**DISCUSSION**:
*Each engine supplies is its our source for bleed air, which circulates ONLY in the nacelle. It, DUH, only operates when the engine is running. When selected, NAI is displayed on the EICAS to indicate minimum N1 limits if TAT below +10C. Also, continuous ignition is energized by this switch.*

**6**

**F/O: PACK CONTROL SELECTORS .................. NORMAL**

**7**

**F/O: AFT CARGO HEAT switch .................. ON**



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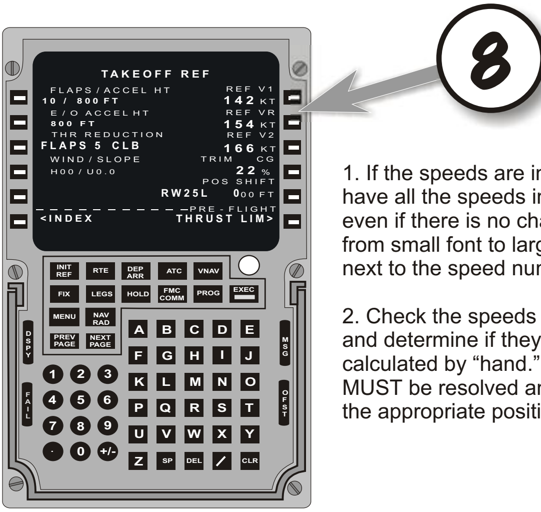
# more AFTER START STUFF

## CAPT and F/O:
## CHECK the FMS CDU take-off speeds.

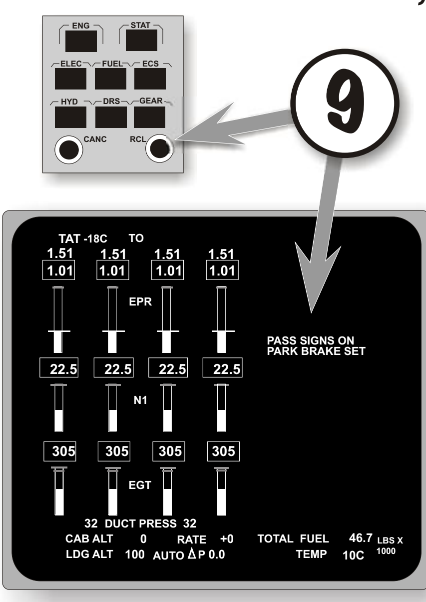



Verify take-off speeds are indicated on the TAKEOFF REF page of the CDU. There are two things to look for.

1. If the speeds are in "small font." It is SOP to have all the speeds indicated as large dark fonts, even if there is no change to the value. To change from small font to large, simply push the button next to the speed number on the CDU.

2. Check the speeds indicated on the CDU display and determine if they differ from the speeds calculated by "hand." If there is a discrepancy, it MUST be resolved and the proper values placed in the appropriate position on the CDU.

## F/O:
## EICAS ....... RECALL, RESOLVE, CANCEL




Push the RCL switch and check the EICAS UPPER DISPLAY for alert messages. These can be warning (RED), caution (AMBER), advisory (WHITE), memo (WHITE at bottom of the display).

If an EICAS alert message appears, do what is necessary to extinguish the message. Reconfigure the aircraft, accomplish appropriate IRREGULAR procedure, contact SAMC (24 hour on-call maintenance facility) to determine if MEL relief is available.

Make appropriate logbook entry if applicable.

***NOTE:***
***THE EICAS SCROLL SHOULD BE COMPLETELY RESOLVED PRIOR TO TAKE-OFF.***





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# BEFORE TAXI OUT

**WARNING:**
**THE CAPTAIN MUST NOT REQUEST A TAXI CLEARANCE NOR RELEASE THE PARKING BRAKE UNTIL BOTH OF THE FOLLOWING SIGNALS ARE RECEIVED AND ANNOUNCED:**

***SALUTE SIGNAL,***
***and***
***GUIDANCE SIGNAL (or RELEASE FROM GUIDANCE SIGNAL!)***

**NOTE**:
If the signalman is NOT in a position to be seen by the Captain, it is permissible for the First Officer, with the Captain's concurrence (of course), to view the SALUTE and advise the Captain. ***ONLY*** then may the Captain acknowledge the receipt of the salute by ***FLASHING A RUNWAY TURNOFF LIGHT!***

## *THERE ARE SIX DISTINCT STEPS.*

1 **(C) "I HAVE A SALUTE" ................. announce**

2 **(C) announce:**
**"AND GUIDANCE" or "RELEASE FROM GUIDANCE."**

**WARNING**:
***IT IS CRITICAL TO THE SAFETY OF THE OPERATION THAT NEITHER THE CAPTAIN NOR THE FIRST OFFICER SET THEIR RESPECTIVE AUDIO PANEL CONTROLS UNTIL THE CAPTAIN ACKNOWLEDGES THE MECHANIC'S SALUTE. DOING SO MAY RESULT IN MISTAKENLY ASSUMING TAXI CLEARANCE HAS BEEN RECEIVED AND MOVING THE AIRPLANE PRIOR TO ALL PERSONNEL / EQUIPMENT BEING CLEAR FROM BENEATH THE AIRPLANE.***

3 **(C - F/O) AUDIO PANELS ........................... SETUP.**

4 The Captain will request a TAXI CLEARANCE when She / He is ready to listen and assimilate the information.

5 **(F/O) TAXI CLEARANCE ........................... OBTAIN.**

**Here's the DEAL!**
*Do not even think about getting a clearance until AFTER the Captain requests it. Ensure that both pilots are monitoring the frequency and free from other duties.*

6 **(C) PARKING BRAKE .......................... RELEASE.**



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# THIS IS A SERMON, PAY ATTENTION !!!

# DO NOT ...

## NEVER-NEVER-NEVER

**IT IS EXTREMELY IMPORTANT that you DO NOT MOVE the jet without both:**

- SALUTE and
- RELEASE SIGNAL

## I am devoting a whole page to this topic because it is SO IMPORTANT !.

STOP

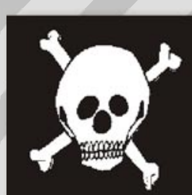
***DISCUSSION:** On this huge moving apartment house it is very easy to get all pre-occupied with some event in the cabin or cockpit and fail to observe the SALUTE-RELEASE from the ground man.*
*Perhaps you can see the tug disappearing into the distance and assume that all personnel have left and are clear ... DANGER - DANGER - DANGER.*

*There is no way to determine if some unsuspecting ground guy isn't waiting, still plugged in, for a release from you. There is NO WAY to see what's going on down there.*

## CAUTION

**BEFORE you release the brakes and start to move this monster ... be ABSOLUTELY CERTAIN that there is no one under the airplane. The ONLY way to know this is to get a SALUTE and a RELEASE FROM GUIDANCE !!!!!**

**DO NOT RELEASE PARKING BRAKE TOO SOON.**



# NO - NO !

**NOTE:** *I just want to EMPHASIZE the point that this is a VERY dangerous place and you can easily KILL or MAIM someone. I realize that you are wanting to beat Brand X, or get a taxi clearance during a lull in the Ground Control chatter, or you just want to "get things going," BUT ... This IS NOT the place to make up time. TRUST ME, do not be a ROCKET SCIENTIST!*

***If you do this ... You will be talking to strange men in black at a long green table. You will be writing letters and making reports until you get your job back.***





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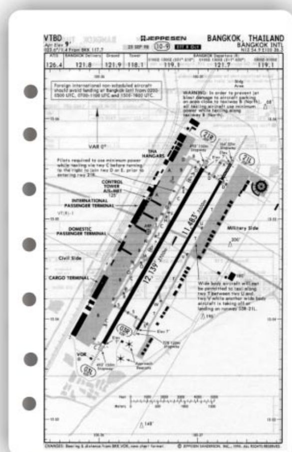
# HOW TO TAXI

## STEP ONE

*GET A CLEARANCE.*




It is ESSENTIAL, particularly when traveling to destinations where English is not the primary language, that the WHOLE crew assist in interpreting and understanding the complete taxi instructions.

Both the Captain and the First Officer should have copies of the airport diagram available for reference.

## STEP TWO

*DON'T HIT ANYTHING.*

**NOTE**:
*First Officers should keep their feet near the brake pedals and feel free to stop the airplane without the Captain's permission if they feel it is necessary.*

**YIPE**:
*Minimum pavement width required to complete a 180 degree turn is 153 feet.*

The flight manual has a whole page discussing the fact that this is a really "BIG" airplane and you can not always see what is going on down there. They chat in great detail about how important it is to have ground personnel help when close to other stuff.
They state that the loss of the body gear steering makes turns more difficult.
They want you to know that the rudder is so huge that there is this big weather cocking problem at taxi speeds with strong cross winds.
The winglets are way out there, and even though the wings are pretty high, don't taxi with them over something, taxi around it.
During turns, the wingtip swings out further than the cockpit end. Inboard pods are only 4 feet above the surface. Use groundspeed readout on the ND for taxi speeds:
Here are the recommended taxi speeds:

***Straight ahead: 25 KTS***
***45 degree turns: 15 KTS***
***90 degree turns: 10 KTS.***

**BIG !!!**

Tires get HOT ... so taxi using "periodic" brake applications to keep speed under control. Do not "ride" the brakes. Take turns slowly to avoid sideloading.

***AVOID EXCEEDING 40% N1 !!!!***

Allow time for the application of TAXI THRUST to take effect. The airplane can be really heavy and it takes time to get it to start to move.

**WARNING**:
DO NOT MOVE FLAPS and FLIGHT CONTROLS UNTIL THE AIRPLANE IS MOVING UNDER IT'S OWN POWER AND IS CLEAR OF GROUND EQUIPMENT AND PERSONNEL.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# DURING TAXI PROCEDURES

## (F/O) set the FLAPS.

After selecting the desired FLAP POSITION, OBSERVE the flap position indicator on the upper EICAS move to the selected position.

**CAUTION**:
*Moving the flaps REQUIRES that the flap movement should be stopped when passing through the detents; and placed positively in the next detent. If you don't, one or more control units may disconnect.*

**NOTE**:
*If a flap control disconnects, here is what to do:*
***CYCLE THE ALTN FLAPS ARM switch to ALTN, then OFF.***

## (F/O) select the EICAS STATUS PAGE

This will bring up the "Flight Control Indications" for the FLIGHT CONTROL CHECK.

## (C,F/O) check the FLIGHT CONTROLS

When on the taxiway clear of congestion; the Captain will call for the "CONTROL CHECK."

CAPTAIN: CHECK RUDDER MOVEMENT.
Hold the nose gear steering bar in a centered position
and push the rudder full throw left and right
while observing the indices respond properly.

**CAUTION**:
***IF THE RUDDERS ARE CHECKED TOO VIOLENTLY; FAILURE OF THE RUDDER COULD OCCUR.***

F/O: CHECK AILERONS and ELEVATORS.
Move the controls through their full movement.
Avoid violent movement, and
always be aware of the other pilot's hands and arms.

## (F/O) select the EICAS ENG PAGE

**NOTE**:
*After engine start, it is NOT necessary to check status messages. The reason is that any message that will have an adverse effect on the safety of flight or requiring crew attention will appear as an EICAS ALERT MESSAGE.*



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## (C) arm LNAV and VNAV (as required)

Normal SOP calls for
BOTH **LNAV** and **VNAV** to be armed.

## (C - F/O) complete BEFORE TAKEOFF CHECKLIST

Complete the checklist down to the MANIFEST CHANGES LINE.

### BEFORE TAKEOFF CHECKLIST

| CHALLENGE (F) | RESPONSE |
|---|---|
| Flaps | _____Planned, _____indicated, detent (C) |
| Control Check | Complete (C,F) |
| LNAV, VNAV (as required) | Armed (C) |
| Nacelle anti-ice | On / off (C) |

--------------- ***MANIFEST CHANGES*** ---------------

**IMPORTANT NOTE:**

Ensure that the flaps are ***SELECTED*** to the ***PLANNED*** position. You will get NO TAKE-OFF WARNING HORN for the mistake.
*For Example: If you PLAN 20 on the CDU but take-off with 10, you will get* **NO WARNING** *but you will have the wrong V speeds.*

## (F/O) check FINAL WEIGHT MANIFEST

*The "**FINAL WEIGHTS**" are obtained by ACARS from the company. If there is anything that is more frustrating, I don't know of it. As you are taxiing towards the takeoff end of the runway, it seems that everything comes to a jarring halt while you "wait for the weights." It is particularly critical if you are #1 for takeoff and have to taxi clear because you don't have your final weights.*

**NOTE**:
***NEVER*** take-off without your updated "weights." No matter how inconvenient or difficult, you MUST have the updated weight check.

## (F/O) confirm TAKEOFF PERFORMANCE

*On the TAKEOFF REF page, confirm and change if necessary the V-speeds and any other items that have changed.*

## (F/O) set STABILIZER TRIM

*Position the stabilizer to the TAKEOFF trim setting. Observe that:*
*the stabilizer trim indicator is in the green band, and*
*STAB TRIM indicator OFF flags are out of view.*



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# DURING TAXI PROCEDURES

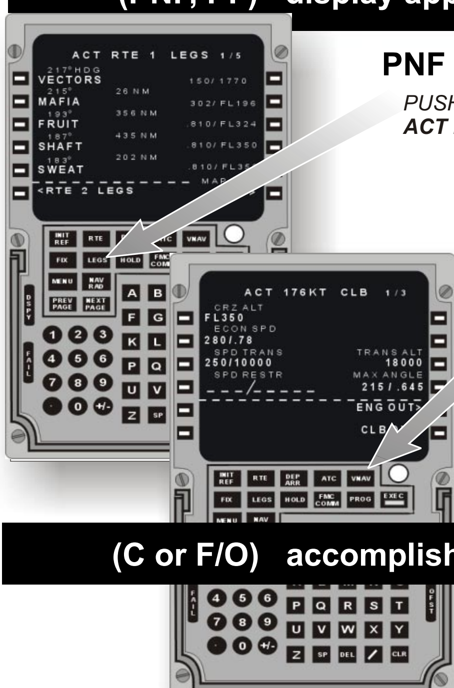
## (C - F/O) complete BEFORE TAKEOFF CHECKLIST

Once we have received the updated "WEIGHTS" ..
Complete the checklist down to the FINAL ITEMS LINE.

### BEFORE TAKEOFF CHECKLIST

| CHALLENGE (F) | RESPONSE |
|---|---|
| Flaps | _____Planned, _____indicated, detent (C) |
| Control Check | Complete (C,F) |
| LNAV, VNAV (as required) | Armed (C) |
| Nacelle anti-ice | On / off (C) |
| ***MANIFEST CHANGES*** | |
| Trim | _____, _____, _____, Set (C) |
| Weight, speeds | Checked (F), set (C,F) |
| FMCs, radios | Programmed, set for departure (C,F) |
| EGPWS/RADAR DISPLAYS | SET (C,F) |
| Thrust | _____ Reduced / max EPR, set (C) |
| MCP | V2_____, heading_____, altitude_____, set (C) |
| ***FINAL ITEMS*** | |

## (PNF, PF) display appropriate CDU PAGES




### PNF display LEGS PAGE

*PUSH the "**LEGS"** key to display **ACT RTE 1 LEGS** page.*

### PF display VNAV ACT XXXX CLB

*PUSH the "VNAV**"** key to display **ACT XXXX CLB** page.*

## (C or F/O) accomplish CABIN NOTIFICATION

*At least TWO MINUTES prior to takeoff, notify the Flight Attendants via the PA:*

***"FLIGHT ATTENDANTS, PREPARE FOR TAKEOFF."***





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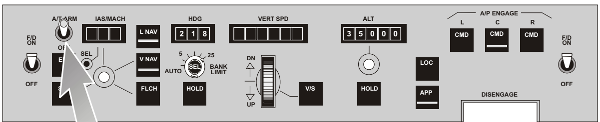
# CLEARED INTO POSITION

## BOTH CAPT and F/O move a switch

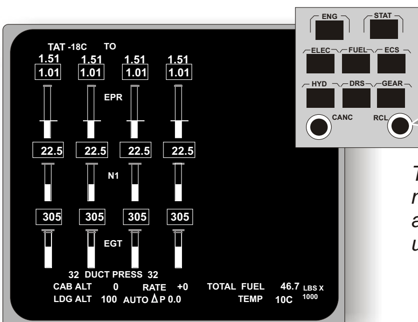




*Captain arms AUTOTHROTTLE switch on the MCP.*

*First Officer places TRANSPONDER switch to TA or TA/RA.*
*Verify TFC is displayed on the ND.*

## (F/O) PUSH RECALL/CANCEL for the EICAS




*Push the RCL switch and check EICAS ALERT messages and MEMO messages.*

*The idea is to see if there are any 'hidden" messages that need attention. Once they are resolved, then the EICAS should be set up to receive new messages.*

## (C,F/O) complete BEFORE TAKEOFF CHECKLIST

### BEFORE TAKEOFF CHECKLIST

| C GE (F) | RESPONSE |
|---|---|
| ........ | _____Planned, _____indicated, detent (C) |
| heck ........ | Complete (C,F) |
| NAV (as required) ........ | Armed (C) |
| anti-ice ........ | On / off (C) |
| ------------ *MANIFEST CHANGES* ------------ | |
| ........ | _____, _____, _____, Set (C) |
| t, speeds ........ | Checked (F), set (C,F) |
| , radios ........ | Programmed, set for departure (C,F) |
| ........ | _____ Reduced / max EPR, set (C) |
| ........ V2_____, heading_____, altitude_____, set (C) | |
| ------------ *FINAL ITEMS* ------------ | |
| Cabin notification ........ | Complete (F) |
| Transponder ........ | TA / RA (F) |
| Autothrottle ........ | Armed (F) |
| EICAS ........ | Recalled, cancelled (F) |





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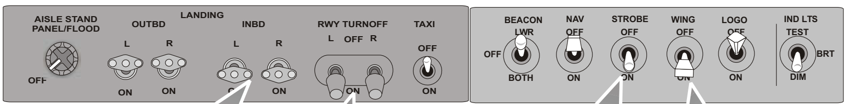
# TAKING THE RUNWAY

*When the airplane crosses the "**HOLD SHORT**" line:*

## BOTH CAPT and F/O turn on 2 lights




***CAPTAIN**:*

*Turns on*
*the **LANDING LIGHTS***
*according to this schedule;*
***On EVEN numbered flights use the INBD lights***

***CAPTAIN**:*
*Turns on BOTH **RUNWAY TURNOFF LIGHTS**.*

***FIRST OFFICER**:*

*Turns on:*
***STROBE LIGHTS and WING LIGHTS.***
***NOTE**:*
*During restricted visibility, reflected flashback may preclude the use of the strobes.*
*If the Captain yells, "Shut those ***** strobes off!" this is usually a clear indication that they are not appropriate for conditions.*

## *SOME TAKEOFF NOTES:*

**DISCUSSION***:*
***REDO THE CHECKLIST ...***
*If any flight control is re-positioned (or not in the proper position) following the completion of the checklist,*
*or*
*There is a lengthy delay prior to takeoff.*

***NOTE**:*
*To prolong engine life, if the engines have been shut down for more than two hours, it is recommended that the engines run for five minutes prior to application of takeoff thrust.*

***HELLO**:*
*If a delay is encountered "in position" ...*
*Do not rely on holding the brakes with your feet. This big mother will creep. It will be a huge surprise to look up from "head down" and see the edge of the runway in front of the airplane.*
***SET THE PARKING BRAKE!***

***BIG SURPRISE**:*
*Even with the BRAKES SET, there is so much residual thrust on this jet, that the airplane could (easily) begin to slide on a wet or icy runway.*
***FURTHER SURPRISE** !*
*If you push up the throttles, this airplane can actually take-off with the brakes set !!! YIPE!*

"GEE, DUH ... What's that horn?"



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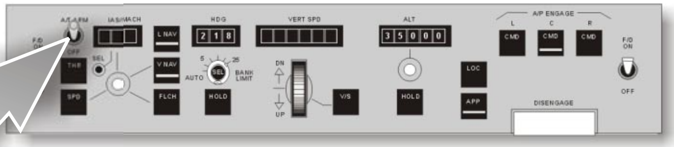
*Some remarks about a confusing but important part of the airplane ...*

# THROTTLE (thrust lever) REVIEW




**AUTO-THROTTLE SELECTOR SWITCH**

**TO/GA SWITCH**
*The TAKEOFF / GO-AROUND switch.*

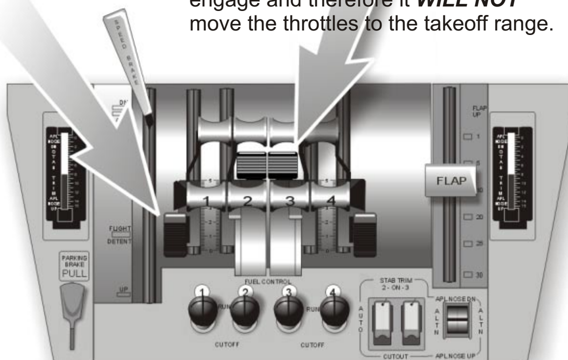
If the TO/GA is selected with the airspeed above 50 KTS, it will not engage and therefore it ***WILL NOT*** move the throttles to the takeoff range.

**AUTO-THROTTLE RELEASE SWITCH**

**NOTE:**

When we use this switch to disconnect the auto-throttle, there are two things to be aware of.

*First, the auto-throttle switch on the MCP will remain "armed."*
*Second, we need to select it twice to disarm the warning horn that will sound if we select it only once.*




***DISCUSSION:***
*When you sit perched 5 stories above the earth, it is very difficult to accurately determine just how fast this big Momma is moving. In fact, if you are cleared for a "rolling take-off" and you push up the throttles in anticipation;*
*Or have a strong headwind coupled with a low rolling speed,*
*It is **EASY** to exceed **50 knots** waiting for the engines to stabilize before you push the TO/GA switch.*
*If you do this, the throttles **WILL NOT** move automatically towards takeoff power. You will be attempting to takeoff with some unknown wimpy power setting and could wind up in the canal.*

## *Let me EMPHASIZE; This is REALLY BIG!!!*

***ANOTHER IMPORTANT NOTE:***
*If we screw up somehow, and at 65 KTS we notice that **HOLD DOES NOT ANNUNCIATE on the PFD** (YIPE!),*
*THEN:*
*DISCONNECT AUTOTHROTTLE*
*(push thumb switch twice),*
*and*
*SET DESIRED THRUST MANUALLY!*
*(You do know what the desired thrust should be, don't you?)*



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# BEFORE YOU BEGIN THE TAKE-OFF EVOLUTION

*We must take a moment at this point in the checkride to evaluate the situation. It is more than likely that the check person has sneakily introduced something into the environment which might affect the takeoff in a negative way.*

*If you can not return and land at the same airport, then you must designate a*

**TAKE-OFF ALTERNATE**

## T/O ALT REQ

**When:**

**DEP AIRPORT is BELOW LANDING MINIMUMS**

**for**
**747-400**
**T/O ALT must be within**

## 850 NM

**NOT more than 2 HR from the departure airport at NORMAL CRUISE in still air with 1 ENG INOP**

- NEW or HIGH MINIMUM CAPTAINS must use their minimums in this determination.
- If you decide to designate a TAKEOFF alternate AFTER filing your release; you MUST have the concurrence of the DISPATCHER and write that alternate on your original copy of the FLIGHT RELEASE DOCUMENT.
- If after dispatch, an ALTERNATE or a different or additional alternate is added to the flight release, that alternate must be written on your original FLIGHT RELEASE DOCUMENT.



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# some legal reasons NOT TO TAKEOFF

- ***MICROBURST: The #1 reason NOT TO T/O is a MICROBURST report from ATC.***

- ***TAILWIND EXCEEDS 10 Knots.***

- ***DO NOT TAKE-OFF if:***
  ***STANDING WATER ... over 1/2 inch***
  ***SLUSH ....................... over 1/2 inch***
  ***WET SNOW ............... over 1 inch***
  ***DRY SNOW ................ over 4 inches***

| | TAKEOFF NOT PERMITTED | SUSPEND OPERATIONS (except emerg) |
|---|---|---|
| SLUSH | OVER 1/2" | OVER 1/2" |
| WET SNOW | OVER 1" | OVER 2" |
| DRY SNOW | OVER 4" | OVER 6" |
| STANDING WATER | OVER 1/2" | OVER 1" |

RUNWAY CLUTTER CHART
(FOM page ALL WX-14)

## KNOW THIS !

Here is the OFFICIAL definition of ***CLUTTER*** (a form of runway contamination):

**STANDING WATER** of 1/8 inch
**SLUSH** of 1/8 inch or greater
**WET SNOW** of 1/4 inch or greater
**DRY SNOW** of 1 inch or greater

Further, less than (the amounts listed in the definition above) are not considered clutter and no weight or V speed restrictions are required.

*If clutter exists, there are pages in the Flight Manual to figure out what adjustments are necessary.*
***NOTE 1****: using CLUTTER CRITERIA REQUIRES that you put the new clutter airspeeds on the AIRSPEED INDICATOR.*
***NOTE 2****: Captain is supposed to make the takeoff.*

- **ICING and FREEZING PRECIPITATION***:*
  ***MODERATE RAIN:***
  ***HEAVY FREEZING RAIN:***
  ***HEAVY FREEZING DRIZZLE:***

## KNOW THIS CHART!

| | LIGHT | MODERATE | HEAVY |
|---|---|---|---|
| FREEZING RAIN | OK | NO-OP | NO-OP |
| FREEZING DRIZZLE | OK | OK | NO-OP |
| SNOW | OK | OK | OK |

**ICING and FREEZING PRECIPITATION CHART**

- ***IF BRAKING ACTION NIL: Takeoff NOT RECOMMENDED.***

- ***WEIGHT of AIRPLANE TOO GREAT for the existing runway conditions.***

- ***AIRCRAFT SYSTEMS NOT READY:***
  ***Either checklist NOT completed, or***
  ***Warning light or horn,***
  ***Flight Attendants NOT ready,***
  ***Ambiguity in clearance or routing,***
  ***Other NO BRAINERS!***

- *Captain is to make the first 10 take-offs and landings after IOE. Captain or F/O under 100 hours and Captain under 300 hours have restrictions outlined on that page. There are also some EXEMPTION 5549 stuff and FAR PART 121.438 limitations.*

## PC ORAL QUESTION!

***TAKE OFF:***
*Captain will ALWAYS make the take-off if the*
***TOUCHDOWN RVR is LESS THAN 1000 or ROLLOUT RVR LESS THAN 1000.***

***LANDING****:*
*Captain will always make the landing it the*
***VISIBILITY LESS THAN 1/2 MILE (1800 RVR).***

## WARNING

***It takes a LAWYER to read these pages!***

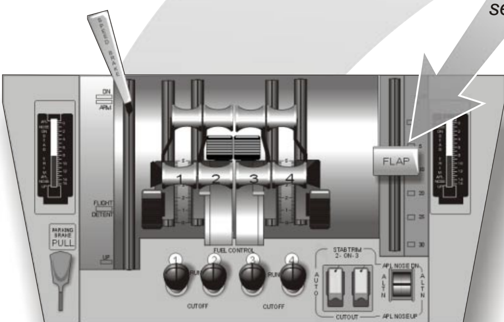
*Therefore, expect the checkguy to ask questions about this stuff!*

# "*FLAPS* 10 -10 -10"

*Here is a "**UNOFFICIAL GOUGE**" that many old-timers use. Just prior to take-off they check three places for their take-off flaps and make it a litany. I our example, we have elected to takeoff with 10 degrees of flaps. Here is how it goes:*

## "FLAPS 10"

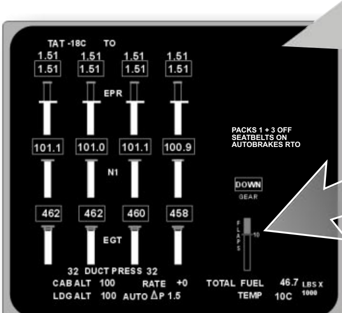
*Check FLAP HANDLE in the 10 degree notch. Some pilots bump the handle with the palm of their hand to see if it is solidly in the notch.*





## "FLAPS 10"

*Check the TAKEOFF REF page to see that FLAPS 10 is displayed.*




## "FLAPS 10"

*Check the FLAP INDICATOR on the EICAS at 10 FLAPS.*

*This is not an official gouge, it is, however, a good idea.*





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# TAKEOFF WARNING HORN

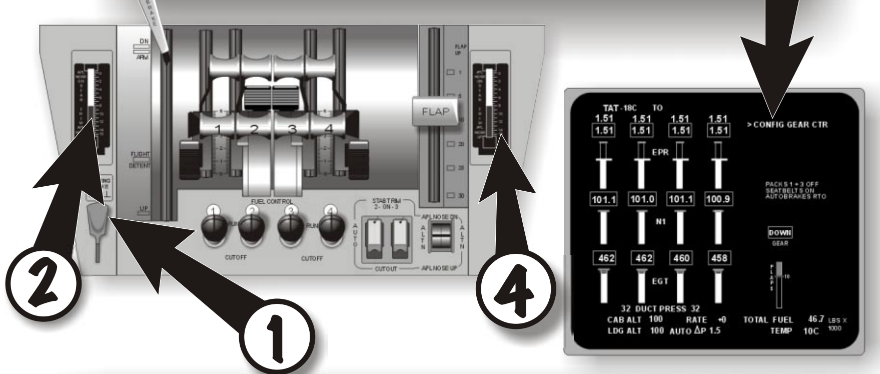
"Gee, What is that noise! DUH!!!"

***If TAKE-OFF WARNING HORN sounds before the airplane is commited to takeoff, the takeoff should be discontinued and the problem corrected.***

*What causes the **TAKEOFF WARNING HORN**to sound?*

***A/C ON GROUND,***
***FUEL CONTROLSWITCHES IN RUN,***
***ENG 2 or3 in TAKEOFF RANGE,***
***AIRSPEED LESS THAN V1,***
***AND**:*

1 ■ ***PARKING BRAKE**is **SET,***
2 ■ ***STAB TRIM**NOT in the **GREEN BAND** (T/O band),*
3 ■ ***SPEED BRAKE** lever NOT in the **DOWN DETENT,***
4 ■ ***FLAPS** NOT in the **T/O RANGE,***
5 ■ ***BODY GEAR NOT CENTERED.***




## DISCUSSION about the RTO (REJECTED TAKEOFF AUTOBRAKE).

*The RTO is a marvelous piece of engineering ... and it applies brakes IMMEDIATELY and FULLY when:*

**THROTTLES are retarded to IDLE and "WHEEL SPEED" above 85 knots.**

*It is NOT a decelerate rate modulated event, it is MAX BRAKING IMMEDIATELY!*

*The rub here is that you could be looking at more than 85 knots on the airspeed indicator, but due to a headwind, you may get "**NO RTO**."*
**Above 85 KNOTS "Wheel" speed**.
*Pull the throttles to idle and you get **AUTOMATIC MAXIMUM BRAKING**!!!*

*Here is the CAVEAT ...**DO NOT EVEN TOUCH THE BRAKES**.*
*This mode is not like the regular "RAMP" where you push the brake pedal and the deceleration mode operates.*
*NO SIREEE, you just push the brakes for 2 seconds and the brakes deselect!*

*If this happens to you ... **APPLY THE BRAKES MANUALLY.***



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# At least one of 5 exciting things that are about to happen to you !

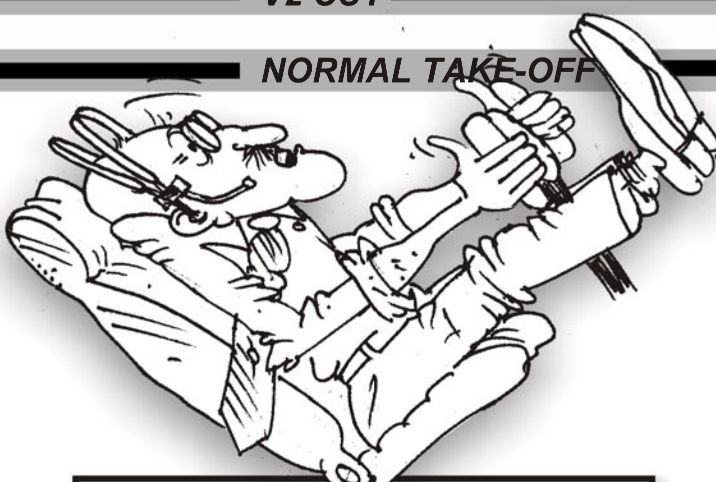
**LOW SPEED ABORT**

**HIGH SPEED ABORT**

**V1 CUT**

**V2 CUT**

**NORMAL TAKE-OFF**



Let's talk about these in greater detail. On the following pages we will make some observations and suggest some techniques to cope with these critical maneuvers.

**Let's break these options out and look at them one at a time:**

# comments about ABORTS ... in general.

**RULE #1:**

***CAPTAIN IS EXPECTED TO MAKE ALL ABORTS !!!***

## *CAPTAIN DOES THIS:*

Whether the Captain is the PF or PNF, she(he) should take control of the airplane, and announce loudly and authoritatively:
"***I HAVE THE AIRPLANE ... ABORTING !***"

- **THROTTLES RAPIDLY TO IDLE**
- **AUTOTHROTTLE RELEASE SWITCH ON THROTTLE ... DEPRESS TWICE.**
- **REVERSE THRUST ...** *apply maximum allowable reverse thrust consistent with directional control***.**

*IF LOW SPEED* (less than ~85 knots)
... *DO NOT USE REVERSE THRUST* !

**IF BELOW 85 KNOTS,**
**APPLY MAXIMUM BRAKING MANUALLY.**
*There will be NO RTO below 85 KTS.*

- **SPOILER LEVER** *... If the lever doesn't extend with the deployment of the reversers,*
***Manually pull the lever AFT to the UP position.***

## *FIRST OFFICER DOES THIS:*

- **VERIFY SPOILERS EXTENDED** *(ONLY if the reversers are used).*
- **CALL TOWER ............** *Call the Tower and tell them what you are doing.*
- **PA** *............... Tell FLIGHT ATTENDANTS and passengers something appropriate; such as:*
*"**REMAIN SEATED.**"*
*If you do not do this, you can expect the Flight Attendants to evacuate the airplane when it comes to a stop.*

**DISCUSSION:**

*Use of the thrust reversers are, of course, up to the Captain: but, consider that below about 80 knots, very little reverse thrust is supplied and the engines will be nothing more than HUGE vacuum cleaners and suck up huge amounts of debris* **...**
**AND THEY WILL CATCH FIRE !!!**
**Either DO NOT deploy the reversers or stow the spoilers if below 80 knots.**





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# ABORTS continued.

**DISCUSSION:**
*Once the jet is stopped, evaluate your situation and determine whether you can move the airplane and taxi clear of the runway. Reference to the Flight Handbook (REJECTED TAKEOFF BRAKE COOLING TABLE in the LIMITS CHAPTER) is advised if speeds greater than 80 knots were achieved. If cooling time required exceeds 70 minutes; THEN:*

***DO NOT SET PARKING BRAKE.***
***APPLY BRAKES MANUALLY ONLY TO STOP AIRPLANE.***
***CONSIDER ENGINE SHUTDOWN TO AVOID BRAKE USE.***
***DO NOT APPROACH MAIN GEAR.***
***DO NOT TAXI.***
***REQUEST NOSE GEAR BE CHOCKED.***
***CONTACT SAMC.***

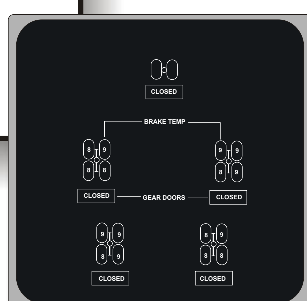
## *CAPTAIN and FIRST OFFICER DO THIS:*

**Once the airplane has stopped,**
**Complete the**
**NORMAL LANDING ROLL PROCEDURE ITEMS:**

**“***Reduce reverse thrust so as to reach idle by 80 knots , and move the reverse levers to forward idle by 60 knots after the engines have decelerated.***”**

**If *EVACUATION HAS STARTED or is DESIRED*:**

- **NOTIFY ATC that evacuation is in progress.**
- **SET PARKING BRAKE.**
- **RETRACT SPEEDBRAKES.**
- **FUEL CONTROL SWITCHES to CUTOFF.**
- **DO THE QRC for “EVACUATION.”**




**When time permits:**

**F/O OPEN BRAKE TEMPERATURE SYNOPTIC and** *MONITOR BRAKE TEMPERATURES.*

**F/O OPEN FLIGHT HANDBOOK *to the BRAKE COOLING TIME TABLE*.**

**CAUTION:**
*Conditions permitting, do not set or hold brakes until referencing the BRAKE COOLING TIME TABLE in the WEIGHTS SECTION of the LIMITS AND SPECIFICATIONS CHAPTER.*

**NOTE:**
*For your information, it takes about 12 minutes for the brake temperatures to be accurate enough to use for cooling calculation.*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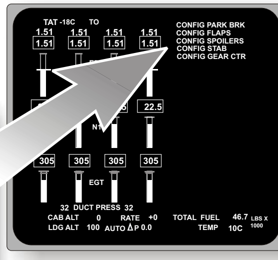
# LOW SPEED ABORT

*Let's talk about the ...* **TAKE-OFF WARNING**

**The TAKE-OFF WARNING occurs when**:

Aircraft is on the ground, and
Take-off thrust set on ENG 2 or 3 ...and either

**PARKING BRAKE SET, or**
**FLAPS NOT IN TAKE-OFF POSITION, or**
**SPOILERS NOT DOWN, or**
**STAB TRIM NOT IN TAKEOFF RANGE, or**
**either BODY GEAR NOT CENTERED.**




**DO NOT TAKE-OFF** until the situation is resolved !

# BIG-TIME PROBLEM

## *ENGINE FAILURE at LOW SPEED*

***DISCUSSION**:*

*It is incredible how much thrust is developed. Probably few people on earth are able to command such a vast power resource, and it is an absolutely unbelievable experience to push up the throttles on a light 747-400. It accelerates like a drag racer.*
***BUT** ...*
*What happens if a sudden engine failure occurs at low speed and high power settings. Without the airflow over the rudder, it does not have adequate authority to overcome the yaw motion. The tiller bar is virtually useless, and differential braking is inadequate.*
*The situation develops in less than a second and the airplane **WILL** leave the confines of the runway unless expeditious action is taken.*

1. ***THROTTLES IMMEDIATELY TO IDLE***
2. ***USE MAXIMUM MANUAL BRAKING***

***NO RTO** because the system is not armed until ground speed is greater than 85 kts.*
***DIFFERENTIAL BRAKING** can't hurt but has little effect.*
***DIFFERENTIAL REVERSE AT A LOW SPEED IS NOT RECOMMENDED !***

***USE OF REVERSE THRUST***
***NOT RECOMMENDED !!!***

*...but, hey, do what you gotta do.*



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## HIGH SPEED ABORT

# *ENGINE FAILURE at HIGH SPEED*

***DISCUSSION***:

***You MUST MAKE YOUR GO/NO-GO DECISION and stick with it***.

*If you have taken your hands OFF the throttle, it is difficult to imagine the situation where it would be a good idea to make a "late" decision to abort, particularly in the simulator.*

*The official position is, and I quote:*

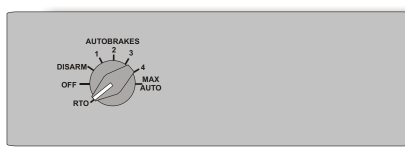
*"**In the high speed regime, especially at speeds near V1, a decision to reject should be made ONLY if the failure involved would impair the ability of the airplane to be safely flown.**"*

*This is a BIG MAMMA-JAMMA and once it gets trucking down the runway, it obtains incredible inertia. While the brakes are really fabulous, and the reversers really effective ... the MOST important factor in stopping on the runway is the rapidity with which the throttles can be retarded and the reversers deployed. Every part of a second you delay, the faster the airplane goes and the less runway that remains.*

## SYSTEM REVIEW: RTO

When RTO is selected;
The system provides **MAXIMUM BRAKING** when:

***THROTTLES ARE RETARDED TO IDLE***,
with
***AIRSPEED ABOVE 85 KTS***.




*Switch located on lower console, right panel.*

85 KTS

SYSTEM DISARMS WHEN:

**BRAKE PEDALS ARE TOUCHED**
Even a slight pressure will cause the RTO to release.
**THROTTLES ARE ADVANCED**
**SPEED BRAKE LEVER moved to the DN**
after speed brakes have been deployed on the ground.
**A FAULT IN THE SYSTEM.**

**and at LIFTOFF.**

***WARNING:***
*If you should inadvertently release the RTO, apply maximum manual braking for the same effect.*
*When you depress the brake pedals, the RTO will disarm BUT incredibly, the switch will remain in the ARM position. It does NOT go to OFF on it's own.*



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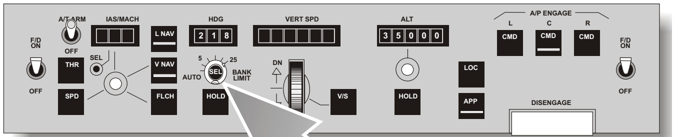
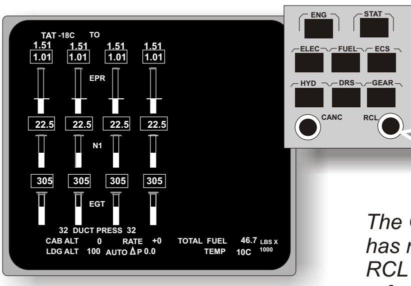
# TAKING OFF

*Once you are "CLEARED FOR TAKEOFF" ...*

## PNF




***PNF** (Pilot Not Flying):*

*Set **HEADING SELECTOR** on the MCP after gear up.*

*Verify that the **PARKING BRAKE IS RELEASED**!*

*The ONLY valid indication that the parking brake has released is the EICAS indication. PUSH the RCL button to ensure that there are no "hidden" references to the parking brake.*

***IMPORTANT NOTE**:*
*CAPTAIN sez, "I (you) have the aircraft, the parking brake is set (released)."*

## PF

*Verify BRAKES RELEASED,*
*ADVANCE THROTTLES MANUALLY,*
*and SET TAKEOFF THRUST by depressing the TO/GA BUTTONS on the THROTTLES.*

***TECHNIQUE**:*
*PF advance throttles smoothly to about 1.10 EPR and allow EGTs to stabilize,*
***then push the TO/GA switch***
*and observe the throttles advance to and stabilize at the TAKEOFF REFERENCE BUGS by 65 KNOTS.*

***NOTE**:*
***THR REF** will be annunciated on the PFD until **65 knots,** then **HOLD** is annunciated above **65 knots**.*

# DANGER !!!

***REALLY SCARY NOTE**:*
*IF EITHER TO/GA switch is not pushed by 50 kts, the autothrottle **cannot be engaged** until above 400 feet AGL, HOLD will be annunciated, and the throttles will stay where you put them. They will NOT set take-off thrust !!!! **OMIGOSH!!!***



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# DURING TAKE-OFF ROLL

## PNF . . . . . . . . . . *AIRSPEED CALLOUTS*

*As airspeed tapes pass 80 knots, PNF calls out,*
*"**80 KNOTS, THRUST SET**."*
*This call provides:*

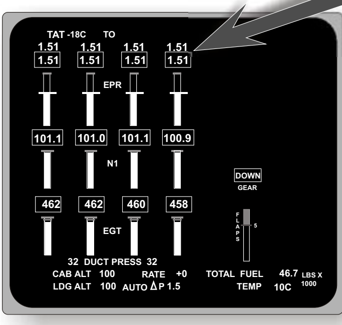
1: *Verification that desired thrust is set.*

2: *Airspeed indicators have been cross-checked.*

3: *An alert that the high speed phase of take-off has been reached where the GO/NO GO decision is critical.*

*CONFIRM the thrust tapes are at the tic marks and the numerical readouts match.*

1





2

*CONFIRM the CAS on the PFD matches the IAS on the Standby Airspeed Indicator.*

*After the TAKEOFF thrust is set, the Captain's hand MUST be on the throttles until the V1 call is initiated.*

*The PNF calls out "**V1**" 5 knots prior to the indication on the speed tape indicator.*

*At V1, the Captain's hand are to be removed from the throttles. It is highly unlikely, even in the real world, that an attempt to abort a take-off after V1 would be successful in remaining on the runway.*

*The PNF calls "**VR**" at the tic mark. The PF initiates rotation.*

*The PNF calls "**V2**" at the V2 tic mark.*



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# ROTATION TECHNIQUE

## PF . . . . . . . . . . . . ROTATION TECHNIQUE

*Start with a slight forward pressure on the yoke and as the airspeed approaches 80 KTS, start slowly relaxing this pressure.*
*At VR, rotate smoothly and continuously using about 3 degrees per second towards your initial target pitch angle which will be indicated on the PFD (approx 15-17 degrees) and which will produce about V2 + 10 KTS. If a greater pitch is required to maintain V2 + 10, do not exceed 20 degrees. This is for passenger comfort.*

***CROSSWIND TECHNIQUE**: Apply RUDDER as necessary to maintain runway alignment and as the airspeed increases, introduce aileron into the wind to maintain wings level. Sometimes, in poor visibility, if the horizon is not distinct, use the PFD to maintain wings level.*

*As airspeed increases and the controls become more effective, displacement has to be reduced slightly. Be smooth. Hold your corrective displacement throughout the rotation, and as the airplane "slips the surly bonds of earth" smoothly return the control wheel and rudder displacement to neutral.*

## TAILSTRIKE

**11° pitch up** **with main gear still on runway !**

***NOTE**:*
*It is possible to get a tailstrike, even though the airplane may actually be airborne. AVOID excessive or abrupt pitch inputs; especially until well clear of mother earth.*

***NOTE**:*
*In gusty or windshear conditions consider delaying rotation and increasing initial climbout speeds.*



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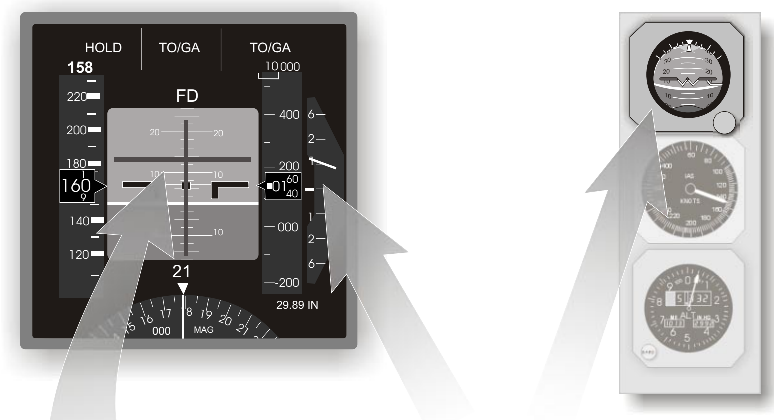
# GETTING AIRBORNE

**PF, PNF**. . . . . . . . . ***Either pilot announce: "POSITIVE CLIMB."***




***NOTE**:*
*"**POSITIVE CLIMB**" is identified by reference to **BOTH** the **PFD VSI** and the **BAROMETRIC ALTIMETER**.*
*They both **MUST** indicate a climb.*

***NOTE**:*
*After liftoff, with all engines operating, the FLIGHT DIRECTOR commands V2 + 10 or greater.*
*The ROLL COMMAND is the GROUND TRACK at liftoff.*

*When BOTH pilots agree that POSITIVE CLIMB has occured:*
*PF calls, "**GEAR UP**"*
*in response PNF calls, "**GEAR UP**" and raises the gear handle.*

Isn't it GREAT! This airplane is so powerful that even at MAX TAKE-OFF GROSS WEIGHT, the loss of an engine procedure is identical with the four engine, normal take-off procedure.

# *REGULAR 4 ENGINE TAKE-OFF, and ENGINE FAILURE ON TAKEOFF.*

***A NORMAL take-off is with LNAV and VNAV ARMED.***
*That doesn't mean that you have to do it that way, and I am certain that there are pilots out there that have their own way to do things, but generally speaking, take-off with LNAV and VNAV ARMED, particularly on the checkride.*

**20 KTS**

*BODY GEAR locks on Take-off roll.*

**50 KTS**

***If TO/GA button has not been depressed by the time the airplane has reached 50 kts tire speed, the autothrottles will not move to select T/O power. Instead, whatever throttle setting you have will remain.***

**65 KTS**

*CHECK and see if **HOLD** is annunciated on FMA...*
***IF IT IS NOT**: manually set T/O power.*

***NOTE**: IF **HOLD** is not annunciated, then autothrottle will NOT be available until 400 feet and must be reselected at that time.*

**80 KTS**

*"**80 KTS-THRUST SET**"*
*Airspeed indicators are checked for validity and concurrence.*
*Also, MASTER CAUTION inhibited until 400'*

**85 KTS**

*RTO available.*
*ABORTS below this speed WILL NOT have RTO.*
***USE MAXIMUM MANUAL BRAKING!***

**V1**

*The suggested GO/NO-GO point.*
*PNF callout made 5 kt before indication on the airspeed indicator.*

***CAPTAIN REMOVES HAND FROM THRUST LEVERS.***

**VR**

***At VR start ROTATION.** The suggested technique is to apply back pressure on the yoke to achieve a 3 degree per second rotation. Aim for the PFD PITCH indicator (should be about 15 - 17 degrees).*
*This should give about V2 +10 kts initially.*

**V2**

*Four engine climbout is V2 + 10 normally; However, climbout is made at V2 (if engine failure occurs at or before V2) or up to V2 + 10 (if speed attained prior to engine failure).*

**POSITIVE CLIMB GEAR UP**

*When BARO ALT and VSI agree*
*"**GEAR UP**"*





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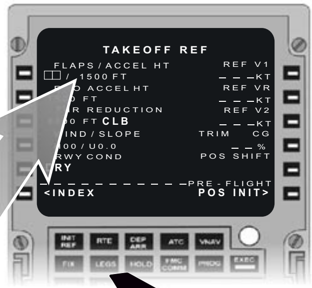
## THRUST REDUCTION

*THR REDUCTION altitude on the TAKEOFF REF page is where the reference thrust setting is changed to the armed climb thrust. The throttles reduce automatically if auto-throttles are armed.*




## ACCEL HT
(default 1500 ft)

***Let airplane ACCELERATE**, and **RETRACT FLAPS (on schedule).***

At **ACCEL HT altitude,** or **ALTITUDE CAPTURE *BELOW ACCEL HT***:
***VNAV** commands the* **PDF COMMAND SPEED BUG** *on the airspeed tape to slew to 250 KTS (or 30 REF + 100 KTS), and the nose pitches over to accelerate.*

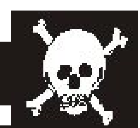
## 800 FEET AGL

***ENGAGE AUTOPILOT** (specific airline restriction)*

**During FLAP RETRACTION, move the flap handle to the next position <u>ONLY</u> when AT or ABOVE THE MANEUVERING SPEED for the new position.**

*Some of you pilots out there are moving the flap handle **BEFORE** it is appropriate. **REMEMBER**: DO NOT move the handle to the next setting until the SPEED BUG is at or above the green indicator for that NEW flap position.*

*For example: If you want FLAPS 1;* **DO NOT** *select FLAPS 1 until the speed bug is at or above the FLAPS 1 indicator.*



## 400 FEET AGL

*"**VNAV**" ENGAGES*
*(If pre-selected BEFORE TAKE-OFF)*
*SPEED INDICATOR on PDF goes from V2 to V2 + 10*
*THRUST MODE goes to **THR REF***

## 250 FEET AGL

***AUTOPILOT COMMENTS***

*The Autopilot is certified for engagement above 250 feet. Most airlines, however, are more conservative and use higher figures such as the 800 feet suggestion used in this diagram.*

## 50 FEET AGL

*"**LNAV**" ENGAGES*
*(If pre-selected BEFORE TAKE-OFF)*
*ROLL bar swings to indicate heading to on course.*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# FLAPS stuff

**LIMITATION**

*Use of the Flaps is restricted to below 20,000 feet.*

The flaps position is selected by the flap handle, which transmits the information to three ( FLAP CONTROL UNITS (FCUs). They control the sequence of movement, monitor assymetry, control the flap relief system, and provide information to the EICAS and other systems.

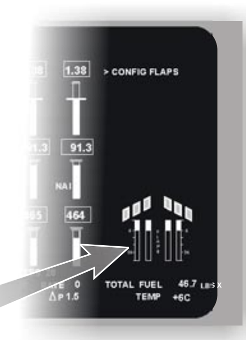
Normally, TRAILING EDGE FLAPS are HYDRAULICALLY powered and LEADING EDGE FLAPS are PNEUMATICALLY powered. If part of the flaps malfunction, the FCU automatically shifts that group of the flaps and its opposite group to ELECTRICAL motors. This is called secondary mode.
Secondary mode operation is much slower than primary (How much slower is it?)

*0-5 FLAPS takes approx. 4 minutes,*
*0-25 FLAPS takes approx. 6 minutes.*

This is an “EICAS DRIVEN AIRPLANE.” As such, the flap indicator is on the eicas screen. 10 seconds after the flaps are raised the entire flaps display is removed.

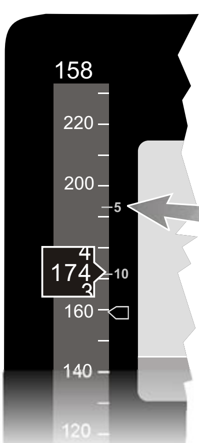
Should any flap position be “NON-NORMAL” or you are operating the flaps electrically or FLAPS ALT control mode is armed ; then:

the PRIMARY FLAP INDICATOR will be automatically be replaced with the SECONDARY or ALTERNATE MODE FLAP EICAS indicator.




*It looks like this and provides information about the individual flaps and leading edge devices.*

## *IMPORTANT NOTE ABOUT RAISING the FLAPS*




***The flaps MUST NOT BE RAISED until the little green numbers corresponding to that NEXT FLAP SETTING are AT or BELOW the ACTUAL AIRSPEED INDICATOR on the PFD.***

*For example, we CANNOT raise the flaps to 5 degrees until that little “5” is next to the pointer on the actual*

*Some Brain Surgeons posing as pilots have actually infiltrated our cockpits and continually raise the flaps BEFORE the indicator gets to the that flap setting number on the airspeed tape indicator.*

“GEE, DUH, What’s that vibration?”





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# More boring FLAPS stuff

## IMPORTANT NOTE ABOUT EXTENDING the FLAPS

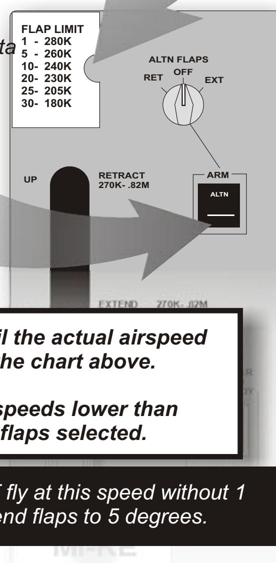
*Most airlines understand that pilots can get really busy sometimes and not be able to remember the **MAXIMUM FLAP SPEEDS**. So, they usually have a **MAX FLAP SPEED PLACARD** posted on the instrument panel.*

*Some airlines have even come up with a 10 kts company restriction to those limits to provide an additional buffer against the dreaded **FLAP OVERSPEED**.*

| FLAPS | 1 | 5 | 10 | 20 | 25 | 30 |
|---|---|---|---|---|---|---|
| $V_{fe}$ -10 kts | **270** | **250** | **230** | **220** | **195** | **170** |

## *THESE ARE MEMORY ITEMS !*

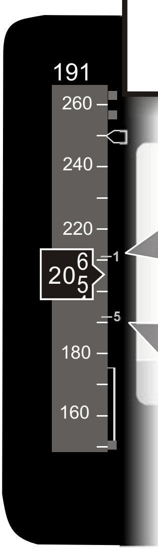
*If the FLAP HANDLE is moved too rapidly or there is not a short pause at the detents (little notches) then there is the good chance that the flaps will get all screwed up. You gotta be methodical and smooth in raising or lowering the flaps.*




*If the FLAP CONTROL UNITS should disconnect, and they will do so occasionally, here is a potential fix.*

**Reach up and cycle the ALTN FLAPS ARM switch to ALTN and then back to OFF.**

***The flaps MUST NOT BE EXTENDED until the actual airspeed is BELOW the restricted values on the chart above.***
***ALSO***
***The airplane should NOT be flown at speeds lower than those indicated on the PDF for the flaps selected.***

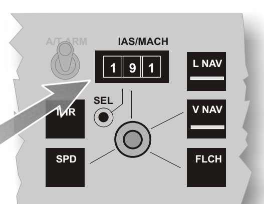



*In our example, we CANNOT fly at this speed without 1 degree flap, but we CAN extend flaps to 5 degrees.*

### The command to extend flaps involves three steps:

*1. Ensure that the airspeed is below the limit for that flap setting.*

*2. Pilot Flying (PF) call for the desired flap using this terminology "FLAPS __5__, SET SPEED __191__." Get the speed from the PFD airspeed indication next to the little green flap setting number.*



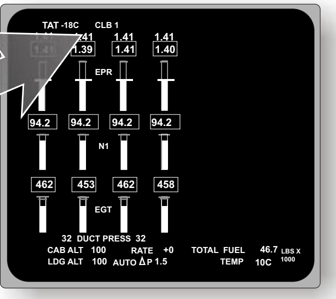

*3. The Pilot Not Flying (PNF) will confirm the limit airspeed from the placard and set the speed for that flap setting from the Pilots Flight Director (PFD) on the Mode Control Panel (MCP) using SPEED INTERVENE knob.*

# AFTER TAKE-OFF

## (PNF) MONITOR THRUST REDUCTION TO CLIMB THRUST.

The PNF is to observe the reduction to climb thrust. This will automatically occur @ Climb thrust reduction altitude (THR REDUCTION) set on TAKEOFF REF page of the CDU, or

On NON-VNAV take-offs, by selection of the THR switch.




## (PNF) LANDING GEAR LEVER ......... OFF

This shuts off hydraulic system pressure to the landing gear.

## (PNF) PACK CONTROL SELECTORS ... NORMAL

An automatic time interval inhibits multiple packs from starting simultaneously in the air. The auto protection is not available on the ground.

## (C) SEAT BELT SIGN SELECTOR.....AUTO/ON

**OFF** ............ Turns OFF signs.
**AUTO** ......... The fasten seat belt signs are OFF when:
Gear and flaps up and airplane above 13,000 feet.
The fasten seat belt signs are ON when:
Airplane descends below 13,000 feet OR
when the gear are extended OR
flaps are extended.
The fasten seat belt signs come on when:
The cabin altitude exceeds 10,000 feet.
**ON** ............... Turns ON signs.

## (PNF) AFTER TAKE-OFF CHECKLIST .. COMPLETE

### AFTER TAKEOFF CHECKLIST

(To be checked ***ALOUD*** by the pilot not flying)

Landing gear lever............................................................ Off
Flaps ........................................................................ Up





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# HOW TO CLIMB(and descend)

## *BRIEF and BORING DISCUSSION*

*There are a whole bunch of ways to operate the FMC on this airplane, but for the beginner, here are four commonly used ways to make this machine climb:*

**HANDFLY**. This is always an option but a poor one and beyond the scope of this book. The airplane is a GREAT flying machine and a pleasure to hand fly … but I don't recommend that you try to fly your checkride by hand. *Hook it up to the auto-pilot and get your head out of the cockpit!*

**V/S** ...... Vertical speed knob is really flexible and easy to use, but has some serious shortcomings not the least of which is that it can fly the airplane into a catastrophic stall.
For example; if you are at altitude and attempting to step climb when you are too heavy, V/S can fly you into a stall.
It also can depart an MCP altitude without a target leveloff altitude and there is the very real possibility of flying into the ground.
For example; During a non-precision approach where you leave the MDA in a descent using V/S.

***TO RE-CAP THE TWO MOST CRITICAL ELEMENTS OF A V/S CLIMB:***

*V/S will fly away from an altitude even though it is set in the MCP and captured.*

*V/S will fly to and CAPTURE an altitude if it is set in the MCP.*

*If in a descent (or climb) without a target altitude set in the MCP: V/S can climb into a stall or descend into the ground.*

*It seems contradictory, and according to studies conducted in such matters, pilots are confused by the DUAL function of the V/S knob.*

**FL CH** .... This mode provides some protection. It will not leave an altitude that is on the MCP. It will only fly towards a selected altitude and it will not climb or decend beyond that limit.
It has a shortcoming, however. It relies on the airspeed set in the MCP for control and if you are making a large climb/descent, it does not take into account any factors that adjust for altitude. This could drive the airplane into an overspeed situation.
My advise: Use FL CH for climb/descents of only a few thousand feet or less.

**VNAV**. *This complex mode is simply NOT INTUITIVE and so it is confusing and difficult to operate. If you get in that position, revert to the simple **FL CH** until you sort things out. I would say that 63% of the times when you ask, "What is it doing?" It is because of the **VNAV**.*

*Because of the complexity, I am going to spend a whole page talking about VNAV*

# The mysterious VNAV enigma

*The VNAV function is far too complex for a mere human airline pilot to understand so let's accept the fact that we will NEVER fully understand VNAV. We must be constantly aware of what it is doing and confirm that it complies with what we want it to be doing, however.*

***MAINTAIN SITUATION AWARENESS***

*According to piles of engineering reports by everyone from NASA and the FAA to Boeing and the airlines themselves; everyone of them agrees:*

> *"The VNAV function … Accounts for the majority of reported human factor issues with cockpit automation."*
>
> *"63% of pilot-cockpit interaction issues were in the control of the … VNAV function."*
>
> *'The VNAV function is the most disliked feature of automated cockpit systems."*
>
> *"...73% of pilots used VNAV in the climb phase, while only 20% used the function in descent and 5% use the function in approach."*

## The heart of the VNAV problem !!!

*If you are changing from a NON-VNAV pitch mode such as FLCH or ALT (for example after a go-around) or de-selecting speed intervene while in VNAV mode; and simply push the VNAV selector button, the AIRSPEED COMMAND BUG is likely to slew up or down to some airspeed that has no meaning to the human operator. In most cases, the engines either come on with a sudden burst of power, or worse yet, go to idle and the airspeed starts dropping below the selected flap speeds.*

*Anyway … NOT GOOD and this unexpected event causes pilots all over the world to start pushing buttons, clicking off stuff, twiddling knobs, and generally getting all excited while trying to regain control of the jet. This is usually followed by some comment like:*

***"WHAT THE CAT HAIR IS IT DOING NOW????"***

***THIS COULD ALL BE AVOIDED***

*If we simply knew what airspeed the VNAV would annunciate as its target when selected!*

*The VNAV, however, wants to fly a secret algorithm predicated on stuff not told to the human operator in order to meet criteria usually hidden from display in the FMC. It will even use modes that it will not annuciate on the FMA. There are literally hundreds of complex options open to the VNAV module computer.*

*What's a pilot to do?*





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# VNAV SECRETS

*It may seem that I am saying that VNAV can only be mastered by an Albert Einstein … this is simply NOT true. I think that the VNAV function is truly marvelous, BUT we have to get control of the rascal and understand why it selects the airspeeds that it does … OR, and here is my suggestion, tell it what you want it to do for you.*

*The airspeed targets it selects are usually reasonable when we see what it is trying to do. They are airspeed from the bowels of its little computer heart that are imposed to protect the jet from exceeding some restriction or limitation.*

## *Here is a way to input an airspeed request into the VNAV.*

*1. Select **VNAV** page on the **CDU**.*

*2. Confirm that the speed listed as **MCP SPEED** is the same as the speed on the **MCP**.*

*3. Enter that speed or whatever speed you want the **VNAV** to maintain in the scratchpad.*

*4. Line select it to the **MCP** line and observe the entry changes to **SEL SPD** and your speed is inserted.*

*5. Select illuminated **EXECUTE** button.*

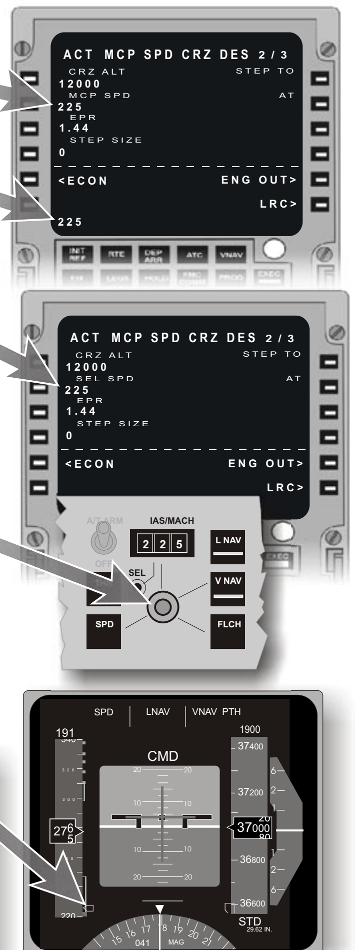
*6. The **VNAV** now has your requested airspeed in its database.*

*7. On **MCP**, de-select the speed intervene or depress **VNAV** button to select **VNAV**.*

*8. Hopefully, Observe the **SPEED COMMAND BUG** on the **PFD** move to your desired speed.*

*Now, here is the place where the **VNAV** may or may not comply with your request. It has its own secret reasons.*

*9. If it does not, depress **SPEED INTERVENE** knob and set the desired speed manually.*




*Here is the bottom line … Don't get involved in the VNAV magic. It will fly a great NON-ILS profile, climb profile, descent, and cruise … but do not be remiss in letting it get you slow or fast. When it is necessary,*

***speed intervene** and*
***FLY THE AIRPLANE !***

# HOLDING!

*There is something that strikes fear into the heart of even the most intrepid aviator ... it is that dreaded statement from the controller...*

***"I HAVE HOLDING INSTRUCTIONS WHEN YOU ARE READY TO COPY."***

*When we receive this message, there are three things we have to compute:*

1. ***HOW MUCH FUEL DO I HAVE IN MINUTES.***
2. ***HOW LONG CAN I HOLD?***
3. ***WHAT IS MY "NEW" PLANNED ALTERNATE AIRPORT?***

*After receiving your clearance to hold:*

***CONTACT THE DISPATCHER with your fix and EFC.***

*You should do this via ACARS, because you can bet that the Dispatcher is really busy with lots of other pilots holding and diverting.*

*The HOLDING/DIVERT scenario is particulary difficult because all the resources normally available to you for consultation will be occupied and not available to you. If unable to contact the Dispatcher or she (he) does not respond it is essental that you go through the same steps she (he) would in assessing your FUEL/TIME problem.*

## HERE IS HOW IT WORKS:

***STEP 1**:* Use alternate designated on your FPF or go to FOM page APT-111 ff.
*Assume you are no longer going to your destination and select some realistic alternates. The selection process **MUST** involve the list on FOM APT-111 ff.*
***STEP 2**:* Determine how much fuel you want to have on board when you park the jet at THE NEW DESTINATION.
***STEP 3**:* Determine how much fuel it will take to:
- *(a) get from the holding fix to the initial approach fix at the new destination,*
- *(b) fly the approach and landing,*
- *(c) fuel for additional holding if appropriate,*
- *(d) taxi to the gate.*

***STEP 4**:* Subtract that from what you have on board*; convert to minutes and decide when it will be time to depart holding.*

***STEP 5**:* **DO NOT STAY AROUND beyond your limit**. *It has been my experience that these things can drag on and on and even when cleared to the next controller, additional holding may be required. **BE TOUGH!***





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# HOLDING

This machine is FABULOUS at holding. It is so intuitive that even I have trouble screwing it up.

## STEP 1

*Depress* **HOLD** *key, then*
*Either*
*type it the designator for the holding fix, or line select the fix from the LEGS page.*

**NOTE**

*The selected holding fix does not have to be on your route of flight or even on an airway. Any fix may be used as a holding fix without entering it in the route of flight first.*

## STEP 2

Depress LS6 (next to the little row of boxes).

## STEP 3

Depress the LS button next to place where you want to hold in the list of fixes. In our example, we want to hold after **MAGGI** so we pushed the button next to **BAMBO**.

Then, without prompting, the **MOD RTE 1 HOLD** page comes up for us to peruse and add to or change. Once it is the way we like it, we push the EXEC button

## STEP 4

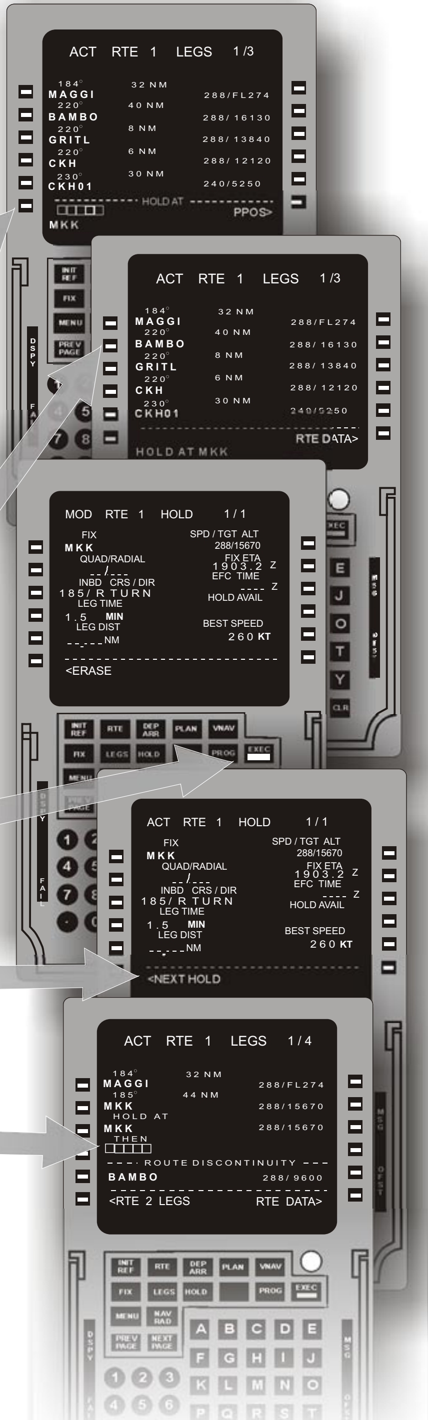
The “HOLD” page changes to add <NEXT HOLD at the bottom. At this time you may add additional holding patterns as needed.

## STEP 5

Select the LEGS page and close up the discontinuity.
When the jet gets to the holding pattern fix, it will automatically enter holding.

**NOTE**

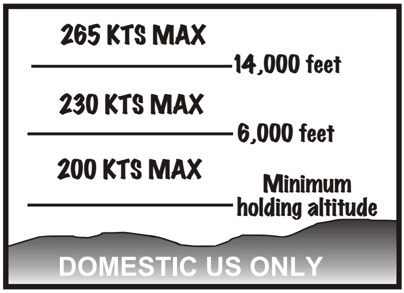
*Airspeed will have to be controlled by the pilot. It is suggested that you obtain a clearance to slow to holding speed from Air Traffic Controller on your way to the fix.*



# HOLDING OP SPECS

Here are some of the things that you will be expected to know about holding. Even though the "MAGIC GLASS" does a miraculous job of figuring the entry, etc; there are some other things that we have to have at our fingertips.

## "NORMAL" HOLDING SPEEDS




**NOTE 1**: If your airplane is "TOO HEAVY" to hold at that speed, you ***MUST*** obtain ATC clearance to hold at a higher airspeed.

**NOTE 2**: It is a common ploy for the check person to issue a clearance to hold when the CMS (clean maneuvering speed) is greater than the allowed holding speed. BE ALERT! Possible ***STALL*** danger. YIPE!

**NOTE 3**: Remember that if you are given holding right at the 14,000 feet boundary, then your holding speed maximum is 230 KTS

**NOTE 4**: Be aware of "Minimum Holding Altitudes." Usually the best indicator is the "GRID MORA." MEAs usually are not good choices as they require remaining too close to the airways. If the holding pattern is depicted, the little altitude inside it is the MHA.

**NOTE 5**: These "NORMAL" holding speeds do not count when flying to places that have published their own speeds; such as Military places, London , New York Area, etc. These places will inform you what their speeds are with some hidden note on the approach plates, charts, 10-7/20-7 page, etc. BE ALERT!

**NOTE 6**: The recommended "BEST SPEED" annunciated on the HOLD PAGE does not take into account "compressibility." This means that holding AT ALTITUDE MAY necessitate a correction, otherwise the possibility of LOW SPEED BUFFET is enhanced. I recommend that at altitude, ADD 20 KNOTS TO THE FMC MINIMUM HOLD SPEEDS.

## HOLDING INSTRUCTIONS

An ATC clearance to Hold will include:

1. Direction (NE, SW, etc)
2. FIX
3. Radial, course, bearing, etc.
4. Leg length
5. Direction of turns
6. EFC ... Complete holding instructions ***MUST*** include ***EFC !***

***Standard holding*** is:

**Right Hand Turns**
Inbound legs 1 minute at or below 14,000 feet
and 1 1/2 minutes above 14,000 feet
25 degrees bank (using autopilot)

*IF ... THEN: Pilot Training 101. If you accept a clearance without an EFC, the Check Person will have an UNCONTROLLABLE URGE to fail your radios!*

## HOLDING REPORTS

ENTERING HOLDING: You MUST report:
1: FIX
2. TIME
3: ALTITUDE

***WHAT PILOTS SCREW UP: Most common deletion is for the pilots to forget to report their atitude.***

LEAVING HOLDING: You MUST report:
departing the holding fix

You are then expected to resume normal operating speed.



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### *A BRIEF DISCUSSION ABOUT:*

# VNAV, CANPA, CROD, and CDAP

**VNAV:** **V**ertical **Nav**igation

The Boeing 747-400 is certified to fly approaches using VNAV procedures; i.e. Using the autopilot to control the glide slope on approaches where the glide slope is NOT defined by a ground based transmitter (that is ILS).

**CANPA**: **C**onstant **A**ngle **N**on **P**recision **A**pproach

This is defined as flying the approach from the Final Approach Fix to the Missed Approach Altitude using a constant angle.

**CROD**: **C**onstant **R**ate **O**f **D**escent

This is defined as flying the approach from the Final Approach Fix inbound to the Missed Approach Altitude using a constant rate of descent.

**CDAP**: **C**onstant **D**escent **A**pproach **P**rocedures

This is defined as flying that part of the approach from .3 miles outside the FAF to MDA + 50 feet using a predetermined Vertical Rate of Descent.

These procedures only apply to that small but important portion of the approach from the FAF to the MDA. The major airline with the "lotus" on it's tail has elcted to use the CDAP method ***ONLY.***

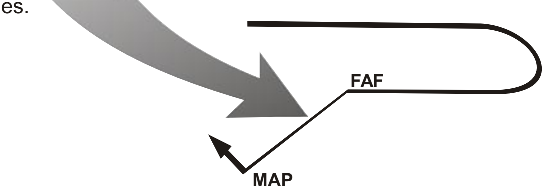
## *The reality is, however*:

1. We will still be using "dive and drive" techniques for those portions of the approach outside the FAF.

2. The only place where there are changes to our previous technique is in that portion of the approach from the FAF to the MDA. All the rest is the same as before.

3. Also, this will ONLY apply to Non-ILS (Non-Precision) approaches … even though the airline reminds us that *ALL* approaches will use CDAP.

4. Precision Approaches (ILS based glide-slope) have always been descent-rate controlled by their very nature, so they will be flown using the same basic techniques.





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*After we have flown the agonizing long trip, we get up from the bunk to prepare to land in some exotic far-a-way place.*


*Let's talk about how we go about*

# *flying ...*

# *THE CDAP* PROFILES

**"**RA**" is short for "**REDISPATCH ACCEPT.**" When flying long distances, particularly over-water, it may be necessary to file for a destination short of your desired landing airport for fuel purposes. Upon arriving at your "redispatch point," if the fuel situation is appropriate, you can accept a redispatch to continue to your destination.*

# *Introductory Comments regarding the approaches.*

*As we are completing the enroute portion of the flight, we must get ready to consider the approach in detail. I encourage to take plenty of time to get **ALL** the preparations possible completed **PRIOR TO COMMENCING DESCENT**!*
*It has been my experience that "getting behind" in your praparation just before the approach phase begins can make things a little rushed.*

*As the T/D point passes under the nose of the aircraft, the brief and preparation for the approach should be well underway.*

## *DO NOT GET BEHIND !*

*It is SOOOOO easy to be chatting, or getting a cup of coffee, or swapping seats. We MUST give ourselves those extra few moments to get everything completed ... and get READY.*

*At least 90% of the IMC (instrument flight rules) approaches flown today use the ILS related approach evolution. While it is true that the state of the art is currently in a transition to the more sophisticated GPS and "other" advanced technologies, currently the ILS glide-path is still considered the most commonly used approach in the world.*
*While the NON-ILS (formerly called NON-PRECISION) approaches are usually required to be demonstrated by the pilolt in the simulator for training purposes … we as pilots should gain proficiency in accomplishing these maneuvers and consider that there actually may be sometime-someplace when we may have to accomplish one of these NON-ILS maneuvers. So we will discuss them in detail also.*

*We will **NOT** include the FMS or other GPS related related approaches in our discussion; neither will we consider the ASR, PAR, GCA and other voice-command controlled glideslope venues.*

*While it is true that the 747-400 series aircraft are certified by Boeing and the FAA to fly all instrument approaches using the VNAV technique (… and it works fabulously); we will be describing the CDAP (Constant Descent Approach Procedures) technique. Doing this adds a continuity to both the NON-ILS and the ILS approaches fleetwide that is lacking in using other procedures; this consideration is referred to as Fleet Commonality.*

*Just to reiterate: "**CDAP**" is different from the old "**Dive and Drive**" and from the "**VNAV**" technique favored by Mr. Boeing. It is not necessarily the "best" way to fly these approaches, but has been adopted for other reasons.*

*We will now describe the*
# *CDAP technique*
*for flying the approaches.*



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# SOME SPECIAL CDAP RULES

*CONSTANT DESCENT APPROACH PROCEDURES*

- *All approaches are to be flown at a constant descent rate to a descision point (DA or decision altitude) where a decision is made to either land or go-around. This is called CDAP (Constant Descent Approach Procedures).*

- *For all non-precision approaches, if weather is less than 1000/3 they must be flown using the autopilot, disconnecting at no less than 50' below the published MDA.*

- *For Non-precision and VMC; If landing, the autopilot MUST be disconnected no later than 50' BELOW THE PUBLISHED MDA.*
  *I included this restatement in order to emphasize that this gives us 100' from DA to the MDA-50' disconnect altitude to tweak the final descent using the autopilot. This is the recommended technique. STAY ON AUTOPILOT if acquiring the runway for landing at DA.*

- *CDAP non-precision approaches are flown to a DA, where the decision to land or go-around is made.*

- *All non-precision approaches require one pilot (PF or PNF) to monitor raw data no later than the FAF or IAF for piloted constructed approaches.*

- *There is no longer a requirement to compute a PDP.*

- *There is NO ALLOWANCE for descent rates greater than 1000 fpm below 1000' AFE.*

- *DA is computed by adding 50' to the published MDA.*

- *All CDAP approaches are flown with the TDZE in the MCP. TDZE is computed by rounding up the published TDZE to the next highest hundred.*

- *A descent rate correction of NO MORE THAN +/- 300 fpm from the computed descent rate may be made during the approach.*

**BIG !**

*IF more than +/-300 fpm correction is required, the approach is considered unstable and a go-around is **REQUIRED**.*

**EXPLANATORY NOTE***: Momentary corrections exceeding +/- 300 fpm **DO NOT** require a go-around.*
*Frequent or sustained corrections DO require a go-around.*

- *The MISSED APPROACH altitude is to be set in the MCP **during** the go-around, **after** the "gear up" command.*

**ALSO BIG !**



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# CDAP TALK THROUGH

CONSTANT DESCENT APPROACH PROCEDURES

The "old" dive and drive technique is still to be utilized outside of the FAF. Remember that the CDAP only applies to the vertical component of the approach INSIDE the FAF; however, there are some CDAP items that must be completed prior to reaching the FAF.

Even though there is NO PDP calculation, the PF will be ***REQUIRED*** to compute and include in your brief:

> Computed descent rate, and
> Computed TDZE, and
> Computed DA
> (and set on appropriate altimeter).

Once you level off at the FAF altitude, and ALT CAP is annunciated, you should set the TDZE in the ***MCP EVEN THOUGH THERE MAY BE STEPDOWN FIXES INSIDE THE FAF***.
That means that we don't use "dive and drive" inside of the FAF.

Once established at FAF altitude,
select Vertical Speed and check for "zeros."

If a stepdown segment exists inside the FAS (Final Approach Segment) it is considered GOOD TECHNIQUE to prefigure a "howgozit" by adding 1 mile and 300 feet to the stepdown crossing fix criterium. You can write that right on the approach plate.

At .3 miles prior to the FAF on the non-precision approach, roll the Vertcal Speed selector on the MCP to the pre-figured descent rate figure. Start descent aggressively and don't delay as you ***WILL*** get high.

Once stabilized in the descent, you are allowed to observe and adjust the "green arc." It should rest approximately at the approach end of the runway.

The 1000 foot call should occur at 3 miles from the runway.

Vertical corrections using the Vertical speed knob should be carefully selected. I found that one "click" adjustments sould be adequate and it takes some time for the correction to be reflected in the green arc.

> ***In any case, DO NOT SUSTAIN +/- 300 fpm deviation from planned!***

Once established in the Go-around it is necessary to set the MISSED APPROACH ALTITUDE on the MCP. The callout goes like this:

***"Go around Thrust"***
***"Flaps 20"***
***"Gear Up"***
***"Set Missed Approach Altitude"***

**DO NOT FORGET!**





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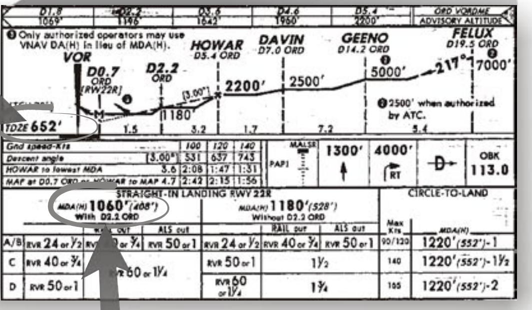
THERE ARE ***<u>THREE KEY ELEMENTS</u>***
TO THE CDAP BRIEF:

**- Computed TDZE**
**- Computed DA**
**- Computed DESCENT RATE**

## *Computing the TDZE*

*The definition of TDZE is Touchdown Zone Elevation, and we get that from the APPROACH PLATE PLANFORM DIAGRAM. The "COMPUTED" TDZE is that value rounded up to the next higher 100 feet.*

*For example: If the published TDZE is 301 feet, round up to 400 feet; and if the published TDZE is 399 feet, round up to 400 feet.*




*This computed TDZE is placed in the MCP (Mode Control Panel) once ALT CAP is annunciated at the FAF (Final Approach Fix) altitude and outside the FAF.*

## *Computing the DA*

*The definition of DA is DECISION ALTITUDE, and we get that from the APPROACH PLATE PLANFORM DIAGRAM. The "COMPUTED" DA is the MDA (for non-precision approaches) value plus 50 feet.*

*For example: If the published MDA is 1060 feet, then the computed DA will be 1110 feet; that is 1060 + 50 = 1110 feet.*

*This computed DA is placed on the barometric altimeter for non-precision and precision approaches.*

## HOW TO CALCULATE THE
# VERTICAL RATE OF DESCENT!

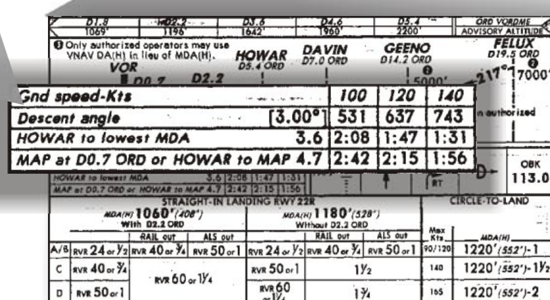
There are THREE suggested ways to figure the Vertical Speed:

# METHOD 1.
## *USE THE APPROACH PLATE PLAN-FORM DIAGRAM.*

Determine your approach GROUNDSPEED. This information can be taken right off the ADI (757/767), HSI (737) or ND (747-400).

**NOTE**

Technically, the FMC generated groundspeed information should not be used for glideslope computation UNTIL:
- the airplane is fully configured and
- inbound on approach airspeed.




*A couple of notes:*

*1. We can only make simple adjustments to the V/S wheel anyway, so more "accurate" calculations are a waste of time.*

*2. If the airspeed is "off scale" in the chart ( a common situation), make an estimate. It seems to be better to guess higher rather than lower.*

*3. If the wind-speed on the ground is low and the wind at altitude is dramatically different, be aware that it could affect the calculation significantly. The pilot must constantly be aware of the changes and adjust by "tweaking" the VERTICAL SPEED knob.*

*BELOW 1000 AFE (above field elevation)Op Specs DO NOT allow:
vertical speeds greater than 1000 fpm; or sustained
corrections greater than +/- 300 fpm*



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# METHOD 2:

*THERE IS A CHART IN THE FOM* called:

"***Descent angle and descent rate chart***."

It seems to me, however, that it would be excessively complicated to be digging into my flight bag and thumbing through some bulky FOM to find a chart that would require lots of interpretation.

# METHOD 3.

*USE A RULE OF THUMB*:

> ½ groundspeed X 10 + glideslope correction.
>
> *Note: Glideslope correction = +50 fpm for each 0.25 degrees that the G/S is greater that 3 degrees.*

*Example: at 140kts G/S on a 3 ½ degree glideslope,*
*the descent rate should be:*
*140/2=70, 70 X 10 = 700 fpm + glideslope correction.*
*since the G/S is 2 X .25 degrees greater than 3 degrees,*
*then we add 100 fpm.*
*Therefore, the computed descent rate should be*
*700 fpm + 100 fpm = 800 fpm.*

***Wheew!!! That seems way too complicated for me****, so I recommend the special MIKE RAY* ***Simple application of METHOD 3*****:**

> *USE 800 FPM INITIALLY FOR A STANDARD 3 DEGREE GLIDE-SLOPE.*
> *IF GLIDE-SLOPE GREATER THAN 3 DEGREES,*
> *START OFF WITH 900 FPM.*

***IMHO*** *(In Mike Ray's humble opinion)*

*It seems to me that there is only a small time window where the ground speed can be evaluated. It is from the point 3 miles outside the FAF until pushover at .3 miles from FAF. This is the only place where this observation can be accurately made. I thought to myself that this was a real time tight area where there is a lot going on and I would be hard pressed to concentrate on this.*

*I also observed that the descent rate solution was nearly always 800 fpm and also that a higher initial descent rate worked better than a shallower descent. That way, corrections requiring reducing the descent rate can be made without exceeding the 1000 fpm descent restriction; however, steeper descent corrections made to make descent milestones are SEVERELY restricted by the +/- 300 fpm limitation and the 1000 fpm restriction below 1000 FAE.*

*This applies particularly on approaches where the glide-slope is greater that 3 degrees. On those approaches, the required descent rate was around 900 FPM.*

*My advise, GET ON THE DESCENT QUICKLY, and BE AGGRESSIVE in your calculation and in starting down. The nose of the airplane* ***SHOULD*** *be coming over by the time you cross the FAF.*





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*CONSTANT DESCENT APPROACH PROCEDURES SECRETS !*

# WHAT PILOTS SCREW UP !

## *THERE ARE (at least) 11 MAJOR THINGS PILOTS FAIL TO DO ON THE CDAP:*

☐ 1. Failure to set next altitude on the MCP after ALT CAP when maneuvering ***OUTSIDE*** FAF. This is not to be confused with arriving at the FAF altitude inbound, in which case you would set the TDZE.
It is important to still use the “dive and drive” techniques when maneuvering outside of the FAF.

☐ 2. Failure to use the CDAP procedures and restrictions on the ILS and Visual approaches.

☐ 3. Failure to BRIEF:
- Computed Descent Rate
- Computed TDZE
- Computed DA

☐ 4. Failure to set Computed DA on the barometric altimeters, setting instead the published MDA. Remember, computed DA = MDA + 50 feet.
Op specs still allow you to use the autopilot down to 50 feet below published MDA.

☐ 5. Failure to set COMPUTED TDZE in the MCP at ALT CAP on the level off inbound to the the FAF.

☐ 6. Pilots tend to OVER-CONTROL the glidepath. Excessive reliance on the green arc and not allowing enough time for the arc to “settle down” after a correction is applied.

☐ 7. Pilots EXCEED the +/- 300 fpm restriction to the announced Computed descent rate without initiating a go-around. The approach is considered unstable inside the FAF if that restriction is exceeded for a sustained period of time.

☐ 8. If a step-down fix is depicted, the pilot ***MISTAKENLY*** sets “step down fix” altitude inside the FAF in the MCP instead of the computed DA. The suggested technique for determining if the restriction at the step-down fix is going to be met is to
add 1 mile and 300 feet to the fix altitude.

☐ 9. Failure to cross-check that the 1000 foot call-out occurs at 3 miles from touchdown. *This is presented as awareness technique an **NOT** as a requirement*.

☐ 10. Failure to initiate go-around at the “computed DA,” Instead, allowing the airplane to descend to the “published MDA” before
initiating the go-around.

☐ 11. Failure to set Missed Approach Altitude in the MCP after the request to raise the gear.

This is probably the greatest memory gouge in this book.

# The FABULOUS A.I.R.B.A.G. MEMORY GOUGE

*HOW TO REMEMBER ALL THOSE LAST MINUTE THINGS TO DO TO PREPARE FOR THE APPROACH.*

I don't know about you, but right here in the flight evolution, there is a lot going on ... and also, everything has to be done completely and accurately. In order to assist in doing everything from memory, there is a really great gouge; it is called "**AIRBAG**."

During the stress of the simulator check-ride, when things are coming apart ... revert to this gouge.

If you have a problem, just remember the gouge. The first thing you do after the immediate action items during an emergency is to try and get the jet on the ground.
Any time you are preparing to land ... go to the gouge.

It is fairly easy to tick off the items in your memory and ask for them in a manner that makes you look like you know what you are doing. Particularly after an emergency or irregular event requiring a return to the field, it makes preparation to land fairly easy.

"*Get the ATIS,*
*Install the approach,*
*Tune the Radios,*
*Brief the approach,*
*Do the Approach-Descent Checklist,*
*Brief the Go-Around.*

*Any questions?*"

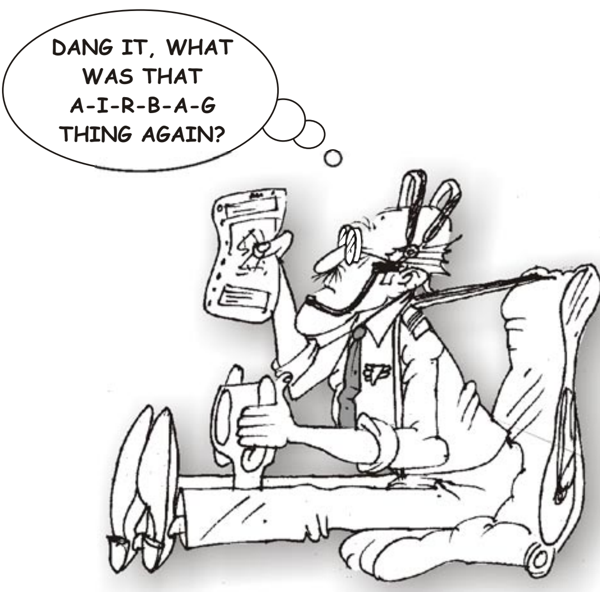
Before starting any approach, there is a bunch of stuff that we have to do. I have heard some pilots using the acronym ***A-I-R-B-A-G.***

# what is "A-I-R-B-A-G"

**A** - ***ATIS***
**I** - ***INSTALL APPROACH***
**R** - ***RADIOS***
**B** - ***BRIEF***
**A** - ***APPROACH-DESCENT CHECKLIST***
**G** - ***GO-AROUND/GET OFF***

On the following few pages, I will take each of the items in turn and treat them in some detail. The usefulness of this gouge comes when you are confronted with either a normal landing ... or an irregular landing situation.

***NOTE***: *This will set you up to do the APPROACH DESCENT CHECKLIST items.*



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# get ATIS

## ATIS - Airport Terminal Information Service

There are a lot of ways to get the weather at the destination airport. If you are within VHF range, of course, you can monitor the ATIS facility on the airport. The frequency is located at the upper left corner of the approach plate.
If you are out of radio range, you can monitor the HF radio, especially over the ocean. That works pretty good ... sometimes.

On this airplane, however, there is a third CDU unit on the console that is normally dedicated as the ACARS unit. It has the capability of receiving the weather and sending it to the printer for a hard copy readout. Very nice.

Here is th information that will be contained in the ATIS message:

**AIRPORT NAME**
**ATIS INFORMATION PHONETIC DESIGNATION** (alpha, bravo, juliet, etc).
**TIME OF REPORT** (Zulu time i.e. UTC)
**WIND DIRECTION / SPEED**
**VISIBILITY**
**CEILING**
**TEMPERATURE**
**DEW POINT**
**BAROMETRIC PRESSURE**
**TYPE OF APPROACH IN USE**
**RUNWAY IN USE**
**NOTAMS** (Notices to airman)

**ATIS FORMAT**

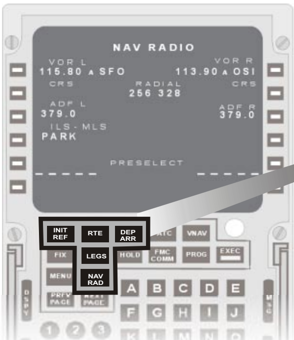
I'm telling you what to expect because if you are receiving the ATIS by listening over the radio, sometimes the reception can be garbled or more commonly, the operator giving the message is difficult to understand.
Since the international language is English and many of the persons making the transmission do not speak English, it can be very difficult for a non-English speaking pilot to understand. If we know what we are expecting, then it greatly reduces the challenge.

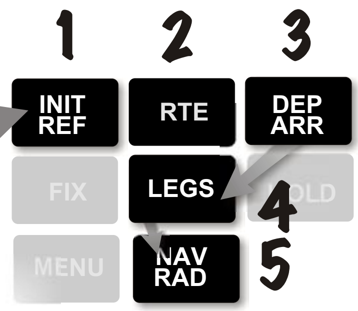
**FYI: THE ATIS IS ALWAYS GIVEN IN THIS SAME FORMAT.**

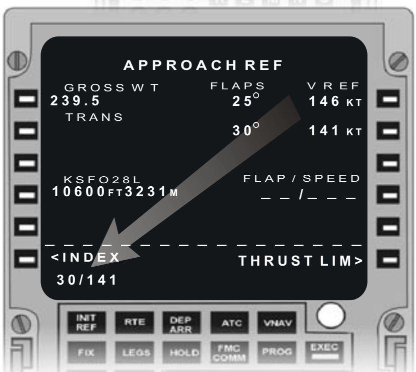
# INSTALL THE APPROACH

## "T" = Install approach

*Some really intelligent pilot thought up a memory gouge that I will pass on to you for your consideration. It is a simple way to remember how to install the approach and tune the radios.*
***The five "keys" involved make a "T."***

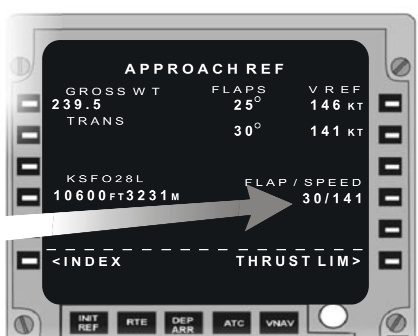



## 1 INIT REF page

This will bring up the "APPROACH REF" page. On there are displayed the V speeds and gross weight.




Decide whether you are going to use a 25 or 30 degree flaps setting for landing. Then Line select either to the scratch pad and place in the FLAP/SPEED line. This will then tell the FMC what the target airspeed and flap setting will be for the approach and landing.

**SOME THOUGHTS ABOUT FLAPS**:
I have found that either works really well. The 30 degree setting causes more pitch over and so more over the nose visibility is available. That seems to be the choice during a low visibility/CAT III situation. The 25 degree setting seems to work a little better in a crosswind.



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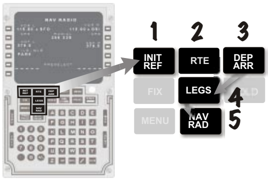
# INSTALL THE APPROACH




## 2 RTE page


*The second key is the RTE key.*

*We should check that we have the proper destination inserted here.*
*If you are diverting or if you have changed your destination, here is the place where you would input that destination.*

**NOTE:**
*NEVER place the runway of intended landing on this page. We place the runway information on the DEP/ARR page. Let me re-iterate this for you.*

***CAUTION:***
***DO NOT USE THIS PAGE TO INSERT THE LANDING RUNWAY !***
***USE THE DEP/ARR PAGE.***

*If you are using an UPLINK system to install your routes, the data will be placed in the FMC automatically and you are just checking to see that it meets your company criteria.*

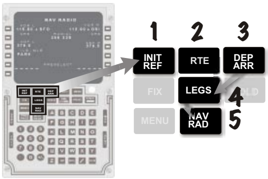
## LAND SHORT option

*If you have decided to LAND SHORT, then you will have to tell the box where you are going so it can get all ready to help you out.*

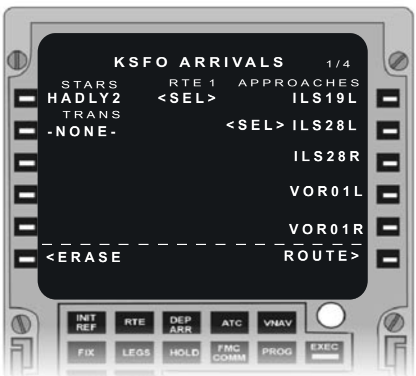
*Type the designator for the airport that you intend as your new destination and LS1R (lpush the first button on the right side of the CDU).*
*Check for the correct entry and agree with the other pilot that we should really be doing this,*
*Then depress the EXECUTE button.*

*Another place where you would use this option is if you are going to do multiple approaches to the same airport as during training. Simply place the departure airport in the departure slot as well. Now the airplane knows what we are doing.*

# INSTALL THE APPROACH




## 3 DEP ARR page




When more than 400 miles from your departure airport or the further from the departure airport than the arrivel, this page will display all the approach, stars, and transitions that are in the FMC memory for the ***DESTINATION AIRPORT SELECTED on the RTE page***. The FMC decides which airport to display predicated on the DESTINATION you have selected on the ROUTES page. Normally, we have selected the proper destination airport during the preflight phase; however, during a divert or land-short scenario, it is encumbent on the pilot to enter the "new" airport; but this must be done in the RTE page.

CAUTION:
Select the **APPROACH, STAR**, and **TRANSITION** in that order. If one of the items is changed or deleted, you must install all three items in the order I have just listed, even though one or more of the items may not have changed.

## AIR-TURNBACK feature

Mr. Boeing built into the FMC a great feature. If you have some reason to immediately turn back and land, the quick and dirty solution to setting up the box for arrival is the "AIR TURNBACK feature.

If, after departure, you are:

*LESS THAN 400 MILES FROM DEPARTURE AIRPORT, or NEARER TO THE DEPARTURE AIRPORT THAN ARRIVAL*

*Then; all you have to do is depress the **DEP/ARR** key and the arrivals for the departure airport are automatically displayed.*





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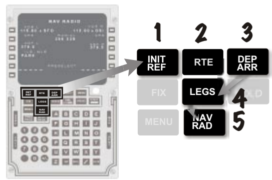
# INSTALL THE APPROACH




## 4 LEGS page

On the legs page, you are going to see **ROUTE DISCONTINUITIES**. These would be represented by a row of little boxes. We must inspect the route (using the **ND and charts**) and see if “closing up” the discontinuity would be appropriate. Normally, the FMS desires a continuous path of linked legs all the way from departure to destination.

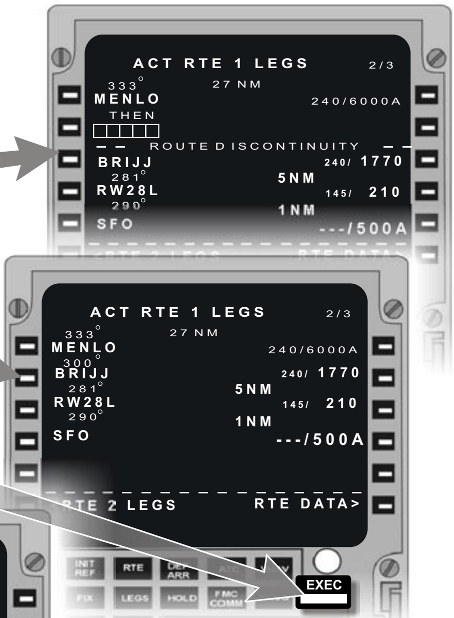
## EXAMPLE 1

Looking at the **LEGS** page and comparing it with the **ND** and the **STAR** page, we can see that it is desirable to have a smooth linked transition between **MENLO** and **BRIJJ**.
To do this we would;

Line Select the FIX directly below the row of boxes to the Scratch Pad, and Then Line Select the row of boxes.

This would “**CLOSE THE DISCONTINUITY**.”

Don’t forget to push the “**EXECUTE BUTTON.”**



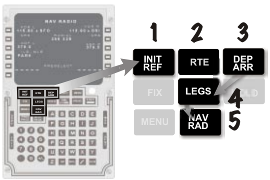


## EXAMPLE 2

In this first example, we can see that it would be INAPPROPRIATE to close up the discontinuity. When we examine the route from SAU direct to BRIJJ on the ND, we see should expect an ***LNAV-RADAR VECTOR-APPROACH*** transition to the fix **BRIJJ**. So, we would consider leaving the discontinuity “open” and expect RADAR VECTORS from ATC.

***Ensure that the IAF or FAF were NOT DELETED or the auto-tune on the navigation radios WILL BE INHIBITED !***

# RADIOS tune and identify




## 5 NAV RAD page

When you first start flying this airplane, you will ask, "Where are the nav radio knobs?" Well, there aren't any. You use the **NAV RAD** page on the CDU. This modern marvel uses ***AUTO-TUNING*** and it is fabulous, ***BUT*** ... we always have to be on guard that it is tuning the right radios and giving us what we want.

**NOTE**:

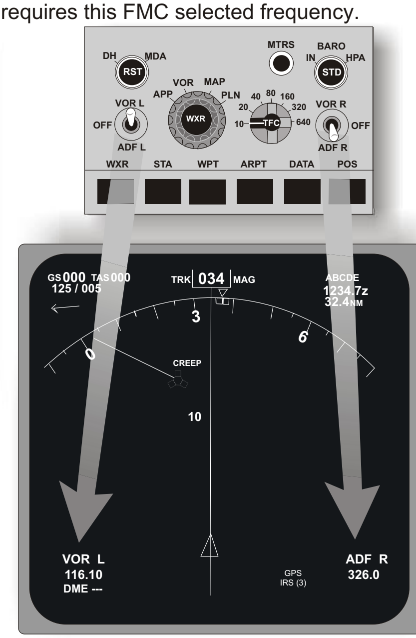
AUTO-TUNE only applies to the ILS and the VOR radios. It does ***NOT TUNE THE NDB (ADF)*** radios.

AUTOTUNING will not override MANUAL tuning.

Deletion of a corresponding manual frequency returns the system to autotuning.

The VOR has 4 tuning status modes:

- **A** - Auto-tune. FMC has selected best frequency for position updating.
- **M** - Manual tuning is PILOT entered.
- **R** - Route defining VORs are being tuned by the FMC.
- **P** - Procedure on active flight plan requires this FMC selected frequency.


Using the **EFIS**, the pilot can select the **VOR** or **ADF** displays on the **ND** (Navigtion Display).





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# RADIOS tune and identify

## 5 NAV RAD page continued

*On the **PFD**, the "**APPROACH REFERENCE**" will display either:*
*IF IDENTIFIED by FMC, it will show the **ILS IDENTIFIER**; but*
*IF NOT IDENTIFIED by FMC, it will display the frequency.*
*Once receiving it, it will display the **DME**.*


The ILS tunes automatically when:

**A** - AUTO: When an ILS, LOC, VOR, or a runway equipped with an ILS is selected on the NAV RAD page ... ***AND***

within 150 nm of the airport, or

within 50 nm of the T/D (Top of descent), or

in FMC (VNAV) descent.

**PARK** - On the **NAV RAD** page the PROMPT CARET (< >) and freq/crs will be displayed after **ILS** or **LOC** is selected, and

within 200 nm of **T/D**, or

more than halfway along the active route (whichever comes first).

Line selecting changes the tuning status to **M** (Manual).

**M** - **MANUAL**: Receivers tuned manually. Deleting a manually tuned freq/crs returns the **ILS** to the **FMC** autotuning. Autotuning ***WILL NOT OVERRIDE*** manual tuning.

**ILS WILL NOT TUNE WHEN**:
*Autopilot engaged, AND either glideslope or localizer are captured.*

*A FLIGHT DIRECTOR is engaged, either glideslope or localizer is captured, and the airplane is below 500 feet RA.*

*On the ground, with localizer alive, airplane heading within 45 degrees of the front course, and greater than 40 knots.*

*Auto tuning inhibited for 10 minutes after take-off.*


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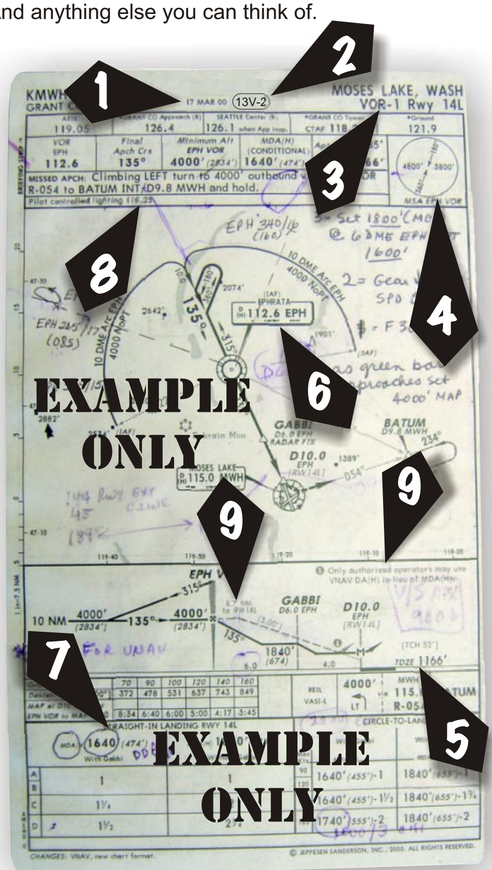
# APPROACH PLATE BRIEF

**DISCUSSION**

The Approach Chart brief is a somewhat difficult venue to discuss because every briefing situation and approach is different.
Here is what we are trying to achieve: ***SAFETY***. We want the approach to be as safe as we can make it, so we are interested in discussing anything on that approach that might compromise that goal. Mountainous terrain, towers, hazards of any kind or specific notes.
We also want to make certain that the pilots all have the same approach plate and that the airplanes database conforms to what we are trying to do.
We want to know what we are going to do if we have to make a missed approach.
And anything else you can think of.




***Here is some sample stuff. The list is NOT to be taken as definitive or complete. You will have to make up your own as the situation dictates.***

1: Date and number of plate.
2: Chart number
(a "V" indicates VNAV ready).
3: City and Runway.
4: MSA
(Minimum sector altitude).
5: TDZE
(Touchdown zone elevation).
6: Frequencies of NAV facities.
7: MDA
(Minimum Descent Altitude).
8: Missed Approach
9: NOTES and comments.

So, when you do the approach brief, try to include as much IMPORTANT information as is available.

**GOOD CAPTAIN HABIT**

***ALWAYS END THE BRIEF WITH THE QUESTION***
***…***
***"Are there any questions or comments?"***



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# APPROACH DESCENT CHECKLIST

## OBSERVATION:

*The **APPROACH DESCENT CHECKLIST** has to be done expeditiously and accurately. I ABSOLUTELY DO NOT recommend memorizing checklists; however, I also feel that being familiar enough with the contents of this checklist to quickly and without faltering or stumbling be able to complete it succinctly and with total accuracy. This is a particularly important checklist.*

***THE APPROACH DESCENT CHECKLIST IS TO BE READ ALOUD AND COMPLETED BY THE PNF.***

**APPROACH DESCENT CHECKLIST**

**(To be checked *ALOUD* by the pilot not flying)**

| | |
|---|---|
| Approach briefing . . . . . . . . . . . . . . . . . . . . . . . | Complete |
| FMCs, radios . . . . . . . . . . . . . . . | Programmed, set for landing |
| EICAS . . . . . . . . . . . . . . . . . . . . . . . . . . . . | Recalled, cancelled |
| Airspeed . . . . . . . . . . . . . . . . . . . . | _____ Flaps, _____, set (Ref) |
| Autobrakes . . . . . . . . . . . . . . . . . . . . . . . . . | Level ____, /Off |
| **——————— *TRANSITION LEVEL* ———————** | |
| Altimeters . . . . . . . . . . . . . . . . . . . . . . . . . | ________, Set (In/hPa) |

## IMPORTANT:

*The Altimeter setting MUST be cross-checked and confirmed correct ... This means:*

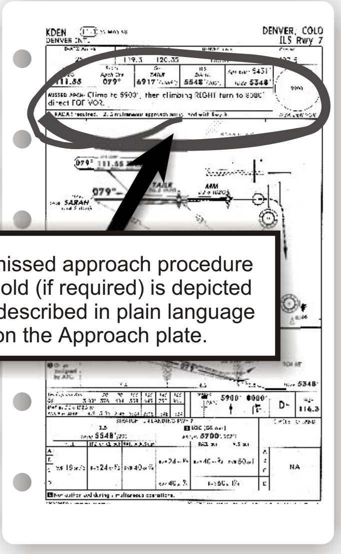
***BOTH ON THE SAME SETTING, AND***
***BOTH USING THE APPROPRIATE SETTING (HPA OR IN HG).***

the G part of AIRBAG is

# GO AROUND - GET OFF

## GO AROUND

The approach will have several possible conclusions. You will land and go to the hotel and have dinner.
Or, you will not land but have to go-around. Here is where you discuss what will happen if the approach doesn't work out.
There are three possibilities to discuss:
***RETURN TO LAND, OR***
***GO TO HOLDING, OR***
***PROCEED TO ALTERNATE.***




The missed approach procedure and hold (if required) is depicted AND described in plain language on the Approach plate.

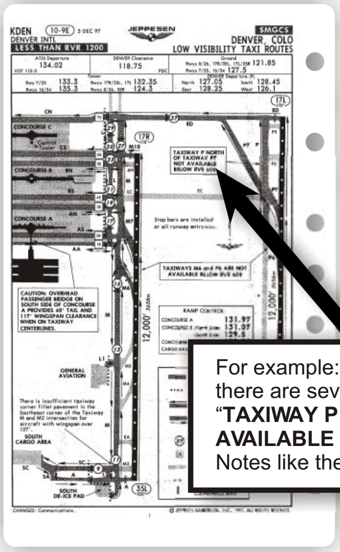
Include in your brief an estimate for the amount of time that you can remain in the area and what would be your divert plans. These may be predicated on fuel available, weather trends, traffic in the area, etc.

If holding after the go-around is possible,
(1) check the hold page on the CDU and see if the routing and hold pattern are described properly, and
(2) indicate how you would get to holding fix, and
(3) how long you could remain

## GET OFF

There are two things to be concerned with here.
First, if there are a lot of airplanes ahead, such as at LAX and the high-speed turn-offs may be blocked, brief a reasonable plan for getting off the runway. VMC landings should have a "target" off ramp.

In limited visibility situations, particularly where "smegs" (Low Visibility Taxi Routes) are in effect, there are "usually" charts that address the situation. They will have specific instructions and notes.




For example: On the Denver low visibility taxi route chart there are several notes, one which says, "**TAXIWAY P NORTH OF TAXIWAY P7 NOT AVAILABLE BELOW RVR 600.**"
Notes like these should be briefed if they are applicable.



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INTENTIONALLY LEFT BLACK

# LET'S SIMPLIFY

***EVERYTHING ... including the non-ILS approaches.***

## WORTHLESS DISCUSSION:

The really good news about flying this incredibly complex machine is that it is pretty easy. The engineers at Boeing realized that ordinary, garden variety airline pilots would be operating the jet ... so they tried to keep it simple.
The airline training people, however, took this to be a challenge and an opportunity to add complexity. So they did what they could to complicate things.

By a stroke of engineering genius and pure luck, the big bird is so powerful, that we are able to group the normal four engines approaches and the three engine approaches together. All it takes is a little rudder trim, and the procedures are the same.

Mr. Boeing failed to include that obnoxious "reverse sensing" doo-dad" that made us able to fly that goofy back-course procedure ... so, this particular airplane ***CANNOT FLY A BACK COURSE*** approach. Breaks my heart.

**REGARDING THE NDB OR ADF APPROACH.**

*I regard it as a quasi-emergency anyway. I cannot think of anyplace in the world (other than some obscure place in China) where pilots are subjected to using this semi-dangerous piece of aviation memorabilia on a regular basis.*
*It was clearly intended to be used when there was NO OTHER AVAILABLE APPROACH ! No matter how perfectly we can fly the "tail of the needle," there is ALWAYS gross errors in the line-up of the signal. Anyway, I am telling you, that if you have to do this maneuver, get your head out of the cockpit and don't get all tied up in flying the maneuver. The idea is to land the airplane safely.*

*The ADF, even perfectly flown, can place you in a position where a safe landing is in doubt. Be spring loaded to the go-around position. DO NOT accept a dangerous transition.*

***This approach belongs in a museum and was NEVER intended to be flown by a high performance jet the size of a 747-400.***

I am going to make the bold assertion that since we fly all the non-precision approaches similarly, and since there are only three types; ADF (NDB), VOR, and ILS with GLIDE SLOPE OUT (Localizer only); let's emphasis the similarities, then the things that are different become simple to see.



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# Flying the NON - ILS APPROACHES

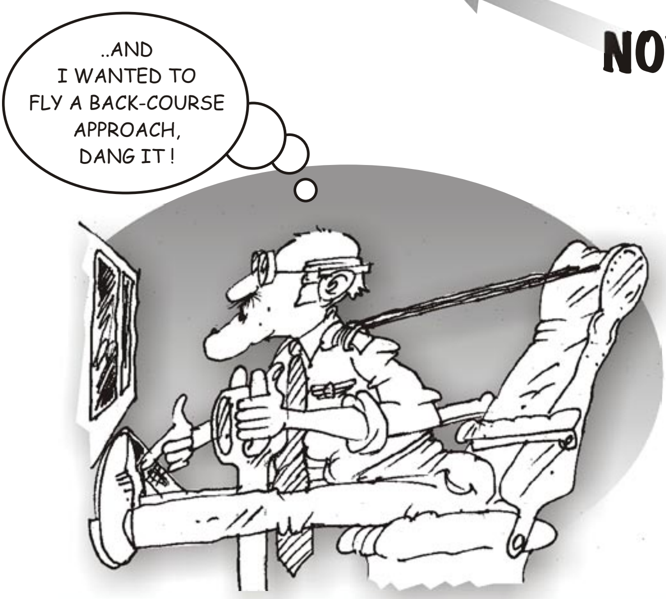
*Formerly known as*

**THE NON-PRECISION APPROACHES**

**VOR**
**NDB (ADF)**
**LOC ONLY (ILS G/S OUT)**

*** THE 747-400 WILL NOT FLY A BCRS**

**NOTE !**




*There are several ways to fly the*
*FINAL APPROACH SEGMENT*
*of a Non-ILS approach.*
*We will cover the CDAP method in this manual*

# NON PRECISION APPROACHES

# OP SPECS

***GENERAL STUFF***:

In weather less than 1000/3, or published minimums, whichever is greater ... ***USE THE AUTOPILOT***.

LNAV OK on VOR and NDB approaches IF the approach is built on the LEGS page and the RAW DATA information is monitored.

If LNAV does not agree with the RAW DATA ... switch to HDG SEL for the remainder of the approach.

Conduct the LOCALIZER ONLY approach in the LOC mode of the AUTOPILOT.

Inside the FAF; USE THE V/S wheel.

***USE OF LNAV:***

The autopilot WILL track a localizer course; BUT it WILL NOT TRACK a VOR or an NDB course.

During a VOR or NDB approach using the FMC generated magenta line and the LNAV ... BE AWARE that the course may deviate slightly from the published VOR or NDB course. That's OK, if it is expected.

APPROPRIATE raw data information MUST BE MONITORED throughout the approach.

***IF A DISAGREEMENT DEVELOPS BETWEEN THE TWO; USE OF THE LNAV MUST BE TERMINATED AND HDG SEL USED TO FOLLOW RAW DATA.***

For ALL non-precision approaches, stepdown fixes MUST be verified by reference to ***RAW DATA***. *You are specifically denied the use of* ***ONLY*** *the FMC generated information.*

To display raw data:
TUNE appropriate navaid on the CDU **NAV RAD** page, and
if applicable use the **EFIS** VOR/ADF switches to display the appropriate information on the **ND** (Navigation Display).

**VOR APPROACHES:**

***VOR APPROACHES REQUIRE that the PF MUST display the VOR on the ND no later than the FAF.***

At the Captain's discretion, the PNF may display the MAP MODE with the VOR bearing pointers displayed as a back-up to a *CONSTRUCTED* approach.

**NDB APPROACH:**

***NDB APPROACHES REQUIRE that both pilots may display either MAP MODE or MAP CTR MODE with the ADF pointers displayed***.

**LOCALIZER ONLY APPROACH:**

During LOCALIZER ONLY APPROACHES, raw data is displayed on the PFD. *Note that it isn't necessary to switch to the ND APP mode*. Both pilots may stay in the ND MAP mode.



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# MORE NON PRECISION APPROACHES OP SPECS

**APPROACH**:

Use these ROLL MODES: VOR and ADF ......... LNAV OK, if confirmed with RAW DATA, otherwise HDG SEL or LOC mode on MCP to intercept and track.

***SET NEXT LOWER ALTITUDE ON THE MCP BEFORE DESCENDING IN V/S***.
*If you do not do this, the airplane will not level off, and the jet will fly into the ground and you will die !!*!
***HELLO ... DUH!!! This is the real BIGGIE!!!***

***FINAL APPROACH***:

***WHEN FMA GOES TO VNAV PATH, SET IN THE TDZE***.

~about 5 miles before FAF:
GEAR DOWN,
FLAPS 20,
20 FLAP speed + 10 KTS
FINAL DESCENT CHECKLIST.

Just prior to FAF (~.3 miles)
LANDING FLAPS
reduce to TARGET SPEED.

Time/distance can be determined elsewhere; but the easiest place to look is the ND display.

**DESCENT to MDA**:

At .3 miles prior to FAF, ***AGGRESSIVELY*** ROLL THE V/S to calculated DESCENT RATE (probably around 800 fpm).

**TRANSITION TO LANDING**:

AT MDA (DH) with runway in sight:

STAY ON AUTOPILOT UNTIL 50 feet BELOW MDA.

USE V/S knob to adjust descent.
USE HDG SEL to tweak line-up
BRIEF PNF to call out 50 feet below!


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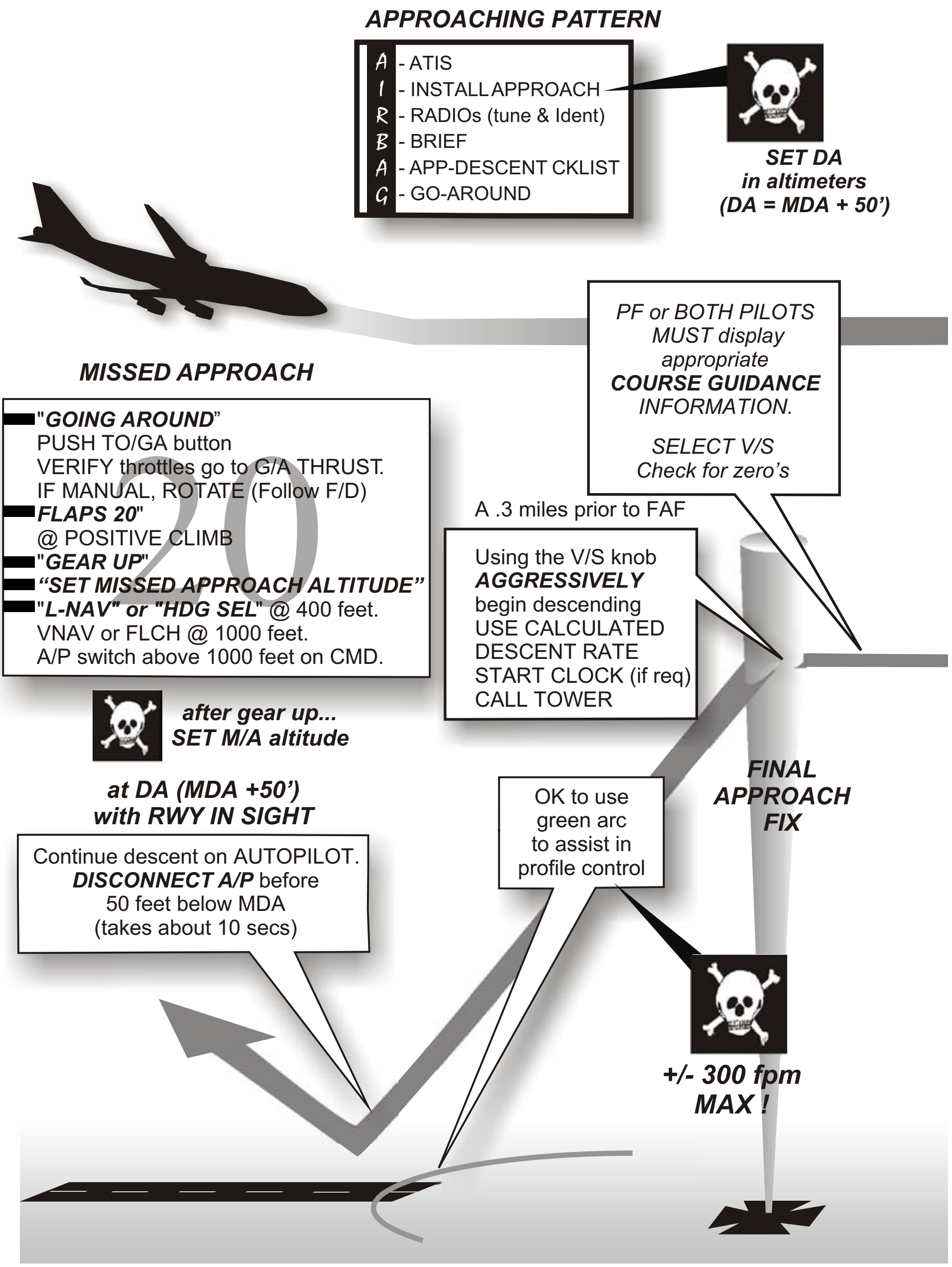
# NON-ILS CDAP

## Generic approach





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## THE KEY to flying NON-ILS APPROACHES

WHEN DESCENDING:
@
**ALT**

***"SET NEXT ALTITUDE"***
***or***
***"TDZE if at FAF ALT."***
***"OPEN V/S WINDOW and CHECK FOR ZERO'S"***

**NOTE:** ** OF COURSE, DON'T SET IN THE NEXT ALTITUDE UNTIL YOU ARE CLEARED !*

**TIP**: FLCH OK when outside FAF; this keeps you altitude protected; but, INSIDE the FAF YOU MUST USE COMPUTED DESCENT RATE.

### *CROSSWIND LEG*

**FLAPS 10**
speed as appropriate
If Engine failure;
Terminate fuel transfer

### START CDAP

At least 3 miles prior to FAF:
***GEAR DOWN,***
***LANDING FLAPS,***
***SLOW TO TARGET A/S,***
***FINAL DESCENT CHECKLIST.***
ALL *"OTHER"* CHECK LISTS done.

### *INTERCEPT VECTOR*

*When "Cleared for Approach" and Course Deviation Bar begins to move ("CASE BREAK"), OR you are within 10 degrees of the inbound course; then you are cleared to begin descent to next altitude.*

REVIEW or CALCULATE COMPUTED DESCENT RATE

@ **ALT** on FMA
1. SET TDZE
2. OPEN V/S
CK zero's

## DON'T FORGET

USE AUTOPILOT and AUTOTHROTTLE !

try to USE LESS THAN **5 degree bank** when tracking

**USE V/S** for descents inside FAF
SET COMPUTED DESCENT RATE @ .3 MILES FAF

**BOTH PILOTS MUST MONITOR ADF POINTERS on ND** if flying ADF

**USE ND** to continuously monitor LNAV and RAW DATA alignment during approach.

**LNAV OK FOR TRACKING** BUT IF CRS deviates from RAW DATA; GO TO HDG SEL and fly the RAW DATA.

**AT ALTITUDE "ALT" on FMA** COMPUTED TDZE select V/S, CHECK ZEROs

**MAX DESCENT CORRECTION** +/- 300 FPM

**MISSED APPROACH at DA** MDA plus 50 feet



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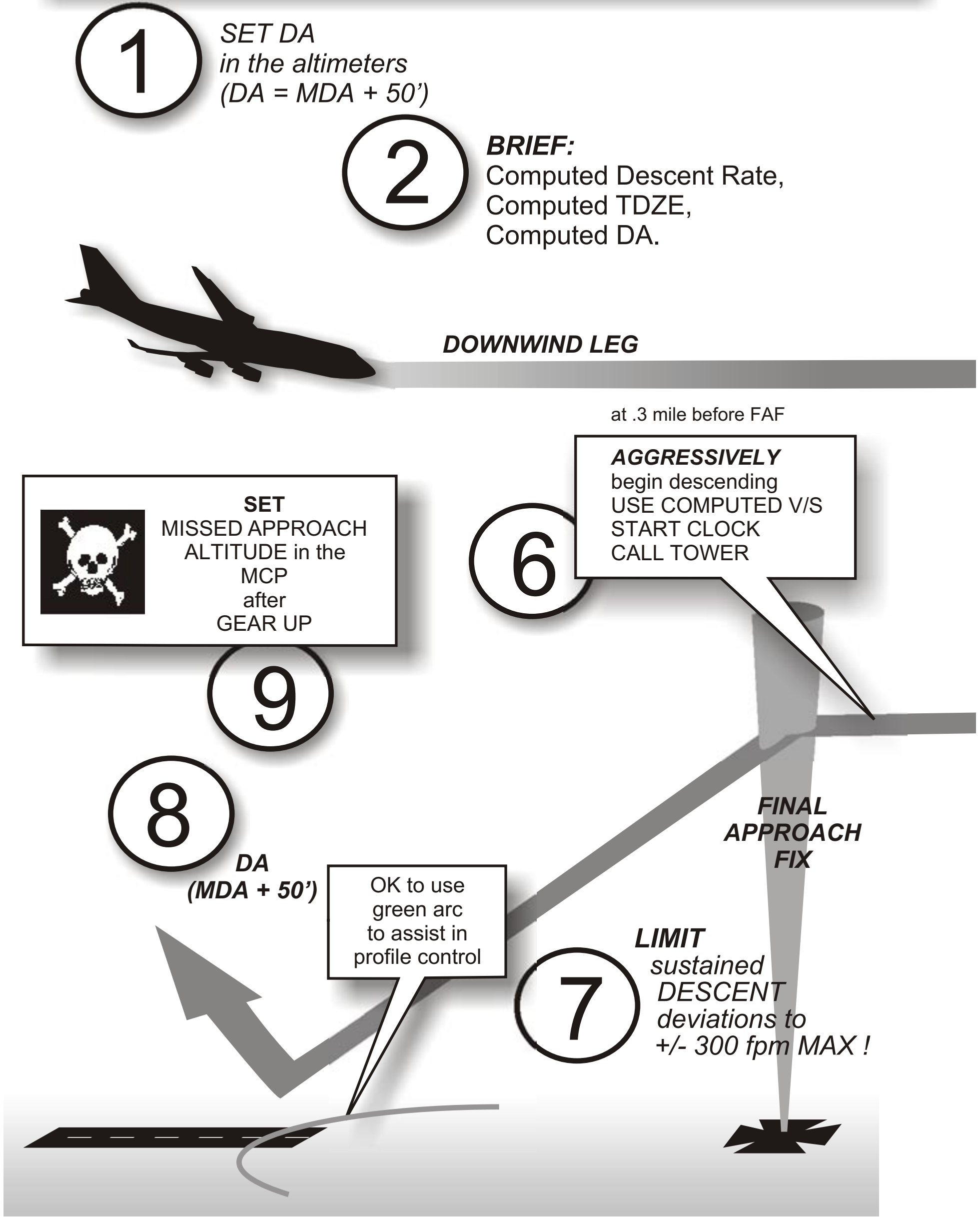
# TYPICAL CDAP APPROACH
## (specifically CDAP items depicted)





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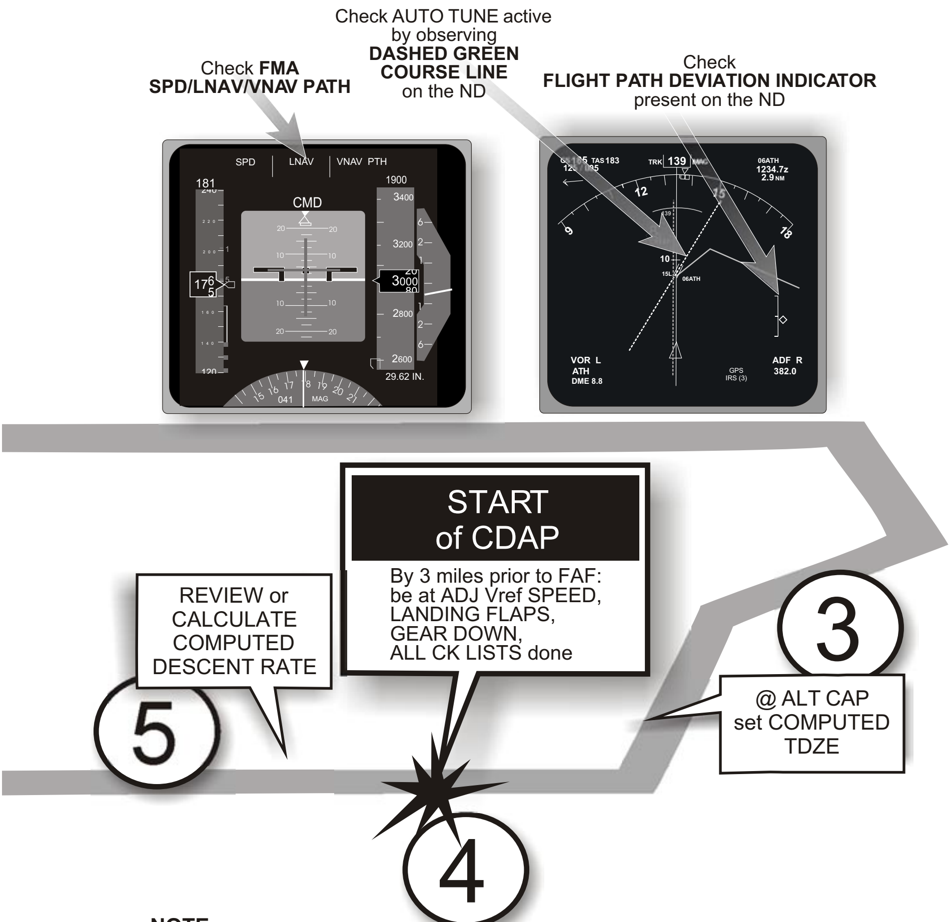


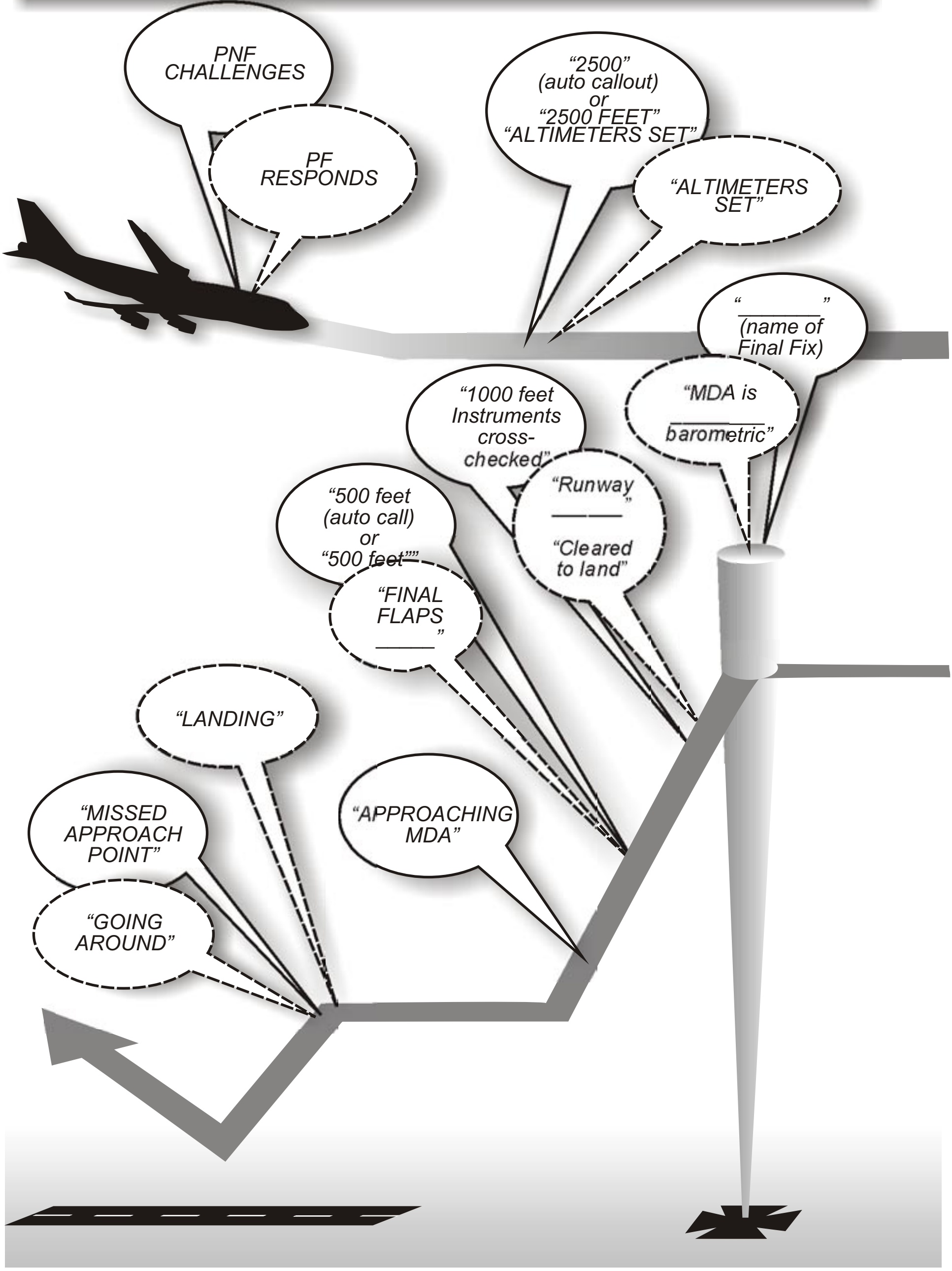

**NOTE:**

CONSTANTLY “ MARRY THE BUGS.” By this I mean; continually keep the HEADING INDICATOR (buckteeth) on the ND aligned with the TRACK INDICATOR (Triangle at the top of the instrument). *Boeing pilots quickly develop a habit of reaching up to the MCP and tweaking the HDG SEL knob contunually.*

CHECK for green dashed line on the ND during the VOR approach. This green line indicates that the VOR radios auto-tuned and are being received suitable for navigation.

CHECK FLIGHT PATH DEVIATION INDICATOR visible on the ND.

# NON-ILS CALL-OUTS





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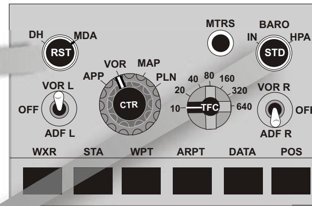
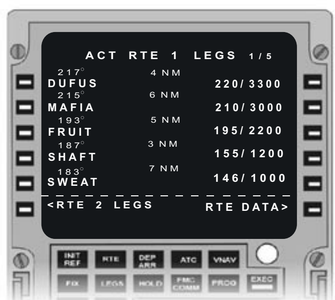



Set the MDA using the little knob at the upper left hand corner of the EFIS. Glance over and confirm that the other guy has his MDA set. Confirm that the altimeter is set on inHg or Hp. You can't check this too many times, especially when operating in foreign places.

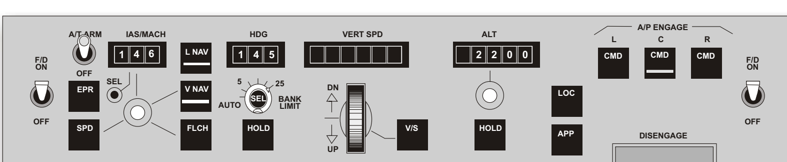

Ensure that the STANDBY ALTIMETER has the correct barometric setting. Specifically notice whether hectropascals or inches of mercury are applicable.

During the approach, monitor the CDU **LEGS PAGE** for specific distance, heading, and fix information.




Descents outside of the FAF (Final Approach Fix) use the FLCH MODE or VNAV. When **VNAV PATH** is annunciated on the FMA, set Missed Approach altitude in the MCP.

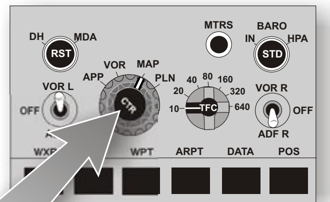
At the MDA with the runway environment in sight suitable for landing, continue your descent below MDA. Stay on the autopilot until 50 feet below the MDA, then disconnect autopilot and make the landing manually.



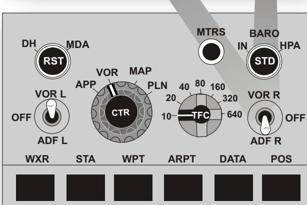
# ADF (NDB) SETUP

## *HOW TO SET UP THE RADIOS and STUFF*

It is assumed that you have completed the **A-I-R-B-A-G** steps which include:
installing the approach on the **DEP ARR** page,
resolving the *DISCONTINUITIES* on the **LEGS** page,
and set the frequencies in the **NAV RAD** page.
*Because I have shown that in detail earlier, I won't repeat those steps.*


BOTH PILOTS must be is the MAP mode, either CTR or EXPANDED. I have depicted using the CTR mode on the outbound vector, because the airport information is behind the airplane and CTR allows more information from behind us without going to larger scale. We obtain the CTR or EXPANDED display by depressing the center of the EFIS selector knob labelled appropriately enough, CTR..




**TECHNIQUE**:
***THE VOR AND THE ADF(NDB) NEEDLES "SHARE" THE SAME SYMBOLS ON THE ND YIPE!!!***. If they are indicating the VOR; they are GREEN. If they are indicating the ADF, they are BLUE.
Big place for confusion: The indicator in the lower corner of the ND will be the same color as the "ARROW" symbols on the ND. Example: If the symbol is green and you can't remember which is which, just look at the lower corner.

The #2 indicator is **BIG AND NICE**, the #1 indicator is a *puny, skinny thing* that you can hardly see. I prefer to use the ***ADF #2*** to fly the approach. The #1 nav radio can be used for a VOR/ADF that is required for approach definition, or turned ***OFF***. That way, I always know what I am doing.

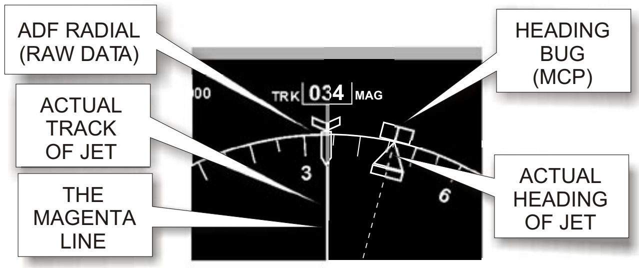
The approach may use LNAV, but BOTH pilots must monitor the MAP mode during the whole approach to continuosly monitor the ADF raw data signal.
*Appropriate RAW DATA information MUST be monitored throughout the approach. If a disagreement between the MAP mode and the RAW DATA occurs, use of the LNAV must be terminated and RAW DATA followed using the HDG SEL knob on the MCP.*

**TECHNIQUE:**
Throughout the approach, even while using the LNAV and AUTOPILOT; it is good technique to be constantly "Marrying the bugs" (setting the HDG SEL bug on the ND to the heading desired) so that should a transition to HDG SEL become necessary, the MCP will be set up and the airplane will not make a turn off course.

## more HOW TO SET UP THE ADF RADIOS and STUFF

I think that using the ND in the EXPANDED MODE once you have turned inbound makes sense. That makes the top of the instrument larger and more easy to line up the indicators.

Outbound from the FAF (Final Approach Fix) which is (almost always) the ADF, here is the picture we want to see.




The MAGENTA LINE and the AIRCRAFT TRACK super-imposed, AND

The "BOMB" resting on the depicted RADIAL from the approach chart

## <u>*ALL THREE MUST REMAIN LINED UP.*</u>

If these three item should not remain lined up,
and you are flying the approach in LNAV:
***<u>YOU MUST TERMINATE USING LNAV !</u>***

**NOTE ON TECHNIQUE**:

*Even though it is not controlling the direction of the airplane if using LNAV, the Aircraft Heading Selector should be continually aligned with the Aircraft heading Selector using the heading selector knob on the MCP.*
THEN ... If you need to transition to
MANUAL" control, when you push the heading slector knob, the airplane won't make some unexpected turn off course ... and csrew up the approach further.

When a heading is selected on the MCP and the HDG SEL knob is pushed in, the autopilot if selected and/or the flight director will fly the SAILBOAT (aircraft heading indicator) into BUCKTOOTH HARBOR (heading selector).
Knowing this, we can fly a FABULOUS ADF with the HDG KNOB.
Here's how: If the Bomb slips off the ADF radial, tweak the heading selector so the jet will fly back to the appropriate heading to line up the **AIRCRAFT TRACK, THE ADF RADIAL AND THE BOMB**.

## <u>*KEEP ALL THREE ALIGNED;*</u>
## <u>*THEY MUST REMAIN LINED UP.*</u>

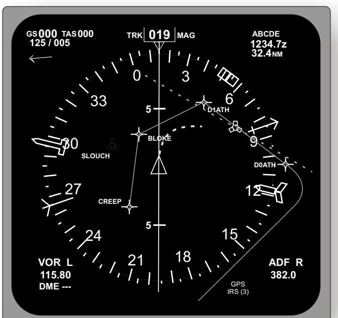
# VOR SETUP

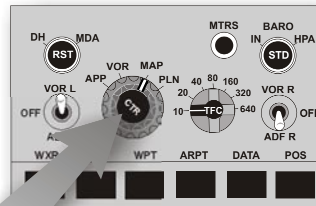
## *HOW TO SET UP THE RADIOS and STUFF*

At this point in the approach set-up, we will assume that you have completed the **P-A-I-R-B-A-G** steps which include:

installing the approach on the **DEP ARR** page,
resolving the *DISCONTINUITIES* on the **LEGS** page,
and set the frequencies in the **NAV RAD** page.

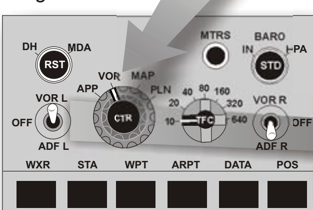
*Because I have shown that in detail earlier, I won't repeat those steps.*



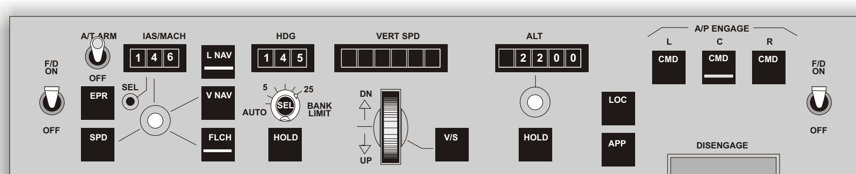

PNF may be is the MAP mode at the Captain's discretion. I have depicted using the CTR mode simply because on the outbound vector, the airport information largely is behind the airplane and CTR allows more information without going to larger scale. We obtain the CTR display by depressing the center of the EFIS selector knob.

PF may be use the MAP mode up to the FAF; after passing the FAF the PF MUST be in the VOR mode. *Appropriate RAW DATA information MUST be monitored throughout the approach. If a disagreement between the MAP mode and the RAW DATA occurs, use of the LNAV must be terminated and RAW DATA followed using the HDG SEL knob on the MCP.*





Throughout the approach, even while using the LNAV and AUTOPILOT; it is good technique to be constantly "Marrying the bugs" (setting the HDG SEL bug on the ND to the heading desired) so that should a transition to HDG SEL become necessary, the MCP will be set up and the airplane will not make a turn off course.





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# LOC ONLY SETUP

## *HOW TO SET UP THE RADIOS and STUFF*

At this point in the approach set-up, we will assume that you have completed the **P-A-I-R-B-A-G** steps which include:

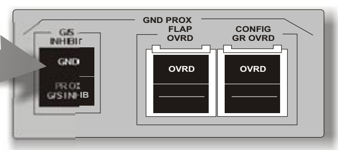
- installing the approach on the **DEP ARR** page,
- resolving the *DISCONTINUITIES* on the **LEGS** page,
- and set the frequencies in the **NAV RAD** page.

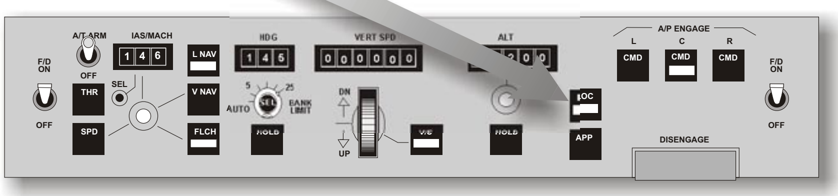
*Because I have shown that in detail earlier, I won't repeat those steps.*

SOME *specifically* LOC STUFF:

**G/S INHIBIT** should be pushed to prevent spurious warnings during the approach.

Once ***CLEARED FOR THE APPROACH***, arm the **LOC** mode.




The ***LOC ONLY*** approach has guidance in the lateral mode only. All vertical guidance must be provided by the pilot.

***VNAV is NOT AUTHORIZED*** due to complexity in the set-up.

Use ***FLCH*** outside the **FAF** and **V/S** wheel inside the **FAF**.
Leaving FAF altitude for MDA, use 1200 FPM.
Leaving MDA on descent to landing, use 800 FPM.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747v1intro02

# FLYING THE ...

# ILS APPROACHES

*These used to be called the PRECISION APPROACHES and are the type that you will be flying MOST of the time out on the line. They are ILS related:*

***ILS CAT I***
***ILS CAT II / III***



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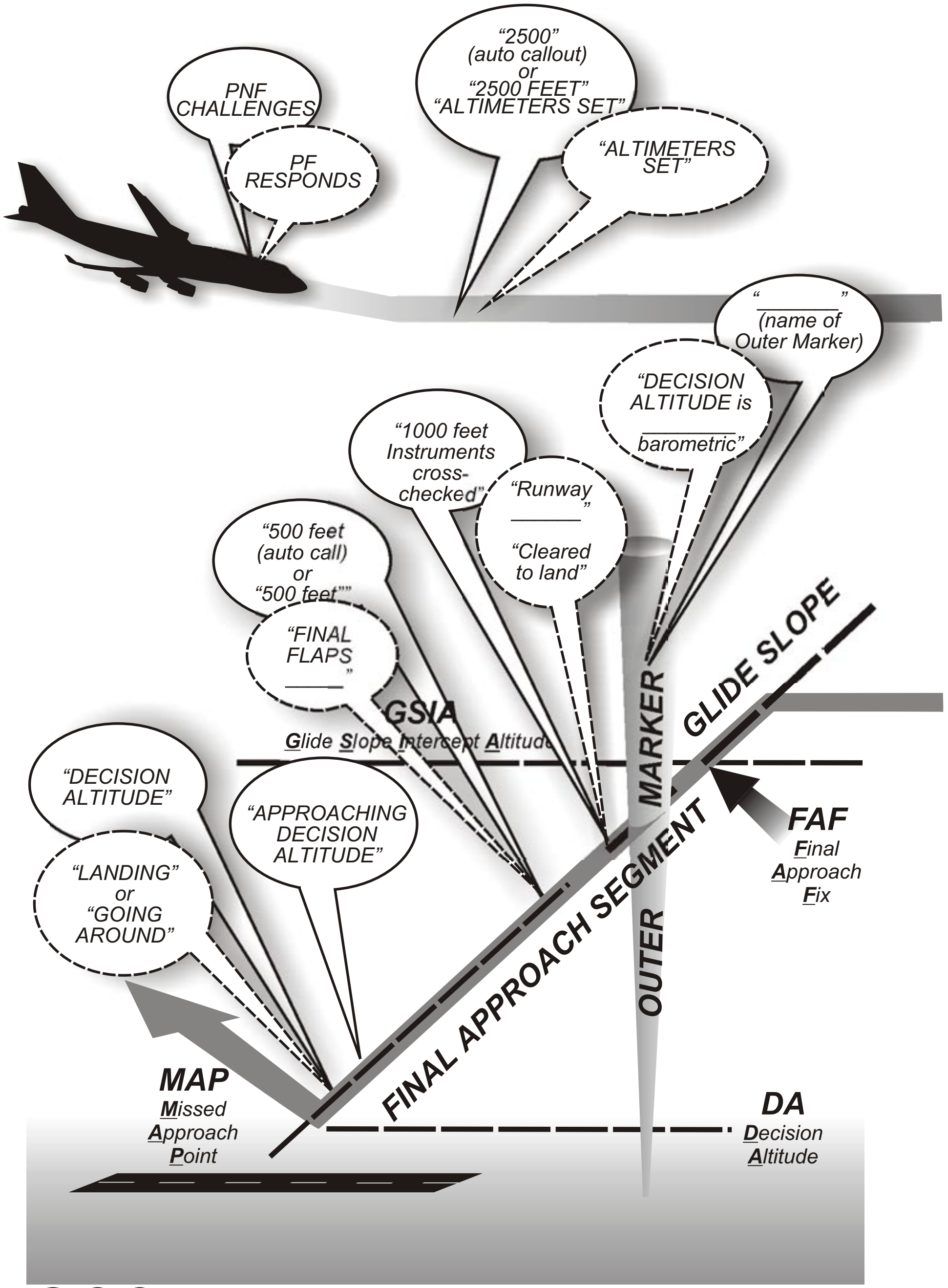
# ILS CAT 1 CALL-OUTS





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# ILS APPROACHES

# OP SPECS

***SOME ILS DEFINITIONS***:
There seems to be a lot of confusion about terminology regarding the ILS approach environment. Here are a few of the terms and their definitions.

**GLIDE SLOPE**: That is the pathway that the airplane flies to the runway. It is strictly defined by the ILS transmitter on the ground. The airplane MUST receive and fly the GLIDE SLOPE in order to be on the approach.

**GSIA or GLIDE SLOPE INTERCEPT ALTITUDE**: This is an altitude depicted on the approach chart that represents the ceiling of the Final Approach Segment.

**FAF** (Final Approach Fix): The place where the Final Approach Segment begins.

***The point in space where the GSIA and the GLIDE SLOPE intersect IS the FAF.***

Technically, the approach has not begun until the airplane has passed the Final Approach Fix.

**OM (OUTER MARKER)**: The "***Outer Marker "IS NOT***" the FAF. It is simply a point that is designated by reference to a ground based transmitter as the outer marker.

**ALERT HEIGHT v. DECISION ALTITUDE**: *Here the Training People got in their licks. AH and DA are the same thing, but designated differently because of some reason we don't have to know about. So, if you are flying an approach with a DA(Decision Altitude), treat it the same as an AH (Alert Height).*

**COMMENT about ENGINE INOPERATIVE OPS**:

*Believe it or not, the airline training people had to admit that this airplane was so fabulous that they could make the regular all engines working approach the same as flying it with one engine shut down. Fantastic. It is incredible, not because the airplane can do that ... but because the Training Kingdom would actually admit that they didn't have a case for cluttering up the procedures. Mark up one for the pilots.*

***ENGINE INOPERATIVE ILS STUFF***:

With an engine inoperative; Use ***NORMAL APPROACH FLAP SETTINGS*** (25 or 30, Captain's choice).

*During landing, the* ***RUDDER TRIM*** may be zeroed at the outer marker or left in; but the training procedures don't suggest attempting to center the rudder on short final. *I never liked doing that anyway and usually forgot*.

Autopilot and Flight Directors stuff is the same for both engine out and all engines running.

***You CAN fly a CAT II or CAT III AUTOLAND with an engine inoperative***.





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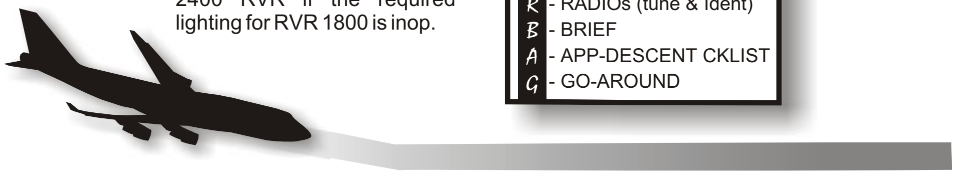
# ILS CAT 1 APPROACH
## RVR 1800 or BETTER

**OP SPECS**: All landings with 1800 RVR or less will be *AUTOLAND*.

**POSBD NOTE**:
Must use AUTOLAND below 2400 RVR if the required lighting for RVR 1800 is inop.

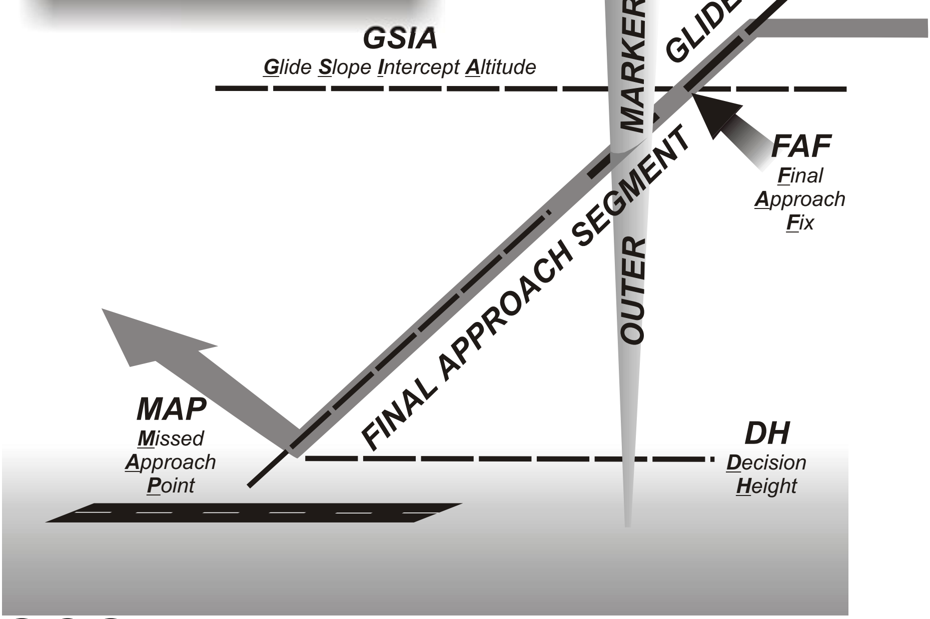
***APPROACHING PATTERN***

- P - PDP
- A - ATIS
- I - INSTALL APPROACH
- R - RADIOs (tune & Ident)
- B - BRIEF
- A - APP-DESCENT CKLIST
- G - GO-AROUND



think about
***MISSED APPROACH***

- "***GOING AROUND***"
- PUSH TO/GA button
- VERIFY throttles go to G/A THRUST.
- ***MANUALLY*** ROTATE (Follow F/D)
- ***FLAPS 20***"
- @ POSITIVE CLIMB
- "***GEAR UP***"
- "***L-NAV" or "HDG SEL***" @ 400 feet.
- "***VNAV or FLCH***" @ 1000 feet.
- A/P switch above 1000 feet.



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# NOTES:

- ALL LANDINGS BELOW CAT I MINIMUMS (less than 1800 RVR) WILL BE "AUTO-LAND."
- ***THE AUTO-LAND IS A MULTIPLE AUTOPILOT MANEUVER.***
- ***DO NOT try to AUTOLAND ON A SINGLE AUTOPILOT.***
- ***DO NOT AUTOLAND ON A RUNWAY THAT IS NOT CAT II or CAT III*** CAPABLE.
- FAF is (USUALLY) INTERSECTION OF GSIA and GLIDE SLOPE.
- WX MUST BE AT or ABOVE MINIMUMS TO CONTINUE PAST GSIA.
- IF WX GOES BELOW MINIMUMS ONCE PAST FAF; OK TO CONTINUE TO MAP; and LAND IF ALL OTHER CRITERIA ARE MET (for example: You see the runway)

# BIG !

**MONITOR PFD**
and *when*
*LOC and G/S go from*
*WHITE (armed) to GREEN (capture)*
*then set MCP up for Missed Appch*:
**M/A ALT and M/A HDG (if req)**

***CROSSWIND LEG***

FLAPS 10
slow to FL10 speed + 10 KTS

If on Single Engine;
Terminate fuel transfer

***AT TOP DOT***
"FLAPS 10"
FL10 + 10 KTS

***AT LOWER DOT***
"GEAR DOWN"
"FLAPS 20"
"FINAL DESCENT CHECK"

***Approaching GLIDE SLOPE***
"FLAPS 25/30"
"TARGET AIRSPEED"


When "***CLEARED FOR APPROACH***"

**ARM the APPROACH MODE;**
Push "**APP**" on MCP
***NOTE***: *A nice touch is to push "**LOC**" until **LOC CAPTURE**; then push "**APP**" to avoid early descent outside of protected airspace.*

**USE ND** IN EITHER APP or MAP MODE
PFD is considered the PRIMARY NAVIGATION INSTRUMENT.

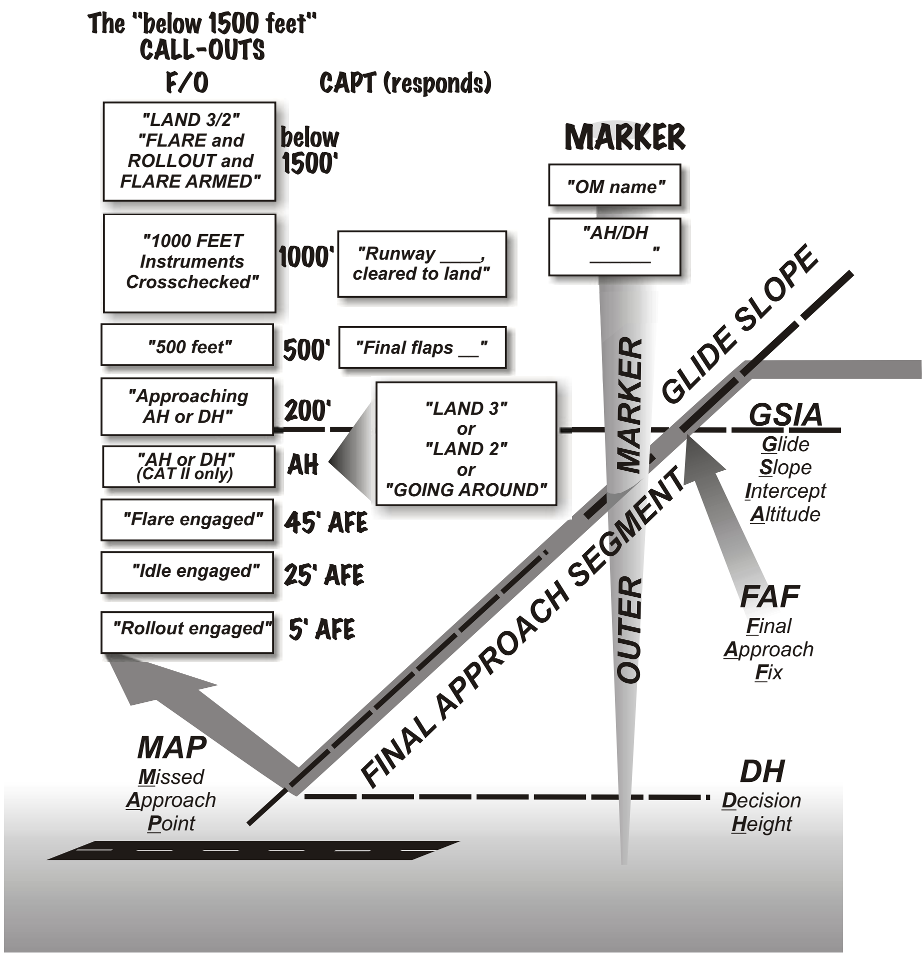
**CDU in LEGS PAGE** for distance to waypoints

**USE AUTOPILOT/AUTOTHROTTLE** EVEN WITH AN ENGINE FAILURE, it is OK to USE AUTO-PILOT TO FLY APPROACH.

# ILS CAT II-III APPROACH
## 3 or 4 ENG with AUTOLAND

### APPROACHING PATTERN

- P - PDP
- A - ATIS
- I - INSTALL APPROACH
- R - RADIOs (tune & Ident)
- B - BRIEF
- A - APP-DESCENT CKLIST
- G - GO-AROUND





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# NOTES

- ***THE AUTO-LAND IS A MULTIPLE AUTOPILOT MANEUVER.***
- ***DO NOT try to AUTOLAND ON A SINGLE AUTOPILOT.***
- ***DO NOT AUTOLAND ON A RUNWAY THAT IS NOT CAT II or CAT III*** CAPABLE.
- FAF is (USUALLY) INTERSECTION OF GSIA and GLIDE SLOPE.
- WX MUST BE AT or ABOVE MINIMUMS TO CONTINUE PAST GSIA.
- IF WX GOES BELOW MINIMUMS ONCE PAST FAF; OK TO CONTINUE TO MAP; BUT, you CANNOT LAND CAT III UNLESS RVR LEGAL (Even if you see the runway).
- ***OK to AUTOLAND with ONE ENGINE INOPERATIVE.***

# BIG !

**MONITOR PFD**
and *when*
*LOC and G/S go from*
*WHITE (armed) to GREEN (capture)*
*then set MCP up for Missed Appch*:
**M/A ALT and M/A HDG (if req)**

***CROSSWIND LEG***

FLAPS 10
slow to FL10 speed + 10 KTS

If on Single Engine;
Terminate fuel transfer

***AT TOP DOT***
"FLAPS 10"
FL10 + 10 KTS

***AT LOWER DOT***
"GEAR DOWN"
"FLAPS 20"
"FINAL DESCENT CHECK"

***Approaching GLIDE SLOPE***
"FLAPS 25/30"
"TARGET AIRSPEED"


"**CLEARED FOR APPROACH**"
you MUST do ***2*** things
1. **ARM the APPROACH MODE;** Push "**APP**" on MCP
*NOTE: A nice touch is to push "LOC" until LOC CAPTURE; then push "APP" to avoid early descent outside of protected airspace.*
2. **ARM OTHER TWO AUTOPILOTS**.

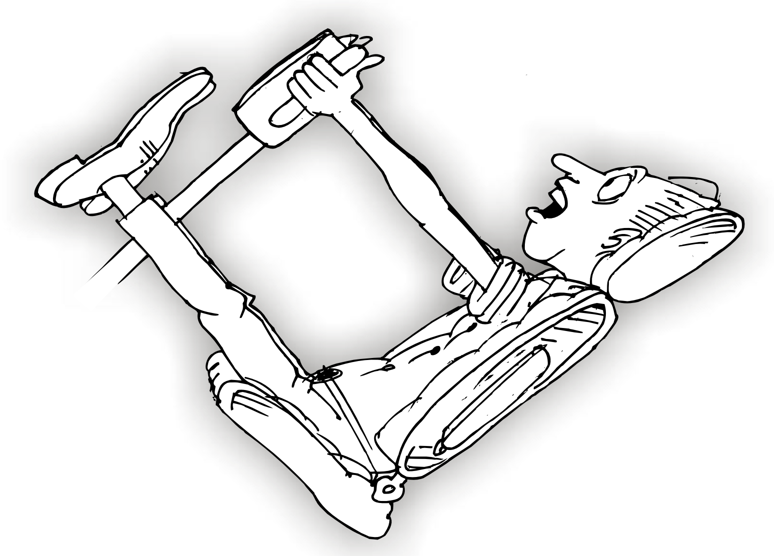
**USE ND** IN EITHER APP or MAP MODE
The PFD is considered the PRIMARY NAVIGATION INSTRUMENT.

**CDU in LEGS PAGE** for distance to waypoints

**USE AUTOPILOT/AUTOTHROTTLE**
EVEN WITH AN ENGINE FAILURE,
it is OK to USE AUTO-PILOT TO FLY
APPROACH and AUTO-LAND.

For some inexplicable reason,
this is ***EASY TO FORGET*** !
You should NOT autoland
using single autopilot.

# Doing the GO-AROUND



There is a time to push the TO/GA button and ...
There is a time to simply add power and
execute a missed approach.

On a light 747-400, if you push the TO/GA button it will become a rocket ship. I tell you this, because I have seen some pilots pushing the GO-AROUND BUTTON when it was probably inappropriate.

Let me explain. If you are at the MDA or MISSED APPROACH POINT, then of course, using the GO-AROUND capability of the airplane is entirely the right thing to do. However, should you elect to abandon an approach , then ***it may be a better idea to push up the power a bit and level off using other available tools***.

Let's talk about this a bit and understand the situation in greater detail.



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Probably one of the most abused events on the check-ride is the Go-around. The problem comes from pilots pushing TO/GA button inappropriately.

***WOWWWW!***! The power rapidly comes on, the nose rapidly pitches up, and the airplane starts climbing and the ILS guidance shuts off and the pilot becomes very disoriented.
Particularly if there is an intermediate level-off, the airplane will be climbing such that it will likely "bust" the altitude. I have observed pilot candidates getting behind the airplane and not fully aware of how to regain control using the automated control systems.

*For example*: Descending on the 25L glide-slope into LAX, you are passing through 3000 feet. The Tower advising you to:

"*Execute missed approach, level off at 5000 feet and maintain runway heading*."

If you push the TO/GA button, the power will come on big-time, the nose will pitch up. The next thing the pilot will instinctively do is, shut off the autopilot and push on the yoke to keep from exceeding the 5000 foot restriction.
***WHEEEEEE***!
Then the airspeed will be building so rapidly, that flap speeds will be exceeded. At that point the pilot candidate with pull the throttles back ... And if the auto-throttle is not disconnected, the throttles will go back to there high power setting.
All the while, the terrified passengers are wondering if they are going to die ... and the pilot is wondering if she/he will pass their check-ride.
I think you get the idea.

> Just because you hear the command,"Go-around" does not mean you have to push the TO/GA button.

A more normal technique "might" be to disconnect the auto-pilot and re-set the flight directors to dis-engage the ILS. Then simply re-engage the auto-pilot and roll the altitude selector on the MCP to 5000 feet. Depress FL/CH and you are all set. The nose will come gently up and the power will keep the airspeed right where it was and if a turn is required, simple select and twiddle the heading selector to the desired heading.
You don't raise a sweat and it is all so smooth and simple.

# Missed Approach Go around or Overshoot

Quote from the manual:
***"IF A MISSED APPROACH IS REQUIRED FOLLOWING AN AUTOPILOT APPROACH, LEAVE THE AUTOPILOT ENGAGED."***

- **"GOING AROUND"**
  *PUSH TO/GA button*
- ***"FLAPS 20"***

  *VERIFY throttles go to **G/A THRUST**.*
  *Monitor autopilot or Manually (Follow F/D)*
- **ROTATE**
  *Observe the autopilot Initially command about 15 degrees and then*
  *pitch between COMMAND SPEED BUG and BUG +25.*

  *@ POSITIVE CLIMB*
- **"GEAR UP"**
- Set **MISSED APPROACH ALTITUDE on MCP** !!!!

20

**"VNAV or FLCH"**
@ 800 feet
FLCH is recommended in order to open SPEED INTERVENE and move the COMMAND SPEED BUG for FLAP retraction.

**800 feet AGL**

**"L-NAV" or "HDG SEL"** @ *400 feet*.
If you don't select another heading mode, the jet will remain on the heading that it was on when you pushed the TO/GA button.

**400 feet AGL**

**NOTE 1**:
*Below 400 feet, selecting LNAV or VNAV does not change the autopilot or flight director modes*.

**NOTE 2**:
*If you are one the go-around from an engine out, autoland, triple autopilot approach; the rudder trims for the assymetry. HOWEVER, when altitude capture occurs above 400 feet AGL, the autopilot reverts to the original single autopilot operation and **REMOVES THE AUTOMATIC RUDDER INPUT**.*

**250 feet AGL**

*A/P (if not already on) OK above 250 feet.*

Expect about a 40 foot descent below the altitude where the go-around is initiated.





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Complete the
"AFTER TAKE-OFF" Checklist.

## MAP (Missed Approach Altitude)

When ALT is annunciated, move the BUG speed up and begin to clean up the airplane.

**"A-B-C"**

A: At ALT,
B: BUG UP
C: CLEAN UP

It is Company SOP to remain configured at 20 degree flap and Approach Speed bug all the way to the missed approach altitude.

**"BUG IN - BUG OUT"**

## BIG PROBLEM

*If you have not set in the MISSED APPROACH ALTITUDE when you raised the gear, FLCH will not have an appropriate target altitude. It may attempt to push over and return to the altitude set in the MCP, in this case it could be the TDZE.*

*FLCH is preferred over VNAV SPEED INTERVENE because if VNAV ALT is displayed, a premature leveloff may occur requiring the selection of FLCH to correct. So, why not already be in FLCH?*

**FL CH TECHNIQUE RECOMMENDED**

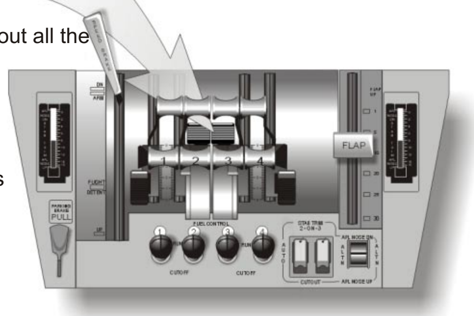
1. At **ALT**, Move "**BUG UP**" to Speed greater than the minimum flaps maneuvering speed for the next flap setting.
When COMMAND SPEED BUG is at FLAP marker on speed tape,
2. PF Request **FLAPS** ____ .
3. PNF sets COMMAND SPEED **BUG** on the MCP.
4. PNF moves **FLAP HANDLE**.
5. **RETRACT** flaps on schedule to desired setting.

**RECOMMENDATION**

*Set the BUG to about 225 Knots or greater if you intend to raise the flaps full up. This will assist in keeping the engines from chasing airspeed and surging back and forth. However, if you intend to return to the field for another landing, perhaps you should consider leaving the flaps 1 or 5 degrees and set speed accordingly.*

# *THE* MOST POWERFUL *BUTTONS ON THE BOEING 747-400 !*

## TO/GA BUTTONS




Here is the SIMPLE description without all the details:

***IF A/C ON THE GROUND***; and
***AIRSPEED BELOW 50 KTS***; then

Pushing either TO/GA button causes the engines to start producing LOTS of thrust.

***IF AIRBORNE***; and EITHER
***GLIDE SLOPE IS CAPTURED***, or
***FLAPS ARE SELECTED***; then

Pushing either TO/GA button causes the airplane to pitch up and the throttles to spool up.

***DISCUSSION***

There are two places where TO/GA can get you into trouble:

***FIRST***, on take-off.
If you inadvertently allow the airplane to attain a speed greater than 50 knots before you push the TO/GA button, then the TO/GA function will be DEACTIVATED and the throttles will *NOT MOVE TO TAKE-OFF SETTING*.

***SECOND***, during the approach.
If you should elect to abandon the procedure before the MAP (Missed Approach Point) and depart from the glide-slope; using the TO/GA button will result in a radical application of power and a departure from the LNAV or approach course. These things could cause you to bust an altitude or deviate from the assigned clearance.

*Let's take a moment to talk about this*. Imagine that you are all locked up on an ILS approach, and Say that the tower tells you;
"*Cancel your clearance to land, execute a missed approach. Turn right to 310 degrees, climb and maintain 5000 feet*."
Your instinct may be to push the TO/GA button and get out of there; but if you do you will have a hand full of rocket powered airplane.



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# CAUTION

## ENGINE FAILURE PROBLEM

Without getting bogged down in a complex system description, take it as true that this Boeing 747-400 can fly an extraordinarily accurate and fabulous approach ... even with an engine failed.
It will fly the whole approach, flare, touchdown and land perefctly ... even with an engine shut-down.

Even if you should elect to Go-Around with an engine shut down, depressing the TO/GA button will result in a perfectly executed procedure. The rudder will be operated by the autopilot and keep the airplane in trim and flying perfectly ... Amazing!!!

# BUT ...

When either:

- Above 400 feet, another roll mode is selected (LNAV or HDG SEL, e.g.), or
- At ALT annunciation, or
- The three autopilots revert to single autopilot operation,

THEN:

***THE RUDDER WILL RETURN TO THE TRIMMED POSITION UNLESS THE PILOT EXERTS THE RUDDER PEDAL FORCE REQUIRED TO MAINTAIN THE RUDDER POSITION.***

# OMIGOSH !!!

This means that if you are not holding the rudders with your feet when the autopilot "lets go," the airplane will

***ROLL OVER AND YOU WILL DIE*!!!**

I have actually observed pilots flying this airplane in the approach environment with their feet on the floor. Not a good idea.



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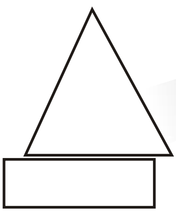
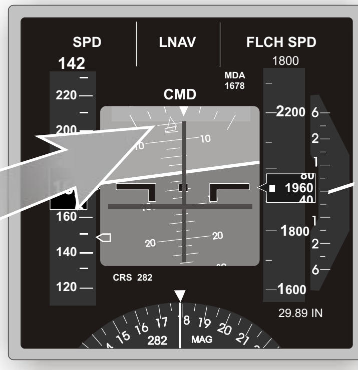
# CAUTION

## ENGINE FAILURE PROBLEM CONTINUED

While it is easy to get really excited about the power and capability of this airplane, even with an engine failure; it must be remembered that it is like any other airplane and only operates at its engineered capabilities when the airplane is in trim.

How do we know if the airplane is in trim: THE SAILBOAT.






The technique is to

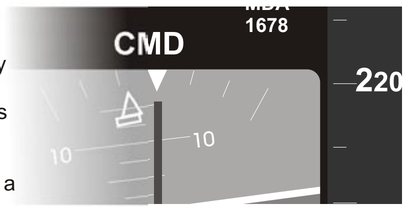
### "*FLY THE SAILBOAT WITH YOUR FEET*."

Now, let me develop this because it is not frequently emphasized in training and can be very important. To keep the airplane in trim, you have to "STEP ON THE SAILBOAT."
This is critical in situations where the airplane is undergoing extreme assymetric thrust.

For example; during take-off with an outboard engine failure, without appropriate rudder input from the pilot, the airplane is virtually uncontrollable. It will take massive amounts of yoke movement and the heading will still be slewing into the bad engine.

Another example would be on spool-up during a manual go-around. There simply MUST BE RUDDER INPUT to control the airplane.

In our example here; we should step on the sailboat; that is put in left rudder. During normal operations, even with protracted turns, it may not be necessary or desireable to push the rudder to keep the rudder/sailboat centered. Indeed, this big hog actually flys a sloppy turn and if you notice, the sailboat will virtually always be 1/3 or so out. I don't think it is a good idea to chase that, but rather just accept the airplanes inherent tendencies.




Example

HOWEVER, during engine out operations ... do not let it get too far out.





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# HOW TO LAND the Boeing 747-400

# FLARE and LANDING

The jet is so big, that the same techniques apply to all landings including crosswind and slippery runway conditions.

DO NOT input sudden, abrupt, or violent movements to the controls UNLESS a EMERGENCY or EXTREMIS situation develops.

***Begin with a stabilized approach on glide path, on speed, and in trim.***

*At about 30 feet above the runway, increase pitch attitude approximately 2 - 3 degrees. This is all you need to slow the rate of descent without setting up a float situation.*

*After the flare is set, retard the throttles slowly to idle, and make small pitch attitude adjustments. Ideally, the touchdown should occur about the same time that the throttles reach the idle position.*

***NOTE**:*
*The nose will have a tendency to pitch nose down as the thrust is reduced. As the engines wind down, you will have to increase the pull force on the yoke to overcome the pitch down tendency and apply the 2 - 3 degree additional pitch up.*

*The airplane should touch down at approximately VREF plus any gust correction.*

***NOTE**:*
**DO NOT TRIM DURING FLARE OR AFTER TOUCHDOWN**.

During the landing, the airplane will have a tendnency to pitch up. It is right here that a potential exists for a tail-strike.
Let's go over the yoke profile again;
*Pull - touchdown - relax some of the pull - allow nose gear to touchdown - relax back pressure.*

*DO NOT hold the jet off, fly it on to the runway. Smoothly roll on the nosegear.*

**LOWER NOSE WHEEL** to the runway ***PROMPTLY***.
From the manual: *"However, applying excessive nose down elevator during landing can result in substantial forward fuselage damage."*

This means that the pilot MUST get the nose gear on the runway as quickly as possible but ***NOT BANG IT DOWN TOO HARD OR IT WILL BEND THE JET***.

**AVOID**
Try not to touchdown with thrust above idle.
*This may establish an airplane pitch-up and increased landing roll.*



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# AFTER TOUCHDOWN and LANDING ROLL PROCEDURE

***SPOILER ALERT***
Both pilots should be alert to the possibility of spoilers NOT deploying. The braking effectiveness is reduced by 60% if the spoilers do not deploy.

In the event the spoiler do not deploy automatically,
**MANUALLY EXTEND**
them immediately. There are no adverse effects if the spoilers are raised while the nosegear is still being lowered to the runway.

***SPOILER DEPLOYMENT IS IMPORTANT !***

***PNF NOTE*** *From theTRAINING MANUAL ...*
*"The position of the spoilers should be announced during the landing phase by the PNF."*

**NOTE:** Reverse thrust and spoiler drag are *MOST EFFECTIVE* during the high speed portion. Deploy spoilers and activate reversers as quickly as possible after landing.

Mr. Boeing recommends: *"Immediate initiation of reverse thrust at touchdown, and FULL REVERSE."*

Start coming out of reverse at about 60 knots so as to be completely in idle reverse by the time the jet slows to taxi speed.

Do not use the NOSE WHEEL STEERING TILLER until reaching taxi speed.

# BRAKES STUFF

**NOTE: "***Autobrakes 2 or greater results in continuous brake application, which can increase carbon brake life."*

The technique for releasing autobrakes is to gradually increase the brake pedal force until the autobrake systems disarms.
A NORMAL braking condition would have the autobrakes releasing about 60 knots.



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# LANDING

## *... including ILS CAT 1 and NON-ILS approaches.*

There is a problem and it is a ***BIG PROBLEM***.
Pilots that have mastered the art of flying the Non-ILS approach are frequently screwing the whole thing up when they get to MDA and decide to make a landing.
There are two problems:

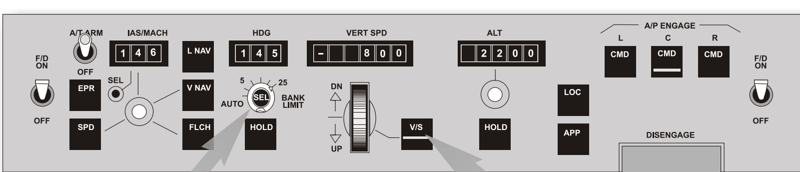
**LINE-UP and DESCENT**.

Any of the suite of NON-ILS approaches available have the inherent problem of line up. The VOR, for example, can have a really big alignment problem and still be within parameters. With an airplane the size of an apartment house, making late course adjustments, even though the jet is very responsive, can be tricky.
With the ADF, even if it is flown EXACTLY PERFECT, is ***NEVER*** going to be aligned with the runway … Period. It is just an inherent part of the ADF system.
So, I said all this to say that alignment ***IS ALWAYS A PROBLEM***.

The decent problem can be directly traced to the habit of the pilot flying turning OFF the auto-pilot TOO SOON. There is no requirement to turn off the auto-pilot at the point where ground contact is made.

**REMEMBER**:
While the MDA is the point where the GO-AROUND/CONTINUE decision must be made, you may still keep the auto-pilot operating to a point 50 feet below the MDA. This 50 extra feet takes several seconds and gives valuable time to continue operating the airplane using the automation. Pilots tend to turn off the autopilot ***AT MDA*** and, thereby, attempt to hand-fly the final descent too early. This is ***NOT GOOD*** !

*The best technique seems to be to remain on instruments almost totally and as those last seconds pass, gradually transition more and more to an outside sight picture until you arrive at the runway with about 80% of your attention outside.*




*The auto-pilot can be used by selecting V/S (vertical speed) and HDG SEL (Heading Select); making small, teensy changes to assist in the line-up process.*
*When the V/S is selected, it will default to the existing rate of descent, and if you have constantly kept the heading buckteeth aligned with the heading boat, the Heading select will default to the airplane heading.*
*Then if everything works out, and you don't drag the trucks in the lights, or land in a skid, or bounce down the runway ….*



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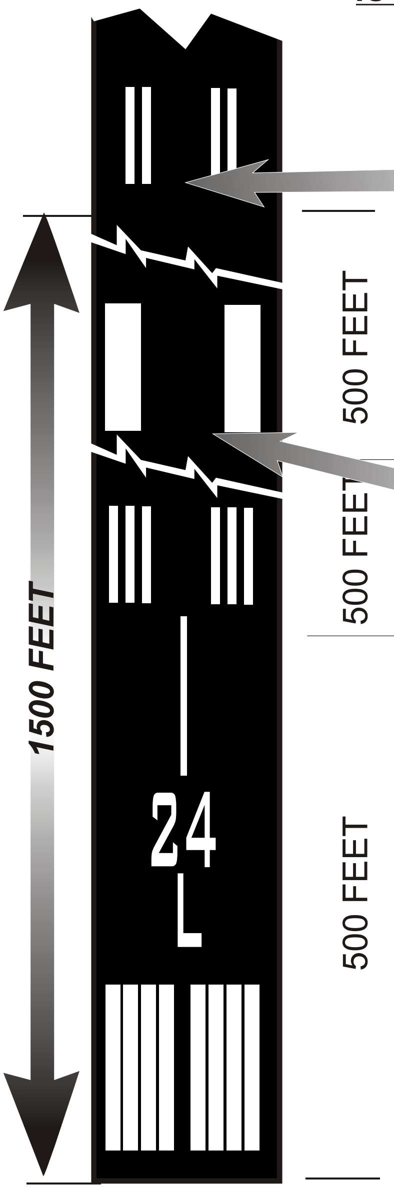
# SIGHT PICTURE

The concern, of course is that you will not drag the trucks in the light array.

***GOING LOW***
***IS NO-NO!***




## PILOT AIM POINT 1500 FEET

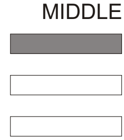
***Pilots should aim for the 1500 FOOT marker.*** Aiming for the 1000 FOOT marker (equivalent to having the 2 bar VASI centered) results in a threshold clearance of 2.6 FEET! YIPE!!!

## TOUCHDOWN TARGET 1000 FEET

If you elect to fly a 2 BAR VASI ... Fly it on the high side and abandon the VASI cues at **300 FEET** above the runway threshold!

## VASI

Normal procedure for a 3 BAR VASI APPROACH is to reference the MIDDLE and the FAR (UPPER) sets of lights to determine the desirable VASI path. Forget the bottom one and fly so that the top light is RED and the middle is WHITE.



While you should be spring loaded to the “don’t get low” profile, on the other hand, you want to get it on. It is an awareness problem. Don’t say I didn’t warn you. Try to land this bird beyond 1000 FEET but don’t float either. Tough assignment.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***Here is the underlined number***

# MINIMUM THRESHOLD CROSSING HEIGHT (TCH)

**DO NOT ATTEMPT AUTOLAND ON ANY RUNWAY THAT HAS A GLIDESLOPE HEIGHT ABOVE THRESHOLD (depicted on approach plate) LESS THAN ...**

# 42 FEET

The key word here is ... **AUTOLAND.**

***BUT ...*** Here are some other landing stuff you will be required to know.

*If the height shown is LESS THAN 42 FEET, then the GLIDESLOPE must be abandoned no later than **200 FEET AFE** and visual cues used to land the jet.*

*The RUNWAY THRESHOLD should disappear under the nose when approximately **75 FEET** is displayed on the Radio Altimeter and "PRIOR" to the 50 foot callout.*

*FYI: Pilots eyes are 45 FEET above the MAIN LANDING GEAR during the landing evolution.*





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# LIMIT CROSS WINDS

| reported BRAKING action | RUNWAY conditions | limit CROSSWIND takeoff | limit CROSSWIND landing |
|---|---|---|---|
| DRY | DRY | 36 | 36 |
| GOOD | WET | 25 | 32 |
| FAIR / MEDIUM | DRY SNOW | 15 | 25 |
| FAIR / MEDIUM to POOR | STANDING WATER / SLUSH | 15 | 20 |
| POOR | ICE - NO MELTING | 15 | 15 |

*It is important to emphasize that these are **GUIDELINES** and **NOT LIMITS**.*

***NOTE 1**: Touchdown with bank angles greater than 6-8 degrees may result in engine nacelle contact with the runway. With crosswinds greater than approximately 16 knots, this bank angle may be exceeded using the sideslip only technique. Use a combination of crab and sideslip to avoid exceeding 8 degrees of bank at touchdown.*

***NOTE 2**: ATIS will include the term "**BRAKING ACTION ADVISORIES ARE IN EFFECT**" when braking action is POOR to NIL.*

***FOM NOTE**: In the FOM there is this note: "**TAXI, TAKEOFF, and LANDING ARE NOT RECOMMENDED WHEN BRAKING ACTION IS REPORTED AS NIL.**"*

## NEVER EXCEED 8° ROLL ON LANDING



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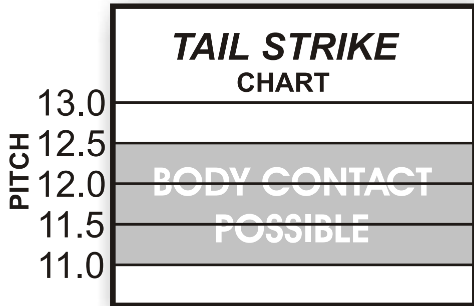
# PITCH and ROLL limits




*Applies to all weights and speeds.*

## MAX PITCH 11°

## MAX ROLL 6°

*Depends on the amount of pitch involved. It can vary from 6 degrees to 8 degrees … SO, we will assume the maximum roll allowed is 6 degrees and that will cover you in all situations.*

**The part of the jet that contacts the earth is the outboard engine nacelle.**

*When you are doing your walk-around, it is a good idea that you check that area on the outboard engines for ground contact. It is possible that the crew could be unaware that they have "drug a pod."*





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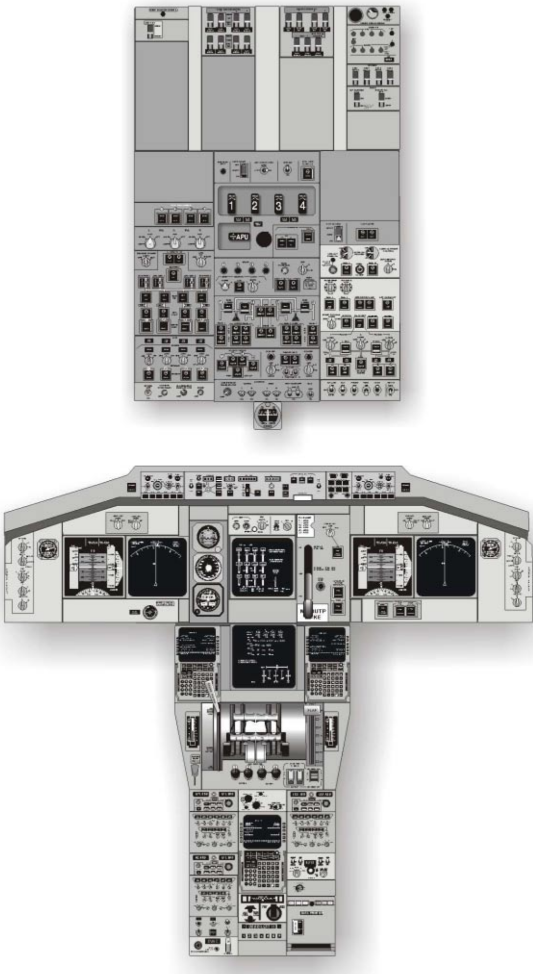
# TAXI-IN



# CAPTAIN and FIRST OFFICER PROCEDURES



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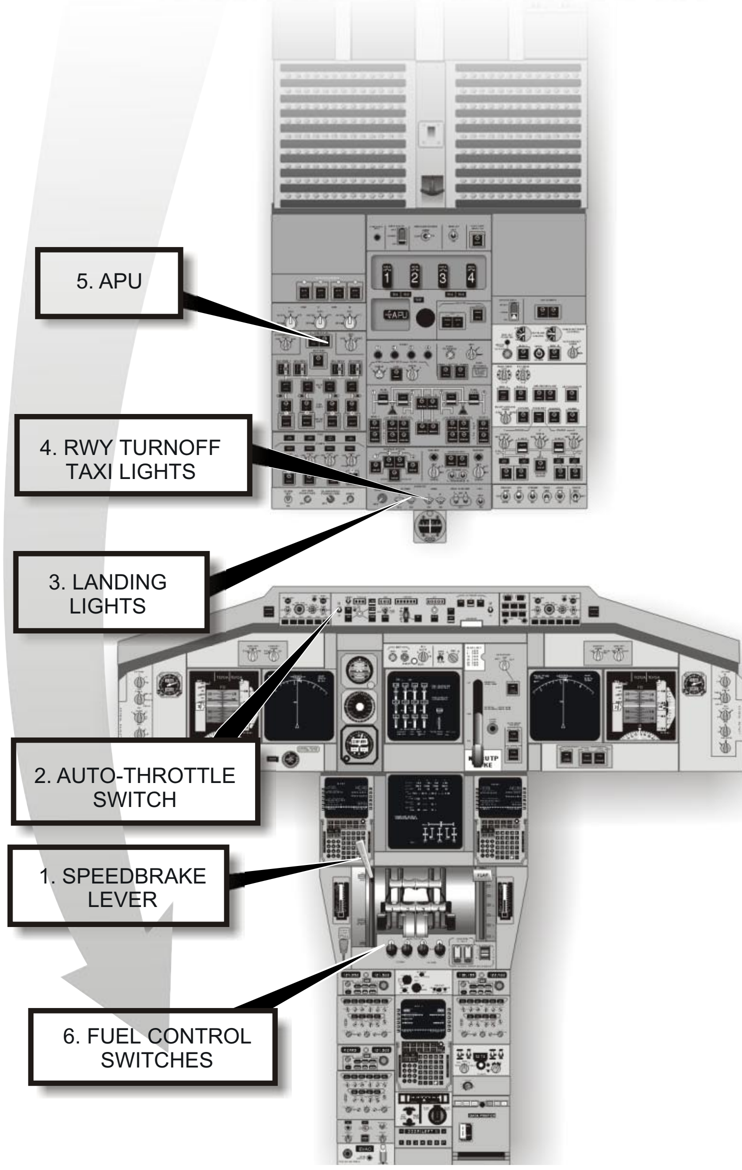
# CAPTAIN TAXI-IN STUFF





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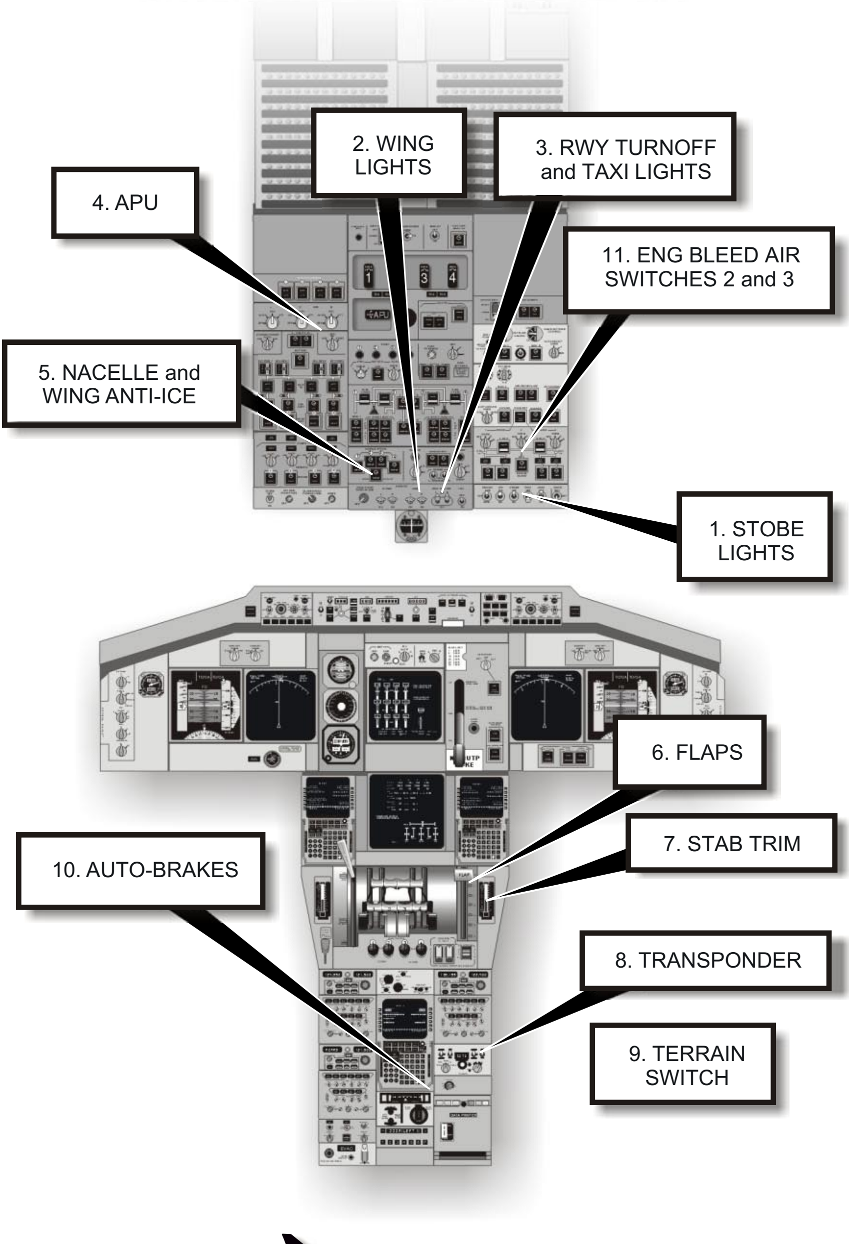
# FIRST OFFICER TAXI-IN STUFF



# SOMETHING IMPORTANT THAT SOME PILOTS DON'T KNOW !

## IF WEATHER GOES BELOW LANDING MINIMUMS DURING THE APPROACH

NON-PRECISION and ILS CAT I/CAT II: If you had adequate minimums to commence the approach at FAF (Final Approach Fix) and it subsequently goes below minimums during the approach, you are OK to continue the approach to MDA or DH; and if you visually acquire the runway (and meet all the other criteria for making a safe landing), you may land.

CAT III: ...a little Different. Once you have commenced the approach with acceptable weather at FAF, and the RVR subsequently goes below minimums, You may continue to AH/DH. ***If weather at AH/DH is not above landing RVR minimums, you must Go-Around; EVEN IF YOU SEE THE RUNWAY. To put it another way, you MUST have landing minimums at AH/DA to continue.***

**THIS IS THE CRUX OF THE PROBLEM!**

## FAQ (Frequently asked question)

If you are flying a CAT III approach and you arrive at CAT II minimums with the runway environment in sight BUT the RVR below CAT III minimums. That is, you started the approach with CAT III minima but you arrive at the DH with CAT II landing criteria satisfied. MAY YOU LAND ?

*The company advocates the "pre-briefed CAT II" idea for every CAT III; That is to say, in your CAT III AUTOLAND approach brief you include the statement, "If the AIRCRAFT SYSTEMS STATUS CHANGES or AUTOLAND ANNUNCIATION goes to **LAND 2**, we will revert to CAT II criteria for landing at AH/DA … That is, **SEE TO LAND**."*

**MIKE RAY's INTERPRETATION**:
*If you arrive at the CAT III DA and the RUNWAY RVR is below CAT III MINIMA ... If you see the runway environment, you MAY LAND. You are essentially invoking the CAT II rule.*

*When I was a young pilot, (in the really old days) It always seemed to me that memorizing the emergency checklists was a pretty stupid concept. In the first place, even when things were going good, I couldn't remember the 34 steps to the DC-6 engine fire procedure ... and when everything started going bonkers and we were having a real emergency, I would have a brain dump and generally couldn't even remember my own name. So, one day, some really smart person (probably another old pilot) decided to create a checklist for emergency procedures. The smartest people on earth are Albert Einstein, Isaac Newton, and this guy (probably retired).*

*So, here is his creation ... the Quick Reference Checklist or as some pilots like to refer to it: **the QRC, QRH, QUICKLIST, etc.** Each airline refuses to use the others designation. We will use QRC, simply because I get to decide which one to use.*

# QUICK REFERENCE CHECKLIST

# QRC

## OR

## WHAT USED TO BE CALLED

# EMERGENCIES

What is expected is:

1. You know which event IS a ***QRC*** event, and
2. If there are ***MEMORY ITEMS*** and what they are.

There are 15 QRC events and 5 of them have memory items:

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# QRC with MEMORY ITEMS

You will be expected to know 3 things about the QRC:

1. The First three items of QRC which are:

   ***FLY THE AIRPLANE***
   ***SILENCE THE WARNING***
   ***CONFIRM THE EMERGENCY***

2. Which "***15 EMERGENCIES***" are on the QRC Checklist

3. What "***MEMORY ITEMS***" (if any) are on the QRC emergency checklist for each situation.

## The 15 QRC EMERGENCIES

the 5 with memory items

***Abnormal Engine Start****
**Starter Cutout**
**Multiple Engine Flameout or Stall**
**High Engine EGT/Compressor Stall**
**Fire Eng/Severe Damage/separation**
**Fire APU**
**Fire Cargo FWD (AFT)**
**Galley Fire/Smoke**
**Fire Wheel Well**
***Smoke/Fumes/Odor****

**IAS Disagree/Airspeed/Mach Unreliable**
***Stab Trim Unschd****
***Cabin Altitude/Rapid Decompression****
**Emergency Descent**
***Evacuation****



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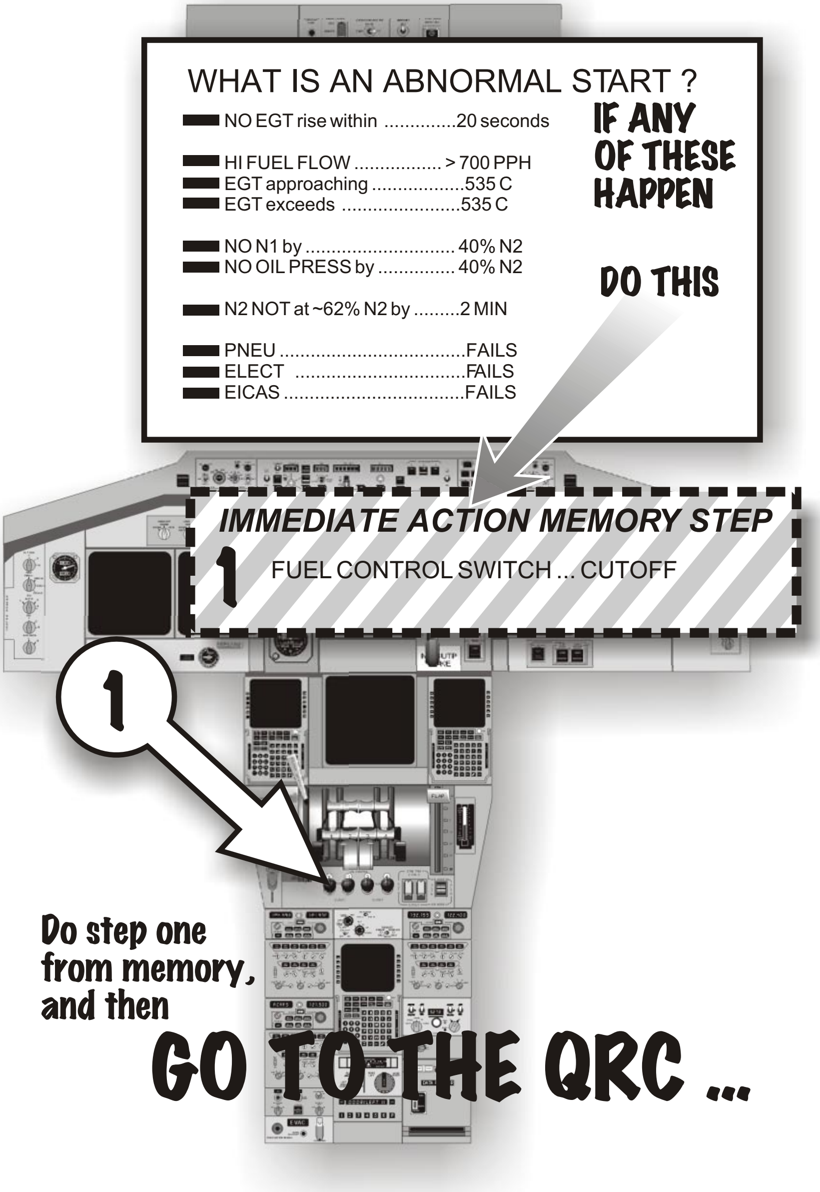
# ABNORMAL ENGINE START

## THIS PROCEDURE HAS IMMEDIATE ACTION STEPS ...



### WHAT IS AN ABNORMAL START ?

- NO EGT rise within ..............20 seconds
- HI FUEL FLOW ................. > 700 PPH
- EGT approaching ..................535 C
- EGT exceeds .......................535 C
- NO N1 by ............................. 40% N2
- NO OIL PRESS by ............... 40% N2
- N2 NOT at ~62% N2 by .........2 MIN
- PNEU ...................................FAILS
- ELECT ................................FAILS
- EICAS ..................................FAILS

IF ANY OF THESE HAPPEN

DO THIS

**IMMEDIATE ACTION MEMORY STEP**

1 FUEL CONTROL SWITCH ... CUTOFF

1

Do step one from memory, and then

## GO TO THE QRC ...





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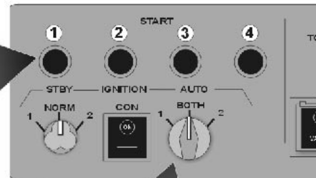
# REFERENCE ACTION SEZ ...

VERIFY ENGINE START SWITCH ILLUMINATED




## IF:

***IF Start switch is NOT ILLUMINATED and N2 is BELOW 15%*** ... THEN:

***PULL*** ENGINE START SWITCH

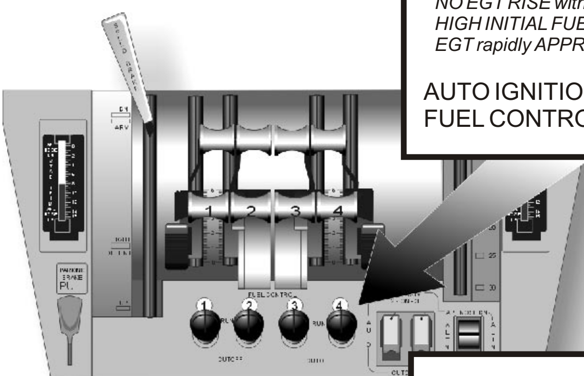
*MOTOR ENGINE for **30 SECONDS** or more*

## HOWEVER:

***IF PROBLEM WAS***:

*NO EGT RISE within 20 SECs or*
*HIGH INITIAL FUEL FLOW or*
*EGT rapidly APPROACHING 535 C*

AUTO IGNITION SWITCH ..... BOTH
FUEL CONTROL SWITCH .... RUN

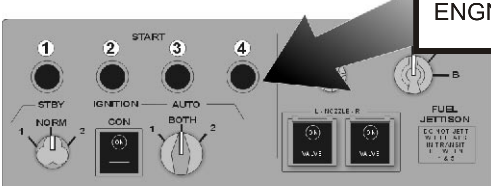



## BUT IF:

***IF PROBLEM WAS***:

*NEITHER OF THOSE TWO or*
*RE-OCCURS ..... then:*

ENGNE START SWITCH ....PUSH




## and when all else fails ... CALL SAM (maintenance)





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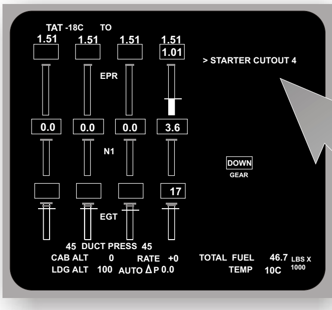
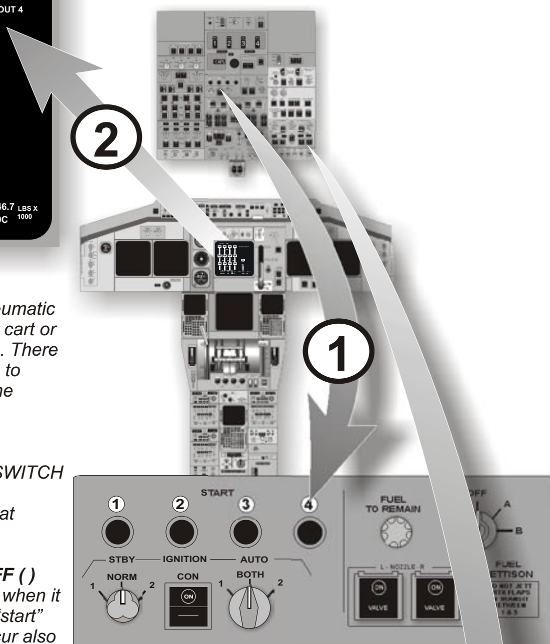
# STARTER CUTOUT ( )

## Displayed on the upper EICAS
## THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.




**_WHAT IS THE PROBLEM?_**
*The engines are started by using pneumatic air, usually from the APU, from an air cart or another running engine (BLEED AIR). There are two (2) separate valves that have to open for the pneumatic air to reach the starter motor:*
 ***The START VALVE,and***
 ***The ENGINE BLEED AIR VALVE***
*They BOTH open when the START SWITCH is PULLED. During start the switch is "normally" held open by a solenoid that automatically closes at 50% N2.*

*The EICAS MSG:* ***STARTER CUTOFF ( )*** *means the starter valve did not close when it was supposed to. This is normally a "start" problem on the ground, but could occur also in the air.*

*IMHO discussion: I personally can't believe the light would just come on by itself for no reason, so I am interpreting the procedure to mean that when you are doing an in-flight re-start. The question is, why would you be doing an in-flight re-start unless you have something else going on.*

## *THE QRC sez:*

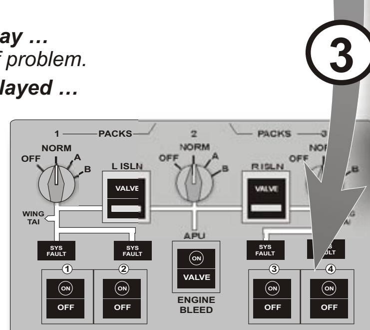
**1. ENGINE START SWITCH ........ PUSH IN**

**2. CHECK EICAS**

***If STARTER CUTOUT message goes away …***
*Checklist is considered complete … end of problem.*

***If STARTER CUTOUT message still displayed …***

***3. ENGINE BLEED AIR SWITCH ............ OFF***
*Push the switch to select the OFF position, check the light in the switch.*




## *THE REFERENCE sez:*

***ON GROUND:***
*Shut down the engine. Place fuel selector to the CUTOFF position.*
***IN AIR:***
*AVOID icing. The engine will* ***NOT*** *have any nacelle anti-ice.*





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# MULTIPLE ENGINE FLAMEOUT or STALL ( )

## THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.

***DISCUSSION:***
*(1) There actually was a -400 that lost **ALL** it's engines while transiting a volcanic ash cloud on descent into Alaska. They got 'em started again (Thank God!) and were able to make an emergency landing.*
*(2) In another incident, a -400 crew lost an engine during the enroute phase. The airplane was pretty heavy and was right at that point where it was struggling to maintain altitude. They made the airplane stay at altitude. They did not initiate a descent and eventually the airspeed decreased and the monster-jet stalled. They did a 22,000 foot high-dive. Eventually they entered denser air and were able to recover.*

***ALWAYS STEP NUMBER ONE:***

**PF DOES ONE THING**

# FLY THE AIRPLANE !!!

***THE DISCUSSION CONTINUES:***
*Assuming the worse case (**LOSS OF ALL ENGINES**); when the airplane is without engine generators (and this assumes that the "windmilling" effect doesn't drive the generators sufficiently) there will be only battery power available.*
*This means there will be:*

*NO EICAS for engine EGT indications, and*
*ENGINE IGNITION*
*will be supplied from the MAIN STANDBY BUS*
*when the FUEL CONTROL switches are in RUN, and*
*NO AUTOPILOTs, and*
*AUTO-THROTTLES, and*
*BUNCHES OF OTHER STUFF GOES AWAY.*

*In other words, as the motors wind down and stuff starts shutting down, it is going to be confusing and virtually impossible to determine the nature of the problem. It will look a lot like a total electrical power failure of some sort.*

**200+ KTS**

REMEMBER: ***FLY THE AIRPLANE !!***

*If some engines are working and the autopilot is available, use it, If not*
***Grab the yoke, get your feet on the rudders and start looking at the standby instruments, because "YOU GOT IT."***

*RVSM - Revised Vertical Separation Minima means that coming right at you, a mere 1000 feet below, is a string of other airplanes right on the magenta line. Also, remember that your airspeed is probably decreasing and a stall is imminent. So, consider:*

1. ***GET OFF THE AIRWAYS, and***
2. ***START YOUR DRIFT-DOWN.***



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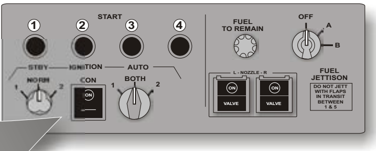
# MULTIPLE ENGINE FLAMEOUT or STALL ( ) continued

### THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.

## THE QRC sez:

**1 CONTINUOUS IGNITION SWITCH ........ ON**

*DEPRESS the light switch,*
*OBSERVE the ON light illuminates.*

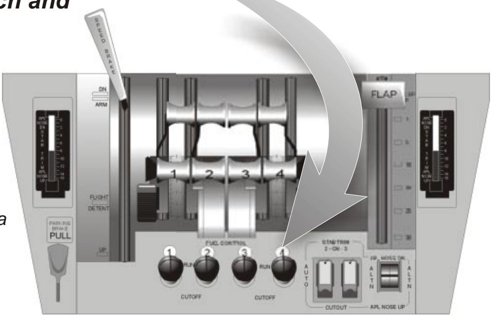



**2 FUEL CONTROL SWITCH(es) ........ *CONFIRM* engine with PF, then CUTOFF**

***Keep your fingers on the switch and When EGT starts to decrease:***

*If the EICAS' are blank, use this technique. After a suitable delay, ASSUME that the temperature is decreasing and proceed to the next step.*

*The idea is to shut down the fuel control lever for all the engines that are flamed out, even if it is all four. Don't do one at a time. We are initially trying to start ANY engine, in the event that all four are flamed-out.*




**3 FUEL CONTROL SWITCH(es) ........ RUN**

***NOTE**: If unable to get engines running, go to the:*

## GO TO THE REFERENCE STEPS:

## REMINDER
## PF ONLY FLIES THE AIRPLANE !!!

***NOTE**:*
*If you were thinking about starting the APU ...*
*here is some things to consider.*

***APU STUFF**:*
*The APU **CANNOT** be started in flight.*
*If already started, it can run in the air up to 20,000 feet.*
*In this case, BLEED AIR can be used to power 1 (ONE) pack up to 15,000 feet.*
*The APU **CANNOT** supply electrical power IF the airplane thinks it is airborne.*

*So much for the APU idea.*

***MULTIPLE ENGINE FLAMEOUT or STALL ( ) continued on next page***





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# MULTIPLE ENGINE FLAMEOUT or STALL ( ) continued

## REFERENCE STEPS


**4** **AUTO IGNITION SELECTOR ........ BOTH**

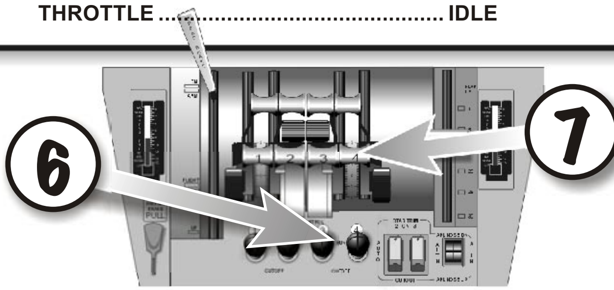
*IF AIRSPEED IS*
*LESS THAN 200 KTS:*

**5** **ENGINE START SWITCH ................ PULL**

***IF ENGINE(S) FAILS TO RESTART:***
***Restart is indicated by EGT RISE within 30 seconds:***

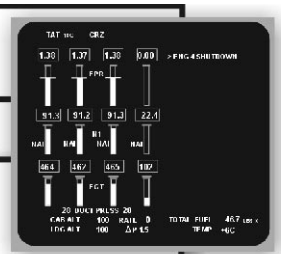
**6** **FUEL CONTROL SWITCH ................ CUTOFF**

**7** **THROTTLE ............................................. IDLE**




### *IF X-BLD is NOT displayed on the N2 Indicator:*

**8a** **FUEL CONTROL SWITCH ................ RUN**
*Monitor EGT during engine start.*




### *IF X-BLD IS displayed on the N2 Indicator:*

**8b** **ENGINE START SWITCH ................ PULL**
*Monitor EGT during engine start.*
**FUEL CONTROL SWITCH ................ RUN**
***POSITION TO RUN when N2 exceeds FUEL-ON indicator.***
*Monitor EGT during engine start.*

### *IF ANY ENGINE FAILS RESTART ATTEMPTS:*

**DO THE ENGINE ( ) FAIL IRREGULAR PROCEDURE**



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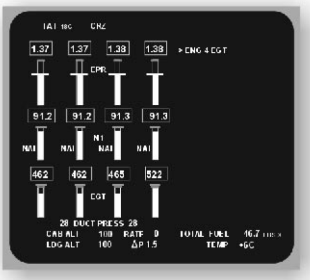
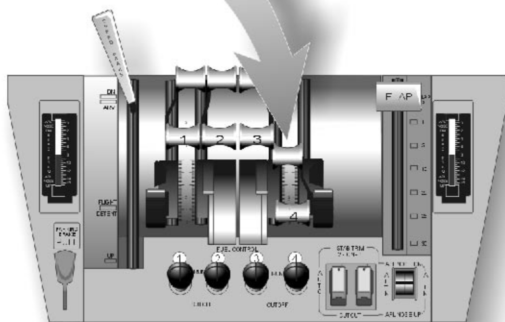
# HIGH ENGINE EGT / COMPRESSOR STALL

## *THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.*
## *THE QRC sez:*

**1 THROTTLE ........... CONFIRM, IDLE**

*The procedure calls for placing the throttle lever* ***ALL THE WAY TO IDLE.***




***<u>If the engine indications are stabilized or EGT decreases.</u>***

**2 THROTTLE .................................. ADVANCE**

*Advance the throttle slowly and observe that RPM and EGT follow throttle movement. Note that under certain circumstances, rpm may increase very slowly.*

**3 ENGINE OPERATION .................................. MONITOR**

*Go ahead and operate engine normally or at a reduced thrust level where the indications are stable and EGT is within limits.*

***<u>If the engine indications are abnormal or if EGT continues to increase or exceeds the EGT limit:</u>***

**625°C**

**4 FUEL CONTROL SWITCH .................................. CONFIRM, CUTOFF**

***<u>If there is no apparent damage to the engine:</u>***

**5 ENG INFLIGHT START IRREG PROCEDURE (7-31) ...............ACCOMPLISH**

*NOTE:*
*If you exceeded the EGT limit, it doesn't preclude you from attempting a restart. However, obviously, the engine should continue to be closely monitored.*

**IF ENG DOES NOT RESTART:**

**6 TRANSPONDER .......................... TA ONLY.**

*NOTE:*
*Taking the Transponder out of RA and placing it in TA prevents climb commands that would exceed the performance capability.*

**7** ***NOTE****: Complete and submit the "****FLAMEOUT / COMPRESSOR STALL / THRUST LOSS*** *report.*
*Complete and submit a "****CAPTAIN'S REPORT****."*





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# ENGINE FIRE ( ) or SEVERE DAMAGE or SEPARATION

## PF: FLY THE AIRPLANE

*MASTER WARNING LIGHTS and BELL, ENGINE FIRE SHUTOFF HANDLE, and FUEL CONTROL SWITCH*

***THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.***

*Depressing the warning light on the glare shield will extinguish the bell and reset the warning system.*

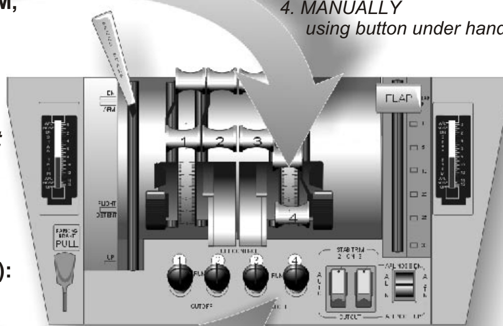
*WHAT RELEASES the handle:*
*1. FIRE WARNING*
*2. FUEL CONTROL in CUTOFF*
*3. FIRE/OVHT test switch*
*4. MANUALLY*
*using button under handle*

### *THE QRC sez:*

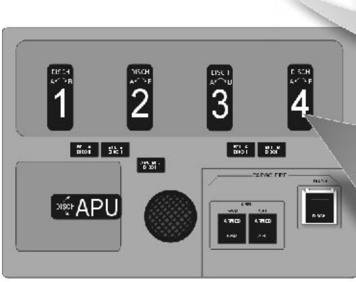
**1 THROTTLE ........... CONFIRM,**
**And then pull to IDLE**

*CONFIRM-CONFIRM-CONFIRM.*

***SMOOTHLY retard the throttle so that the auto-pilot is able to control any yaw that may be induced.***

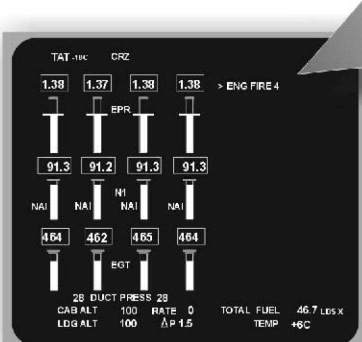



**2 FUEL CONTROL SWITCH(es):**
**........ CONFIRM, and then**
**Pull up and back to CUTOFF**




**3 ENGINE FIRE HANDLE:**
**..... CONFIRM, PULL**

*Pulling the handle CLOSES:*
*FUEL,*
*AIR ,*
*ELECTRICAL,*
*HYDRAULICS,*
*and ARMS*
*EXTINGUISHER*




**IF FIRE MESSAGE DISPLAYED:**
**FIRE HANDLE..... ROTATE**

***GO TO THE REFERENCE STEPS:***





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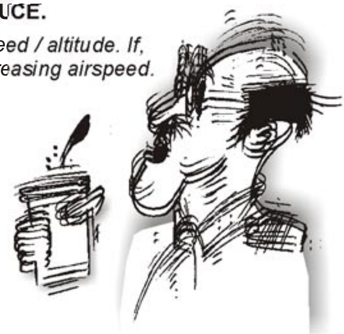
# continuing ENGINE FIRE ( ) or SEVERE DAMAGE or SEPARATION

## HERE ARE THE REFERENCE STEPS:

## IF "HIGH" AIRFRAME VIBRATION OCCURS:

**6** **AIRSPEED and/or ALTITUDE .................. REDUCE.**

*Vibration may be reduced by changing airspeed / altitude. If, however, reducing didn't work ... consider increasing airspeed.*



***NOTE*:**

*It may seem that the "**SEVERE**" vibration is about to shake the airplane to pieces, but the Boeing guys tell us that it is "**UNLIKELY**" that the vibration will damage the airplane or critical systems.*
*Of course, they were sitting at their engineer's desk when they made that statement.*

**7** **TRANSPONDER .................. TA ONLY.**

***DISCUSSION*:**

*The idea here is to avoid some spurious RA. I **DISAGREE** with that for two reasons.*

***FIRST**: It is common for the 747-400 to be cruising at it's highest performance altitude commensurate with fuel considerations. This would preclude any "CLIMB-CLIMB" RAs from being responded to anyway. Further, if the airplane is cruising in RSVM, it becomes **CRITICAL** to avoid contact with another airplane as the driftdown starts.*
***SECOND**: The simulator seldom takes into account the fact that an airplane in distress will most likely be transiting both tracks and altitudes assigned to other airplanes. In reality, if in MNPS, or NCA, or other Oceanic airspace there will be no ATC radar support and it is up to the pilots of the airplane in distress to avoid other airplanes.*
*My argument is for the pilots to assess the situation BEFORE shutting off the RA on the transponder.*

**8** **IF FIRE CONTINUES:**

## LAND AT NEAREST SUITABLE AIRPORT !

***DUH !** I guess they put that in there for brain surgeons who are disguised as pilots.*

**9** **THREE/TWO ENGINE**
**APPROACH AND LANDING CHECKLIST (Flight Handbook 7-92)**
**............ COMPLETE.**

*... and, of course, the MOST IMPORTANT step in this procedure:*

**10** **Complete a FLAMEOUT/COMPRESSOR STALL/THRUST LOSS REPORT.**



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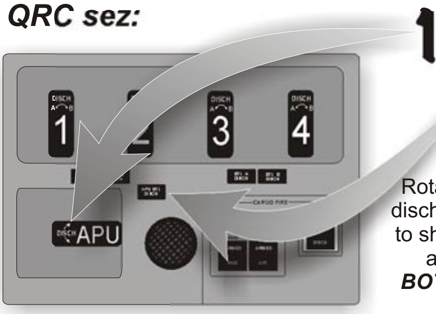
# FIRE APU

## *THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.*

## *THE QRC sez:*




**1 APU FIRE HANDLE:**
**..... PULL and ROTATE**

**2 VERIFY:**
**APU BOTTLE DISCHARGE LIGHT is ON.**

**NOTE**:
Rotating the handle the other way to discharge the "other" bottle just serves to show that you don't know what you are doing. There is ***ONLY ONE BOTTLE*** for the APU(s). Turning the handle either way works.

**DISCUSSION**:
I cannot think of a reason why the APU(s) would ever be operating with the airplane airborne. The APU CANNOT be started in the air and CANNOT supply electrical energy once airborne. if the APU was left running at take-off, it can only supply enough air to operate ONE PACK up to 15,000 feet.

So ... the situation addressed in this procedure seemingly would apply to ***ON THE GROUND operations ONLY!***

## *THEREFORE ... I SUGGEST:*

**3 GET THE PASSENGERS OFF THE AIRPLANE.**
Coordination with the Passenger Agent and/or the Flight Attendants and use the Jetway if available. Use the slides if appropriate, but stop the loading process and minimize the exposure of the passengers to a potential fire on board the aIrplane.

**4 NOTIFY THE FIRE FIGHTERS**
Use the radios to notify the Tower or the Company so that they can coordinate with the Fire Department.

*PULLING THE APU FIRE HANDLE does*:

**SHUTS DOWN APU, bypassing the 60 second cool-down.**

**CLOSES APU FUEL VALVE.**

**CLOSES APU BLEED AIR VALVE**

**TRIPS APU GEN FIELD AND BREAKER**

**ARMS APU FIRE EXTINGUISHER**

**SILENCES HORN in WHEEL WELL.**





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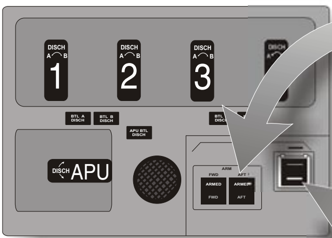
# FIRE CARGO FORWARD (AFT)

## THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.




**1** CARGO FIRE FORWARD/ AFT ARM SWITCH:.......... PUSH

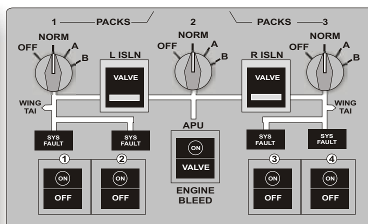
**2** CARGO FIRE DISCHARGE SWITCH: ........... PUSH

***NOTE:***
***The cargo fire warning lights will remain on until the fire is extinguished and the smoke has dissipated.***

## THE REFERENCE ACTION ITEMS:

**3** PACK CONTROL SELECTORS: ........... PACK 1 or PACK 2 OFF.

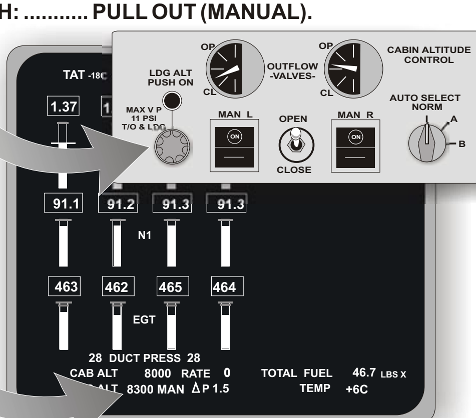
**DISCUSSION:**
*The idea is to shut off all but 1 pack to reduce airflow to the cargo compartments. Here is a* ***747-400 MYSTERY****.*
***When you have all three packs running, and you shut down either Pack #1 or Pack #2, ... Pack # 3 will shut down automatically****.*




**4** LANDING ALTITUDE SWITCH: ........... PULL OUT (MANUAL).

**5** LANDING ALTITUDE CONTROL: ........... SET 8000-8500 feet.

*When you pull out the switch, it activates the manual mode. You twist it to set the landing altitude which is shown on the EICAS followed by a "****MAN****."*




## MORE REFERENCE ACTION ITEMS:





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# FIRE CARGO FORWARD (AFT) cont.

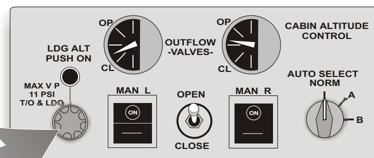
# LAND ASAP

## LAND AT NEAREST SUITABLE AIRPORT:

***NOTE:***
*The decision as to where to park the airplane is a difficult one and I SUGGEST STRONGLY that you get on the radio and get DISPATCH involved as early as possible. They can do wonderful things for you. ATC is good ... but DISPATCH is WONDERFUL !*

## PRIOR TO STARTING DESCENT:

**6** **LANDING ALTITUDE SWITCH: ........... PUSH IN (AUTO).**




**DISCUSSION:**
In auto, while in the descent, this will maintain a differential pressure for equipment cooling and fire fighting agent concentration.

## ON THE GROUND:

Next time you are out over the Pacific Ocean and ***R-E-A-L-L-Y*** bored, take the logbook with the metal cover and turn to that little red book in the back.

> ***ICAO publication DOC 9481-AN/928 "Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods"***
> *(That red booklet stuck in the back of the Logbook)*

### IT WILL TELL YOU:

FIRST: If you have a cargo compartment fire, the Fire personnel are trained to ask for the Hazardous Materials Report BEFORE they open the compartment and fight the fire.

SECOND: The Firefighters expect you to evacuate the aircraft BEFORE they open the Compartment.

> ***WARNING**: Even though all indications of fire may be negative and the fire may actually be out, they are concerned that the sudden influx of fresh air may ignite residual combustible material and cause the airplane to blow up.*

So, (and these are my interpretations) Keep these things in mind during your checkride:

1. Have hazardous materials report in hand when you evacuate.
2. Park airplane at a "remote safe location," **NOT AT THE GATE**!
3. ***Always*** Evacuate the airplane even though the fire seems out.
4. Anticipate fire/explosion after compartment is opened;
   i.e. get everybody away from the airplane .



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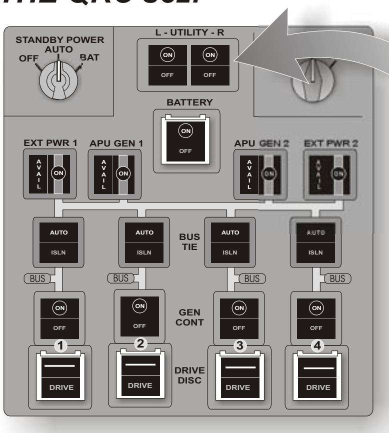
# GALLEY FIRE/SMOKE

## *THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.*

## *THE QRC sez:*




**1** **UTILITY BUS SWITCHES:**
**........ OFF**

## *HERE ARE THE REFERENCE ACTIONS:*

### *IF THE FIRE/SMOKE IS EXTINGUISHED:*

**2** **UTILITY BUS SWITCHES (one at a time): ...................... ON**

**DISCUSSION**:

*Right here is a step that I would be only marginally motivated to perform. Depending on the location of the airplane and the distance to the closest suitable airport, I may consider cancelling the inflight service and giving away food vouchers. Unless I can* ***POSITIVELY*** *determine the location and cause of the fire, I cannot think of any reason to troubleshoot a galley fire just so I can restore electrical power to the cabin for food services.*

### *IF THE FIRE/SMOKE CONDITION RECURS AND IT CAN BE DETERMINED WHICH UTILITY BUS IS THE BAD ONE:*

**3** **ASSOCIATED UTILITY BUS SWITCHES: ...................... LEAVE OFF.**

### *IF THE FIRE/SMOKE BECOMES UNCONTROLLABLE.*

**4** **VACATE THE AREA AND *CONSIDER* AN IMMEDIATE LANDING OR DITCHING.**

It is my opinion that this situation warrants ***SERIOUS*** treatment. I consider troubleshooting which bus is the cause is ***EXCESSIVE***. While proceeding to destination may certainly be an option, but if the fire/smoke is significant enough to warrant an emergency response, I would at least talk with dispatch and SAMC and consider a divert to intermediate airport.



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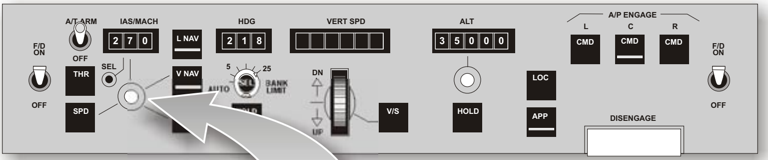
# FIRE WHEEL WELL

## *THERE ARE NO IMMEDIATE ACTION STEPS - GO TO QRC.*

***THIS IS AN AUTOPILOT/AUTO THROTTLE ON PROCEDURE.***

1 **PUSH ON THE MASTER WARNING LIGHTS.**
*This will silence the warnings and re-set the warning system.*

2 **DECLARE AN EMERGENCY AS SOON AS ABLE.**
*This will allow deviation from airspeed requirements from ATC or below 10,000 feet.*




3 **SLOW TO 270 KIAS/.82 M**
*STEP 1: PUSH the airspeed control knob on the MCP.*
*STEP 2: SET 270 knots/.82 Mach*

4 **LANDING GEAR ......................... DOWN**

Slow the jet expeditiously but smoothly.

I suggest this thought process:
***1. SET 270 on MCP SPEED WINDOW***
***2. SPEED BRAKE TO FLIGHT DETENT***
***3. At 270 KTS, GEAR DOWN***
***4. SPEED BRAKE UP***
***5. confirm that THROTTLES ADJUST POWER.***

## *HERE ARE THE REFERENCE ACTIONS:*

5 ***LAND AT THE NEAREST SUITABLE AIRPORT:***

**CAUTION***:*
*1. LEAVE THE LANDING GEAR DOWN FOR A MINIMUM OF 20 MINUTES AFTER THE EICAS GOES OUT.*

*2. CONSIDER RETRACTING THE GEAR ONLY IF NECESSARY TO REACH THE NEAREST SUITABLE AIRPORT.*

*3. IF A GO-AROUND OCCURS, CONSIDER LEAVING THE GEAR DOWN TO PREVENT FURTHER DAMAGE.*

*4. TERMINATION OF THE WHEEL WELL FIRE WARNING DOES NOT NECESSARILY MEAN THAT THE FIRE IS OUT.*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# SMOKE/FUMES/ODOR

## THERE ARE 2 IMMEDIATE ACTION STEPS

1 OXYGEN MASK and REGULATORS .......................... ON, 100%.

2 CREW COMMUNICATIONS ................................ ESTABLISH.

3 SMOKE GOGGLES (IF REQUIRED) .......................... ON.

**WARNING**:
*Leave cockpit door*
***CLOSED***
*unless required by procedure or greater emergency.*

## HERE ARE THE REFERENCE ACTIONS:

4 SMOKE/FUMES/ODOR source ........................ DETERMINE.

## *If smoke source CAN be determined:*

5 ACCOMPLISH appropriate IRREGULAR PROCEDURE

Air Conditioning Smoke (7-1)
Electrical Smoke or Fire (7-24)
Lavatory Smoke or Fire (7-72)
Smoke/Fumes/Odor Removal (7-87)

***NOTE***:
*The procedure referred to as "**SMOKE/FUMES/ODOR**" in the QRC is different from "S**MOKE/FUMES/ODOR REMOVAL**" in the IRREGULARS.*

## *If smoke source CANNOT be determined:*

6 ***LAND AT THE NEAREST SUITABLE AIRPORT:***





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# IAS DISAGREE/ AIRSPEED/MACH UNRELIABLE

## *THERE ARE NO IMMEDIATE ACTION STEPS ... GO TO QRC.*

**DISCUSSION**:

There are two venues where this is a problem:

FIRST, right after take-off, and
SECOND, Icing or failure in the flight phase.

The take-off phase has caused several airplanes to crash right after takeoff. The cause is associated with the pitot static system being blocked or taped shut. This would occur during painting or washing when they tape the outlets shut. it is particularly difficult to see on the walkaround if the tape is painted over.

The airborne situation is more difficult to notice. It is insidious and generally associated with icing.

***TECHNIQUE***:

CROSSCHECK between Captain and First Officers and Standby instruments.
Use the three to resolve ambiguity about which instruments are unreliable.

1 **DISENGAGE AUTOPILOT**
Use the YOKE SWITCH

2 **AUTOTHROTTLES OFF**
Use the MCP panel OFF switch.

3 **FLIGHT DIRECTORS OFF**
Use the MCP panel OFF switch.

4 **ATTITUDE and THRUST adjust.**
Set the power using the chart on page 8-12.
It is called a PITCH-EPR chart.

***SINCE the airspeed indications are unreliable ...***

5 ***LAND AT THE NEAREST SUITABLE AIRPORT:***

Regarding the concept of SUITABLE AIRPORT. With the situation without airspeed, it might be useful to select a VMC location with a LONG RUNWAY, etc.



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# STAB TRIM UNSCHD

Uncommanded stabilizer motion is detected and automatic cutout does not occur.

## *THERE IS AN IMMEDIATE ACTION STEP*

**1** **CONTROL COLUMN ................ MOVE TO OPPOSE TRIM**

SCENARIO: You are cruizin' along at altitude and you perceive that the trim wheel is turning and the trim is running away. You also see that the ***YOKE IS MOVING TOWARDS YOUR LAP***.

Question: QUICK, which way do you move the yoke to "oppose the trim."

Here's the problem. The intuitive reflex is to grab the yoke and "OPPOSE" it's ***motion***, that is to push ***IT*** towards the instrument panel.

"*Is that your final answer?*"

Let's think about this for a moment. The autopilot is tied to the yoke, that is, when the autopilot commands a turn or climb, the yoke moves in response to the autopilot input. So, in this case, with the trim motor running away, the autopilot (controls) are moving to oppose the pressures imposed by the trim.

So, here is the REAL answer, ***YOU MAY HAVE TO MOVE THE YOKE IN THE SAME DIRECTION IT WAS MOVING IN ORDER TO "HELP" THE AUTOPILOT OPPOSE THE TRIM MOVEMENT***.

The problem is, by the time you figure out that you have been pushing the yoke the wrong way, the airplane may be outside of the flight envelope where recovery is possible.

**2** **STAB TRIM SWITCHES ................ CUTOUT**

## *HERE ARE THE REFERENCE ITEMS*

**3** **AUTOPILOT ....... DISENGAGE**

It is UNDER STATEMENT to say that there will be "HIGHER THAN NORMAL" column forces when the autopilot is disengaged.Particularly if you were pushing in the wrong direction, you will have a handful of yoke pressure.

**4** **STAB TRIM SWITCHES (one at a time) ........ AUTO**

Check for correct stabilizer movement.
Trim is available after a short period.
Trim rate is one half normal rate.

**5** **IF UNSKED STAB TRIM reoccurs ........ CUTOUT**

Repeat procedure on other switch.

## ***<u>IF unable to re-establish stabilizer trim:</u>***

Treat the situation as a JAMMED STABILIZER LANDING AND IRREGULAR PROCEDURE (7-70) situation.





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# CABIN ALTITUDE/ RAPID DEPRESSURIZATION

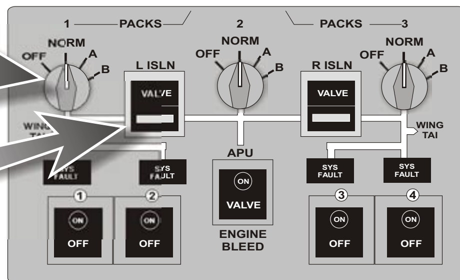
### *THERE ARE 2 IMMEDIATE ACTION STEPS*

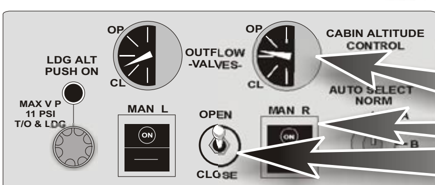
**1** **OXYGEN MASK and REGULATORS ........................... ON, 100%.**

**2** **CREW COMMUNICATIONS ................................ ESTABLISH.**

**3** **ALL 3 PACK SELECTORS ............. NORMAL**

**4** **ISOLATION VALVES (BOTH) ................ CLOSE**




**5** **PRESSURIZATION OUTFLOW VALVES ................ CLOSE**

*FIRST: PUSH BOTH LIGHT SWITCHES.*

*SECOND: HOLD SWITCH TO CLOSE.*

*THIRD: OBSERVE VALVE IND CLOSED.*

## ***IF CABIN ALTITUDE IS UNCONTROLLABLE:***

# DO AN EMERGENCY DESCENT

**6** **CABIN SIGNS ................ ON**

## ***IF CABIN ALTITUDE IS CONTROLLABLE BUT above 14,000 feet.***

**PASSENGER OXYGEN SWITCH ................ ON**

## ***IF CABIN ALTITUDE IS CONTROLLABLE BUT above 10,000 feet.***

**CREW OXYGEN REGULATORS ................ NORMAL**

*Place both regulator levers to the N position to conserve oxygen.*

**PURSER ...................................................... ADVISE.**

*Inform the Purser of what has happened and what may be expected.*

*After cabin has stabilized at 14,000 feet or below, advise the Puser of the cabin altitude, when they may leave their seats, and when oxygen masks may be removed. Consider using the PA.*





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# more ... CABIN ALTITUDE/ RAPID DEPRESSURIZATION

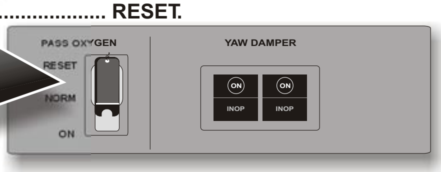
## AFTER AIRPLANE LEVELS OFF

**CAPTAIN MAKE ANNOUNCEMENT:**

**NOTE on ANNOUNCEMENT:**
*The MOST important thing is that you modulate your voice, speak slowly and distinctly, and project an air of confidence.*
*Tell them what happened and explain what is going on.*

## AFTER cabin altitude descends below 9500 feet

**PASSENGER OXYGEN SWITCH ........................ RESET.**




**NOTE:**
*Since this configuration isolates the CENTER BLEED DUCT, an EICAS msg* **TEMP ZONE** *is displayed.*

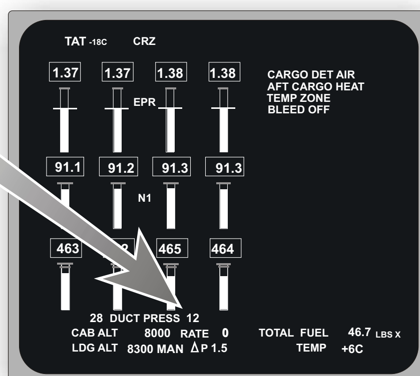
*ALL PASSENGER ZONES will be maintained at* **75 degrees F**.

*EICAS msg CARGO DET AIR because of insufficient airflow for cargo smoke detector.*

## IF cabin altitude CAN BE controlled and BOTH DUCT PRESSURES are normal:

**PACK 2 CONTROL SELECTOR ........................ OFF.**

## IF cabin altitude CAN BE controlled but ONE DUCT PRESSURE remains low:




**ENG BLEED AIR (affected side) ................OFF**

**ISOL VALVE (normal side) ................OPEN**

**PACK SEL (affected side) ................OFF**

**BOTH HYD DEMAND PUMP (affected side) ................OFF**

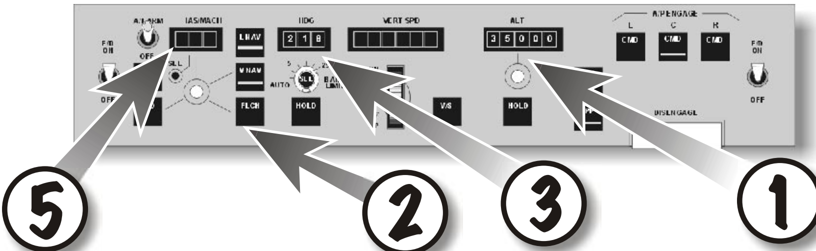
**WING ANTI-ICE .....................................OFF**

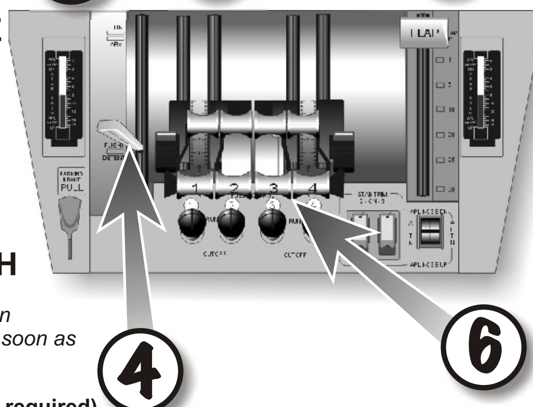
**NOTE:**
DO NOT use WING ANTI-ICE.
*Sufficient bleed air may not be available.*

# EMERGENCY DESCENT

## *LEAVE AUTOPILOT ON !*

*The reasoning goes like this: Should the crew become incapacitated at some point during the procedure, the airplane will continue and level off on it's own.*




### 1 set MCP ALTITUDE

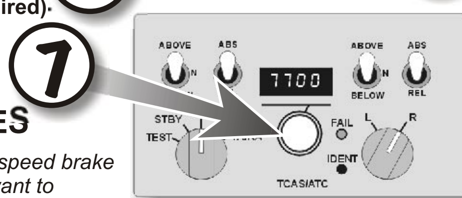
***Descent to 10,000 feet is desired****; however, since a turn off airways is probably required, the use of MORA or GRID MORA is probably the BEST indicator. If you intend to stay on the airways, then MEA would be OK.*

### 2 push FLCH SWITCH

*This prepares the autopilot to begin descent towards target altitude as soon as the throttles are retarded.*

### 3 select HEADING (as required).

*Traffic and terrain clearance are the criteria.*




### 4 Extend SPEED BRAKES

*Expeditiously - BUT SMOOTHLY - pull speed brake lever to and past the flight detent. We want to descend as rapidly as is possible and pressurization considerations are NO LONGER a factor.*

### 5 set SPEED ON MCP to Vmo.

*If structural integrity is in doubt ... limit airspeed and avoid high maneuvering loads.*

### 6 THROTTLES to IDLE

*Move the throttles to IDLE in a FIRM AND AGGRESSIVE manner;*
***BUT DO NOT JERK THE THROTTLES AT ALTITUDE.***

### 7 TRANSPONDER 7700

8

### 8 ATC advise

*Obtain heading information for terrain and traffic avoidance.*



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# *EMERGENCY DESCENT continued*

## *REFERENCE ACTION*

**DISCUSSION:**

*Flight plans take into account the fuel requirements for a decompression. It is predicated on:*

*ALL ENGINES operating*
*14,000 feet*
*Long Range Cruise*
*EQUI-TIME point (most extreme position) to overhead designated diversion airport with NO RESERVES.*
*Predicated on 18,000 feet winds.*

*Descent should be limited to that altitude where a 14,000 foot CABIN ALTITUDE can be maintained.*

**9 CONT IGNITION switch ... ON**

**10 CABIN SIGNS ... ON**

***IF CABIN ALTITUDE above 14,000 feet:***

**11 PASSENGER OXYGEN switch ... ON**

**12 ALTIMETERS (at trans level) SET**

***APPROACHING LEVEL/OFF ALTITUDE:***

***ABOUT 3000 ABOVE DESIRED LEVEL/OFF.***

**13 monitor DESCENT RATE**

**14 retract SPEED BRAKES**

**15 set AIRSPEED as desired.**

*This will cause the nose of the airplane to rise, making a smooth transition and a very efficient leve/loff.*



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# EVACUATION

## *THERE IS AN IMMEDIATE ACTION STEP*

1 **ADVISE ATC** (*Tower, ground, whomever is in control*).

2 **set PARKING BRAKE**

*Setting the parking brake with the airplane in motion denies the use of the anti-skid and could lead to blown tires.*

3 **retract SPEED BRAKES**

***IMPORTANT**: If not retracted, the use of the wings as potential escape route is compromised.*

4 **FUEL CONTROL switches (ALL) CUTOFF.**

*Unless APUs are operating (not likely after a landing) there will be a reversion to battery power.*

5 **PRESS. OUTFLOW VALVES ... OPEN.**

*The PRESSURIZATION should have relieved automatically. We back it up because with residual pressure, the doors will NOT open ... YIPE !*

6 **EVACUATION INITIATE**

*Once you initiate the EVAC ALARM; it is OK to silence the warning horn in the cockpit. The warning will continue to sound at each individual station until extinguished at that site.*

7 **ENGINE and APU FIRE HANDLES ... OVERRIDE, PULL.**

*There are four ways to release the handles:*

*If a FIRE WARNING exists,*
*If FUEL CONTROL LEVER in CUTOFF,*
*FIRE/OVHT test switch is pushed,*
*Manually push release button under handle.*

8 **IF FIRE HANDLES ILLUMINATED ... ROTATE**

## *CREW MEMBER'S RESPONSIBILITIES*

***CAPTAIN:*** IMMEDIATELY AFTER AIRPLANE STOPS:
Accomplish shutdown, Go to cabin and exercise OVERALL COMMAND ***INSIDE THE AIRPLANE.***

***FIRST OFFICER:*** IMMEDIATELY AFTER AIRPLANE STOPS:
Accomplish cockpit shutdown, Go to cabin and determine that all usable exits are open. After you have helped as much as possible, ***LEAVE THE AIRPLANE.***

*If you can't get to the main cabin, leave the airplane using the escape slides and inertia reels.*
*Once on the ground; **ASSEMBLE THE PASSENGERS** upwind a safe distance from the airplane and approaching rescue vehicles.*



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# LIMITS and SPECIFICATIONS

APR 00

The thing about the limits section is that nobody talks about them, they just assume you know them ... and then when you are in your oral, the checkguy usually spends an inordinate amount of time dwelling on those tiny, unknown parts of the Limits section.

So ... in addition to the UNDERLINED ITEMS (You gotta know those definitely) included will be some of the other items that may be part of the ORAL EXAM.

# FLYING NON-PRECISION APPROACHES in LNAV
### ... some really picky technical details.

First, we have to understand some of the jargon associated with this evolution. They have invented a special language and every phrase and word is loaded with meaning.

***CDU LINE SELECTED APPROACHES***: These are approaches that can be selected from the list on the DEP/ARR page.

***CONSTRUCTED APPROACHES***: These are approaches for which there are available procedures and approach plates, but for some reason are not on the list in the DEP/ARR page.

***SUPPLEMENTAL NAVIGATION***: This is the buzz-word which means that LNAV may be used to steer the airplane during the approach.

DISCUSSION:
***WHILE THIS STUFF IS NOT UNDERLINED;***
***YOU WILL STILL HAVE TO KNOW IT!***

*Here is what this is all about, when you are flying a NON-ILS approach,*

*YOU WILL BE REQUIRED TO MONITOR RAW DATA VOR/ADF INDICATION FROM THE FINAL APPROACH FIX INBOUND.*

*Even if this may be an engine out approach or some other irregularity, still, anytime you are flying the NON-ILS, remember that at least **ONE PILOT** has gotta be monitoring RAW DATA (VOR/ADF MODE) from the FAF inbound.*

***ALSO:** On some departure or arrival or Go-around procedures, it is required to track outbound on a certain VOR "RADIAL" (Such as the SFO RWY 28 L/R). Remember, You MUST have the VOR selected on the ND.*
***AND**: There are departures that REQUIRE climbing out on a VOR "RADIAL."*

*ONE FINAL NOTE:*
***WE DO NOT DO BCRS APPROACHES IN THIS BIRD.***

continued ...



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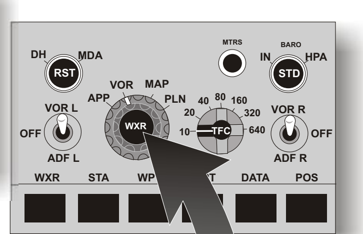
***MAP MODE OK** as reference if desired ONLY IF these requirements are met for the approaches indicated.*

**If you are flying this approach:**

**Then: At least one of the pilots must be monitoring these sources.**

| | |
|---|---|
| **LOC** | **PFD OK** |
| **-DME** | **DME** |
| **NDB** | **ADF bomb on ND** |




**HOWEVER:**
**If you are flying the VOR,**
**THEN (at least ONE pilot) ...**

| | |
|---|---|
| **VOR** | **ND *MUST BE* on VOR** |

**from the FAF inbound.**

**the BIGGIE!**

***TECHNIQUE**:*

*Select the ND to be displayed on the LOWER (supplemental) EICAS in the MAP mode. Select the PF ND to the VOR mode. That way, the PF can monitor the MAP mode and the VOR.*

# $O_2$ CREW minimum 1650 psi

ADJUSTMENTS:

>70 degrees add 3 psi/1 degree above 70.
<70 degrees subtract 3 psi/1 degree below 70.

+3/1>70°<-3/1

and
some non-underlined
but nice to know

# SLIDE STUFF

EXCEPT IN EMERGENCY (of course):

*DOORS 3L/R SHOULD NOT BE OPENED WITH MORE THAN 60,000 POUNDS FUEL ON BOARD.*

*ON UPPER DECK, YELLOW KNOB SHOULD BE VISIBLE IN THE AUTOMATIC VIEWPORT WHEN PASSENGERS ARE UP THERE.*

*FERRY FLIGHTS: (see checklist in additionals) CABIN DOORS 2L/R should be ARMED.*



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# OIL MINIMUM QUANTITY

# 18 QUARTS

## BEFORE ENGINE START

Here is the EXCEPTION: After start, but when engine is at idle RPM, it is normal for the engine indication to decrease about

# 5 QUARTS

So ... I guess that means that we could see as low as 13 quarts after engine start.

# ENG STUFF

some NOT underlined
... but still important

*BUT ... you are definitely required to know these engine parameters COLD!*

## MAX EGT FOR ENGINE START

# 535 °C

*Of course, the RED RADIAL is always a good answer, but how do you know when you are heading for a HOT START if you don't know the number?*

## SOME REVERSE LIMITS:

- NOT ALLOWED IN FLIGHT ! DUH!
- POWERBACK PROHIBITED ! DUH!
- START OUT AT 80 kts so as to be in idle reverse by 60 kts.





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# FUEL STUFF

## FLEET PLANNED LANDING FUEL (FPL)

# 19,000 pounds

*Of course, the Checkguy will be interested in knowing just what that fuel number means:*

> ***"ENSURES:***
> ***OVER ONE HOUR OF USABLE FUEL***
> ***AT MAX ZFW PLUS FPL (535,000 + 19,000)***
> ***AT 10,000 feet MSL***
> ***AT HOLDING SPEED."***

*FYI: The amount of fuel required to execute a go-around at runway threshold to 1000 feet AGL, fly a VFR pattern, intercept a 3 degree glideslope approximately 2 1/2 miles from the runway, and continue to land is:* **5600 pounds**

*FYI: The MINIMUM DISPATCH fuel:* **22,000 pounds**

*FYI: Fuel jettison rate:* **4,650 pounds per minute**

*FYI: TAXI PER MINUTE:* **130 pounds per minute**

*FYI: MINIMUM ALTERNATE:* **6,500 pounds**

*FYI: MINIMUM DESIRED LANDING FUEL:* **11,100 pounds**

***"ENSURES SUFFICIENT FUEL ON BOARD AT THE THRESHOLD IN A WORST CASE CONDITION WITH MAXIMUM FUEL QUANTITY INDICATOR ERROR (indicator reads too high)."***

# HYDRAULICS

## MINIMUM BRAKE ACCUMULATOR PRECHARGE PRESSURE

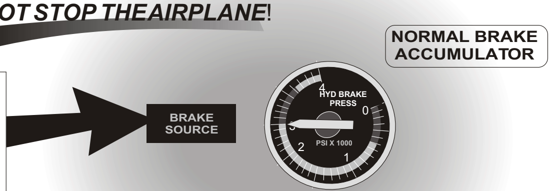
## 750 psi

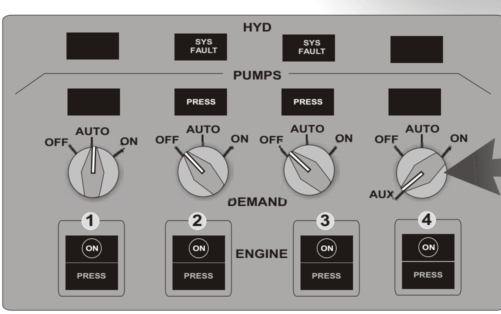
*Some things about the HYDRAULIC BRAKE ACCUMULATOR that you will be asked about on the oral.*

The accumulator provides sufficient pressure to (1) **SET** and (2) **HOLD** the **PARKING BRAKES** when all other sources of brake pressure fail.

The accumulator ***WILL NOT STOP THE AIRPLANE***!

*This light indicates LOW PRESSURE in the active brake source. It comes on well before 750 psi.*




***THIS COULD BE IMPORTANT**: During the Captain's "FINAL COCKPIT PREPARATION" set-up, he is to turn the **#1** hydraulic pump switch to **AUTO** and the **#4** to **AUX. I**t is IMPORTANT that the **#4 AUX** be selected "**BEFORE**" the #1 switch is turned to **AUTO**.*

***REASON**: Since the parking brake accumulator can ONLY be replenished by HYD SYS #4;*
*If HYD SYS #1 is pressurized (without pressurizing HYD SYS #4) and HYD SYS #1 fails; there may be NO PARKING BRAKE AVAILABLE (depending on the residual status of the accumulator which has not been replenished). If, however, HYD SYS #4 is pressurized, should HYD SYS #1 fail, parking brake capability will be available.*

*I am still foggy as to the whole problem, but technique is to turn #4 to AUX first, and then #1 to AUTO. Just do it!*





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# USE NACELLE ANTI-ICE WHEN

## OFFICIAL DEFINITION OF ICING CONDITIONS

**10°C OR BELOW**

*What can pilots screw up here. Well, 10 degrees C is about 50 degrees F. So, you could be planning a departure one 50 degree day and think that just because it isn't 32 degrees F that it is NOT icing. WRONG!*

**and**

**VISIBLE MOISTURE**

*Visible moisture is restricted visibilities of 1 mile or less, and on the ground there is the additional consideration about ground clutter. it could be CAVU to the moon, but if there is crap on the taxiways or runways that could freeze on engine parts, that is "visible" moisture.*

# DO NOT USE WING ANTI-ICE

- ***WHEN TAT EXCEEDS 10 degrees C.***
- ***WHEN FLAPS ARE EXTENDED.***



P.O. Box 1239, TEMECULA, CA 92593

How fast can you ...

# ROCK and ROLL?

## TURBULENT AIRSPEEDS

Or ... Airspeeds to fly during turbulent air.

# 290/.82

NOT UNDERLINED, but nice to know:

| | |
|---|---|
| 340/.84 | STD CLIMB above 10K (FMC INOP) |
| 340/.86 | STD CRUISE above 10K (FMC INOP) |
| 290/.84 | STD DESCENT above 10K (FMC INOP) |





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# MAX STRUCTURAL WEIGHTS (pounds)

Checkguys L-O-V-E this chart; and I can guarantee that they will ask you numbers from this matrix on your oral.

| | |
|---|---|
| 878,000 | MAX TAXI |
| 875,000 | MAX T/O |
| 630,000 | MAX LAND |
| 535,000 | MAX ZFW |

OK ... practice ... practice ... practice... practice

| | |
|---|---|
| MAX TAXI | |
| MAX T/O | |
| MAX LAND | |
| MAX ZFW | |



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# 45,100

## MAXIMUM OPERATING PRESSURE ALTITUDE

(feet msl)





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*INTENTIONALLY LEFT BLACK*

747v1intro02

INTENTIONALLY LEFT BLACK

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