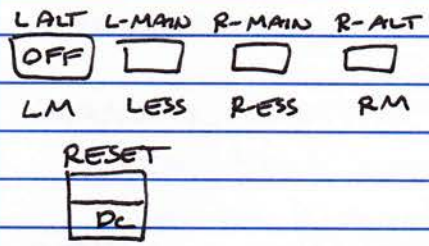
ELECTRICS

3/10/6

Boost Pumps



Electrical Power
- AC → Motors, heaters, chargers
- DC → Everything else

Battery Lights "ON" if:
1) Powering ESS DC Bus
2) If using aux pump
3) if APU starter engaged

Batteries → 53 amp-hour
Should last 30mins (assumes 2 APU starts)

Electrical Panel Set
- 5 switches IN (2 batts, 3 gens)
- 5 switches OUT (Reset, 2 bustres, Ext Pwr, E-Inv)

Generator Switches
- IF IN, msg shows function On or OFF
- IF OUT, stays black
- Green "ON" at 57% HP
- "OFF" if Failed

APU Gen "ON" @ 99% +/- 2 seconds

45 Flow → APU ON, SGs NORM, Master Sw ON, IRS NAV, ~~APU~~

3/10/6

Reset

DC → MB-19
Press RESET once

RESET
AC → EA-7
Gen off
Press RESET
Gen ON

1:35 BusTie Switch → All this switch does is allow GCU/BPCP to close or prevent it from closing

E-INV Switch → All this switch does is prevent relay from closing

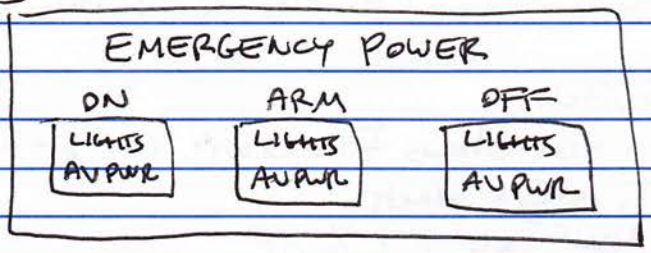
1:46 Standby Electrical Power — Quickest source of sustainable AC power requires electrical power to come on

HMG powers 2 standby buses (DU 3, 4)
AUX TRU (LESS RESS)

HMG 10 KVA - no altitude restrictions — LEFT HYD OR PTU

HMG Overwater Test N1-12 — Speed Brakes full travel 3 sec w/HMG

1:53 Emergency Power (E-BATTS)
- Avionics LEER/REER (Left and Right)
- Lighting (REER) AEER) (Forward and AFT)



TEST
1) ARM
2) 'ON ("LIGHTS/AV PWR") illuminated
3) Check STDBY Instruments, gear lights, RFMU, Audio Control Panel
4) Batteries ON ✓ 22V
5) OFF

3/10/6

AUX TRU

TRU switches → allow L DCMAIN, R DCMAIN to be powered by opposite TRU

2:01 Galley master load sheds if less than 2 generators on in Flight

CABIN WDO-HT "IN AND OFF" during preFlight goes black once W off W
can be bypassed for 10 mins on 10 mins off

NBPT → any time 1 DG involved, except abnormals
APU → EXT or EXT → APU causes break

Any time you have a BPT, check data, ebats, pressurization control, all green data

Batteries weigh ~ 93 lbs

E-Inverter powers cabin press control

Batteries charge 38A, variable Voltage

AUX, Left Main, Left ESS TRU under Fwd Floor
Right ESS, Right Main in REER

"Guys I gotta tell you I'm not in a good mood today. I came home yesterday and found my next door neighbor in bed with my wife. 'Vicky,' I said, 'what are you doing?' She turned to him and said, 'See, I told you he isn't very bright.'"

Bus Power Control Unit — L → NBPT, Ext AC
Additional Duties — R → Ext DC

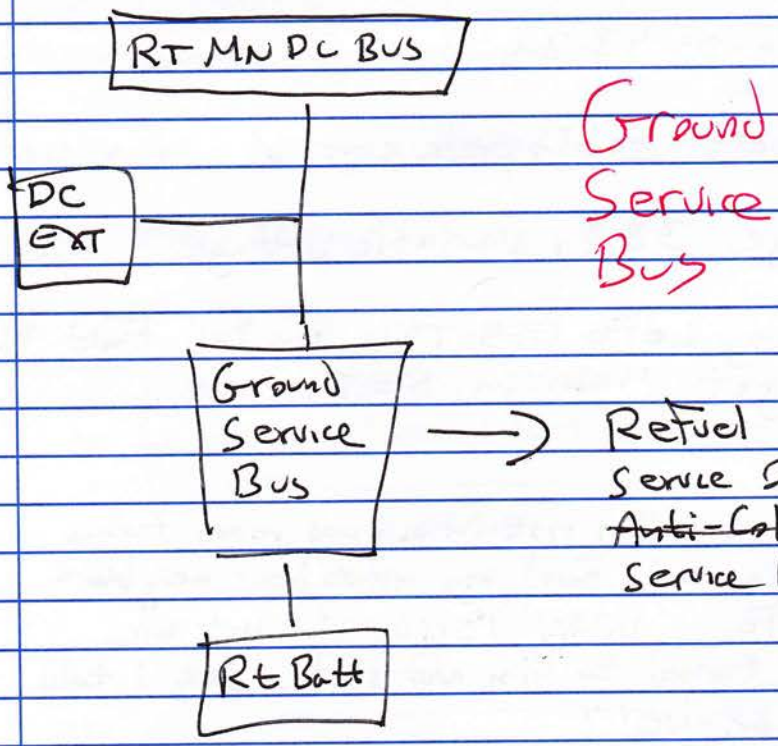
3/10/6

Battery Charge Mode: 38A up to 32.2V down to 28.75
TR Mode: 5DA
Powered by AC Buses

Battery will not charge if < 7 V

5 causes of batt charger fail
- loss of power to charger
- overcurrent
- over/under voltage
- battery over temp
- disconnected sense cable

Outside door switches
- 3 doors, each w/ switch and light
- One door has to be open for switch to work
- Right main DC bus



Ground Service Bus

Refuel
Service Oil, Hyd
~~Anti-Col lights~~ BCN
Service Lights

3/10/6

E-Batts

4 E-BATTS 24V DC 9 amp-hour

Charge Mode: will Fill & charge EBPB in 1½ hour

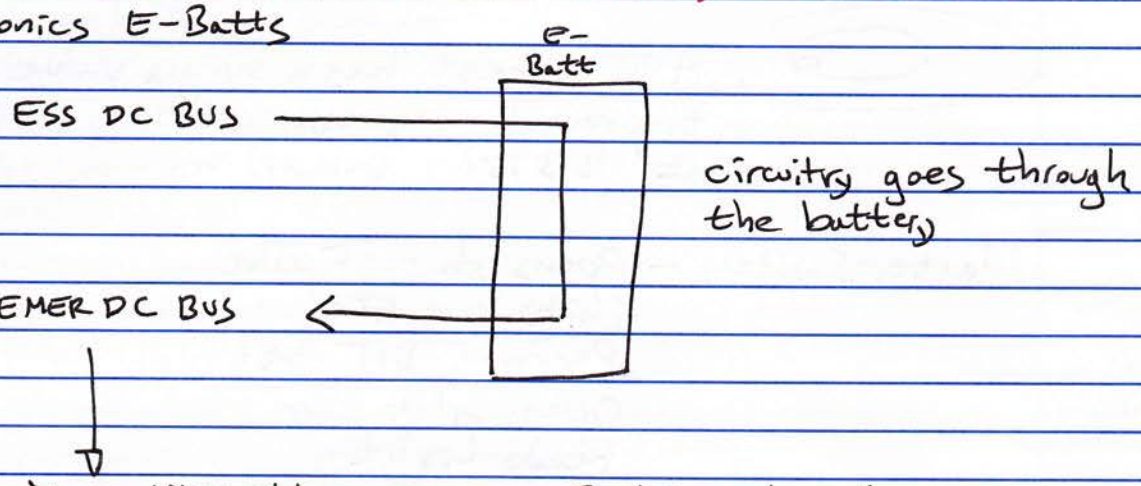
TR Mode: 14A @ 28V DC

On when < 20V DC on DC ESS Bus

Will last 45 mins - 1 hour

All 4 required For dispatch "How many avionics Ebatts?" 2

Avionics E-Batts



Left → VHF #1
RFMU #1
Comb WOW
PAQ
AIU #1
LSDD
IRS 1, 3

Right → Log Gear
L/R Fuel qty
ATC #1
NAU #1
Log Gear Cont
IRS #2

Lighting E-Batts

Left Main AC → Fwd
Right Main AC → aft

Dual Generator Failure
- 4 - Bleed Tubes
- 3 - SBY switches (HMG, LESS, RESS)
- 2 - Display System Control Switches (EICAS, CP-ALT)
- 1 - Fuel Switch (Cross Flow)

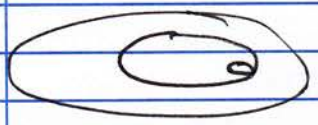
See AFM versus QRH (Gives RESET option)

APU

3/10/6

APU (Honeywell RE220)

Operates up to 45K
Starts up to 43K (guaranteed to 39K)



APU exhaust has a surge value pipe to prevent compressor stalls at 16,375' (~16,500) and above

Above 35K Bleed Air Augmentor Valve will delay start

Master Switch – Opens shutoff valve
Initializes ECO
Performs BIT test
Opens inlet door
Ready Light

Ready light goes out @ 12%

Start Switch – when above 39,000' opens BAAV and starts 15 sec later

Stop – When > 20,000' : load sheds, 100% for 1 min, then shuts down
When <20,000' : load sheds, decelerates ½%/sec for 1 min, then shuts down

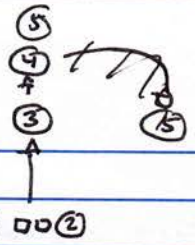
You can hit START during that 1 minute period

Turn master off < 5%
Door starts to close @ 40%, shut @ 10%

APU goes to "Essential Mode" any time operated in air and remains that way until 15 mins or 4 hours after touchdown (depending on ECU)

If in essential mode, will not auto shutdown for 7 items that would normally cause shutdown on ground.

3/10/6



APU Start (NB-1)

1. L/R Batteries ON
2. Battery Volts ≥22V
3. Display Control SG 1 NORM
4. ND ENG/EICAS, SYS/EICAS
5. APU Fire Test (8 lights, 3 chimes)
6. Ensure bottles not discharge
7. Display Control OFF/OFF/OFF
8. ND NORM/NORM
9. APU AIR OFF
10. NAV Light ON
11. L MAIN Boost Pump ON
12. APU Master ON
13. Ready Light, APU Start
14. Ensure GEN on
15. APU Bleed Air ON after 1 min
16. Check TAT Probes for airflow

IF inflight RT BATT OFF (CEA-16)

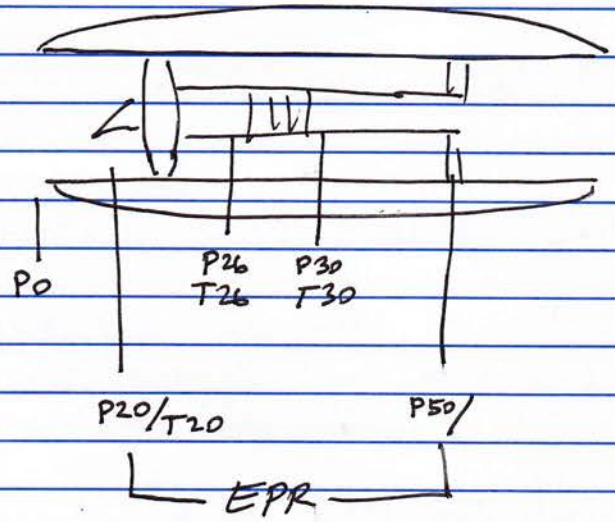
3/13/6

15 Ice Detection System test has ~~failed~~ changed
(See AFM)
- Cowl/Wing A/I - OFF
- Press switch
- Look for CAS messages "Ice detected" "Ice det. Fail"
- Release switch
- Cowl/Wing A/I - AUTO

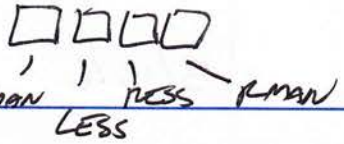
21 Cabin Pressure Controller ✓
- Will be in the "Landing/Auto" Mode
- Press "SEMI", turn altimeter setting to something different (just to see if you can)
- Press "AUTO" and verify bars window switches back to that set in P's PFD
- Press "MANUAL", verify you can close outflow valve
- Drive past 1/2 way
- Move back again
- Press "MANUAL" again to put system back in Auto and verify outflow valve opens

Power Plant

46 Rolls-Royce 14,750 lbs thrust up to 95°
Bypass 4.0 to 1



3/13/6

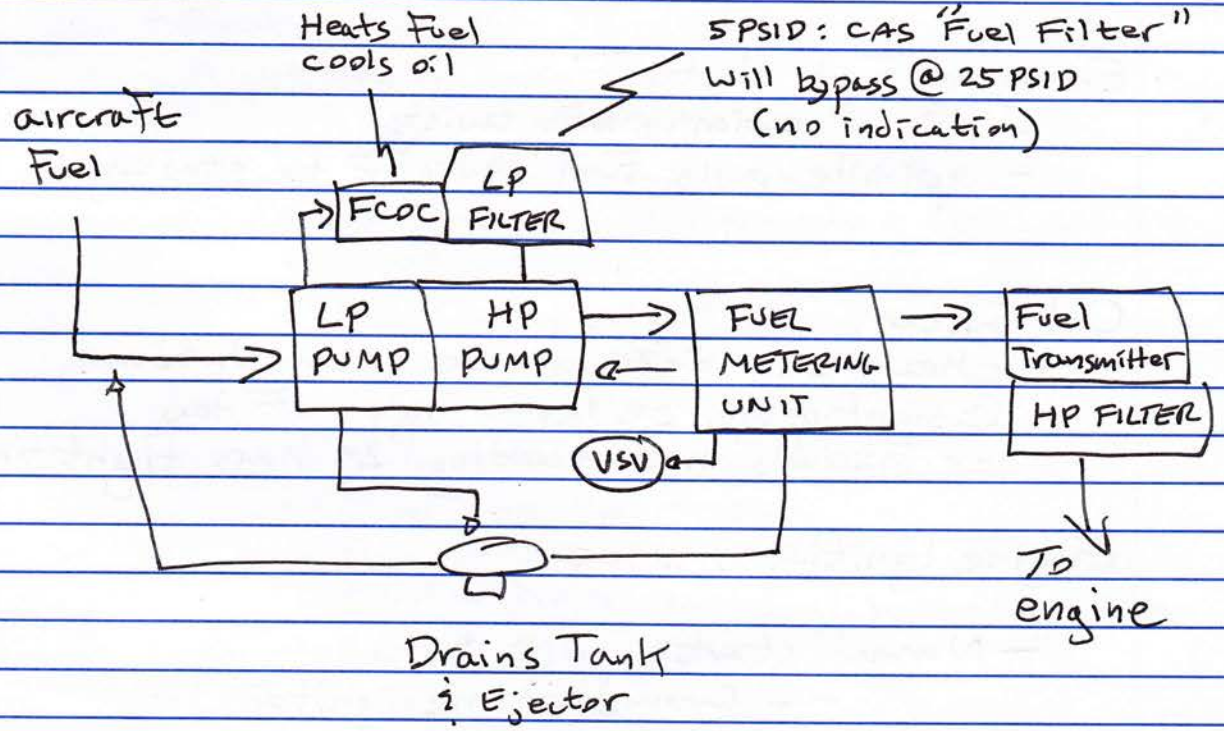
Boost Pumps 

EPR is P20/P50 – no inlet probe (uses pitot)

56 P26/P30

T26/T30 – looks for rapid temperature drop through compressor is water ingestion turns ignitors on

102 FADEC driven by internal 2-channel generator once engine > 35% independent of acft but can revert to ESS DC — FUEL —



Variable Stator Vanes – First 3 stages of HP sends excess air to bypass to prevent compressor stalls
- Controlled by FADEC
- Powered by Fuel metering unit

3/13/6

Boost pumps don't have autostart

Can dispatch w/ one imp

113

Drains tank and ejector
- can hold fuel from 2½ aborted starts
- emptied once engine started
- dumps to NACA if full

Heated Fuel Returns System HFRS

- Comes on @ 0° C
- Turns off @ 10°C
- Doesn't work during crossflow or high fuel flow demands
- Doesn't heat the fuel, it lessons the cooling
- If selected off, FADEC can't use it
- "Coldest I've ever seen tank is -28"

Emergency Fuel shutoff
- if LP section shaft twists
- spindle pulls fuel shutoff to stop engine

Oil System 5-30
- check oil ~~[illegible]~~ minutes after shutdown @ sight gauge on last flight of day or intervals not exceeding 24 hours flight time

Engine Ignition Modes

- Normal start
  - -- Ground - one ignitor
  - -- Air - both
- Alternate start
  - -- Continuous Ignition
- Auto Relight - both
- Quick Relight - both

3/13/6

Start Master Switch → Uses FADEC For normal ground starts

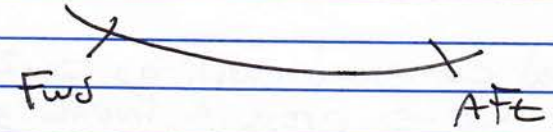
Crank Master Switch → Depends on you

Normally start Right engine first to test PTU

12 Normal Ground Start NC-5

- BCN -- ON
- Parking Brake -- SET / 3000 PSI
- Power Levers -- IDLE
- Gust Lock -- OFF
- L/R MAIN Boost PUMPS - ON
- Engine Start Synoptic Page — shows all but LP
- Bleed air pressure 40 psi min
- Check For tailwind and residual TGT
- Start Master - ON
- Right Engine Start
  - -- Press RENG Start
  - -- SVO will illuminate LP, HP turns
  - -- Good technique Wait For EVM ↓ before adding fuel
  - -- HPF LPF EVM ↓
  - -- Fuel Control Switch
  - -- IGN will illuminate
  - -- Fuel Flow ↑ TGT ↑ Hyd Pressure ↑
  - -- 42% IGN out 47% SVO out
  - -- should stabilize ~450°
  - -- Flow >58% HP, TGT stable, oil temp/press, PTU/R — 3000 PSI Hyd, Single brake / Single Rudder
  - -- Confirm PTU ~3000 PSI
- Left Engine

~~R~~ LP Shaft BDW



no middle support

iF engine shut down 5-20 mins

3/13/6

Rotor Bow start
- Crank start
- Wait till max crank ~28% HP
- Time 30 seconds
- Then fuel control run

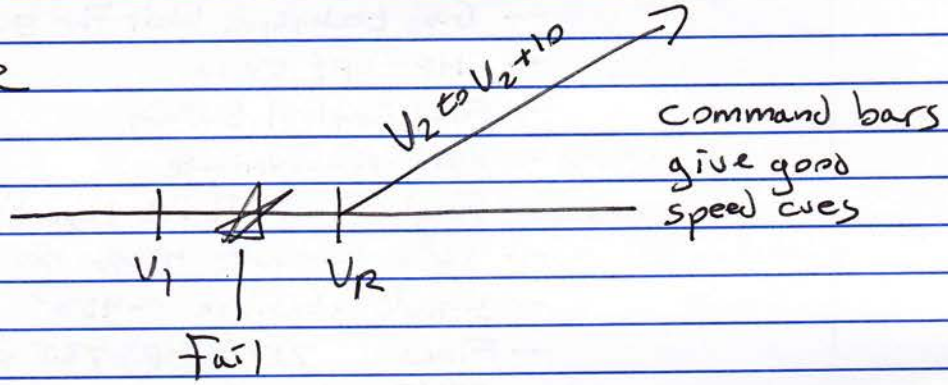
Alt Rotor Bow start
- Crank prior within 20 mins of engine start

Abort Start → Fuel Control Switch off
Master Start Switch off

27 Max TGT 150°C prior to start

- Will have to crank (up to 3 mins) to cool
- Can use Master Start in anticipation of cooling and set FCU at <150
- Caution, if starter > 2 mins, FADEC may abort start

Engine Failure



Climb out @ V_2+10 till 1500'
then accelerate
Flaps up @ V_2+10
climb @ V_{SE}

Speed command will go to 200 outside ATA
SO → press MANUAL speed @ V_{SE}
↓
FLCH

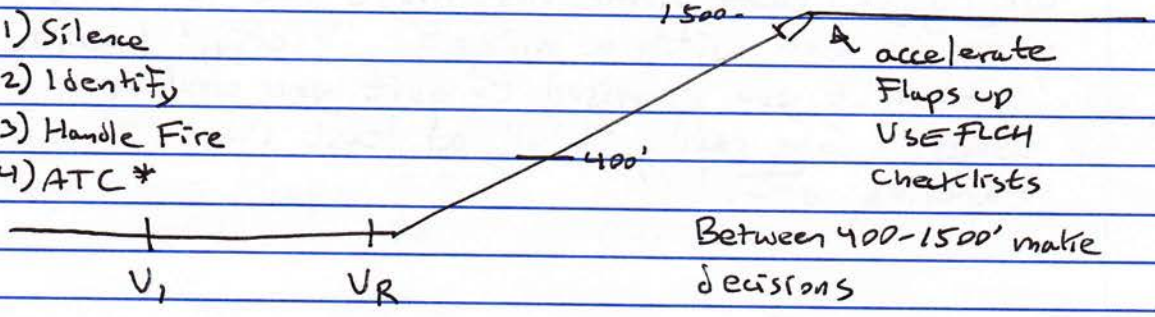
3/13/6

Could BOX MCT on TRS page - but don't bother

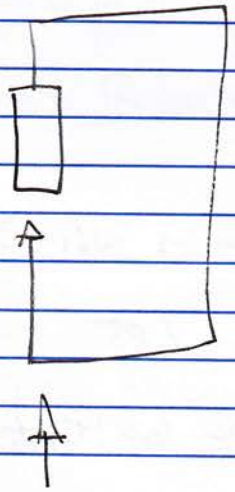
Confirm which Power Lever, then idle
" " Fuel Control Switch, then off
Need to confirm which FCG
→ is apparent on PFD if A/P engaged
AP1 or AP2

IF any hydraulic pressure at all, engine not seized.

FSI → Don't do anything until 1500' other than GU, silence warning, climb @ V_2+10



* Declare emergency "I'll get back with you"



← Set up FMS, change destination, change altitude, arrival, tune freq (hold?) MDA

← F10, auto speeds from here on

Final → set Missed Altitude
HDG to course
✓ Approach speeds
DC NAV

3/13/6

Airstart Modes
- Automatic 99% of the time
  Assisted < 250 KCAS is faster/cooler
  gives normal lights, CAS
  Windmill - no start lights, icons
  if assisted and speed goes up, starter drops
- Airstart Starter Assist
  -> For when Master Switch doesn't work
- Airstart Windmilling
  -> Only if in icing conditions

"Well guys I came home last night and found my wife in bed with a miget. 'Vicky,' I said, 'I thought you promised to quit your cheating ways.'" She said, 'Well, at least I'm tapering off.'"

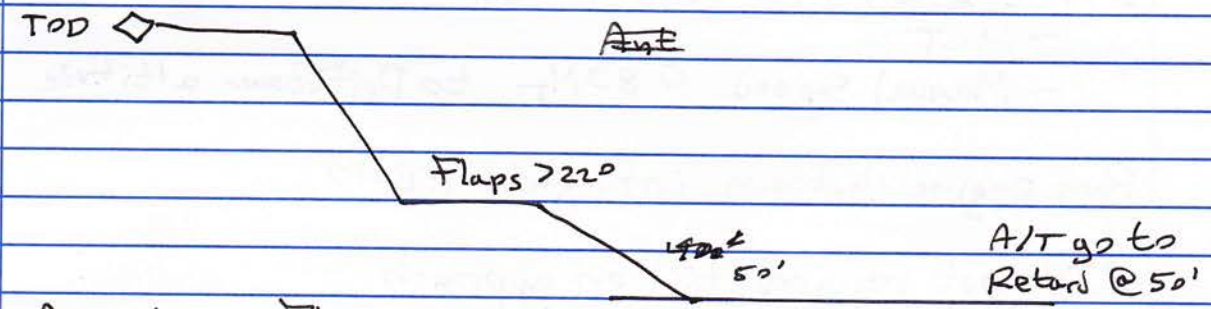
AUTO RELIGHT
- When difference between command N_2 and actual N_2
- Engine above idle
- Till 35% N_2
- It could fail if bad FADEC
- If you switch channel it may start

QUICK RELIGHT (Air Only)
- Turn fuel control switch OFF then on w/in 30 sec

A/T Requires valid EPR target 1.05
ISO valve closed
Goes to hold mode @ 60 Knots till 400'

3/16/6

ALT Control – Soft Reversion amber "ALT"
- FADEC does this when it can't see EPR and will leave engine thrust where it was
- If you see EPR it may have been intermittent
  -- Box, unbox ALT
  -- Might get it back
- If no EPR, hard select ALT on both engines
  (Checklist involves bringing power lever to idle)



Any time Flaps < 22°
→ low idle 64–70%

Any time Flaps > 22°
→ high idle 70–85%

Touchdown +5 seconds → low idle

Thrust Reversers
Black – Stowed
White – In Transit
Green – Deployed
Amber – Uncommanded on ground
Red – Uncommanded in air

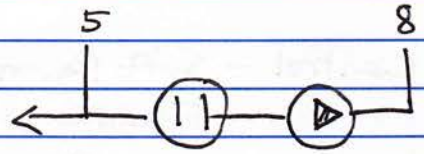
If T/R deploys uncommanded, engine goes to idle
power lever stays

T/R cannot be deployed w/o Weight on Wheels or Wheel Spin Up

Need Main DC power

3/16/6

Cowl A/I – 5th Stage only



valve fails open
valve needs 5th stage to hold close

Engine Vib amber > .79
check secondary sensor
check other indications

Drift Down Procedures in Volume 4
- MCT
- Manual Speed 0.80 M_T to Driftdown altitude

Run engine shutdown in Flight EB-17

PTU not required till on approach

See AFM For SF 10g versus QRH EB-18