PROFESSIONAL AIRBUS PILOTS AND SERIOUS FLIGHT SIMMERS WILL BOTH FIND THIS BOOK REALLY USEFUL ...

LET ME SHOW YOU HOW TO DO IT.



There is more than a little pride and a great deal of satisfaction in being a part of the Airbus pilot community and being able to operate a superb flying machine such as the Airbus A320. It is a challenge that is as rewarding as it is enjoyable, and this beautiful and responsive flying marvel will supply a lifetime of pleasant memories and the material for thousands of interesting flying stories.
Learning to master the art of flying the Airbus jet series will require something really unique ...and this book is part of that toolset. This little volume is a source of information and technique that makes complicated things interesting, understandable and ... well, almost simple. Captain Mike Ray not only writes the information authoritatively, he actually does it in a way that is entertaining and almost fun!
Join him in an adventure in learning as we discover the Airbus A320.

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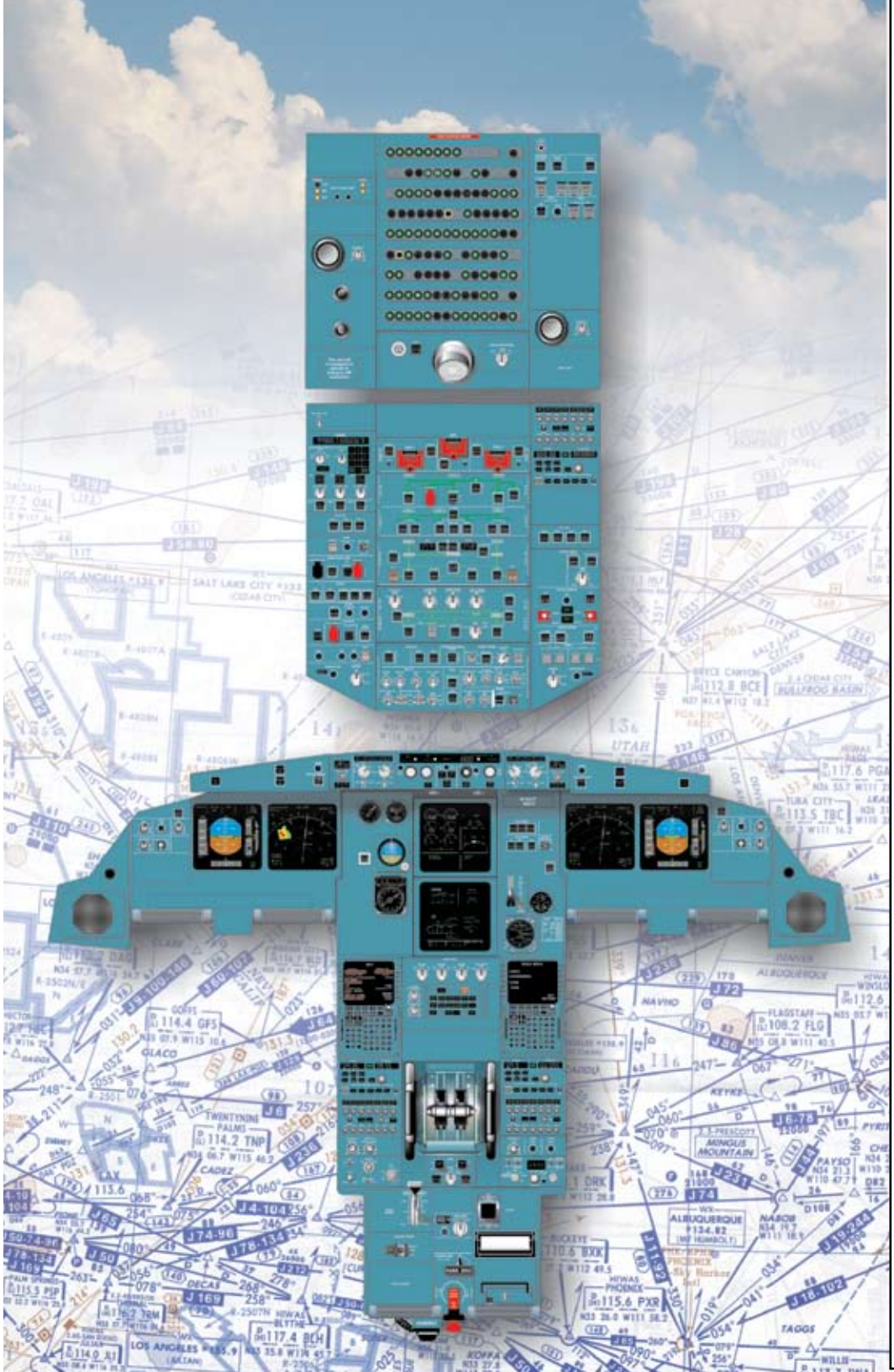
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THE UNOFFICIAL AIRBUS A320

SIMULATOR AND CHECKRIDE PROCEDURES MANUAL

VERSION

PUT TOGETHER BY
MIKE RAY
CAPTAIN UAL



LEGAL STUFF

O*K, Listen up.*

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PO Box 1239, Temecula, CA 92593-1239

You can contact Captain Mike Ray:

My e-mail:
mikeray@utem.com
I try to answer every e-mail personally, but sometimes I get a little behind.

My FAX #: 1-951-698-3676

My Post Office Box:
P.O. Box 1239
Temecula,
CA 92593-1239

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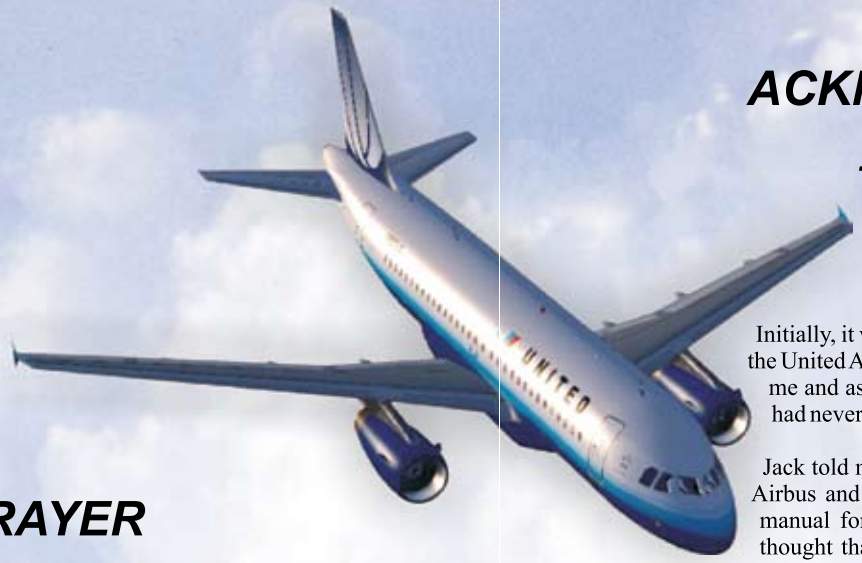
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Screenshot from Wilco/Feelthere Airbus A320 Series 1 simulation
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PILOT'S PRAYER

"Please God,
Don't let me screw up."

Unnamed Astronaut

Screenshot from Wilco A320 Series one Simulation by Feelthere.
Used by permission.

ACKNOWLEGEMENTS

...and just plain "THANK YOU"

Initially, it was ***Dr. Jack Rubino***, the Manager of Human Factors at the United Airlines Training Center in Denver, Colorado that contacted me and asked if I would be interested in doing an Airbus project. I had never thought about it, but Jack's argument was compelling.

Jack told me that he had met a guy who was involved in training at Airbus and they had discussed briefly the development of a flight manual for pilots that would be "different". He asked Jack if he thought that Captain Mike Ray would be interested in developing something for the Airbus. It seemed like a good idea.

Here is that manual ... it is presented with all its flaws and warts; but it is probably everything that it ever will be and as good as it gets.

Finally, after I had gone over it again and again and again until I was ready to puke, I turned the manuscript over to ***Dr. Raynald Bedard.*** associate professor, College of Aviation at ***Embry-Riddle Aeronautical University*** in Prescott, Arizona. He selected some of his students to find the remaining mistakes in grammar and punctuation. They were ***John Wigntman, Jon Standley, and Chris Turner***. Thank you.

My printer, ***Dave Marlow*** and his associate ***Rod Mina*** from ***Whitmar Electronic Press*** in San Diego worked with me in developing some of the unique features of the document. Their advise and direction where the printing side is concerned has been greatly appreciated.

INTRODUCTORY COMMENTS

The material in this document is specifically developed ONLY for the use of professional Airline pilots in preparing for their simulator check-ride.

Why did I develop this project?

I was specifically asked if I could write a book about the Airbus A320 for the professional airline pilot community.

Ordinarily, I would question whether I thought there would be any reason to set aside literally hundreds of hours of my time to a pursuit that had no purpose, but when the request comes from someone who actually is a big player in the Airbus Community, my ears perked up and my brain started to churn.

I said, "yes." Here is that book.

For the next few moments of your life, you are going to be treated to an immersion into the world of the Airbus A320. Few people on earth will know as much about this marvelous piece of aviation engineering as you hopefully will. But the experience is much much more than a simple teaching-learning experience ... it is an all encompassing experience. You will dream about her and she will occupy most of your waking moments as you ponder her intricate details and minute characteristics. She is so complex, that a lifetime spent with her is not enough to know everything about her ... She is ALWAYS full of surprises and just when you think you know her, she will do something that is totally unexpected.

Comon then, let's meet her.

Come fly with me ... let your mind and imagination soar through the heavens as we meet and become acquainted with our beautiful new sweetheart. She is as lovely and responsive as her beauty suggests, and I know you will come to appreciate and enjoy her subtle yet demanding personality. Ever a challenge ... she will provide many hours of pure enjoyment and satisfaction as you get to know her intimately.

... explaining some stuff about the download version.

Since you have elected to purchase the "electronic" version of the document. Let me make some comments about that.

First, since some purchasers actually prefer the idea of a "PDF" format that displays on a monitor screen, I reluctantly constructed this version to fulfill that niche. I personally find fumbling with "e-book" manuals to be a cumbersome and frustrating concept and much prefer a "paper version".

Here is a big problem. Many of you guys purchased this version and want the ability to copy the PDF image files for ... whatever reason. However, the material in this product has been encrypted and reproducing the images is not permitted. This is a big disappointment to many of you that anticipated having the ability to "reproduce" and "print-out" multiple copies of the document ... let me offer this explanation.

I have a responsibility to the vendors who sell the "paper version" NOT to offer a competing product. It is my feeling that if a purchaser wants a "paper book" they should buy that version. If they want an electronic version, they should buy that.

I have attempted to create something that would "fit" on your monitor screen, and so a landscape layout is presented. The colors look absolutely vibrant on a screen, and that is a plus. The file size was a problem, but since most computers have the capability to accommodate vast amounts of data, I didn't compress the images excessively ... and I think you will agree that the screen is clear and easy to read.

Since we are all adults here, I will speak directly to the importance of maintaining integrity between purchaser and supplier. Particularly in a small niche market such as flight simulation, there *MUST BE* an understanding that unless we support the guys that produce the terrific materials and products for our pleasure and interest, they will simply disappear.

'nuff said there.



SCREENSHOT OF UNITED A319 OVER PARIS, FRANCE
created using WILCO/FEELTHERE A320 Series 1 software.
All screenshots are used by permission of Wilco and Feelthere.

Abbreviations

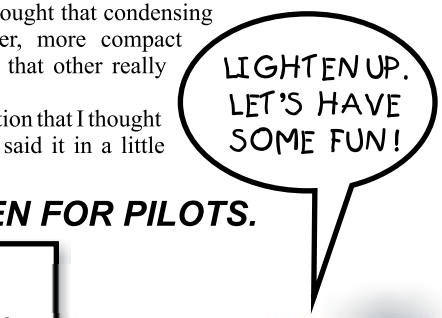
a SHORT LIST of a few of the bewildering and strange Airbus TERMS



ACARS ..... ARINC Communications and Reporting System
ACP ..... Audio Control Panel
ACGW ..... Aircraft Gross Weight
ADI ..... Attitude Director Indicator
ADIRS ..... Air Data Inertial Reference System
ADIRU ..... Air Data Inertial Reference Unit
ADM ..... Air Data Module
ADMIN ..... Administration
ADR ..... Air Data Reference
AEVC ..... Avionics Equipment Ventilation Computer
AFE ..... Above Field Elevation
AFDS ..... Autopilot Flight Director System
AGL ..... Above Ground Level
AH ..... Alert Height (only on CAT III)
AIM ..... Aeronautical Information Manual
AIDS ..... Aircraft Integrated Data System
AIU ..... Audio Interface Unit
ALL WX ..... All Weather
AMU ..... Audio Management Unit
ANU ..... Aircraft Nose Up
AOA ..... Angle of Attack (alpha)
AP ..... Auto Pilot
APPU ..... Asymmetry Position Pick-off Unit
APU ..... Auxiliary Power Unit
ARINC ..... Aeronautical Radio, Inc.
A/THR ..... Auto Thrust
ATIS ..... Automatic Terminal Information Service
ATOG ..... Allowable Takeoff Gross Weight
ATSU ..... Air Traffic Services Unit
ATT ..... Attitude
ATTND ..... Attendant
AVAIL ..... Available
BARO ..... Barometric
BCL ..... Battery Charge Limiter
BCDS ..... BITE Centralized Data System
BDDV ..... Brake Dual Distribution Valve
BFO ..... Beat Frequency Oscillator
BITE ..... Built-in Test Equipment
BLD ..... Bleed
BMC ..... Bleed monitoring Computer
BRK ..... Brake
BSCU ..... Brake and Steering Control Unit
BTC ..... Bus Tie Contactor
C ..... Captain, Celsius, Center, course
CA ..... Cabin Altitude
CAB ..... Cabin
CAM ..... Cabin Attendant Module
CANC ..... Cancel
CAP ..... Capture, Captain
CAT ..... Category, Clear Air Turbulence
CAUT ..... Caution
CAVOK ..... Ceiling and Visibility OK
CAVU ..... Ceiling and Visibility Unrestricted
CB ..... Circuit, Cumulo-nimbus
CBMS ..... Circuit Breaker Monitoring System
CDAP ..... Constant Descent Approach Procedure
CDL ..... Configuration Deviation List
CDLS ..... Cockpit Door Locking System
CDU ..... Control Display Unit
CF ..... Centerline fix
CFDIU ..... Centralized Fault Data Interface Unit
CFDS ..... Centralized Fault Display System
CFIT ..... Controlled Flight Into Terrain
C/L/R ..... Command/Leadership/Resource management
CG ..... Center of Gravity
CH ..... Channel, change
CHR, CHRONO ..... Chronometer
CI ..... Cost index
CIDS ..... Cabin Inter-communication Data System
CKPT ..... Cockpit
CLNC ..... Clearance or Clearance Delivery
CLR ..... Clear, Clearance
CLR ..... Command Leadership Resource
CONF, CONFIG ..... Configuration
CPA ..... Closest Point of Approach
CPCU ..... Cabin Pressure Controller Unit
CQP ..... AQP version of an annual checkride
CRC ..... Continuous Repetitive Chime
CRS ..... Course
CRM ..... Crew Resource Management
CRT ..... Cathode Ray Tube
CSCU ..... Cargo Smoke Control Unit
CSD ..... Constant Speed Drive
CSM/G ..... Constant Speed Motor/Generator
CSTR ..... Constraint
CTR ..... Center
CVFP ..... Charted Visual Flight Procedures
CVR ..... Cockpit Voice recorder
CZC ..... Cabin Zone Controller
DA ..... Decision Altitude or Drift Angle
DC ..... Direct Current
DDRMI ..... Digital Distance Radio Magnetic Indicator
DEACT ..... Deactivated
DECEL ..... Decelerate
DEF/AB ..... Definitions/abbreviations
DEP ARR ..... Departure Arrival
DES ..... Descend, Descent
DEST ..... Destination
DFDR ..... Deferred
DFDR ..... Digital Flight Data Recorder
DFIDU ..... Dual Function Interactive Display Unit
DH ..... Decision Height
DIFF ..... Differential
DIL ..... Deferred and Inbound Log (maint)
DISCH ..... Discharge
DMC ..... Digital Management Computer
DME ..... Distance Measuring Equipment
DMU ..... Data Management Unit
DPWM ..... Display Planned Weight Manifest
DRM ..... Dispatch Release Message
DSPCH ..... Dispatch
DTMF ..... Dual Tone Multi-Frequency
DVRSN ..... Diversion
DVRT ..... Divert
EAI ..... Engine Anti Ice
EAT ..... Expected Approach Time
ECAM ..... Electronic Centralized Aircraft Monitoring
ECB ..... Electronic Control Box (APU)
ECON ..... Economy
ECP ..... ECAM Control Panel
EDP ..... Engine Driven Pump
EEC ..... Electronic Engine Control
EFC ..... Expect Further Clearance
EFCS ..... Electronic Flight Control System
EFIS ..... Electronic Flight Instrument System
EGPWS ..... Enhanced Ground Proximity Warning System
EGT ..... Exhaust Gas Temperature
EIS ..... Electronic Instrument System
EIU ..... Engine Interface Unit
ELAC ..... Elevator Aileron Computer
ELEV ..... Elevator
E/O, EO ..... Engine Out
EOSID ..... Engine Out SID
EPR ..... Engine Pressure Ratio
EPR/ATOG ..... Performance Data Sheet
ETA ..... Estimated Time of Arrival
EVMU ..... Engine Vibration Monitoring Unit
E/WD ..... Engine/Warning Display
EXPED ..... Expedite
EVAC ..... Evacuate
F ..... Flaps, Degrees Fahrenheit
FAC ..... Flight Augmentation Computer
FADEC ..... Full Authority Digital Engine Control
FAF ..... Final Approach Fix
FAP ..... Final Approach Point
FAS ..... Final Approach Segment
FBS ..... Fixed Base Simulator
FCDC ..... Flight Control Data Concentrator
FCOM ..... Flight Crew Operating Manual
FCU ..... Flight Control Unit
FD ..... Flight Director
FDIU ..... Flight Data Interface Unit
FDU ..... Fire Detection Unit
FF ..... Fuel Flow
FFS ..... Full Flight Simulator
FIDS ..... Fault Isolation and Detection System
FL ..... Flight Level
FLX/MCT ..... Flex/Maximum Continuous Thrust
FMA ..... Flight Mode Annunciator
FMCS ..... Flight Management Computer System
FMGC ..... Flight Management Guidance Computer
FMGS ..... Flight Management Guidance System
FMS ..... Flight Management System
FMU ..... Fuel Metering Unit
FMV ..... Fuel Metering Valve
FOB ..... Fuel On Board
FOM ..... Flight Operations Manual
FOQA ..... Flight Operations Quality Assurance
FPA ..... Flight Path Angle
FPD ..... Flight Path Director
FPF ..... Flight Plan Forecast
FPL ..... Fleet Planned Landing
F-PLAN ..... Flight Plan
FPPU ..... Feedback Position Pick-off Unit
FPV ..... Flight Path Vector
FQI ..... Fuel Quantity Indicator
FRM ..... Fault Reporting Manual
FRV ..... Fuel Return Valve
FTI ..... Flight Technical Specialist
FWC ..... Flight Warning Computer
FWS ..... Flight Warning System
GA ..... Go-Around
GCU ..... Generator Control UNit
GPS ..... Global Positioning System
GPWS ..... Ground Proximity Warning System
GS, G/S ..... Glide Slope or Ground Speed
HCU ..... Hydraulic Control Unit
HDG ..... Heading
HF ..... High Frequency
Hg ..... Mercury
HP ..... High Pressure
hPa ..... Hectopascals
HSI ..... Horizontal Situation Indicator
HYD ..... Hydraulic
IAF ..... Initial Approach Fix
IAP ..... Instrument Approach Procedure
ICAO ..... International Civil Aviation Organization
IDENT ..... Identifier
IDG ..... Integrated Drive Generator
IFR ..... Instrument Flight Rules
IGN ..... Ignition
IGVA ..... Inlet Guide Vane Actuator
ILS ..... Instrument Landing System
IM ..... Inner Marker
IMC ..... Instrument Meteorological Conditions
INIT ..... Initialization
INBD ..... Inboard
INOP ..... Inoperative
IPC ..... Intermediate Pressure Check Valve
IPPU ..... Instrumentation Position Pick-off Unit
IRS ..... Inertial Reference System
ISA ..... International Standard Atmosphere
KIAS ..... Knots Indicated Airspeed
KTS ..... Knots
LAF ..... Load Alleviation Function
LCA ..... Line Check Airman
LCD ..... Liquid Crystal Display
LDA ..... Localizer-type Directional Aid
LE ..... Leading Edge
L/G ..... Landing Gear
LGCIU ..... Landing Gear Control Interface Unit
LGPIU ..... Landing Gear Position Indicator Unit
LNAV ..... Lateral Navigation
LP ..... Low Pressure
LLWAS ..... Low Level Wind-shear Alert System
LLZ ..... ILS Localizer (ICAO)
LM ..... Line Maintenance
LRC ..... Long Range Cruise
M ..... Mach
MAP ..... Missed Approach Point
MAX ..... Maximum
MCDU ..... Multifunction Control Display Unit
MCT ..... Maximum Continuous Thrust
MDA ..... Minimum Descent Altitude
MDA ..... (in MCDU) any minimum based on barometric altimeter.
MEA ..... Minimum Enroute Altitude
MEL ..... Minimum Equipment List
METAR ..... Aviation Routine Weather Report (ICAO)
MF/FL ..... Maintenance/Fuel/Loading
MIN ..... Minimum
MKR ..... Marker
MLH ..... Maintenance Log History
MLW ..... Maximum Landing Weight
MM ..... Middle Marker
MMO ..... Mmax MACH Operating Speed
MRD ..... Maintenance Release Document
MRM ..... Maintenance Reporting Manual
MSL ..... Mean Sea level
MID ..... Middle (RVR)
MMI ..... Manual Magnetic Indicator
MTOG ..... Maximum Allowable Takeoff gross Weight
MVA ..... Minimum Vectoring Altitude
MX ..... Maintenance
N ..... Engine or APU RPM (%)
NAM ..... Nautical Air Miles
ND ..... Navigation Display
NM ..... Nautical Miles
NOTAM ..... Notice To Airman
NR ..... Not Required
NWS ..... Nosewheel Steering
OAT ..... Outside Air Temperature
OBS ..... Observer
OEW ..... Operational Empty Weight
OM ..... Outer Marker
OMC ..... Observer Member of Crew
OPP ..... Opposite
OPSPEC ..... FAA Operational Specifications
OPT ..... Optimum
OVBD ..... Overboard
OVHT ..... Overheat
OVRD ..... Override
PASS ..... Passenger
P/B ..... Pushbutton
PBD ..... Place/Bearing/Distance Waypoint
PBX ..... Place-Bearing/Place-Bearing
PC ..... Proficiency Check-ride
PCT ..... Percent
PCU ..... Power Control Unit
PDC ..... Predeparture Clearance
PF ..... Pilot Flying
PHC ..... Probe Heat Computer
PI ..... Pilot Instructor or Procedural index
PFD ..... Primary Flight Display
PIREP ..... Pilot Report
PNF ..... Pilot Not Flying
POS ..... Position
POSBD ..... Posted Bulletins
PPOS ..... Present Position (Dynamic)
PPU ..... Position Pick-up Unit
PRED ..... Predictive
PRM ..... Precision Runway Monitoring
PROC ..... Procedure
PROG ..... Progress
PROT ..... Protection
PROX ..... Proximity
PSI ..... Pounds per Square Inch
PTT ..... Push To Talk
PTU ..... Power Transfer Unit (Hydraulic)
PWS ..... Predictive Wind Shear
QNE ..... Standard Pressure (at altitude)
QNH ..... Standard Pressure (at Field Elevation)
RA ..... Resolution Advisory (TCAS)
RA ..... Radio Altimeter
RAT ..... Ram Air Turbine (Blue Hyd System)
RC ..... Required Controlling
RCA ..... Reach Cruise Altitude
RDI ..... Remote Dial-up Interface
RDU ..... Redispatch Unacceptable
REV ..... Reverse
RMI ..... Radio Magnetic Indicator
RMP ..... Radio Management Panel
RNAV ..... Area Navigation
RNP ..... Required Navigation Performance
RWY ..... Runway
RO ..... Rollout (RVR)
RSV ..... Reserve
RSVR ..... Reservoir
RTE ..... Route
RTO ..... Rejected Takeoff (Abort)
RVR ..... Runway Visual Range
RVSM ..... Reduced Vertical Separation Minimum
RWY ..... Runway
SAI ..... Standby Attitude Indicator
SAM ..... System Aircraft Maintenance
SAMC ..... SAM Controller
SAT ..... Static Air Temperature
SE ..... Single Engine
SC ..... Standards Captain, Single Chime
SD ..... System Display, Step Descent Point
SDAC ..... System Data Acquisition Concentrator
SDCU ..... Smoke Detection Control Unit
SEC ..... Spoiler Elevator Computer
SELCAL ..... Selective Calling
SFCC ..... Slat Flap Control Computer
SI ..... Static Inverter (DC-AC)
SID ..... Standard Instrument Departure
SL ..... Sea Level
SMGCS ..... Surface Movement Guidance and Control System
SI ..... Static Inverter
SOP ..... Standard Operating Procedure
SPLR ..... Spoiler
SRS ..... Speed Reference System
SSD ..... Single Segment Dispatch
STAR ..... Standard Terminal Arrival Route
STRG ..... Steering
STS ..... Status
TA ..... Traffic Advisory (TCAS)
TAS ..... True Airspeed
TAT ..... Total Air Temperature
T/C ..... Top of Climb
TCAS ..... Traffic Collision and Avoidance System
TD ..... Touchdown (RVR)
T/D ..... Top of Descent
TE ..... Trailing Edge
TEMP ..... Temperature
TERPS ..... Terminal Instrumental Procedure
TERR ..... Terrain
TFC ..... Traffic
TGT ..... Target
THR ..... Thrust
THS ..... Trimmable Horizontal Stabilizer
TKOFF ..... Takeoff
TLA ..... Thrust Lever Angle
TLA ..... Three letter acronym
TMPY ..... Temporary
TOGA ..... Take-Off/Go-Around (TO/GA)
TOG ..... Takeoff Gross
TOGW ..... Takeoff Gross Weight
T-P ..... Turning Point
TR ..... Transformer Rectifier (AC-DC)
TRK ..... Track
TROPO ..... Tropopause
TRU ..... Transformer Rectifier Unit or True heading
TW ..... Tailwind
V ..... Volts
V_A ..... Design Maneuvering Speed
V_{APP} ..... Approach Speed
V/DEV ..... Vertical Deviation
VERT ..... Vertical
V_{FE} ..... Flaps/Slats Extended Limit Speed
V_{FE} NEXT ..... Max Speed for the Next Flap
VFR ..... Visual Flight Rules
VHF ..... Very High Frequency
V_{LE} ..... Extended Gear Limit Speed
V_{LO} ..... Operating Gear Limit Speed
V_{LS} ..... Lowest Selectable Speed
VMC ..... Visual Meteorological Conditions
V_{MCA} ..... Minimum Control Speed Ground
V_{MCA} ..... Minimum Control Airspeed Air
V_{MO} ..... Maximum Operating Speed
VIA ..... IAF (on MCDU)
V_{MAX} ..... The lower of Vmo, Mmo, VLE, and VFE
VNAV ..... Vertical Navigation
VOR ..... VHF Omnidirectional Range
VOT ..... VOR Test
V_R ..... Rotation Speed
V_{REF} ..... Reference Speed
V_S ..... Stall Speed
V/S ..... Vertical Speed
VSI ..... Vertical Speed Indicator
V_{SW} ..... Stall Warning Speed
V_1 ..... Takeoff Decision Speed
V_2 ..... Takeoff Safety Speed
WAG ..... Wild Ass Guess
WAI ..... Wing Anti Ice
WARN ..... Warning
WHC ..... Window Heat Computer
WPT ..... Waypoint
WR ..... Weather Radar
W/S ..... Windshear
WSHLD ..... Windshield
WTB ..... Wing Tip Brakes
WX ..... Weather
WXR ..... Weather Radar
X-BLEED ..... Cross Bleed
X-FEED ..... Cross Feed
XFR ..... Transfer
XPDR ..... Transponder
XTK ..... Crosstrack
ZFW ..... Zero Fuel Weight
ZFWCG ..... Zero Fuel Weight Center of Gravity

WHAT KINDA BOOK IS THIS, ANYWAY ?

This rather imposing collection of information about the Airbus A320 is certainly NOT intended to be a substitute for that huge pile of official documents that you have already accumulated ... you know the materials I am referring to. That huge mountain of publications and printed handouts from the Company, the Federal Aviation Agency, the Air Traffic Control administrator, Airbus airplane company, your Mother-in-law, and whomever else who may have something to say. All those sources are way more important and authoritative than what I have put in this book ... but I thought that condensing some of that material into a smaller, more compact collection may help to understand all that other really important stuff.
So I wrote down as much of the information that I thought was interesting to pilots ... and I just said it in a little different way.



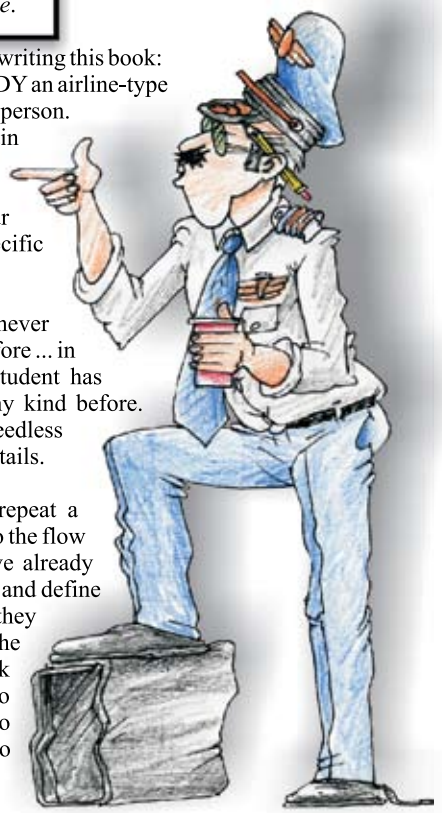
THIS BOOK IS WRITTEN FOR PILOTS.

The sole purpose of this manual is to help prepare the pilot-student for a training and check-ride experience.

Here are some of the concepts I used in writing this book: It is assumed that the reader is ALREADY an airline-type pilot or at least a seriously interested person. That allows the assumption of a certain level of competency and familiarization with the ATC system and general aviation knowledge on your part. Therefore, that will not be a specific part of this presentation.

It is also assumed that the reader has never seen an Airbus A320 series airplane before ... in fact, it is further assumed that the student has never flown an Airbus product of any kind before. Because of that, there may be a needless "over-simplification" of some of the details.

This leads me to this point. I will repeat a description or detail that I think fits into the flow of the text, even though we may have already covered that item earlier. I will also try and define the abbreviations and acronyms as they appear. I will try to tell you where the specific feature is located when we talk about it ... in short, the text is written so that an entry level pilot will be able to follow along without undue reference to "other" source materials.



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The really serious portion of the book ... you can skip this part.

HOW DO PILOTS LEARN STUFF?

In the beginning, a bunch of guys dressed in white lab coats and calling each other "Doctor" did some experiments. They took cats and mice and wired them to complicated instruments and recording devices and made them run mazes and do stuff like that. From the data they collected they developed a complex set of criteria regarding learning. Their conclusions went something like this.

They found that there are two separate parts to learning.
Cognitive understanding and
Psycho -Motor skill demonstration.

The Cognitive part of learning is the ability to understand and conceptualize the nature of the required task, and
The Psycho-Motor Skill part is actually being able to accomplish the task.

Airline Pilots could have saved them a lot of time and effort because they have known this all along. When they go for their training and check-rides at the Training Center for their airline, they continually experience the two separate parts to the evaluation:

ORAL EXAM (which is the Cognitive part), and
SIM RIDE (which is the Psycho-Motor Skills demonstration).

THERE ARE 2 SEPARATE LEARNING DOMAINS

This Study and Information Manual will be divided into those two separate domains.

PART 1- Information directed at systems information in preparation for articulating verbally a proficiency level knowledge of the aircraft systems during the **ORAL EXAMINATION** and

PART 2- Description of how to do the actual hands-on maneuvers with suggested tips and techniques in preparation for the actual manipulation of the controls during the **SIMULATOR EVALUATION**.

probably worthless and certainly boring

DISCUSSION:

It has been my observation that regular garden variety Airline Pilots, in preparation for their check-ride, all too often concentrate about 85% of their study and preparation time asset concentrating on **SYSTEM REVIEW** directed at performing well during the cognitive discussion that takes place during the Oral Examination. What I propose here is a study mechanism and tool-set where the "student" pilot can be exposed to both learning venues and begin to understand how the whole memory set comes together. The concept here is to help the pilot achieve a more complete knowledge base so that they are able to **BOTH ARTICULATE AND DEMONSTRATE** how the airplane flight systems operate.

The object of this book is to help you begin to "**GET IT**". This is the goal of any good instructor or teaching system ... to start the student on the road to gaining a more complete understanding of the operation of a complex system such as the Airbus A320 series airplane.

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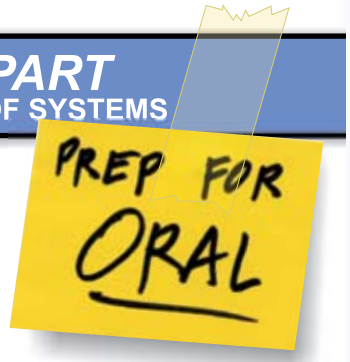
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SCOPE OF THE CONTENTS:

HOW THIS BOOK IS LAID OUT.

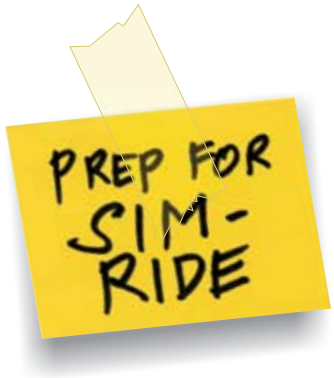
In keeping with our two modality teaching/learning model, this book breaks the mountain of material down into two "*general*" sections.
- The first part is composed of set-up, system description, and knowledge items. This is referred to as the cognitive part of learning referred to during the **Oral Exam**, and is followed by
- The actual manipulation of the airplane controls. This is called the Psycho-motor skills demonstration known as the **Simulator Check-ride**.

THE FIRST PART
BASIC DESCRIPTION OF SYSTEMS



- SYSTEM REVIEW
- GROUND SCHOOL
- PRE-FLIGHT MATERIAL

THE SECOND PART
OPERATION OF THE SYSTEMS



- SETUP FLOWS
- PUSHBACK
- ENGINE START
- TAXI-OUT
- TAKE-OFF
- CLIMB
- CRUISE
- APPROACH
- DESCENT
- LANDING
- TAXI-IN
- PARKING
- SECURE SHUTDOWN

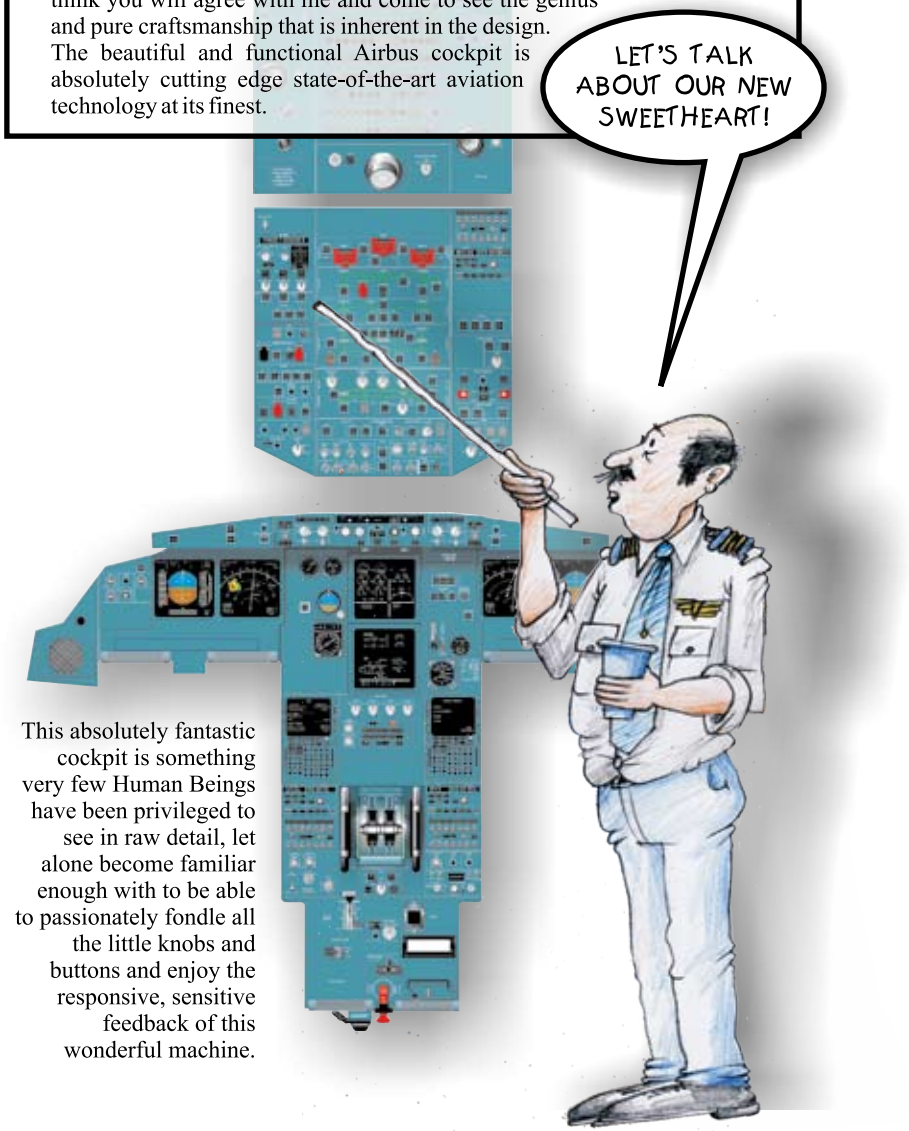
On our journey through this volume, there will be a huge number of additional items that will be included if they fall naturally into the flow of the material. Much of the more obvious information that should be intuitively obvious will be ignored.

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PART 1
THE SYSTEM REVIEW

Here is the section where a new Airbus pilot can learn about some of those strange and esoteric doo-dads and thing-a-ma-jigs that populate the A320 cockpit. Presented here is a simple, basic system review of the cockpit parts that will help answer some of your initial questions and assist is gaining familiarity with the flight deck layout.
This is also an invitation to become acquainted with your new front office. I think you will agree with me and come to see the genius and pure craftsmanship that is inherent in the design.
The beautiful and functional Airbus cockpit is absolutely cutting edge state-of-the-art aviation technology at its finest.



This absolutely fantastic cockpit is something very few Human Beings have been privileged to see in raw detail, let alone become familiar enough with to be able to passionately fondle all the little knobs and buttons and enjoy the responsive, sensitive feedback of this wonderful machine.

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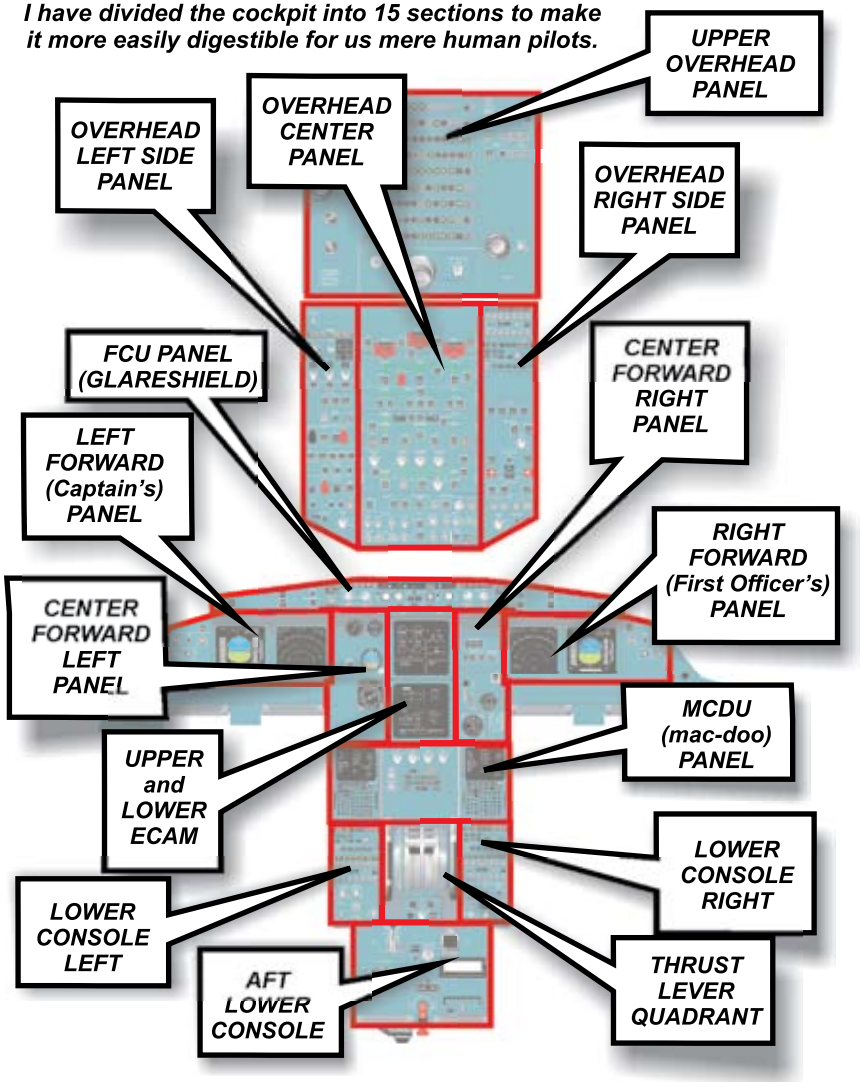
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CATALOG of PARTS

Here is how to find where all these mysterious and strange sounding buttons and switches are located.

Before even the most seasoned pilot can climb into the seat of any new jet and even begin to understand the operation of the systems, there must first be a familiarization with the content and layout of the seemingly incredibly complex and unknowable cockpit. I am proposing here that you go over this catalog of parts and get a little acquainted with the dazzling array of instrumentation that populates the flight deck. A small word of caution, there "***MAY BE***" slight differences between what is presented here and your "real" cockpit. However, these differences are subtle and probably not important.

I have divided the cockpit into 15 sections to make it more easily digestible for us mere human pilots.



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BEFORE WE GET STARTED: First things first ...
just how do these funny looking light-switches work?

LIGHT-SWITCH TECHNOLOGY

Many of the switches featured on the Airbus are a push-release type of design. Let me try to describe how they operate.

If you want to change the setting, you push the switch in. This actuates a **MECHANICAL** release, and when you release it, the switch operation will change to the alternate setting.

Most of the switches also incorporate a message feature that can display information regarding the nature of the operating system. Messages such as **ON, OFF, MAN, AUTO, FAULT** and so forth; may be displayed when appropriate.

POTENTIAL PILOT PROBLEM:

*These switches have to be pushed **ALL THE WAY IN** to release the mechanical switching mechanism. Sometimes, pilots will "tap" the button, or depress the switch too rapidly for the release to reposition.*

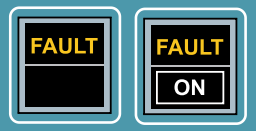
SUGGESTED TECHNIQUE

1. **DEPRESS THE BUTTON FULLY.**
2. **MOMENTARILY HOLD** switch in depressed position.
   This is less than a second to allow mechanical release to actuate.
3. **RELEASE and OBSERVE** that the switch has selected requested action.

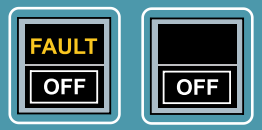
SAMPLE SWITCH OPERATION EXAMPLE



During normal operation, the switch may have either ON or OFF (illuminated) or more commonly ON (dark) with NO FAULT light visible.



When a FAULT is detected, the FAULT light may illuminate.
In some cases, the ON indication may remain illuminated.



Depressing the switch, and then releasing it will select the alternate switch position; in our example OFF.
Notice that the FAULT light may or may not continue to monitor the system status.



When the system FAULT is no longer detected, the FAULT light may cease to illuminate. This could indicate that the system FAULT has been removed and the system is waiting for manual re-activation. Depressing switch may restore the system to normal operation.

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Flightdeck panel preview

UPPER OVERHEAD PANEL



NOTE
This sub-panel in the upper right corner is NOT normally used by pilots. It is for maintenance and troubleshooting purposes.

Details on the next page are for information ONLY.

COCKPIT DOOR-LOCK CONTROLS

CIRCUIT BREAKERS panel

CAPTAIN READING LIGHT panel

TOILET OCCUPIED LIGHT

AUDIO SWITCHING CONTROLS

FIRST OFFICER READING LIGHT

BLUE HYDRAULIC SYSTEM
override:
This switch allows BLUE system to be energized without the engine running. Normally, the BLUE system can be pressurized after engine start by either ELECTRIC PUMP or RAT. RAT can produce up to 2500 PSI.

CVR
(COCKPIT VOICE RECORDER)
HEADSET RECEPTACLE

OXYGEN TIMER RESET switch
There are two parts to the indicator light.
ON - resets system and shuts OFF the ON light.
FAULT- If it comes on, door latches have remained energized longer than 30 seconds.

SERVICE INTERPHONE OVER-RIDE

AVIONICS COMPARTMENT LIGHT

LEAK MEASUREMENT VALVES
MAINTENANCE ONLY!
BUT ...IF a LIGHT is ON,
it means part of the hydraulic system is inoperative.

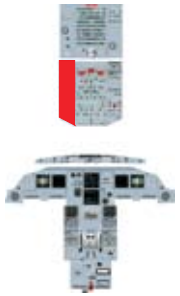
APU AUTO-EXTINGUISHING TEST PANEL
APU TEST SWITCH
and
APU TEST
CIRCUIT RESET

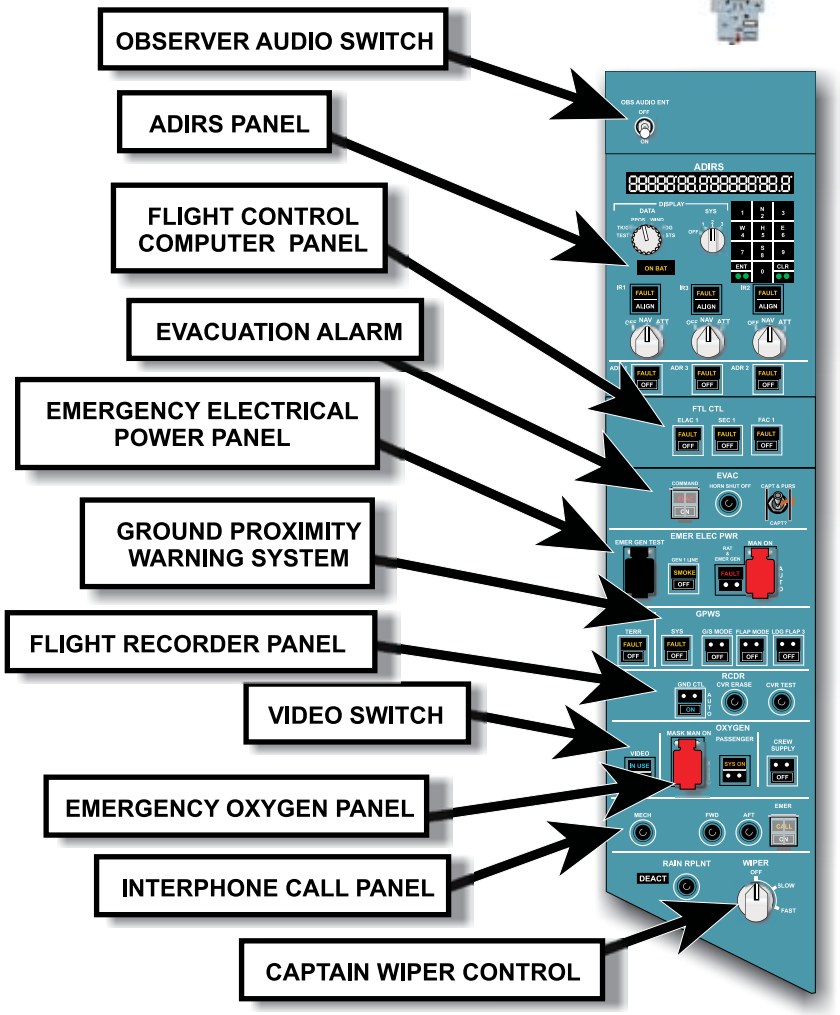
NOTE: ACTUATING THIS TEST WILL SHUT DOWN THE APU

ENG MAINT PANEL
not used by pilots
Switch powers **FADEC** without engine running IF **ENG FIRE** switch not released.
NOTE:
FADEC
(FULL AUTHORITY DIGITAL ENGINE CONTROL)

Flightdeck panel preview

OVERHEAD
left side panel





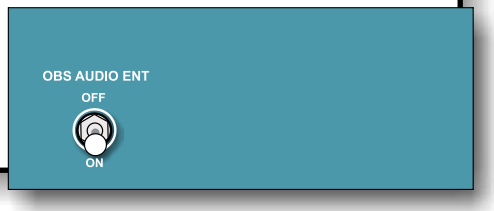
Some cursory details about these specific items is on the following pages:

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OBSERVER AUDIO ENTERTAINMENT

(OBS AUDIO ENT)

Usually, the entertainment **CHANNEL 9** is used to relay cockpit communications to the cabin for passenger monitoring.



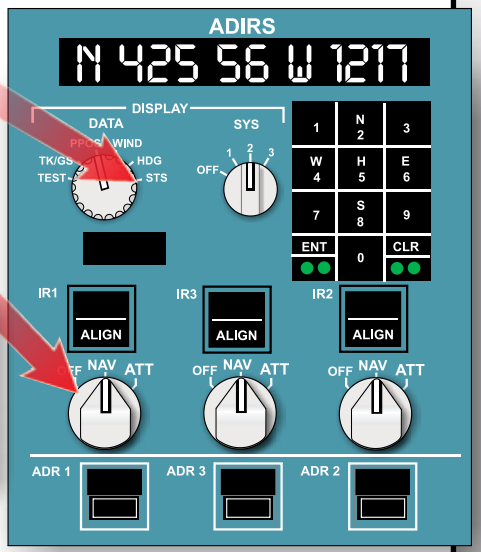
ADIRS PANEL

(Air Data Inertial Reference System)

NOTE: *Pilots **DO NOT** normally input aircraft LAT/LONG position information into this unit except in extremely rare instances of a failure.*

OK to select **STS** (status) to provide a countdown to completion during the alignment.

THE ONLY NORMAL PILOT INPUT IS TO SELECT THE THREE POWER SWITCHES TO "NAV " TO INITIATE THE ALIGNMENT CYCLE .



DO NOT MOVE THE JET DURING ALIGNMENT
(takes about 10 minutes).

POINT of POTENTIAL CONFUSION: The instrument is numbered 1-3-2, instead of 1-2-3. Just a note of awareness here, that CAPT IR/ADR is #1, F/O is #2, CAPT or F/O can use #3.

"Flashing" **IR ALIGN** *light means;*
- *Present position not entered after 10 minutes*
- *Error between shutdown position and entered position.*
- *Alignment fault.*

"Steady" **IR FAULT** *light means:*
- *IRU unavailable.*

ADIRS ON BAT *light means: Normal check on startup, runs for a few seconds. Steady light indicates that unit is running on battery.*
- *IR 1 will run on battery until it fails.*
- *IR 2 and 3 will run for 5 minutes*

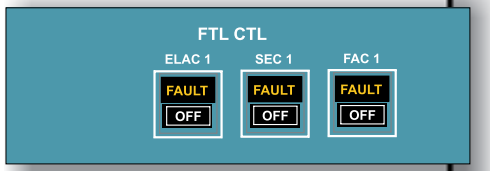
However, IF ATT HDG on CAPT 3, then:
- *IR 3 will run on battery until it fails, and*
- *IR 1 and 2 will run for 5 minutes.*

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FLIGHT CONTROL COMPUTER PANEL

The **FLY-BY-WIRE** flight control system normally controls the flight control surfaces using THREE independent ELECTRICALLY controlled HYDRAULIC systems.



IN AN EMERGENCY *... The pilots can maintain control using MECHANICAL connections to the STABILIZER and RUDDER. There will be a* ***USE MAN PITCH TRIM*** *message on the PFD.*

The FLIGHT CONTROL system consists of:

- *Two side sticks*
- *Two autopilots*
- *Two Elevator Aileron Computers (ELACs)*
- *Three Spoiler Elevator Computers (SECs)*
- *Two Flight Augmentation Computers (FACs)*

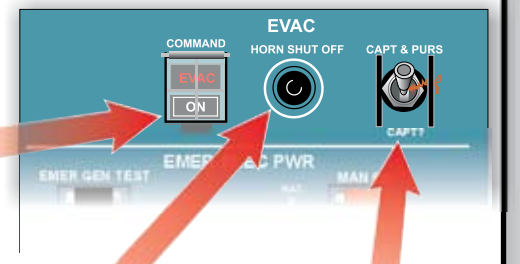
The FACs (*Flight Augmentation Computers*) have 3 main functions:

- *Rudder and Yaw Damping inputs*
- *Flight Envelope and Speed computations*
- *Windshear Detection*

EMERGENCY EVACUATION SIGNAL PANEL

Flip up the plastic cover, and depress the switch and the EVAC light flashes and the horn sounds in the COCKPIT and the CABIN.

Pushing the switch a second time CANCELS the EVAC ALARM.



KNOW THIS:
Pushing the HORN SHUTOFF button, silences the EVAC HORN in the COCKPIT.
The horn continues to sound throughout cabin.

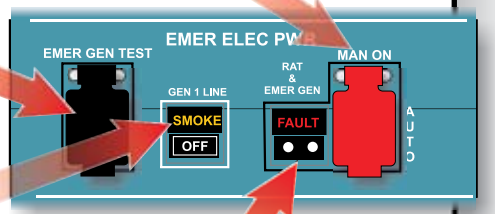
This switch is permanently safety wired.

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EMERGENCY ELECTRICAL POWER CONTROL PANEL

DO NOT SELECT THIS SWITCH.
THE RAT WILL FALL OUT.
Even on the ground!
THIS SWITCH IS *ALWAYS* HOT!



The **EMER GEN TEST** switch is normally used only by maintenance.

SMOKE LIGHT
This light illuminates AMBER when smoke is detected in the AVIONICS VENTILATION system.
This switch is used during the **"AVIONICS SMOKE ECAM"** procedure.

RAM AIR TURBINE (RAT) & EMERGENCY GENERATOR LIGHT

IF this **FAULT** light comes on,
it indicates that the RAT HAS BEEN DEPLOYED
BUT
RAT EMERGENCY GENERATOR not supplying power, AND
(on some 320s) the nose gear is retracted!

NOTE: *The RAT will continue to supply power down to 140 kts; however on "older 320s" once the gear is down, RAT ceases to operate. The good news: On "newer" 320s and 319s, the rollout capability is good down to 125 knots.*

SOME QUESTIONS answered:

The RAT deploys automatically when:
1. Airspeed greater than 100 knots, and
2. Loss of AC BUS 1and AC BUS 2
OR
The RAT can be deployed MANUALLY using the EMER ELEC PWR MAN ON switch

The airstream spins a little propeller on the RAT that supplies HYDRAULIC PRESSURE to the BLUE SYSTEM. This allows BLUE system to power the EMERGENCY GENERATOR using a HYDRAULIC MOTOR. The RAT also supplies hydraulic power to 2 SPOILERS (One in each wing) and the RUDDER.

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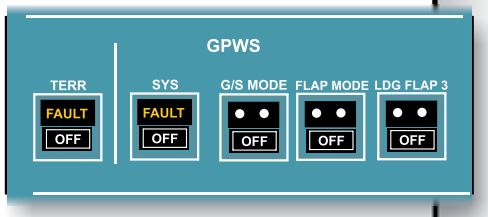
GROUND PROXIMITY WARNING SYSTEM

Called the GPWS or "JIP-WIS"

NOTE:

There are some differences in the installation between airplanes. This is considered the "standard" Airbus set-up.

Operation of the ON-OFF switch is intuitive: that is OFF is OFF and ON is ON. There are reasons why a pilot might want to *MANUALLY* switch off different features during different flight operations. Here are three common ones:



1. **G/S MODE** should be selected OFF during a GLIDE-SLOPE OUT or LOCALIZER ONLY approach.

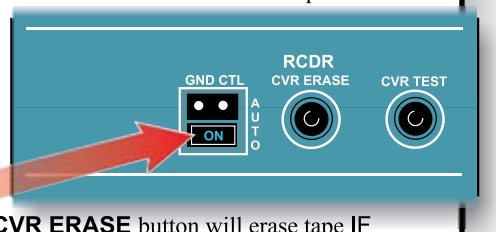
2. **FLAP MODE** should be selected OFF when landing with other than LANDING FLAPS 3 or FULL. For example during a HYDRAULIC FAILURE or NO FLAP abnormality.

3. **LDG FLAP 3** should be selected OFF when FLAPS 3 is selected as the final flap setting.

4. **RADAR NOTE**: In AIRBUS configuration, EGPWS must be manually de-selected using the TERRAIN switch in order to display the weather radar.

COCKPIT VOICE RECORDER (CVR) and DIGITAL FLIGHT DATA RECORDER (DFDR)

Generally, operation of the CVR is automatic, and while the CVR is programmed to stop recording 5 minutes after the last engine is shut down, any power interruption will cause the unit to revert to automatic operation. Normal SOP is to select the **GND CTL** "**ON**" so that the reading of the checklists can be recorded.



The **AUTO ON** light indicates that both the **CVR** and the **DFDR** are energized for operation.

CVR ERASE button will erase tape IF

- *It is held for 2 seconds, AND*
- *Airplane is on the ground, AND*
- *PARK BRK handle is ON.*

CVR TEST requires PARKING BRAKE switch MUST be "ON."

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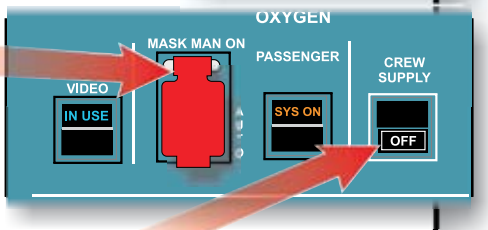
OXYGEN PANEL

OXYGEN MASK MAN...ON switch.

AUTO (cover closed): The mask ***DOORS*** at the individual passenger seats open automatically when the ***CABIN ALTITUDE*** exceeds 14,000 feet.

PILOT SCREW-UP: Confuses "***CABIN***" altitude with the "***AIRPLANE***" operating altitude. The cabin altitude is displayed on both the **LOWER ECAM CRUISE** page and the **ECAM CAB PRESS**

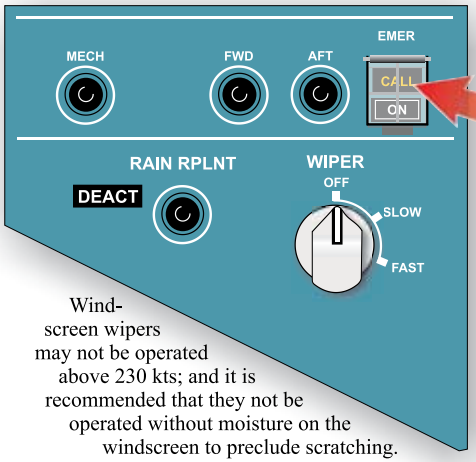




PUSHING "MASK MAN ON" SWITCH will *OPEN ALL THE CABIN MASK DOORS.* Requires maintenance action to restore to operation.

When **CREW SUPPLY** light **ON,** it indicates that low pressure OXYGEN is supplied to the Crew Masks (Desirable and NORMAL). If the switch is **OFF** (as indicated) the Oxygen Supply Valve is **CLOSED** (No Oxygen can flow). We want this to be **ON**.

CALL SELECTORS and WIPER CONTROLS



To call **ALL FLIGHT ATTENDANT** stations at the same time, use this switch. Selection is accompanied with WHITE lights, AMBER lights, RED flashing lights, and an EMERGENCY CALL message. In addition, CHIMES sound throughout the cabin.

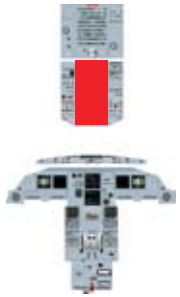
Wind-screen wipers may not be operated above 230 kts; and it is recommended that they not be operated without moisture on the windscreen to preclude scratching. The wiper blades can be stowed out of view in the OFF switch position.

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Flightdeck panel preview

OVERHEAD center panel



ENGINES and APU FIRE PANEL

HYDRAULIC CONTROL PANEL

FUEL PANEL
Controls and Indicators

ELECTRICAL CONTROL PANEL
Controls and Indicators

AIR CONDITIONING PANEL
Controls and Indicators

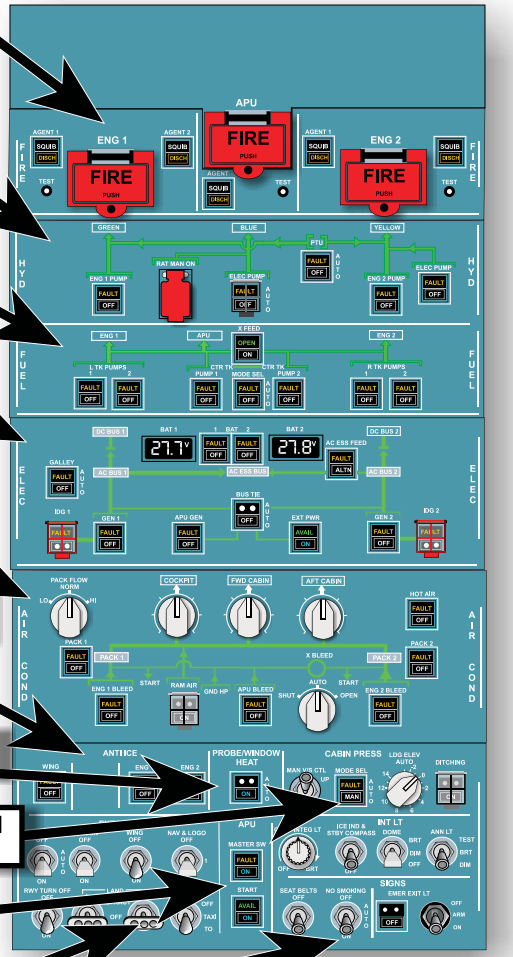
ANTI-ICE CONTROL PANEL

PROBE and WINDOW HEAT

CABIN PRESSURIZATION and DITCHING SWITCH

APU START CONTROLS

LIGHTS and SIGNS



More Details

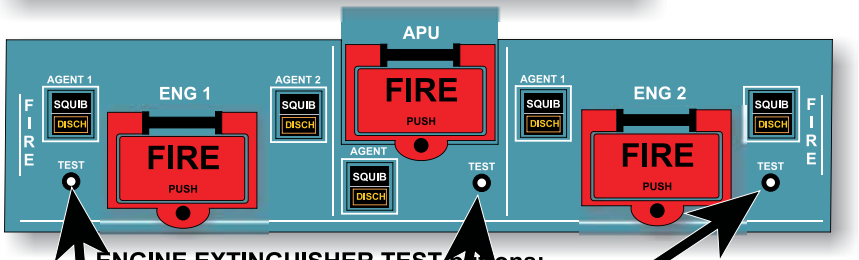
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ENGINE and APU FIRE PANEL

Controls and Indicators

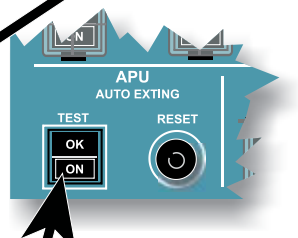
When FIRE WARNING detected:

- Continuous Repetitive Chime (CRC) sounds,
- appropriate FIRE light on FIRE PANEL illuminates,
- All MASTER WARNING LIGHTS illuminate,
- ECAM WARNING on the E/WD,
- If an ENGINE FIRE,
  the appropriate FIRE LIGHT illuminates
  on ENG panel just aft of the throttle console.



ENGINE EXTINGUISHER TEST buttons:

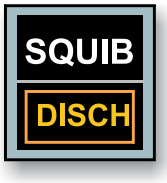
- ECAM ENG FIRE warning,
- flashing MASTER WARN light,
- ENG or APU FIRE switch illuminated,
- SQUIB lights illuminate
  unless extinguisher pressure is LOW,
- DISCH lights illuminated,
- FIRE lights on ENG START panel.



IMPORTANT NOTE REGARDING THE APU FIRE TEST SWITCH:

Pushing the APU test switch on the FIRE panel **DOES NOT** cause the APU to shut down.

HOWEVER, pushing the APU TEST button on the **APU AUTO EXTINGUISHING** panel on the **UPPER OVERHEAD PANEL** ***SHUTS DOWN THE APU!***



There are **4 ENG AGENT** switches. They are armed when the corresponding **FIRE** switch is activated. The SQUIB light illuminates to indicate activation.

When armed and LIGHT/SWITCH is pushed momentarily;
- Fire Extinguisher Bottle is **DISCHARGED**, and
- **DISCH** light illuminates when pressure becomes **LOW.**

***NOTE**: Each engine has 2 dedicated FIRE EXTINGUISHERS, APU has 1 extinguisher.*

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ARE WE ON FIRE?

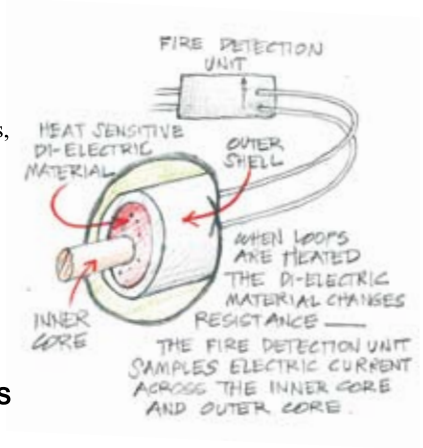
HOW DOES IT KNOW ?

There are three sets of double loops mounted in parallel.
- one set for the Engine and Pylon on each side, and
- one set for the APU compartment.

These detect heat by registering a change in resistance.
When they get HOT they register an ***OVERHEAT***,
when they get REALLY HOT, they register a ***FIRE***.
Normally it takes ***BOTH*** sensor wires to detect
a fire before an alarm is given,

WHAT IF ONE OR BOTH
OF THE SENSORS IS BROKEN?

Here's what they did about that,
If there is a fault or break in one of the sensors,
it alerts the system and the system
reverts to a single sensor warning.



Fire warnings appear when:

- BOTH LOOPS DETECT A FIRE.

- ONE LOOP DETECTS THE FIRE and THE OTHER LOOP IS FAULTY.

- A BREAK IN BOTH LOOPS OCCURS WITHIN 5 SECONDS.

-A FIRE TEST IS PERFORMED.

What does the FIRE SWITCH DO when it is activated?

ENGINES	APU
Silences Aural warning	Shuts down APU
Arms Squibs (Squib light ON)	Silences Aural warning
Deactivates generator	Arms Squibs (Squib light ON)
FADEC power removed	Closes:
Closes:	FUEL LP valve
FUEL LP valve	APU fuel pump turned OFF
Hyd Fire Shutoff	APU Bleed
Engine Bleed	CROSSFEED valve
Pack Flow Control	APU generator

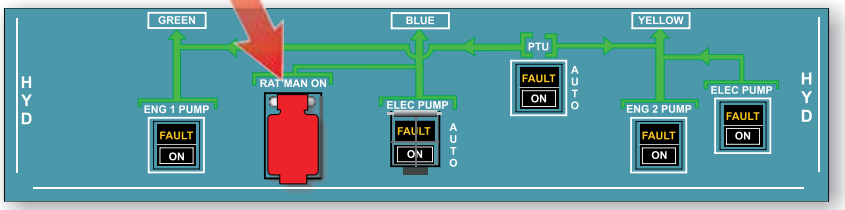
Later in our discussion regarding engine shut-down, if the engine will not shut down using normal techniques we will discover that an "approved" technique is to "starve" the engine by selecting the ENGINE FIRE SWITCH.
NOTE: *Only selecting the ENGINE FIRE SWITCH does not release the fire suppression agent into the engine or APU compartment.*

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HYDRAULIC CONTROL PANEL

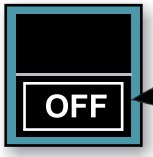
DO NOT PUSH THIS SWITCH.
THE RAT WILL FALL OUT.
THIS SWITCH ALWAYS HOT!
Even on the ground!
Can only be reset by maintenance action on the ground.



Illumination of any of the 5 FAULT light indicates:

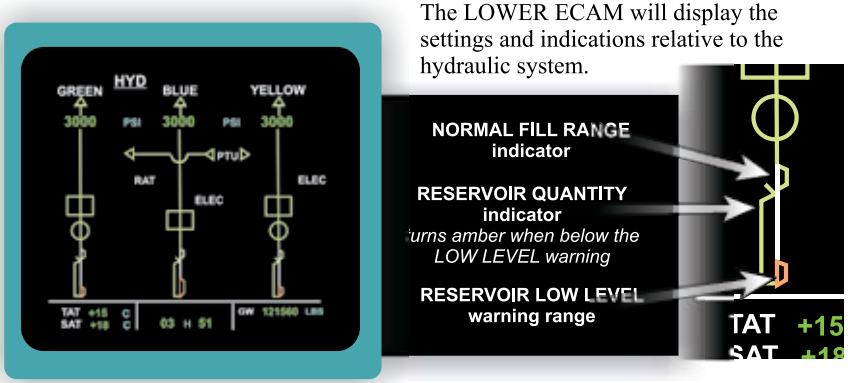


RESERVOIR LOW LEVEL
RESERVOIR OVERHEAT
RESERVOIR LOW AIR PRESSURE
PUMP LOW PRESSURE
PUMP OVERHEAT



Selecting the OFF position, INHIBITS the selected PUMP and turns off the FAULT light EXCEPT when **OVERHEAT** is present.

The LOWER ECAM will display the settings and indications relative to the hydraulic system.



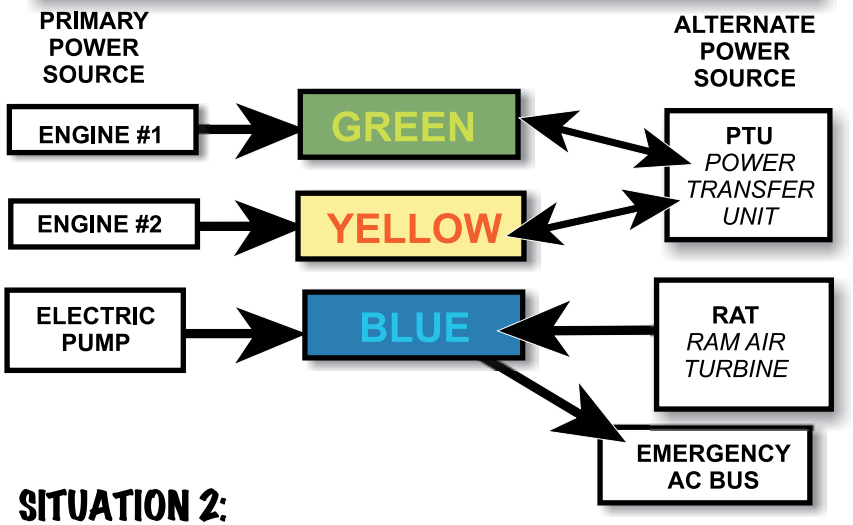
NOTE: *The RESERVOIR QUANTITY indicator moves up and down to correspond to the indication.*

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HYDRAULIC SYSTEM DESCRIPTION

SITUATION 1:

IF A PUMP QUITS, IT IS NOT REALLY A BIG DEAL ...
BECAUSE
Every pump is backed up by an alternate hydraulic power source.



SITUATION 2:

IT IS NOT POSSIBLE TO TRANSFER HYDRAULIC FLUID BETWEEN SYSTEMS.
THEREFORE, IF A SYSTEM LOSES FLUID ...
SOME SYSTEMS CAN NO LONGER BE OPERATED.

Here is a list of the affected systems:

GREEN

GEAR RETRACTION

REVERSER #1

NOSE WHEEL STEERING
(*if gear extended manually*)

MEMORY JOGGER:
(green) **G - R - N**

BLUE

The EMERGENCY GENERATOR

YELLOW

REVERSER #2

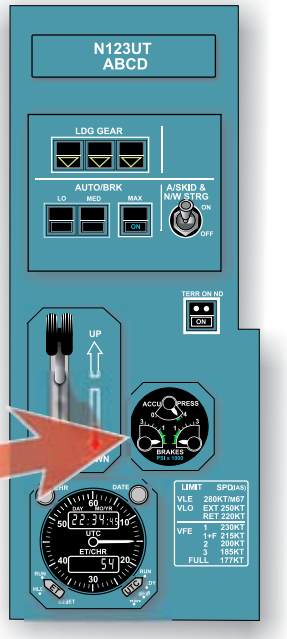
PARKING BRAKE ACCUMULATOR RECHARGING

CARGO DOOR

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a BRAKE SYSTEM discussion



Probably the most difficult and complex issue regarding the hydraulic system is the relationship between:

- **YELLOW SYSTEM**
- **PARKING BRAKE**
- **STEERING**
- **HYDRAULIC PRESSURE GAUGE**
- **GREEN SYSTEM**
- **BSCU**

I can almost guarantee that the Check Captain will DEMAND an explanation of this relationship from the pilot candidate.

Here is a pilot's explanation of the details of this system.

If you look at the pressure gauge located near the gear handle you are looking at the pressure in the **PARKING BRAKE** and **ALTERNATE BRAKING** system supplied by the **YELLOW SYSTEM.**

The **NORMAL** brake system uses **GREEN SYSTE**M pressure. That gauge DOES NOT reflect **GREEN SYSTEM** or **NORMAL BRAKING** pressure. Here is where pilots get confused.

When you depress the RUDDER BRAKES or "TOE" BRAKES then you are selecting **GREEN SYSTEM** and the pressure gauge should indicate "ZERO".

Further confusion, When you depress the rudder toe brakes, the system shifts to GREEN system. IF you see ANY pressure indicating on the gauge, that meas that YELLOW system pressure is available to the alternate brakes ... then you have a ***PROBLEM***!

That problem is a failure of the **BSCU** (Brake and Steering Computer Unit) or **BDDV** (Brake Dual Distribution Valve) and renders the airplane a potential unguided and unstoppable rolling disaster without IMMEDIATE and PROPER action.

The situation is further exacerbated because the proper action by the pilot involves a totally un-intuitive response. The Captain MUST remove pressure from the brakes before turning OFF the **BRK & STRG** switch in order the actuate the alternate system.

If the Captain has pressure on the TOE BRAKES when the **BRK & STRG** switch is turned off, the airplane will

HIT A BRICK WALL.

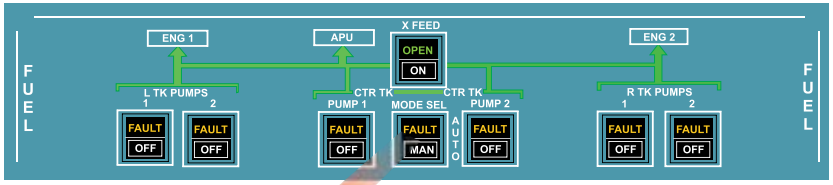
We will be constantly referring to this situation many more times during the course of our discussion about this airplane.

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FUEL PANEL

Controls and Indicators



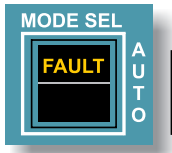
MODE SELECTOR SWITCH

If MODE SEL SWITCH is DARK

This means **AUTO** operations allowed. Here are three **AUTO** situations:



1	If fuel in **CENTER TANK**; then **CENTER TANK PUMPS RUN** (except when SLATS are extended.)
2	Turns off any **PUMP** 5 minutes after **LOW LEVEL** indication.
3	**BOTH ENGINE PUMPS** run for 2 minutes after engine **START** (if fuel present and regardless of slats position).



If MODE SEL FAULT LIGHT ON .. means

***CENTER TANK** contains more then* **550 pounds** *and* ***LEFT or RIGHT WING TANK** less than* **11,000 pounds**.



If MODE SEL MAN light on ...

***ALLOWS MANUAL CONTROL** of the **CENTER TANK PUMPS** using* **CTR TK PUMP** *switches.*

TK PUMP SWITCH



If TK PUMP FAULT LIGHT ON .. means

Pump pressure is **LOW**. Light inhibited when switch **OFF**.

RECIRCULATION SYSTEM:

Fuel is used to cool the **IDG** (Integrated Drive Generators that produce electricity). Fuel goes to the engine, but a small amount is diverted to cool the **IDG**. Then the heated fuel is sent by a return line to the **WING TANK OUTER FUEL compartment**.

If the **CENTER TANK** is supplying fuel, the **WING TANK** can overflow

...SO here is what they did:

When the **INNER WING TANK** is full, the **CENTER TANK PUMPS** shut off. This causes the wing tank to supply fuel to the engine, and when it has used approximately **1100#**, the **CENTER TANK PUMP** resumes operation.

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FUEL SYSTEM

IMPORTANT FUEL NOTES:

- There are **3 FUEL TANKS.**
  In all, however, there are **7 FUEL COMPARTMENTS**.

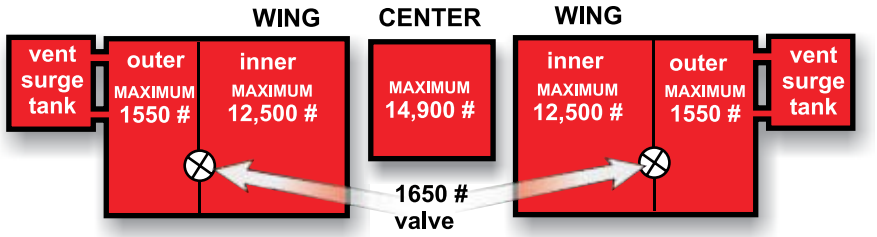
- The **WING TANK PUMPS** are designed to operate continuously.

- The **ORDER** for fuel usage is for the **CENTER TANK** to be used **FIRST**, then **WING TANKS**.
  *In order for to do that, the **WING TANK** pumps are fitted with **PRESSURE RELIEF VALVES** so the **CENTER TANK PUMPS** supply greater pressure.*

- **FUEL CANNOT BE TRANSFERRED BETWEEN THE 3 TANKS**
  (*except during normal fueling operations, of course*)

- **THERE IS NO FUEL JETTISON SYSTEM.**

- **ENGINES WILL SUCTION FEED, BUT FROM WING TANKS ONLY.**



The 1650 VALVE discussion:

When
EITHER WING INNER FUEL COMPARTMENT
decreases to 1650 # fuel,
BOTH LEFT AND RIGHT SIDE 1650 Valves OPEN.
They cannot be re-set UNTIL next Fueling cycle on the ground.

FUELING NOTES:

Requires ELECTRICAL POWER supplied from *EITHER*
- **EXTERNAL SOURCE**
- **APU**
- **AIRPLANE BATTERY**

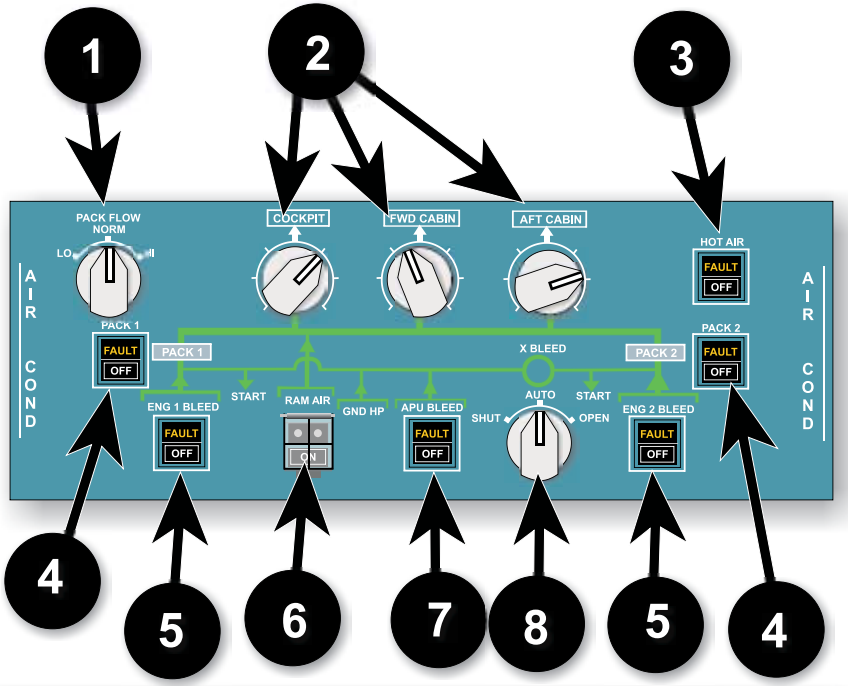
NOTE: If the BATTERY is used to supply the electrical power for fueling:
- the TANK MAY NOT fill to full capacity, and
- the TRANSFER VALVES may not fully close.
  (However, they will close when normal power is resumed).

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AIR CONDITIONING PANEL

Controls and Indicators



1 **PACK FLOW selector**

If **APU** is supplying air, or One pack fails, goes to **HIGH FLOW**.
In **LOW**, if **PACK** wants more air, it reverts to **NORMAL.**

The **PACK FLOW** is set manually in accordance with PASSENGER comfort using the 3 Zone Temperature Selectors.

2 **ZONE TEMPERATURE** selectors

The selectors may be set in accordance with the loading or with the desires of the Cabin crew depending on loading of passengers, density, and ambient conditions.

3



HOT AIR switch:
FAULT means **DUCT OVERHEAT.**
With switch **OFF**,
when temp drops, light goes **OUT.**

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4

PACK switch:

FAULT means:

- PACK FLOW CONTROL valve disagrees with commanded position, or
- Compressor/Pack outlet OVERHEATS.



5

ENGINE BLEED switch:

ON: Opens valve if:

- Upstream pressure greater than 8 psi,
- APU bleed valve closed,
- No Leak detected,
- No Overpressure detected,
- No Over temperature detected,
- ENG FIRE switch not released out,
- ENG START valve is closed.

OFF: Closes **BLEED** valve and **HP** valve.

6

RAM AIR switch (guarded**):**

OFF: (switch dark) This is the normal situation.

ON: When selected on, Ram Air may or may not flow into MIXING unit depending on the differential pressure.

***NOTE**: If ditching switch is selected, switch is over-ridden and RAM AIR INLET is CLOSED.*

7

APU BLEED switch

ON: Valve opens IF there is NO leak on APU or LEFT SIDE BLEED.

OFF: Closes the APU valve.

APU BLEED FAULT LIGHT: Illuminates when LEAK detected.

8

CROSS BLEED selector:

AUTO:

Opens crossbleed valve IF APU BLEED VALVE **OPEN**.
Closes crossbleed valve IF APU valve closed or LEAK detected.

OPEN: Opens crossbleed valve.
SHUT: Closes crossbleed valve.

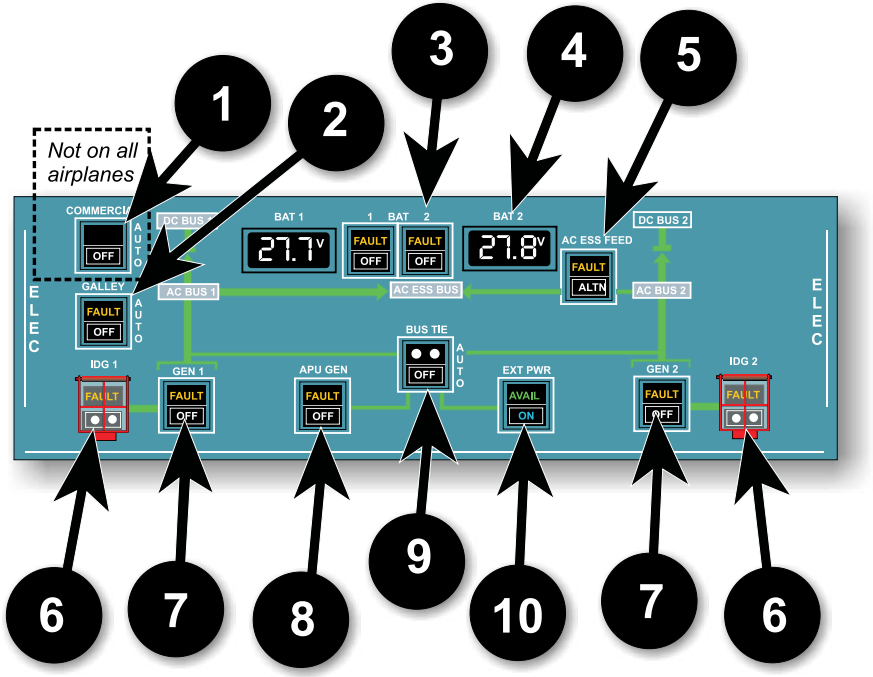
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ELECTRICAL CONTROL PANEL

Controls and Indicators

Three generators (one from each **ENGINE** and **APU**) provide **AC** power. Two batteries provide **DC** power for **APU** start and for **EMERGENCY** power. There is an emergency air driven **RAT** (Ram Air Turbine) that can be deployed to provide some emergency **AC** power in case all three of the main generators fail.

The Electrical system is normally **AUTOMATIC**;
and the systems normally operate **ISOLATED** from one another.
NOTE: *The APU can supply electrical power for the entire airplane on the ground.*



1 **COMMERCIAL selector**
(This switch is not on all airplanes)

ON - Supplies power to "commercial" loads.

- -cabin and cargo lights
- -water and toilet systems
- -drain mast ice protection
- -galleys
- -passenger entertainment systems
- -in seat power supply system

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2 **GALY** (galley) **& CAB** (cabin) Switch

AUTO - The MAIN GALLEY bus, In-seat power, and Passenger entertainment AUTOMATICALLY SHED when:
Only ONE GENERATOR is operating,
except on ground when the APU or EXTERNAL is ON.

OFF - All that stuff is shut OFF.

FAULT LIGHT - ON when associated generator is above 100% its rated output. The Associated **ECAM** annunciates.

3 **BAT** (battery) Switch - Controls operation of the corresponding **BATTERY CHARGE LIMITER.**

AUTO - Batteries connected to DC BAT bus during:
- APU starting Batteries NOT connected
- BATTERY charging
- Below 100 kts on ground with **AC BUSSES 1 AND 2** unpowered.

OFF - Battery charger NOT operating and Battery line contactor open.
The OFF light will illuminate white if DC BAT bus powered.
The **HOT BAT BUSSES** remain powered.

FAULT - illuminates when **CHARGING CURRENT** outside limits ...the Battery contactor opens automatically.

4 **BAT** Indicator - Displays ***BATTERY VOLTAGE***.

5 **AC ESS** (essential) **FEED** Switch.

ALTN (alternate) **-** Allows **AC ESS BUS** to be powered from AC BUS 2 (*normally power comes from AC BUS 1*).

FAULT - means **AC ESS BUS** is NOT powered.

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6 **IDG** Switch - Guarded with a plastic cover and normally spring loaded to the extended outward position. When pushed momentarily, it will cause the IDG to become disconnected and ***CANNOT BE RECONNECTED IN FLIGHT!***

CAUTION

1. ***DO NOT PUSH SWITCH FOR MORE THAN 3 SECONDS.*** (*the drive disconnect coupling can be damaged*)
2. Do not disconnect the IDG when the engine is NOT running (or windmilling). *The engine must be turning.*

TIP! *If you have a "seized" engine abnormality (N1 "ZERO"), DO NOT DISCONNECT the IDG.*

FAULT - indicates:
- IDG oil outlet overheat,
- IDG low oil pressure. *Inhibited below 14% N2.*

7 **ENGINE GEN** (generator) Switch -

ON - Generator FIELD energized and Line contactor is closed **IF** electrical parameters are normal.

OFF - Opens contactor, de-energizes the generator field, and ***RESETS FAULT CIRCUITRY.***

FAULT - has only two possible indications, it means either:

1. Protection trip is initiated by GCU (Generator control unit), or
2. Contactor OPENS with GEN Switch still ***ON***.

8 **APU GEN** (generator) Switch -

ON - Generator FIELD energized and Line contactor is closed **IF** electrical parameters are normal, AND EXT PWR line contactor is OPEN.

OFF - Generator field is turned off and line contactor OPENS. illuminates only if airplane powered by AC power.

FAULT - has only two possible indications, it means either:

1. Protection trip is initiated by GCU (Generator control unit), or
2. Contactor OPENS with GEN Switch ON.

The APU GEN FAULT light inhibited from coming on during low APU speed power transfers.

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9 **BUS TIE Switch -**

AUTO - The BUS TIE contactors open and close automatically. They keep power on AC BUSSES 1 and 2.

During ENGINE shutdown, AUTO attempts to keep AC BUS TIE powered.

OFF - Both BUS TIE contactors are OPEN.

10 **EXT PWR** (External Power) Switch -

Situation 1: **AVAIL LIGHT ON,** When PUSHED:

-External power contactor closes,
-AVAIL light goes OUT,
-ON light comes ON
(and remains ON until the engine generators start supplying electrical power).

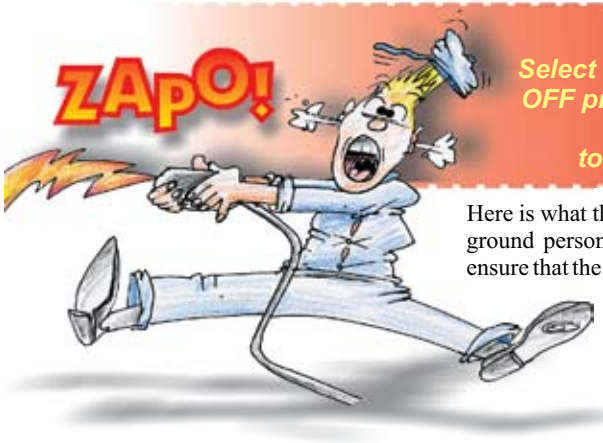
Situation 2: **EXT PWR** (External Power) **ON** light illuminated:

-External power contactor OPENS,
-**ON** light goes out,
-AVAIL light illuminates.

The **NORMAL PRIORITY** is:

- **ENGINE GENERATORS,**
- **EXTERNAL POWER** *(when EXT PWR switch is ON)*,
- **APU.**

After the second engine has been started, the **ENG GENERATORS** will automatically be powering the **AC busses.** The **APU** or **EXTERNAL PWR** is automatically disconnected from the **AC busses**; however, it remains connected to and continues to power the **AC TIE BUS** and the **EXT PWR ON** light remains illuminated. The **EXT PWR ON** light remains illuminated until the **EXT PWR** switch is selected **OFF.**



CAUTION:
Select the EXT PWR switch OFF prior to disconnecting ground power to avoid surges.

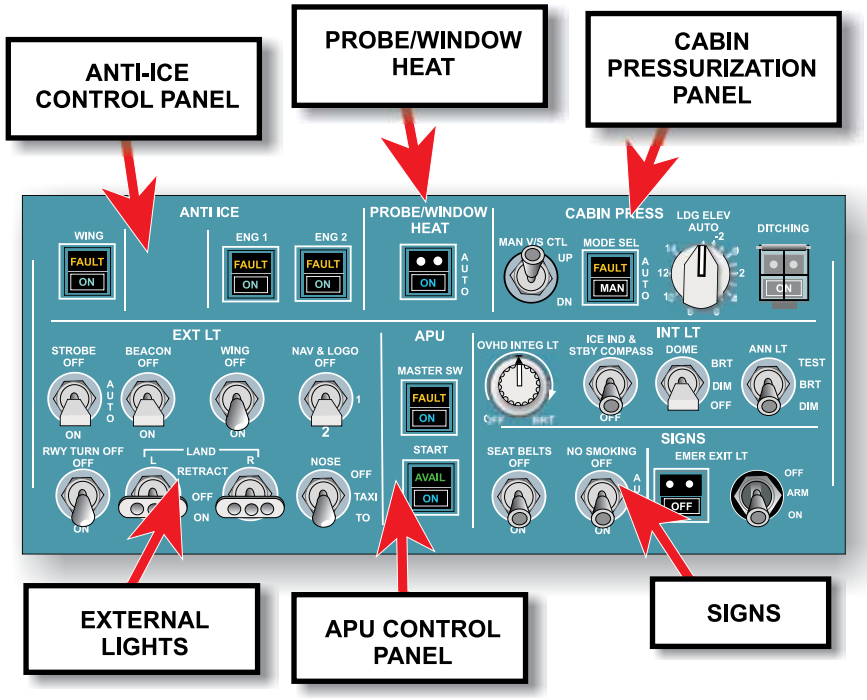
Here is what that sez: BEFORE you tell the ground personnel to "**DISCONNECT**" ... ensure that the **EXT PWR** switch is de-selected. It could be a BIG surprise to both of you!

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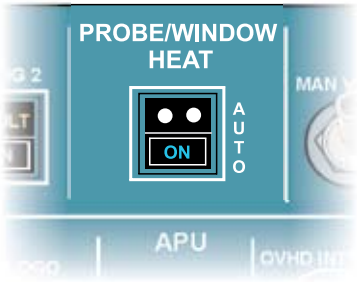
POTPOURRI PANEL

(Anti-ice, Probe and Window heat, Cabin Pressurization,
Ditching Switch, APU control, Lights and Signs.



PROBE/WINDOW HEAT CONTROL SWITCH

Three independent probe heater computers *AUTOMATICALLY* control the ground/flight modes and overheat and fault indications. *The TAT is NOT heated on the ground.*
The PROBE HEAT operates at LOW HEAT on the ground and automatically switches to HIGH in the air.

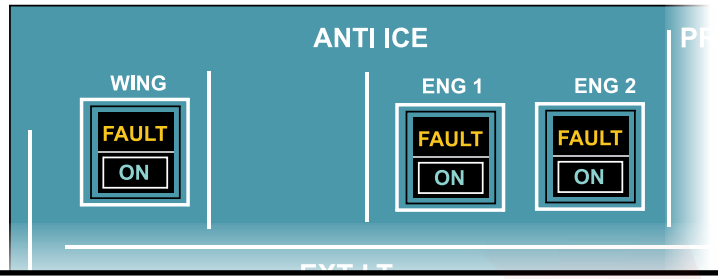


AUTO - Once one engine has started, then the automatic heating feature activates.
ON - over-rides the requirement for having an engine running.

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ANTI-ICE CONTROL PANEL



WING anti-icing operates inflight ***ONLY.*** Hot **BLEED AIR** is used for anti-icing **THREE OUTBOARD SLATS** on each **WING**. When either valve open:

- **EPR LIMIT** is reduced,
- **MINIMUM IDLE RPM** is increased.

ON - Anti-ice supplied to ***BOTH*** wings at the same time.

- **ON** light illuminates (blue)
- **WING A.** message on **ECAM MEMO**.

Wing anti-ice valves open ***ONLY*** IF Pneumatic Air Supply available.

NOTE:

When selected on the ground,
valve opens for 30 seconds ONLY (for test purposes).

FAULT LIGHT means:

- Wing anti-ice valve position disagrees with switch position.
- LOW PRESSURE detected.
- Flickers momentarily when valve in transit.

Hot **BLEED AIR** is used for anti-icing **ENGINE NACELLE** . Engine must be running for valve to open. When operating:

- **MAX N1 LIMITED**,
- **CONTINUOUS IGNITION** supplied,
- **MAX IDLE RPM** increased.

ON - Anti-ice supplied to SELECTED engine.

ON light illuminates (blue)
ENG A. ICE message on ECAM MEMO.
Engine anti-ice valve open IF ENGINE BLEED available.

OFF - Shuts ENGINE ANTI-ICE valve off, ON light goes out.

If there is a loss of electrical power, the valves open.

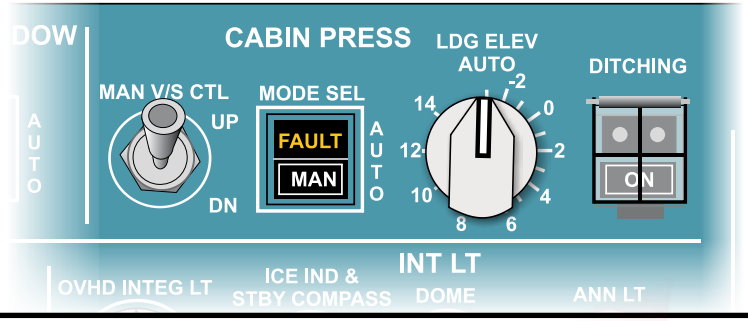
FAULT LIGHT means:

- Engine anti-ice valve position disagrees with the selected position, or
- flickers momentarily when valve in transit.

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CABIN PRESSURIZATION PANEL



CABIN PRESSURIZATION panel
Operates ***FULLY AUTOMATIC***.
Two Identical independent Cabin Pressure Controllers (CPC) use a single outflow valve that is powered by one of three available DC motors. Each computer has its own DC motor and a third one is used for manual operation. The manual operation is initiated by depressing the MODE SEL switch, and using the MAN V/S CTL lever to toggle the outflow valve.
Only one unit will operate at a time; until the other is automatically selected after landing or in case of failure.

QNH information comes from FMGC.
PRESSURE ALTITUDE comes from ADIRS.
REFERENCE DATA from ADIRS set by captains barometric altimeter.
LANDING ELEVATION comes from the FMGC database.
also used are thrust lever position and ground/flight logic.
Zone controllers provide Air Conditioning and airflow information.

FAULT LIGHT - ONLY comes on when a fault is detected in **BOTH** systems.
MAN LIGHT - Pushing the MODE SEL light/switch changes to MANUAL operation and the **MAN V/S CTL** control switch is activated.

AUTO - Outflow valve is controlled by one system at a time automatically. Other system selected on landing.
MAN - actuates the MAN V/S CTL switch.

MAN V/S CTL (Manual vertical speed control) **-** To operate, HOLD the toggle switch in position until TARGET VERTICAL SPEED (displayed on ECAM/CAB PRESS page) is reached. Operation in this mode is s-l-o-w.

POTENTIAL BIG PROBLEM:
If you are operating the pressurization in the MANUAL MODE; The cabin WILL NOT automatically depressurize on landing; therefore, in this case ***DIFFERENTIAL PRESSURE MUST BE MANUALLY SET TO ZERO BEFORE OPENING ANY EXIT DOOR.***

THIS IS SERIOUS!

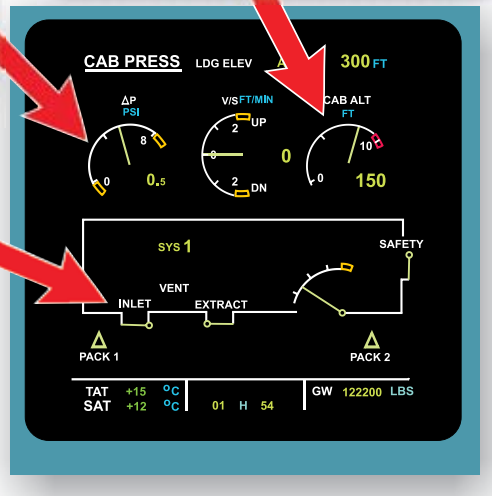
IF CABIN PRESSURIZATION EXCEEDS about 10,000 feet THERE IS A LEVEL 3 WARNING.

A LEVEL THREE WARNING IS:
- CRC (Continuous Repetitive Chime)
- MASTER WARN flashing light
- WARNING MESSAGE on E/WD (ECAM)

MAXIMUM ALLOWED CABIN DIFFERENTIAL
-1.0 PSI differential
+8.6 PSI differential
NOTE:
Safety relief valve opens at +8.6 PSI differential

DO NOT exceed ***CABIN ALTITUDE*** of 10,000 feet **EXCEPT**:
to maintain MEA or
in an EMERGENCY

RAM AIR INLET
LIMIT
Open the Ram Air Inlet
ONLY
if pressure differential is
LESS THAN 1 PSI !



The (guarded) RAM AIR control switch is on the Air Conditioning panel.
If you should select it, the Ram Air Inlet will open. However, if there is a diff press greater than 1 psi, the control will remain normal and NO RAM AIR will flow into the mixing unit.

DITCHING SWITCH WARNING:
On the GROUND with all the doors closed; IF ANY ground conditioned air or pneumatic system air to the packs pressurizes the airplane, everybody onboard is subjected to a serious ear-banging experience.

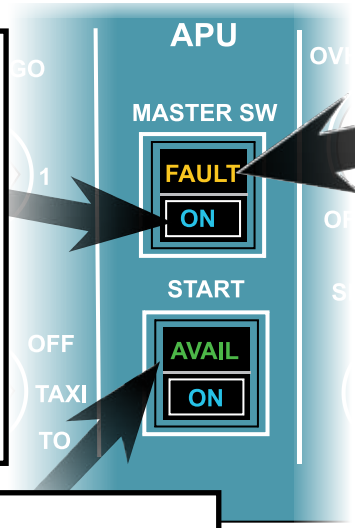
IF CABIN PRESSURIZATION EXCEEDS 14,000 feet PASSENGER OXYGEN MASKS DEPLOY.

APU START PANEL

MASTER SWITCH

ON -
- ON light illuminates
- ECB power-up test initiated
- APU air inlet flap opens
- APU fuel isolation valve opens
- APU fuel pumps runs if needed
- ECAM APU page displayed

OFF -
- ON light goes out
- APU shuts down
- AVAIL light goes out



START SWITCH

ON -
- ON light illuminates
  as soon as the air inlet flap is fully open:
- APU starter is energized
- IGNITION occurs
- At a preset (unknown to pilots) the N1, starter, and ignition shut off.

AVAIL LIGHT -
- Comes on when N1 is above 95%
- Goes out when APU shuts down.

APU START WARNING

DO NOT start APU during fueling operations following an APU automatic shutdown or failed start.

MASTER SWITCH FAULT LIGHT
Comes **ON** when **AUTOMATIC** shut down occurs.

APU SHUTS DOWN WHEN:
- *APU FIRE on the ground*
- *APU air inlet flap didn't open*
- *APU overspeed*
- *APU underspeed*
- *Abnormal start*
- *Over temperature*
- *Low Oil Temperature*
- *High oil temperature*
- *DC power failure*
- *ECB failure*
- *Loss of over-speed protection*
- *Reverse airflow.*

some APU TECH *stuff*

APU MAXIMUM ALTITUDES

APU start using airplane BATTERY	25,000 feet
APU start using normal electrics	39,000* feet
Two-pack operation	15,000 feet
One-pack operation	20,000 feet
For engine start	20,000 feet

***NOTE**: *APU start capability is improved below 31,000 feet*

APU OIL QUANTITY

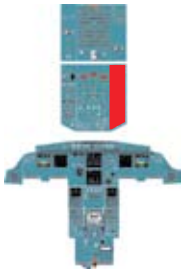
If you get an APU ECAM page LOW OIL LEVEL message: Don't panic ... the remaining oil quantity allows for normal operation for approximately 10 hours.

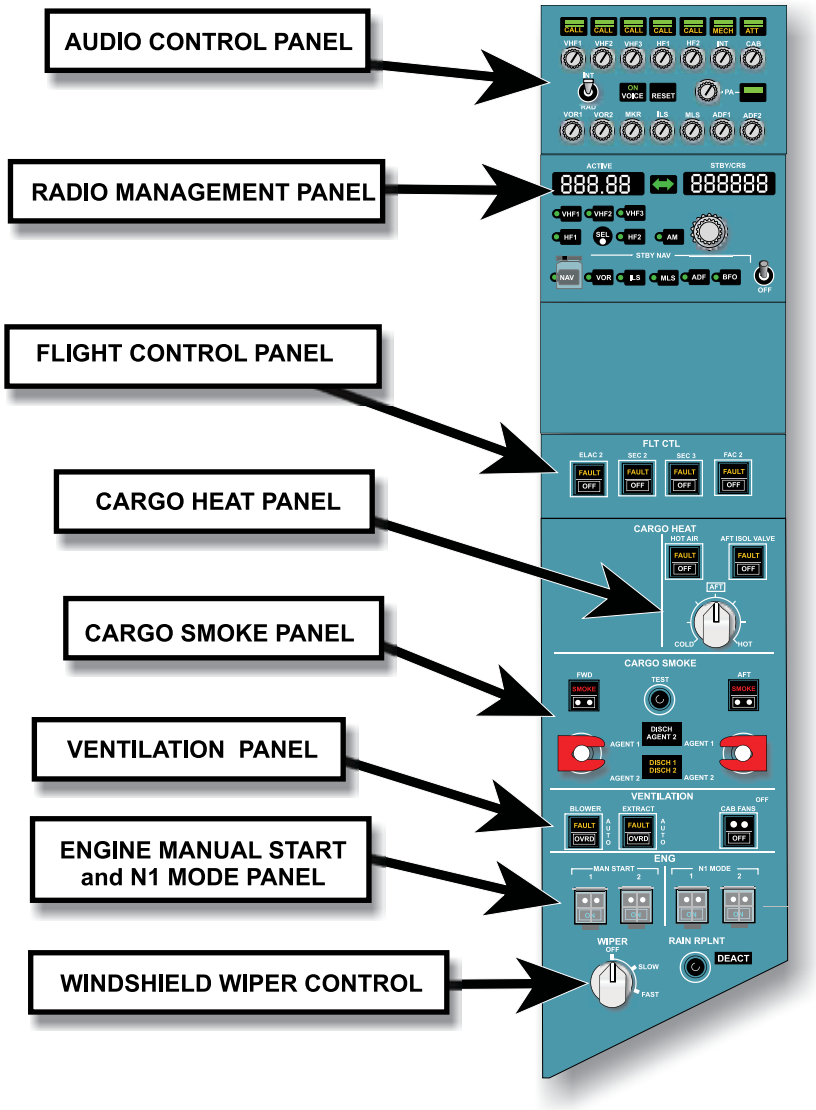
APU STARTER DUTY CYCLE

Start attempts	Cooling Time Limit
Between each start cycle	1 minute
After first 3 start attempts	60 minutes

Flightdeck panel preview

OVERHEAD
right side panel

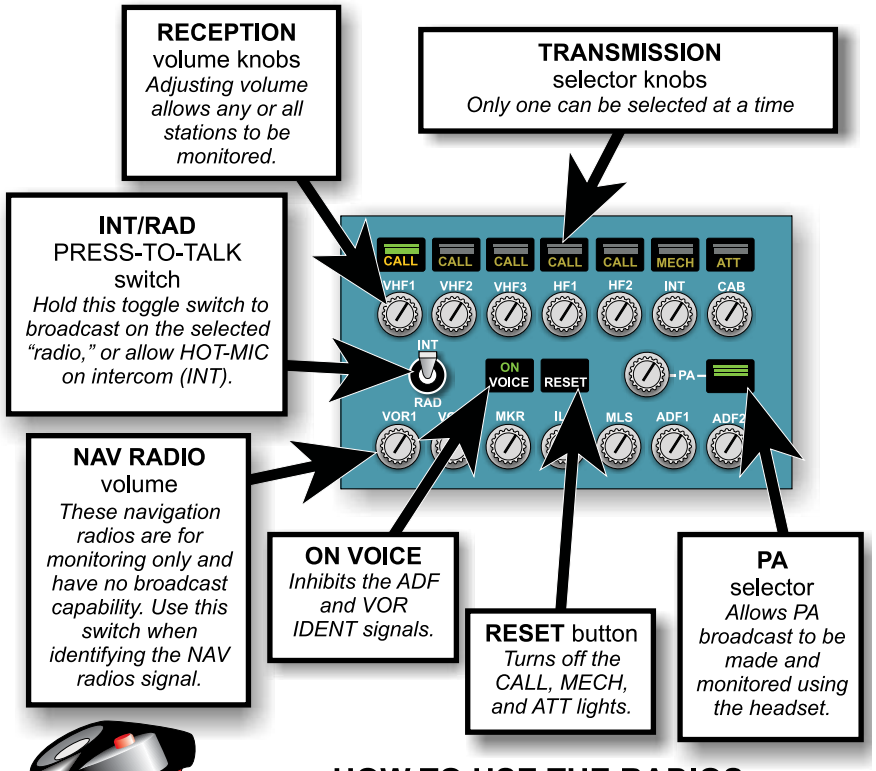




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COMMUNICATIONS PANELS

Audio Control Panel



HOW TO USE THE RADIOS

The radio panel is set up so that you can only broadcast with one radio at a time. Across the top of the Audio Control panel are the selections. They are labeled appropriately and indicate with a light : VHF1, VHF2, VHF3, HF1, HF2, INT (Flight interphone or MECH light indicates a call from external interphone), and CAB (cabin/service interphone). ATT light indicate a call from a flight attendant station.

Simply depress the button with the illuminated CALL light, and all other radios will be disconnected from the broadcast even though you will still be monitoring the incoming signal.
Then, to actuate the radio transmitter, toggle the INT/RAD key or the activate the transmit trigger on the side-stick.

YOU CANNOT TRANSMIT AND LISTEN AT THE SAME TIME.
In order to hear the incoming calls, you will have to release the transmit button after you have made your transmission.

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COMMUNICATIONS PANELS

RMP (Radio Management Panel)

TRANSFER BUTTON
Depressing this switch will place the STANDBY frequency in the ACTIVE display; thereby tuning the selected radio to the new frequency.

STANDBY FREQUENCY (or COURSE)
This display responds to the selector knob. It shows what frequency (course) we are tuning.

ACTIVE FREQUENCY
This display indicates which frequency is in use.



RADIO SELECTORS
These buttons allow us to select the radio in order to observe or change the frequency (course).

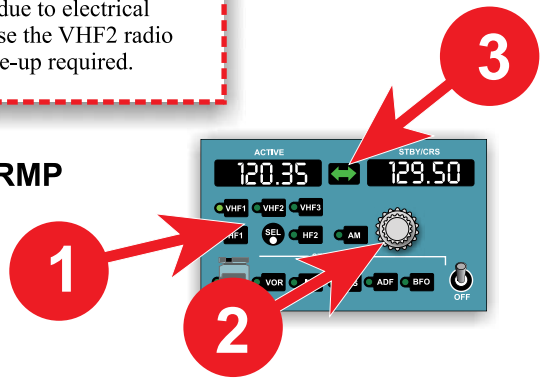
TUNING KNOB
*This knob will change the settings in the STANDBY/COURSE window **ONLY**!*

ON/OFF switch
When this switch is turned OFF or the unit fails, then RMP3 is connected directly to the associated ACP.
NOTE:
RMP3 is located on the upper overhead panel.

NOTE:
Using VHF1 radio to tune the higher frequencies (such as 135.97) there may occur an increase in background noise. This is due to electrical interference. If this occurs, use the VHF2 radio instead. No logbook write-up required.

HOW TO USE THE RMP

1. Select the desired radio
2. Tune desired frequency
3. Depress the transfer button

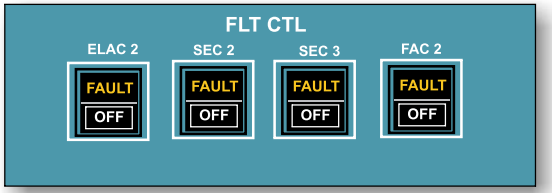


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FLIGHT CONTROL (FTCL) PANEL

There are two of these panels on the overhead, one on the left side, and this one on the right side. They monitor and control the flight control computers. Failure of these systems results in degraded operational capability. These levels of capability are referred to as LAWS.



ELAC is the **ELEVATOR and AILERON** computer
SEC is the **SPOILER and ELEVATOR** computer
FAC is the **FLIGHT AUGMENTATION** computer

WHAT IF THEY FAIL?

THE LAWS

A short introduction.

You have certainly heard about the highly touted "FLY-BY-WIRE" flight control system on this airplane. Flight control computers interpret the pilot's command and move the flight control surfaces so as to achieve flight ... enhanced for safety and operational considerations, of course. This system is designed to keep the pilot from hurting the airplane or flying outside of the safe envelope box. These are the little computers that operate the flight controls and make it all happen.
As a result, when everything is going normally ... the airplane is as close to fool-proof as the engineers could make it. Life is good.
There are back-ups to the back-ups and ordinarily these things work pretty well. But, when these little guys screw up or go off-line ... then things get interesting.

They refer to these types of failures as LAWS. For example, when you are on the ground, you are operating in **NORMAL LAW-GROUND MODE**. Once the airplane gets airborne, at lift off, the controls transfers to **NORMAL LAW-FLIGHT MODE**.and remains there until the flare mode engages during landing at 50 feet RA.

In that envelope, should any of the control computers malfunction or fail, the airplane is said to be operating in a **DEGRADED LAW**. There are about FIVE basic levels of Degraded Law:

- **ALTERNATE LAW,**
- **ALTERNATE LAW WITHOUT SPEED STABILITY,**
- **DIRECT LAW,**
- **ABNORMAL ATTITUDE LAW,** and the ever popular
- **MECHANICAL BACK-UP**.

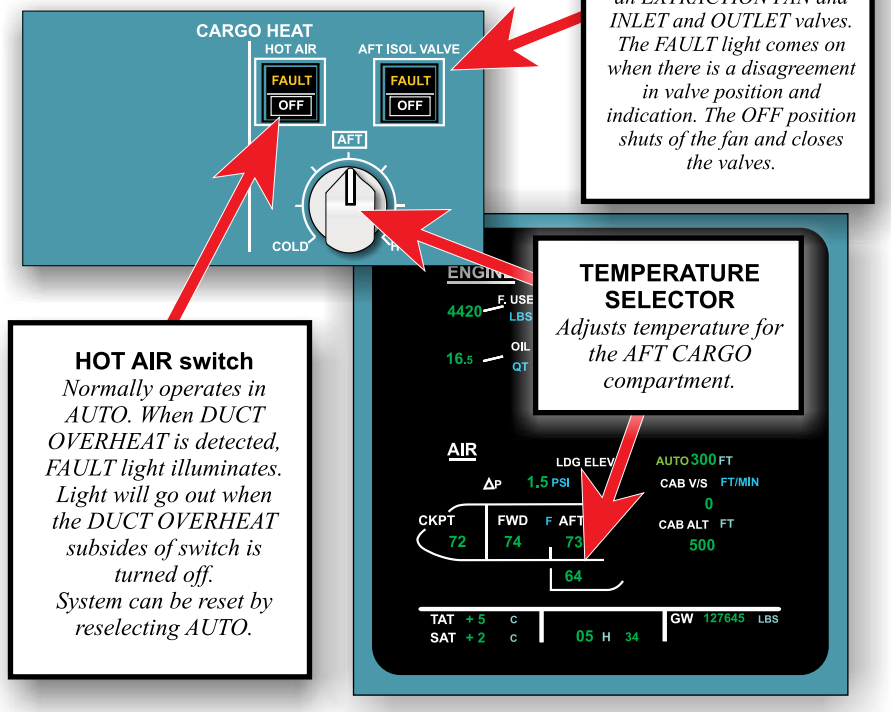
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AFT CARGO HEAT PANEL (A320)

There are two cargo compartments. The temperature in the **FORWARD** one is controlled by routing cabin air around the enclosure.
The **AFT** cargo compartment has an automated system involving a fan and inlet and outlet valves. The temperature is controlled by the rheostat switch in the cockpit.
If smoke is detected by an "aft cargo compartment smoke detector" the system will:

- shut off the fan,
- close the valves and
- illuminate a FAULT light on the cockpit panel.



AFT ISOLATION VALVE
In AUTO this switch controls an EXTRACTION FAN and INLET and OUTLET valves. The FAULT light comes on when there is a disagreement in valve position and indication. The OFF position shuts of the fan and closes the valves.

TEMPERATURE SELECTOR
Adjusts temperature for the AFT CARGO compartment.

HOT AIR switch
Normally operates in AUTO. When DUCT OVERHEAT is detected, FAULT light illuminates. Light will go out when the DUCT OVERHEAT subsides of switch is turned off.
System can be reset by reselecting AUTO.

FWD CARGO (A320) and FWD/AFT CARGO (A319)

Ventilation and heat are NOT available ... however, cabin air is routed around the compartments to maintain a suitable temperature inside the compartment.

NOTE:
It is OK to carry animals in either cargo compartment, although the AFT compartment is preferred.

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CARGO SMOKE panel

IF YOU GET A "SMOKE" WARNING,
YOU ARE EXPECTED TO TREAT THIS AS A SERIOUS SITUATION.

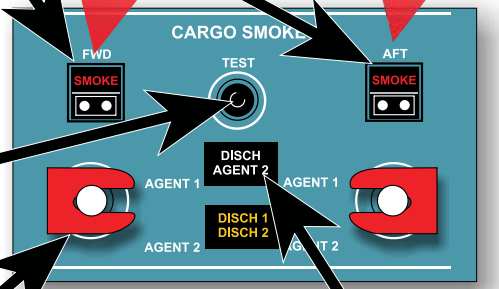
The FORWARD and REAR cargo compartments have a dual loop smoke detector system. If one system is disabled, the other still provids detection.

WHEN SMOKE IS DETECTED:

CRC (Continuous Repetitive Chime) sounds,
SMOKE light illuminate on SMOKE panel,
MASTER WARNING lights illuminate,
ECAM warning on the E/WD.

THIS IS A BIG DEAL ...prepare to LAND ASAP!

SMOKE indication light
Illuminates RED when SMOKE is detected. In the case of the AFT light/switch, if you push it you will
CLOSE the AFT INLET and
OUTLET ISOLATION VALVES, and
SHUT OFF the EXTRACTION FAN.



TEST button
Pressing the button tests:
-SMOKE detectors in sequence,
-SMOKE lights twice with associated ECAM,
-DISCHARGE lights.

AGENT DISCHARGE switch.
(*Has a red guard over the switch*)

Intuitive arrangement allows discharge of either agent 1 or 2 in either compartment.

DISCH AGENT 2
Comes on 60 minutes after AGENT 1 discharged. Goes OUT when AGENT 2 is discharged.

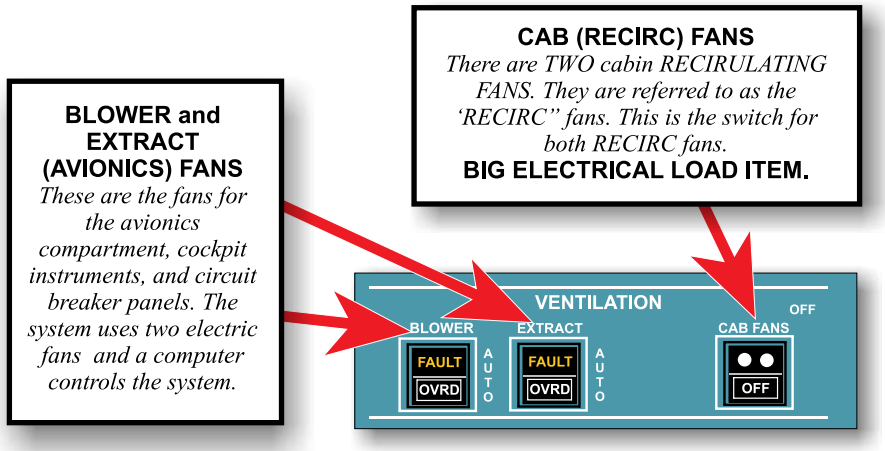
NOTE 1:
The first bottle discharges in approximately 60 seconds. The second bottle discharges in approximately 40 minutes and is vented through a flow control system.

NOTE 2:
Expect the SMOKE warning to remain after the agent is discharged, even if the smoke source is extinguished. Here is the problem, the smoke detectors are "OPTICAL SENSORS" and the dispersed fire fighting agent itself looks like smoke to the detector.

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VENTILATION panel

BLOWER FAN, EXTRACT FAN, and RECIRCULATION FANS



BLOWER and EXTRACT (AVIONICS) FANS

operating modes:

There are FIVE different modes of operation for these fans.
THREE NORMAL and 2 ABNORMAL MODES:

NORMAL MODES:

1. ***OPEN*** *(on ground). Outside air used to cool the equipment.*

2. ***CLOSED*** *(in-flight and on ground with COLD air). Cooling air is circulated through a "skin heat exchanger" and exits under cargo compartment.*

3. ***INTERMEDIATE*** *(In-flight with warm temperature). Air is circulated through the "skin heat exchanger" and exits under the cargo compartment AND through the EXIT VALVE.*

ABNORMAL MODES:

4. ***ABNORMAL*** *(Either BLOWER or EXTRACT fan selected to OVRD). System reverts to CLOSED system but air is supplied from Air Conditioning system and there is NO CARGO HEATING.*

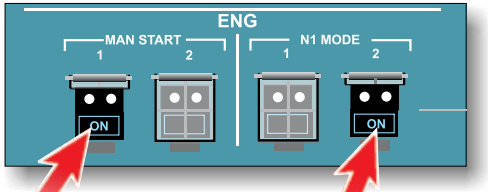
5. ***SMOKE CONFIGURATION*** *(When* ***BOTH BLOWER*** *and* ***EXTRACT*** *fans are selected to* ***OVRD****). Blower fan stops and extract fan continues to operate. Air conditioning air is used to cool the avionics and it is extracted overboard.*

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ENGINE MANUAL START and N1 MODE panel

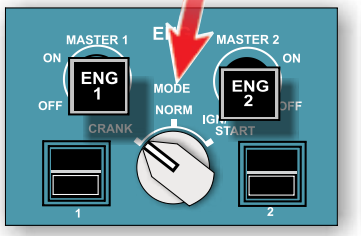
The **MAN START** panel is *NOT* normally used to start the engines. It is used by pilots during a **TAILPIPE TORCHING** situation (See **QRH** procedure).



These guarded switches will OPEN the START VALVE IF:

- *ENG MODE selector is in either CRANK or IGN/START, and*
- *N2 is less than 15%.*

When the start valve is open, the **ON** light will illuminate blue.



N1 MODE SWITCHES

(*Not used during NORMAL operations***)**

When selected, the THRUST control reverts from the normal (EPR) control mode to the alternate (N1) control mode.

When a reversion to N1 rated or unrated mode occurs automatically, selecting the N1 MODE switch will ***CONFIRM*** the mode by illuminating the ON light in blue.

YIPE! - HEADS UP:

The reversion to the N1 mode is recognized by the FMGC as an engine-out condition.

THEREFORE: the EO (engine out) prompt on the MCDU should be pressed to recover flight management capabilities for 2 engines.

RANDOM NOTES:

1. Recovery of the **EPR MODE** on both engines may be attempted by switching off both **ENG N1 MODE** switches.

2. When N1 is confirmed on the affected engine, the other engine **MUST BE** reverted to the rated N1 mode to ease thrust setting.

3. You will have to revert to **MAN THR** and *MANUALLY ADJUST* the throttles. This may result in the engines being unaligned.

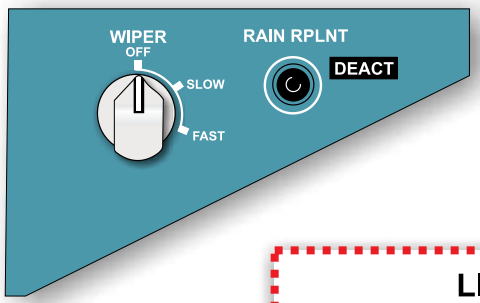
4. In un-rated N1 mode, the engine IS NOT protected from OVERBOOST.

DO NOT EXCEED THE N1 LIMIT.

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WINDSHIELD WIPER control

Each windshield has a two-speed electric wiper that are controlled by their individual WIPER selector,



LIMIT:
DO NOT OPERATE
windshield wipers above
230 KIAS

Operational comment:

Operating the windshield wipers on a 'DRY" windshield is not recommended.

***TECHNIQUE**: During light precipitation, the rain particles will mostly be "blown" off the windscreen surface. It is only during periods of heavy rain that the wipers are really effective.*
As far as freezing precipitation that manifests itself as Ice and snow; it is a combination of windshield heat and wipers that is most effective.

RAIN REPELLENT

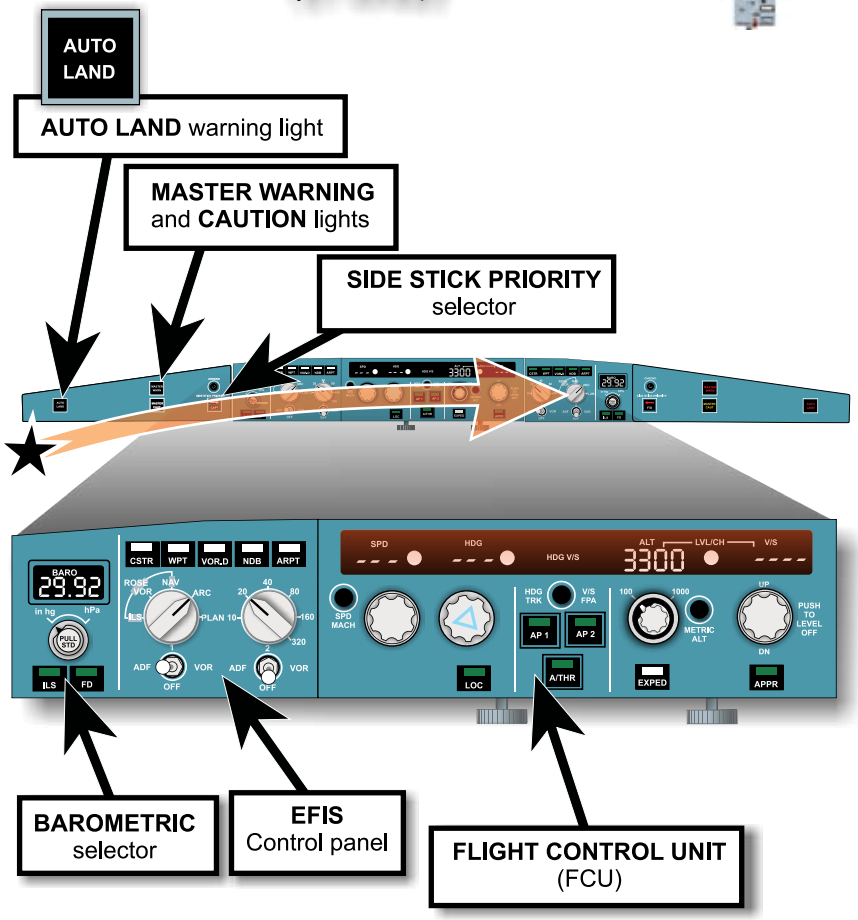
"DEACTIVATED"

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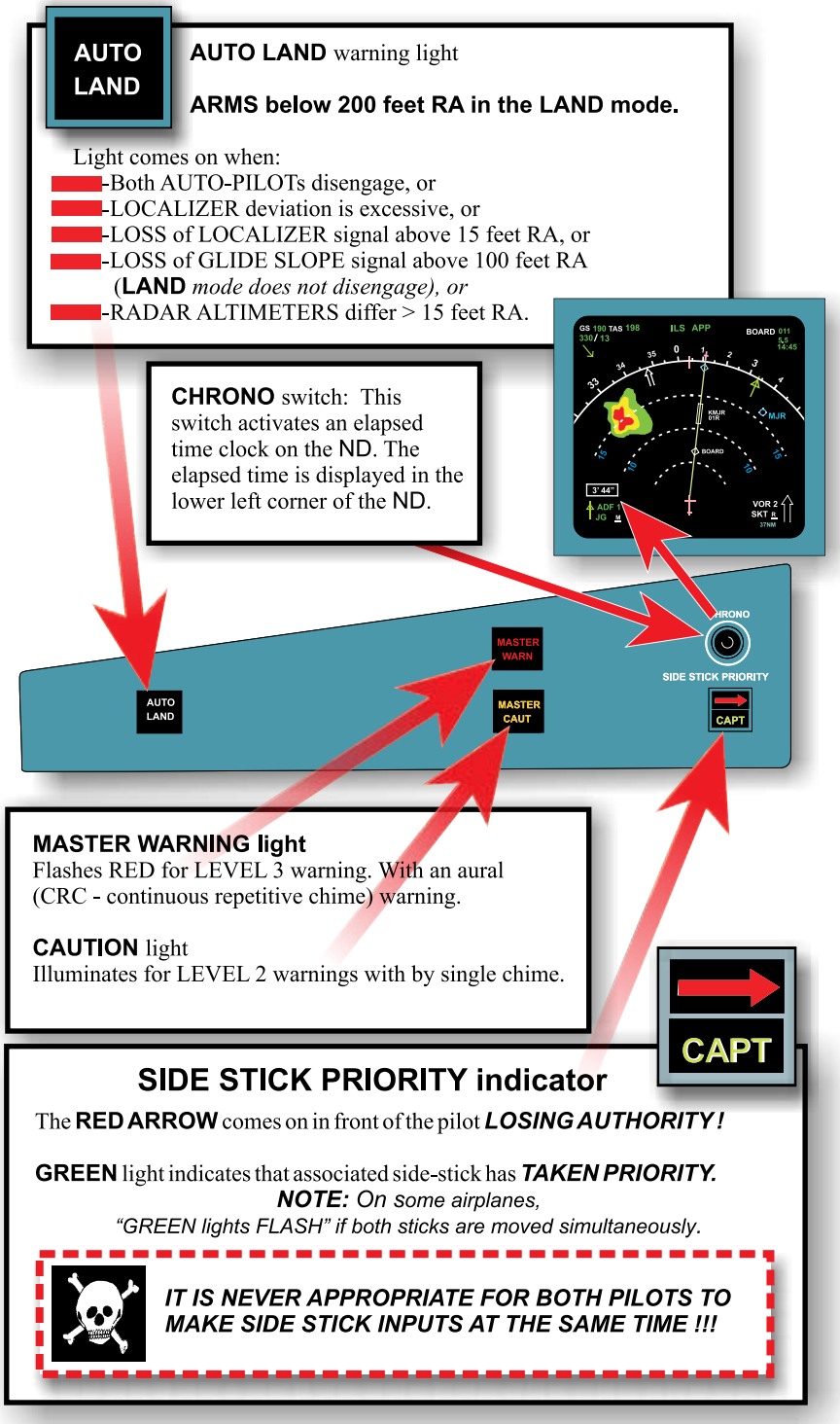
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Flightdeck panel preview

GLARE SHIELD and FLIGHT CONTROL UNIT (FCU)



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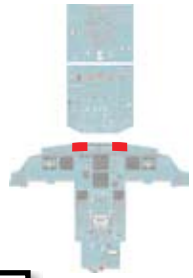
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Even though it is referred to as the:

ELECTRONIC FLIGHT INSTRUMENT SYSTEM (EFIS) CONTROL PANEL.

BUT

This panel actually controls the information on the **NAVIGATION DISPLAY (ND).**

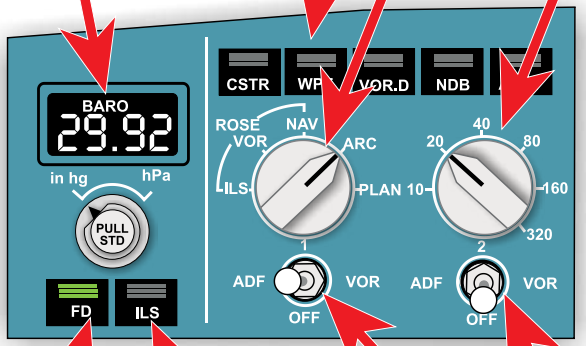


BAROMETRIC SELECTOR
Pull the knob and it sets Standard Barometric setting QNE (29.92 in hg/1013 hPa); Push the knob and you can set the QNH.

DATA DISPLAY push buttons

MODE selector

DISPLAY RANGE selector



FLIGHT DIRECTOR (FD)
Selects FD Command bars or Flight Path director on the PFD

NOTE:
At least ONE F/D (Flight Director) *MUST* be selected ON for the A/THR (Auto-thrust) to engage.

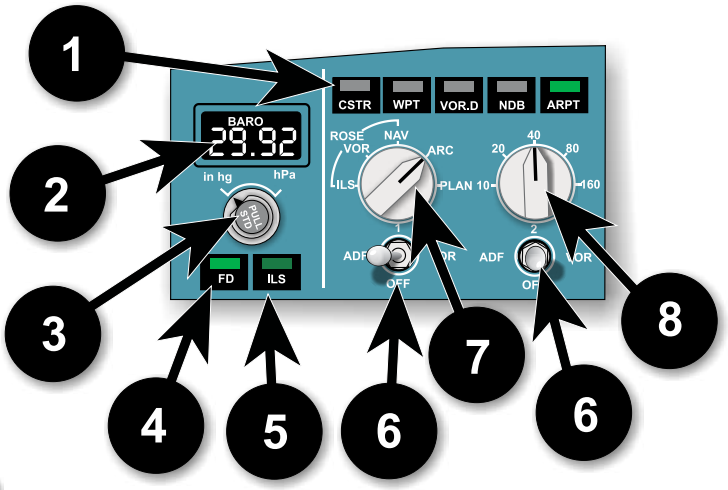
ILS or LS button
Places ILS information on the PFD including RADIO and FLIGHT PATH information (radio cluster). Labeled LS on some airplanes.

VOR/ADF selectors
Places the indicators and pointers on the respective ND. Displays frequency and identifier when VOR/ADF selected on the **RAD NAV** page is identified.

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more EFIS CONTROL PANEL details



1

DATA DISPLAY on **ND**: Depressing these buttons will display on the ND the location and name of 5 specific navigation related ground based items. Frequently, use of these selectors is the cause of "clutter" on the ND screen and therefore it is suggested they used singly and sparingly, particularly at higher range settings.

CSTR- CONSTRAINTS
WPT- WAYPOINTS
VOR- location of VORs
NDB- location of NDBs
ARPT- AIRPORTS. Some airlines pre-set the database to display ONLY airports the have criteria they set. For example, only airports with more than 6000 feet of runway. Each airline may configure the FMGC to display its own set of criteria.

Place the criteria used by your airline here.

2 *Let's take a moment and review this barometric stuff. Some of you new guys are going to be exposed to International flying for the first time. This is* ***CRITICAL INFORMATION.***

BARO window: Displays barometric pressure reference. There are two choices: Either Inches of Mercury (in Hg) or Hectopascals (hPa). Notice that they are different numerically when representing the same value. For example; the "STANDARD" barometric pressure is 29.92 in hg or 10.13 Hpa. They both represent the same pressure, but have different numerical values. Different parts of the world use either one setting or the other, there is no consensus on which should be used.



Why does a pilot care: Because if you get confused, and place the improper reading in the window, the airplane WILL NOT indicate the proper altitude ... and you could ***CRASH and DIE***!!!

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3 **BAROMETRIC** selector: Turning this knob selects the barometric reference for all the relevant systems of the airplane/sim. If it is **PULLED**, it will display the standard reference used in the **QNE (**29.92 In Hg or 1013 hPa**)**. If you **PUSH** the knob, you can manually select the desired barometric pressure (**QNH**) using the OUTER SELECTOR.
There is an INNER selector which allows you to select either In Hg or hPa.

4 **FD**: This is the FLIGHT DIRECTOR selector button. It is important to have this selected. At least one F/D must be selected for the A/THR to operate.

5 **ILS**: The ILS/IL button will cause to be displayed on the PFD:
- the LOCALIZER AND GLIDE-SLOPE indicators, and
- the ILS IDENTIFIER, FREQUENCY, and DME, and
- the COURSE BAR on the heading scale, and
- DEVIATION SYMBOLS are displayed when a valid ILS signal received.

6 **VOR/ADF** switches: This is where you select the VOR or ADF needle to display on the ND. These needles won't display if using the PLAN mode. IDs and appropriate navaid data is also displayed.

> Tuning the frequencies may be either manually or automatically done on the **RAD NAV** page of the **MCDU.** However, note that the ADF/NDB may not auto-tune until the FAF, so it is good technique to ALWAYS manually tune the ADF/NDB during the ADF/NDB

7 **MODE SELECTOR:** There are 5 modes indicated on the selector. Most of the time, you will be using the **ARC** mode. It gives the best forward coverage; however, the **NAV** (**ROSE**) mode is also excellent when desiring to view features aft of the wings.
The **ILS** and **VOR** mode are used during those approaches for reference.
The **PLAN** mode is useful during flight planning and when evaluating a route. It is coupled with the **F-PLN** page of the **MCDU.** When you use the **SCROLL ARROW KEYS**, the **PLAN** display will move the selected way-points to the center of the display, allowing you to "*walk your way through the flight plan*."

When using the **PLAN MODE,** note that
the display will be oriented to the NORTH.

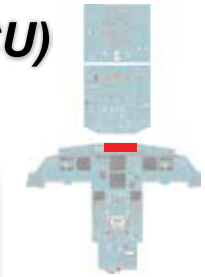
8 **RANGE SELECTOR:** There are 6 ranges available. Pilots will be constantly twiddling this knob during a flight in order to keep the "best" picture displayed on the ND.
TECHNIQUE: Keep the next waypoint at the top of the ND.

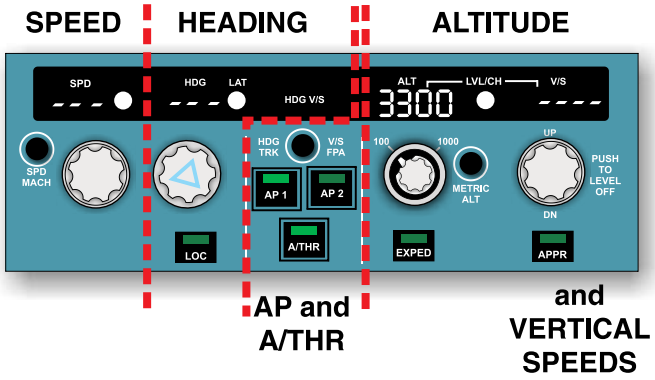
The range must be 80 NM or less to display SID and STAR waypoints.

> In the event of a mode or range data failure, The ND defaults to a ROSE NAV mode with an 80 NM range.

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FLIGHT CONTROL UNIT (FCU)





There are two basic modes of operation:

- **MANAGED**: This is the *AUTOMATIC* mode. The airplane is guided along the path as entered in the MCDU. The FMGC computer is "flying" that mode of operation.
- **SELECTED**: This is the *MANUAL* mode. Airplane will fly the values selected by the pilot.

GOUGE:
PUSH *towards the instrument for the computer to fly,*
PULL *towards the pilot to take manual control.*

NOTE:
Except during certain instances, such as TAKEOFF or inflight with LOC, LOC, APCH NAV; when you select a heading, speed, altitude, or vertical speed, the selector knob* ***MUST BE PULLED within 45 seconds*** *after the selection is made, or the indicator will revert to dashes and to the managed mode.*

The pilot can ONLY select the following LATERAL modes:
- **HDG** (Heading)
- **TRK** (Track)

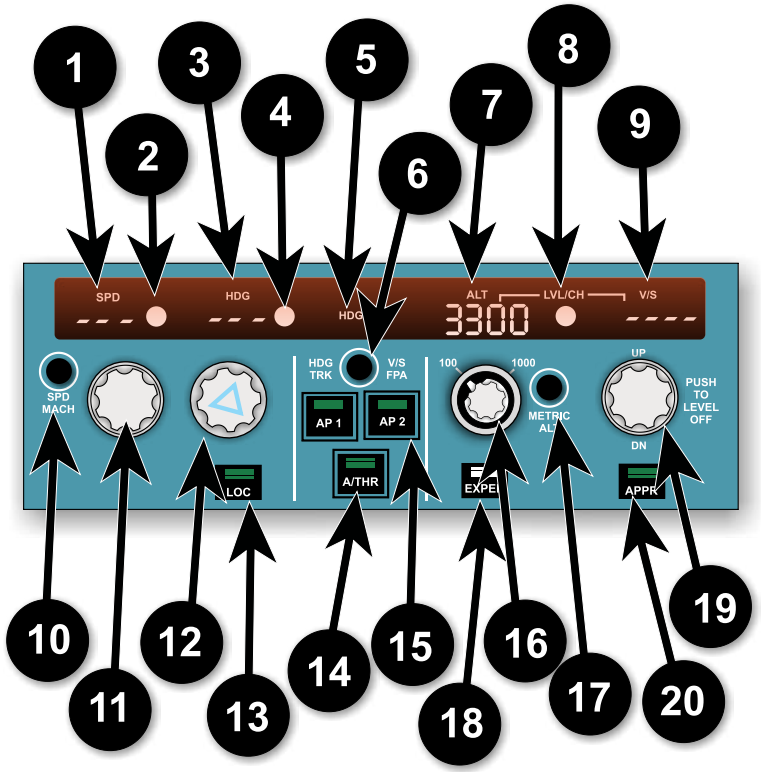
ALL other LATERAL modes are **MANAGED** modes:

The pilot can ONLY select the following VERTICAL modes:
- **OP CLB, OP DES** (Open Climb, Open Descent)
- **V/S-300** (Vertical Speed greater than 300 FPM)
- **FPA-3.3** (Flight path angle greater than 3.3 degrees)
- **EXP CLB, EXP DES** (Expedited climb, Expedited Descent)
- **ALT and ALT*** (Altitude and Altitude pre-set)

ALL other VERTICAL modes are **MANAGED** modes:

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FCU *details continued*



1 **SPEED/MACH (SPD/MACH)** window:

Displays DASHES when speed is operating in the Managed speed Mode (FMGC controlling speed).
Displays the selected SPEED/MACH numerically when operating in the selected mode (Pilot controlling the speed).

2 **MANAGED SPEED/MACH (SPD/MACH) light**
Illuminates when a managed speed is being provided by the FMGC. When this light is ON, it indicates SPEED is managed and coincides with dashed lines for the SPEED/MACH indication.

3 **HEADING/TRACK (HDG/TRK)** window:
This windows displays either **HDG** or **TRK**. The selection can be toggled using the button labeled 6 on our drawing. When the **MANAGED LATERAL MODE** is engaged, then **DASHES** are displayed. Pushing the button (12) will allow a speed to be manually selected.

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4 **MANAGED HEADING/TRACK light**
When this light is **ON**, it indicates HEADING/TRACK is managed and the dashed lines indicate that the FMGC is controlling the HEADING/TRACK.

5 **FLIGHT DIRECTOR DISPLAY** mode indicator light.
Displays Either HDG-V/S or TRK-FPA in response to the mode of operation selected by button 6..

6 **HDG-V/S / TRK-FPA** button
Selects either HDG-V/S or TRK-FPA for the PFD display.
This is useful during the CDAP approach, for example.

7 **ALTITUDE (ALT)** window
Displays altitude selected. The window NEVER displays dashes, even when CLB or DES is engaged. This is the TARGET altitude for the FMGC.

8 **LVL/CH** light
Indicates that MANAGED VERTICAL SPEED is either armed or engaged.

9 **VERTICAL SPEED (V/S) / FLIGHT PATH ANGLE (FPA)**
Displays either the V/S or the FPA. When not in either of those modes ... displays DASHES.

10 **SPEED/MACH** button
When pushed, toggles indication between MACH and AIRSPEED.

11 **SPEED/MACH** selector: If airspeed visible in the window, rotating the knob will change the value.
If dashes visible, turning the knob has no effect.

PULL ... selected speed displays current airspeed and engages knob to allow manual changes.
PUSH ... FMGS managed airspeed engaged, managed SPD light comes on, and dashes displayed.

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12 HEADING/TRACK selector

PULL: Heading may be selected and jet will turn to that heading.
PUSH: **NAV** arms or engages and **LAT** light comes on.

If heading is visible in the window, rotating the knob will change that value.

PULL ... The displayed **HDG/TRK** in the display is engaged and the heading selector knob is engaged.

IF heading is selected by the FMGC ***PRIOR TO*** pulling the knob: *Then the airplane turns in the shortest direction to the selected heading.*

IF knob pulled ***DURING*** a turn (heading not visible): *Then the airplane will roll out on the existing heading.*

IF heading selected ***AFTER*** pulling the knob: *Then the airplane will turn to the selected heading in the direction that the selector is turned.*

NOTE*: Except during TAKEOFF or inflight with LOC, LOC*, APCH NAV; when you select a heading, the selector knob* ***MUST BE PULLED within 45 seconds*** *or the indicator will revert to dashes.*

PUSH ... When the knob is pushed,
NAV engages and the **LAT** light illuminates.

PUSH towards airplane to engage managed values,
PULL towards pilot for pilot control.

13 LOC button

Arms, Engages or disengages LOC mode.

It actually "toggles" the LOC mode.
When the LOC or LOC* engages the selected localizer course:
- MANAGED LAT light comes ON, and
- Dashes appear in the HDG/TRK window

NOTE: *It takes a minimum of 3 seconds after arming for the LOC to arm.*

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14 AUTOTHRUST (A/THR) button

Arms or dis-engages auto-thrust system (**A/THR**).

A/THR (Auto-thrust) button: Toggles the AUTO-THRUST system from engaged to off..

NOTE: *If TOGA/LOCK occurs, you can re-set the system by toggling the A/THR button OFF and then back ON.*

15 AUTO-PILOT (AP) button

Engages or dis-engages the selected auto-pilot.

AP (Auto-pilot) buttons: Toggles the selected auto-pilot.

NOTE: *It is necessary to engage BOTH auto-pilots to fly a coupled ILS.*

16 ALTITUDE (ALT) selector.

Changes altitude displays in the ALT window.
INNER SELECTOR: Changes altitude value
OUTER SELECTOR: Selects 100 or 1000 foot increments.

PULL: OP CLB or OP DES engages.
PUSH: CLB or DES engage, and LVL/CH light comes on.

PULL: OP CLB or OP DES engages.

PUSH: CLB or DES engages and LVL/CH light illuminates.

17 METRIC button.

Displays FCU (FLIGHT CONTROL UNIT) altitude in meters.

METRIC ALT button: Displays the FCU altitude in meters on the bottom of the lower ECAM.

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18 **EXPED** button (Not used in NORMAL OPERATIONS)
When engaged, the airplane will attempt to climb/descend to the selected altitude set in the ALT window.
Sets "**GREEN DOT**" airspeed during climb and **.80M/340 kts** during descent.
It will automatically engage the managed airspeed mode.

NOTE:
EXP CLB ***NOT*** recommended above FL 250.

SPECIFICALLY USED ONLY FOR EMERGENCY DESCENT.

EXPED: Engages the EXPED mode to reach the altitude set in the altitude window with MAXIMUM speed gradient.
Pushing the button automatically engages managed speed.
To disengage EXPED, select a new vertical mode or selected speed.

CAUTION:
EXP CLB is not recommended above FL250, since the MACH NUMBER for the GREEN DOT airspeed is too low.

What is a **"GREEN DOT"** airspeed?
Green dot refers to the little circle on the airspeed indicator that is visible whenever the flaps are "0"..
It represents the BEST LIFT/DRAG speed. This gives us
- *Best angle of climb speed,*
- *Max endurance speed,*
- *Single engine driftdown speed.*



HOWEVER, when using the MACH numbers at higher altitude above FL 250, the green dot can actually get the airplane too slow and all sorts of bad things can happen.
The angle of attack can get to the point where it triggers α prot.
YIPE!!!!

19 **VERTICAL SPEED / FLIGHT PATH ANGLE** selector.

ROTATE: This Pre-selects a value.
PULL: V/S or FPA engages that value.
Rotate knob to change V/S in window.
PUSH: Airplane LEVELS OFF.

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20 APPR (APPROACH) button

CAUTION:
There exists an unfortunate terminology similarity and this is ***NOT THE APPROACH PHASE*** selector. The **APPR PHASE** is manually selected using the display on the **PERF/APPR PAGE** of the **MCDU**.

- If an **ILS** approach is loaded on the **MCDU,** then selecting the **APPR** switch Arms, engages, or disengages the following modes:
LOC and **G/S** modes.

- If any" line selectable" non-ILS approach (such as **VOR** or **NDB**) is loaded on the **MCDU,** then selecting the **APPR** switch Arms, engages, or disengages the following modes:
APP NAV, FINAL, and **FINAL APP** modes.

Here are some ways a pilot can screw up using the APPR button!

SCREW UP 1: ***If you ARM the ILS APPR mode above 8000 feet AGL***, *the auto-pilot disengages at glide-slope capture and the Flight Directors revert to* ***HDG-V/S***.

SCREW UP 2: *If flying the* ***APPROACH-NAV*** *approach,* ***DO NOT SELECT ILS*** .

SCREW UP 3: *If flying any non-ILS approach, the second auto-pilot* ***WILL NOT ARM***.

SCREW UP 4: *If flying a VOR or NDB approach, the LOC and APPR buttons* ***WILL NOT ARM for LOC or G/S***, *even if ILS is manually tuned.*

SCREW UP 5: *An ILS approach* ***MUST BE selected via the F-PLAN page*** *of the MCDU.*

SCREW UP 6: *If an ILS approach is loaded and the* ***LOC or APPR button is depressed PRIOR TO SELECTING the ILS or LS switch***, *then an AMBER ILS will flash on the PFD.*

SCREW UP 7: *If a non-ILS is loaded on the F-PLAN and the ILS/LS and APPR buttons are selected,* ***V/DEV flashes on the PFD***.

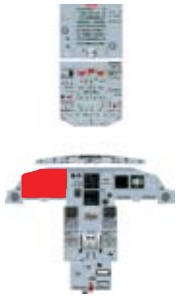
These are the ones I came up with ... I am certain, however, that there is some brain surgeon pilot out there that can come up with some additional creative screw-ups.

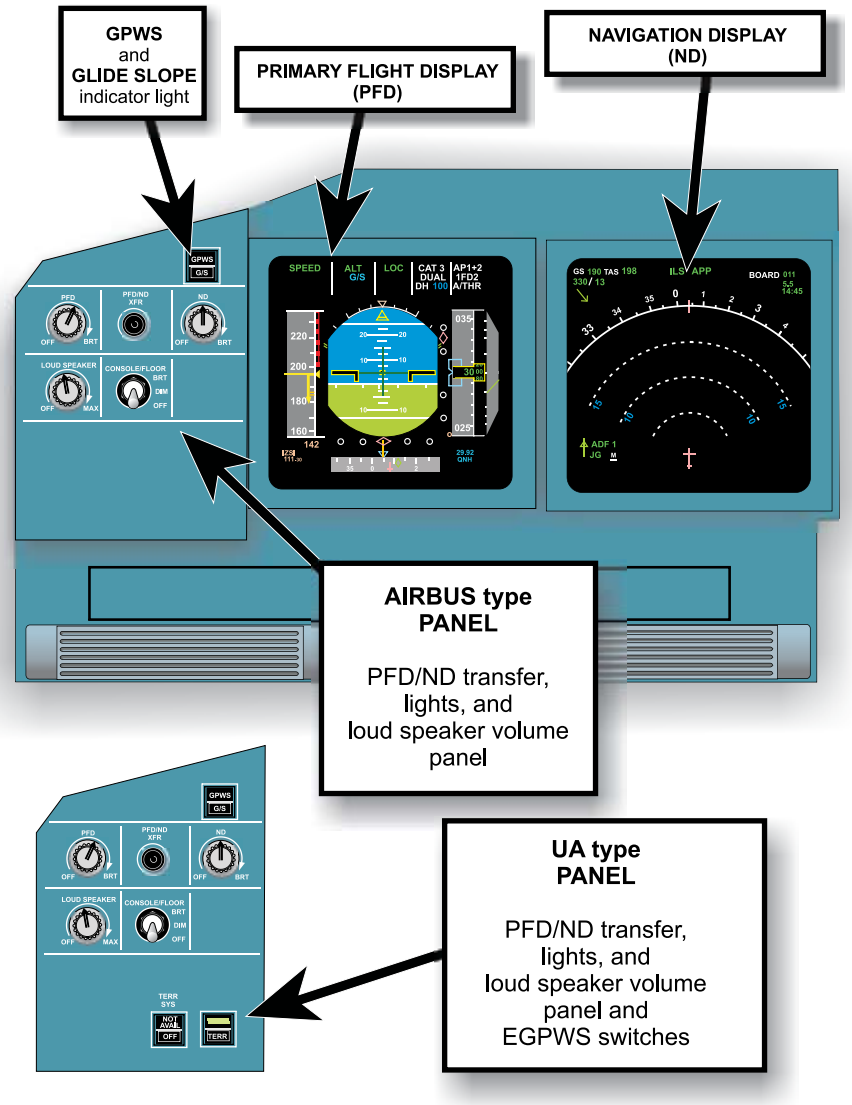
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Flightdeck panel preview

LEFT FORWARD "CAPTAIN'S" panel





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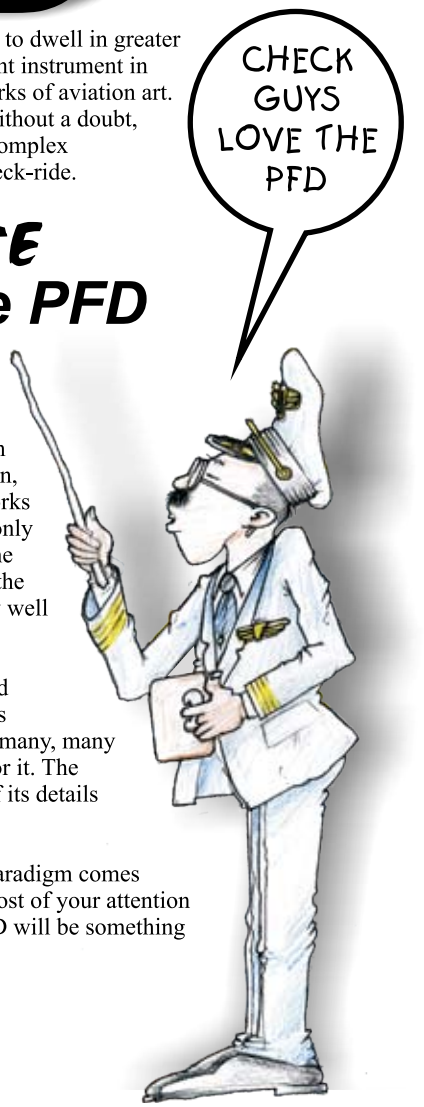
Here is where we introduce you to the

PRIMARY FLIGHT DISPLAY

referred to as the

PFD

We need to take the opportunity at this time to dwell in greater detail on what is arguably the most important instrument in the whole collection of beautiful Airbus works of aviation art. The reason we are going to do this is that without a doubt, the check airman is going to focus on this complex instrument during your oral part of your check-ride.



CONCENTRATE on learning the PFD

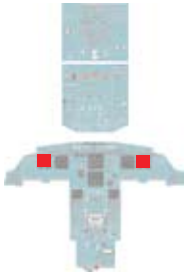
What we will do at this point in our discussion is to create a body of information that you can reference periodically. The idea is to learn how each part of this instrument operates in isolation, and then get a feel for how everything works in concert with the rest of the EFIS. Not only will this be essential to the operation of the airplane, but you can bet your bippy that the check-Captain can hardly wait to see how well you know this instrument.

We will try and cover a lot of the bells and whistles, but learning all the details of this incredibly complex display will take you many, many hours of actual operation to get the feel for it. The more you get used to using it, the more of its details will become visible to you.

The PFD is THE place where the flight paradigm comes together. The PFD is THE place where most of your attention will be focused during the flight. The PFD will be something that the Check-guy will zero in on.

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PRIMARY FLIGHT DISPLAY



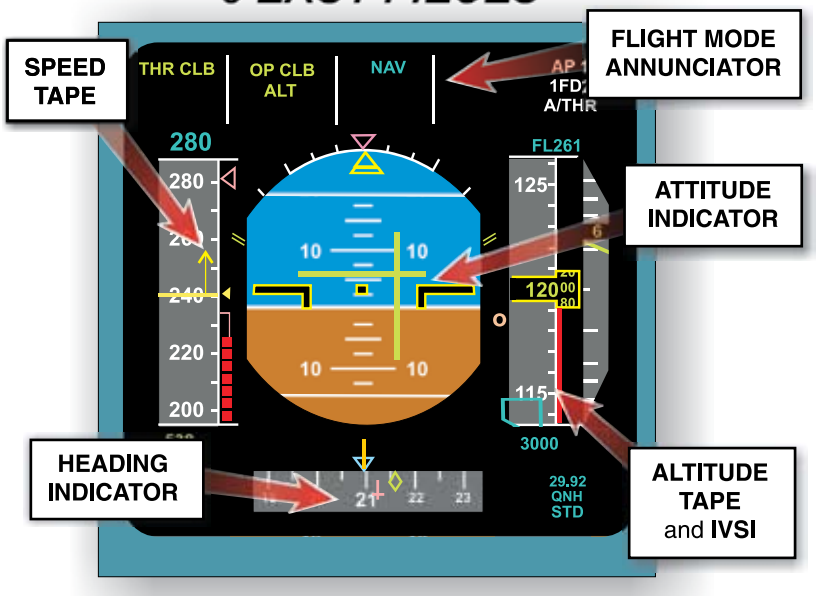
The simply fantastic and gorgeous Primary Flight Display will be the focus of most of your attention during a flight. This truly amazing instrument can tell us virtually everything we need to know about "*what the airplane is doing*" at any given moment ... and what it is going to do next. We are going to spend some time tearing the PFD apart and examining its parts.

TIP! *I can guarantee that one of the main items of interest to the check-pilot will be the depth of your knowledge of the PFD (Primary Flight Display).*

...and it is of major interest to us as pilots to know as much about this instrument as we can. We should be familiar enough with the indications on the instrument to be able to give an identity and some kind of meaning to even the most obscure detail. That will be the focus of this section, later we will actually demonstrate the unit in operation during the tutorial flight.

If we look at it carefully, we can see that the PFD (Primary Flight Display) has FIVE basic and separate parts to it, and I think it would be easier to understand if we break the instrument into these five parts and examine each piece in isolation.

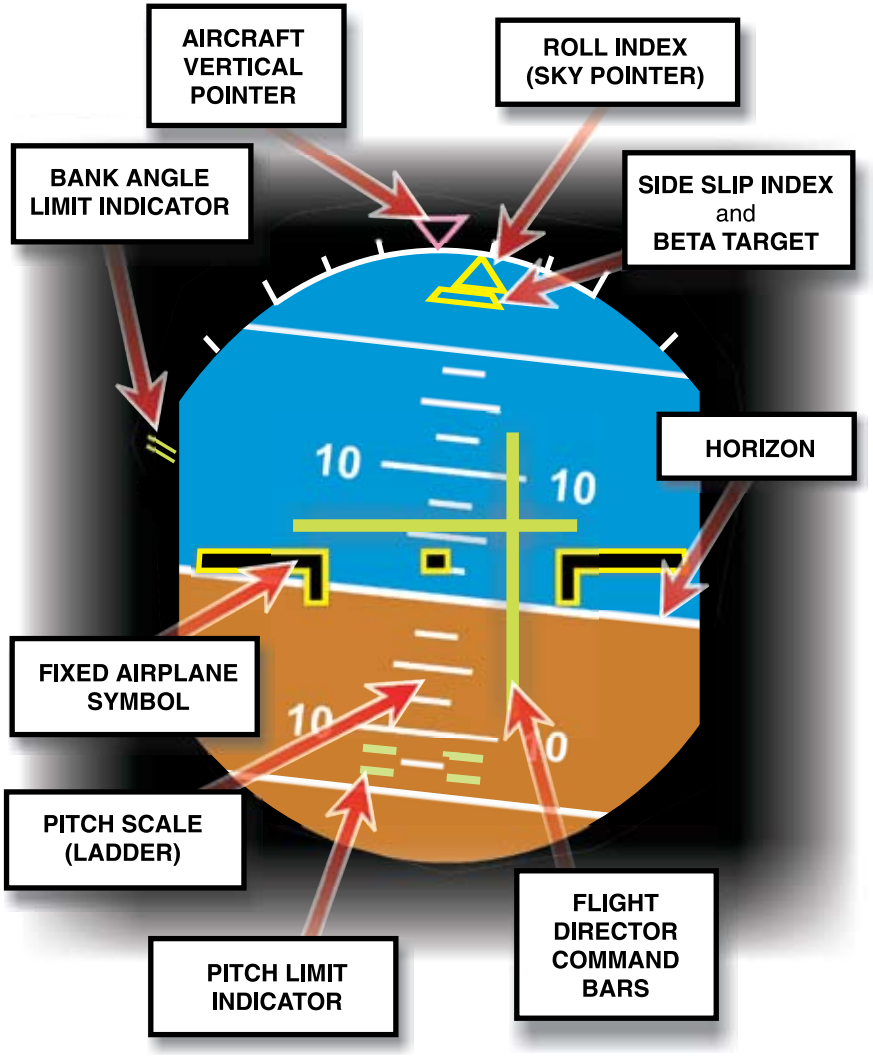
5 EASY PIECES



OH WOW!! Eye candy. It is a piece of aviation jewelry. Simply beautiful.

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ATTITUDE INDICATOR



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ROLL INDEX: The triangular indicator points to the number of degrees scale and indicates the angle of bank on the airplane.

The airplane auto-flight system is constructed so that the angle of bank should NEVER exceed the "**BANK ANGLE LIMIT INDICATOR**" (The two little green hash marks on the side of the instrument.) Those marks are set at 67 degrees on the roll scale.

SIDE SLIP indicator: When you push the rudder on the ground, this indicator will show the lateral acceleration.
Inflight; displacement indicates side slip as provided by ADIRS. When the pilot Pushes the rudder to center the roll index, then side slip is zero.

BETA TARGET: If there is a difference in power output between the engines (.25 epr) then the indicator will turn "BLUE". Pushing the rudder to center the BETA index will set up the side slip for optimum airplane performance.

I should point out that operating the rudder by either the trim knob or with your feet, will ***NOT*** cause the auto-pilot to disconnect.

FLIGHT DIRECTOR COMMAND BARS: Depressing the Flight Director selector button will arm the Flight Director bars.

When we begin the take-off roll, the F/D bars are NOT displayed. This could be confusing because I have observed both of these events on different airplanes. The F/D bars appear on the Attitude Indicator when either:

- SRS is selected (Thrust levers moved to the FLX or TOGA position). or
- Gear struts extend after take-off.

FLIGHT DIRECTOR COMMAND BAR limits:

Bars bias out of sight when:
- BANK angle exceeds 45 degrees.
- PITCH exceeds +25^{o} or -13^{o}
- Touchdown in the ROLL OUT mode

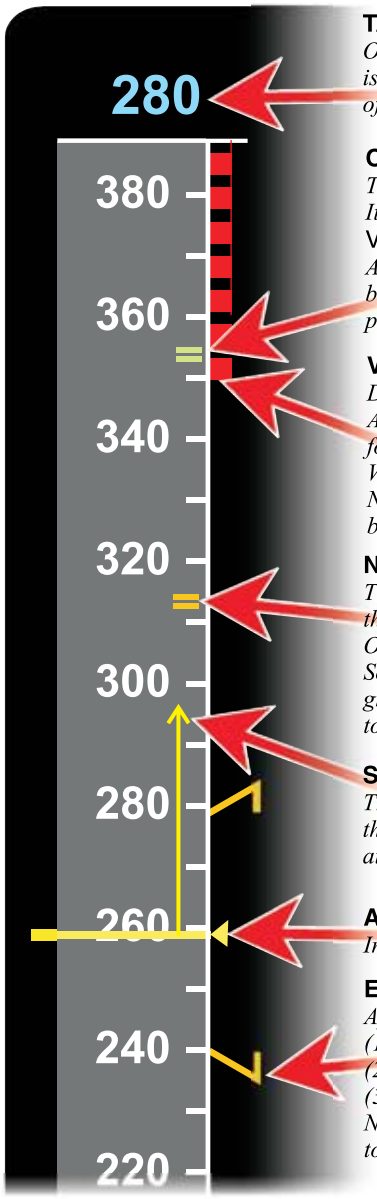
Bars "FLASH" when:
- a REVERSION occurs
- loss of LOC or G/S siganl in "LAND" mode.

NOTE: *A "REVERSION" is an event that causes the autoflight system to automatically change mode. Here are some examples, but by no means all the possibilities.*
- *If the FCU altitude is reset when ALT* is engaged, or*
- *If FCU reset below actual airplane altitude during climb, or*
- *If FCU reset above actual altitude during a descent, or*
- *Loss of NAV mode if VNAV engaged, or*
- *Excessive vertical speed, and so forth.*

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SPEED TAPE (PFD)



TARGET AIRSPEED
Only displays when target speed is beyond the range of the speed tape.

OVERSPEED PROTECTION SYMBOL
The speed at which high speed protection activates. It is actually 6 kts (.01 Mach) above Vmo.
Vmo is 350 KIAS, Mmo is .82 Mach.
Autopilot will disconnect, and the nose will begin to pitch up. At +30 kias, the jet will begin a pitch up that the pilot cannot over-ride with the stick.

Vmax
Displayed by the lower end of the "bricks." Airplane should NOT be flown faster than this point for the configuration selected. It is the lower of Vmo, Vle (landing gear extended - 280 Kias) or Vfe. NOTE: Vmo is 320 Kias when out of Normal Law, but tape will still indicate 350 Kias.

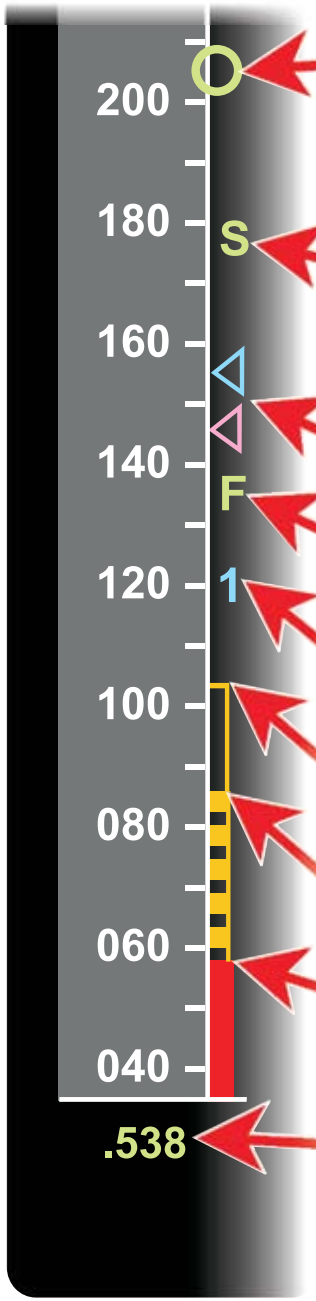
NEXT FLAP EXTENDED SPEED (Vfe next)
The placarded max speed for selecting the next greater flap setting. Only displays below 15,000 or 20,000 feet. Some airlines SOP requires selecting the "NEXT" greater flap setting 10 Kias below this airspeed to avoid OVERSPEED.

SPEED TREND ARROW
The tip of the arrow points to the airspeed to be attained in 10 seconds.

ACTUAL AIRSPEED REFERENCE LINE
Indicates the actual airspeed.

ECON SPEED RANGE
Appears when (1) In DES PHASE, (2) SPEED MANAGED, (3) DES FMA annunciated. Normally represents a +/- 20 Kias spread to minimize thrust variations during descent.

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GREEN DOT SPEED
Displayed when flap handle in "0".
Represents the BEST L/D *(LIFT/DRAG) speed.*
This gives:
(1) Best angle in climb speed,
(2) Max endurance,
(3) Single Engine driftdown speed,
(4) Single Engine climbout speed,
(5) Holding airspeed

MINIMUM SLAT RETRACTION SPEED
Displayed when Flap handle in position 1.
Minimum speed for retraction of flaps from position "1" to "0".
Airplane will slow to this speed during approach when managed and Flaps 1.

TARGET AIRSPEED POINTER
***SELECTED** = blue*
***MANAGED** = magenta*

MINIMUM FLAP RETRACTION SPEED
Displayed when Flap handle in position 2 or 3.
F is the min speed to retract flaps to position 1.
Airplane will slow to this speed during approach when managed and with Flaps 2 or 3.

TAKEOFF DECISION SPEED (V1)
Because it was "selected" on the PERF/TAKE-OFF page, it is blue.

LOWEST SELECTABLE SPEED (VLS)
The minimum speed that provides an adequate margin above stall. Slowest speed that the AUTOFLIGHT will fly.

ALPHA PROTECTION SPEED
Alpha floor protection activates.

ALPHA MAXIMUM SPEED
Maximum angle of attack speed.
Holding the stick full aft, this is the slowest speed that the airplane will allow you to fly.

MACH NUMBER
Displays when the MACH is greater than.5 and ILS button NOT selected.

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HEADING INDICATOR (PFD)

1 ILS INFORMATION

When the ILS button is pressed and an ILS is being received, it will annunciate and display the

- ILS IDENTIFICATION
- ILS FREQUENCY
- ILS/DME distance IF a DME is collocated.

2 HEADING SCALE

in 10 degree increments

3 SELECTED HEADING or TRACK INDEX

Displays when a heading is pre-selected while in NAV mode. Indicates the selected heading or track.

4 HEADING SCALE REFERENCE LINE

A fixed yellow line that indexes the moving heading scale. It displays MAGNETIC information. If, however, it reverts to true, then a 'TRU" will appear over the top right corner of the heading tape.

5 ILS FRONT COURSE POINTER

Appears when an ILS frequency and course are tuned and the ILS button is pushed.

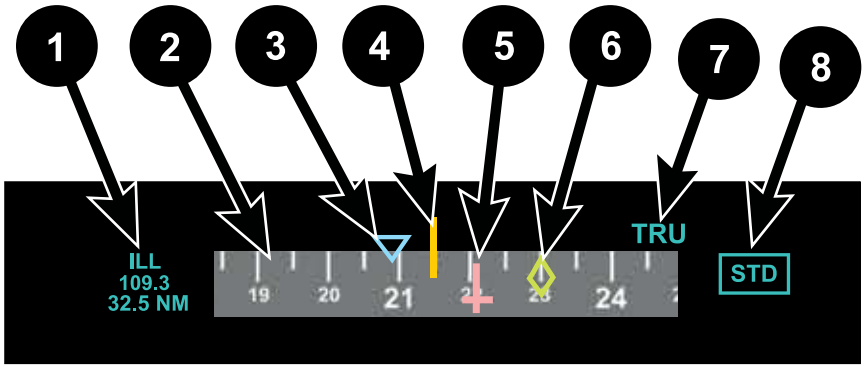
6 ACTUAL TRACK DIAMOND

Indicates actual track of the airplane. If displayed, the FPV indicator appears directly above the diamond on the PFD attitude indicator..

7 TRU

Displays when true heading is displayed.

8 BAROMETRIC STATUS INDICATOR



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ALTITUDE TAPE (PFD)

and INSTANTANEOUS VERTICAL SPEED INDICATOR

GLIDE SLOPE INDEX
Displays ONLY if the ILS/LS button is selected AND a valid IULS signal is being received.

(IVSI) Instantaneous VERTICAL SPEED INDICATOR
Indicates rate of climb in feet per minute
Example: in our display, we are showing a descent of 600 fpm.

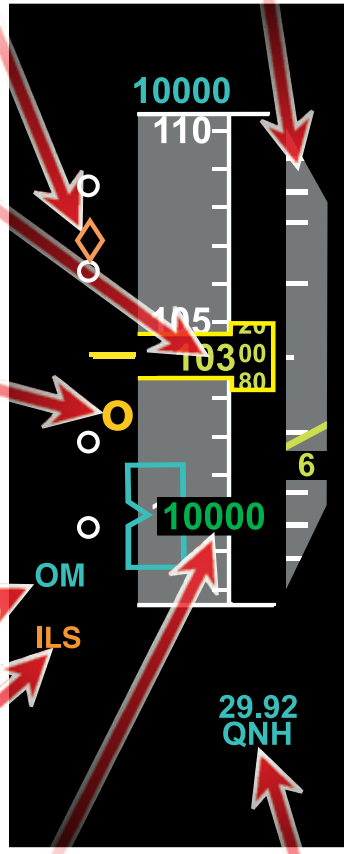
ALTITUDE INDICATION
*Displays current barometric altitude. The window will flash "**YELLOW**" when airplane approaches altitude target.*

*Flashes "**AMBER**" when airplane deviates from the target altitude.*

*Readout turns "**AMBER**" if airplane descends below MDA (if defined in MCDU).*

VNAV DESCENT PATH INDICATOR
Displays automatically during managed descent and approach phases. Indicates deviation from the VNAV path and will move when aircraft within +- 500 feet of a computed descent path. Numerical information available on the PROG page.

V/DEV is something else and only appears when a Non-precision approach is selected in the MCDU and the APPR button ON.



OM INDICATOR
This means we are passing the outer marker indicator. MM displays (amber) for the Middle Marker, and AWY displays (white) for the Inner Marker.

ILS INDICATOR
If an ILS is selected in the MCDU, but the ILS/LS button is not pushed, then this light will be flashing .

TARGET ALTITUDE INDICATOR
Indicates the altitude selected on the FCU.

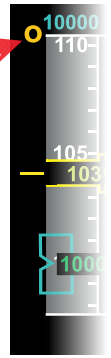
BAROMETRIC REFERENCE

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VERTICAL NAVIGATION DEVIATION INDICATOR

"THE DONUT"

Let's take a moment to discuss that little magenta "donut" that magically appears along the side of the ALTITUDE TAPE during the descent. The VNAV donut is displayed during the **DESCENT** and **APPROACH PHASES** of flight and indicates the jets relationship to an FMGC computed VNAV path.

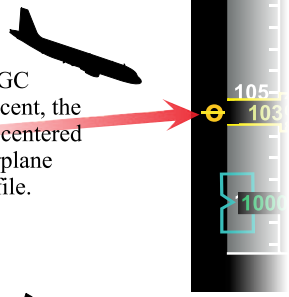


Suggested technique

If you start your descent about 5 NM (Nautical miles) from the T/D (top of descent) point, the airplane will assume a 1000 FPM rate of descent and will intercept the programmed descent profile and then increase descent rate to accommodate the descent profile.



The deviation from the planned descent profile may be monitored on the PROG page of the **MCDU**.



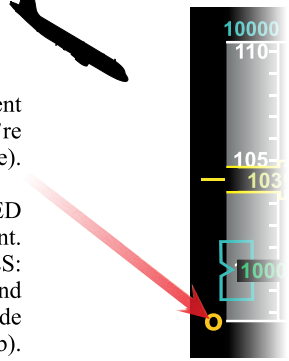
Once on the FMGC programmed descent, the DONUT will be centered as long as the airplane descends on profile.

HIGH and LATE

If you wait until you are "past" the top of descent indicator a start a "LATE" descent, you will get a"you're HIGH" DONUT (indicator at the bottom of the scale).

The PFD will usually display a DRAG REQUIRED message prompting you to begin your descent. Remember that the airplane RERQUIRES:

1. Manually set lower altitude, and
2. Manually select a descent mode (PUSH the FCU ALT knob).



VERTICAL DEVIATION INDEX

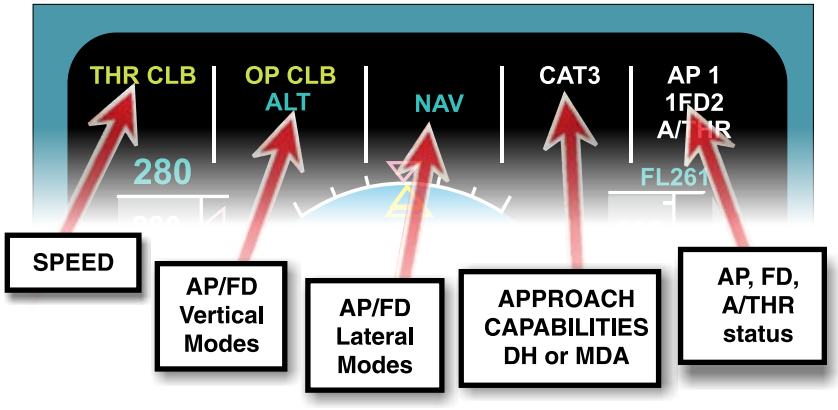
NOTE: This shouldn't be confused with the **VERTICAL DEVIATION INDEX**, which only appears when a Non-precision approach has been programmed in the MCDU and the APPR button has been selected ON. Referred to as the "MAGENTA SHOEBOX.

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FLIGHT MODE ANNUCIATOR (FMA)

NOTE:
The FMAs are the ONLY VALID indication of the status of the AUTO-FLIGHT SYSTEM.



GREEN = ENGAGED Mode.
BLUE = ARMED Mode.
WHITE = STATUS indication,
AMBER = ADVISORY indication.

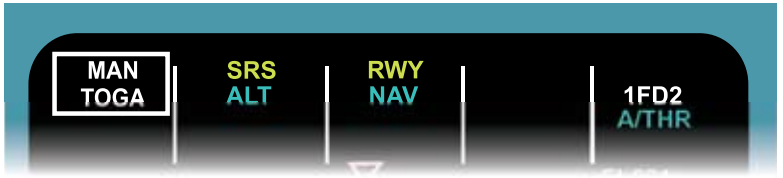
FIRST LINE = ENGAGED/CAPTURED Mode.
SECOND LINE = ARMED Mode.

When the AUTO-THRUST system is in an ARMED MODE,
the FMA automatically engages when the THRUST LEVERS are placed in the "ENGAGEMENT RANGE" .

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On runway, engines running, ready for take-off.



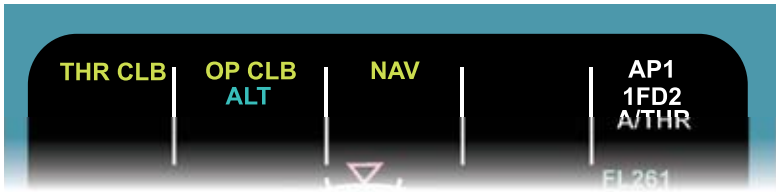
Thrust levers placed in **TOGA** (or **FLX**). **SRS** (**SPEED REFERENCE SYSTEM**) becomes active, and this places the airplane in the "**TAKE-OFF PHASE**".



Once the airplane has started to climb and the landing gear extends, the Flight Directors will be displayed, and the engaged heading mode is NAV.



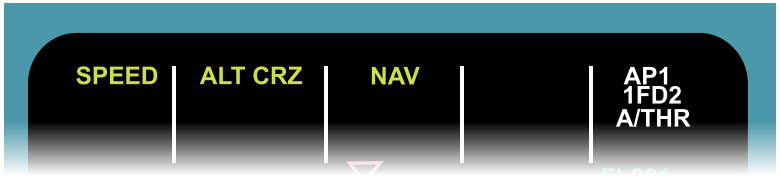
Once the airplane has passed the **ACCEL** altitude, The **LVR CLB** starts flashing to prompt the pilot to ***MANUALLY*** retard the thrust levers to the **CL** detent. If you select the HEADING, and the AUTO-PILOT, they will annunciate.
The airplane is now in "**CLIMB PHASE**"



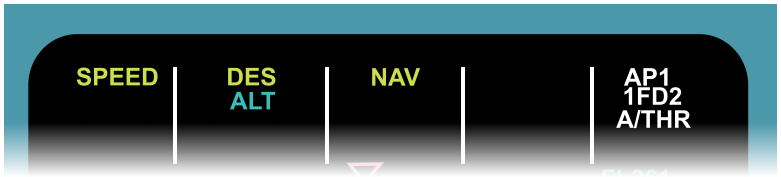
Once the airplane is operating in "managed mode" the indications during climb look like this.

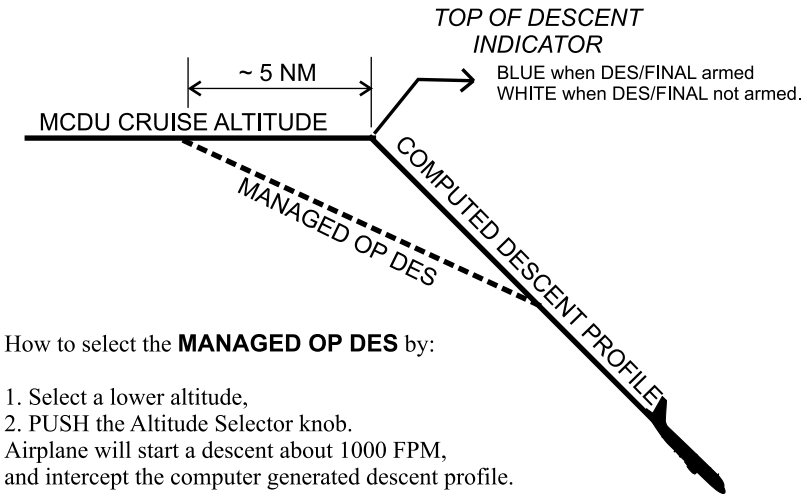
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After reaching the cruise altitude selected on the **MCDU** (can be checked or changed on the **PERF** page).
The airplane is now operating in **CRUISE PHASE**.



After leaving the cruise altitude and beginning the descent. I have illustrated the annunciations if the pilot selects descent (pushes the altitude selector knob) about 5 miles prior to the Descent indicator (Hockey stick). The fact of leaving the cruise altitude places the airplane in **DESCENT PHASE**.





How to select the **MANAGED OP DES** by:

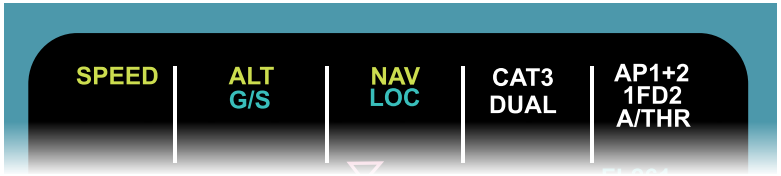
1. Select a lower altitude,
2. PUSH the Altitude Selector knob.
Airplane will start a descent about 1000 FPM,
and intercept the computer generated descent profile.

The airplane will descend to the altitude selected on the FCU and level off.

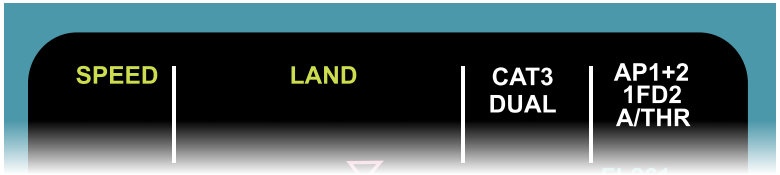
© MIKE RAY 2008

Once inbound to the landing runway, selecting ILS on the FCU, and having the IDENTIFIER, FREQUENCY, and DME for the runway will be displayed on the lower left corner of the PFD.

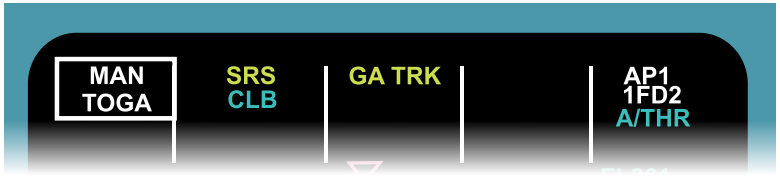
Then, we may select the APPR (or LOC mode if outside of 10 degrees from the localizer) mode and then select the second AUTO-PILOT. The airplane should now be set up to intercept and fly the CAT III ILS. Here are the indications on the FMA.



At about 400 feet AGL, the auto-pilot mode changes to the auto-land coupler. There is an audible voice an the FMA announcing the change.



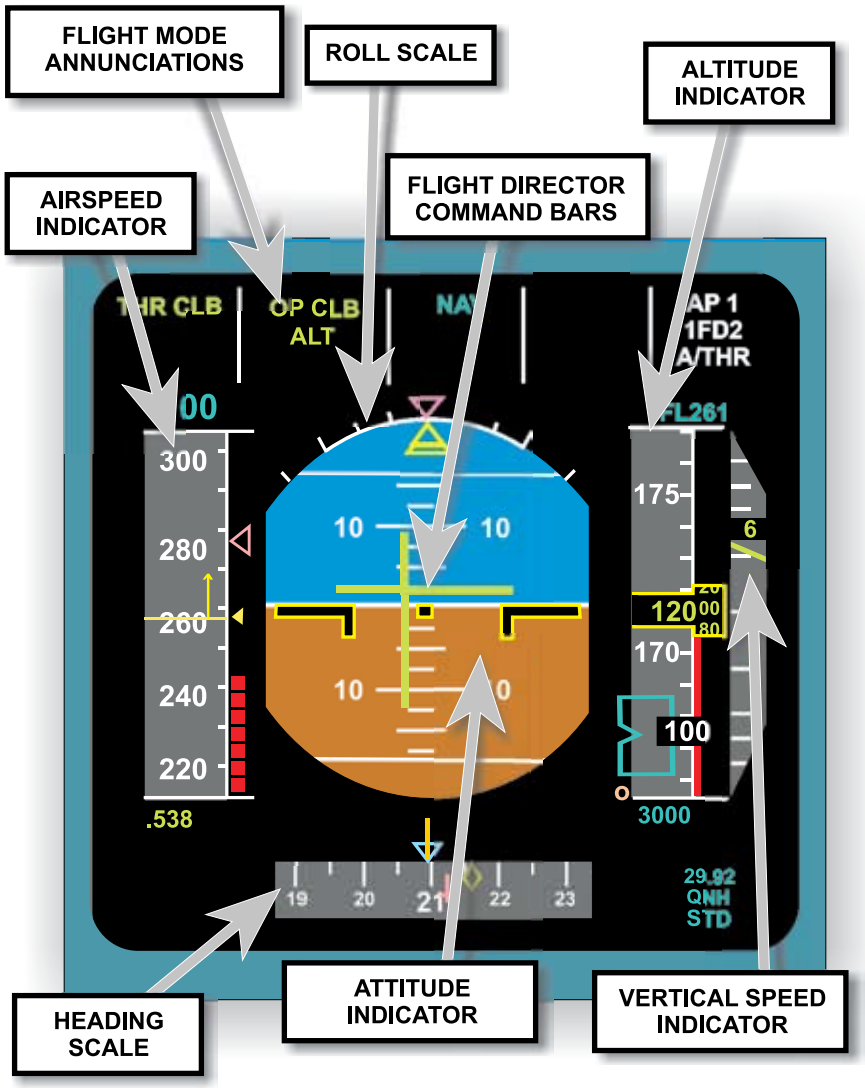
Selecting TOGA will activate the GO-AROUND PHASE. The airplane will select SRS and automatically increase thrust to TOGA, raise the nose to maintain go-around airspeed, and select current aircraft heading as Go-around track.



These are just a few of what I consider to be the most important FMA (Flight Management Annunciations) on the PFD. I suggest that you take a moment and review them for your Oral examination on your check-ride.

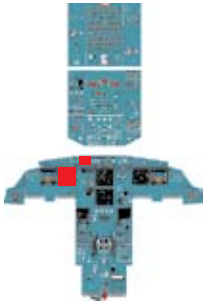
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PRIMARY FLIGHT DISPLAY
(PFD)



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This is the companion piece to the **PFD**, it is called the **NAVIGATION DISPLAY** and is referred to by pilots as the "**ND**" (pronounce EN-DEE).



ND

NAVIGATION DISPLAY

The Navigation Displays provide displays in beautiful color for:

- ROUTE,
- TRAFFIC,
- WEATHER,
- GROUND PROXIMITY.

There are 5 modes of operation:

- ARC mode,
- ROSE NAV mode,
- ROSE VOR mode,
- ROSE ILS mode,
- PLAN mode.

ADF and VOR display components, display scales, and 5 different data display elements may also be added to the display.



ECU

EFIS CONTROL UNIT

The controls that operate the ND are locared a smaller unit that sits perched on the glare shield is for some reason called the **EFIS CONTROL UNIT**. If I were king, I would have labeled this piece of hardware the ND control unit.



COMMENTS concerning the ND:

This is the magic part of the "GLASS COCKPIT" concept. It is also referred to as the "MOVING MAP DISPLAY". It is very precise and is constantly updated during operation using the three ADIRU onboard inertial navigation computers, ground based navigation aids such as VORs, and GPS satellites. This is the defining technology for this EFIS (Electronic Flight Instrument System) and what sets it apart from its predecessors.

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NAVIGATION DISPLAY MODES

ARC MODE

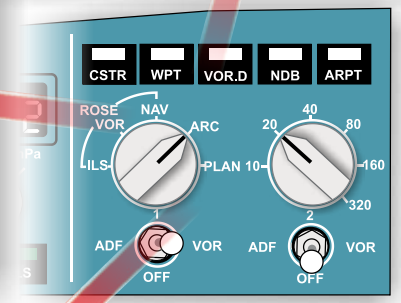
The pilot has the option to select from some different display options. The most commonly



The NAV, VOR, and ILS display modes are referred to as the:

ROSE MODE







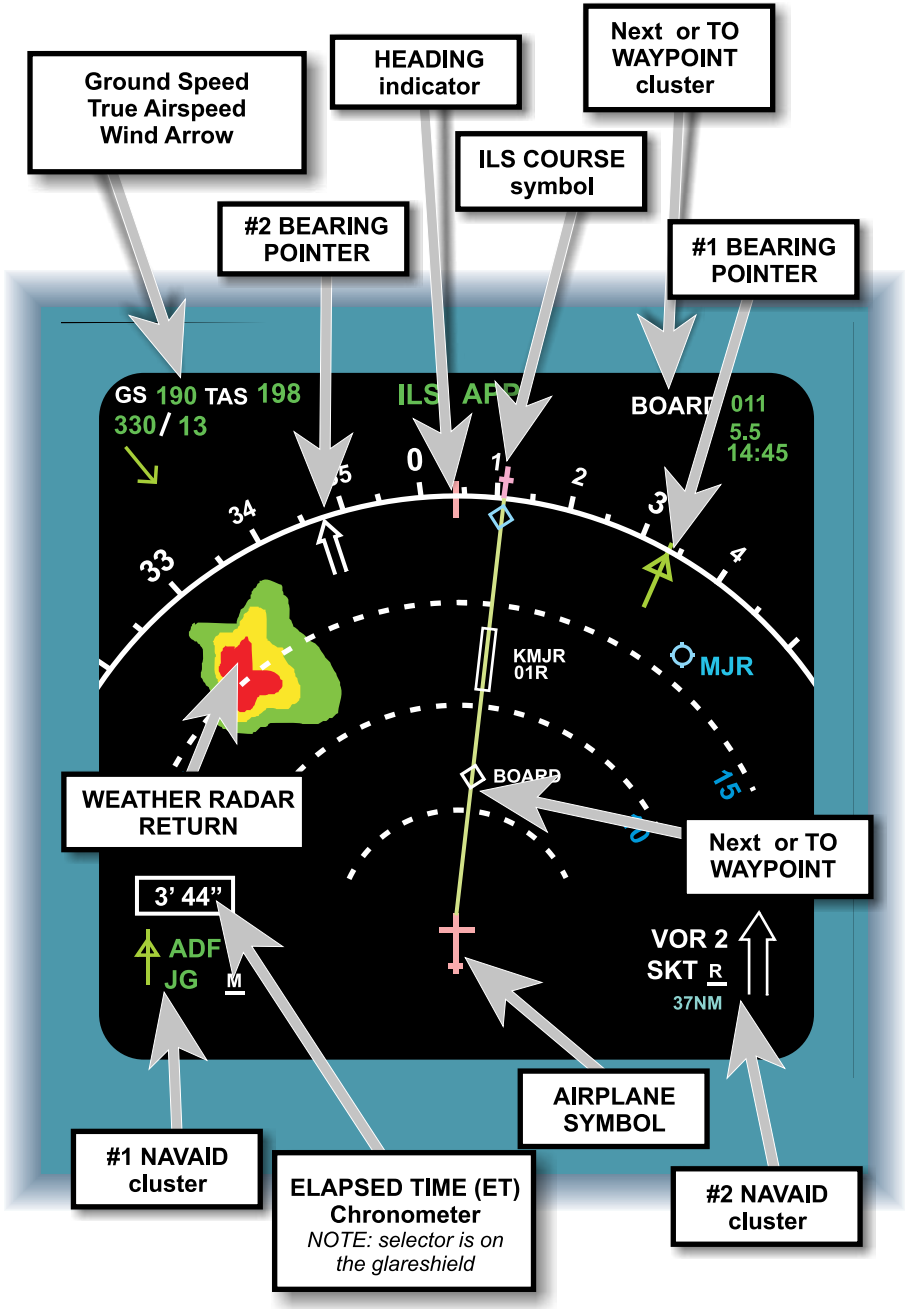
The **PLAN MODE** is useful for planning or reviewing the route. This mode gives you the ability to look ahead to details that are too distant to view using the other modes.

NOTE: The orientation of the PLAN display is always NORTH. This can be a distracting feature.

You "step through" the fixes along the route by using the "UP ARROW" on the F-PLAN page on the MCDU.

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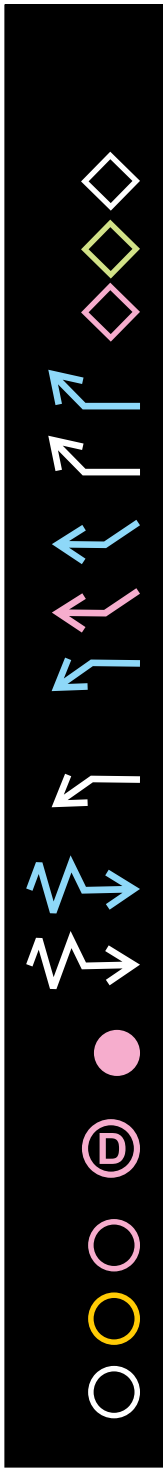
NAVIGATION DISPLAY (ND ARC MODE)



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A little bit of

ND SYMBOLOGY



TO waypoint

ALL other waypoints

Waypoints not in flight plan
when **WPT** selected on ECU.

Point where predicted
climb starts (**CLB** armed)

Point where predicted
climb starts **(CLB** not armed**)**

FCU selected altitude

VNAV altitude constraint.

TOP OF DESCENT (DES/FINAL ARMED)and also
indicates **"FLY-OFF" SEGMENT** on the
APPROACH-NAV-APPROACH

TOP OF DESCENT (DES/FINAL NOT ARMED).

INTERCEPT POINT for actual aircraft descent path and
FMGC computed flight path **(DES ENGAGED)**

INTERCEPT POINT for actual aircraft descent path and
FMGC computed flight path **(DES NOT ENGAGED)**

SPEED CHANGE: increase or decrease
to meet computed speed demands**.**

DECELERATE POINT: SWITCHES TO APPROACH PHASE.
AUTOMATIC DECELERATION TOWARDS **Vapp.**
DECELERATION OCCURS AUTOMATICALLY
ONLY IF NAV ENGAGED**.**

ALTITUDE CONSTRAINT predicted to be met.

ALTITUDE CONSTRAINT predicted to be missed**.**

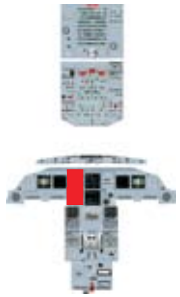
IF ALTITUDE CONSTRAINT guidance ignored and nav engaged.

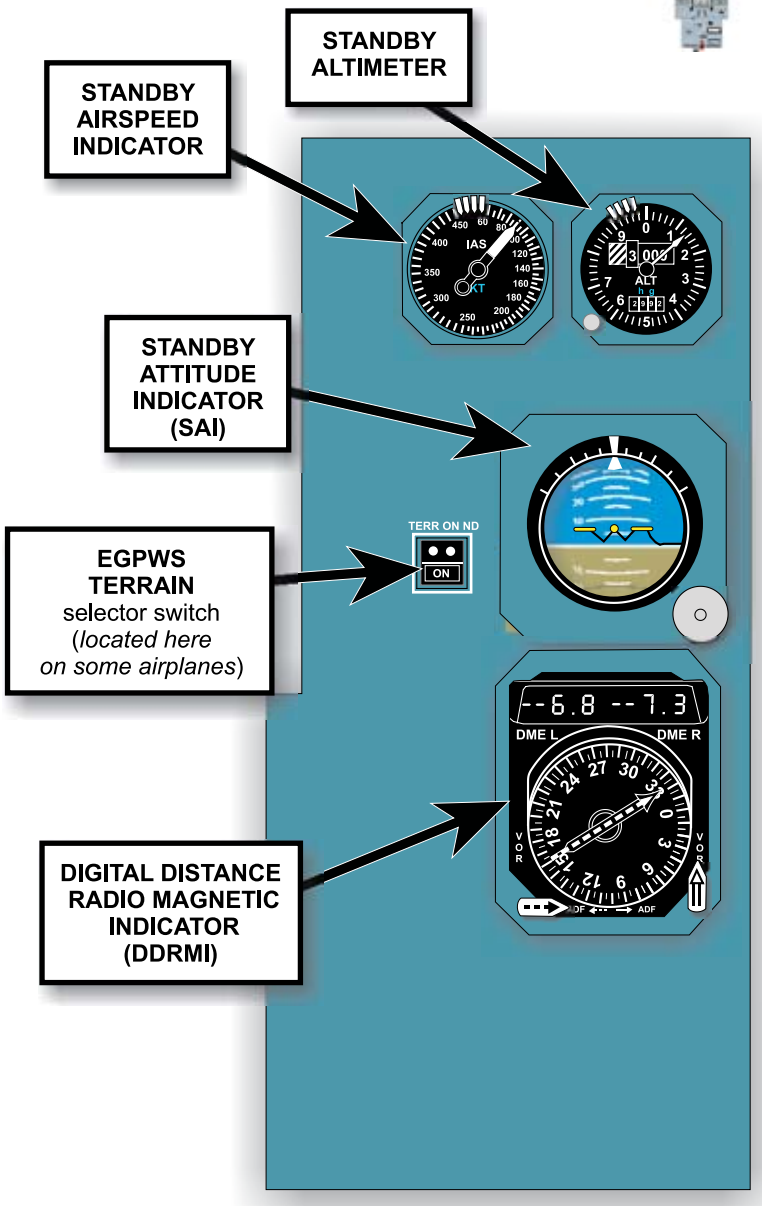
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Flightdeck panel preview

CENTER FORWARD LEFT panel

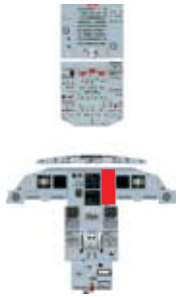


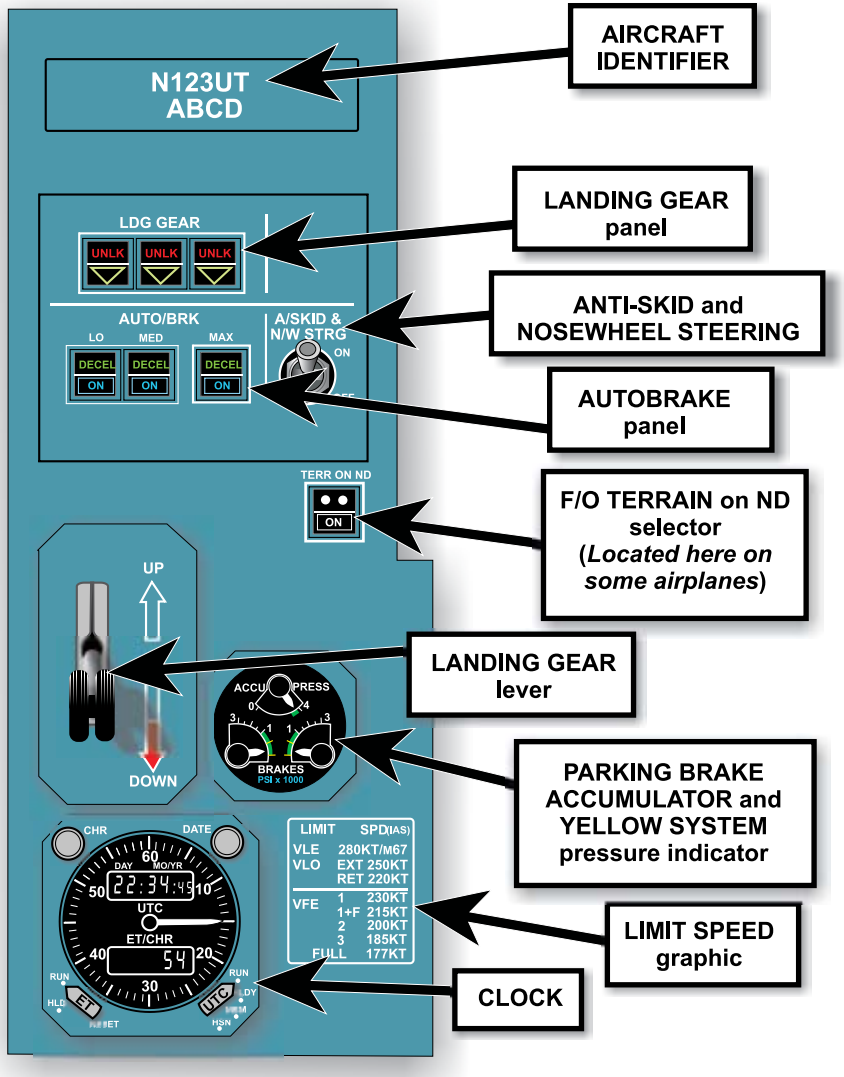


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Flightdeck panel preview

CENTER FORWARD RIGHT panel





AIRCRAFT IDENTIFIER

LANDING GEAR panel

ANTI-SKID and NOSEWHEEL STEERING

AUTOBRAKE panel

F/O TERRAIN on ND selector (*Located here on some airplanes*)

LANDING GEAR lever

PARKING BRAKE ACCUMULATOR and YELLOW SYSTEM pressure indicator

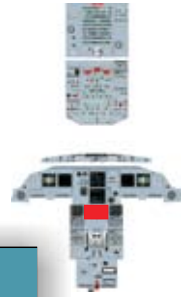
LIMIT SPEED graphic

CLOCK

© MIKE RAY 2008

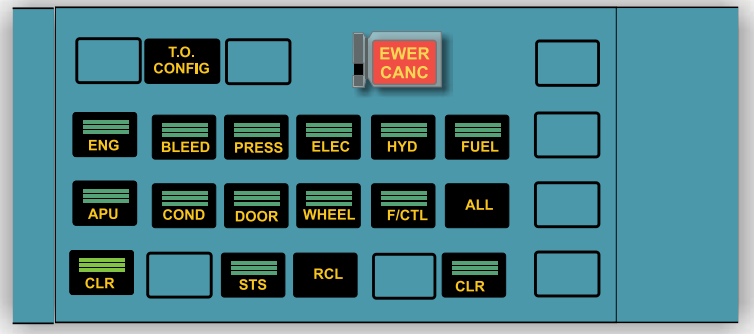
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Flightdeck panel preview



ECAM panel

(Electronic Centralized Aircraft Monitoring)
Control Panel



- **T.O. CONFIG** button. When pushed it simulates TAKEOFF power in order to check if the airplane is properly configured. If everything is OK, the message T.O. CONFIG NORMAL is displayed in green on the ECAM MEMO.

- **CLR** button. Comes on when an ECAM warning, caution, or status message is displayed. When illuminated, if pushed, the ECAM display changes

- **EMER CANC** button.
  WARNINGS: Aural warning cancelled. MASTER WARN switches extinguish. ECAM not affected.
  CAUTIONS: cancels that specific caution for the REST OF THE FLIGHT! Status page automatically displays and the words CANCELLED CAUTION appear. Can be manually recalled by pushing the RCL button for more than 3 seconds.

- **SYSTEM PAGE** buttons: Self explanatory

- **ALL** button: Push and hold and the pages cycle in 1 second intervals. If only one ECAM page available, tap the key to cycle the pages.

- **RCL** button: Push to recall warning and caution messages that have been removed with the CLR button. If no messages, **NORMAL** will display for 5 seconds. Hold key for more than 3 seconds to display the EMER CANC messages.

- **STS** button: Illuminates when ECAM STATUS page is displayed. I status page desired, pushing the button displays the **STATUS PAGE** on the lower **ECAM**.

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ECAM SWITCHING PANEL

There are 4 situations addressed by this panel:
1- Loss of information to screen by DMC (Display Management Computer), and
2- Failure of IR (Inertial Reference), and
3- Failure of Air Data (ADR), and
4- Failure of the display unit.

NOTE:
Normally systems labeled
"1" supply the Captain's side, and
"2" supply the First Officer's (F/O) side.

SITUATION 1

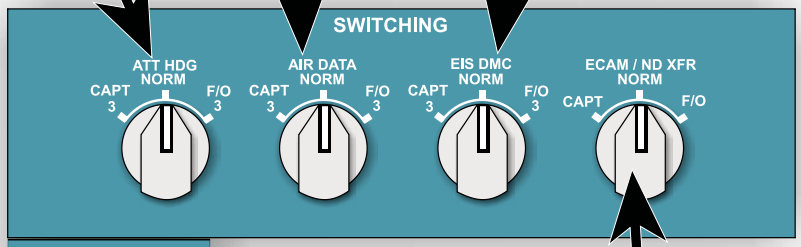
EIS DMC FAILURE
(Electronic Instrument System-
Display management Computer)

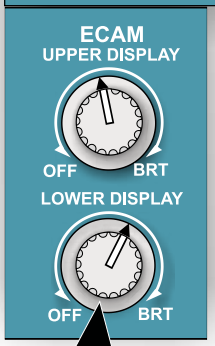
This switch is used when the screen loses the ability to generate symbols and a diagonal line is displayed on the screen.



IR
(laser gyro inertial reference)

AIR DATA (ADR)





ECAM
lighting controls panel

SITUATION 2

ECAM / ND XFR selector
Electronic Centralized Aircraft Monitoring System /
Navigation Display
XFR = Transfer



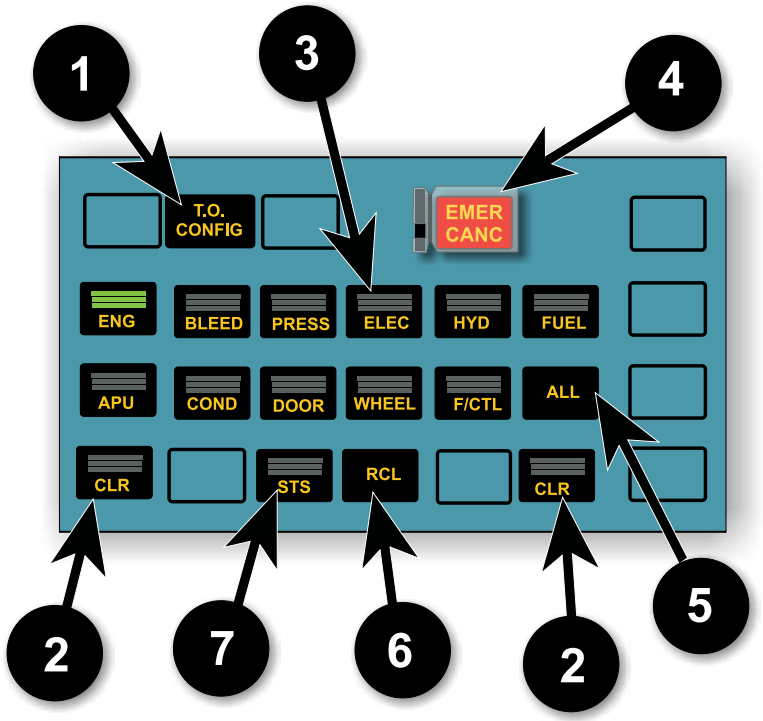
This switch is used when the LOWER ECAM SD (system display) goes BLACK.

CAPT: Transfers SD to CAPT ND.
F/O: Transfers SD to First Officer's ND

In case BOTH E/WD (upper display) and SD (lower display) go BLACK; then the selector transfers the E/WD to either ND.

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The ECAM CONTROL UNIT



1 **T.O. CONFIG button:**

Push to see if jet configured for takeoff. If everything OK; then **TO CONFIG NORMAL** displayed in the takeoff memo.

2 **CLR button:**

Illuminates when an ECAM warning, caution, or status message displayed. Depressing CLR button changes the display.

3 **SYSTEM PAGE buttons:**

Pushing causes the **ECAM** to display the selected system on the **LOWER ECAM** screen.
Pushed button will illuminate when depressed or when associated system **ADVISORY** is detected.

*If the button is pushed while illuminated, the **SYSTEM PAGE** or **CURRENT WARNING** is displayed.*

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4

EMER CANC button:

When pushed:

WARNINGS:
Aural warning cancelled,
MASTER WARN switches extinguish,
ECAM message NOT affected.

CAUTIONS:
Currently displayed **CAUTION** cancelled for remainder of the flight.
CANCELLED CAUTION message and title of inhibited failure appear.
Can be manually recalled by pushing **RCL** button for more than 3 seconds.

NOTE: ONLY spurious MASTER CAUTIONS should be cancelled.
(For example: Excess V/S during emergency descent)

5

ALL button:
When depressed and held, all the systems pages display be flipping in 1 second intervals.

***IF ECAM FAILS**: Push and hold the **ALL** button until the desired page occurs, then release button to keep that screen displayed.*

***IF ONE ECAM SCREEN INOPERATIVE**: Push the ALL button repeatedly to cycle the pages.*

6

RCL button: Pushing recalls previously inhibited warnings.
NORMAL appears for 5 seconds if NO warnings.
Push button for more than 3 seconds, CAUTION messages removed by the use of the EMER CANC button can be recalled.

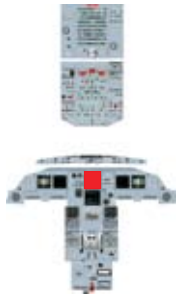
7

STS (status**) button:** When you push this button, the STATUS page is displayed on the ECAM LOWER display.

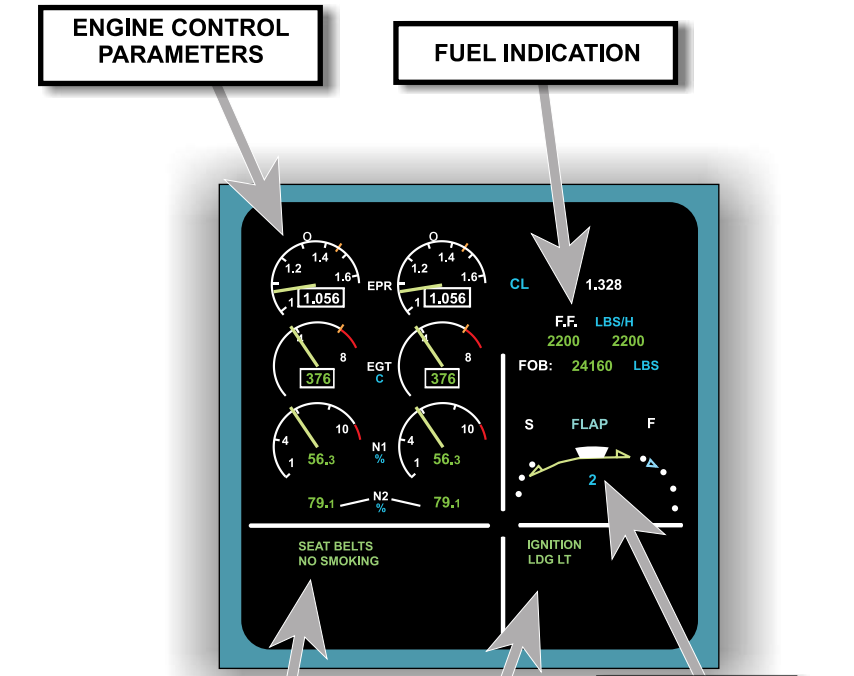
The STATUS page can be cleared by pushing the STS button a second time,
or bypushing the CLR button.

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Flightdeck panel preview



E/WD
Engine/warning display
upper ECAM display

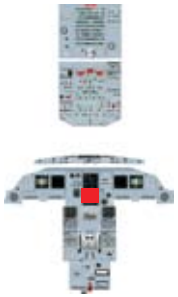


MEMO/FAILURE INFORMATION

1. *During normal OPS, displays MEMOs.*
2. *if SYSTEM FAILURE detected, displays failure and required action.*
3. *(Most) actions are cleared messages as the action is completed.*
4. *When ECAM CLR button is pushed, previous MEMO reappears.*

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Flightdeck panel preview



SD
Status display
Lower ECAM display

The SD (System Display) has 12 different system pages that can be selected using the ECAM control unit, OR displayed AUTOMATICALLY when

- signaled by the FLIGHT PHASE (provided the pilot hasn't manually selected different page).
- System failure, or
- Automatic ADVISORY.





There is a "PERMANENT DATA SECTION" at the bottom of the display that includes TAT, SAT, UTC, load factor or metric altitude, and Gross Weight.

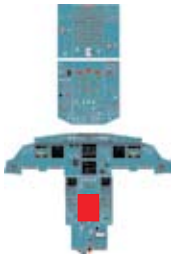
There is also a STATUS PAGE that provides an operational summary of the airplanes system status.
The STATUS PAGE is displayed AUTOMATICALLY when

- the pilots have cleared all the pages corresponding to any current failure, and
- when FLAPS lever is moved to the UP position.

The STATUS page can be selected MANUALLY by pushing the STS selector on the ECAM control panel.

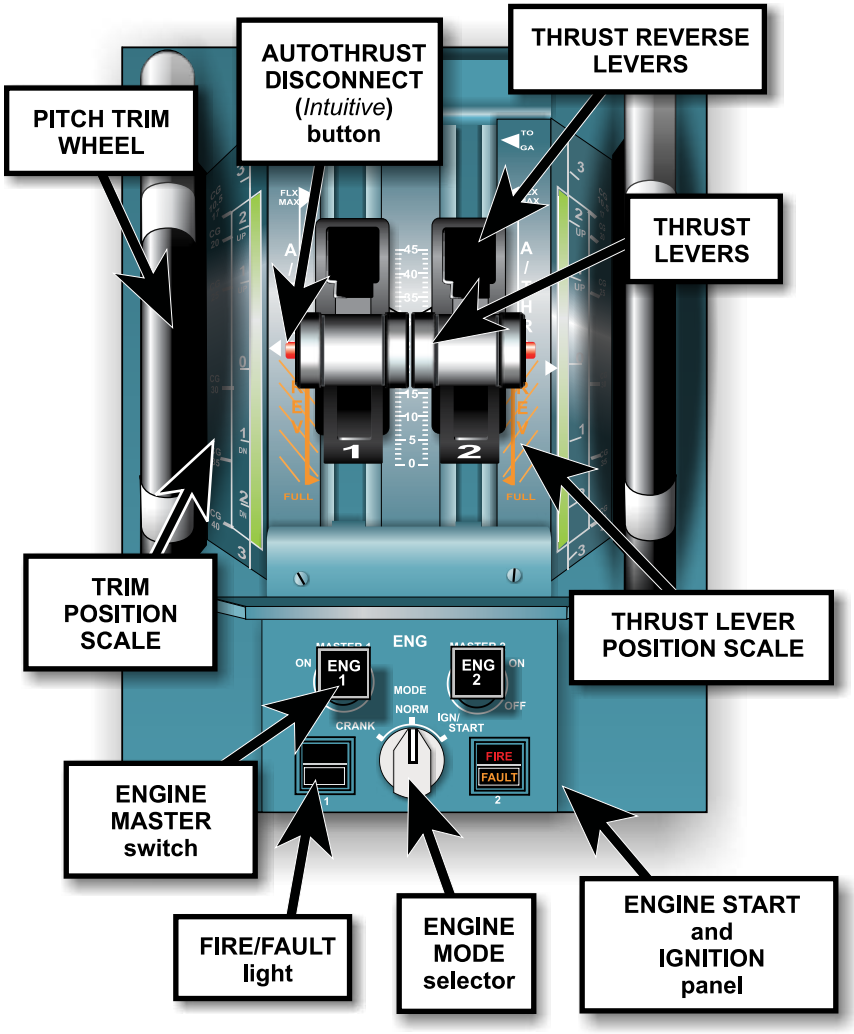
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Flightdeck panel preview



THRUST LEVER
control pedestal

THRUST LEVERS CAN ONLY BE MOVED MANUALLY.
They do not move automatically



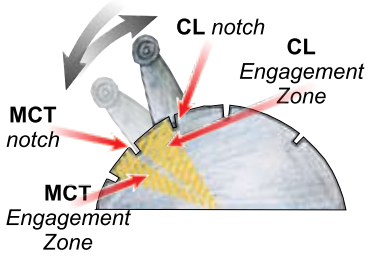
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Let's take a moment and try to clear up an important (but apparently unclear) feature of the Airbus:

THRUST LEVER ENGAGEMENT ZONES

There are two engagement zones on the Thrust lever quadrant:

- CL engagement zone, and
- FLX to MCT engagement zone.



The quick and dirty of this is that you have to engage CL and MCT from forward to back, that is to say that you cannot engage MCT or CL from a lower thrust lever setting, but you must select a higher setting and then pull the thrust lever back into the notch. Ordinarily, this is not a problem and we don't even think about it, but there are three instances that need some clarification.

SITUATION ONE: *ENGINE FAILURE*

This occurs during the engine failure during take-off or V1 cut maneuver. If the pilot elected to use FLX for take-off, and has a subsequent engine failure, and elects NOT TO push the thrust levers to the full TOGA setting (all legal and OK technique) ... then when it is time to select MCT (Max Continuous Thrust), the "good" thrust lever MUST be pushed lever forward and then pulled back into the MCT notch.

SITUATION TWO: *TOGA LK*

If you are flying and allow the airspeed to get too slow, the airspeed indicator will indicate in the "bricks" (red boxes at the bottom of the airspeed tape on the PFD, called Vmin);

A.FLOOR will annunciate on the ND and a flashing **A FLOOR** will flash on the PFD, followed quickly by **TOGA LK** annunciated on the PFD. The thrust will go to TOGA (full take-off thrust) and be locked there.

UH-OH ... NOW WHAT DO YOU DO???

FIRST PRIORITY: *FLY THE AIRPLANE!!!*

If you are "hand-flying" be aware that the airplane is EXTREMELY sensitive at this point and is at stall threshold. To out this in perspective: "*YOU ARE ABOUT TO DIE*." You must v-e-r-y carefully "fly" the airplane out of the situation. Altitude permitting, allow the nose to come down as the airspeed increases, do not try to climb until you have some margin from the Vmin (bricks) indicators. Let the airspeed build towards the green dot.

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Once under control, the airspeed will continue to increase because the thrust levers are LOCKED in TOGA."

YIPE!! NOW WHAT DO I DO ???

In order to unlock the thrust levers, and re-set the A/THR, you must cycle the A/THR button. This will place the auto-throttles in "SPEED" mode and the airplane airspeed will stabilize at the magenta triangle (selected airspeed).

This does NOT, however, reset the CLB mode. Even though the thrust lever is physically still in the CLB` detent, it must be reset so that you will have the proper annunciation on the ND. You have to physically move the thrust levers forward of the CL detent and back into the notch. Confirm that A/THR button is illuminated and CLB is annunciated on the ND.

NOTE: Technique is to "match the thrust levers to the thrust indicated ... in this case, when in TOGA-LK, move the thrust levers to the forward "TOGA" position and this will satisfy the need to re-set the thrust levers.

SITUATION THREE: *NORMAL TAKE-OFF*



If you level off and fail to select CLB after take-off (ignoring the flashing "LVR CLB warning on the PFD), then while the thrust levers are still in TOGA or FLX, the airspeed will increase to the point where an "over-speed" condition exists. This could place the airplane in a situation of exceeding the maximum allowable airspeed (Vmax). This is NOT GOOD!

GEE, WHAT'S THAT CLACKING NOISE ?

Here is the typical confused pilot response, they will manually retard the thrust levers past the CL detent into IDLE positon. The thrust will reduce, and the airplane will slow down. The A/THR, however, will disconnect (light on FCU goes out) and the airspeed will simply continue to slow until A.FLOOR is annunciated on the PFD and the ND; followed by a flashing TOGA LK on the PFD.

Then the typical pilot will place the throttles into the CLB detent . CLB will annunciate of the ND, but WILL NOT select the A/THR, and the A/THR button light will remain"OFF". The airspeed will continue to decrease until the airplane goes to A.FLOOR and TOGA-LK again.

Suggested technique is to move the thrust lever to a position beyond CLB (TOGA) and then pull the thrust lever "back"(or select) to the CLB position. This will arm the A/THR and place the airplane in CL mode ... which is desired.

OMIGOSH !!!

Here is the technique stated another way: The thrust levers MUST be pushed past the CLB detent and then pulled "BACK" into the CLB detent to automatically re-set the thrust lever automation. The A/THR button will once more illuminate, and the thrust will be set at CLB. Everything will be normal.

Another technique is to simply select CLB and then depress the A/THR button to re-arm the system.

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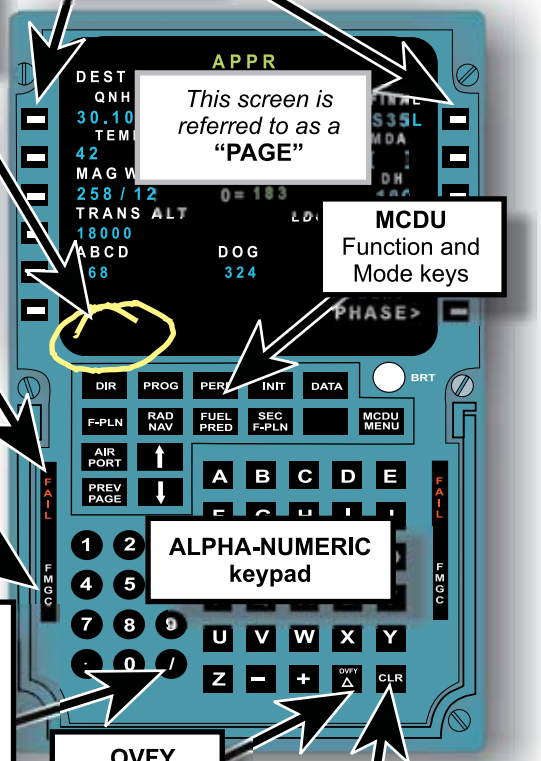
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Flightdeck panel preview

MCDU

(MULTIFUNCTION CONTROL DISPLAY UNIT)
really cool pilots call it the
"MAC-DOO"





LINE SELECT keys

This part of the screen is referred to as the **"SCRATCHPAD"**

FAIL (RED)
Indicates MCDU not operating properly. Usually accompanied by ***BLANK DISPLAY*** *and* ***FMDG FAIL*** *appears.*

This screen is referred to as a **"PAGE"**

MCDU Function and Mode keys

FMDC
Illuminates when FMGC not linked.
PILOT ACTION*:*
Select ***MCDU MENU*** *and line select* ***<FMGC****.*

ALPHA-NUMERIC keypad

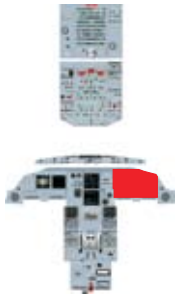
SLASH (/) key
This key is used to separate two entires in the same data field (i.e: 240/56).
NOTE*: except for frequencies and identifiers on the RADIO NAV page ...*
The trailing entry of a pair must be preceded by a slash if it is entered alone (e.g: /56).

OVFY (overfly) key

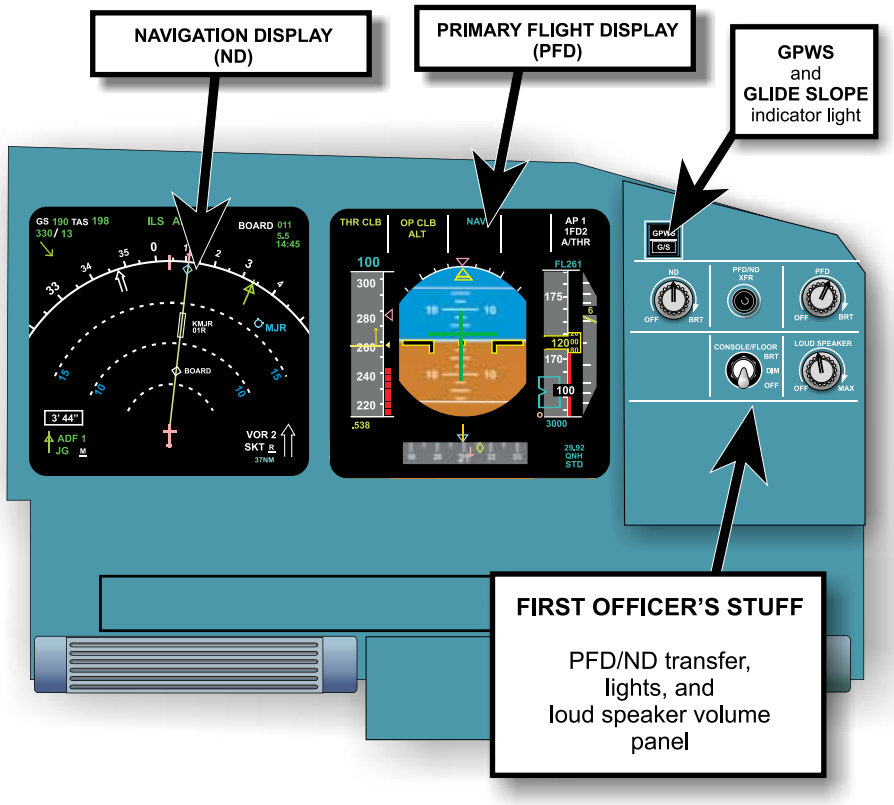
CLEAR key
Push when making entry in the scratchpad, and the last character is removed. Keep the key depressed and the whole entry is removed.
If the scratchpad is empty, CLR will appear in the scratchpad when selected, and when line selected abeam an entry,

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Flightdeck panel preview



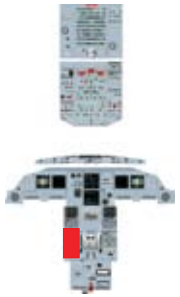
RIGHT FORWARD "FIRST OFFICER'S" panel

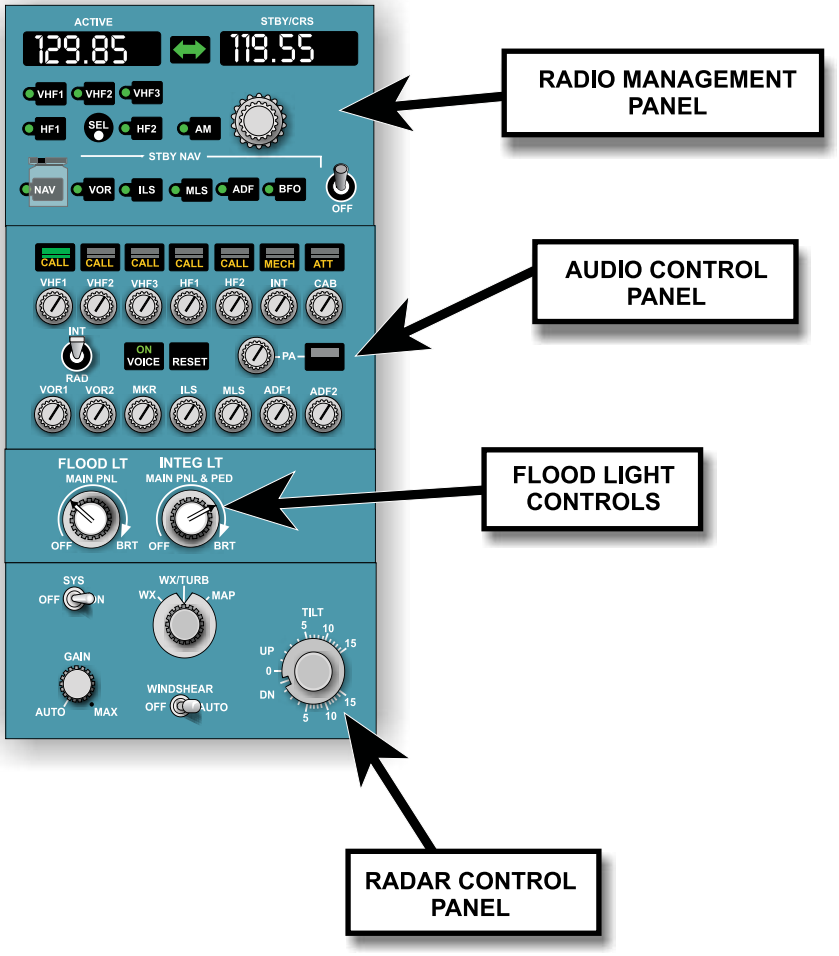


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Flightdeck panel preview

LOWER CONSOLE left side panel



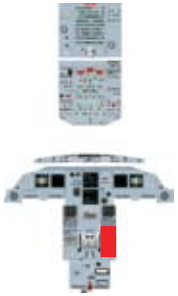


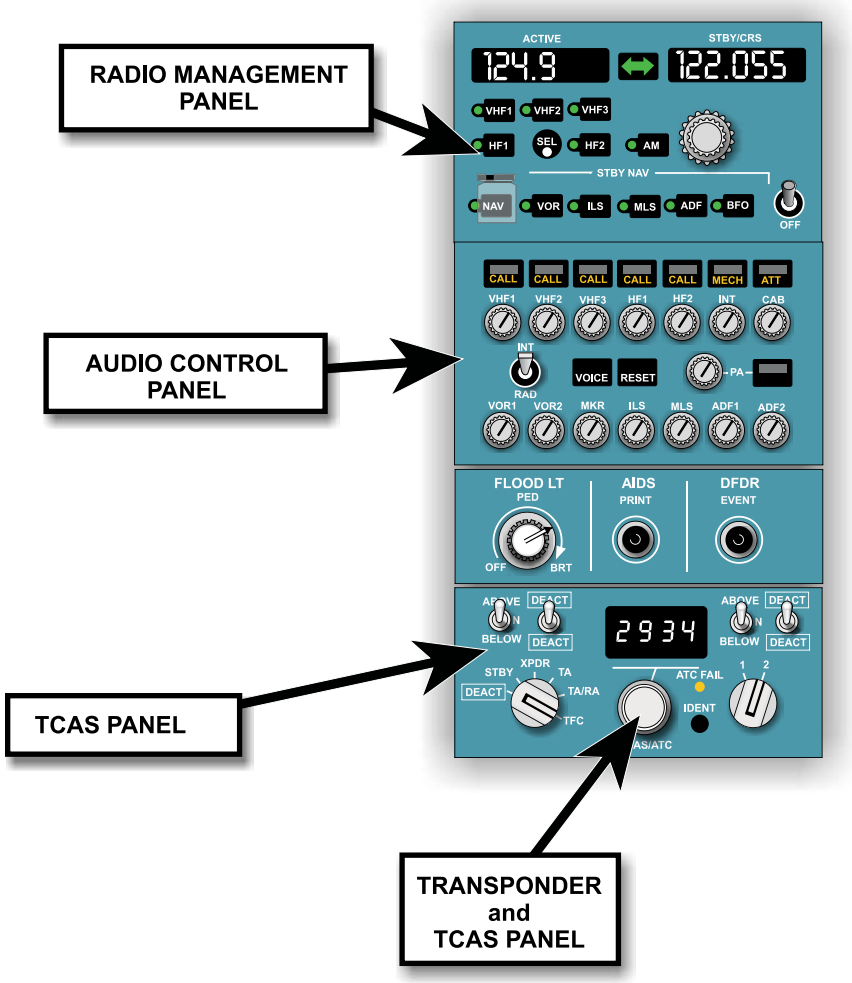
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Flightdeck panel preview

LOWER CONSOLE right side panel



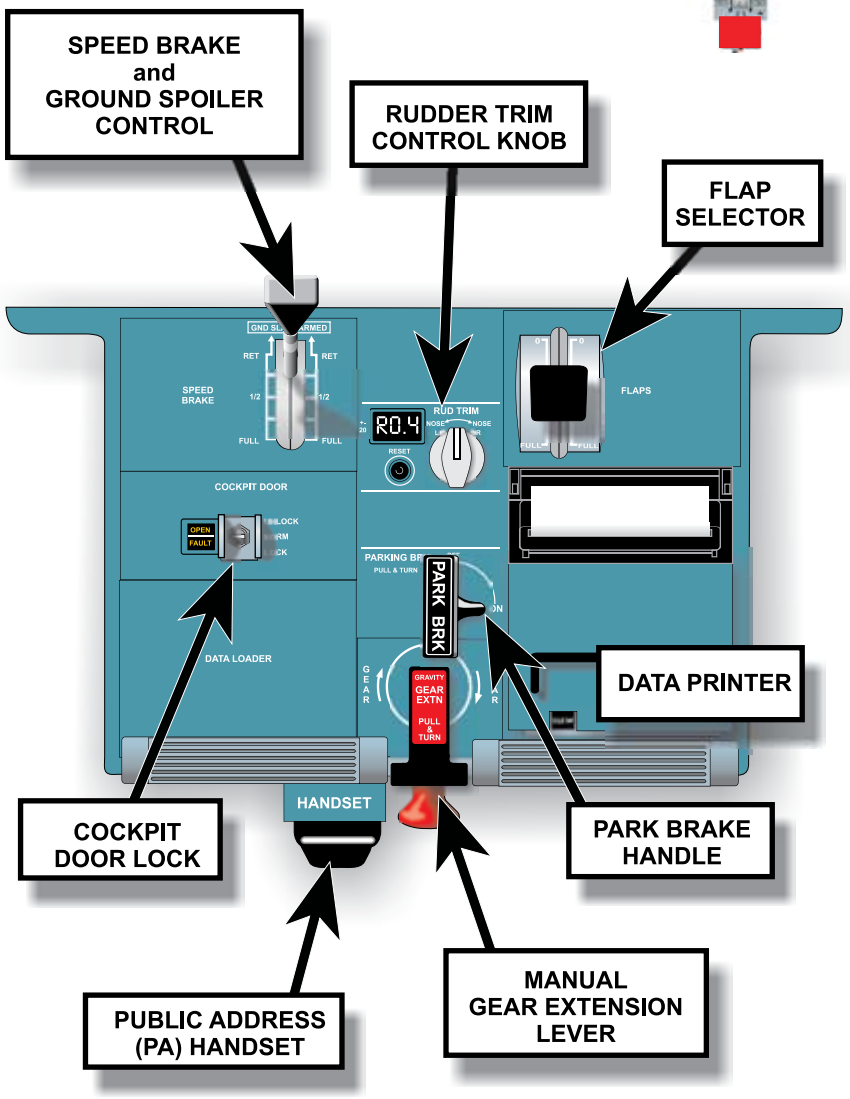


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Flightdeck panel preview

AFT LOWER CONSOLE





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introducing the concept of

FLOW DOMINOES



The Airbus engineers thought logically about the whole flight paradigm. They viewed it as an evolving process, a distinct line of separate events. They called these flight events "**PHASES**."

In that same sense, we are going to enlarge on that concept and develop a much greater view of the flight evolution that will incorporate the Airbus idea. We will break the whole, complete operation of the airplane from the moment we enter the cockpit until we exit after landing into small modules called "**FLOWS**."

While I don't want to confuse you at this point, I want you to see that there is a logical FLOW to this whole learning process. As each FLOW is completed, it leads logically into the next, like so many "**FLOW DOMINOES**."

Simply treat each separate, small part of the flight as an individual piece of the overall picture. learn to complete that part, and then move on to the next part. As each individual piece is completed and we move on to the next part, we will eventually complete the whole trip.

> If we take each flow module, identify it, understand it, and complete it fully ... and then once it is complete go logically to the next flow ... the complexity of the task is eliminated and the process is vastly simplified.

On the following pages, I will be acting as your guide and telling you as much as I think you need to know in order to pass your check-ride with flying colors and with a minimum of stress on your part. My intent is to repeat information as many times as possible in order to have it made a part of your memory. While I don't want to simplify the import of the material, I do intend to bypass stuff I don't think is important enough to include and to emphasis the items I think you will have to demonstrate during both the oral examination as well as the simulator ride (also called the psycho-motor skill demonstration).

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PILOTS ARE ONLY HUMAN ...

At the beginning of a training cycle, when initially exposed to the incredible amount of detail involved in learning a new airplane, it is difficult to imagine remembering all this pilot stuff. It makes the up-grading process a daunting task, sometimes pilots will bypass a possible change of airplane assignment simply in order to avoid the extreme pressure required to reach a passable standard of performance and knowledge.

A long time ago, a really intelligent pilot devised a really useful training method. He took the flight evolution, and divided it into appropriate sections and then listed each grouping in the order as they occurred in a typical flight process. That way, the pilot could learn each separate part in isolation. Then, accomplishing each part in order, the whole process results in a complete flight. This was known as "chaining" and I refer to this whole process as the "**FLOWS.**"



FLOWS

Once you grasp the idea of the flows, It becomes an intuitive and obvious leap to see that each flow module is part of a chain, and once one unique identifiable "FLOW" has been completed, we can proceed naturally and logically to the next. This is referred to as chaining, and the whole process can be viewed as a line of dominoes falling one into the other.

We can visualize the process as if they are the "*FLOW DOMINOES.*"

If we take each flow module, identify it, understand it, and complete it fully ... and then once it is complete go logically to the next flow ... the complexity of the task is eliminated and the process of learning is vastly simplified.

FLOW DOMINOES

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CAPTAIN to CAPTAIN

some random thoughts before we start ...

Generally speaking, your check-ride Check Captain will be seeking to determine if you are capable of taking a cold dark airplane that has been sitting for an indeterminate length of time in some remote part of the earth and get it to fly safely to its destination. This determination begins even before you are actually in the cockpit.

As you approach the aircraft, there are some things you will want to know BEFORE you mount your fabulous magic carpet. These comments are NOT intended to substitute for the exterior walk-around ... but just to satisfy your professional curiosity. Here are some of those things:

Are the wheels chocked or is the airplane attached to the tow tractor. We want to make certain that the airplane doesn't start moving until we are ready.

Check the areas around the engine's inlet and outlet for obstructions and debris. Is there clutter such as snow piles or equipment that will be affected by the jet blast at engine start.

Is the fuel truck or fuel station hose plugged into the airplane and the fueling in progress. If so, it might be useful to check with the person doing the fueling and determine if he is placing the latest fuel load into the airplane and that he has the correct fuel load requested for your flight.

Is the airplane using external power. Even if the power supply is plugged in and the power source is operating, that does not mean that the airplane is operating on external power. The fueling may be done using battery power.

Is the APU running? Again, even if it ***IS*** already running, that does not mean that the airplane is operating on APU power. Once it is selected as the power source, the APU can provide electrical power and pneumatic air for the entire plane on the ground.

Is unanticipated maintenance activity going on? Unless you are expecting such an event and have been briefed on it, it might be useful to go over and determine what is going on. Are there going to be unexpected delays?

Is the main door open and a ladder or jet-way attached. Is there a way to get into and out of the airplane. Depending on the remoteness of the location, access to the airplane may be a problem.

And so on.

If this is your first trip of your Airbus career, it is likely that you will be a bit intimidated at the awesome responsibility at first, particularly if you are carrying passengers. That is a typical response and you are not alone. Take it one piece at a time, be thorough and complete each separate task before going on to the next piece of the puzzle.
There will "always" be a rush to get everything done and get the flight dispatched. Push-push-push. It is up to you as the Captain to set the tempo of the operation.

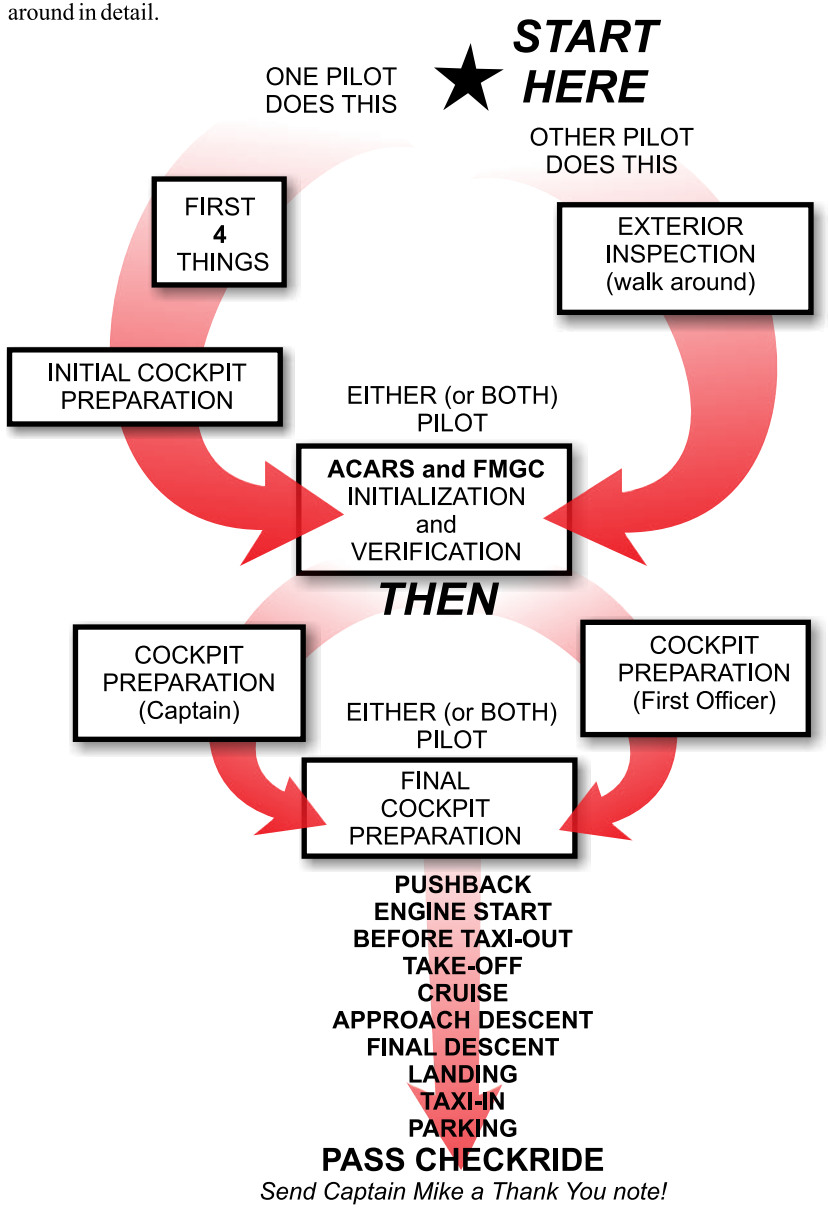
Let's do it!

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HERE THEN ARE THE FLOWS

The flows start like this. The Captain may do the walk-around (not likely) ; however, it is almost traditional that the F/O do this. BUT, don't be fooled, on the check-ride the First Officers will be required to know the Initial Cockpit Preparation flows and the Captain will have to be able to cogently describe a walk-around in detail.

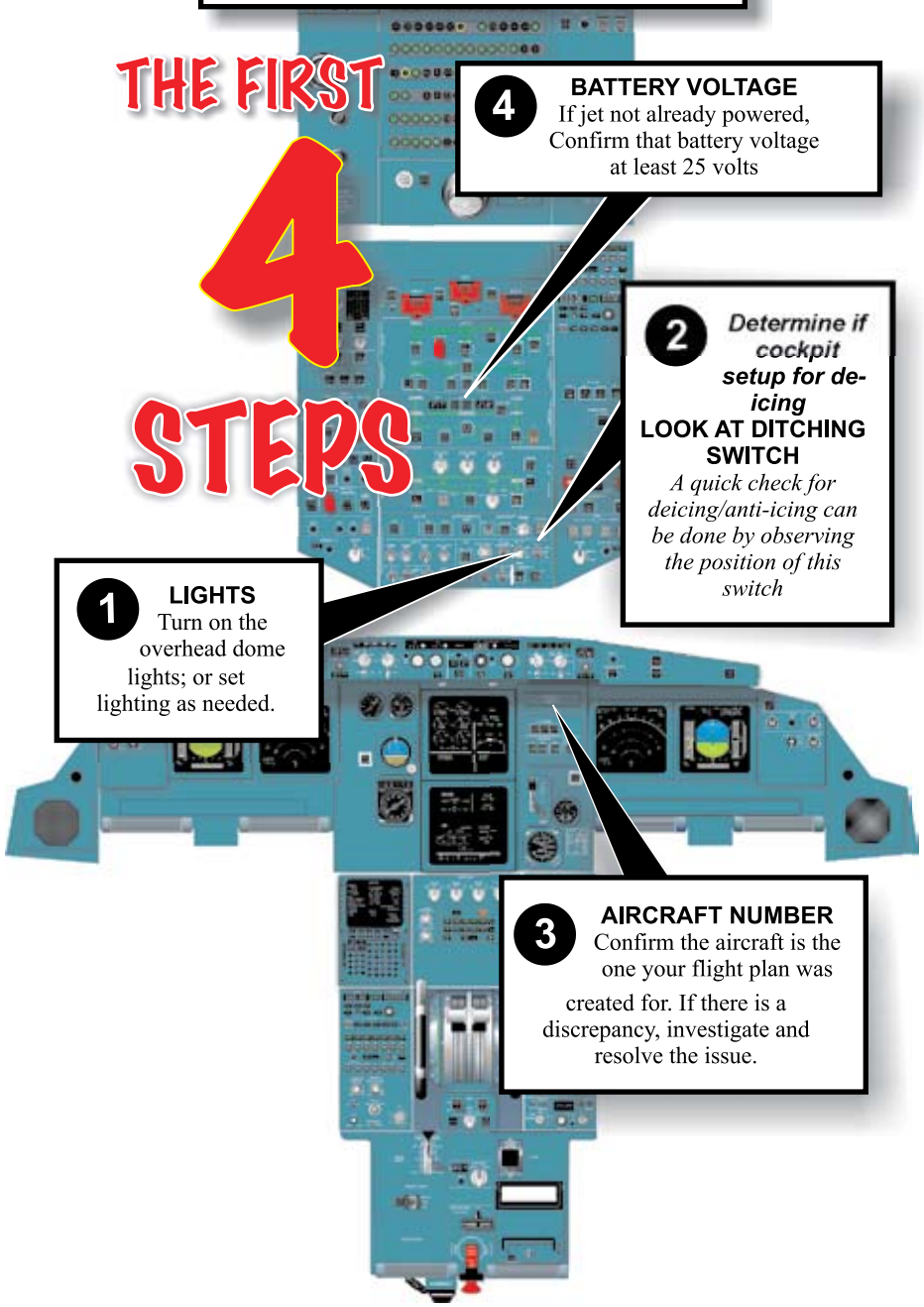


Send Captain Mike a Thank You note!

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Start your cockpit set-up with these four initial items that will begin the preparation for flight.

THE FIRST 4 STEPS



4 BATTERY VOLTAGE
If jet not already powered, Confirm that battery voltage at least 25 volts

2 ***Determine if cockpit setup for de-icing***
LOOK AT DITCHING SWITCH
A quick check for deicing/anti-icing can be done by observing the position of this switch

1 LIGHTS
Turn on the overhead dome lights; or set lighting as needed.

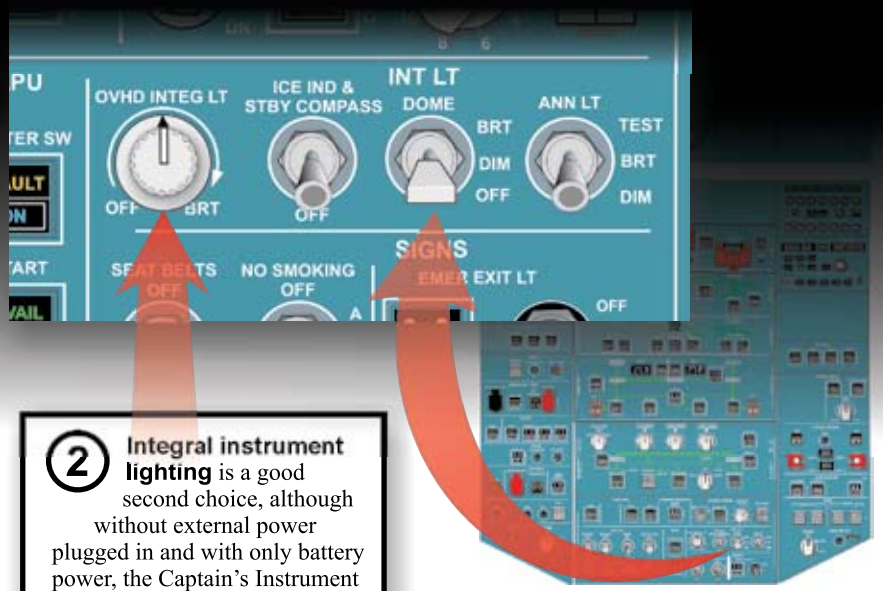
3 AIRCRAFT NUMBER
Confirm the aircraft is the one your flight plan was created for. If there is a discrepancy, investigate and resolve the issue.

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STEP 1 TURN ON THE LIGHTS

GOLLY, YOU DIDN'T TELL ME IT WAS GOING TO BE DARK.

It may seem that I am exaggerating, but the first time you will encounter a "real" cockpit on your own ...it will probably be on some dark rainy night and the cockpit will be pitch black.



② **Integral instrument lighting** is a good second choice, although without external power plugged in and with only battery power, the Captain's Instrument Panel lighting would be the only selected source of illumination.

TIP ! *When you flip the DOME LIGHT switch, if only the **RIGHT DOME LIGHT**(and some other essential lighting) comes ON, this is a good way to determine that there is NO AC power to the airplane.*

① One of the BEST choices for AIRPLANE LIGHTING is the DOME LIGHT switch. Ceiling mounted **DOME LIGHTS** provide general illumination.
Since there may be NO AC AIRPLANE power source available; the **RIGHT DOME LIGHT**(and some other essential lighting) is still available with only the battery powering the system.

FLIP SWITCH TOWARDS YOU.

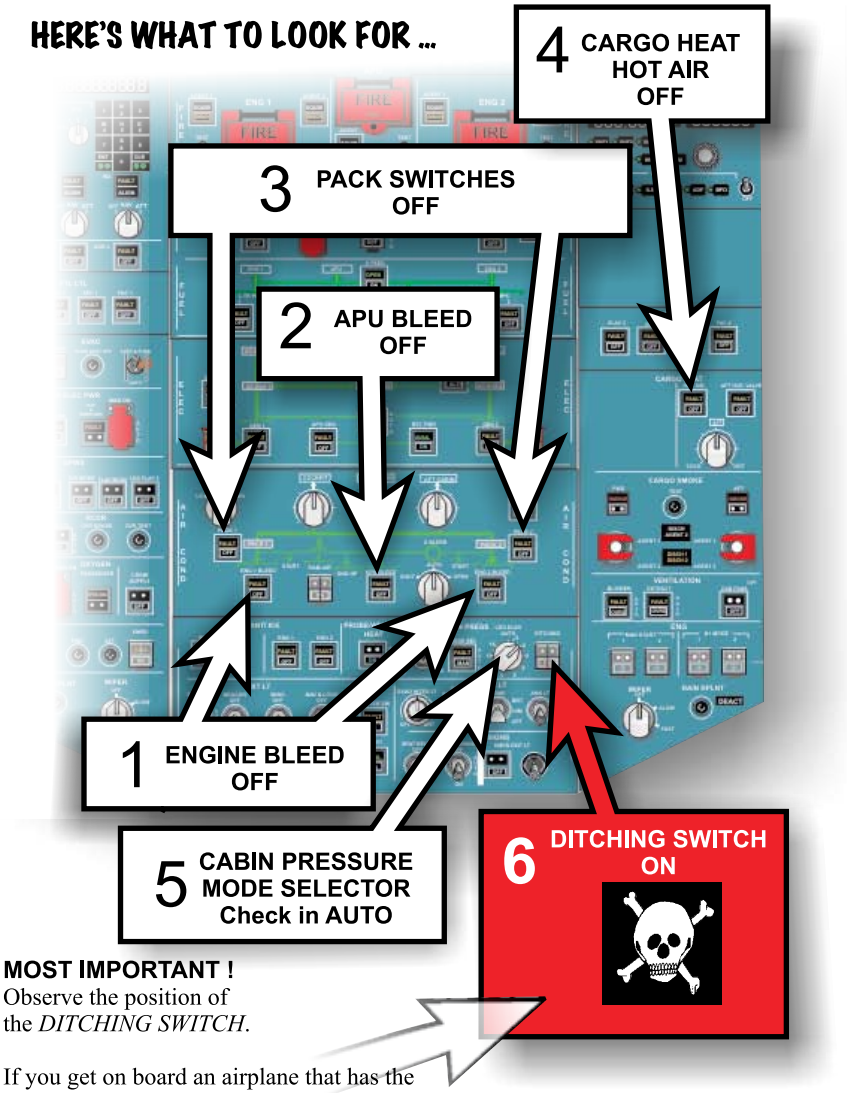
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STEP 2

DETERMINE IF JET PREPARED FOR DEICING

NOTE: *In general, during normal airline operations, the flight crew will be notified of the status of the cockpit regarding deicing. However, for the sake of our exercise, we will assume that you do not know.*



MOST IMPORTANT !
Observe the position of the *DITCHING SWITCH*.

If you get on board an airplane that has the **DITCHING SWITCH ON**, that would be the most important indication that the cockpit is prepared for deicing.

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STOP !

Let's take a moment and discuss the operation of the DITCHING SWITCH
and why it is important to be aware of it's position.

When the DITCHING SWITCH is placed on, it closes up the airplane and shuts all the holes. Here are the items is closes:

- **OUTFLOW VALVE** (main pressurization opening)
- **EMERGENCY RAM AIR INLET**
- **AVIONICS INLET and EXTRACT VALVES**
- **PACK FLOW CONTROL VALVES**

And this works really great if we are going to ditch at sea because it means that the airplane may actually float.

AND ...

Since we are at the gate prior to push-back, it is likely that we would like to have some air-conditioning, and it makes good sense to get some air from the APU or the outside air sources introduced into the cabin.

BUT ...



YIPE! NEVER

*NEVER ALLOW GROUND PERSONNEL TO INTRODUCE LOW or HIGH PRESSURE AIR INTO AN AIRPLANE THAT HAS **THE DOORS CLOSED***

IF THE DITCHING SWITCH is ON

It is possible to OVER-PRESSURIZE the cabin.



PILOT ACTION

The first thing you want to check once you have some lighting on in the cockpit is;

THE DITCHING SWITCH!

If the protective guard is dangling down, SUSPECT that the cockpit is set-up for deicing/anti-icing.

If on pushback or if cabin doors closed;

DO NOT OPEN THE BLEEDS** with the **DITCHING SWITCH ON!

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Once GATE DEICING is complete

Record the Deicing data and

DITCHING SWITCH ..... OFF

STOP !



DO NOT TURN ON
ENG BLEED or APU BLEED
Until you first VERIFY that
the OUTFLOW VALVE is open.

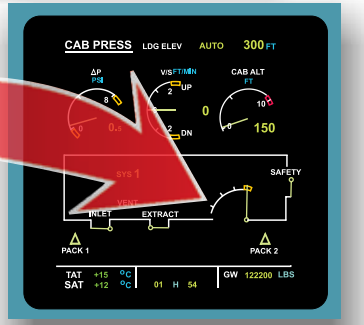
IMPORTANT STEP !

Verify that the

OUTFLOW VALVE is OPEN

HOW TO VERIFY





Select the ECAM CAB PRESS
(cabin pressurization) page.
Verify the OUTFLOW VALVE graphic is OPEN on the ECAM display.

When you have verified that the Outflow valve is indicating OPEN,
go ahead and turn the;

ENGINE BLEED SWITCHES ..... ON

DO NOT TURN ON APU BLEED until
..... 60 seconds AFTER APU start, or
..... Completion of deicing.

DO NOT USE APU BLEED FOR PACKS
..... until 15 minutes AFTER deicing is complete.

APU bleed ..... as required
CARGO HEAT HOT AIR switch ..... as required

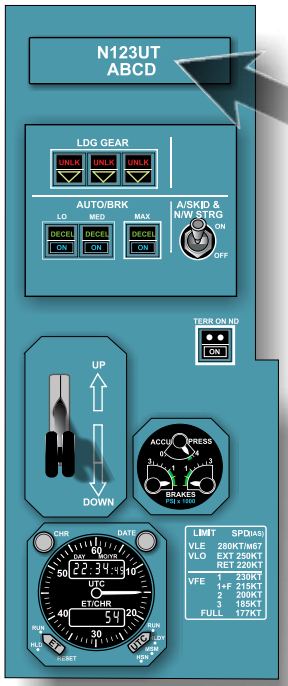
CARGO HEAT HOT AIR switch
may be returned to AUTO
..... after the APU BLEED switch is OFF or
..... 15 minutes after deicing is complete.

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STEP 3

ARE WE ON THE RIGHT AIRPLANE ?



Determine if you are on the right airplane.

Compare the Airplane number on the flight papers with the ACTUAL airplane number. On most airplanes, that number is on the INSTRUMENT PANEL just above the landing gear lever.

CHECK THE AIRPLANE NUMBER !

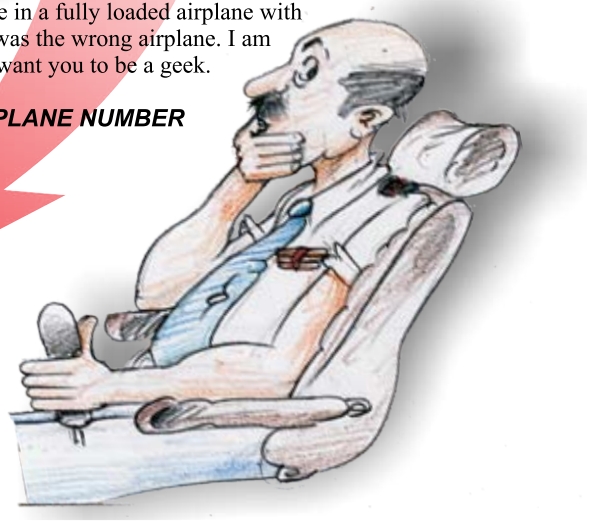


Every day, at airports around the world, perfectly good airline pilots get on the wrong airplane. You probably wonder how I know about such things? ***IT CAN HAPPEN TO YOU!***

Some crews have even managed to actually get airborne in a fully loaded airplane with a full load of passengers and it was the wrong airplane. I am telling you this because I don't want you to be a geek.

DO THIS: ***CHECK THE AIRPLANE NUMBER*** ...and match it with the number on the flight papers...

EVERY FLIGHT SEGMENT!



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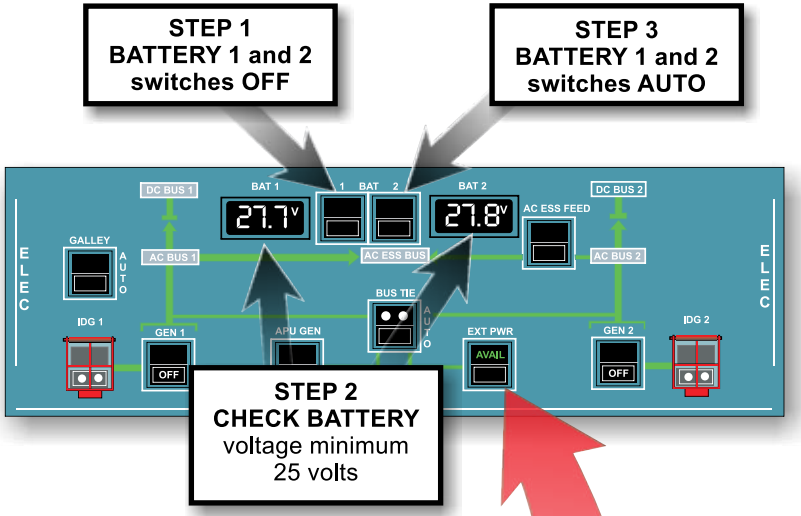
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STEP 4 IF AIRPLANE NOT POWERED ...

CHECK BATTERY VOLTAGE

If the airplane is not powered by the APU, or
External power, and
The batteries have been "at rest" for at least 6 hours.
Then we have to ensure that the batteries have at least 25 volts.

Here is how we do that:



NOTE:
If the BATTERY voltage is less than 25 volts, contact maintenance. Dispatch may or may not be allowed and the pilot is not expected to make that assessment.

After the battery check,

ESTABLISH ELECTRICAL POWER

IF NOT YET DONE.

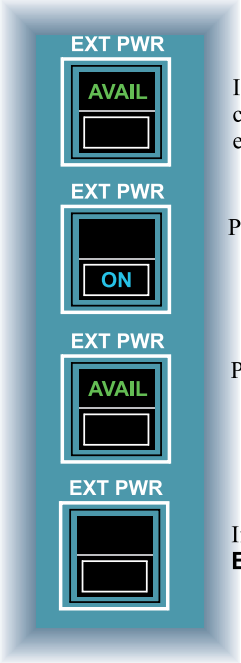


It is MOST desirable to use EXTERNAL POWER instead of the APU because of fuel savings and cost of operating the APU. So, if the AVAIL light is illuminated, push the switch to establish AC power to the airplane.

If the AVAIL light is NOT illuminated, consider starting the APU.

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THE ON-AVAIL light
(external power)



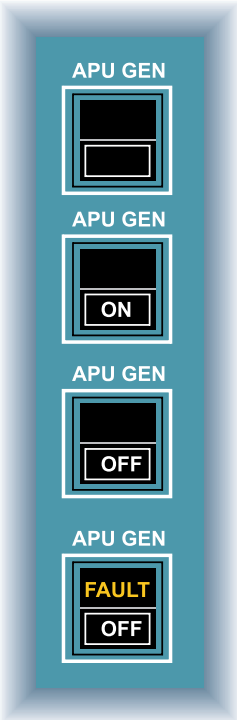
If **AVAIL** is visible, that means that the external power is connected and electrical parameters are normal. The external power is AVAILABLE for use.

Pushing the switch with the **AVAIL** light illuminated,
CLOSES the External Power Contactor
AVAIL goes out,
ON light illuminates.

Pushing the switch with the **ON** light illuminated,
OPENS the External Power Contactor
ON light goes out,
AVAIL light illuminates.

If switch is **DARK**, that means
EXTERNAL POWER NOT AVAILABLE.

THE APU GEN light
(Auxiliary Power Unit)



If switch is **DARK**, that means
APU POWER NOT AVAILABLE.

ON light means that the **APU** is running and automatically takes the bus **IF** the **EXTERNAL POWER NOT** connected.

APU generator field shuts **OFF**,
and line contactor **OPENS**.
*The **OFF** light illuminates*
ONLY if the airplane is powered by AC.

APU FAULT light indicates that
the protection circuit OPENED, or
CONTACTOR opened without being selected.

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... IF EXTERNAL POWER IN NOT AVAILABLE; *THEN START THE APU.*

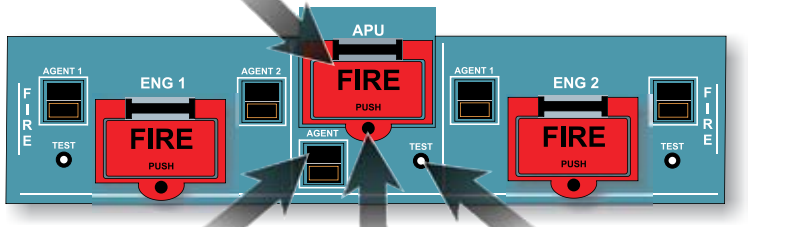
It is considered SOP(Standard Operating Procedure) to wait on starting the APU until about 10 minutes before departure. However, use your judgement to decide if it is required for air conditioning, electrical power, or powering the coffee maker.

HOW TO START THE APU.

*First, do the **APU FIRE TEST.***

HOW TO DO THE APU FIRE TEST

STEP 1
Ensure APU FIRE switch is IN and GUARDED



STEP 2
check APU AGENT DISCH light OFF

STEP 3
Press the APU FIRE TEST button

STEP 4
observe APU FIRE switch illuminates



STEP 5
observe SQUIB and DISCH light illuminates

STEP 6
Listen for CRC (Continuous Repetitive Chime)

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HOW TO START THE APU



STEP 1
push APU MASTER switch,
observe **ON** light illuminates

STEP 2
push APU START switch



The start sequence starts automatically.
At 95% N1, APU ON light goes out and
the AVAIL light illuminates.

If external power is powering the airplane, the APU goes into a standby mode. When external power removed, the APU automatically takes the AC TIE BUS and powers the airplane. When the engines are started and the IDGs start producing electricity, they will automatically take over and return the APU to a standby status.

The APU provides electrical power as well as bleed air for
air conditioning and
engine start.

Fuel for the apu is normally supplied from the left fuel feed line using boost pumps in the left wing tank or the left center tank.

There is a special fuel pump that guarantees adequate fuel pressure if the line pressure drops for any reason.

SPECIAL GROUND SAFETY NOTE

The APU can run on the ground without supervision.
If an APU fire occurs:
Cockpit APU warning goes off in cockpit,
Horn sounds in nose wheel well,
APU automatically shuts down,
APU fire extinguisher is discharged.

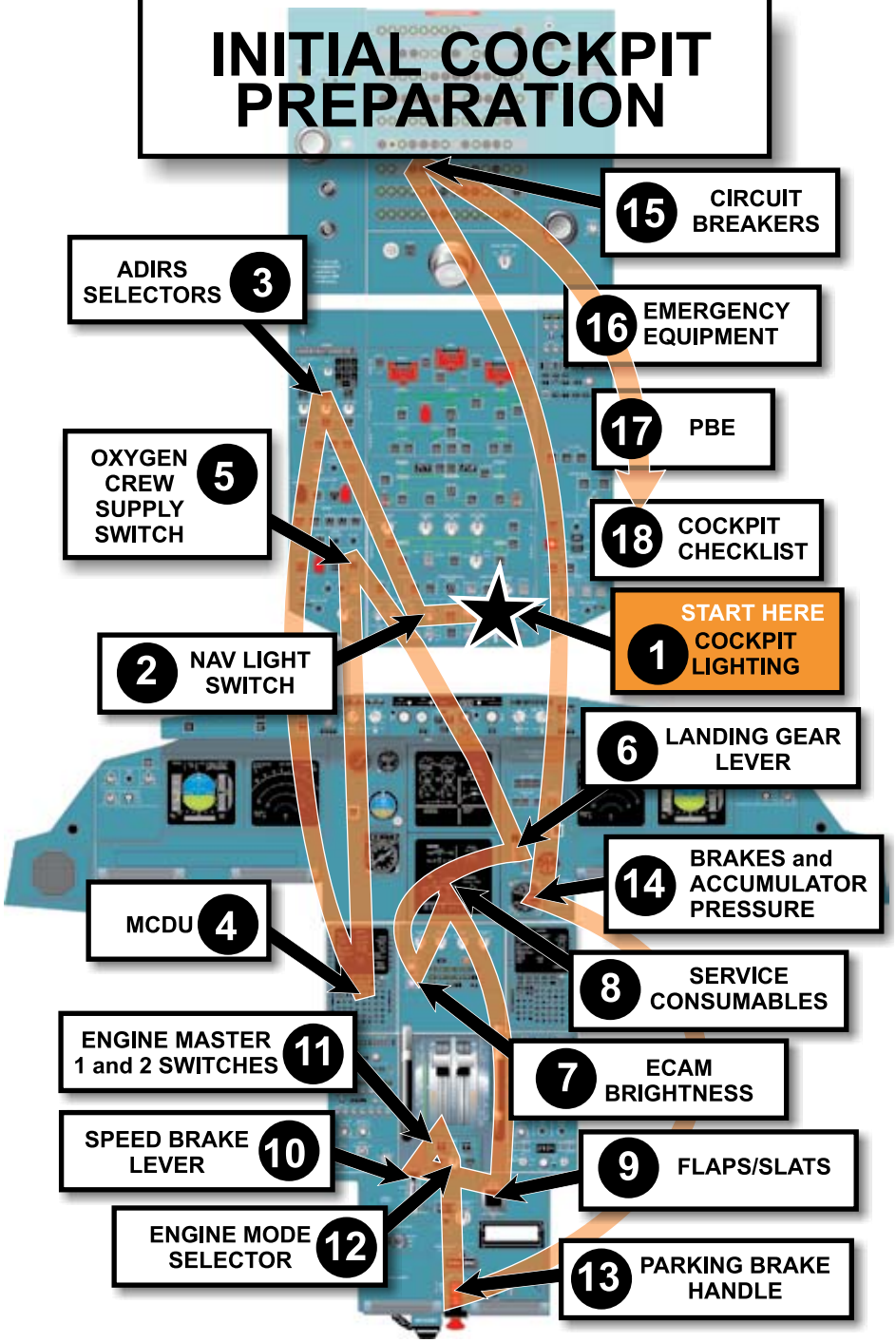
WORTHLESS DETAIL

If the ECAM is powered, AVAIL is indicated on the APU display page for about 15 seconds and then is replaced with the DOOR display.

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INITIAL COCKPIT PREPARATION

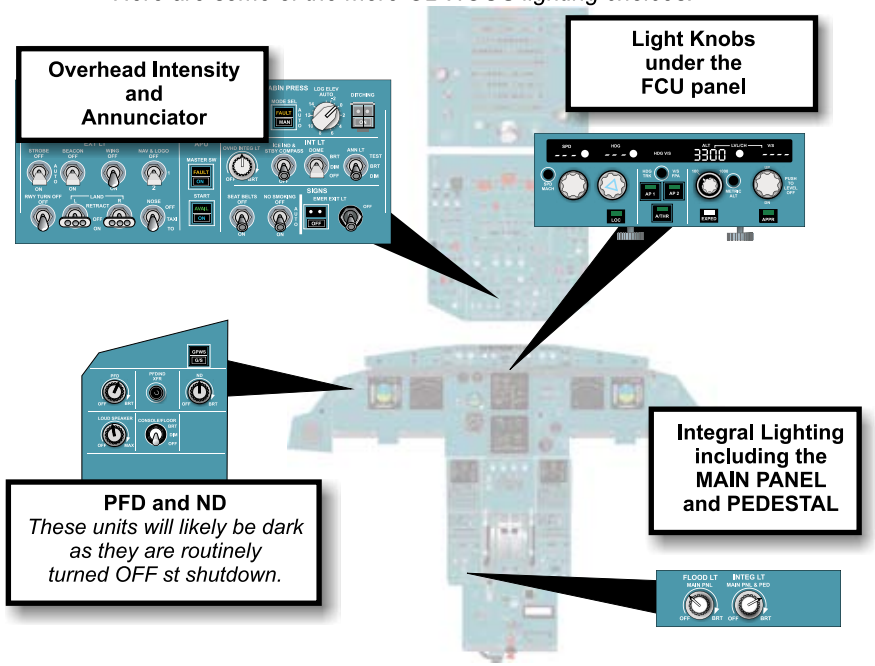


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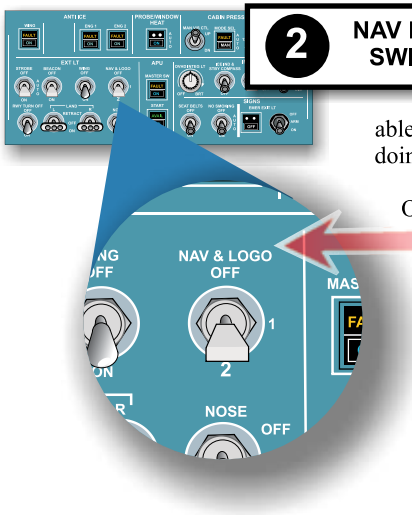
1 COCKPIT LIGHTING

At this point in the cockpit set-up, I wouldn't get all involved in setting up the lighting for every little dial and indicator. The idea here is to get adequate lighting so we can see what we are doing. Later, when we sit down, we can tweak all the light levels to suit our needs.

Here are some of the more OBVIOUS lighting choices.



2 NAV LIGHT SWITCH



It is necessary to get the NAV or NAV/LOGO light on as quickly as you can so that the other guy will be able to check the bulbs while she/he is doing the walk-around.

On some airplanes, the light is called a Nav light, on others it is called the NAV/LOGO light.

This light MUST remain ON at all times.

Select position #1 ONLY if system #2 is inoperative.

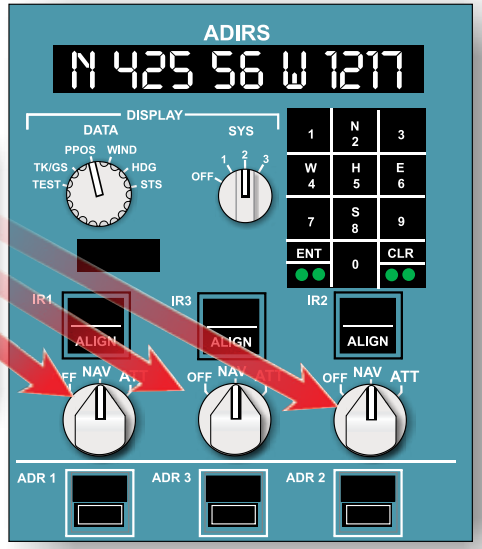
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3 **ADIRS (IR) SELECTORS**

Turn ALL THREE IR switches to NAV.

DO NOT go to ATT.

If you accidentally go to ATT, go back to OFF and start over.



It is desirable to get the ADIRS alignment process started as soon as possible.

FULL ALIGNMENT takes about **10 minutes.**

The ALIGN lights illuminate during the process.

ASAP
after initiating alignment:
ENTER PRESENT POSITION in MCDU

The FMGC/ADIRS' ***MUST HAVE*** a position input as soon as possible after they are turned on in order to minimize drift accumulated during the alignment cycle.

We INPUT THE PRESENT POSITION using the MCDU.

DISCUSSION:

While it is acceptable to position the DATA selector to STS to monitor the warm-up and countdown for the ADIRS', it is not part of the cockpit set-up flows. A lot of the pilots like to know the progress of the alignment and this would be how to do that.

We DO NOT NORMALLY input the aircraft's present position into the FMGC using the ADIRS unit on the overhead panel. The ONLY action we normally do on the unit itself is to select the units to "ON".

The airplane MUST NOT BE MOVED until the alignment is complete.

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DISCUSSION:

- **The flight manual says**:"*Enter Present Position IMMEDIATELY after placing the IR selectors in NAV.*"
- **It also says**:"*The full alignment process takes approximately 10 minutes."*
- **Then it says**:*"The FLIGHT NUMBER must first be entered on the FMGC INIT A page in order to retrieve ACARS information."*

SO ... We MUST input some preliminary information into the MCDU

Since power is supplied to the MCDU and FMGC when aircraft is powered, and because there are several SELF TESTS that the MCDU/FMGC must complete ...

ALLOW 3 MINUTES WARM-UP BEFORE PUSHING ANY KEYS !!

4 *prepping the* MCDU

When you first "turn on" the airplane, the MCDU may connect to the FMGC or it may reflect whatever mode it was operating on when it was shut down (such as ACARS).

NEW GUY STUFF:

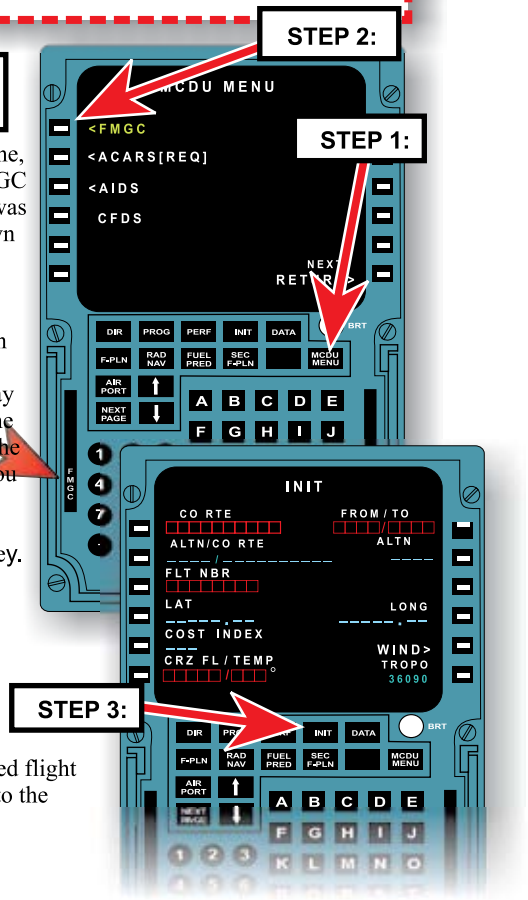
If you find the **FMGC** light **ON,** then you know that the MCDU is not connected to the FMGC, and you may even see an unexpected display on the screen. You will have to re-connect the MCDU to the FMGC. Here's how you do that:

STEP 1: Depress **MCDU MENU** key.

STEP 2: Select the **<FMGC** entry with the line select key (**LS1L**).

STEP 3: Select the INIT key. This gives you the **INIT A** page.

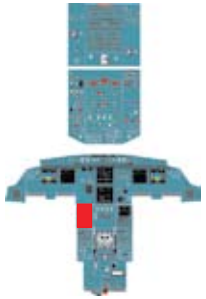
You are now ready to input the desired flight number and position information into the MCDU/FMGC.

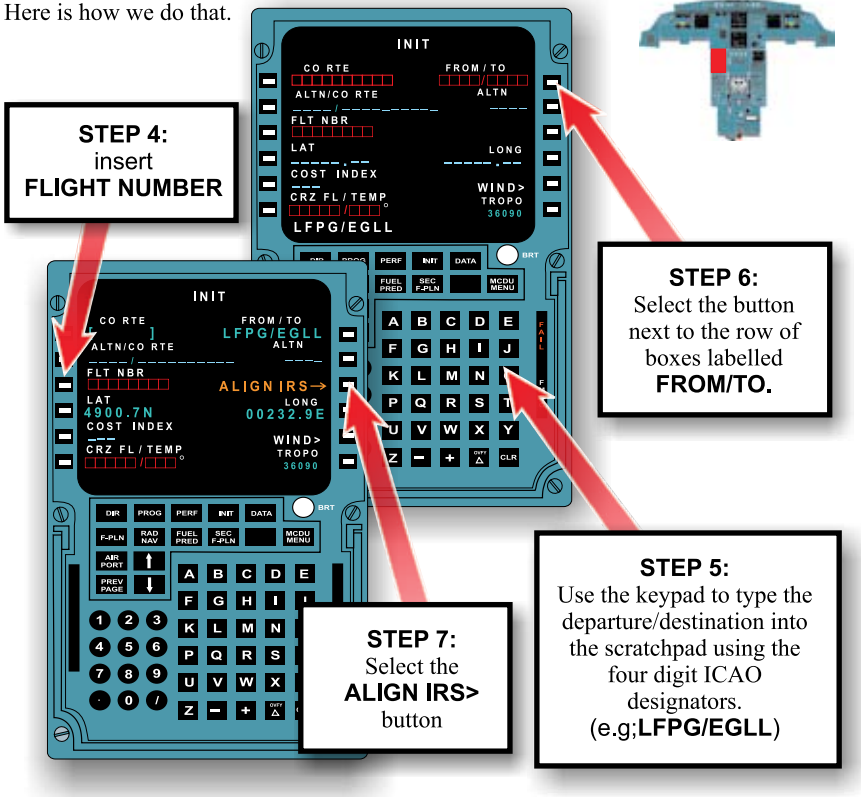


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MCDU continued

Continuing with our placement of the **-FLIGHT NUMBER** and **-POSITION INFORMATION** in to the MCDU.
We complete this by placing the required information on the **INIT A** page.
Here is how we do that.





ATTENTION NEW GUYS:

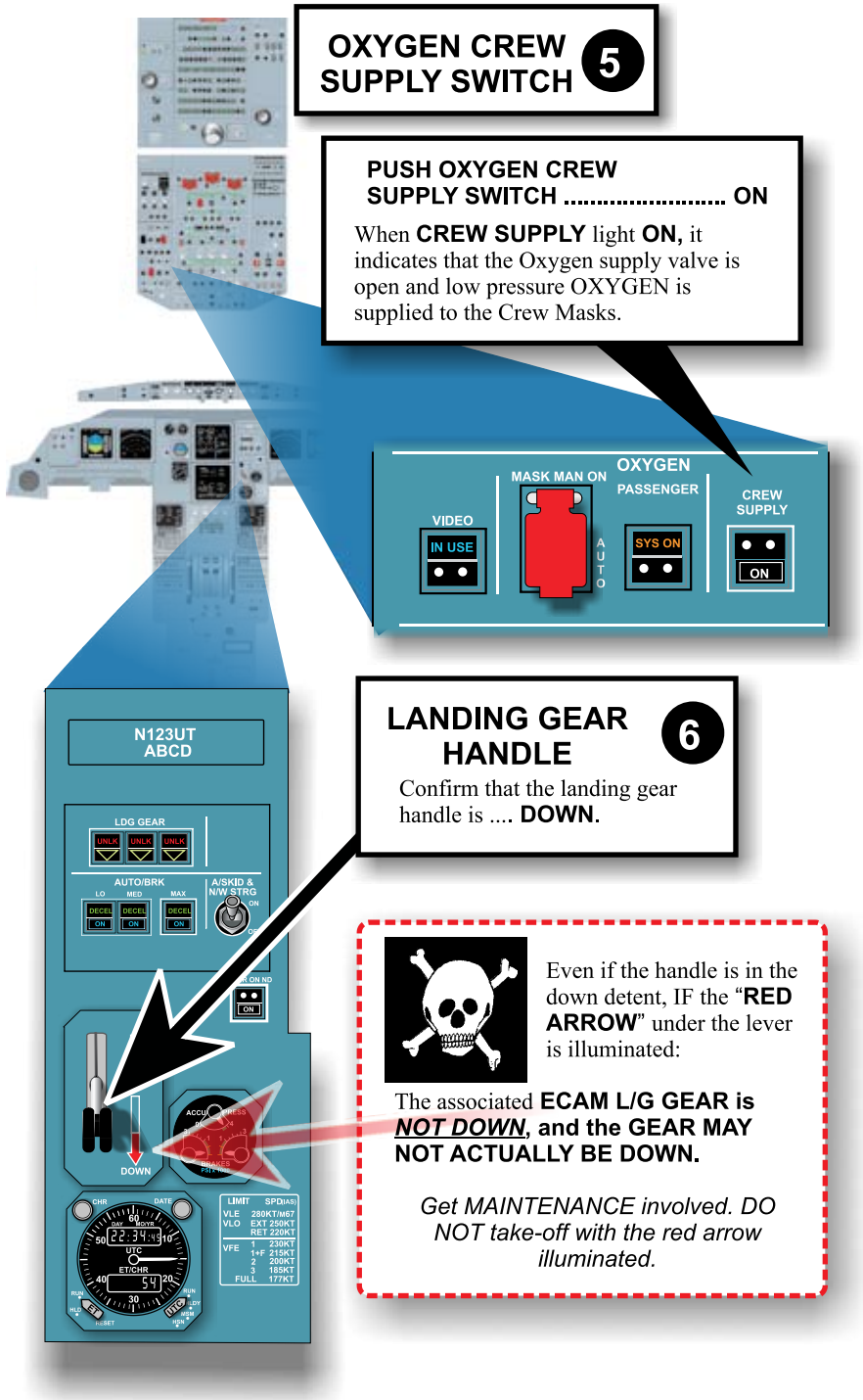
I have observed some seasoned Airbus pilots directly deviating from the Flight Manual procedure and while "head down" in this part of the "**INITIAL COCKPIT PREPARATION**" flow, have completed with the "**ACARS and FMGC INITIALIZATION and VERIFICATION**" steps out of sequence.

STOP WORKING WITH THE MCDU
at this point. Return to the flows as presented,
we will get back to the MCDU later.

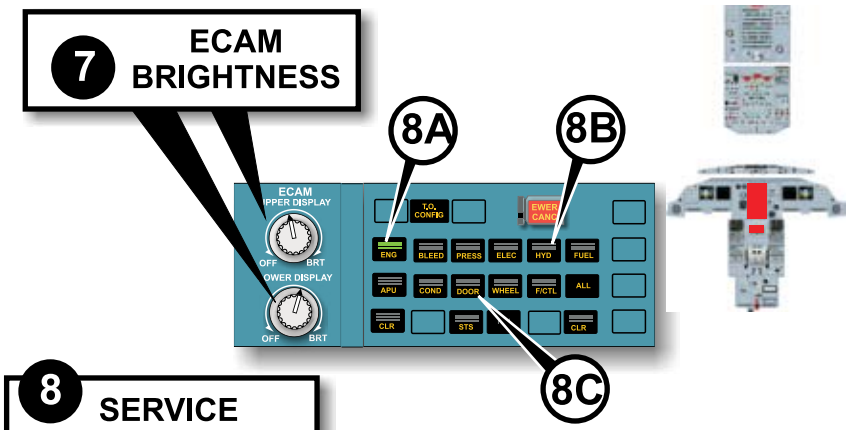
I suggest that once you have selected the '**ALIGN TO**" button on the MCDU, that you return to the next step in the "Initial prep" steps as suggested in the text.

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8 SERVICE CONSUMABLES

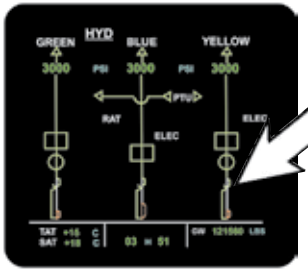
LOWER ECAM DISPLAY
indications



8A To check the **OIL QUANTITY**
select the **ENGINE ECAM PAGE**

Circular gauges accompanied with numerical readout indicate the OIL quantity in quarts.

MINIMUM BEFORE START 17 QUARTS

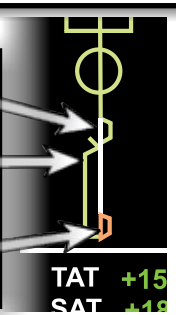


8B To check the **HYD QUANTITY**
select the **HYD ECAM PAGE**

NORMAL FILL RANGE indicator

RESERVOIR QUANTITY indicator
turns amber when below the LOW LEVEL warning

RESERVOIR LOW LEVEL warning range





8C To check **OXYGEN QUANTITY**
select the **DOOR ECAM PAGE**

Alpha numeric indicator is in the upper right corner of the ECAM page.

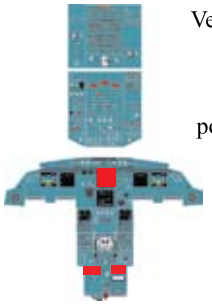
MINIMUM OXYGEN PRESSURE 850 PSI.

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STOP! At this point, we simply want to verify the position of the Flaps and Slats.
DO NOT MOVE THE LEVERS!

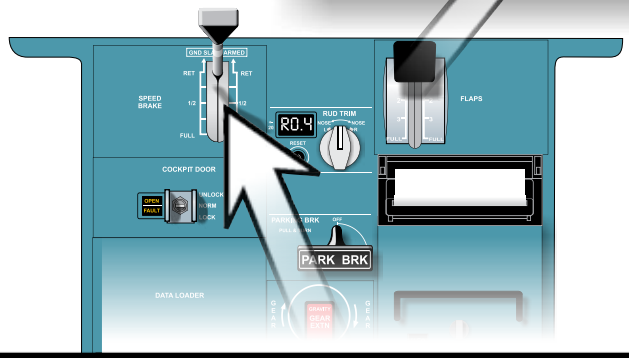


9 FLAPS/SLATS ..... CHECK



Verify that the position of the FLAPS lever corresponds to the FLAP and SLAT positions displayed on the ECAM.





10 SPEED BRAKE LEVER .... RETRACT, DISARM

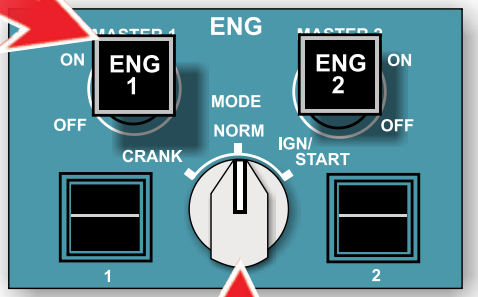
Verify that the SPEED BRAKE lever is in the RET (retract) position and DOWN.

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11 ENGINE MASTER 1 and 2 switches ..... OFF

Verify that the position of the **MASTER SWITCH** is **FULL AFT**, which is the **OFF** position.

Placing the switch **OFF** does the following things:
-Closes the HP valve, and
-Closes the LP valve, and
-Turns OFF the IGNITION, and
-RESETS BOTH CHANNELS OF THE FADEC.



PILOT AWARENESS NOTE: *During the "**ENGINE DUAL FAILURE**" procedure, if no relight for 30 seconds, the procedures recommend cycling **ENGINE MASTER** switch. This will RESET the FADEC.*

*The **FADEC** (**F**ull **A**uthority **D**igital **E**ngine **C**ontrol) is the computer that controls the thrust of the engines. Pilots refer to it as the "FAY-DECK".*

12 ENGINE MODE selector..... NORM (normal).

IGN/START position:
During ground start:.
- Displays **ENG** page on lower **ECAM** (unless another page has been manually selected).
- **ARMS** the **ENG MASTER** switch.
- **CLOSES PACK VALVES**.

Inflight start:
- **ARMS** the **ENG MASTER** switch.

With ENGINE already running:
- **CONTINUOUS IGNITION** using both IGNITERS.

CRANK:
START VALVE OPENS if ENG MAN START switch ON and N2 less than 10%.
NO ignition supplied.

NORM: If engine running, Continuous ignition supplied when either:
- FLX or TO/GA selected on the ground, or
- TO/GA selected in flight, or
- ENG ANTI-ICE switch is ON, or
- Engine surge or stall occurs in flight, or
- Flaps selected while in approach idle.

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SIDEBAR *discussion about the feared and dreaded*

BSCU AND **BDDV**

The **BRAKE AND STEERING CONTROL UNIT**(**BSCU**).

The **BRAKE DUAL DISTRIBUTION VALVE** (**BDDV**)

Since it is an important part of operating this airplane from the pilot's point of view, we need to understand how the BSCU or BDDV can ruin an otherwise great afternoon.

EVERYTIME (and I mean everytime) you set the parking brakes or release the parking brakes on the ground, you will be required to check the BSCU or BDDV *... and be prepared on your check-ride because the Check Captain* ***WILL*** *fail the BSCU or BDDV* ... you will be required to IMMEDIATELY do the appropriate procedure exactly and properly to regain control of the airplane.

RECOGNIZING A BSCU or BDDV FAILURE.

You have a BSCU problem if:

-When the parking brake lever (switch) is placed to OFF,
there is still some pressure indicated on the gauge.

Especially at take-off ... ***this is a NO-GO situation***.

- If you turn the parking brake switch to ON and there is NO pressure.
- If you depress the toe brakes and you see pressure on the gauge.
- If you are cruising along and look down at the gauge and see some pressure.
- If you lower the landing gear and you see pressure.
- If you lose nosewheel steering.
- If you are taxiing and your brakes fail.

and so forth ad nauseum.

If you are taxiing or moving the airplane and you lose NOSEWHEEL STEERING or BRAKES. Here is the procedure for stopping the airplane:

STEP 1: RELEASE the RUDDER TOE BRAKES.
YIPE!! What could be more counter intuitive.
STEP 2: A/SKID and N/W STRG switch ..... OFF
STEP 3. THEN Use RUDDER TOE BRAKES to stop and steer airplane using differential pressure. ***DO NOT EXCEED 1000 psi indicated on the "gauge"***.
STEP 4. When airplane has stopped, Set the PARKING BRAKE.
STEP 5. Get outside assistance. Use the radio, get maintenance and tower involved. It may be possible to reset the system (using outside guidance and authority) but generally using the Captain's emergency authority to reset the system is not encouraged. Continuing the trip without maintenance release and appropriate logbook entries is against Federal guidelines. This is a serious problem.

WHAT PILOTS SCREW UP.

They turn off the A/SKID & N/W STRG switch
with the Captain STILL pushing on the toe brakes!

NOTE*: Captain MUST release brakes* ***BEFORE***
turning OFF the ***A/SKID & N/W STRG*** *switch.*

OR ... ***one whopping BIG stop that feels like the airplane has hit a brick wall***.

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13 SET PARKING BRAKE SET ..... ON

Unless brakes have been deliberately released for brake cooling.

DO NOT DEPRESS THE TOE BRAKES TO SET BRAKES.

The PARKING BRAKE switch is actually ONLY an electric switch !

is PARKING BRAKE SET ...or NOT?

EVEN IF PARKING BRAKE HANDLE IS ON

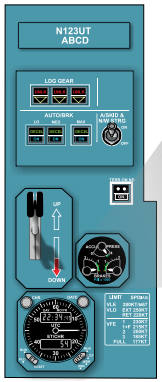
we still have to ***CONFIRM*** that the brake is set.

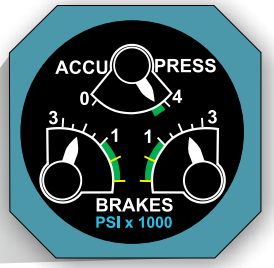


CAUTION:

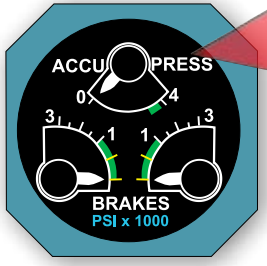
*The ONLY confirmation that the **PARKING BRAKES** are set is an indication of **PARKING BRAKE PRESSURE** on the **PARKING BRAKES PRESS** indicators.*

Checking the BRAKE PRESS is the *ONLY* way to determine if the PARKING BRAKES are set.





PARKING BRAKES ARE SET



PARKING BRAKES ARE *NOT* SET

IF PARKING BRAKE HANDLE IS OFF

consider the cause. It could have been left OFF to allow for brake cooling.

ADDITIONAL NOTE:

If the brakes are OFF (released) then the BRAKE WEAR indicators will not be accurate when observed during the exterior inspection.

YOU MUST REMEMBER

If the parking brakes has been left un-set for brake cooling ... to confirm that the parking brake is set ***ON*** prior to accomplishing the **BEFORE START CHECKLIST.**

14 BRAKE and ACCUMULATOR ..... CHECK

CAUTION:

IF the ACCUMULATOR PRESSURE is LOW

WARNING

DO NOT pressurize the GREEN (#1 engine) or ***YELLOW*** (#2 engine) system prior to engine start ***WITHOUT GROUND PERSONNEL PERMISSION.***

IF the accumulator pressure is LOW ...

OPERATIONAL NOTE: If you notice that the accumulator pressure is low, don't panic. The pressure usually comes back up when the cargo doors are opened or closed.

AFTER *...you have advised appropriate ground personnel Here is how to recharge the accumulator.*

STEP 1:

PTU SWITCH .....OFF

This prevents pressurizing the GREEN system.

STEP 2:

YELLOW ELECTRIC PUMP switch ..... ON

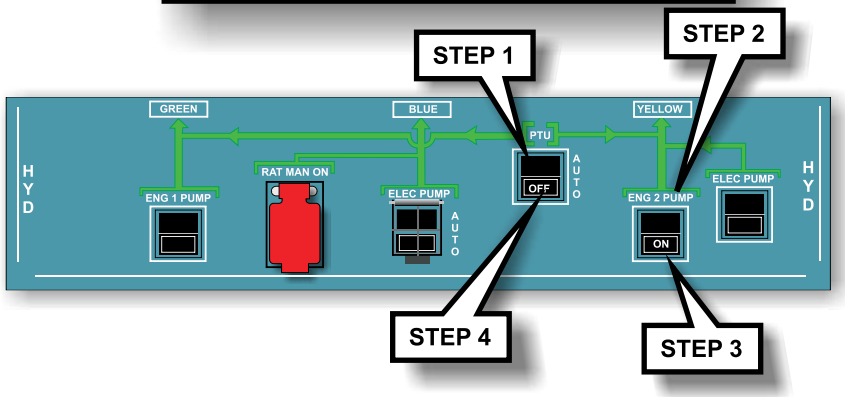
This recharges the accumulator.

STEP 3:

YELLOW ELECTRIC PUMP switch ..... OFF

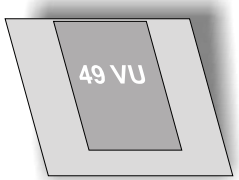
STEP 4:

PTU switch ..... AUTO



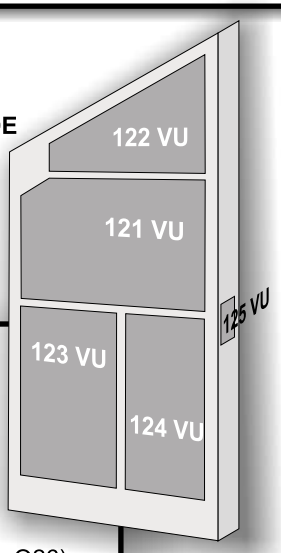
15 CIRCUIT BREAKERS ..... CHECK

There are 6 different panels to check.



UPPER OVERHEAD

AFT RIGHT-SIDE BULKHEAD



PROHIBITED/RESTRICTED circuit breakers

DO NOT RESET or CYCLE the following CIRCUIT BREAKERS!

- ANY wing tank fuel pump (N23, Q23, N26, Q26) ***ON THE GROUND or INFLIGHT!***
- ANY RED-GUARDED WING TIP BRAKE ***ON THE GROUND or INFLIGHT***!
- SFCCs, including SLT or FLP CTL and MONG SYS 1 & 2 ***IN FLIGHT!***

The following circuit breakers may be reset ***ONLY AS FOLLOWS***:

- BSCU when the airplane is at a COMPLETE STOP.
- EIU/FADEC when the engine is shut down.

Circuit breakers are extremely reliable and any tripped circuit breaker should be considered an indication of ***SIGNIFICANT*** system malfunction.

BEWARE: Some circuit breakers are linked to multiple systems and resetting or cycling may result in the loss of systems not associated with the faulty system.

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CIRCUIT BREAKER RULES

1. Do not cycle more than ONE circuit breaker at a time.
(Exceptions include authorization by a Flight Manual procedure).

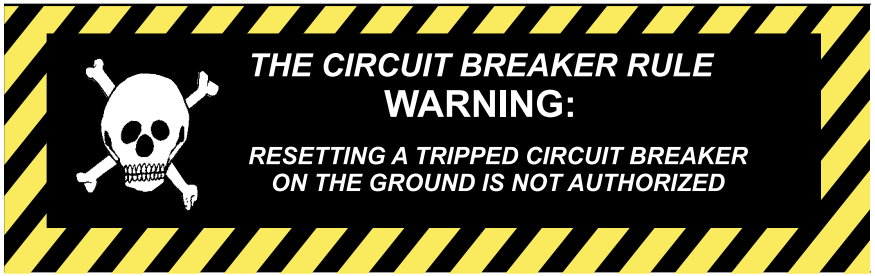
2. When CYCLING a circuit breaker, wait at least 5 seconds before closing.

3. In flight, ONLY Flight Manual authority may be used to restore a system.

DEFINITIONS:

RESETTING is PUSHING IN a CIRCUIT BREAKER that has become unseated.
CYCLING is PULLING and RE-SETTING a CIRCUIT BREAKER.

ON THE GROUND:



The airplane MUST BE STOPPED with the PARKING BRAKE SET prior to cycling ANY CIRCUIT BREAKER !

IN FLIGHT:

RESETTING a circuit breaker may be accomplished ONLY if the Captain using his **EMERGENCY AUTHORITY** deems it **NECESSARY** for the **SAFETY OF FLIGHT**.

CYCLING a circuit breaker may be accomplished ONLY if part of a flight manual procedure.
HOWEVER, the Captain may use **EMERGENCY AUTHORITY** if necessary.

***A major airline has this* CAPTAIN'S NOTICE**:
*Whether in the air or on the ground, **CYCLING** a circuit breaker REQUIRES an MRM code 996 to be entered in the ACARS.*
Enter the cycled circuit breaker(s) grid location (e.g.; D9), name (e.g.; LGC1U), and the reason for cucling in the comments field .... and send.
This complies with current FAA directives regarding logbook currency.

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16 EMERGENCY EQUIPMENT ..... CHECK

Verify the 7 things are **INSTALLED** and **PROPERLY STOWED**:

F
FIRE EXTINGUISHER (HALON)

Check pressure in the NORMAL band, seal intact.

O
OXYGEN MASKS

There are FOUR to check: Captain, First Officer, Observer (2).

A
AXE (CRASH AXE)

Check on board and stowed properly.

M
MEDICAL KIT, SECONDARY

Two green seals REQUIRED;
if yellow, broken, or missing ... report to maintenance.

E
ESCAPE ROPES

There are two rope enclosures to check.

L
LIFE VESTS

There are FOUR to check: Captain, First Officer, Observer (2).

F
FLASHLIGHT

17 (PBE)PROTECTIVE BREATHING EQUIPMENT .... CHECK

Observe the VISUAL INDICATOR:
BLUE indicates it is OK,
PINK "may" indicate that it needs to be replaced, if there is any question, ask maintenance to make an independent evaluation. It has been my experience that even when it looks "pink" to me, it is generally OK. The maintenance people have their own set of criteria for dispatch purposes.

18 Cockpit CHECKLIST CARD ..... CHECK

Check for unserviceable damage, out-of-date, or missing.
There are specific guidelines in the Flight Operations Manual regarding the acceptability of checklists with damage.

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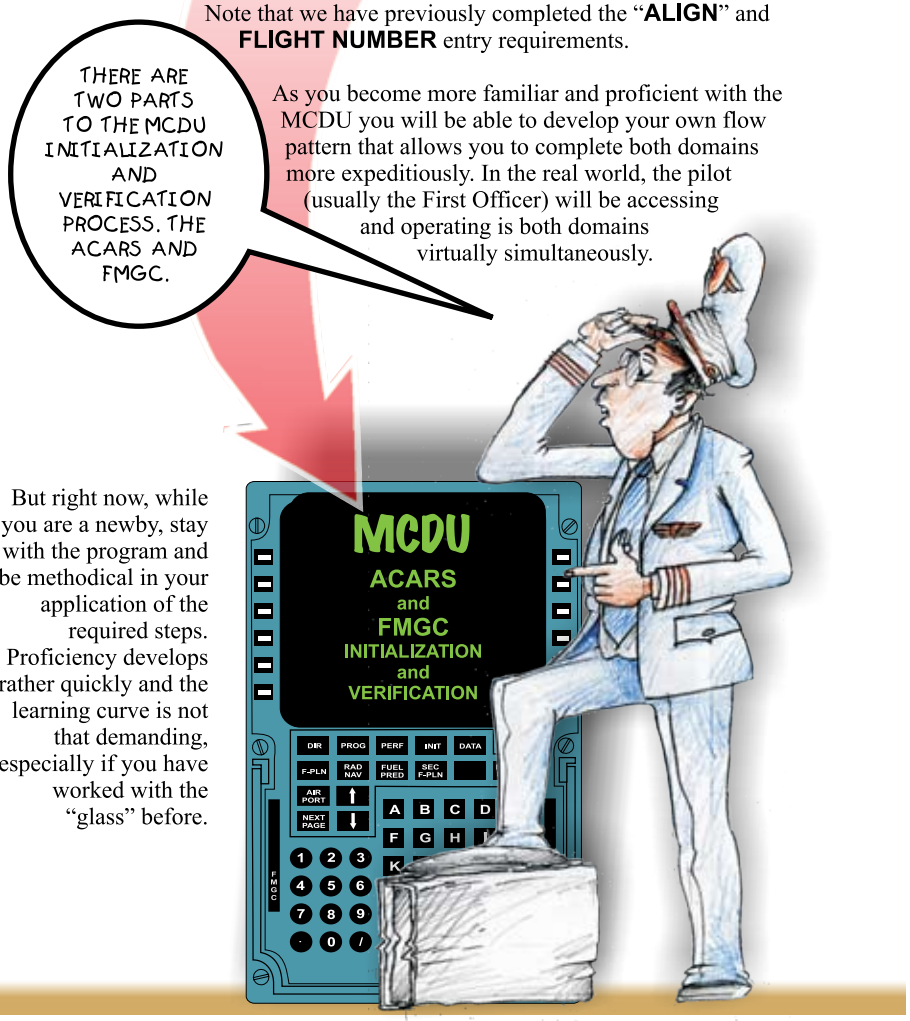
INTRODUCING

THE NEXT *intimidating* FLOW SECTION

LOADING THE MCDU

We are going to divide the **MCDU** loading task into two separate domains.
First, we will initialize the **ACARS** and
Second, we will load the **FMGC**.
There may be some confusion at the start, but if we do this step by step it will come together at the end.

Note that we have previously completed the "**ALIGN**" and **FLIGHT NUMBER** entry requirements.



As you become more familiar and proficient with the MCDU you will be able to develop your own flow pattern that allows you to complete both domains more expeditiously. In the real world, the pilot (usually the First Officer) will be accessing and operating is both domains virtually simultaneously.

But right now, while you are a newby, stay with the program and be methodical in your application of the required steps. Proficiency develops rather quickly and the learning curve is not that demanding, especially if you have worked with the "glass" before.

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Here are some GENERAL

MCDU INFORMATION

FMGC initialization would normally be completed prior to the Captain and First Officer's cockpit preparation flows. If, however, all the necessary data is not available (flight plan, ATC clearance, ATIS, fueling data, etc) then the FMGC initialization may be done at any point in the Cockpit Preparation flow. However, here is my recommendation for your check-ride and until you become familiar with the flows ...
stay with the flows as they are presented here.

definition of term:

Just what do they mean by
INDEPENDENT VERIFICATION?

One pilot loads the data without assistance or influence from the other pilot; THEN
the other pilot INDEPENDENTLY VERIFIES all entries are correct. Discrepancies must be discussed, verified, and corrected.

Both the FMGCs and the FCU conducts internal testing when electrical power is first applied; so



WAIT 3 MINUTES
after the initial power application
before pushing any FMGC keys.
If the **PLEASE WAIT** message appears
in the scratchpad,
DO NOT PUSH ANY MCDU KEY
until the message disappears.

If the

OPP FMGC IN PROGRESS

message appears; that means
only the opposite FMGC is working.
If that occurs, the POSITION MONITOR in the DATA page displays a position for the working FMGC only.

Note for First Officers:
If you receive the FINAL WEIGHTS before engine start, you may enter the final ZFW on INIT page B. After engine start, INIT page B is automatically replaced with the FUEL PRED page.

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First, we will complete the ACARS iniialization:

ACARS

Pilots call it "AY-KARZ."

ACARS stands for "**AIRCRAFT COMMUNICATIONS ADDRESSING and REPORTING SYSTEM.**"

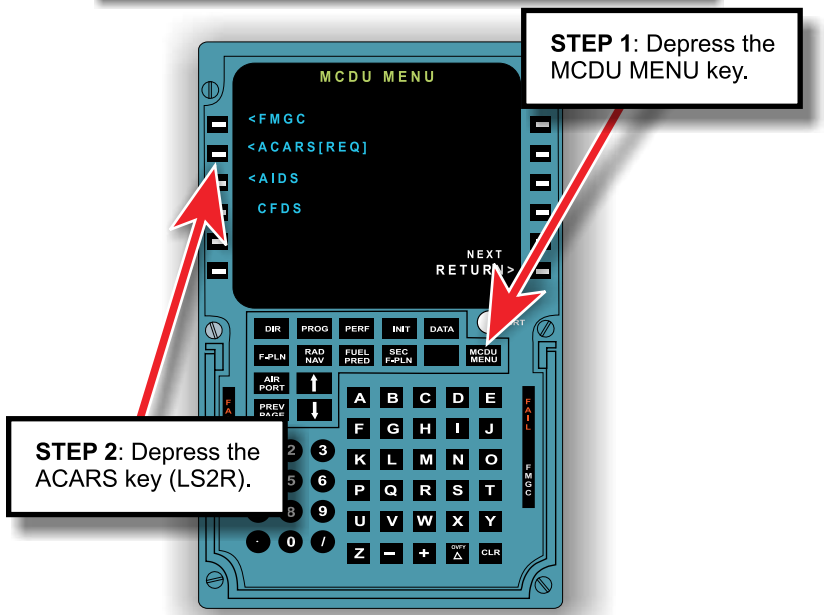
This is a system that provides high speed two way digital link communication between Pilots and the Dispatchers, Load Planning and Maintenance coordinators. The no. 3 radio is normally dedicated solely for the use of **ACARS**. The radio is not normally tuned manually, but has a sophisticated automatic system that selects frequencies that "relieve congestion" in high-traffic areas.

> *Some airplanes are equipped with an even more complex system called* ***ATSU*** *(AIR TRAFFIC SERVICES UNIT). Fortunately, however, ATSU integrates seamlessly with the ARINC system and so that operations are very similar to the standard ARINC unit. Wheeew!*

Data is usually entered automatically, but information may be entered manually. Here are some places where automatic transmission of data routinely occurs:

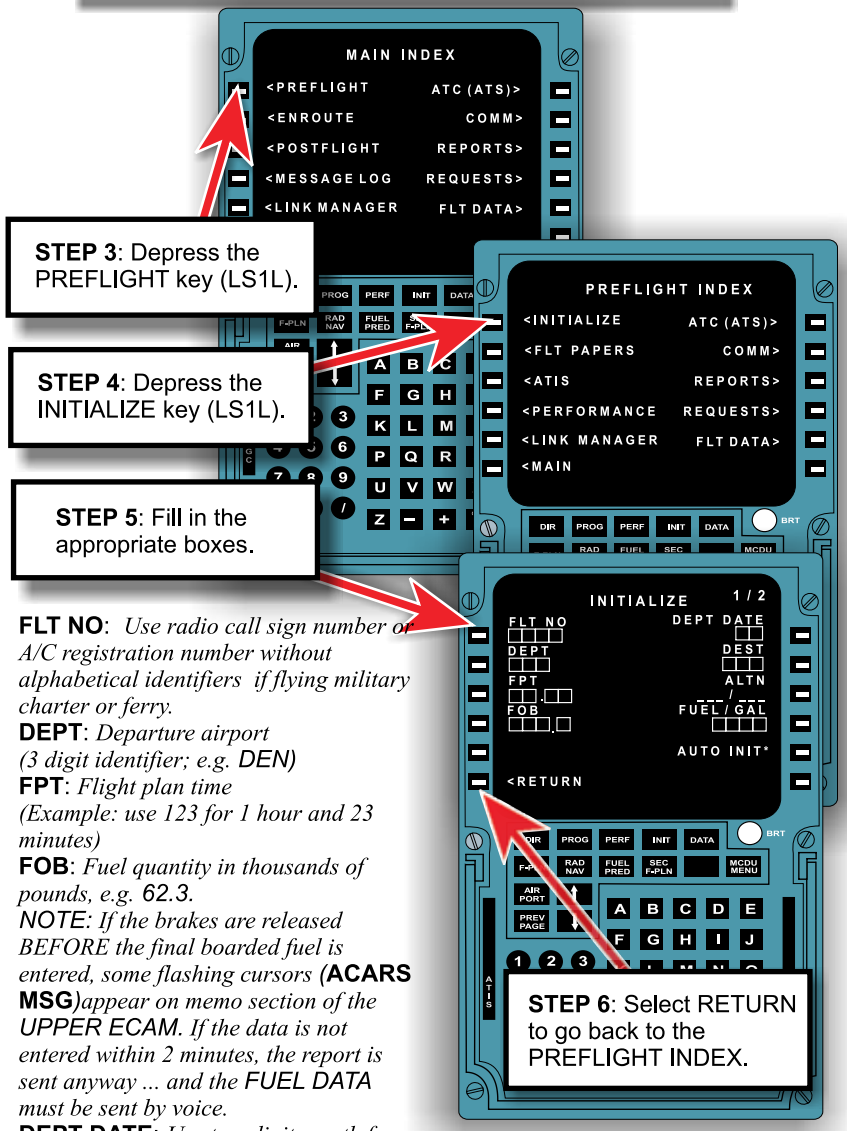
- **OUT REPORT** is sent after *PARKING BRAKE is* FIRST released with all entry doors closed.
- **OFF REPORT** is sent after *LIFTOFF*.
- **ON REPORT** is sent after *TOUCHDOWN*.
- **IN REPORT** is sent after *PARKING BRAKE IS SET* **AND** an *ENTRY DOOR OPENED.*
- **ENGINE** and **AIR DATA REPORTS** sent ENROUTE.

How to access THE ACARS/ATSU



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then INITIALIZE THE ACARS/ATSU



FLT NO: *Use radio call sign number or A/C registration number without alphabetical identifiers if flying military charter or ferry.*
DEPT: *Departure airport (3 digit identifier; e.g. DEN)*
FPT: *Flight plan time (Example: use 123 for 1 hour and 23 minutes)*
FOB: *Fuel quantity in thousands of pounds, e.g. 62.3.*
*NOTE: If the brakes are released BEFORE the final boarded fuel is entered, some flashing cursors (***ACARS MSG***)appear on memo section of the UPPER ECAM. If the data is not entered within 2 minutes, the report is sent anyway ... and the FUEL DATA must be sent by voice.*
DEPT DATE: *Use two digit month from Flight Plan (may differ from local month).*
DEST: *Destination airport (3 digit identifier; e.g. LAX)*
ALTN: *Enter selected airports (if desired)*
FUEL/GAL: *Actual GALLONS boarded (TTL FROM TRUCKS); e.g. 1453.*

go to:
PAGE 2/2 ...*and enter* ***CAPT NAME*** *and* ***FILE NUMBER*** *and other pertinent requested information.*

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*After completing the **ACARS INITIALIZATION** and selecting the **RETURN** key, the MCDU display should be on **PREFLIGHT INDEX.***
We can use the ACARS to obtain information to complete the FMGC setup.

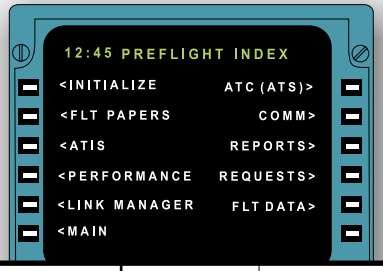
OBTAIN ACARS FLIGHT INFORMATION

Here is some of the information needed from the ACARS in order to complete the FMGC initialization:

1- ATIS
2- Weight Manifest
3- Runway Data
4- PDC
5- Release Verify
6- Gate Connections

6 ITEMS

NOTE: At a minimum:
- ATIS
- Runway Data
are needed to complete the FMGC initialization.



Here is a chart I made up that has a suggested sequence of key-strokes that will help you get the desired information.

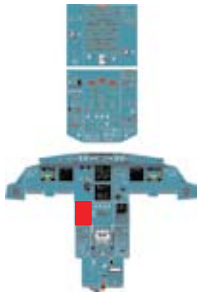
TO GET THIS	SELECT	then SELECT		
1- ATIS	ATC	ATIS	SEND	
2- WEIGHT MANIFEST	REQUESTS	PERFORMANCE	WEIGHT MANIFEST	SEND
3- RUNWAY DATA	REQUESTS	PERFORMANCE	SEND	
4- PDC	ATC	PDC		
5- RELEASE VERIFY	REQUESTS	DISPATCH	RELEASE VERIFY	
6- GATE CONNECTIONS	REQUESTS	GATE CONNECTIONS		

It is assumed that you can "fill in the appropriate" blanks on the selected pages using your intuition. I won't waste your time on detailing the steps precisely.

Once we have completed the ACARS, we are ready to initialize the FMGC

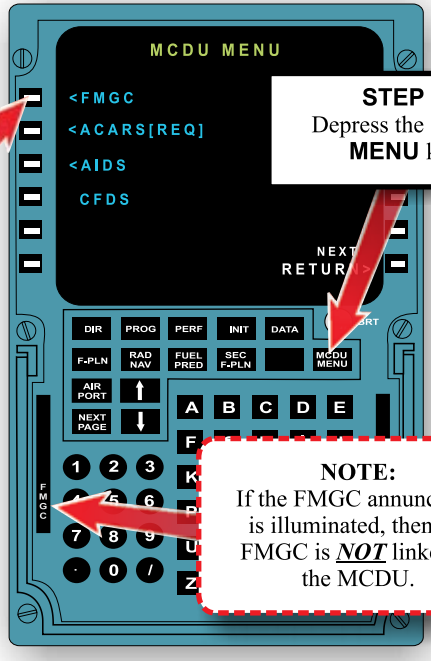
NOTE:
You cannot retrieve ACARS information
UNTIL
The FLIGHT NUMBER has been entered on the FGMC INIT A page.

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In order to continue with the FMGC initialization, we have to place the MCDU into the FMGC mode.

LINKING the MCDU to the FMGC



STEP 1:
Depress the **MCDU MENU** key.

STEP 2:
LSK 1L .... <FMGC.
This will ensure a connection from the FMGC to the MCDU.

NOTE:
If the FMGC annunciator is illuminated, then the FMGC is ***NOT*** linked to the MCDU.

SHORT DISCUSSION:
The MCDU can actually function as the operator control interface for many modalities other than Flight Management. That means that this unit may be used to access other databases than simply pilot stuff. Here are some potential choices you might see displayed. There are others, of course, and these are shown as examples only.

FMGC = Flight Management and Guidance Computer
ACARS = Aircraft Communications and Reporting System
ATSU = (*used in lieu of ACARS when installed*)
AIDS = Aircraft Integrated Data System (*normally Maintenance only*)
CFDS = Centralized Fault Display System (*normally Maintenance only*)

PROTOCOL NOTE:
In this presentation we will use the following notation to identify the Line Selector Keys alongside the MCDU display this way:
LSK 1L (Line Select Key 1 left).
or for another example;
LSK 2R (Line Select Key 2 Right)

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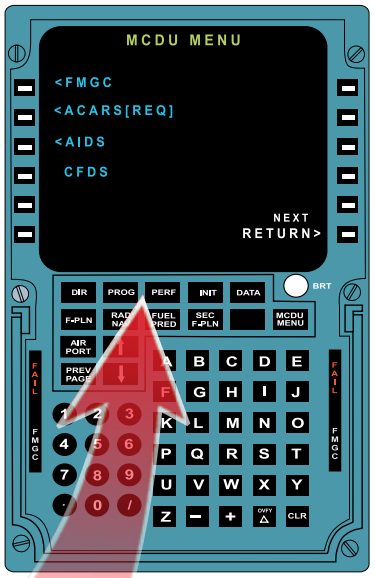
TIME-OUT

I FEEL YOUR PAIN ...

This is an almost impossible task when you first start, I know how you feel. So, since the MCDU is a little complex when you are first starting to use it, and we want to ensure that we get every little detail completed ...here is what has evolved in airlines around the world. It is the ubiquitous "gouge" or acronym that will help even the most memory challenged pilot to get everything done.

Before I reveal my "secret" formula for remembering the MCDU loading steps, let me say that there are a whole bunch of these little memory joggers out there; and different airlines favor different ones. For example, one major airline uses this scheme:

D = DATA page
I = INIT page A, INIT page B
F = F-PLAN page A, F-PLAN page B
R = RAD NAV page
S = SEC F-PLAN
F = FUEL PRED page
P = PERF page



It seems to work for them. However, we will use a slightly different order to our set of pages. I tell you this to point out that when you get a little more experienced, there is nothing that says you can't do anything you want and in any order ...as long as everything gets done.

However, here is the acronym we will be using for this tutorial.

D-I-F-R-I-P+P-S

D = DATA page
I = INIT A page
F = F-PLAN page
R = RAD NAV page
I = INIT B page
P = PERF page
P = PROG page
S = SEC F-PLAN page

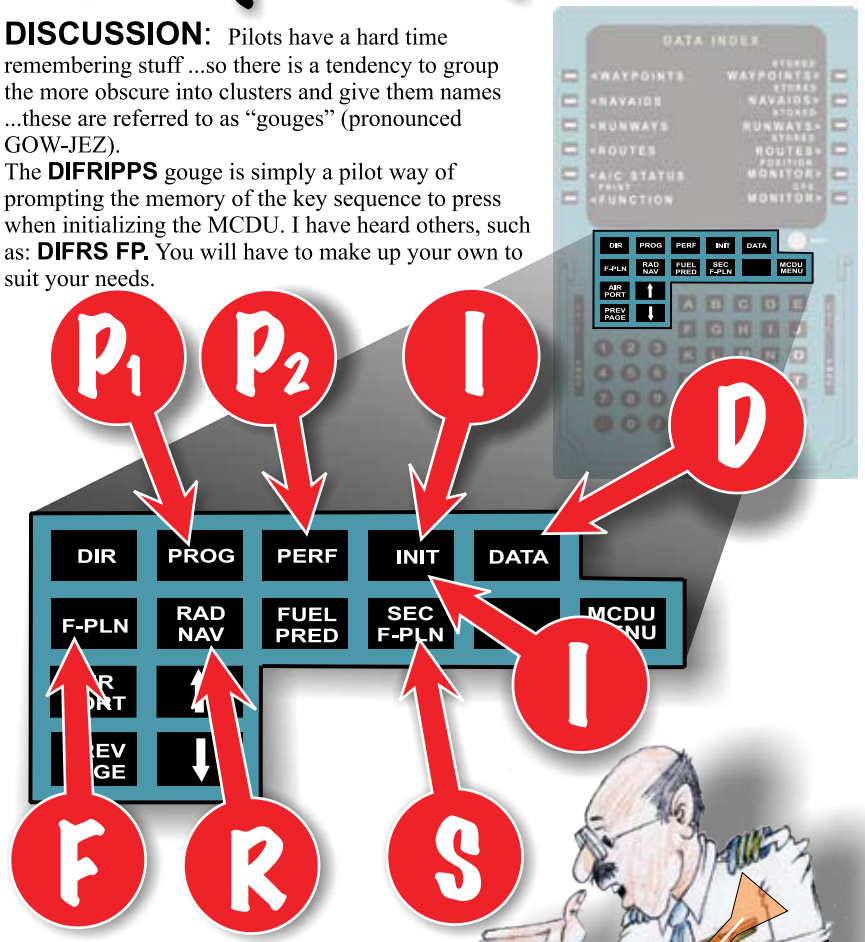
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WHAT IS DIFRIP+PS???

D-I-f-R-I-p+P-S

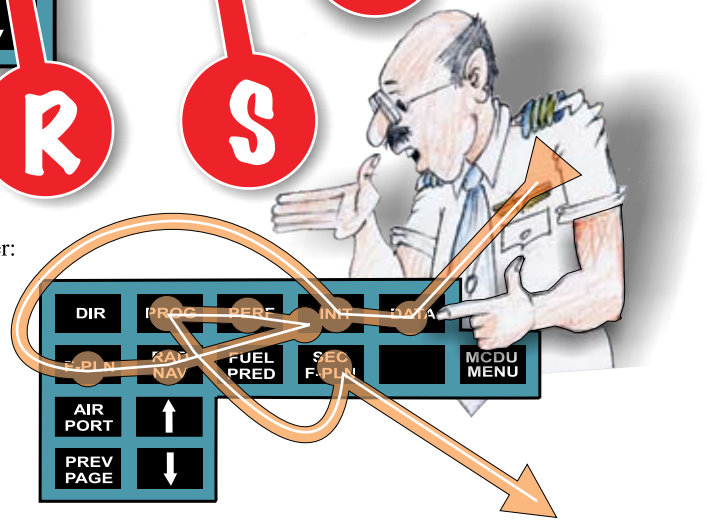
DISCUSSION: Pilots have a hard time remembering stuff ...so there is a tendency to group the more obscure into clusters and give them names ...these are referred to as “gouges” (pronounced GOW-JEZ).

The **DIFRIPPS** gouge is simply a pilot way of prompting the memory of the key sequence to press when initializing the MCDU. I have heard others, such as: **DIFRS FP.** You will have to make up your own to suit your needs.

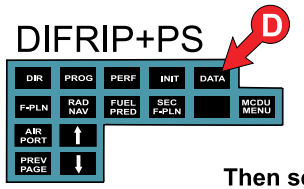


We will program the pages in this order:

D = *DATA*
I = *INIT A*
F= *F-PLN*
R = *RAD NAV*
I = *INIT B*
P = *PERF*
P= *PROG*
S= *SEC F-PLN*



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SELECT DATA KEY

Then select

AC STATUS KEY (LSK 5L)

This will reveal the STATUS page
(this page is titled using the aircraft model #)

Here is where you verify that the airplane and the computer are referencing the same database. Check and see if the following are correct:

- AIRPLANE TYPE
- ENGINE TYPE
- CURRENT DATABASE

The database changeover time is 0901 UTC on the first day of the database effective date.

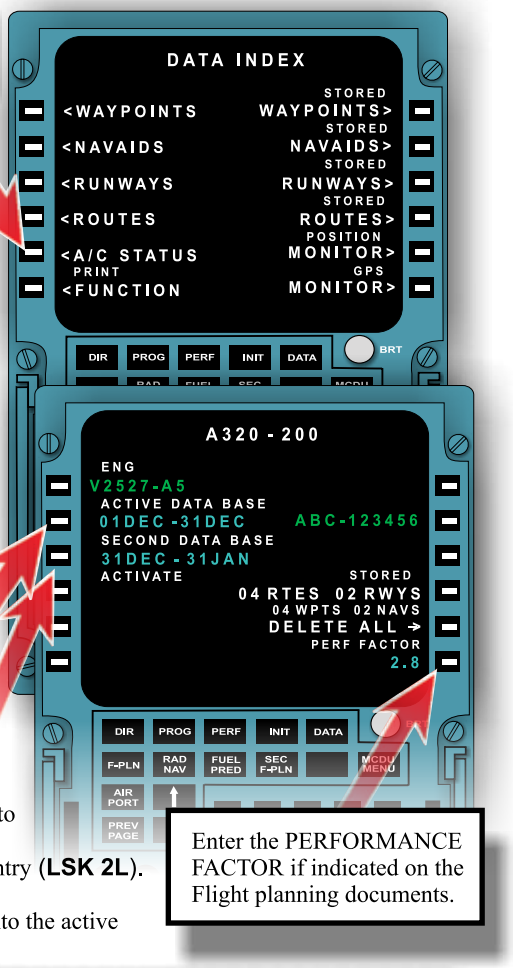
If the database effective date does not match the airplane clock date, then a scratchpad message will appear:
CHECK DATA BASE CYCLE

If that happens or the database is out of date, here is what you do.

Line select **SECOND DATABASE** to scratchpad **(LSK 3L)**, then
Line select **ACTIVE DATABASE** entry (**LSK 2L**).

This will move the "new" database into the active database line and update the system.

This will reveal the DATA INDEX page



Enter the PERFORMANCE FACTOR if indicated on the Flight planning documents.

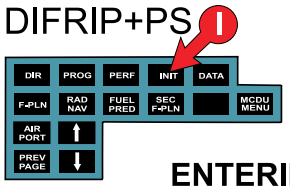


DO NOT CHANGE DATABASE IN FLIGHT

If you do some bad stuff will happen:
- the flight plan will be deleted
- speed predictions will go away
- ND will go blank
- green dot will be managed speed target.

WHAT CAN PILOTS SCREW UP?
After getting airborne, they decide that the database is going to be out of date or actually get a CHECK DATA BASE message, then they try to change the database "in the air."

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SELECT INIT KEY

ENTERING THE AIRPLANE POSITION

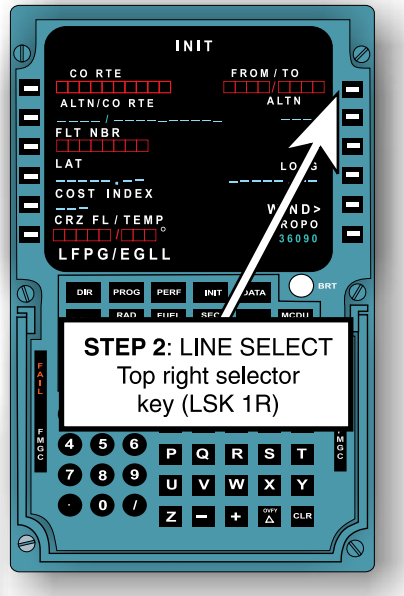
Here is where we place the airplane LAT/LONG position into the FMGC. When you do this step, the airplane actually knows what the LAT/LONG of the departure airplane is, so you don't actually put in all those numbers. Simply entering the four digit ICAO designator for the destination is all that it needs.

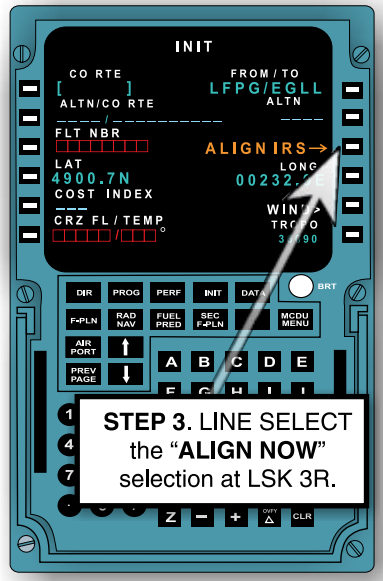
This is a very important step, it is the FIRST thing we do. We have to place the DEPART/DESTINATION as a FROM/TO entry.

Since we have decided to go
FROM: **LFPG**
(Charles-de-Gaulle airport in Paris)
TO: **EGLL** (Heathrow Airport in London);

STEP 1: We type that in the scratchpad using the keypad of the MCDU: **LFPG/EGLL.**
NOTE: You MUST include the " / " between the two city IDs.

STEP 2: **LINE SELECT** the top right selector key **(LSK 1R)**





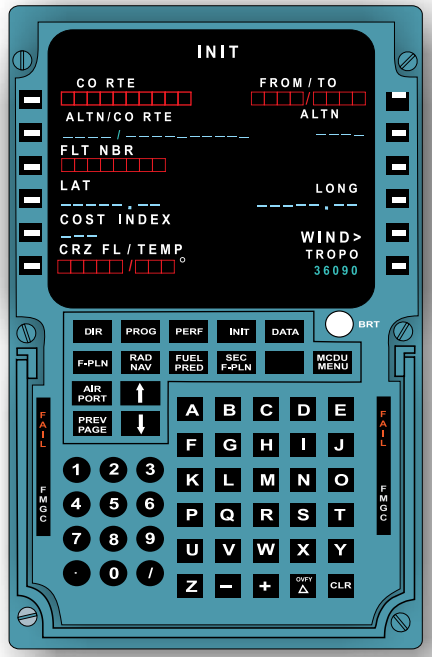
STEP 3: This will cause "**ALIGN IRS**" to be automatically displayed at LS3R.
Depress the Line Select key.
This will send the LAT / LONG of the departure airport to the ADIRU for the alignment process.

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INIT PAGE CONTINUED

CO RTE: If your flight plan says **FMCS YES**, then you enter the flight plan using the nine-digit route designator. For example, if you are going from CDG to LHR using the route 05K, you would enter **CDGLHR05K.**

If your flight plan says **FMCS NO**, then you enter the flight plan using the ICAO four letter designators in the FROM/TO boxes.
Example: **LFPGEGLL** Notice that the same destinations are now using the ICAO four letter designators.



We will cover manually entering the flight plan when we get to the F-PLAN page.

FLT NBR. Note that without this flight number entered, you CANNOT retrieve the information you previously requested on the ACARS.

LAT - LONG: Confirm the values (if displayed) are consistent with the airport reference point LAT-LONG (i.e; chart 10-9 page).

COST INDEX (CI): This is the command to the FMGC to adjust the speed so as to affect fuel usage. Smaller numbers generally indicate better fuel economy but slower airspeed, higher numbers call for higher airspeeds.
Normally the numbers indicated on the flight plane are in the 35 to 50 range.

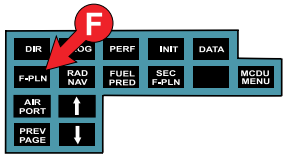
CRZ FL/TEMP: Enter the first planned cruise flight level.
TEMP: The data defaults to the ISA. If the flight plan provides a deviation.
...ADD that to the displayed and enter the new value.

TROPO: Defaults to **36,090** feet. Enter the RCA (reach cruise altitude) tropo from the flight plan or 39000 whichever is lower.
Use a FIVE DIGIT number.
ALTITUDE OF TROP MUST BE ENTERED IN FEET and not as a flight level or in meters.

WIND: Select the prompt and the wind pages will appear. You can insert HISTORY winds or use the forecast winds from the flight plan.

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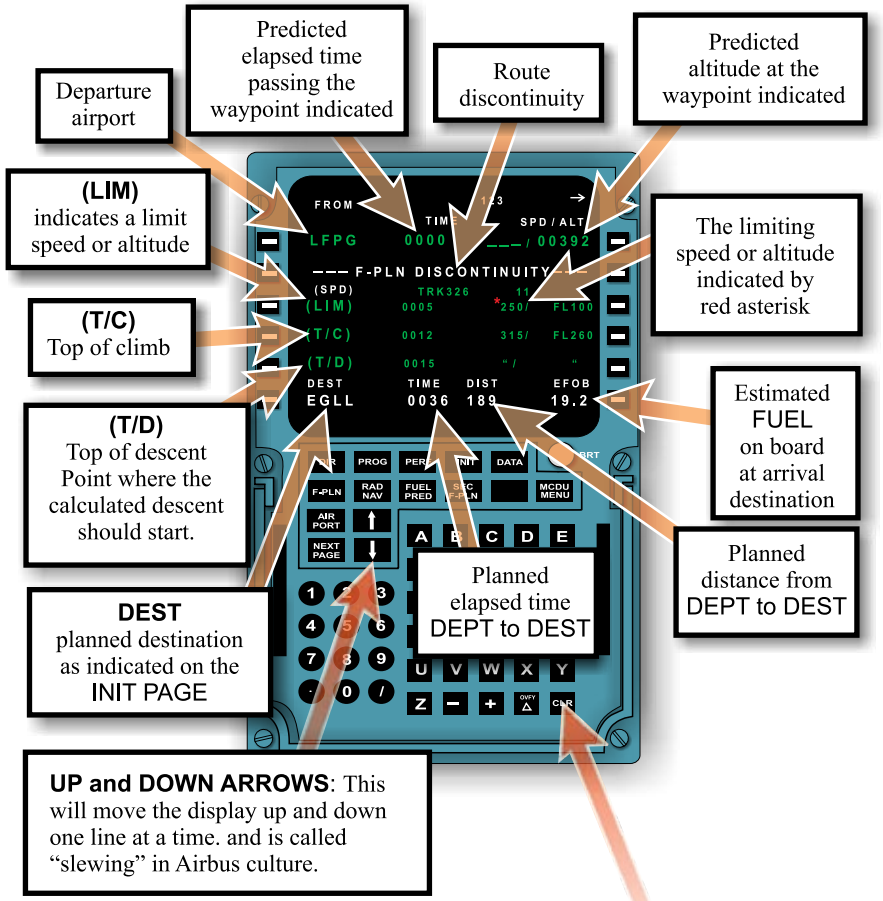
DIFRIP+PS



SELECT F-PLN KEY

This will reveal the FLIGHT PLAN page

When we first select the **F-PLAN** or on some airplanes, the F-PLN key, we will be greeted with this display. Let us take a moment and try and understand what we are looking at and what the dazzling display of entries on this page mean.



UP and DOWN ARROWS: This will move the display up and down one line at a time. and is called "slewing" in Airbus culture.

The CLR key: The **CLR** key will put "CLR" into the scratchpad. Selecting CLR next to a line on the MCDU "erases" that line. For example: We will want to remove the "**F-PLN DISCONTINUITY**" so we would press the CLR key, placing the word "CLR" in the scratchpad. Then if you LS2L, that line would be removed and the discontinuity would disappear from the computed flight plan routing.

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What is a ..

"LATERAL REVISION"

The flight manual simply states "*Perform a lateral revision ...*".
And you would probably be happy to do that if you knew what it was. Well, let me show you how to do a lateral revision.

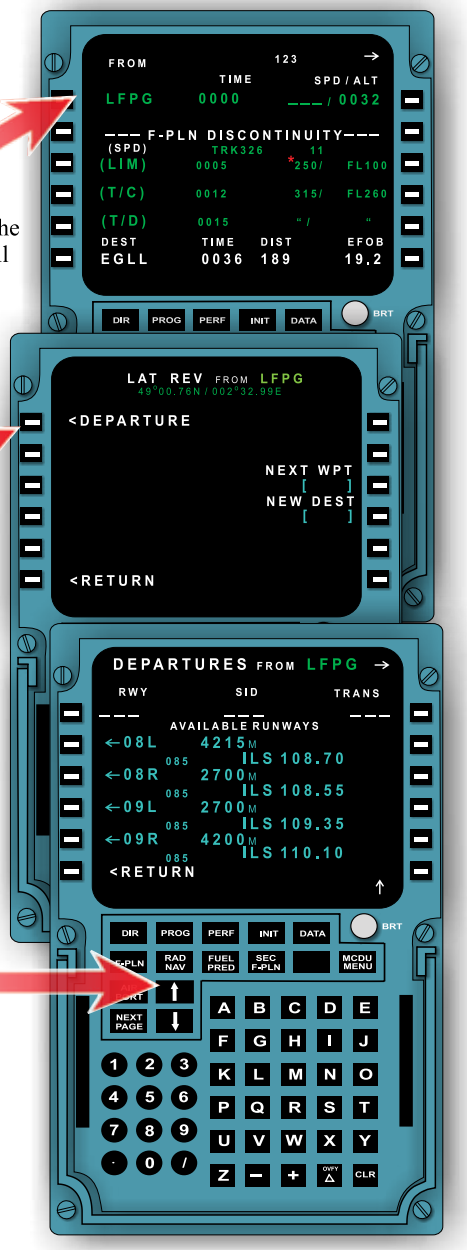
While this may seem to be a fairly exhaustive exercise; it is intended to include detail so as to cover most questions by illustrative example.

STEP 1: LEFT LINE SELECT the appropriate WAYPOINT from which the revision will occur. In our case, we will use the DEPARTURE waypoint.

STEP 2: LINE SELECT the **<DEPARTURES.**
This action will cause the available DEPARTURE RUNWAYS to be displayed.

STEP 3: We can see that the display page for the runway list DOES NOT have displayed the runway we have pre-selected or have been assigned from the ATIS, Runway 27L.
In order to get that runway displayed, we will have to use the scroll function; that is, the ARROW KEYS.

When you do this, notice that the UP key causes the list of choices to scroll UP.



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STEP 4: When your desired runway is displayed, select it.
This will cause the display to change to the SID/TRANS selection page.

Line select the **27L** key.

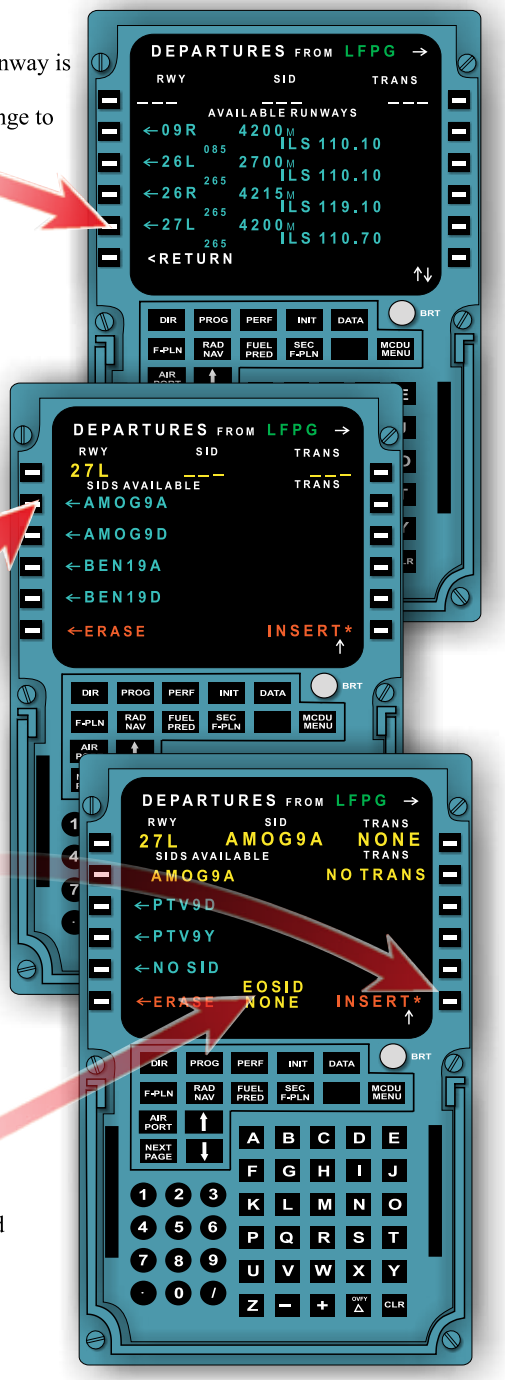
STEP 5: For illustration purposes, let's assume that we are assigned the **AMOG9A SID** (Standard Instrument Departure) by ATC as a part of our clearance.
While it is essential in real life to have a paper copy of the SID for review, in the sim we will find that if the SID is in the database, we can rely on the MCDU to place the waypoint/speed/altitude targets right on the F-PLAN page.

For our example, we will Line select the **AMOG9A** key.

STEP 6: Since there is no TRANS available, we now can insert the selected routing into the flight plan.
If there are changes we wish to make to the routing, we will do that AFTER we have activated the routing

Select the **INSERT** key.

NOTE: EOSID means "ENGINE OUT SID"
... if availble will appear at the end of the SID list.
The EOSID can be accessed by using the slew arrow key.



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LOADING THE ROUTE MANUALLY

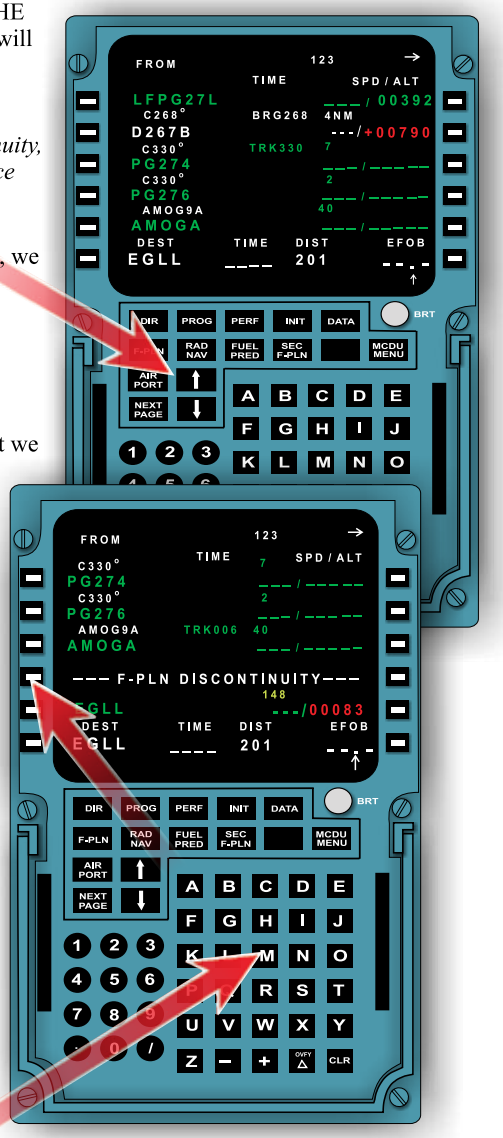
STEP 7: After we have selected and inserted the SID, we can then place the flight plan routing into the MCDU.

Use the arrow key to SCROLL TO THE END OF THE SID ROUTING. This will usually be indicated by an F-PLN DISCONTINUITY.

NOTE: *For now, ignore the discontinuity, we will eliminate it after we have place the complete routing in the MCDU.*

STEP 8: From our flight planning, we have decided to fly the following routing. We obtained it from the MSFX/MSFS flight planner.

LFPG.DPE.UM605.SFD.EGLL



In looking at the planned routing that we have, we can see that the FIRST fix after out departure airport is DPE. Now follow me through on this because there could be a little bit of confusion possible. We have already placed a SID in our routing that wasn't included in this flight plan. This is normal and desirable.

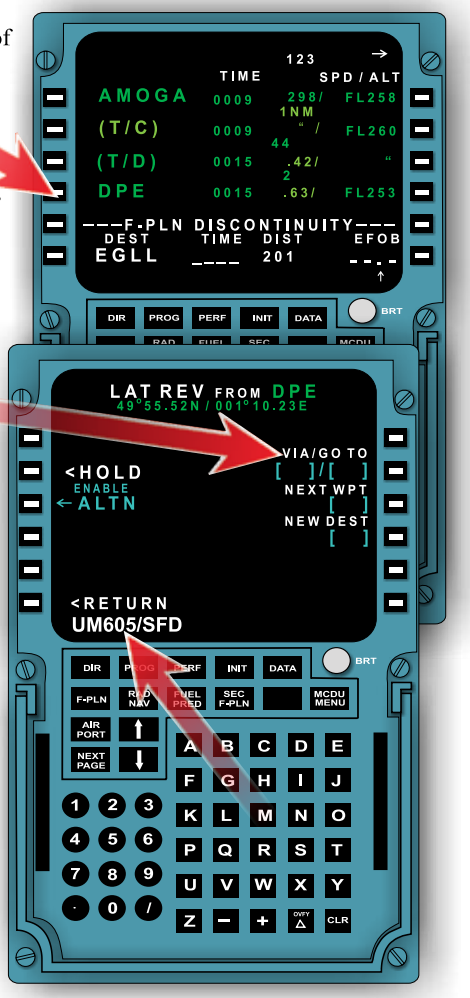
We "**HAVE TO ASSUME**" that the SID routing was automatically placed "**AFTER**" the departure runway by the FMGC and goes "**BEFORE**" the first fix in our flight plan route. Look at how the routing is depicted in the MCDU. In other words, the next fix after AMOGA will be DPE.
If DPE was not part of the departure SID, we can assume that the routing from the last point of the SID will be a direct routing to the first fix of our enroute clearance.
Generally speaking, and there are exceptions, the place where that first route fix goes will be occupied by a F-PLN DISCONTINUITY.

TYPE "**DPE**" into the scratchpad.
Line select the line after **AMOGA**, replacing the DISCONTINUITY with DPE .

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STEP 9: Once we have placed the waypoint into the MCDU, line selecting the waypoint will allow us to perform a LATERAL REVISION.

Select **DPE**, and the menu will appear. This example will be a demonstration of use ot the "**VIA/GO TO**" page.



STEP 10: Since our flight plan shows a routing of DPE.UM605.SFD, we will enter

UM605/SFD

into the scratchpad, and then line select that entry into the **VIA/GO TO** Line (**LS2R**).

DISCUSSION:

Lets look at what we just did. It is called a LATERAL REVISION. It allows us to select from a range of interesting options:

- **HOLD**
- **(enable) ALTERNATE**
- **VIA/GO TO**
- **NEXT WAYPOINT**
- **NEW DESTINATION**

This is the way we can establish a re-route destination, designate a hold, enter a flight plan change, and "enable" an alternate.

Here's a couple of tricks: To hold at present position, perform the lateral revision on the FROM waypoint.

To enter a NEW waypoint, type HELP in the scratchpad and then line select it to the point in the flight plan where you want the new waypoint to be placed. You will then be shown the 4 different formats with which to designate the waypoint.

- **LAT/LONG** (eg; 1234.5N/67890.1W (dot-slash-dot)
- **P/B/D** (place/bearing/distance) eg; ABC/123/45 (slash-slash)
- **P/BP/B** (place-bearing/place-bearing)
  ABC-123/DEF-321 (dash-slash-dash)
- **PD** (Along track waypoint)
  eg; ABCDE/10 or ABCDE/-10 (waypoint/ plus, minus)

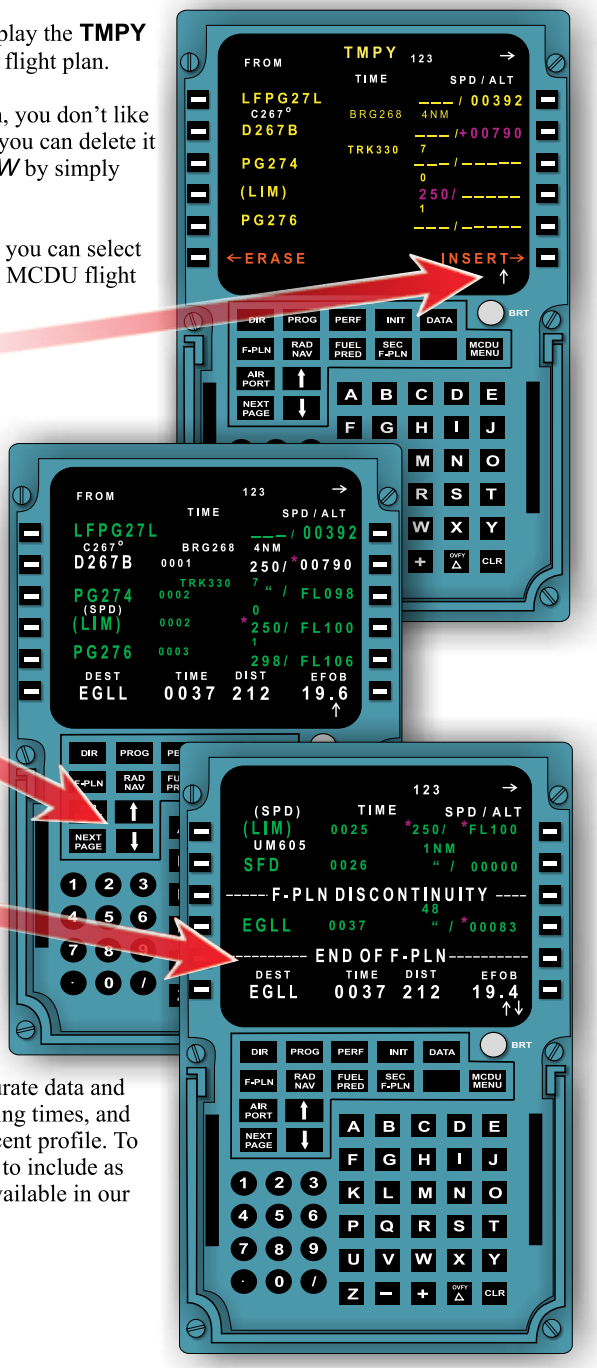
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STEP 11: This will display the **TMPY** (TEMPORARY) selected flight plan.

NOTE: If for some reason, you don't like this displayed flight plan, you can delete it *WHILE IT IS IN YELLOW* by simply pressing the **ERASE** key,

Or (as we are going to do) you can select it and make it a part of the MCDU flight plan display.

Select the **INSERT** key.



STEP 12: Use the UP ARROW to scroll to the bottom of the flight plan display.

If you scroll down far enough, there should be a line "**END OF F-PLAN**" visible on the display. What we want to do is have a completed flight plan on the MCDU (from Departure airport to Destination) so the FMGC can provide us with meaningful and accurate data and projections on fuel, crossing times, and most importantly the descent profile. To accomplish this, we want to include as much information as is available in our initial flight plan.

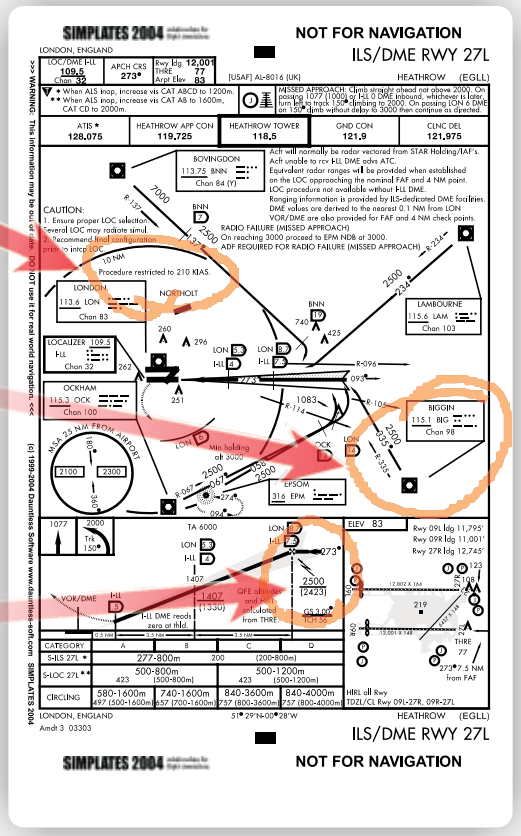
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Let's take a moment an look at an **APPROACH CHART** for the arrival runway. As pilots, we can make a general assessment of the situation and decide what would work for us while continuing to be compliant with the structure of the ATC designated approach requirements.

In our case, we are coming into Heathrow airspace from a South-East direction. The exact information will, of course, be given by ATC or available on the ATIS. Since we are planning a landing on Runway 27L (typical for arrivals into Heathrow) we will likely be using **BIG** (Biggin Hill) for our **IAF** (initial approach fix).

A note on the chart indicates that AIRSPEED is restricted to 210 kts So we should be planning to be ***AT*** 210 kts or less after passing **BIG** inbound.

According the approach chart depicted (may be outdated, but useful for this example), the inbound "FEEDER" route indicates we can descend to no lower than 2500 feet immediately after departing BIG outbound on the 035 radial on BIG.



Since the GSIA (Glide-slope intercept altitude) is 2500 feet MSL (That is designated by the little underlined **2500** at the crotch of the "feather. You CANNOT descend below 2500 feet unless you are receiving the glide-slope signal and descending using that for information. It also represents the beginning of the **FAS** (Final Approach Segment) of the approach.

So ... predicated on this meager information and the lack of any MEA guidance **into BIG, I propose that we plan to go from SFD to** BIG and cross **BIG** at or above 2500 feet msl and **210** kts or less (or "**GREEN DOT**"), departing **BIG** to the runway intercept point on the **BIG 035** radial.

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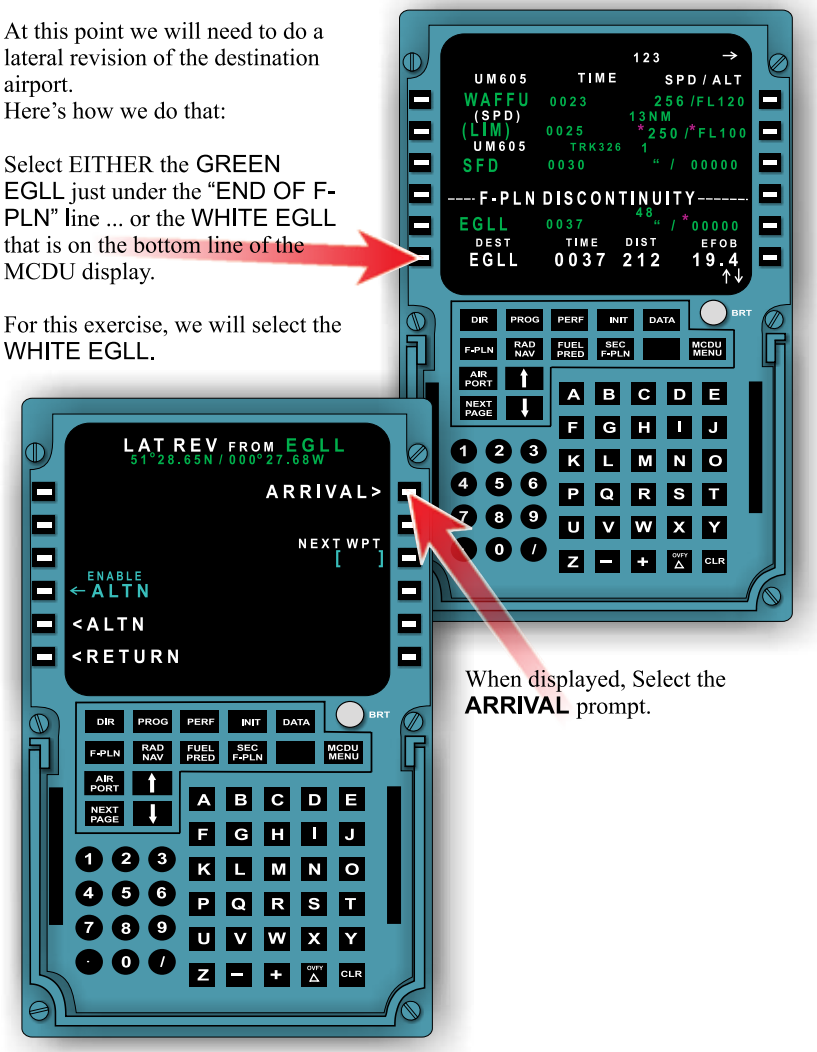
If we do not know what the arrival runway is going to be, or there is simply not enough information available to do a lateral revision, the FMGC will accept the EGLL as a end point for the flight plan and will make its calculations accordingly. Some pilots are wary of selecting an anticipated landing runway because it can cause inaccuracies in the ETA/EFOB indications.

If we do not elect to select a landing runway, we simply must remove the "**F-PLN DISCONTINUITY**" and that would complete the flight plan entry. We would then enter a more complete lateral revision as we were approaching the destination, but for a short flight like we are planning today, we will assume that we are going to be landing on Runway 27L at EGLL and perform a lateral revision reflecting that information during this pre-flight plan..
Here is how we do that.

At this point we will need to do a lateral revision of the destination airport.
Here's how we do that:

Select EITHER the GREEN EGLL just under the "END OF F-PLN" line ... or the WHITE EGLL that is on the bottom line of the MCDU display.

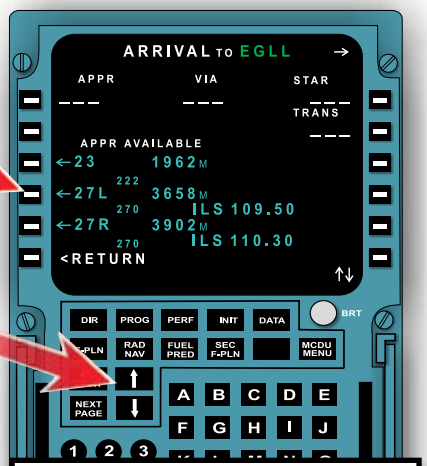
For this exercise, we will select the WHITE EGLL.



When displayed, Select the **ARRIVAL** prompt.

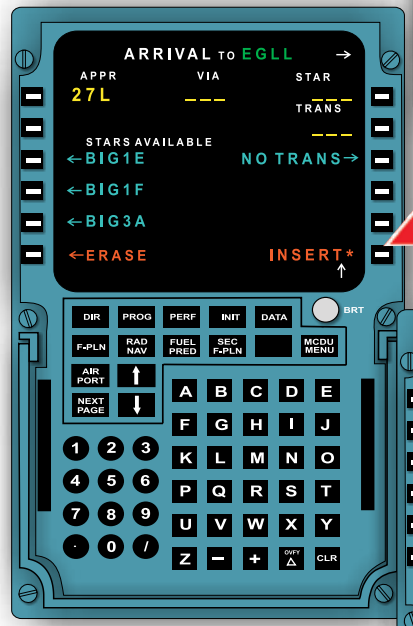
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This page will reveal the available approaches;
Line select runway **27L** when it is revealed.



NOTE: we may have to use the **ARROW KEYS** to scroll the selections until the desired runway (in our case 27L) is revealed.

This will reveal the next page which includes a list of the available **STARs** (STandard Arrivals).



I will tell you ahead of time, that none of the available STAR routings will link up with the last point on our flight path. I am going to suggest that we DO NOT select a STAR but rather:

Select the **INSERT** key.



Remove the **F-PLAN DISCONTINUITY.**

Remember how to do that:
*Select **CLR** to the scratchpad, then Line select the **F-PLN DISCONTINUITY.***

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Since we have decided that we will make **BIG** (Biggin Hill) our IAF (initial approach fix) we need to enter that into our flight plan.

Type **BIG** into the SCRATCHPAD and then

LINE SELECT the line just below **SFD.**

This will cause the MCDU to automatically reveal the

DUPLICATE NAMES page.

I want to spend a few moments in discussing the "duplicate names" page.
The controlling agencies for the world (ICAO to name just one) got together and created a standard for naming places. There are literally hundreds of thousands of these nametags on places all over the world ... and sometimes, in spite of their best efforts, the names are duplicated.
It really wasn't very important when the criteria was developed and names beyond a certain distance from each other were tolerated... but nowdays, we have this fabulous capability that can locate anyplace anywhere on earth.

So, when there is a duplicate name, the FMGC will tell the MCDU to go "ask the pilot."

Generally, the names are easy to differentiate because on a trip of about 200 NM it is doubtful that one of the waypoints would be 3857 NM from the starting point. So we can simply look at the list and see that the second from the top is the one we want because it is 169 NM from the airplanes starting point ...logical.
But, on long trips it may be necessary to use the LAT/LONG solution.



Since we have decided that the second **BIG** on the list is the one we want,

LINE SELECT that choice.

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Once we make the selection of the appropriate "BIG", the MCDU display will place BIG in place of the F-PLN DISCONTINUITY.

Use the ARROW KEYS to slew the display so that the next F-PLN DISCONTINUITY is displayed.

At this point we need to scroll through the flight plan and see if there are any "F-PLN DISCONTINUITY" messages. There are "rare" situation where you might want to keep a DISCONTINUITY in the flight plan routing, but for our tutorial, we will assume that we are going to eliminate ALL the discontinuities, and this is the most common situation you will encounter.

Scroll the complete flight plan entries using the "**UP ARROW**".



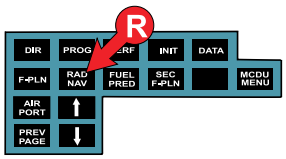
CHECKING THE LOADED PLAN :

The recommended way to determine if there are any improper or undesirable way-points in the routing we have inserted. It is to look at the final total DIST figure and compare it with the PLANNED DIST figure.
Our flight planned figure was 189.8 NM.
Our FMGC calculated distance figure is 219 NM. When we compare the two figures, they are "similar enough" to confirm that the routing is "probably" correctly inserted without a ridiculously improper way-point being used.

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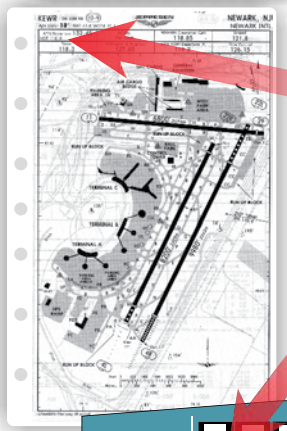
DIFRIP+PS



SELECT RAD NAV KEY

This will reveal the SELECTED NAVAIDS page

WARNING:
If any RMP (Radio Management Panel) is selected to NAV, The fields on this MCDU page will be blank on BOTH MCDU units.

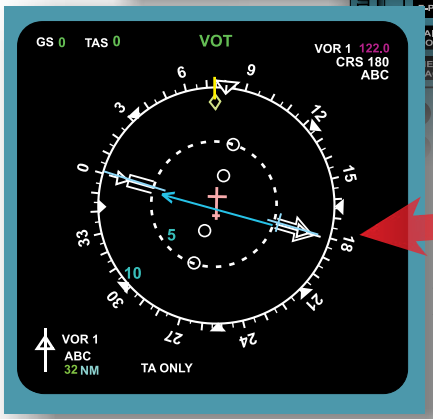


What we will do here is a "VOT" test.

Get the VOT frequency. That is found on the 10-9 page in the top radio frequency banner.

Tune FREQUENCY/HEADING on the RAD NAV page of the MCDU, and
Select VOR ROSE and and VOR switch on the EFIS CONTROL panel..



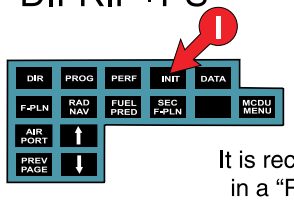


Both VORs must agree within 4 degrees when 180° is selected.

If no VOT is available, tune both VORs to the same VOR frequency. VORs must be within 4 degrees of each other when the CDIs (Course Deviation Indicators) are centered.

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SELECT INIT KEY

We get to the INIT B page by selecting the "NEXT PAGE" on the MCDU keypad.

INIT B page

It is recommended that the best way to fill in this page is in a "REVERSE HORSE-SHOE" direction, starting with the upper right hand entry.

ZFW: Enter the **ZFW** plus the **BLOCK** fuel in the boxes.

NOTE: *Sometimes you may get a* FORMAT ERROR. *If you do, then include a " / " (slash) before the entry.*

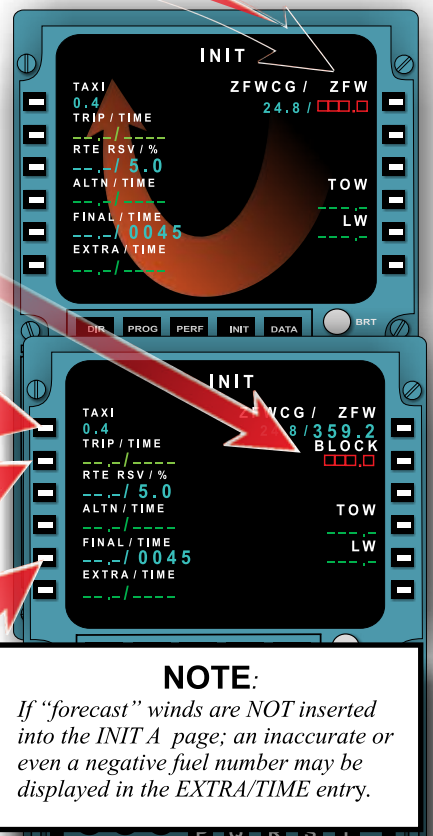
(***DO NOT CHANGE the ZFW CG***) .

Once you **LSK1R** the **ZFW** boxes, the display automatically changes to display boxes labeled "**BLOCK.**" This is a request for the fuel and we find that fuel figure on the upper **ECAM** labeled **FUEL TOTAL.**

TAXI: Defaults to .4 (400 lbs). Use judgement as to requirement. Technique is to push the LSPB (Line Select pushbutton) to make it a "BIG FONT" even if you don't make a change.

RTE RSV (ROUTE RESERVE): Enter the fuel desired remaining at destination if everything went alright ... Is is "recommended" that you use a "0".

FINAL QUANTITY: Leave at zero.
TIME: Check this at **45.** This is consistent with the 45 minute FAR minimums we have entered.



NOTE:

If "forecast" winds are NOT inserted into the INIT A page; an inaccurate or even a negative fuel number may be displayed in the EXTRA/TIME entry.

WHAT CAN THE PILOT SCREW-UP:

*The F-PLAN page should be completed **BEFORE** completing the INIT page B. Leaving the FOB entry blank will avoid the computer having to constantly re-calculate each page entry, which takes extra time and turns the computer into a slug. This could lead to the pilot getting all upset and wondering why the computer is so slow.*
*That's the reason we complete the F-PLAN **BEFORE** the INIT B.*

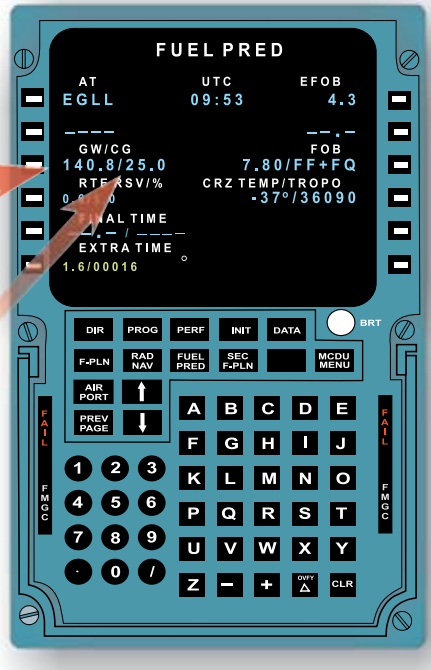
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FUEL PRED page

WHOOPS!! After the second engine has been started, the INIT B page can no longer be referenced and subsequent changes to the flight plan and the weights will be made using the FUEL PRED page.

During taxi-out, you will normally receive changes and updates to the weights and need to place those changes into the MCDU. Use the FUEL PRED page.



Enter the airplane's actual GROSS WEIGHT on the FUEL PRED page by adding the
- **FINAL ZFW** (Zero Fuel Weight) to the
- **ACTUAL FOB** (Fuel On Board).

Always enter the **FINAL CG**.

If the CG is FORWARD of 25% (that is 24.9% or LESS), use the forward CG CHARTS in the TAKEOFF PERFORMANCE section of the pilot's handbook to determine the "**FORWARD CG RUNWAY LIMIT WEIGHT**". It is kinda complicated. If you have a question, contact the dispatcher.

SERMON:

Here is a sermon from experience. If there is some anomaly or any question about the aircraft being "legal" to operate in the runway and weather environment ... coordinate with the tower and get a suitable location and **STOP THE JET AND SET THE PARKING BRAKE**.
I recommend that if both pilots are unable to satisfactorily resolve the situation that you contact the dispatcher and involve her/him and the resources available to them to come up with the solution.

CONTACT THE DISPATCHER

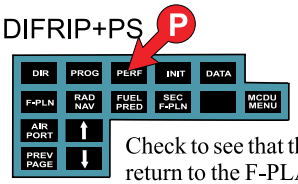
While it is incumbent on the pilots to be conversant with managing the weight and balance, clutter assessment, wind-shear evaluation, and all that esoteric stuff ... there are tremendous resources available for your use. The Check Captain will be observing and evaluating your awareness in utilizing all the information sources necessary. I personally would not be reluctant to involve the dispatcher at the very beginning of a potential problem.

The Dispatchers bear a shared responsibility with the Captain for the safe operation of the flight and are eager and willing to have you communicate your concerns to them. They are your ally and want to be used.

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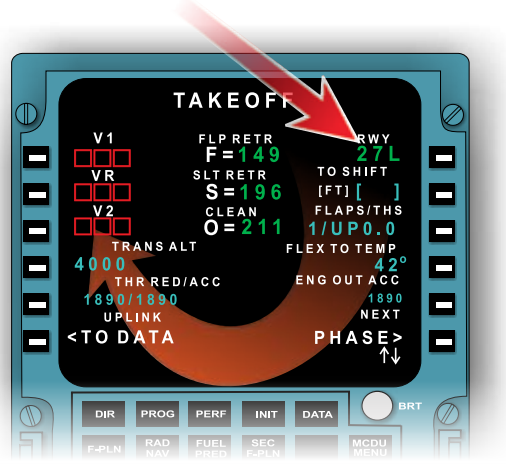
DIFRIP+PS



SELECT PERF KEY

This will reveal the TAKEOFF page there are 4 pages to this entry

Check to see that the proper departure runway is displayed. If it is not, return to the F-PLAN page and do another LATERAL REVERSION on the DEPT airport and insert the proper runway.



COMMENT: *If there is a runway change during the pre-takeoff phase, you would "update" the FMGC using the F-PLAN page.*

- T/O SHIFT: If required because runway length limited. Be sure you use ***UNUSABLE DISTANCE, NOT RUNWAY REMAINING***!

- FLAPS: This entry "has no effect on FMGC computations" and is for display only.

- FLEX TO TEMP (°C): Flex take-off temperature is REQUIRED only if a reduced thrust takeoff is planned.
(**NOTE**: *Flex temperature MUST be greater than than OAT*).

- ENG OUT ACC (*Engine out acceleration altitude*). Normally 500 feet above the runway elevation (AFE) or if special runway procedure, use that altitude. This entry is for information only. It does not affect the FMGC.

- THR RED/ACC (*Thrust reduction / acceleration altitude*).

ACCEL ALT IS THE "PHASE TRIGGER" FOR THE CLIMB MODE.
These are important numbers because at ACCEL ALT the airspeed indicator will slew to the climb speed, and the Flight Director will pitch radically to accommodate that change. I STRONGLY suggest that you DO NOT try to chase the flight director until AFTER passing ACCEL ALT.

- TRANS ALT (*transition altitude. 18000 feet in US, but is indicated on appropriate ICAO departure and airport charts*). This is the altitude which causes the QNH to flash yellow to remind the pilot to re-select the barometric pressure.



POTENTIAL PILOT SCREW-UP:
When planning a reduced thrust takeoff using engine anti-ice,
SUBTRACT 5°C from the FLEX temperature
BEFORE entering it into the FMGC.
This ensures that the FADEC calculates the correct reduced EPR.
THEN *to calculate the adjusted V speeds*
USE THE UNADJUSTED FLEX TEMPERATURE
(the temp before the 5 degree correction).

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PERF page continued

Place the calculated V speeds or those provided by the flight planning documents using the scratchpad technique in the appropriate boxes.

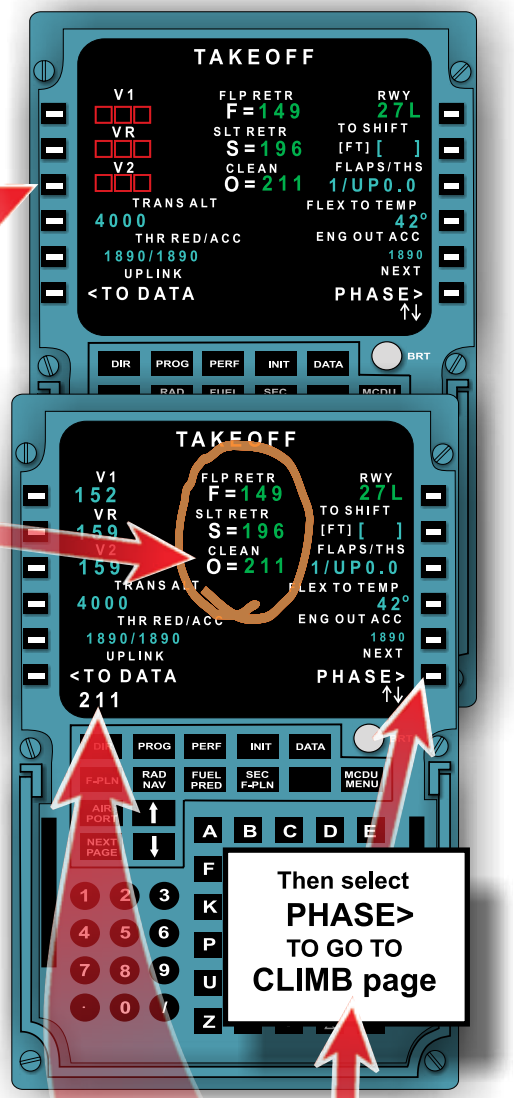
It is worth noting that placing an entry into the V2 box is what **ARMS the SRS**.

Discussion about the three values: **F**, **S**, and **O**.

These are Minimum airspeed limits.
"**F**" is FLAP RETRACT speed,
"**S**" is SLAT RETRACT speed,
"**0**" is ZERO FLAP speed.

These speeds will be indicated on the speed tape on the PFD.

NOTE: *In the US, the MAXIMUM speed allowed in the "Class B" airspace is 200 kts; which means we will not be able to maintain the 200 knot speed "limit" after take-off without using some flap until outside of the "B" class boundary. In ICAO places, the maximum airspeed in the airport area is usually listed on the approach plate.*
WHOOPS! *Most jets cannot fly that slow without some flaps ... so regulations were altered to allow jets to use their "0" flap speed as the exemption airspeed. For us, that is the* ***"GREEN DOT"*** *airspeed.*



GOOD PILOT TECHNIQUE:
Type the "**O**" flap speed into the scratchpad. This represents the "GREEN DOT" airspeed that is the ATC mandated airspeed for operating in the "B" CLASS airspace.
We're gonna enter it on the CLIMB page.

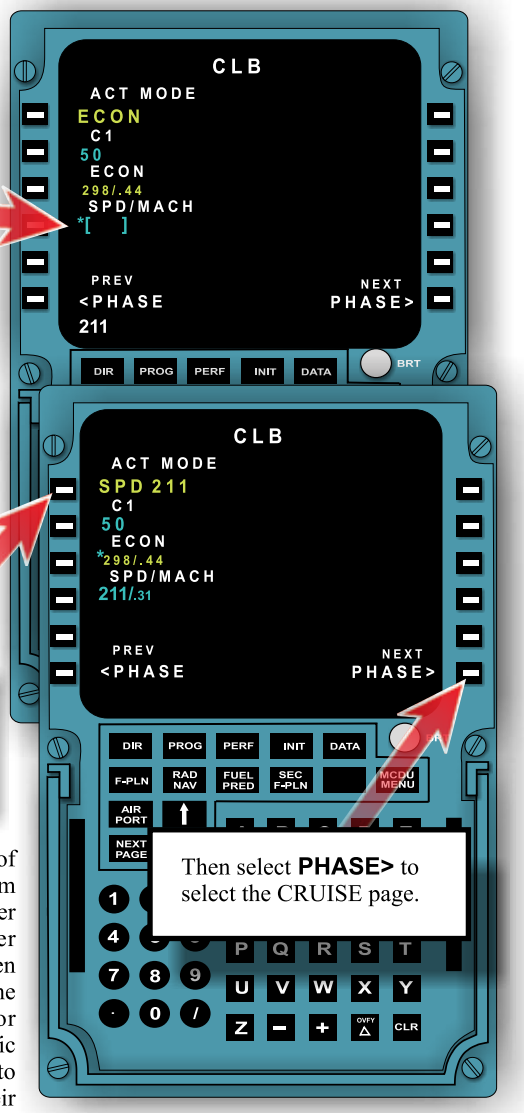
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PROGRAMMING THE CLIMB PAGE

ENTER or **MODIFY** the following entries:

- SPD / MACH: Enter the GREEN DOT speed as the initial climb speed.

Let's go over this step with a little more clarity. The FMGC (and therefore the airplane) is pre-programmed to fly at 250 kts when below 10,000 feet MSL. And during the CLIMB PHASE when the airplane climbs to an altitude higher than 10,000 feet MSL, it will slew the airspeed to the figure displayed in the ECON line.
However, If we want the airplane to start the climb at a different airspeed, we would enter that in the brackets on the PERF/CLIMB page of the MCDU;



then, once in CLIMB PHASE, the jet will automatically select that "bracket" airspeed as the default airspeed target.

Then select **PHASE>** to select the CRUISE page.

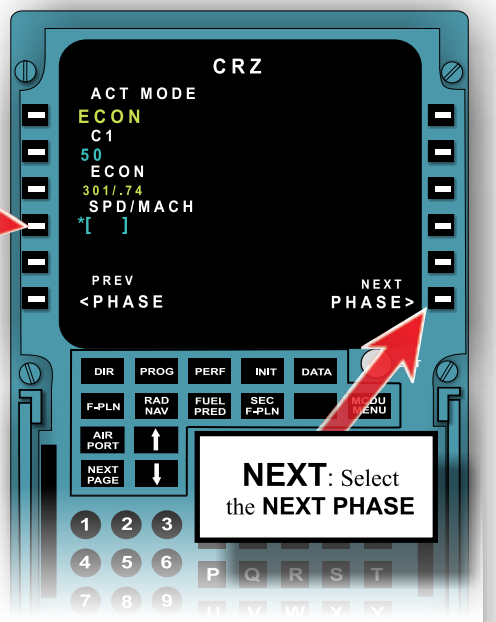
When operating within about 10 nm of a major airport, we are restricted from exceeding 200 knots in US (note: other international airports have other restrictions, usually 210 kts) when flying in Class "B" airspace (That is the restricted airspace around major airports in the US). ATC (Air Traffic Control regulations) allows airliners to exceed that speed and use instead their "0" flap or "clean maneuvering speed" as their limitation. On Airbus airplanes, that figure is called the "GREEN DOT" airspeed.

Once the airplane is outside the "B" Class airspace and cleared to resume normal airspeed (some airlines use 3000 feet) all the pilot has to do is PUSH the SPD selector on the FCU panel and the airspeed selector indicator of the PFD will slew to the appropriate pre-selected enroute climb airspeed.

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PROGRAMMING THE CRUISE PAGE



- SPD / MACH: Enter the desired airspeed if different from the "ECON" airspeed.

DISCUSSION:

We have told the airplane that we want it to cruise at a fixed airspeed or one that reflects the restrictions imposed by the COST INDEX we have assigned. Remember that a different CRUISE airspeed CANNOT be entered once we are airborne and the CRZ is the active phase. If other airspeed restrictions are imposed by ATC or navigational requirements, the pilot may either:

1. Change the **CI** (Cost Index) ... Setting the cost index to a "high" value will cause the airplane to "speed up." in fact, it can increase airspeed all the way to the bottom of the "red bricks" (Vmo or maximum allowed airspeed); but the auto-flight system will NOT allow the airplane to exceed that maximum. This is useful in an abnormality or emergency where maximum airspeed is required or desired.

> If a very high CI (say 200) is selected; the airplane will fly at the maximum allowable airspeed.

2. If a specific airspeed is desired (before the jet enters the cruise phase), enter that figure in the "[brackets]" on the cruise page.
3. Leaving the entry blank will result in the airplane flying ECON airspeed. If the flight plan requests a varying speed (.776 then .786), leave the entry blank.

4. There is always the manual (selected) option: If you get a specific request from ATC after you are in CRUISE phrase, PULL the airspeed selector on the FCU and set the requested mach number.

WARNING:

Using the EXPED selector commands the following airspeed:
DESCENT: managed **.80/340 KIAS** (Knots indicated airspeed).
CLIMB: managed "**GREEN DOT**".



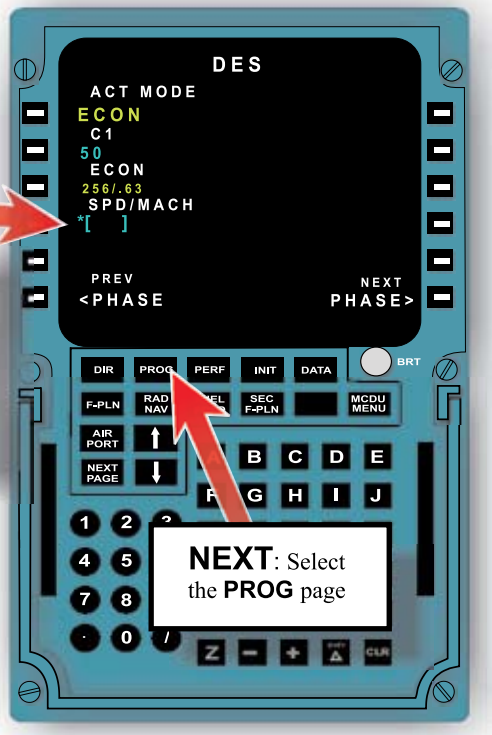
DO NOT use EXPED CLB above FL 250
because the MACH corresponding to green dot is
TOO LOW. YIPE!!!!

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PROGRAMMING THE DESCENT PAGE

ENTER or **MODIFY** the following entries:

- SPD / MACH: Enter the desired airspeed if different from the "ECON" airspeed.



DISCUSSION:
Once the airplane leaves the CRUISE altitude as set in the PROG page CRZ entry, the DESCENT PHASE is triggered and *descent DATA cannot be changed*.

If you wished to make a change in the descent parameters, you could switch to the 'Selected" (manual) mode, but here is a work-around for continuing "managed" mode operation.

If you wish to change the MCDU descent speed after you have initiated the descent (departed cruise altitude); do this;

1. Enter a new "lower" CRZ altitude on the PROG page. This will force the FMGC back into the cruise phase until it crosses this " new" altitude.
2. During this time, you may make the changes desired to the DESCENT page.

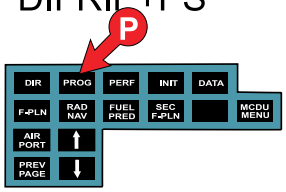
BE AWARE:
If you should start a descent PRIOR to reaching your cruise altitude; during that period of time when you are descending in "cruise phase" or operating in "selected" (manual) mode, the FMGC no longer obeys the restrictions and crossing constraints set in the F-PLAN page of the FMGC; but rather simply descends at a fixed rate of descent.

MORE COMPLICATING DISCUSSION:

Another point to make regarding ***ANY*** descent and climb operations: A managed descent (or climb) is *NOT* available if you are operating the airplane in the **HEADING** mode. You must be in **NAV** to use managed climb/desent.

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SELECT PROG KEY

This will reveal the TO (take0ff) page



- COMPARE:
Look at the values for:
- CRUISE ALTITUDE and
- OPTIMUM ALTITUDE and
- MAXIMUM ALTITUDES.

The planned cruise altitude should be lower than the REC MAX (recommended maximum) altitude and will usually be equal to or lower than the OPT (optimum) altitude.

WHAT PILOTS SCREW UP:

They try to fly an airplane at an altitude for which it is too heavy or "outside the V_n Envelope". This can result in some interesting situations; such as wing buffet and high speed stall. The **REC MAX** altitude should be taken into consideration when making an altitude selection .

another boring DISCUSSION:

The place where a pilot can get in trouble is trying to reach a cruise altitude for which the airplane is too heavy to fly. Sometimes during long flights, ATC will give you the alternative to either descend to a lower altitude (cost more fuel) or to climb to an altitude above your recommended maximum. It is a judgement call, but I would be very wary of trying to fly the jet above the maximum recommended altitude.

ENGINE FAILURE at ALTITUDE:

To further extend on this argument, if you should LOSE an engine while at or near the **REC MAX**, it should be of primary concern to get to a lower altitude ASAP. Trying to keep the jet at an altitude that it cannot maintain is the root cause of some "UPSET" situations.

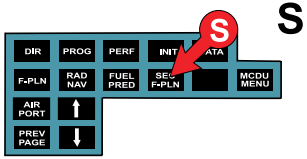
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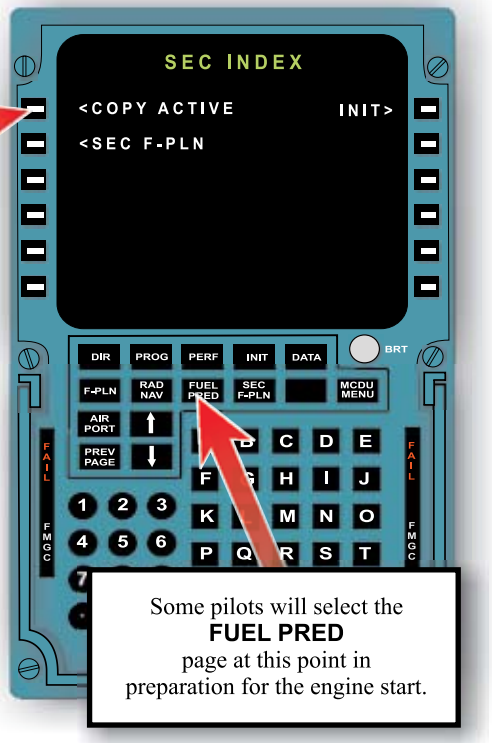
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SELECT SEC F-PLN KEY

This will reveal the SEC INDEX page





<COPY ACTIVE: Push the COPY ACTIVE prompt (LS1L).

Why would we want to make a "copy" of the flight plan. The flight manual suggests that it is because we might want to do a "what if" scenario. Here is my take on the subject, we do a copy of the F-PLAN because we might screw up the original F-PLAN and be stuck trying to re-construct the whole thing because the FMGC dumped all the data. I have found that when operating the MCDU, sometimes it enters my data and dumps a lot of other interim fixes and stuff without me intending that to happen. This is especially important when using the DIR function. When you drop the waypoint in the box ... everything between here and there is now history.

YIPE!!!

GOOD PILOT TECHNIQUE:

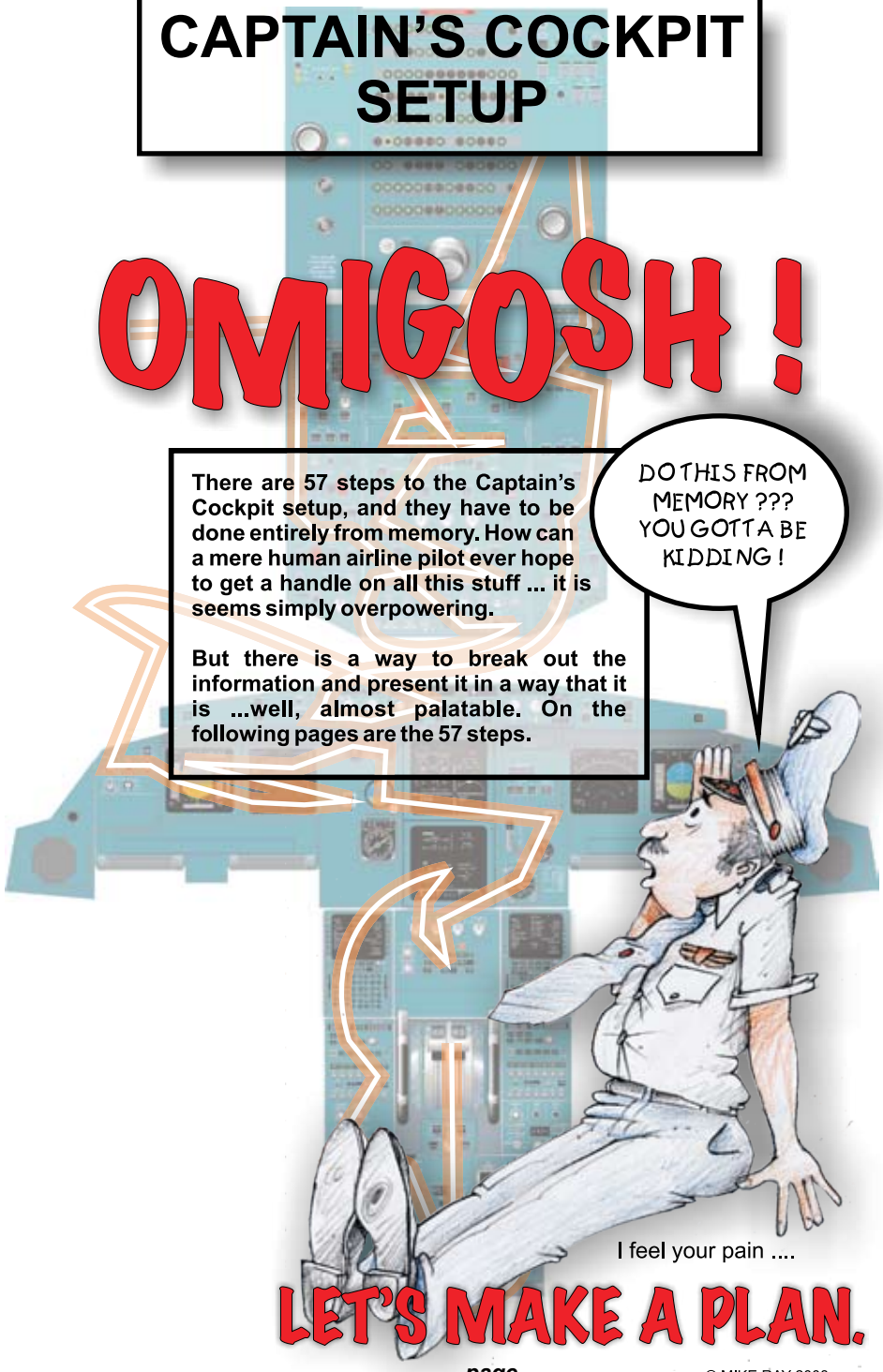
When the second engine has been started, it is no longer possible to access the **INIT B** page to install changes in fuel and take-off gross weight. This chore switches to the **FUEL PRED** page and it is useful, I think, to leave the **MCDU** on the **FUEL PRED** page at this time to facilitate making those last minute changes from the load planner.

This is the end of the FLOW:

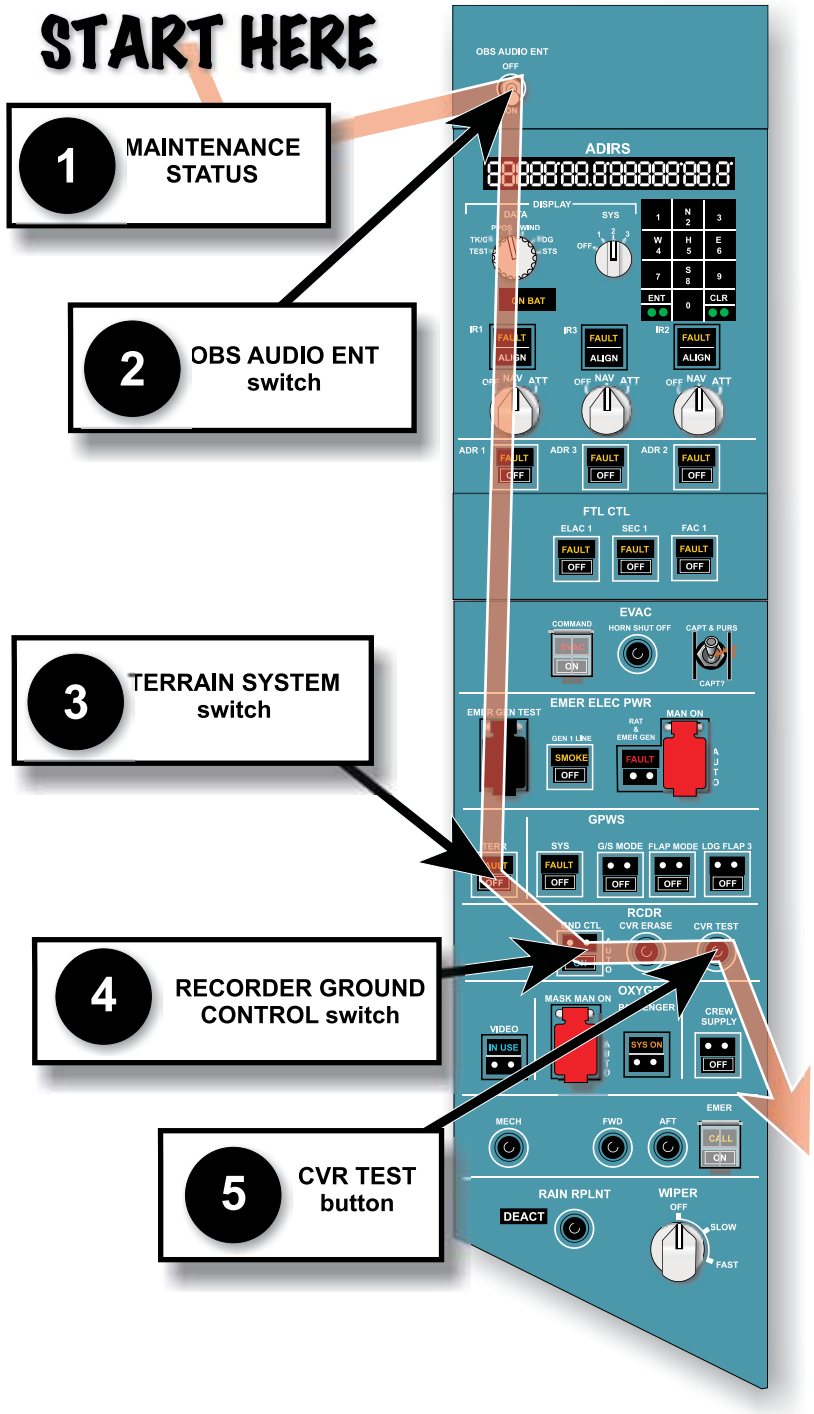
ACARS and FMGC INITIALIZATION
and
VERIFICATION

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CAPTAIN'S COCKPIT SETUP



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1 MAINTENANCE STATUS ..... CONFIRM

The ***CAPTAIN*** ***MUST*** do these things.
This status check ***CANNOT*** be delegated!

1. *Confirm the correct Maintenance Documents are on board and reviewed in accordance with directives and Federal mandates.*

2. *Develop a thorough understanding of the maintenance status of the airplane.*

3. *Understand the potential effects of any DF or CF items will have on the operation of the airplane.*

4. *Ensure that the crew is briefed.*

2 OBS AUDIO ENT switch ..... ON

The Observer Audio Entertainment switch will enable the passengers to monitor the cockpit communications. It is usually company policy to have this switch ON.

It is my understanding that if any negative result occurs as a result of passengers interpreting the information they may hear will NOT result in punitive action to the flight crew..

3 TERRAIN SYSTEM switch ..... verify ON

When **ON** is selected, this activates ALL modes of the **EGPWS** terrain modes including POP-UP.

4 RECORDER GROUND CONTROL switch .. ON

This switch is turned **ON** in order to comply with FAA requirement to record the reading of the Checklists.

The reason is that the CVR automatically turns off 5 minutes after turn on, so in order to keep the CVR running, it is necessary to manually turn it on to keep it running..

5 CVR TEST button ..... PUSH and HOLD

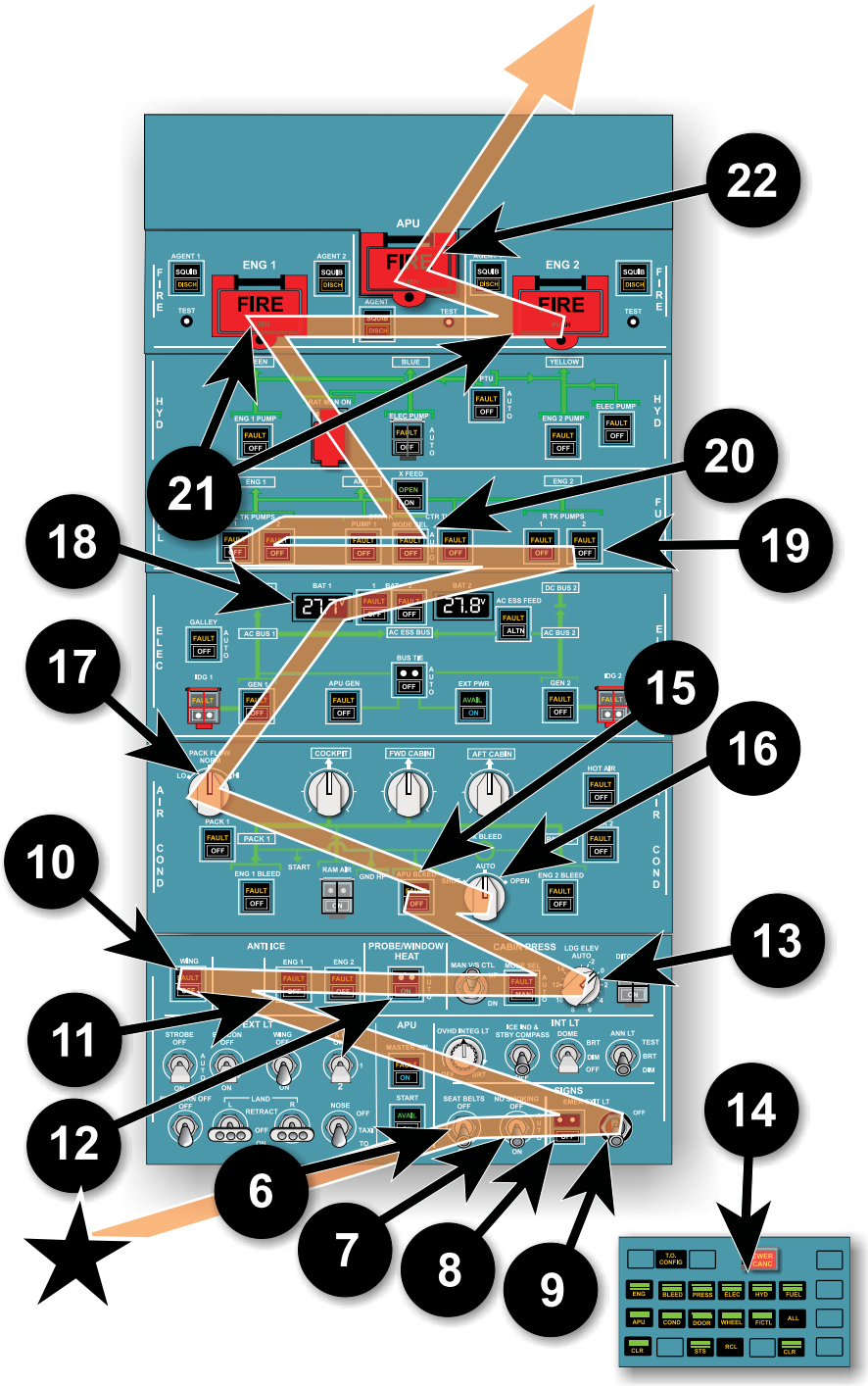
The TEST PROCEDURE IS:

1. Place the RCDR GND CTL switch ON.
2. PUSH and HOLD the CVR TEST button
3. LOW FREQUENCY SIGNAL sounds over the loudspeakers.

NOTE: Loudspeakers DO NOT have to be turned ON to hear this signal.
NOTE 2: The PARKING BRAKE must be ON.

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6 **SEAT BELT SWITCH ..... OFF**

OFF is selected for the period during boarding so as to avoid ambiguity being associated with the activation of the message.

7 **NO SMOKING SIGN selector ..... ON**

Most airline do not allow smoking and leave the sign on for the duration of the flight. In some instances, such as a charter to Havana for the Cigar smokers international convention, it may be allowed if company directives dictate.

8 **EMERGENCY EXIT LIGHT selector ..... ARM**

This arms the EMERGENCY LIGHTING system, which includes the escape path lighting, overhead emergency lights, and the EXIT signs.

9 **ANNUNCIATOR LIGHT selector ..... TEST**

1. Place the ANN LT selector to TEST.
2. Visually verify ALL cockpit lights illuminate.

NOTE: Include CKPT DOOR CONT lights on the AFT OVERHEAD panel.

3. Confirm that all Liquid Crystal displays (LCD) displays 8s.

10 **WING ANTI-ICE switch ..... OFF**

11 **ENGINE ANTI-ICE switch ..... OFF**

12 **PROBE/WINDOW HEAT switch ..... AUTO**

13 **CABIN PRESSURE LANDING ELEVATOR selector ..... AUTO**

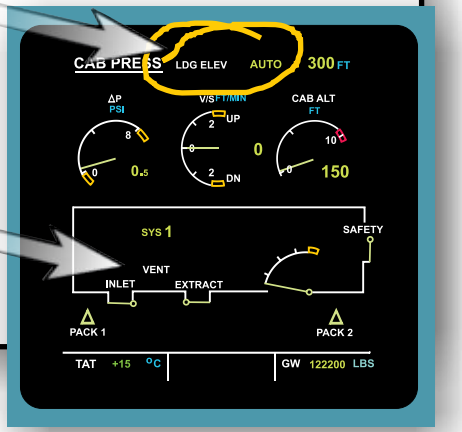
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14 ECAM PRESS page ..... CHECK

VERIFY LDG ELEV AUTO is displayed.

NOTE: *Destination field elevation MAY NOT be correctly displayed until after takeoff is started.*
NOTE 2: ***VENT INLET*** *and* ***EXTRACT VALVE*** *may appear amber but there actually be NO malfunction. This might occur when the temperature is close to the preset valve opening or closing threshold; BUT if there is any question, notify maintenance.*



15 APU BLEED switch .... AS REQUIRED

NOTE: If DITCHING switch is closed, do not OPEN the APU BLEED switch.

NOTE 2: If external conditioned ground air is connected (and potable water pressure is desired), turn BOTH pack switches OFF before turning the APU BLEED switch ON.

16 CROSSBLEED selector ..... AUTO

17 PACK FLOW selector ..... AS REQUIRED

LO ..... If less than 115 passengers expected.
HI ..... If Hot or Humid.
NORM ..... All other conditions..

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18 BATTERY CHARGE CURRENT ..... CHECK

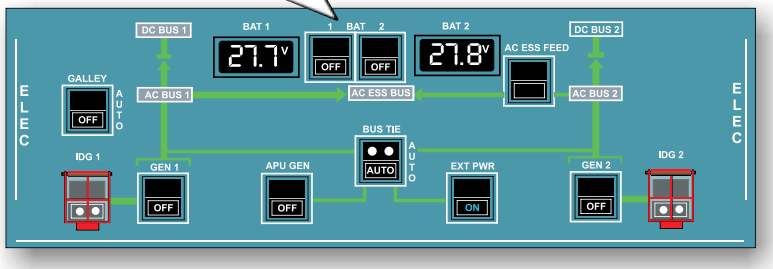


HOW TO DO "THE CHECK"

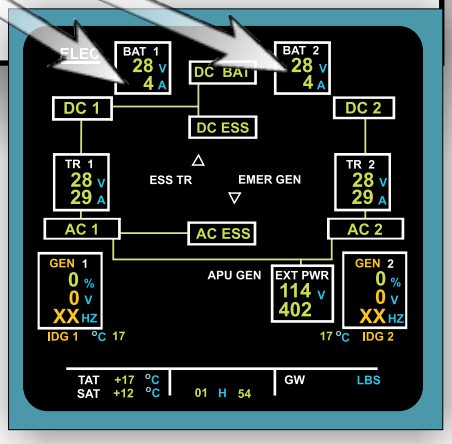
1. *Select the **ECAM ELEC** page.*

2. *Select **BAT 1** and **BAT 2** switches to **OFF**.*

3. *Select **BAT 1** and **BAT 2** switches back to **AUTO**.*



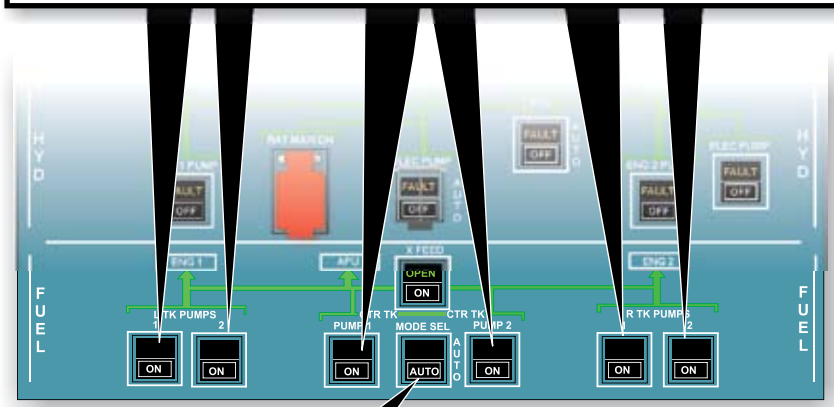
4. *After 10 seconds, the battery charging current*
MUST BE BELOW 60 AMPS and DECREASING.
If not, contact maintenance



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19 FUEL PUMP SWITCHES ..... ON

There are 6 pump switches to turn on.



20 FUEL MODE SELECTOR ..... AUTO

This will ARM the center tank pumps for automatic operation in the following conditions.

***NOTE 1**: If there is fuel in the CENTER TANK, the center tank pumps will run EXCEPT when the SLATS are extended.*
***NOTE 2**: The pumps turn OFF 5 minutes after center tank low level is reached.*
***NOTE 3**: Even with the slats extended, the pumps will run for 2 minutes after EACH engine reaches idle.*

WHAT PILOTS CAN SCREW UP

They could leave this switch in **MANUAL**.
Manual mode will allow manual control of the **CENTER TANK PUMPS** using the **CTR TK PUMP** switches; but more importantly, it will de-select the **AUTO** mode..

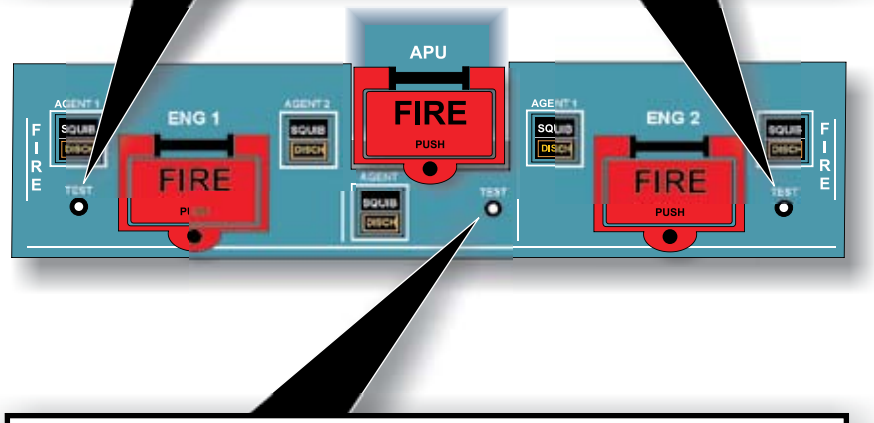
If this switch is inadvertently left in MANUAL, none of the automatic features will operate.
This is NOT a good thing.

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21 **ENGINE 1 and ENGINE 2**
FIRE TEST SWITCHES ..... PUSH

OBSERVE:

- Associated Engine **FIRE** switch illuminates
- **SQUIB** light illuminates
- **DISCH** light illuminates
- **MASTER WARN** lights FLASH
- **CRC** (continuous repetitive chime) sounds
- ECAM **ENG FIRE** warning activates
- Engine **FIRE** light illuminates on the control pedestal



22 **APU FIRE TEST SWITCH ..... PUSH**

OBSERVE:

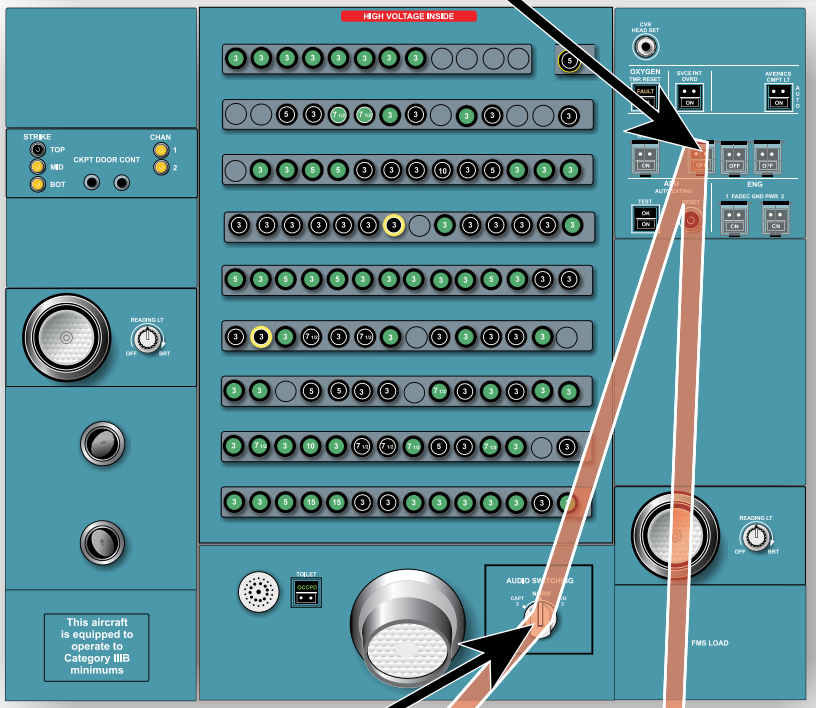
- APU **FIRE** switch illuminates
- **SQUIB** light illuminates
- **DISCH** light illuminates
- **MASTER WARN** lights FLASH
- **CRC** (continuous repetitive chime) sounds
- ECAM **APU FIRE** warning activates

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24 **OVERHEAD MAINTENANCE PANEL ..... CHECK**

All you are to do is to check and see if there are any lights visible. If there are any lights on, contact maintenance.

NOTE: This panel is for Maintenance use ONLY!



23 **AUDIO SWITCHING SELECTOR ..... NORMAL**

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25 OBSERVERS AUDIO CONTROL panel ..... SET

1. Ensure the VHF 1 reception knob is released OUT
2. VOLUME is set to MID-LEVEL
3. ALL other reception knobs are OFF

26 OBSERVERS RMP ..... SET

Ensure that the RMP is ON and
The SEL light in NOT illuminated.

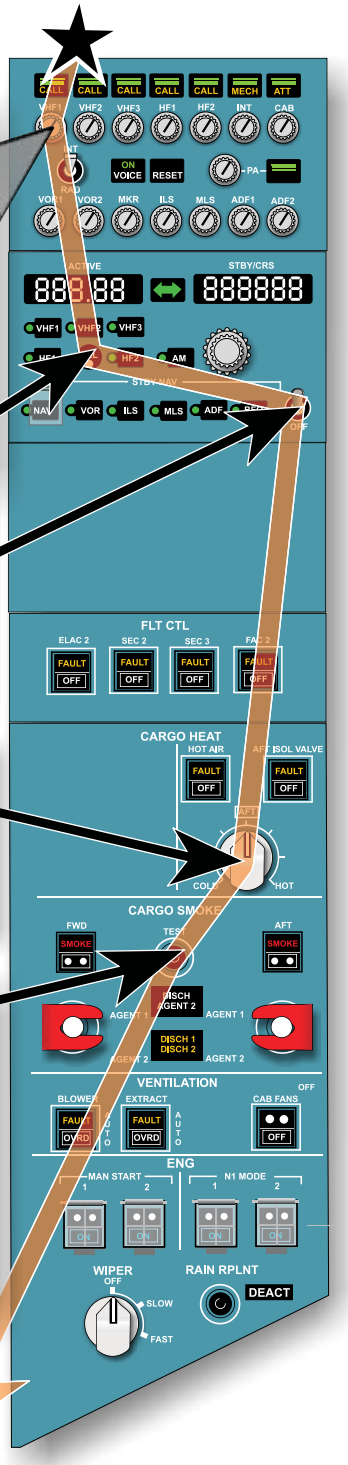
27 AFT CARGO HEAT ..... MID RANGE

This switch on the **A320** *ONLY.*

28 CARGO SMOKE test button .....

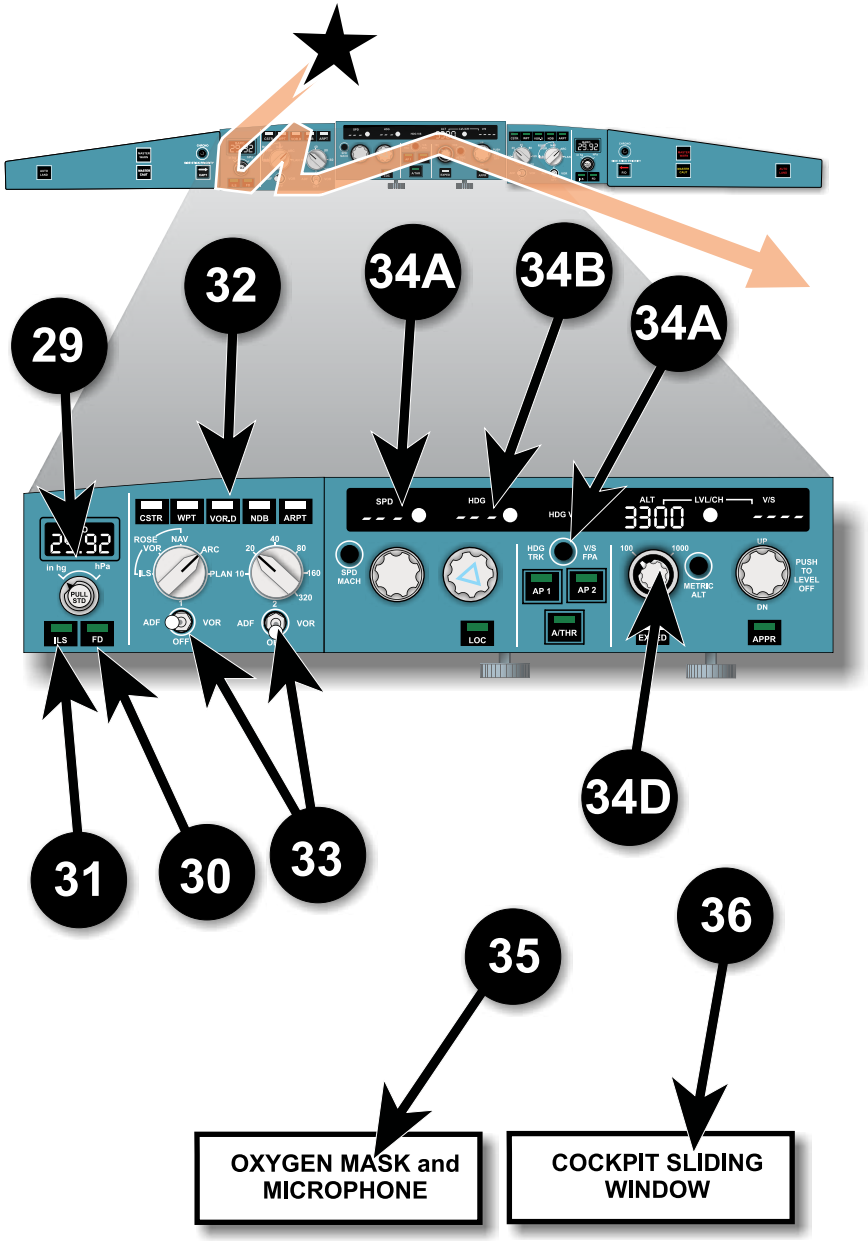
PUSH and HOLD 3 seconds

OBSERVE:
-SMOKE lights illuminate TWICE with associated ECAM
-DISCH lights illuminate



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29 **BAROMETRIC REFERENCE ..... SET**

Obtain the current barometric setting.

*1. This will require the use of a RADIO, or the CDU/ACARS/Printer to obtain the **ATIS**. or*

2. Call ATC for the current field barometric altimeter setting.

When the barometric setting is dialed into the unit, not only is it displayed on the instrument, but is also repeated on the lower right corner of the PFD.

30 **FLIGHT DIRECTOR BUTTON ..... ON**

MUST BE ARMED in order to engage certain important AUTO-PILOT modes! This ARMS the climb and nav modes.

31 **ILS/LS BUTTON ..... AS REQUIRED**

This is not normally required nor desired to be displayed on the PFD or the ND during departure.
If, however, the ILS localizer or the ILS DME is required to comply with departure procedures, then this switch must be selected in order to be displayed.

32 **EFIS CONTROL PANEL ..... SET as required**

Personal preference is allowed, of course; BUT here are some recommendations:
- ARC for straight out departures
- ROSE NAV if turns back over the field are anticipated
- I personally prefer 40 nm range, but 10 or 20 is OK.

33 **VOR/ADF SELECTORS ..... AS REQUIRED**

The VOR and/or ADF is not normally required nor desired to be displayed on the PFD or the ND during departure.
If, however, the VOR and/or the ADF is required to comply with departure procedures, then this switch must be selected in order to be displayed.

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STOP !!

We cannot continue without having the FMGC initialization complete.

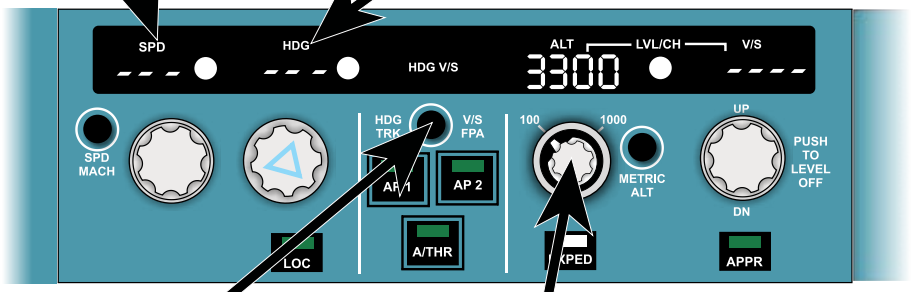
The FMGC cannot be operated until the ADIRS (Inertial reference system) has been initialized; and that takes about 10 minutes from the time it was turned to "NAV."
We can tell the unit is ready for use when the PFD and ND displays are operating.

WE CANNOT CONTINUE UNTIL FMGC IS INITIALIZED

34 **FCU (Flight Control Unit) ..... CHECK**

34A The SPEED/MACH indicator may be indicating some speed such as "100". **PUSH** the selector and Verify that the window is displaying "**DASHES**."

34B Verify that the HEADING/TRACK window is displaying "**DASHES**."

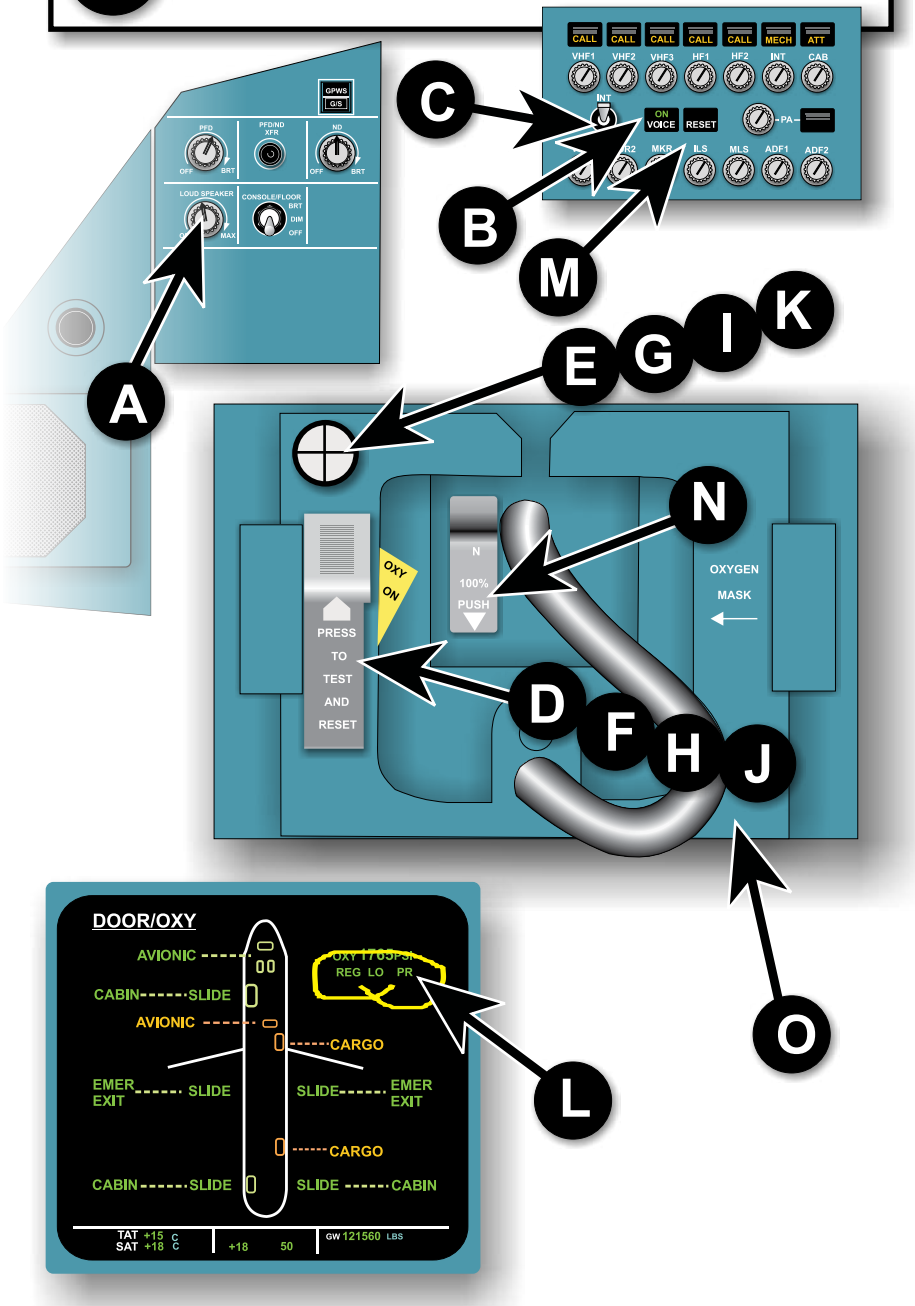


34C HDG-V/S / TRK FPA button:
Select HDG-V/S

34D Set INITIAL ALTITUDE or Expected ALTITUDE.
Pushing or pulling the selector has no effect.

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35 OXYGEN MASK and MICROPHONE ..... TEST



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OXYGEN MASK and MICROPHONE ..... TEST

This is an "every flight" item; however, this test is NOT required on subsequent flights IF the pilot stays on the same jet.

WARNING

*The test is performed **WITHOUT** removing the mask from the enclosure. If you insist on removing the mask, get ready for a protracted effort similar to that of attempting to stuff a 100 pound anaconda into a Cracker Jack box.*

BEWARE:

Before you begin the test,
MAKE SURE the other guys INT reception knob is *OFF!*
... or run the risk of blowing his brains out.



DO THESE STEPS:

A LOUDSPEAKER ..... ON

B INT reception knob ..... ON

C INT/RAD switch selected to ..... INT

D Press-to-test and reset
SLIDE LEVER ..... PUSH and ***HOLD***

Accomplish the following three items while holding the SLIDE LEVER.

E FLOW SELECTOR ..... OBSERVE

It should turn YELLOW momentarily, and then turns BLACK. This indicates the regulator is leak tight.

F REGULATOR EMERGENCY/
Press-to-test ..... PRESS and RELEASE

G LOOK and LISTEN

Verify the sound of oxygen flow across the mask microphone and FLOW INDICATOR turns YELLOW.

H Press-to-test and reset
SLIDE LEVER ..... RELEASE

I Verify the FLOW INDICATOR is BLACK and all oxygen flow ceases.

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J **REGULATOR EMERGENCY/**
Press-to-test ..... PRESS and RELEASE

K **VERIFY ...**the FLOW indicator stays BLACK,
indicating NO OXYGEN flow,

L **upper ECAM DOOR page ..... CHECK**

Verify the REGUL LO PR message is NOT displayed. This check should be made AFTER all masks have been checked to ensure the LOW PRESSURE valve is OPEN.

NOTE:

Residual pressure in the line between the low pressure valve and the masks may be sufficient to accomplish a mask test with the valve closed.

M **AUDIO CONTROL PANEL ..... RESET**

The idea is to restore the audio panel to its original set-up.

RETURN INT/RAD switch to NEUTRAL, and
RETURN other pilot's INT RECEPTION knob to its original position.

OXYGEN MASK ..... SET

N **N/100% LEVER ..... VERIFY 100%**

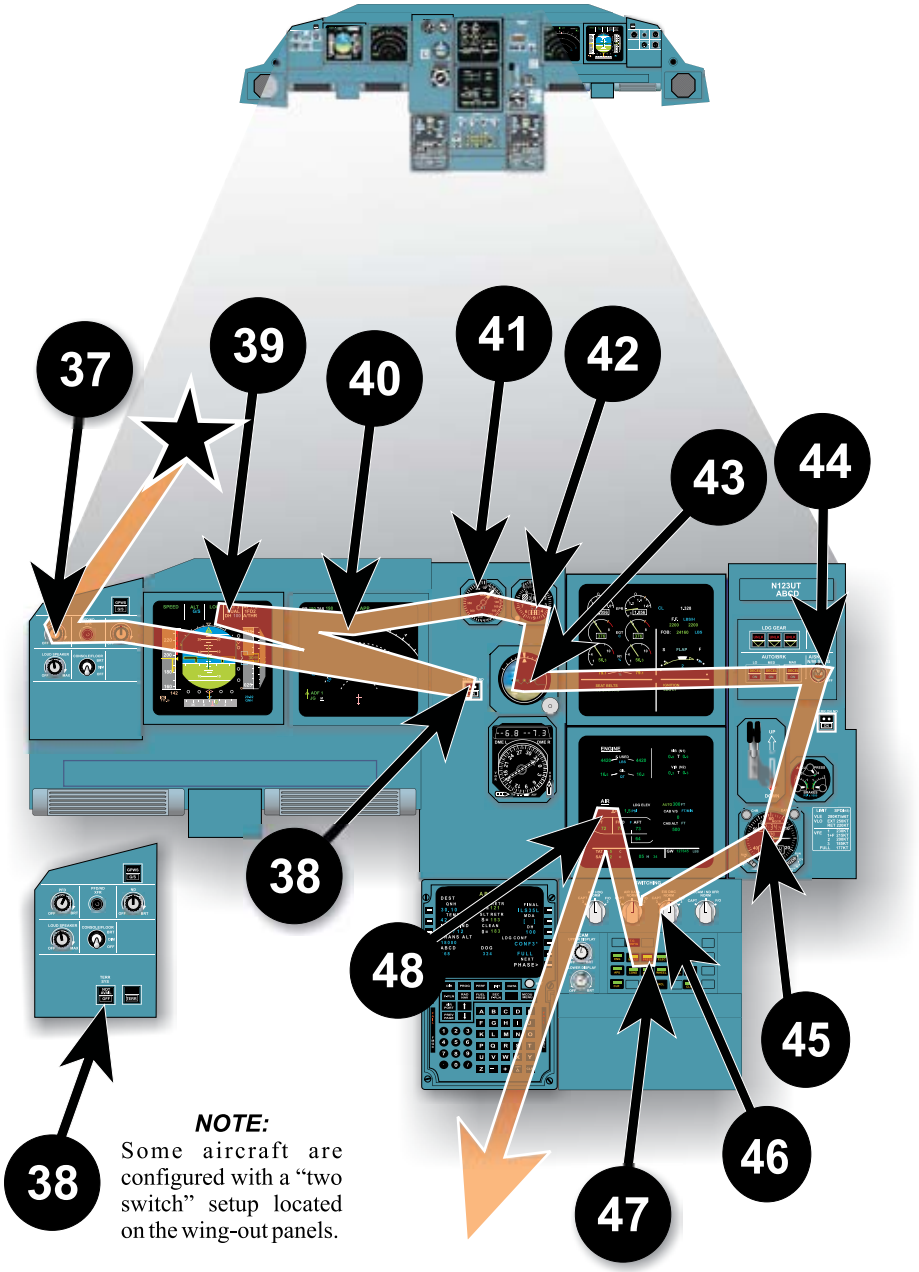
O **ENCLOSURE DOORS ..... VERIFY CLOSED**

36 **SLIDING WINDOW ..... CLOSE and LOCK**

Check that the RED UNLOCKING button is fully popped out and the window does not open.

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NOTE:
Some aircraft are configured with a "two switch" setup located on the wing-out panels.

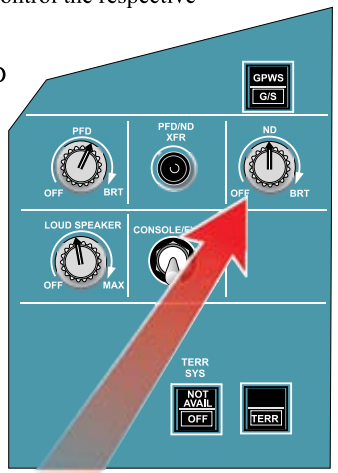
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37 *PFD and ND brightness ..... As required*

Ensure EGPWS and RADAR DISPLAYS visible

The two brightness control knobs manually control the respective illumination level.

IF a PFD FAILS or is shut OFF, then the PFD display will shift automatically to the respective ND. When this happens, you can display the PFD or the ND on the "other" LCD screen using the PFD/ND XFR switch.



NOTE: *Once the PFD/ND XFR switch is depressed, the brightness controls shift. That is, the PFD controls the ND, and the ND controls the PFD display brightness.*

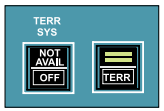
The ND selector has an OUTER SELECTOR that controls the brightness of the weather **RADAR** and the **EGPWS** image only.

NOTE: *The outer selector of the ND brightness selector MUST BE ON and BRIGHT to ensure the EGPWS pop-up feature is visible in the event of a windshear.*

38 EGPWS TERRAIN SYSTEM SWITCH (TERR or TERR ON ND) (*if installed*) ..... verify ON

BIG AREA OF CONFUSION!

★ There are at least two DIFFERENT locations for the **EGPWS TERR ON SWITCH** and the switch functions slightly different for each configuration. Also, the switch has at least two different names.



UA configuration

NOTE: *In the **UA configuration**, Turning on the Radar automatically de-selects the terrain display. The switch must then be MANUALLY re-selected to display terrain. In the **Airbus configuration**, **EGPWS** must be MANUALLY de-selected in order to display the **RADAR**.*



AIRBUS type A

PILOT SCREW UP**: If the radar won't display on the ND, assumes that it is inoperative. Simply de-select the **TERR** or **TERR ON ND** switch with the radar set turned on ... and **VOILA!



AIRBUS type B

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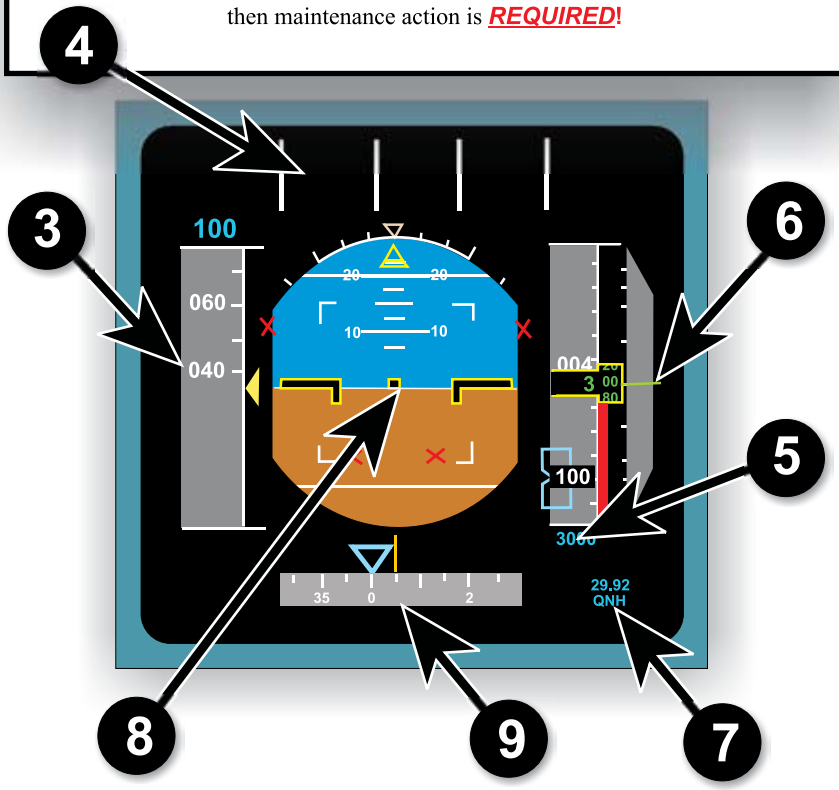
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39 PFD ..... CHECK

1. Verify PFD displayed on the appropriate CRT
2. No flags displayed
3. Verify IAS correct
4. Verify FMA correct
5. Verify INITIAL TARGET ALTITUDE
6. Verify VSI correct
7. Verify Altimeter setting correct
8. Verify Attitude is correct
9. Verify HEADING agrees with ND, DDRMI, and STBY COMPASS.

NOTE:

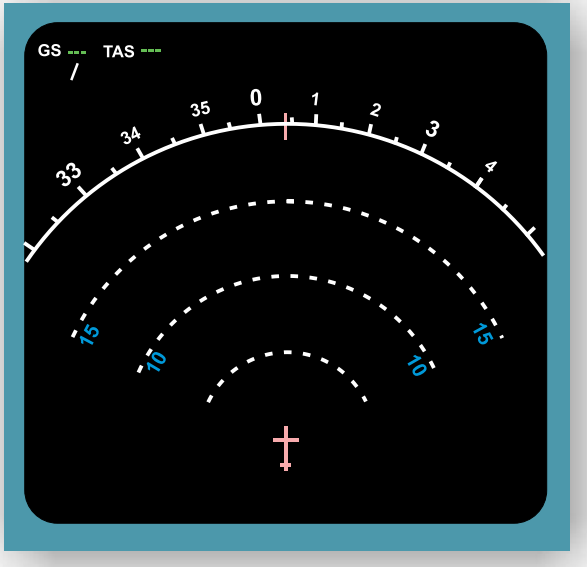
The altimeters should read
ELEVATION PLUS 10 FEET AGL.
This is difficult, because we seldom know the exact elevation of the airplanes position UNLESS at the runway end where it is noted on the approach plate runway diagram.
If the altimeters do not read with
WITHIN +/- 25 FEET OF ELEVATION
and agree with each other
WITHIN 20 FEET
then maintenance action is ***REQUIRED***!



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40 **ND ..... CHECK**

1. Verify PFD displayed on the appropriate CRT
2. No flags displayed

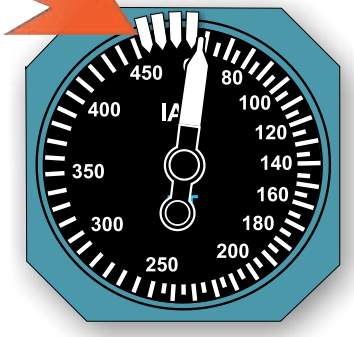


41 **STBY AIRSPEED INDICATOR ..... CHECK**

If the indication is not less than 60 knots; notify maintenance.

4 plastic carets (bugs) should remain grouped together at the top of the instrument.

IF ANY BUGS ARE MISSING A DEFERRAL IS REQUIRED.



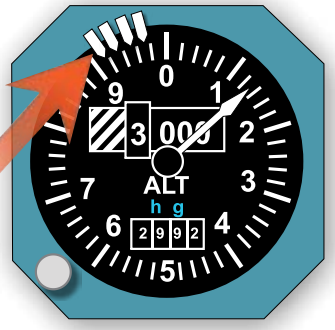
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42 STANDBY ALTIMETER ..... CHECK

The STANDBY ALTIMETER should read
WITHIN +/- 300 FEET of ACTUAL ELEVATION.
If the unit is outside of the tolerance,
CONTACT MAINTENANCE.

DISCUSSION:

This has always been an area of ambiguity, since the only place where the pilot can be absolutely certain of the altitude is taxiing over the take-off threshold. That altitude is printed on the approach plate. Other references to the airport altitude are specifically located at airport geographical center, tower, etc. Some airports, however, actually paint the altitude in the ramp area. A call to the Tower can usually get the ramp altitude.



4 plastic carets (bugs) should remain grouped together at the top of the instrument.

NOTE

IF ANY BUGS ARE MISSING A DEFERRAL IS REQUIRED.

HAPPY NOTE:
The ALTIMETER VIBRATOR is inoperative on the ground

43 STBY ATITUDE INDICATOR ..... CHECK

The INDICATION should be
- **ERECT** (indicating level flight)
- **NO FLAG**



If the standby attitude indication is cocked or not level,
PULL THE CAGING KNOB OUT
until the indicator becomes level. It is not unusual to see this "spun down" condition on airplanes that have been sitting without power for awhile.

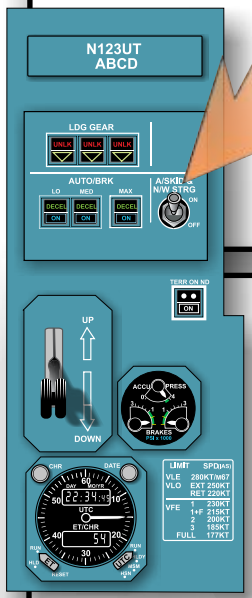
If, after "caging" the unit, the instrument will not maintain a "level indication," suspect that the dedicated instrument rechargeable battery is faulty or depleted.
CALL MAINTENANCE.

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44 ANTI-SKID and NOSE WHEEL STEERING switch ..... ON

Anti-skid is automatically de-selected when the airplane speed is below 20 kts, even with the switch ON.



The NOSE WHEEL STEERING is ELECTRICALLY controlled and HYDRAULICALLY operated. There is NO hydraulic pressure to the nosewheel steering until:

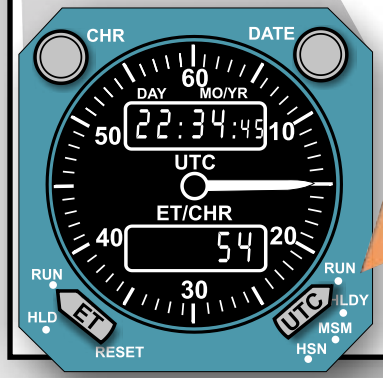
- ***NOSE GEAR DOORS are CLOSED***
- ***A/SKID & N/W STRG switch ON***
- ***TOWING CONTROL LEVER NORMAL***
- ***At least ONE ENGINE RUNNING***
- ***MAIN LANDING GEAR compressed.***

45 CLOCK ..... CHECK/SET

NOTE: *There are two types of clocks: a GOOD one and a BAD one. The good one is digital and requires no attention. The bad one (displayed here) is difficult for a pilot to understand.*
Verify that the time and date agrees with UTC time and date. The only readily available source we have for the UTC time is the HF radio. ***WHOOOPS!***

WARNING:
DO NOT OPERATE THE HF RADIOS during fueling operations.

A little personal warning here ... this sucker is DIFFICULT to understand ...and I absolutely GUARANTEE that if you start fiddling with the switches you are going to get it all screwed up and waste a lot of valuable time trying to get the thing to run properly.
The crux of the problem is the UTC selector. To help you out, here are the definitions for the dual function switch settings:



HSD = Hours/days
MSM = Minutes/Months
HLDY = Hold/Year
RUN = Begins normal operation

The DATE button selects between the available dual function settings. Selecting the switch will cause the clock to advance one unit per second.
Go ahead, I dare you to try and set it.

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46 **SWITCHING PANEL selectors ..... NORMAL**



47 **ECAM warning/caution messages ..... RECALL**

PUSH THE RCL (recall) KEY FOR ABOUT 5 SECONDS. This will cause messages that have been cleared by the CLR key or cancelled by the EMER CANC key to re-appear.
If no messages, **NORMAL** appears on the ***UPPER*** ECAM memo.

48 **ECAM STATUS PAGE .....CHECK**

PUSH THE STS KEY. If there are NO status messages, NORMAL is displayed for 5 seconds on the UPPER ECAM memo.

AFTER IRSs ARE ALIGNED

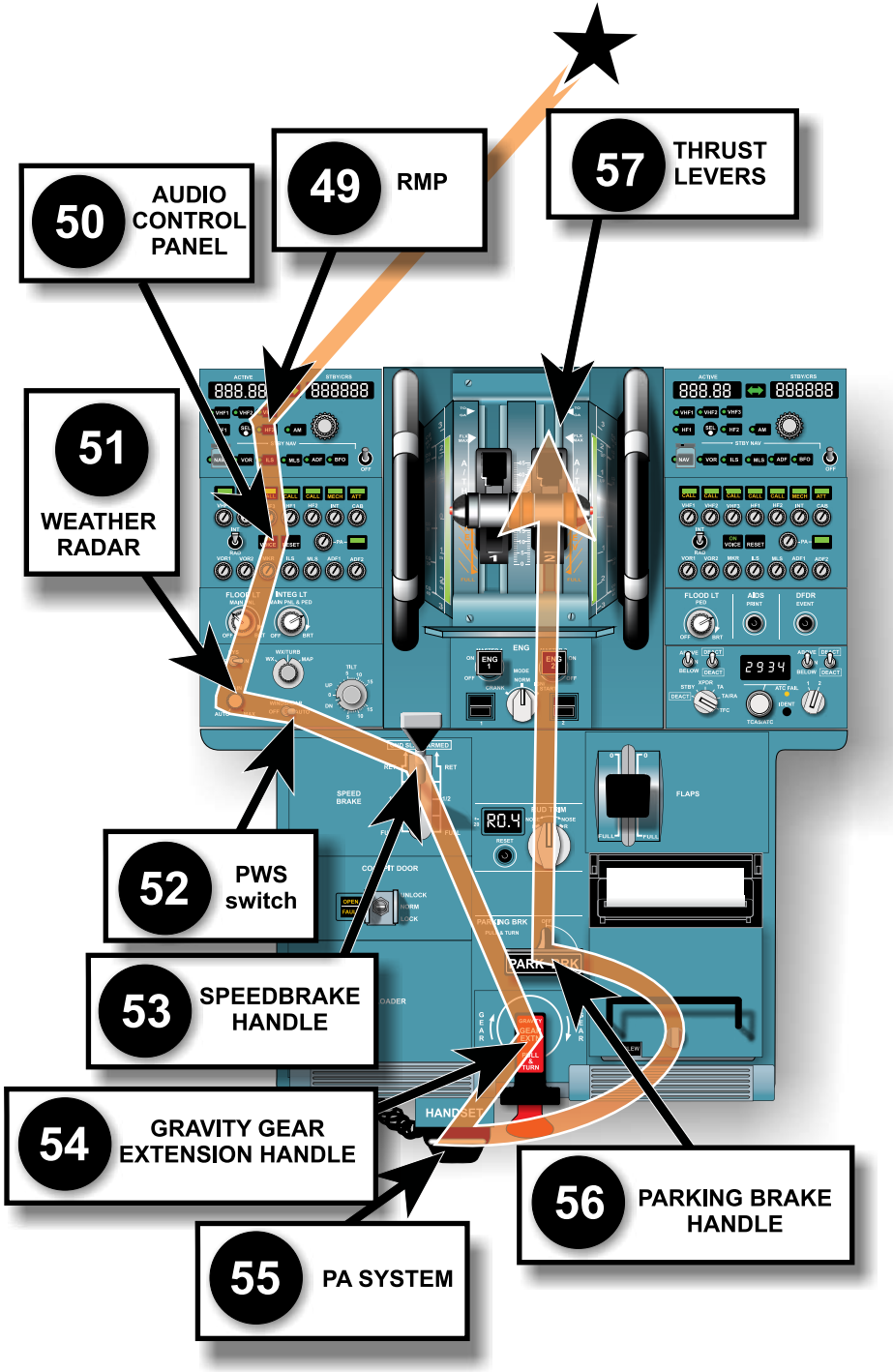
If there are status messages:
- Determine if they affect dispatch
- Determine if they require maintenance action
- Verify if FAULT or MAINT messages are OK with MRD.
- Verify if any FAULT or MAINT messages that MUST be cleared or deferred.

NOTE:
MAINT (ClassII) messages are NOT FLIGHT CRITICAL; however, the MUST BE cleared or deferred prior to dispatch.

FYI: *The display of MAINT messages is inhibited after engine start.*

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49 RMP (Radio Management Panel) ..... SET

1. Verify RMP selector switch is ON.
2. GREEN NAV light should be OFF

In general, VHF 1 is used for ATC, VHF 2 is used for Company, ATIS, and other communications. VHF 3 is reserved for ACARS/ATSU.

WARNING
DO NOT OPERATE HF RADIOS during fueling operations.

FURTHER WARNING:
Ensure that personnel stay a minimum of 6 feet away from the vertical stabilizer antenna while the HF system is being tested.



50 ACP (Audio Control Panel) ....As Required

There are a couple of items to be aware of.
To ***AVOID HOT MIKE*** on frequency .... deselect the VHF 1 whenever you are not monitoring it or have left your seat.

Another point, if you are not going to have your headset on, it might be useful to monitor the Flight Attendant switch (ATT button).

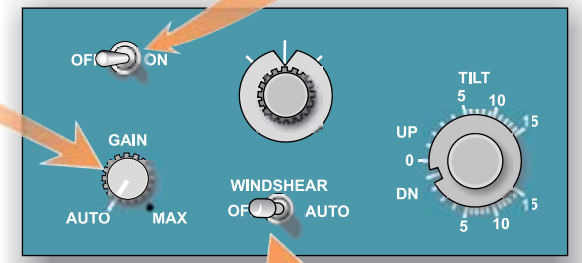


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51 WEATHER RADAR ..... OFF

Verify that the POWER SWITCH is in the OFF position.

Verify that the GAIN selector is in the AUTO position.



Just a note in passing. There are TWO different cockpit layouts I know of that have different techniques for viewing the radar/EGPWS on the **ND**:

The Airbus configuration requires that you "de-select" the **EGPWS** to view the radar return. You do this by depressing the **TERR** or **TERR ON ND** switch located on the forward instrument panel. There is a separate selector for each pilot.

The "OTHER" configuration is a "two switch" set-up (Installed on UA airplanes) that automatically de-selects the **EGPWS** display when you select the radar **ON**. There is also a separate selector for each pilot.

On both systems, even with the radar or **EGPWS** displays deselected, if you should encounter an **EGPWS** warning, the **EGPWS** display will automatically display on the **ND**.

*Now, here is a problem ... you MUST HAVE the intensity of the display set high enough for it to be viewed ... and the **EPGWS** intensity selector is on the "wing-out" panel on the outer ring of the **ND** brightness selector.*

52 PWS (Predictive Wind Shear) ..... OFF

WARNING
The WEATHER RADAR and the PWS (predictive Wind Shear) MUST BE OFF !!!
There exists a radiation hazard to ground personnel and First Officers doing their walk-around.

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RADAR ops

This *WILL NOT* be a definitive guide to operating the **WEATHER RADAR**. Learning to operate the **WX RADAR** is a continually developing art-form, and learned best by actually operating the set over a long period of time. What we will present here are just some of the pilot information necessary to "get you started."

RULE NUMBER ONE:
AVOID SEVERE WEATHER.

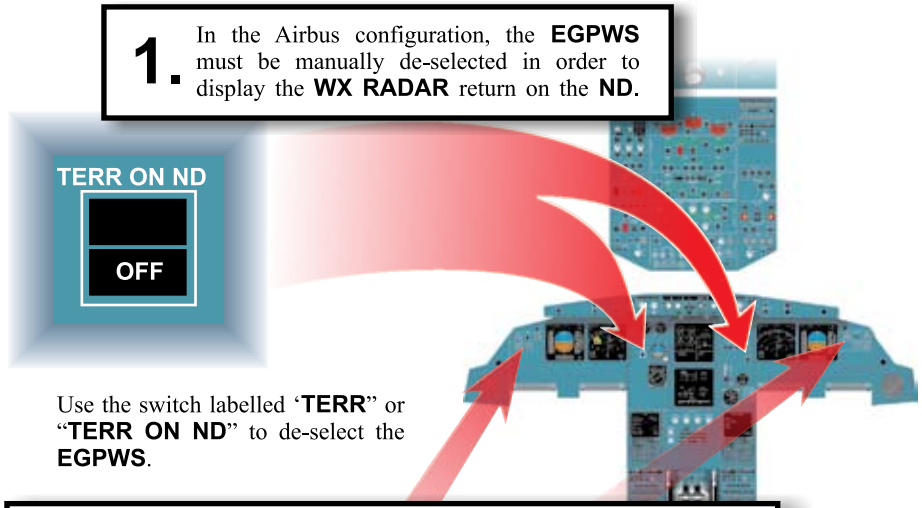
The weather radar is designed as one of your tools to *keep you out of* severe weather situations and not intended to be used as a penetration tool.

***WARNING*:**
DO NOT OPERATE THE RADAR when:
- Personnel within 15 feet of the radar antenna
- while fueling or defueling.

HOW CAN A PILOT SCREW UP?

If you can't get the darned thing to work, consider these two things ***BEFORE*** you get the maintenance guy to come out and embarrass you.

1. In the Airbus configuration, the **EGPWS** must be manually de-selected in order to display the **WX RADAR** return on the **ND.**



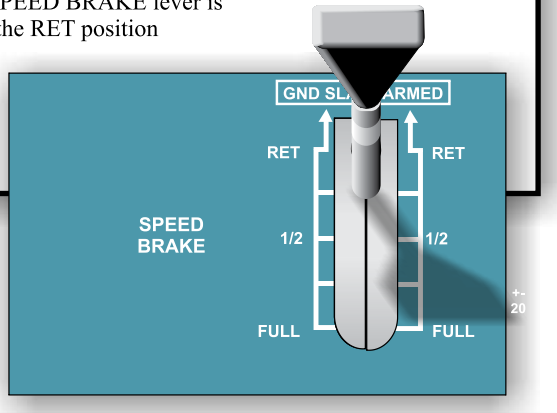
Use the switch labelled '**TERR**" or "**TERR ON ND**" to de-select the **EGPWS**.

2. Sometimes, if the brightness is not balanced properly, you cannot see the return on the **ND**. While your first impulse might be to think the radar is not working, adjust the **ND BRIGHTNESS CONTROL KNOB** on the forward panels. These are turned all the way down when the airplane is secured.

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53 SPEED BRAKE LEVER ...RETRACT, DISARM

Verify that the SPEED BRAKE lever is full forward in the RET position
AND
the lever is down in the stowed detent.

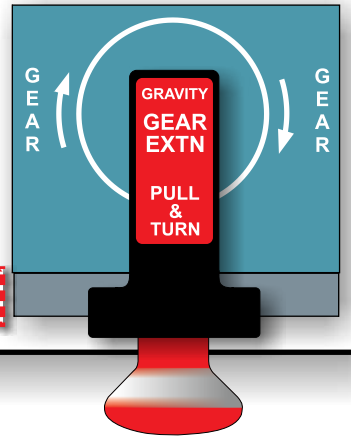


54 GRAVITY GEAR EXTENSION HANDLE ..... STOWED

Sometimes in the sim, you will follow a crew whose arduous encounter may have included a manual gear extension. Make certain that the handle is stowed ...and that the systems actuated have been reset.

When the crank is turned, the hydraulic pressure is shut off, Main gear is "locked" down, (and most importantly)

Nose wheel steering is deactivated.



55 PASSENGER ADDRESS SYSTEM ..... CHECK

Pick up the handset and make a PA announcement to check the clarity, volume, and overall operation of the unit.

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56 PARKING BRAKE HANDLE ..... SET

THIS IS A ***BIG DEAL!***

Even IF PARKING BRAKE HANDLE IS ON
Then we still have to ***CONFIRM*** that the parking brake is set.

The PARKING BRAKE switch is actually ONLY an electric switch



NOTE:

The parking brake should be set IF:
- **RAMP IS ICY**
- **WIND SPEED or GUSTS OF 40 KTS or greater.**

CAUTION:
The *ONLY* confirmation that the parking brakes are set is an indication of **PARKING BRAKE PRESSURE** on the **PARKING BRAKES AND ACCU PRESS** indicators.



If the pressure indicators are "**OUT OF THE GREEN BAND**" and indicating yellow system pressure ... then, and only then, can we assume the parking brakes are set.

IF PARKING BRAKE HANDLE IS OFF

consider the cause. It could have been left OFF to allow for brake cooling.

ADDITIONAL NOTE:
If the brakes are OFF (released) then the BRAKE WEAR indicators will not be accurate when observed during the exterior inspection.

YOU MUST REMEMBER
to confirm that the parking brake is set prior to accomplishing the **BEFORE START CHECKLIST.**

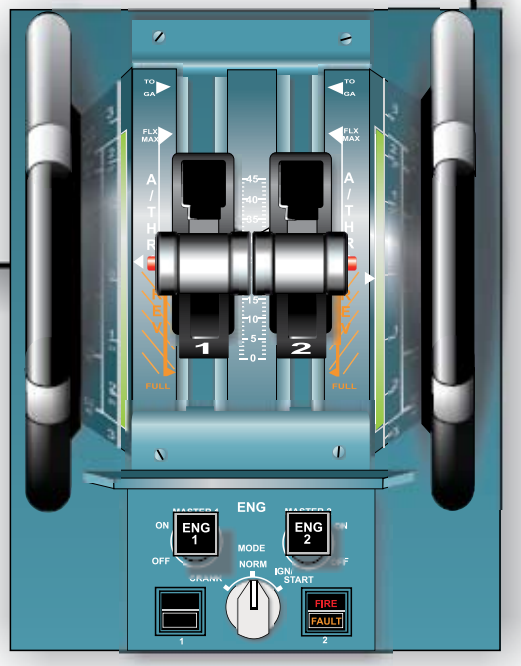
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57 THRUST LEVERS ..... IDLE

There are 5 positions defined by stops and detents:

- MAX REVERSE
- FORWARD IDLE
- CLIMB (CL)
- FLEX (FLX/MCT)
- TOGA



The Thrust Levers should be "standing up" in the IDLE position.

END of the flow:
COCKPIT PREPARATION - CAPTAIN

WHEEEEW!

EXTERIOR INSPECTION

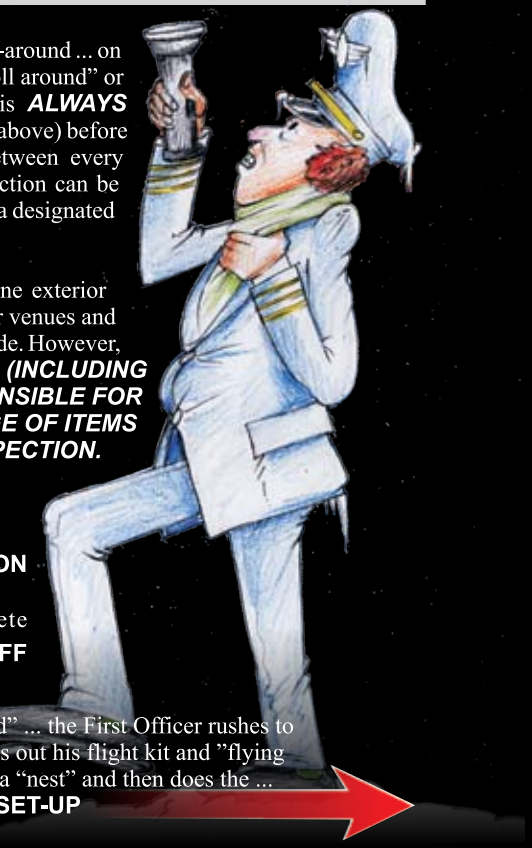
ALSO CALLED A PILOT WALK-AROUND

THE DIVERSION EXCLUSION:

"If a flight is diverted to another station, it may be difficult to accomplish a pilot walk-around due to station overload, a lack of stairs or loading bridge, foreign/station restrictions, etc. In this rare instance, the Captain may use discretion to depart the station without accomplishing a pilot walk-around. If the Captain deems a walk-around necessary, it will be done using any means available, including having a qualified line mechanic substitute for the pilot, or waiting for the station to provide stairs or a loading bridge."

While it is known to by pilots as a walk-around ... on balmy days it could actually be a "stroll around" or in bad weather a "run around". It is ***ALWAYS ACCOMPLISHED*** (exception noted above) before the initial flight of the days and between every subsequent flight segment. The inspection can be accomplished by either the Captain or a designated crew member
... normally by the First Officer (Duh!).
This book will not describe the routine exterior inspection as that is illustrated in other venues and is not typically a part of the simulator ride. However,

ALL CREW MEMBERS (INCLUDING CAPTAIN) WILL BE RESPONSIBLE FOR DEMONSTRATING KNOWLEDGE OF ITEMS ON THE EXTERIOR INSPECTION.



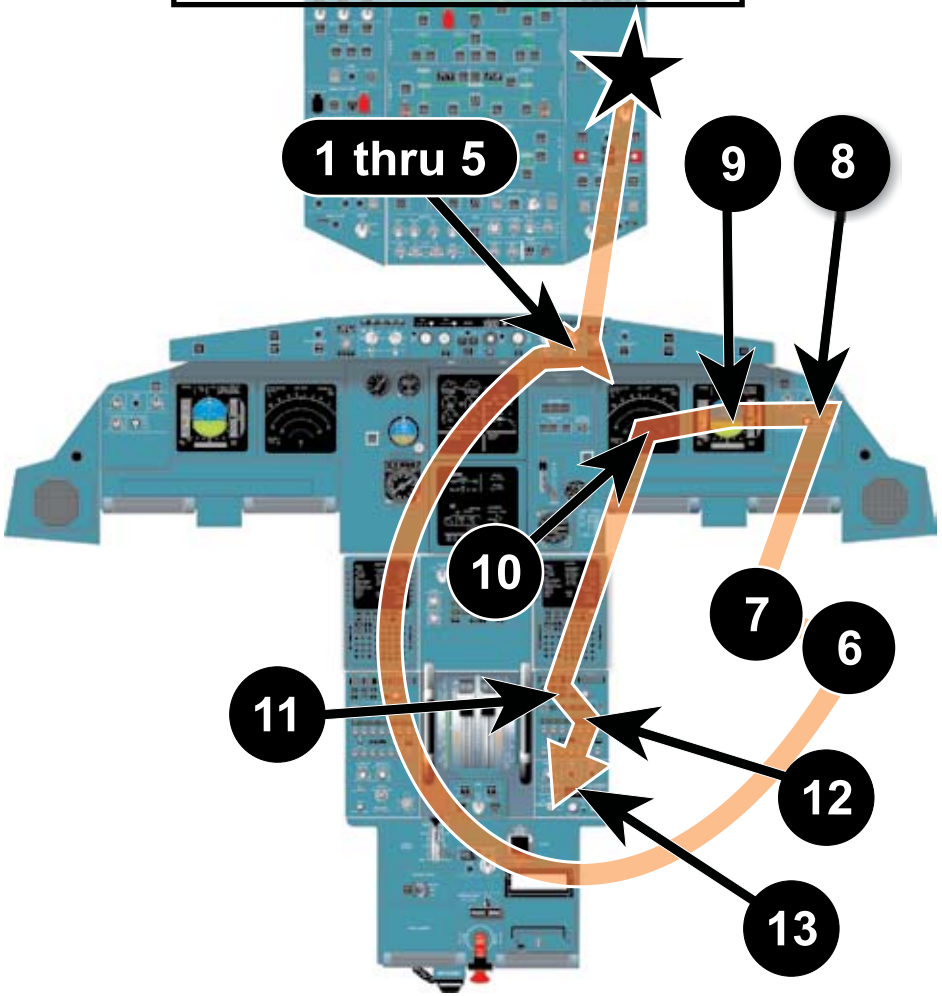
STEP 1: Wing Light Switch ..... **ON**

After exterior inspection compete
STEP 2: Wing Light Switch ..... **OFF**

After completing the "walk-around" ... the First Officer rushes to the cockpit, stows his raincoat, gets out his flight kit and "flying stuff," adjusts his seat, and makes a "nest" and then does the ...
FIRST OFFICER'S COCKPIT SET-UP

FIRST OFFICER'S COCKPIT SETUP

There are only 13 steps to the First Officer's Cockpit setup, but they also have to be done entirely from memory. Let's make it simple.



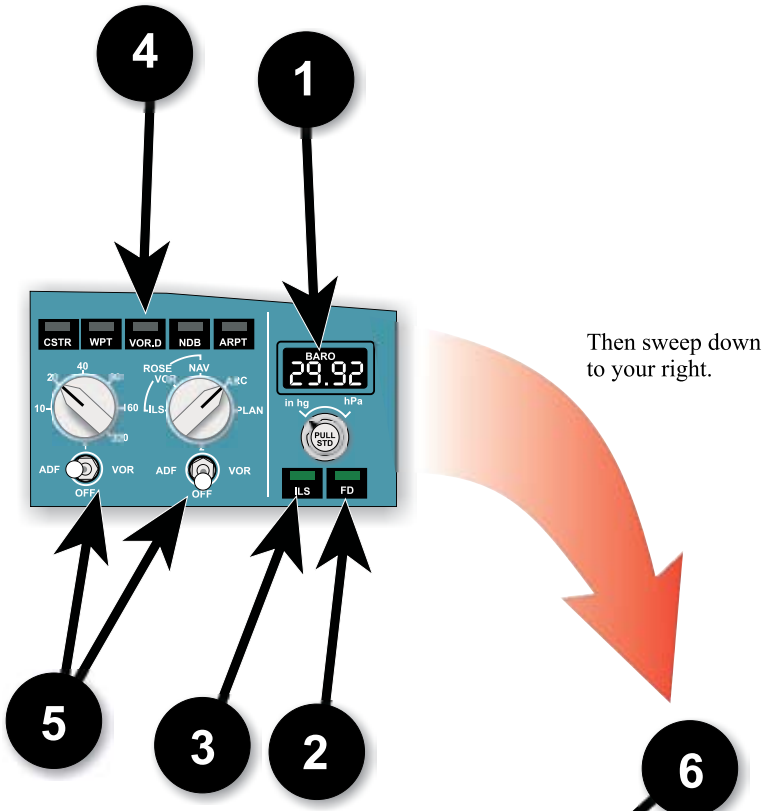
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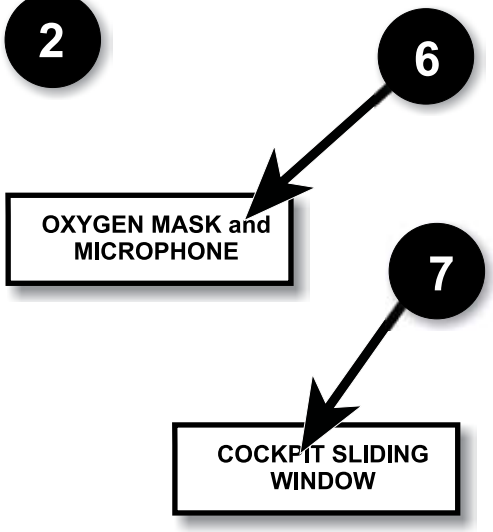
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5 EASY PIECES

Start your set-up with the **EFIS CONTROL UNIT**.
There are 5 things to set.



Then sweep down to your right.



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1 **BAROMETRIC REFERENCE ..... SET**

Obtain the current barometric setting.

*1. This will require the use of a RADIO, or the CDU/ACARS/Printer to obtain the **ATIS**. or*

2. Call ATC for the current field barometric altimeter setting.

When the barometric setting is dialed into the unit, not only is it displayed on the instrument, but is also repeated on the lower right corner of the PFD.

2 **FLIGHT DIRECTOR BUTTON ..... ON**

MUST BE ARMED in order to engage certain important AUTO-PILOT modes! This ARMS the climb and nav modes.

3 **ILS/LS BUTTON ..... AS REQUIRED**

This is not normally required nor desired to be displayed on the PFD or the ND during departure.
If, however, the ILS localizer or the ILS DME is required to comply with departure procedures, then this switch must be selected in order to be displayed.

4 **EFIS CONTROL PANEL ..... SET as required**

Personal preference is allowed, of course; BUT here are some recommendations:
- ARC for straight out departures
- ROSE NAV if turns back over the field are anticipated
- A good start is 40 nm range, but 10 or 20 is OK.

5 **VOR/ADF SELECTORS ..... AS REQUIRED**

The VOR and/or ADF is not normally required nor desired to be displayed on the PFD or the ND during departure.
If, however, the VOR and/or the ADF is required to comply with departure procedures, then this switch must be selected in order to be displayed.

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6 OXYGEN MASK and MICROPHONE ..... TEST

This is an "every flight" item; however, this test is NOT required on subsequent flights IF the pilot stays on the same jet.

WARNING

*The test is performed **WITHOUT** removing the mask from the enclosure. If you insist on removing the mask, get ready for a protracted effort similar to that of attempting to stuff a 120 pound boa constrictor into a tobacco can box.*

BEWARE:

Before you begin the test,
MAKE SURE the other guys INT reception knob is *OFF!*
... *or run the risk of blowing his brains out.*

DO THESE STEPS:

A LOUDSPEAKER ..... ON

B INT reception knob ..... ON

C INT/RAD switch selected to ..... INT

D Press-to-test and reset
SLIDE LEVER ..... PUSH and ***HOLD***
*Hold down the **SLIDE LEVER** while you do the next three steps.*

E FLOW SELECTOR ..... OBSERVE
It should turn YELLOW momentarily, and then turns BLACK. This indicates the regulator is leak tight.

F REGULATOR EMERGENCY/
Press-to-test ..... PRESS and RELEASE

G LOOK and LISTEN
Verify the sound of oxygen flow across the mask microphone and FLOW INDICATOR turns YELLOW.

H Press-to-test and reset
SLIDE LEVER ..... RELEASE

I Verify the FLOW INDICATOR is BLACK and all oxygen flow ceases.

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J **REGULATOR EMERGENCY/**
Press-to-test ..... PRESS and RELEASE

K **VERIFY ...**the FLOW indicator stays BLACK,
indicating NO OXYGEN flow,

L **upper ECAM DOOR page ..... CHECK**

Verify the REGUL LO PR message is NOT displayed. This check should be made AFTER all masks have been checked to ensure the LOW PRESSURE valve is OPEN.

NOTE:

Residual pressure in the line between the low pressure valve and the masks may be sufficient to accomplish a mask test with the valve closed.

M **AUDIO CONTROL PANEL ..... RESET**

The idea is to restore the audio panel to its original set-up.

RETURN INT/RAD switch to NEUTRAL, and
RETURN other pilot's INT RECEPTION knob to its original position.

OXYGEN MASK ..... SET

N **N/100% LEVER ..... VERIFY 100%**

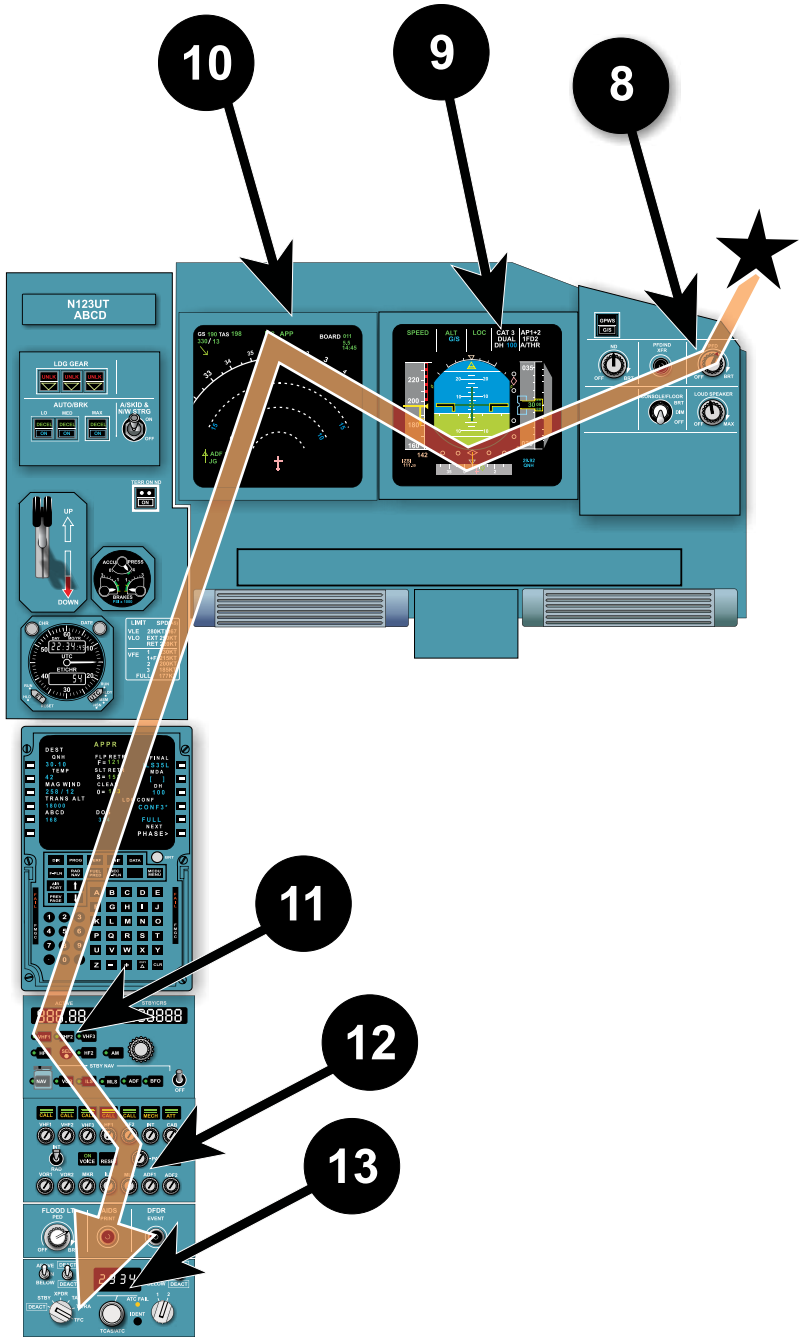
O **ENCLOSURE DOORS ..... VERIFY CLOSED**

7 **SLIDING WINDOW ..... CLOSE and LOCK**

Check that the RED UNLOCKING button is fully popped out and the window does not open.

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8 PFD and ND brightness ..... As required

Ensure EGPWS and RADAR DISPLAYS visible

The two brightness control knobs manually control the respective illumination level.

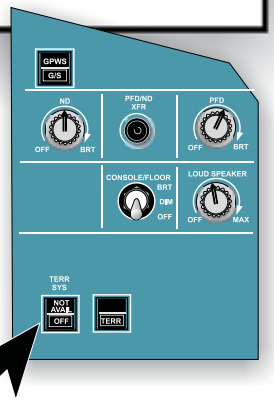
IF a PFD FAILS or is shut OFF, then the PFD display will shift automatically to the respective ND. When this happens, you can display the PFD or the ND on the "other" LCD screen using the PFD/ND XFR switch.

NOTE: *Once the PFD/ND XFR switch is depressed, the brightness controls shift. That is, the PFD controls the ND, and the ND controls the PFD display brightness.*

The ND selector has an OUTER SELECTOR that controls the brightness of the weather **RADAR** and the **EGPWS** image only.



NOTE: *The outer selector of the ND brightness selector MUST BE ON and BRIGHT to ensure the EGPWS pop-up feature is visible in the event of a windshear.*



NOTE:
Some aircraft (UA type) are configured with a "two switch" setup located on the wing-out panels.

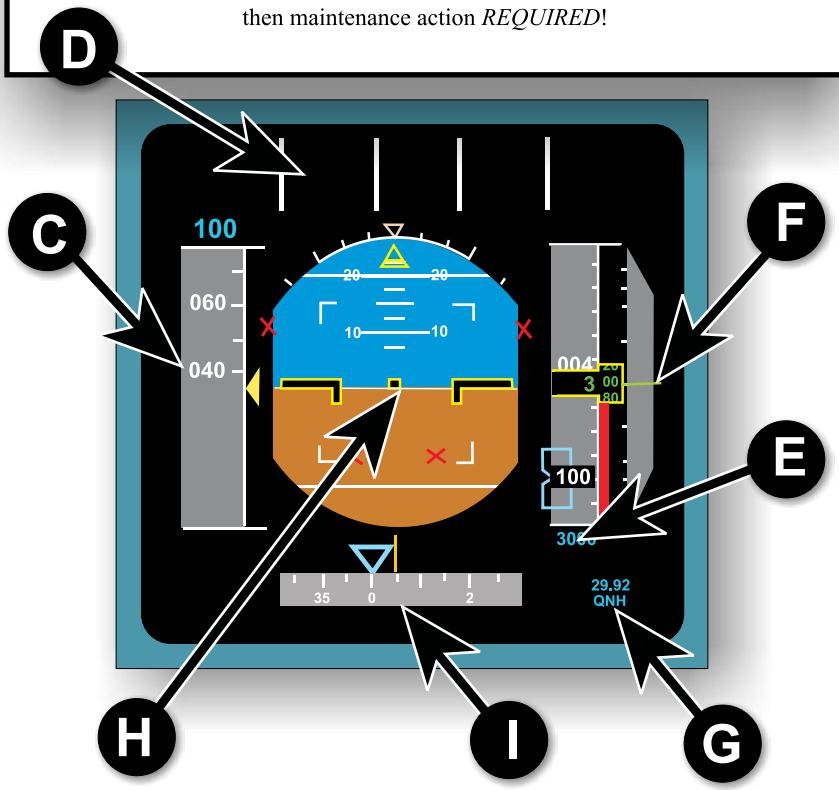
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9 PFD ..... CHECK

A. Verify PFD displayed on the appropriate CRT
B. No flags displayed
C. Verify IAS correct
D. Verify FMA correct
E. Verify INITIAL TARGET ALTITUDE
F. Verify VSI correct (indicator horizontal)
G. Verify Altimeter setting correct (get info from ATIS)
H. Verify Attitude is correct (No roll or pitch indicated)
I. Verify HEADING agrees with ND, DDRMI, and STBY COMPASS.

NOTE:

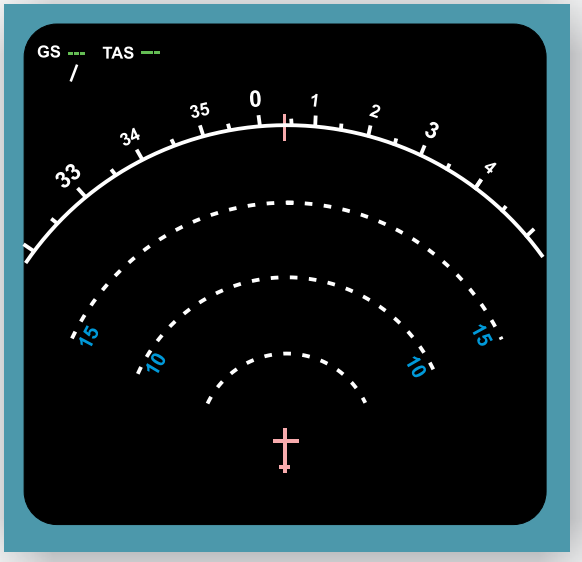
The altimeters should read
ELEVATION PLUS 10 FEET AGL.
This is difficult, because we seldom know the exact elevation of the airplanes position UNLESS at the runway end where it is noted on the approach plate runway diagram.
If the altimeters do not read with
WITHIN +/- 25 FEET OF ELEVATION
and agree with each other
WITHIN 20 FEET
then maintenance action *REQUIRED*!



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10 **ND ..... CHECK**

1. Verify PFD displayed on the appropriate CRT
2. No flags displayed



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11 RMP (Radio Management Panel) ..... SET

1. Verify RMP selector switch is ON.
2. GREEN NAV light should be OFF

In general, VHF 1 is used for ATC, VHF 2 is used for Company, ATIS, and other communications. VHF 3 is reserved for ACARS/ATSU.

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FURTHER WARNING: *Ensure that personnel stay a minimum of 6 feet away from the vertical stabilizer antenna while the HF system is being tested.*



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There are a couple of items to be aware of.
To ***AVOID HOT MIKE*** on frequency .... deselect the VHF 1 whenever you are not monitoring it or have left your seat.

Another point, if you are not going to have your headset on, it might be useful to monitor the Flight Attendant switch (ATT button).



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13 TRANSPONDER MODE ..... STANDBY

We want to ensure that the transponder does NOT clutter the ATC system with unexpected returns on their radar equipment. Particularly such codes as 7700.

When Transponder selector is placed in STBY, the message TCAS STBY displays in green on the upper ECAM.

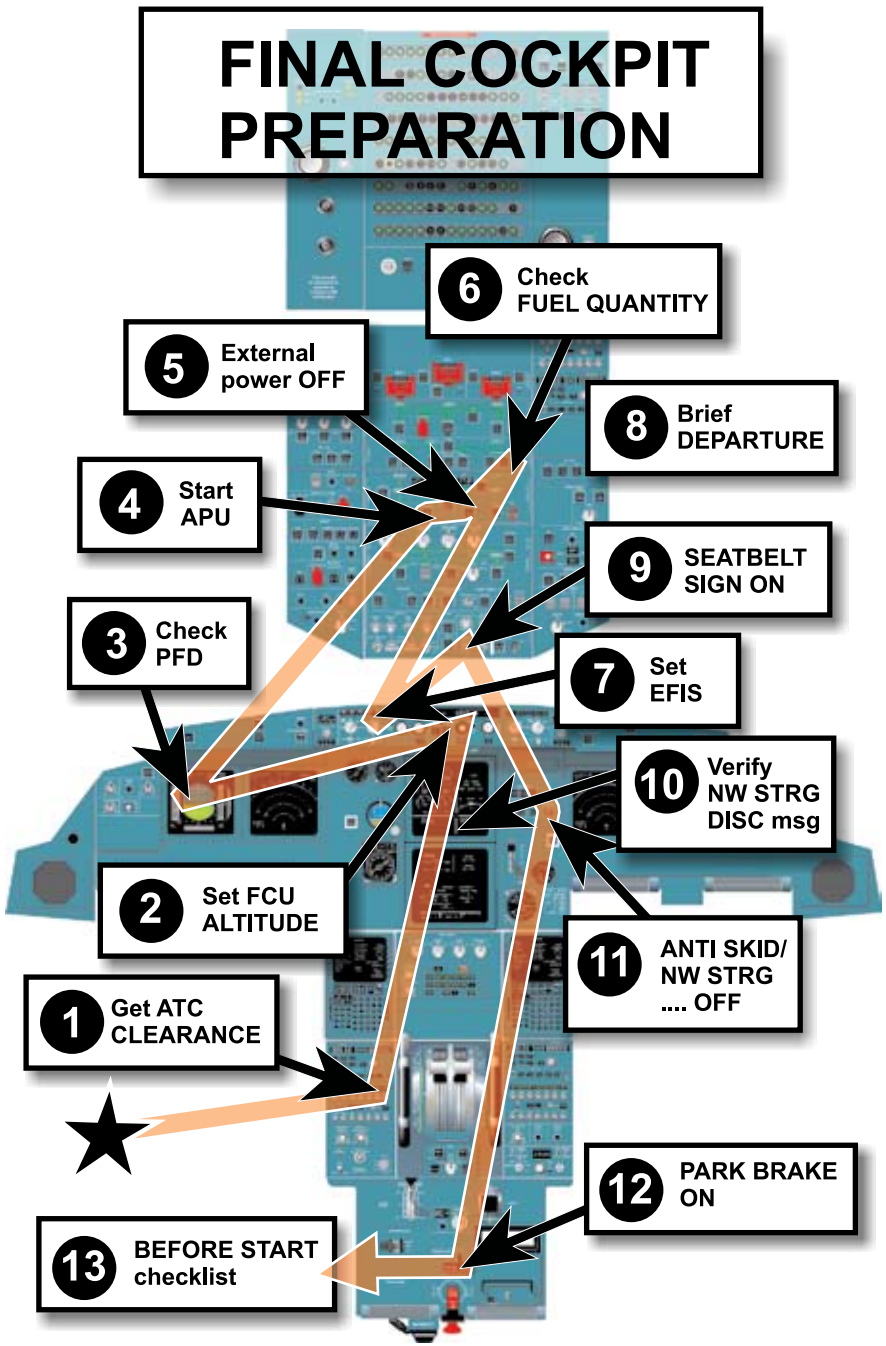




END OF COCKPIT PREPARATION - FIRST OFFICER

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FINAL COCKPIT PREPARATION



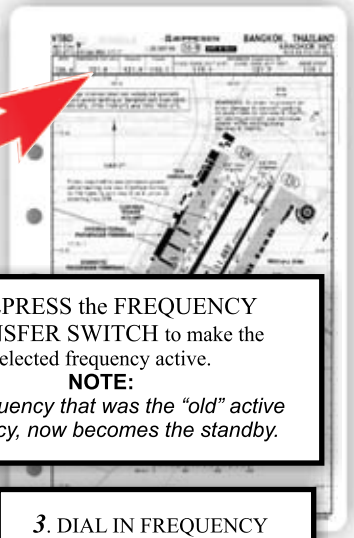
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About 20 minutes prior to pushback …
or as indicated on the airport information sheet ...

1. GET ATC CLEARANCE

There are basically two ordinary ways to get the clearance.

Using the VHF radio, and
Using the center CDU and PDC

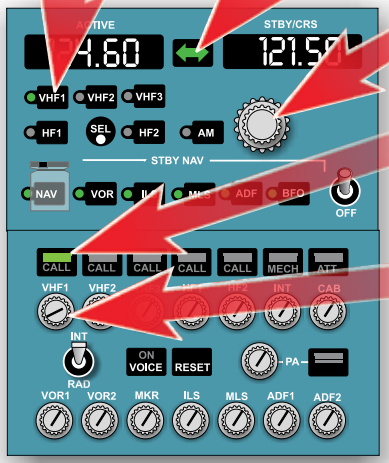


1: DETERMINE desired frequency (In this case we will use the 10-9 page to obtain CLEARANCE DELIVERY frequency)

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

6. ADJUST associated receiver volume control knob.

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

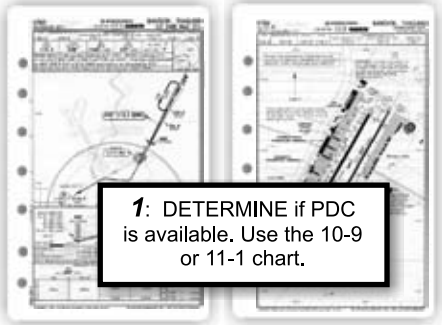
8. Make transmission and request clearance.
Use either:
SIDESTICK switch,
REMOTE pendant, or
DEPRESS INT/RAD switch .

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*.

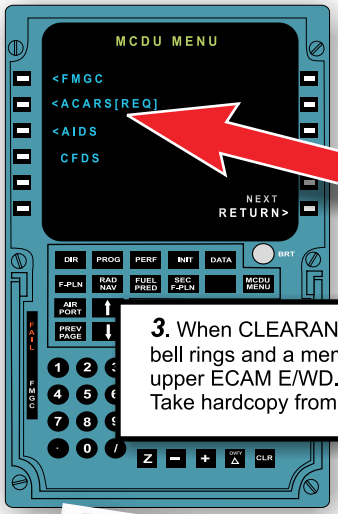
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GETTING THE CLEARANCE using PDC technique

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 NOTAM.

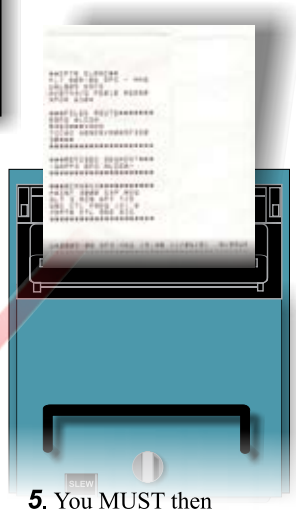


1: DETERMINE if PDC is available. Use the 10-9 or 11-1 chart.

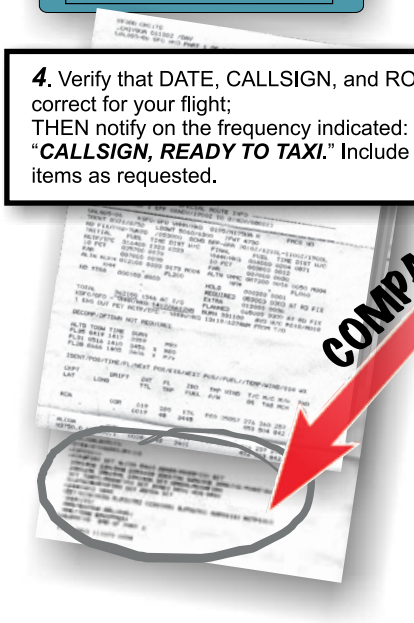


2. Make appropriate input to **MCDU**:
SELECT ACARS
SELECT CLEARANCE

3. When CLEARANCE is received, a bell rings and a memo appears on the upper ECAM E/WD.
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.



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.

5. Make appropriate changes to the routing in the MCDU.

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2. FCU Altitude ..... SET

Set the first altitude restriction on your clearance or the lowest restriction depicted on the departure SID. Ensure that you have been assigned an altitude. **You will *NEVER* be cleared without a**

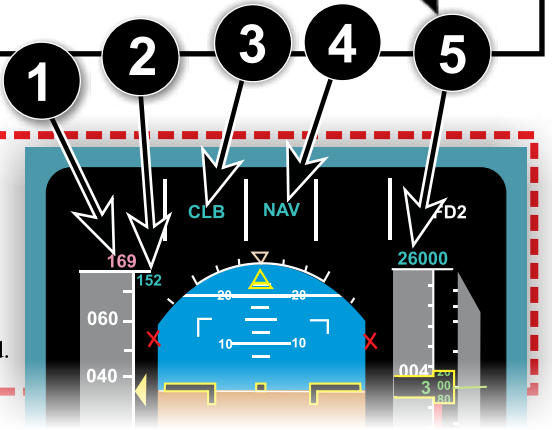


GOOD TECHNIQUE: Check that the FCU altitude selected is annunciated on the PFD.

IMPORTANT STEP

3. PFD

Both pilots verify that:
1. **V2,**
2. **V1,**
3. **CLB MODE** is **ARMED,**
4. **NAV MODE is ARMED**
5. **FCU ALTITUDE** displayed.



4. APU ..... START (if not already running)

Since we have previously discussed starting the APU, I will let you refer to that page for information about this topic. Once the **APU AVAIL** light is illuminated you may switch to APU power... ***BUT*** (read next step).

5. EXTERNAL POWER switch ..... OFF

Once the APU is started, it WILL NOT take the BUS automatically. The EXTERNAL POWER must be disconnected manually.

WARNING:

Select the external power OFF using the switch BEFORE notifying the ground person "cleared to disconnect." If the EXTERNAL power source is still powering the airplane, there will be a BIG ZAAAAPPPOOOO when the plug is pulled ...and the potential exists for injury to the ground personnel.

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6 FUEL quantity ..... CHECK

Since the person who actually performs the fueling will come to the cockpit, you cannot control the timing for this check. I recommend strongly, that when the fueller comes to the cockpit ...STOP what you are doing and take the time to ensure your fuel load. Once you have the final fueling information, you can perform the necessary calculations as outlined in company procedures.

7 EFIS control panel ..... SET

Depending on the departure requirements, each situation may involve a different set of parameters. Generally, use a setting with

ARC as display mode and

20 or 40 nm.



8 DEPARTURE briefing .....

Depending on the departure requirements, each situation may involve a different set of parameters. Take a moment and list some of the items you might include in ***YOUR*** brief.

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9 SEATBELT SIGN..... ON

Some Captains will take a moment and make an announcement drawing the customers attention to the illumination of the sign.
If you do: ***KEEP IT BRIEF*** as this is a critical phase of the loading of the cabin and you don't want to detract from that activity.

10 NW STRG DISC message ..... VERIFY

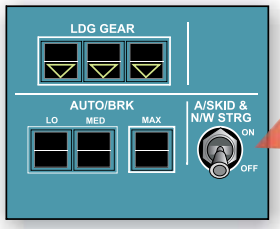
(IF NOSE LANDING GEAR BYPASS PIN is installed)

When the Ground maintenance personnel hook up the tow bar for pushback, they will insert the Nose Wheel steering bypass pin and disconnect the nosewheel steering.
It is that indication that we are looking for that will confirm that the airplane is configured for push.



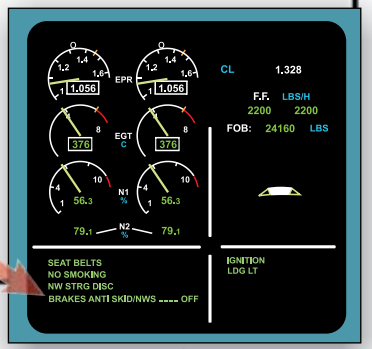
WARNING: Before pushback, the **ECAM** message **NW STRG DISC** ***MUST BE DISPLAYED.***

11 A/SKID & N/W STRG switch ..... OFF



Once we are sure that the nosewheel bypass pin is inserted and the Nosewheel steering has been disconnected, then we can turn OFF the hydraulic pressure to the nosewheel steering so that the push-back can be accomplished.

Once you do that, the ECAM shows the message **BRAKES ANTI SKID/NWS ... OFF.**
We then have to clear that message and check that the ECAM screens are showing NORMAL indications in preparation for engine start.



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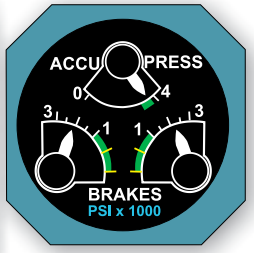
12 PARKING BRAKE HANDLE ..... ON

EVEN IF THE PARKING BRAKE HANDLE IS ON
We still have to ***CONFIRM*** that the parking brake is set.

The PARKING BRAKE selector handle is actually ***ONLY*** *an electric switch.*



CAUTION:
The ONLY confirmation that the parking brakes are set is an indication of **PARKING BRAKE PRESSURE** on the **PARKING BRAKES AND ACCU PRESS** indicators.



13 BEFORE START CHECKLIST ..... COMPLETE

Departure brief	Complete
FMGC and radios	Programmed, set, verified
ADIRS	Nav, aligned
Fuel panel	___ Pumps on, crossfeed closed
Fuel quantity	___ #, cleared with ___ #
Cabin signs	On
Oxygen check	Complete
Engine master switches	Off
Parking brake	Set, pressure normal
Altimeters	____ in/hPa, set
Airspeed	G.W.___, FLAPS___, V1, VR, V2, set

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PREPARATION FOR PUSHBACK

There are three scenarios that will play at this point:

1. Start engines at Gate before push-back,
2. Start engines during pushback,
3. Start engines after pushback.

We are sitting there ready to go fly. We have already completed the "BEFORE START CHECKLIST" and perhaps have even started the engines, and are waiting for the signal to leave the gate.

Just prior to PUSHBACK

(or when prompted by the pushback crew)

Do these FOUR STEPS:

STEP 1: (C) DOORS and SLIDES .....Verify CLOSED and ARMED.
This will require co-ordination with the Flight Attendants or Purser. They will initiate the call-up using the interphone.
Check the DOORS page of the ECAM to confirm doors closed.

STEP 2: (C) Cabin Preparation ..... Verify COMPLETE.
This will usually be accomplished by conversation with theFlight Attendants or Purser. They will also provide additional information at this point; such as final passenger count, specials, and get a coffee request from you.

STEP 3: (F/O) Cockpit door ..... verify CLOSED and LOCKED.
Check Flight Operations Manual for details.

STEP 4: (C,F/O) BEFORE PUSHBACK CHECKLIST ..... complete

BEFORE PUSHBACK CHECKLIST

CHALLENGE [F]	RESPONSE
Sliding windows	Closed, locked [C, F/O]
Doors, slides	Closed, armed [C]
Cabin preparation	Complete [C]

CHECKLIST COMPLETE

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The signal to begin the push-back is initiated by the Ground Person. Generally, they will establish communication with a cheery "Hello" or some such, but here is the bare-bones dialog that you can expect.

GROUND	CAPTAIN
"Ground to Cockpit, pre-departure check complete"	"Stand-by (if not ready)" or "Before Pushback Checklist complete" or "Brakes released, Hold the Push"
"Roger, cleared to push, Ramp is clear."	"Nose wheel steering disconnect message is displayed. Brakes released. Cleared to push"
"Cleared to start engine(s)." This command will be given at the sole discretion of the ground crew."	"Roger, Cleared to start engine(s)."
"Set brakes".	"Brakes set, Pressure normal."
"Tow bar disconnected" "Disconnecting Headset, Watch for Salute." (If a delay is required such as to load late bags, the ground will advise crew: "Standby.")	"Disconnect Headset" (at Captain's discretion) If you detect a problem or potential problem, keep the ground guy on the line until you resolve the situation.
Ground person will walk away from the airplane, then at a safe distance turn and: Stand at attention and Salute. Release from guidance signal: Both arms extended in direction of taxi.	Acknowledge Salute by turning the NOSE light switch to TAXI, then OFF.

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When **PUSHBACK CLEARANCE** received from the Ground Pushback Personnel:

Then do these FIVE STEPS:

STEP 1: (F/O) Pushback Clearance ..... OBTAIN.
Use the appropriate frequency from the Flight Operations Manual or the Airport pages.

NOTE:
Captain *WILL NOT* be monitoring the push-back frequency.

STEP 2: (F/O) Beacon switch ..... ON
The beacon should be ON any time:
- the airplane is moving or
- the engines are running.

STEP 3: (F/O) Transponder Mode Selector ..... XPDR.
Placing the transponder to the XPDR position on the ground allows the transponder to respond to selective interrogation modes of mode S; at some airports with ground control radar transponder capability..
In flight, with XPDR selected, the transponder will switch to ON automatically.
This also places the TCAS to Standby.

STEP 4: (C) PARKING BRAKES ..... RELEASE.
Just a reminder for those coming over from "other" airplanes. Releasing the brakes involves ONLY turning the brakes selector to OFF ... and checking the BRAKE PRESS gauges go to the "green band" indication.

DO NOT release brakes UNTIL clearance received from:
- the gound pushback crew, ... or in some cases
- Tower, Ground Control, or Ramp controlling agency.

STEP 5: (C) Notify Ground Personnel:
"*CLEARED TO PUSH, BRAKES RELEASED.*"

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ENGINE START

There is no one single way to start the engines on the Airbus A320. There are several different techniques and here are some:

- **GROUND PNEUMATIC start**
- **CROSS-BLEED START**
- **MANUAL ENGINE START**
- **STORED AIR GROUND START**
- **START VALVE MANUAL OPERATION**
- **IN-FLIGHT ENGINE START**

and all of these may be encountered on a check-ride. Since, reference to the appropriate ADDITIONAL and IRREGULAR procedure by using the FLIGHT MANUAL as a reference is not only suggested, but required; I have elected to exclude these from our discussion at this point and will concentrate solely on the

- **NORMAL ENGINE START using AUTOSTART.**

WHAT IS AUTOSTART?

This is pure engineering magic and is referred to as autostart. Some hidden and mysterious doo-dad called the **FADEC** (*Full Authority Digital Engine control*) does everything. It controls the start valve, both igniters, and high pressure valve. It also monitors N1, N2, EGT, and further has the ability to detect hung starts, stalls, and no starts. ***Amazing!***

As long as N2 is below 50%, the FADEC will automatically abort the start if it sees anything improper and then, amazingly, automatically continues to crank the engine if it is needed to cool it and eliminate residual fuel vapors. If, however, N2 is above 50%, the FADEC will no longer do all that monitoring and will not abort the start.

Another feature is that during an automatic start, if the residual EGT is above 250°C, the amazing FADEC will crank the engine until the EGT decreases below 250°C before initiating the start sequence. Unfortunately, there is no ECAM message to indicate this.

IF AN ABORTED START OCCURS, a manual start may be attempted. However it will be necessary to;

- Report the failed automatic start attempt (use the radio or ACARS),
- Make a LOGBOOK entry,
- Obtain clearance to continue the flight from Company Maintenance
- get "NEW" MRD (Maintenance Release Document).

BEFORE you can continue with the flight.

DO NOT TAKE OFF WITH A DIRTY LOGBOOK.

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Some
LIMITATIONS
associated with starting

STARTER DUTY CYCLE	ON	OFF
CONSECUTIVE STARTING ATTEMPTS *Measure timing from start valve opening until closing.*	**2 minutes**	**15 seconds**
	2 minutes	**15 seconds**
	1 minute	**30 minutes**
CONTINUOUS CRANKING	**4 minutes**	**30 minutes**

IF start valve open for more than 2 minutes, then the ENG MASTER switch MUST BE SELECTED OFF for 30 minutes.

Maximum Starter re-engagement RPM	**10% N2**

STARTER PRESSURE

Minimum DUCT PRESSURE while starter rotating (PSI)	GREEN

ENGINE and THRUST MAXIMUM	TIME LIMIT	INSTR MARKING	EGT (°C)
START	*See limits above*	**RED**	**635**
TAKE-OFF / GO-AROUND	**5** minutes	**RED**	**635**
MAXIMUM CONTINUOUS	**UNLIMITED**	**AMBER**	**610**

***NOTE**: Time limit is maximum operating time at thrust setting.*

RPM - MAXIMUM

N1 and **N2** rotors	**100 %**

CAUTION:
If N2 vibration exceeds "5"
(indicated with an accompanying pulsating GREEN indicator)
and does NOT decrease after engine start ...
SHUT DOWN THE ENGINE and contact maintenance.

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OIL LIMITATIONS	
Minimum **OIL PRESSURE**	**60 PSI**
Minimum **OIL QUANTITY** before START	**17 Quarts**
Minimum **OIL QUANTITY** at IDLE RPM	**12 Quarts**
Maximum **OIL TEMP** (continuous operation)	**155°C**
Maximum **OIL TEMP** (up to 15 minutes)	**165°C**
Minimum **OIL TEMP** (prior to start)	**-40°C**
Minimum **OIL TEMP** (prior to exceeding idle RPM)	**-10°C**
Minimum **OIL TEMP** (prior to takeoff)	**+50°C**

The FADEC is NOT available to SHUT DOWN an engine after 50% N2 has been reached.

If an **ENG 1(2) FAIL** message appears after 50% N2 , but prior to reaching idle speed, then a manual start may be required.
This requires a maintenance logbook entry and a new maintenance release to continue.

If a cargo door is opened after the first engine has been started (common occurrence to accommodate late passenger bag loading)
WAIT 1 MINUTE
after the door is closed before starting the second engine.

COLD WEATHER START COMMENT:

During cold weather (and after anti-icing) start engines using the normal procedures. However, be alert that starting problems are more frequent during cold weather. Oil pressure may rise slowly and then go to higher than normal readings until it warms up. Remember, Oil pressure MUST BE within normal range for take-off:

60 PSI minimum

CAUTION:

If there is no oil pressure indicated by the time the engine reaches stabilized idle, follow the ECAM procedures.

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The ENGINE START FLOW

Let's take a moment as review some of the information that is part of the engine start. The Check Captain my give you a thought problem to resolve. Here are a couple of common examples.

For example, the Check person might provide you with updated wind information that indicates a strong "TAILWIND". If you receive that information during the push-back, communicate with the ground personnel that you would prefer a "tail downwind" for the start.
If the Check-guy prompts you with a simulated question from the ground guy, "Captain, which direction do you want the jet to face."
Take that as a clue that the wind might be a factor.
"Put the tail downwind."

Another example might be: A high temperature or high altitude situation may not provide enough pneumatic duct pressure for the start. It may be necessary to unload the pneumatic air requirements on the airplane: turn off the packs, maybe make an announcement to the passengers. Be creative in your response. Show her/him that you are in charge of the situation.

Be expecting a start problem

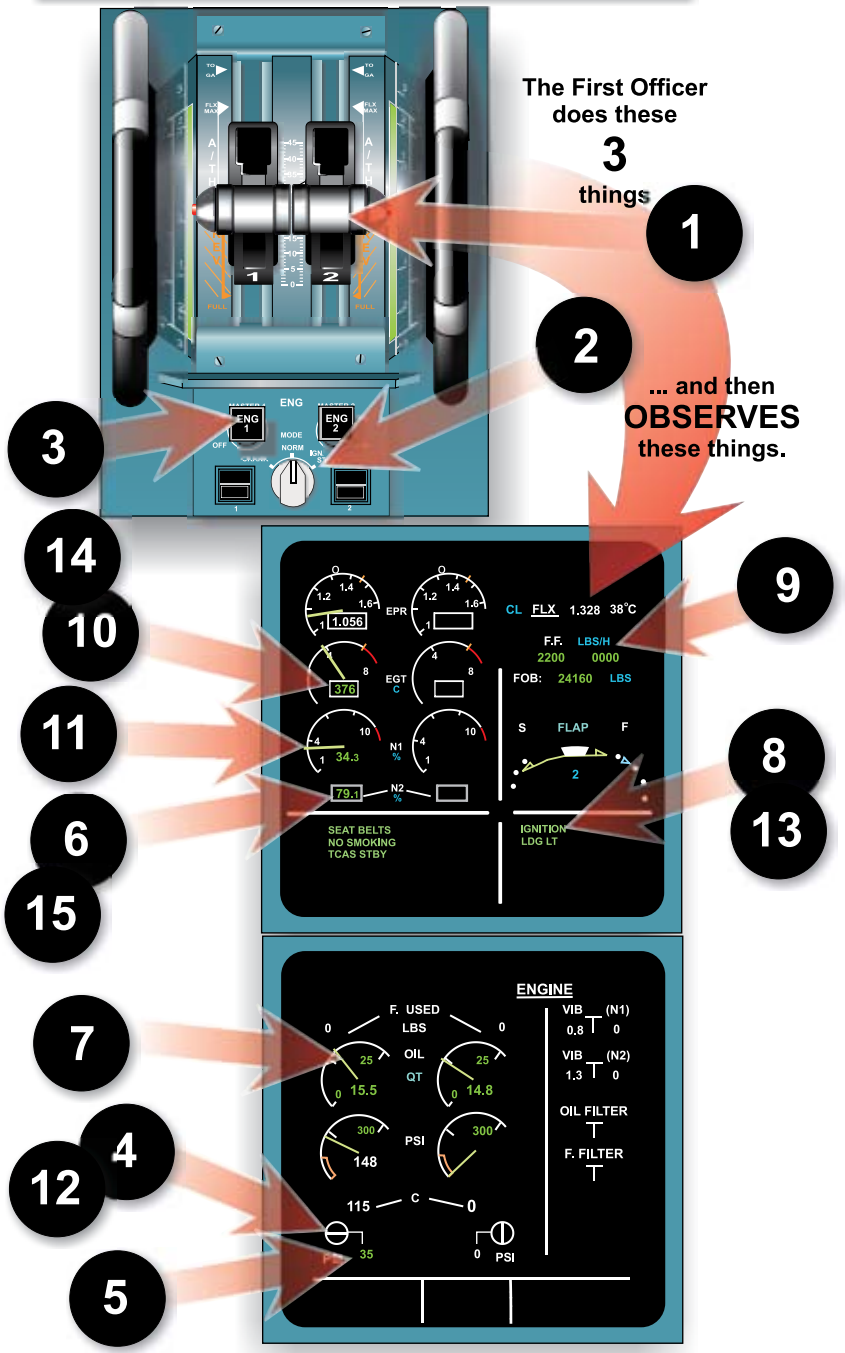
Review the list of start and engine limitations on the next page.

Since we will be using a SPECIFIC engine and SPECIFIC engine starting techniques used at a SPECIFIC airline for this demonstration, you may find that the procedures at your airline differ somewhat from those specified here. Don't get your underwear in a bunch, keep in mind that the learning curve can be enhanced by taking the material here and (with a ball point pen) making whatever changes you deem worthy right in the margins of the text.

The A320 (in this demonstration) has two IAE V2527-A5 high bypass turbofan engines. Each engine can produce 26,500 pounds of thrust.
We will also be referencing the A319 and it has two IAE V2522-A5 engines, rated at 22,000 pounds of thrust.
Each engine is equipped with a "FULL AUTHORITY DIGITAL ENGINE CONTROL" (FADEC) for engine management.

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HOW TO START THE ENGINES



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FIRST OFFICER does these three things:

1. **(F/O) THRUST LEVERS**
   Verfiy at IDLE

2. **(F/O) ENGINE MODE SELECTOR** Select IGNITION/START:
   This will:
   - Display ENG page on lower ECAM
   - Power up the FADEC
   - AMBER XXXXs disappear from indicators (except N1 and N2)
   - ENG MASTER switch is armed.
   - The PACK valves close.

   If the ENG MASTER switch is not selected within 30 seconds, the pack valves re-open. They re-close when switch selected on.

3. **(F/O) ENGINE MASTER SWITCH..... ON**

FIRST OFFICER OBSERVES

4. **START VALVE ... open:**
   The start valve indicator will display a horizontal line when the start valve opens. A vertical line indicates the valve is closed.

5. **OIL PRESSURE** indications is colored **GREEN.**
   This displays the BLEED PRESSURE upstream from the pre-cooler. When N2 exceeds 10% with the engine start valve NOT closed and the pressure is below 21 PSI; then the value becomes AMBER. Also when bleed over-pressure is detected.

6. **N2 INCREASES.** During engine start brightness intensifies and a gray box surrounds the figure. If it exceeds 100%, The value turns RED and a red cross appears. This indication remains during the whole flight segment.

7. **OIL PRESSURE INCREASES**: Either pointer or value will indicate the increase. If above 390 PSI, the value will "pulse." Below 80 PSI becomes AMBER, and RED below 60 PSI.

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30 Seconds after ENG MASTER switch ON:

8 **IGNITION ON.**
The ECAM message will read "IGNITION". The FADEC will introduce ignition approximately 30 seconds after the ENG MASTER is selected ON. The start valve will close and the ignition will cut off when N2 reaches 43%.

9 **ENGINE FUEL FLOW.**
The indicators will display the flow for each engine.

10 **EGT increases within 20 SECONDS after the FUEL FLOW indication**. Normally displays in GREEN. When EGT exceeds 610°C. display turns AMBER. When 635°C is exceeded, display turns RED.

11 **N1 starts increasing *BEFORE* 34% N2.**
Normally displays in GREEN. When N1 exceeds rating limit, It pulses in AMBER. It pulses in RED when N1 EXCEEDS 100%.

AT 43% N2

12 **START VALVE closes.**

13 **IGNITION is shut OFF.**

14 **EGT decreases**

WHEN N2 STABILIZED AT GROUND IDLE ...

15 **GRAY BOX around N2 disappears.**

This is the end of the start.

NOTE:
As soon the first engine has reached 50% N2, then the start of the second engine may be initiated.

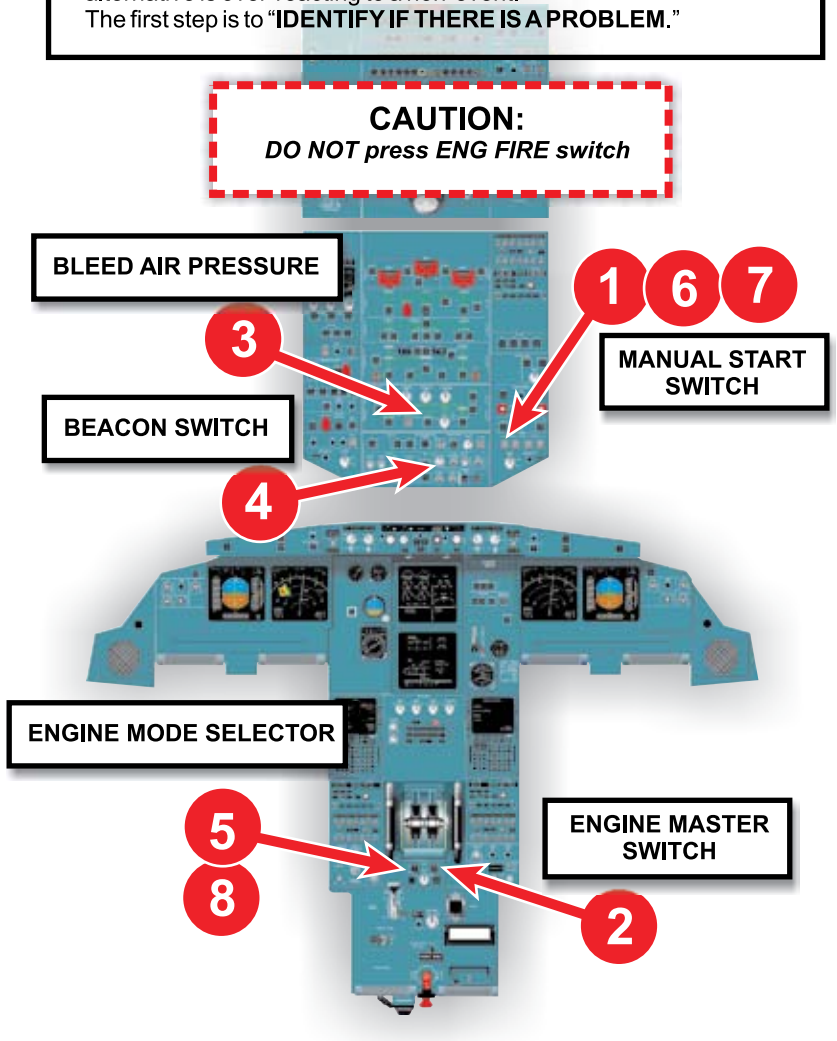
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QRC*
* QUICK REFERENCE CHECKLIST

TAILPIPE TORCHING DURING START / SHUTDOWN

There is no bell, siren, caution light or flashing warning ... there is no cockpit indication that relates to this "EMERGENCY." Your indication will come from the ground personnel who will be observing the start. It is even possible that a passenger or Flight Attendant may give you a call telling you what they are observing.
The Captain will have to make a judgement about the severity of the situation. At risk is NOT taking the situation seriously, but the alternative is over-reacting to a non-event.
The first step is to "**IDENTIFY IF THERE IS A PROBLEM.**"

CAUTION:
DO NOT press ENG FIRE switch

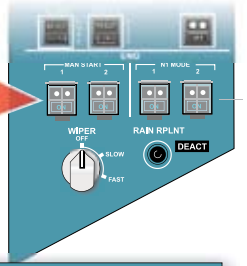


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STEP 1: MANUAL START SWITCH ..... OFF

Unless you are doing a manual start,
these switches should be OFF already.
These switches will ***OPEN the START VALVE*** if:

- ENG MODE selector is in
  either CRANK or IGN/START, and
- N2 less than 15%.



STEP 2: ENG MASTER SWITCH ..... OFF

This will:

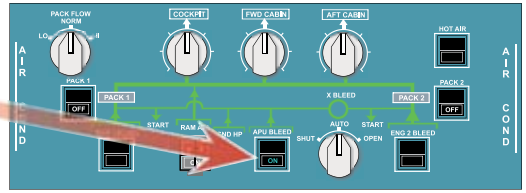
- CLOSE HP and LP fuel valves,
- TURN OFF ignition
- Reset FADEC

This step will STOP any flow of fuel into the engine.



STEP 3: BLEED AIR PRESSURE .... ESTABLISH

During a start there should be bleed air available; however, during shutdown, it is possible that the last engine shut down would be left without bleed air of some sort. Unless ground air is available, then the only way to get bleed air, is to start the APU.



STEP 4: BEACON SWITCH .... ON

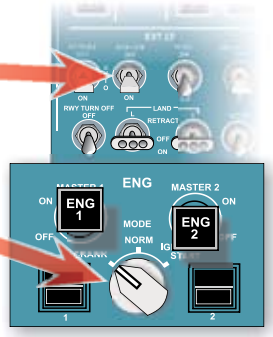
The beacon should be "ON" for ALL operations already.

STEP 5: ENG MODE .... CRANK

The start valve will OPEN if:

- ENG MAN START switch is on, and
- N2 is less than 10%.

NOTE: Ignition is NOT supplied



STEP 6: MANUAL START ..... ON

The start valve will OPEN if:

- ENG MODE selector is CRANK or IGN/START, and
- N2 is less than 15%.

NOTE: Blue ON light indicates START VALVE open.
Start the chronometer, since there is a 4 minute time restriction for NORMAL starter cranking operations. If required, of course, crank all you need. Crank the engine and "blow" the fire and residual fuel out of the tailpipe.

WHEN FIRE IS OUT

STEP 7: MANUAL START SWITCH ..... OFF

STEP 8: ENGINE MODE SELECTOR ..... NORMAL

END OF QRC CHECKLIST

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AFTER START CLEAN-UP

FIRST OFFICER does these SEVEN things:

1 **(F/O) ENG MODE selector ..... NORMAL**

When the Mode selector is placed to NORMAL, the LOWER ECAM replaces the ENG page with the WHEEL page. This is a check for the crew, that if the IGN/START switch selected, the ENG page will be displayed. Whoooops!

2 **(F/O) GROUND SPOILERS: ..... ARM**

If Ground Spoilers are ARMED, then they will extend automatically during a rejected take-off WHEN:

- **Wheel speed greater than 72 knots,**
- **BOTH thrust levers are in FORWARD IDLE**

The indication that the Ground Spoilers are ARMED is a green MEMO in the upper ECAM: **SPLRS ARM**

3 **(F/O) RUDDER TRIM ..... ZERO**

If there is a left over trim setting from the previous leg, consider only rolling out about half of that amount.

4 **(F/O) PITCH TRIM ..... SET**

Use the TRIM KNOB on the THRUST CONTROL PANEL to manually the value.

CAUTION NOTE: *When you set the trim using the "trim wheel" it is advisable to use an OPEN HAND so that the trim wheel won't pinch or "BITE" your fingers.*

The figure is in percent MAC and is provided in the "Final Weights." Note that there may be available from dispatch via radio/ACARS after taxi-out up-dated "final" MAC data..

5 **(F/O) APU BLEED switch ..... AS REQUIRED**

The APU bleed switch is located on the overhead panel on the AIR control panel. If planning an engine shut-down due to lengthy taxi delays, it might be useful to remain on APU air.

6 **(F/O) APU MASTER switch ..... AS REQUIRED**

APU may be left running if extended ground delays requiring engine shutdown are expected.

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7 **(F/O) ENGINE ANTI-ICE ..... AS REQUIRED**

Be aware that with ENGINE ANTI-ICE selected:
- MAXIMUM N1 is limited
- CONTINUOUS IGNITION is provided
- MINIMUM idle RPM is increased.

There is always the question as to whether or not ANTI-ICE is required. Here are the specific guidelines:

"Engine anti-ice MUST be on during ALL GROUND and FLIGHT operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below -40° C SAT."

"Engine anti-ice MUST be on PRIOR TO AND DURING descent in icing conditions, including temperatures BELOW -40° C SAT."

What is the definition of **ICING CONDITIONS**?

"Icing conditions exist ON GROUND and for TAKE-OFF when

-TEMPERATURE is 10°C or below, and
-VISIBLE MOISTURE is present in any form including *clouds, fog or mist with visibility of 1 mile or less, rain, snow, sleet, or ice crystals.*
-SURFACE CLUTTER while operating on ramps, taxiways, or runways *where surface snow, standing water, or slush may be ingested by the engines or freeze on the engines, nacelles, or engine sensor probes."*

"Icing conditions exist INFLIGHT when

-VISIBLE MOISTURE is present in any form including *clouds, fog or mist with visibility of 1 mile or less, rain, snow, sleet, or ice crystals.*

What pilots screw up:

They think that icing conditions exist at 32°F.

10°C = 50°F

Icing conditions exist at 50°F.

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TAXI STUFF

THE CAPTAIN *ALWAYS* STEERS THE AIRPLANE.

However, the First Officer may steer the airplane if a **SAFETY** considerations arises; **BUT**

- ONLY using rudder pedals, and
- ONLY on a straight segment of the taxiway.

If, however, there is an **EMERGENCY**, of course, the First Officer has the capability to steer the airplane from her/his side of the cockpit ... and in that case may use the tiller bar.

What is the problem here and why do these restrictions exist.
Here is

TILLER BAR technical information.

These are some of the boring technical details. Nose-wheel steering is ELECTRICALLY controlled by a computer (BSCU) and HYDRAULICALLY operated by the GREEN hydraulic system. When we are ready to taxi, and only when all the criteria for operation are satisfied, then the nose-wheel steering is operable.

You can steer the airplane using either

- Steering tillers
- Rudder pedals ...and, of course,
- Auto-pilot (effective only on Auto-land rollout) .

THE STEERING PROBLEM



The big problem is that the pilot input (rudders or tiller bars) from both sides is "**ALGEBRAICALLY SUMMED**." This means that if "both" pilots are trying to steer with either the rudders or the tiller bars at the same time ... the resulting effect is a virtually UNCONTROLLABLE situation ... and the resulting over-steer can result in a runway excursion.

The steering sensitivity changes with the speed of the airplane, that is,

**THE FASTER THE JET GOES,
THE LESS SENSITIVE IS THE STEERING.**

The **TILLER** steering is
+/- 75° up to 20 kts and decreases to 0° at 70 kts.
The **RUDDER** steering is
+/- 6° up to 40 kts and decrease to 0° at 130 kts.

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COLD WEATHER START

ENGINE START notes

Start engines normally, there is no specific procedure for starting an engine in cold weather; however, staring problems are encountered more often during cold weather. A big problem is COLD OIL:

- Oil pressure may rise more slowly than normal,
- Oil pressure may reach higher than normal pressure until it warms,
- Oil pressure must be in normal range for take-off.
- Oil Temperature MUST BE above 50°C
  to provide enough heat to de-ice the fuel during take-off.

CAUTION
If there is NO OIL PRESSURE indication by the time the engine reaches stabilized idle, follow the ECAM procedures.

GROUND DEICING/ANTI-ICING

The Captain is responsible for ensuring that the airplane is not dispatched with adhering precipitation. In order to meet that requirement, the Captain has several tools at his disposal, such as:

- Avoid operating in conditions deemed unacceptable,
- Ground de-icing to remove the adhering precipitation,
- Anti-icing to inhibit accumulation,
- a visual wing inspection.

GROUND DE-ICING comments

It is beyond the scope of this book to outline the steps necessary for ground deicing and the subsequent hold-over tables. Here are a few comments that are suitable for this level of discussion:

CAUTION
Single Engine taxi NOT authorized in icing conditions.

In icing conditions,
TAXI WITH THE FLAPS RETRACTED
until approaching the runway.

To avoid losing the deicing layer on the wings, maintain greater than normal separation from preceding airplanes and taxi at slower speeds.

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MAXIMUM TAXI THRUST

Maximum *recommended* breakaway thrust is:

40% N1

Do NOT exceed 40% N1 within congested areas unless cleared by appropriate personnel.

Airplane response to engine thrust may be slow, particularly with a heavy airplane. So the technique is to add the thrust and wait for it to take effect before adding additional excess thrust.

NOTE: The ability of the airplane to start moving may be impeded by having the tiller cranked hard over so that the nose-gear acts like a brake.

DO NOT ride the brakes to control taxi speed. The technique is to reduce excess speed with a steady application of brake and then release brake.
Repeat as necessary.

BLIND SPOTS

Like any airplane, there are areas where the pilots cannot see. Since the Captain does the taxiing, he has to look across cockpit, particularly when making right turns ... this is a SIGNIFICANT problem and virtually REQUIRES that the First Officer be involed in "clearing" the area. If obstacle clearance is in doubt in the RAMP AREA, wing walkers are advised.

ENGINE POD CLEARANCE

The airplane Engine pod is only 21 inches above the surface and is 20 feet from the centerline. ***BE EXTREMELY CAREFUL*** if there are obstructions such as snow piles along the edge of the taxi-way.

AIRCRAFT CLEARANCE IN TURN

The ARC of the TAIL is several feet greater than the arc of the airplane NOSE.
The ARC of the OUTSIDE WING-TIP is greater than that of the TAIL.

PROHIBITED FROM MAKING 180° TURN ON STANDARD 75 FOOT TAXIWAY.

The geometry of the airplane dictates that the nose wheel should be outside of the centerline when making a turn to keep the main gear centered. Add that the pilots sit about 10 feet in front of the nose wheels. The minimum pavement required to make a 180° turn is 80 feet, so the airplane is ***PROHIBITED*** from making a 180° turn on a standard 75-foot taxiway

SPEED IN TURNS

Use the speed readout on the ND (Navigation Display) to monitor taxi speed.
Here are the MAXIMUM recommended speeds:

- **STRAIGHT AHEAD ..... 25 Kts**
- **TURNS up to 45° ..... 25 Kts**
- **TURNS greater than 45° ..... 10 Kts**

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WARNING !!!

DO NOT move the flaps or flight controls until airplane is **MOVING** under its own power and is **CLEAR** of ground personnel and equipment.

OVER-STEER TENDENCY

The nose gear steering system is electrically controlled and incorporates a non-linear relationship between tiller bar deflection and nose wheel deflection. What is meant by this is that the tiller becomes increasingly sensitive when exceeding 60^{o} of deflection. This can contribute to the tendency to over control the turn.

HOW PILOTS CAN SCREW THIS UP!

DURING TAXI IN ICING.

The result of this oversteer tendency can be disastrous on an icy taxiway. If the nose gear starts to slip and the Captain responds by increasing the steering input in order to try and regain control. NOT GOOD! BAD IDEA!

DIFFERENTIAL BRAKING MAY BE MORE EFFECTIVE THAN NOSE WHEEL STEERING ON VERY SLIPPERY SURFACES.

NOSE WHEEL SLIPPAGE DURING TURNS

Since the nose gear strut is angled forward, as you turn the steering wheel and the angle of deflection increases, the outside tire is lifted off the ground, resulting in only one tire being more in contact with the pavement than the other. This reduces the amount of tire footprint and contributes to nose wheel slippage.

Now there is an understatement. Particularly in icing or slippery taxiway conditions, you will need all the “rubber on the road” that you can get. Cranking the tiller bar around reduces the rubber footprint continuously by an amount proportional to the angle of the tiller-bar. The tighter the turn, the less rubber on the asphalt.

Differential thrust can assist in maintaining airplane momentum through a turn.

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ANTI-ICE PENALTIES

There is NO GROSS WEIGHT penalty
when using ENGINE ANTI-ICE for TAKE-OFF.

NOTE:

When using anti-ice with a reduced thrust takeoff, SUBTRACT 5° C from the flex temperature BEFORE entering it into the MCDU (PERF page). This is to ensure that the FADEC calculates the correct reduced EPR.

VISUAL WING INSPECTION

Even if the airplane was de-iced in preparation for take-off and if the holding time HAS NOT expired, and there is any question as to the need for additional de-icing, then:
It is the Captain's responsibility to make a visual inspection of the wing surfaces. The Captain may designate another member of the cockpit crew. (Observer Member of the Crew (OMC) are also considered appropriate)
Here are the inspection criteria:

- Flaps set for take-off.
- Within 5 minutes of the take-off time.
- The inspection takes place from inside the cabin from the most advantageous windows (normally marked with black triangles):
  A320: Second window forward of the overwing emergency exits,
  A319: Sixth window aft of the overwing emergency exits.

ENGINE ICE discussion

Ice may build up on parts of the engine while the rest of the airplane shows no visible accumulation. Here's how that happens: during ground operations in idle, as the air enters the engine inlet, it accelerates and the pressure drops causing the temperature to drop resulting in ice potentially forming on the interior parts of the engine.

50% N1

Periodic engine run-ups should be based on the existing weather conditions rather than on visible airframe ice. Periodic engine run-ups are required even though the engine anti-ice is on.

When in weather requiring engine anti-ice, you should run-up to a minimum of 50% N1. The purpose is to SHED ICE. Shedding ice is dependent on the rotational speed of the N1 rotor. There is no requirement sustain the high RPM, just to achieve 50%, even momentarily. The amount of ice shed is not proportional to the amount N1 rotor speed. Thrust settings below 50% are not effective in shedding ice.

ENGINE RUN-UP comments

As soon as you can after leaving the gate area but not more than 10 minutes after engine start ... the first run-up should be accomplished. The interval between run-ups should not exceed 10 minutes. To avoid lateral slipping problems, it is suggested that both engines be run up simultaneously.

If the airplane slides, move to another location where there is drier pavement.

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ENGINE RUN-UP

During ICING CONDITIONS, it is considered Standard Operating Procedure (SOP) to perform an engine run-up just prior to take-off. When in position on the runway just before you begin the take-off roll:

- Set Parking Brake,
- Run both engines up to 50%,
- Check all primary engine instruments for normal operation,
- Release Brakes,
- Initiate the take-off.

50%

If engine indications are NOT normal:
- Reduce thrust to idle, then
- Perform a second run-up.

If OK, GO ... if not taxi clear of the runway and contact maintenance.

CAUTION

DO NOT RELY ON HOLDING THE BRAKE PEDALS DURING RUN-UPS.

Airplane movement occurring while you are preoccupied with monitoring the engine instruments is a real possibility. On really icy surfaces, brakes may not be able to restrict the movement of the airplane at run-up power settings ... be prepared to limit thrust.

PITCH UP PROBLEM

I'm just going to mention this as an awareness item. The potential is for a tail strike ... or if there is an asymmetrical lift vector, it could induce a roll and the potential for a pod strike.

During ICING conditions, a combination of
- Contaminated leading edge, and
- Faster than normal rate of rotation (3º per second is considered normal).

can possibly result in a "spontaneous" pitch up.

WING ANTI-ICE

Since the wing anti-ice can be used effectively as a de-icer, conditions permitting, plan to turn on WING ANT-ICEAFTER first power reduction.

If the take-off is to made with ENGINE BLEEDS OFF, do not turn on wing anti-ice until AFTER the engine bleeds have been turned ON.

WARNING

Prolonged operation in icing conditions greater than light would be appropriate ***ONLY IN AN EMERGENCY !***

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DANGER !

Right here is one of the most dangerous places in the flight evolution. It is a place where the pilot must NOT get pushed or do things in a rush. The ground crew, the jet, and the pilot's career are in great jeopardy ...

DO NOT SCREW THIS UP!



Every year there are literally hundreds of crews around the world that start their taxi ***BEFORE*** they are ready. The flight crews get pre-occupied with getting their jet "out on time" or are desperately trying to get in the line-up for take-off before Brand X, or ....
THIS IS A MOMENT OF CRITICAL PRESSURE.

There are 2 PROBLEMS

- Premature TAXI with push-back crew still "hooked up."
- Start TAXI with the **NW STRG DISC** message displayed on the ECAM.

WARNING

The Captain *MUST NOT* request a taxi clearance ***UNTIL***:

- **NW STRG DISC** message no longer on **ECAM**, and
- Guide man gives BOTH
  SALUTE SIGNAL, and
  RELEASE FROM GUIDANCE SIGNAL.

If the Captain CANNOT PHYSICALLY see the guideman ... it is permissible for the First Officer, with the concurrence of the Captain, to view the salute and advise the Captain.
HOWEVER
ONLY the Captain can acknowledge the salute by

FLASHING THE NOSE TAXI light from TAXI back to OFF.

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One major airline is so concerned, they have developed a seven step procedure that ***MUST BE COMPLETED BEFORE*** the Captain is to release the parking brake.

Here is one solution proposed by a major airline:

THE 7 STEP GATE DEPARTURE PROCEDURE

STEP 1: [C] **"*I have a salute...*"** The Captain verifies, announces, and PHYSICALLY returns the guide-man salute. This indicates that all personnel are clear of the aircraft.

STEP 2: [C] **" *And a release from guidance*"** ... The Captain verifies and announces he has the signal to taxi. This signal means that in the guide-mans opinion, the airplane may commence taxi without further guidance from him. ***IT DOES NOT MEAN*** that the airplane is cleared to taxi. The Captain responds to the ground personnel by "flashing" the TAXI LIGHT.

STEP 3: [C] **Antiskid and Nose Wheel Steering switch .... ON.**
If you try to taxi with this switch OFF, you will have ***NO NOSE WHEEL STEERING and NO ALTERNATE BRAKES***.

NOTE:
YOU MUST "RELEASE" ALL STEERING AND BRAKE PEDAL INPUTS BEFORE TURNING ON THIS SWITCH.

STEP 4: [C,F/O] **Audio Control Panels** ..... Each pilot set their own panel.

STOP ...WARNING!
DO NOT *set up the audio control panels until the Captain announces the she/he has a"Salute and a release from guidance." This has proven to be a place where PILOTS SCREW UP.*

STEP 5: [C] *Politely requests* ***"Taxi Clearance, Please."***
(I put that "polite" thing in there myself.)

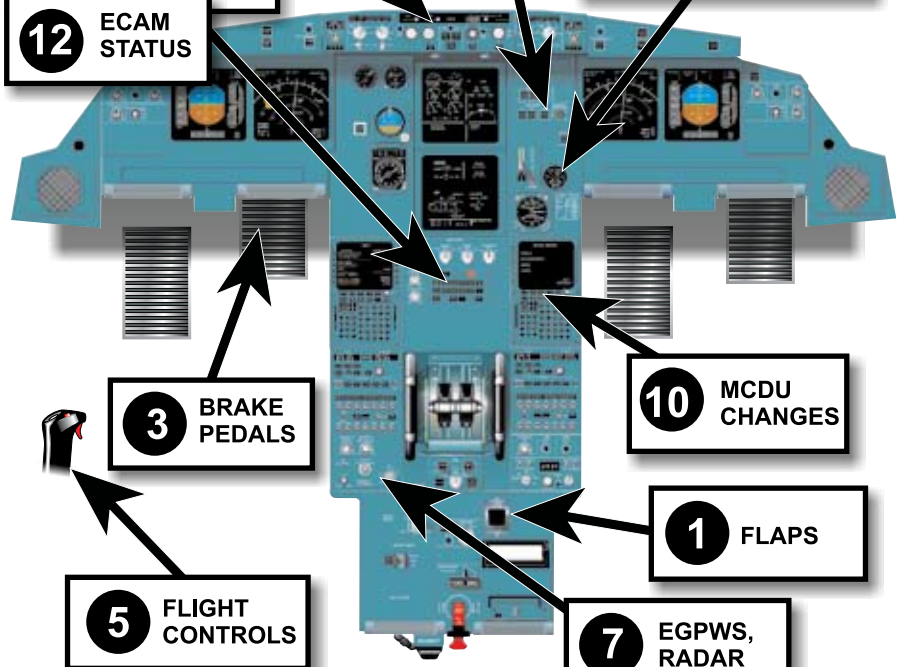
STEP 6: [F/O] **Obtain the taxi clearance.**
The First Officer WILL NOT call for the taxi clearance until BOTH pilots are ready to copy and confirm the information. Do NOT request taxi clearance in anticipation of taxi PRIOR TO the request from the Captain. Experience has shown that this is one of the places where confusion results in potential unsafe operation.

STEP 7: [C] **Captain may now release the parking brake.**
Turn the handle off and observe the brake pressure gauges move to "ZERO."

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TAXI OUT FLOW



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1 **(F/O) FLAPS ..... SET**
Move FLAP selector to the TAKE-OFF setting;
VERIFY Flap handle position is the same as the FLAP INDICATOR on the upper ECAM.

NOTE:

The following discussion is intended as an example ONLY for one specific airlines approach. I do not know exactly how EVERY other airline selects the take-off runways; but since Airbus has actually certificated the airplane to operate using "Optimized V-Speeds" I can only guess that other operators use similar techniques to comply with their airplane certification.

FLAP SELECTION DISCUSSION:

Airbus certified their airplanes using something called **OPTIMIZED V-SPEEDS**. This is different from old-school techniques such as "balanced field" that have been used for years by other airplane companies. It greatly simplifies flap selection and works sorta like this. The Airline engineering staff (SFOEG for the UAL guys) takes each runway and makes a database that pre-selects the appropriate takeoff flap settings predicated on weight and "optimum V1" so as to take advantage of the full runway length. As a general statement, here are the broad guidelines used for applying flap choices (doesn't necessarily cover all situations):

FLAPS 1 - Use for long runways where BRAKE ENERGY could be a factor. For example a HIGH ALTITUDE airport like Denver, Colorado. Flap 1 V1 speeds are lower than Flap 2 V1 speeds for a given weight. The up-side is that these lower V1speeds provide a better brake energy limit; the downside is that the lower V2 results in a reduced performance limit weight because of the reduced climb gradient.

FLAPS 2 - Where long runway is available and BRAKE ENERGY and stopping the airplane on the runway is NOT the major concern. Flaps 2 "generally" provides the BEST PERFORMANCE LIMIT WEIGHT due to the increased climb gradient.

FLAPS 3 - A Short runway where you might want the least take-off roll. Flaps 3 provides the best runway limit weight for shorter runways.

IMPROVED FLAPS V-SPEEDS - (Generally speaking) Provides the greatest take-off weight capability. However, these procedures are designed to be used ONLY if the actual takeoff weight is greater than the maximum allowable gross weight for the runway in question using normal flaps and V-speeds.
Typically used on
- Short runways where runway limit weight needs to be maximized,

or
- Long runways at high altitude runways where performance limit needs to be maximized.

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So ... all that is interesting, but WHERE do I get a take-off flap setting?

Since the flap settings are already derived and the FMGC has all the necessary information resident in it's database to accomplish a calculation, the information can be derived by using the MCDU to yield the solution.

TECHNIQUE 1: Use the **ACARS** function. This is the easiest way.

STEP 1. Pull up the **RWY DATA** page.
STEP 2: The ONLY required entry is the runway. Enter the runway number.
This is a little tricky and here is the protocol for that:
Enter the runway number. For example; 33
or for single digit runways only enter the single digit,
such as 9. **Do NOT enter the zero in front of the 9**.
If there is a following modifier, enter it; such as 35L.
You can enter two digit if appropriate; such as 16LJ.
STEP 3: Since you have only entered the runway and nothing else,
the FMGC will use this logic to determine appropriate Flap configuration.
- If reduced thrust NOT available,
  it will select the lowest flap setting possible.
- If reduced thrust IS available,
  it will select the flap setting with the highest assumed temperature.
- If assumed temperatures are the same.
  it will select for the lowest flap setting.

TECHNIQUE 2: Use the **EPR/ATOG** message

STEP 1. Compare the "ASSUMED TEMPERATURES" with the choices for available flap settings. If the assumed temperatures are different, select for the flap setting that has the HIGHEST assumed temperature.

WHY THIS WORKS:
The ASSUMED TEMPERATURE represents the measure of the take-off "pad" or "buffer" available. So, the higher the assumed temperature, the greater that "safety margin."

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THIS IS A BIG, BIG DEAL!!!

UNDERSTAND THIS !

THE BRAKE CHECK
(*or more appropriately, the BSCU check*)

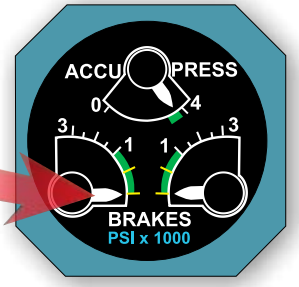
DISCUSSION:

The BIG problem with this system is not some hydraulic line blowing up or leaking or coming undone ... but rather the dreaded failure of the BSCU (BRAKE STEERING CONTROL UNIT) computer.

2 **(C) BRAKES ..... CHECK**

The BRAKE CHECK must be performed after the airplane is moving.

HOW TO DO THE BRAKE CHECK:



3 **STEP 1: [C]** Press the BRAKE PEDALS (top of the rudder pedals) smoothly.

4 **STEP 2: [C]** YELLOW system parking brake pressure ..... Verify "zero."

DISCUSSION:

This system is very difficult for a mere human pilot to understand. Let's talk about the situation.

The way the hydraulics are plumbed on the Airbus;

- The GREEN system powers the "NORMAL BRAKES", and
- The YELLOW system supplies pressure to the PARKING BRAKE and the ALT BRAKES.

Here is where the pilots get confused,
that little gauge on the instrument panel is for the "PARKING BRAKE" and represents the YELLOW system pressure being supplied to the PARKING and ALT brake system ONLY.
If we depress the "TOE" brakes on the rudder pedals, GREEN system pressure is supplied to the brakes. Since there is no gauge on the instrument panel to monitor that pressure, the brake pressure gauge should indicate "ZERO" pressure to the parking/alt brakes from the YELLOW system. In a kinda negative proof way, it indicates a "normal" brake situation.

BOTTOM LINE:

If you depress the "toe" brakes and the airplane stops, the system is operating normally **ONLY IF** there is "**ZERO**" pressure indication on the (parking) BRAKE PRESS gauge."

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DISCUSSION:

As soon as we can after getting the salute and release from guidance, we want to determine if the BSCU is working properly. DO NOT get jammin' down the taxiway and then do the BRAKE/STEERING CHECK. Do it while you are still creeping along at some snail pace.

BIG PROBLEM!!!

IF EITHER OR BOTH

THE BRAKE and/or NOSEWHEEL STEERING FAIL



DO NOT TURN THE

A/SKID & N/W STRG switch OFF

until

RELEASING TOE BRAKE PRESSURE

DISCUSSION:

If you were to turn off the A/SKID & N/W STRG switch OFF with the TOE brakes even a teensy-tiny bit depressed.

WHAM!!!

The brakes apply MAX braking immediately and the airplane feels like it has hit a brick wall. Even at very small forward speeds the effect is truly memorable. The flight attendants particularly will forever reserve a place for you in their memories.

(C) BRAKES ..... immediately RELEASE
Remove ALL (Did I say ALL!!!) pressure from the toe brakes.

(F/O) A/SKID & N/W STRG switch .....OFF
Right here is where the problem can occur. The First Officer MUST coordinate with the Captain to ensure ALL pressure is removed from the TOE brakes. The problem is that the Captain is trying to regain braking by pushing harder on the toe brakes ... it is counter intuitive for him to release the pressure momentarily so the "switch" can be turned OFF. Then..

(C) USE TOE BRAKES TO ACTIVATE ALTERNATE BRAKING and STEERING.
Do not continue taxiing. Use differential braking pressure to steer the airplane and bring the airplane to a stop. ***DO NOT EXCEED 1000 PSI on the BRAKES and ACCU PRESS gauge.***
If for some reason, the alternate system doesn't activate and the toe brakes still don't work. You can use successive short parking brake applications to slow and stop the airplane. Once you are stopped ...

(C) SET PARKING BRAKE.
Get outside assistance via radio to either repair (reset BSCU) or tow to maintenance area.

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When there is an appropriate lull in the activities, the Captain will call for ...

5 [C,F/O] THE FLIGHT CONTROL CHECK

The ECAM F/CTL page will be automatically displayed whenever flight control inputs are detected. It will remain displayed for 20 seconds after the last input.

***NOTE**: The control check MUST be performed in the required order.*

Both pilots will be involved in the check, with the First Officer "HEAD DOWN." The Captain MUST maintain situational awareness during the check and not run into anything.

HOW TO DO THE FLIGHT CONTROL CHECK:

STEP 1: Captain announces and moves side-stick "**UP (BACK)** and **DOWN (FORWARD)** and **NEUTRAL".**
First Officer verifies full and proper movement of control surfaces on the ECAM F/CTL page, and responds "**CHECK.**"

STEP 2: Captain announces and moves side-stick "**LEFT** and **RIGHT** and **NEUTRAL**".
First Officer verifies full and proper movement of control surfaces on the ECAM F/CTL page, and responds **"CHECK".** All the spoiler panels should be retracted.

NOTE: Ailerons will "DROOP" if the flaps are extended.

STEP 3: Captain will press the **PEDALS DISC** switch on the tiller bar; and apply **FULL LEFT** and **FULL RIGHT** and **NEUTRAL** rudder while maintaining forward direction with the tiller bar.
The First Officer will follow through on the rudder pedals and verify full and proper movement of the control surface on the ECAM F/CTL page, and responds "CHECK."

STEP 4: First Officer then verifies "**LEFT, RIGHT, NEUTRAL**" using the right side side-stick.



WARNING:
YOU MUST ensure that the GROUND SPOILERS are RETRACTED before ARMING THE AUTO-BRAKES.

6 [F/O] AUTOBRAKES SWITCH ..... MAXIMUM

The only time we select MAX is for take-off. It is used for take-off ONLY!

WHAT PILOTS SCREW UP!

If the ground spoilers are extended even a teensy bit; when you arm the auto-brakes ...
THE AUTO-BRAKES WILL ACTIVATE IMMEDIATELY TO MAX!
***WHOOOOPS !!!! ...**another chance to "HIT A BRICK WALL!"*

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7 **[F/O] EGPWS and RADAR displays ..... SELECT (as required)**

If the use of the weather radar is required; then either or both pilots may select the TERR or TERR ON ND switch OFF.
If weather radar is not to be used; then both pilots should select TERR or TERR ON ND.

NOTE:
Even if both pilots are in the weather radar display mode, the terrain display pop-up feature is still available.



The ND selector has an OUTER SELECTOR that controls the brightness of the weather **RADAR** and the **EGPWS** image only.

NOTE:
The outer selector of the ND brightness selector MUST BE ON and BRIGHT to ensure the EGPWS pop-up feature is visible in the event of a windshear.

8 **[F/O] PWS SWITCH ..... AUTO**

9 **[C,F/O] BEFORE TAKE-OFF CHECKLIST .....COMPLETE**
(Down to manifest changes)

BEFORE TAKE-OFF CHECKLIST

CHALLENGE [F]	RESPONSE
Control check	Complete [C,F/O]
Engine anti-ice	On/off [C]
Autobrakes	Max [C]
Flaps	___Planned____indicated, detent [C]
Engine Mode Selector	Normal/ignition start [C]

---------- MANIFEST CHANGES ----------

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DANGER ZONE

Right here is where the flight crew gets really over powered with the crush of "getting it all done". Particularly during a short taxi, the First Officer can easily get into task saturation. Each separate item MUST be completed properly before proceeding to the next ...HOWEVER, that seems impossible since the crew does NOT set the pacing of the task stream. ATC is giving information that demands attention, the Load Planner is passing streams of data that must be checked and entered appropriately, the Flight Attendant is needing your attention and has important information, an ECAM warning appears, and on and on.

This is
FIRST OFFICER
BUSY TIME !

The Captain is the moderator and controlling agent. The First Officer will be "HEAD DOWN" and up to her elbows in alligators. The Captain MUST maintain

SITUATIONAL AWARENESS

If necessary, coordinate with ATC (Ground Control), taxi clear of the taxi-way, set the parking brake and resolve any issues.

Here is the OFFICIAL model for
WORKLOAD MANAGEMENT:

- **PLAN**
- **PRIORITIZE**
- **SEQUENCE**
- **ASSIGN**



while the Captain remains "IN CHARGE". All crew members are empowered to speak up on any issue and it is assumed that communication can resolve problems.

If the First Officer is a Newby, take that into consideration and slow the tempo of the operation to an appropriate level.

Final word of advice to Captains: Take whatever time is required to get everything done. This is ***NOT*** the place to make up time.

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10 [F/O] RUNWAY and/or ROUTE CHANGES

(if appropriate) .....ENTER

Runway and or route changes changes are made on the MCDU F-PLAN page. It can be kinda tricky.

Go to the F-PLAN page and re-enter the departure runway using a LATERAL REVISION off the first fix. In our case: **LFPG27L**.

Route changes can be entered directly on the F-PLAN page, use the **CLR** feature to delete "old" routing. This is fairly intuitive and doesn't need much explanation. If you screw things up, you can always use the SEC F-PLAN that we had copied just for this situation.



WHAT PILOTS SCREW UP:

They try to change runways on the PERF page. While this seems simple solution, it will NOT work. You have to make the runway/route changes on the F-PLAN page.

DO NOT MAKE RUNWAY CHANGE ON PERF PAGE.

LISTEN UP: another *POTENTIAL SCREW UP*

There is a very special feature of the Airbus MCDU that operates on the **F-PLAN** page. It is called **AUTO STRINGING**. This is intended as a speed tool, but until you understand it, you will be baffled when you first see it work.

Hey, Where'd all my fixes go?

Here is a description of this feature.

When a waypoint is inserted into a flight plan, such as during a lateral revision, and the same waypoint occurs in a SID, STAR, or transition routing ... the FMGC automatically removes the intervening waypoints and connects the two common waypoints.

If a waypoint on the selected STAR is an IAF for the selected approach, the FMGC will autostring the two together, thereby deleting the STAR waypoints that are beyond the IAF (Initial Approach Fix).

AUTOSTRINGING MAY NOT REFLECT YOUR ACTUAL ATC CLEARANCE, YOU MUST VERIFY ROUTING AFTER A CHANGE.

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DO NOT TAKE OFF WITHOUT THE FINAL WEIGHTS.

The final weight manifest ***MUST BE*** received and the changes made (if appropriate) prior to crossing the runway threshold. Generally, these changes are received while the airplane is taxiing to the runway. The information can be passed to the airplane using either voice radio or cockpit printer.

CONFIRM THAT THE CHANGES YOU HAVE ARE THE CORRECT CHANGES FOR YOUR FLIGHT !

[F/O] FINAL WEIGHTS ..... ENTER

NOTE: *Once the second engine is already started, it will not be possible to access the* **INIT B** *page, Use the* **FUEL PRED** *page for weight changes.*

1. If the final weights were not entered prior to engine start, enter the airplane's actual gross weight on the FUEL PRED page by adding the final ZFW to the actual fuel on board.
2. ***ALWAYS*** enter the final CG.
3. If the CG is forward of 25%, use the forward CG flowcharts in the Take-off Performance chapter.
4. Verbally advise the Captain of any weight changes and if there are any V-speed changes and final CG.
5. Reset the stabilizer trim, if necessary, and confirm rudder trim is zero.

[F/O] TAKEOFF PERFORMANCE ..... CONFIRM

After you get the final weights;
- VERIFY that the takeoff performance is acceptable, and
- MODIFY V-speeds for the actual gross weight, if required.

IMPORTANT NOTE:

If the actual weight of the airplane is too heavy for the current FLEX TEMPERATURE, use the ACARS to obtain "new" flex thrust takeoff data.

[C,F/O] FLIGHT PLAN PAGE on MCDU ..... SELECT

While there is no "hard and fast" rule about this, it is recommended that both pilots select the F-PLAN page for takeoff.

11 **[F/O] TAKEOFF CONFIGURATION PAGE ..... SELECT (on ECAM)**

Verify at least two entries:
- **NORMAL** is displayed.
- **FLAP SETTING** is correct.

12 **[F/O] ECAM STATUS ..... CHECK**

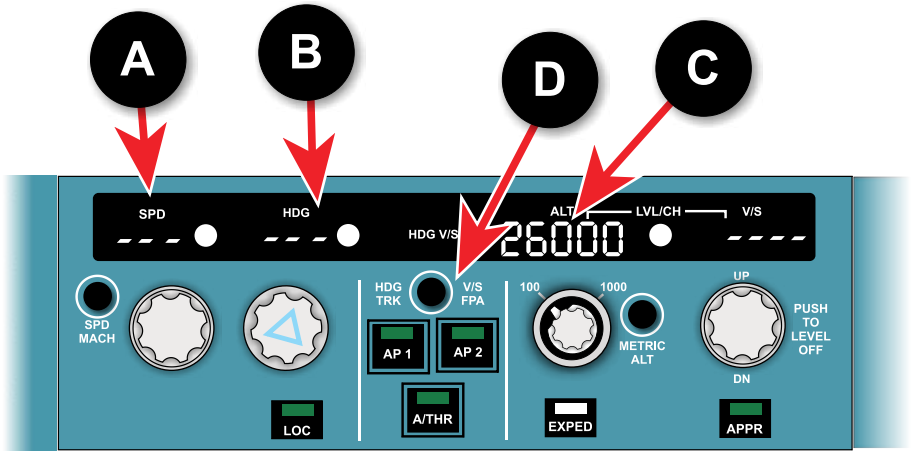
If **STS** (Status Page on ECAM) is NOT DISPLAYED ..... disregard this step.

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13 [F/O] FCU ..... CHECK

Ensure that the FCU is set-up as follows:



A. SPEED WINDOW ..... DISPLAY "WHITE DOT" and dashes

With the "dashes and dot" displayed, the "hidden" value selected will be the speed displayed on the **PERF/CLIMB** page in the **MCDU**. If an undesired airspeed is displayed, "**PUSH**" the selector knob to display the "dashes and dot"..

B. HEADING/NAV ..... Verify

OPTION 1: If you are going to use **NAV** for your departure heading, then all you have to do leave the "white dot and dashes" in the window.
At 30 feet, the NAV will engage and the airplane will start an aggressive turn towards the next waypoint.

OPTION 2: Pull the HDG SEL knob to fly runway heading, ensure that the airplane is heading indicator is on the runway heading, then, at 30 feet RWY TRK will engage.

OPTION 3: You may preset a desired after-takeoff heading.

TECHNIQUE

Setting runway heading in the display is desirable for a couple of reasons.
1. In the event of an engine failure, we would want runway heading since that will represent protected (clear of obstacles) airspace up to 1500 feet.
2. Turns at extremely low altitudes are undesirable.

C. ALTITUDE ..... Verify

Set in the NEXT cleared altitude.

D. HEADING-VS/TRK-FPA ..... Verify

Select HDG TRK or V/S FPA

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14 **[C,F/O]**
BEFORE TAKEOFF CHECKLIST.....
COMPLETE DOWN TO FINAL ITEMS.

---------- MANIFEST CHANGES ----------

Trim ..... ____%, Zero, set [F]
Weight, speeds ..... Checked [F], set [C,F]
FMGCs, radios ..... Programmed, set for departure [C,F]
EGPWS, radar displays ..... Terrain/weather [C,F]
PWS ..... Auto [F]
Thrust ..... ____Flex/TOGA EPR, set [C]
FCU ... Managed heading, heading ___/nav, altitude____, set [C]
Takeoff configuration ..... Normal [F]
ECAM status check ..... Complete [F]

---------- FINAL ITEMS ----------

ABOUT 2 MINUTES BEFORE DEPARTURE

15 **[F/O] CABIN NOTIFICATION ..... ACCOMPLISH**

The announcement should be a "stand alone" message. By that I mean, the only thing you want to say in this message is:
"**FLIGHT ATTENDANTS PREPARE FOR TAKEOFF**"
or some such statement.
Do not include other material in this announcement.

When APPROACHING TAKEOFF RUNWAY or "Cleared to HOLD SHORT"

[F/O] TRANSPONDER ..... TRAFFIC

[F/O] TAKEOFF MEMO..... CHECK

Verify all the lines in the TAKEOFF memo are GREEN

[C,F/O] BEFORE TAKEOFF CHECKLIST..... COMPLETE

---------- FINAL ITEMS ----------

Cabin notification ..... Complete [F]
Transponder ..... Traffic [F]
Takeoff memo ..... Green [F]

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This is the moment of truth:

At this point in the flight evolution, we have to ask ourselves this question:

IS THERE ANY REASON WHY I SHOULD NOT TAKE OFF?

If there is ANY ambiguity that might affect the successful resolution of the take-off or the flight, we MUST confess, get a clearance to taxi clear, park the airplane, and resolve that ambiguity. *This is what the Check Captain is going to want to see. She/he will want to see you evaluate the situation and resolve the potential problem.*

DISCUSSION:

This is a sad but true fact, there are so many restrictions to flight in commercial aviation that are hidden in a huge pile of manuals and handbooks, that it is virtually impossible for a mere human pilot to have every one of the impediments committed to memory and available for instantaneous recall ... much less even know where to look. Plus they are constantly being changed and altered into a continuously evolving mountain of obscura and eclectic knowledge. Don't expect the ultimate solution here, but let's list just a few of the items that your will be responsible for.

NOTE: *If your airline has different ones, cross these out, write your restriction in the box, continually be adding to your own personal list. Make it a hobby.*

WIND

Takeoff/landing CROSSWIND guidelines

"REPORTED" Braking action	TAKEOFF	LANDING
GOOD	*See CROSSWIND LIMITS in next table*	
FAIR/MEDIUM	**25**	**25**
POOR	**15**	**15**
NIL/UNRELIABLE	**OPERATIONS *NOT RECOMMENDED***	

NOTE: *The ICAO term for FAIR is MEDIUM, NIL is UNRELIABLE*

MAXIMUM "demonstrated" CROSSWINDS

... with FLIGHT CONTROLS in NORMAL or DIRECT LAW (with or without yaw damper).

	A320		A319	
WIND DIRECTION	TAKEOFF	LANDING	TAKEOFF	LANDING
CROSSWIND	**29 Knots**	**33 Knots**	**29 Knots**	**33 Knots**
CROSSWIND with GUSTS	**38 Knots**			
TAILWIND	**15 Knots**	**10 Knots**	**10 Knots**	

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Just when you thought you were all ready to takeoff ...

> *"... if the weather conditions at the airport of takeoff are below the landing minima in the certificate holder' operations specifications for that airport (to include increased landing minima in the case of newly qualified Captains with high minimums), no person may dispatch or release an airplane from that airport unless the dispatch or flight release specifies an alternate airport located within the following distances from the airport of takeoff..."*
> *FAR part 121.617*

Here is what that said.

*IF you cannot return and land at the same airport because the weather is below landing minimums then you must designate a **TAKEOFF ALTERNATE.***

TAKEOFF ALTERNATE REQUIRED

When:

WEATHER AT DEPARTURE AIRPORT is BELOW LANDING MINIMUMS

for
A319 / A320
TAKEOFF ALTERNATE must be within

370 NM

1 HR NORMAL CRUISE
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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MICROBURST:

The #1 reason NOT TO T/O is a MICROBURST ALERT from ATC.

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

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.

NOTE: *If "clutter" exists, it may require adjustment to the V speeds. Check your Flight Operations Manual for guidelines.*

ICING and FREEZING PRECIPITATION:

	LIGHT	MODERATE	HEAVY
FREEZING RAIN	OK	NO-OP	NO-OP
FREEZING DRIZZLE	OK	OK	NO-OP
SNOW	OK	OK	OK

NOTE: *I have heard that "ICE PELLETS" have been added to this list (... but I can't confirm that).*

IF BRAKING ACTION NIL:
Takeoff NOT RECOMMENDED.

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!

WEIGHT of AIRPLANE TOO GREAT for the existing runway conditions.

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EOSID, "T" procedure, E-route,
and other single engine escape techniques

Unless otherwise noted, every runway that you will fly out of will have the following criteria:

> "*Terrain clearance will be ensured if you fly the extended runway centerline up to 1500 feet AFE.*"

Some airlines and airports have made provision for special routing after take-off in the event of an engine failure. They are concerned that airplane performance may be seriously jeopardized by loss of an engine to the point where the "normal" departure becomes questionable where terrain and obstacle clearance is concerned ... so in accordance with directives from the controlling agencies (FAA and JAR-OPS subpart G) they sent their engineering personnel to every airport where they thought there might be a problem and devised an alternate escape procedure, contingency plan, special departure procedure, "T" procedure, etc. for every airport/runway they expected to use. The officially used title for these procedures is ...

EOSID

Engine Out Standard Instrument Departure

There are basically two types of EOSID (Engine Out Standard Instrument Departure) procedures:

- **EOSID**; which will reposition you for an immediate return to land.
- **Special EOSID** (EMERGENCY TURN) which presumes avoidance of obstacles due to lack of performance.

Official definition of EOSID: "*An EOSID is a departure procedure diverging from SID published by the local authorities, to be flown in case of engine failure. The EOSID is produced by the operator ...". "Local authorities [may] propose themselves the EOSID in a particular airport (e.g.: Innsbruck).*"

"T" page, "E-route", and

other company developed procedures

Some airlines felt that these were not enough and so they added some of their own procedures where the EOSID were considered inadequate. These "special" procedures are not necessarily recognized by the various control agencies (Towers, Departure Controls) where the airline operates. As a result, if you are attempting to fly some "T" or EOSID procedure ... you will be required to either obtain a clearance ... or declare an emergency and state your intentions.
For example: "*ABC Tower, this is XYZ123, we have experienced an engine failure/fire and I am declaring an emergency. I am turning to a heading of 123 degrees, etc.*"

BIG CONFUSING AREA

If there is both a contingency procedure such as a "T" page and a conflicting EOSID ... which one should the pilot fly?

You need to sort this out NOW, before you are up to you eye-lashes in a pool of alligators. Here are some thoughts.

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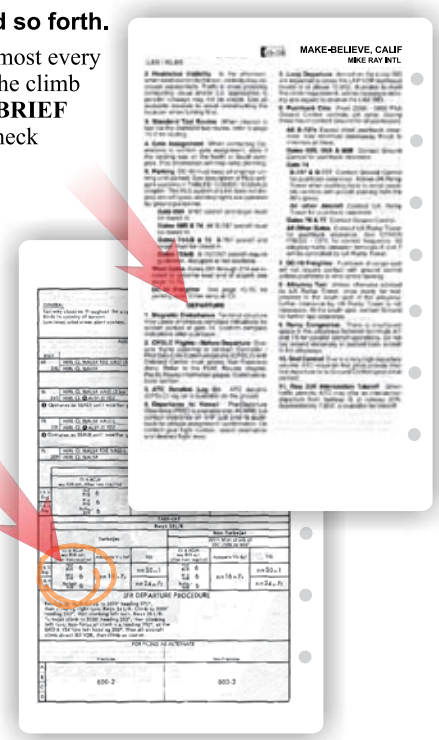
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CHARTS, NOTAMS, PIREPS, and so forth.

There is information on the charts for almost every contingency. Eng failure after take-off, the climb corridor, noise abatement, and so forth. **BRIEF EVERY APPLICABLE PART**. The Check Captain will be looking for that.

Also, be aware that there are TAKE-OFF MINIMUMS. In general, and this is just a statement from me, you will have to look at the individual chart ... Take-off minimums look something like this 600-600-600; Where they are describing the three parts of the takeoff runway using “landing” nomenclature. By that I mean TDZ (touchdown zone), MID (midfield), ROLLOUT (far end). For example; if there is a fog bank blowing onto the runway, and the rollout end becomes less than 600 RVR; it would be controlling and you could not take-off.

Be Alert.



ETC., ETC., ETC.

I can’t think of every imaginable thing that we would have to consider before taking off ... and each airline and airplane model has their own set of rules; besides they are constantly changing. So, I am leaving part of this page blank for you to write some of the restrictions to take-off that you can come up with.

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Here are two suggested briefing guides that are used at a major aircarrier for their pilots to use during the check-ride. It leads you to believe that these are the only items essential to pass the check-ride. I personally used these only as a prompting mechanism as there are missing items as well as superfluous items on the list.

BUT

that being said, it is a good place to start, and I suggest you make up a similar list to jog your memory.

TAKEOFF DATA BRIEFING

- ☐ NOSE NUMBER matches LOGBOOK and MAINTENANCE RELEASE.
- ☐ RELEASE NUMBER is correct for paperwork.
- ☐ ZFW/TOGW matches MCDU
- ☐ TRIM SETTING.
- ☐ BLEED CONFIGURATION.
- ☐ FLAP SETTING.
- ☐ EPR/N1.
- ☐ RUNWAY LIMIT/PERFORMANCE LIMIT.
- ☐ WIND CORRECTION.
- ☐ T or ESOID PROCEDURES.

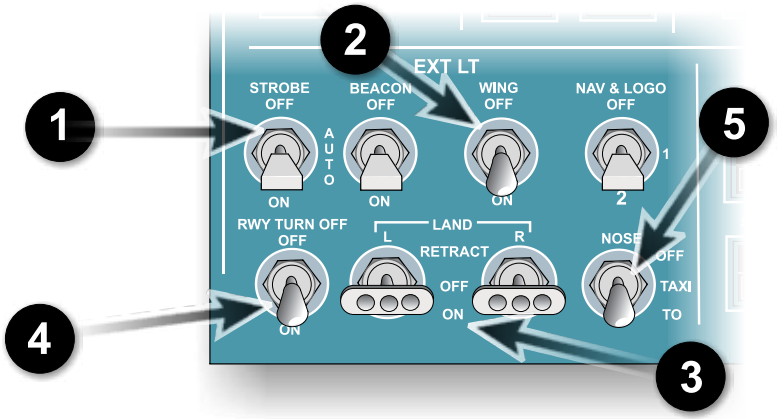
PRE-DEPARTURE BRIEFING

- ☐ CREW DUTIES.
- ☐ FLIGHT PLAN CHANGES.
- ☐ NOTAMS/BULLETINS.
- ☐ WINDSHEAR.
- ☐ RUNWAY CONDITIONS.
- ☐ REJECTED TAKE PLAN.
- ☐ ENGINE FAILURE PROFILE.
- ☐ CLEARANCE.
- ☐ SID.
- ☐ EOSID or T-PROCEDURE.
- ☐ TAKEOFF PROFILE.
- ☐ TERRAIN / OBSTACLES.
- ☐ TRANSITION ALTITUDE.
- ☐ TRAFFIC WATCH.
- ☐ OBSERVER BRIEF.

ENTERING THE CONFINES OF THE RUNWAY

When we finally receive the clearance from the tower to enter the confines of the runway; they will issue a clearance like:
"Position and Hold" or "Cleared for line up."

Anytime the airplane has entered ANY runway environment; it is some company's policy to "**TURN ON THE LIGHTS**".



1. **[C] STROBE LIGHT SWITCH ..... ON**
2. **[C] WING LIGHT SWITCH ..... ON**
3. **[C] LANDING LIGHT SWITCHES ..... ON**
4. **[C] RUNWAY TURNOFF LIGHT SWITCH ..... ON**
5. **[C] NOSE LIGHT SWITCH ..... ON**

For a takeoff from a FULL STOP ... The Captain will steer into position and align the airplane on the runway centerline.

DO NOT RELY ON "HOLDING" THE BRAKES
SET THE PARKING BRAKE

[C] PARKING BRAKE ..... SET, CHECK PRESSURE.

GENERAL COMMENTS

regarding the TAKEOFF

It is Company SOP that **BOTH** flight directors be on for **ALL** takeoffs, if available. At least one flight director MUST BE ON for the SRS to operate.

WARNING:
DO NOT USE THE TILLER BAR
DURING TAKE-OFF ROLL !

Maintain directional control using the rudder. Remember that the rudder pedal controls nosewheel steering and that it does so in a continuously diminishing way. That is: steering authority starts to decrease above 40 kts and is completely removed by 130 kts.

Rolling Take-offs are OK. While they don't increase the takeoff capability, they do expedite takeoff, make for a smoother transition, and reduce (somewhat) the potential for FOD damage.

TAIL STRIKE

Outside of running off the runway by using the tiller bar during the take-off roll, the MOST FEARED event is the dreaded TAIL-STRIKE. Oh sure, there are a lot of reasons this could occur:
Early rotation, Erroneously LOW Vr, Flaps set improperly, Trying to get off to avoid birds or obstacles, directional control problems due to gusty winds, etc.
BUT the ***NUMBER ONE REASON*** a tail-strike could occur is:

BOTH PILOTS MAKING
SIMULTANEOUS STICK INPUTS !!!

Pilots aren't stupid (usually) so how could this occur. The NUMBER ONE REASON is that both pilots think that they are supposed to be doing the take-off.
THIS IS A BIG DEAL!!!

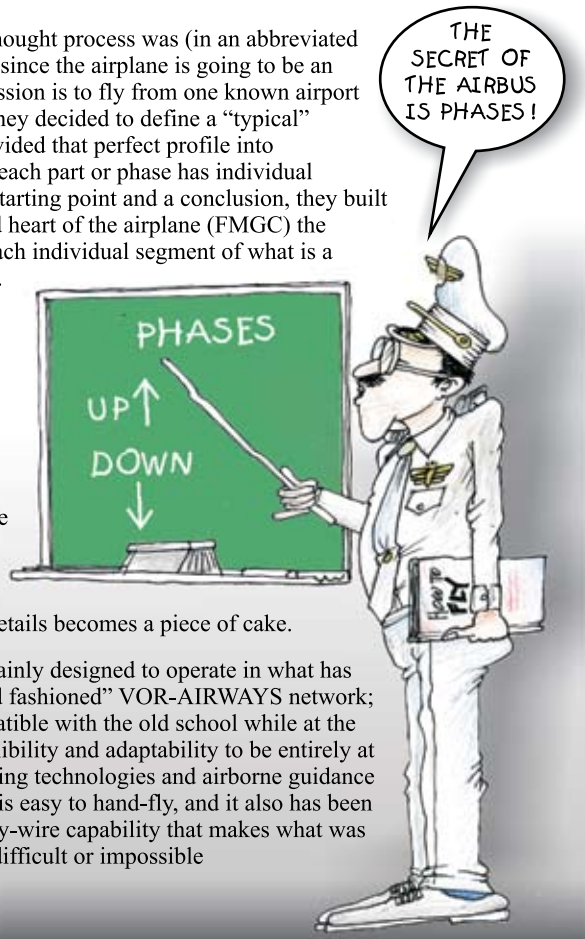
IMPORTANT:
Captain makes a statement confirming who is going to make the takeoff and the status of the brakes:
"***I (You) have control of the airplane, and the parking brakes are (are not) set***".
The First Officer acknowledges a transfer of control.

STOP! LET'S TAKE A BREAK FOR A TIMELY DISCUSSION

GROUND SKOOL

At this point in our conversation, we need to talk a little about philosophy, Airbus philosophy 101 to be exact. To develop a fundamental understanding of the Airbus flight paradigm we need to go back to ground school.
What I am going to try and do here is to describe what those fabulous engineers over at Airbus did to create what may be the most modern and cutting edge jet in the world. Their boss gave them a "clean sheet of paper" and the mandate to be as creative as they wanted. What they came up with is nothing short of genius.

Here is what I think their thought process was (in an abbreviated version). They figured that since the airplane is going to be an airliner and the primary mission is to fly from one known airport to another known airport, they decided to define a "typical" flight profile. They then divided that perfect profile into individual "phases." Since each part or phase has individual requirements, a definitive starting point and a conclusion, they built these into the computerized heart of the airplane (FMGC) the necessary parameters for each individual segment of what is a continuous chain of phases.



This concept is a lot like DOMINOES ... one falls into the next, and once it has fallen, going back is difficult.

Once we get a handle on that and understand how the modeling for their airborne computer driven airplane is constructed, filling in the details becomes a piece of cake.

While the Airbus jet is certainly designed to operate in what has become the ubiquitous "old fashioned" VOR-AIRWAYS network; they made it entirely compatible with the old school while at the same time giving it the flexibility and adaptability to be entirely at home with the latest emerging technologies and airborne guidance technologies. The airplane is easy to hand-fly, and it also has been given a computerized fly-by-wire capability that makes what was formerly either extremely difficult or impossible
... well, almost easy.

INTRODUCING The concept of PHASES

In order to create their unique and exquisite solution to the flight paradigm, the Airbus Engineering team divided a typical, perfect flight evolution into parts that they called "**PHASES**." There are at least eight major phases and the ones we will consider in our discussion are:

- **PREFLIGHT (TAXI)**
- **TAKE-OFF**
- **CLIMB (CLB)**
- **CRUISE (CRZ)**
- **DESCENT (DES)**
- **APPROACH (APPR)**
- **LANDING**
- **GO AROUND**

Each phase is separate from the one before and the one after. Each has a unique set of operating parameters and considerations. Each phase is separated from the next one by a unique "**PHASE TRIGGER**."

IMPORTANT NOTE:
Each of these separate and distinct phase kernels has a specific beginning and ending. The FMGC *requires* each phase to be complete before it will go to the next phase of the flight operation sequence.

For an example of failing to "trigger" the next phase; let's say that you had initially programmed a cruise altitude of FL 330 on the INIT A page of the FMGC, but decided during the climb phase that you would instead make your final cruise altitude FL 310. The FMGC would not actuate the phase trigger (reaching cruise altitude) nor transition to the CRZ phase and therefore none of the subsequent automatic features would operate ... such as DES (descent) phase indicators and profiles.

Therefore, we have to be aware of these things called the **PHASE TRIGGERS**. These are the events that tell the computer to switch to the next "phase" of operation. If the airplane does NOT execute these trigger events, it ***WILL NOT*** progress to the next phase. On the next page, I have made a list of the phase triggers I have identified.

So, to simplify, let me re-state the situation:
1. A flight is divided into **PHASES**.
2. Each phase has a "**PHASE TRIGGER**" that initiates that phase.
3. You must complete one phase to go to the next.
4. An incomplete chain of phases does ***NOT*** allow complete use of the automated features.

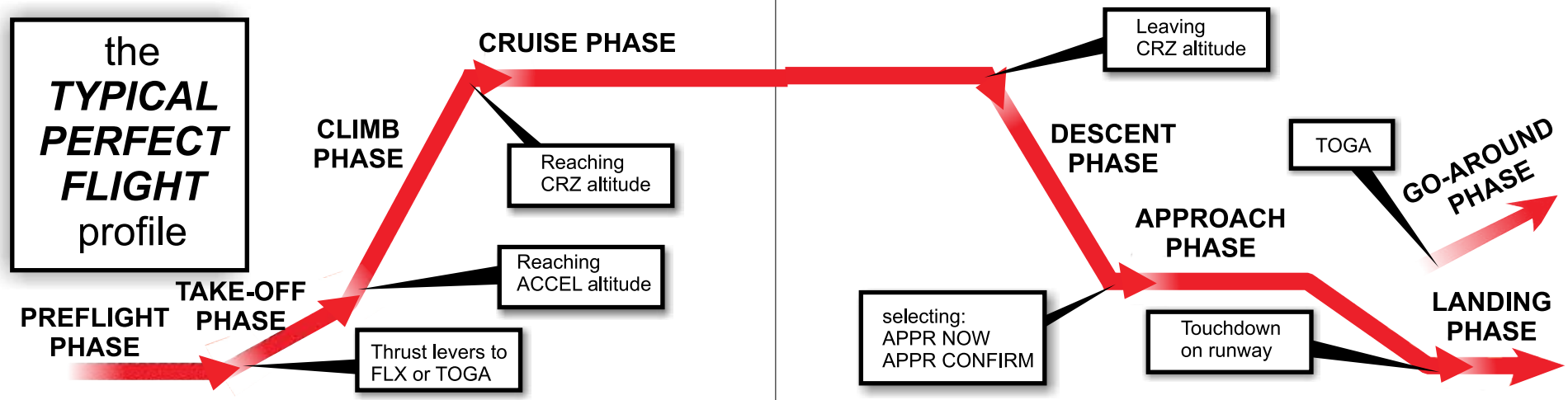
That is the approach we will take in our tutorial. We will construct a flight plan that is a "typical" routing and describe how it could be flown "perfectly." The goal is to make each flight just like the preceding one... similar and perfect.
Understanding and implementing the idea of phases is crucial to understanding how to fly an Airbus. If you can "get" this, you can become an Airbus Ace.

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PHASE TRANSITION	*a simplified list of* PHASE TRIGGERS
PREFLIGHT to TAKE-OFF	*Thrust levers to either the FLX or TOGA detent.*
TAKE-OFF to CLIMB	*Reaching the ACCEL level entered on the PERF page.*
CLIMB to CRUISE	*Reaching programmed cruise altitude entered on the PERF page.*
CRUISE to DESCENT	*Manual activation of descent. Leaving cruise altitude.*
DESCENT to APPROACH	*Manually "ACTIVATE and CONFIRM APPR" on the PERF page.*
APPROACH to LANDING	*Disconnect Auto-pilot, or Aircraft touchdown*
APPROACH to GO-AROUND	*TOGA detent on the thrust levers during the approach phase.*
APPROACH to DONE	*30 seconds after landing; and goes Back to PREFLIGHT when INIT or PERF key is pressed*

*These "triggers" I have listed here are not a complete list ...**BUT** they are the ones that pilots "normally" use to operate the jet. Be aware that some limitations and necessary flight control selections are not referenced here.*



A quick overview of the PHASE *OPERATING CRITERIA*

Let's take a quick and dirty look at each phase in isolation and try and identify some of the unique requirements and operating criteria that exist. This is just to give us a feel for a more detailed look to follow.

PREFLIGHT PHASE: During the preflight (taxi) phase, the throttles act just like any other airplane. The pilot has FULL MANUAL control and can move them and expect the engines to respond in kind.

During taxi, the PFD will display the "IRON CROSS" and it will move in response to the stick. Note that there is NO flight director in the taxi phase.

TAKE-OFF PHASE: Once the thrust levers are moved manually into the FLX or TOGA detent, the FADEC takes control of the thrust and the pilot no longer controls the thrust of the airplane directly.
NOTE: *The pilot can physically retard the thrust levers, taking the FADEC out of the FLX/TOGA mode while still on the ground and return to taxi phase operations. This is for aborted take-offs.*

The PFD "IRON CROSS" will disappear and there will be no Flight director; however, a single green "runway heading"lineup indicator line will become visible on the PFD. Depending on how the airplane is configured, either when the airplane is airborne and the landing gear oleos extend, or when SRS (throttles to FLX or TOGA detent) selected, then the Flight directors will be displayed on the PFDs.

CLIMB PHASE: During the climb phase, the airspeed target on the speed tape will automatically reflect the value selected on the PERF/CLB page of the MCDU or a managed airspeed of 250 kts below 10,000 feet. At 10,000 feet, the managed airspeed will slew towards ECON (unless another value had been selected on the CLB page). The FCU will display a "selected" airspeed if one has been selected, or it will display white dot and dashes if it is allowed to be managed.
To revert to managed airspeed from the indicated selected airspeed, the pilot has to "PUSH" the airspeed selector on the FCU.

The airplane will turn towards the next waypoint on the F-PLAN page *IMMEDIATELY* when the auto-pilot is selected unless the FCU has a selected heading displayed.

CRUISE PHASE: During the cruise phase, the airplane will remain at the managed altitude until the pilot *PHYSICALLY* initiates a descent. Even though a lower altitude may be set into the FCU prior to the descent point (Hockey stick), the airplane will not leave the cruise altitude at the descent point or after without input from the pilot.

This requires a little finesse, and I will suggest that you start your descent (PUSH the ALT knob) about 5 miles prior to the descent point using the managed auto-flight technique. This will cause the FMGC to establish a 1000 fpm descent rate until it intercepts the calculated descent profile as indicated on the PFD altitude tape by the "VNAV descent profile indicator" donut.
If you should elect to manually control the descent (PULL the ALT knob), be aware that all the automated descent indications and crossing altitude/airspeed controls are eliminated.

APPROACH PHASE: During the approach phase, we will attempt to use the automation to fly the airplane to a landing. The steps to do this are simple to remember:

- Select ILS. When the desired ILS identifier appears on the PFD. This will cause the "descent profile indicator" to be removed and the glide slope and localizer indices to be displayed.
- Select LOC.
- Within about about 10 miles from the airport, select "APPR PHASE" and then select "CONFIRM APPR". This will cause the airspeed target symbol on the PFD to slew to GREEN DOT ("0" flap or clean maneuvering) airspeed and the airplane will slow to that speed.

Selection of flaps will cause the airspeed bug to slew and the airspeed to constantly decrease to maintain green dot airspeed for the selected flaps.

- When the localizer starts to move, select APPR on the FCU.
- If below 8000 feet, select the second auto-pilot.
  This will arm the autoland mode.
- When the glide slope is one dot from the horizon,
  select gear and landing flap.
- At 400 feet the auto-land will engage.
- At "RETARD" ...pilot must MANUALLY select
  the thrust levers to the reverse gate, and
- on touchdown, MANUALLY select REVERSE.
- Airplane "should" track centerline.
  Once slowed and ready to exit the runway,
  de-select the autopilot and that will trigger the taxi phase.

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GO-AROUND PHASE: If, during the APPROACH phase, the thrust levers are manually placed into the TO/GA detent, the airplane enters the GO-AROUND phase.

If BOTH auto-pilots are engaged (such as during an auto-land or CAT III approach) they will remain engaged until:
Either another LATERAL or VERTICAL mode is annunciated. THEN
the #2 Auto-pilot will dis-engage.

If the airplane should touch down during the go-around evolution, it will continue the go-around.



SCREENSHOT USED BY PERMISSION
FROM WILCO/FEELTHERE A320 SERIES ONE

INTRODUCING *the CONCEPT OF*

MINIMIZED GROUND SPEED

... or as the pilots call it:

MINI GS

The Airbus engineers looked at the way that other aircraft manufacturers had handled the unique situation surrounding windshear during the approach and decided that they had a better idea. What they came up with is simple and exquisite: Minimized Ground Speed.

PILOT ACTION REQUIRED:
1: Place ATIS winds in the PERF/APPR page
2: Allow the airplane to fly the approach using MANAGED airspeed, and the FMGC will do all the rest. It is a no brainer.

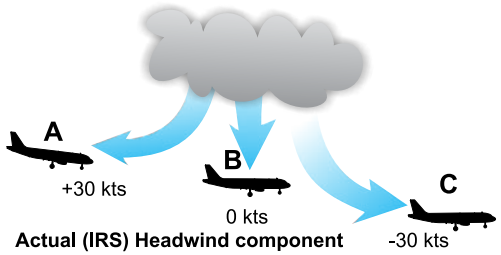
What that does for us: Flying from a headwind condition into a microburst that then results in a tailwind condition, the airplane will maintain a higher final operating airspeed with enhanced stall margin. WE ensure we are taking advantage of this feature by flying the approach **MANAGED APPROACH SPEED**. It will calculate the MINI-GS automatically.

HOW TO SHUT OFF THE Mini-GS
If we PULL the AIRSPEED knob and fly "SELECTED" airspeed, then the Mini-GS feature is de-selected.

SAMPLE CALCULATION:

ATIS WIND = 270/12

V_{REF} = V_{LS} = 148 Kts (*obtained from MCDU*).
V_{APP} = V_{LS} + 1/3 ATIS HW = 148 + 4 = 152 Kts.
Mini-GS = V_{APP} - HW (*ATIS*) **= 152 - 12 = 140 Kts.**
V_{TGT} = Mini-GS + IRS WIND = 140 + 30 = 172 Kts.



V_{TGT}*
MANAGED DYNAMIC TARGET SPEED
Point A = 172 Kts
Point B = 152 Kts
Point C = 152 Kts

***V_{TGT} (TARGET) BUG SPEED CAN *NEVER* BE LESS THAN V_{APP}.**

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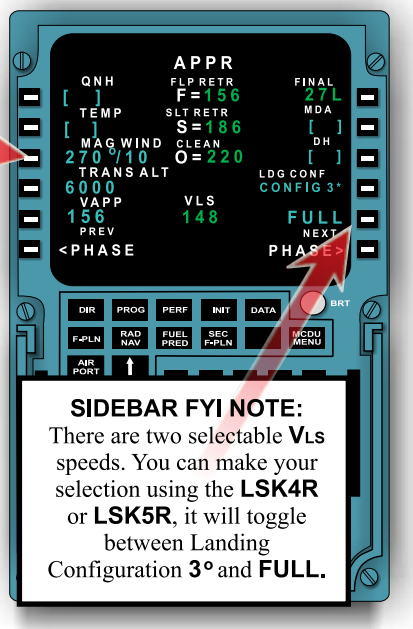
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MINI GS *continued*

There is no operational reason why you would want to understand the details ... however, you can expect to see the managed speed fluxuating when flying the approach in gusty wind conditions. This is why.

You can find the relevant airspeeds listed on the MCDU. Simply select the **PERF** page and using the **PHASE>** selector scroll to the **APPR** page. Once you are on that page, you can enter the ATIS winds, and the FMGC will calculate the MANAGED AIRSPEED TARGET (**VTGT**) using the MINIMIZED GROUNDSPEED technique

PILOT ACTION:
All the pilot has to do is "manually" enter the ATIS winds.



SIDEBAR FYI NOTE:
There are two selectable **VLS** speeds. You can make your selection using the **LSK4R** or **LSK5R**, it will toggle between Landing Configuration **3°** and **FULL.**

VLS is Minimum Selectable Speed. While you can actually select a lower airspeed, it is the lowest speed the auto-flight will fly, and is the lowest speed you can fly with a "safe" margin above stall.

Vref = VLS for the flaps at "**FULL CONFIGURATION**".
NOTE: *All irregular procedures base adjustments using VLS for CONFIG FULL.*

Vapp (Approach speed) = **VLS + 5 and/or* 1/3 HW** on ATIS winds
(placed in MCDU by pilot).
* "**or**" = Newer A320s,
*"**and**" = Older A320s.

VAPP WILL *NOT* EXCEED VLS BY MORE THAN 20 KTS.

MINI GS (Minimized Ground speed) = **Vapp - Headwind in MCDU.**
(ATIS winds placed there by the pilot).
There is no place to monitor Mini GS.

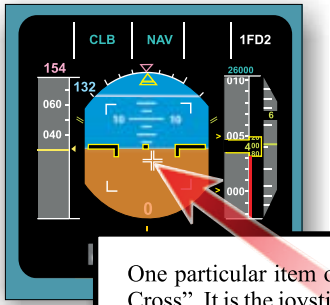
ACTUAL HEADWIND is derived by the FMGC from "real time " observation using onboard sensors (IRS).

VAPP minus Mini-GS plus IRS WIND =
The MANAGED TARGET AIRSPEED (VTGT)

Mini-GS PLUS the ACTUAL HEADWIND COMPONENT (derived from the IRS) becomes the dynamic, constantly changing, managed **V_{TGT} (TARGET) BUG SPEED.**

VTGT (TARGET) BUG SPEED CAN *NEVER* BE LESS THAN VAPP.

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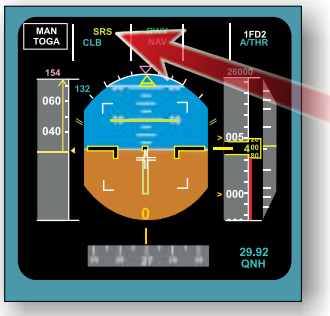


When you initially take the runway, you will notice that the airplane will not be displaying the Flight Director ... in fact, a lot of information will not be displayed. here is what you can expect to see before the thrust levers are pushed to the take-off power position and the SRS system is engaged..

One particular item on the PFD to be aware of is the so-called “Iron Cross”. It is the joystick/flight control position indicator. We should be aware of the location of that indicator BEFORE we push up the thrust levers and select the SRS, since it directly affects the control of the direction in which the airplane will accelerate. We want that Iron Cross centered horizontally on the PFD initially and not cocked off to the side.

SPEED REFERENCE SYSTEM (SRS).

Selecting the SRS is accomplished by pushing thrust levers to the take-off position and is the PHASE TRIGGER for going from taxi to take-off phase.



SRS

Pushing the thrust levers to the TOGA/FLX position will cause the SRS to become engaged and annunciated on the PFD. The instructor will expect you to be aware of that engagement indication on the annunciator panel.

SRS (Speed Reference System) is a BIG DEAL on the Airbus. The Check-person will be wanting you to know about it. Here are few facts to make you look like you know what you are talking about.

7 THINGS TO KNOW ABOUT THE SRS.

1. At least ONE FLIGHT DIRECTOR or AUTO-PILOT must be ON for SRS to operate.
2. It is ***ARMED*** when you program V2 on the MCDU and
   - the flaps are NOT at “0” position.
3. It is ***ENGAGED*** when
   - the thrust levers are placed in TOGA or
   - FLX/MCT with a flex temp set.
4. The pitch bar initially indicates 10 degrees until aircraft becomes airborne, then: the SRS system commands the pitch to maintain airspeed during two venues;

TAKE-OFF AND GO-AROUND:

5. - Normal 2 engine take-off ... V2 + 10 Kts.
6. - Single engine take-off ... Speed existing at time of the engine failure BUT not less than V2 Kts.
7. - Go-around ...Speed existing at the time of the Go-around BUT not less than Vapp.

NOTE: *the SRS will allow the speed to decrease to maintain a minimum of 120 FPM climb. It will always struggle to maintain a positive rate of climb.*

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SRS

SPEED REFERENCE SYSTEM

The Speed Reference System is a fundamental mode of the FMGC and one which we as pilots need to understand. We will be using the SRS for every flight. It is strictly a pitch mode and controls the airplane airspeed during high thrust settings by using pitch commands.

At least ONE auto-pilot or flight director MUST be on.



The SRS operates in two venues:
- **TAKE-OFF,** and
- **GO-AROUND.**

For TAKEOFF, the SRS system is ***ARMED*** when
- **V2** is entered in the MCDU (PERF page), and
- FLAPS NOT at "0" or to put it another way; there MUST be some flaps selected.

The SRS system is then ***SELECTED*** when:
- **THRUST LEVER** is moved to the FLX/MCT position, (with FLEX temperature set in MCDU), or
- THRUST LEVER is moved to TOGA position.

During the Go-Around, manually moving the thrust lever to the TOGA position when the flap lever is NOT in "0" position, will select the SRS mode.

When selected, it will provide pitch information for one of four basic airspeeds:
- Take-off with 2 engines ..... V2 + 10 kts.
- Take-off with ENG failure after V1
  .... Speed at time of failure, but not less than V2.
- Go-around phase
  ... speed existing at the time of the go-around but not less than Vapp.

To recap: These are the four target airspeeds:

4
- V2 + 10
- V2 (in event of a engine failure)
- Vapp (approach speed)
- Speed at time of selection



NOTE:
The SRS will allow the speed to decrease below these figures in an attempt to maintain a minimum 120 fpm climb.

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AUTO-THRUST STUFF

There are only 5 Thrust Lever positions defined by stops or detents:

MAX REVERSE
FORWARD IDLE
CLIMB (CL)
FLEX/MAX CONTINUOUS THRUST (FLX/MCT)
TAKE-OFF/GO-AROUND (TOGA)

The AUTO THRUST system is **ARMED** on the ground by:

- setting the thrust lever to TO/GA if at least one flight director is on.
- setting the thrust lever to FLX if at least one flight director is on and a FLEX temperature has been entered in the FMGC.

Moving the Thrust Levers forward to the TOGA/FLEX position will "SELECT" the AUTO-THRUST (A/THR) ON.

NOTE:
The autothrust system WILL NOT ARM when the thrust levers are advanced for takeoff
IF
BOTH FLIGHT DIRECTORS ARE OFF



The AUTO THRUST system is **ARMED** IN FLIGHT by:

- Pushing the A/THR button when the thrust levers are not in the engagement range.

The AUTO THRUST system is **ENGAGED** IN FLIGHT by:

- setting thrust levers in the engagement range with the auto-thrust armed.
- pushing the A/THR button when the thrust levers are in the engagement range.
- Activating ALPHA FLOOR, regardless of position or arming status.

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There are actually two distinct parts to the Take-off:

SPOOL-UP and ROTATION phase

Spooling up the engines is pre-take-off phase, however, once the engines have
- **TOGA/FLX** selected, and
- **SRS** is annunciated,

the jet enters the **TAKE-OFF** phase..

DISCUSSION ABOUT THE KOZ
(*KEEP OUT ZONE*)



On "some" Airbus engines there is an idiosyncracy that occurs on the ***GROUND ONLY***. During operations in this specific RPM range, the lip of the cowl interferes with the flow of air and the engine spool-up can be interrupted. Not a problem in the air. The FADEC has a built in feature which does not allow the engine to stabilize in this range;
HOWEVER, if you elect to "manually" spool-up the engines, be aware that you "COULD" get an asymmetric thrust application if your thrust application is done TOO SLOWLY!!.

YIPE!!

The solution is to let the automation spool up the engines.

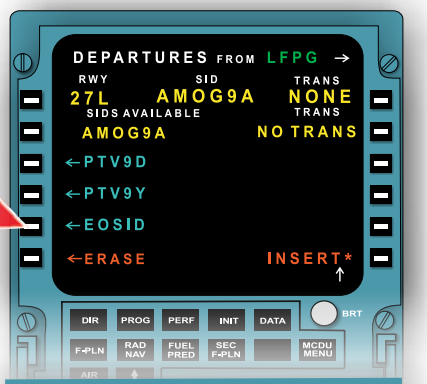
KEEP OUT ZONE (KOZ)
61% to 74% N1
FADEC wil not allow engine to stabilize in this range because it produces stress on the fan blades.

Moving the Thrust Levers forward to the TOGA/FLEX position will "SELECT" the AUTO-THRUST (A/THR) ON.

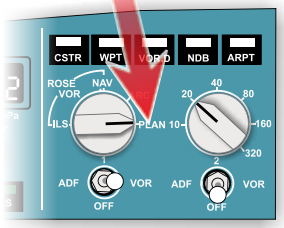
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HOW DOES EOSID WORK?

To determine if you have an EOSID routing in the database;
FIRST, select the departure runway,
THEN scroll to the bottom of the list of available **SIDs**.
IF the last entry is **EOSID**, then you have an assigned Engine-Out routing available in the database.



To preview the EOSID routing,
- select it on the SID page, or another way to do it is to simply
- SELECT **PLAN** on the EFIS CONTROL selector panel





The EOSID routing will be displayed in YELLOW (temporary)and will not change to GREEN (active) until:
- Engine failure detected, and
- **INSERT*** (LSK6R) is selected.

The DIVERSION WAYPOINT is the last waypoint common to both the SID and the EOSID, and is the point where the EOSID diverges from the SID. In our example, that point is "**PLANT**".

CASE 1

If engine fails prior to the DIVERSION WAYPOINT:
The EOSID will AUTOMATICALLY display on the ND in YELLOW (Temporary) and may be either INSERTED or ERASED.
If inserted:
The EOSID becomes the ACTIVE FLIGHT PLAN (NAV or HDG ok).

CASE 2

If engine fails AFTER the DIVERSION WAYPOINT or if there is NO DIVERSION POINT:
(*such as might occur during the ENGINE FIRE scenario.*)
The EOSID routing will AUTOMATICALLY display on the ND in YELLOW, BUT it ***CANNOT*** be inserted. It can be used, however, as pilot information, and the pilot may:
- continue to fly the original SID (using HDG or NAV),
- Return to and fly the EOSID routing using the HDG select,
- Fly another escape routing and determine terrain clearance. (*such as in VMC conditions*).

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"NO EOSID" displayed on the SID queue of the runway page means there is no "ENGINE OUT SID" available in the MCDU database. That does NOT, however, relieve you of the responsibility of briefing (and subsequently flying) an engine out routing. Also, if there is a "T" page or other escape procedure listed in your company materials, then you must use that routing. Either way, you should be aware of and brief the routing you will utilize should there be an engine failure on/after take-off.

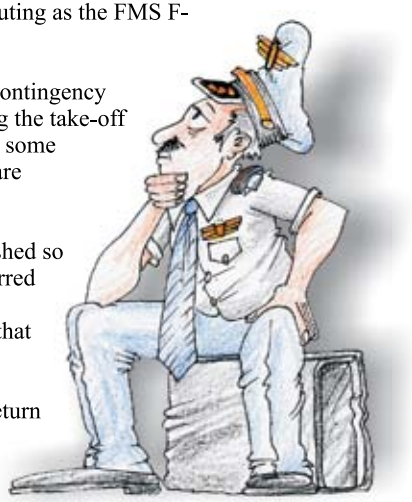
Since the EOSIDs are developed (in most cases) by the airline operator, the routing will most likely be the same as any other published "escape" procedure (such as "T" procedure). Therefore, We will refer to these Single Engine escape procedures as EOSID.

Thoughts about *EOSID.*

1. An EOSID needs to be considered for EVERY take-off, NORMAL approach, and specifically for ENGINE-OUT approaches. The idea here is to treat engine failure as a potential for both landing as well as take-off.

2. Some Captains say that they "expect" an engine failure on EVERY take-off and missed approach and brief accordingly. I think that is prudent and I would EXPECT that on a check-ride every Captain candidate would include a discussion about what he intends to do in the case of an engine failure/fire.

3. If executing an FMGC database described EOSID, be aware of the steps necessary to recall and insert that EOSID routing as the FMS F-PLAN page.



4. If confronted with both a "T" (company contingency plan) or EOSID, decide BEFORE attempting the take-off or approach and brief accordingly. Note that some EOSIDs are not in the FMGC database but are described on the airport approach plates.

5. Consider that a "special EOSID" is published so as to preclude contact with an obstacle (referred to as crashing) such as some earth bound structure or landmark and does NOT imply that there is a single engine situation.

6. Consider that the EOSID is designed to return you to the airport for landing.

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THE LAWS

The Airbus has designated the term "LAWS" to indicate levels of automated flight envelope protection available with degraded flight control capability.
There are 5 levels or LAWS;

- ***NORMAL LAW***
- ***ALTERNATE LAW***
- ***ALTERNATE LAW (without speed stability)***
- ***DIRECT LAW***
- ***MECHANICAL BACK-UP***.

These LAWS operate in two modes:

- ***GROUND MODE and***
- ***FLIGHT MODE***.

My personal view is that "memorizing" the parameters of protection for each of the laws, let alone trying to determine which LAW you are actually operating under when there is an emergency failure involving airplane control, is asking too much of a mere mortal airline pilot.

THE ONLY PRIORITY IMPORTANT CONCERN IS TO
MAINTAIN CONTROL OF THE AIRPLANE.

NORMAL LAW

If everything is operating NORMAL and everything is fine, then the airplane is said to be operating in "NORMAL LAW". This is the highest level of automated protection available and provides three axis protection envelopes for:

- ***LOAD FACTOR LIMITATION***
- ***PITCH ATTITUDE PROTECTION***
- ***HIGH ANGLE OF ATTACK PROTECTION***
- ***HIGH SPEED PROTECTION***
- ***BANK ANGLE PROTECTION***.

When operating in "NORMAL LAW", regardless of the pilot's input the computers prevent excessive maneuvers and maintains the airplane in the limits of a "safe" envelope in pitch and roll.
NOTE: *The rudder has no protection in any LAW.*

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THE *NORMAL LAW* PROTECTION LIST

In **NORMAL LAW**, when everything is going right and all the flight control computers are up and running, here is what the airplane sees as LIMITATIONS that requires it to do something. There is a GROUND mode and a FLIGHT mode ... but who really is concerned about the GROUND mode ... so we will concentrate on the FLIGHT mode.

FLIGHT MODE NORMAL LAW

The FLIGHT MODE is active from LIFTOFF until FLARE MODE engages during landing at 50 feet RA.

PITCH

The pitch mode constantly trims the elevator. It tries to maintain 1 G load on the side stick at neutral and with wings level. If the pilot moves the side-stick, the pitch mode trims the elevator to maintain a load factor proportional to the side-stick deflection regardless of airspeed. The pitch trim is automatic with or without the auto-pilot engaged.

LOAD FACTOR LIMITS:

The pitch trim tries to keep the airplane within these limits:

+2.5g to -1.0g (Trailing edge flaps retracted)
+2.0g to 0.0g (Trailing edge flaps extended).

PITCH ATTITUDE LIMITS:

The pitch is maintained to these limits:

30° NOSE-UP reducing to 25° at low speed (with flaps 0 to 3)
25° NOSE-UP reducing to 20° at low speed (with flaps FULL)
15° NOSE DOWN

The **FLIGHT DIRECTOR BARS** are removed from view when the pitch exceeds **25° UP** or **13° DOWN.**

α PROT

HIGH ANGLE OF ATTACK PROTECTION

This is called the α (alpha) protection mode and includes three angle of attack functions:

- Alpha Protection (α prot)
- Alpha Floor (α floor)
- Alpha maximum (α max)

When Angle of Attack gets to be greater than "α prot":
STUFF HAPPENS!!! This event is usually a surprise to the pilot.

- AUTO-PILOT ..... DISCONNECTS
- SPEED BRAKES ..... RETRACT
- NOSE-UP PITCH TRIM ..... INHIBITED
- BANK ANGLE LIMIT ..... reduced from 67° to 45°
-ANGLE of ATTACK ..... is set by side-stick deflection:

IMPORTANT NOTES

1. α max CANNOT be exceeded
even if the stick is held full back against the stop.
2. If ANGLE OF ATTACK PROTECTION is active,
the side-stick must be pushed forward to return to normal mode.

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THE *DEGRADED LAWS* PROTECTION LIST

Anything not In **NORMAL LAW** is operating in some *DEGRADED LAW mode.* Now, I don't know about you, but there are sometimes when I am aviating and things are not going well that I don't want to have to revert to some memory item that doesn't make any difference anyway. That is pretty much the way I think about identifying which "LAW" the airplane is operating in. I think it is adequate to know if you are in NORMAL LAW or simply in any of the other DEGRADED LAWS.
So, I am not going to spend much time on trying to sort out the various laws. Things are either NORMAL or they are NOT.

Here are some generalizations regarding DEGRADED LAWS:

- ***THE AIRPLANE CAN BE STALLED !***
- There are radically REDUCED protections.
- Vmo is reduced to 320 KIAS
- Expect no YAW DAMPING.
- The SPEED TAPE on the PFD may be modified with the addition of a black and red barber pole indicating stall warning speed.

... and some other stuff that will be totally confusing since the information load is different depending on the nature and extent of the failures.

Bottom line assessment ... if the airplane gets so screwed up in attitude, airspeed, control failure, or other unknown triggers that it winds up in some ABNORMAL or ALTERNATE LAW ... it probably cannot return to NORMAL LAW even if the situation is corrected.

EXPECT the remainder of the flight to be flown in some degraded mode such as ALTERNATE MODE.

THE ABSOLUTE WORSE CASE LAW
MECHANICAL BACKUP

OMIGOSH!!! If you should experience a "***COMPLETE LOSS OF ELECTRONIC FLIGHT CONTROL SIGNALS***" the airplane is still certified for flight. You can EXPECT this situation to be demonstrated during training. But if you should have the Check-Pilot from Hell, here are the flight tools available.

- **PITCH** is controlled using the **MANUAL TRIM WHEEL.**
- **LATERAL** control using the **RUDDER PEDALS.**
- **CLIMBS/DESCENTS** use the **THRUST LEVERS.**
- a red **MAN PITCH TRIM ONLY** warning appears on the **PFD**.

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DANGER ZONE

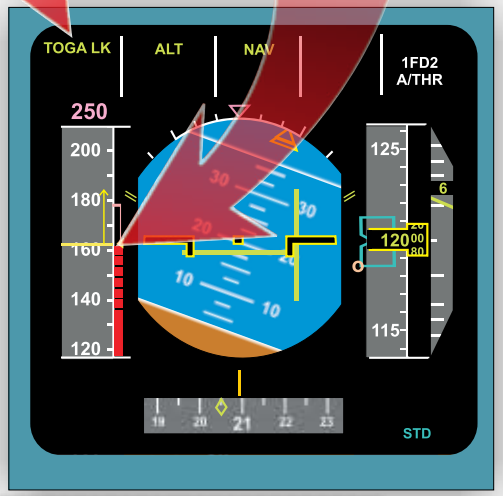
FLASHING TOGA LK WARNING

If Airspeed slows to the top of the "**BRICKS**" at the bottom of the airspeed tape, then:

- "**A-FLOOR**" (boxed green) momentarily flashes on the PFD, but is almost immediately replaced with a flashing **TOGA LK** (green) annunciation.
- **THRUST** goes to **TOGA** regardless of other factors, even if you are hand flying and not using the thrust management system in any kind of automatic mode,

and stays frozen there until ...
ACTION BY THE PILOT CHANGES IT.





I'M SCREAMING AT YOU:
Even though the **ATHR** *button is illuminated, the thrust is frozen in* **TOGA.**

As a result, even after you regain control of the airplane, the airspeed will continue to increase until the airplane overspeeds. the jet is in jeopardy of being destroyed.

GAME OVER!!!

... unless you regain control of the thrust and turn off the TOGA LOCK.

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HOW TO TURN OFF

"TOGA LOCK"

SIMPLE ANSWER:
TURN OFF THE AUTO-THRUST SYSTEM.

The **AUTO-THRUST** system. It can be **DISENGAGED IN FLIGHT** by:

1. Pushing the **A/THR** button on the **FCU** panel,

OR

2. Pushing *EITHER* disconnect button on the sides of the THRUST LEVERS. These are referred to as the **INTUITIVE SWITCHES**.





PANIC ANSWER

STEP 1: FLY THE AIRPLANE !!!

Once you have sorta recovered and the airspeed is increasing, ***THEN*** you need to think about getting the thrust back to a normal situation.

TOGA

STEP 2: "**MATCH THE DONUTS**" ... by that I mean physically push the thrust lever to the full forward position so that the little white circles at the top of the thrust indicators "MATCH" the thrust indicator settings. This is done by pushing the thrust levers to the full stop forward.

CLICK

STEP 3: "**DISCONNECT THE A/THR**" ... You can click the "INTUITIVE SWITCH" ... BUT here is ***PILOT SCREW-UP*** warning. ***DO NOT HOLD THE SWITCH IN*** ... if held more than 15 seconds the A/THR will be rendered inoperative for the rest of the flight segment.
TECHNIQUE COMMENT: Use the FCU switch. It is simpler just to push it once (OFF) and a second time (ON) ... CLICK-CLICK.

CLICK

STEP 4: "**RE-ENGAGE THE A/THR**" ... Once you have the thrust lever full forward, push the A/THR switch on the FCU and observe:

- **A/THR** in WHITE on the PFD FMA, ***AND***
- **A/THR** button on the FCU illuminated.

CL

STEP 5: "**RE-SET THE A/THR**" ... Pull the thrust levers "G-E-N-T-L-Y" back to the **CL** detent.
NOTE: In the air, there is NO KOZ ("Keep out zone") considerations.

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HOW PILOTS CAN SCREW UP and get into TOGA-LK

DISCUSSION:

There are a couple of places where 'Bus pilots can get into **A-FLOOR** situations and get the **TOGA LK** annunciated. Here are a couple of screw-ups for you to think about:

AFTER TAKE-OFF: A level off right after take-off and before the "**LVR CLB**" reduction, with the thrust levers still at take-off setting (**TOGA** or **FLX**) will result in airspeed will building rapidly towards over-speed. If the pilot chooses to control the excess thrust by MANUALLY retarding the thrust levers to IDLE ... this will DESELECT the Auto thrust mode (**A/THR** switches off automatically).
Here is where pilots screw up, as the airspeeds slows, they will place the thrust levers towards the **CL** detent, thinking that the thrust is now in AUTO-THRUST mode. ***IT IS NOT!*** Since the **A/THR** mode is "STILL" de-selected. As a result the airspeed may decay slowly, perhaps un-noticed, until 'A-FLOOR" is annunciated.

OMIGOSH

Low altitude, low airspeed, low energy ... not a happy place to be.

AT ALTITUDE: There are two high altitude situations that are built into this airplane that can bite your butt:

SITUATION 1: If the airplane is at 31,000 feet or higher and the airspeed is greater than .75 Mach; If the spoilers are deployed greater than ½, you can get A-FLOOR protection.
You may say, "*Yeah, but, if the auto-pilot is on, the spoilers are automatically limited to ½ extension.*"
However, if the pilot pulls the speed-brake lever to "FULL" and then for some reason turns OFF the auto-pilot, the protection is removed and the speed-brakes immediately extend to full and the A FLOOR could be annunciated along with all that other exciting stuff.
BIG SURPRISE!

SITUATION 2: You are cruising along above FL 250 at ECON MACH and you get an **RA**. A voice starts yelling at you,"TRAFFIC, TRAFFIC" followed by "INCREASE CLIMB, INCREASE CLIMB". ***OMIGOSH*** .. there he is on the ND ... and closing. You swiftly reach up to the **FCU**, set in a higher altitude and depress the **EXPED** switch.

WHOOPS!!!

Here is the problem. In EXPED mode, the airspeed will target "GREEN DOT" in a climb. The MACH number for a "green dot" airspeed is below minimum stall speed above Fl250 ... so, guess what ... Alpha protection, A FLOOR, TOGA LOCK. I can't even imagine what a surprise this would be.
Have a nice day.

CHECK PILOTS LOVE this stuff.

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What would happen if the airplane got really slow and the pilots didn't notice it? Normally, the airplane would stall and probably crash ... but those wily engineers at Airbus, never trusting pilots to be constantly paying close attention, built a 'FAIL SAFE" feature into their airplane. They called it "∝ (Greek letter for ALPHA) FLOOR." Generally, pilots don't write Greek, so it is referred to as "A-FLOOR" on the ND and the PFD and called ALPHA FLOOR when being referred to in writing.

∝ (ALPHA) FLOOR

DEMONSTRATION:

Airline pilots are required to demonstrate an A-FLOOR initiation and recovery procedure during their check-ride. It is an interesting and useful exercise since it demonstrates both the limitations and the utility of this Airbus feature.

A-FLOOR DEMONSTRATION setup

To set-up the airplane for thise demonstration, here is a recommended procedure ... of course, this is just an simple sample of one of the many way a pilot can screw up and get in this position. Here are the steps:

STEP 2- Retard thrust.

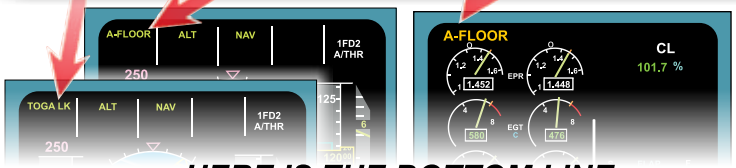
STEP 1- Disengage **AUTO-PILOT** and **A/THR**.

STEP 3- Let airspeed decay to "green dot".



STEP 4- Simulate "pop-up" traffic and make an aggressive avoidance maneuver UP and LEFT.

STEP 5- As the airspeed decays towards the "red bricks", **A-FLOOR** will annunciate momentarily on **PFD** (flashing) and **ECAM**; then be replaced with a flashing **TOGA LK**. Note that even though the Thrust will immediately increase to **TOGA**, the Selected thrust lever position setting will remain.
There is *NO AUTOMATIC THRUST LEVER MOVEMENT.*



HERE IS THE BOTTOM LINE

What happens at "TOGA LK" is:

1. the thrust goes to TOGA and without regard for other factors and

2. stays frozen there until action by the pilot changes it.

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a suggested

A-FLOOR RECOVERY technique

When **A-FLOOR** is activated, the airplane will be in a position of extremis and requires EXTREMELY sensitive control inputs to avoid UPSET and STALL related problems. Let me put it this way: "***YOU ARE ABOUT TO DIE***." At this point, the pilot MUST concentrate on recovery ONLY!!!. These events occur so rapidly, that your recovery must be swiftly and accurately completed.

STEP 1- Reduce angle of attack by pushing the stick gently forward. (*In a real life situation, this will disconnect the autopilot and you will be treated to the warning horn*). A green flashing **TOGA LK** should immediately annunciate on the **PFD** and the THRUST will go to **TOGA** regardless of any other factors.

STEP 2- ***FLY THE AIRPLANE*** so that the airspeed begins to increase towards the "green dot." This is the most difficult part. I ***STRONGLY*** suggest that you remove any rolling tendencies or aileron/spoiler input, and level the wings. G-E-N-T-L-Y lower the nose and allow the airplane to fly out of the A-FLOOR situation.

CAUTION:
Once you have recovered, the airplane will continue to accelerate VERY rapidly, and you are now faced with a potential *OVERSPEED* situation.

WHEN AIRPLANE IS UNDER CONTROL

STEP 3- PUSH throttles to the forward stop (**TOGA**).
We do this to match the THRUST LEVER setting to the ACTUAL thrust setting.
REMINDER: The thrust is ALREADY at **TOGA**.

Shut OFF the TOGA-LK

STEP 4- Disengage **A/THR** (use the FCU button).
This will turn off the **TOGA LK**
...and after a very short delay

STEP 5- Re-select the **A/THR** (use the **FCU** button).

A simple way to think about this step is to push the A/THR button twice. (Shut it off, and then back on).

STEP 6- Ensure the thrust levers are placed in **CL** detent once again. Physically move the thrust levers to the **CL** detent and observe **CL** indicated on the **ECAM**.

STEP 7: Stabilize flight, get auto-pilot re-engaged (if necessary) and re-establish normal flight inbound to the next fix.

PART TWO

All that stuff that went before was just preparation for the 'ride.

THE SIM RIDE

or

PSYCHO-MOTOR SKILLS demonstration

LET'S DO IT!



IT'S TIME TO SHOW 'EM WHAT YOU GOT!

HOW TO TAKE OFF

When take-off clearance is received:

1 **PARKING BRAKE handle ..... OFF**

Turn handle on the lower console to OFF and check the gauge under the gear handle goes to "**ZERO**".



BIG PROBLEM:

NOTE: *If the pressure does not go to zero, consider a potential BDDV (Brake Dual Distribution Valve) failure. Do not TAKE-OFF or try and taxi, reset the brake and get assistance in clearing the runway. Your flight is over until the BDDV is changed.*

DO NOT TAKE OFF !!!

2 **THRUST LEVERS ..... FLEX or TOGA**

Once more, Let's go over that
Technique for advancing the thrust levers:

- Advance levers to about 1.05 EPR and
- allow engines to stabilize at about 50% N1.
- Then "rapidly" move the thrust lever through the KOZ (Keep Out Zone) and smoothly to the FLEX or TOGA notch.

BIG PROBLEM: *If you move the thrust levers too slowly through the KOZ, there is the potential for a mis-matched or assymetrical thrust.*

YIPE!! *That event could cause the airplane to exit the runway and ruin your whole day. It is essential that you monitor the thrust throughout the spool-up venue and make corrections as necessary.*

DISCUSSION:

The THRUST LEVERS are being operated manually at this point and will remain so until the CL detent is selected after take-off. Even though TOGA or FLX is annunciated, the pilot has full control of the thrust levers and can abort a take-off or pull the thrust levers to idle at ***ANY TIME***!

Target: Have THRUST LEVERS set by 40 KNOTS

Planning to have the Thrust set by 40 knots is a good target, and covers the worse case scenario where you have a crosswind greater than 20 knots or a tailwind.

TIP!

Here is a recommendation: If you have elected to use the FLX setting for take-off, and get an ECAM warning, select TOGA. The reasons for the warning might be flex temperature not entered in MCDU or the FLEX annunciation on the UPPER ECAM changes to TOGA. Whatever the cause, if you select TOGA, the warning will more than likely be cancelled.

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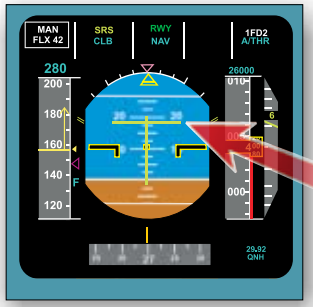
TIME-OUT

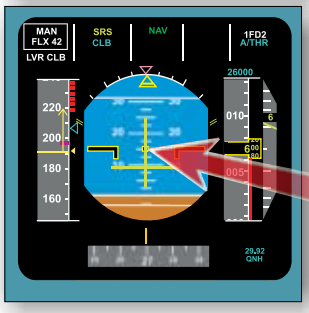
Let's take a moment and talk about the pitch bar on the Flight Director. Initially, it appears to be pitching up and then down and back up again ... what's with that?

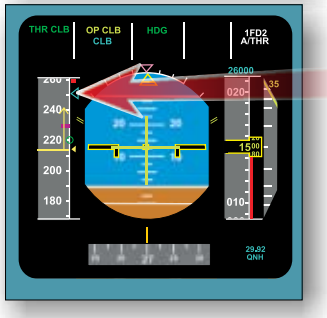
In simple terms, the flight director pitch bar is trying to cause the nose of the airplane to move up or down. This is usually to comply with an airspeed command initiated from either the FMGC or the pilot.

> Here's the *BASIC* Flight Director paradigm:
> *If the requested airspeed is GREATER than the indicated airspeed, the nose should be pitched over to gain airspeed.*
> *If the requested airspeed is LESS THAN the indicated airspeed, the nose is pitched up to lose airspeed.*

Here is the problem.







The actual flight director pitch bar will be fixed at 10 degrees initially and does not actually become operable until the airplane has become airborne; and you will already be in your rotation when the bar starts to move, and here is the first ***OMIGOSH*** moment. The flight director pitch bar will initially respond to the speed tape requested airspeed (**SRS** on the magenta triangle) with a RADICAL PITCH UP command. IGNORE the pitch bar and ...

PITCH TOWARDS 12.5 (single engine) to 15 DEGREES!

DO NOT INITIALLY FOLLOW
THE FLIGHT DIRECTOR PITCH BAR.

Once the airplane has climbed out of the ACCEL altitude that is set on the PERF/CLB page, then the target airspeed will slew to either:

250 kts or (if requested) "**0**" flap speed. We had selected "0" clean maneuvering (GREEN DOT) airspeed because it complied will the speed restriction imposed by the "Class B" airspace. However, don't follow that pitch bar! **REMAIN FOCUSED AT 12.5 to 15 DEGREES** pitch until the pitch bar comes down almost to the airplane symbol ...then: You may engage the auto-pilot if airplane above 100 feet with SRS annunciated.

Passing about 3000 ft AFE, if you are cleared to resume normal airspeed, select **250 KTS** below 10,000 feet for the climb-out. You do that by PUSHING the SPD knob on the FCU. It should indicate "WHITE DOT" and the target indicator will slew to **250 kts**.

If we have the auto-pilot engaged, the pitch indicator should remain centered as the airplane automatically adjusts attitude to maintain the target airspeed (pitches down to increase airspeed). If manually flying the jet, FOLLOW THE PITCH BAR.

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ITS TIME TO ...

SPOOL 'EM UP



SET TAKE-OFF THRUST

Move the THRUST levers to the FLX or TOGA detent. Check the upper right corner of the ECAM for the appropriate THRUST SETTING annunciation.

***TECHNIQUE*:**

Manually ease the throttles to about 1.05 EPR, and allow engines to stabilize at the 12 O'clock position, then more aggressively push the thrust levers to the TOGA or FLX detent. The idea is to let the **FADEC** (engine controlling computer) complete the spool up of the engines through the KOZ.
then RELEASE the BRAKES.

NOTE:

Slowly pushing up the throttles manually through the **KOZ** (Keep Out Zone) may result in asymmetric power application.

Here is a recommended crosswind technique:

IF CROSSWIND AT OR BELOW 20 KTS with NO TAILWIND

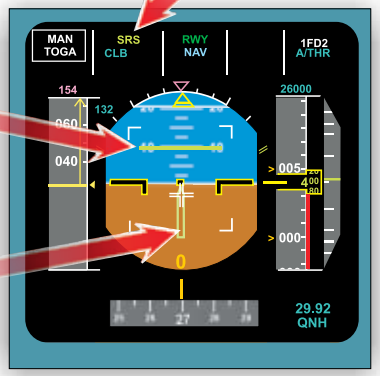
Use ½ forward stick deflection until about 80 knots, then slowly release back pressure on the side stick so that the iron cross reaches a neutral position at about 100 knots.

IF CROSSWIND GREATER THAN 20 KNOTS OR THERE IS A TAILWIND.

Maintain FULL FORWARD stick deflection until 80 knots, then slowly ease side stick pressure so as to be at neutral by 100 knots.

- Target is to have take-off thrust set by 40 knots

When the Thrust levers are in the appropriate TAKE-OFF detent, the FMA will indicate that the SRS (Speed Reference System) is now selected.



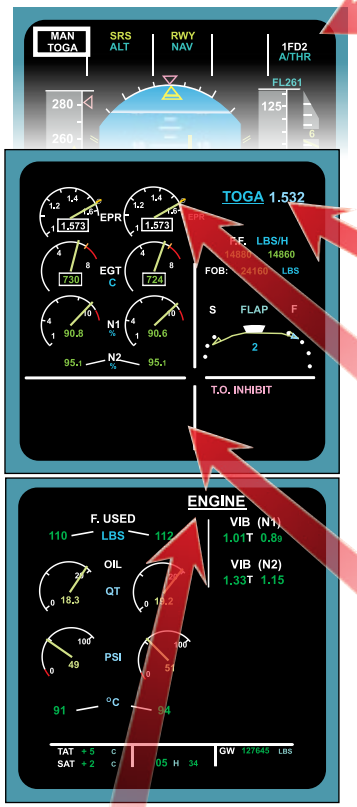
Notice that only the Flight Director pitch bar will be displayed. It is not controlled by the Flight Director at this point but only indicates a fixed 10 degree pitch.

The single green "runway heading" indicator should be displayed.

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AFTER TAKE-OFF THRUST HAS BEEN SET

CHECK 4 THINGS



1. FLIGHT MODE ANNUNCIATORS .... both pilots confirm proper indications.

- White boxed THRUST setting (**MAN** over **TOGA** or **FLX/TEMP**). If you have selected FLX, but the FLEX TEMP has not been entered in the FMGC, an ECAM warning will occur. A quick solution is to select TOGA rather than try to insert a flex temp.
- **SRS** *MUST* be annunciated for the system to be armed.
- **LNAV** selections. If Heading indicator has been pulled, then **HDG** or RWY (runway heading)will be the operating heading indication (GREEN). otherwise **NAV** will be armed (BLUE)
- **BLANK**
- "**1FD2**" indicating flight directors armed. At least one flight director must be armed for the SRS to operate. **A/THR** (BLUE) indicating the auto-throttles are armed.

2. EPR SETTINGS .... When the thrust levers are moved to the take-off setting (**FLX** or **TOGA**), that setting is indicated on the upper right of the upper **ECAM**, and the "WHITE DONUTS" will move to the desired thrust settings on the engine indicators. As the engines spool up, the thrust indicators should move to match the donuts.
NOTE: *Be aware of the proper target "donut" settings before making the thrust selection.*

3. CALL OUT ABNORMAL SITUATIONS .... The MEMO pad on the UPPER ECAM will be your target instrument. It will annunciate any abnormal or emergency situation in its computerized brain. However, if you see a situation or indication that you think should be addressed, whether annunciated or not, "***CALL IT OUT***!" This is THE place to correct any item that you feel affects the outcome of the take-off.

4. ENG page should automatically replace the **WHEEL page** on the lower **ECAM.** If it does not, the manually select the **ENG** page using the **ECAM** selector panel.

Note about **T.O. INHIBIT** (MAGENTA) indication. This feature is active from the application of take-off power to 1500 feet or for 2 minutes. It stops some aural warnings, cabin interphone (including emergency calls) and most ECAM indications. At 80 knots even more ECAMs are inhibited leaving only a few *VERY CRITICAL* items uninhibited.

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THE ROTATION PART OF THE TAKE-OFF

TAKING-OFF to INITIAL CLIMB

EVENTS HAPPEN REALLY FAST!

Once the jet starts to move, it will be in a continually accelerating mode and the flow of events will become an overpowering wave unless we "pre-think" and make a plan. Let's discuss what will happen and see if we can come up with a method to deal with the situation.

TRACK CENTERLINE: The airplane may or may-not track exactly down the runway. So the first order of business is to make corrections to the airplanes take-off vector that coincide with the confines of the runway.
LOOK "**DOWN THE RUNWAY**" towards the horizon and make your corrections based on that sight picture.

Push forward on the stick very ***gently*** and move the pitch indicator (flight director MAY NOT be displayed yet) to a point just below the horizon indicator on the PFD. This will help prevent an undesired early rotation and possible "***TAIL STRIKE***".

at 80 KTS: Relax any forward pressure so as to be at neutral by 100 Kts.

at V1: On the PFD speed-tape, the little "1" is our "GO-NO GO" speed. It is important in the real world that we are aware of what is happening during the speed build-up to V1. Are there warning lights, or fire indications, or engines failing, or ???

at VR: Start an extremely gentle rotation towards our initial pitch attitude of 12.5 to 15 degrees. Pitch towards V2+10 kts airspeed. The rate of rotation should be about 2 to 3 degrees per second. ***TAIL STRIKE*** potential highest right here.

Initially, you may NOT have a flight director, but as the airplane rotates and the gear oleo extends, the Flight Director bars will be displayed.

at **12.5 to 15 degrees pitch on the PFD ... HOLD THAT SIGHT PICTURE.**
Use every bit of your excess brain power to keep from chasing the flight director pitch bar. Stay at 12.5 to 15 degree, wings level. ***DO NOT FOLLOW THE F/D PITCH BAR initially!***

> Initially, when the thrust levers are placed in the take-off (SRS) detent, the pitch bar goes to 10 degrees pitch up.
> - the Flight Director bars will NOT be displayed initially.

NOTE:

Leaving ACCEL altitude, the pitch bar will move to display either:
- The speed we have pre-set on the MCDU PERF/CLIMB page ("green dot"/ 0 flap maneuvering) or
- 250 Kts below 10,000 feet.

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some TAKE-OFF check-ride protocols

CAPTAIN'S HAND MUST BE ON THE THRUST LEVERS UNTIL V1 IS ANNOUNCED BY PNF (Pilot Not Flying).

The Captain should be "SPRING-LOADED" to the abort position.

at 80 KNOTS

The PNF (Pilot Not Flying) calls out "***80 KNOTS, THRUST SET***."
This call-out verifies:

- ***THRUST is actually set at TOGA/FLX.***

PNF checks the UPPER ECAM for indications.

- ***AIRSPEED indications have been cross-checked.***

PNF glances at 3 locations.
Speed tape on both pilots PFD and Standby Airspeed indicator.

- ***NO ECAM MEMO or other abnormal indications*** ... IF SO "***CALL THEM OUT***".

If there are abnormals ... abandon the take-off, stop the airplane, exit the runway, evaluate the situation. Normally reverse thrust and high speed abort techniques are usually NOT desired nor required.
A "HOT BRAKES" situation is normally not experienced is aborts below 80 knots.

at V1

The PNF (pilot not flying) calls out "**V1**" ***5 KNOTS BEFORE*** reaching the V1 speed.
EXPLANATION: *The ability to stop on the runway is predicated on initiating the abort* ***AT or BEFORE*** *V1. Aborts after V1 should be avoided. By the time the PNF makes the call and the Captain moves his hand ... takes about 5 knots.*
The Captain's hand should be removed from the thrust levers AT V1.
The reasons are:

- Reinforce the "GO" decision,
- Prevent an instinctive abort above V1.
- Normally, ***NEITHER*** pilot's hand should be on the the thrust levers between V1 and the GEAR-UP call.

Brief discussion: *I think we are all aware of the crew that managed to save an airplane with a last minute abort AFTER V1 when another airplane pulled on the runway in front of them in a foggy situation. Enough said about that, use your head!*

at VR and V2

The PNF calls out "**VR**" and "**V2**" as those speeds are reached.

LET THE FUN BEGIN!



High Flight

Oh! I have slipped the surly bonds of earth
And danced the skies on laughter-silvered wings;
Sunward I've climbed, and joined the tumbling mirth
Of sun-split clouds - and done a hundred things
You have not dreamed of - wheeled and soared and swung
High in the sunlit silence. Hov'ring there
I've chased the shouting wind along, and flung
My eager craft through footless halls of air.
Up, up the long delirious, burning blue,
I've topped the windswept heights with easy grace
Where never lark, or even eagle flew -
And, while with silent lifting mind I've trod
The high untresspassed sanctity of space,
Put out my hand and touched the face of God.

Pilot Officer Gillespie Magee
No 412 squadron, RCAF
Killed 11 December 1941

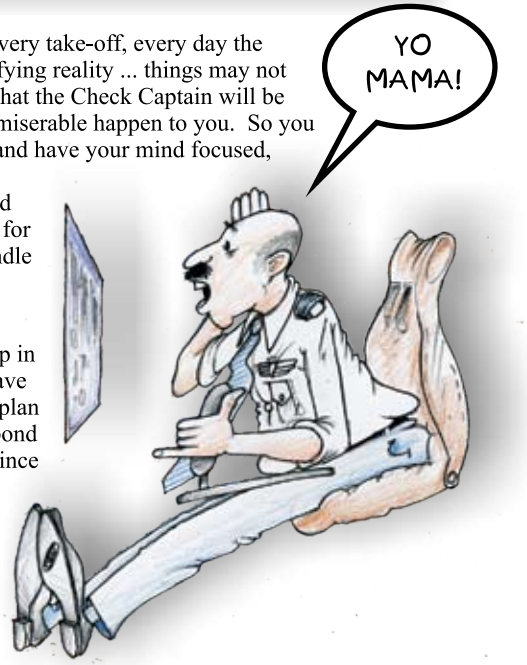
Screenshot from Wilco/Feelthere A320 Series ONE.
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One of 5 things is about to happen to you !

Let's examine is some detail how the different TAKEOFF scenarios will unfold ... and what we should do in each case.

- LOW SPEED ABORT
- HIGH SPEED ABORT
- V1 CUT (Engine fail on runway).
- V2 CUT (Engine failure after take-off)
- NORMAL TAKE-OFF

Every flight, every check-ride, every take-off, every day the pilot is faced with the same terrifying reality ... things may not go as planned. And you can bet that the Check Captain will be just waiting to make something miserable happen to you. So you simply MUST BE PREPARED and have your mind focused, ready to react.
We pilots are like a highly trained athlete ready to spring, prepared for the unexpected, and ready to handle any situation ... aren't we?



Let's look at a few of the potential situations, and before we get caught up in trying to invent the wheel while we have our panties in a bunch ... let's make a plan for each situation and be ready to respond crisply and succinctly enough to convince the Check Person that we know what we are doing. It is always embarrassing to thrash around, screaming and shouting and in general looking like you don't know what is going on.

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"LOW SPEED ABORT"

Rejecting take-off below 80 knots

Aborting a take-off before reaching 80 Kts is generally considered no big deal. In fact, I can almost guarantee that the Check Captain is going to give you a potential reject situation to see how you respond. I would make the assessment that almost anything could trigger a low speed abort.
*In this speed range, if you are uncertain whether to stop or not ...**STOP!***

THE CAPTAIN IS EXPECTED TO MAKE ALL ABORTS !

★ If Captain decides to abort ... She/he should announce LOUDLY:
"***I HAVE THE AIRPLANE ... ABORTING!***"
The First Officer (if making the take-off) should respond, and remove ***ANY CONTROL INPUTS!!!.***

AUTOBRAKE will normally NOT deploy since it only activates above 72 Knots. Use "normal" toe brakes to slow the airplane and exit the runway.

[F/O] Notify TOWER

1. Expeditiously state your intention to ABORT.
2. State RUNWAY and position.
2. Be prepared to request assistance, such as Fire Department.

[C,F/O] Treat situation as a landing roll and accomplish routine post landing procedures since the situation is not an emergency nor does it require any irregular handling.

IMPORTANT NOTE:
If the slow speed abort procedures are completed and a subsequent take-off is planned:
RESET BOTH FLIGHT DIRECTORS.

Generally speaking, a low speed abort will not require abnormal braking ... therefore, it is unlikely that there will be a residual tire temperature problem. Delaying subsequent departure for tire and brake cooling is <u>*probably*</u> not required. *For the record, I would*
*monitor the **ECAM WHEEL** page and*
*check the **REJECTED TAKE-OFF** cooling chart*
*... this tells the check person that you are aware of a potential **HOT BRAKE** problem.*
NOTE: ECAM temperature indications may be slow to respond.

HOWEVER ...

There was some reason that you aborted the take-off. DO NOT forget to resolve that ambiguity before you start preparations for another take-off.

COMMON PILOT SCREW-UP:

During the check-ride, the crew is so relieved and satisfied when they complete a successful abort, that they completely overlook the need to resolve the reason for the abort in the first place. There is a lot going on.

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"HIGH SPEED ABORT"

Rejecting take-off between 80 knots and V1



The **HIGH SPEED ABORT** is arguably the ***MOST DANGEROUS*** event in commercial aviation.
The current airline thinking is: "*If it will fly ... continue the take-off.*"
There are exceptions such as FIRE/ENGINE FAILURE before V1.

THE CAPTAIN IS EXPECTED TO MAKE ALL ABORTS !

★ If Captain decides to abort ... She/he should announce LOUDLY:
"***I HAVE THE AIRPLANE ... ABORTING!***"
The First Officer (if making the take-off) should respond, and remove ***ANY CONTROL INPUTS!!!.***

Generally speaking, the decision to abort in this speed regime should be made only if the failure involved would impair the ability of the airplane to fly.

CAPTAIN DOES THIS:

[C] Aggressively move thrust levers to FULL REVERSE.
The use of less than maximum reverse is OK.

MONITOR AUTOBRAKE.
The AUTOBRAKE will come on at MAX (if selected) when:
1. Ground-speed greater than 72 knots, and
2. Thrust Levers command ground spoilers to activate by being pulled to idle.

If autobrake FAILS to actuate, apply maximum "toe" braking.

FIRST OFFICER DOES THIS:

[F/O] Notify TOWER
1. Expeditiously state your intention to ABORT.
2. State RUNWAY and position.
2. Be prepared to request assistance, such as Fire Department.

Make PA to Flight Attendants/PAX "**REMAIN SEATED**". If the cockpit fails to provide direction and there is no PA announcement made, you can expect the F/A to initiate an evacuation on their own initiative..

Maintenance action required when:
1. AUTOBRAKES or MAXIMUM MANUAL braking used.
2. TEMPERATURE between TWO BRAKES ON SAME GEAR is greater that 150°.
3. TEMPERATURE of one of those two brakes is > 600°C or < 60°C.
4. ANY BRAKE temperature exceeds 900°C.



If **BRAKES HOT** ECAM message remains after parking ... request that ALL gear be chocked so that brakes can be released. The Check Captain will expect you to ***CONSULT THE BRAKE COOLING TIME TABLES***.

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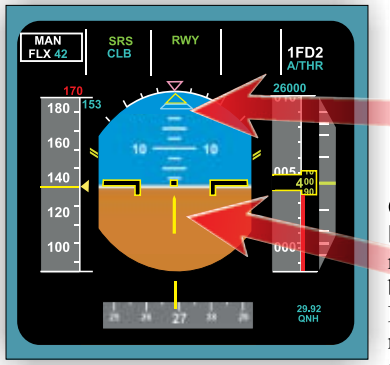
"V1 CUT"

Engine Failure after V1
Airplane on the ground

Here is "my" V1 cut profile. It is not put forth as an official or SOP concept. It is just my idea and might work for you.

1 Once you have passed V1 airspeed, the Captain's hand should be removed from the thrust levers. When indication of an 'ENGINE FAILURE" is observed, the pilot noting the failure says; "ENGINE FAILURE."

At time of engine failure, between V1 and V2; here are the PFD indications.



BETA TARGET:
Side slip indicator changes to "BLUE" when:
- CONF 1,2, or 3 selected, ***AND***
- ANY engine EPR exceeds 1.25, ***AND***
- Difference of EPRs > .25.

GROUND ROLL COMMAND BAR:
Flight director may not be visible, but the ground roll command bar will provide lateral guidance based on"RUNWAY TRACK" memorized by FMGC before engine failure. Continue to maintain visual tracking (look at far end of the runway) as long as possible.

TOGA = If taking off in FLEX, consider pushing thrust levers to TOGA.
(*TOGA not required as a/c is certificated SE FLEX*).
TALK = PNF to TOWER: "*ENGINE FAILURE*"
TURN if required by EOSID procedure or "T" procedure turn, tell TOWER.
TRIM = Rudder takes about 20 seconds (A320), 30 seconds (A319).

4-Ts
TOGA
TALK
TURN
TRIM

@ positive climb

PITCH 12.5 degrees
GEAR UP
CENTER BETA target

***Auto-pilot OK*:**
Above 100 feet;
IF
- In **TRIM**, and
- **SRS** on FMA

1 **KEEP NOSEWHEEL GROUNDED** until at least VR.

2 Speed V_2 or greater

There is no requirement to rotate "exactly" at VR.
TIP! Keep nose wheel grounded for a few knots beyond VR if you need it.

***NOTE*: *MAX TIRE SPEED* 195 Kts.**



OAE @ 1000
O=OP CLB
A=AUTO-PILOT
E=ECAM actions

O **OP CLB**: ***Pull*** the **ALTITUDE SELECTOR** knob towards you, This will select **GREEN DOT** airspeed and **OP CLB.**

A **AUTO-PILOT** will reduce pitch so as to reach green dot airspeed.

E **ECAM** actions should be done methodically (so as NOT to shut down wrong engine).

4 ***@ GREEN DOT airspeed***
THRUST to MCT
Continue Climb

5 *As airplane accelerates;*
FLAPS on schedule to UP
AFTER TAKE-OFF CHECKLIST

6 ***passing 1500 feet***

Notify:
FLIGHT ATTENDANTS
PASSENGERS
COMPANY

Consider:
RELIGHT ENGINE
RETURN TO LAND
GO TO ALTERNATE
Etc.

READ THIS:
Select **MCT** (Max Continuous Thrust) on "good" engine:
NOTE: If FLEX was used for take-off, to select MCT you MUST:
1. Move thrust lever from FLX to TOGA, and then
2. Move thrust lever back to MCT.

If you DO NOT go to TOGA first, you will remain in FLX.

At airspeeds less than GREEN DOT, bank angles are limited to 15°. I have indicated that with a dashed line.

After 500 feet, when the Flight Director or autopilot is on, bank angle limited to "commanded" bank angle.

Terrain clearance is ONLY ensured by climbing to 1500 AFE while tracking the extended RUNWAY CENTERLINE.

"V1-CUT" bad techniques and stupid screw-ups.

Arguably, the most busted event on the check-ride is the ***V1-CUT***! It is indeed a challenging and confusing event and demands that the pilot use his pilot bag of skills to the fullest. Involving thinking and understanding as well as the ability to actually fly the airplane using your hands ... it is a dreaded and feared event. But let me guide you through the process and see if we can conquer the beast. Here is my list of ...

THE BIG 5 V1-CUT SCREW-UPS

Although by no means all the ways a clever and determined pilot can screw up.

Presented in the order of their appearance ... drum roll please.

SCREW-UP # 1 ... ABORTS AFTER V1.

As the airplane goes hurtling down the simulator runway, once you have taken your hands off the thrust levers at V1 ... ***DO NOT REACH UP AND PULL THE THRUST LEVERS BACK***. Do not attempt to abort the take-off after V1 ... at this point you should visualize yourself as "committed to fly."

DISCUSSION: *Attempts to abort after V1 are always an improper response in the sim. I realize, however, that in the real world there have been "airplane saves" by alert crews who have aborted after V1 to avoid disastrous situations. However, an abort after V1 is not something you want to be talking about in the debrief after a simulator session.*

SCREW-UP # 2 ... PUSHES WRONG RUDDER.

Even though the nosewheel of the airplane is on the ground, the most important control input is from the RUDDERS. The rudder is very effective on this airplane and it really isn't necessary to know which engine has failed. All you have to do is keep the nose of the airplane headed down the runway. You don't want to get "walking" the rudders and the airplane wallowing from one side to the other as you try to figure out which rudder to push. It should be intuitive. DO NOT THINK ABOUT WHICH LEG TO PUSH ... just ease in the rudder that makes the nose go where you want.
In a catastrophic engine failure, there is no question about which rudder to push, and it will take almost full extension to control the heading. Push the rudder so that the nose of the jet goes in the direction you want. Use enough input to make the correction you want, then "lock" your leg to everything but teensy-tiny corrections.

TIP! *Right rudder makes the nose go right, and left rudder makes the nose go left.*

OBSERVATION: For some reason, pilots have gouges such as "working foot - working engine", or they try to figure out by looking at the engine gauges which rudder to push. I have actually observed some guys using the 50-50 technique (they push one rudder knowing they have a 50% chance of being wrong). Pretty ugly ... and 50% of the time the airplane exits the runway.

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SCREW-UP # 3 ... ROTATES BEFORE VR.

I can almost guarantee that the first time the other pilot screams "ENGINE FAILURE" your first instinct will be to ease back on the stick. If you do that and the nosewheel loses its grip, the jet will head off the runway and across the airport grass like a scared rabbit.

DO NOT ROTATE WHEN THE OTHER PILOT YELLS ENGINE FAILURE.

It is my opinion that there should actually be a slight downward pressure on the nosewheel to aid in controlling the tendency of the airplane to swerve off the runway. I also advocate keeping the nosewheel on the runway for a few seconds after **VR**. There is no requirement to initiate rotation right at **VR**, and a few seconds beyond that actually helps in the evolution.

DISCUSSION: Maximum tire speed is 195 Knots. You can stay in contact with the runway until reaching that limit. The only requirement is that you get airborne before the end of the runway passes under the nose.

SCREW-UP # 4 ... POOR ROTATION TECHNIQUE.

When you initiate the rotation, the airplane will hesitate slightly at about 8 to 10 degrees. It does this because the airflow to the elevators is disturbed by the wings. Some awareness on your part is required to "pull" the nose through the burble and then return immediately to normal rotation pressures.
You are aiming for about 2 to 3 degrees per second.

1. If you rotate too aggressively, the tail will drag the runway. The tail can strike the runway even though the main landing gear are actually in the air.
A TAIL STRIKE IS NOT GOOD!
2. If you fail to complete the rotation to 12.5 degrees, the airplane will fly "more or less" level at 8 to 10 degrees. This can result in contact with Mother Earth off the end of the runway. This is called Controlled Flight Into Terrain and
CFIT IS NOT GOOD!
3. Keeping the back pressure in for too long, and exceeding 12.5 degrees will result in a loss of airspeed, the rudder losing effectiveness, the nose of the airplane slewing uncontrollably into the "bad" engine, you will stall and crash.
A STALL AND CRASH IS NOT GOOD!

SCREW-UP # 5 ... NO PREPARED PROCEDURE.

Probably the most pitiful thing to observe is some pilot trying to invent the wheel as the airplane is charging down the runway with one engine spooling down. Without a plan, without a set of ideas already set in his mind, the hapless airplane driver is along for the ride. Trying to accomplish this procedure without a methodically thought out plan and a series of specific milestones is simply check-ride suicide.

MAKE A PLAN BEFORE YOU FLY!

I have presented my ideas about what a plan "could" look like, but it is up to you to sit down and go through the steps to create a plan that works for you. Once you have that plan, you will have to go over it again and again to firmly set the details in your memory. ...and then go over it some more until you are ready to puke. I GUARANTEE that your brain will turn to putty the first time you are confronted with this situation and you will have little or no brain-power left over to improvise.

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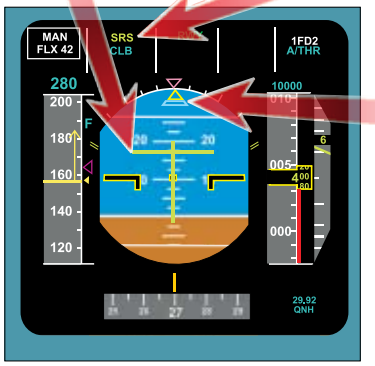
"V2 CUT"

Engine Failure after Airplane off ground, single engine approach, or engine fails during go-around.

RULE NUMBER 1 is *FLY THE AIRPLANE* !

While this situation is generally depicted as happening right after take-off, it also could occur on a MISSED APPROACH. It could be the result of the Check Captain screwing up (selecting the engine failure too late). All this doesn't matter. You will be expected to fly the airplane and avoid contact with the earth.

LOWER NOSE: Make your initial target pitch 12.5 degrees. DO NOT follow the PITCH BAR on the FLIGHT DIRECTOR initially. If SRS is NOT displayed, maintain speed NO LOWER than V2.



LEVEL WINGS: Use the Flight Director ROLL indicator for guidance.

CENTER BETA TARGET: Use the **RUDDER** to center the BLUE "beta target" indicator on the bottom of the yaw indicator (Sailboat).

TRIM: The RUDDER to maintain the "beta target" indicator centered.

4-Ts
TOGA
TALK
TURN
TRIM

TOGA = If taking off in FLEX, consider TOGA.
(*TOGA not required as a/c is certificated SE FLEX*).
TALK = PNF to TOWER: "*ENGINE FAILURE*"
TURN if required by EOSID or "T" procedure turn, tell TOWER.
TRIM = Rudder takes about
20 seconds (A320), 30 seconds (A319).

If GO-AROUND ... TOGA

PITCH 12.5 degrees
@ POSITIVE CLIMB
GEAR UP
CENTER BETA target

Auto-pilot OK:
Above 100 feet;
IF
- In **TRIM**, and
- **SRS** on FMA

Speed **V2** or greater

Auto-pilot OK:
Above 100 feet; IF
- In **TRIM**, and
- **SRS** on FMA



O **OP CLB**: ***Pull*** the **ALTITUDE SELECTOR** knob towards you, This will select **GREEN DOT** airspeed and **OP CLB.**

A **AUTO-PILOT** will reduce pitch so as to reach green dot airspeed.

E **ECAM** actions should be done methodically (so as NOT to shut down wrong engine).

OAE @ 1000
O=OP CLB
A=AUTO-PILOT
E=ECAM actions

As airplane accelerates;
FLAPS on schedule to UP
AFTER TAKE-OFF CHECKLIST

passing 1500 feet

Notify:
FLIGHT ATTENDANTS
PASSENGERS
COMPANY

Consider:
RELIGHT ENGINE
RETURN TO LAND
GO TO ALTERNATE
Etc.

@ GREEN DOT airspeed
THRUST to MCT
Continue Climb

READ THIS:

Select **MCT** (Max Continuous Thrust) on "good" engine:
NOTE: If FLEX was used for take-off, to select MCT you MUST:
1. Move thrust lever from FLX to TOGA, and then
2. Move thrust lever back to MCT.

If you DO NOT go to TOGA first, you will remain in FLX.

At airspeeds less than GREEN DOT, bank angles are limited to 15°. I have indicated that with a dashed line.

After 500 feet, when the Flight Director or autopilot is on, bank angle limited to "commanded" bank angle.

Terrain clearance is ONLY ensured by climbing to 1500 AFE while tracking the extended RUNWAY CENTERLINE.

SPECIAL CASE:

ENGINE FIRE ON TAKE-OFF

A potential "Check-ride from HELL" event. If you get an engine fire warning after V1, the Check-Captain will be looking for you to continue the initial part of the take-off profile *WITHOUT SHUTTING DOWN THE ENGINE*. It is too easy to get involved with shutting off the engine at a low altitude ... and while becoming pre-occupied with the shutdown and get slow, or worse yet - HIT THE GROUND.

In this situation, you may have a fire warning, BUT you are not single engine yet ... and you can pick your spot. It is a judgement call on your part and I am not trying to set SOP, but normally, waiting until out of about 500 feet before shutting down the engine and fighting the fire is desirable.

REMINDER:

You can do a perfect engine shut-down procedure, but if you CFIT (Controlled Flight Into Terrain) you will be trying to explain the event in the debrief while scheduling your re-check.

Once you shut 'er down, you can revert to EOSID routing and Single Engine procedures and check-lists.

This is a Captain to Captain discussion about aborting after V1. I think we have all heard about the courageous crew that aborted after V1 to avoid contact with another airplane that had taxied onto the runway in the fog ... and they got stopped and saved the day. Heroes no doubt.
And there is not a pilot among us that wouldn't try to do the same thing in that situation ... but late aborts are probably the ***MOST DANGEROUS EVENT IN AVIATION***. You probably do not want to be trying to explain your late abort decision to the Check Airman in the de-brief. Here is the official position of one major air carrier:



WARNING:

"In the HIGH SPEED REGIME, especially at speeds near V1, a decision to reject should NOT be based on the perceived ability that the airplane can be stopped. The decision to reject should be made ONLY if the failure involved would impair the ability of the airplane to be safely flown."

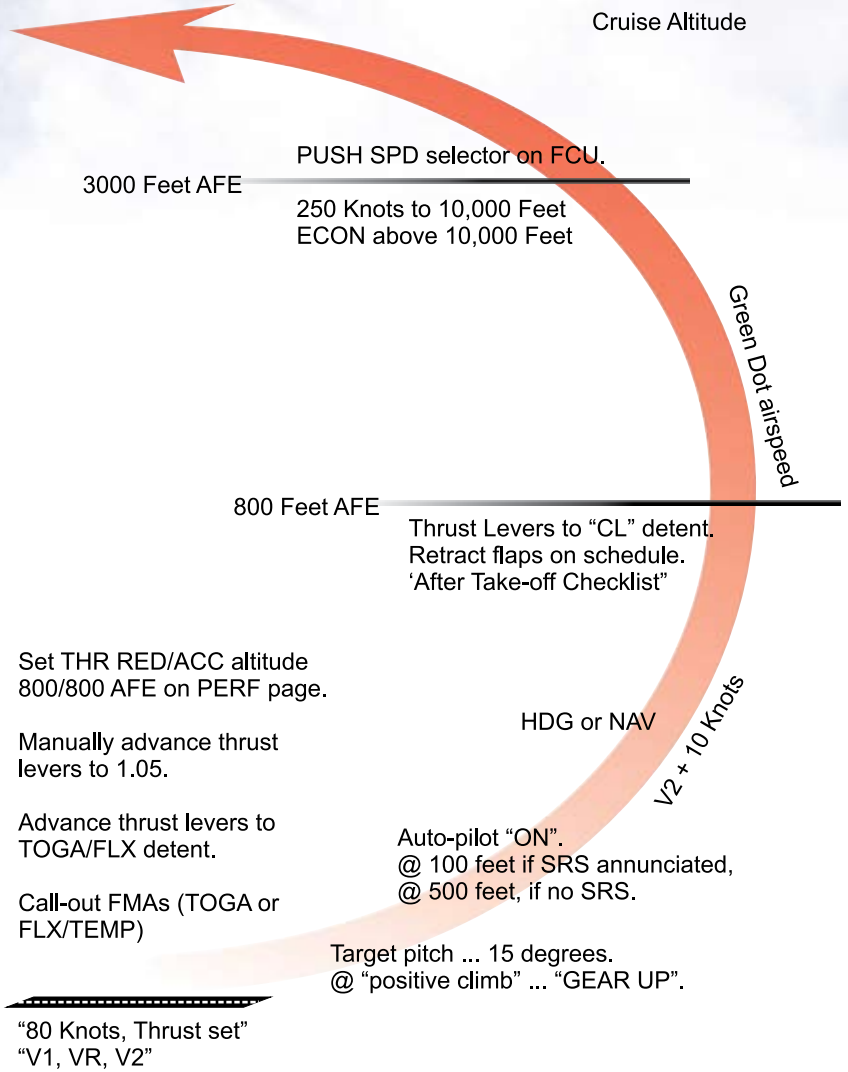
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"NORMAL TAKE-OFF"

One thing you can expect on your check-ride is a "normal take-off". Unfortunately, the check-guy isn't going to tell you which of the many flight profiles you are going to fly is the "normal" one. Here is a simple profile that represents a

STANDARD NOISE ABATEMENT TAKE-OFF.



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ROTATION technique

The Pilot Flying will rotate the airplane smoothly and gently. The movements are barely perceptible and should produce about 2° to 3° per second of nose vertical pitch change. You want to target 12.5° (single engine) to about 15° up. You want to slowly arrive at the SRS pitch command on the PFD.

TAIL-STRIKE

11.5° PITCH JET HITS EARTH

(13.5 degrees for the A319, but who's counting!)

WINGTIP or ENGINE POD SCRAPE

Particularly in a gusty crosswind, there may be a tendency to over-control the ailerons as the airplane comes un-stuck and begins flying. It is possible to "get a pod or a wingtip" since the engine is a mere 21 inches above the runway surface.

at **16° ROLL** JET HITS EARTH

CROSSWIND

TAKE-OFF LIMITS

Demonstrated maximum with flight controls either normal or direct law with or without yaw damper.

BRAKING ACTION: GOOD	A320/A319
CROSSWIND	29 KNOTS
CROSSWIND with GUSTS	38 KNOTS
TAILWIND	15 / 10 KNOTS

REPORTED BRAKING ACTION	ALL MODELS
FAIR/MEDIUM	25 KNOTS
POOR	15 KNOTS
NIL/UNRELIABLE	OPERATIONS NOT RECOMMENDED

As the airplane is accelerating, the situation is very fluid and several factors are changing. For one:

- RUDDER actuated NOSEWHEEL steering has more effect at lower airspeed. Using the rudder pedals, at 40 knots the input is +/- 6° and gradually diminishes until at 130 knot there is 0° input to the nosewheel steering from the rudders.

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"POSITIVE CLIMB"

Either the Pilot Not Flying (PNF) or the Pilot Flying (PF) will call-out; "**POSITIVE CLIMB**," when the airplane indicates that it has physically left the earth. That requires a check of BOTH the IVSI on the side of the PFD instrument, AND a check of the barometric (Standby) VSI.

"GEAR UP"

The Pilot Flying (PF) will call-out; "**GEAR UP**," and the Pilot NOT Flying (PNF) will respond "**GEAR UP**" and then place the gear handle to the UP position.

NOTE: Selecting the **LANDING GEAR** handle UP only actuates an electrical switch and it NOT directly tied to any cable or mechanical device. There are two **LGCIU** (Landing Gear Control and Interface Units) that monitor proximity sensors and that provides information for the **ECAM** and other gear indicators.

at 260 KNOTS

When airspeed below 260 Knots, selecting the gear UP or DOWN will perform all the normal functions of the gear and gear doors.
When airspeed greater than 260 Knots, a HYDRAULIC SAFETY VALVE cuts off any fluid to the gear actuation mechanism.

NORMAL RETRACTION

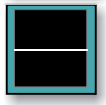
GEAR INDICATIONS:
- Automatic braking is applied to main gear.
- Landing gear locked in Wheel Wells MECHANICALLY.



The gear are "**DOWN AND LOCKED**"



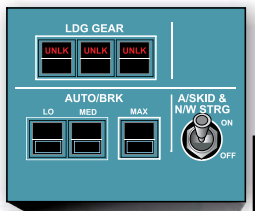
The gear are "**UNLOCKED**" or "**IN TRANSIT**"



No indication if the gear are "**LOCKED UP**"



The "**WHEEL SYNOPTIC - LOWER ECAM**" showing the gear door positions as locked. The lack of a "wheel" depiction indicates that the **GEAR** is LOCKED UP.



YEAH, BUT ARE THE GEAR UP?
If there is NO GEAR INDICATION on either the LANDING GEAR PANEL or the ECAM WHEEL synoptic page indications, then we are to assume that the GEAR ARE UP and LOCKED.

After raising the **GEAR HANDLE,**
DISARM the GROUND SPOILERS.

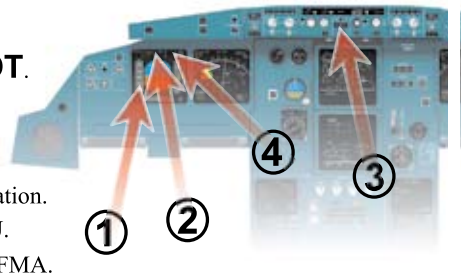
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Discussion about engaging **THE AUTO-PILOT**.

If SRS is annunciated, the auto-pilot may be engaged when above ***100 Feet.***
If SRS NOT annunciated,
The auto-pilot may not be engaged until passing ***500 Feet.***

Either pilot may engage the auto-pilot. I personally think it is better to have BOTH pilots involved, but during periods of high task loading, it sometimes make sense for the PF to engage the auto-pilot.
It is SOP for the PF (Pilot Flying) to verify engagement by observing the FMA annunciation on the PFD. Just because the little light goes on in the FCU switch does not mean that the auto-pilot is engaged.
NOTE: *On your check-ride, the Check Captain may ask you if your auto-pilot is engaged, and she is expecting you to reference the PFD FMA, not the FCU.*

How to turn on **THE AUTO-PILOT**.



1.Check altitude
2. If above 100 feet but below 500 feet, check the PFD FMA for SRS annunciation.
3. Depress the A/TH 1 button on the FCU.
4. Verify auto-pilot engaged on the PFD FMA.

There are basically TWO ways to control the heading of the jet:
1. PULL the HDG/TRK selector button on the FCU and Manually select a heading (such as Runway heading), or
2. PUSH the HDG/TRK selector on the FCU to select NAV mode and fly the MCDU defined pathway.

It is my opinion that on a check-ride, ALWAYS consider selecting the RWY or HDG and attempt to track outbound on the extended centerline since we are always expecting an engine failure. This will give us obstacle clearance up to 1500 feet.



BIG PROBLEM.

If the first waypoint or fix is to the side of the extended runway centerline, and you have elected to fly a "NAV" mode for the LNAV or lateral navigation, then when you select the auto-pilot ON, the airplane will turn immediately towards that initial fix. If there are obstacles such as the tower in your projected departure path, then there is a possibility that the airplane my pass over, in the near vicinity of, or through the tower. Not a good thing. It is, therefore, generally considered 'GOOD CAPTAIN PRACTICE" to limit all significant turns to 400 feet and above, particularly in restricted visibility situations.

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at 30 FEET

Once airborne, the selected heading mode will engage at 30 feet AGL.
If we hadn't set anything in the FCU, it will default to NAV.
If we had selected a heading, then that would be visible on the FCU.
If we had "pulled" the selector, then RWY TRK would be the operative heading.

at ACCEL or ALT*

SRS is (normally) the operating pitch mode up to the acceleration altitude that is set in the PERF page. At this point, the FMGC transitions to the CLIMB PHASE and the pitch mode target speed shifts to

- Climb speed programmed by the pilot in the CLB PERF page (usually GREEN DOT speed), or
- 250 Knots below 10,000 Feet AGL.

at "flashing" LVR CLB on the FMA

1. Look at speed trend arrow on the PFD and it should be indicating an acceleration. Reduce the pitch slightly if necessary.

2. Monitor the UPPER ECAM for the THRUST indication. It should be **TOGA** or **FLX**.

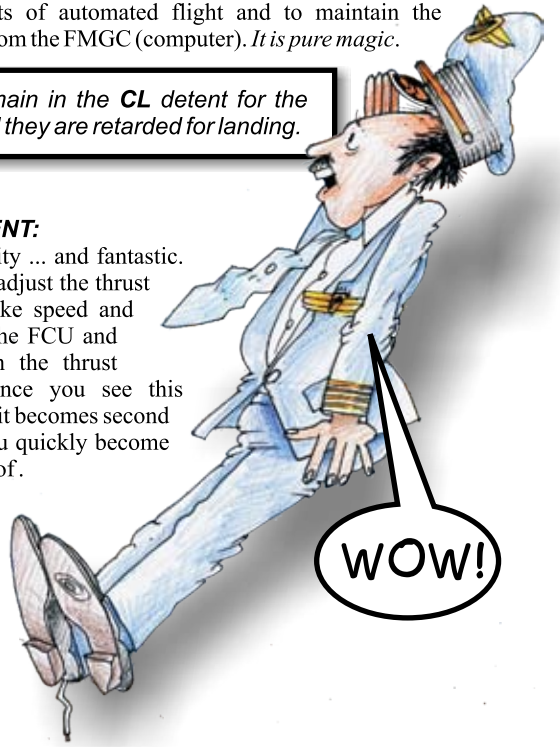
3. Pull the THRUST LEVERS back until **CL** is the indicated operating mode. The thrust levers should be in the CL detent on the thrust lever quadrant. Once in this detent, the application of thrust is automatically controlled. The thrust levers no longer physically move, but the thrust will be constantly changing to accommodate the requirements of automated flight and to maintain the airspeed and pitch commands from the FMGC (computer). *It is pure magic*.

*The thrust levers will remain in the **CL** detent for the remainder of the flight until they are retarded for landing.*

COMMENT:

This is a truly unique capability ... and fantastic. The pilots are not required to adjust the thrust levers manually but may make speed and pitch commands using only the FCU and MCDU which will result in the thrust responding automatically. Once you see this system in action, you will find it becomes second nature to depend on it and you quickly become used to it. It is virtually foolproof.

BUT ... how can a pilot screw it up?



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ONE OF THE "BIG TEN" PILOT SCREW-UPs

BIG MONSTER PROBLEM.

GOOF UP PART # 1.



When responding to the flashing "LVR CLB" on the PFD, if the thrust levers are inadvertently retarded back *beyond* the CL detent, the engines will spool down accordingly ... and if pulled into the IDLE range, they will spool down all the way to idle. ***The A/THR will disconnect***.

GOOF UP PART # 2.

If you push the thrust levers back towards the CL detent, even though CL may be the annunciated thrust lever setting, the thrust will remain in manual control because the A/THR is deselected..
This is ***NOT A GOOD THING***.
To "re-engage" the automated "CL" mode, you must re-arm the A/THR mode. Either push the thrust levers forward beyond the CL detent into the engagement zone, and then retard back to the CL detent.
Or re-select A/THR on the FCU with the thrust levers in the CL position.

GOOF UP PART # 3.

If you do not do this, and do not recognize that the thrust is in manual ... even with CL annunciated ... the airspeed will possibly decay into the "red bricks" and you will get an A-FLOOR annunciation and the thrust will go to TOGA LOCK.
Or ... it could generate an over-speed situation and the airplane integrity could be compromised. Either way, that will pretty much be the end of your check-ride.

Here is the way the simulator problem can develop:

1. After take-off, you accept a low altitude level off.
2. With the thrust levers set at TOGA/FLX, the airspeed increases VERY rapidly.
3. Airspeed approaches Vmax, and
4. Pilot manually retards the thrust levers to IDLE.

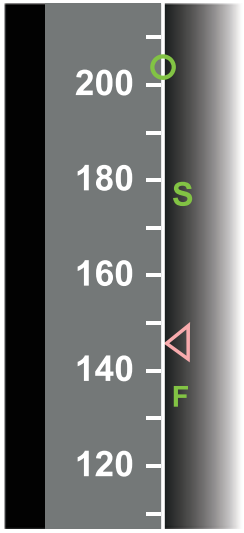
Whoops! BIG MISTAKE!!!

5. Airspeed diminishes to Vmin (the Bricks) and A-FLOOR is annunciated.
6. Thrust goes to TOGA LK with thrust levers physically in idle position.
7. Airspeed increases to Vmax.
8. Pilot becomes confused and doesn't know what to do.
9. Airspeed over-speeds.
10. Airplane comes apart, pilot busts check-ride.

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RAISING THE FLAPS

The PF calls for the flaps using the speed cues on the PFD.
Once the airspeed is greater than:

- "**F**" speed, the PF may call for "**FLAPS 1**,"
- "**S**" speed, the PF may call for "**FLAPS UP**."

NOTE:
"F" speed is displayed only if the take-off is made with the flaps in configuration 2 or 3.

Once the flaps have fully retracted, the **ECAM ENG** page is automatically replaced with the **ECAM CRUISE** page.

AFTER TAKE-OFF CHECKLIST

Pilot Not Flying will complete the After Take-off Checklist without response.

AFTER TAKE-OFF CHECKLIST ..... COMPLETE

(To be checked ALOUD by the pilot not flying)

Landing Gear	UP
Flaps	UP
ECAM memo	Checked

at 3000 Feet AFE (*Above Field Elevation*)
SELECT MANAGED SPEED

Depending on whether you are restricted to a specific airspeed or not (possibly in Class "B" airspace) it is generally accepted that you may accelerate to 250 Knots below 10,000 Feet. 10,000 Feet and above you will (probably) be cleared to accelerate to your desired climb airspeed (normally ECON).
The computer has already been programmed for all this, so all you have to do is select "MANAGED" airspeed by PUSHING the SPD knob on the FCU.
The target airspeed pointer will turn to MAGENTA and slew to the appropriate setting.

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LOUSY WEATHER OPS during *CLIMB PHASE*

If un-forecast icing is encountered during the flight, notify the ATC controller, of course, and don't forget to send an ACARS message to the Dispatcher

USE OF ENGINE ANTI-ICE in CLIMB and CRUISE

Engine anti-ice MUST be used during CLIMB and CRUISE in icing conditions ***EXCEPT*** when the temperatures are below -40°C SAT.

I would mention this now for future reference that in the descent, when in icing conditions, the engine anti-ice ***MUST BE ON*** prior to and during long descents ***EVEN IF*** the temperature is below -40°C SAT.

CAUTION

DO NOT DELAY the use of engine anti-ice until ice buildup is visible from the cockpit. *SEVERE* engine damage or flame-out can result.

ENGINE VIBRATION concerns

If an increase in vibration occurs due to icing, here is what should happen. The engine fan section should automatically shed the ice and the vibration should decrease. Normally, OK to continue.
BUT
if the vibration does NOT decrease,
go to the flight manual for guidance and procedures.

WING ANTI-ICE guidelines

Ice accumulation on the visual ice indicator, cockpit window frame, windshield center post, or on the wiper arm indicates structural icing and the need for wing anti-ice.

There are two ways to use the wing anti-ice system:

- as a de-icing system. This provides the cleanest airfoil, least run-back, and least thrust and fuel penalty.
- as an anti-icing. Use this method when in extended operations in icing conditions such as holding.

The Deicing and Anti-icing equipment IS NOT intended to permit extended operations in other than LIGHT ICING. If icing conditions of greater than **LIGHT** is encountered or expected to develop ...
EXIT THE AREA IMMEDIATELY!

WARNING

Prolonged operations in icing conditions greater than light are appropriate ***ONLY IN AN EMERGENCY SITUATION***.

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CLIMB PHASE

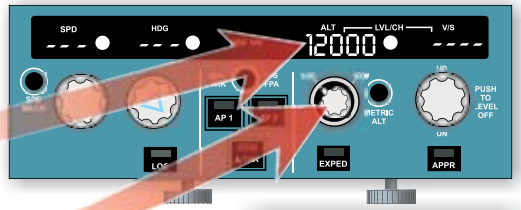
MEMORY REFRESHER:
The CLIMB PHASE begins when the airplane climbs through the ACCEL ALT that we had selected on the MCDU. The CLIMB PHASE terminates ONLY when the airplane ***REACHES*** the CRUISE ALT we had selected on the MCDU.
Intermediate "CLEARED TO" altitudes that we select on the FCU do NOT satisfy the FMGC (computer brains) that we have reached CRUISE PHASE unless that altitude co-incides with the cruise altitude selected in the MCDU.

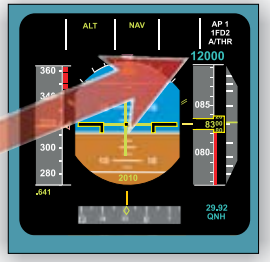
BIG PROBLEM !
BUSTING YOUR ALTITUDE

During the entire time that you will be airborne, you will constantly be receiving altitude changes. Either they come from ATC or are printed on the SID/STAR and approach charts. There are actually TWO problems in this situation.

- Setting the correct altitude, and
- Ensuring the altitude remains correctly set during the selection of the vertical mode.

This is strictly technique and not necessarily SOP, but try this. When an altitude change is received,





1. The PF points at the FCU altitude window and reads back the CLEARED TO altitude.

2. The PNF repeats the altitude and twists the selector to set that CLEARED TO altitude.

3. The PF selects the desired vertical mode (push or pull the knob) and,

4. Confirms that the target altitude remains selected by reference to the altitude indicated on the top (or bottom if descent) of the PFD ALT tape.

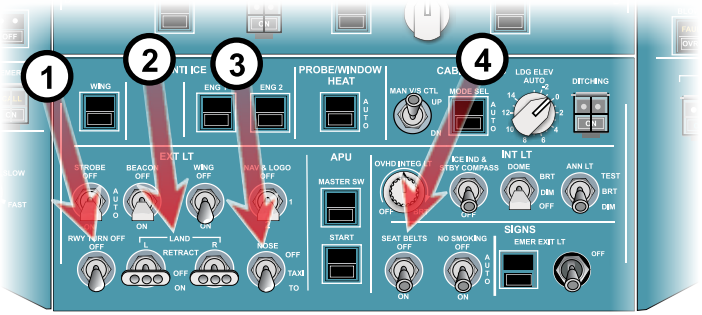
Discussion: Since they started employing the automated systems, altitude excursions have greatly diminished ... BUT, the problem still persists. The solution seems to be to get BOTH pilots involved in the setting the new cleared to altitude. It may seem redundant and unimportant, but I suggest that you make some routine a habit pattern. Especially during high task loading situations, specifically the approach part of the flight.

SITUATIONAL AWARENESS

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LIGHTS (before 250 Kts)



1. LANDING LIGHT SWITCHES retract before **250 Kts**.
When to turn out the lights is largely a matter of Pilot preference and conditions. However, the **LANDING LIGHT SWITCHES** should be retracted ***BEFORE*** reaching **250 KTS**. I couldn't find any specific reference to the retraction/extension speed limit of the landing lights, but they are driven in and out by little electric motors ... and that implies a speed restriction.

2. RUNWAY TURNOFF LIGHT SWITCH ..... OFF.

3. NOSE LIGHT SWITCH .....OFF.
This switch controls both the taxi and take-off light. When the nose gear are retracted, both lights automatically shut off.

4. SEAT BELT SIGNS .....OFF (at Captains discretion).
Normally this is shut down as soon as Flight conditions permit. This will allow the flight Attendants to conduct their in-flight duties.

PASSING TRANSITION ALTITUDE

(In the US, this is always 18,000 Feet)

1. Both pilots set altimeters to STD (Pull the EFIS control panel BARO switch).

2. Captain sets the STANDBY ALTIMETER to 29.92/1013 In/hPa. You do that using the knob on the instrument and observing the window in the display.



HOW CAN A PILOT SCREW THIS UP???

Sometimes, if a DESTINATION altimeter setting is known, it can be pre-selected on the instrument so that it can be easily retrieved during the approach phase. BIG PROBLEM if you forget to select STD.

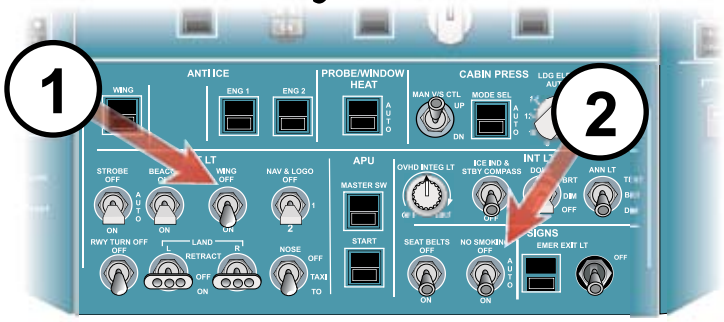
You will BUST YOUR ALTITUDE!!! Really ugly.

This occurs with alarming frequency, so:
"Pilots are not allowed to pre-set the destination altimeter setting ***UNTIL*** the airplane is in **ALT CRZ** or at selected cruise altitude."

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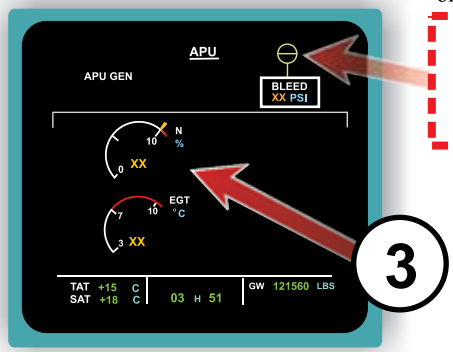
PASSING 18,000 Feet



1. [Captain] Turn the **WING LIGHTS** switch ..... **OFF**

2. [PNF] **NO SMOKING** SIGN ..... cycle **AUTO** then back to **ON**.
If the flight is going to cruise below 18,000 Feet, then cycle it when you are level at the cruise altitude. The idea is to activate the "chime" to signal the Flight Attendants that the "**STERILE COCKPIT**" is no longer in effect. It has nothing to do with smoking.

3. [Captain] "Verify" **APU** (Auxiliary Power Unit) **..... OFF**
The official technique for "verifying" the APU is OFF is to select the **ECAM APU** page.
Look at the "**N**" to see if it is " turning", and look at the "**EGT**" to see if it is "burning".
The BLEED AIR switch is programmed to close when the APU shuts down without action from the pilot. If you see the bleed air switch indication "OPEN" with the APU not running, then further investigation is in order.



You do NOT want to be airborne with the APU off and the APU BLEED AIR switch OPEN simultaneously.



4.[PNF] **MANUALLY-TUNED** navaids.
Go to the **NAV-RAD** page of the **MCDU** and clear any manually tuned navaids; unless, of course, they are being used .... DUH!
To clear then, use the **CLR** key.

If the radio frequency has been "*MANUALLY*" tuned, LS (line selecting) CLR to the frequency line will return to the AUTO-TUNE nav-aid from the database.

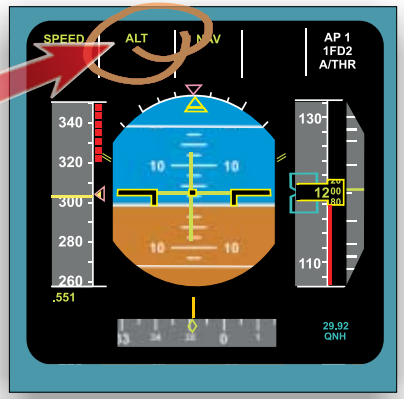
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DOING THE CLIMB

The autoflight will initially climb at 250 Knots airspeed (Unless MCDU was set-up with another airspeed such as GREEN DOT airspeed) until reaching 10,000 feet MSL, where the nose will pitch over and the airplane will accelerate to ECON climb airspeed (Somewhere around 280 - 300 Knots).

INTERMEDIATE LEVEL-OFF (ALT)
versus
CRUISE ALTITUDE (ALT CRZ)

Once the airplane reaches a target altitude we have set on the **FCU**; look at the **PFD** display screen. Across the top is the **FMA**, and the second annunciation from the left should read "**ALT.**" Once **ALT** (or **ALT CRZ)** is annunciated, we are OK to pre-set another **FCU** target altitude in preparation for an anticipated descent or climb, and the airplane will remain at the altitude.



Look at the ND display screen. The projected point on the green route line depicted by a bent ARROW (referred to as a "Hockey Stick) is the point where the airplane will reach the cruise altitude that has been pre-selected on the **PROG** page (FL260 in our example). Once the jet reaches this point in the route, it should be at the point where it will capture the ALTITUDE, annunciating **ALT CRZ** on the **PFD**, and enter the cruise phase.



Once **ALT** or **ALT CRZ** is annunciated, even with a different target altitude set in the **FCU** display, the airplane will remain at altitude, waiting for the signal to descend. You may pre-select higher or lower altitudes when the **PFD FMA** is indicating **ALT*, ALT,** or **ALT CRZ** and the airplane will remain at altitude, waiting patiently for your command.



DO NOT PUSH OR PULL THE ALTITUDE SELECTOR UNTIL READY TO CHANGE ALTITUDE.

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ONE OF THE "BIG TEN" PILOT SCREW-UPs

Climb phase is initiated when the airplane climbs through the **ACCEL** altitude and continues until the airplane "captures" the **CRUISE** altitude that was displayed on the **PROG** page during **MCDU** pre-flight setup. If the airplane is allowed to climb all the way to the planned cruise altitude, the **MCDU PROG** page will automatically shift to **ECON CRZ** page and the jet will then be in the **CRUISE** phase.

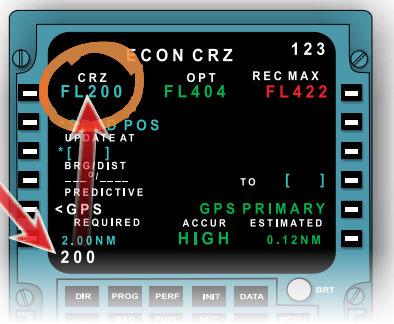
WHOOOOPS !

HOWEVER ... what if the airplane does not reach the planned cruise altitude set in the **MCDU**? If the jet reaches an **FCU** selected target altitude that is BELOW the planned **MCDU PROG** page altitude, then even though **ALT** will be annunciated in the **PFD**, the flight algorithm will still remain in **CLIMB** phase. You will still be operating in CLIMB PHASE. This is ***NOT GOOD***!

There is a simple way to resolve the situation, it is called re-cruising.
Here is what you do:

HOW TO RE-CRUISE IN CLIMB:

A simple solution to this problem is to re-set the airplane's actual altitude on the **MCDU PROG** page to create a "new" cruise altitude. You access the proper page by selecting the **PROG PAGE** key on the **MCDU** and the **XXX CRZ** page will be displayed. Type the new cuise altitude to the scratchpad and line select it to **LSK1L**. Once the new altitude is substituted for the "old" one, the airplane will then re-transition to a new CRUISE PHASE. This is called "**RE-CRUISING**".



EXAMPLE: *Say you have initially set FL260 (26,000 feet) in the MCDU as your planned cruise altitude, but during the climb, you decide for some reason (let's say that there is turbulence reported at that altitude) to opt to cruise at a lower altitude (Let's say FL200). You set the lower altitude in the FCU and the jet levels off at that altitude.*

WHOOPS! *In order to complete the Airbus phase algorithm, you must tell the FMGC about your new cruise altitude. It is easy, just go to the* **PROG** *page and, simply change the cruise altitude to reflect your new cruise altitude (in our example FL200).*

The **PROG** *page will reflect the appropriate cruise phase page, such as* **ECON CRZ.**

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SITUATION 1:

Once the airplane is established in cruise at the planned altitude; when and if you decide to continue your climb to another higher altitude.

1 - Set your new HIGHER altitude in the **FCU** altitude window.
2 - PUSH the **ALT** selector button (selecting managed mode).
3 - The "new" selected cruise altitude will AUTOMATICALLY be inserted in the **PROG** page.
5 - The **PROG** page will shift to **CLB.**
6 - A message across the bottom of the **MCDU** will say: "**NEW CRZ ALT ENTERED.**"
7 - The airplane will start a climb to the new higher cruise altitude.

SITUATION 2:

With the airplane is established in cruise at the planned altitude; if you decide to descend to a lower altitude and the airplane is more than 200 NM from the destination:

1 - Set your new LOWER altitude in the **FCU** altitude window.
2 - PUSH the **ALT** selector button (selecting managed mode).
3 - The "new" selected cruise altitude will AUTOMATICALLY be inserted in the **PROG** and **INIT** page.
5 - The **PROG** page will shift to **CLB.**
6 - A message across the bottom of the **MCDU** will say: "**NEW CRZ ALT ENTERED.**"
7-The airplane will start a descent to the new lower cruise altitude.

NOTE: *A Flight Level less than the current FCU altitude cannot be directly inserted into the* **PROG** *or* **INIT** *page.*

WHEN A PILOT SCREWS UP!

If you "ACCIDENTLY" start the descent or push the "APPCH NOW" key, and change your mind ...



SITUATION 3:

If the **DESCENT** or **APPROACH PHASE** is inadvertently activated, the **CRUISE PHASE** can be recovered by re-entering a new cruise flight level on the **PROG** or **INIT** page.

SITUATION 4:

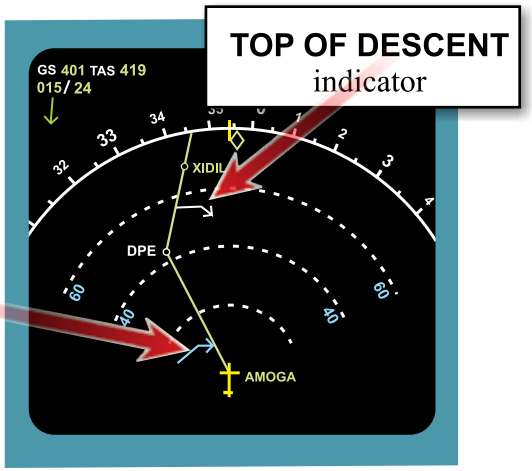
If **ENGINE FAILURE** occurs, **PROG** page automatically displays the recommended **EO** (Engine Out) altitude. That would be the single engine altitude computed for **LONG RANGE CRUISE** (LRC) speed at **MAX CONTINUOUS THRUST** and **ANTI-ICING OFF**. Useful information when performing a DRIFT-DOWN.

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HOCKEY STICKS

TOP OF CLIMB and TOP OF DESCENT:

As we continue our flight profile, we can see two little "bent arrows" on the green route line on the ND. These are the "TOP OF CLIMB" and "TOP OF DESCENT" indicators. They are placed there by the **FMGC** in response to the flight parameters that we have entered (or allowed to be defaulted) when we loaded the **MCDU**.
Referred to as "hockey sticks, they are *ONLY* indicators and are used for planning purposes.



THE "TOP OF CLIMB" INDICATOR

"Top-of-climb" indicates where the airplane will reach the "PLANNED" cruise altitude that was set in the **INIT A** page and we can now view in the **PROG** page. Note that the airplane will automatically level off *ONLY* at the **FCU** displayed altitude, not necessarily the "hockey stick" point. The **PFD** will annunciate "**ALT**" *ONLY* when the auto-pilot captures the **FCU** selected altitude.
If, and this is the case most of the time, the Planned Altitude on the **INIT A** or **PROG** page and the **FCU** selected altitude are the same, then the airplane will level off, capture and annunciate **ALT CRZ**, and the jet will transition to the CRUISE PHASE.

THE "TOP OF DESCENT" INDICATOR

"Top-of-descent" indicator ONLY displays the point where a managed descent profile, if started at this point, will meet theconstraints that are displayed on the **F-PLAN** page. The actual initiation of the descent REQUIRES manual input from the pilot. It is a two step process:

1- SET LOWER ALTITUDE IN THE FCU
2- PUSH THE ALT SELECTOR BUTTON

A managed descent is desirable in this airplane since in that mode it gives an indication of the relationship of the airplane to the "planned" flight path. There is a MAGENTA DONUT that appears on the Altitude Tape of the **PFD**, and you can monitor the vertical progress on the **PROG** page during the descent.

It is generally considered good practice to start the descent using the managed technique described above about 5 miles prior to the T-D point.

The airplane will assume a fixed descent rate (about 1000 fpm) until is flies into the descent profile and from that point on, it will capture and fly that profile.
If you get a late start and over-fly the T-D point, use the OP DES technique. Pull the

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CRUISE PHASE
(After level-off)

MEMORY REFRESHER:
The **CRUISE PHASE** begins when the airplane level-offs at the **CRUISE ALTITUDE** that is indicated on the **PROG** page. This is indicated by the **PFD** annunciator indicating **ALT CRZ**.

In RVSM, it is recommended that the AUTO-PILOT be used to make the actual cruise altitude capture and continue to be engaged during cruise. Except where disengagement is required such as during TURBULENCE or TRIMMING. It is absolutely essential that the airplane capture and remain as close to the cleared cruise altitude / flight level as possible.
After level off complete, it is considered SOP to perform an altimeter check. Altimeters MUST BE within 200 feet of each other.

DISCUSSION ABOUT RVSM
(*Reduced Vertical Separation Minimum*)



RVSM extends the altitude where 1000 foot vertical separation between airplanes exists to above FL 290 to FL 410. This is predicated on the increased accuracy of the pressure sensitive altimeter. There are two potential problems.

DANGER 1: Above transition altitude, if the altimeters are NOT set to **STD** or **29.92 In** or **1013 hPa**, then the airplane will NOT actually be cruising at the appropriate altitude.

DANGER 2: The altimeters MUST BE within 200 Feet of each other or the airplane is not in compliance with the FAA operational requirements.

DO THESE
7
THINGS
AFTER LEVEL-OFF

1. **LEVEL-OFF** ..... Verify
2. **ALTIMETERS** .....Check
3. **CRUISE WINDS** ..... Enter
4. **ECAM MEMO** ..... Review
5. **ECAM SYSTEM PAGES** ..... Review
6. **FLIGHT PROGRESS** ..... Monitor
7. **FUEL** ..... Monitor.

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LNAV stuff:

HEADING SELECT:

For this discussion, we are only considering auto-pilot controlled flight. This is not a hand flown, auto-pilot off discussion. At almost any point in a flight (and that includes holding) you can revert to manually selected heading control and steer the airplane in any direction. This can occur during climb, cruise, descent and most of the approach phases of flight.



Here's how you do that:
STEP 1 -Turn the heading selector knob to the desired heading.
STEP 2 - PULL the heading selector knob.
STEP 3 - Airplane will turn immediately to that heading.

There can be some complexity to this. Let me clear the air a little. Once you PULL the heading selector button, here are the three rules:

RULE 1 - If the selected heading is different from that of the airplane track PRIOR TO PULLING the knob, the airplane will turn in the shortest direction towards the selected heading.

RULE 2 - If the knob is pulled DURING a turn (heading may not be visible), then the airplane will roll out on the existing heading.

RULE 3 - If the heading is selected AFTER the knob is pulled, then the airplane will turn to the selected heading in the direction that the selector was turned.

LIMITATIONS TO RULE :3

If you PUSH the HEADING SELECTOR knob, and the airplane is within capture criteria, it will turn, intercept, and fly the blue course line. The PFD annunciation will be NAV.

If you PUSH the HEADING SELECTOR knob, and the selected airplane heading/position is outside the capture criteria, the airplane will remain in open mode, and the PFD will annunciate HDG.

BIG MEMORY ITEM !

PUSH towards airplane ... to select AUTO-PILOT (***MANAGED***)control.
PULL towards pilot ..... to select PILOT (***SELECTED***) control.

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LNAV stuff:

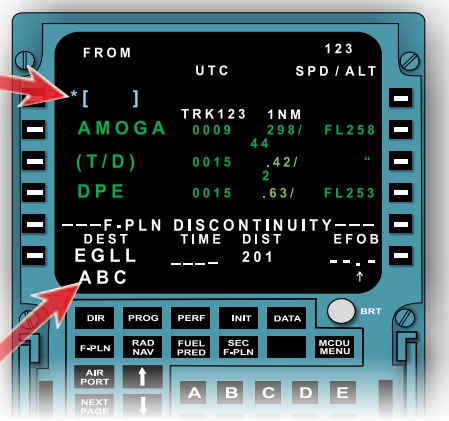
GOING DIRECT:

Programming the airplane to go directly to a fix is pretty straight-forward.

SITUATION ONE: If the fix is already on your flight plan (F-PLAN page), then it is a simple two step process:

STEP 1- Select the DIR key.
This will place a *[ ] bracket in the top of the queue.

STEP 2- LSK the desired FIX.
The airplane will IMMEDIATELY place that fix at the top of the **F-PLAN** queue, and the airplane will go directly towards the new fix.



SITUATION TWO: If the desired fix is NOT already in your flight plan queue, and we want to make it the **NEXT** or **GO TO** way-point, then we would

STEP 1 - Type the desired fix in the scratchpad.

NOTE: *There are a few different ways to write the new fix:*
LAT/LONG,
P/B/D (place/bearing/distance),
P-B/P-B (place-bearing/place-bearing),
PD (Place-distance along the track waypoint; for example BIG/-10 would be a waypoint ten miles this side of BIG along our track).

STEP 2 - Select the **DIR** key. This will open the *[ ] at LSK1L.
STEP 3 - LSK1L to place the new fix at the top of the queue in the brackets.
STEP 4 - Resolve "**DUPLICATE NAMES**" conflict if it exists.
STEP 5 - Review "**YELLOW TMPY**" screen, and if correct.
STEP 6 - Select **INSERT*.**
STEP 7 - Remove **F-PLAN DISCONTINUITY**.

WHAT CAN A PILOT SCREW UP?

Taking enroute re-direct routings, even from ATC, ***MUST ALWAYS*** involve a calculation regarding the ability of the airplane to fly above the terrain on Single Engine. Even though this information may be covered in the METHOD 1 and 2 calculations included on your flight plan, those are specifically for the "planned routing".
BE AWARE: This is a favorite Check-pilot ploy to evaluate your awareness. Generally it is a simple "Cleared direct to ---" and when you hear that, get out your chart and look for MOCA or other terrain indications between you and the new waypoint that are above your single engine altitude, even if you are operating on both engines.
IF ...THEN: I can tell you, **IF** you do not check for terrain clearance; **THEN** the Check guy will fail an engine and ... whoooops! Things get ugly.

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LNAV stuff:

LATERAL REVISION:

If you line select a fix that is in the Flight Plan queue (**MCDU F-PLN** page), you will get the **LAT REV** page. This is the key that unlocks many mysterious secrets of the Airbus **MCDU**. Here are just some of the things you can do from the LATERAL REVISION (**LAT REV**) page.

-NEXT WPT (Next Waypoint)
-HOLD (Holding)
-VIA/GO TO (used for placing Airways/Endpoint)
-NEW DEST (New Destination ... divert or alternate)
-ENABLE ALTN (make selected alternate the destination)

We have already used the Lateral Revision technique in our pre-flight planning, and now we can see where it is also a powerful in-flight management tool. I would draw your attention to the usefulness of this LATERAL REVISION tool in diversion scenarios where we need to re-select an alternate or diversion airport or re-file the flight path routing, particularly during weather deviation or EMERGENCY situations.

Let's take a look at these things in a little more depth.

NEXT WAYPOINT:

If we want to insert a new fix/waypoint into the queue after another way-point, then we could use the LATERAL REVISION method.



STEP 1 - Line Select the fix that we want to insert the new fix AFTER and observe the **LAT REV** page is displayed.

STEP 2 - Type the desired fix in the scratchpad. For example: **ABC**.

IMPORTANT: *Do Step 1 BEFORE Step 2. That is; select the FIX for lateral revision* ***BEFORE*** *typing the new fix into the scratch pad.*

STEP 3 - LSK3R "**NEXT WPT**".
STEP 4 - Resolve "**DUPLICATE NAMES**" conflict if it exists.
STEP 5 - Review "**YELLOW TMPY**" screen, and if correct.
STEP 6 - Select **INSERT*.**
STEP 7 - Remove **F-PLAN DISCONTINUITY**.

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LNAV stuff:

REVIEW: Select **F-PLN** page on the **MCDU** and line-select a fix using the buttons on the left side of the **MCDU**. This is called a **LATERAL REVISION**.

VIA/GO TO:

This is a technique by which a pilot can enter an airway and waypoint endpoint from the lateral revision point.
Here is an example to illustrate this feature. Say you have been cleared from **DPE** via **UM605** to **SFD**.

Perform a lateral revision from **DPE** and use the **VIA/GO TO** entry. Place the entry like this: **UM605/SFD** in the **[ ]/[ ]** brackets.



We can use this technique during pre-flight planning and set-up as well as during flight enroute changes, such as diversions and re-routes.

NOTE: You ***CANNOT*** perform airway to airway reroutes by entering notation like this: **J45/J133**.

NEW DEST:

The "New Destination" feature allows the pilot to quickly re-direct the direction of the flight. Doing so, automatically creates a temporary flight path. This feature is available ONLY when you use waypoints in the active flight plan.



What that means is that you will have a routing to the new destination directly from one of the waypoints that exist in the flight plan.

Destination identifiers are four digit ICAO letters; for example **EGCC**.

DISCUSSION:

Using the "New Destination" feature inflight for ordinary operations such as arrival destination not available, fuel considerations, passenger medical emergency, re-route from ATC, and so forth is all pretty routine, but for the check-ride we must be prepared for the EMERGENCY that demands an immediate landing. If in ETOPS or METHOD 1 or 2 restricted, the decision of which runway or airport to select will be a critical part of the decision paradigm.
If IMMEDIATE landing required (e.g: Both engines fail), then:

- ATC may be your best resource.
- Do NOT overlook the dispatcher as a potential for making your selection.
- The AIRPORT SELECTOR on the ND. It will display airports that are long enough for you to land (usually 6000 feet plus) .

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IF YOU GOTTA LAND ASAP ...

If you have set in a lower altitude in the **FCU** for a descent, and you are frantically trying to start the descent using the managed (PUSHing the alt selector knob) and it simply won't select... chances are you never got to cruise altitude (check **PROG** page), but are actually trying to start your descent while the airplane is still in the CLIMB phase instead of the CRUISE phase, you may want to perform a "RE-CRUISE".
Or you could simply PULL the **ALT** selector button and start an **OP DES** descent.

RE-CRUISING IN DESCENT:

If the airplane is allowed to remain in **CLIMB** phase by leveling off before reaching the planned cruise altitude that is entered the **PROG** page, or the climb is interrupted before it is complete; then a "managed" descent can not be initiated. The managed descent milestones and profile limits will not be available to either the displays or the **FMGC** during the descent. This is ***NOT GOOD***!
What does it mean? It means that if you descend using the auto-pilot in OPEN (OP DES) mode, the descent will not be controlled to respond to any of the managed control points for the descent. The airplane will simply assume a descent path predicated on a fixed descent rate. I offer the argument that while OP DES is a perfectly good descent technique, it might be helpful to restore the managed mode for the descent.

A simple solution to this problem is to re-set the cruise altitude on the **PROG** page to a "new" cruise altitude that is lower than the current actual altitude of the airplane, even if already started in the descent using OP DES. As the airplane passes through the "new" cruise altitude, the airplane computer will detect that it has left the cruise altitude and transition to DESCENT mode. This will allow the managed descent mode to be activated restoring the managed mode parameters. You must then re-select the managed mode (PUSH the ALT selector).
Wheeeew! Saved again! This is also referred to as "**RE-CRUISING**".

EXAMPLE: *Say you are in the climb, but you level off prior to reaching your cruise altitude. This might happen, for example if you were to encounter a situation (emergency or major system failure) requiring immediate descent for landing. The problem occurs more commonly, however, when a pilot simply "forgets" to re-cruise after changing his planned cruise altitude. I would point out that there is no prohibition against making the descent using OPEN DESCENT mode. However, descents from higher altitude that are "on course" would benefit from a re-cruise.*
In my opinion, it is desirable to re-cruise for no other reason than regain the descent profile indicator (magenta donut).

REMINDER:
If you RE-CRUISE in OP DES descent, even though the "managed" descent capability is restored when you pass through the "new cruise altitude" it does NOT automatically become the selected mode of operation. You will have to re-select the managed mode (once it becomes available) by pushing the alt selector button.

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LNAV stuff:

HOLDING

HOW TO GET INTO HOLDING:

Any discussion regarding HOLDING must include a link to the Lateral Revision page. The first few times you try to find the HOLD PAGE, you notice that there is no hold key on the Airbus. Those wily engineers decided to cleverly hide the "HOLD" command on the LAT REV page. Once you get used to it, you will see that there is a logic behind that.

SITUATION ONE: Hold at your present position.

STEP 1: Open the **F-PLAN** page.
STEP 2: LSK1L; that is Line Select the top way-point in the queue.
This will open the **LAT REV** page.
STEP 3: LSK3L **<HOLD**.
STEP 4: This will reveal the **COMPUTED HOLD at PPOS** page.
Look at the parameters and change them if desired.
STEP 5: LSK6R **INSERT***.
STEP 6: The Holding pattern will be displayed on the ND in GREEN, and the airplane will immediately start a turn so as to fly that pattern.

SITUATION TWO: Hold at a way-point in your route.

STEP 1: Open the **F-PLAN** page.
STEP 2: LSK the desired way-point in the queue.
This will open the **LAT REV** page.
STEP 3: LSK3L **<HOLD**.
STEP 4: This will reveal the **COMPUTED HOLD at ---** page.
Look at the parameters and change them if desired.
STEP 5: LSK6R **INSERT***.
STEP 6: The Holding pattern will be displayed on the ND in GREEN at the selected way-point. When the airplane arrives at that way-point it will enter the holding pattern.

SITUATION THREE: Hold at OFF route way-point.

STEP 1: Open the **F-PLAN** page.
STEP 2: Select the **DIR** key.
This will place ***[ ]** at the top of the queue.
STEP 3: Place way-point/fix name in scratchpad.
STEP 4: LSK1L. This will place the new way-point/fix at LSK2L position (second in the queue).
STEP 5: LSK2L. This will display the **LAT REV** page
STEP 6: LSK3L **<HOLD**.
STEP 7: This will reveal the **COMPUTED HOLD at ---** page.
Look at the parameters and change them if desired.
STEP 8: LSK6R **INSERT***.
STEP 9: The Holding pattern will be displayed on the ND in GREEN at the new selected way-point.

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HOW TO GET OUT OF HOLDING:

There are a few ways to depart the holding pattern. We will discuss only five of them.

THE 2 BAD TECHNIQUES:

1 - Shut off the auto-pilot and hand fly. While always an option, it a brute force solution and leaves us with the problem of how to return to our "route".

2 - HEADING select, and using the OPEN mode, steer out of the holding pattern. We have to re-shuffle the queue on the F-PLAN page to return to our original flight planned route. Not particularly pretty.



THE 1 "ACCEPTABLE" TECHNIQUE

An "acceptable" technique is to use the CLR key to delete the holding fix. This is risky because *unless you have a clearance from present position to the next way-point,* when you delete the holding fix, the airplane will proceed from the position it was when the fix was deleted directly to the next fix ... and may, during that evolution, leave the confines of the established holding area.

THE 1 GOOD TECHNIQUE:

This is perhaps the most logical to use.
Use the '**DIR**" key and select the holding fix.
Some care must be taken so that the airplane doesn't make a turn that leaves the confines of the holding pattern.

THE MOST ELEGANT TECHNIQUE:

This is the technique the Check Pilot will be looking for.
Once you enter the holding pattern, the F-PLAN page will display an entry "**IMM EXIT***" at LSK2R. If you select that entry (LSK2R) it will toggle to "**RESUME HOLD***" and the jet will start a turn so as to make the most expeditious return to the holding fix and continue on the original routing.
Really cool .... and the technique that is the most desirable.

RE: HOLDING REPORTS:

There are three reports required: Entering holding and departing holding and altitude. These are important since the controller CANNOT discriminate between airplanes that are in holding because of the transponder clutter. She/he relies solely on your radio reports.

ENTERING HOLDING REPORT includes:

1. FIX
2. TIME
3. ALTITUDE

LEAVING HOLDING REPORT:

1. Departing holding fix.

You are then expected to resume normal operating speed.

What pilots generally screw up.
They fail to report their
- Altitude entering holding,
- Leaving Altitude while in holding,
- Arriving at Altitude in holding.

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GETTING READY FOR THE ...

APPROACH DESCENT

FINALLY ... At this point in our flight, we should be thinking about and getting ready to descend and land. To somehow simplify and make certain we don't forget anything, we need a simple way to gather our thoughts and get everything ready to make the approach and land. In the world of airline flying, pilots have developed "gouges" (pronounced GOW-JEZ) to help them remember how to complete some of the more complex tasks. These crutches are usually acronym driven. By that I mean they are a sequence of letters, each one representing a more complex task.

I am suggesting that you should develop a memory device to use, here is one that some pilots use: "**A-I-R-B-A-G**".

It is simple and will help focus your thoughts. It works really in emergencies as well as ordinary garden variety flight profiles.

A-I-R-B-A-G

A- ATIS
I - Install the approach
R- Radios set-up
B- Brief the approach
A- Approach Descent checklist
G- Go around and alternate

Here is what the concept is, and it applies to both a routine flight as well as an emergency/irregularity situation where you brain turns to useless putty. Having something to fall back on to ensure that you have done everything is really invaluable.

So, here are the details.



So, when your brain turns to putty and you can't think of what to do next ... **A-I-R-B-A-G**.

A stands for **ATIS.** Every airport (almost) has a radio frequency that continuously broadcasts an Automated Terminal Information Service, or **ATIS**. It contains important stuff we would need to know to plan our landing. The frequency for the **ATIS** is, of course, right on the APPROACH PLATE for the airport.

Use the number 2 radio so as not to interfere with ATC communications.

STEP 1: Use the knob to set the requested frequency in the STBY/CRS window.

STEP 2: Select the frequency to the ACTIVE window by depressing the double headed arrow.

STEP 3: Ensure VHF 1 button is selected and has a green activate light illuminated.

STEP 4: Select the VHF 1 "CALL" button and ensure that the volume knob is turned up.



When within radio range (about 195 NM or line-of-sight), the ATIS should become audible. Copy the ATIS.

Place a copy of it in a place where both pilots can refer to it during the approach.

Some comments about the ATIS:

Generally speaking, the ATIS transmitter is located at the airfield. This qualifies it as a "LOCAL FACILITY". The ATIS broadcast uses a VHF transmitter, which means that it is line-of-sight and as such usually can't be received outside of about 200 NM from the airport, depending on your altitude. Expect at that range for the transmission to sometimes be scratchy and broken, particularly if the person reading the weather is difficult to understand.

Other sources for the weather, such as a **METAR**, may be copied using the **HF** (High Frequency) radio. While these can be monitored at virtually any distance from the airport, they are not suitable for use if flying the **APPROACH NAV APPROACH** procedure because of the requirement that:

> "The ***ALTIMETER SETTING MUST BE FROM A LOCAL FACILITY***. Remote altimetry is NOT authorized."

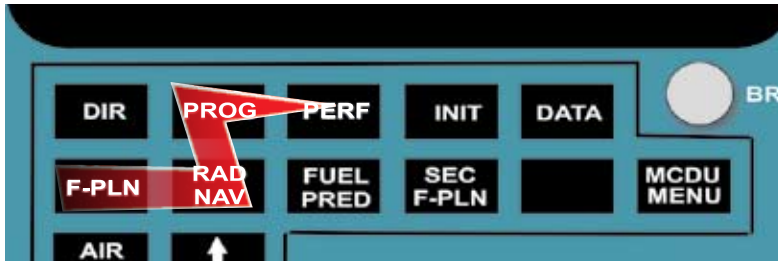
Of course, the current Control Tower for the airport of intended landing issues the weather information that is the *MOST AUTHORITATIVE* and supercedes the others during the execution of the approach.

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I - R stands for **INSTALL THE APPROACH and RADIOS.** Once we have the ATIS information, we have enough data to install the approach. Once these details are added to the **FMGC**, it will allow the computer to make more accurate ETA/EFOB calculations.

To facilitate the process and make life easier, let's use the "**REVERSE Z**" to help cover all pages in a coherent order: **F-PLAN ... NAV RAD ... PROG ... PERF.**

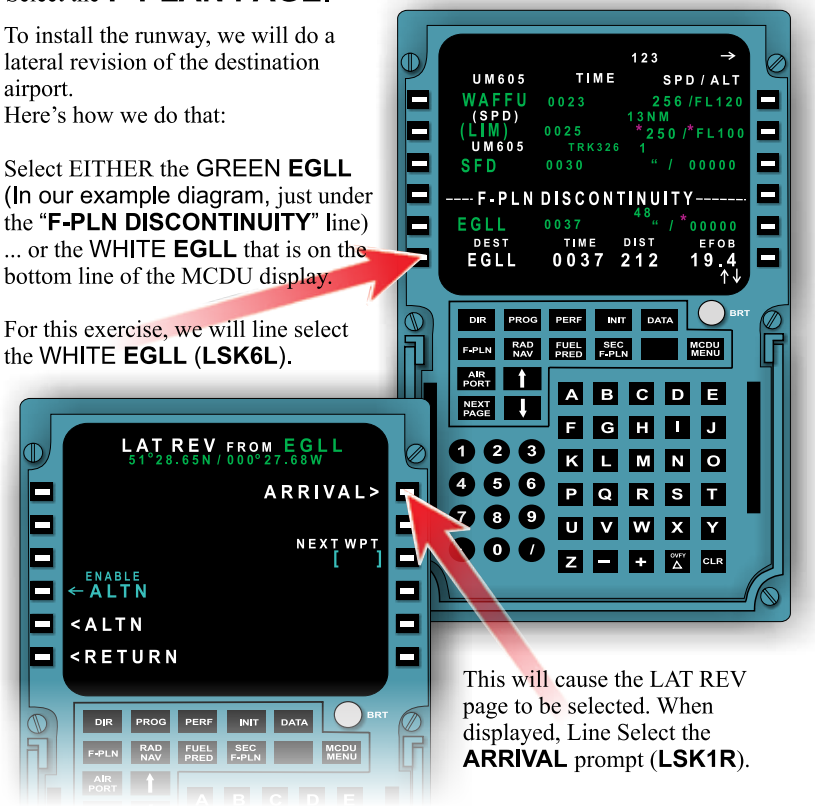


First ...
Select the **F-PLAN PAGE.**

To install the runway, we will do a lateral revision of the destination airport.
Here's how we do that:

Select EITHER the GREEN **EGLL** (In our example diagram, just under the "**F-PLN DISCONTINUITY**" line) ... or the WHITE **EGLL** that is on the bottom line of the MCDU display.

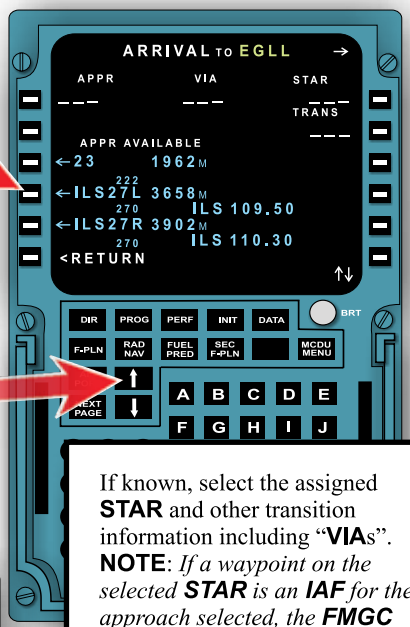
For this exercise, we will line select the WHITE **EGLL** (**LSK6L**).



This will cause the LAT REV page to be selected. When displayed, Line Select the **ARRIVAL** prompt (**LSK1R**).

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This page will reveal the available approaches; Line select the desired approach/runway. We can get that from the ATIS or Tower. For our example **ILS27L** is indicated.



★ ***For the non-ILS APPROACH-NAV approach we would have to see a "line selectable" entry for that specific approach: such as VOR27L.***

NOTE: we may have to use the **ARROW KEYS** to scroll the selections until the desired runway

Once selected, this will reveal the next page which includes a list of the available **STAR**s (**ST**andard **AR**rivals).



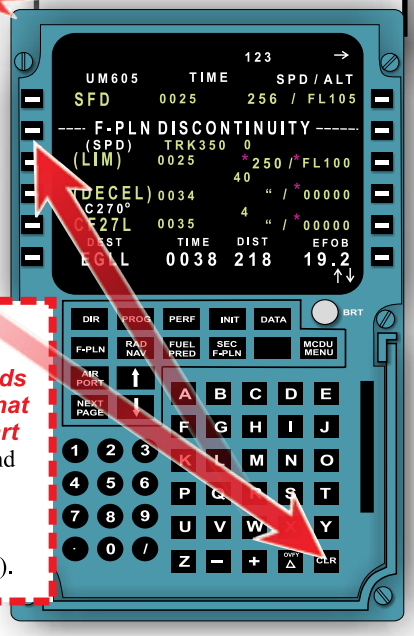
If known, select the assigned **STAR** and other transition information including "**VIA**s".

NOTE: *If a waypoint on the selected **STAR** is an **IAF** for the approach selected, the **FMGC** will auto-string them, and in the process DELETE the **STAR** waypoints that are beyond the **IAF**. If this is a problem, select **NO VIA**.*

Select the **INSERT*** key.

Remove any **F-PLAN DISCONTINUITY** lines that may have been inserted**.**

Remember how to do that:
*Select **CLR** to the scratchpad, then Line select the **F-PLN DISCONTINUITY.***



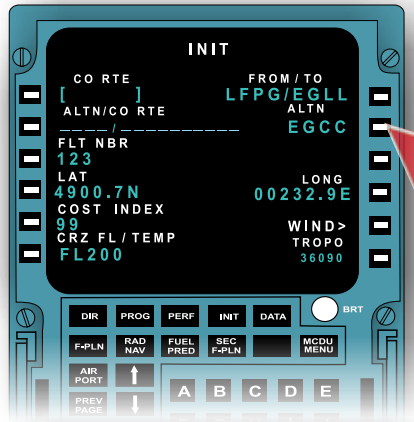
IMPORTANT

Check the F-PLAN pages for speeds and altitude constraints and see that they agree with the approach chart restrictions. Add other constraints and restrictions if required using the **VERTICAL REVISION** technique (Line select right column of fix information line on the **MCDU** display).

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INSTALLING AN ALTERNATE

For this example, we will assume that you HAVE NOT already programmed an alternate in the **INIT A** page at the beginning of this flight. My comment about this would be that it is probably a good idea to ALWAYS designate your alternate (should one be needed) during the initial **MCDU** set-up.



Go to the INIT page. The INIT A page has a place to insert the selected ALTN (Alternate) destination. Placing the four digit ICAO identifier in that position (LSK2R) automatically adds that airport to the end of the queue on the F-PLN page.

For our example trip, I have arbitrarily designated Manchester (EGCC) as our Alternate for London's Heathrow (EGLL).



HOWEVER, IF YOU DIDN'T DO THAT ...

If you didn't do that at the beginning of the flight, you will find that the INIT PAGE is "locked out" and you can no longer access that page for input,

So ... here is one alternative for inputting the alternate. Take the routing from your destination (EGLL) to your alternate (EGCC).

EGLL.HON.LOVEL.EGCC

Enter the fixes into the MCDU below the END OF F-PLAN DISCONTINUITY line and before the EGCC. I prefer having at least one fix for the MCDU to use. This, at least, gives me somewhere to point the airplane after the missed approach.

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R Set up the **RADIOS**. This activity takes place primarily on the **RAD NAV** page of the **MCDU**.
An idiosyncrasy of the Airbus system is that the radio set already KNOWS what the frequencies are for the approach selected on the F-PLAN page; therefore, if you have selected either an ILS, a VOR or an NDB from the queue, then it will know which radios to tune and what the frequencies are. There are some limitations and restrictions and I will list some of them here:

NDB (also referred to as an ADF)
These approaches are displayed on the **ND** and the **DDRMI.** They are auto-tuned ***ONLY*** when an **ADF** approach is selected from the database during the lateral revision of the destination on the **F-PLAN** page, AND
the first fix of the selected approach is the "**TO**" way-point. Generally they are slow to tune and so we will usually MANUALLY TUNE the NDBs.

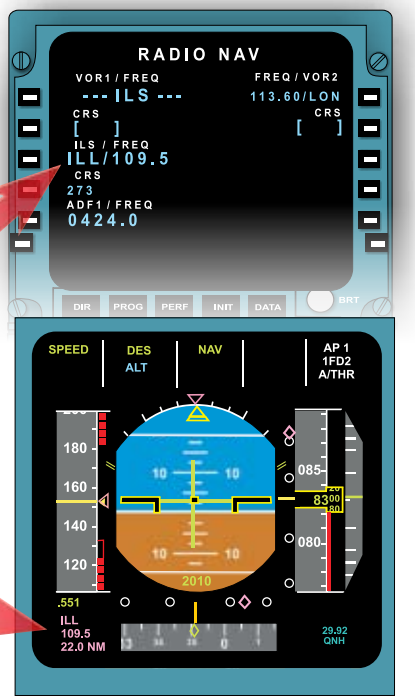
VOR DME
Can be displayed on the NDs and the DDRMI.

ILS DME
Can be displayed on the NDs and the DDRMI.

VOR
VOR 1 and 2 bearing information can be displayed on both the NDs and the DDRMI CDI (Compass Deviation Indicator).
Other available approaches will be listed in the queue in the MCDU.

The **ILS CAT IIIb** is *THE* approach that this airplane was designed to fly. It is the only approach that can be flown to a landing using the auto-land system in weather down to 300 RVR and be landed without obtaining visual contact with the runway or runway environment. It is the approach of choice for Airbus crews.

NOTE: Flying an AUTO-LAND approach *REQUIRES* two auto-pilots. Single auto-pilot ILS approaches require the auto-pilot be shut off at minimums and the landing hand flown.

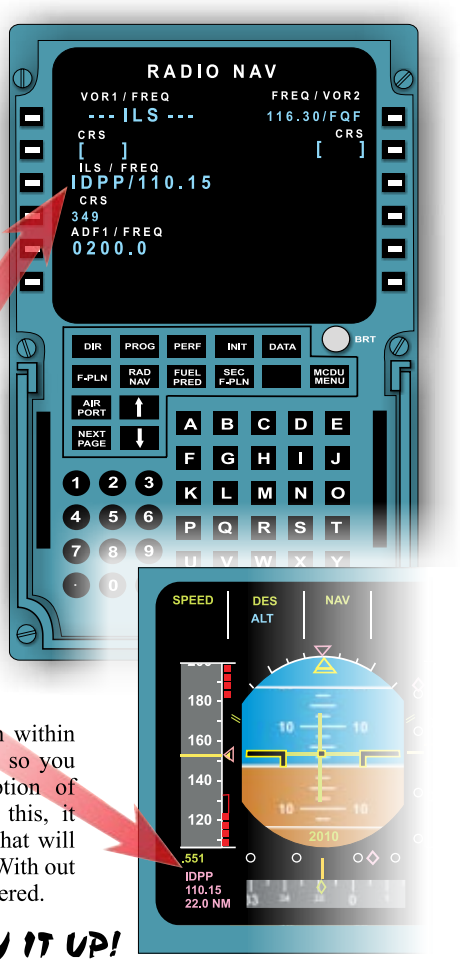


The **ILS/FREQ** line will display the ID/FREQ/HEADING when the runway information is received suitable for navigation. That will also be repeated on the PFD lower left corner in the radio cluster display. Once that appears, you may engage the **APPR** mode on the **FCU**. However, until that information is displayed, the **APPR** mode will be locked out.
It has been my experience that the radio cluster does not tune until within about 10 or 20 miles of the airport ... also;
The radio cluster will not display the information until the **EFIS** control unit has the **ILS** button selected.

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CONFIRMING ILS RADIO TUNED
to the proper frequency.

The RAD NAV or RADIO NAV page is an indication of which radios have been tuned ... and since the Airbus incorporates an "AUTO-TUNE" system, we have to look at this page to see which radios are tuned to what frequencies.
Since we are MOST interested that the computer will be tuned to the ILS for the RUNWAY we have indicated we are going to land on, we look at the LSK3L. When it has a four digit (sometimes three or even two digits depending on the radio facility) identifier (such as IDPP) and that coincides with our expected runway ID, then we can assume that it is tuned to the appropriate ILS frequency.

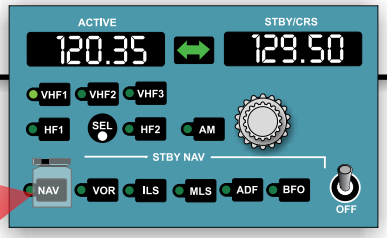


This will match the information displayed on the PFD lower left corner. This is called the **RADIO CLUSTER**, and will display the tuned ILS when it is identified and ready for use.

DISCUSSION: This will all happen within about 20 NM of the landing airport, so you have to be alert. We have the option of manually tuning the radios. To do this, it requires a RUNWAY IDENTIFIER that will positively identify that radio facility. With out the ID, course MUST BE manually entered.

HOW PILOTS CAN SCREW IT UP!

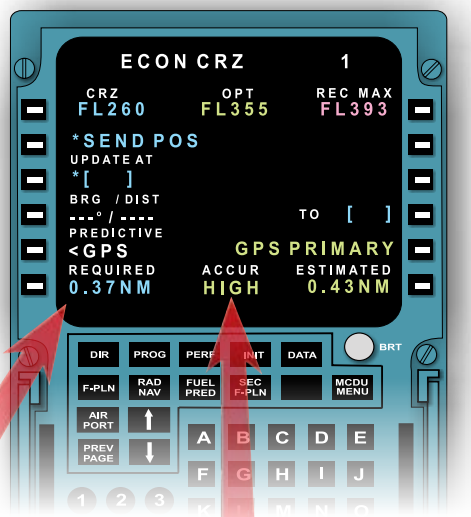
IF ANY RMP IS SELECTED TO NAV, *the fields on the RAD NAV page will be* ***BLANK on both MCDUs !***



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Next ...

Select the **PROG PAGE.**



If flying a LINE SELECTABLE non-ILS approach, then use the **APPROACH-NAV-APPROACH** procedure. However, for ALL Non-ILS approaches, it will be necessary to check the following two required items to ensure that the airplane systems meet the minimum requirements for executing the approach.

ITEM 1: The **RNP**.

The RNP (Required Navigation Performance) is related to the preciseness of the ability of the airplane to accurately predict its position. Here are the actual requirements:

- Prior to initiating the FAS (Final Approach Segment) we check the RNP within 5 NM of the FAF. It should have a default value of 0.37 (unless a non-standard RNP is published and manually entered).

- If the RNP is below 0.36, the ILS approach MUST BE auto-coupled.

If **GPS** is required for the approach, there will be a notation right on the APPROACH PLATE. Then **GPS** must be installed and must be **PRIMARY** for navigation.

ITEM 2:
The **ACCURACY**.

The accuracy of the system MUST BE HIGH.

- Inside the FAF, if the ANP goes below the RNP, a MISSED APPROACH must be executed. This is indicated by a **LOW ACCURACY** message on the ND and the MCDU.

another boring **DISCUSSION:**

When **EPE** (Estimated Position Error) is greater than the **RNP**, then **NAV** accuracy is LOW and **NAV ACCUR DOWNGRADE** is annunciated on the **ND**.

Some approaches may specifiy a non-standard RNP, which must be entered into **LINE 6L** on the PROG PAGE before the beginning of the FAS.

If a MISSED APPROACH is necessary, it will be required to manually clear the manually entered RNP.

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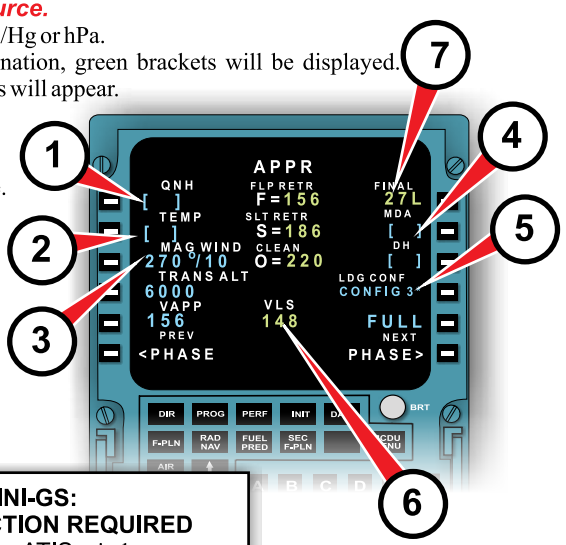
COMPLETE THE PERF / APPR PAGE

Select the **MCDU PERF** page, it should appear and be labeled **APPR.**

1: Enter the **ALTIMETER SETTING.**
Must be from a "LOCAL" source.
QNH at dest is entered in either In/Hg or hPa.
Beyond 180 NM from the destination, green brackets will be displayed.
Within 180 NM, four amber boxes will appear.

2: Enter the **TEMPERATURE**.
Enter in **C°**. This information is used to refine the descent profile.
APPROACH-NAV approach restriction >-15°C.

3: Place the wind component (don't include gusts) from the **ATIS** in the appropriate entry (**LSK3L**). This is the only pilot input required to arm the Mini GS (Minimized ground speed) feature of the Airbus computer.



To ARM MINI-GS:
THE ONLY PILOT ACTION REQUIRED
"manually" enter the ATIS winds.

4: Enter the **MDA** or **DH**.

ILS	**CAT I:** barometric minimums in the **MDA** field. **CAT II/III:** Radio altimeter in the DH field.
APPCH-NAV	**DH** in the **MDA** field
CDAP	**MDA PLUS 50 FEET** in the **MDA** field.

NOTE: *If a runway change is made, it will erase these entries for MDA and DH.*

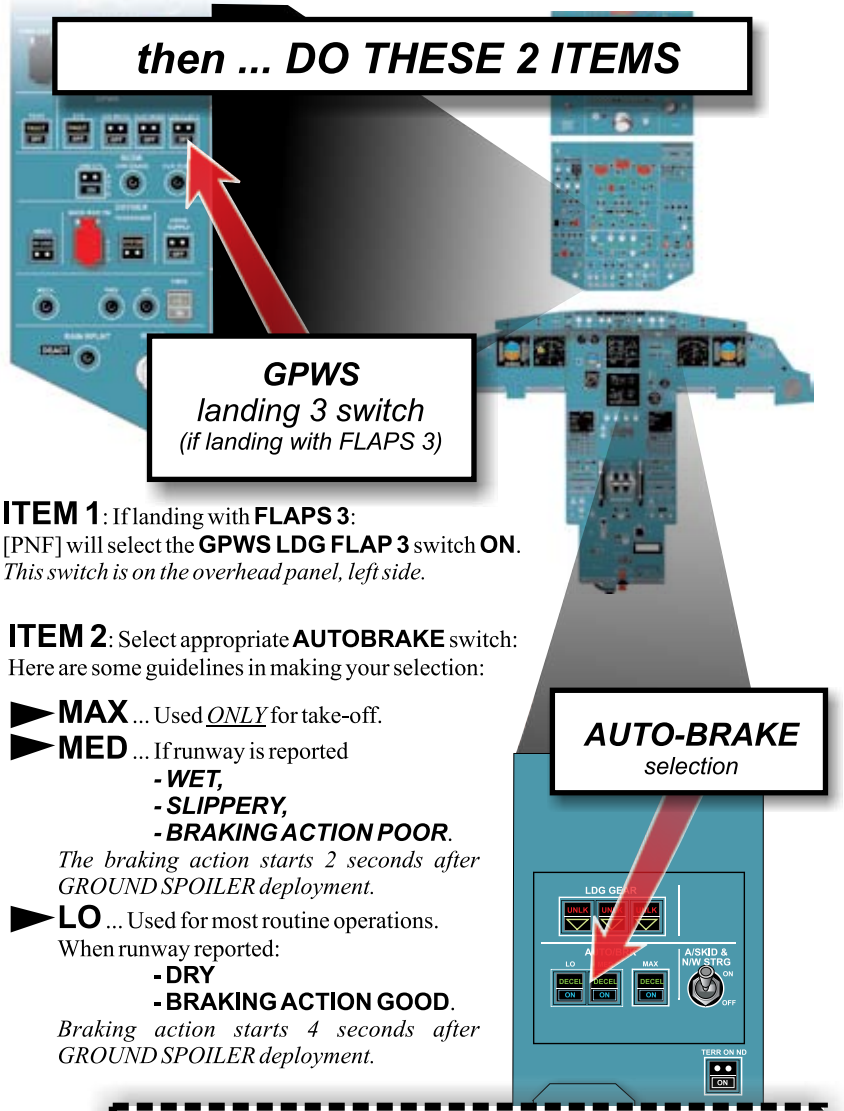
5: Check **LANDING CONFIGURATION:**
If landing with **FLAPS 3,** Select **CONF 3** to obtain the correct approach speeds.
This is the flap setting at which the airplane will slow to managed approach speed.

6: ***IMPORTANT AIRSPEED NOTE***:
If an IRREGULAR or EMERGENCY procedure requires an approach speed modification, the additional speed increment must be added the **VLS** for **CONF FULL**, even if the landing is to be accomplished using another flap setting. **VLS** is computed by the **FMGC** for **LANDING 3** or **FULL**. It cannot be modified by the pilots.
VREF *equals* ***VLS*** *for* ***LANDING CONFIG FULL***.

7: Confirm **RUNWAY** assignment. However, changes to the runway CANNOT be made on this page. Use the **F-PLAN** page lateral revision to destination to change runway.

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ITEM 1: If landing with **FLAPS 3**:
[PNF] will select the **GPWS LDG FLAP 3** switch **ON**.
This switch is on the overhead panel, left side.

ITEM 2: Select appropriate **AUTOBRAKE** switch:
Here are some guidelines in making your selection:

- **MAX** ... Used *ONLY* for take-off.
- **MED** ... If runway is reported
  - ***WET,***
  - ***SLIPPERY,***
  - ***BRAKING ACTION POOR.***

  The braking action starts 2 seconds after GROUND SPOILER deployment.
- **LO** ... Used for most routine operations.
  When runway reported:
  - **DRY**
  - **BRAKING ACTION GOOD.**

  Braking action starts 4 seconds after GROUND SPOILER deployment.

NOTE: GROUND SPOILER extension occurs automatically when BOTH GEAR have touched down, and
- BOTH THRUST LEVERS in forward idle when system is **ARMED**, or
- Reverse thrust selected on ONE ENG with OTHER THRUST LEVER at idle if ground spoilers **NOT ARMED**.

During **AUTOLAND**, ground spoilers extend at half speed, 1 second after **BOTH** main landing gear touch down.

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AIRBAG *continued*

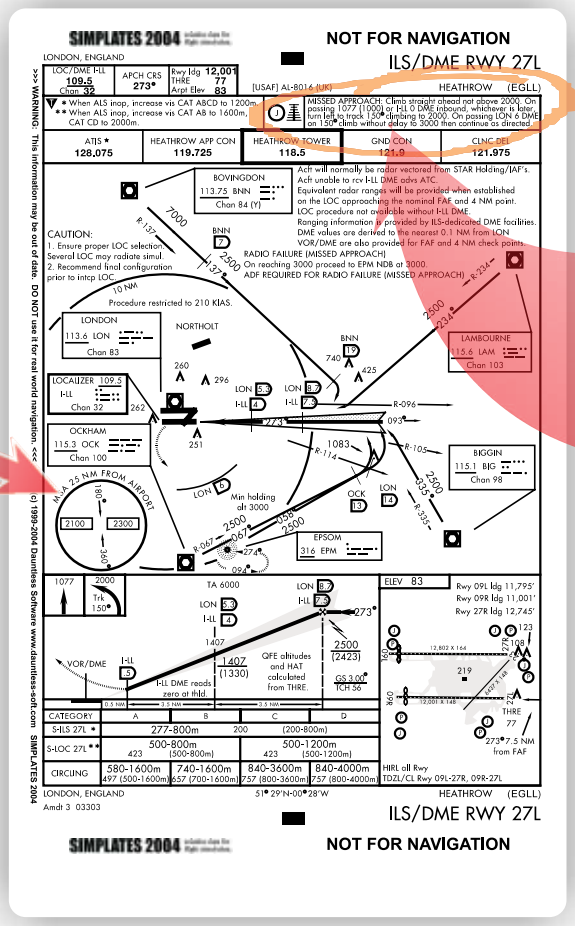
B stands for BRIEF THE APPROACH. I don't want to bore you with redundant information; however, let's just identify a few of the items that we might want to review before starting the approach and include in a BRIEF.

Airport elevation = 83 feet
ATIS frequency = 128.075
Tower frequency = 118.5
ILS ID = **I-LL**
ILS freq = 109.5
ILS heading = 273
GSIA altitude = 2500 feet
A/S restriction = 210 Kts

Be especially alert to the notes that are scattered all over the chart.

The MSA (minimum sector altitude) circle will show highest obstacle in that sector.

The "brief" should include a clear description of what you intend to do in a normal takeoff situation ... and a description of what your plans are if you lose and engine or have to return to the field..
Something like this: *"I'm going to fly a CAT IIIb approach to runway 27L at Heathrow airport in London. The ILS frequency is ... and so forth and on and on ... blah, blah, blah."*



A **Call for the APPROACH DESCENT** checklist: Here is the place where we want to complete all the before landing items that we can.

APPROACH DESCENT CHECKLIST

APPROACH BRIEFING ..... Complete
FMGCs, radios ..... Programmed, set for approach
EGPWS, radar displays..... Terrain/weather
Auto-brakes .....Lo/med/off

..... TRANSITION LEVEL .....

Altimeters ..... _____ In/hPa, set

AIRBAG *continued*

G **GO-AROUND and GET OFF**: Brief what you intend to do if the landing doesn't work out and you have to execute the GO-AROUND or MISSED APPROACH procedure. Also brief what you intend to do if the approach works out OK.

DO NOT FLY THIS PROCEDURE
unless specifically requested by ATC.

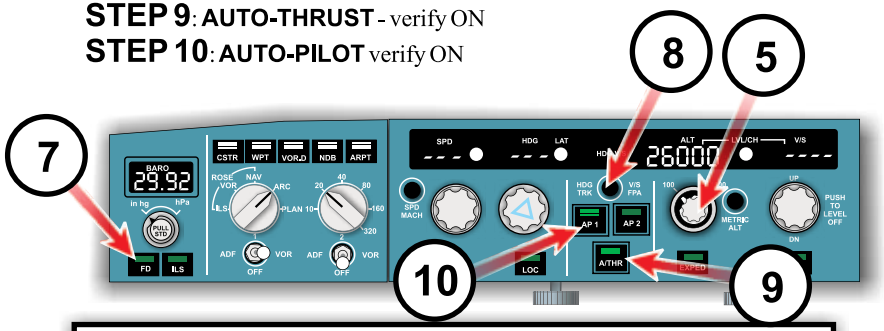
Take a moment and go over what you would do if you were to execute a missed approach (also called a go-around or overshoot). You can create your own procedure, or ... Here are some of the Overshoot steps that I have identified:

GO-AROUND *REVIEW*

STEP 1:"**GO AROUND THRUST**" - Select TOGA thrust.
STEP 2: **PITCH 15° up**. If auto-pilot ON, monitor pitch.
STEP 3: **"FLAPS"**- Raise flaps one notch .
STEP 4: **"GEAR UP"-** when Positive climb established.
After raising the gear:
STEP 5: **"SET MISSED APPROACH ALTITUDE"** if not already done.

When **ALT*** or **OP CLB** annunciated or
Flashing **LVR CLB** alerts pilot, change thrust to the CL detent.
STEP 6: THRUST to "CL" .

Then go to the **FCU** and **EFIS Control Panel** and do 4 things:
STEP 7: **FLIGHT DIRECTOR** verify ON
STEP 8: **HDG - V/S** mode - verify ON
STEP 9: **AUTO-THRUST** - verify ON
STEP 10: **AUTO-PILOT** verify ON



NOTE: Terrain and Obstacle clearance is assured up to 1500 feet AGL, ***IF*** we track the runway centerline. **TOGA** will select and fly the airplane track at the time of selection; this is approximately runway heading.

AIRBAG *continued*

Review and brief these procedures ...

When to set THE MISSED APPROACH ALTITUDE

ILS	After **GLIDE SLOPE** capture.
APPCH-NAV	When **FINAL APP** is engaged.
CDAP	After jet **BEGINS FINAL DESCENT** (and is below Missed Approach Altitude).

Since we are considering what to do in case we have to "Go-around" it would be useful to have someplace for the airplane to go-around to. There are basically three options:

- an alternate.
- accept vectors and re-enter the destination airport traffic pattern and be directed by ATC to another landing approach.
- go into holding "somewhere" and decide what you are going to do when there.

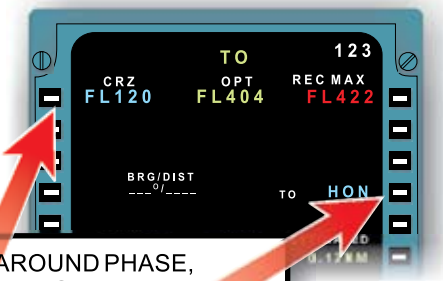
2 NON-STANDARD ACTIONS that must be completed during the go-around:

1 ***RE-SELECT HDG-V/S mode***,
if the approach was flown using the TRK-FPA mode (The BIRD).

2 ***CLEAR ANY MANUALLY ENTERED RNP***.
If an RNP was manually entered during the approach, either because a non-standard RNP was specified on the approach plate or the RNP value was improper (less than 0.37).

HOW TO TURN OFF "GO-AROUND PHASE" and return to a NORMAL CLIMB PHASE

Once we have accomplished the missed approach and are climbing through about 1500 feet AGL, we need to get control of the airplane so that we could continue a normal climb using a normal climb phase technique. Here is how to get the airplane back into the CLIMB PHASE.



When we have an active GO-AROUND PHASE,
we can re-activate the CLIMB PHASE by:
- Selecting a NEW DESTINATION FIX, and
- Entering a NEW CRZ FL on the PROG page.

End of A-I-R-B-A-G briefing

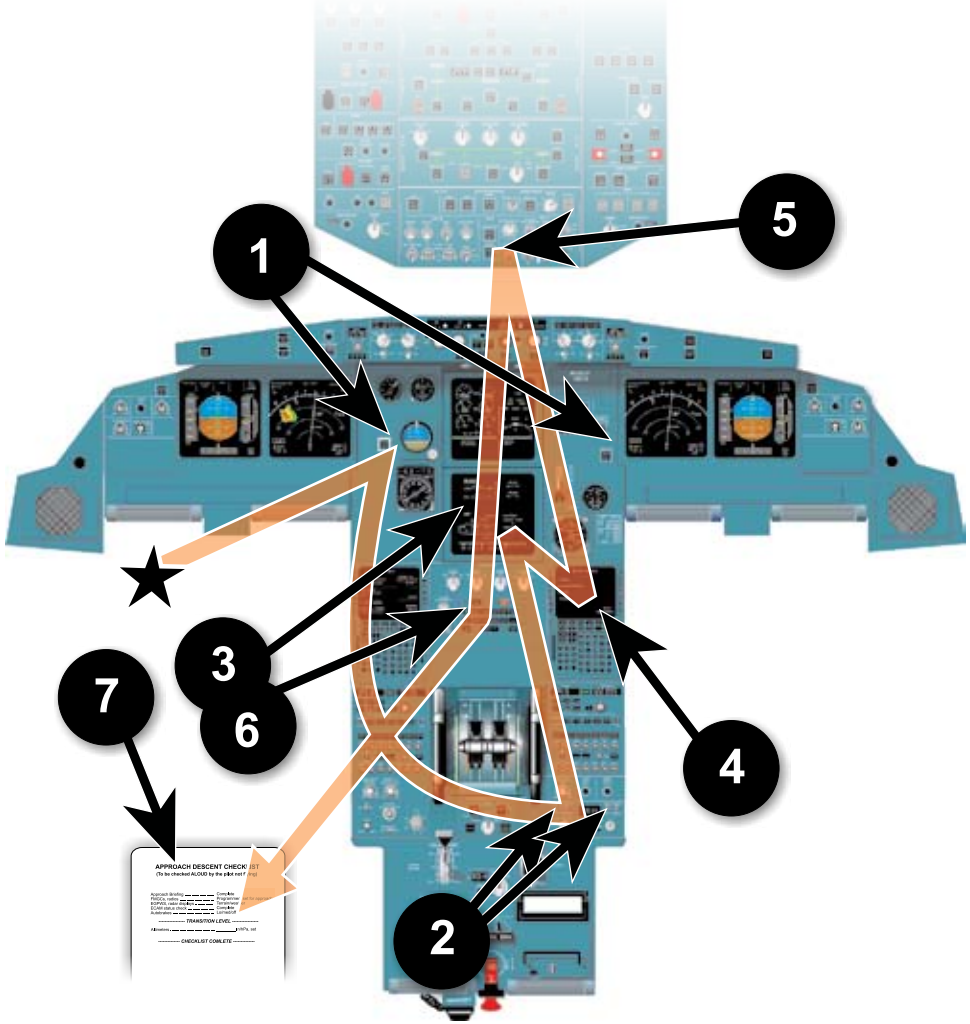
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approaching the TOP OF DESCENT

There are seven things we will be discussing that should be accomplished prior to the top of the descent. These things are in addition to the A-I-R-B-A-G items that we have discussed:

1. **EGPWS** and **RADAR** displays ..... Setup.
2. **NORMAL** or **BELOW** on the **TCAS** ..... Select.
3. **LANDING ELEVATION** ..... Verify.
4. **NAVIGATION ACCURACY** ..... Check.
5. **SEAT BELT SIGN** switch ..... ON.
6. **ECAM STATUS** ..... check.
7. **APPROACH DESCENT CHECKLIST** ..... complete to transition level line.



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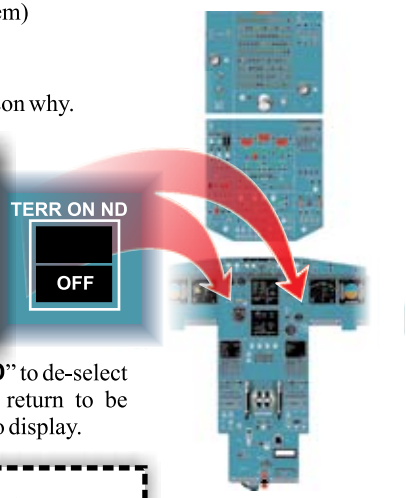
1. EGPWS and RADAR displays

EPWS (Enhanced Ground Proximity Warning System) and the **WEATHER RADAR**.

We will consider both these systems, as operating one affects the operation of the other. Here's the secret reason why.

Turn OFF the EGPWS display, to turn ON the radar display.

In the Airbus configuration, the **EGPWS** must be manually de-selected in order to display the **WX RADAR** return on the **ND**.



Use the switch labelled '**TERR**" or "**TERR ON ND**" to de-select the **EGPWS** and therefore allow the **RADAR** return to be displayed on the **ND**. That's how you get the radar to display.

If **WX RADAR** not required; both pilots should select
TERR or **TERR ON ND** ..... **ON.**

If **WX RADAR** is required; either or both may select
TERR or **TERR ON ND** switch ..... **OFF**.

Even if BOTH pilots are using the **WX RADAR**, the **EGPWS** "pop-up" feature is still available.

If weather is a "potential factor" during the descent, and it is my experience that it *ALWAYS* is a possibility. Turn on the **WEATHER RADAR**. While operation is fairly intuitive, it is actually an complex art-form and requires many hours of operation to master the subtleties of the device.



RADAR RULE NUMBER ONE:
AVOID SEVERE WEATHER.

WHAT CAN A PILOT SCREW UP?

Sometimes, if the brightness is not balanced properly, you cannot see the return on the **ND**. While your first impulse might be to think the radar is not working, adjust the
ND BRIGHTNESS CONTROL KNOB on the forward panels.

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Discussion about

CFIT, EGPWS, GPWS , and POP-UP

During your training and check experience, your instructor or check person will *DEFINITELY* be required to include a **CFIT** (Controlled Flight Into Terrain) event.

Terrain warning is an area of confusion for the new Airbus pilot. Let's try to get a grip on this system because we definitely are going to encounter a terrain warning during the descent as a part of the training. Here is some information.

There are two separate systems that operate independently:
★ - **GPWS**, and
- **EGPWS**.

GPWS SYSTEM

The **GPWS** is a **G**round **P**roximity **W**arning **S**ystem that has **NO DATABASE**, but relies on sensors located on the airplane itself. It monitors certain parameters and when it senses that the airplane is going to exceed these limits, issues a warning.

The GPWS is considered reliable and REQUIRES a response from the pilot.

EGPWS SYSTEM

The **EGPWS** is an **E**nhanced **G**round **P**roximity **W**arning **S**ystem and uses an onboard world-wide terrain **DATABASE**, FMGC position, and airplane flight path and altitude. The database contains all the runways in the world that are 3500 feet or longer for which terrain issues exist. It is INDEPENDENT of the **GPWS** system. If the **EGPWS** fails to operate properly, it *DOES NOT* affect the **GPWS** systems operation. While primarily an ND display function, it also issues aural Caution and Warning alerts. Note that the **EGPWS** system does not account for man made obstacles.

There is a "*POP-UP*" feature

Since the **EGPWS** must be deselected (depress **TERR** or **TERR ON ND** switch) in order to see the radar display, how would we be protected by the **EGPWS** if both pilots were monitoring the radar and we encountered a terrain conflict?

The answer is an automatic "pop-up" display feature. If an alert occurs, the **ND** display automatically changes to the **EGPWS** display, and the **EGPWS** then remains in view until either the threat no longer exists or the **TERR/TERR ON ND** switch is manually deselected.

a word about ...

TERRAIN DISPLAY and SPURIOUS EGPWS WARNINGS

The background terrain display associated with the onboard database will sometimes provide spurious indications and nuisance alerts. The reasons for error are usually associated with position misalignment issues, such as map shift.

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2. TRAFFIC DISPLAY SWITCH

Select NORMAL or BELOW on the TCAS.



It is suggested that during descents that we orient the TCAS antenna DOWN in order to better assess traffic that may be in our path. Similarly, when in a climbing attitude, it is suggested that we tilt the antenna UP.

There is one way we could screw up ... we could flip "*THE OTHER GUYS SWITCH!*" Whoops, Cockpit etiquette dictates that unless directed or specifically required, one pilot should not necessarily move the other pilot's controls.

3. LANDING ELEVATION .... Verify

Verify that the **LANDING ALTITUDE** shown on the **LOWER ECAM** cruise page is the same as that of the airport of intended landing. Normally, this would be the destination ... but in the case of a diversion, it would be some other place.

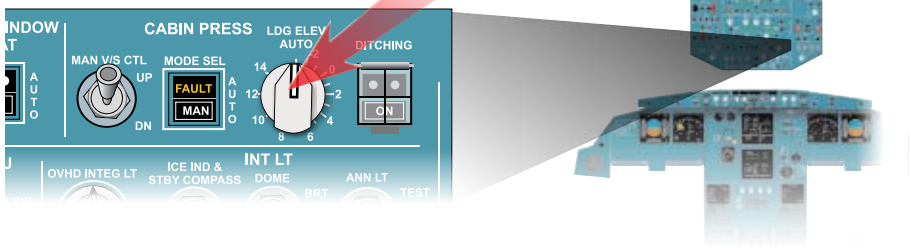
Entering the diversion airport in the **MCDU** will cause the **FMGC** to calculate a "new" altitude. We should check to see that the information is appropriate for the landing airport.

NOTE:

This same information is available on the **ECAM PRESS** page.



IF THE CORRECT INFORMATION IS NOT DISPLAYED; set the desired field elevation using the **LDG ELEV** selector.



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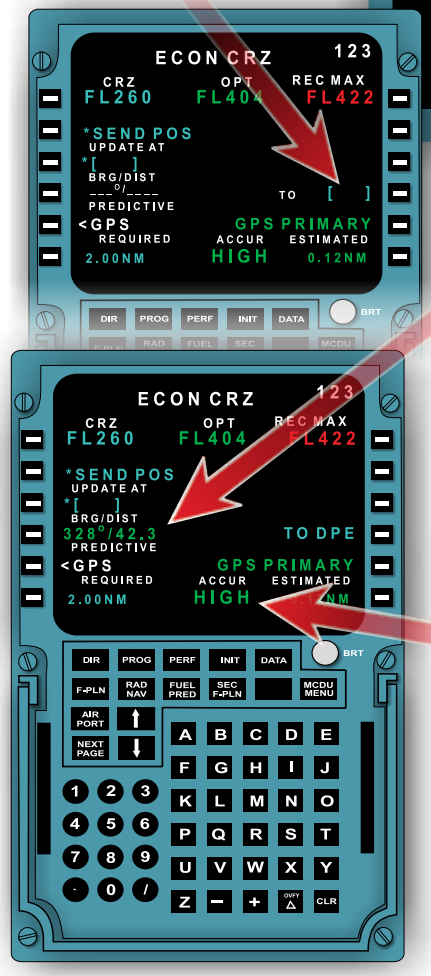
4. NAVIGATION ACCURACY check

There are several ways to do a NAV GROSS ERROR check. Here is a simple and quick method.

STEP 1: Select a **VOR** from your **ND** displayed flight plan. In this example, we'll use **DPE**.

STEP 2: Place your selected VOR (**DPE**) into the **PROG page / ECON CRZ** in the "**TO**" brackets (**LS4R**).





STEP 3: Compare the **FMGC** generated distance on the **PROG page** with the raw data distance displayed on the **ND.**

The MAXIMUM tolerance for a "**TERMINAL AREA**" accuracy check is 1 NM.

LIMITATION:

In the **TERMINAL AREA** or **ON APPROACH**, **NAV** may be used only if

- the airplane is in **HIGH** NAV ACCURACY and

- the NAV ACCURACY CHECK was satisfactory.

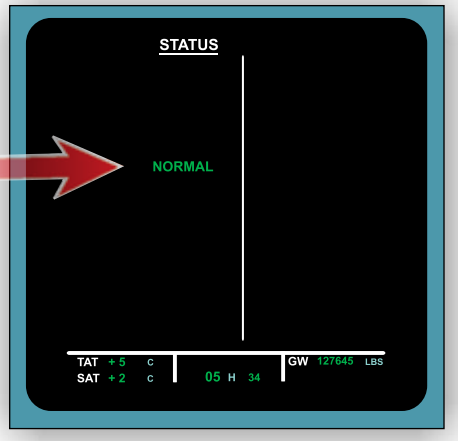
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5. SEAT BELT SIGN switch



The decision of when to place the **SEAT BELT sign** ON resides with the Captain; however, by making the seat belt sign announcement and illumination prior to beginning the descent will help clear the aisles for the Flight Attendants, will free the cockpit crew, and will prepare for possible unexpected turbulence in the descent. All that being said, it is still up to the Captain as to the timing for the seat belt sign "ritual."

6. ECAM STATUS page check



The **ECAM STS** page will be displayed IF there is any anomaly that should require attention. If you should select **STS** page, it should reflect the NORMAL status of the airplane systems. An abnormal situation should cause the appropriate system page to be automatically displayed for your information and review.

Obviously, should there appear an abnormal situation, you will be expected to make the appropriate response to the indication.

7. APPROACH DESCENT checklist

Complete the APPROACH DESCENT checklist to the TRANSITION LEVEL line.

APPROACH DESCENT CHECKLIST

(To be checked ALOUD by the pilot not flying)

Approach Briefing	Complete
FMGCs, radios	Programmed, set for approach
EGPWS, radar displays	Terrain/weather
ECAM status check	Complete
Autobrakes	Lo/med/off

---------- TRANSITION LEVEL ----------

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STARTING THE DESCENT

DISCUSSION:

The Airbus WILL NOT initiate a descent on its own; it requires the pilot to MANUALLY tell it to start the descent. There are two question you are asking:

- When do we start the descent, and
- How do we start the descent.

WHEN ?

Look at the ND display screen again. The projected point on the green route line where the airplane is computed to "start" the descent is depicted by a "hockey stick" or bent ARROW (also referred to as the "**TOP OF DECENT**" or "**T/D**"). Once the jet reaches a point in the route just prior to this white arrow, it should be given the descent command.

I suggest about 5 to 10 miles prior to the "bent arrow," start the descent.



DO NOT START DOWN LATE !!!

HOW ?

Once the descent clearance is received, and the target altitude is placed in the FCU and verified, there are two basic ways to descend. One is the "MANAGED" (**DES**) or automatic way. It is simple to initiate:

PUSH THE ALTITUDE SELECTOR KNOB.

One way you could screw up is to "PULL" the knob instead. That would initiate the second basic descent option, "**OP DES**" or Open Descent command. This method will require the pilot to control the descent instead of relying on the computer generated profile.

DISCUSSION:



If the **DES** mode is selected (PUSH the FCU altitude selector knob) prior to the hockey stick, the airplane will start to descend at about 1000 FPM, gradually flying into the projected ideal descent path and when able, it will intercept and descend on the computerized flight path indicated by the magenta "donut" on the **PFD.** The jet will begin level off at **ALT*** so as to arrive on the altitude selected on the FCU altitude display (in our example 7300 feet).

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Normally, if everything went well, and we started down prior to the hockey stick or bent arrow, we would use DES (PUSH for managed descent) and life would be good.

BUT IF WE HAVE A PROBLEM AND NEED TO ...

GET DOWN RIGHT NOW!

OR if we just get a late start in the descent.

*The most effective method of increasing the descent rate is to maintain a **HIGHER AIRSPEED** until **ALT*** and **THEN** decelerate rather than trying to slow up while in the descent.*

The two primary drag tools are:
- **SPEED BRAKE,** and
- **LANDING GEAR**

ABOVE 31,000** feet, if airspeed greater than **.75 MACH** you MUST NOT use greater than **½ SPEED BRAKE** extension.* There is the possibility of activation of the high angle of attack or alpha-floor protection. ***YIPE!
To preclude this possibility *the speed brake deflection is limited to ONE HALF deflection with the auto-pilot engaged.*

HOW A PILOT CAN SCREW THIS UP!
If you shut off the auto-pilot, and pull the speed brake to full deflection in this situation, you can get ALPHA FLOOR and the THRUST LEVERS may go to TOGA LOCK.

31,000 feet

DO NOT extend the gear above 250 Kts and 25,000 feet!
This is the maximum landing gear extend speed and altitude.

25,000 feet

DO NOT extend the FLAPS OR SLATS above 20,000 feet MSL!
This is the maximum FLAP extend altitude.

20,000 feet

ALT*

Retraction of the spoilers should begin about ALT* on the PFD FMA, and slowly continue until stowed.

There should be **NO SPOILERS DEPLOYED** as the thrust levers begin to increase the thrust.

1500 feet AGL

The SPEED BRAKE/SPOILERS have restrictions to use below 1500 feet, and for the purposes of this discussion, we should consider this a target altitude for the retraction of the spoilers.

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notes on using SPEED BRAKE/FLAPS for drag.

✈- When extended, speed brakes increase the **VLS**.

✈- ***BIG PROBLEM!!!*** When the speed brakes are fully extended, the **VLS** may actually be higher than the **VFE** . What this means is that if you try to lower flaps with speed brakes extended, you may overspeed the flaps.

You ARE REQUIRED to notify maintenance if **VFE** *is exceeded.*
Logbook entry REQUIRED after landing.

It may be necessary, in this case, to retract the speed brakes, decrease the rate of descent and allow the speed to decrease ***BEFORE*** selecting the flaps.

✈-***FURTHER PROBLEM***: In flight extension of the SLATS "increases" the engine idle speed and thrust with little noticeable increase in drag.

✈- Speed brake rate of retraction is slower when going fast. May take as long as 25 seconds (50 seconds for A319) from full extension.

✈- At **ALT*** (just prior to reaching the level-off altitude) start gently and smoothly retracting the speed brake. AVOID aggressive speed brake movement!

Here are the ***SPEED BRAKE LIMITATIONS***:



NO GREATER THAN ONE-HALF POSITION when
- BELOW .75 MACH, and
- ABOVE FL 310.
POSSIBLE activation of
the high angle of attack protection!

NOT GOOD!

INFLIGHT with SLATS RETACTED:
- DO NOT USE SPEED BRAKE BELOW 200 KIAS!!!

notes on using the GEAR for drag.

Extending the LANDING GEAR will provide a significant amount of drag and does NOT cause excessive noise or vibration in the cabin even at higher airspeeds.

Here are the ***LANDING GEAR LIMITATIONS***:

MAX SPEED to EXTEND THE GEAR (**VLO**)..... 220 Knots
MAX SPEED to RETRACT THE GEAR (**VLO**) ..... 250 Knots
MAX SPEED with the GEAR EXTENDED (**VLE**) .... 280 KIAS/ .67 MACH

MAX EXTEND ALTITUDE .....25,000 feet MSL

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Since we are on the subject of descents, I thought it would make sense to discuss the EMERGENCY DESCENT procedure at this point.

EMERGENCY DESCENT

This is an AUTO-PILOT "ON" MANEUVER

IMMEDIATE ACTION ITEMS

1: O2 MASK and REGULATORS ..... As required.
2: Crew communications ..... Establish.

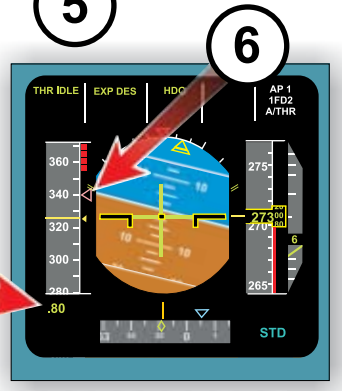
3: **FCU** target altitude ..... SET either a safe altitude or 10,000 feet.
The target descent altitude is to get the airplane down to 10,000 feet in order to meet the oxygen requirements for passenger survival. The biggest concern is NOT to hit any terrain, so we have to pick a heading that ensures terrain clearance. Reference to the navigation charts will indicate MEA, MORA or MOCA if descending on airways. In descents OFF airways to avoid traffic conflicts, use the GRID MORA. If under the control of ATC, request vectors "clear of terrain."

4: **FCU EXPED** switch ..... **PUSH** and observe light illuminate.
It automatically engages managed speed.
The expedite function will generate commands to reach the altitude set in the FCU window with 'maximum vertical gradient". In descent, we can expect airspeed commands of **.80 M/ 340 KIAS**. To dis-engage EXPED, select a new vertical speed mode or selected speed.



5: **HEADING** ..... **SET** as required.
Particularly when flying in RVSM (Reduced Vertical Separation Minima) it may be necessary to "get off the airways ASAP". So the initial descent heading will probably be 90 degrees to the current heading...then you consideration will revert to terrain clearance.

FIRST ... CONCERN FOR TRAFFIC; THEN CONCERN FOR TERRAIN.



6:**TARGET SPEED ..... CONFIRM ONLY,** use the **PFD** indication.
DO NOT SET AIRSPEED on FCU. Since we are using the EXPED switch, we can expect the speed triangle to be at .80M/340 KIAS.

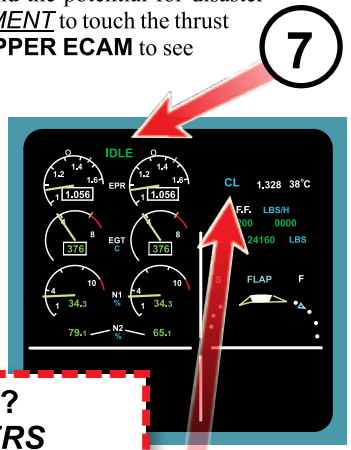
Here's the problem, If we were to firm select .80M at altitude using the FCU knob, as the airplane descended, the airspeed would increase until an over-speed would result.

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7: **THRUST** ..... **"CONFIRM" in idle.**

Potential problem. It is VERY desirable to continue to operate in AUTO-THRUST ... So ***DO NOT*** move the thrust levers manually to the idle detent. If you do move the thrust levers to the idle detent, the **A THR** will shut off and the potential for disaster becomes greatly increased. There is *NO REQUIREMENT* to touch the thrust levers during this evolution. We look at the **PFD / UPPER ECAM** to see what the thrust is.



NOTES:

The **FADEC** has three IDLE modes. When in **EXPED**, it uses the "MODULATED" mode which governs the thrust to maintain bleed systems demands of the airplane. When in this idle mode, the word IDLE is displayed on the **UPPER ECAM**. (FYI: *The two other modes are APPROACH IDLE and REVERSE IDLE).*

How can a pilot screw up?
PULLS THE THRUST LEVERS MANUALLY INTO THE IDLE DETENT !

If the pilot looks at the ECAM and sees the display **CL** as well as **IDLE** and thinking that the thrust must be calling for something well above IDLE thrust .. *AND PULLS THE THRUST LEVERS TO THE IDLE DETENT*!. ***OMIGOSH !***
Don't do that! As long as **IDLE** is annunciated on the display between the instrument indicators and the thrust indicators reflect an idle indication, the engines are in idle.

8: **SPEED BRAKES** ..... **EXTEND**

On auto-pilot, speed brake extension is limited to ½ when altitude is above 31,000 feet. *The reason is that >FI310 and <M.75 possibility of activation of the High Angle of Attack protection can occur if full extension is used on the speed brake.* ***YIPE!!!***.

How can a pilot screw this up? ... turns OFF the AUTO-PILOT!
DO NOT TURN OFF AUTO-PILOT
particularly in order to get full extension on the speed brake.

9: **TRANSPONDER** **7700**

10: **ATC** ..... **Advise**

This is an obvious event if we are within radio range of the controlling agencies. If outside VHF communications range (such as NATS), use other airplanes to handle your communication as it may be a somewhat complex situation. Use whatever resource is at

Go to the **QRH** checklist to complete the **REFERENCE ITEMS**.

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passing FL 180

WING LIGHTS switch ..... ON



The idea of turning on the wing lights is to improve the ability of other airplanes to "SEE YOU." The LANDING LIGHTS have a 250 kt limitation on extension.

FYI: FL180 is also the TRANSITION LEVEL for all of the US airspace as well as many other places in the world. Transition levels can be much lower, such as FL40 (4000 feet MSL) in Paris, France; but I have never seen the transition level higher than FL180.

STERILE COCKPIT procedures begin.

DEFINITION OF STERILE COCKPIT:

NO flight crewmember may engage in ***ANY*** activity which distracts or interferes in any way with the proper conduct of duties. This would include:

- Radio calls for non-safety related purposes,
- Announcements to the passengers promoting company or points of interest,
- Paperwork unrelated to safe conduct of the flight,
- Eating meals or drinking beverages (NO COFFEE OR COLA, etc)
- Engaging in nonessential conversation,
- Reading materials not related directly with the proper conduct of the flight.

NO SMOKING switch ..... AUTO, then back to ON

Cycle the **NO SMOKING** sign when leaving FL 180 or when leaving cruise altitude if it is lower than FL 180. Here is the reason: cycling the switch one time rings two chimes ... and this is the signal to the Cabin Attendants that this is the beginning of a STERILE COCKPIT.

Descending through TRANSITION LEVEL

ALTIMETERS set and announce QNH (In/hPa)

There are three altimeters to set. Captains, First Officers on their respective EFIS control panels, and the Captain sets the Standby Altimeter Kollsman window.

APPROACH DESCENT checklist

Complete the APPROACH DESCENT checklist

---------- ***TRANSITION LEVEL*** ----------

Altimeters ..... _____ In/hPa, set

---------- ***CHECKLIST COMLETE*** ----------

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When slowed to 250 Kts

LANDING LIGHTS ..... ON

During extension, the landing lights are pushed into the slipstream by little electric motors. Once extended, the speed restriction no longer applies.

RUNWAY TURNOFF LIGHTS ..... ON

NOSE LIGHTS ..... ON

CABIN NOTIFICATION

DO NOT FORGET THIS ANNOUNCEMENT! If you are flying with the cabin crew on subsequent legs and expect a cup of coffee, don't forget.. The Cabin Attendants will be waiting for this in order to get prepared for landing.
It is intended to be a "stand-alone" broadcast ... by this I mean, it is ONLY the following statement unaccompanied by any other comment:

"*Flight Attendants prepare for landing*."

Setting up the Captains comm panel can be time intrusive and complex, so I recommend that you use the handset located at the rear of the lower console.

WHAT CAN PILOTS SCREW UP!

In addition to forgetting the Cabin Attendants, there are two other possibilities here:

1. Broadcasting to the whole world your Cabin announcement. I am sure you have heard plenty of these broadcast on the ATC frequency. ***DOH!***
A good way to avoid this is to use the handset for cabin announcements.

2. The second screw up is to not get the handset properly re-seated. This could keep the handset mic "HOT" and everything then that is said in the cockpit is broadcast to the cabin. This is ***NOT*** a good thing.

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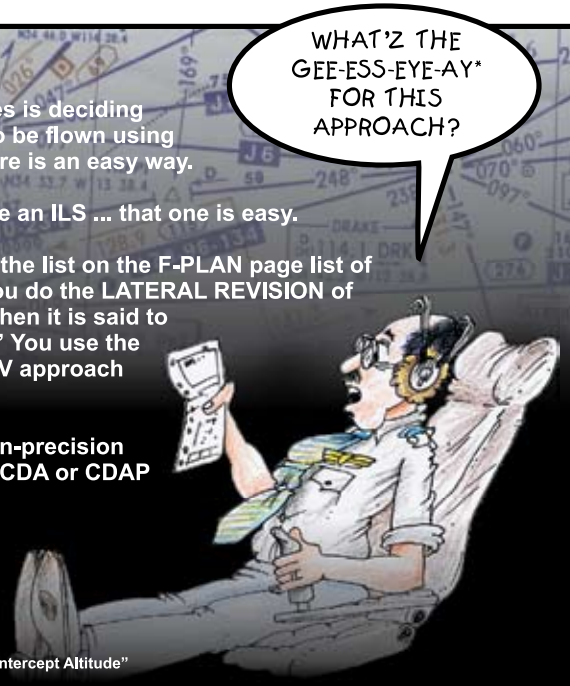
FLYING THE APPROACHES AIRBUS STYLE

The Airbus A320 airliner in this discussion is certificated to fly the following approaches to published minimums. They are in three broad procedure categories;

- **ILS** (precision approaches) which includes CAT I, CAT II/III Autoland, ILS PRM (precision monitoring approach).

- **APP NAV** approaches (managed) which includes VOR, NDB, GPS, and RNAV. All must be line selectable.

- **CDA** or **CDAP** approaches (selected) which includes LOC only, SDF, LDA without glideslope, LOC Back Course, ASR, and the VOR and NDB if NOT line selectable.



One of the challenges is deciding which approach is to be flown using which technique. Here is an easy way.

ILS is to be flown like an ILS ... that one is easy.

If the approach is in the list on the F-PLAN page list of approaches when you do the LATERAL REVISION of the landing airport, then it is said to be "line-selectable." You use the managed or APP NAV approach technique.

All the rest of the non-precision approaches use the CDA or CDAP technique.

*GSIA is "Glide Slope Intercept Altitude"

INTRODUCTION

Probably the MOST challenging part of the flight evolution is that small segment between the Final Approach Fix (FAF or GSIA) and the Missed Approach Point (MAP). Unfortunately, there exists a vast library of publications, manuals, periodicals, hand-outs, and other sources filled with a never-ending list of limitations and rules governing the operation of the approach segment. These are only clearly understood by one or two experts ... and they don't talk to pilots. So we are left with the daunting task of trying to sort out the situation for ourselves. In reality, all it is that pilots really want to do is FLY SAFELY, not bend the airplane, and stay out of the Chief Pilot's office. So, here is the *EXTREMELY* condensed version of ONLY what you absolutely need to know to slip by and pass your check-ride.

Where this particular airplane model and type is concerned, there are only

THREE TYPES OF APPROACHES

(I'm NOT including VISUAL APPROACHES in this list)

There are the ONLY three general types of approaches we will discuss in this manual:

- **ILS** approaches,
- **APP NAV APPROACH**,
- **CDAP** non-precision approaches.

ILS is the most common approach Airbus line pilots will fly. There are two basic levels of the ILS: **CAT I** and **CAT II/III**.

APPROACH NAV APPROACHES or MANAGED APPROACHES are basically **NON-ILS** (or non-precision) approaches that are "***LINE SELECTABLE***".
These include: **VOR, NDB, LOC BC** (back-course), **LOC, SDF, LDA** (without glideslope), **RNAV**, and **GPS**.
In this approach, the FMGC will construct a FLIGHT PATH that the airplane will fly without pilot input, just like a coupled ILS.

CDAP (Constant Descent Approach Procedure) or SELECTED MODE APPROACHES are basically "everything else". Any Non-ILS approach that cannot be line selected must be categorized as a **CDAP** approach.
This CDAP technique requires the PILOT to control the vertical path to the runway using the V/S-FPV selector on the FCU. Using a reference to the FPV indicator (the "BIRD") or the Vertical Deviation Indicator (the "DONUT") to

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INTRODUCING "APPCH PHASE".

REVIEW of **APPCH PHASE**:
Remember that selecting the APPROACH PHASE does NOT have anything to do with the selection of a specific approach or navaid tuning. All it does is manage the airspeed during flap extension by calculating and continually slowing to the next "GREEN DOT" airspeed after each degree of flaps are selected.

This is possibly a new concept to some non-Airbus pilots; but is one of the features that 'Bus drivers appreciate about their jet. It is extremely labor saving and takes much of the work out of calculating the speeds during the very busy approach environment. Here is how to get it to work.

APPROACH PHASE
activated and confirmed

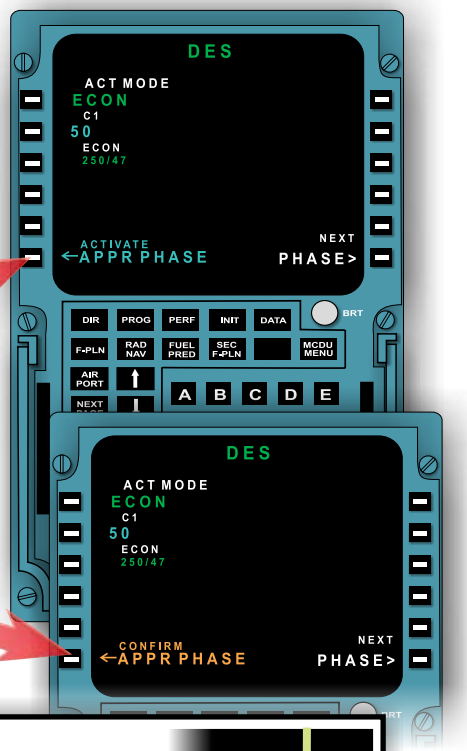
HOW TO SELECT the APPCH PHASE:

STEP 1: on the **MCDU**, Open the **PERF** page. It should have the title "**DES**" at the top. Line 6L (bottom line on the left hand side) should be "ACTIVATE APPR PHASE" in blue. If not displayed, select the "**NEXT PHASE**" entry at **LSK6R**.

STEP 2: Line select "ACTIVATE APPR PHASE".

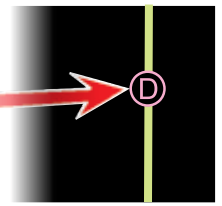
STEP 3: The title should change to "CONFIRM APPR PHASE".

STEP 4: Select **LSK6L** "CONFIRM APPR PHASE".



...*OR* if you forget all that **...**

Alternately, the **APPCH PHASE** will *AUTOMATICALLY* activate when
- a managed LATERAL MODE is engaged, and
- the DECEL waypoint has been passed on the **ND**.



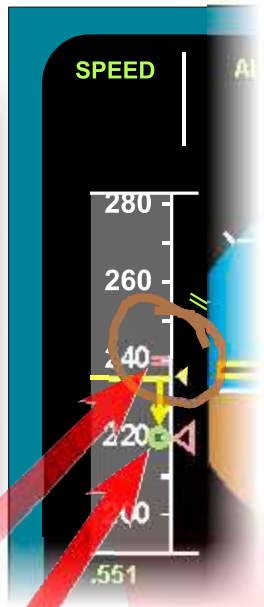
NOTE: *The DECEL waypoint will NEVER be above 7200 feet AGL.*

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"APPCH PHASE" *continued*

When the airspeed drops below **250 KTS** (which is the ***MAXIMUM GEAR EXTEND*** airspeed) you may lower the landing gear.



NOTE 1: You are not allowed to extend the gear above **25,000** feet MSL.
Generally, the landing gear is not extended until actually flying the ILS glide slope ... an exception is during descent using gear as drag tool. A quick memory gouge is
"**OK TO EXTEND LANDING GEAR**"
below **250 Kts** and **25,000 feet.**

NOTE 2: Once the gear is "**EXTENDED**", the airspeed limitation with the gear hanging out is: **280 Kts/.67 Mach.**
NOTE 3: In order to "**RETRACT**" the landing gear the airspeed ***MUST BE*** below **220 Kts**.

DISCUSSION:

This is the part of the PFD that that tells you when it is OK to lower the flaps to the next setting ... and it is a teensy-tiny part of the instrument.
It is the **MAXIMUM FLAP SPEED** indicator and it looks like a small magenta "EQUAL" sign.
You can you barely see it ... it is insignificant visually, but VERY IMPORTANT to the operation of the airplane.
DO NOT drop flaps to the "next" lower flap setting until your airspeed is less than "=".

HOW "APPCH PHASE" WORKS

As the airplane slows, and the airspeed drops below the "**MAXIMUM FLAP EXTEND**" airspeed indication for the next flap setting, if desired you are cleared to extend the flaps ONE notch.
When you extend the flaps, the green dot airspeed will slew to the next lower green dot airspeed, and the airplane will start to slow to that speed. As it does, the **MAXIMUM FLAP EXTEND** airspeed indicator slews also. When your airspeed drops below that indicated airspeed, select the next flap setting.

NOTE:

The airlines, in a panic that you will overspeed the flaps, have placed a restriction on lowering the flaps.
DO NOT LOWER FLAPS UNTIL AIRSPEED 10 KNOTS BELOW THE MAGENTA EQUAL SIGN.

GOOD TECHNIQUE is to decelerate to near **GREEN DOT, S,** or **F** before selecting the flaps to minimize wear on the flaps/slats.

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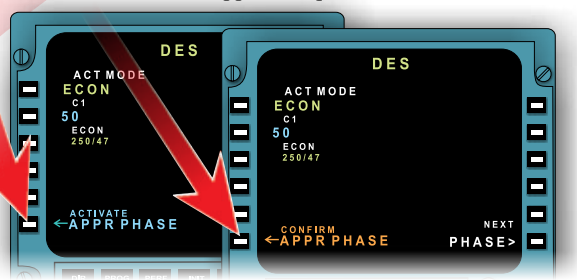
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SIMILAR TERM CONFUSION

Let's clear out any confusion between "**ACTIVATING THE APPCH PHASE**" and "**ARMING THE APPCH**". Both are important and have major ***SCREW-UP*** possibilities.

ACTIVATING THE APPROACH PHASE

Activating and confirming the approach PHASE may be done on the **PREF APPR/DES** page of the **MCDU**. This will cause the MANAGED AIRSPEED to target the GREEN DOT or APPROACH SPEEDS. These approach speeds will be linked on the amount of flap selected.



If, you screw up and accidentally select APPCH phase while in CRZ phase; the airplane will not enter the DES phase and will instead slow to managed speeds (in this case it will be "GREEN DOT"). You may accept that and use the SPEED SELECT to set the speed for the rest of the descent, by-passing the automated SPEED control features of the FMGC,

Or ... you can correct the situation and re-enter the current cruise altitude on the PROG PAGE for the CRZ altitude. This will force the FMGC back into the CRUISE (CRZ) PHASE.

Alternatively, the airplane will automatically enter the APPCH PHASE during descent when it passes the Ⓓ.

Generally speaking, it is good Captain practice to ACTIVATE and CONFIRM the APPR PHASE below 10,000 Feet. The airplane is starting its slow-up anyway and that makes for a better fit into the ATC traffic flow. Just a suggestion.

Here is the first point of confusion; Activating the **APP PHASE** can be done **AT ANY ALTITUDE**. However, **ARMING THE APPCH** must be accomplished ***ONLY*** **BELOW 8000 Feet AGL.**



ARMING THE APPCH

Arming the approach is accomplished by selecting APPCH on the FCU . There are the procedures to be aware of:

- On the ILS, do not arm the ILS APPCH MODE above 8000 Feet.
  If you do, the autopilot and flight directors will disengage.
- On APP NAV approach, arm the APPCH MODE when at FAF altitude.
- On CDAP approach, do not arm APPCH MODE,
  Pilot uses FCU to define glide path.

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DANGER

KNOW what is the difference between a VNAV deviation indicator, a V/DEV indicator and a Glide Slope deviation indicator?

VERTICAL DEVIATION INDICATOR and VERTICAL NAVIGATION DEVIATION INDICATOR versus ILS GLIDE-SLOPE

Misunderstanding the difference could lead you to try and land below the surface of the earth ...and this is NOT good. ***YOU WILL DIE*** ...and bust your check-ride.

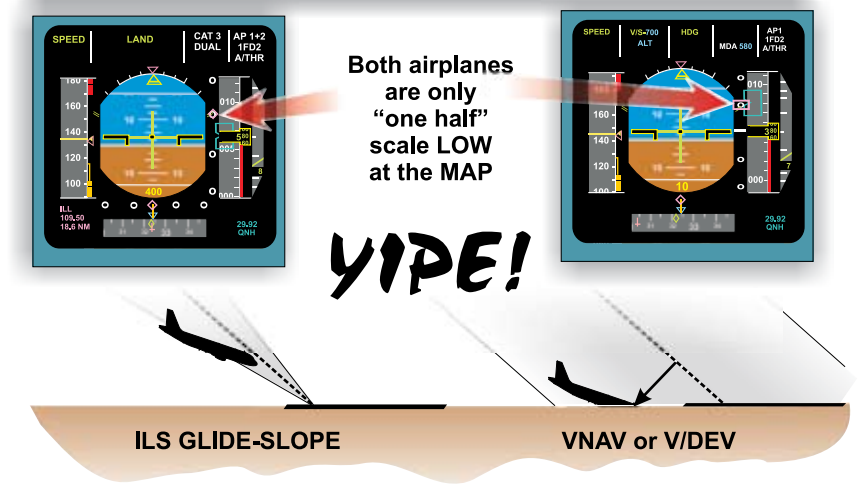
Here is the crux of the problem.

1. The ILS Glide Slope scale **CHANGES**, getting more sensitive the closer you get to the ground.
2. The **VNAV** donut represents a computed vertical pathway predicated on calculation from the FMGC. The range of the **VNAV** scale is **ALWAYS +/- 500 FEET**.
3. The **V/DEV** scale for the **Non-ILS Approach Nav** mode is predicated on a "pseudo" glide path constructed without reference to any fixed position on the earth. The range of the **V/DEV** scale is **ALWAYS+/- 200 FEET**.

HERE IS THE PROBLEM. Since we fly about 90% of our approaches using the **ILS**, once we get into the **Non-ILS** environment, it is very simple to get confused as to the relative position of the airplane to the flight path and the ground. Consider this situation:



Using either the VNAV or the V/DEV for a flight path; Even if you are at 240 feet on the VNAV (or 90 feet on the V/DEV) AFE point in the published approach, but you are more than half scale below the expected glide path ... ***YOU ARE BELOW THE SURFACE OF THE EARTH***! I mean you are dead. You have crashed.



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Some notes regarding:

TRAILING EDGE FLAPS and LEADING EDGE SLATS

Four hydraulically operated wing tip brakes are installed to *LOCK THE FLAPS AND/OR SLATS* in case of:

- *ASYMMETRY*
- *OVERSPEED*
- *SYMMETRICAL RUNAWAY*
- *UN-COMMANDED MOVEMENT*

NOTE!

These brakes *CANNOT* be reset in flight.

Similarly, a FLAP disconnect detection system stops flap movement if excessive differential movement is detected between the inner and outer flaps on the same wing.

An α-LOCK function ***PREVENTS*** initiation of slat retraction from position 1 to 0 at a high angle of attack or low airspeed. The inhibition is removed automatically when the angle of attack is reduced or airspeed increased.

TAKEOFF WITH FLAPS 1:

When **FLAPS 1** is selected for takeoff **(1 + F)**, the trailing edge flaps AUTOMATICALLY retract to 0 at 210 Knots.

TAKEOFF OR GO-AROUND WITH FLAPS 2 OR 3:

1. When **FLAPS 1** is selected, the **1 + F** configuration is obtained if airspeed is LESS THAN 210 Knots.
2. The trailing edge flaps automatically retract to configuration 0 at 210 Knots.

FLAPS SELECTION IN FLIGHT:

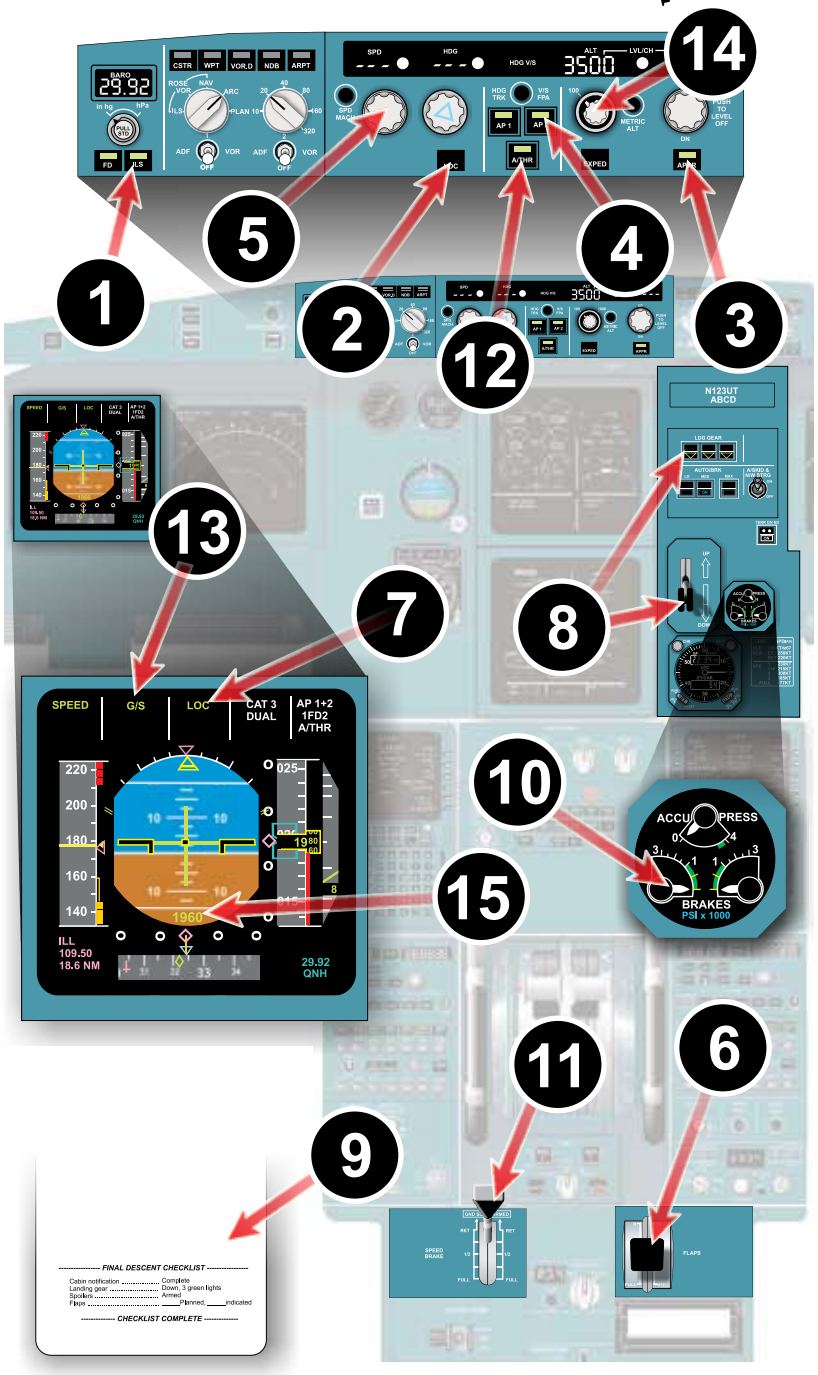
1. When **FLAPS** lever is moved from 0 to 1 in flight, only the slats are extended.
2. After **FLAP** retraction, configuration **1 + F** is no longer available until the airspeed is 100 Knots or less, *UNLESS* **FLAPS 2** or more has been previously selected.

POSITION	SLATS	FLAPS	MAX SPEED	USE FOR ...
1	18	0	230	INITIAL APPROACH
1(1+F)	18	10	215	TAKEOFF
2	22	15	200	TAKEOFF/APPROACH
3	22	20	185	TO/APPRCH/LAND
4	27	40	177	LANDING

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FINAL APPROACH steps



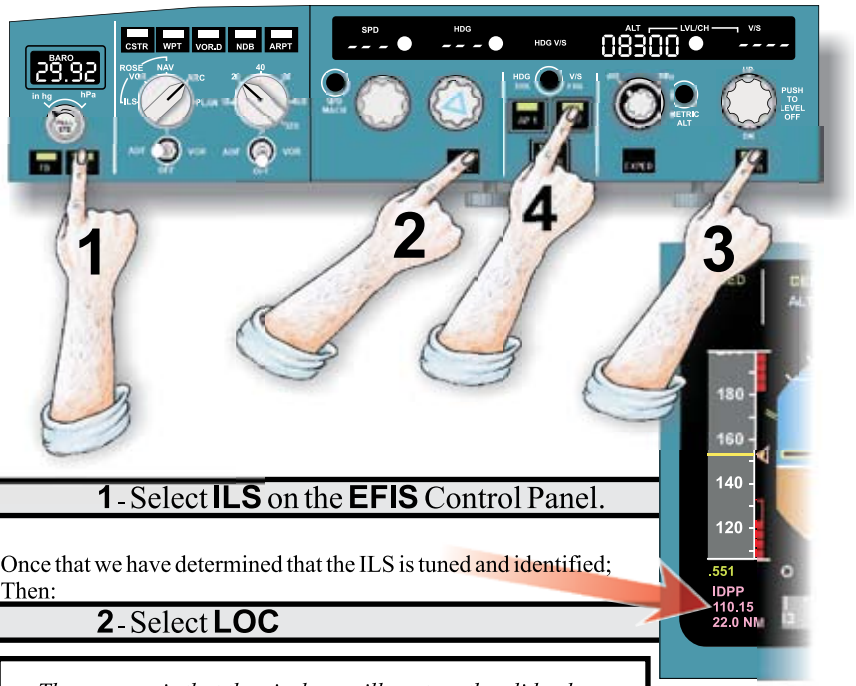
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SETTING UP FOR THE TYPICAL

ILS

CAT III AUTO-LAND

In order for the jet to automatically fly the glide-slope and arrive at the runway ready to land, it has to be set up. Here are steps that make this rascal perform its magic.



1 - Select **ILS** on the **EFIS** Control Panel.

Once that we have determined that the ILS is tuned and identified; Then:

2 - Select **LOC**

> *The concern is that the airplane will capture the glide-slope and start a descent before it is within the boundaries of the approach criteria which is at "case break" or 10 degrees of the localizer path. The CDI (course deviation indicator) can be monitored on the ND by selecting the appropriate (ILS or VOR) indication on the EFIS control selector.*

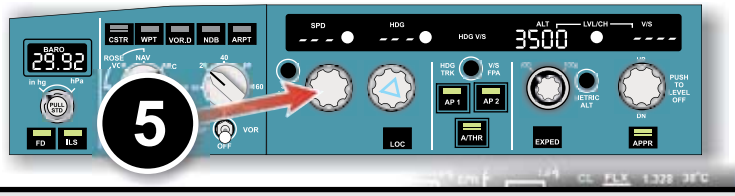
(when within 10 degrees of capture), then....

3 - Select **APPR** on the **FCU,** and

4 - Select the second **AUTO-PILOT(AP2)** on the **FCU**.

If everything works, the airplane will intercept the glide-slope and the localizer and fly itself AUTOMATICALLY to the runway threshold. It is truly a sight to behold.

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5. MANAGED speed ..... SELECT

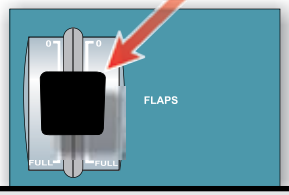
(on command from the PF).
If an airspeed is annunciated in the FCU, it will be necessary to PUSH the selector knob to transition to the managed mode. Managed speed is recommended unless **ATC** or other flight contingencies require a specific speed to be flown or set as a target.
With **APPR PHASE** as the operative mode and managed airspeed, the airplane will slow to **GREEN DOT** airspeed.



6. FLAPS ..... SELECT (on command).

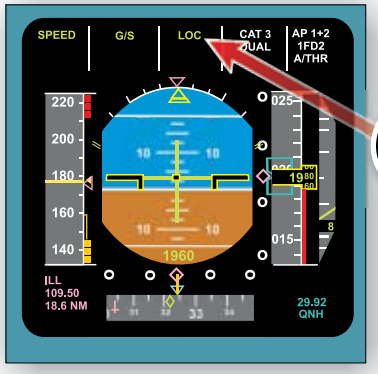
Respect the limitation, 10 knots below the extend flap limit speed ("=" sign on the speed tape). Ideally, allow the airspeed to decelerate to green dot, S, or F airspeed is desirable.

Once selected, the flaps extension progress can be monitored on the UPPER ECAM.

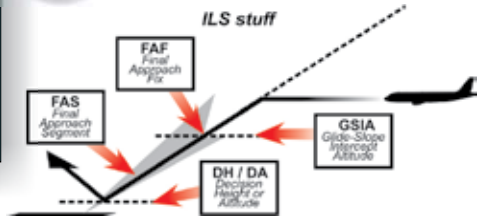


7. [PF] "LOC" capture .....

7. [**PF**] "**LOC**" capture ..... "**ANNOUNCE**".
When the localizer becomes the operative heading mode, the airplane is now considered to be within the confines of the approach.
The PF monitors the capture on the annunciator of the **PFD** and states so.



IMPORTANT: The technique is to acquire "**LOC**" (localizer) capture *BEFORE* beginning your descent below the **GSIA** on the **ILS** approach. Otherwise, you could violate the minima restrictions and "bust" your altitude.



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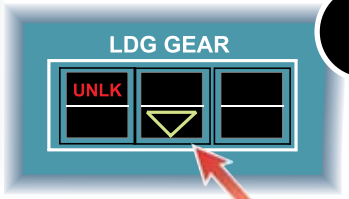
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8. LANDING GEAR lever..... DOWN

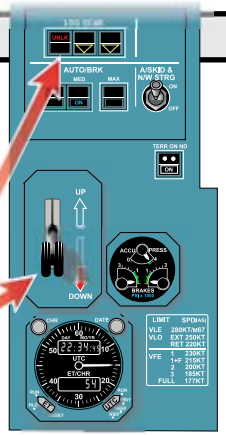
(on command from the PF).

Exactly when to lower the landing gear is an art-form. Only experience will give you the proper feel for when to actually "throw out the rollers". Some pilots use the technique of dropping the gear to co-incide with the airplane's pushover as it intercepts the glide slope. They will put the handle down when the pitch indicator passes the lower dot on the PFD altitude tape..



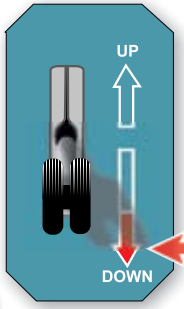


8



The **LDG GEAR** lights display proximity detector information received from **LGCIU 1**. They will be illuminated as long as **LGCIU 1** is electrically powered.

- The **RED UNLK** lights indicate that the gear IS NOT in the "selected" position.
- The **GREEN TRIANGLE** indicates the gear is locked down.
- **DARK** indicator when **GEAR UP.**

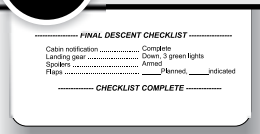


The **RED DOWN ARROW** illuminates when the **LOWER ECAM L/G GEAR NOT DOWN** warning is activated.

This indicator comes on when ***ANY GEAR IS NOT DOWN*** and:

- ***RAD ALT*** *below* ***750 feet AGL with power back*** *regardless of flaps position, or*
- ***RAD ALT*** *below* ***750 feet AGL*** *with* ***FLAPS 3 or FULL*** *selected, or*
- ***FLAPS 3 or FULL*** *selected with* ***BOTH RAD ALTs*** *inoperative.*

9. FINAL DECENT checklist ..... COMPLETE.

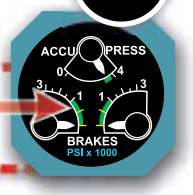


It is considered "GOOD TECHNIQUE" to include the words **"GEAR DOWN, FINAL DESCENT CHECKLIST"** as a single phrase.

10. ALT and PARKING BRAKES press indicator

NOTE: This gauge ***ONLY*** displays the yellow hydraulic system pressure that is supplied to parking and alternate brakes.

With the landing gear down and the parking brake not set, the parking brake gauge should indicate "**ZERO**".



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BRAKE and ACCUMULATOR check

One thing we will have to get used to as Airbus Pilots is this annoying 'Brake and Accumulator pressure indicator" check. It seems to be a constant concern that this system might have failed. ...and what would happen if it fails???



The concern is that any pressure existing on the system gauge would indicate that the PARKING BRAKE may be set or partially engaged. We DO NOT want to have hydraulic pressure from the YELLOW system indicating on the BRAKE PRESSURE gauge.

AVOID ANY ACTION ON BRAKE PEDALS DURING FLIGHT

GOOD CAPTAIN TECHNIQUE

If we see that residual pressure has been accumulatng on the BRAKE PRESSURE gauge, it might be a good idea to drop the gear a little early to allow time to try and fix the problem.



IF AFTER PLACING THE GEAR DOWN, there is residual pressure indicating on the **BRAKES HYDRAULIC GAUGE**, ***WE MAY HAVE A PROBLEM*** !

Do this ONLY AFTER GEAR EXTENSION:

- Depress the brake pedals several times. This may help decrease the pressure indication.
- Leave the ANTISKID and NOSEWHEEL switch ..... **ON.**

Then after landing:

IF PRESSURE REMAINS and AUTOBRAKES AVAILABLE:

Select **AUTOBRAKES** switch to **MED.**
This will cause the NORMAL brake system to take priority on landing and cancel the alternate pressure.

IF PRESSURE REMAINS and AUTOBRAKES ARE NOT AVAILABLE:

Apply **MANUAL BRAKING** just after touchdown.
What this does is cancels the alternative pressure by giving priority to the normal braking system source. Some asymmetry may occur, but it can be controlled by using differential braking.

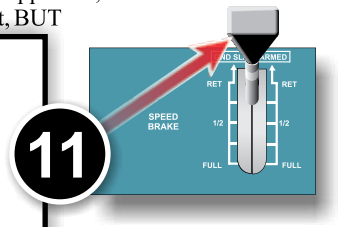
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11. GROUND SPOILERS ..... ARM

Using the speed brakes is allowed during the approach, even after the completion of the Final Descent Checklist, BUT

SPEED BRAKES MUST BE *FULLY RETRACTED and GROUND SPOILERS ARMED* before:
- **FAF** (Final Approach Fix),
- **OM** (Outer Marker), or
- **1000 Feet AGL** (VMC).



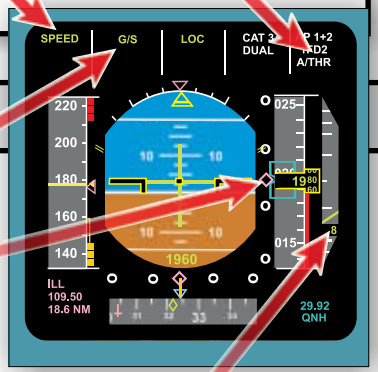
12. AUTO-THRUST mode ..... SPEED or OFF

NOTE: ***OPEN DESCENT IS PROHIBITED*** beyond the
- **FAF** or **FAP** on an instrument approach,
- **BELOW 1500 feet AGL** on a VISUAL APPROACH

Verify that either
- **SPEED** annunciated on the PFD, or
- **AUTO-THRUST** mode not selected.

Here's the details:
If operating in **OP DES** (OPEN DECENT), the **A/THR** setting is **THR IDLE**.
If operating in **SPEED** mode, the **A/THR** mode system varies the thrust setting to maintain speed (selected or managed).

So ... we want to either be in **SPEED** mode or **A/THR** OFF.



13. "GLIDE-SLOPE" capture ..... "ANNOUNCE".

Looking at the **PFD**, we want to observe the glide-slope indicator on the move downwards towards the level pitch line, and the the **ANNUNCIATOR** change to **G/S** and the aircraft pitch to maintain that indication.
***NOTE**: capturing the glide-slope does not put the airplane into auto-land mode. That does not occur until descending below 400 feet AGL.*

The PNF has the SOP assigned duty to "*monitor the sink/descent rate*". Using the best CRM procedure and all communication skills at their command (screaming OK if required) tell the PNF of any excessive rate or trend.

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14. MISSED APPROACH ALTITUDE ..... SET on FCU.

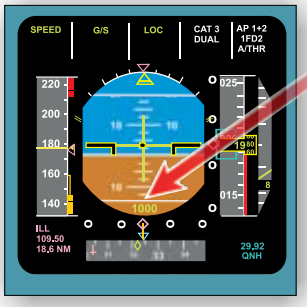
IMPORTANT DISCUSSION:

Since the 3 different styles of approaches have been introduced, there may *DEFINITELY* be some confusion about when to set the missed approach altitude during the approach procedure.

Here is the protocols I am ***suggesting***, These things change and maybe your airline has different criteria. Check these with your specific Company

WHEN TO SET MISSED APPROACH ALTITUDE ON FCU	
- On **PRECISION (ILS):**	At **GLIDE SLOPE CAPTURE**.
- On **APPROACH NAV:**	When **FINAL APP** indicates **ENGAGED** on the **PFD FMA**.
- On **CDAP:**	After airplane begins **FINAL DESCENT**, and is ***BELOW*** the **MISSED APPROACH ALTITUDE**.

15. @ *1000 feet AGL* *(RAD ALT on PFD)* ..... [PNF] **ANNOUNCE**:



"*1000 FEET, INSTRUMENTS CROSSCHECKED, LANDING MEMO GREEN*".



"Instruments crosschecked" means:

- **Radios,**
- **Autopilots,**
- **Flight Directors**

are correctly configured for the approach and have the appropriate indications.

If any **LANDING MEMO** item is not green,
- CORRECT the condition, ot
- PNF announce exception

("*...landing memo green except for* ___").

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Some of those whacky

DEFINITIONS

used to define the APPROACH ELEMENTS.

FAF - Final Approach Fix.

In general, the Final Approach Fix for a non-ILS will ne depicted on the approach plate by a "Maltese Cross" symbol. It is the point where the Final Approach Segment begins.
What pilots screw up: They confuse the FAF with the FPA Intercept Point. Note that the descent does not actually begin until the airplane intercepts the Flight Path Angle for the approach.

FLY OFF SEGMENT.

In order to comply with constraints of the approach, it will be necessary to include a "Fly Off Segment" after the FAF. This will allow the airplane to intercept the computed FPA. We can tell if there is a significant "Fly Off Segment" by looking at the ND and observing a "**BLUE HOCKEY STICK**" after the FAF.

FPA - Flight Path Angle.

The Airbus FMGC has the remarkable capability to generate a "glide slope" from the database. It does this by taking a point 50 feet TCH (touchdown point on the runway) and extending it up to the FAF altitude. This is the basis for the Approach Nav approach to fly the vertical profile segment automatically.
In the CDAP approach, it is the PILOT who must define the FPA using either Rate of Descent or the FPA controls.

FAF Altitude - Final Approach Fix Altitude.

Since the Airbus FMGC only generates the flight path information from the FAF altitude to 50 feet .... the airplane ***MUST BE AT FAF ALTITUDE*** in order to use the Approach Nav Approach capability. This is the key to this approach.

FAS - Final Approach Segment

ILS FAS begins at a point where the GSIA and the GLIDE SLOPE intersect and continues to the MAP..
Non-ILS FAS starts at the FAF and goes to the **MAP**.
NOTE: The Non-ILS descent from FAF altitude may not begin until intercepting the computed FPA.

MAP - Missed Approach Point

This is where the approach terminates ... you either LAND or you GO-AROUND. No other options. While several factors including Op Specs and company policy may dictate a higher altitude, the absolute minimum altitude that the airplane can descend to without landing is **50 Feet below MDA**. ***PERIOD!!!!***

DA - Decision Altitude

In general, when flying the Non-ILS Approach, enter the DA in the MDA field of the PERF APPR page of the MCDU.
NOTE: For the CDAP approach, use the charted DA + 50 feet.

GSIA - Glide Slope Intercept Altitude

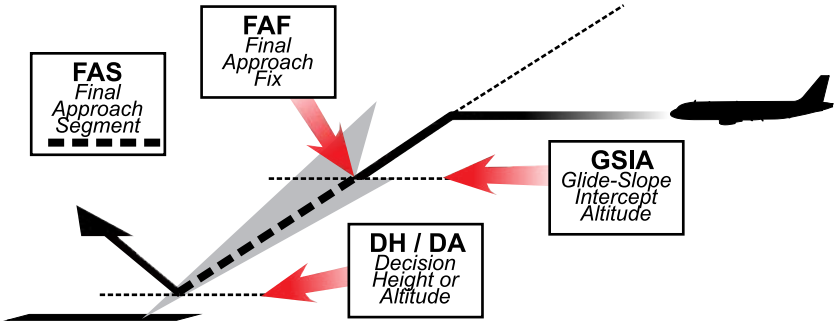
The GSIA is depicted on the Approach Plate.

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COMMON TERM USAGE:

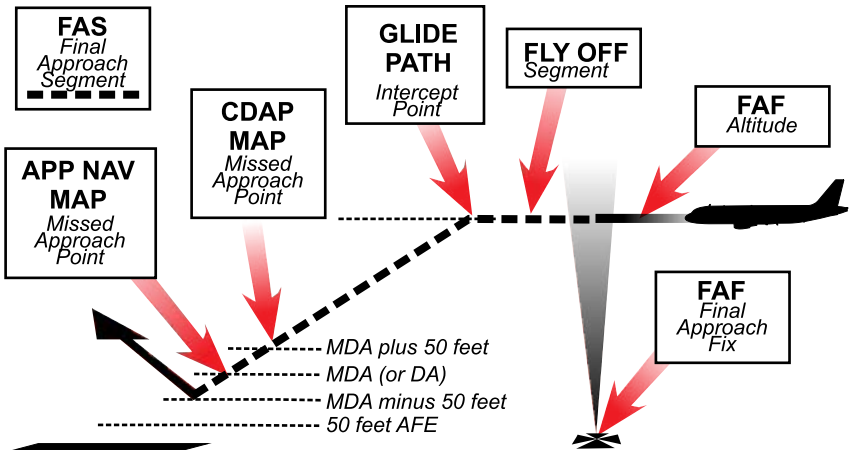
Here are some of the elements of the approaches. I drew the diagrams to help us all get "on the same page" and talking about the same things. While I am trying to use commonly used terminology associated with this evolution, I realize that there is a wide variation in the labels that are placed on these items.

ILS



NON-ILS

Approach Nav and CDAP



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AIRBUS ILS
AUTOLAND

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A-I-R-B-A-G gouge

APPROACH DESCENT checklist

Set lower altitude in FCU

About 5 NM prior to TD start descent PUSH ALT selector

@10,000 feet slow to 250 Kts
In managed descent this will occur automatically

As the GLIDE SLOPE indicator approaches center of the instrument, put **GEAR** down, extend **LANDING FLAPS**.



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At 400 Feet AGL, **LAND** annunciated.

@ about 10 feet **MANUALLY** retard thrust to idle

ILS Glide Slope

GSIA

400 Feet AGL

~ 10-25 Feet AGL

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Once established at inbound altitude you no longer need the magenta descent donut.
@ 10 to 20 NM PUSH **ILS** button

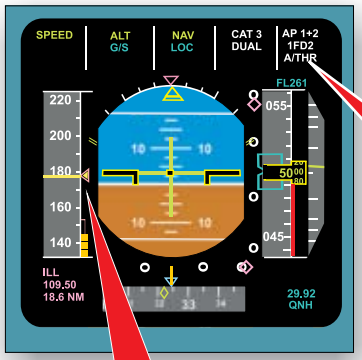
BELOW 8000 Feet
Go to **PERF** page of MCDU:
ACTIVATE APPR PHASE and **CONFIRM APPR PHASE.**
A/C will Slow to Green Dot airspeed.

@ magenta = sign on PFD Select FLAPS to first notch.

Select RAD NAV page of MCDU, Monitor for runway ILS ID and FREQ



After verifying ILS signal: look at lower left PFD, select:
1. **ILS** (verify ON),
2. **LOC**,
when LOC captured
3. **APPR**,
4. **AP2.**



Observe appropriate annunciations on PFD:

CAT 3 (if autoland)
A+P 1+2
ILL,109.50, 18.6 NM
LOC and G/S indices

Select FLAPS successively @ magenta "=" indicator

On a precision **ILS APPROACH** after **GLIDE SLOPE** capture, set **MISSED APPROACH** ALTITUDE.

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FLYING THE "APPROACH-NAV" APPROACH

REVIEW:

The Approach-Nav Approach is

> (1) **NON-ILS** (Non-precision) and
> (2) **LINE SELECTABLE**.

When you select the approach from the **F-PLAN** lateral revision of the **DEST** fix ... you *MUST* be able to "Line select" the approach with that name (for example **VOR14L**) from the list on that page ... it *MUST* be complete in the database. You *CANNOT* "build" the approach, add fixes, or manipulate the approach from the **FAF** (Final Approach Fix) inbound. The approaches in this category are:

> **VOR, NDB (ADF), GPS,** and **RNAV**.

Incredibly, the Airbus engineers were able to create a program that is able to construct a flight path that extends from a point 50 feet above the landing point on the runway up a 3 degrees slope to a point that co-incides with the FAF altitude (sometimes even higher).

What is even more amazing is that the airplane can actually hook-up and fly that pseudo-glide slope like an ILS and the PFD is equipped with the similar flight path indicators ... and even further astonishing is that the jet is certified by the FAA to do so down to 50 Feet AFE.

In order to accomplish this feat, there is a list of pre-approach criteria that must be met. Here is the list I have collected:

SYSTEM REQUIREMENTS:

If these requirements are not met
THE APPROACH IS NOT AUTHORIZED

AUTO-PILOT MUST be USED IF: Ceiling and Visibility< 1000/3.
2 OPERATING FMGCs (*PFD FMA should show* **1FD2**) **and** **BOTH F/D MUST be ON.**
RAW DATA MUST BE MONITORED (*If available*)
APPROACH MUST BE DATABASE SELECTABLE
APPROACH CHART and CONSTRAINT ALTITUDEs on F-PLAN PAGE MUST AGREE
RNP VALUES and ACCURACY BEFORE FAF; RNP=0.37, ACCURACY=HIGH.
TEMP MUST BE > 15°C or AS PUBLISHED.
ALTIMETER SETTING MUST BE FROM LOCAL SITE.
HDG-V/S MUST BE USED for the MISSED APPROACH
MUST CLEAR "PILOT INPUTED RNP" ON CLIMBOUT IF MISSED APPROACH.

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DO THE REVERSE "Z" ...

This seems like a daunting feat of memory on first glance ... but if you simply do the "**REVERSE Z**" in the "**A-I-R-B-U-S**" set-up, you will have accomplished the important parts of this task.



BIG SCREW-UP!

If you should be making the intercept using the speed selector, when you select the **NAV** mode, the speed will go to that selected. If you don't check it, the chances are that the thrust will come on and the airplane will try to accelerate.

BRIEF THIS: DO NOT PUSH THE ILS/IL BUTTON!

If you push the **ILS/LS** button, the **RNAV** indications will be disabled and an amber **V/DEV** will start flashing on the **PFD**.

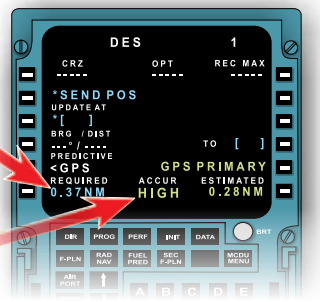
SET MINIMUMS	DH in the MDA field (PERF/APP page)
HARD TUNE NAVAID	NDB (ADF) SPECIFICALLY
BEFORE ACTIVATING APPROACH	ENSURE SELECTED AIRSPEEDS ARE CONSISTENT
ARM NAV (LNAV)	WHEN "CLEARED FOR THE APPROACH"
MUST BE AT FAF ALTITUDE	BEFORE ARMING THE APPROACH
ARM APPCH (FCU)	WHEN AT FAF ALTITUDE
DESCEND TO FAF ALTITUDE	WHEN CLEARED and Within 10° of FINAL COURSE or ON PUBLISHED FAS
CHECK RNP	Inside of 5 NM from FAF
BE FULLY CONFIGURED	NOT LESS THAN 2 NM from FAF
SET M/A ALTITUDE	When FINAL APP indicates ENGAGED on the PFD FMA.

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"APPROACH-NAV" APPROACH
COMMENTS and SCREW-UPS!

The RNP Discussion:

There are 3 points to be made here.



POINT 1: Officially, 0.3 is required, but the Airbus computer will display **0.36** or **0.37**. Don't let this confuse you. If 0.37 is not displayed, manually enter 0.37 in ***BOTH*** MCDU PROG pages (LSK6L). The EPE (Estmated Position Error) must be lower than the RNP. If it is, then the PROG page should display a required ACCURACY value of **HIGH.** If you don't have this situation, you will get a **NAV ACCURACY DOWNGRADE** message on the MCDU.

POINT 2: If this happens, you may select the auto-pilot for the other FMGC and see if that resolves the issue. That is to say, if ***BOTH*** FMGCs display an error message you will have to execute a MISSED APPROACH.

POINT 3: If a MISSED APPROACH becomes necessary for any reason ... guess what, the manually entered RNP must be cleared.

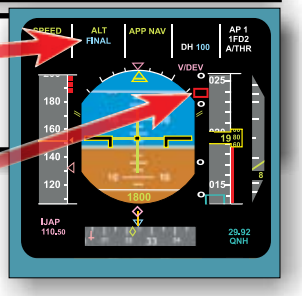


*The **FLY OFF** segment discussion:*

Since the computed vertical flight path "never" exactly co-incides with the FAF ... there will "always" be a short horizontal segment where the jet flies past the FAF to intercept the vertical flight path. This is called the "**FLY OFF**". It will be identified by a "hockey stick" on the ND that goes from "white" to "blue" when FINAL APP is captured. Don't get all anxious when the jet doesn't start down right at the FAF.

BEFORE the FAF/FPA

The FMA indications on the PFD should be:
APP NAV (ARMED or ENGAGED) and
FINAL (ARMED).



Here is where the V/DEV indicator (called "**THE BRICK**") starts to become visible. It operates ***ALMOST*** like an ILS GLIDE SLOPE indicator.

PILOT GOUGE
"0.36 HIGH HOCKEY FINAL"

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"APPROACH-NAV" APPROACH
COMMENTS and SCREW-UPS!

MONITORING RAW DATA means:
- **DISPLAY the BEARING POINTERS:** On the VOR,NDB (ADF) use the switches on the EFIS control panel to select. ROSE mode OK for VOR.
- **CONFIRM TUNING** by observing identifiers on PFD and ND.
- **AURALLY CONFIRMED** by listening to the IDENT signal.
- **CONTINUOUSLY MONITOR THE AURAL SIGNAL** of the **NDB (ADF)**during the approach.

Normally fly the **APP-NAV** approach using
ONE AUTO-PILOT AND BOTH FLIGHT DIRECTORS ON.
NOTE: The second auto-pilot will physically not engage. If both auto-pilots have failed, then a manual **F/D RNAV** is permitted.

THE APPROACH MUST BE LINE SELECTABLE. Only use the EXACT approach from the database ... *DO NOT* attempt to manually build, add, or delete waypoints inside the FAF to the runway.

Using **NAV** is **PROHIBITED for PROCEDURE TURN** course reversals. When the F-PLAN shows a **PROC T**, use the HDG or TRK mode to steer the procedure turn.

NAV mode may be engaged when on a heading that will intercept the final approach course to the FAF/FAP.

Only when ***"CLEARED FOR THE APPROACH"*** should you press the **APPR** button on the **FCU**.

Airplane must be **FULLY CONFIGURED**, the **FINAL DESCENT CHECKLIST** completed, and at **FINAL APPROACH SPEED** before FAF/FAP.

The **FMGC** computed VERTICAL FLIGHT PATH starts (or ends) at the published FAF ALTITUDE. The jet ***MUST BE AT FAF ALTITUDE*** to capture the flight path for the descent.

***This is* BIG !**

*If you are flying an APPROACH NAV approach (a line selectable Non-ILS approach), you **MUST BE AT** the **FAF ALTITUDE** passing the **FAF** in order to intercept and acquire the glide path.*

The **APP NAV APPROACH** procedure *MUST BE USED* for **VOR** and **NDB** approaches (if the requirements for an APP NAV APPROACH are met).

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AIRBUS APP NAV Approach



DO THE REVERSE "Z" ...

LINE SELECT THE APPROACH
VOR, NDB, GPS, RNAV

SET MINIMUMS — *DH in the MDA field (PERF/APP page)*

HARD TUNE NAVAID

CONFIRM SELECTED AIRSPEEDS ARE CONSISTENT

BIG SCREW-UP!

FAILS TO ACTIVATE and CONFIRM!

If flying vectors to the intercept using manually set speeds, when selecting **NAV** mode, the speed goes to **250 Kts**.

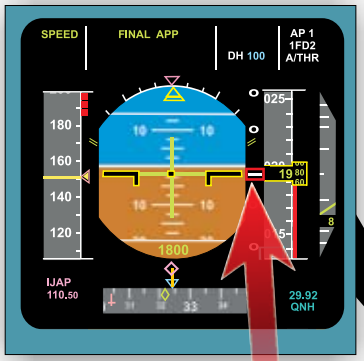
WHEN "CLEARED FOR THE APPROACH" and ON INTERCEPT HEADING select NAV mode.

PUSH to **ARM LNAV**



When FINAL APP indicates ENGAGED on the PFD FMA.
SET M/A ALTITUDE





NOT LESS THAN 2 NM from FAF
BE FULLY CONFIGURED
GEAR DOWN
LANDING FLAPS
FINAL DESCENT CHECKLIST
APPROACH AIRSPEED

WHEN CLEARED and Within 10° of FINAL COURSE or ON PUBLISHED FAS
DESCEND TO FAF ALTITUDE

Inside of 5 NM from FAF
"0.36-HIGH-HOCKEY-FINAL"

FAF

FLY OFF SEGMENT

2 NM **5 NM**

WHEN AT FAF ALTITUDE
PUSH TO **ARM APPCH**



FLY THE "BRICK"

The airplane will couple to and fly the vertical flight path automatically.

MDA(DH)

MDA-50 FEET
AUTOPILOT DISENGAGES
F/D REVERTS TO HDG-V/S

DO NOT PUSH THE ILS/IL BUTTON!

If you push the **ILS/LS** button, the **RNAV** indications will be disabled and an amber **V/DEV** will start flashing on the **PFD**.

FLYING THE CDAP APPROACH

TECHNICAL DETAILS

This approach may be selected whenever the APP NAV approach can't be flown.
Here are the reasons the APP NAV approach cannot be flown:

- The approach is based on a localizer, or
- The requirements for an APP NAV approach are not met.

Here are a list of approaches that may be flown using the CDAP procedure.

- **LOC** (**ILS** with glide-slope out of service),
- **LDA** (without glideslope),
- **SDF**,
- **VOR**,
- **NDB** (**ADF**),
- **LOC BACK COURSE**,
- **ASR**, and other voice commanded approaches

DISCUSSION:

If the approach course is based on a
LOCALIZER FRONT COURSE,
then we use the **LATERAL (LNAV)** to track the **LOC** course.

If the approach course is NOT based on a
LOCALIZER FRONT COURSE,
then we would use **LNAV** in the **TRK** mode.

The **VNAV** (vertical path) in ALL CASES
is flown using the **FPA** to an adjusted **DA(CDAP DA).**

*what is the **ADJUSTED CDAP DA?***
ADD 50 feet to the **PUBLISHED MDA**.
Insert this **CDAP DA** on the **PERF APP PAGE** (**MDA** field).

PLAIN LANGUAGE TALK:

This approach is a lot like the APP NAV approach BUT the airplane does NOT automatically follow a vertical segment after the FAF.

1. The pilot must decide WHEN to start down, and
2. HOW FAST to descend so as to remain on the "glide path".
3. The pilot controls the vertical descent segment using the FPA-V/S knob on the FCU.

There are two options for the descent control and indication, Either:

- FPD (Flight Path Director called "The Bird"), or
- Command Bars and Vertical Deviation Indicator (called the "Donut").

Unless you are REALLY FAMILIAR with flying that funny little indicator they call tre Bird (**FPD**), I would not attempt to try and learn during the check-ride. There is some complexity to understanding just how it works. So when you start down on the 3 degree glide-slope, look for the vertical deviation indicator and if the "**FLY THE DONUT**".

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FLYING THE EDAP APPROACH

There are three questions that the pilot wants to know:
- How do I determine the FPA (Flight Path Angle?),
- When do I start down?,
- How do I "fly" the descent to MDA?

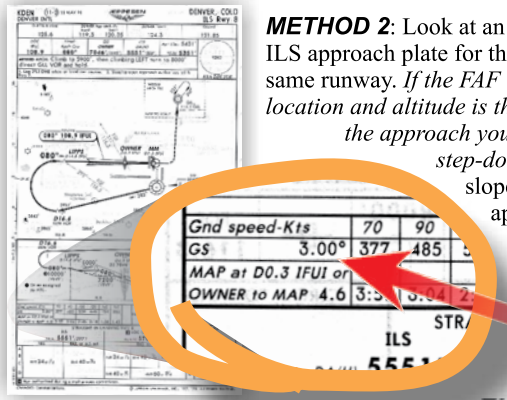
HOW TO DETERMINE THE FPA.

Here are FOUR methods:

METHOD 1: Look on the approach chart.

On "some" charts there will actually be a notation that states what the FAS (Final Approach Segment) flight path angle is. In our example, we can see that the FPA is 2.94°. We can also see that the FAS begins at the OUTER MARKER or 4 NM from touchdown point and 4.8 from the VORTAC (VOR). This tells us 2 ways to determine when to start down.



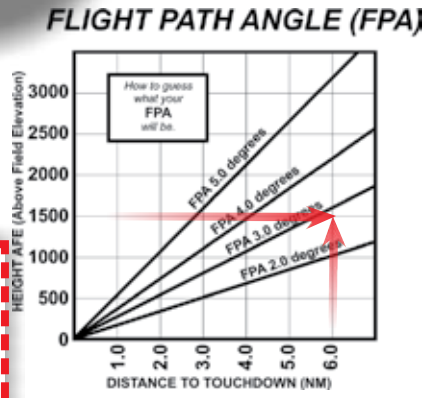


METHOD 2: Look at an ILS approach plate for the same runway. *If the FAF location and altitude is the same as the approach you are flying AND there are no step-down fixes;* then: Use the glide slope angle published on the approach chart conversion table on the ILS approach plate.

In our example, departing the FAF at a 3 degrees FPA would get us to the runway threshold.

METHOD 3: Look in Flight Manual for appropriate graph or chart. Here is a "rough" chart I made for my use, yours may look a little different.

EXAMPLE: If the FAF is 6 NM from the runway and the FAFaltitude is 1500 Feet AGL, then fly a FPA of 2.8°.



FLY OFF WARNING:
When using this technique, if glide-slope is excessively shallow (less than 2°) using the FAF as a starting point ... delay the descent to a point (FLY OFF) where a "normal" 3° descent can be made.

BEST TECHNIQUE

METHOD 4 *(My personal favorite)*:
Still using our chart, Start with a 3 degrees glide slope. If, for example, the FAF altitude is 1500 Feet AGL, then you would have to start your descent (FAP) about 5.6 NM from the touchdown point.

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WHEN TO START DOWN.

The Airbus has the remarkable capability to construct a "virtual" Flight Path Angle (FPA) that the pilot can select on the FCU. Once the distance is calculated for the departure from FAF altitude and this FPA (Flight Path Angle) is known, it is a simply extension of logic that if the airplane flies the FPA it should arrive close enough to the runway landing area to actually land the airplane.

Every approach FAS segments start after passing the **OUTER MARKER.** Most outer markers are identified by:

- **STATION PASSAGE,**
- **DME** from a **NAV RADIO,**
- **DISTANCE** on the **ND,**
- **AURAL SIGNAL** (Incessant beeping).

The distance AFTER the FAF for the descent point (FAP) is called the "**FLY OFF**. On some approaches, all you will have is the CF (Centerline Fix) on the ND. Some approaches use timed descent points and some use distance or radials from ground based navigation radios. Each FAS (Final Approach Segment) situation will be different. We have to determine AND BRIEF how we are going to determine our descent point (FAP).

It is recommended that IF a line selectable approach is available ...*USE IT*! It will have waypoints that can be used to measure your progress during the approach. If the approach is NOT line selectable, it may be good technique to insert waypoints into the FMGC flight plan for progress milestones.

Once you have decided how to identify the point
where the descent FPA is to begin ... ***BRIEF IT!***
PLAN TO START YOUR PUSHOVER ABOUT
.3 NM BEFORE YOUR DESCENT POINT.

THE FINAL APPROACH SEGMENT.

This final approach segment is (usually) flown using the auto-pilot and the FCU. Here is the 1-2-3.



STEP 1: Be **AT FAF ALTITUDE**, configured, on airspeed, Final Approach Checklist completed, and cleared for the approach.

STEP 2: Crossing the **FAF**: Contact Tower with report, start clock, etc.

STEP 3: Select the FPA button

STEP 4: Set in your FPA (Flight Path Angle).

CONFUSING NOTE:You then have 45 seconds to PULL the V/S knob towards you or the display reverts to dashes; BUT the value you set in is 'STILL ACTIVE".

STEP 5: Approaching the descent point, which is about .3 miles before FAP (Final Approach Point),

PULL the *Vertical Speed Selector knob (KNOB C)*.

STEP 6: If you have set in some milestone waypoints,
tweak the V/S knob if necessary to stay on the glide slope.

STEP 7: Once the airplane starts the descent and is actually below the missed approach altitude, ***SET THE MISSED APPROACH ALTITUDE IN THE FCU***.
Even if you have visual contact, continue to use the auto-pilot
to control the airplane up to 50 feet below the published MDA.

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CDAP OP SPECS and REVIEW ITEMS

The VERTICAL PATHWAY in all cases is flown using the FPA to an adjusted DA.

To determine the "adjusted" CDAP DA ... add 50 feet to the published MDA (minimum descent altitude) and insert this adjusted CDAP DA on the PERF/APPR page in the MDA field.

> On FAS (final approach segment), FPA may be adjusted, ***BUT NOT MORE THAN +/- 1 degree*** from the predetermined angle. For example, you can adjust a 3 degree FPA from 2 to 4 degrees. If you require more than +/- 1 degree ... ***GO AROUND*** (DUH!!!).

Once established on final, a MISSED APPROACH is required if:
- Sustained raw data deviation exceeds 5 degrees,
- Loss of auto-pilot IF REQUIRED for the approach.

AUTO-PILOT REQUIRED for the approach when:
- Ceiling reported less than 1000 feet, or
- Visibility reported less than 3 miles, or
- Raw data not available.

Definition of "**RAW DATA**": Navigational information from ground-based Navaids.

Monitoring Raw Data: When raw data is displayed, pilots must confirm proper tuning by observing the decoded identifier on the PFD or ND. If the identifier IS NOT displayed, the pilot MUST use the AURAL IDENTIFIER ... and further, for the NDB (ADF), it ***MUST BE CONTINUOUSLY MONITORED*** !

- **LOC, LDA, SDF**: ILS/IL button must be selected to display localizer on the PFD
- **LOC BACK COURSE**: ROSE ILS must be used to display the localizer on the ND. Because of ***REVERSE SENSING ... DO NOT SELECT ILS/LS*** button.
- **VOR and NDB**: Use the VOR/ADF switches on the EFIS control panel. ROSE VOR may be used if desired.

While the pilot determines and controls the vertical pathway to the runway, the **LATERAL PATH** is always flown using "raw data".

For a CDAP, the reported visibility must be above the published minimums to begin the FAS, with these exceptions:
- **NDB (ADF)** ... reported visibility ***NOT LESS THAN 2 miles***.
- If weather less than **800/2** *MUST HAVE* an **EGPWS** operational.

ALL MISSED APPROACH/GO-AROUNDs must be flown using the **HDG-V/S**. On some airplanes. advancing the thrust levers to TOGA will automatically change the F/D mode to HDG/V/S. However, it is up to the pilot to monitor that situation.

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KNOBS and BUTTONS review

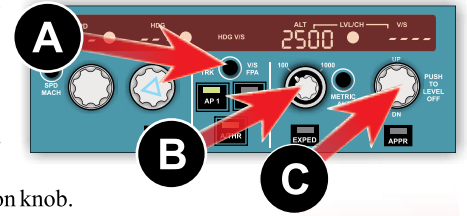
ILS/IL switch SCREW-UP:

On the APPROACH NAV approach, we ***NEVER*** touch the **ILS/IL** selector!!! In fact, if a localizer is used for the approach ... we are forbidden from using the APPROACH NAV technique.

HOWEVER,

On the CDAP, if a localizer is to be used for navigation, we select the **ILS/IL** switch, BUT if we are flying a LOC BACK COURSE we *DO NOT* select the **ILS/IL** switch because of reverse sensing.

BUTTON A: There are two choice for vertical path mode ... you can set a Flight Path Angle (FPA) or a Vertical Speed (V/S). We make that selection by depressing the little black button in the middle of the unit.



KNOB B:

You can change the target altitude for the system using the ALTITUDE SELECTOR knob. It is a multi-function knob.

That is the easy part, here is where it gets complicated:

- **PUSH** will select DES mode allow the FMGC computer to climb or descend to the altitude selected on the FCU altitude window.
- **PULL** will select OP DES mode and allow the airplane to climb or descend in the most expeditious manner to the altitude in the FCU.
- **TURN** to select the target altitude.

KNOB C:

This is also a multi-function knob:

- **PUSH** the knob to LEVEL OFF.
- **PULL** the knob to ACTIVATE the selected vertical path mode.
- **TURN** the knob to change the value for the vertical path descent or climb (either PFA in degrees or V/S in feet per minute).

BIG SCREW UP!

When the **KNOB C** (V/S knob) is **PULLED**, the airplane will descend or climb at the FPA or V/S selected and try to go to the target altitude selected in the FCU altitude window and then level off.

If there is *NO INTERVENING SELECTED ALTITUDE* in the FCU altitude selector window, the airplane will continue to climb until it goes into **A.FLOOR/TOGA-LK** ... or if it is descending, it will

FLY RIGHT INTO THE EARTH !

The **CDAP** approach has the potential for this disaster. Since we will be descending at low altitude with the altitude set in the FCU window for the MISSED APPROACH altitude, we must

MAINTAIN SITUATIONAL AWARENESS!!!

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Personal observations and comments

SIMPLIFY - SIMPLIFY - SIMPLIFY

Let me preface any personal comments with the caveat that the following comments are NOT to be interpreted as a suggestion that you deviate from any standard operating procedures (SOP) or officially sanctioned information. This is just a "Captain-to Captain" conversation. ***DO NOT*** quote me on this but ...

SIMPLIFY THE PROCEDURES ... I feel that where it isn't necessary to complicate a subject ... that it shouldn't be done. Here is my first example:

When to set the Missed Approach altitude in the FCU. This debate has been raging for years and I have been watching it with amazement. Right at the point where the pilot is the most pre-occupied, there is inserted in the procedure the requirement to set the missed approach altitude.
Look at the procedures presented in this book ...

WAY TOO COMPLICATED!

ILS	After **GLIDE SLOPE** capture.
APPCH-NAV	When **FINAL APP** is engaged.
CDAP	After jet **BEGINS FINAL DESCENT** (and is below Missed Approach Altitude).

If I were King ...

Wouldn't it be much easier and certainly more simple if:

"When established at FAF altitude, GSIA, or intercept altitude inbound to the FAF (with **ALT** *displayed on the PFD FMA) ... set the Missed Approach altitude."*

If you arrive at the FAF and the weather (or other considerations) make commencement of the approach undesireable, This would greatly simplify the problem of executing the Missed Approach at the FAF. Simply PUSH the Altitude Selector knob.

Another example would be the choice of LANDING FLAP. On this airplane and during a checkride ... why not simplify your life and select "FULL" flaps. This would avoid selecting that overhead switch (GPWS LDG FLAP 3), avoid changing the flap selection to CONFIG 3 on the PERF APPR page, avoid the **VLS** speed change problem and all those other considerations associated with FLAPS 3.

Or how about during the sim-ride we dispense with that FLEX take-off. After you have demonstrated proficiency in calculating the flex temperature ... just use the TOGA position.

As so on ... as you become more familiar with the operation of the Airbus, you will see many places where you can simplify the operation. I have found that my brain freezes or turns to putty when I get past a certain amount of complication; particularly when I am new on a piece of equipment and particularly in a check-ride situation. But remember ...

ALWAYS BE SAFE.

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AIRBUS CDAP Approach



DO THE REVERSE "Z" ...

VOR, NDB (ADF), LOC only,
LDA, SDF, ASR
IF flyingLOC back course,
GPWS G/S MODE - OFF

CDAP MINIMUMS — *published MDA plus 50 feet in the MDA field (PERF/APP page)*

HARD TUNE NAVAID

PRE-COMPUTE FPA, or
USE 3° and compute FAP (push-over)

*OK to use **NAV (PUSH KNOB)** up to the **FAF** if proper guidance available ... **BUT**:*

DO NOT USE NAV
between the
FAF and the RUNWAY!

(pull knob - set headings)





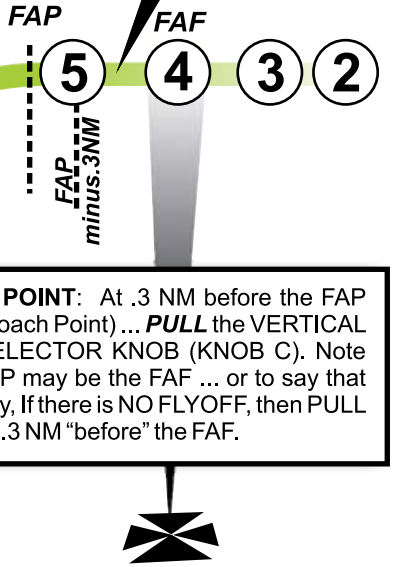
***SET FAF ALTITUDE** in the FCU window and WHEN CLEARED ...*
DESCEND TO FAF ALTITUDE (PULL KNOB)

DOING THE PUSH-OVER

1: Be Configured, at FAF altitude, VAPP
2: PUSH BUTTON A select FPA,
3: ROTATE KNOB C-Set FPA (3°).
If the knob is not pulled within 45 seconds, the window reverts to dashes BUT the value selected is still active..
4: Start clock, Report, etc.
5: PULL KNOB C at .3 NM before the FAP.
6: Tweak DESCENT rate using KNOB C.
7: Set KNOB B to MAA when below MAA. (Missed Approach Altitude).

NOT LESS THAN 2 NM from FAF
BE FULLY CONFIGURED
GEAR DOWN
LANDING FLAPS
FINAL DESCENT CHECKLIST
APPROACH AIRSPEED

FLY OFF SEGMENT



CRITICAL POINT: At .3 NM before the FAP (Final Approach Point) ... ***PULL*** the VERTICAL SPEED SELECTOR KNOB (KNOB C). Note that the FAP may be the FAF ... or to say that another way, If there is NO FLYOFF, then PULL the knob at .3 NM "before" the FAF.

CDAP approach NOTES and SUGGESTIONS:

- If procedure turn is required, DO NOT USE **NAV** but rather steer around the turn using the **HDG SEL or TRK-FPA**.
- Select **TRK-FPA** before becoming established on the FINAL APPROACH COURSE.

- If approach based on a LOCALIZER FRONT COURSE (**LOC, LDA, or SDF**) then you can use the LOC mode for the lateral guidance.

- ***DO NOT USE NAV*** between FAF and the RUNWAY.
OK to use "**LOC**" (see note above).

- Once established on the FAS, inside the FAF, *the lateral navigation **MUST BE** flown using "**RAW DATA**"*.

- If you are going to try and use **NAV** at any point in the approach ... ensure that the **F-PLAN** is properly sequenced.
I recommend if there is any question that you select TRK-FPA early on and use TRK for the whole approach profile. Trying to use **NAV** in close on a **CDAP** is a recipe for disaster.

- **TRK** mode already has the wind correction.
Just move the cursor to the direction you want to go.

LANDING the jet *(a quick overview)*

The AUTO-THRUST system should normally be used up to the point where "**RETARD**" (about 20 feet AFE) is called-out by the automated voice. Then the thrust levers MUST BE manually pulled to the idle position.
However, and I am reluctant to even mention this, if thrust control is required, depress the intuitive button , and manually control the thrust. ***DUH!!!***

8° — **DO NOT EXCEED 8° of PITCH** during the landing.

11.5° — DO NOT delay touchdown with a prolonged float to get a grease job:
TAIL STRIKES EARTH:
A320 @ 11.5° pitch; A319 @ 13.5°.

16° — CROSSWIND LANDING:
WING-TIP or ENGINE SCRAPE:
occurs at 16° of roll.

WARNING:
DO NOT ATTEMPT to GO-AROUND
AFTER initiating REVERSE THRUST.

The landing sequence goes something like this:

@10 - 20 feet (AGL)
above ground level — Select thrust levers to **IDLE** at the "**RETARD**" callout (20 feet AFE).

IF AUTO-LAND ... Let airplane control the ***ROTATION, TOUCHDOWN, AND ROLLOUT*** to a complete stop

@ TOUCH DOWN — Select **REVERSERS**
AUTO-BRAKING system will select **ON**
GROUND-SPOILERS will auto **EXTEND**.

@ 80 knots — Start coming out of reverse.

@ 60 knots — Be out of reverse

When SLOWED or STOPPED
Thrust levers to idle
Raise **FLAPS (Unless in icing)**
Stow **GROUND SPOILERS**

TAXI SPEEDS
Use the **ND** groundspeed indicator.
Maximum recommended speeds:
- Straight Ahead .....25 Kts
- Turns less that 45° ..... 25 Kts
- Turns greater than 45° .... 10 Kts



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LANDING ROLLOUT

As airplane touches down and nose-gear is gently grounded ...

1. VERIFY ..... THRUST LEVERS to IDLE.

Use the **RUDDER** to maintain directional control and **AILERONS** to maintain wings level. These controls are effective down to about

60 KNOTS.

DO NOT USE NOSEWHEEL STEERING above normal taxi speeds.

2. FULL REVERSE ..... *after main gear touchdown.*

It is OK to reverse before nose gear touchdown,
but be aware that a slight pitch-up may occur. Side-stick will easily control it.

3. GROUND SPOILERS..... DEPLOYED

If they do not deploy, call out the abnormality and PF manually deploy spoilers if desired. Use of the spoilers is MOST EFFECTIVE at higher speeds. Note that it is NOT REQUIRED to meet calculated landing distances.

4. IDLE REVERSE..... SELECT AT 80 KNOTS.

CAUTION:
Ensure forward idle reverse is achieved by
60 KNOTS.

Here is the problem: High thrust settings at low airspeeds has two results:
- Compressor stalls (Bang - bang - bang ... we have all heard that)
- FOD (Foreign Object Damage) .. and we have all seen it.

If desired, leave the reversers in "IDLE REVERSE" down to 25knots.

5. ENGINE PARAMETERS ..... MONITOR

The biggest concern is ***ASYMMETRIC REVERSE THRUST*** that would result in difficulty in steering. Other things to look for is excessive EGT, engine not in reverse.

6. AIRSPEED CALLOUTS ..... "60 KNOTS and 80 KNOTS"

7. THRUST LEVERS ..... FORWARD IDLE

PROBLEM:
When deselecting reverse, the thrust levers have this resistance point that requires a little more pressure to transcend, and as a result, it is easy to inadvertently apply forward thrust by getting the thrust levers forward of the idle position.

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8. BRAKES ..... AS REQUIRED

Braking is normally recommended to be initially accomplished using the AUTO-BRAKE system. Auto-brakes use the GREEN HYDRAULIC system and initiation is activated by the extension of GROUND SPOILERS. Then, when the Pilot Flying depresses the top of the RUDDER PEDALS, the auto-brakes will disconnect automatically and normal braking will occur.

WARNING:
Do NOT disengage the AUTO-BRAKES using the AUTO-BRAKE switch. Depress the BRAKE PEDALS.

WARNING

If the BRAKES or NOSE-WHEEL STEERING fails,

RELEASE THE BRAKE PEDALS
BEFORE
selecting the A/SKID and N/W STRG switch off

IF YOU DON'T, IT'S LIKE
HITTING A BRICK WALL!!

- BRAKE PEDALS ..... IMMEDIATELY RELEASE
- A/SKID & N/W STRG switch ..... OFF
- BRAKE PEDALS ..... MODULATE

At this point, it is my opinion that the first thing to think about is:
- **STOPPING ON THE CONFINES OF THE RUNWAY.**

The secondary response is to
- **TAXI CLEAR OF THE RUNWAY.**

If there is any doubt, remain in position and

9. SET THE PARKING BRAKES.

We have continually encountered the BSCU failure problem during this manual flow discussion. It is a constant concern, and I would comment that I personally don't consider it a good Captain decision to try and taxi or continue the trip with this issue.

Stop the airplane, set the parking brake, contact appropriate ATC control agency. Once that is done, contact company maintenance and dispatch personnel and determine the contingency plan.

My personnel view is that this BSCU problem , while it can achieve resolution with the flight crews, requires the co-ordination of appropriate personnel outside the cockpit.

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TAXI-IN

DO NOT EXCEED
40% N1
when operating within congested areas

ENGINE COOL DOWN discussion:

The basic rule is:

3 MINUTES @ IDLE BEFORE SHUTDOWN

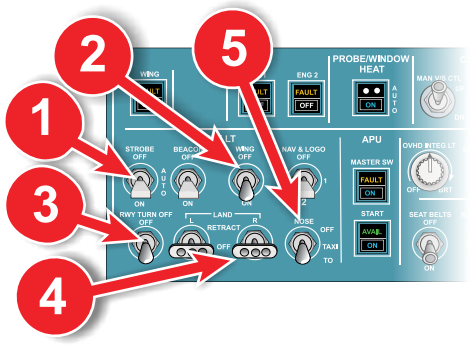
If you operate the engines above IDLE, then they should be motored for three minutes before shut down. However, If the taxi time from landing to parking is less than three minutes, it is not necessary to motor the engines at the gate to achieve the three minutes.

WHEN CLEAR of the RUNWAY

The ***NUMBER ONE*** thing that the crew should be doing is listening to the ATC (usually Tower or Ground Controller) for taxi instructions. While I don't say that you absolutely CANNOT be doing some of the runway exit flows, these are of secondary importance at this point.

The Captain has a fairly cursory list of items that involve shutting down the lights ... but the First Officer will be "head down" during part of this FLOW. The Captain MUST maintain situational awareness ... and if there is an ambiguity ... ***STOP THE JET AND RESOLVE THE ISSUE***. This is very important where language differences between the crew and the controllers may make the situation questionable.

CAPTAIN .....TURNS OFF 5 LIGHT SWITCHES

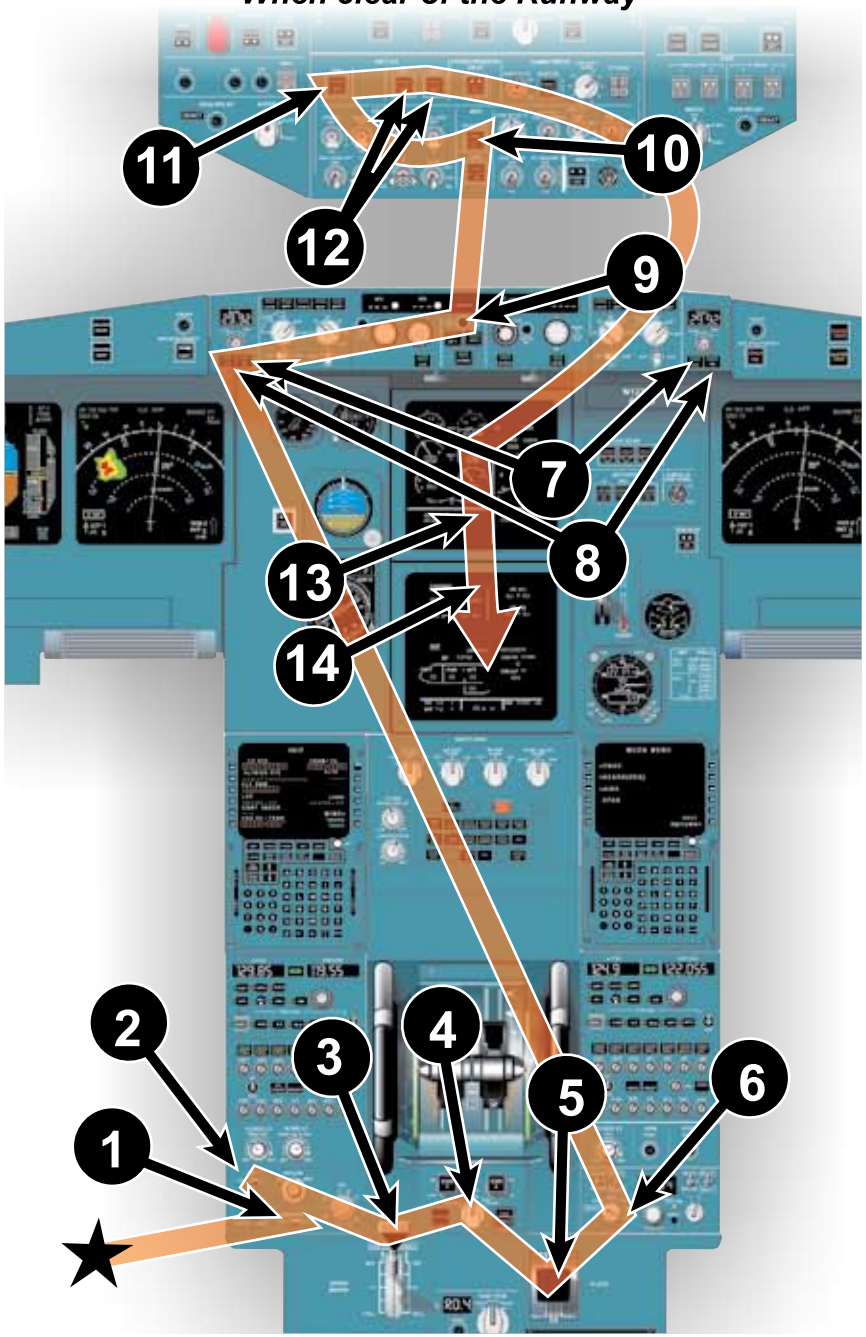


1. **STROBE LIGHTS**
2. **WING LIGHTS**
   The wing lights may be left on if desired.
3. **LANDING LIGHTS**
4. **RUNWAY TURNOFF LIGHTS**
5. **NOSE LIGHTS**

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FIRST OFFICER FLOWS

When clear of the Runway



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FIRST OFFICER TAXI-IN FLOW

1. PWS (Predictive Wind Shear) **switch ..... OFF**

2. WEATHER RADAR ..... OFF

WARNING

The **WEATHER RADAR** and **PWS** must be
OFF
When operating in the ground environment around personnel.

3. GROUND SPOILERS ..... DISARM

Verify the SPEED BRAKE is in the RET position, and down.

4. ENGINE MODE SELECTOR ..... NORMAL

5. FLAPS ..... UP

CAUTION

If there is the possibility of ice accumulation on the FLAPS,
LEAVE THE FLAPS EXTENDED.
Notify the ramp that a flap inspection and potential de-icing may be necessary.

6. TRANSPONDER MODE SELECTOR ..... XPDR

7. ILS/LS BUTTONS ..... OFF

8. FLIGHT DIRECTOR SELECTOR ..... OFF

9. HDG-V/S / TRK-FPA BUTTON ..... HDG-V/S

10. APU ..... AS REQUIRED

The need to start the APU in order to supply electrical power or pneumatic air for passenger comfort should be evaluated. The APU not started until approaching the parking area to conserve fuel and minimize APU service time.

11. WING ANTI-ICE SWITCH ..... OFF

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12. ENGINE ANTI-ICE SWITCH ..... AS REQUIRED

It is true that the engine anti-ice should be continued during taxi-in if being operated in icing conditions; however, be aware that when we operate the engine anti-ice, ***the thrust output is increased.***

DEFINITION OF ICING

Icing conditions exist on the ground when
OUTSIDE AIR TEMPERATURE is 10° C or below, and
- Visible moisture in any form is present
- the existence of surface snow, standing water, or slush may be ingested by the engine..

BE AWARE OF THIS

If ANTI-ICE is on, perform engine run-ups
EVERY 10 MINUTES DURING TAXI-IN.
If icing conditions exist, leave engine anti-ice ON until engine shutdown.

It is a requirement that pilots report braking action to the controlling ATC agency and the company when they experience braking action less than good.

13. DIFFERENTIAL CABIN PRESS ..... VERIFY ZERO

If differential pressure is NOT zero:
Go to the Irregular Procedures section and it will tell you to:

1. Cabin Press mode selector MANUAL

2. Manual V/S control FULL UP



Put page number from your Pilot Flight Manual for this irregular procedure.

WARNING:

Automatic depressurization WILL NOT occur upon landing when the cabin pressurization is being operating in the manual mode.

YOU MUST ENSURE THE DIFFERENTIAL PRESSURE IS ZERO BEFORE OPENING ANY CABIN EXIT.

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14. BRAKE TEMPERATURE ..... MONITOR

The brake temperatures are displayed on the **ECAM WHEEL** page. If **BRAKES HOT ECAM** message is displayed oin the upper **ECAM** message, then you are required to advise Station Manager/Maintenance and request the gear be chocked.

CAUTION

MAINTENANCE ACTION REQUIRED WHEN:

- *Autobrakes or maximum manual braking was used to reject a takeoff.*
- *Maximum manual braking used for landing.*
- *The temperature difference between two brakes on the same gear is greater than 150° C and the temperature of one of those brakes is at or above 600°C or below 60°C.*
- *any brake's temperature exceeds 900°C.*

Approaching the gate area, we need to make an evaluation regarding the braking action. Can we stop and turn and maneuver as will be necessary. If not, it might make sense to get a tow-in to the gate and parking position.

If the brakes are to be released for cooling

CHOCK THE WHEELS and RELEASE THE BRAKES

CAUTION

POSITIVELY CONFIRM

Either have a flight crew member or ground personnel visually verify with the chocking personnel prior to releasing the parking brake.

THE AIRPLANE MAY MOVE IF NOT CHOCKED WHEN PARKING BRAKE IS RELEASED.

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PARKING

CAPTAIN DOES 4 THINGS

ONCE AIRPLANE IS STOPPED

The ground personnel will be expecting the **RIGHT ENGINE** to be shut down first. It is encumbant on the flight crew to shut down that engine as expeditiously as possible to avoid injury to ground personnel.

1. [C] PARKING BRAKE SELECTOR ..... ON

The parking brake is set simply by turning the handle to "ON". It is actually nothing more than a switch and DOES NOT require the Captain to hold the brake during the selection.

> The *ONLY* indication that the parking brake is set is an indication of BRAKE PRESSURE on the forward ***BRAKES and ACCU PRESS*** gauge.

Captain says, "*BRAKES SET, PRESSURE NORMAL.*"
First Officer verifies that the BRAKE PRESS gauge is indicating.

Unless released for cooling, the parking brake should be set even though the wheels are chocked. There is no situation where one would leave the airplane "un-chocked" for a prolonged period, even with the parking brake set since the accumulator pressure will gradually bleed off leaving the airplane unrestrained. It is assumed that the accumulator will hold adequate pressure for parking brakes up to 12 hours.

There are charts in the Limitations section for the hold-over times for brake cooling.

2. [C] SEAT BELT SIGN ..... OFF

3. [C] EMERGENCY EXIT LIGHT SWITCH ..... OFF

4. [C] ENGINES SHUTDOWN ..... REQUEST

WHAT CAPTAINS CAN SCREW UP !!!

DO NOT PRESS THE BRAKE PEDALS DURING ENGINE SHUTDOWN.

If you have the TOE BRAKES depressed (even a little teeny bit) when the engines are shut down, the **BSCU** will memorize the "last braking command". Then when the engines are started next time, there could occur a brake problem.

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ENGINE SHUT-DOWN

[FO] #2 ENG MASTER SWITCH ..... OFF, FUEL FLOW ZERO



If not already shut down and on the Captain request, shut down the number 2 engine immediately after arrival at the gate.
Verify engine shutdown by observing zero fuel flow, decreasing EGT and N1.
NOTE: *Failure of the EGT to decrease after turning the ENG MASTER switch OFF may indicate engine tailpipe torching.*

This is a typical check-pilot ruse, so be ready. The procedure is on the QRC, so ask for the QRC checklist.

[C,FO] ESTABLISH ELECTRICAL POWER

IF USING EXTERNAL POWER:

1. **[C,FO] Verify the EXT PWR AVAIL light ..... ON**
2. **[C,FO] EXTERNAL POWER SWITCH ..... ON**
3. **[C,FO] VERIFY "ON" LIGHT ..... Illuminates.**

IF USING APU POWER:

1. **[C,FO] Verify the APU PWR AVAIL light ..... ON**

[FO] #1 ENG MASTER SWITCH ..... OFF, FUEL FLOW ZERO

Once **GROUND POWER** or **APU** available, shut down the #1 engine.
The electrical power will shift over automatically.

or ... Simple PROBLEM

As an awareness item, the Check-Captain may give you a sim problem to see if you are monitoring the parameters ... and this could be a real world problem also. If all the engine parameters are NOT decreasing after selecting the ENGINE MASTER switch OFF, then

[C,FO] PUSH ASSOCIATED ENGINE FIRE SWITCH.

This will cut off the fuel to the engine at the Low Pressure Valve. The engine will continue to run until it has burned the remaining fuel in the fuel line. This will take about ONE L-O-N-G minute.

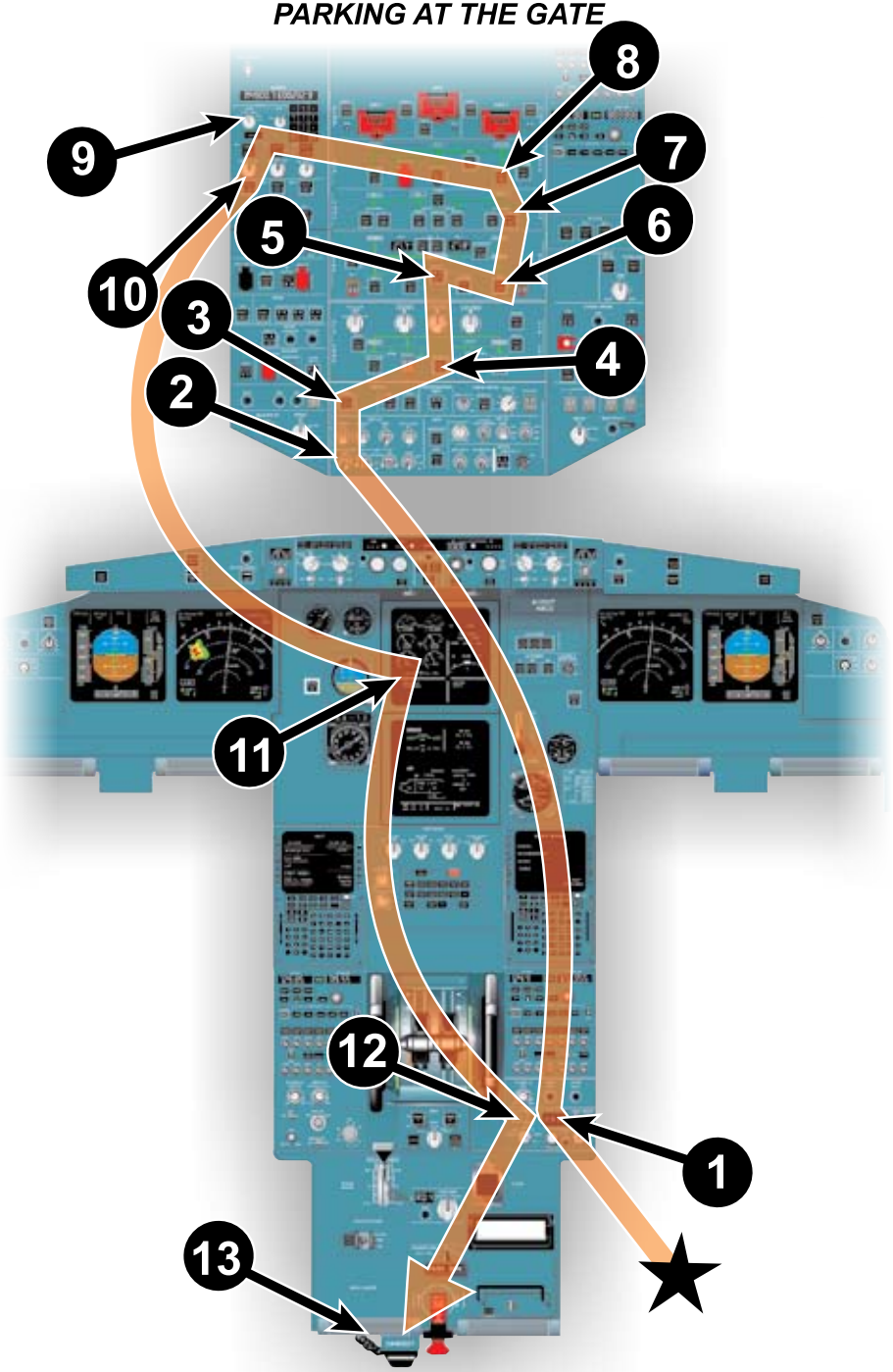
NOTICE THE DIFFERENCE BETWEEN THESE TWO SITUATIONS:
1. QRH ... All engine parameters decreasing EXCEPT EGT.
2. Simple problem ... When ENG MASTER off, engine continues to run.

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FIRST OFFICER FLOWS

PARKING AT THE GATE



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FIRST OFFICER FLOWS

PARKING AT THE GATE

1. TRANSPONDER MODE SELECTOR ..... STBY

2. BEACON SWITCH ..... OFF

This is the signal to all the ground and servicing personnel that the engines are shut down and it is safe to approach the aircraft.

3. ENGINE ANTI-ICE SWITCHES ..... OFF

4. APU BLEED SWITCH ..... AS REQUIRED

If you are going to use the APU for CABIN air conditioning; wait until the engines are shut down before selecting the switch ON to prevent engine fumes from being pumped into the cabin.

5. CROSSBLEED SWITCH ..... AUTO

6. #2 ENGINE GENERATOR ..... ON

Required when single engine taxi procedure used.

7. FUEL PUMP SWITCHES ..... OFF

There are SIX PUMP SWITCHES to de-select.

8. YELLOW ELECTRIC HYDRAULIC PUMP ..... OFF

Required when single engine taxi procedure used.

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9. IRU ..... CHECK

This is called the:
POSITION DEVIATION AND RESIDUAL GROUNDSPEED check.
Here is how we do it.

- Select the POSITION MONITOR and Check each IRS position DEVIATION. If position deviation greater than **5NM** *REPORT DEFECT.*

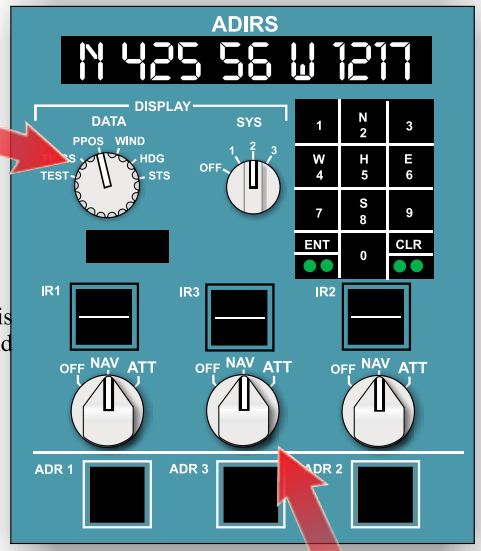
-Select the TK/GS position and Check each IR residual groundspeed. If greater than or equal to **15 Kts** REPORT DEFECT.

To report defects:
Send an MRM code 3489X, where X is the IRU unit (such as 1, 2, or 3) and include the following data field:

EXAMPLE of a possible message:

POS DEV 1.6 NM
GS 16 KTS
2.8 HRS IN NAV

Where the time in NAV is the trip time.



10. IRUs ..... ALL OFF

11. ECAM STATUS ..... CHECK

ALL abnormal ECAM items should be cleared. Contact MAINTENANCE personnel if a maintenance status message displays.

12. TRANSPONDER CODE SELECTOR ..... SET ZERO

13. DOOR EVACUATION SLIDES ..... DISARMED

THIS IS BIG!



You ***MUST*** ensure that ALL DOOR SLIDES are disarmed. If a cabin door is opened while it is armed, the slide will deploy and there is the potential for some serious injury. The FLIGHT ATTENDANTS are the big players here, and they will initiate a call to you using the interphone telling you that the doors are disarmed. If you are arriving at the gate and they haven't called ... initiate a call to the them for door disarmed confirmation.

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CAPTAIN and FIRST OFFICER FLOWS

FINAL ITEMS for PARKING AT THE GATE

14. TRANSMISSION KEYS ..... OFF



15. INTERPHONE VOLUME KNOBS ..... FULL UP

16. LOUDSPEAKERS ..... ON

17. CRTs ..... DIM

18. PARKING CHECKLIST ..... COMPLETE

19. REPORTS ..... COMPLETE

It is ultimately the Captain's ***RESPONSIBILITY*** to see that all required maintenance, company reports, defect notifications, and ATC flight plan closure and terminations are properly filed ... however, it is a joint operation by both the Captain and the First Officer. It is ***ALWAYS*** desirable for the crews to seek out and debrief the maintenance personnel on mechanical problems in addition to the written reports in the log book.

20. FINAL ITEMS checklist ..... COMPLETE

Before you remove your flight bag, slide the seat forward and leave it in the full forward position. Unless otherwise directed, it is customary to leave the cockpit door open.

CLEAN UP YOUR MESS

and generally leave the flight station in the same or better condition that you found it.

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SECURE THE COCKPIT FLOWS

IF OVERNIGHT or REMOVAL OF ELECTRICAL POWER

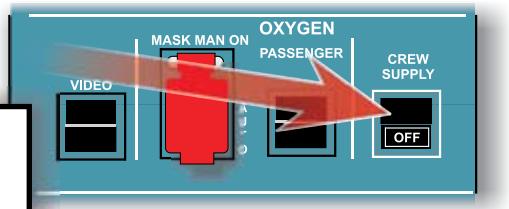
1. [C] PARKING BRAKE ..... SET, PRESSURE NORMAL

When parking for a prolonged period, keep in mind that the accumulator will bleed off pressure over time. The flight manual says that it will take "more than" 12 hours before it can no longer "set the brakes". With that in mind, if we are leaving our shiny jet as some location for awhile ...
CHECK THAT THE WHEELS ARE CHOCKED.

The ONLY confirmation that the parking brakes are set is an indication of pressure on the **BRAKES and ACCUMULATOR PRESSURE** indicator.

2. [C] CREW OXYGEN SWITCH ..... OFF

When parking for a prolonged period, keep in mind that the OXYGEN will bleed down if left on..



MINIMUM CREW OXYGEN PRESSURE REQUIRED FOR DISPATCH:
★ **850 PSI**

It is a good idea to pass on to maintenance if the O2 is getting low.

3. [FO] NO SMOKING SIGNS ..... OFF

4. [C,FO] CRTs ..... OFF

WHEN APU NO LONGER NEEDED:

5. [FO] APU BLEED SWITCH ..... OFF

6. [FO] APU MASTER SWITCH ..... OFF

CAUTION

Wait 2 MINUTES after the APU AVAIL light goes out to allow for the closure of the APU FLAP before turning OFF the batteries.

6. [FO] BATTERY 1 and 2 SWITCHES ..... OFF

GO TO LAYOVER HOTEL.

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THERE ARE at least 10 SCREW UPS!

... any ordinary garden variety Airline pilot can experience!



This list is by no means all the ways that pilots can ruin a otherwise perfectly good afternoon. Even if I were to expand the list to include everything I could think of ... there is always some brilliant brain surgeon pretending to be a pilot out there that figures out a new way to ***SCREW UP!***

For openers, here are three THRILLING

BRICK WALL OPPORTUNITIES.

Here is the rule: *The SPEED BRAKE lever must be in the RET position and DOWN position prior to arming the ground spoilers.* Here is the problem. The autobrakes system can be armed with the PARK BRK selected ON, and further, auto-braking is initiated by ground spoiler actuation, that is, the ground spoiler lever being moved "'***OUT OF THE DOWN DETENT***!" Should you start to taxi with the auto-brake in MAX and pull the spoiler lever up to activate them for slowing the taxi or if the ground spoiler lever is out of the DOWN position when you select autobrakes to MAX ... the autobrakes may activate.

Look at it another way, if you have both MAX BRAKING selected, and the ground spoiler lever out the detent ... Wham, the airplane will stop like right now! ***OOOOO, BRICK WALL!!!***

Along the same thread ... If during the flight control check ... and a good crew can do the check in a mere matter of seconds. There is the problem. If the First Officer is too quick to go from flight control check to the next item which is ARM the autobrakes ... Second opportunity to screw up the same way ... hitting a brick wall. Not pretty.

Here's the rule: ***Ensure that the ground spoilers are retracted prior to arming the autobrakes.***

My third "**BRICK WALL** goober involves the infamous BSCU ... clearly the most misunderstood system on the Airbus.

Here's the situation: released from guidance with a clearance to taxi. You push up the thrust levers and crank the tiller bar to start your turn and "OMIGOSH" you don't have any steering or brakes. Here's where the BIG PROBLEM occurs.

The Captain yells at the First Officer, "*Shut off the anti skid and nosewheel steering switch.*" All the while desperately pushing on the toe brakes on the rudder pedals.

"***WHAM"... OOOOOPS!"*** You hit the brick wall and depending on how much inertia the airplane has accumulated during the evolution, the "g" loading during the stop will make you an infamous target for derision with the flight attendants.

The rule for this: ***Release the brake pedals before selecting the A/SKID & N/W STRG switch to OFF.***

"KOZ" problem

The Captain decides that he will s-l-o-w-l-y and deliberately increase the thrust on take-off so as to avoid alarming the customers, or perhaps he is concerned that a potential icing situation that he feels warrants a smoother application of power from that supplied by the FADEC.

Here is the problem: This airplane has a designated KOZ (keep out zone) where inlet scoop turbulence can interfere with engine spool-up and potentially result in an asymmetric thrust situation.

Need I describe the panic as I imagine the nosewheel slewing to the side and the airplane looking at the runway edge approaching.

WHOOOPS!

TAIL STRIKE

Here is the BIGGEST cause for TAIL STRIKE in this airplane.

DISCUSSION: The marvelous side-stick is an incredible tool. However, it has some quirks. One of which is the fact that if BOTH sticks are moved simultaneously, it will apply the ALGEBRAICALLY SUM the inputs of both sticks.

If both pilots "get on the stick" the situation becomes quickly unmanageable.

THE RULE: If the transfer of the airplaneis made prior to take-off, the Captain SHOULD make the following statements: "*You have the airplane, the parking brake is set/released*".

HERE'S AN ALTITUDE BUSTER.

Ever on the lookout for ways to "stay ahead of the airplane", when passing QNE ... a quick witted steely eyed airline professional may decide to "pre-select" the destination altimeter setting. That way, when the descent is started, a mere flick of the switch and the QNH will already be there waiting to be selected.

BUT ... and here is a problem that is repeated every day in cockpits around the world ... the STD never gets selected and the airplane levels off at the altitude represented by the QNH of the destination airport.

Let's look at some numbers here. Say destination QNH is 28.00. If we preset 28.00 and left it in the barometric selector window instead of selecting STD (29.92) at QNE. How would that affect our cruise altitude?

Answer, we would level off about ***2000 feet HIGH***! ***WHOOPS!***

ALPHA PROTECTION AT ALTITUDE. YIPE!

The EXPED switch was designed to make life easy for the pilot who gets HIGH on descent all the time. And in the descent function, its major usefulness is doing the "HIGH DIVE" or emergency descent. Some major airlines restrict its use to that only ... and here is why.

SYSTEM REVIEW: Depressing the EXPED switch will result in the airplane making the most expeditious descent or climb to the altitude selected on the FCU. During climbs, it will retard the speed to the "GREEN DOT".

Here is the problem: Green Dot airspeed target numbers above about 25,000 feet do NOT provide enough MACH number ... and may trigger α PROT (Alpha protection).

HERE'S THE RULE: ***EXP CLB not recommended above FL 250.***

"APPCH" button PROBLEM

Here is the situation: You are all set up for an autoland right down to CAT III minima. But, no sweat, you have everything all ready and working smoothly. Then, at GLIDE SLOPE capture, the AUTO-PILOTdisengages and the FLIGHT DIRECTORS revert to some goofy HDG-V/S mode. What is happening???
The Problem: You armed the ILS APPR mode above 8000 feet AGL. Radio signals are not available above this altitude, and with the APPR button armed, the autopilot disengages at glideslope capture and Flight Directors revert to HDG-V/S.

TAKE-OFF TOGA LK

Situation: You have just taken off and the tower advises, "*You have crossing traffic at twelve O'clock, maintain your present altitude*".
You depress the VERTICAL SPEED selector on the FCU and the nose comes over, the airplane levels off and since the airspeed is still in TOGA, the overspeed red bricks drop really quick on the speed tape. Your immediate response is to grab the thrust levers and pull them to IDLE.
Tower calls, "*Continue your climb*". You push the thrust levers to the CL notch, look at the ECAM and see that it is annunciated and the engine N1 looks about right.
The next thing you notice is the 'A-FLOOR" annunciated, followed almost immediately by "TOGA LK" and the thrust coming on is a powerful rush.
Before we take this to it's ultimate extreme, here is the problem: When you pulled the thrust levers to IDLE, the A/THR de-selected. Placing the thrust levers to the CL detent did not engage the auto-throttles and you were trying to fly at some derated thrust setting. Eventually the airplane went into an α protection mode and TOGA LK ensued.

To restore normal operation, you will need to do a couple of things. Here is a recommended solution.
1. PUSH the thrust levers to the TOGA detent to match the power setting.
2. Depress the A/THR switch "OFF" and then "ON" to deselect the TOGA LK.
3. Pull the thrust levers back into the CL detent.

My palms get sweaty just thinking about it.

NOSEWHEEL TAXI PROBLEM

There are two characteristics of the NoseWheel steering that we have to get used to:
- The nose gear slants forward. This geometry means that as the wheel is rotated, less and less of the upper wheel is in contact with the surface and the frictional footprint is increasingly diminished. That means that the nosewheel has a greater tendency to slip the more the tiller bar is cranked over.
- Coupled with that is the variable rate feature that increases the rate that the wheel turns proportionally with the tiller displacement. This means that the more you turn the tiller, the faster the wheel turns.

Here's the problem: If you are operating in slippery or wet runway conditions, and the nosewheel starts to slip ... there is a tendency to "increase" tiller bar displacement to compensate. That is exactly the wrong response as it exacerbates the problem.
Solution: Slow down and back off instead of increasing the demand.

I have a bunch more ... and I think you can identify a few of your own ... but let's call it a day and wrap this thing up.

APPENDIX

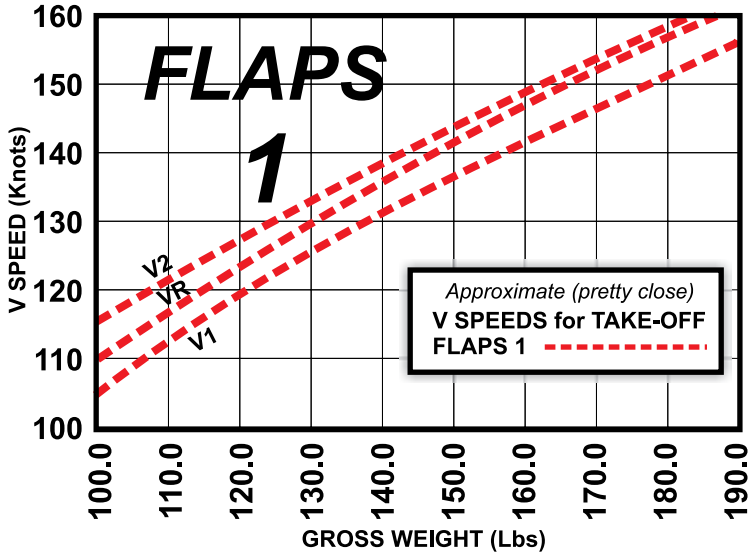
... and other left-over and
"ex cursus" material

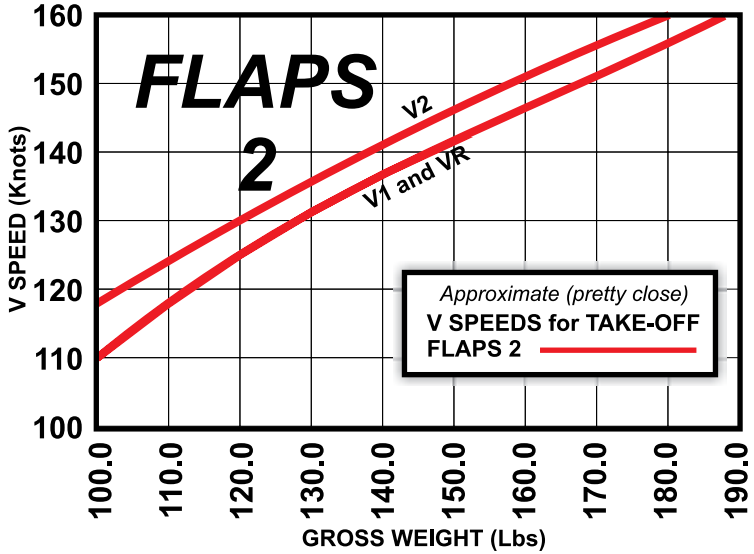


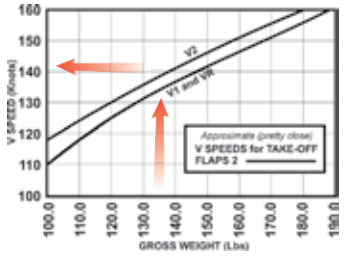
SCREEN SHOT USED BY PERMISSION FROM
WILCO/FEELTHERE A320 SERIES ONE SIMULATION

QUICK and DIRTY CHARTS for ESTIMATES ONLY.

V SPEEDS guess chart



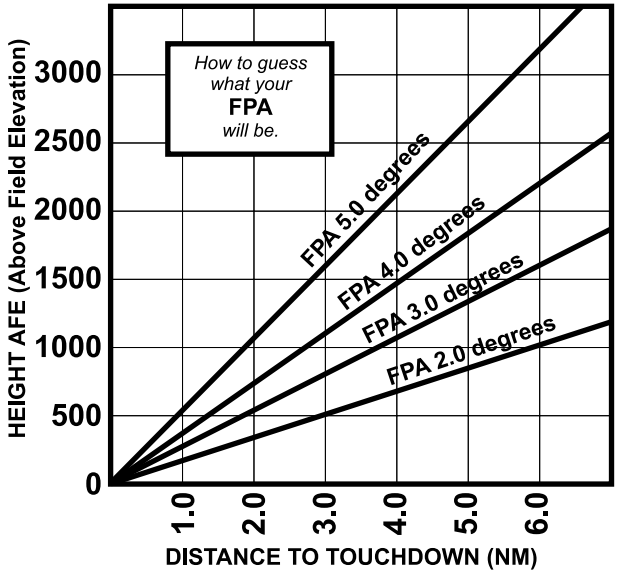


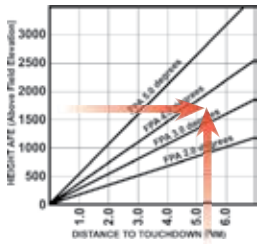


SAMPLE:
Flaps 2
136,000 Lb takeoff weight,
V1 and VR is about 132 Kts,
V2 is about 139 Kts.

QUICK and DIRTY CHARTS for ESTIMATES ONLY.

FLIGHT PATH ANGLE (FPA)





SAMPLE:
If you are 5.4 NM from touchdown, and at 1600 feet (AFE), then the FPA is about 3.5 degrees

MAX WEIGHTS

	A320	A319
	GROSS WEIGHT (1000 #)	
TAXI	170.6	167.3
TAKEOFF	169.7	166.4
LANDING	★ 142.2	★ 137.7
ZERO FUEL	134.4	128.9

MAX ALTITUDE

★ 39,100 feet

MAX WIND

	A320		A319	
WIND DIRECTION	TAKEOFF	LANDING	TAKEOFF	LANDING
Crosswind	★ 29 Kts	★ 33 Kts	★ 29 Kts	★ 33 Kts
Crosswind with GUSTS	38 Kts		38 Kts	
Tailwind	★ 15 Kts	★ 10 Kts	★ 10 Kts	

These are the maximum demonstrated crosswinds with flight controls in normal and direct law (with or without yaw damper).

★ *indicates a required memory item.*

QUICK REFERENCE CHECKLIST

ENGINE TAILPIPE TORCHING DURING START/SHUTDOWN

CAUTION: DO NOT PRESS ENG FIRE SWITCH !

Manual start switch ..... Off
Engine master switch ..... Off
Bleed air switch ..... Establish
Beacon switch ..... On
Engine mode selector ..... Crank
Manual start switch ..... On

When fire is out:
Manual start switch ..... Off
Engine mode selector ..... Normal

--------- CHECKLIST COMPLETE ----------

DRIFTDOWN

Autopilot ..... Engage
Autothrust ..... Off
Thrust levers ..... FLX/MCT
Green dot speed ..... Set
FCU altitude ..... Set
Open descent ..... Initiate
Heading ..... As required
ATC ..... Advise

--------- Refer to Reference Action Items ----------

SMOKE, CABIN/COCKPIT

Oxygen masks and regulators ..... On, 100%
Crew and flight attendant communications..... Establish

Cabin fans switch ..... Off
Blower switch ..... Override
Extract switch ..... Override
Galley/galley and cabin switch ..... Off
Cabin signs ..... On
Descent ..... Initiate
WARNING: *Do not delay descent or diversion to find smoke source.*

--------- Refer to Reference Action Items ----------

AIRSPEED/MACH UNRELIABLE

Autopilot ..... Disengage
Autothrust ..... Off
Flight directors ..... Off
Attitiude, thrust ..... Adjust
- **Below thrust reduction altitude ....15°, TO/GA**
- **Above thrust reduction altitude ..... 10°, CL**
- **Above 10,000 feet MSL ..... 5°, CL**

--------- Refer to Reference Action Items ----------

EMERGENCY DESCENT

Oxygen masks and regulators ..... As required
Crew communications .....Establish

FCU altitude (safe altitude or 10,000'..... Set
If structural integrity in doubt:
Limit airspeed and avoid high maneuvering loads.
FCU expedite switch ..... Push
Heading ..... As required
Target speed ..... Confirm, .80M/340 KIAS
Thrust ..... Confirm, idle
Speed brakes ..... Extend
Transponder 7700
ATC ..... Advice

--------- Refer to Reference Action Items ----------

EVACUATION

ATC ..... Advise

Parking brake ..... Set
Dome light switch ..... Bright
Differential pressure ..... Check zero
If not zero, MODE SEL to MAN, MAN V/S CTL to UP
Engine master switches ..... OFF
Evacuation ..... Initiate
Engine and APU fire switches ..... PUSH
Illuminated fire switch(es):
Agent switch(es) ..... Push
Sliding windows, escape lines ..... As required

--------- CHECKLIST COMPLETE ----------

LIMITING AIRSPEEDS and ALTITUDES

COCKPIT WINDOW OPEN

MAXIMUM	200 KIAS

DESIGN MANEUVERING SPEED *CAUTION* -VA

CAUTION

RAPIDLY ALTERNATING LARGE RUDDER APPLICATIONS IN COMBINATION WITH LARGE SIDESLIP ANGLES MAY RESULT IN STRUCTURAL FAILURE AT ANY SPEED, EVEN BELOW VA.

FLAPS/SLATS EXTENDED SPEEDS - VFE (KIAS)

These are the absolute MAXIMUM DO NOT EXCEED speeds. If they are exceeded, a MAINTENANCE REPORT and INSPECTION IS REQUIRED!

FLAPS	1	1 + F	2	3	FULL
VFE	230	215	200	185	177

FLAPS/SLATS EXTENDED SPEEDS - VFE-10 (KIAS)

*To preclude a FLAP OVERSPEED problem, these are the OPERATING MAXIMUMS promulgated for your use. Treat these as **ABSOLUTES**. These are the numbers you should memorize and use.*

FLAPS	1	1 + F	2	3	FULL
VFE - 10	★ 220	★ 205	★ 190	★ 175	★ 167

LANDING GEAR SPEEDS - VLO/VLE

RETRACTION *(GEAR COMING UP)*	★ 220
EXTENTION *(GEAR GOING DOWN)*	★ 250
EXTENDED *(OPERATING WITH GEAR DOWN)*	280 KIAS/.67 MACH

MAXIMUM OPERATING SPEED - VMM/VMO

ABSOLUTE MAXIMUM OPERATING SPEED	★ 350 KIAS/.82 Mach

MAXIMUM TIRE SPEED

TIRES *(restricted NOT maximum)*	195 Knots groundspeed

MAXIMUM ALTITUDE *(Pressure)*

TAKEOFF and LANDING	9200 feet
OPERATING	★ 39,100 feet

MAXIMUM OPERATING ALTITUDE

FLAPS	★ 20,000 feet MSL
GEAR	25,000 feet MSL

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